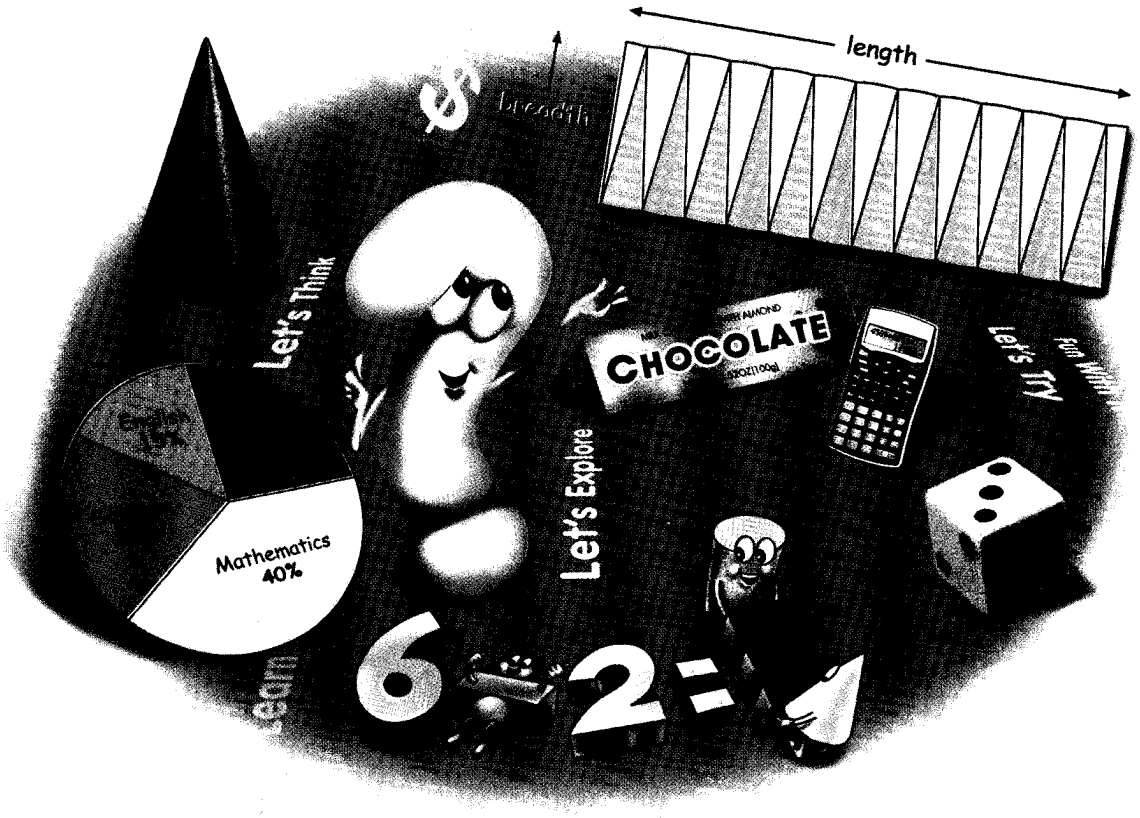
New Syllabus

# Primary Mathematics





**Consultants:**
Dr Foong Pui Yee • Dr Fan Liang Huo

**Authors:**
Teh Pick Ching (BA, MA) • Lu Jitan (Ph.D, MSc, BSc)


**6B**


*shinglee publishers pte ltd*

**SHINGLEE PUBLISHERS PTE LTD**
120 Hillview Avenue #05-06/07
Kewalram Hillview Singapore 669594
Tel: 67601388 Fax: 67623247
email: info@shinglee.com.sg
http://www.shinglee.com.sg



**First Published 2009**

ISBN 978 981 237 379 3

Cover design by Dave Cheong


Printed in Singapore by Mainland Press Pte Ltd

# CONTENTS

# PREFACE

The New Syllabus Primary Mathematics (NSPM) series is designed and written based on the latest primary mathematics syllabus. In this series, the concrete to abstract approach is adopted to introduce new concepts. Vivid and stimulating illustrations are used throughout the series to enhance learning. The knowledge base is built incrementally as the pupils progress up the levels so as to consolidate the linkages among mathematical concepts.

The series aims to meet the learning needs of pupils from Primary One to Six. It comprises textbooks and workbooks at each level. Every worksheet in the workbook corresponds to each concept learnt. Textbook 6B comprises 6 chapters and two revisions. Each chapter comprises the following sections:

**Do You Know?** Relevant, thought-provoking questions are asked with regard to the real life situation presented at the beginning of each chapter to link Mathematics to daily life.

**Let's Learn** New concepts are explained in a straight-forward and interesting way. Creative and critical thinking, as well as an awareness of problem-solving strategies, are developed through worked examples in this section. Guided examples provide reinforcement and consolidation of the concepts taught.

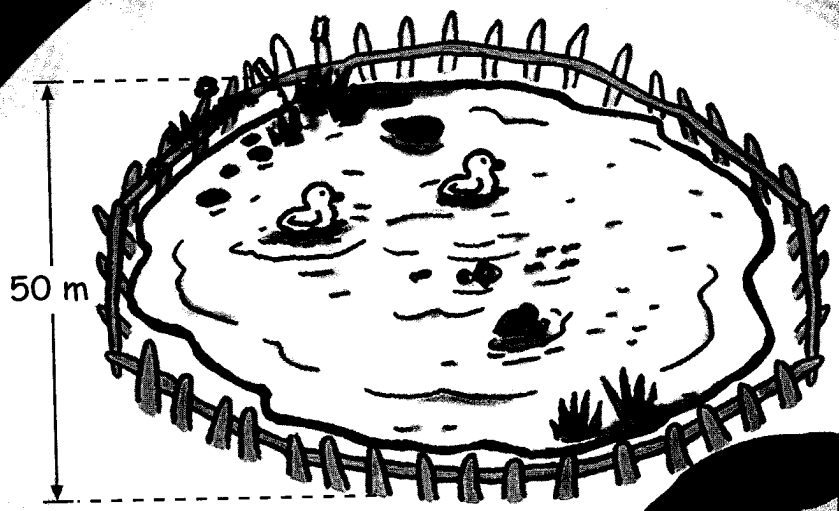
**Let's Explore** Active participation in exploration of the concepts learnt and creative application of Mathematics to daily life, including IT and hands-on activities, help to develop lifelong learners. Social skills such as effective communication, cooperation and team spirit are encouraged through group and pair work.

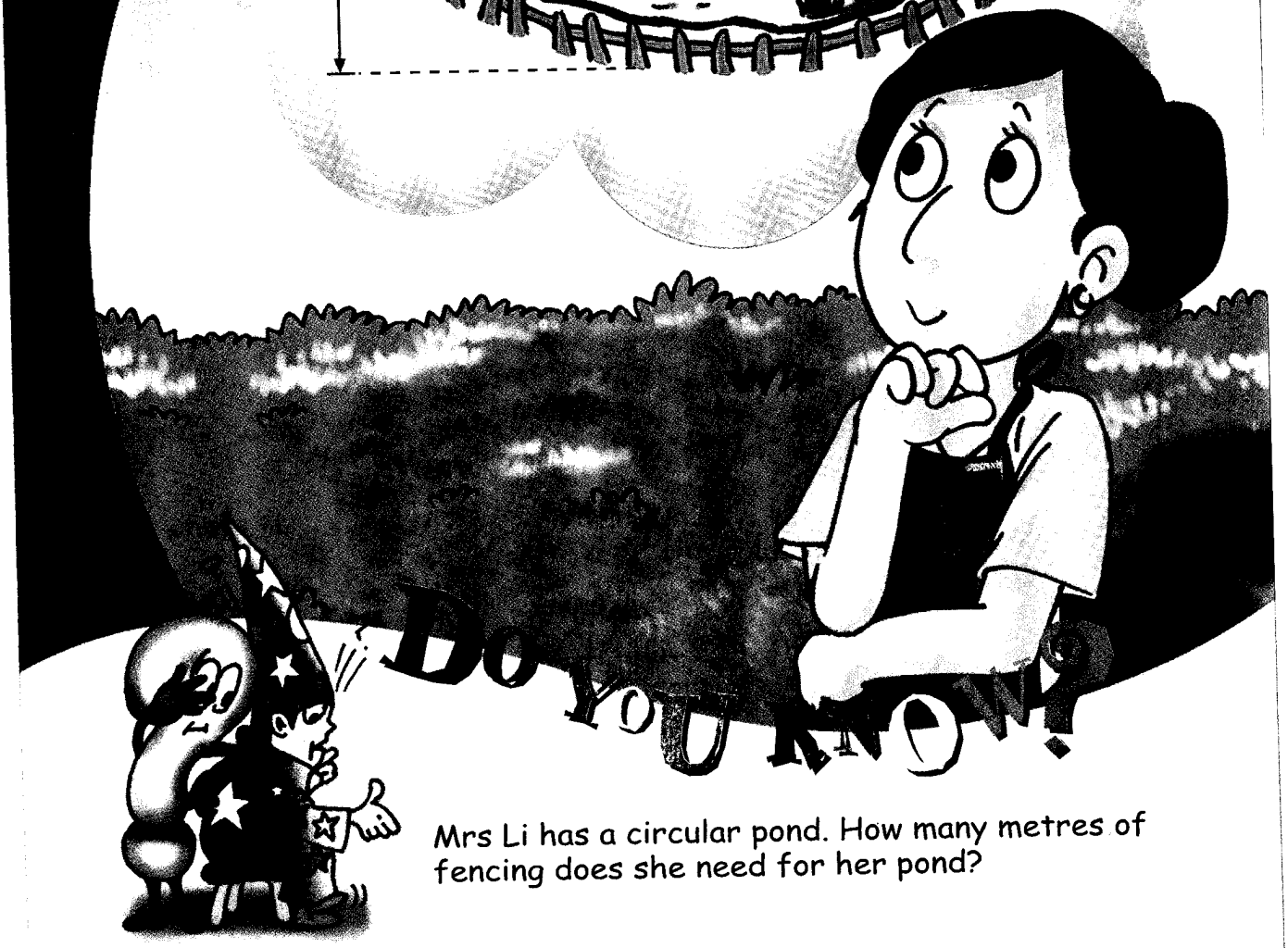
**Let's Think** Opportunities are provided to develop higher order thinking skills and proficiency in applying the concepts learnt through non-routine and challenging questions.

**Let's Try** Exercises are provided for pupils to develop their problem-solving skills, so that pupils grow into confident and independent learners.

**Fun with Maths** Mathematical concepts are extended beyond the boundaries of the classroom and taken into the realm of games and experiments to further engage and develop pupils' interest in Mathematics.

# 7 Circle

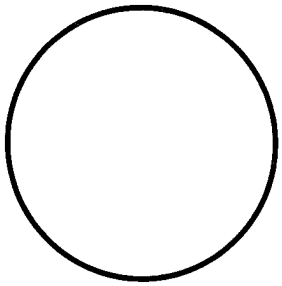



Mrs Li has a circular pond. How many metres of fencing does she need for her pond?

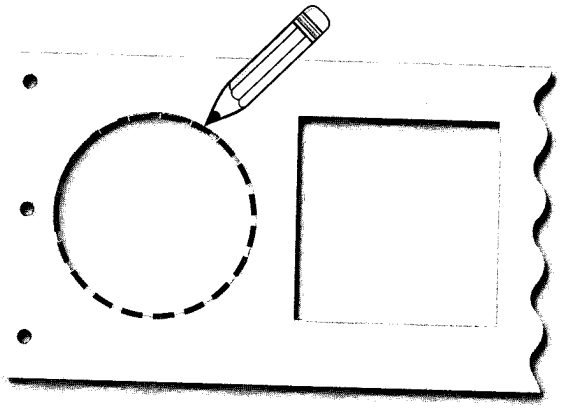
# Let's Learn .. Circle

This is a circle.

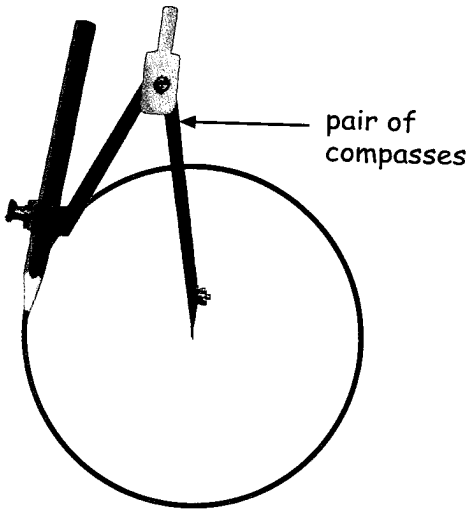


We can draw a circle by:

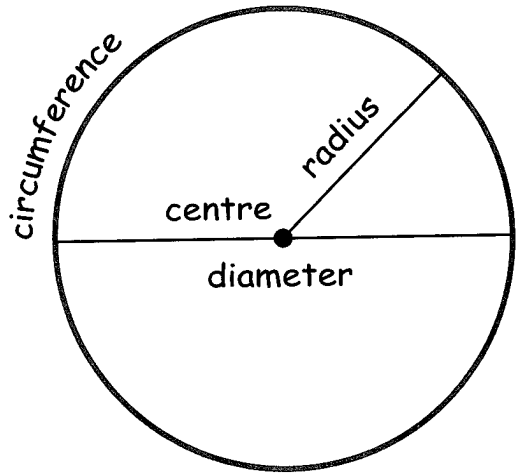
(a) Tracing a circular object

(b) Using a pair of compasses



The following terms are used to describe a circle:

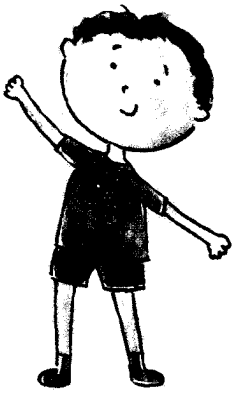



**centre** It is the fixed point from where a circle can be drawn.

**radius** A line joining the centre to any point on the circular edge of the circle.

**diameter** Any line passing through the centre of the circle and joining two points on the circular edge of the circle.

