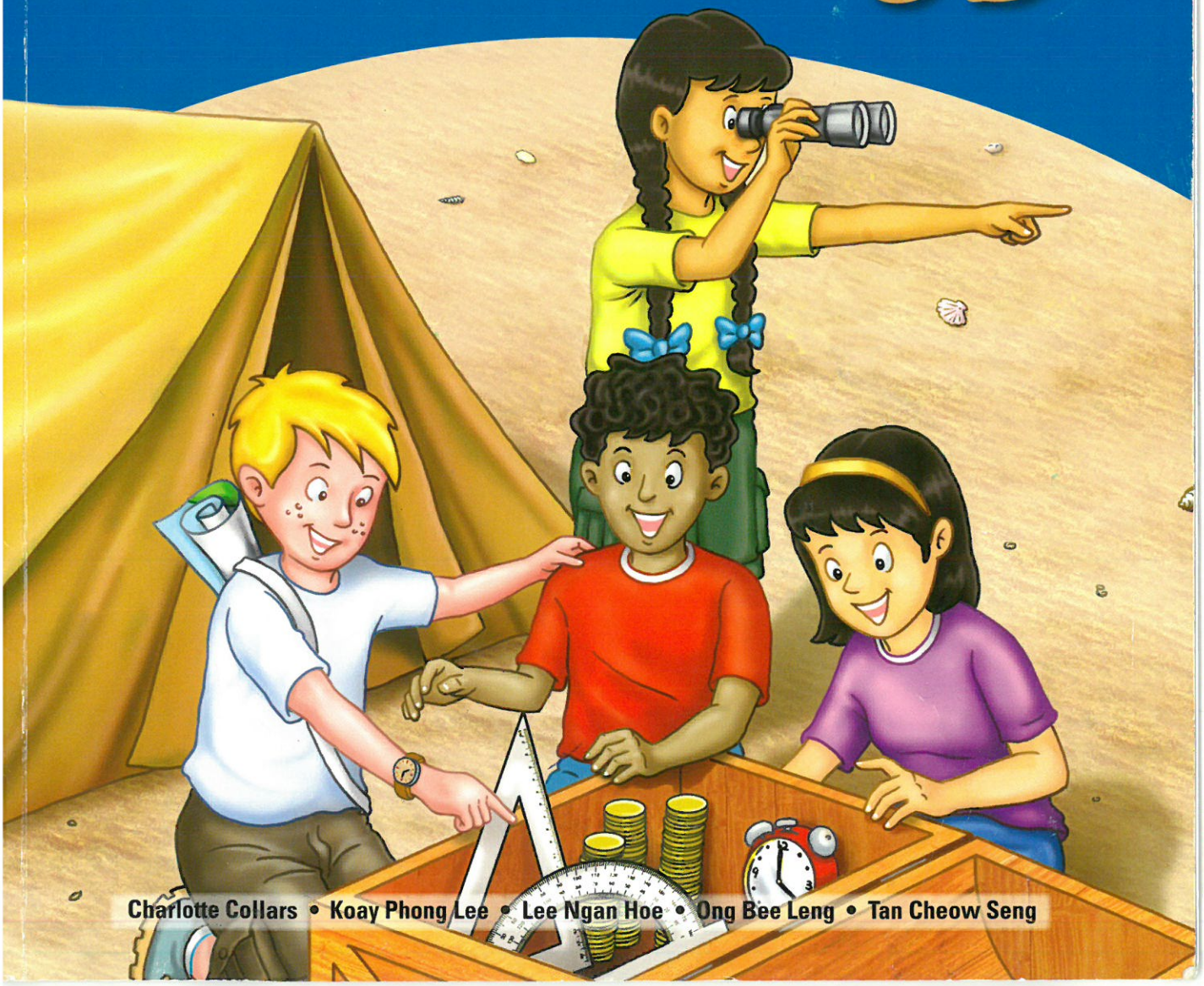
Marshall Cavendish Education

Shaping Maths

COURSEBOOK 2nd Edition 6B



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PREFACE

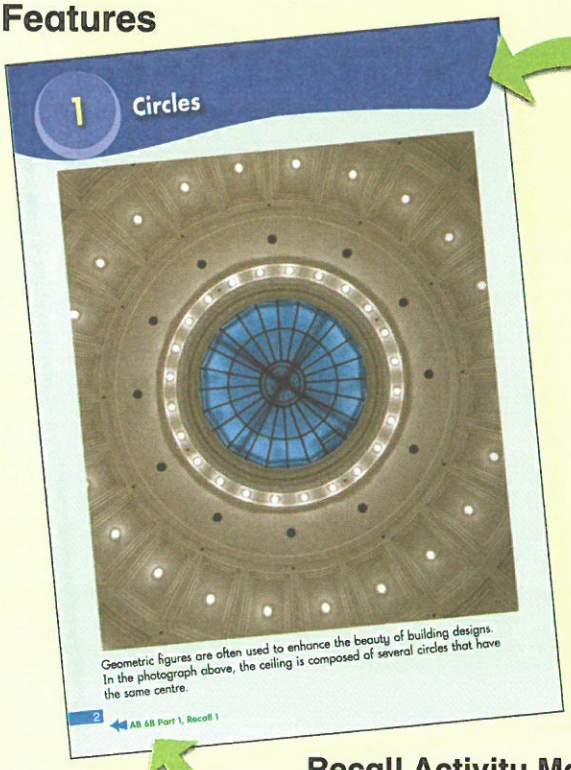
Shaping Maths is an instructional package written according to the latest Primary Mathematics Syllabus provided by the Ministry of Education, Singapore. The package is designed to meet the learning needs of pupils from Primary 1 to 6. For Primary 6, the package consists of two coursebooks, four activity books and a teacher's resource pack.

Approach

The Primary 6 (2nd Edition) package is designed to provide continuity in the way pupils experience Mathematics through the lower primary packages. Wherever possible, familiar everyday situations are used to introduce new topics so that pupils will be able to relate the application of new concepts learnt with their daily lives. Through its concrete-pictorial-abstract approach in implementing the spiral curriculum, this package seeks to promote pupil engagement and enhance the learning process.

Continuing research in education has resulted in the introduction of new features in the second edition. Through these features, educators are further equipped with various strategies in addressing teaching and pupils' learning needs. These features also include more open-ended questions so as to encourage exploration and in-depth thinking among pupils. Thus, mathematically inquisitive learners are born!

Features



Chapter Openers
Encourages active pupil participation in learning.

Friends of *Shaping Maths*
The themes in the coursebook revolve around Aini, Bala, Caili and David. The characters help to stimulate pupils' interest and heighten their involvement in the learning process.

NEW

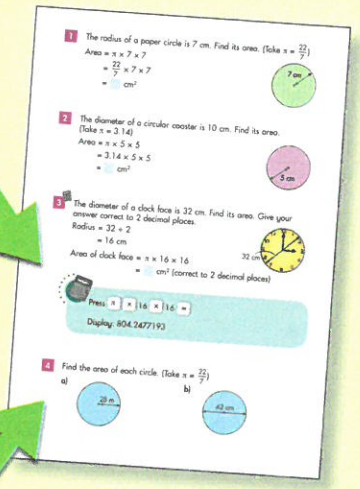
Recall Activity Marker
Emphasises the importance of establishing connections in learning mathematics. The marker directs pupils to a diagnostic exercise, *Recall*, in the activity book.

Use of Calculator

NEW

Inculcates the appropriate use of calculators without compromising basic computational skills through:

- introducing pupils to and providing guidance on the use of calculators,
- encouraging pupils to exercise judgement where the use of calculators is optional, thus appreciating the power of mental computation versus calculator-based computation,
- exposing pupils to investigations involving tedious computation, so that they can appreciate the calculator as a learning tool.



Question Classification

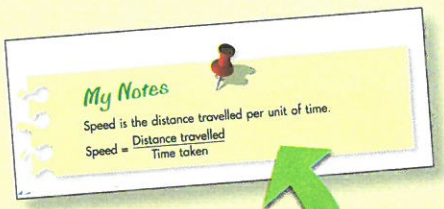
NEW

◆ – pre-requisite skills

■ – reinforcement of current concepts

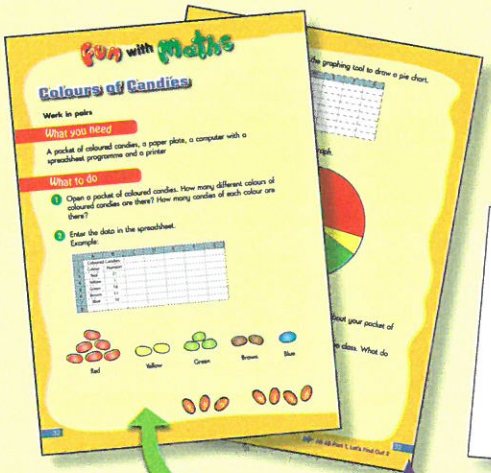
● – higher-order thinking skills

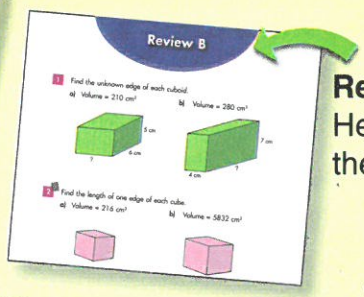
Helps teachers to spend their time more effectively by using the appropriate questions to get pupils to master the necessary skills.



My Notes

Helps pupils to consolidate and recall their learning and commit to memory some key ideas.





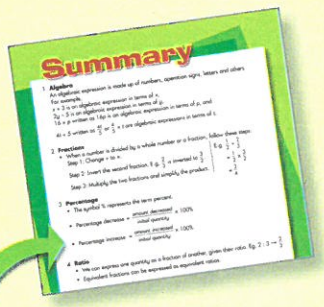
Review

Helps pupils to consolidate their learning.

Fun With Maths

NEW

Engages pupils in interactive mathematical activities that encourage exploration, discovery and active thinking.



Summary

NEW

A one-page summary helps pupils to consolidate their learning for each semester. It also serves as a quick revision guide for pupils, especially when preparing for semestral assessments.

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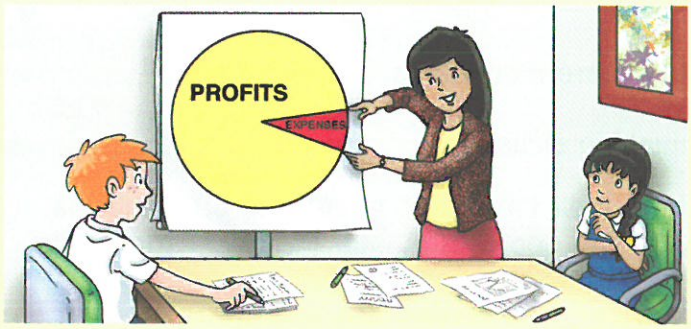

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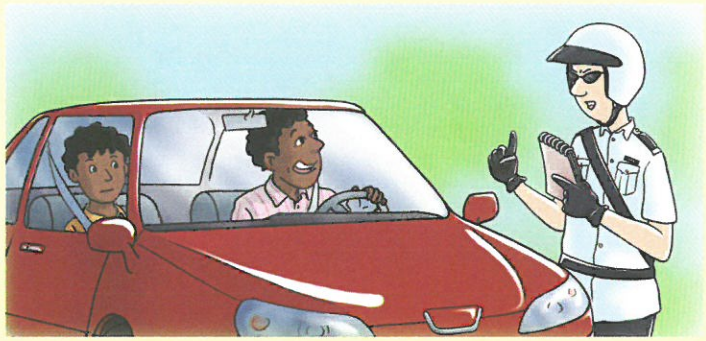

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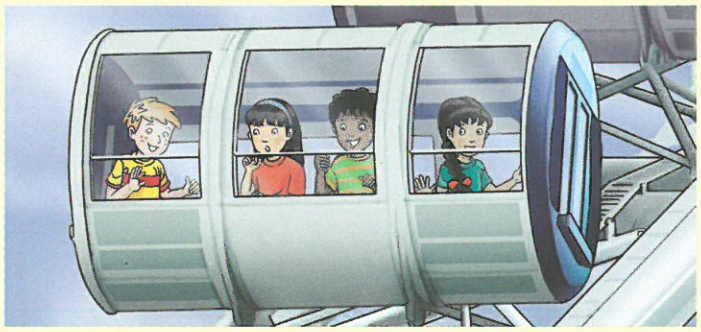


My Summary *147*

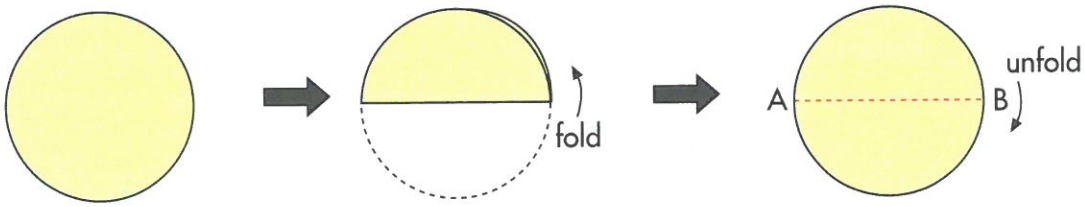
1 Circles

Geometric figures are often used to enhance the beauty of building designs. In the photograph above, the ceiling is composed of several circles that share the same centre.

AB 6B Part 1, Recall 1

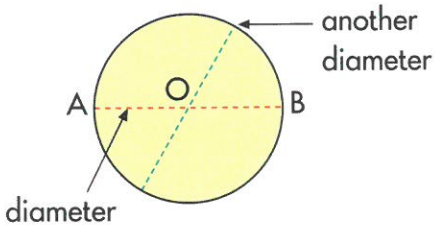
Radius and Diameter

Trace a 50¢ coin on a piece of paper. Cut out the tracing of the paper circle. Then, fold the paper circle in half as shown. Draw and name the fold line as AB.

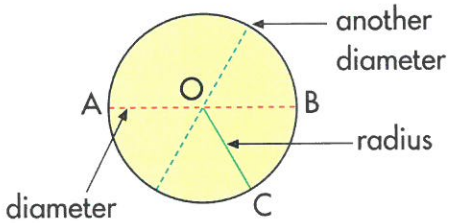


The line AB divides the circle into equal halves. AB is a **diameter** of the circle. How long is the diameter of the 50¢ coin?

Fold the paper circle in half in another way to obtain another diameter of the circle. The two diameters meet at a point. This point is the **centre** of the circle. Name the centre O.



Draw a straight line from the centre O to any point C on the edge of the circle. The line OC is the **radius** of the circle. How long is the radius of the 50¢ coin?

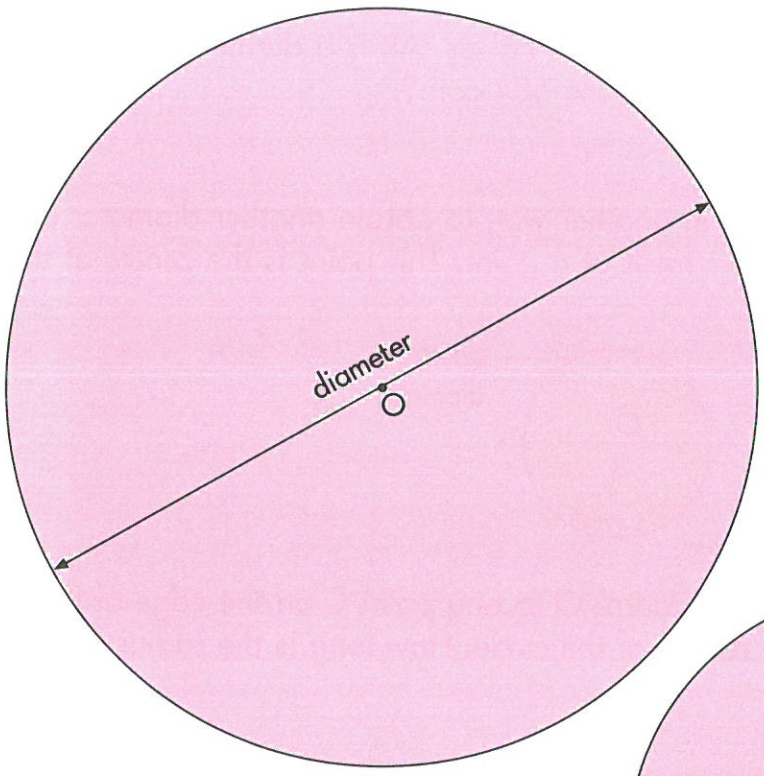


Compare the diameter AB and the radius OC.
What do you notice?

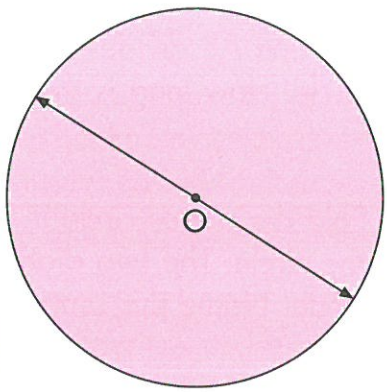
My Notes

The diameters of a circle pass through the centre of the circle.
The **diameter** of a circle is **twice its radius**.
Diameter = 2 × **Radius**
Radius = **Diameter** ÷ 2

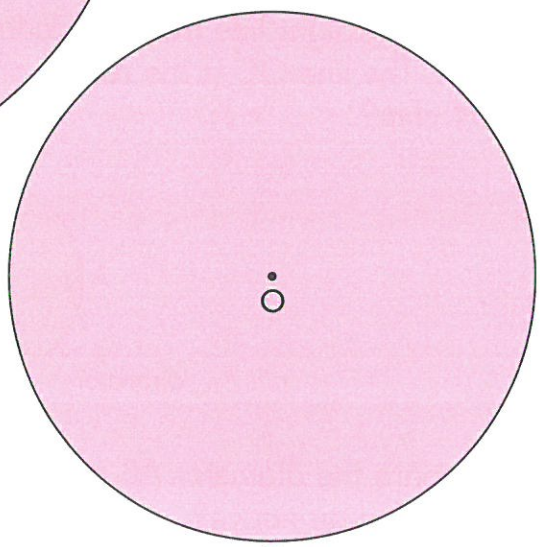
1 Measure the diameter of each circle. Calculate the radius.



A

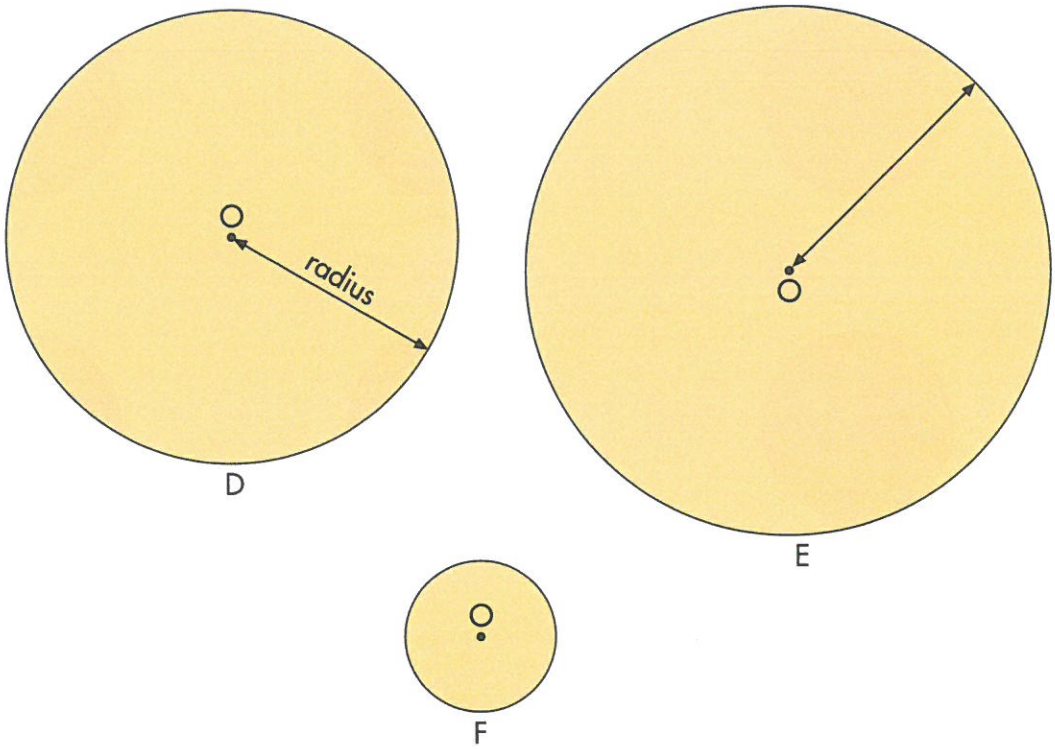


B



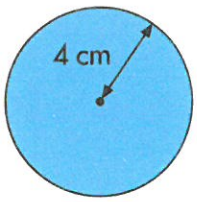
C

2 Measure the radius of each circle. Calculate the diameter.



The circles to the right are not drawn to scale.

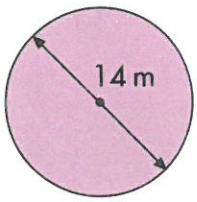
3 The radius of the circle is 4 cm. Find its diameter.



Diameter = 2 × ☐

= ☐ cm

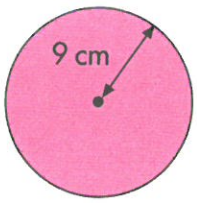
4 The diameter of the circle is 14 m. Find its radius.



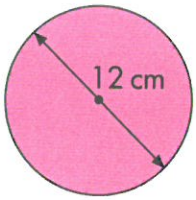
Radius = ☐ ÷ 2

= ☐ m

5 The following circles are not drawn to scale.



A



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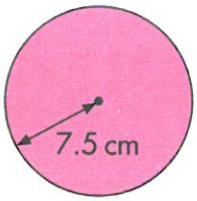

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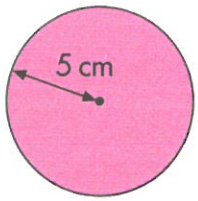

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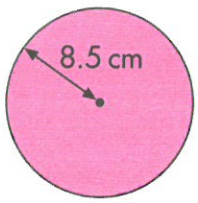

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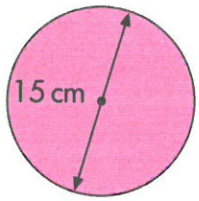


F

a) Complete the table.

Circle	Radius	Diameter
A	9 cm	9 cm × 2 = ☐ cm
B	12 cm ÷ 2 = ☐	12 cm
C	7.5 cm	☐
D	☐	☐
E	☐	☐
F	☐	☐

b) When you draw the circles to scale,

i) which circle is the smallest?

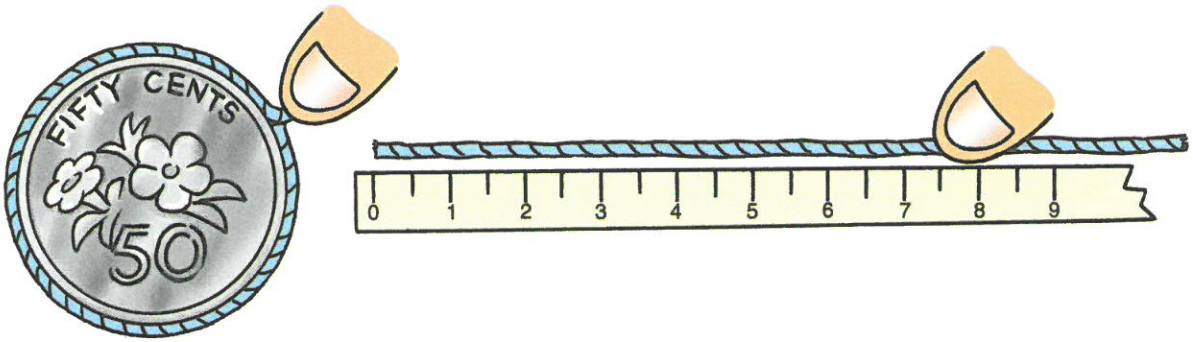
ii) which circle is the biggest?

iii) which two circles are identical?

AB 6B Part 1, Activity 1.1

Circumference

The **circumference** of a 50-cent coin is its perimeter. It can be measured using a string like this.



The length of the string around the coin is the circumference of the coin.

In the table below, record the diameters of Circles A, B and C in Question 1 on page 4.

Measure their circumferences using a string. Record the results and complete the table.

Circle	Diameter	Circumference	Circumference ÷ Diameter (Correct to 2 decimal places)
50-cent coin	2.4 cm	7.5 cm	3.13
A	▢ cm	▢ cm	▢
B	▢ cm	▢ cm	▢
C	▢ cm	▢ cm	▢

What do you notice?

The circumference of a circle is slightly longer than ▢ times its diameter.

My Notes

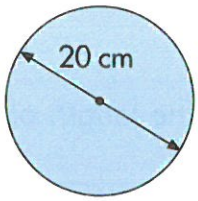
The circumference of any circle is about 3.14 times the diameter. This approximate value, 3.14, is represented by π.

We read π as 'pi'.

π is $\frac{22}{7}$ or approximately 3.14.

Circumference of circle = π × Diameter

1 The diameter of a discus is 20 cm. Find its circumference. (Take $\pi = 3.14$)

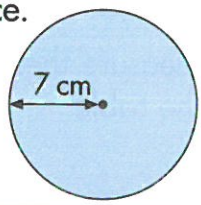


Circumference = $\pi \times 20$

$= 3.14 \times 20$

$=$ ____ cm

2 The radius of a paper circle is 7 cm. Find its circumference. (Take $\pi = \frac{22}{7}$)



Method 1

Diameter = $2 \times 7 = 14$ cm

Circumference = $\pi \times 14$

$= \frac{22}{7} \times 14 =$ ____ cm

Method 2

Radius = 7 cm

Circumference = $2 \times \pi \times 7$

$= 2 \times \frac{22}{7} \times 7 =$ ____ cm

Diameter
= 2 × Radius
Circumference
= π × Diameter
= 2 × π × Radius

3 The diameter of a one-dollar coin is 2.2 cm. Find its circumference. Give your answer correct to 2 decimal places.

Circumference = $\pi \times 2.2$

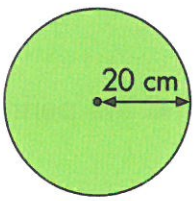
= 6.91 cm (correct to 2 decimal places)

Press: C π × 2.2 =

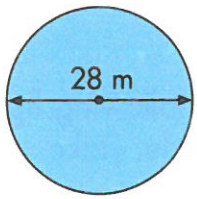
Display: 6.911503838

4 Find the circumference of each circle. Give your answer correct to 2 decimal places when you use a calculator.

a) (Take $\pi = 3.14$)



b) (Take $\pi = \frac{22}{7}$)



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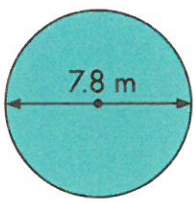

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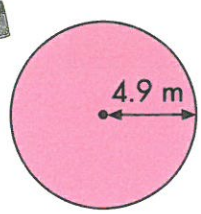


5 Find the circumference of a bicycle wheel of radius 25 cm. Leave your answer in terms of π.

Diameter = ____ × 25

= ____ cm

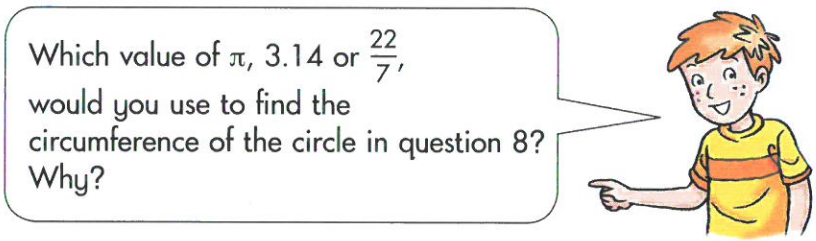
Circumference = $\pi \times$ ____

= ____ cm

6 Find the circumference of a round clock face of diameter 30 cm. (Take $\pi = 3.14$)

7 Find the circumference of a circular pond of radius 33 m. Give your answer correct to 2 decimal places.

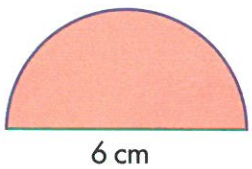
8 The radius of a circle is 21 cm. Find the circumference of the circle.



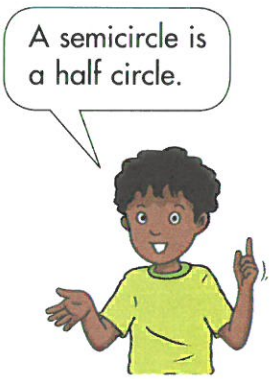
AB 6B Part 1, Activity 1.2

9 Each of the following figures is a semicircle. Find the perimeter of each semicircle. (Take $\pi = 3.14$)

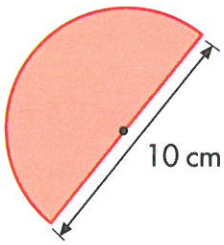
a)



a) Perimeter of a semicircle
= Half the circumference of the circle + 2 × radius
= $\frac{1}{\cancel{2}_{1}} \times 3.14 \times \cancel{6}^{3} + 6$
= 9.42 + 6
= ☐ cm



b)



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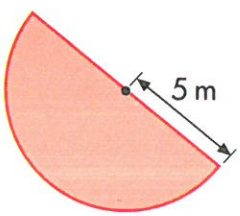


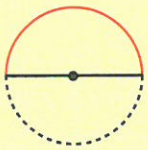
10 Each of the following figures is a quadrant. Find the perimeter of each quadrant. (Take $\pi = \frac{22}{7}$)

a)

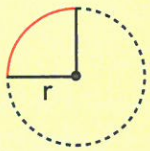
a) Perimeter of a quadrant
= A quarter of the circumference of the circle + 2 × radius
$= \frac{1}{4} \times \frac{22}{\cancel{7}_{1}} \times \cancel{28}^{4} + 2 \times 14$
= 22 + 28
= ____ cm

b)

My Notes



Perimeter of a semicircle
= π × Radius + 2 × Radius

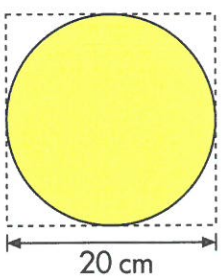


Perimeter of a quadrant
$= \frac{\pi \times \text{Radius}}{2} + 2 \times \text{Radius}$

11 Find the perimeters of the following figures. Give your answers correct to 2 decimal places.

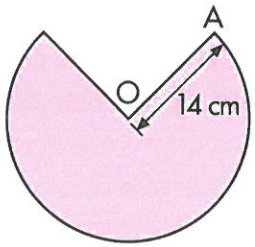
a) A semicircle of radius 6.7 cm
b) A quadrant of radius 3.9 cm

12 The figure shows a circle within a square. Find the circumference of the circle. (Take π = 3.14)

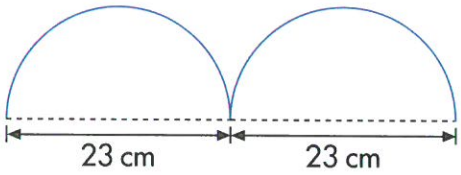


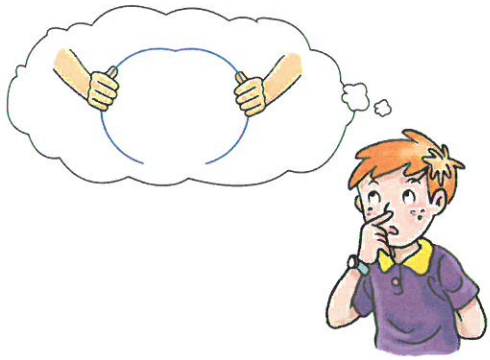
13 The figure shows a three-quarter circle. O is the centre of the circle. The length of OA is 14 cm. Find the perimeter of the figure.

(Take $\pi = \frac{22}{7}$)

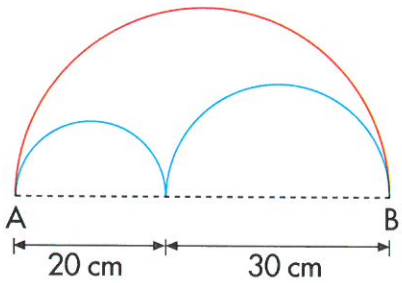


14 David bent a thin piece of wire to form two semicircles as shown below. Find the length of the piece of wire. Give your answer correct to 2 decimal places.



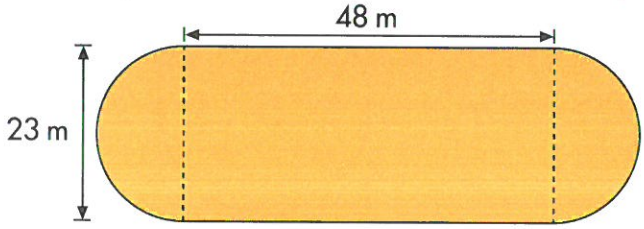


15 The figure is made up of three semicircles. There are two routes from Point A to Point B along the semicircles. Which route do you think is longer? Calculate and compare. Leave your answer in terms of π.

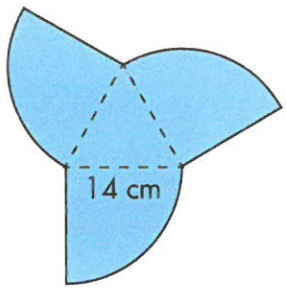


AB 6B Part 1, Activity 1.3

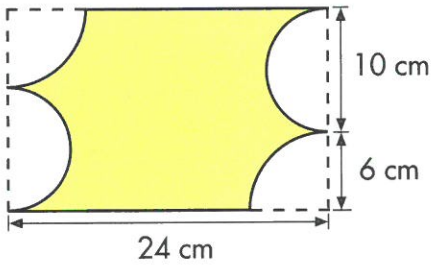
16 A playground is made up of a rectangle and two semicircles. Find its perimeter. Give your answer correct to 2 decimal places.



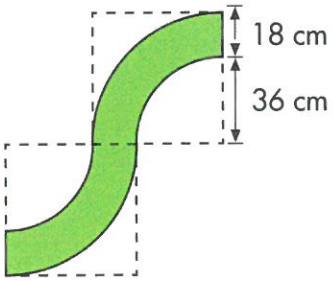
17 The figure shows an equilateral triangle and three quadrants. Find the perimeter of the figure. (Take $\pi = \frac{22}{7}$)



18 The figure shows two identical semicircles and two identical quadrants in a rectangle. Find the perimeter of the shaded part. (Take $\pi = 3.14$)



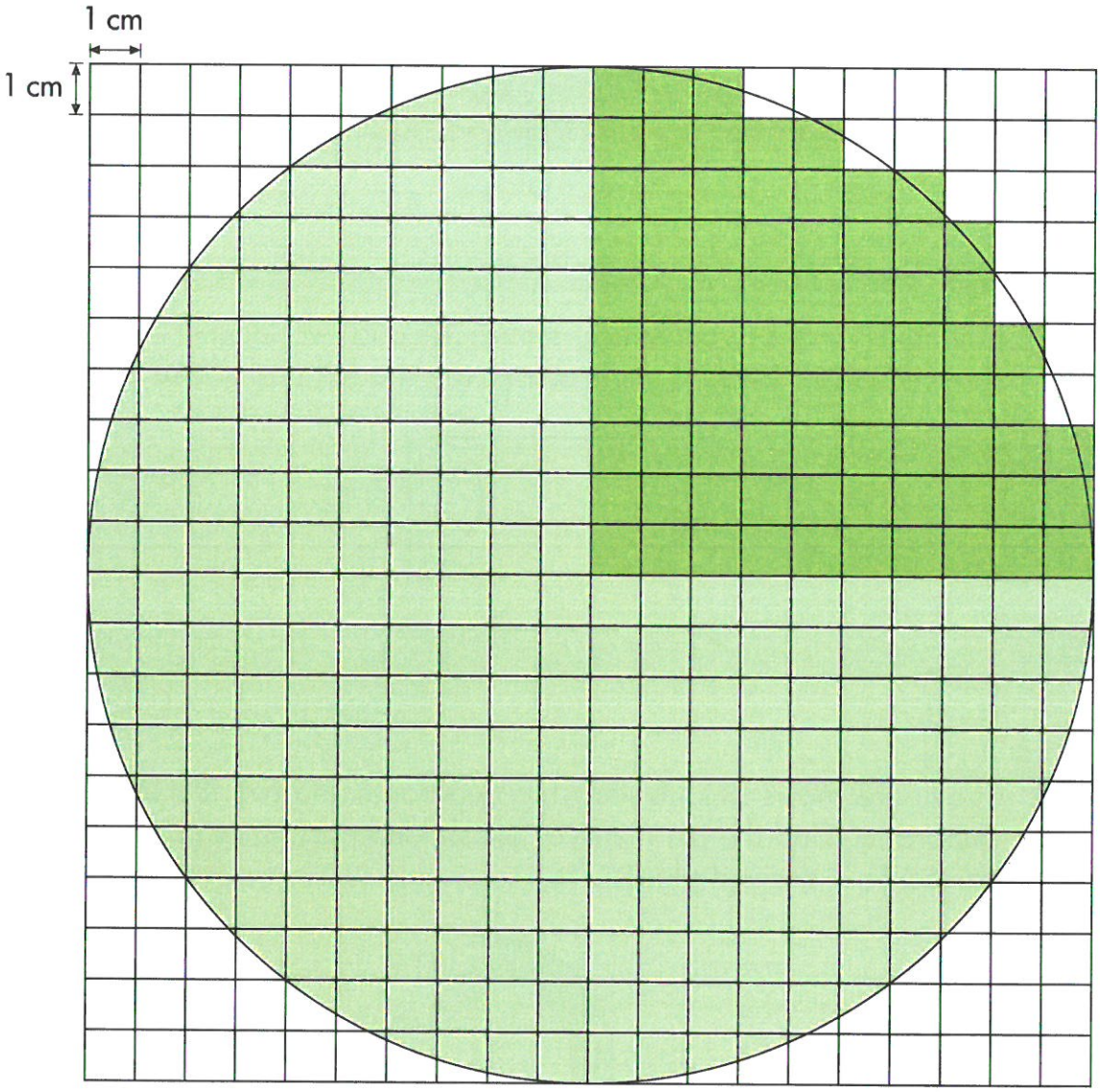
19 The figure shows two identical big quadrants and two identical small quadrants. Find the perimeter of the shaded part. Give your answer correct to 2 decimal places.



AB 6B Part 1, Activity 1.4

Area

A circle is drawn on a 1-cm square grid. The figure is not drawn to scale.

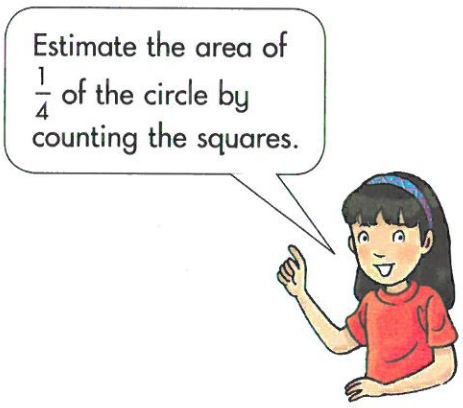


Radius of the circle = 10 cm

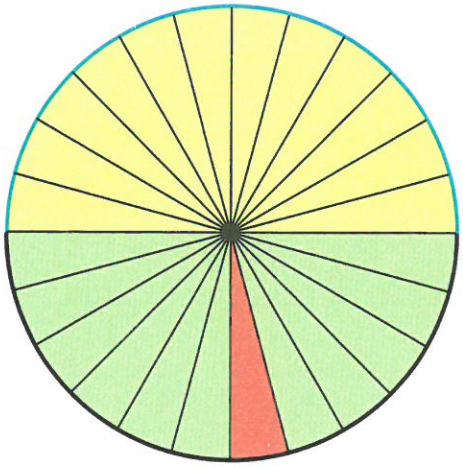
Area of $\frac{1}{4}$ of the circle $\approx$ ☐ cm^2

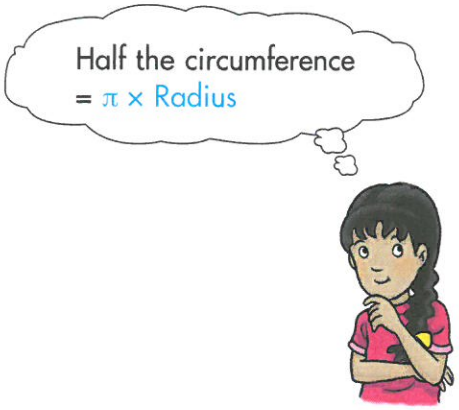
Area of the circle $\approx 4 \times$ ☐

$=$ ☐ cm^2

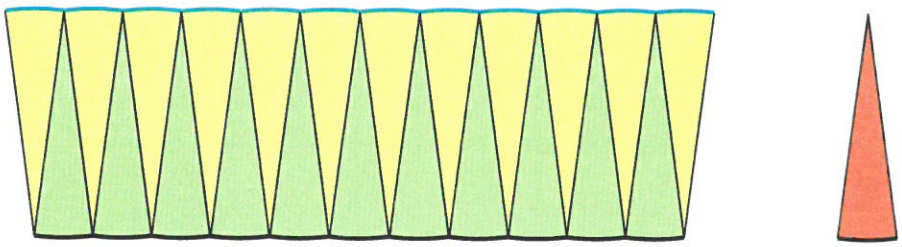


Aini finds the area of a circle in another way. She cuts a paper circle into 24 equal pieces.

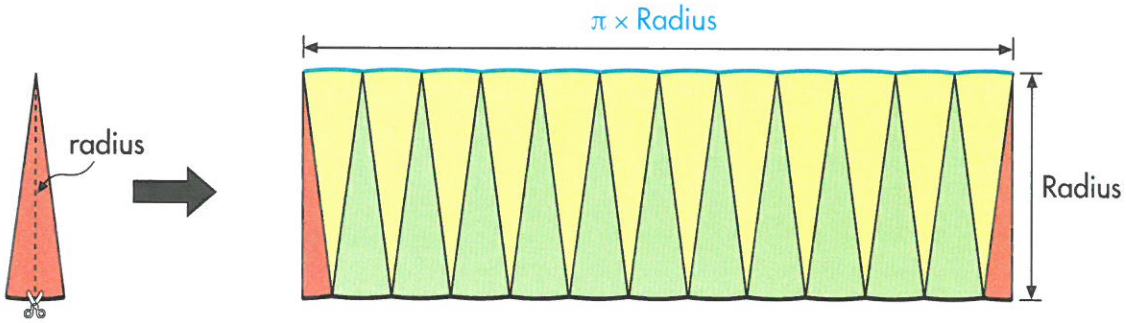


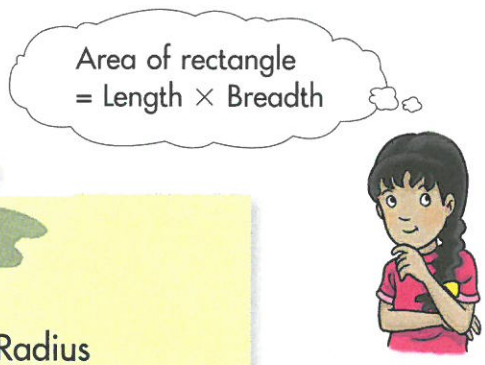


She rearranges 23 pieces to form a pattern like this:



She then cuts the last piece into halves. She places one half at each end of the pattern to make it look like a rectangle.





My Notes

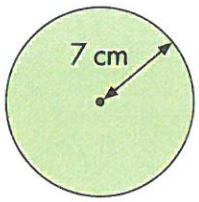
Area of circle = π × Radius × Radius

1 The radius of a paper circle is 7 cm. Find its area. (Take $\pi = \frac{22}{7}$)

Area $= \pi \times 7 \times 7$

$= \frac{22}{7} \times 7 \times 7$

$=$ ____ cm^2

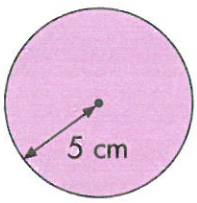


2 The diameter of a circular coaster is 10 cm. Find its area. (Take $\pi = 3.14$)

Area $= \pi \times 5 \times 5$

$= 3.14 \times 5 \times 5$

$=$ ____ cm^2



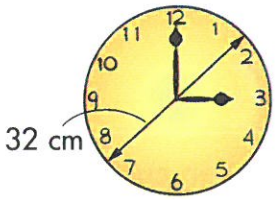
3 The diameter of a clock face is 32 cm. Find its area. Give your answer correct to 2 decimal places.

Radius $= 32 \div 2$

$= 16$ cm

Area of clock face $= \pi \times 16 \times 16$

$=$ ____ cm^2 (correct to 2 decimal places)

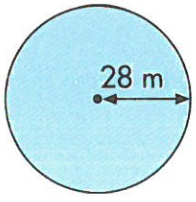


Press π × 16 × 16 =

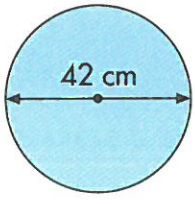
Display: 804.2477193

4 Find the area of each circle. (Take $\pi = \frac{22}{7}$)

a)

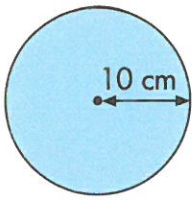


b)

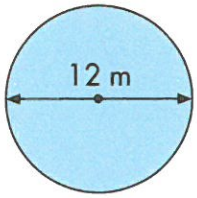


5 Find the area of each circle. Give your answer correct to 2 decimal places when you use a calculator.

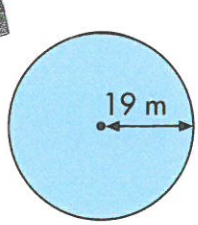
a) (Take $\pi = 3.14$)



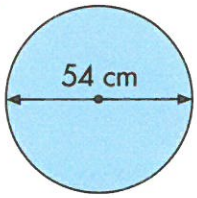
b) (Take $\pi = 3.14$)



c)



d)



6 Find the area of a circular pancake of radius 9 cm. (Take $\pi = 3.14$)

7 Find the area of a circular plate of diameter 24 cm. Leave your answer in terms of π.

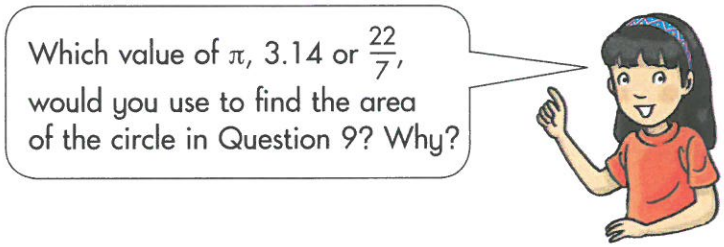
Radius = ____ cm

Area = $\pi \times$ ____ $\times$ ____

= ____ cm^2

8 Find the area of a circular pool of diameter 48 m. Give your answer correct to 2 decimal places.

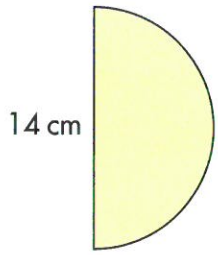
9 The radius of a circle is 20 cm. Find the area of the circle.



AB 6B Part 1, Activity 1.5

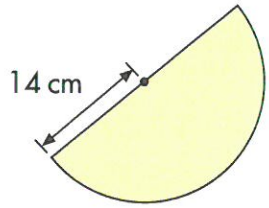
10 Find the area of each semicircle. (Take $\pi = \frac{22}{7}$)

a)



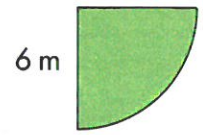
a) Area of semicircle
= Half the area of the circle
$= \frac{1}{2} \times \frac{22}{7} \times 7 \times 7$
= ☐ cm^2

b)



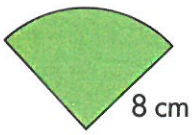
11 Find the area of each quadrant. (Take $\pi = 3.14$)

a)

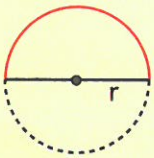


a) Area of quadrant
= A quarter of the area of the circle
$= \frac{1}{4} \times 3.14 \times 6 \times 6$
= ☐ m^2

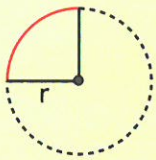
b)



My Notes



Area of a semicircle
$= \frac{\pi \times \text{Radius} \times \text{Radius}}{2}$

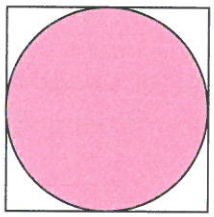


Area of a quadrant
$= \frac{\pi \times \text{Radius} \times \text{Radius}}{4}$

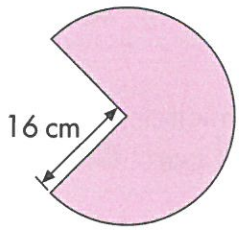
12 Find the area of the following figures. Give your answers correct to 2 decimal places.

a) A semicircle of diameter 58 m
b) A quadrant of radius 47 cm

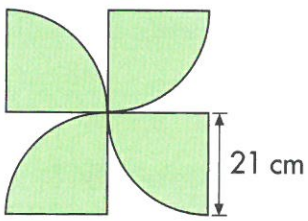
13 The figure shows a circle within a square. The area of the square is 64 cm^2. Find the area of the circle. (Take $\pi = 3.14$)



14 The figure shows a three-quarter circle with a radius of 16 cm. Find the area of the figure. Give your answer correct to 2 decimal places.

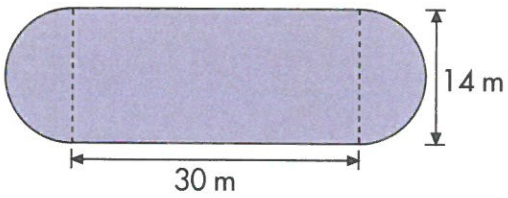


15 The figure is made up of four identical quadrants. Find the area of the figure. (Take $\pi = \frac{22}{7}$)

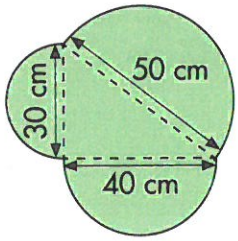


AB 6B Part 1, Activity 1.6

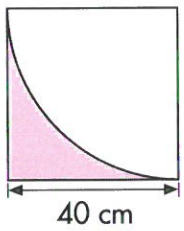
16 The ice-skating rink shown is made up of a rectangle and two semicircles. Find the area of the ice-skating rink. (Take $\pi = \frac{22}{7}$)



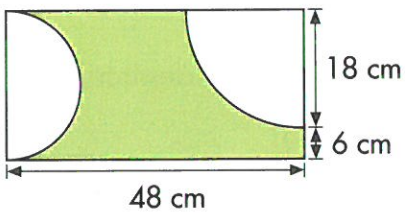
17 The figure shows a right-angled triangle and three semicircles. Find the area of the figure. Give your answer correct to 2 decimal places.



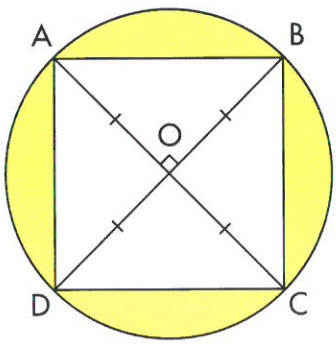
18 The figure shows a quarter circle in a square of side 40 cm. Find the area of the shaded part. (Take $\pi = 3.14$)



19 The figure shows a semicircle and a quadrant in a rectangle. Find the area of the shaded part. Give your answer correct to 2 decimal places.



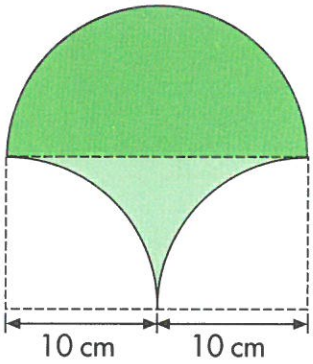
20 The figure shows a square ABCD in a circle. O is the centre of the circle. AC is a diameter. AC = 20 cm. Find the total area of the shaded part. (Take $\pi = 3.14$)



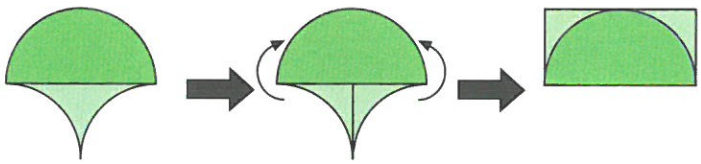
AB 6B Part 1, Activity 1.7

More Problems on Circles

The figure below is formed by a semicircle and two quarter circles.

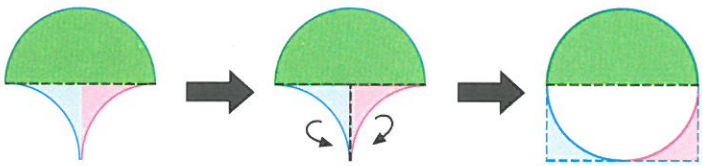


David moves the parts of the figure as shown below to find the area of the figure.



Area of the figure = ____ cm × ____ cm
= ____ cm^2

He moves the parts of the figure in another way as shown below to find the perimeter of the figure.

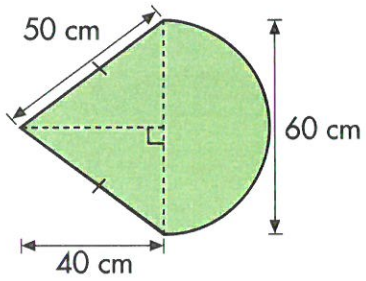


Perimeter of the figure = $\pi \times 20$
$= 20\pi$ cm

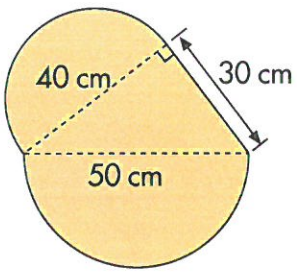
My Notes

Moving the parts around can help simplify the question.

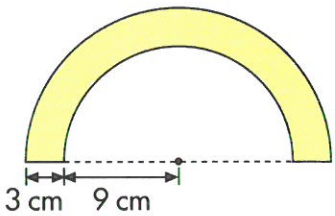
1 The figure is made up of a triangle and a semicircle. Find its area and perimeter. (Take $\pi = 3.14$)



2 The figure shows two semicircles and a triangle. Find its area and perimeter. Give your answers correct to 2 decimal places.

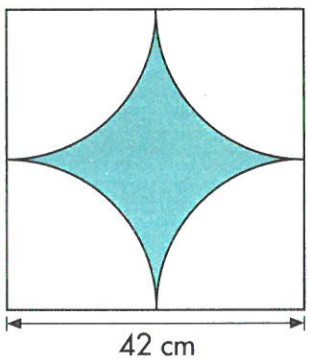


3 The figure is made up of two semicircles. Find the area and perimeter of the figure. Leave your answers in terms of π.

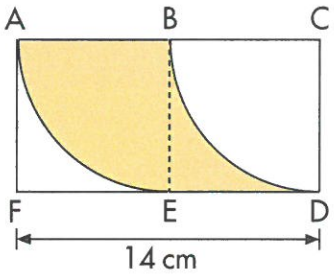


AB 6B Part 1, Activity 1.8

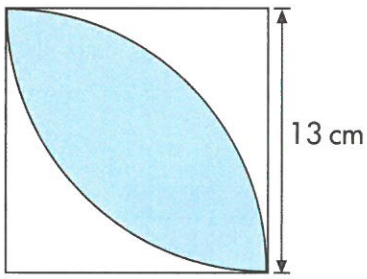
4 The figure shows four identical quadrants in a square. Find the area and perimeter of the shaded part. (Take $\pi = \frac{22}{7}$)



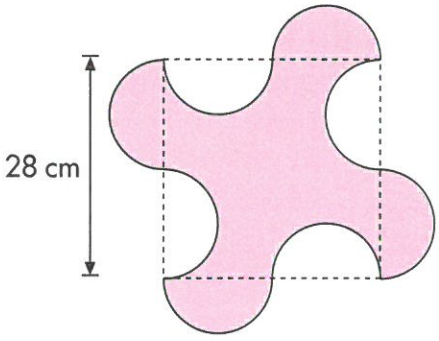
5 ACDF is a rectangle made up of two quadrants in two squares. Find the area and perimeter of the shaded part. (Take $\pi = \frac{22}{7}$)



6 The figure is made up of a square and two quarter circles. Find the area and perimeter of the shaded part. Give your answers correct to 2 decimal places.

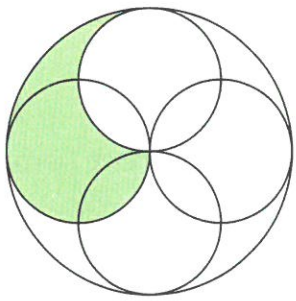


7 The figure shows semicircles of equal area at the sides of a square. The diameter of each semicircle is equal to half the length of the side of the dotted square. Find the area and perimeter of the shaded part. Give your answers correct to the nearest 2 decimal places.



8 Four identical circles of diameter 10 cm are arranged in a big circle. (Take $\pi = 3.14$)

a) Find the area of the shaded part.
b) Find the perimeter of the shaded part.



AB 6B Part 1, Activity 1.9

Fun with Maths

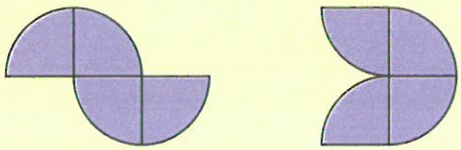
Shapes with the Same Area

What you need

4 quadrants cut from a circle

What to do

1. Use the quadrants to form figures such that the quadrants are joined from side to side. Two examples are shown below:



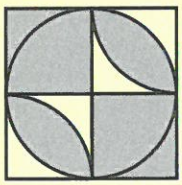
2. Compare the area and the perimeter of the two figures shown in the examples above. What do you notice?

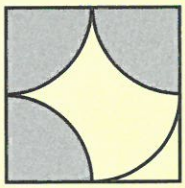
3. Use the four quadrants to form another figure with the **same** area and **same** perimeter as the figures shown in step 1. Compare your figure with that of your friend. What do you notice?

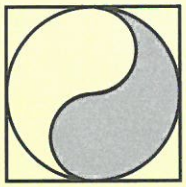
4. Use the four quadrants to form a figure with the **same** area but **different** perimeter from the figures shown in step 1. Compare your figure with that of your friend. What do you notice?

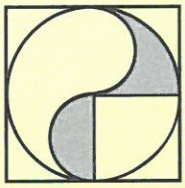
Challenge

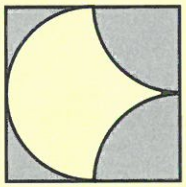
Study and match the following figures.
Which pairs of figures have equal shaded areas? How can you tell?

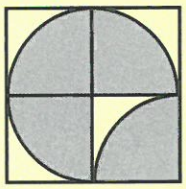
A 

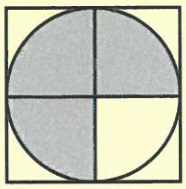
1 

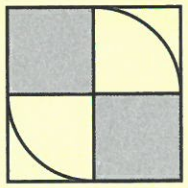
B 

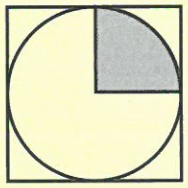
2 

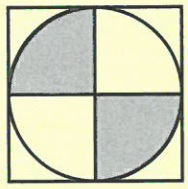
C 

3 

D 

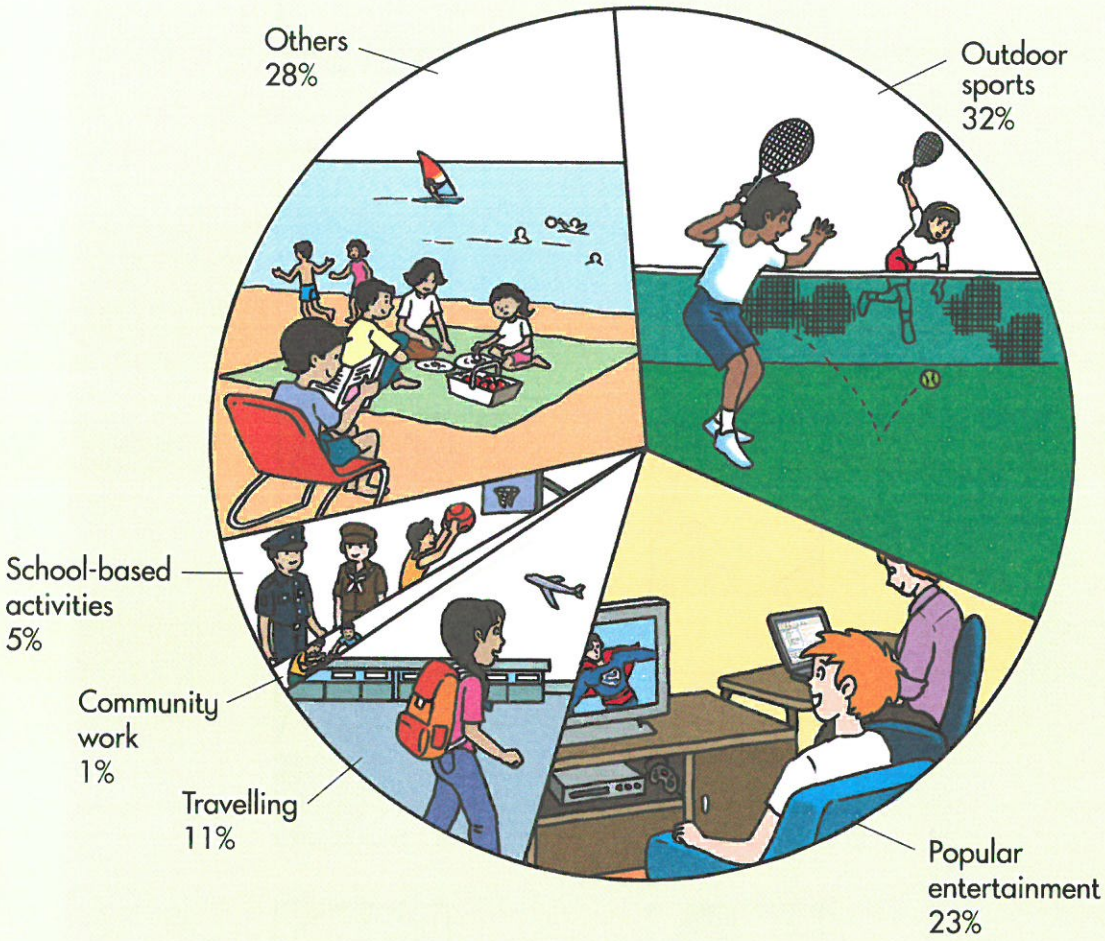
4 

E 

5 

2 Pie Charts

A survey conducted by a school showed the kind of activities that pupils in the school are interested in doing during their leisure time.



Which is the most popular activity?
Which is the least popular activity?
How can you tell?

AB 6B Part 1, Recall 2

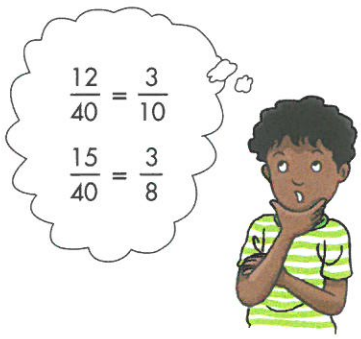
Reading Pie Charts

Miss Lee did a similar survey with her class of 40 Primary Six pupils.
The table shows the number of pupils with their choices.

Activity	Reading	Playing computer games	Doing sports	Watching television
Number of pupils	8	12	5	15

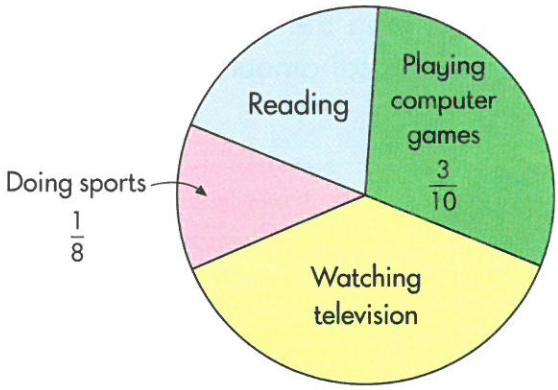
$\frac{3}{10}$ of the pupils liked to play computer games.

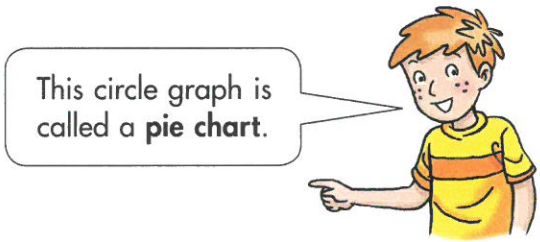
$\frac{3}{8}$ of the pupils liked to watch television.



What fraction of the pupils liked reading?
What fraction of the pupils liked doing sports?

The fractions can be shown like this:

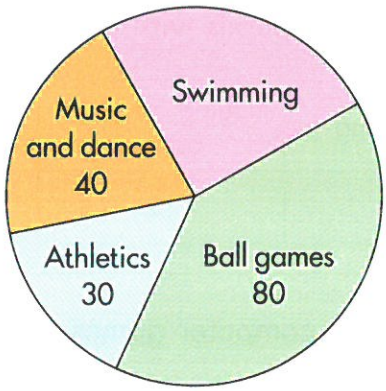




The pie chart represents the choices of activities of the **whole** class of pupils during their leisure time.

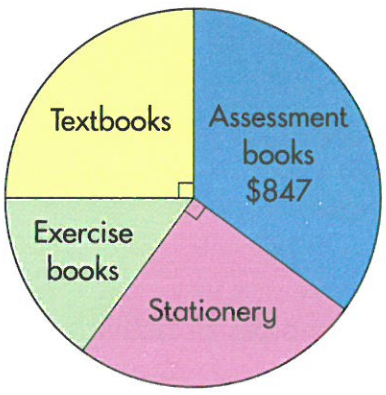
Which was the most popular activity among the Primary Six pupils in Miss Lee's class?
Which was the least popular activity among the Primary Six pupils in Miss Lee's class?

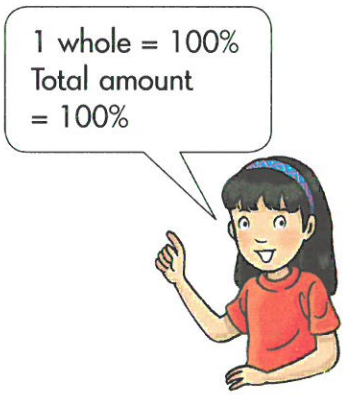
1 There are 200 Primary Six pupils in a certain school. Each pupil was asked to choose a co-curricular activity. The pie chart represents the number of pupils with their choices.



a) Which is the most popular activity?
b) How many pupils chose swimming?
c) What fraction of the pupils chose athletics?
d) How many times as many pupils chose ball games as compared to those who chose music and dance?

2 The pie chart shows the amount collected from the sale of different items in a bookshop on a certain day. The total amount collected was $2684.

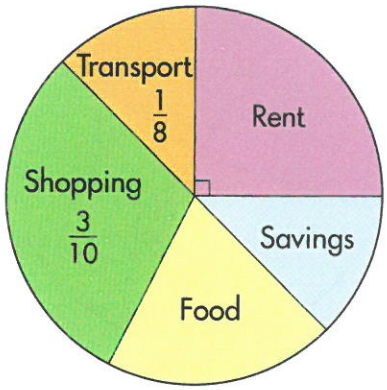




a) How much money was collected from the sale of textbooks?
b) What percentage of the total amount collected was from the sale of assessment books? Give your answer correct to the nearest one percent.
c) What was the ratio of the amount collected from the sale of stationery to the amount collected from the sale of assessment books?

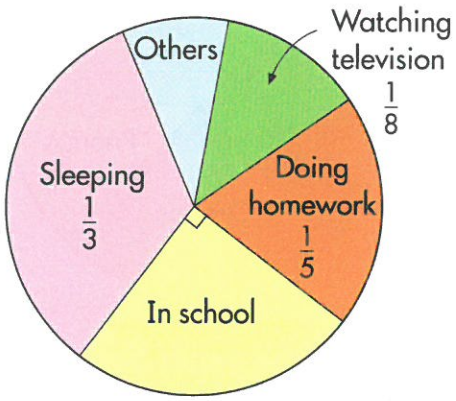
AB 6B Part 1, Activity 2.1

3 Bryan earned a monthly salary of $2400. The pie chart shows his expenditure and savings in a certain month.



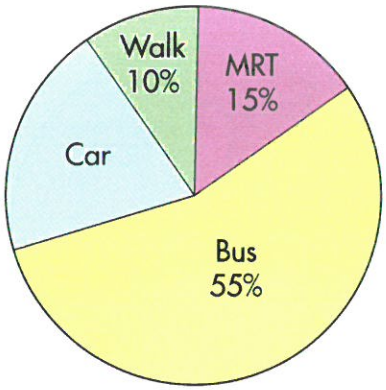
a) What fraction of his salary was spent on food?
b) What fraction of his salary was spent on rent?
c) What fraction of his salary did he save?
d) What percentage of his salary was spent on shopping?
e) How much did he spend on transport?
f) Did he spend more on rent or transport? Explain.

4 The pie chart shows how Caili spent her time on a certain day.



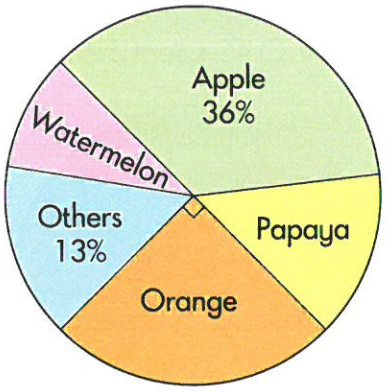
a) How long did she sleep?
b) How much time did she spend on watching television?
c) What fraction of the day did she spend in school?
d) What percentage of the day did she spend on her homework?
e) Did she spend more time in school or sleeping? Explain.

5 The pie chart shows how a group of 120 pupils go to school.



a) What fraction of the pupils go to school by bus?
b) What percentage of the pupils go to school by car?
c) How many pupils go to school by MRT?
d) How many more pupils go to school by MRT than walk to school?

6 A group of pupils are asked to name their favourite fruits. The pie chart represents their choices.



a) What percentage of the pupils like papayas?
b) If 400 pupils like oranges, how many pupils are there in the group?
c) What fraction of the pupils like apples and papayas?
d) Which is the more popular fruit, apple or papaya? How can you tell?
e) What is the ratio of the number of pupils who like papayas to the number of pupils who like apples?

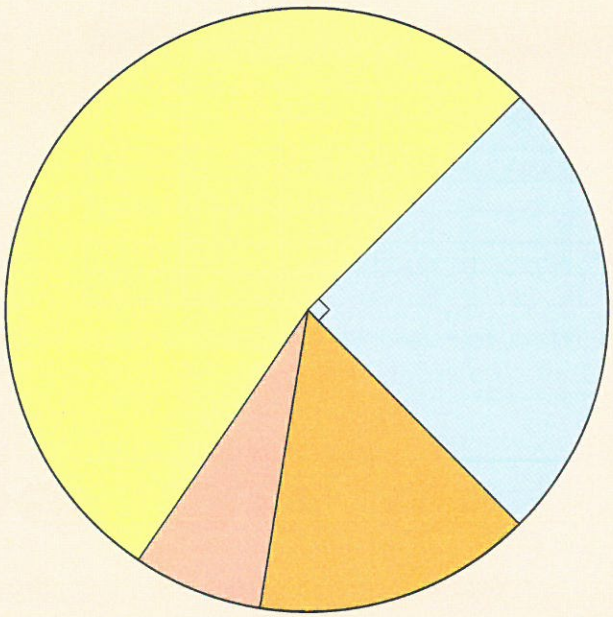
Activity

Work in groups of three. Complete the following activity.

A survey is carried out to find out the type of burger 200 children like best.

Types of burger	Number of children
Chicken	more than half
Vegetable	a very small number
Cheese	25%
Fish	15%

The pie chart is drawn to represent the results of the survey.



a) Match the types of burger with the parts of the pie chart.

b) Suggest two questions based on the completed pie chart.

AB 6B Part 1, Activity 2.3

Colours of Candies

Work in pairs

What you need

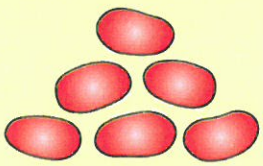
A packet of coloured candies, a paper plate, a computer with a spreadsheet program and a printer

What to do

1. Open a packet of coloured candies. How many different colours of coloured candies are there? How many candies of each colour are there?

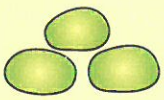
2. Enter the data in the spreadsheet.
Example:

	A	B	C	D	E	F	G
1	Coloured Candies						
2	Colour	Number					
3	Red	21					
4	Yellow	5					
5	Green	18					
6	Brown	14					
7	Blue	10					
8							



Red

Yellow



Green

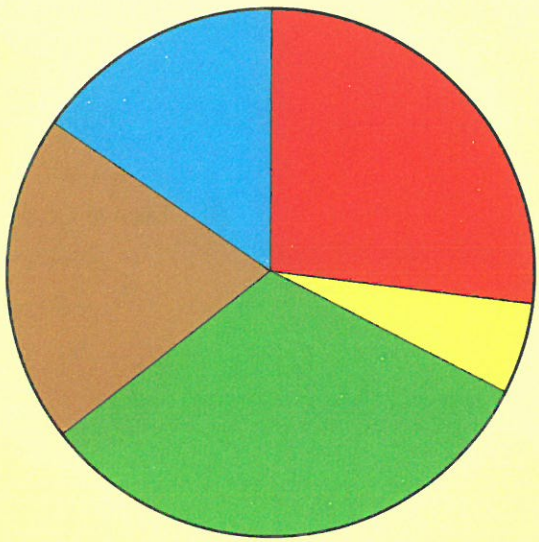
Brown

Blue

3 Select the data and use the graphing tool to draw a pie chart.

	A	B	C	D	E	F	G
1	Coloured Candies						
2	Colour	Number					
3	Red	21					
4	Yellow	5					
5	Green	18					
6	Brown	14					
7	Blue	10					
8							

4 Insert a suitable title for your graph.



5 Print out the pie chart.

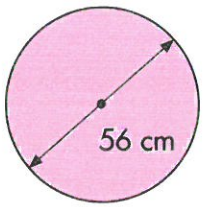
6 Examine your pie chart. What can you say about your packet of coloured candies?