**circumference** The length of the circular edge of the circle. It is the perimeter of the circle.



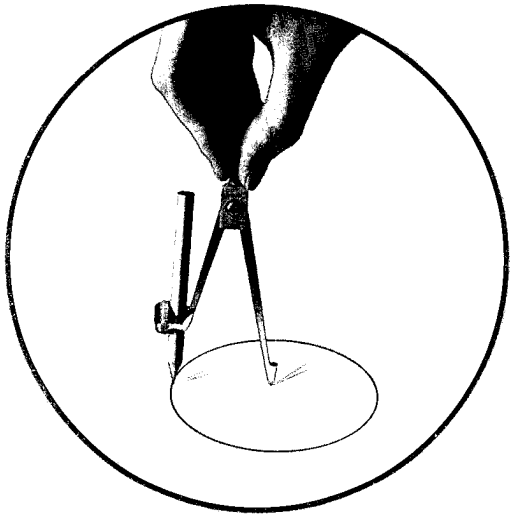

Draw a circle with a radius of 3 cm using a pair of compasses. Next draw three radii and three diameters in the same circle and measure their lengths.

Do you find the following:

1. All the radii have the same length of 3 cm.
2. All the diameters have the same length of 6 cm.

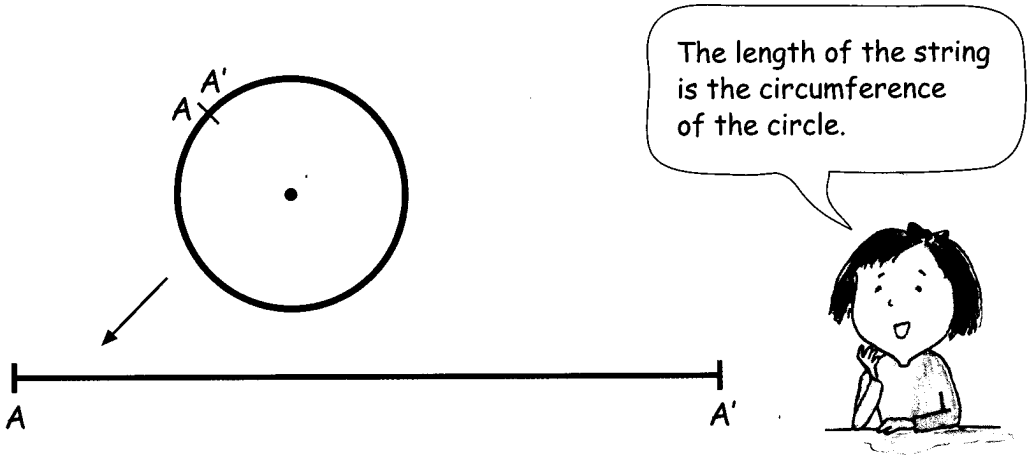
In general,

1. All radii have the same length.
2. The length of the diameter is twice the length of the radius.



# Let's Learn .. Circumference

Draw a circle with radius 1.5 cm.
Use a string to measure the circumference of the circle:




By measuring the length of the string, we get the circumference of the circle, that is about 9.4 cm.

Draw circles with radii of 2 cm, 2.5 cm and 3 cm and measure their circumferences as above.

Copy and fill in the following table based on the results you measured.

| Radius (cm) | Diameter (cm) | Circumference (cm) | Circumference ÷ Diameter |
|---|---|---|---|
| 1.5 | 3 | 9.4 | [redacted] |
| 2 | 4 | [redacted] | [redacted] |
| 2.5 | 5 | [redacted] | [redacted] |
| 3 | 6 | [redacted] | [redacted] |

Do you notice anything special for the numbers in the last column of the table?

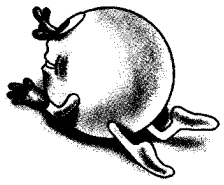
From the above table, we see that the ratio of the circumference to the diameter of a circle always comes close to a particular value. This value is approximately 3.14. Usually, this value is represented by the Greek letter $\pi$, and it is read as pi.

Thus,

$$\text{Circumference} \div \text{Diameter} = \pi$$

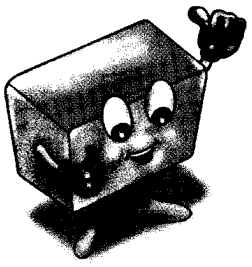
or

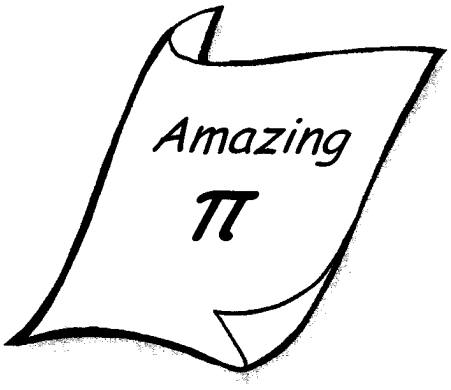
$$\text{Circumference} = \pi \times \text{Diameter}$$
$$= 2 \times \pi \times \text{radius}$$



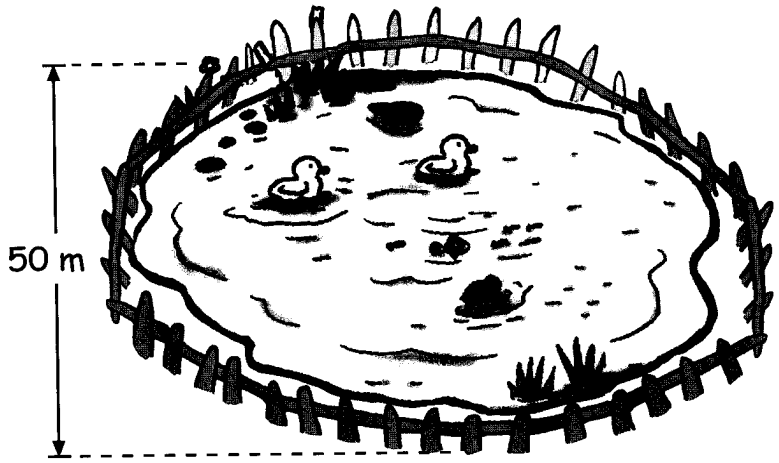

Search the Internet to find out more about $\pi$. Based on your findings, write a journal entitled "Amazing $\pi$".

Share your journal with your classmates.





Now, let us look at the question on the introductory page.




The diameter of Mrs Li's pond = 50 m

Circumference of the pond = $\pi$ x diameter
= 3.14 x 50
= 157 m

Mrs Li needs 157 m of fencing for her pond.


1. Find the circumference of a circle with a radius of 7 m.

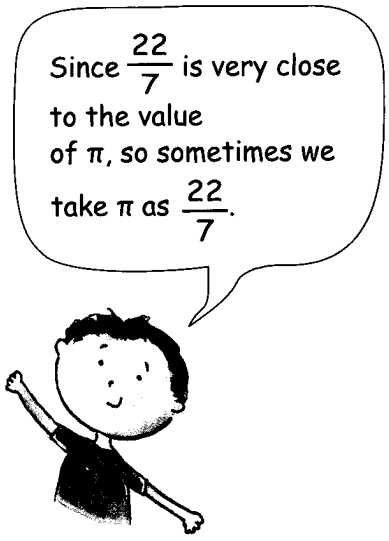
(Take $\pi = \frac{22}{7}$)

Circumference = 2 x $\pi$ x radius

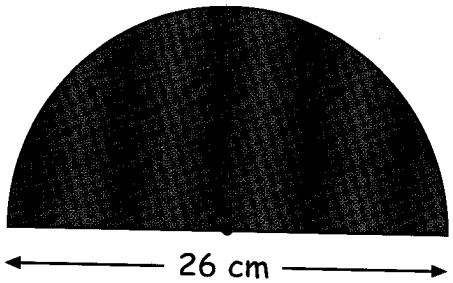
$= 2 \times \frac{22}{7} \times 7$

= 44 m

The circumference is 44 m.



2. The figure shown is a semicircle. Find its perimeter. Give your answer correct to 1 decimal place.

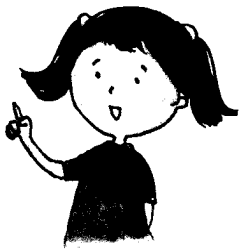



The perimeter of the semicircle is the sum of $\frac{1}{2}$ of the circumference of the circle and the diameter.

Circumference of the circle = $\pi$ x diameter

= $\pi$ x 26 cm

Press the keys [2nd F], [■], [■], [2], [6], and [=], one by one, on the face of a scientific calculator. Then we get 81.68140899.



So, circumference of the circle = 81.68140899

= 81.68 cm (correct to 2 decimal places)

The value of $\pi$ stored in a scientific calculator is 3.141592654. We usually use this value of $\pi$ when using a calculator.

$\frac{1}{2}$ of the circumference of the circle = $81.68 \times \frac{1}{2}$

= 40.84 cm

The perimeter of the semicircle = 40.84 + 26

= 66.84 cm

= 66.8 cm (correct to 1 decimal place)

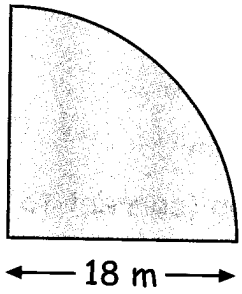
The perimeter of the semicircle is 66.8 cm.

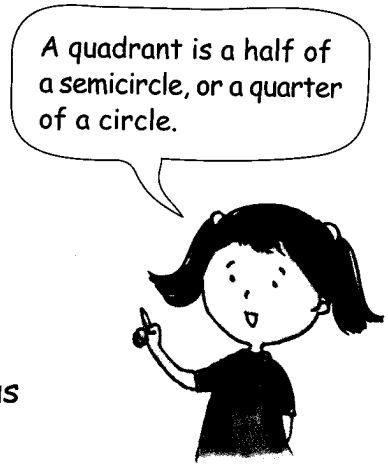

Discuss in groups.

A Why did we keep the answer to the circumference of the circle correct to 2 decimal places and not 1 decimal place in Example 2?

B Take $\pi$ = 3.14 and do Example 2 again.
Do you get the same result?
Why does the difference happen?

3. The figure shown is a quadrant. Find its perimeter.
Give your answer correct to 2 decimal places.



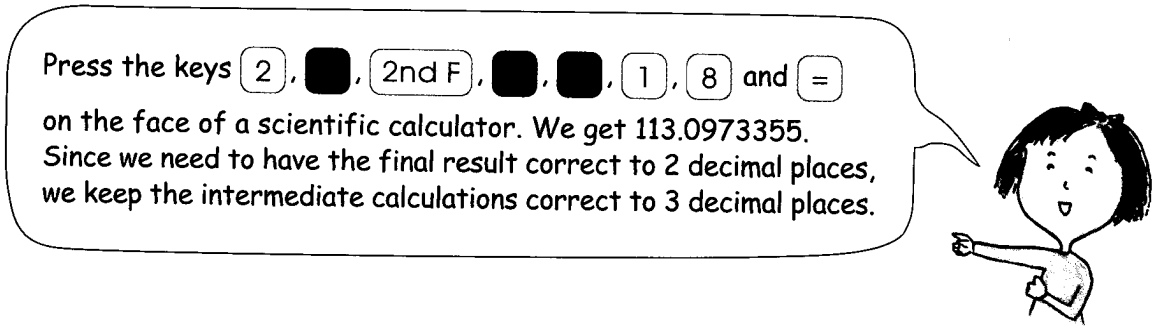




Radius of the circle = 18 m

Circumference of the circle = $2 \times \pi \times$ radius

$= 2 \times \pi \times 18$

$\approx 113.097$ m




$\frac{1}{4}$ of the circumference of the circle = $113.097 \div 4$

$\approx 28.274$ m

Perimeter of the quadrant = $28.274 + 18 + 18$

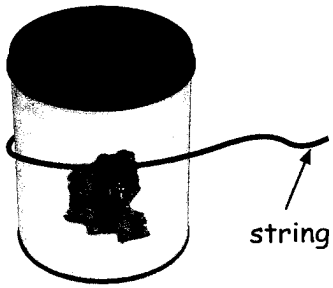
$= 64.274$

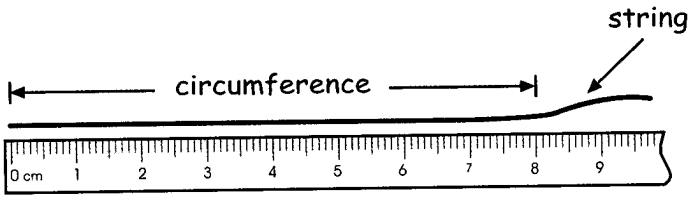
= 64.27 m (correct to 2 decimal places)


Collect several circular objects of different sizes, e.g. cans, bottles, circular tins etc.

Measure the diameter of each circular object correct to the nearest cm.

Measure each circumference to the nearest cm with a string.




Record these measurements for each object. Divide the circumference by the diameter and give your answer correct to 2 decimal places.

Copy and complete the following table.

| Radius (cm) | Diameter (cm) | Circumference (cm) | Circumference ÷ Diameter |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |

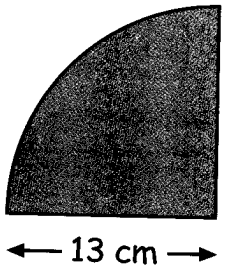
Is each of the answers in the last column close to 3.14?

# Let's Try .. Circle

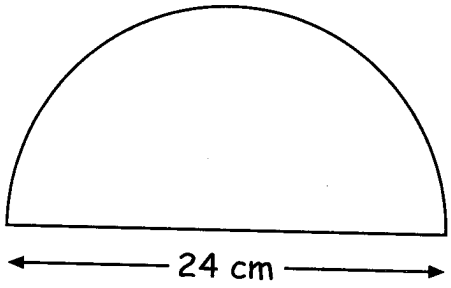
1. Find the circumference of each of the following circles.
Give your answer correct to the nearest whole numbers.

(a) Diameter = 5 cm.
(b) Radius = 6 cm.

2. The figure below is a quadrant. Find its perimeter.
Give your answer correct to 1 decimal place.

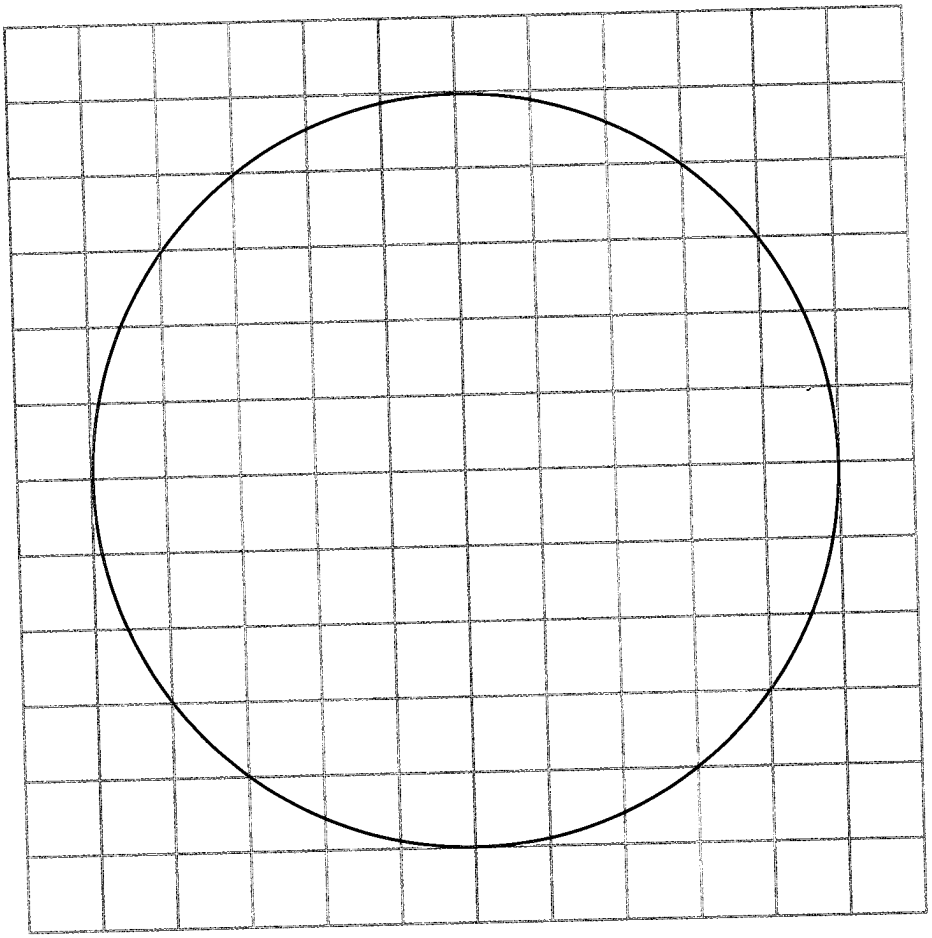



3. The figure shown is a semicircle. Find its perimeter.
Give your answer correct to 2 decimal places.



# Let's Learn .. Area of a Circle

Draw a circle with a radius of 5 cm on a piece of grid paper.
Count the number of squares inside the circle, and the number of squares overlapping with the circle.



The number of squares inside the circle completely is 60.

The number of squares overlapping with the circle is 88.

Each square is 1 cm by 1 cm.

Area of one square is 1 $cm^2$.

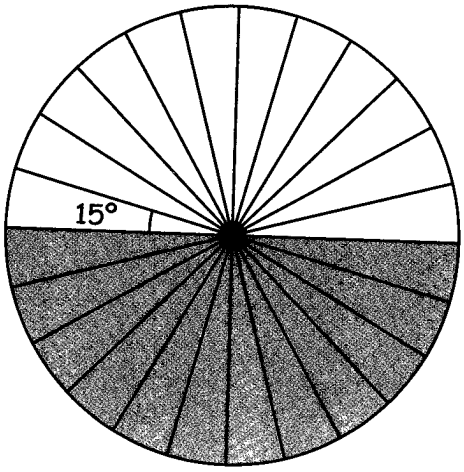
Area of 60 squares is $60 \times 1 = 60$ $cm^2$.

Area of 88 squares is $88 \times 1 = 88$ $cm^2$.

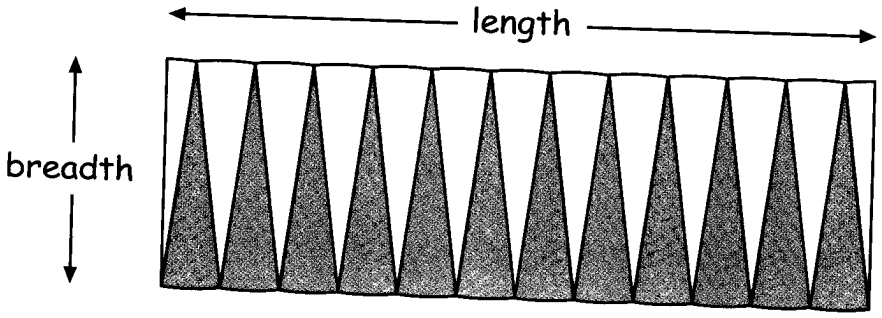
So the area of the circle is between 60 $cm^2$ and 88 $cm^2$.

Now, let's study the area of a circle.

Draw a circle.
Using a protractor, divide the circle into 24 parts as shown:




Cut out these 24 parts and cut one of the pieces into 2 equal parts.
Arrange them to form roughly a rectangle as shown:



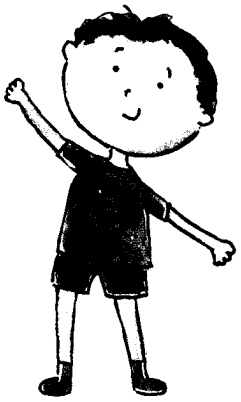
Length of the rectangle is about half of the circumference of the circle. That is $\pi$ x radius of the circle.

The breadth of the rectangle is the radius of the circle.

Area of the rectangle = Length x breadth
= $\pi$ x radius x radius

Hence, we get

**Area of a circle = $\pi$ x radius x radius**



1. Find the area of a circle with a radius of 5 cm.

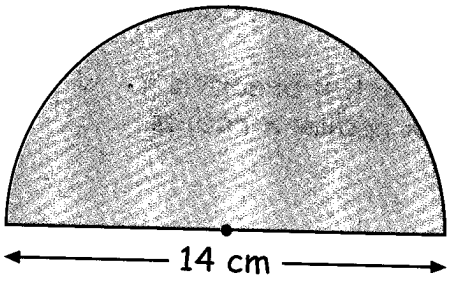
   (Take $\pi$ = 3.14)

   Area of circle = $\pi$ x radius x radius
   = 3.14 x 5 x 5
   = 15.7 x 5
   = 78.5 $cm^2$

Recall that we estimated on page 13 that the area of the circle is between 60 $cm^2$ and 88 $cm^2$!

2. Find the area of the semicircle as shown below.

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




Radius of the circle = 7 cm

Area of semicircle = Half of the area of a cricle

$$= \frac{1}{2} \times \pi \times \text{radius} \times \text{radius}$$

$$= \frac{1}{2} \times \frac{22}{7} \times 7 \times 7$$

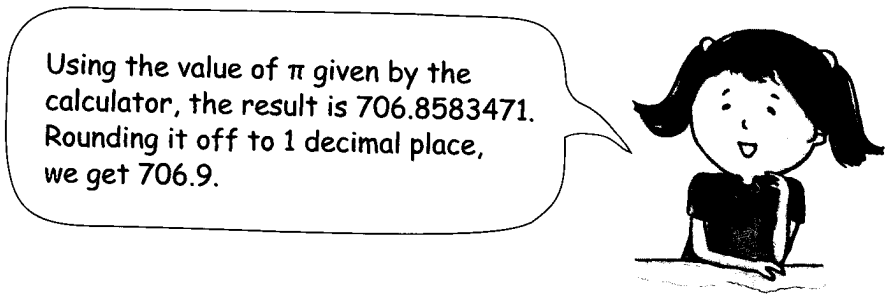
$$= 77 \text{ cm}^2$$

3. Find the area of a circle with radius 15 cm.
Give your answer correct to 1 decimal place.

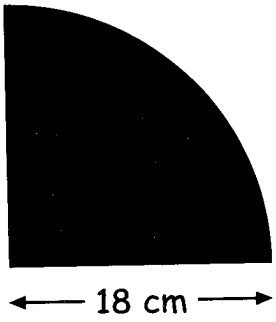
Area of the circle = $\pi \times$ radius $\times$ radius

$= \pi \times 15 \times 15$

$= 706.9 \text{ cm}^2$ (correct to 1 decimal place)



4. Find the area of the quadrant of a circle with a radius of 18 cm. Give your answer correct to 2 decimal places.




Area of the circle = $\pi$ x radius x radius

= $\pi$ x 18 x 18

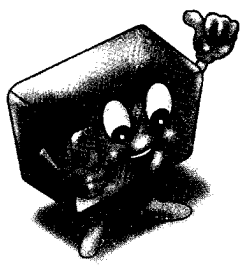
= 1017.876 $cm^2$ (correct to 3 decimal places)

Area of the quadrant = $\frac{1}{4}$ x Area of the circle

= $\frac{1}{4}$ x 1017.876

= 254.469

= 254.47 $cm^2$ (correct to 2 decimal places)



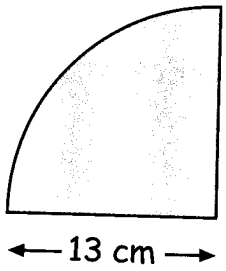

# Area of a Circle

1. Find the area of each of the following circles:

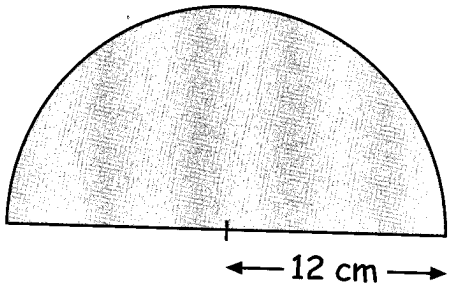
   (a) Diameter = 20 cm. (Take $\pi = 3.14$)

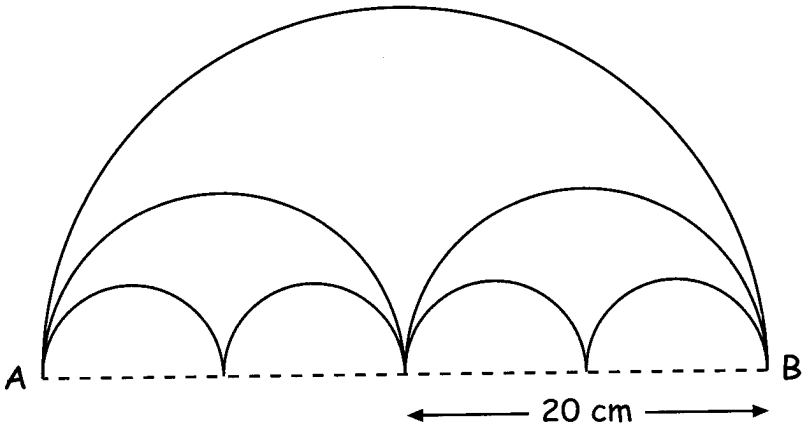
   (b) Radius = 21 cm. (Take $\pi = \frac{22}{7}$)

2. The figure below is a quadrant. Find its area.
   Give your answer correct to 1 decimal place.




3. The figure shown is a semicircle. Find its area.
   Give your answer correct to 2 decimal places.






There are three paths from A to B indicated by different colors: blue, green and red. Each of them is formed by semicircles.

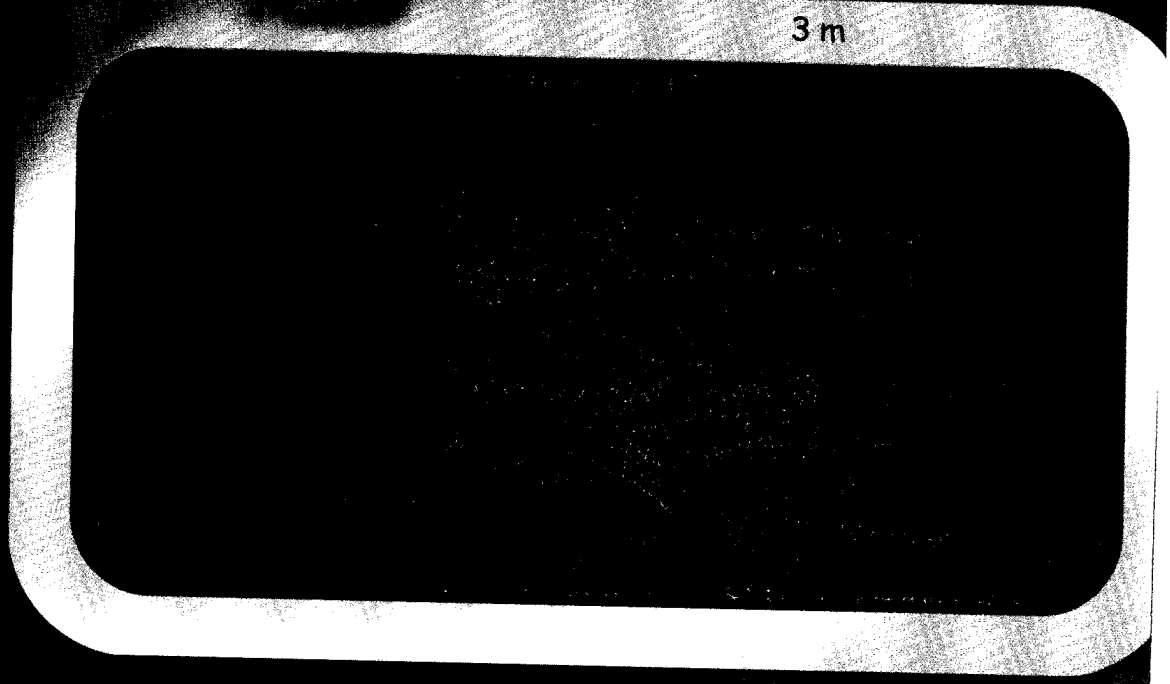
Guess which path is the longest.

Then calculate the total length of each path.

Is your guess correct?

Are you surprised with the result?