7 Compare your results with your classmates in the class. What do you notice?

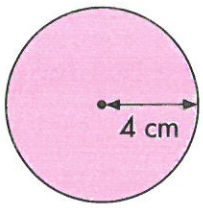
Review A

1 Find the circumference of each circle. Give your answer correct to 2 decimal places when you use a calculator.

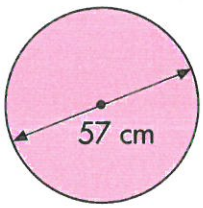
a) (Take $\pi = \frac{22}{7}$)



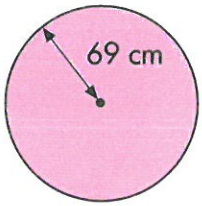
b) (Take $\pi = 3.14$)



c)



d) Leave your answer in terms of π.



2 Find the circumference of a CD of diameter 9 cm. (Take $\pi = 3.14$)

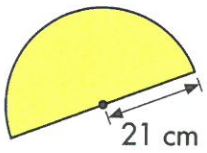
3 Find the circumference of a circle of radius 28 cm. (Take $\pi = \frac{22}{7}$)

4 Find the circumference of a circular tin of radius 64.5 cm. Leave your answer in terms of π.

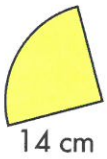
AB 6B Part 1, Review 4

5 Find the perimeters of the following semicircles and quarter circles. Give your answers correct to 2 decimal places when you use a calculator.

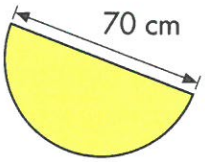
a) (Take $\pi = \frac{22}{7}$)



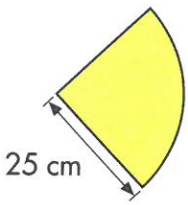
b) (Take $\pi = \frac{22}{7}$)



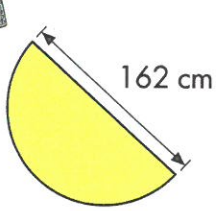
c) (Take $\pi = 3.14$)



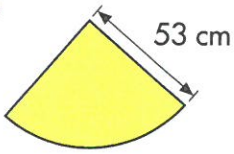
d) (Take $\pi = 3.14$)



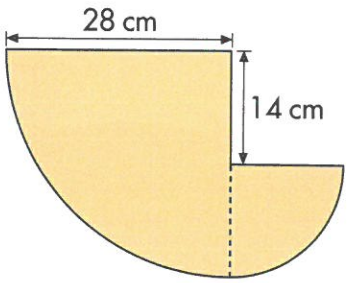
e)



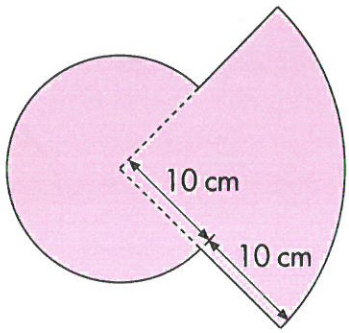
f)



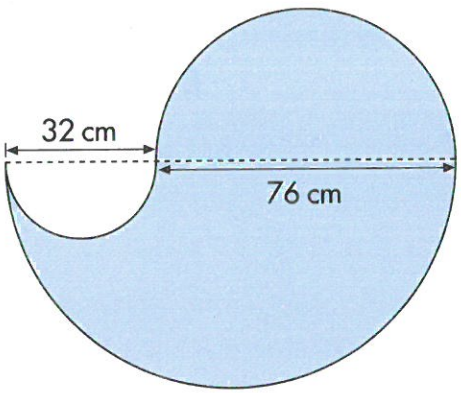
6 The figure is made up of a big quarter circle and a small quarter circle. Find the perimeter of the figure. (Take $\pi = \frac{22}{7}$)



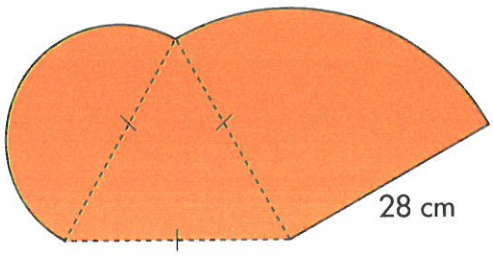
7 The figure shows a three-quarter circle and a big quarter circle. Find the perimeter of the figure. (Take $\pi = 3.14$)



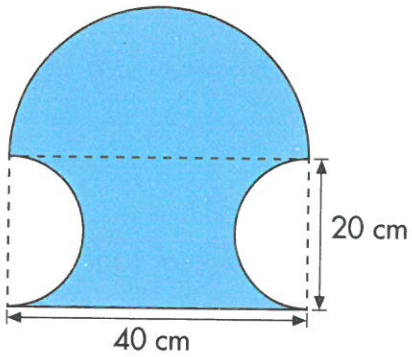
8 The figure is made up of three semicircles. Find the perimeter of the figure. Give your answer correct to 2 decimal places.



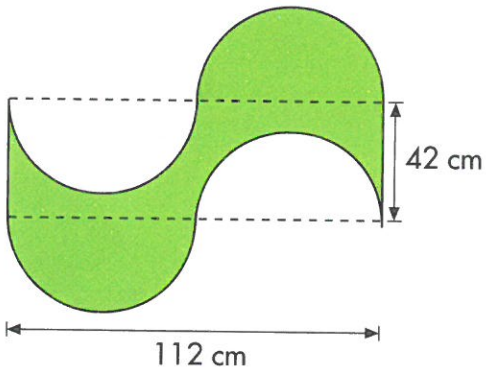
9 The figure shows an equilateral triangle, a semicircle and a quarter circle. Find the perimeter of the figure. (Take $\pi = \frac{22}{7}$)



10 The figure shows a rectangle, a big semicircle and two small semicircles. Find the perimeter of the shaded figure. (Take $\pi = 3.14$)

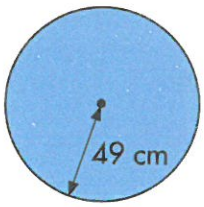


11 The figure shows a rectangle and four identical semicircles. Find the perimeter of the shaded figure. Give your answer correct to 2 decimal places.

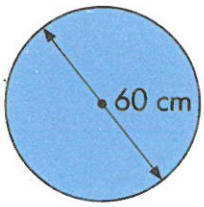


12 Find the area of each circle. Give your answer correct to 2 decimal places when you use a calculator.

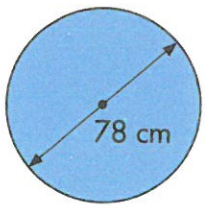
a) (Take $\pi = \frac{22}{7}$)



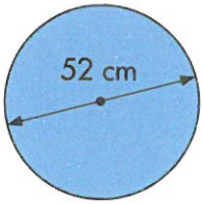
b) (Take $\pi = 3.14$)



c)



d) Leave your answer in terms of π.



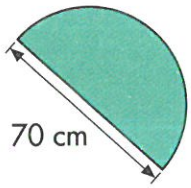
13 Find the area of a circular clock face of radius 21 cm. (Take $\pi = \frac{22}{7}$)

14 Find the area of the circular base of a big pond of diameter 40 m. (Take $\pi = 3.14$)

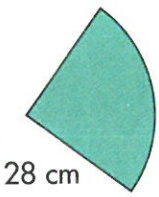
15 Find the area of a circular plot of land of diameter 68 m. Leave your answer in terms of π.

16 Find the areas of the following semicircles and quarter circles. Give your answers correct to 2 decimal places when you use a calculator.

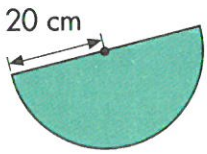
a) (Take $\pi = \frac{22}{7}$)



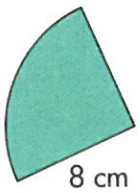
b) (Take $\pi = \frac{22}{7}$)



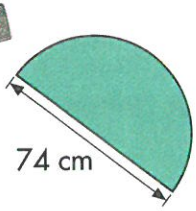
c) (Take $\pi = 3.14$)



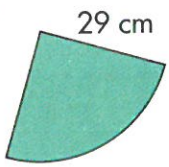
d) (Take $\pi = 3.14$)



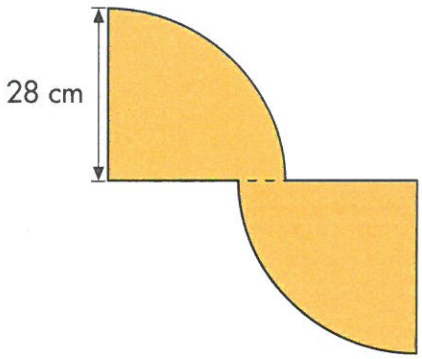
e)



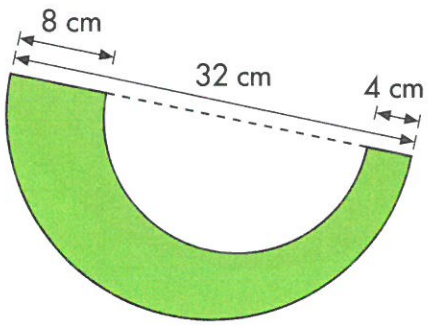
f)



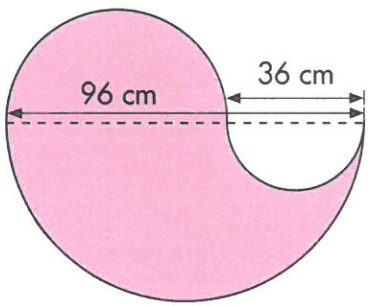
17 The figure is made up of two identical quarter circles. Find the area of the figure. (Take $\pi = \frac{22}{7}$)



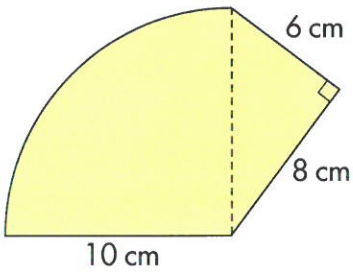
18 The figure is made up of a big semicircle and a small semicircle. Find the area of the shaded part. (Take $\pi = 3.14$)



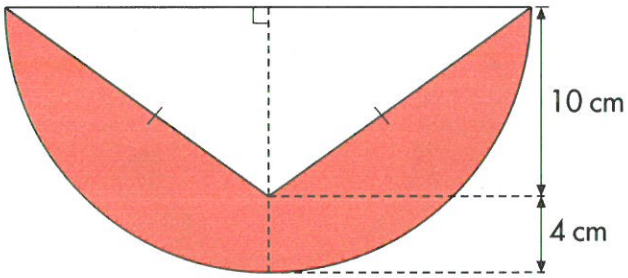
19 The figure is made up of three semicircles. Find the area of the shaded figure. Give your answer correct to 2 decimal places.



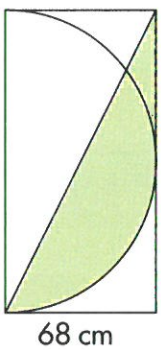
20 The figure is made up of a quarter circle and a triangle. Find the area of the figure. (Take $\pi = 3.14$)



21 The figure shows a semicircle and an isosceles triangle. Find the area of the shaded part. (Take $\pi = \frac{22}{7}$)

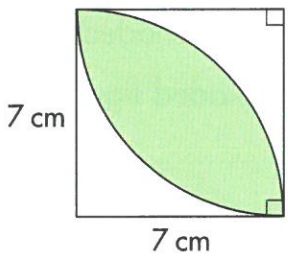


22 The figure shows a semicircle in a rectangle. Find the area of the shaded part. Give your answer correct to 2 decimal places.

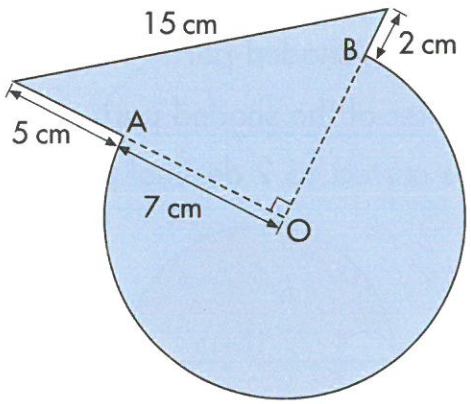


23 The figure shows two identical quarter circles and a rectangle. The length of the rectangle is 4 times its breadth. Find the area and perimeter of the shaded part. (Take $\pi = 3.14$)

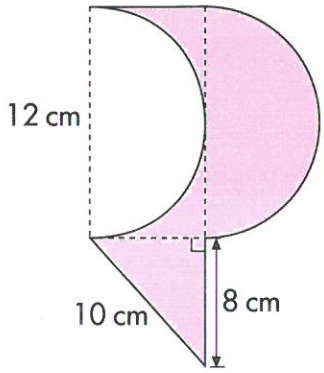
24 The figure is made up of two identical quarter circles. Find the area and perimeter of the shaded part. (Take $\pi = \frac{22}{7}$)



25 The figure shows a right-angled triangle and a three-quarter circle AOB. Find the area and perimeter of the figure. (Take $\pi = \frac{22}{7}$)



26 The figure shows two identical semicircles, a rectangle and a triangle. Find the area and perimeter of the shaded figure. Leave your answer in terms of π.

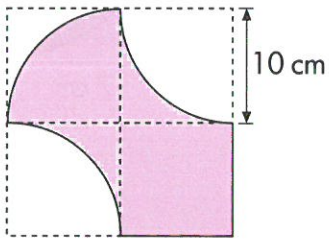


27 A wire is bent to form the shaded figure below. The curved parts are identical quarter circles.

a) Find the perimeter of the shaded figure.

b) Find the area of the shaded figure.

(Take $\pi = 3.14$)

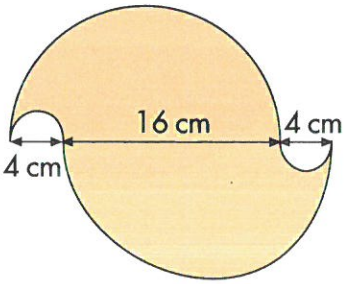


28 The figure is made up of two identical big semicircles and two identical small semicircles.

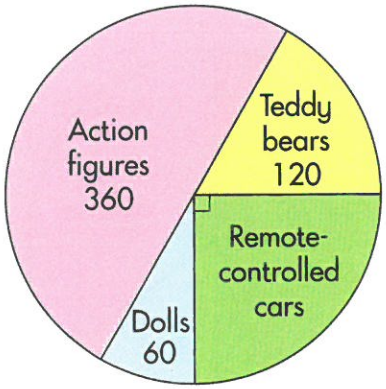
a) Find the area of the shaded part.

b) Find the perimeter of the shaded part.

Give your answers correct to 2 decimal places.



29 The pie chart shows the number of different types of toys sold in a toy shop in January. 720 toys were sold altogether.



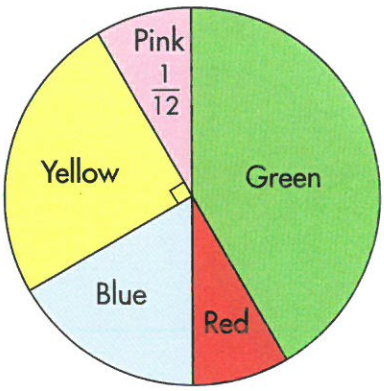
a) How many remote-controlled cars were sold in January?

b) What is the ratio of the number of teddy bears sold to the number of action figures sold?

c) What fraction of the toys sold in January were dolls?

d) How many times as many action figures as dolls were sold?

30 A shopkeeper has 180 scarves in five different colours. The pie chart shows what fraction of the scarves are in each colour.



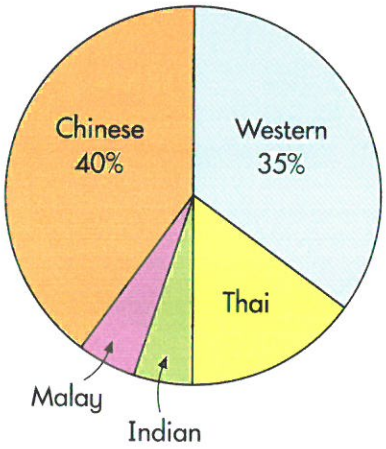
a) What fraction of the scarves are green?

b) How many red scarves are there?

c) What fraction of the scarves are blue?

d) How many green and red scarves are there?

31 Some pupils are asked to name their favourite type of food in a survey. 50% of the pupils like western food or Thai food. An equal number of pupils like Malay and Indian food. The pie chart shows their choices.



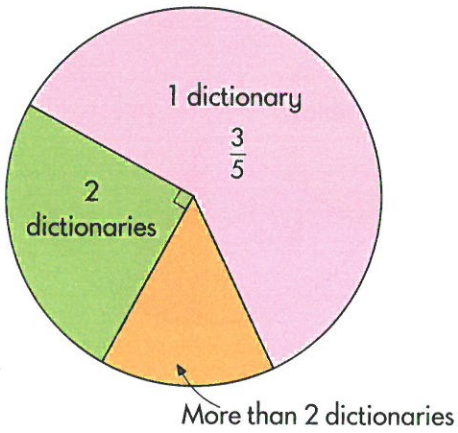
a) How many percent of the pupils like Thai food?

b) How many percent of the pupils like Malay food?

c) What is the ratio of the number of pupils who like Western food to the number of pupils who like Chinese food?

d) Given that 200 pupils like Chinese food, how many pupils are surveyed?

32 The pie chart shows the number of dictionaries each Primary Six pupil in a particular school has.



a) What fraction of the pupils has at most 2 dictionaries?

b) What fraction of the pupils has more than 2 dictionaries?

c) If there are 120 pupils who have 1 dictionary, how many pupils are there altogether?

Revision A

Part A

For Parts A and B of this revision exercise, do **not** use any calculators.
Choose the correct answer.

1 Round off 680 906 to the nearest 1000.

(1) 600 000
(2) 680 000
(3) 681 000
(4) 700 000

2 What is the missing number in the box?
7601, 7701, 7901, ☐, 8601, 9101

(1) 8001
(2) 8101
(3) 8201
(4) 8301

3 Find the remainder when 8348 is divided by 5.

(1) 8
(2) 2
(3) 3
(4) 5

4 What is the missing numerator?

$3.508 = 3 + 0.5 + \frac{\square}{125}$

(1) 1
(2) 2
(3) 8
(4) 4

5 Express 1.005 as a mixed number in its simplest form.

(1) $1\frac{5}{100}$
(2) $1\frac{1}{20}$
(3) $1\frac{5}{1000}$
(4) $1\frac{1}{200}$

6 Divide 4.8 by 200.

(1) 0.0024
(2) 0.024
(3) 0.24
(4) 2.4

7 Which of the following shows the greatest mass?

(1) $12\frac{2}{3}$ kg
(2) $12\frac{1}{2}$ kg
(3) $12\frac{3}{5}$ kg
(4) $12\frac{1}{4}$ kg

8 Find the value of $\frac{4}{7} \times \frac{3}{14}$.

(1) $\frac{8}{3}$
(2) $\frac{7}{21}$
(3) $\frac{6}{49}$
(4) $\frac{6}{7}$

9 Which of the following is **not** equivalent to 5 : 3 : 2?

(1) 15 : 9 : 6
(2) 10 : 6 : 4
(3) 3 : 1 : 0
(4) 20 : 12 : 8

10 Which of the following fractions is greater than 0.51?

(1) $\frac{5}{11}$
(2) $\frac{8}{12}$
(3) $\frac{7}{15}$
(4) $\frac{10}{25}$

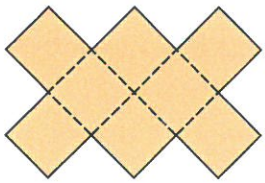
11 Express 135% as a decimal.

(1) 0.135
(2) 1.35
(3) 13.5
(4) 135.0

12 Jane and Gary share a sum of money. For every \$4 Jane has, Gary has \$3. If Gary has \$18, how much more money does Jane have than Gary?

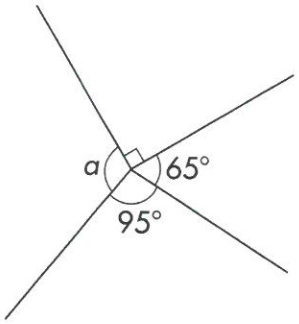
(1) \$1
(2) \$6
(3) \$19
(4) \$24

13 The figure consists of eight 1-cm squares. What is the perimeter of the figure?



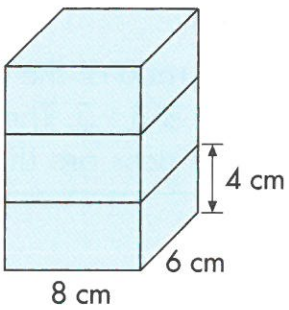
(1) 16 cm
(2) 20 cm
(3) 24 cm
(4) 32 cm

14 The figure is not drawn to scale. Find $\angle a$.



(1) 85°
(2) 90°
(3) 110°
(4) 135°

15 Three identical blocks, each measuring 8 cm by 6 cm by 4 cm, are stacked together to form the solid shown. What is the area of the largest face of the solid?



(1) 32 cm^2
(2) 48 cm^2
(3) 72 cm^2
(4) 96 cm^2

Part B

16 Find the value of $25 - 20 \div 5 + 5$.

17 Simplify $2 - \frac{3}{4} + \frac{1}{8}$.

18 Find the value of $\frac{3}{4} \div 9$.

19 John is 1.42 m tall. He is 10 cm taller than Pauline. What is Pauline's height in metres?

20 Find the value of 20% of 1.5 kg. Express your answer in grams.

21 During an aerobic exercise, Kelly's heart beats 16 times in 10 s. How many times does it beat in one minute?

22 Doreen used 24 bottles of mineral water to prepare some drinks for a party. Each bottle contained 600 ml of mineral water. How many litres of mineral water did she use altogether?

23 The ratio of the number of blue pens to the number of red pens in a box is 8 : 5. There are 12 more blue pens than red pens. How many blue pens are there in the box?

24 Chee Yang has 12 key chains. His sister has m fewer key chains. How many key chains do they have in total?

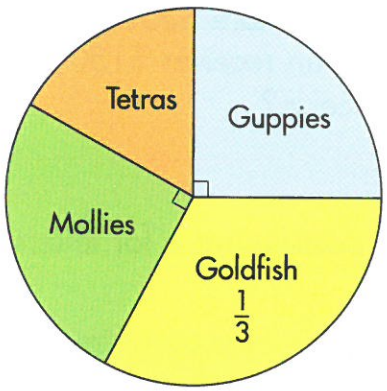
25 Plums are sold at 6 for \$2.50. What is the number of plums that can be bought with \$10?

26 A jug is $\frac{3}{5}$ full of water. This volume is equal to 6 glasses of water. How many more glasses of water are needed to fill the jug completely?

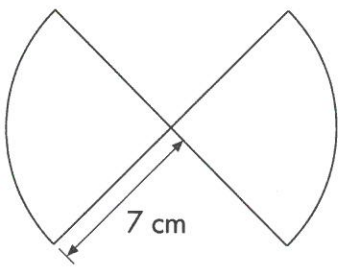
27 The average of 2 numbers is 47. Their difference is 18. What is the greater number?

28 A snail is crawling at a speed of 0.6 cm/s. At this speed, how far does it move in 15 seconds?

29 A group of pupils were asked to choose the fish they would like to have in their class aquarium. Their choices are shown in the pie chart. What fraction of the pupils chose tetras?



30 A piece of wire is bent to form two identical quarter circles. How long is the piece of wire? (Take $\pi = \frac{22}{7}$)



Part C

You may use a calculator to solve these problems.

31 The areas of two squares are 196 cm^2 and 324 cm^2. What is the difference in their perimeters?

32 The length of a cuboid is 12 cm and its height is $\frac{2}{3}$ of its length. Its width is 6.85 cm. Find the volume of the cuboid.

33 The mass of a 2-metre rod is 12.5 kg. What is the mass of a 3-metre rod of the same thickness and material?

34 Issac, Joshua and Justin share $3600. Issac and Joshua receive equal amounts and Justin receives $150 more than Issac. How much money does Justin receive?

35 The table shows the postage rates for letters from Singapore to Malaysia.

Mass step not over	Postage
20 g	45¢
50 g	55¢
100 g	85¢
Every additional step of 100 g	$1.00

What is the total postage for 15 letters with masses of 50 g each and 12 letters with masses of 160 g each?

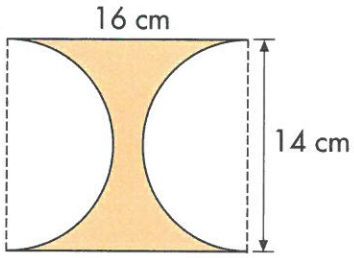
36 Kassim exchanged 2550 twenty-cent coins for 5-dollar notes. How many 5-dollar notes did he get?

37 To make a jar of lemon tea, Shirley mixed 1 glass of lemon with 4 similar glasses of tea. How many glasses of tea did she use to make 150 similar jars of lemon tea?

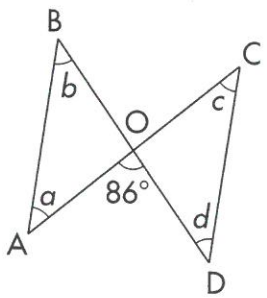
38 Peiyin used $\frac{3}{4}$ of a tub of margarine to bake a cake and $\frac{3}{4}$ of the remaining tub of margarine to bake cookies. What fraction of the tub of margarine did she use?

39 A watch cost \$200. It was sold at a discount of 15%. When Mohan went to pay for it, he found out that he had to pay 7% GST on the price after discount. How much did Mohan pay for the watch?

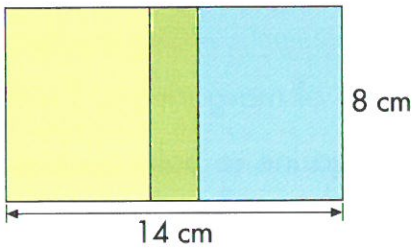
40 The figure shows a rectangle and two identical semicircles. Find the area of the shaded part. Express your answer correct to 1 decimal place.



41 The figure below is not drawn to scale. AOC and BOD are straight lines. BO = OC = AO = OD. What is the sum of $\angle a$, $\angle b$, $\angle c$ and $\angle d$? What do you notice about $\angle a$, $\angle b$, $\angle c$ and $\angle d$?

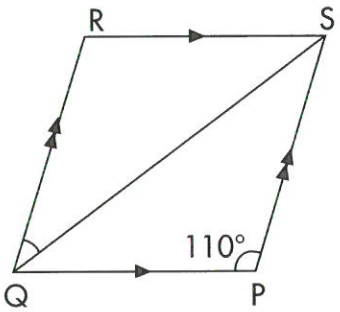


42 Two squares, each of side 8 cm, overlap to form a rectangle as shown. Express the area of the overlap as a fraction of the whole rectangle.



43 The average height of 39 pupils is 1.37 m. When a new pupil joins the group, their average height becomes 1.375 m. What is the height of the new pupil?

44 PQRS is a rhombus. $\angle QPS = 110°$. Find $\angle RQS$.



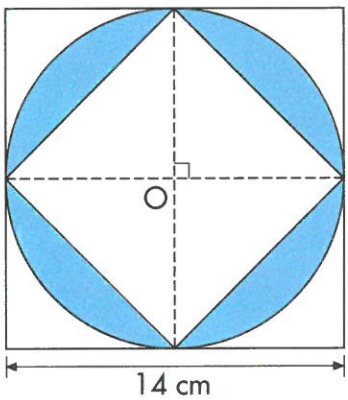
45 A school badminton team needs to buy 5 rackets and 10 tubes of shuttlecocks. The team has only \$150 to spend. A racket and a tube of shuttlecocks cost \$48.80. Each racket costs 3 times as much as a tube of shuttlecocks.

a) How much will the 5 rackets and 10 tubes of shuttlecocks cost altogether?

b) How much more money does the team need?

46 A motorist travelled 270 km from Town A to Town B. He travelled the first $\frac{2}{3}$ h of the journey at an average speed of 90 km/h and completed the rest of the journey in $2\frac{1}{2}$ h. Find the average speed for the remaining distance.

47 In the figure, O is the centre of a circle drawn inside a square of side 14 cm. (Take $\pi = \frac{22}{7}$)



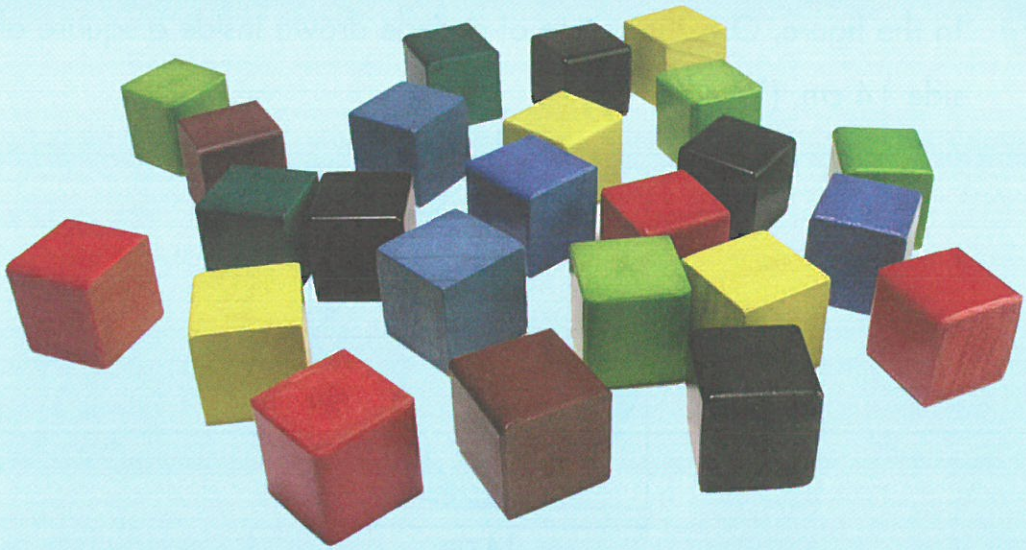
a) What is the area of the circle?

b) What is the total area of the shaded parts of the figure?

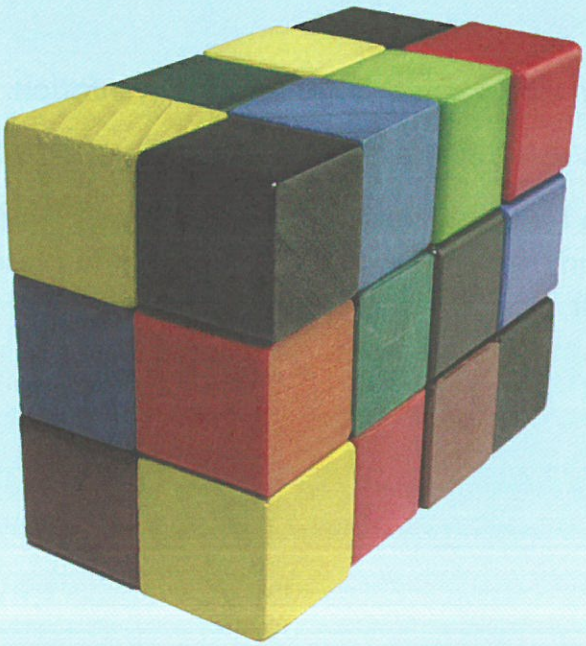
48 Mr Teoh had 760 durian and rambutan trees in his plantation. After $\frac{1}{4}$ of the rambutan trees were destroyed by a plant disease, Mr Teoh planted 50 more durian trees. Now Mr Teoh has 6 times as many rambutan trees as durian trees. How many more rambutan trees than durian trees did Mr Teoh have before the rambutan trees were destroyed?

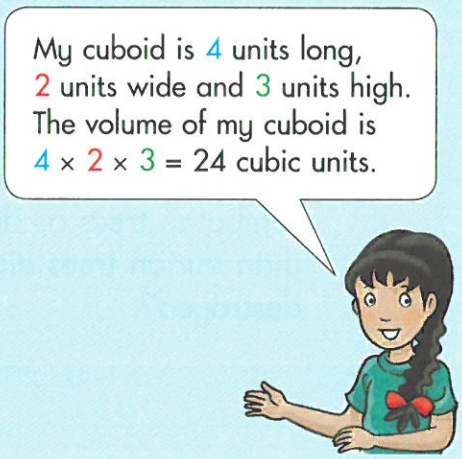
3 Volume

Each child uses 24 unit cubes to build a cuboid.



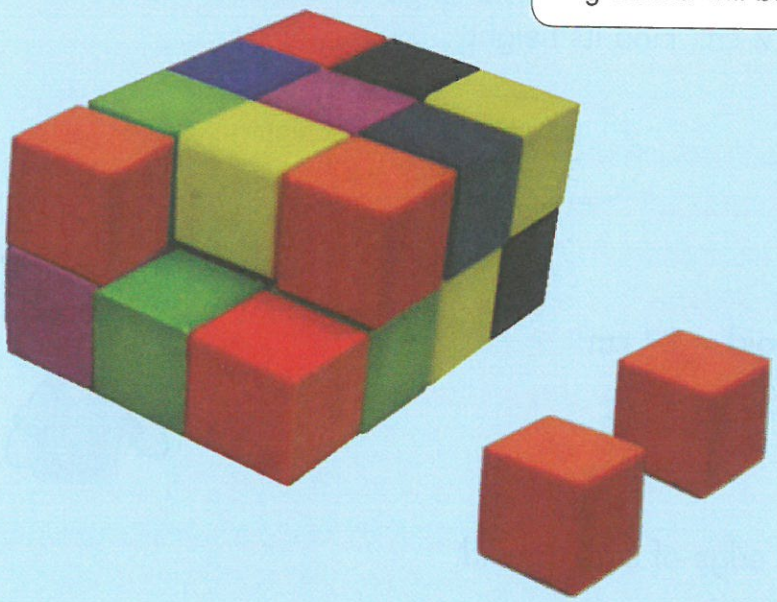
This is Aini's cuboid.



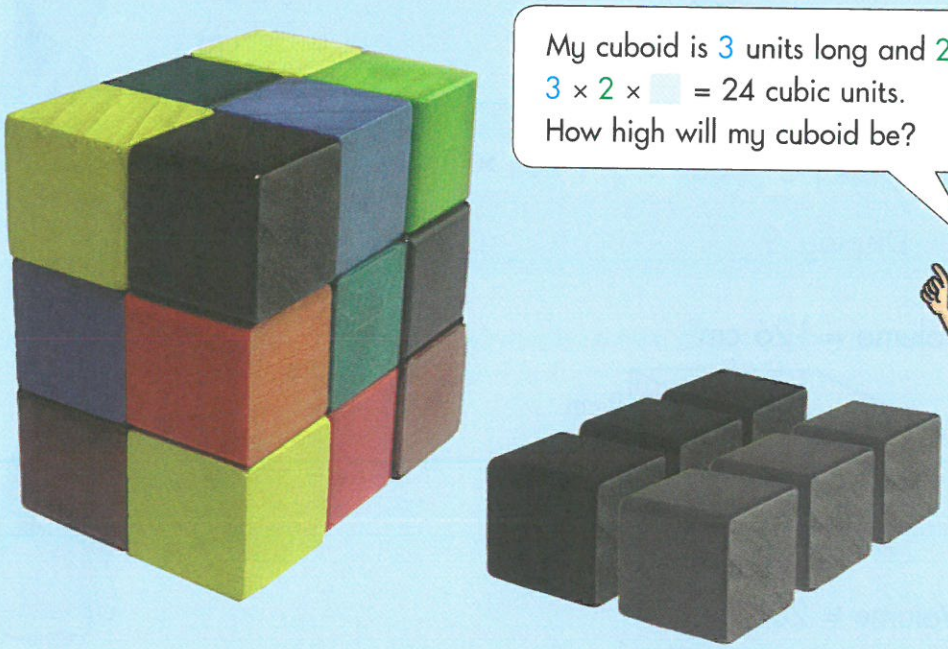


AB 6B Part 2, Recall 3

This is Bala's unfinished cuboid.



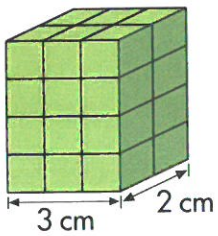
This is Caili's unfinished cuboid.



Use 24 unit cubes to build a cuboid that is different from the cuboids built by Aini, Bala and Caili. What is the length, breadth and height of your cuboid?

Cubes and Cuboids

1 The volume of a cuboid is 24 cm^3. The length of the cuboid is 3 cm and its breadth is 2 cm. Find its height.



Length × Breadth × Height = Volume
3 × 2 × Height = 24

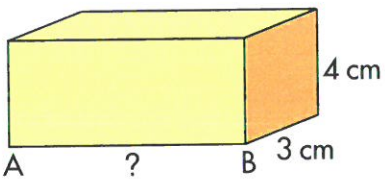
Volume of the cuboid = 24 cm^3

Height of the cuboid $= \frac{24}{3 \times 2}$

$=$ ☐ cm

2 Find the unknown edge of each cuboid.

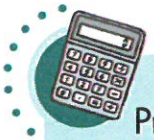
a) Volume = 108 cm^3



Length × 3 × 4 = 108

$AB = \frac{108}{3 \times 4}$

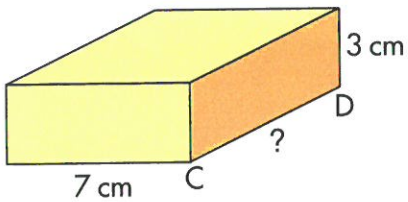
$=$ ☐ cm



Press: C 108 ÷ (3 × 4) =

Display: 9

b) Volume = 126 cm^3

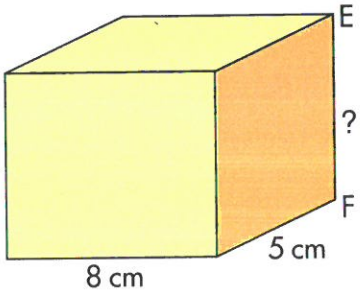


7 × Breadth × 3 = 126

$CD = \frac{126}{\square \times \square}$

$=$ ☐ cm

c) Volume = 280 cm^3

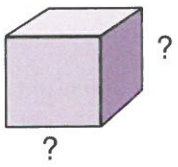


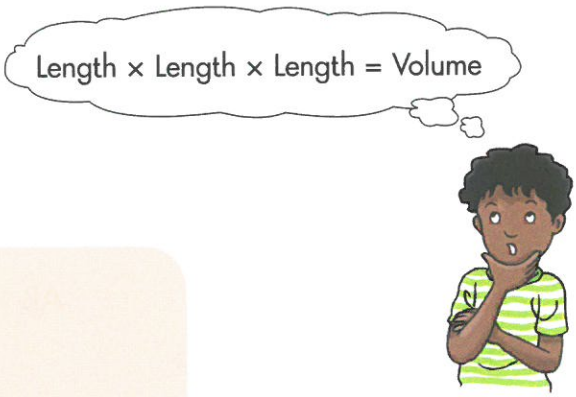
$EF = \frac{\square}{\square \times \square}$

$=$ ☐ cm

3 Find the length of one edge of each cube.

a) Volume = 125 cm^3





Method 1

$\square$ cm × $\square$ cm × $\square$ cm = 125 cm^3

Length of one edge = $\square$ cm

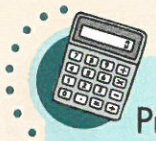
Method 2

Length × Length × Length = Volume of cube

Length = $\sqrt[3]{\text{Volume}}$

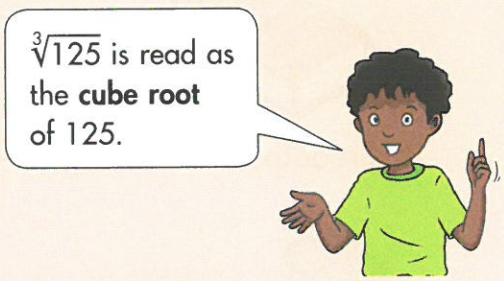
= $\sqrt[3]{125}$

= $\square$ cm

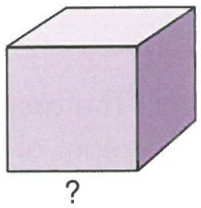


Press: C $\sqrt[3]{\ }$ 125 =

Display: 5



b) Volume = 4913 cm^3



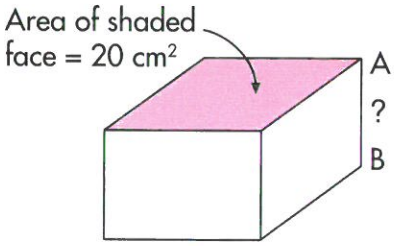
Length = $\sqrt[3]{4913}$

= $\square$ cm

AB 6B Part 2, Activity 3.1

4 Find the height of each rectangular box.

a) Volume = 40 cm^3



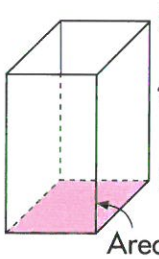
Area of shaded face

Length × Breadth × Height = Volume

20 × Height = 40

$AB = \frac{40}{20} =$ ☐ cm

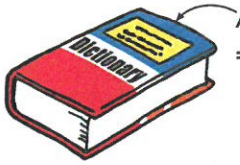
b) Volume = 72 cm^3



Area of shaded face = 9 cm²

$CD = \frac{\square}{\square} =$ ☐ cm

5 **a)** The volume of the dictionary is 1470 cm^3. Find its breadth.



Area of face = 105 cm²

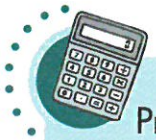
Area of face

Breadth × Length × Height = Volume

Breadth × 105 = 1470

Breadth of dictionary $= \frac{1470}{105}$

= ☐ cm



Press: C 1470 ÷ 105 =

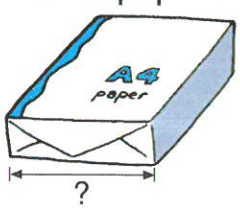
Display: 14

The breadth of the dictionary is ☐ cm.

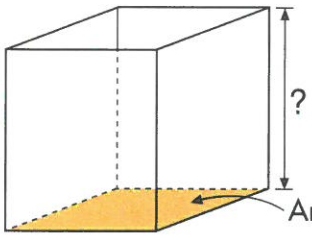
b) The volume of a ream of paper is 18 216 cm^3. The area of the shaded face is 552 cm^2. Find the length of the ream of paper.

Length of the ream of paper $= \frac{\square}{\square}$

= ☐ cm



6 A rectangular box has a volume of 960 cm^3. The area of its base is 120 cm^2. Find the height of the box.



Volume of cuboid = Area of **base** × Height

Height = $\frac{960}{\square}$

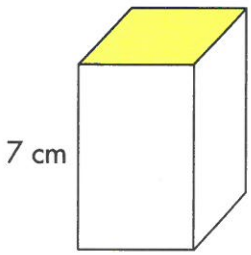
= $\square$ cm

7 A rectangular container has a volume of 9352 cm^3. The area of its base is 668 cm^2. What is its height?

AB 6B Part 2, Activity 3.2

8 Find the area of the shaded face of each cuboid.

a) Volume = 56 cm^3

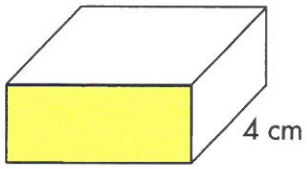


Area of shaded face × Height = Volume
Area of shaded face × 7 = 56

Area of the shaded face = $\frac{56}{7}$

= $\square$ cm^2

b) Volume = 120 cm^3

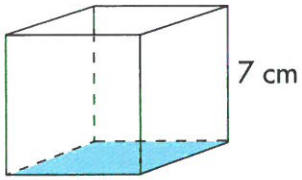


Area of shaded face = $\frac{\square}{\square}$

= $\square$ cm^2

9 The volume of a cuboid is 1008 cm^3. Its height is 7 cm. It has a square base.

a) Find the area of its base.
b) Find the length of its side.



a) Area of shaded base = ___

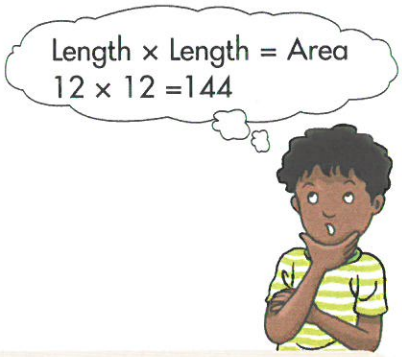
= ☐ cm^2

b)

Method 1

☐ cm × ☐ cm = ☐ cm^2

Length of side = ☐ cm

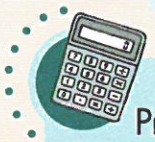


Method 2

Length = $\sqrt{144}$

= ☐ cm

Length × Length = Area
Length = $\sqrt{\text{Area}}$
$\sqrt{144}$ is read as the **square root** of 144.



Press: C $\sqrt{\ }$ 144 =

Display: 12

The length of the side of the base is ☐ cm.

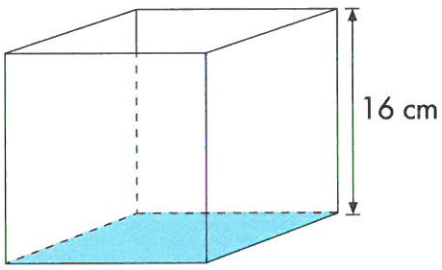
10 A rectangular box with a square base has a volume of 4096 cm^3 and a height of 16 cm. Find the length of the side of the base. Is the box a cube? Explain.

Area of base = ___

= ☐ cm^2

Length of the base = ☐

= ☐ cm

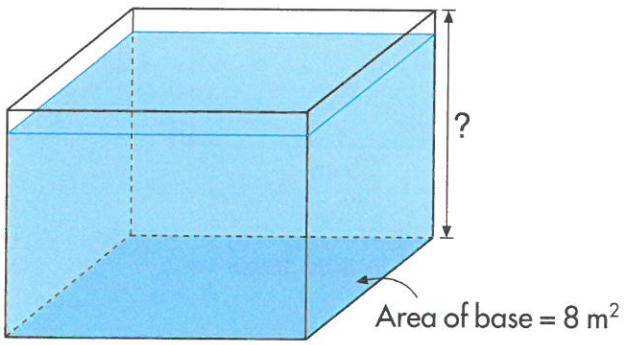


The box is a ☐.

AB 6B Part 2, Activity 3.3

Solving Word Problems

1 The area of the base of an empty rectangular tank is 8 m^2. Mr Chan pours 24 m^3 of water into the tank. Find the height of the water level in the tank.

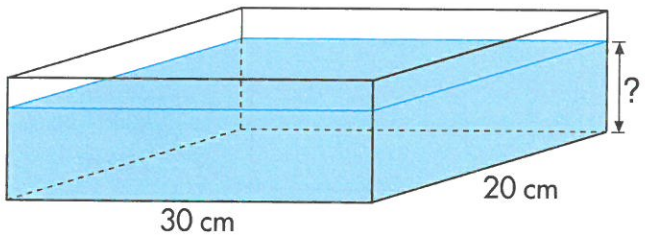


Volume of water = 24 m^3

Height of water level = $\frac{\square}{\square}$

= $\square$ m

2 A rectangular container is 30 cm long and 20 cm wide. It contains 4.5 l of water. Find the height of the water level in the container. (1 l = 1000 cm^3)



Volume of water = 4.5 l

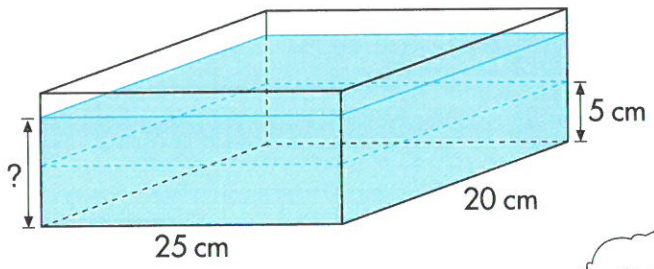
= 4.5 × 1000 cm^3

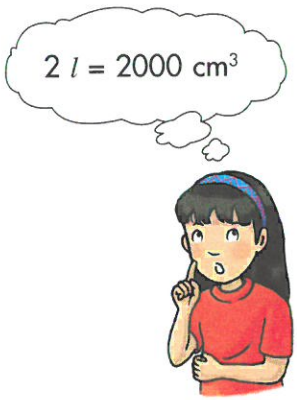
= $\square$ cm^3

Height of water level = $\frac{\square}{\square \times \square}$

= $\square$ cm

3 A rectangular container is 25 cm long and 20 cm wide. The height of the water level in the container is 5 cm. 2 l of water are then poured into the container. What is the height of the water level now? (1 l = 1000 cm^3)





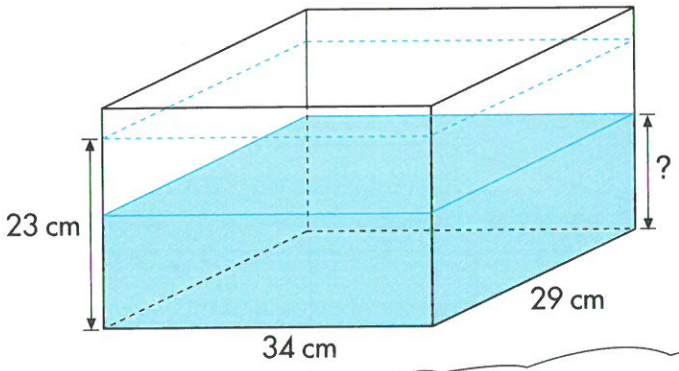
Increase in height of water level = $\frac{2000}{\square \times \square}$

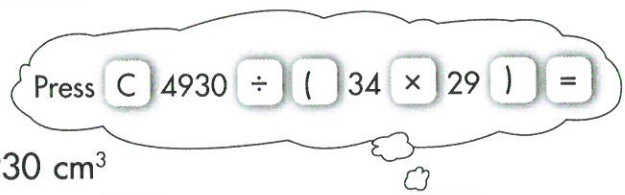
= $\square$ cm

Height of water level = $\square$ + $\square$

= $\square$ cm

4 A rectangular container is 34 cm long and 29 cm wide. The height of the water level in the container is 23 cm. After 4930 cm^3 of water are removed from the container, what is the height of the water level?





Volume of water removed = 4930 cm^3

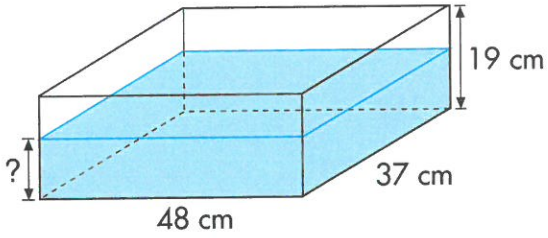
Decrease in height of water level = $\frac{4930}{34 \times 29}$

= $\square$ cm

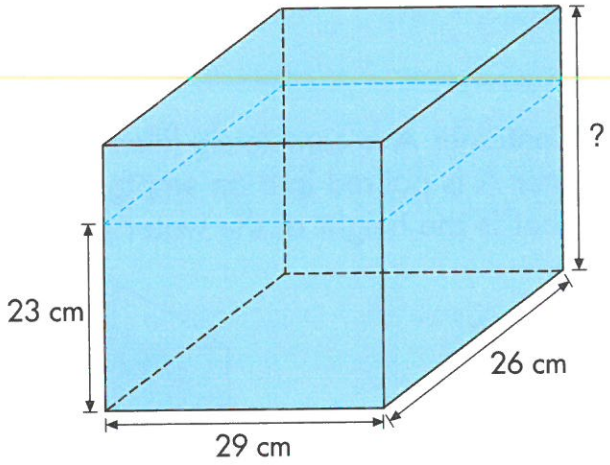
Height of water level = $\square$ − $\square$

= $\square$ cm

5 A rectangular tank is 48 cm long, 37 cm wide and 19 cm high. It is filled with 8.88 l of water. What is the water level, measured from the top of the tank?

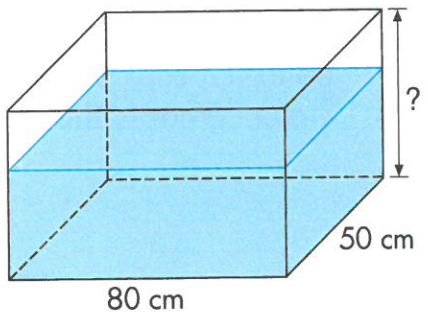


6 A rectangular container is 29 cm long and 26 cm wide. The height of the water level in the container is 23 cm. 9 l 48 ml of water are poured into the container to fill it to its brim. What is the height of the container?



7 A rectangular tank is 80 cm long and 50 cm wide. It contains 160 litres of water when it is $\frac{2}{3}$ full. Find the height of the tank.

(1 litre = 1000 cm^3)



Volume of water = 160 l

= ____ cm^3

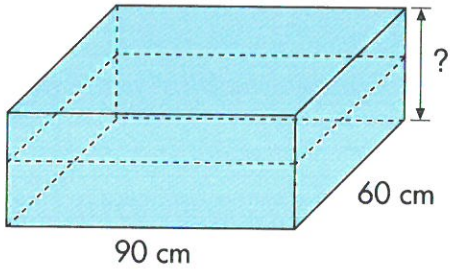
Height of water level = $\frac{\quad}{80 \times 50}$

= ____ cm

$\frac{2}{3}$ of the height of tank = ____ cm

Height of tank = ____ cm

8 A rectangular tank, 90 cm long and 60 cm wide, is $\frac{3}{5}$ filled with water. When 108 litres of water are poured into the tank, the water level rises to the brim of the tank. Find the height of the tank.
(1 litre = 1000 cm^3)



Volume of water = 108 l

= ____ cm^3

Increase in height of water level = $\frac{\quad}{90 \times 60}$

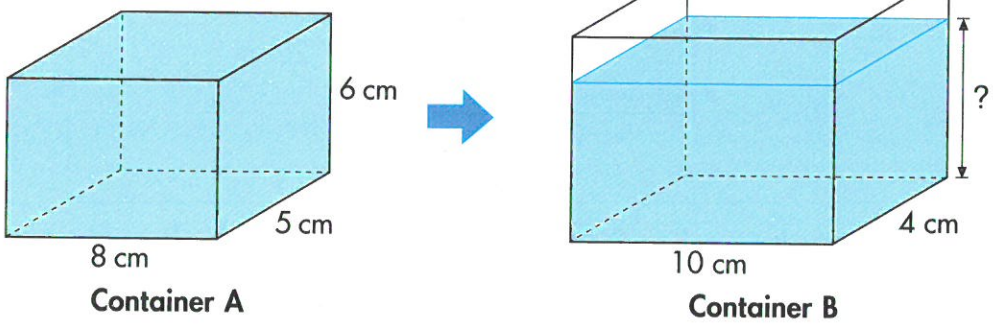
= ____ cm

$\frac{2}{5}$ of the height of tank = ____ cm

Height of tank = ____ cm

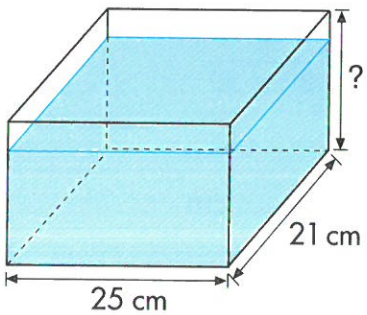
AB 6B Part 2, Activity 3.4

9 A rectangular Container A is completely filled with water. All the water in Container A is poured into an empty rectangular Container B. What is the height of the water level in Container B?

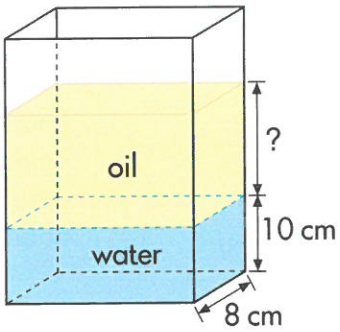


Container A **Container B**

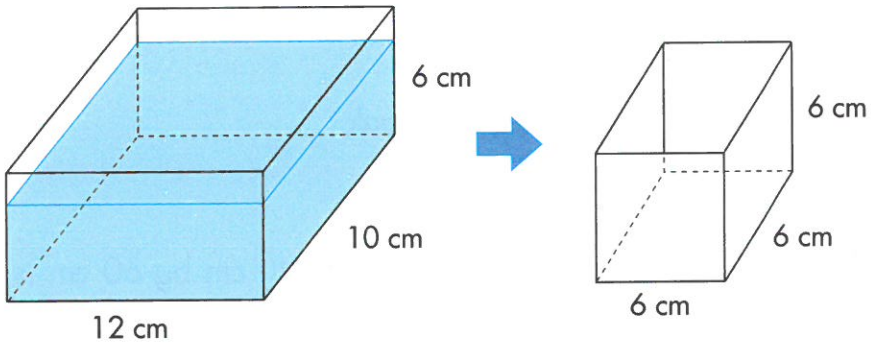
10 An empty rectangular tank is 25 cm long and 21 cm wide. Bala pours 27 cups of water into the tank. Each cup contains 350 cm^3 of water. What is the height of the water level in the tank?



11 A rectangular tank is 8 cm wide. It contains 2 l of water and 3 l of oil. The height of the water level in the tank is 10 cm. Find the height of the oil level.



12 Container A is a rectangular container, measuring 12 cm by 10 cm by 6 cm. It is $\frac{2}{3}$ filled with water. Container B is an empty cubical container of side 6 cm. Water in Container A is then used to fill Container B to its brim. Find the height of the water level left in Container A.



Container A **Container B**

Volume of water in Container A = ☐ × ☐ × ☐ × ☐

= ☐ cm^3

Capacity of Container B = ☐ cm × ☐ cm × ☐ cm

= ☐ cm^3

Volume of water left in Container A = ☐ cm^3 − ☐ cm^3

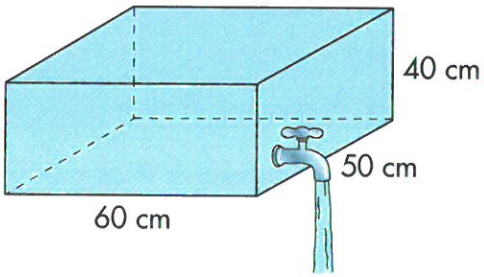
= ☐ cm^3

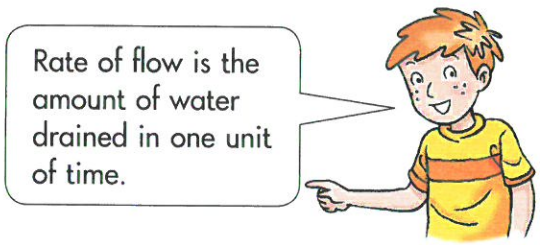
Height of water level left in Container A = $\frac{\square}{\square}$

= ☐ cm

AB 6B Part 2, Activity 3.5

13 A rectangular tank measures 60 cm by 50 cm by 40 cm. It is filled with water to its brim. The water is then drained at a rate of 8 litres per minute. How long will it take to empty the tank?
(1 litre = 1000 cm^3)





Volume of water = 60 cm × 50 cm × 40 cm

= ____ cm^3

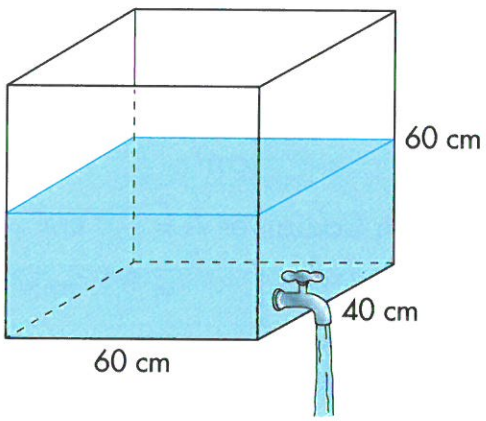
= ____ l

Time taken = $\frac{\text{____}}{8}$

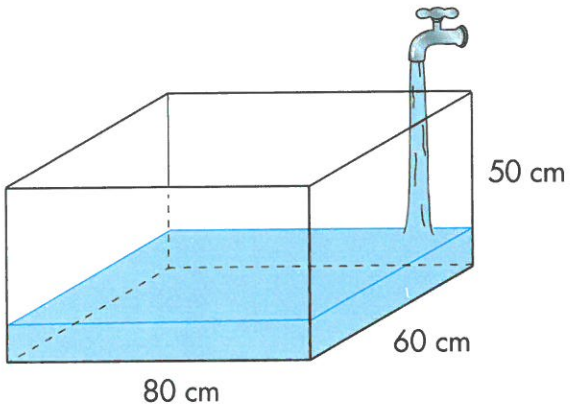
= ____ min

It will take ____ min to empty the tank.

14 A rectangular tank measuring 60 cm by 40 cm by 60 cm is $\frac{1}{2}$ filled with water. The water is then drained at a rate of 4 litres per minute. How long will it take to empty the water from the tank?
(1 litre = 1000 cm^3)



15 A rectangular tank measures 80 cm by 60 cm by 50 cm. It is being filled with water flowing from a tap at a rate of 12 litres per minute. How long will it take to fill the tank to its brim?



Volume of tank = 80 cm × 60 cm × 50 cm

$$= \frac{80 \times 60 \times 50}{1000}$$

$$= (8 \times 6 \times 5)\ l$$

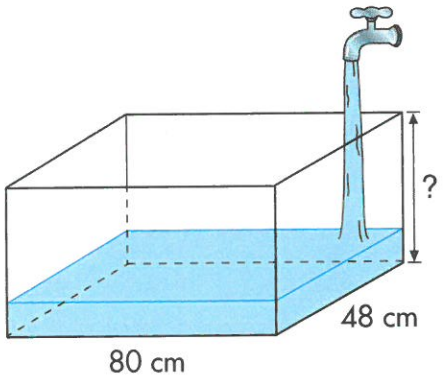
Time taken = $\frac{8 \times 6 \times 5}{12}$ min

= ____ min

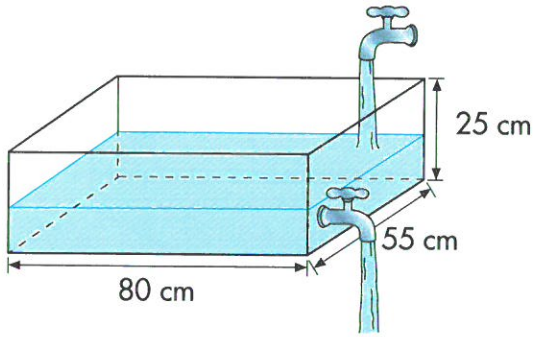
It will take ____ min to fill the tank to its brim.

16 An empty rectangular tank is 80 cm long and 48 cm wide. It is being filled with water flowing from a tap at a rate of 12 litres per minute. It takes 16 minutes to fill the tank to the brim.

a) Find the volume of water in the tank after 15 minutes.
b) Find the height of the tank.



17 An empty rectangular tank measures 80 cm by 55 cm by 25 cm. It is being filled with water flowing from a tap at a rate of 12 litres per minute. At the same time, the water is drained at a rate of 7 litres per minute. How long will it take to fill the tank completely?



Volume of tank = ____ cm × ____ cm × ____ cm

= ____ cm^3

= ____ l

Amount of water being added into the tank in one minute

= ____ litres − ____ litres

= ____ litres

Time taken = $\frac{\text{____}}{\text{____}}$

= ____ min

It will take ____ min to fill the tank completely.

18 An empty cubical tank of side 30 cm was being filled with water flowing from a tap at a rate of 8 litres per minute. After 4 minutes, the tap was turned off. Water was then drained at a rate of 6 litres per minute. Find the height of the water left in the tank 5 minutes later. Express your answer correct to 1 decimal place.

Amount of the water left in the tank = ____ − ____

= ____

Height of the water = $\frac{\text{____}}{\text{____} \times 30}$

= ____

AB 6B Part 2, Activity 3.6

Fun with Maths

Cubes of Numbers

What you need

A calculator

What to do

We can write the cubes of the first three numbers as follows:

$1^3 = 1$

$2^3 = 3 + 5$

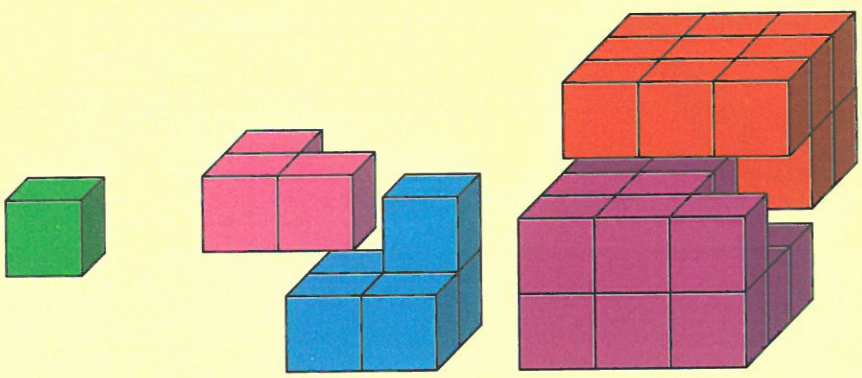
$3^3 = 7 + 9 + 11$

1. Add the next three lines to this pattern.

2. Use the calculator to check that your number sentences are true.

3. Look for a pattern. How do you express 7^3 as a sum of numbers? 7^3 can be expressed as the ____ of ____ consecutive ____ numbers, starting from ____.

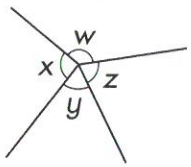
4. Using only the number keys and the + key on your calculator, find the value of 9^3.



4 Triangles and Four-sided Figures

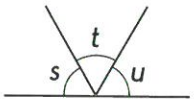
Let's recall.

Angles at a point



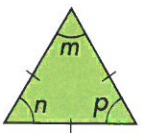
$\angle w + \angle x + \angle y + \angle z = 360°$

Angles on a straight line



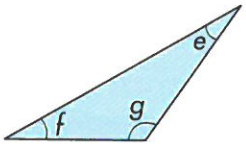
$\angle s + \angle t + \angle u = 180°$

Equilateral triangle



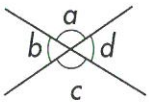
All sides are equal.
$\angle m = \angle n = \angle p = 60°$

Angle sum of triangle



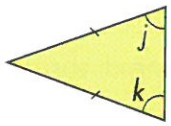
$\angle e + \angle f + \angle g = 180°$

Vertically opposite angles



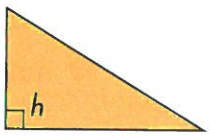
$\angle a = \angle c$
$\angle b = \angle d$

Isosceles triangle



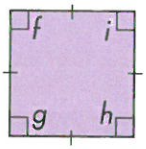
Two equal sides.
$\angle j = \angle k$

Right-angled triangle



$\angle h = 90°$

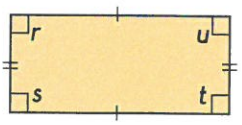
Square



$\angle f = \angle g = \angle h = \angle i = 90°$

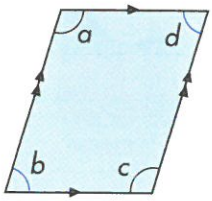
AB 6B Part 2, Recall 4

Rectangle



$\angle r = \angle s = \angle t = \angle u = 90°$

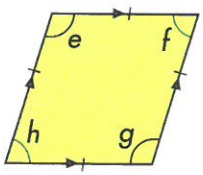
Parallelogram



$\angle a = \angle c$
$\angle a + \angle b = 180°$
$\angle a + \angle d = 180°$

$\angle b = \angle d$
$\angle c + \angle d = 180°$
$\angle c + \angle b = 180°$

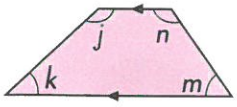
Rhombus



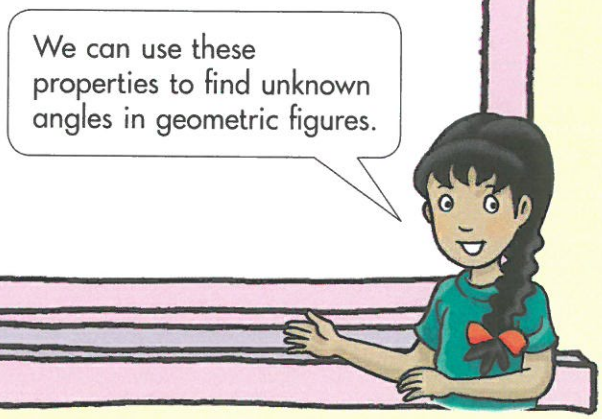
$\angle e = \angle g$
$\angle e + \angle h = 180°$
$\angle e + \angle f = 180°$

$\angle f = \angle h$
$\angle f + \angle g = 180°$
$\angle h + \angle g = 180°$

Trapezium

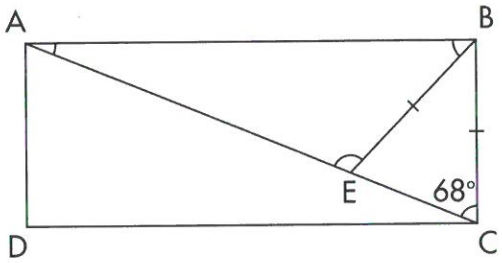


$\angle j + \angle k = 180°$
$\angle n + \angle m = 180°$



In the figure, not drawn to scale, ABCD is a rectangle. AEC is a straight line. BE = BC and ∠BCE = 68°.

Find **a)** ∠ABE
b) ∠BAC
c) ∠BEA



a) Triangle BEC is an isosceles triangle.

∠BEC = ∠BCE = ☐°

∠EBC = 180° − 68° − ☐°

= ☐°

The angles of Triangle BEC add up to 180°.

ABCD is a rectangle.

∠ABE = 90° − ☐°

= ☐°

b) Triangle ABC is a right-angled triangle.

∠BAC = 180° − ☐° − ☐°

= ☐°

c) AEC is a straight line.

∠BEA + ∠BEC = 180°

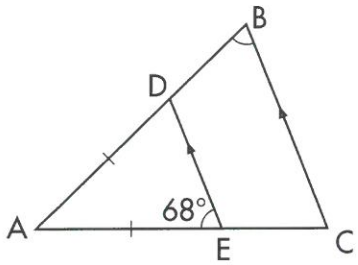
∠BEA = 180° − ☐°

= ☐°

The sum of adjacent angles on AEC is 180°.

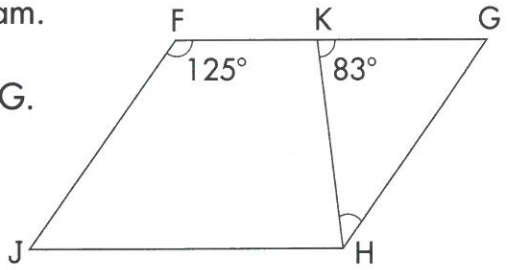
The following figures are not drawn to scale.

1 In the figure, ADE and ABC are isosceles triangles. AE = AD, AB = AC, DE // BC and ∠AED = 68°. Find ∠ABC.



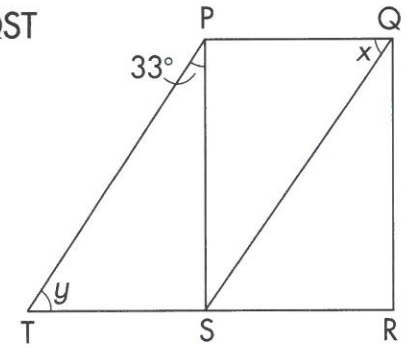
∠AED = ∠ADE = 68°
∠DAE = 180° − (° + °)
= °
∠ABC = °

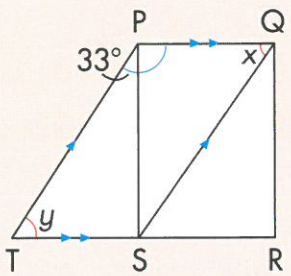
2 In the figure, FGHJ is a parallelogram. ∠JFG = 125° and ∠HKG = 83°. JF // HG and JH // FG. Find ∠KHG.



∠HGK = ° − 125°
= °
∠KHG = ° − 83° − °
= °

3 In the figure, PQRS is a rectangle and PQST is a parallelogram. TSR is a straight line. Find ∠x and ∠y.

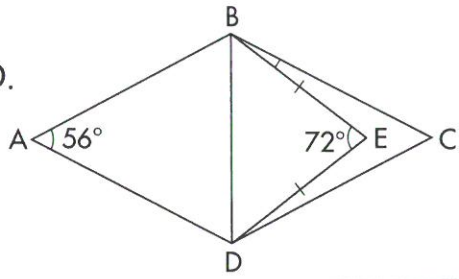


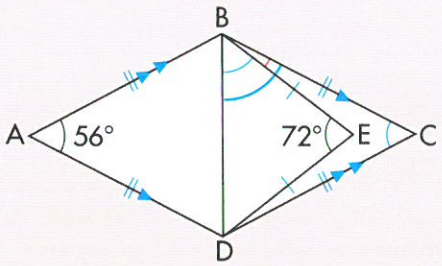


PQRS is a rectangle.
∠QPT = ° + 33°
= °
PT // QS
∠x = 180° − 123° = °
PQST is a parallelogram.
∠y = °

AB 6B Part 1, Activity 4.1

4 In the figure, ABCD is a rhombus. $\angle BAD = 56°$, $\angle BED = 72°$ and $BE = ED$. Find $\angle CBE$.





ABCD is a rhombus.

$\angle BCD =$ ____ °

Triangle DBC is an isosceles triangle.

$\angle DBC = (180° -$ ____ ° $) \div 2$

$=$ ____ °

Triangle EBD is an isosceles triangle.

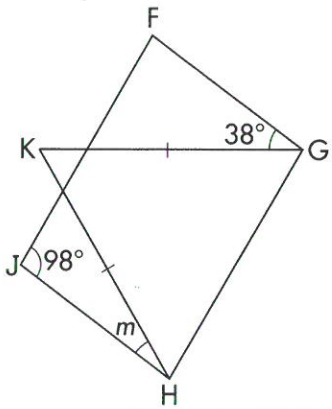
$\angle EBD = (180° -$ ____ ° $) \div 2$

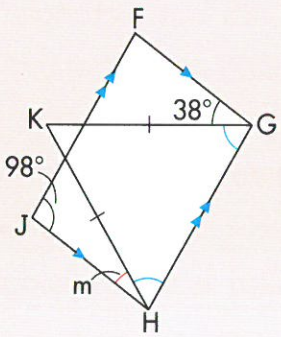
$=$ ____ °

$\angle CBE =$ ____ ° − ____ °

$=$ ____ °

5 The figure shows a parallelogram FGHJ and an isosceles triangle GHK. $\angle FGK = 38°$, $\angle FJH = 98°$ and $KG = KH$. Find $\angle m$.





FGHJ is a parallelogram.

$\angle FGH =$ ____ °

$\angle KGH = 98° - 38° =$ ____ °

Triangle KGH is an isosceles triangle.