# 8 Area and Perimeter



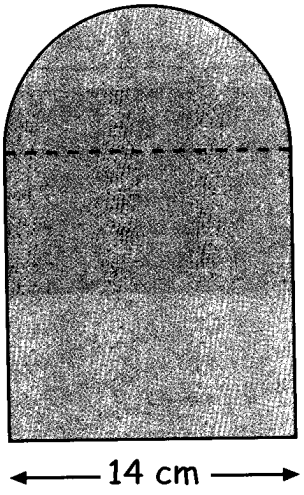

## DO YOU KNOW?

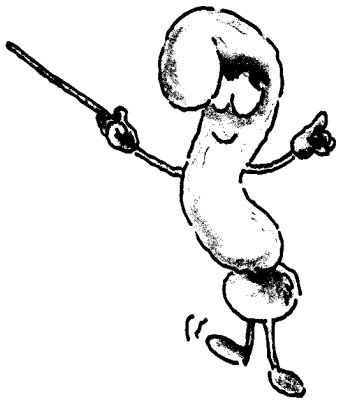
How do we find the inner and outer perimeters of this track from the given information? What about the whole area of the field enclosed by the inner perimeter?

# Let's Learn .. Perimeter of a Composite Figure

The figure below is made up of a semicircle and a square.
Find its perimeter.

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



Diameter of the circle = 14 cm

Circumference of the circle = $\frac{22}{7}$ x 14

= 44 cm

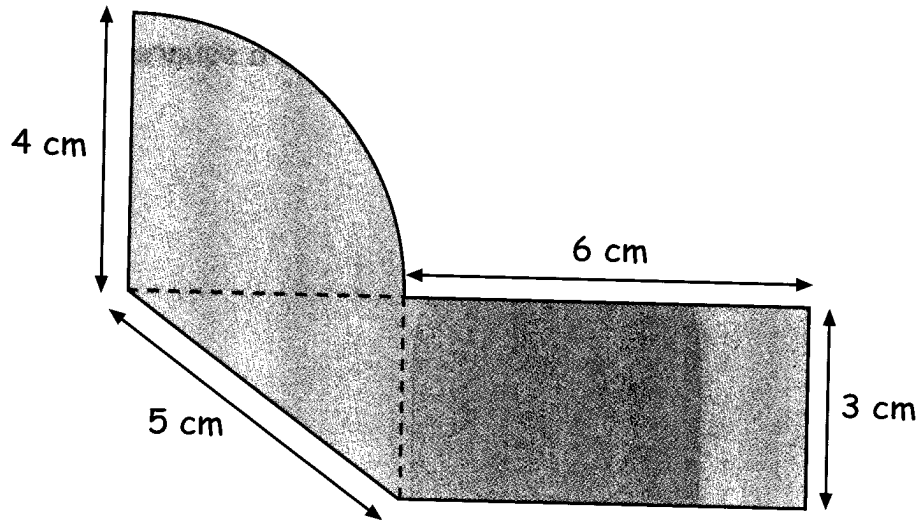
$\frac{1}{2}$ x Circumference of the circle = 44 ÷ 2

= 22 cm

Perimeter of the figure = 22 + 14 + 14 + 14

= 64 cm

2. The figure below is made up of a quadrant, a triangle and a rectangle. Find the perimeter of the figure.
(Take $\pi = 3.14$)




Radius of the circle = 4 cm

Circumference of the circle = $2 \times \pi \times$ radius

$= 2 \times 3.14 \times 4$

$= 25.12$ cm

$\frac{1}{4} \times$ Circumference of the circle $= 25.12 \div 4$

$= 6.28$ cm

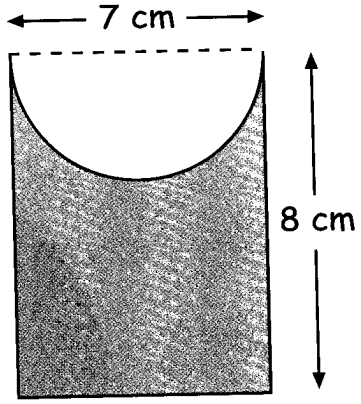
Perimeter of the figure $= 6.28 + 6 + 3 + 6 + 5 + 4$

$= 30.28$ cm

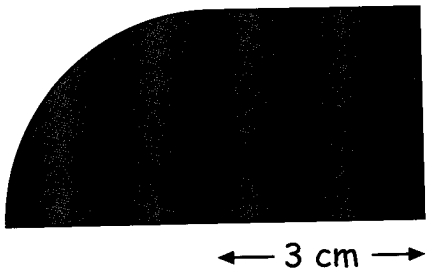

# .. Perimeter of a Composite Figure

1. The figure shows that a semicircle is cut off from a rectangle. Find the perimeter of the shaded part.

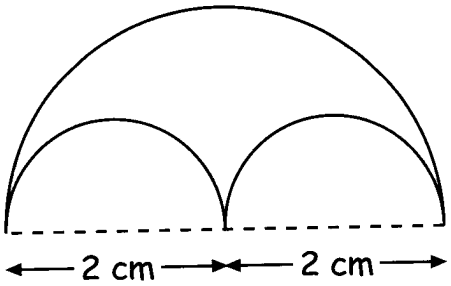
   (Take $\pi = \frac{22}{7}$)




2. The figure shown is made up of a quadrant and a square. Find its perimeter. (Take $\pi = 3.14$)

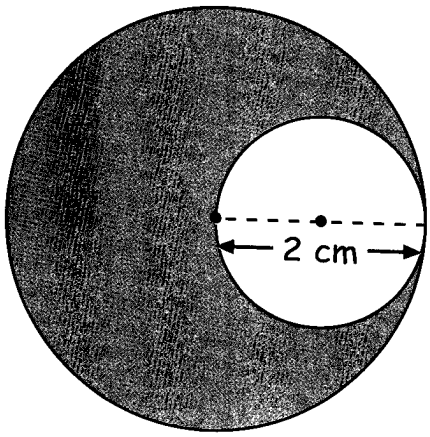


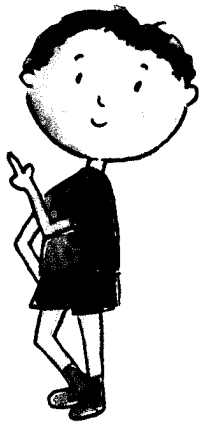

3. The figure shown is made up of three semicircles. Find its perimeter. Give your answer correct to 2 decimal places.



# Let's Learn .. Area of a Composite Figure

1. The figure shows a bigger circle with a radius of 2 cm and a smaller circle with radius 1 cm. Find the area of the shaded part. (Take $\pi = 3.14$)



Area of the bigger circle = $3.14 \times 2 \times 2$

$= 12.56 \text{ cm}^2$

Area of the smaller circle = $3.14 \times 1 \times 1$

$= 3.14 \text{ cm}^2$

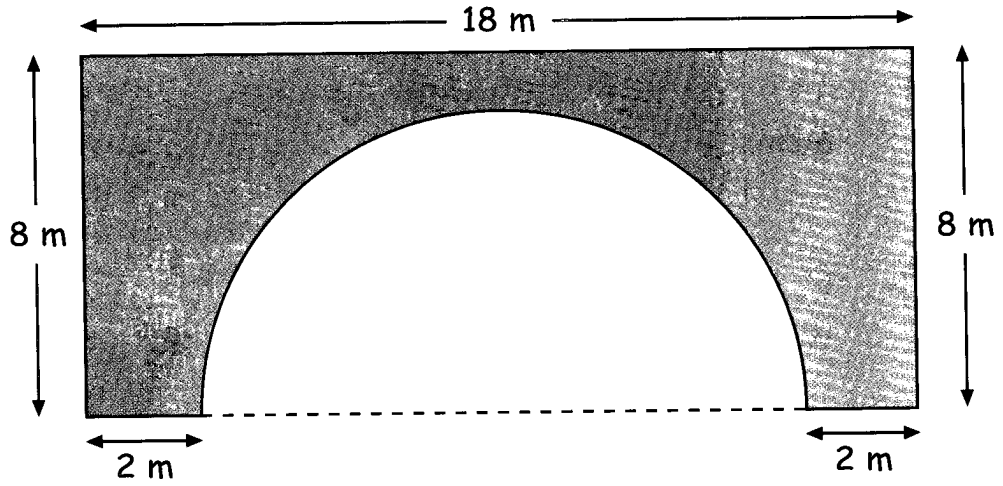
Area of the shaded part = Area of the bigger circle - Area of the smaller circle

$= 12.56 - 3.14$

$= 9.42 \text{ cm}^2$

2. The figure below shows the shape of a bridge. A semicircle is cut out from a rectangle. Find the area of the shaded part.

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




Area of the rectangle = 18 x 8
= 144 $m^2$

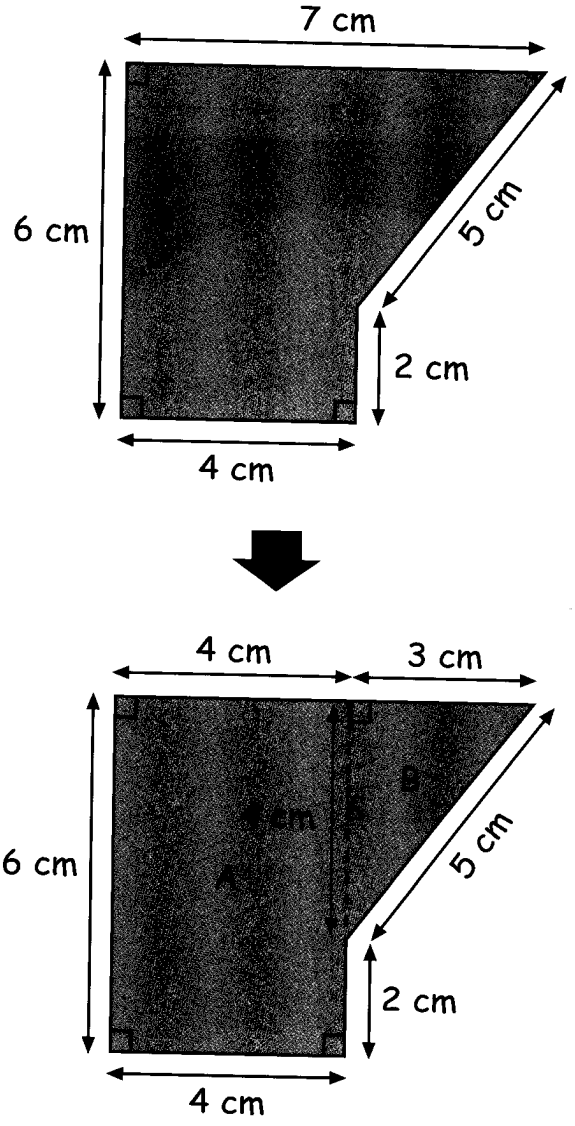
Radius of the circle = $\frac{1}{2}$ x (18 - 2 - 2)
= $\frac{1}{2}$ x 14
= 7 m

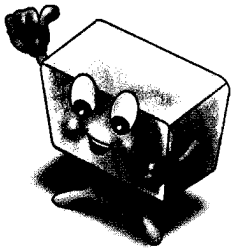
Area of the semicircle = $\frac{1}{2}$ x $\pi$ x radius x radius
= $\frac{1}{2}$ x $\frac{22}{7}$ x 7 x 7
= 77 $m^2$

Area of the figure = 144 - 77
= 67 $m^2$

The area of the figure is 67 $m^2$.

3. Find the area of the figure.
Divide the figure into basic shape: a rectangle and a triangle.



The given figure is made up of a rectangle (A) and a right-angled triangle (B).

Therefore,
the area of the given figure = area of rectangle A + area of triangle B

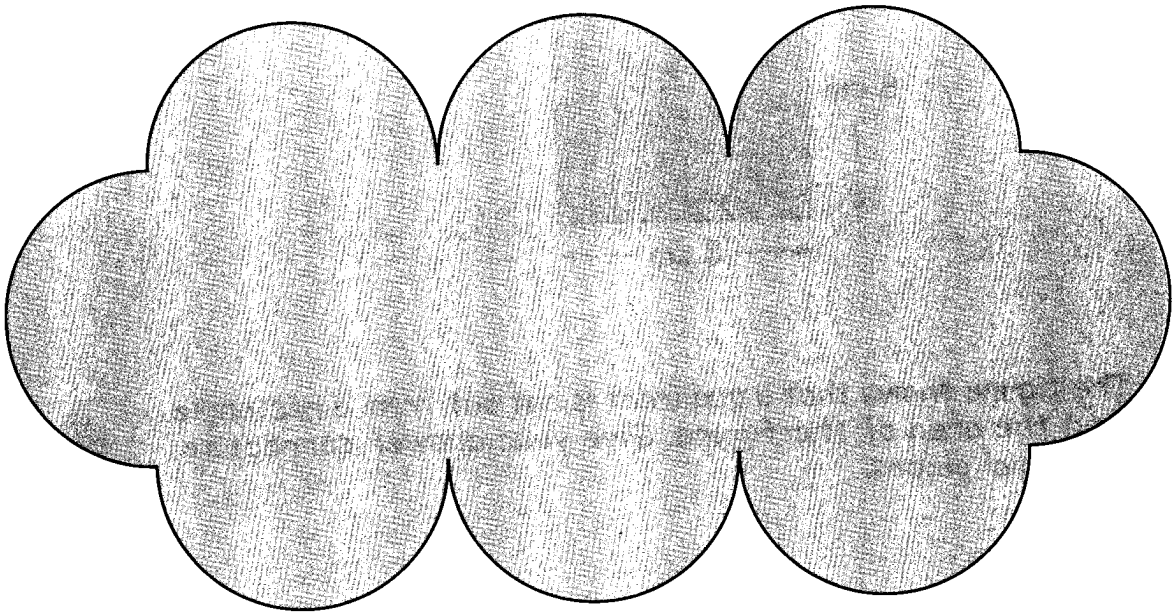
$$= 6 \times 4 + \frac{1}{2} \times 4 \times 3$$

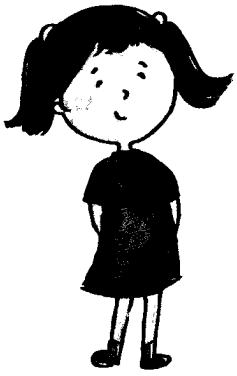
$$= 24 + 6$$

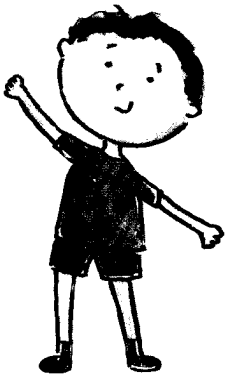
$$= 30 \text{ cm}^2$$


The figure is made up of 8 semicircles with the same size. The diameter of each semicircle in the figure is 14 cm. Find the area and perimeter of the figure.