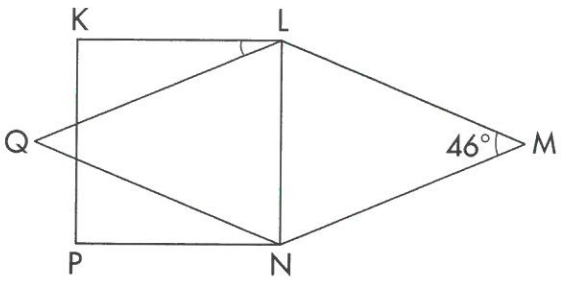
$\angle KHG =$ ____ °

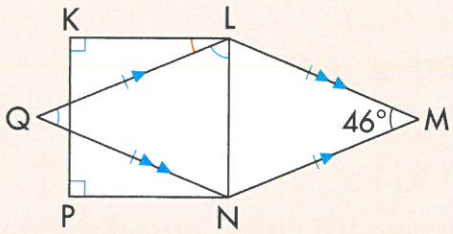
JF // HG

$\angle JHG = 180° - 98° = 82°$

$\angle m = 82° - 60° =$ ____ °

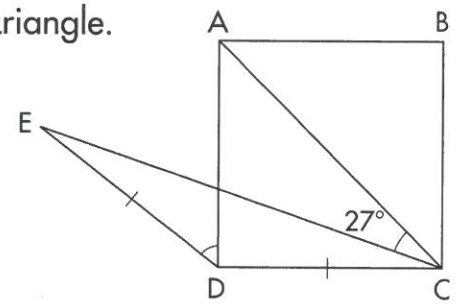
6 The figure shows a square KLNP and a rhombus LMNQ.
$\angle LMN = 46°$. Find $\angle KLQ$.

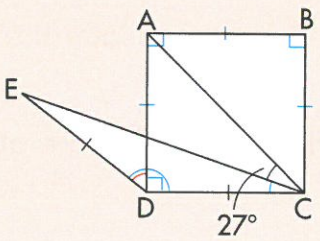




LMNQ is a rhombus.
$\angle LQN =$ ☐ °
Triangle QLN is an isosceles triangle.
$\angle QLN =$ ☐ °
KLNP is a square.
$\angle KLQ = 90° - 67° =$ ☐ °

7 ABCD is a square. EDC is an isosceles triangle.
$\angle ACE = 27°$. Find $\angle ADE$.

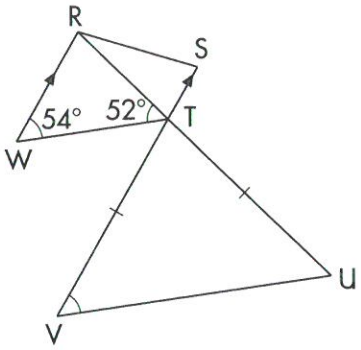


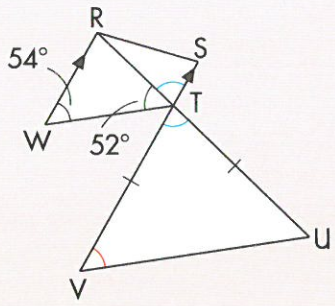


In Triangle ADC, $\angle ACD =$ ☐ °.
$\angle ECD =$ ☐ °
Triangle ECD is an isosceles triangle.
$\angle EDC =$ ☐ °
$\angle ADE = 144° - 90° =$ ☐ °

AB 6B Part 2, Activity 4.2

8 The figure shows a trapezium RSTW and an isosceles triangle TUV. WR // TS. TV = TU. RTU and STV are straight lines. ∠RWT = 54° and ∠RTW = 52°. Find ∠TVU.





WR // TS

∠RTS = 180° − 54° − 52° = ☐°

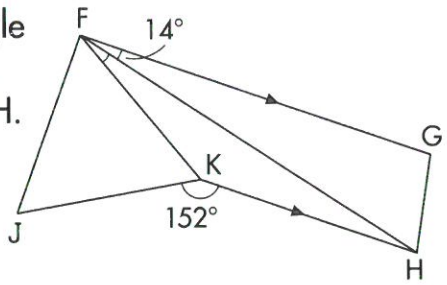
∠RTS is vertically opposite ∠VTU.

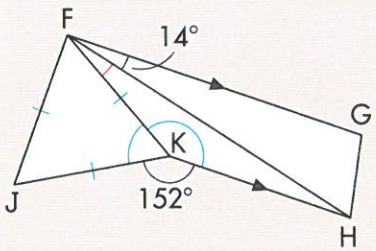
∠VTU = ☐°

Triangle VTU is an isosceles triangle.

∠TVU = (180° − 74°) ÷ 2 = ☐°

9 In the figure, FJK is an equilateral triangle and FGHK is a trapezium. ∠GFH = 14°, ∠JKH = 152° and FG // KH. Find ∠KFH.





Triangle FJK is an equilateral triangle.

∠FKJ = ☐°

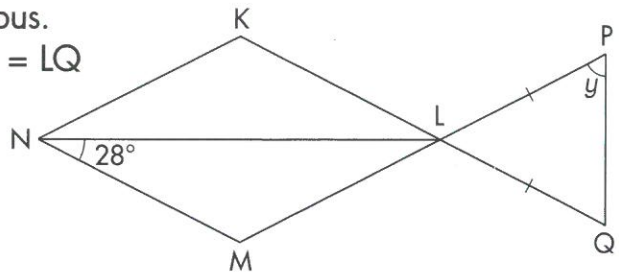
∠FKJ, ∠FKH and ∠JKH are at point K.

∠FKH = ☐°

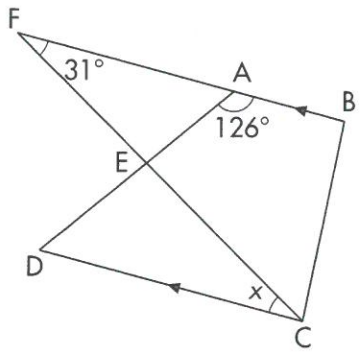
FG // KH

∠KFH = 180° − 14° − 148° = ☐°

10 In the figure, KLMN is a rhombus. PQL is an isosceles triangle. PL = LQ and ∠LNM = 28°. KLQ and PLM are straight lines. Find ∠y.

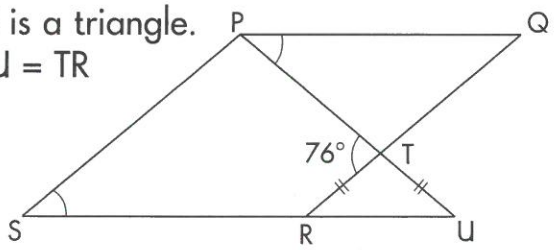


11 In the figure, ABCD is a trapezium and BCF is a triangle. BF // CD, ∠BAD = 126° and ∠BFC = 31°. Find ∠x in two different ways.

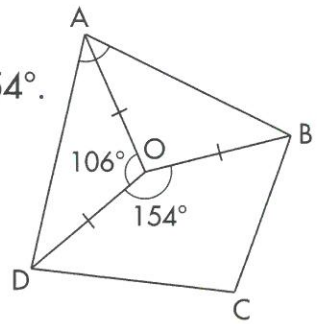


12 PQRS is a parallelogram and PUS is a triangle. SRU and PTU are straight lines. TU = TR and ∠PTR = 76°.

a) Find ∠PSR.
b) Find ∠QPT.



13 In the figure, ABCD is a four-sided figure. AO = OB = OD, ∠AOD = 106° and ∠BOD = 154°. Find ∠BAD.



AB 6B Part 2, Activity 4.3

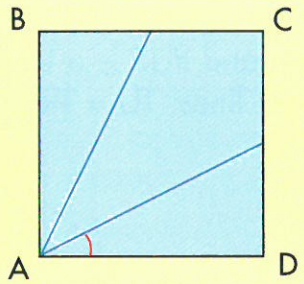
An Eight-sided Figure in My Square!

What you need

A square piece of paper ABCD, ruler, pencil and calculator

What to do

1. Work with a friend.
2. Mark the mid-point of each side of the square paper ABCD.
3. Join corner A to the mid-points of the opposite sides as shown below.



4. Repeat Step 2 with the other three corners.
5. Can you see an eight-sided shape (known as an octagon) at the centre of the paper?
   Study the octagon shape and answer the following questions:
   How many pairs of parallel sides does it have?
   How many angles does the shape have?
   Are all these angles equal?

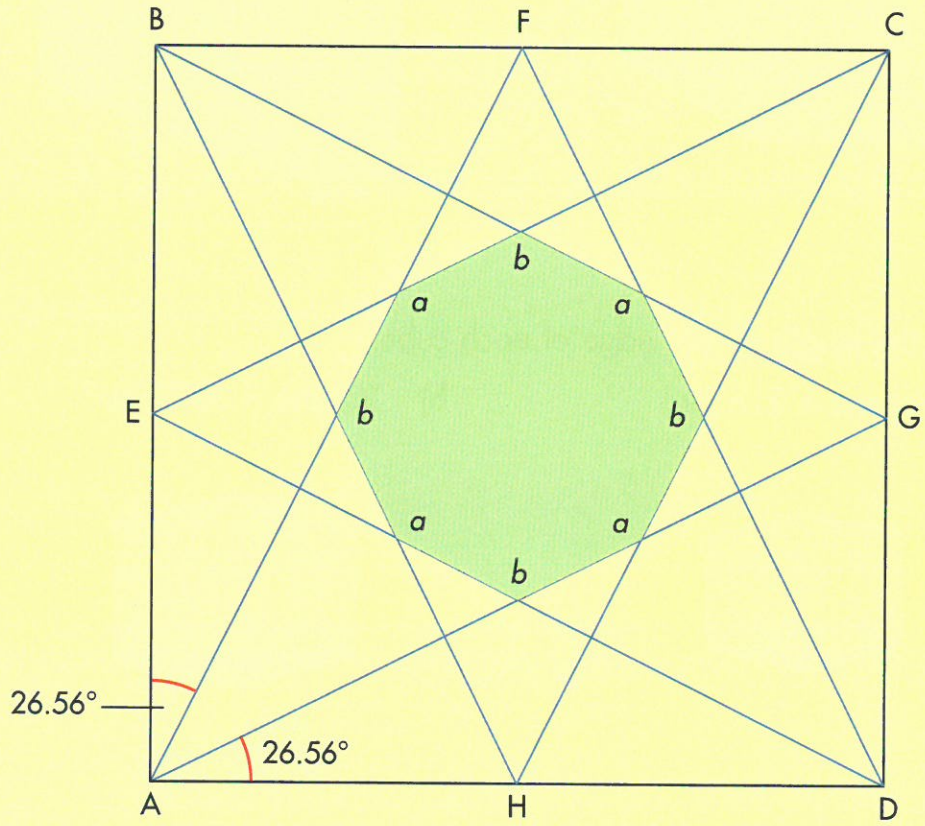
Challenge

The diagram below shows the eight-sided figure formed on your paper.
$\angle BAF = \angle GAD = 26.56°$

a) What do you notice about the opposite sides of the figure?

b) Find $\angle FAG$.

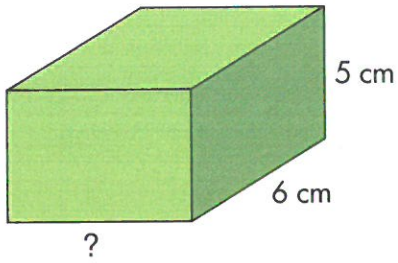
c) Find $\angle a$.



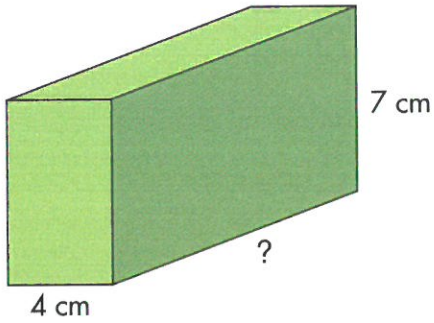
Review B

1 Find the unknown edge of each cuboid.

a) Volume = 210 cm^3

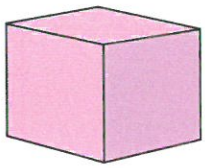


b) Volume = 280 cm^3

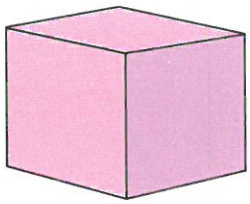


2 Find the length of one edge of each cube.

a) Volume = 216 cm^3

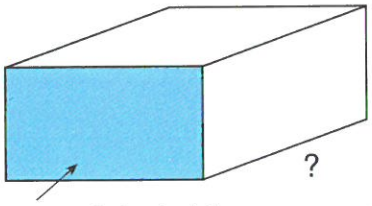


b) Volume = 5832 cm^3



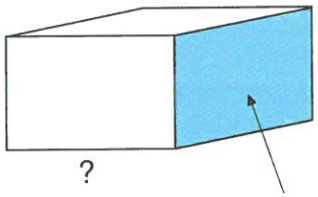
3 Find the unknown edge of each cuboid.

a) Volume = 196 cm^3



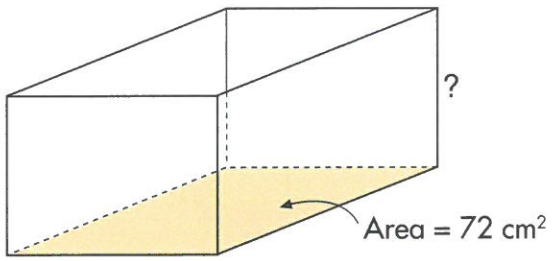
Area of shaded face = 28 cm^2

b) Volume = 11 328 cm^3

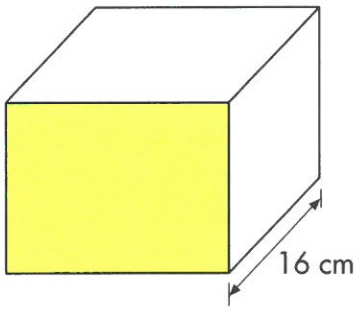


Area of shaded face = 354 cm^2

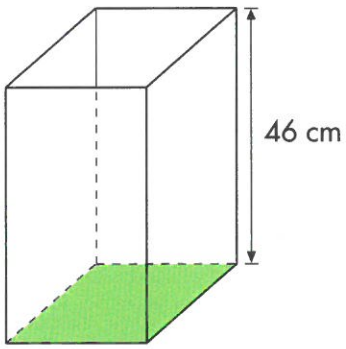
4 A rectangular storage box has a capacity of 432 cm^3. The area of its base is 72 cm^2. Find the height of the box.



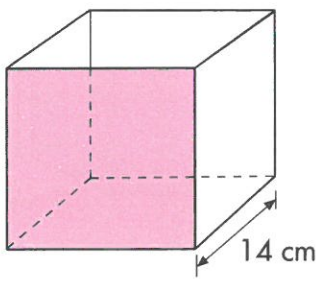
5 The volume of a cuboid is 736 cm^3. It has a width of 16 cm. Find the area of the shaded face.



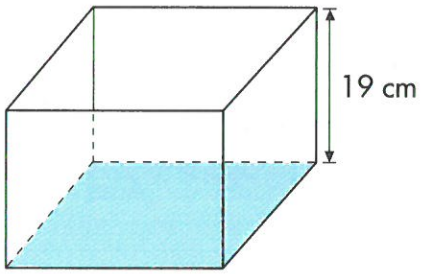
6 The volume of a rectangular box is 9982 cm^3. It has a height of 46 cm. Find the area of the shaded base.



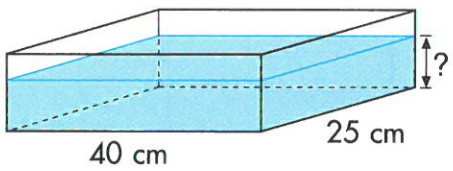
7 A rectangular box with a square face has a volume of 9464 cm^3. Its width is 14 cm. Find the area of the shaded square face and the length of its side.



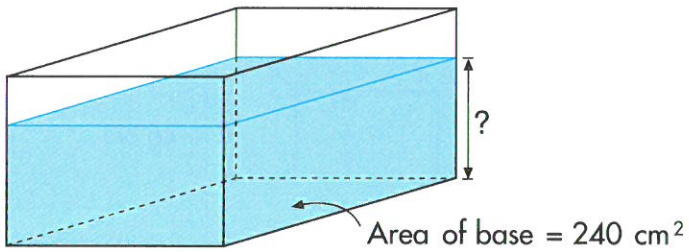
8 The volume of a rectangular box with a square base is 8379 cm^3. It has a height of 19 cm. Find the area of the base and the length of its side.



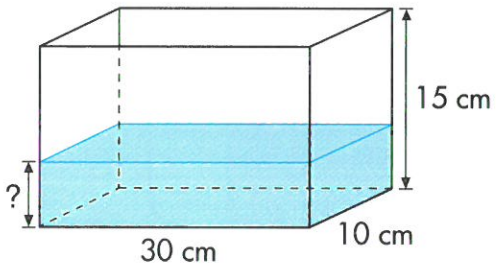
9 A rectangular container 40 cm long and 25 cm wide contains 8 l of water. Find the height of the water level in the container.



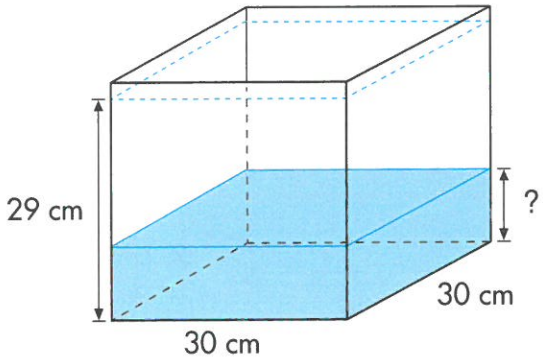
10 A rectangular container contains 3.6 l of water. It has a base area of 240 cm^2. Find the height of the water level in the container.



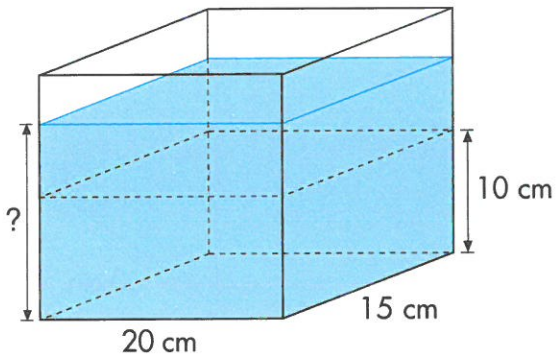
11 A rectangular container measures 30 cm by 10 cm by 15 cm. It is filled with water to its brim. 3 l of water are then poured out from the container. Find the height of the water left in the container.



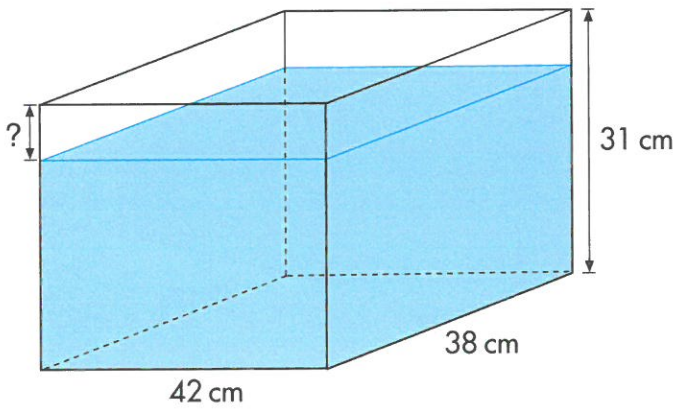
12 Samuel filled a cubical container of edge 30 cm with water to a height of 29 cm. After 18 l of water were removed from the container, what was the height of the water level in the container?



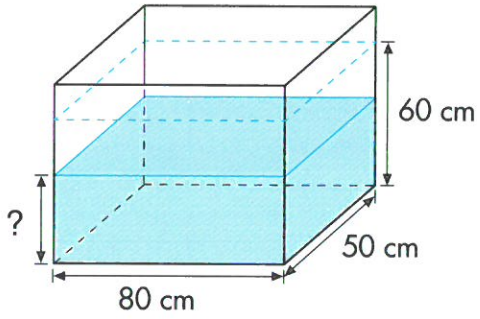
13 A rectangular container is 20 cm long and 15 cm wide. The height of the water level in the container is 10 cm. After 1800 cm^3 of water are poured into the container, what is the new height of the water level in the container?



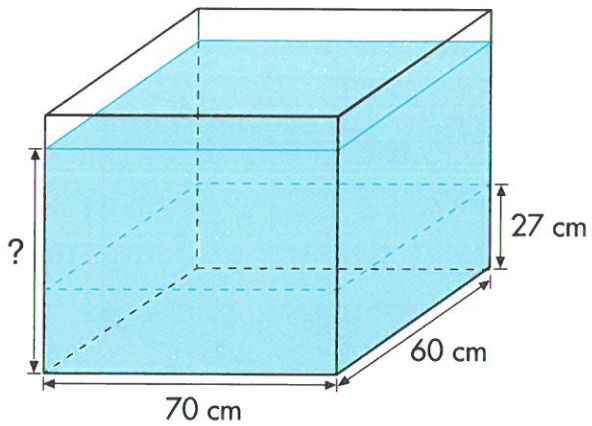
14 A rectangular container is 42 cm long, 38 cm wide and 31 cm high. It is filled with 39.9 l of water. What is the height of the water level, measured from the top of the container?



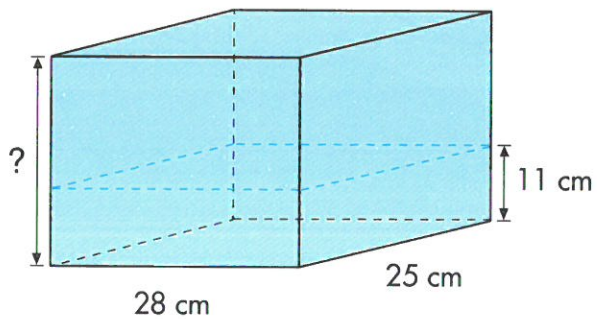
15 A rectangular tank, 80 cm long and 50 cm wide, is filled with water to a height of 60 cm. What is the new height of the water level when 60 litres of water are poured out from the tank?



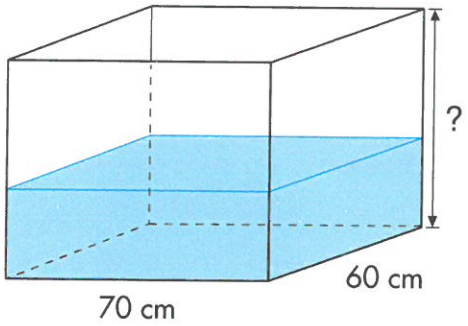
16 A rectangular tank, 70 cm long and 60 cm wide, is filled with water to a height of 27 cm. What is the new height of the water level after 168 litres of water are poured into the tank?



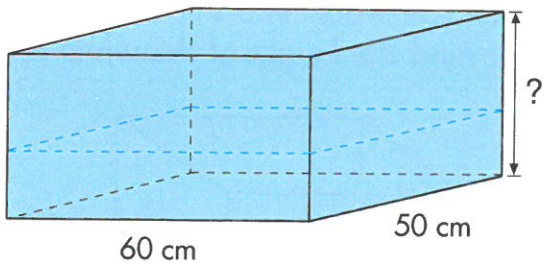
17 A rectangular tank is 28 cm long and 25 cm wide. The height of the water level in the tank is 11 cm. 11.2 litres of water are poured into the tank to fill it to its brim. What is the height of the tank?



18 A rectangular container is 70 cm long and 60 cm wide. It contains 84 litres of water when it is $\frac{2}{5}$ full. Find the height of the container. (1 litre = 1000 cm^3)

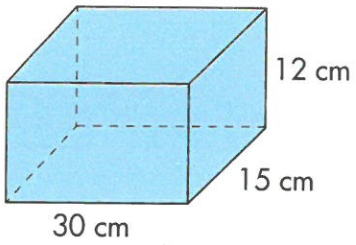


19 A rectangular tank, 60 cm long and 50 cm wide, is $\frac{1}{3}$ filled with water. When 60 litres of water are added, the water level rises to the brim of the tank. Find the height of the tank. (1 litre = 1000 cm^3)

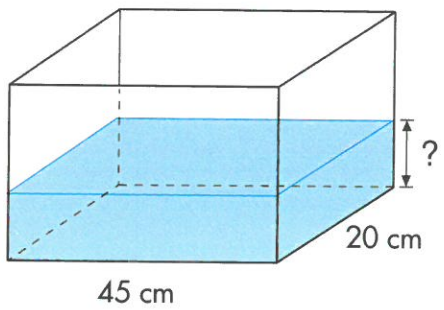


20 Container A is completely filled with water. All the water in Container A is then poured into Container B. Find the height of the water level in Container B.

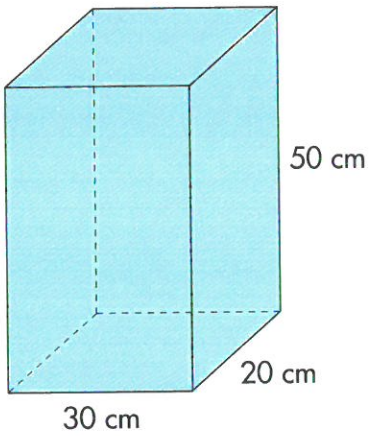
Container A



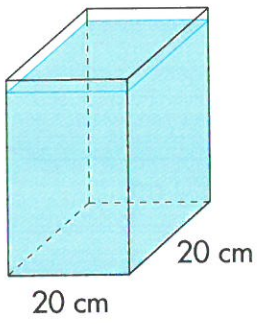
Container B



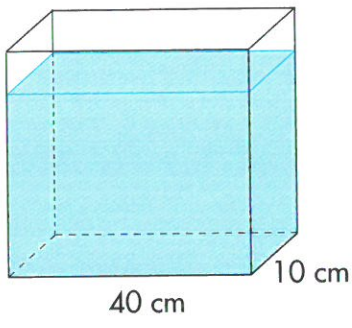
21 Rectangular Container A is completely filled with water. All the water is then poured into two empty rectangular containers, B and C, so that the height of the water is the same in both containers. Find the height of the water in each container.



Container A

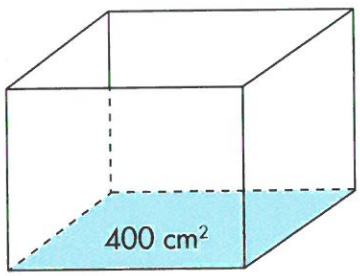


Container B

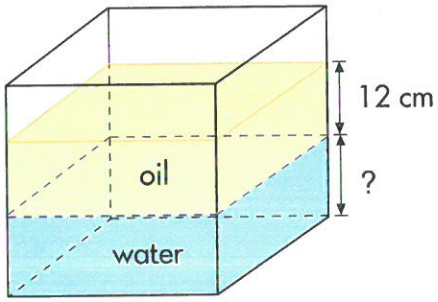


Container C

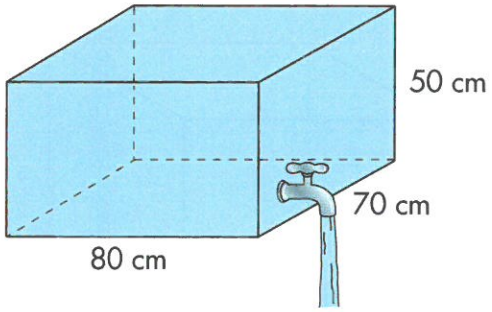
22 The area of the base of an empty rectangular tank is 400 cm^2. Jenny pours 24 cups of water into the tank. Each cup contains 480 cm^3 of water. Find the height of the water level in the tank.



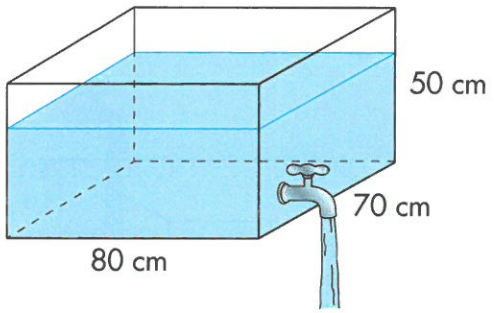
23 A rectangular tank contains 6.48 litres of water and 5.184 litres of oil. The height of the oil level from the top of the water level is 12 cm. Find the height of the water level.



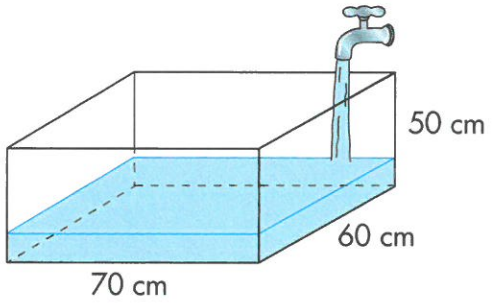
24 A rectangular tank measuring 80 cm by 70 cm by 50 cm is filled with water to its brim. The water is then drained at a rate of 7 litres per minute. How long will it take to empty the tank?
(1 litre = 1000 cm^3)



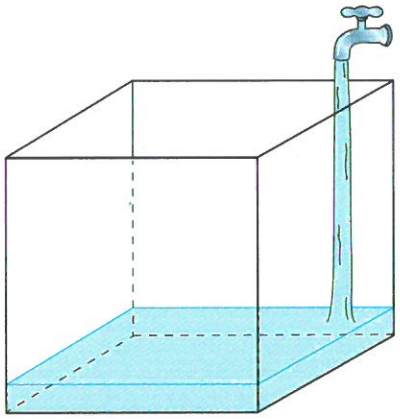
25 A rectangular tank measuring 80 cm by 70 cm by 50 cm is $\frac{4}{5}$ filled with water. A tap drains water out of the tank at a rate of 14 litres per minute. How long will it take to empty the tank?
(1 litre = 1000 cm^3)



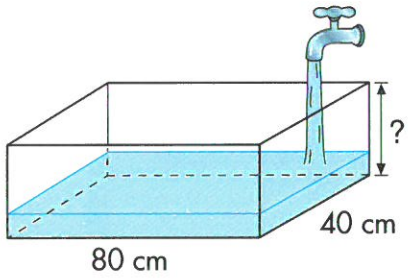
26 An empty rectangular tank measures 70 cm by 60 cm by 50 cm. It is being filled with water flowing from a tap at a rate of 15 litres per minute. Find the height of the water in the tank after 7 minutes.
(1 litre = 1000 cm^3)



27 An empty cubical tank of edge 50 cm is being filled with water flowing from a tap at a rate of 5 litres per minute. How long will it take to fill the tank to $\frac{4}{5}$ of its capacity? (1 litre = 1000 cm^3)

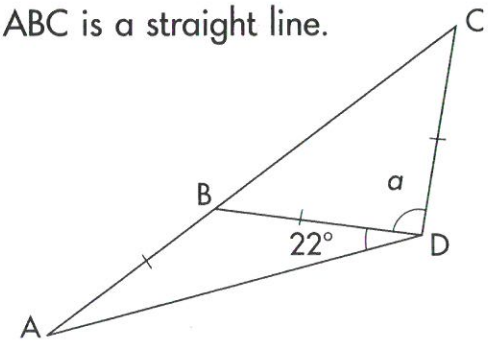


28 An empty rectangular tank is 80 cm long and 40 cm wide. It is being filled with water flowing from a tap at a rate of 12 litres per minute. It takes 8 minutes to fill the tank to its brim. Find the height of the tank.

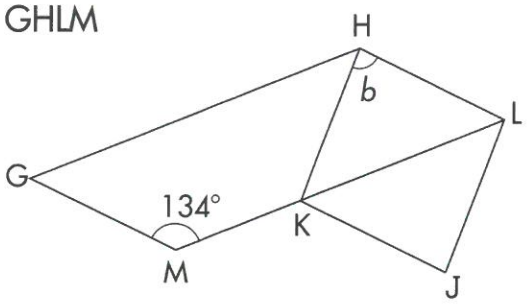


The following figures are not drawn to scale.

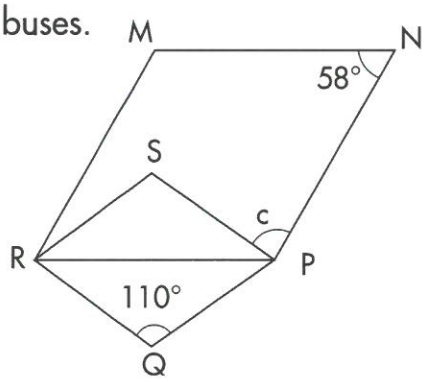
29 In the figure, AB = BD = CD and ABC is a straight line. Find $\angle a$.



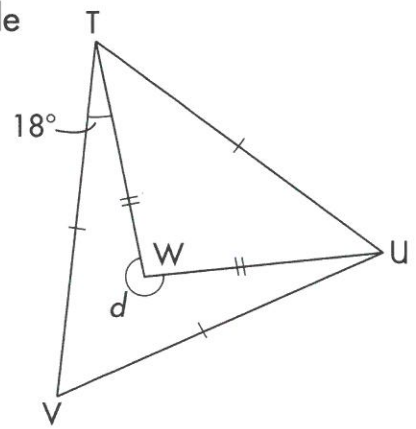
30 The figure shows a parallelogram GHLM and a rhombus HLJK. Find $\angle b$.



31 In the figure, MNPR and PQRS are rhombuses. Find $\angle c$.



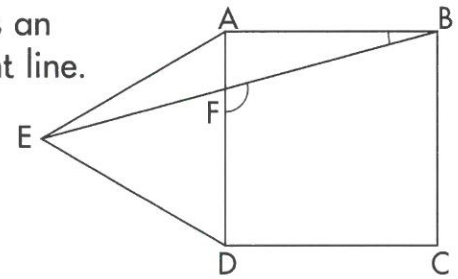
32 In the figure, TUV is an equilateral triangle and TWU is an isosceles triangle. TW = WU and $\angle VTW = 18°$. Find $\angle d$.



33 In the figure, ABCD is a square, ADE is an equilateral triangle and BFE is a straight line.

a) Find $\angle ABE$.

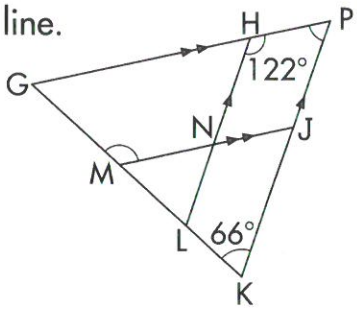
b) Find $\angle DFB$.



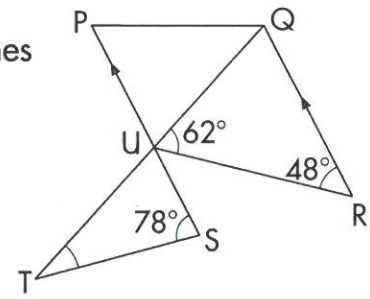
34 In the figure, GPJM and HPKL are trapeziums. GP // MJ and HL // PK. GMLK is a straight line.

a) Find ∠GPK.

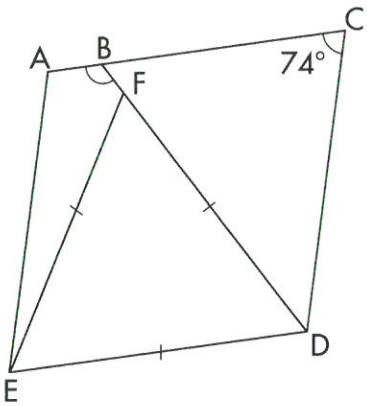
b) Find ∠GMJ.



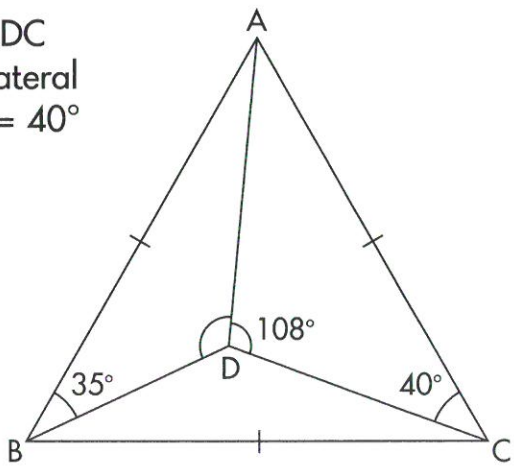
35 The figure shows a trapezium PQRU and a triangle STU. PUS and QUT are straight lines and PU // QR. Find ∠STU.



36 In the figure, ACDE is a parallelogram, DEF is an equilateral triangle and BFD is a straight line. Find ∠ABF.



37 In the figure, three triangles ABD, ADC and BCD are drawn inside the equilateral triangle ABC. ∠ABD = 35°, ∠ACD = 40° and ∠ADC = 108°. Find ∠ADB.



AB 6B Part 2, Review 5

Revision B

Part A

For Parts A and B of this revision exercise, do **not** use any calculators.
Choose the correct answers.

1 Which number reads 185 000 when rounded off to the nearest 100?

(1) 184 930 (2) 184 990
(3) 184 890 (4) 184 497

2 What is the product of 3.05 and 3000?

(1) 9.150 (2) 91.50
(3) 915.0 (4) 9150

3 What is the value of $3 \times 14 - 4 \div 2$?

(1) 15 (2) 19
(3) 36 (4) 40

4 What is the value of $\frac{1}{1000} \times 1013$?

(1) 101.3 (2) 10.13
(3) 1.013 (4) 0.1013

5 The radius of a circle is 3 cm. What is the area of the circle in terms of π?

(1) 1.5π cm^2 (2) 3π cm^2
(3) 6π cm^2 (4) 9π cm^2

6 Express 20 750 ml in litres.

(1) 2.075 l (2) 20.75 l
(3) 207.5 l (4) 2075 l

7 The perimeter of a rectangle is 24 cm. Its breadth is 5 cm. What is its area?

(1) 4.8 cm^2 (2) 30 cm^2
(3) 35 cm^2 (4) 120 cm^2

8 Find the duration between Monday 23 45 and Tuesday 04 55 of the same week.

(1) 5 h 10 min (2) 18 h 55 min
(3) 28 h (4) 28 h 40 min

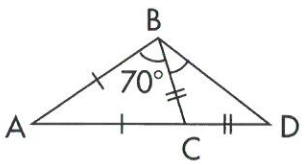
9 A rectangular tank measures 60 cm by 40 cm by 30 cm. How many litres of water are needed to fill the tank to $\frac{4}{5}$ of its capacity?

(1) 14.4 l (2) 57.6 l
(3) 72 l (4) 90 l

10 Nela is 4 years older than Devi. Their average age is 16 years. What is Nela's age?

(1) 14 (2) 18
(3) 20 (4) 28

11 The figure below is not drawn to scale. ACD is a straight line. AB = AC, BC = CD and $\angle ABC = 70°$. Find $\angle CBD$.



(1) 30° (2) 35°
(3) 40° (4) 70°

12 The ratio of Tom's expenses to Shiqi's expenses is 2 : 3. The ratio of Tom's expenses to Rosli's expenses is 4 : 5. What is the ratio of Shiqi's expenses to Rosli's expenses?

(1) 6 : 8 (2) 5 : 3
(3) 3 : 5 (4) 6 : 5

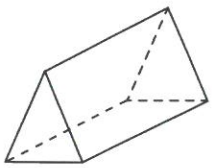
13 A man drives for 4 hours. He drives at 60 km/h for the first 2 hours, 80 km/h for 1 hour and 100 km/h for the remaining 1 hour. What is his average driving speed for the whole journey?

(1) 60 km/h
(2) 70 km/h
(3) 75 km/h
(4) 80 km/h

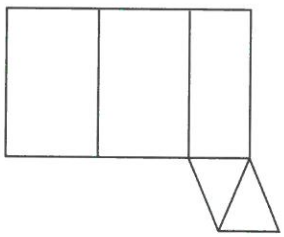
14 The price of a tie is \$40. It is sold at \$35 during a sale. Find the percentage discount.

(1) 5%
(2) $14\frac{2}{7}\%$
(3) $12\frac{1}{2}\%$
(3) $87\frac{1}{2}\%$

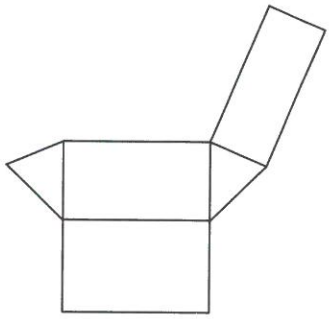
15 The figure shows a prism. Which of the following is a net of the prism?



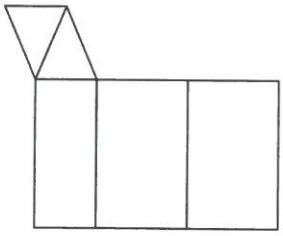
(1)



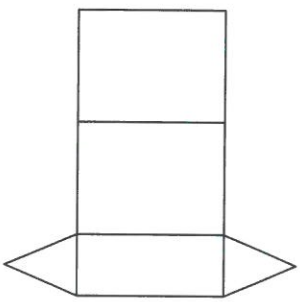
(2)



(3)



(4)



Part B

16 Find the value of $25 \div (8 - 3) \times 12$.

17 What is the value of $\frac{2}{3} \div 6$?

18 Express $\frac{7}{200}$ as a decimal.

19 Find 13% of 2 litres.

20 The sum of three numbers is $2n + 15$. One of the numbers is 12. The other two numbers are equal. What is each of the other numbers in terms of n?

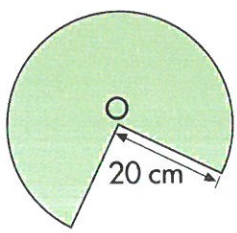
21 Huilan had \$50. She spent \$36.50. What fraction of her money was left? Express your answer in the simplest form.

22 The ratio of the sale price of a rice cooker to its usual price is 5 : 7. The usual price is \$147. What is the sale price?

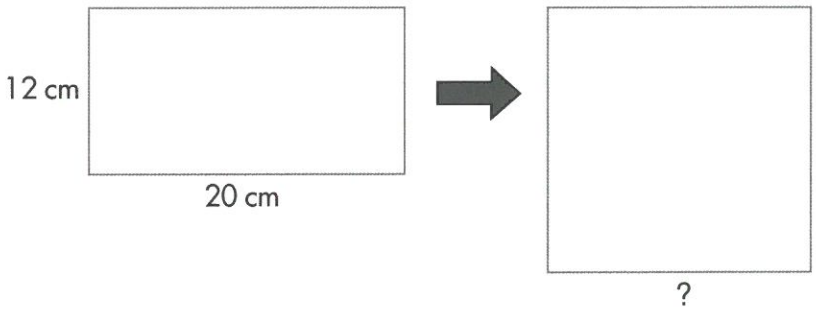
23 The average of 4 numbers is 24. Three of the numbers are 20, 26 and 30. What is the fourth number?

24 An empty jug has a mass of 840 g. When the jug is filled to the brim with water, its mass is 2.4 kg. What is its mass when it is half-filled?

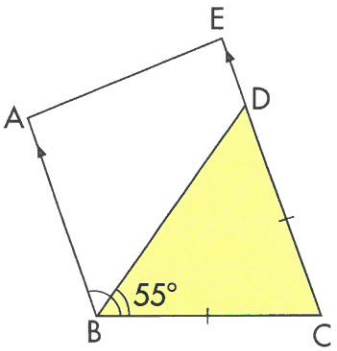
25 In the figure, O is the centre of a three-quarter circle of radius 20 cm. Find the area of the figure. (Take $\pi = 3.14$)



26 A wire is used to form a rectangle 20 cm by 12 cm. It is reshaped to form a square. What is the length of each side of the square?

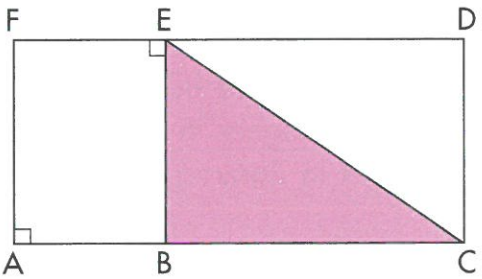


27 In the figure, not drawn to scale, BA // CE, CD = CB and ∠DBC = 55°. CDE is a straight line. Find ∠ABC.



28 Sharon and Lathi share $20. Sharon gets $4 more than Lathi. What is the ratio of Lathi's share to Sharon's share expressed in the simplest form?

29 In the figure, ACDF is rectangle. ABC and FED are straight lines. The ratio of the length of AB to the length of BC is 1 : 2. What fraction of the whole figure is shaded?



30 Liang Ming paid $25 for 20 chicken pies. How much more money will he need if he buys 4 more chicken pies?

Part C

You may use a calculator to solve these problems.

31 The table shows the charges for water consumption.

Amount of water used	Charge
Up to 40 m^3	117¢ per m^3
More than 40 m^3	140¢ per m^3

The Yeo family used 62 m^3 of water in June. How much was the family charged for its water consumption?

32 Cecilia exchanged $25 for one-dollar coins, another $25 for twenty-cent coins, $15 for ten-cent coins and $5 for five-cent coins. How many coins did she get altogether?

33 The table shows the test marks of 4 pupils. Who scored 5 marks above the average test marks?

Name	Marks
Aihua	55
Bee Lan	80
Carrie	70
Anuar	75

34 Vela scored 88 marks in a Mathematics test in February. She scored 10% higher in February than in January. How many marks did Vela get in January?

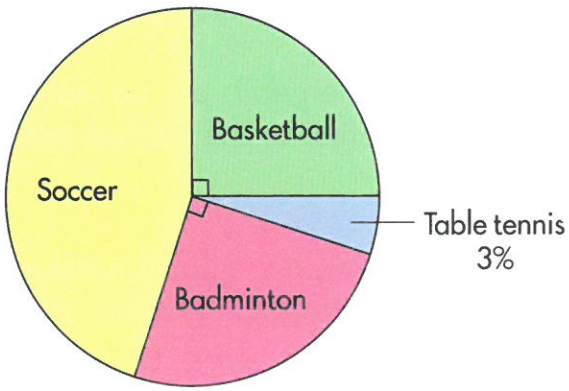
35 After spending $\frac{2}{5}$ of her money, Aisha had $132.90 left. How much money had she at first?

36 4913 pieces of 1-cm cubes are placed together to form a larger cube. What is the area of its base?

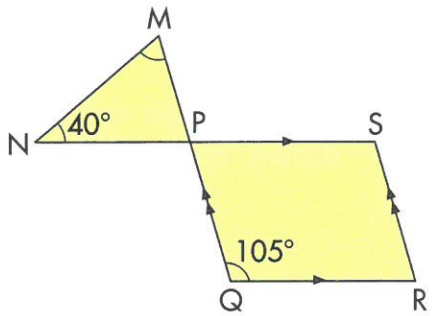
37 The pie chart shows the favourite games of the pupils in a school. 33 pupils enjoy playing table tennis.

a) How many pupils enjoy playing basketball?

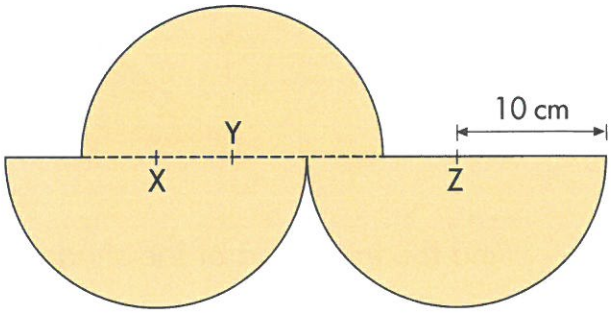
b) What is the ratio of the number of pupils whose favourite game is table tennis to the number of pupils whose favourite game is basketball?



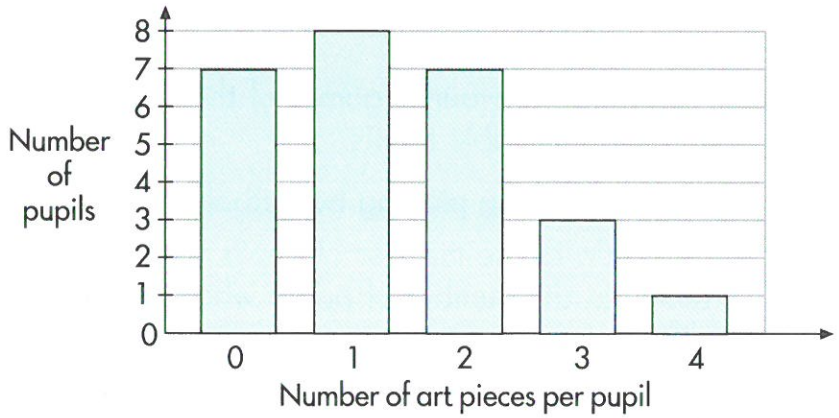
38 The figure is not drawn to scale. NPS and MPQ are straight lines and PQRS is a parallelogram. Find ∠NMP.



39 The figure is made up of 3 identical semicircles. Each semicircle has a radius of 10 cm. Find the perimeter of the figure. Give your answer correct to 2 decimal places.



40 The bar chart shows the number of art pieces put up by pupils during an exhibition.



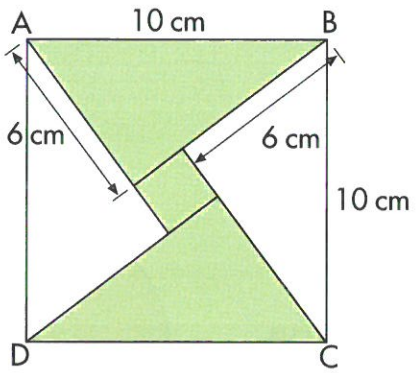
What percentage of the pupils put up more than 1 art piece? Give your answer correct to the nearest percent.

41 Azlinda has $\$8y$. After paying for 2 notebooks at $\$y$ each and 4 marker pens at \$2 each, she has just enough money to pay for 5 boxes of drawing pins.

a) What is the price of each box of drawing pins in terms of y?

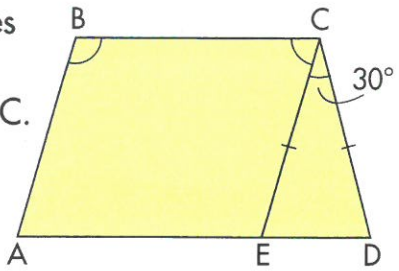
b) If $y = 3$, what is the cost of each box of drawing pins?

42 Four identical right-angled triangles are arranged to form the figure shown. Each triangle has sides 6 cm, 8 cm and 10 cm.



Find the total area of the shaded parts.

43 ABCE is a parallelogram. CDE is an isosceles triangle and CD = CE. ∠ECD = 30° and AED is a straight line. Find ∠BCE and ∠ABC.



44 Mr Chan drove from Johor Bahru to Kluang. He drove at an average speed of 90 km/h for the first 30 km. His average speed for the remaining 80 km of the journey was 100 km/h. What was the total time that he took for the whole journey?

45 Last year, the ratio of the number of boys to the number of girls in a fitness club was 3 : 2. This year, 126 new members joined the club. The number of boys is now twice that of last year and the number of girls is 3 times that of last year. How many girls are there in the fitness club this year?

46 Fiona earned $2000 in October. She earned 10% more in November than in October and earned 10% less in December than in November. How much did she earn in December?

47 On Sunday, a cafeteria served 138 more children and 120 more adults than on Saturday. It served a total of 1014 customers on both days. How many customers did it serve on Sunday?

48 Mr Lim used 1-cm cubes to build a cuboid measuring 40 cm by 20 cm by 30 cm. He rearranged the 1-cm cubes to build 2 large cubes of the same size and had some cubes left over.

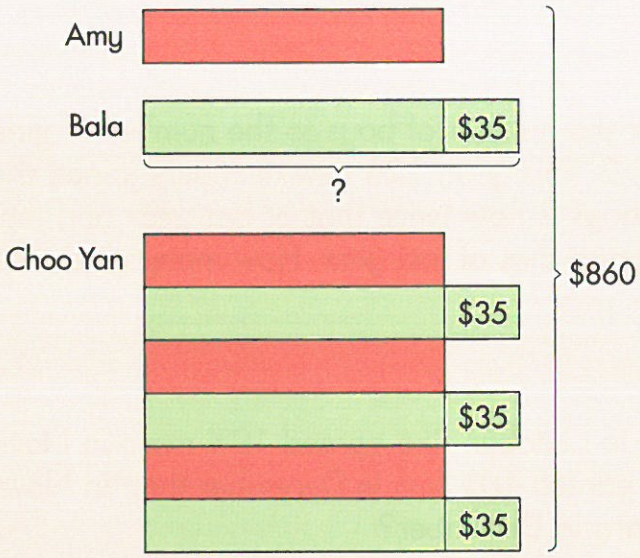
a) What was the greatest length of the edge of each large cube?

b) How many 1-cm cubes were left over?

5 More Challenging Problems (1)

Whole Numbers and Decimals

1 Amy, Bala and Choo Yan collected $860 for charity. Bala collected $35 more than Amy. Choo Yan collected 3 times as much as the sum collected by Amy and Bala. How much money did Bala collect?



$35 × 4 = $140

1 unit = ($860 − $140) ÷ 8
= ☐ ÷ 8
= $ ☐

Amount collected by Bala = $ ☐ + $ ☐
= $ ☐

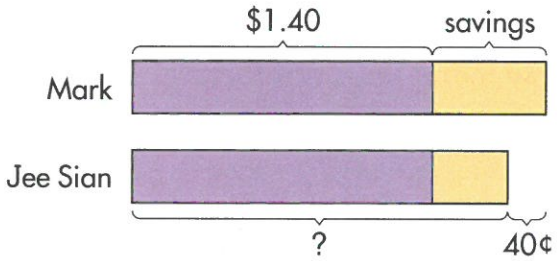
Bala collected $ ☐ .

2 Edwin, Felix and Gerard saved a total of $1180. Felix saved $25 more than Edwin. Gerard saved 3 times as much as the total amount saved by Edwin and Felix. How much did Edwin save?

3 Mr Taufik is 12 kg heavier than his wife. Their daughter is 4 kg heavier than Mrs Taufik. The total mass of Mr and Mrs Taufik is 128 kg. What is the total mass of Mrs Taufik and her daughter?

4 4 girls and 7 boys sold 580 booklets of funfair tickets. Each boy sold 20 more booklets than each girl. How many booklets did each boy sell?

5 Mark's daily pocket money is 40¢ more than Jee Sian's. Each of them spends $1.40 each day and saves the rest. By the time Jee Sian has saved $50, Mark has saved $20 more than Jee Sian. How much is Jee Sian's daily pocket money?



Number of days it takes Mark to save $20 more than Jee Sian

= 2000 ÷ 40

= ____

Jee Sian saves $50 in ____ days. She saves $ ____ each day.

Amount of Jee Sian's daily pocket money

= $1.40 + $ ____

= $ ____

Jee Sian's daily pocket money is $ ____ .

6 Joti and Aini start saving money at the same time. Each day, Joti saves $2.50 and Aini saves 30¢ more than Joti. When Aini has saved $15 more than Joti, how much money has Joti saved?

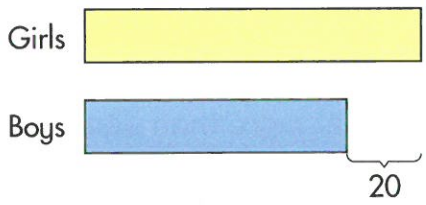
7 Maria and Santos each had the same amount of money. Each day, Maria spent $12 and Santos spent $6 more than Maria. When Santos had spent all of his money, Maria had $72 left. How much money did Santos have at first?

8 Each day, Rahman saves 90¢. 6 days after Rahman starts saving, Minah starts saving 20¢ more than Rahman each day. When Minah has saved $4.60 more than Rahman, how much money has Rahman saved?

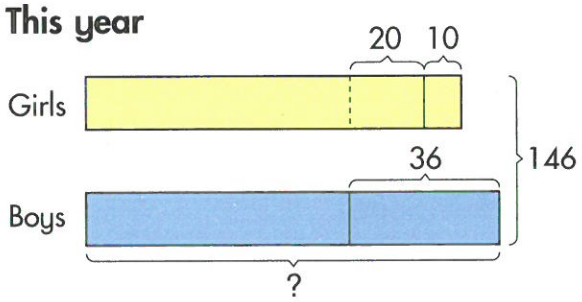
9 Mrs Lim planned to pack some sweets equally into 7 bags. However, 4 of the bags were found to be torn, so she put 20 sweets more into each of the other bags. How many sweets were there altogether?

10 There were 20 more girls than boys in the school chess club last year. After 36 boys and 10 girls joined the club this year, there were 146 members altogether. How many boys are there in the chess club this year?

Last year



This year



2 units = 146 − ☐

= ☐

1 unit = ☐

1 unit + 36 = ☐

There are ☐ boys in the chess club this year.

11 There were 25 fewer men than women in the Aerobics Club last year. After 20 men and 25 women joined the club this year, there are 150 members altogether. How many women were there in the club last year?

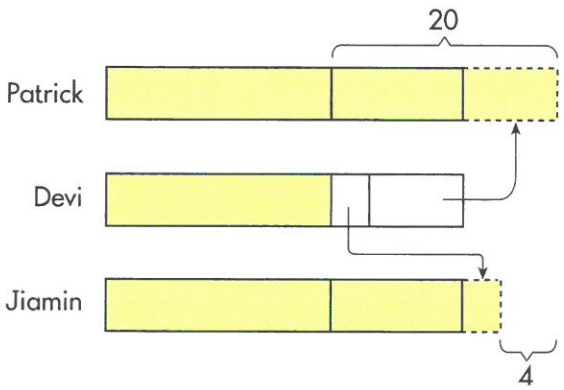
12 Sylvia had 3 times as many hair clips as Caili. After Sylvia gave away 80 hair clips and Caili gave away 20 hair clips, they each had an equal number of hair clips left. How many hair clips did Sylvia have at first?

13 Muthu had 70 stamps more than Ali. After Ali gave Muthu 30 stamps, Muthu had twice as many stamps as Ali. How many stamps did they have altogether?

14 Two housing estates P and Q have a total of 36 000 people. After some people move from estate P to estate Q, estate Q has 5 times as many people as estate P. Find the difference in the number of people between estates P and Q now.

15 Dawei had $180 and Yawen had $55. After their aunt gave each of them an equal amount of money, Dawei had twice as much money as Yawen. How much money did their aunt give to each of them?

16 Patrick, Devi and Jiamin each have the same number of beads. How many beads must Devi give to Patrick and Jiamin so that Patrick has 20 beads more than Devi and Jiamin has 4 fewer beads than Patrick?



17 Some children share a packet of sweets. If each child is to get 3 sweets, there will be 2 sweets left. If each child is to get 4 sweets, 3 more sweets will be needed.

a) How many sweets are there in the packet?
b) How many children are there altogether?

If each child gets 3 sweets:

Number of children	Number of sweets needed	Total number of sweets
2	6	6 + 2 = 8
3	9	9 + 2 = 11
4	12	12 + 2 = 14
5	15	**15 + 2 = 17**

If each child gets 4 sweets:

Number of children	Number of sweets needed	Total number of sweets
2	8	8 − 3 = 5
3	12	12 − 3 = 9
4	16	16 − 3 = 13
5	20	**20 − 3 = 17**

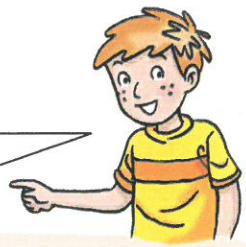
a) There are ____ sweets in the packet.
b) There are ____ children altogether.

18 There are some chickens and cows on a farm. There are 30 heads and 86 legs altogether. How many chickens and cows are there?

19 Mrs Koh has a packet of ice-cream sticks for an activity in her Art class. If she gives each pupil 10 ice-cream sticks, she will have 10 ice-cream sticks left. If she gives each pupil 8 ice-cream sticks, she will have 80 ice-cream sticks left. How many ice-cream sticks are there in the packet?

20 A number when divided by 8, gives a remainder of 2, and when divided by 9, gives a remainder of 3. What is the number?

21 Meiping bought a DVD player for $175. She paid the cashier in $10 and $5 notes. She used 23 notes altogether. How many of each type of note did she use?



Method 1

Number of $10 notes	Number of $5 notes	Total value of the sweets
11	12	$10 × 11 + $5 × 12 = $110 + $60 = $170
12	11	$10 × 12 + $5 × 11 = $ ☐ + $ ☐ = $ ☐

$170 is less than $175.

Use more $10 notes and fewer $5 notes.

She used ☐ notes of $10 and ☐ notes of $5.

Method 2

$10 + $5 = $ ☐

10 sets of each note = $ ☐

$175 = $150 + $25

$150: 10 notes of $10, 10 notes of $5

$25: $20 (2 notes of $10), $5 (1 note of $5)

She used ☐ notes of $10 and ☐ notes of $5.

22 Mohan bought a total of 50 apples and mangoes. If he exchanged every mango for 3 apples, he would have 78 apples in all. How many apples did he buy?

23 Hamid has a triangular plot of garden. He wants to plant 18 palm trees along the sides of the plot with an equal number of trees along each side. What is the largest number of palm trees he can plant on each side of the plot if he plants 1 tree at each corner of the plot?

24 Mr Lee has 20 pots of plants. He wants to arrange all the pots along the sides of a square carpet so that each side has the same number of pots. How many pots will there be on each side of the carpet if he places 1 pot at each corner?

25 Naser has a square plot of land. He wants to plant an equal number of durian seedlings along each side of the plot. He has 36 seedlings and starts planting a seedling at each corner of the plot. How many more seedlings must he have if he wants to plant 12 seedlings along each side of the plot?

26 Among all the 2-digit numbers, how many of them contain the digit 6?

There are ____ numbers with digit 6 in the tens place.

There are ____ numbers with digit 6 in the ones place.

____ number(s) contain(s) the digit 6 in both the tens place and ones place.

Number of 2-digit numbers that contain the digit 6

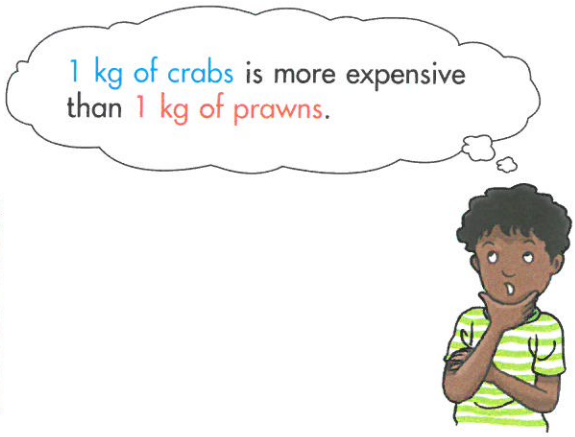
= ____ + ____ − ____

= ____

There are ____ 2-digit numbers that contain the digit 6.

27 Among all the 2-digit even numbers, how many of them contain the digit 4?

28 Mrs Liew has \$70 which is just enough to pay for 3 kg of crabs and 4 kg of prawns. If she wants to buy 4 kg of crabs and 3 kg of prawns, she would need another \$3.50. Find the cost of 1 kg of prawns and 1 kg of crabs.



1 kg of crabs cost \$3.50 more than 1 kg of prawns.

\$3.50 × 3 = \$10.50

Cost of 7 kg of prawns = \$70 − \$10.50
= \$59.50

Cost of 1 kg of prawns = \$59.50 ÷ 7
= \$ ____

Cost of 1 kg of crabs = \$ ____ + \$3.50
= \$ ____

The cost of 1 kg of prawns is \$ ____.

The cost of 1 kg of crabs is \$ ____.

29 A notebook and a file cost \$3.50. Siti paid \$32.80 for 12 notebooks and 8 files. How much would Wendy have to pay for 8 notebooks and 12 files?

30 At a supermarket, a customer collects one coupon for every $20 purchased. The customers can exchange 5 coupons for a saucer, 9 coupons for 2 cups and 15 coupons for a teapot. How much must a customer spend at the supermarket so as to collect a sufficient number of coupons to exchange for 4 saucers, 4 cups and a teapot?

31 Mrs Lim bought 600 g of fish paste and 25 pieces of fish cake. She paid a total of $11.05. If 5 pieces of fish cake cost $1.25, what was the cost of 100 g of fish paste?

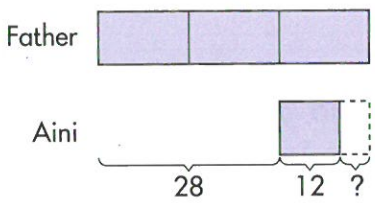
32 The charges for renting a bicycle are shown.

Time	Charge
1st hour or less	$4
Every additional $\frac{1}{2}$ hour or part thereafter	$1.50

5 boys rented 4 bicycles from 9.00 a.m. to 4.15 p.m. They shared the charges equally. How much did each boy pay?

33 Cindy and Devi each saved a fixed amount of money daily. Devi, who started saving before Cindy, saved $3 daily. When Devi had saved for 15 days, Cindy had saved $40. When Devi had saved for 20 days, both had saved an equal amount of money. How many days after Devi started saving did Cindy start saving?

34 Aini is 12 years old. Her father is 28 years older than her. In how many years will Aini's father be 3 times as old as her?



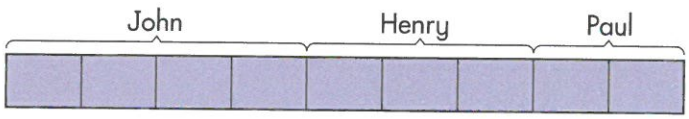
35 Mr Gopal is 57 years old. Fadzil is 48 years younger than him. In how many years will Mr Gopal be four times as old as Fadzil?

Fractions

1 Henry, John and Paul share a bag of marbles. Paul's share is $\frac{2}{7}$ of what Henry and John get. John's share is $\frac{4}{9}$ of the total number of marbles and he gets 50 more marbles than Paul.

a) What fraction of the total number of marbles does Paul get?
b) How many marbles are there in the bag?

a)

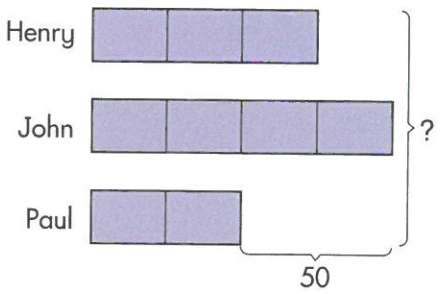


John and Henry get 7 units out of 9 units.
Paul gets 2 units out of 9 units.

2 out of 9 = $\frac{\square}{\square}$

Paul gets ☐ of the total number of marbles.

b)



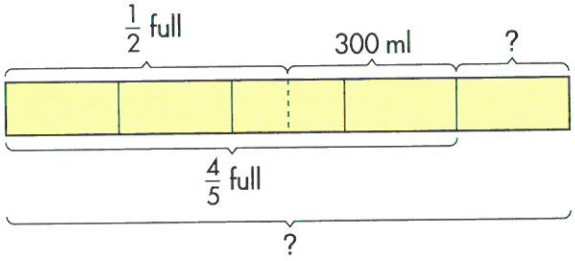
2 units = 50 marbles
1 unit = ☐ marbles
9 units = ☐ marbles

There are ☐ marbles in the bag.

2 A container was half full of water. When another 300 ml of water were poured into the container, it became $\frac{4}{5}$ full.

a) What was the capacity of the container?

b) How many more millilitres of water were needed to fill the container completely?



a) $\frac{4}{5} - \frac{1}{2} = \frac{8}{10} - \frac{5}{10}$

$= \frac{3}{10}$

$\frac{3}{10}$ of container's capacity = 300 ml

$\frac{1}{10}$ of container's capacity = 100 ml

$\frac{10}{10}$ of container's capacity = ☐ ml

The capacity of the container was ☐ ml.

b) $\frac{1}{5}$ of ☐ ml

$= \frac{1}{5} \times$ ☐ ml

= ☐ ml

☐ ml more water were needed to fill the container completely.

3 Noraidah had some material. She used $\frac{1}{3}$ of it to make a blouse and $\frac{3}{4}$ of the remainder to make a skirt. She had 50 cm of material left. What was the total length of material Noraidah used?

4 Leo spent $\frac{2}{5}$ of his money on tennis balls and $\frac{1}{3}$ of the remainder on 5 ping-pong balls. Each tennis ball cost twice as much as a ping-pong ball. How many tennis balls did he buy?

5 Miss Lee spends $\frac{4}{5}$ of her money on 6 glasses and 4 mugs. With the remaining money, she can buy another 3 glasses. If she spends all her money on mugs only, how many mugs can she buy?

6 Raj spent $\frac{1}{2}$ of his money on 4 papayas and 5 oranges. Each papaya cost 3 times as much as an orange. How many such oranges could he buy with the rest of his money?

7 $\frac{3}{4}$ of the paper clips in a box are red. The rest are yellow and blue paper clips. There are 3 times as many yellow paper clips as there are blue paper clips. If there are 25 blue paper clips, how many more red paper clips than yellow paper clips are there?

8 Anna took 2 days to read $\frac{3}{10}$ of the pages in a book. She took another 6 days to read the remaining pages at the rate of 35 pages a day.

a) How many pages did the book contain?
b) On average, how many pages did she read in one day?

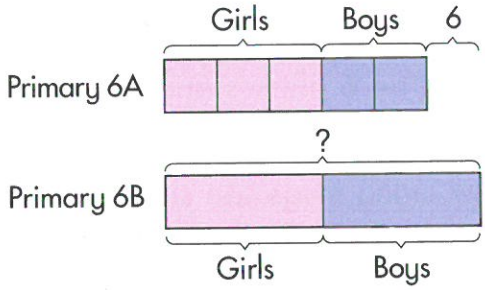
9 Neela used $\frac{4}{5}$ of the mass of a packet of sugar to bake a cake and make a syrup mixture. The mass of sugar used for the syrup mixture was 4 times the mass of sugar used for the cake. She then had 250 g of sugar left, what was the mass of sugar in the syrup mixture?

10 $\frac{3}{5}$ of the pupils in Primary 6A and $\frac{1}{2}$ of the pupils in Primary 6B are girls. Both classes have the same number of girls. Primary 6B has 6 more boys than Primary 6A.

a) How many pupils are there in Primary 6B?

b) If $\frac{1}{3}$ of the girls and $\frac{2}{5}$ of the boys in the two classes wear spectacles, how many pupils in the two classes wear spectacles?

a)



1 unit = 6 pupils

6 units = ☐ pupils

There are ☐ pupils in Primary 6B.

b) 6 units = ☐ girls

5 units = ☐ boys

$\frac{1}{3}$ of ☐ girls = ☐ girls

$\frac{2}{5}$ of ☐ boys = ☐ boys

☐ girls and ☐ boys wear spectacles.

☐ pupils in the two classes wear spectacles.

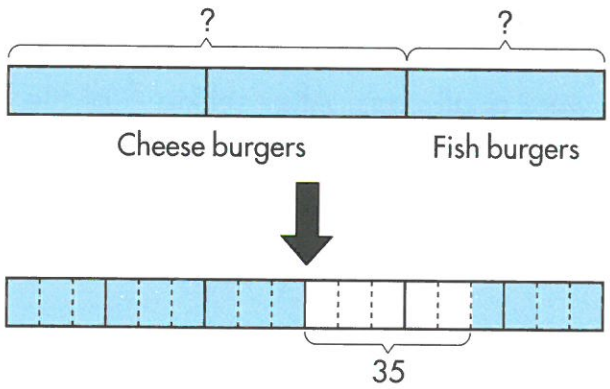
11 $\frac{1}{3}$ of the pupils in Primary 6A and $\frac{2}{5}$ of the pupils in Primary 6B wear spectacles. The number of pupils who wear spectacles is the same in both classes. If there are 35 pupils in Primary 6B, how many more pupils are there in Primary 6A than Primary 6B?

12 Ali and Zainab have $800 altogether. They both contributed the same amount of money to a charity donation. Ali contributed $\frac{1}{2}$ of his money while Zainab contributed $\frac{1}{3}$ of his money. How much money does Zainab originally have?

13 Lily and Meiying had 210 g of flour altogether. After Lily had used $\frac{1}{3}$ of her mass of flour and Meiying had used $\frac{1}{2}$ of her mass of flour, they each had the same mass of flour left. How much flour did Meiying have at first?

14 There are 720 people at a school concert. $\frac{3}{5}$ of the female audience and $\frac{1}{2}$ of the male audience are children. There is an equal number of male and female adults. How many children are there altogether?

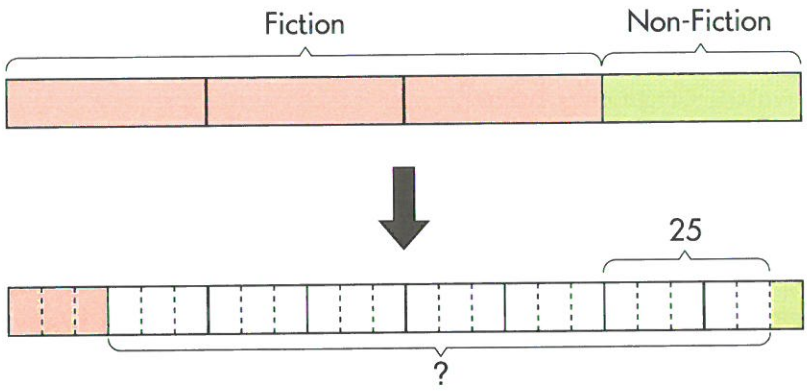
15 Mrs Yong made only cheese burgers and fish burgers. $\frac{2}{3}$ of the burgers she made are cheese burgers. Her guests ate $\frac{3}{4}$ of the cheese burgers and $\frac{2}{3}$ of the fish burgers. She had a total of 35 burgers left. How many burgers did she make?



16 A bookseller had some books. $\frac{3}{4}$ of the books were fiction books and the rest were non-fiction books. After selling $\frac{5}{6}$ of the fiction books and 25 non-fiction books, he had $\frac{1}{6}$ of the original number of books left.

a) What fraction of the original number of books were the fiction books sold?

b) How many books were sold altogether?



a) $\frac{5}{6} \times \frac{3}{4} =$ ☐

The number of fiction books sold was ☐ of the original number of books.

b) 5 units = ☐ books

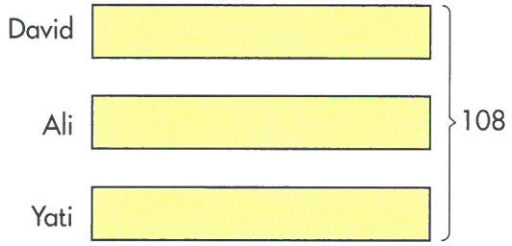
20 units = ☐ books

☐ books were sold altogether.