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

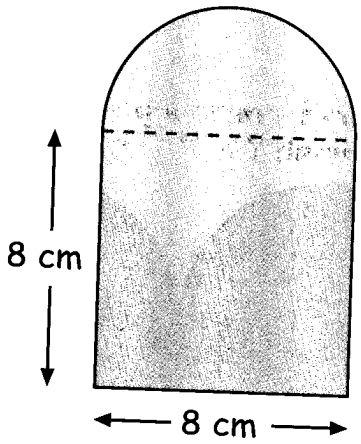




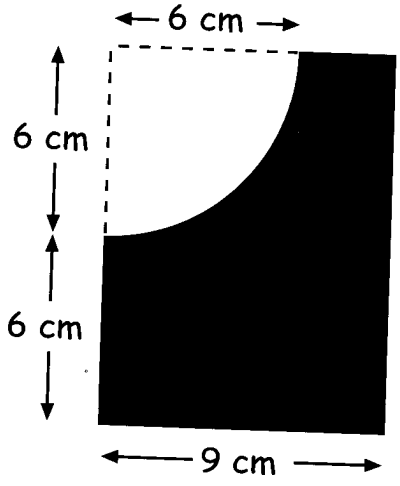


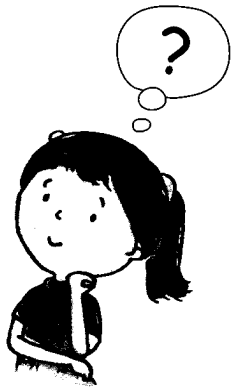

# Area of a Composite Figure

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



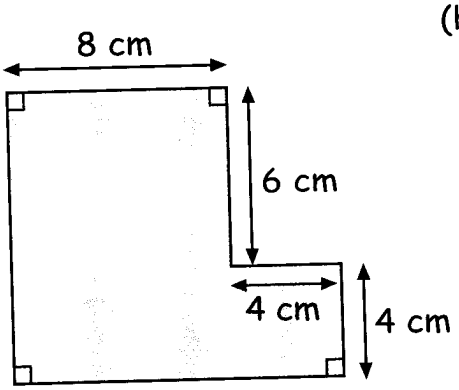

2. The figure shows that a quadrant is cut out from a rectangle. Find the area of the figure. Give your answer correct to 2 decimal places.



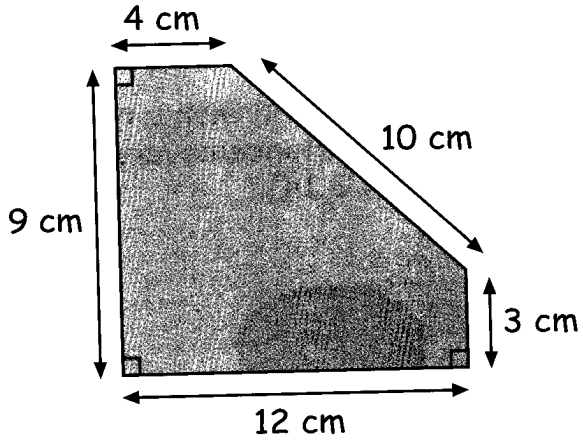



3. Find the area of each of the following figures.

(a)

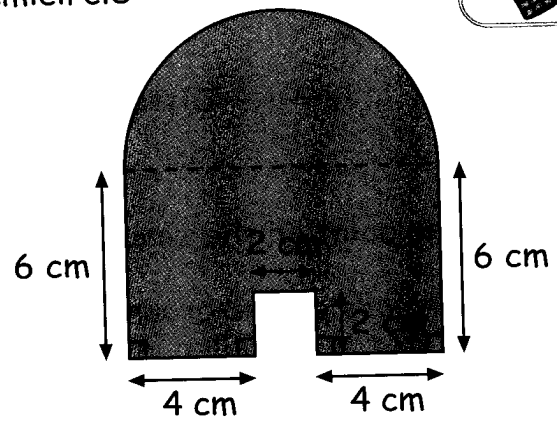



(b)

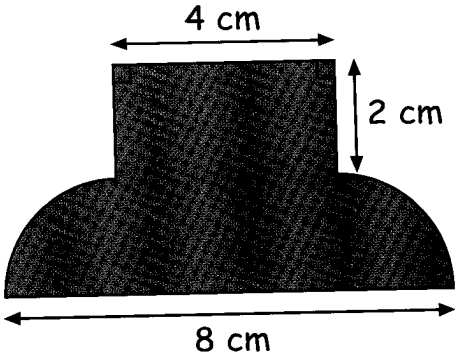



4. Find the area of each of the following figures.
Give your answers correct to 2 decimal places.

(a) The figure is formed by a semicircle and some straight lines.

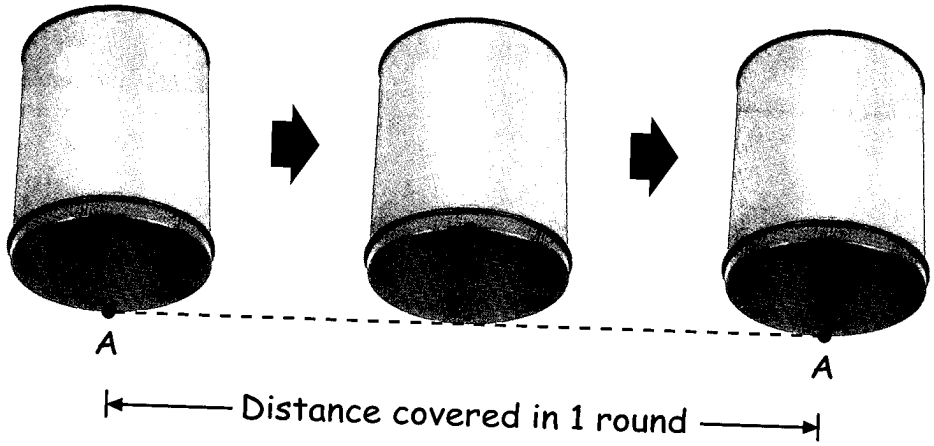



(b) The figure is made up of a 2 quadrants and some straight lines.



# Let's Learn .. Word Problems

1. A cylindrical tin with a radius of 4 cm rolls 10 rounds on the ground. Find the distance covered by the tin. (Take $\pi = 3.14$)




A is the point on the circle touching the ground.

The tin rolls on the ground until A touches the ground again. The distance travelled is 1 round.

This distance is the same as the circumference of the circle.

So the distance travelled in 1 round = $\pi$ x diameter

= 3.14 x 8

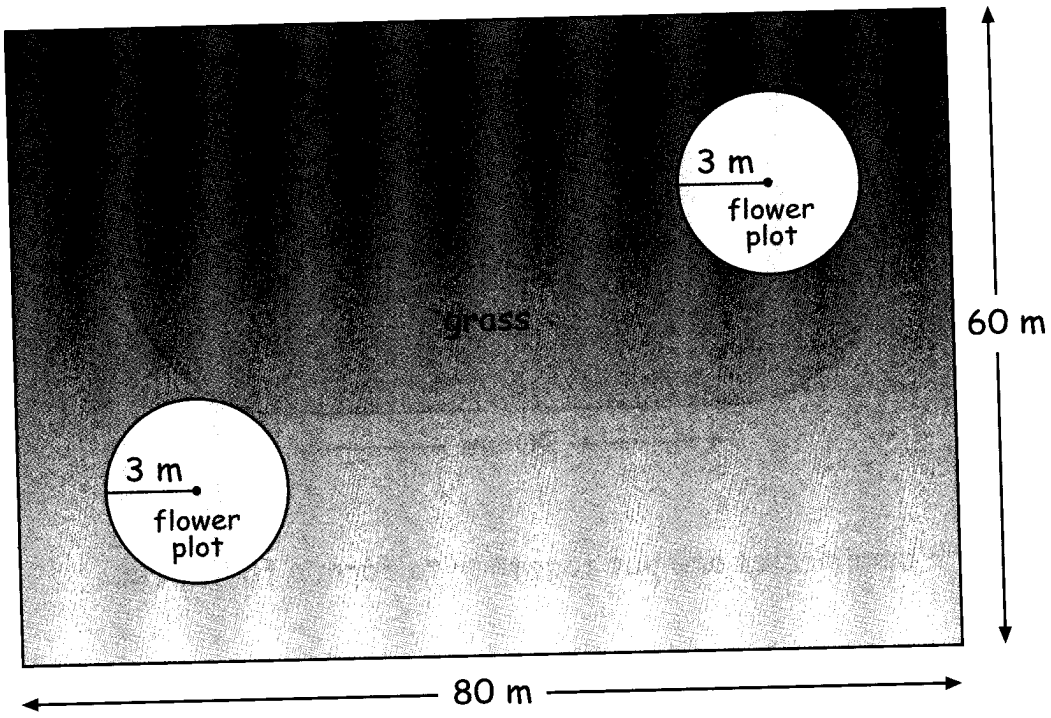
= 25.12 cm

For 10 rounds, the distance covered = 10 x 25.12

= 251.2 cm

The distance covered by the tin is 251.2 cm.

2. A rectangular piece of land of length 80 m by 60 m has 2 circular plots which are equal in size and are used for planting flowers. The radius of each circular plot is 3 m. The rest of the land is planted with grass. Find the area of the land planted with grass.
(Take $\pi = 3.14$)




Total area of the land = 80 x 60

= 4800 $m^2$

Area of the 2 equal circular plots = 2 x $\pi$ x radius x radius

= 2 x 3.14 x 3 x 3

= 56.52 $m^2$

Area of the land planted with grass = 4800 - 56.52

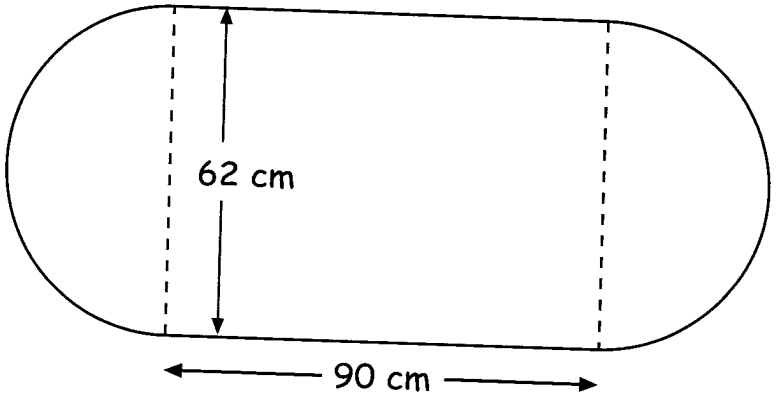
= 4743.48 $m^2$

Area of the land planted with grass is 4743.48 $m^2$.

3. The diagram shows a table top which is made up of a rectangle with semicircles at both ends. Find

(a) the perimeter of the table top,
(b) the area of the table top.

Give your answers correct to 2 decimal places.




(a) 2 semicircles are put together to form a full circle.

Circumference of a full circle = $\pi \times 62$

$\approx 194.779$ cm

Adding the circumference to the two lengths of the rectangle,

the perimeter of the table top

= 194.779 + 90 + 90

= 374.779

= 374.78 cm (correct to 2 decimal places)

The perimeter of the table top is 374.78 cm.

(b) Area of 2 semicircles is equal to the area of 1 full circle.

Radius of the circle $= \frac{1}{2} \times 62$

$= 31$ cm

Area of the circle $= \pi \times 31 \times 31$

$\approx 3019.071$ cm$^2$

Area of the rectangle $= 90 \times 62$

$= 5580$ cm$^2$

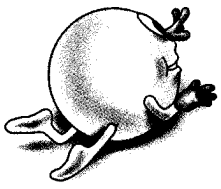
Adding the area of the circle to the area of the rectangle, the area of the table top

$= 3019.071 + 5580$

$= 8599.071$

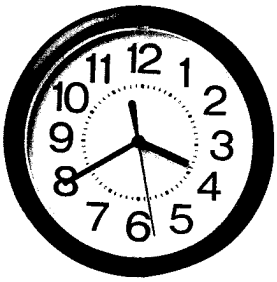
$= 8599.07$ cm$^2$ (correct to 2 decimal places)

The area of the table top is 8599.07 cm$^2$.



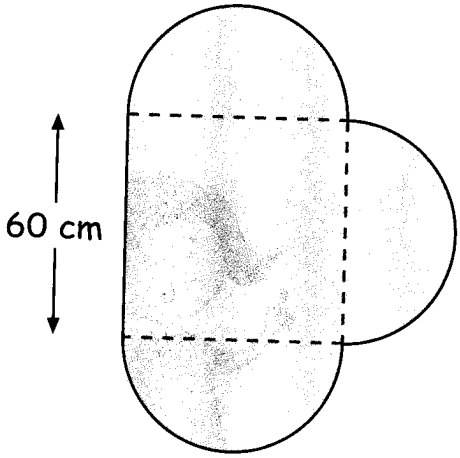
# Let's Try .. Word Problems

1. The length of the minute hand of a clock is 8 cm.
Find the distance travelled by the tip of the minute hand in 45 minutes.
(Take $\pi = 3.14$)



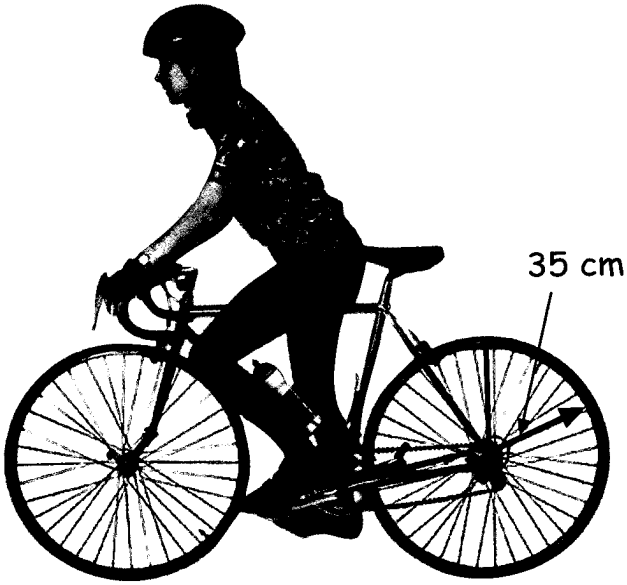

2. The diagram shows a garden which is made up of a square and 3 semicircles.
Find (a) the area of this garden,
(b) the perimeter of this garden.

Give your answers correct to 2 decimal places.

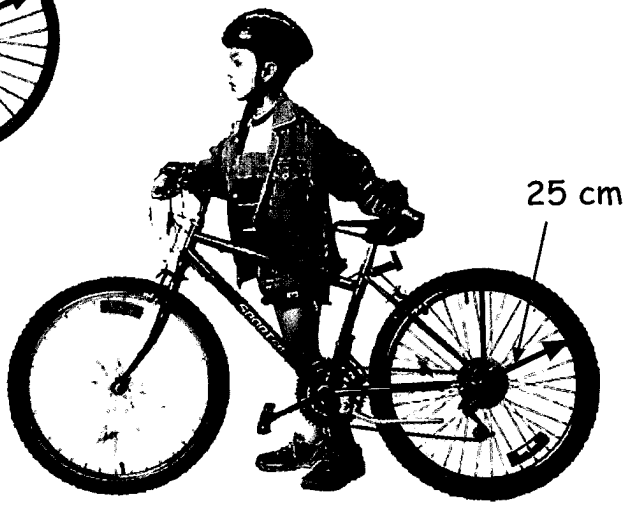



Mary and John travel on their bicycles. The radii of the wheels of Mary's bike are 35 cm each and that of John's are 25 cm each.

The wheels of Mary's bicycle rotate 80 rounds in one minute. The wheels of John's bike rotate 100 rounds in one minute. Who travels faster, John or Mary?




Mary




John

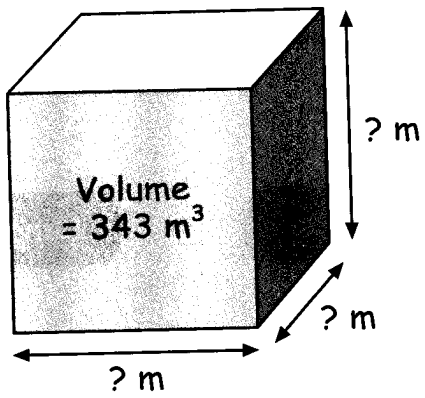
# Volume


## DO YOU KNOW?

The fish tank is 50 cm long and 40 cm wide. What is the height of the water level in the fish tank after David pours 40 ℓ of water into it?


# Find the Unknown Dimension of a Cube

1. The volume of a cube is 343 $m^3$. Find the length of its edge.




Let's recall,

Volume of a cube = Length x Length x Length

In this case,

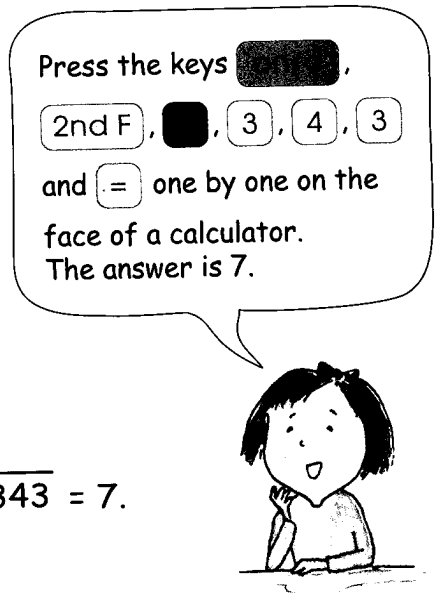
Length x Length x Length = 343

7 x 7 x 7 = 343

The length of the edge of the cube is 7 m.

We write, Length = $\sqrt[3]{343}$ = 7 m.

Using a calculator, we can also find that $\sqrt[3]{343}$ = 7.




Using a calculator, find the length of the edge of the cube for each of the following.

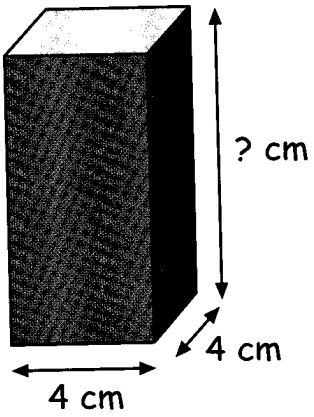
Give your result correct to 2 decimal places in the last two examples.

| | Volume of the cube | Length of the edge |
|---|---|---|
| 1 | 216 $cm^3$ | |
| | 729 $cm^3$ | |
| 3 | 315 $cm^3$ | |
| | 1050 $cm^3$ | |

# Let's Learn .. Find the Unknown Dimension of a Cuboid

1. The volume of a cuboid is 108 $cm^3$. The length of the cuboid is 4 cm and the breadth is 3cm. Find the height of the cuboid.

Volume = 108 $cm^3$




Let's recall,

Volume of a cuboid = Length x Breadth x Height

So we have,

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

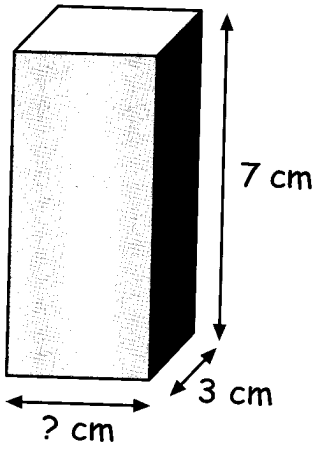
In this case,

$$\text{Height} = \frac{108}{4 \times 3} = \frac{108}{12} = 9 \text{ cm}$$

The height of the cuboid is 9 cm.

2. A cuboid has a volume of 84 $cm^3$. Its breadth is 3 cm and its height is 7 cm. Find its length.

Volume = 84 $cm^3$




From

Volume of a cuboid = Length x Breadth x Height

We have,

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

In this case,

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

$$= \frac{84}{3 \times 7}$$

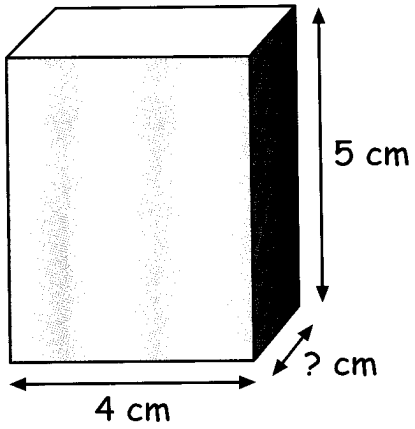
$$= \frac{84}{21}$$

$$= 4 \text{ cm}$$

The length of the cuboid is 4 cm.

3. The volume of a cuboid shown is 60 $cm^3$. Its height is 5 cm and its length is 4 cm. Find its breadth.

Volume = 60 $cm^3$




From

Volume of a cuboid = Length x Breadth x Height

We have,

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

In this case,

$$\text{Breadth} = \frac{60}{4 \times 5}$$

$$= \frac{60}{20}$$

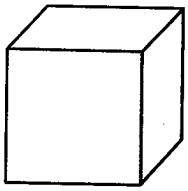
$$= 3 \text{ cm}$$

The breadth of the cuboid is 3 cm.

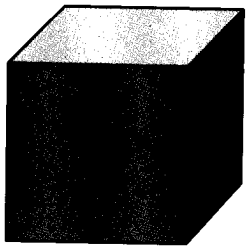
# Let's Try ... Find the Unknown Dimensions of Cubes and Cuboids

1. Find the length of the edge of each of the following cubes.

(a) Volume = 8 $cm^3$

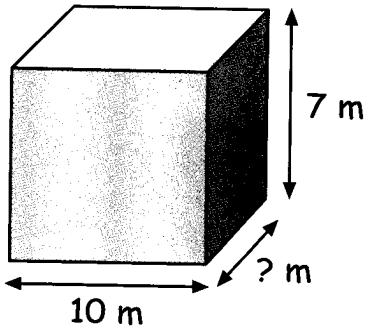


(b) Volume = 1000 $cm^3$

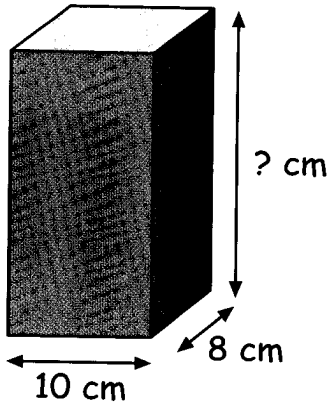


2. Find the length of the unknown edge of each of the following cuboids.

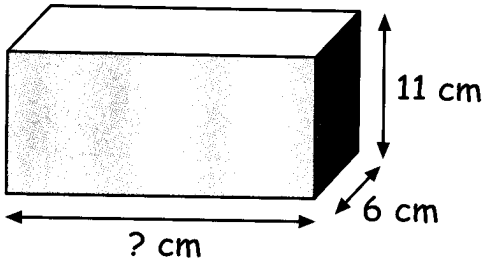
(a) Volume = 420 $m^3$




(b) Volume = 1440 $cm^3$

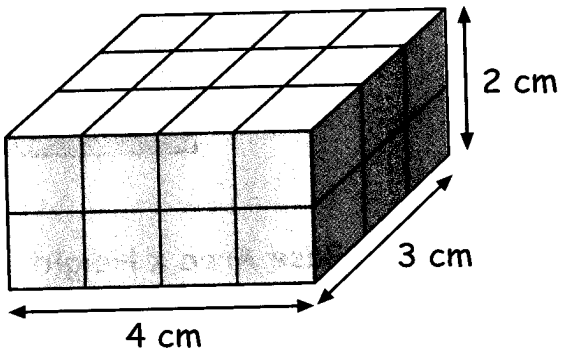



(c) Volume = 924 $cm^3$




# Let's Learn .. Base Area and Volume of a Cuboid

For the cuboid shown, its volume can be obtained by using the formula:




Volume = Length x Breadth x Height
= 4 x 3 x 2
= 24 $cm^3$

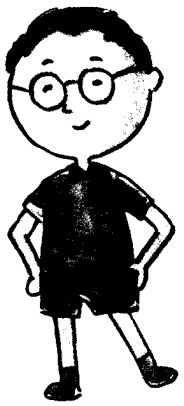
Note that the base of the cuboid is a rectangle and its area is

Length x Breadth = 4 x 3 = 12 $cm^{2/}$

So, we have,

Area of the base x Height
= 12 x 2
= 24 $cm^3$

That is extactly the volume of the cuboid.



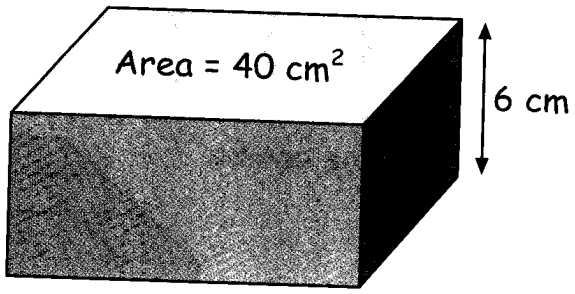
Generally, for a cuboid we have

**Volume = Base Area x Height**

Hence, $\text{Base Area} = \frac{\text{Volume}}{\text{Height}}$

and $\text{Height} = \frac{\text{Volume}}{\text{Base Area}}$

1. A cuboid with a base area of 40 $cm^2$ has a height of 6 cm. What is the volume of the cuboid?




Volume = Base Area x Height

= 40 x 6

= 240 $cm^3$

The volume of the cuboid is 240 $cm^3$.

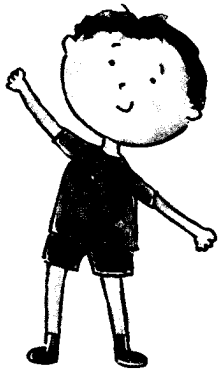
2. A cuboid has a volume of 616 $cm^3$ and height of 7 cm. Find the area of its base.

$$\text{Base Area} = \frac{\text{Volume}}{\text{Height}}$$

$$= \frac{616}{7}$$

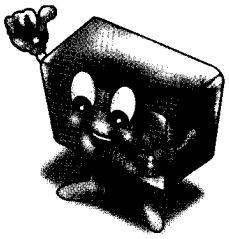
= 88 $cm^2$

The area of its base is 88 $cm^2$.



3. The volume of a cuboid with a square base is 845 $cm^3$. Its height is 5 cm. Find the length of the edge of the square base.

$$\text{Area of the square base} = \frac{\text{Volume}}{\text{Height}}$$



$$= \frac{845}{5}$$

$$= 169 \text{ cm}^2$$

Recall that:

Area of a square = Length x Length

That is,

Length x Length = 169

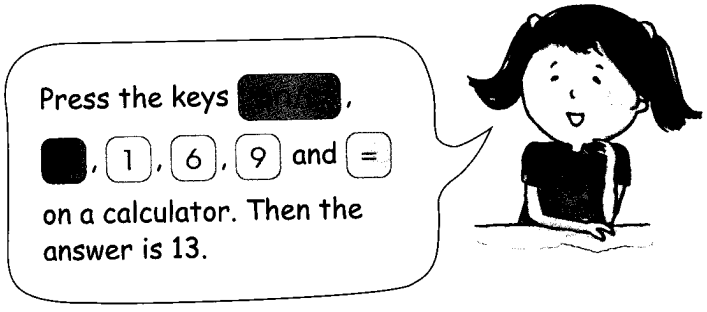
We write this as,

Length = $\sqrt{169}$ cm

Using a calculator, we find that

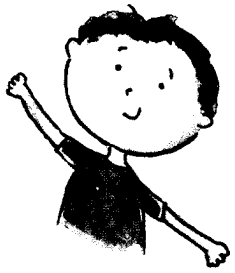
$\sqrt{169}$ = 13.

The length of each edge of the square base is 13 cm.




Using a calculator, find the length of the side of the square in each of the following.

Give your result correct to 1 decimal place.



| | Area of the square | Length of the side |
|---|---|---|
| 1 | 45 $cm^2$ | |
| | 105 $cm^2$ | |
| 3 | 142 $cm^2$ | |
| | 1095 $cm^2$ | |
| 5 | 6537 $cm^2$ | |


# Base Area and Volume of a Cuboid

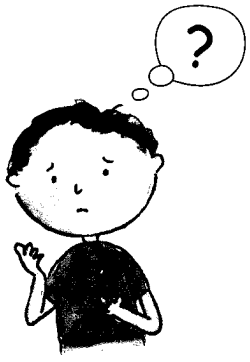
1. The area of the base of a cuboid is 84 $cm^2$ and its height is 5 cm. Find the volume of the cuboid.