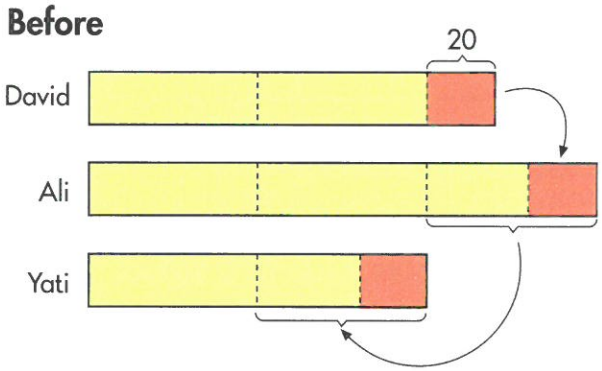
17 Mr Govinasamy had some eggs. $\frac{3}{5}$ of the eggs were chicken eggs and the rest were quail eggs. After selling $\frac{2}{3}$ of the chicken eggs and 270 quail eggs, he had $\frac{3}{10}$ of the original number of eggs left. How many chicken eggs had he left?

18 David, Ali and Yati had 108 stamps altogether. David gave 20 of his stamps to Ali. Ali then gave $\frac{1}{3}$ of the total number of stamps he had to Yati. Now, all the children have the same number of stamps. How many stamps did each have at first?

After



Before



At first, David had 2 units + 20 stamps.
Ali had 3 units − 20 stamps.
Yati had 1 unit.

1 unit = 108 ÷ 6 = ☐

2 units = ☐ × 2 = ☐

Number of stamps David had at first = ☐ + 20 = ☐

3 units = ☐ × 3 = ☐

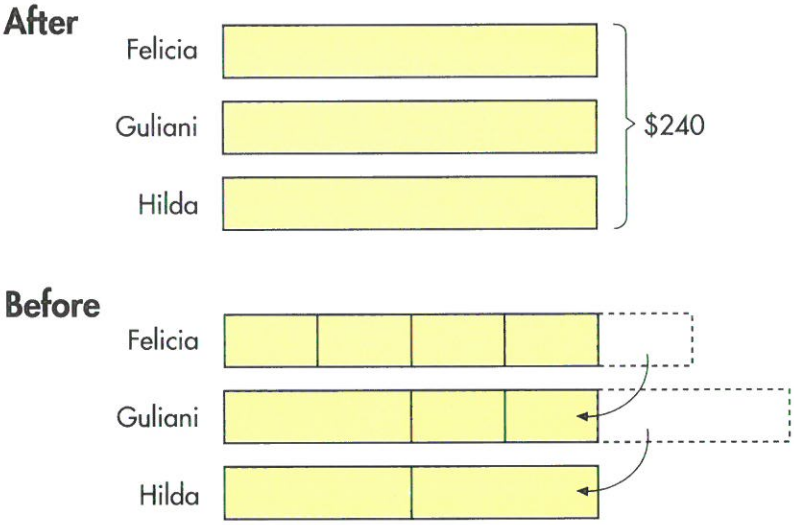
Number of stamps Ali had at first = ☐ − 20 = ☐

David had ☐ stamps at first.

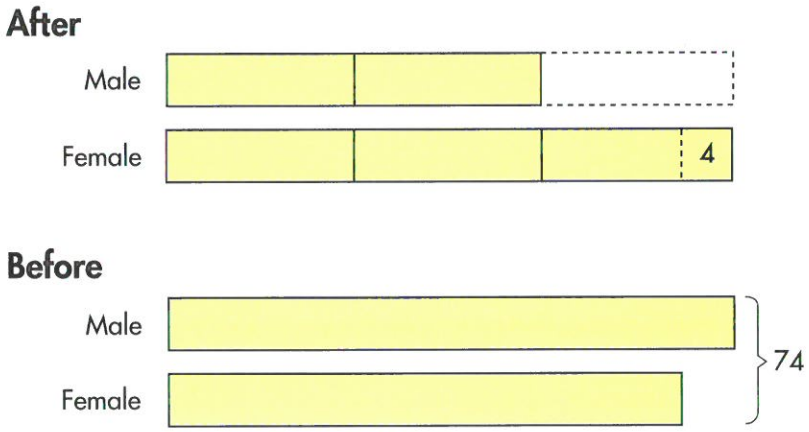
Ali had ☐ stamps at first.

Yati had ☐ stamps at first.

19 Felicia, Guliani and Hilda had \$240 altogether. Felicia gave $\frac{1}{5}$ of her money to Guliani. Guliani then gave $\frac{1}{3}$ of her total sum to Hilda. Hilda now had double the amount of money she had before. The three of them had the same amount in the end. How much money did each of them have at first?



20 There were 74 members in the Robotics Club in a school. After $\frac{1}{3}$ of the male members left the club and 4 new female members joined the club, the number of male members became $\frac{2}{3}$ of the number of female members. How many male members and female members were there at first?



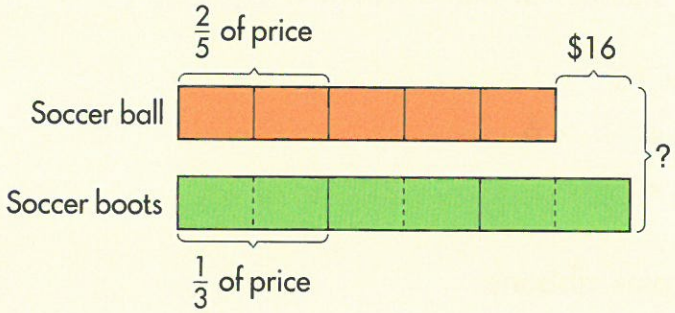
6 More Challenging Problems (2)

Ratio

1 $\frac{1}{3}$ of the price of a pair of soccer boots is $\frac{2}{5}$ of the price of a soccer ball.

a) What is the ratio of the price of the soccer ball to the price of the pair of soccer boots?

b) If the price of the pair of soccer boots is \$16 more than the price of the soccer ball, what is the total price of the soccer boots and the soccer ball?



a) The ratio of the price of the soccer ball to the price of the pair of soccer boots is ☐ : ☐.

b) 1 unit = \$16
11 units = \$16 × 11
= \$☐

The total price of the soccer boots and the soccer ball is \$☐.

2 $\frac{2}{3}$ of Ahmad's age is the same as $\frac{4}{7}$ of Putra's age.

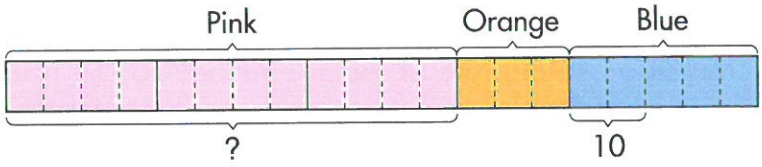
a) What is the ratio of Ahmad's age to Putra's age?

b) Putra is 6 years older than Ahmad. How old is Putra?

3 $\frac{3}{5}$ of the ribbons in a box are pink. The rest are orange and blue. The ratio of the number of orange ribbons to the number of blue ribbons is 3 : 5.

a) What is the ratio of the number of pink ribbons to the number of orange ribbons to the number of blue ribbons?

b) If there are 10 more blue ribbons than orange ribbons, how many pink ribbons are there?



a) The ratio of the number of pink ribbons to the number of orange ribbons to the number of blue ribbons is ☐ : ☐ : ☐.

b) 2 small units = 10

12 small units = ☐ × 6

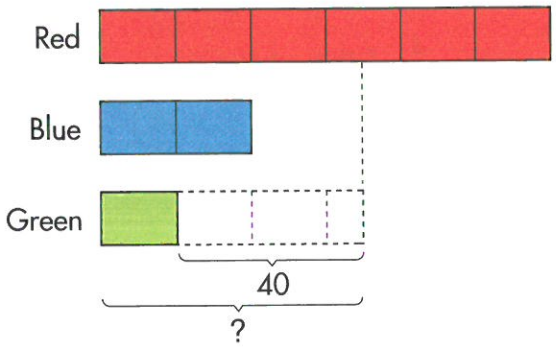
= ☐

There are ☐ pink ribbons.

4 There are some red, blue and green balls in a bag. The ratio of the number of red balls to the number of blue balls is 3 : 1. The ratio of the number of red balls to the number of green balls is 6 : 1.

a) What is the ratio of the number of red balls to the number of blue balls to the number of green balls?

b) If 40 red balls are removed and 40 green balls are added, there will be an equal number of red balls and green balls. What will the new number of green balls in the bag be?



5 During a dance performance, the total number of participants was 180. There were 100 children and the rest were adults. The ratio of the number of boys to the number of girls was 2 : 3. There were 20 more women than men. What was the ratio of the number of male participants to the number of female participants?

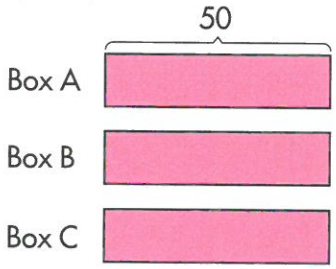
6 Devi, Eva and Fabian shared the cost of a gift. The ratio of Devi's share to Eva's share was 3 : 2. The ratio of Eva's share to Fabian's share was 1 : 2.

a) What was the ratio of Devi's share to Eva's share to Fabian's share?

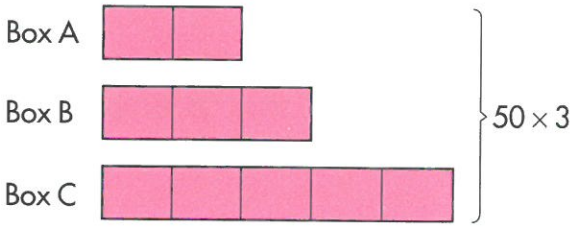
b) If Eva's share was $30, what was the cost of the gift?

7 Three boxes A, B and C contain 50 marbles each. How many marbles should be moved from Box A and Box B to Box C so that the ratio of the number of marbles in Box A, Box B and Box C will be in the ratio 2 : 3 : 5?

Before



After



$50 \times 3 = 150$

There are 150 marbles in the three boxes altogether.

10 units = 150 marbles

2 units = 30 marbles

There are 30 marbles left in Box A.

$50 - 30 =$ ☐

☐ marbles should be moved from Box A to Box C.

3 units = 45 marbles

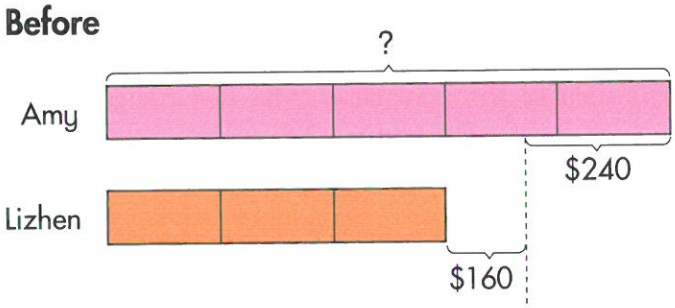
There are 45 marbles left in Box B.

$50 - 45 =$ ☐

☐ marbles should be moved from Box B to Box C.

8 The ratio of Amy's savings to Lizhen's savings was 5 : 3 at first. After Amy had spent $240 and Lizhen had saved another $160, they had an equal amount of savings each. How much savings had Amy at first?

Before



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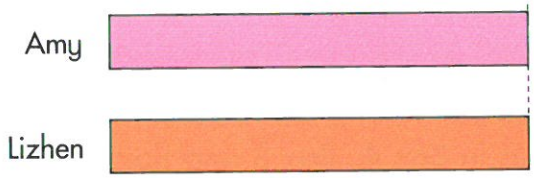


2 units = $ ____

1 unit = $ ____

Amount of savings Amy had at first = 5 units

= $ ____ × 5

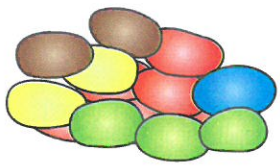
= $ ____

Amy had saved $ ____ at first.

9 Salim and Latiff shared a sum of money in the ratio 3 : 2. After Salim gave $\frac{1}{2}$ of his share to Latiff, Latiff had $140. What was the sum of money?

10 The volume of water in Container X and Container Y is in the ratio 4 : 7. Half of the water in Container X is poured into Container Y. $\frac{1}{3}$ of the water in Container Y is then poured into Container X. What is the new ratio of the volume of water in Container X to the volume of water in Container Y?

11 Jar A and Jar B contained some jelly beans. After $\frac{1}{10}$ of the jelly beans in Jar B were transferred into Jar A, the number of jelly beans in Jar A and Jar B was in the ratio 4 : 3. What was the ratio of the number of jelly beans in Jar A to the number of jelly beans in Jar B at first?



12 The number of pamphlets in Bundle A and Bundle B was in the ratio 3 : 7. Bundle B had 24 more pamphlets than Bundle A. After some pamphlets from Bundle B were taken out and put into Bundle A, the ratio of the number of pamphlets in Bundle A to the number of pamphlets in Bundle B became 5 : 7. How many pamphlets were taken out from Bundle B?

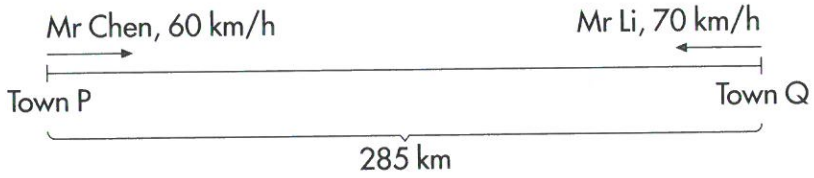
13 Last year the ratio of the number of boys to the number of girls who received prizes in a certain school was 3 : 4. This year, the ratio is 4 : 5 with the same number of boys and 3 fewer girls receiving prizes. How many fewer boys than girls receive prizes this year?

14 There were altogether 1000 hen eggs, duck eggs and quail eggs in a shop. After $\frac{2}{3}$ of the hen eggs and 205 duck eggs were sold, the ratio of the number of hen eggs to the number of duck eggs to the number of quail eggs was 3 : 2 : 4. Find the number of duck eggs left in the shop.

Speed

1 Town P and Town Q were 285 km apart. Mr Chen travelled from Town P to Town Q at an average speed of 60 km/h. At the same time, Mr Li travelled from Town Q to Town P at an average speed of 70 km/h along the same route.

a) Find the distance between Mr Chen and Mr Li after 2 hours.
b) Mr Chen left Town P at 8.30 a.m. Find the time that he arrived in Town Q.



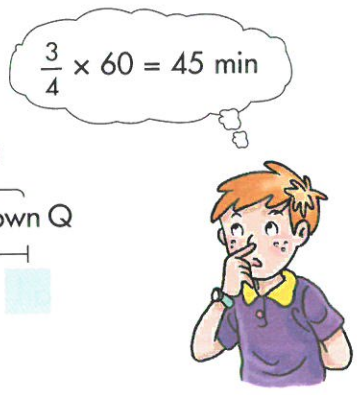
a) Distance covered by Mr Chen in 2 hours = 60 km × 2
= ☐ km

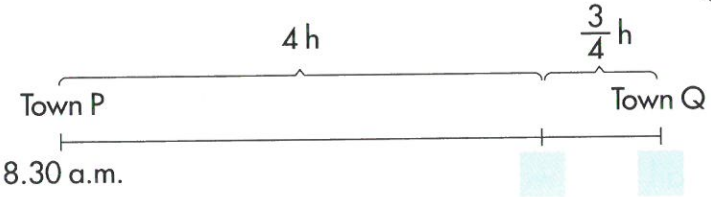
Distance covered by Mr Li in 2 hours = 70 km × 2
= ☐ km

Distance between Mr Chen and Mr Li = 285 km − ☐ km − ☐ km
= ☐ km

The distance between Mr Chen and Mr Li after 2 hours is ☐ km.

b) Time taken by Mr Chen to travel from Town P to Town Q
= ☐ ÷ 60
= ☐ hours





Mr Chen arrived in Town Q at ☐.

2 Mr Ibrahim and Mr Abdullah were travelling towards each other. They were 300 km apart at 08 00. They passed each other at 10 00. If Mr Abdullah was travelling at an average speed of 60 km/h, find the average speed of Mr Ibrahim.

3 Tom and Aisha were walking towards each other. They were 1950 m apart at 8 a.m. They passed each other at 8.15 a.m. If Tom was walking at an average speed of 60 m/min, what was Aisha's average walking speed?

4 At 12 noon, Sumay drove from Town P to Town Q at an average speed of 80 km/h and Lily drove from Town Q to Town P at an average speed of 60 km/h along the same road. Town P was 210 km from Town Q. Find the time Sumay and Lily passed each other.

5 Ahmad left Town A at 7 a.m. and drove to Town C. He travelled $\frac{2}{3}$ of the distance to Town B at an average speed of 90 km/h for 40 min. He stopped in Town B for 15 min. Then he drove the rest of the distance at an average speed of 60 km/h. At what time did he arrive in Town C?

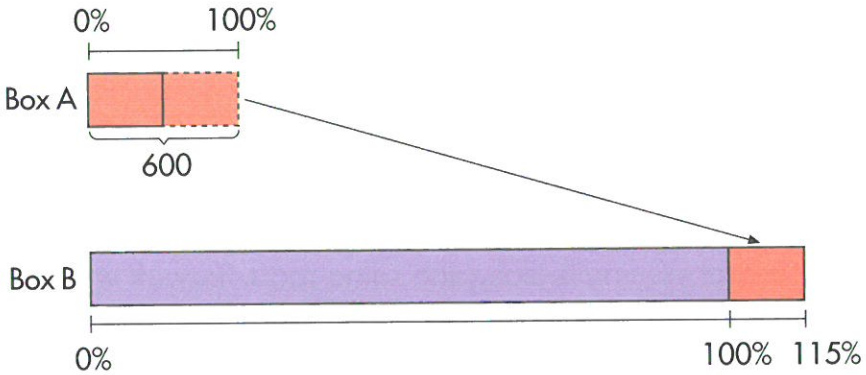
6 A van left Town X at 8 a.m., travelling at an average speed of 60 km/h. 3 h later, it arrived in Town Y. A lorry had left Town X an hour earlier and arrived in Town Y at the same time as the van. What was the average speed of the lorry?

7 Simon cycled from Village E to Village F at an average speed of 15 km/h. Paul cycled from Village F to Village E, along the same route, at an average speed of 12 km/h. Both started cycling at 12 noon. The distance between the villages was 20 km. How far apart were the boys at 12.40 p.m.?

8 A bus and a car were travelling from Town A to Town B. Town A and Town B were 250 km apart. The average speed of the bus is 50 km/h. The car arrived 2 h earlier than the bus. Find the average speed of the car.

Percentage

1 Box A contains 600 beads. After 50% of the beads in Box A are transferred to Box B, the number of beads in Box B increases by 15%. How many beads are there in Box B now?



50% of 600

$= \frac{50}{100} \times 600$

$= 300$

300 beads are transferred from Box A to Box B.

15% ⟶ 300 beads

1% ⟶ ☐ beads

100% ⟶ ☐ beads

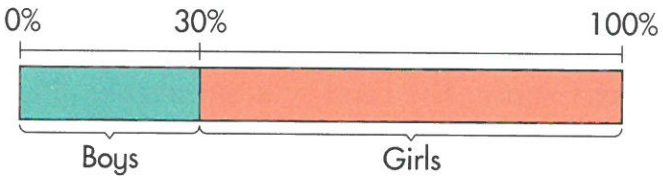
115% ⟶ ☐ beads

There are ☐ beads in Box B now.

2 The enrolment of School B is 80% of that of School A. After 58 pupils are transferred from School B to School A, the number of pupils in School A increases by 20%. Find the number of pupils in School B now.

3 There were 80 members in the school band at first. 30% of them were boys. After some boys left the band, the percentage of boys in the band dropped to 20%. How many boys left the band?

Before



$30\% \text{ of } 80 = \frac{30}{100} \times 80$

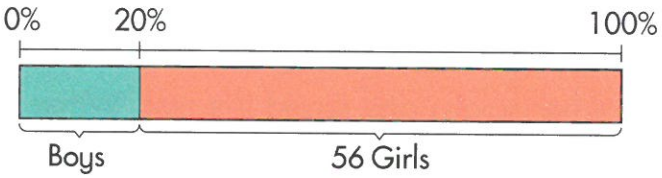
$= 24$

There were 24 boys in the band at first.

$80 - 24 = 56$

There were 56 girls in the band at first.

After



80% ⟶ 56

10% ⟶ 56 ÷ 8 = ☐

20% ⟶ ☐

☐ boys remained in the band.

24 − ☐ = ☐

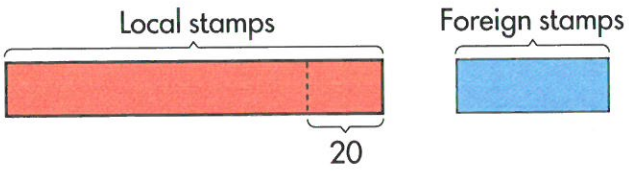
☐ boys left the band.

4 An Art club had 120 members. At the end of the year, $\frac{3}{5}$ of the members left the club and 90 new members joined the club. By what percentage had the number of members increased?

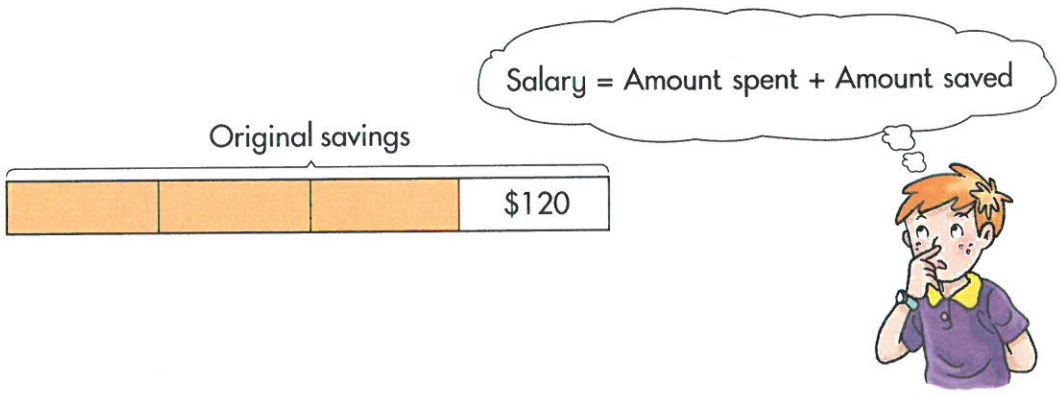
5 30 boys and 20 girls represented Kent Primary School at the National Sports Meet. 20% of the boys and 25% of the girls won prizes. What percentage of the participants from Kent Primary School won prizes?

6 A bag of marbles is shared by Ali, Bala and Calvin. Calvin's share of the marbles is $\frac{1}{7}$ of Bala's share. The total size of Bala's and Calvin's share is $\frac{2}{3}$ of Ali's share. What percentage of the bag of marbles does each boy get?

7 Nisha collects both local and foreign stamps. She has 60 local stamps. When she exchanges 20 of the local stamps with an overseas friend for 20 foreign stamps, the number of foreign stamps that she has increased by 50%. How many stamps are there in Nisha's collection?



8 Mrs Neo spent $960 of her salary and saved the rest. When she decreased her spending by $120, her savings increased by 25%. What was her salary?

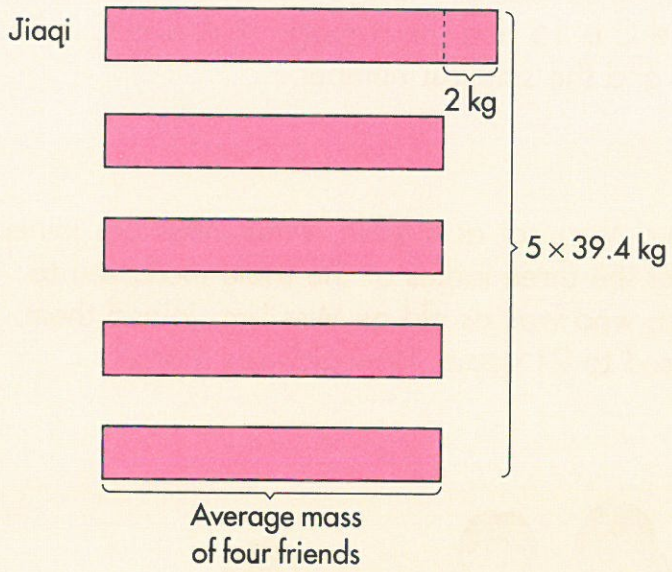


9 Mrs Lin's salary was $1800 in March. She saved $\frac{1}{2}$ of her salary and spent the rest. In April, her salary increased by 10% and her spending increased by 12%. Did she save more or less money in April as compared to March? How much more or less money did she save?

7 More Challenging Problems (3)

Average

1 The average mass of Jiaqi and his four friends is 39.4 kg. Jiaqi is 2 kg heavier than the average mass of his four friends. What is Jiaqi's mass?



Total mass of Jiaqi and his four friends = 5 × 39.4 kg
= 197 kg

5 units = ☐ kg − 2 kg
= ☐ kg

1 unit = ☐ kg ÷ 5
= ☐ kg

Mass of Jiaqi = ☐ kg + 2 kg
= ☐ kg

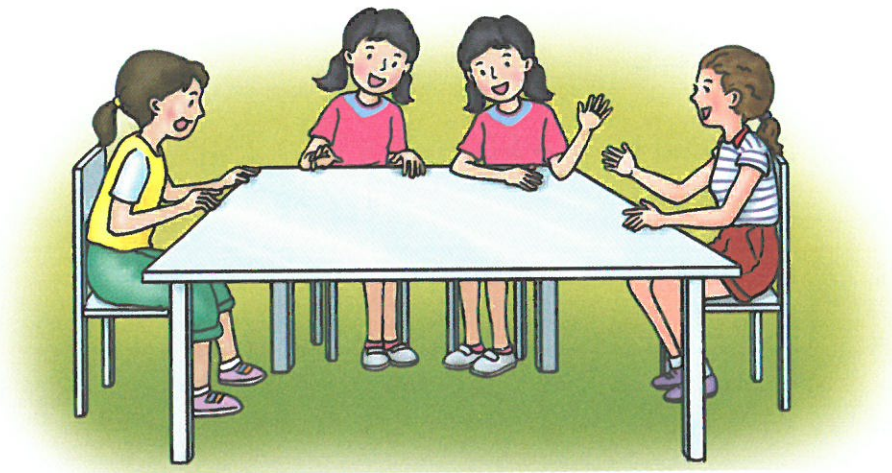
Jiaqi's mass is ☐ kg.

2 Mariya scored an average of 64 marks in 6 tests. What must she score in her next test to increase her average marks to 66?

3 Sue sold an average of 49 loaves of bread on Monday and Tuesday. She sold an average of 45 loaves on Tuesday and Wednesday of the same week. If she sold 52 loaves on Wednesday, how many loaves were sold on Monday?

4 There are three numbers, A, B, and C. The average of A and B is 18, the average of B and C is 15 and the average of A and C is 16. Find the largest number and the smallest number.

5 A pair of twins, Mary and May, sat at a table. When Miss Lim joined them, the average age of the three ladies at the table increased to 18 years. Later, Miss Siti, who was as old as Miss Lim, joined them. The average age increased to 21 years. How old was Mary?



6 The average of 4 numbers is 56. Subtract 8 from each of 3 of the numbers. What is the average of the 4 new numbers?

7 Mr Sim bought 2 pairs of pyjamas at $6.25 each and 3 pairs of long pants. Each pair of long pants cost $6 more than each pair of pyjamas. What was the average cost of the 5 items?

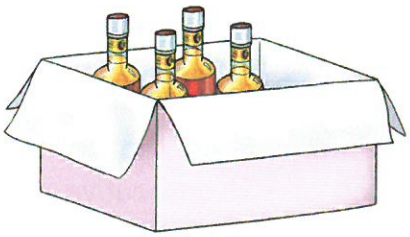
8 A piece of blue string is 45 cm longer than a piece of red string. $\frac{1}{2}$ of the length of the red string is the same as $\frac{1}{3}$ of the length of the blue string. What is the average length of the 2 strings?

9 Consecutive numbers are numbers that follow in order, e.g. 4, 5, 6, 7. Given that the average of 13 consecutive numbers is 17, what is the average of the first 8 numbers in the set?

10 The ratio of Aini's savings to Bala's savings to Caili's savings was 3 : 2 : 5. After Caili spent as much as Aini's savings, the average amount of savings the three children had was $63. What was the average amount of savings the three children had at first?

11 Bala received the results of his three tests. He scored 141 marks in total for his English and Mathematics tests. The total marks for his Mathematics and Science tests was 155. The total marks for his English and Science tests was 130. Find the average marks of his three tests.

12 An empty carton has a mass of 470 g. It can hold 27 bottles of orange juice. When the carton is $\frac{2}{3}$ full of bottles, it has a mass of 29 kg. On the average, what is the mass of each bottle of orange juice? Leave your answer in kg and g.



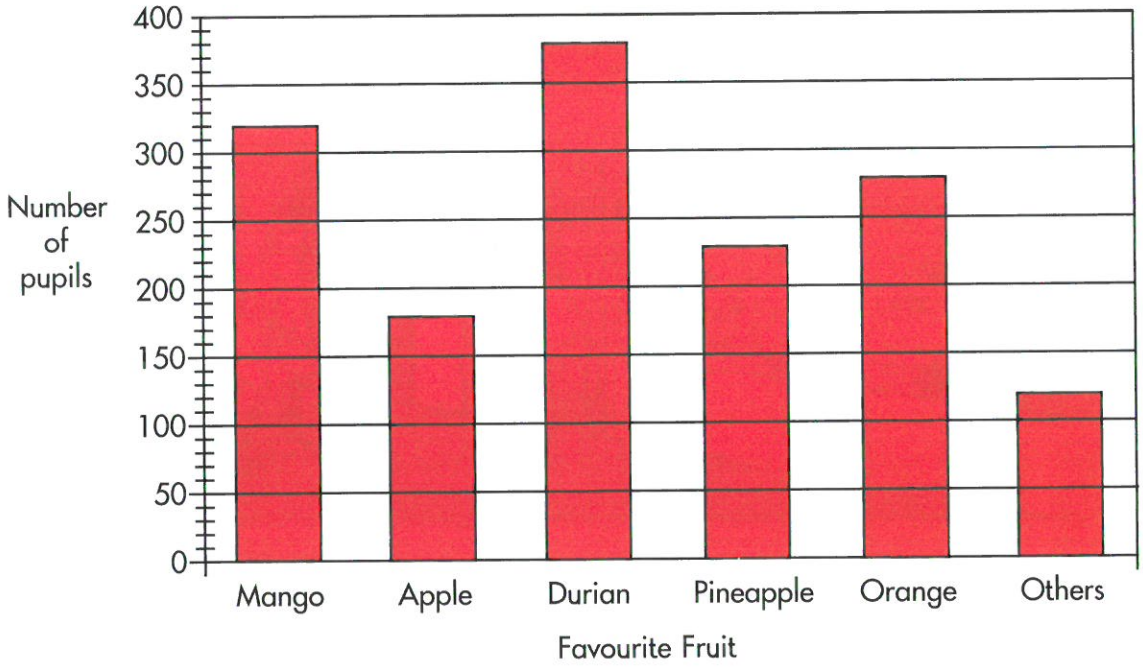
13 Caili went shopping. She spent $40 more than half of her money at a shoe shop. She then went to a book store and spent $35 more than half of her remaining money. She had no money left. What was the average amount she spent at each store?

14 There were 42 people on Bus P. There were 4 more adults on Bus Q than on Bus P. The average number of adults on the buses was 18, which was 2 less than the average number of children on the buses. How many more children were there on Bus P than on Bus Q?

Bus	Adults	Children	Total
P			42
Q			
Average	18		
Total			

Graphs

1 A survey was carried out on a group of 1500 Primary 6 pupils from some schools on the pupils' favourite fruits. The bar graph shows the results of the survey.



a) $\frac{9}{50}$ of the pupils like a particular fruit. Which fruit is this?

$\frac{9}{50} \times 1500 =$ ____

The fruit is ____.

b) If a certain number of pupils decide to change their favourite fruit to pineapple, 16% of the pupils surveyed would have chosen pineapple as their favourite fruit. How many of the pupils have changed their choice to pineapple?

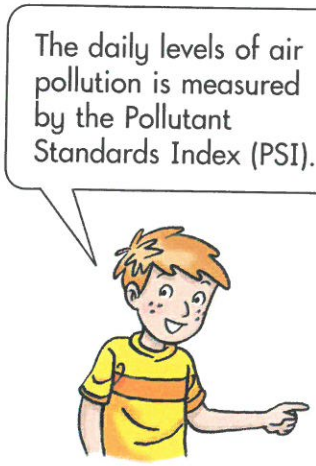
$\frac{16}{100} \times 1500 =$ ____

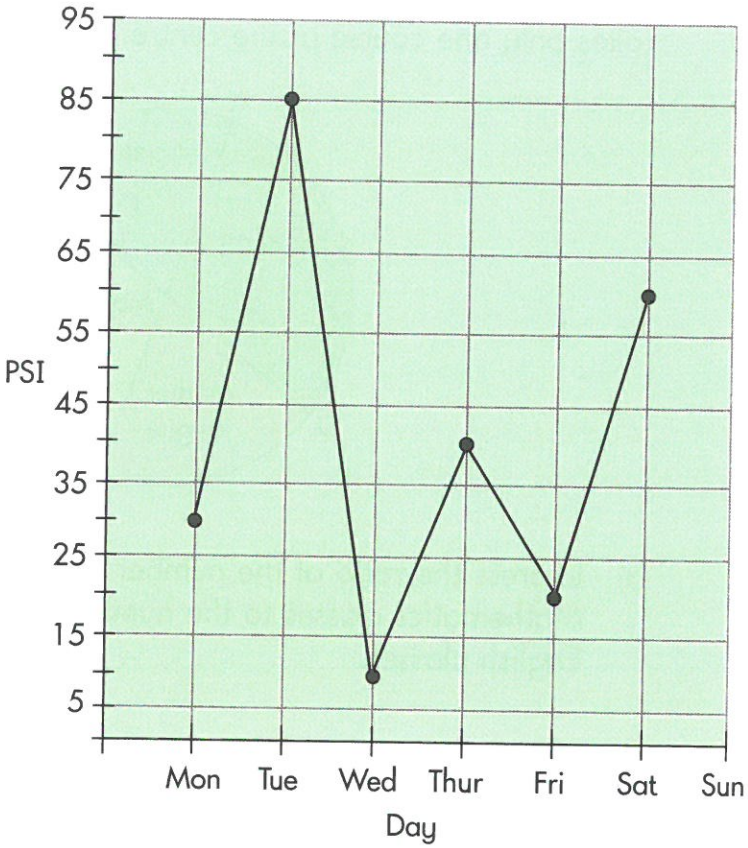
____ $- 230 =$ ____

____ pupils would have changed their choice to pineapple.

c) What is the least popular fruit among the pupils?

2 The line graph shows the PSI reading taken regularly at 4 pm during a certain week.





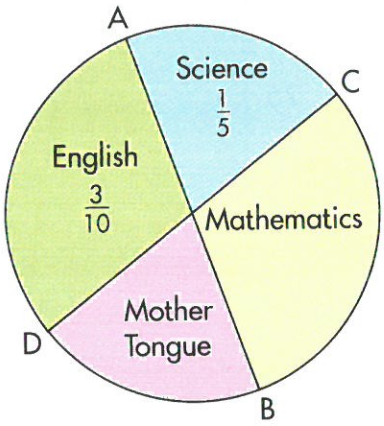
a) What is the average PSI reading from Monday to Friday?

b) The ratio of the PSI reading on Saturday to the PSI reading on Sunday is 4 : 3. What is the PSI reading on Sunday?

c) Between which two days is the reduction in the PSI reading the largest? Find the percentage decrease. Give your answer correct to 2 decimal places.

d) What might have caused the reduction in the PSI reading in part c)?

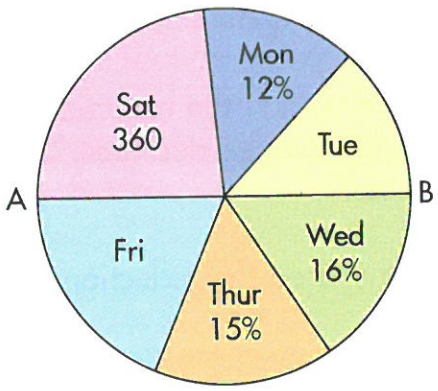
3 The pie chart shows the number of primary school pupils who attend classes at ABC Enrichment Centre. On the pie chart, AB and CD are straight lines passing through the centre of the circle. Each pupil takes only one course at the centre.



a) Express the ratio of the number of pupils who attend the Mathematics classes to the number of pupils who attend the English classes.

b) If 148 pupils attend the Mother Tongue classes, how many pupils attend the classes at ABC Enrichment Centre?