2. The volume of a cuboid is 240 $cm^3$ and its height is 7 cm. Find the area of the base of the cuboid. Give your answer correct to the nearest $cm^2$.

3. The volume of a cuboid is 168 $cm^3$ and the area of its base is 42 $cm^2$. Find the height of the cuboid.

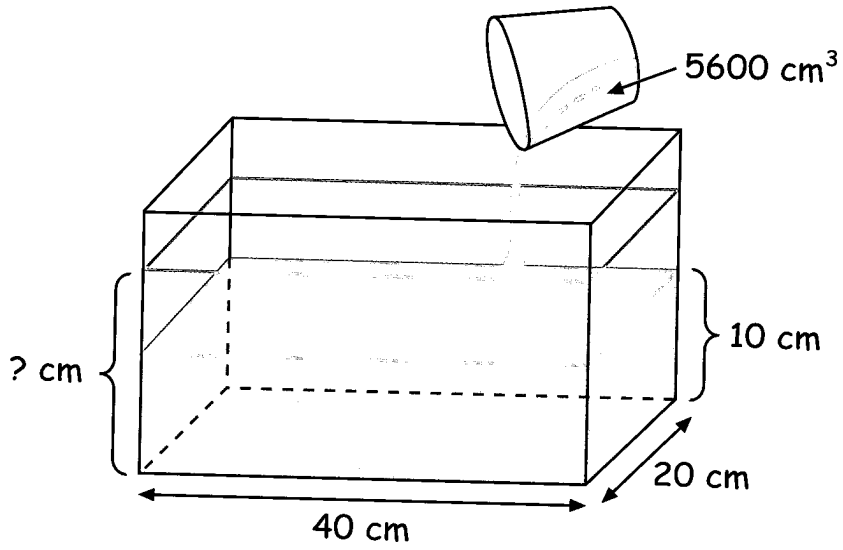
4. A cuboid has a volume of 270 $cm^3$ and a base area of 65 $cm^2$. Find its height. Give your answer correct to the nearest cm.

5. The volume of a cuboid is 722 $m^3$. Its height is 8 m. It has a square base. Find the length of one edge of the square base.



# Let's Learn ... Word Problems

1. A rectangular tank is 40 cm long, 20 cm wide and 20 cm high. It is filled with water to a depth of 10 cm. If 5600 $cm^3$ more water is added into the tank, what will be the height of the new water level in the tank?




If 5600 $cm^3$ of water is added into the tank, then

$$\text{The increase in height of water} = \frac{5600}{40 \times 20}$$

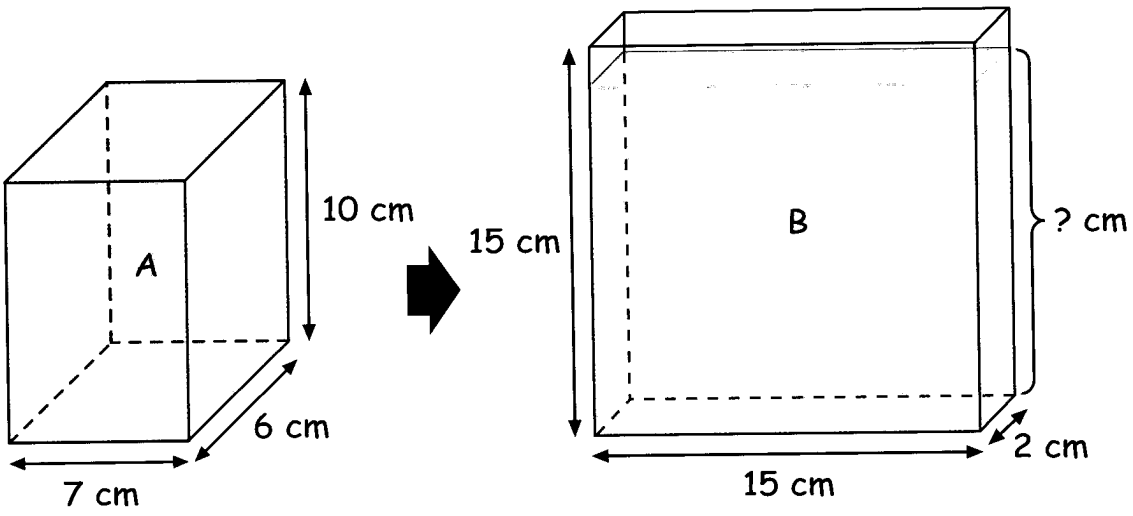
$$= \frac{5600}{800}$$

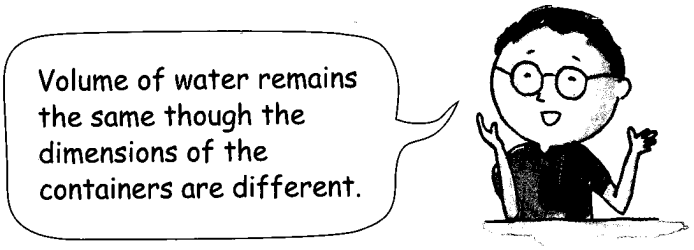
$$= 7 \text{ cm}$$

Height of new water level = original level + additional water level
= 10 + 7
= 17 cm

The height of the new water level in the tank will be 17 cm.

2. Two rectangular containers A and B with their dimensions are shown below. Container A is completely filled with water and Container B is empty. If all the water from Container A is poured into Container B, find the height of the water level in Container B.




Volume of water in Container A = $7 \times 6 \times 10$

$= 420 \text{ cm}^3$

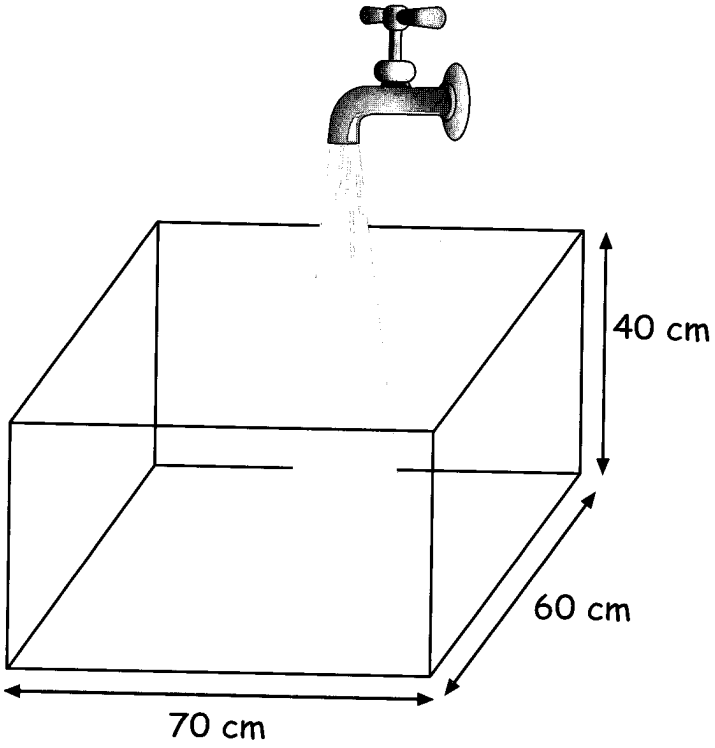
Height of water level in Container B = $\dfrac{420}{15 \times 2}$

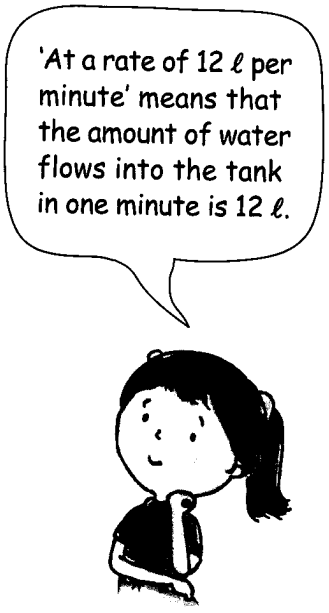
$= \dfrac{420}{30}$

$= 14 \text{ cm}$

The height of the water level in Container B is 14 cm.

3. An empty rectangular tank measures 70 cm by 60 cm by 40 cm. Water flows from a tap into the tank at a rate of 12 $\ell$ per minute. How many minutes will it take to fill the tank completely?




Capacity of the tank = $70 \times 60 \times 40$

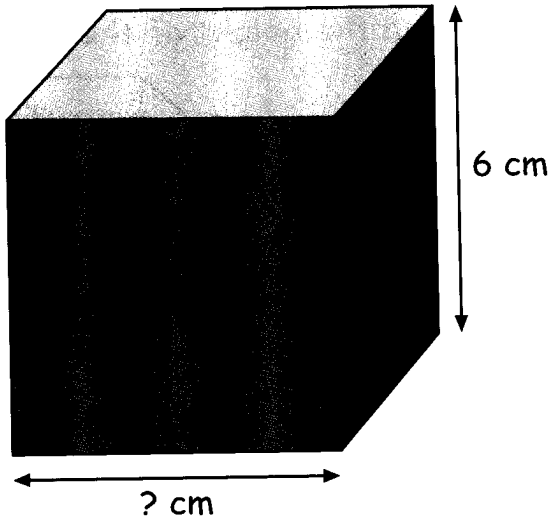
$= 168\,000\ cm^3$

$= 168\ \ell$

Time taken = $\frac{168}{12}$ = 14 min

It will take 14 minutes to fill the tank completely.

4. A box with a square base has a volume of 1176 $cm^3$ and a height of 6 cm. What is the length of the edge of its base?




$$\text{Base Area} = \frac{\text{Volume}}{\text{Height}}$$

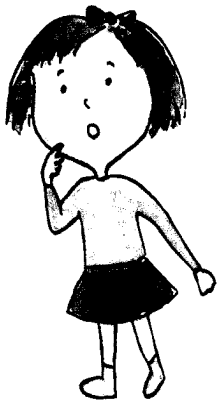
$$= \frac{1176}{6}$$

$$= 196 \text{ cm}^2$$

The length of the square base $= \sqrt{196}$

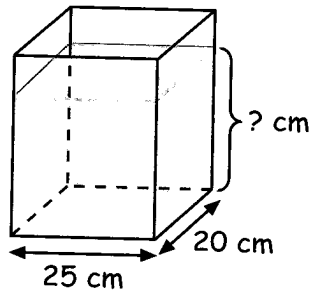
$= 14$ cm

The length of its base is 14 cm.

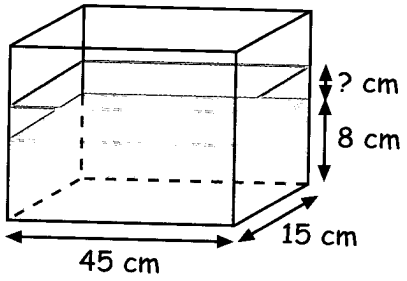


# Let's Try .. Word Problems

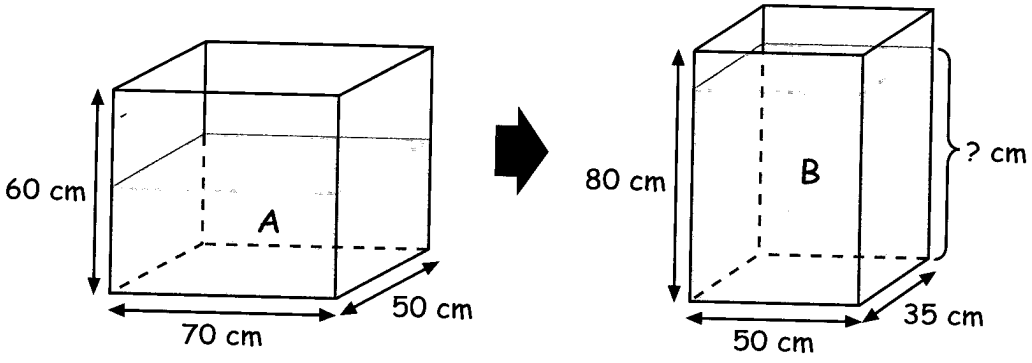
1. There is 15 $\ell$ of water in a rectangular container 25 cm long and 20 cm wide. Find the height of the water level in the container.

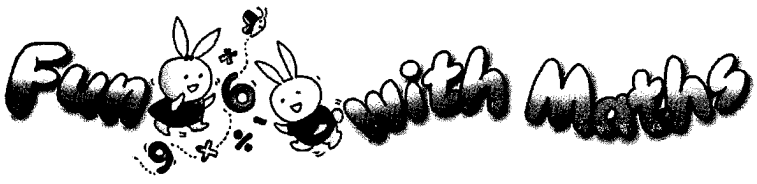



2. A rectangular container is 45 cm long, 15 cm wide and 15 cm high. It is filled to a depth of 8 cm with water. If 1.35 $\ell$ of water is added into the container, what will be the new height of the water level in the container?




3. There are 2 rectangular containers, A and B. Container A is 70 cm long, 50 cm wide and 60 cm high, and it is half filled with water. Container B is 50 cm long and 35 cm wide and 80 cm high and it is empty. If all the water from Container A is poured into Container B, find the height of the water level in Container B.

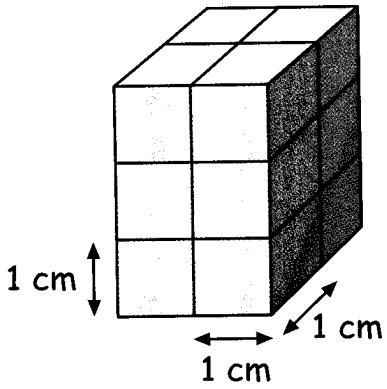


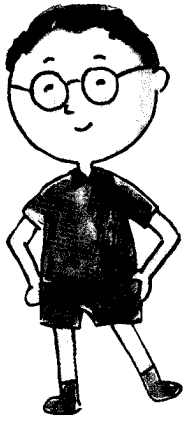



Work in pairs.

In how many ways can you form a cuboid with twelve 1-cm cubes?