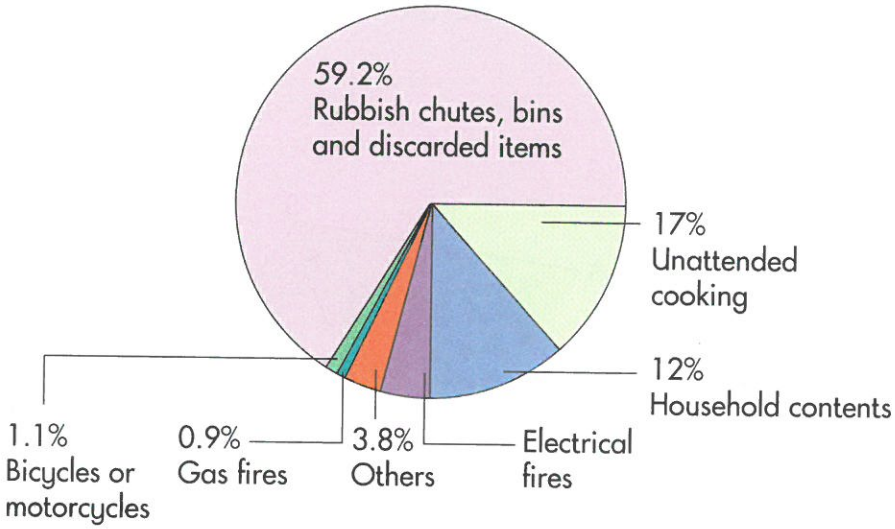
4 A bakery sold a total of 1500 cupcakes in a particular week. The pie chart shows the daily sales of the cupcakes in that week. On the pie chart, AB is a diameter of the circle.



a) How many cupcakes were sold on Monday?

b) What is the percentage of cupcakes sold on Friday?

5 The pie chart shows the causes of fires in and around homes in Singapore in 2006. There were 2957 such fires altogether.



a) What was the most common cause of fires in and around homes in Singapore in 2006? How many such fires were there? Give your answer correct to the nearest whole number.

b) What was the least common cause of fire? How many such fires were there? Give your answer correct to the nearest whole number.

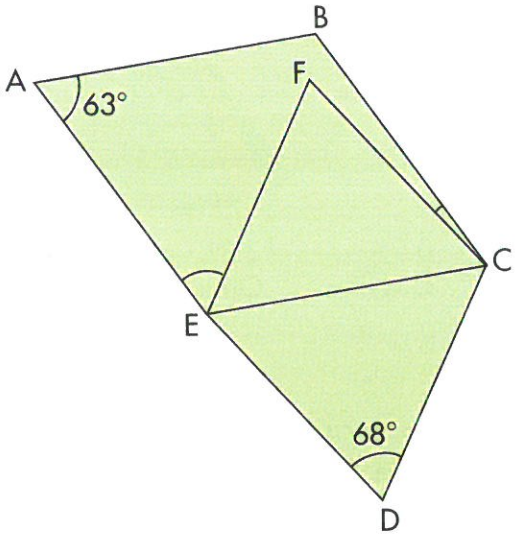
c) What percentage of the fires were electrical fires?

d) Caili claimed that a quarter of the fires is caused by unattended cooking and household contents. Is she correct? Explain.

Geometry

1 In the figure, ABCE and FCDE are rhombuses. $\angle EAB = 63°$ and $\angle EDC = 68°$.

a) Find $\angle AEF$.
b) Find $\angle BCF$.



a) $\angle EFC = \quad °$

$\angle FEC = (180° - \quad °) \div 2$

$= \quad °$

$\angle AEC = 180° - \quad °$

$= \quad °$

$\angle AEF = \quad ° - \quad °$

$= \quad °$

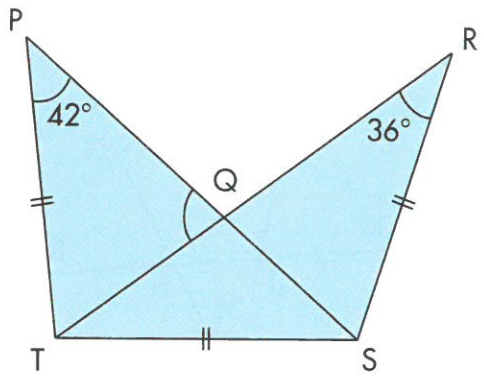
b) $\angle BCE = \quad °$

$\angle FCE = \quad °$

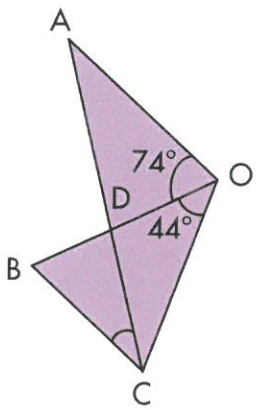
$\angle BCF = \quad ° - \quad °$

$= \quad °$

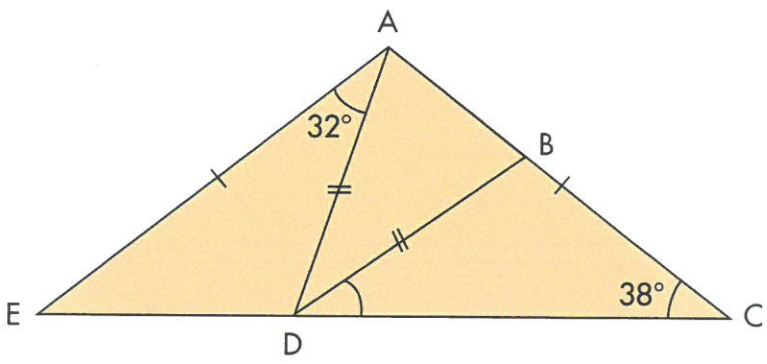
2 In the figure, PTS and RTS are isosceles triangles. $\angle TPQ = 42°$, $\angle TRS = 36°$ and $PT = TS = SR$. Find $\angle PQT$.



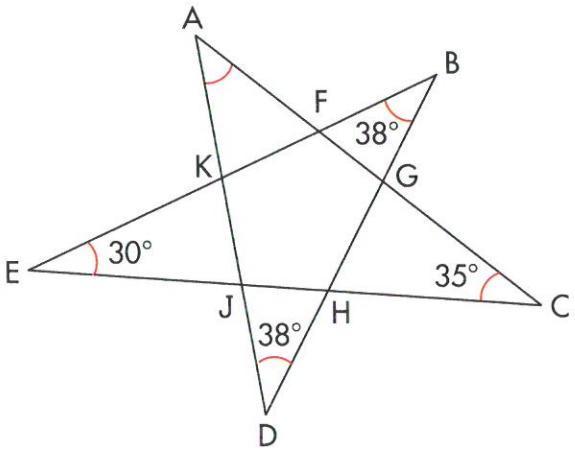
3 In the figure below, $AO = OB = OC$. ADC and BDO are straight lines. $\angle AOB = 74°$ and $\angle BOC = 44°$. Find $\angle ACB$.



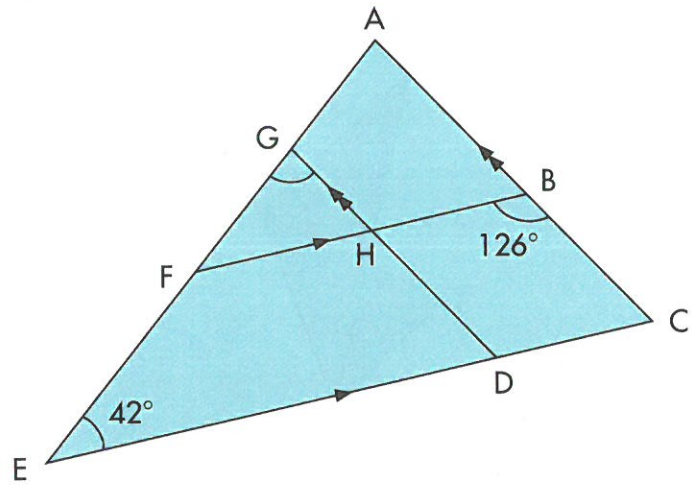
4 In the figure, ACE and ADB are isosceles triangles. $AE = AC$ and $AD = DB$. $\angle EAD = 32°$ and $\angle BCD = 38°$. Find $\angle BDC$.



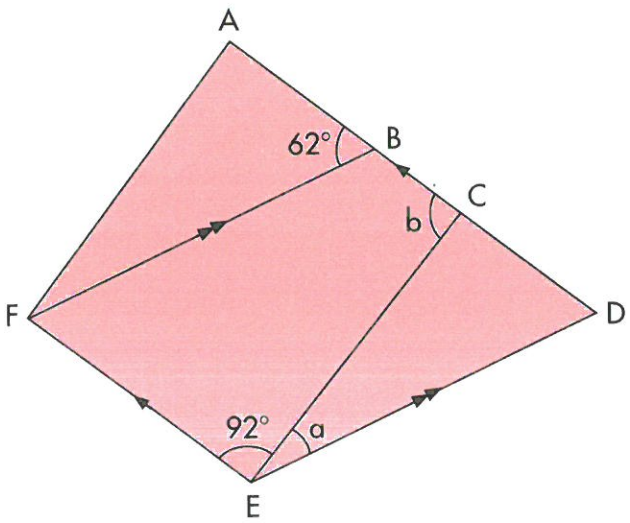
5 In the 5-point star, $\angle FBG = \angle HDJ = 38°$, $\angle GCH = 35°$ and $\angle JEK = 30°$. Find $\angle KAF$.



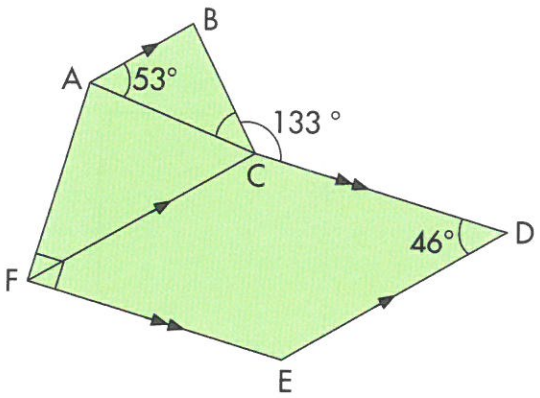
6 In the figure, AEC is a triangle. $\angle FBC = 126°$, $\angle FED = 42°$, FB // EC and GD // AC. Find $\angle EGD$.



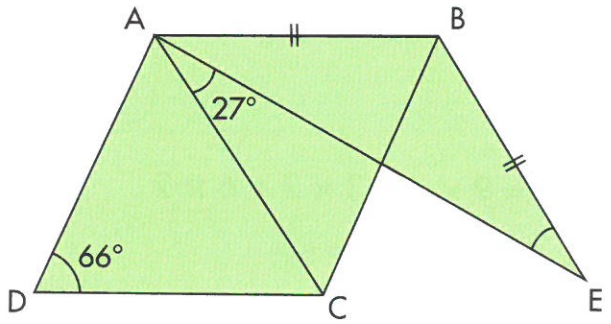
7 In the figure, ADEF is a trapezium. AD // FE. BDEF is a parallelogram. $\angle FEC = 92°$ and $\angle FBA = 62°$. Find $\angle a$ and $\angle b$.



8 In the figure, ABCF is a trapezium and CDEF is a parallelogram. AB // FC // ED and FE // CD. $\angle BAC = 53°$, $\angle BCD = 133°$ and $\angle CDE = 46°$. Find $\angle ACB$.

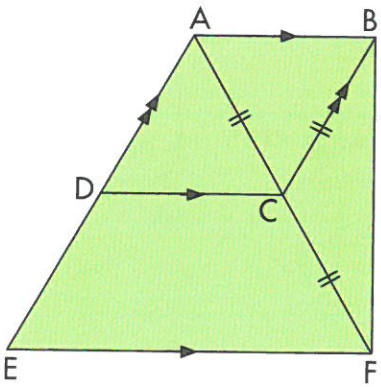


9 In the figure, ABCD is a rhombus and ABE is an isosceles triangle. AB = BE, $\angle ADC = 66°$ and $\angle CAE = 27°$. Find $\angle BEA$.



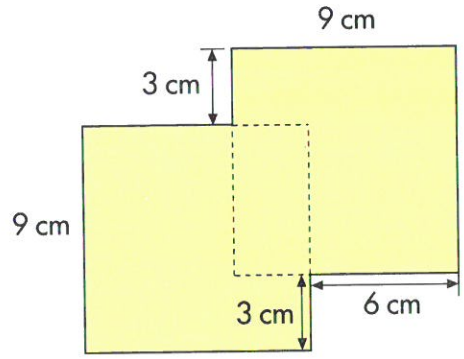
10 In the figure, ABCD is a rhombus and ABFE is a trapezium. AB // DC // EF and AD // BC. AC = BC = CF.

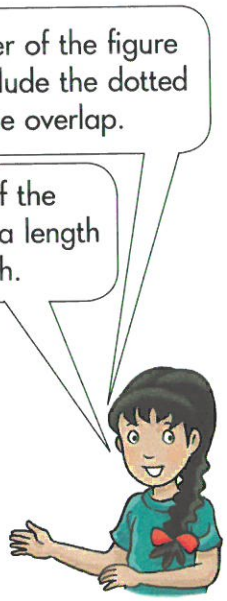
a) Find $\angle AEF$.
b) Find $\angle BFE$.



Measurement

1 Two squares overlap in a rectangle as shown. Find the perimeter and area of the figure.





Perimeter of figure = $9 \times 4 + 3 \times 2 + 6 \times 2$

= ☐ + ☐ + ☐

= ☐ cm

The perimeter of the figure is ☐ cm.

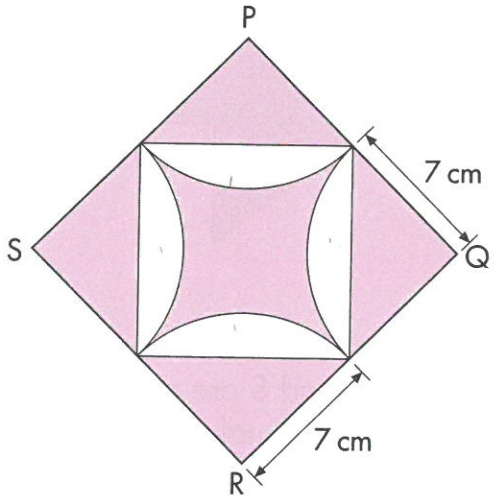
Area of figure = $9 \times 9 \times 2 - 6 \times 3$

= ☐ − ☐

= ☐ cm^2

The area of the figure is ☐ cm^2.

2 PQRS is a square. There are 4 identical quadrants inside PQRS. Find the total area of the shaded parts.
(Take $\pi = \frac{22}{7}$)



Area of one quadrant $= \frac{1}{4} \times \frac{22}{7} \times 7 \times 7$

$=$ ____ cm^2

Area of triangle in each quadrant $= \frac{1}{2} \times 7 \times 7$

$=$ ____ cm^2

Area of unshaded part in each quadrant $=$ ____ $-$ ____

$=$ ____ cm^2

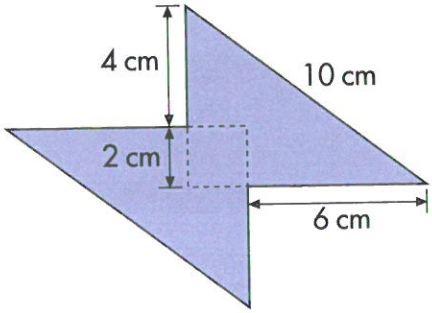
Total area of shaded parts
= Area of PQRS – Area of 4 unshaded parts in the quadrants

$=$ ____ $\times$ ____ $-$ ____ $\times 4$

$=$ ____ cm^2

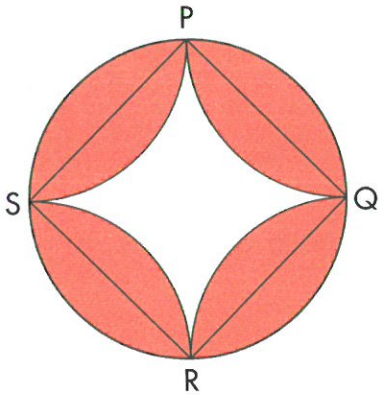
The total area of the shaded parts is ____ cm^2.

3 Two identical right-angled triangles overlap in a square of side 2 cm. Find the perimeter and area of the figure.

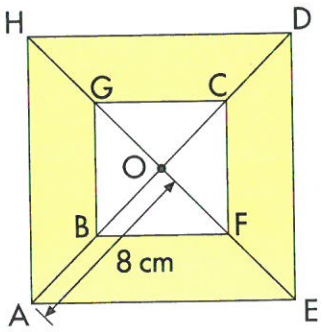


4 PQRS is a square. P, Q, R and S are points on a circle of radius 7 cm. All the 8 shaded parts have equal areas. Find the total area of the shaded parts.

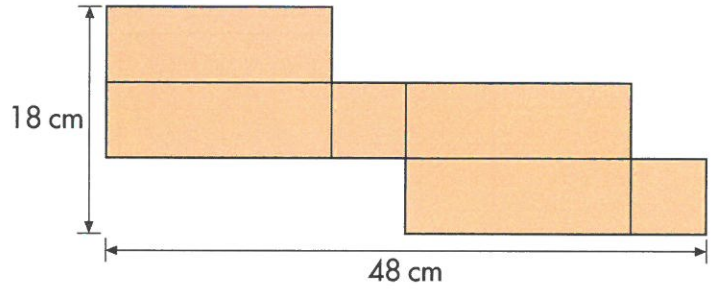
(Take $\pi = \frac{22}{7}$)



5 AHDE and BGCF are squares. AB = BO = OC = CD, EF = FO = OG = GH and AO = EO = 8 cm. Find the area of the shaded part.



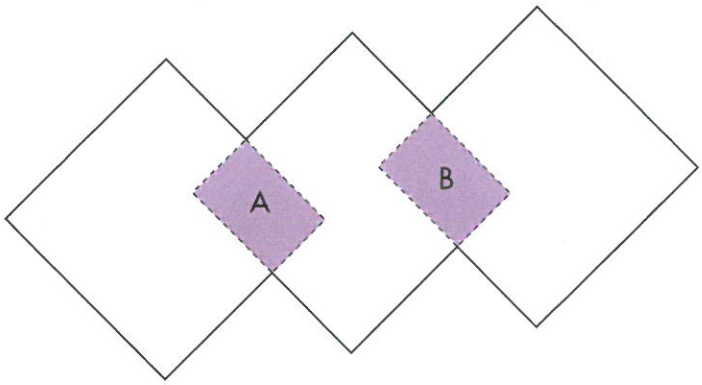
6 The figure is made up of four identical rectangles and two identical squares. Find the total area of the figure.



7 The figure consists of 3 identical squares overlapping in 2 rectangles marked A and B. The areas of A and B are equal. $\frac{1}{8}$ of the whole figure is shaded.

a) Express the total areas of A and B as a fraction of one square.

b) If the area of rectangle A is 6 cm^2, what is the area of the whole figure?



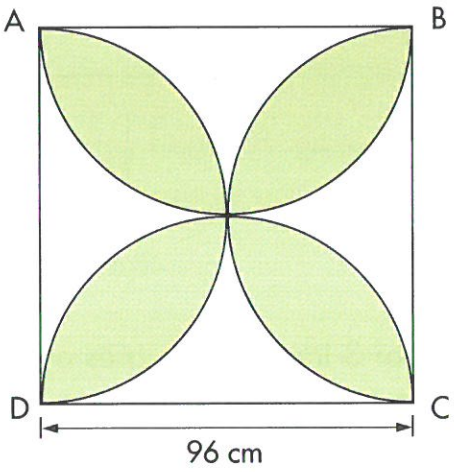
8 The radius of a smaller circle is 7 cm and the radius of a larger circle is 14 cm.

a) What is the ratio of the diameter of the smaller circle to the diameter of the larger circle?

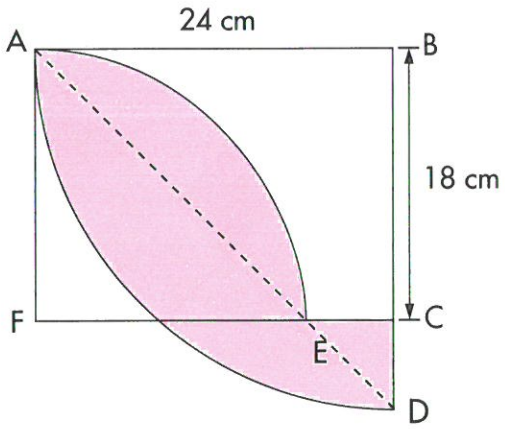
b) What is the ratio of the circumference of the smaller circle to the circumference of the larger circle?

c) What is the ratio of the area of the smaller circle to the area of the larger circle? (Take $\pi = \frac{22}{7}$)

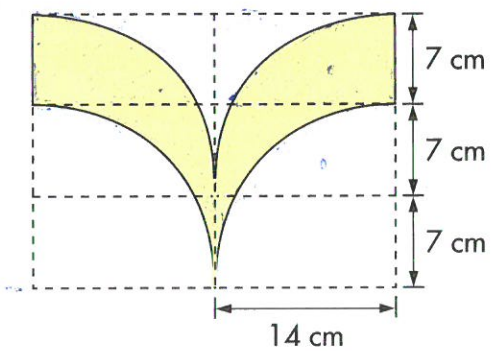
9 The figure shows a square ABCD and four semicircles. Find the total area of the shaded parts. Give your answer correct to 2 decimal places.



10 ABCF is a rectangle of length 24 cm and breadth 18 cm. AEF and ABD are quarter circles. Find the total area and perimeter of the shaded parts of the figure. Give your answers correct to 1 decimal place.



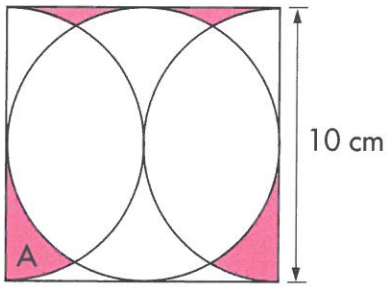
11 The figure shows four identical quarter circles. Find the area and perimeter of the shaded parts of the figure. Give your answers correct to 1 decimal place.



12 The figure shows a square of side 10 cm, 2 semicircles and a circle.

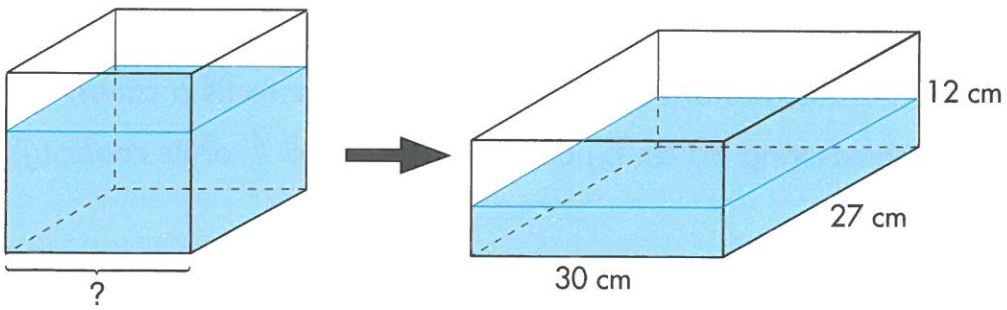
a) Find the total area of the shaded parts. Give your answer correct to 1 decimal place.

b) Find the perimeter of region A.



13 A rectangular aquarium tank is 60 cm long and 30 cm wide. Water flows into the empty tank at a rate of 2.25 l per minute. Find the height of the water level in the tank after 4 minutes if no overflow occurs.

14 A cubical container was $\frac{2}{3}$ filled with water. All the water was then poured into a larger rectangular container, 30 cm by 27 cm by 12 cm, filling 40% of it. What is the length of the cubical container?

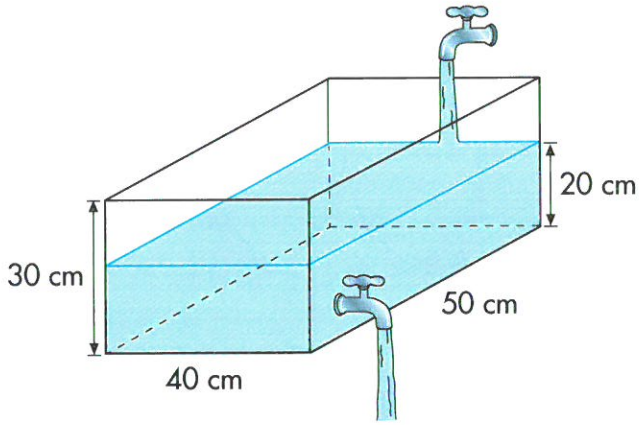


15 The base of a rectangular tank measures 120 cm by 80 cm. It is being filled with water flowing from three taps at the rates of 20 litres per minute, 16 litres per minute and 12 litres per minute each.

a) Find the height of the water level in the tank after 12 minutes.

b) How long will it take to fill the tank completely if the height of the tank is 110 cm?

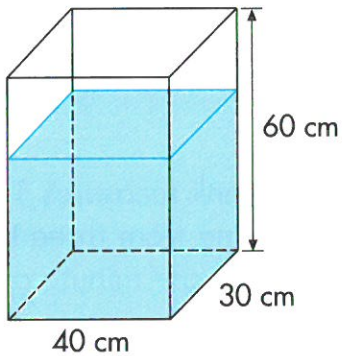
16 An empty rectangular tank measures 40 cm by 50 cm by 30 cm. It is being filled with water flowing from a tap at a rate of 10 litres per minute. At the same time, water is also being drained out from another tap at a rate of 6 litres per minute. How long will it take to fill the tank to a height of 20 cm? (1 litre = 1000 cm^3)



17 An empty container measuring 40 cm by 30 cm by 60 cm is being filled with water flowing from a tap. After 3 minutes, the container is $\frac{2}{3}$ full.

a) Find the rate of the water flowing into the container. Give your answer in litres per minute.

b) At this rate of flow, how long will it take to fill a container measuring 80 cm by 60 cm by 60 cm to $\frac{2}{3}$ of its capacity?



My Summary

Whole Numbers

- We can write a number as a product of two or more factors.

$$\underbrace{12}_{\text{product}} = \underbrace{2 \times 2 \times 3}_{\text{factors}}$$

- $29 \times 20 = 29 \times 2 \times 10$
  $= 58 \times 10$
  $= 580$

  $32 \times 25 = 8 \times 4 \times 25$
  $= 8 \times 100$
  $= 800$

- We use '≈' to represent 'approximately equal to'.

-

Given number	Rounded off to		
	nearest 10	nearest 100	nearest 1000
32 561	32 560	32 600	33 000

-

Given number	Operation	Answer
32	× 10	320
32	× 100	3200
32	× 1000	32 000
23 000	÷ 10	2300
23 000	÷ 100	230
23 000	÷ 1000	23

- Order of Operations
  Step 1: Do the operations in brackets.
  Step 2: Multiply and divide from left to right.
  Step 3: Add and subtract from left to right.

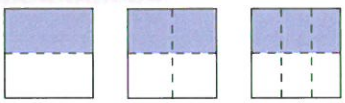
- A rate is expressed as one quantity per unit of another quantity.

Decimals

Given number	Rounded off to		
	nearest whole number	1 decimal place	2 decimal places
14.285	14	14.3	14.29
14.643	15	14.6	14.64

Given number	Operation	Answer
0.003	$\times 10$	0.03
0.003	$\times 100$	0.3
0.003	$\times 1000$	3
3	$\div 10$	0.3
3	$\div 100$	0.03
3	$\div 1000$	0.003

Fractions

-  $\frac{1}{2}$, $\frac{2}{4}$ and $\frac{3}{6}$ are **equivalent fractions**. They represent the same amount. $\frac{4}{5}$ and $\frac{8}{10}$ is another set of **equivalent fractions**.

- $\frac{4}{12}$, $\frac{5}{12}$ and $\frac{7}{12}$ have the same denominator. They are **like fractions**.
  To add/subtract like fractions, add/subtract the numerators and place the answer over the common denominator.

- $\frac{1}{3}$, $\frac{1}{4}$ and $\frac{1}{6}$ have different denominators. They are **unlike fractions**.
  To add/subtract unlike fractions, rename them to like fractions. Then add/subtract the like fractions. Simplify the fraction if necessary.

- $\frac{1}{3}$, $\frac{2}{5}$ and $\frac{5}{8}$ are smaller than 1. They are **proper fractions**.

- $\frac{3}{2}$, $\frac{9}{7}$ and $\frac{6}{6}$ are equal to or greater than 1. They are **improper fractions**. They can be expressed as a whole number or a mixed number.

- $1\frac{2}{3}$ is a **mixed number**.
  A mixed number consists of two parts: whole number and fraction.

- To add/subtract mixed numbers,
  Step 1: Add/subtract the whole number parts.
  Step 2: Change the fractional parts to like fractions.
  Step 3: Add/subtract the fractional parts.
  Step 4: Simplify the fraction if necessary.

  E.g. $2\frac{1}{6} + 1\frac{1}{3}$
  $= 3\frac{1}{6} + \frac{1}{3}$
  $= 3\frac{1}{6} + \frac{2}{6}$
  $= 3\frac{3}{6} = 3\frac{1}{2}$

- To multiply fractions, multiply the numerators first. Then multiply the denominators.

- Dividing by 4 is the same as multiplying by $\frac{1}{4}$.

- Dividing by $\frac{3}{4}$ is the same as multiplying by $\frac{4}{3}$.

- When doing operations with fractions, always express your answer in its simplest form.

Percentage

- 59% means 59 out of 100.

  $59\% = \frac{59}{100} = 0.59$

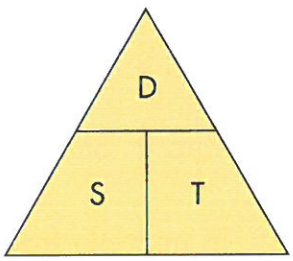
- $\frac{1}{2} = 0.5 = 50\%$ $\frac{1}{4} = 0.25 = 25\%$ $\frac{1}{5} = 0.2 = 20\%$
- $\frac{1}{8} = 0.125 = 12.5\%$ $\frac{1}{10} = 0.1 = 10\%$ $\frac{1}{20} = 0.05 = 5\%$

Ratio

- A ratio does not have units. It remains unchanged if we divide or multiply all its terms by the same number.
  4 : 2 : 6 = 2 : 1 : 3 (Divide by 2)
  3 : 1 : 4 = 9 : 3 : 12 (Multiply by 3)

Speed

- Average speed = Total distance ÷ Total time
- Total distance = Average speed × Total time
- Total time = Total distance ÷ Average speed



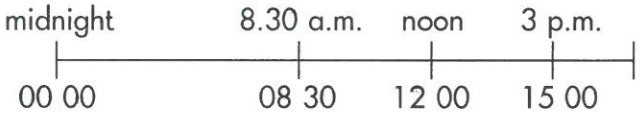
Average

- Average = $\frac{\text{Sum of data}}{\text{Number of data}}$

Measures

- Length
  1 m = 100 cm
  1 km = 1000 m
- Volume
  1 l = 1000 ml
  = 1000 cm^3
  1 ml = 1 cm^3
- Mass
  1 kg = 1000 g

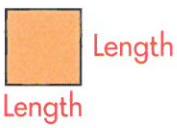
- Time
  1 year = 12 months
  1 week = 7 days
  1 day = 24 h
  1 h = 60 min
  1 min = 60 s



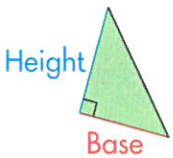
Mensuration

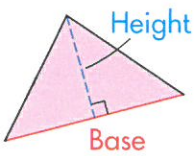
- Area of rectangle = Length × Breadth
  Perimeter of rectangle = 2 × Length + 2 × Breadth

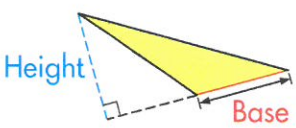
- Area of square = Length × Length
  Length = $\sqrt{\text{Area}}$
  Perimeter of square = 4 × Length



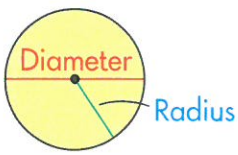
- Area of triangle = $\frac{1}{2}$ × Base × Height







- Diameter = 2 × Radius
  Radius = Diameter ÷ 2



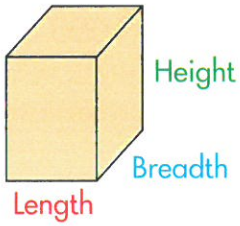
- Circumference of circle = $\pi \times$ Diameter
  $= 2 \times \pi \times$ Radius
  Area of circle = $\pi \times$ Radius $\times$ Radius

- Volume of cuboid = Length × Breadth × Height

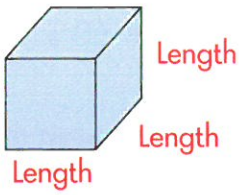
  $\text{Length} = \dfrac{\text{Volume}}{\text{Breadth} \times \text{Height}}$

  $\text{Breadth} = \dfrac{\text{Volume}}{\text{Length} \times \text{Height}}$

  $\text{Height} = \dfrac{\text{Volume}}{\text{Length} \times \text{Breadth}} = \dfrac{\text{Volume}}{\text{Base Area}}$

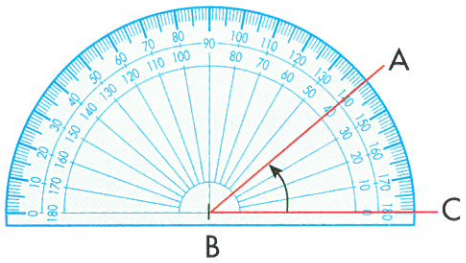


- Volume of cube = Length × Length × Length
  Length = $\sqrt[3]{\text{Volume of cube}}$

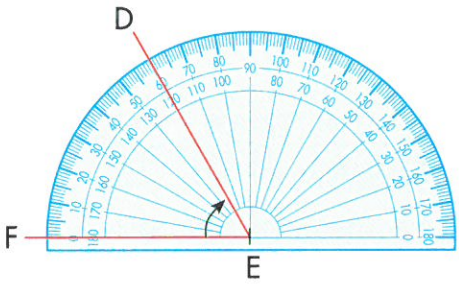


Geometry

-

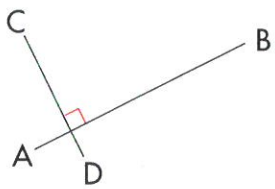


$\angle ABC = 40°$



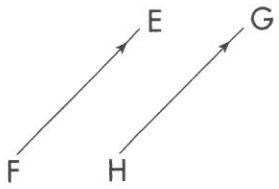
$\angle DEF = 60°$

- Perpendicular lines cross or meet at right angles.
  $CD \perp AB$.

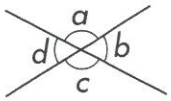


- 1 right angle = 90°

- Parallel lines will not meet.
  EF // GH.

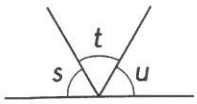


- Vertically opposite angles are equal.



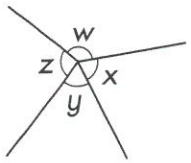
$\angle a = \angle c$
$\angle b = \angle d$

Sum of angles on a straight line is 180°.

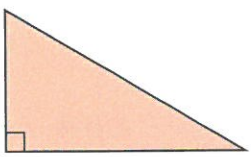


$\angle s + \angle t + \angle u = 180°$

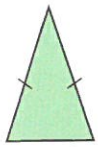
Sum of angles at a point is 360°.



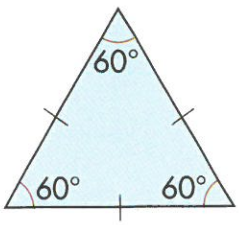
$\angle w + \angle x + \angle y + \angle z = 360°$

- 

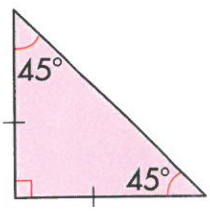
Right-angled triangle



Isosceles triangle

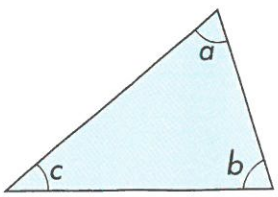
- 

Equilateral triangle

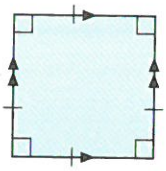


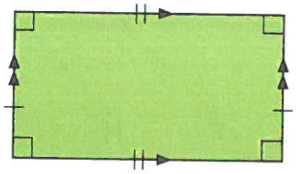
Right-angled isosceles triangle

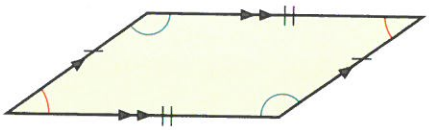
- Angle sum of triangle is 180°.

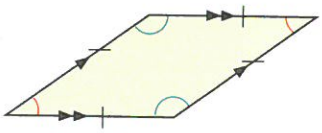


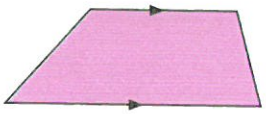
$\angle a + \angle b + \angle c = 180°$

- 
Square

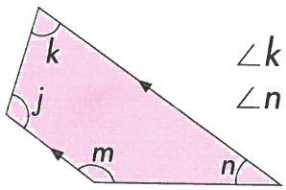

Rectangle


Parallelogram

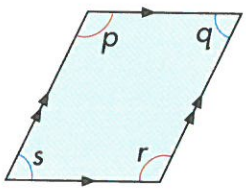

Rhombus


Trapezium

- The sum of a pair of angles between two parallel sides is 180°.



$\angle k + \angle j = 180°$
$\angle n + \angle m = 180°$



$\angle p + \angle q = 180°$
$\angle s + \angle r = 180°$

$\angle p + \angle s = 180°$
$\angle q + \angle r = 180°$

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