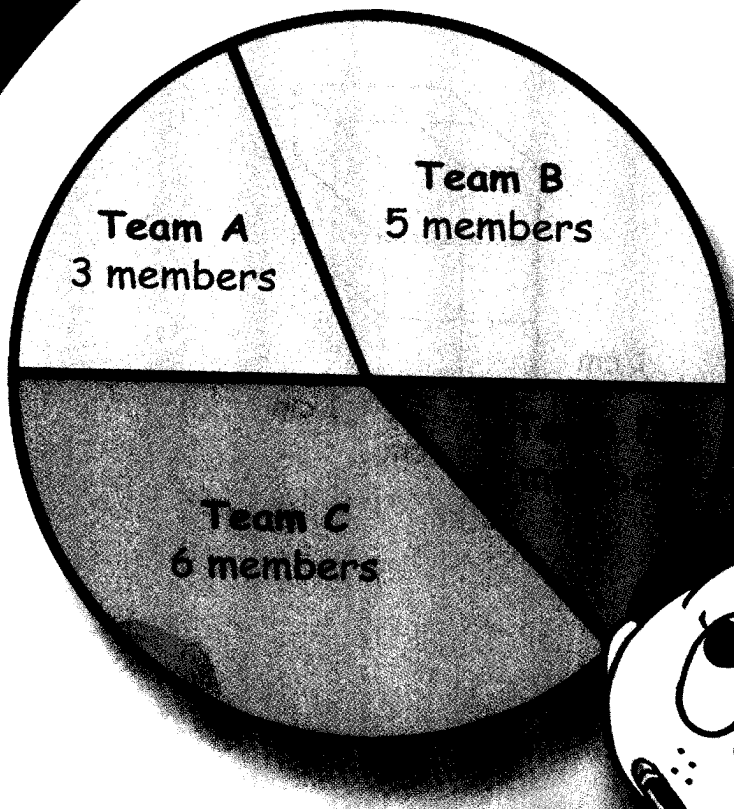
Below is one arrangement:

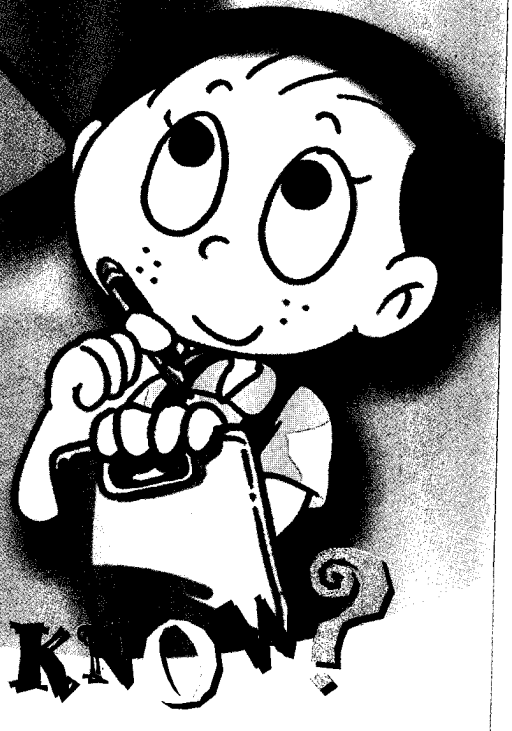


# Pie Charts

## Mathematics Quiz



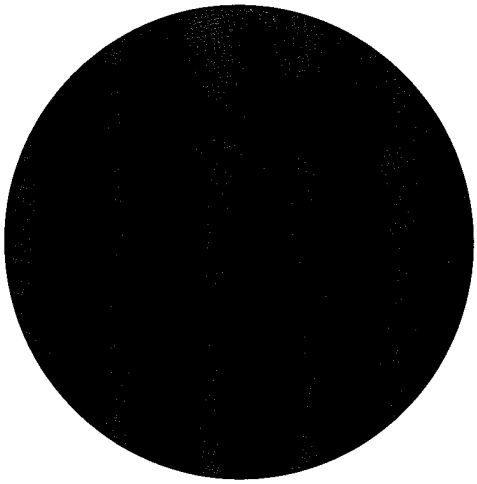



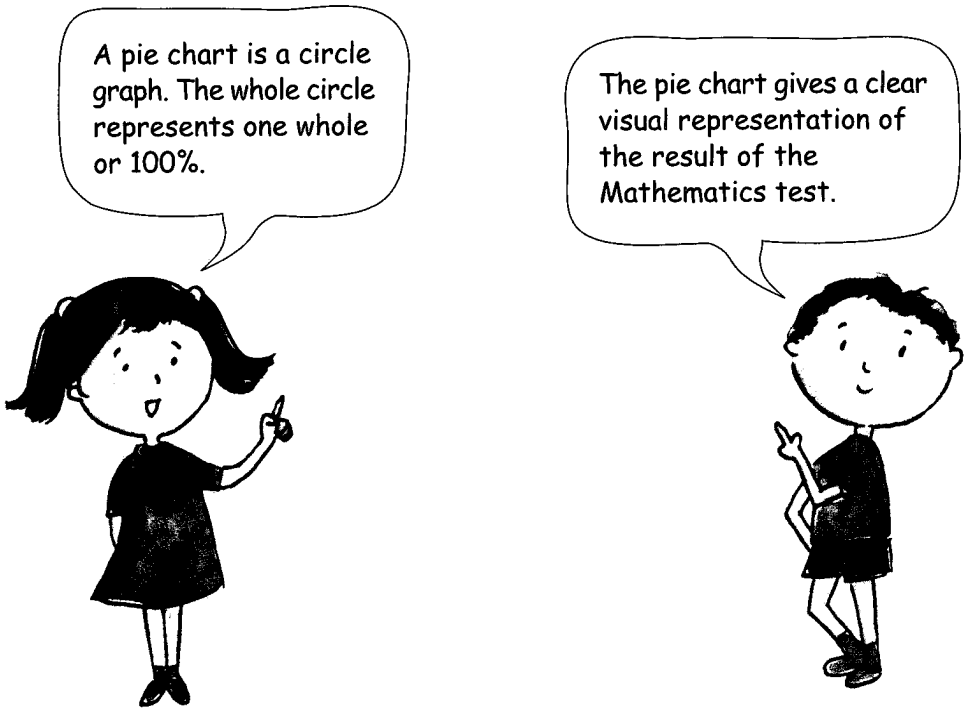
## Do you know?

The diagram above shows the teams that participated in a Mathematics quiz. Based on it, how many teams took part in the Mathematics quiz? How many members were there in each team?

# Let's Learn .. Pie Charts

1. In a Mathematics test, 70% of the pupils passed and 30% of the pupils failed the test. This result can be represented by a pie chart as shown below.





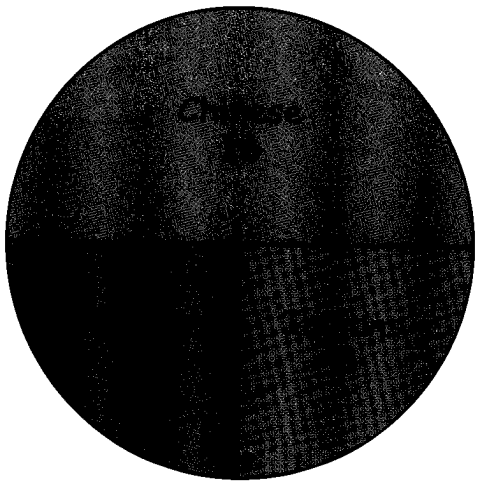
2. Class 6A has 32 pupils. 16 of them are Chinese, 8 are Malays and 8 are Indians.

The fraction of pupils that are Chinese = $\frac{16}{32} = \frac{1}{2}$.

The fraction of pupils that are Malays = $\frac{8}{32} = \frac{1}{4}$.

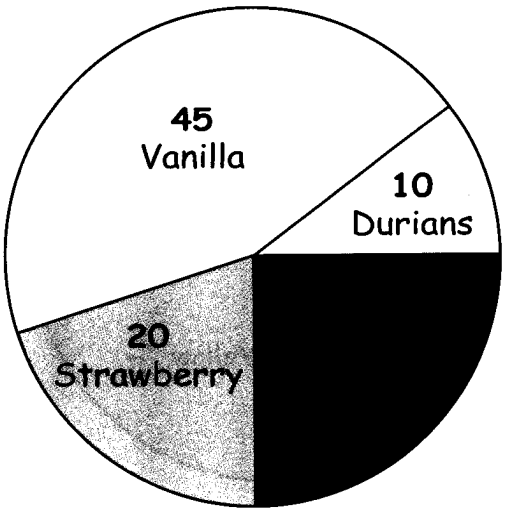
The fraction of pupils that are Indians = $\frac{8}{32} = \frac{1}{4}$.

Colour half of a circle orange, $\frac{1}{4}$ of it green and $\frac{1}{4}$ of it purple as shown below.



This is a pie chart.

3. The following pie chart shows the number of ice-cream cones of different flavours that Mr Toh sold on a certain day.

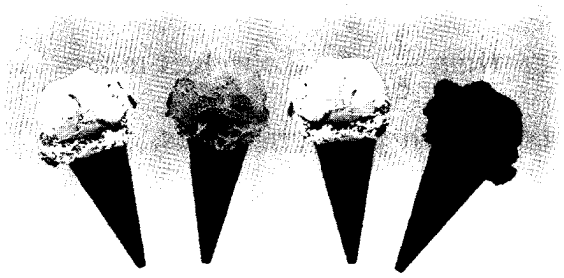



Study the pie chart and answer the following questions.

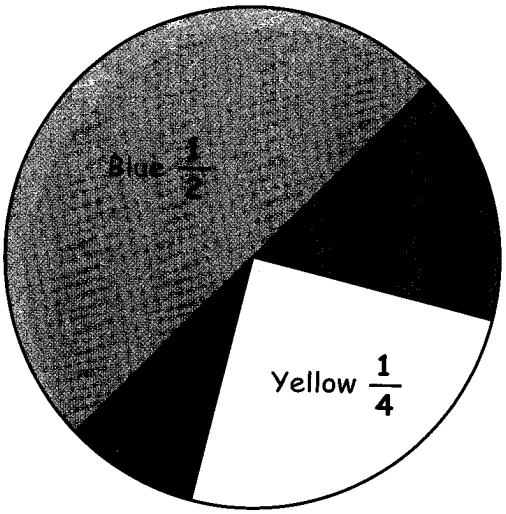
(a) How many strawberry ice-cream cones were sold that day?
(b) Which flavour of ice-cream did Mr Toh sell the most on that day?
(c) Which flavour of ice-cream did Mr Toh sell more, strawberry or chocolate?

From the pie chart, we can see that

(a) 20 cones of strawberry ice-cream were sold that day.
(b) 45 is the greatest among 45, 20, 25 and 10. So, Mr Toh sold the most cones of vanilla ice-cream.
(c) 25 is greater than 20. So, Mr Tan sold more cones of chocolate ice-cream than strawberry ice-cream.



4. The pie chart shows the fraction for the different colours of marbles John has.




Study the pie chart and answer the following questions.

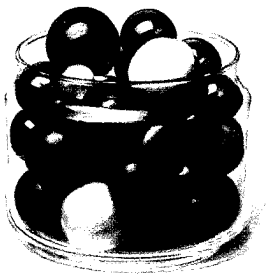
(a) What fraction of the marbles are green?
(b) Which colour of marbles does John have the least?
(c) Which colour of marbles does John have more, yellow or green?

From the pie chart, we can see that

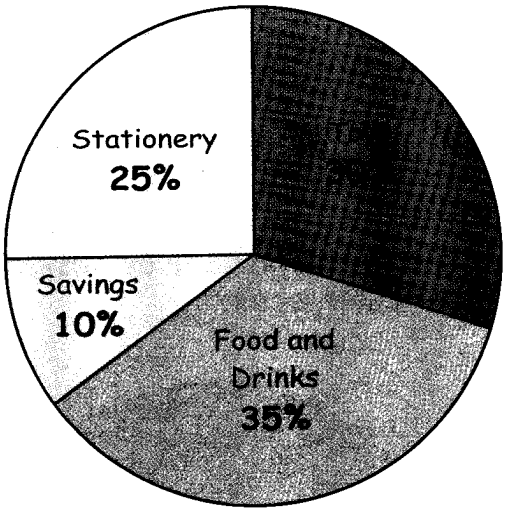
(a) $\frac{1}{6}$ of the marbles are green.

(b) $\frac{1}{12}$ is the smallest among $\frac{1}{2}$, $\frac{1}{12}$, $\frac{1}{6}$ and $\frac{1}{4}$.
So, John has the least red marbles.

(c) $\frac{1}{4}$ is greater than $\frac{1}{6}$. So John has more yellow marbles than green marbles.



5. The pie chart shows how Jane spent her pocket money last month.




(a) What percentage of her pocket money did Jane spend on toys last month?

(b) On which item did Jane spend the most last month?

(c) Did Jane spend more money on toys or on stationery?

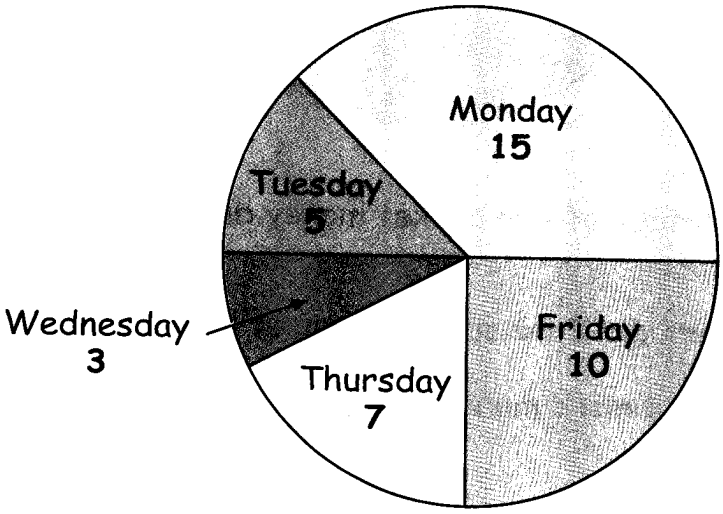
(a) Jane spent 30% of her pocket money on toys last month.

(b) 35% is the greatest among 25%, 10%, 35% and 30%.
So, Jane spent the most on food and drinks.

(c) 30% is greater than 25%. So, Jane spent more money on toys than stationery last month.


Work in pairs.

The following pie chart shows the number of absentees from a school on different days in a particular week.




Discuss with your partner the following questions:

(a) How many parts are there in this pie chart?

(b) Which is the biggest part and which is the smallest part?

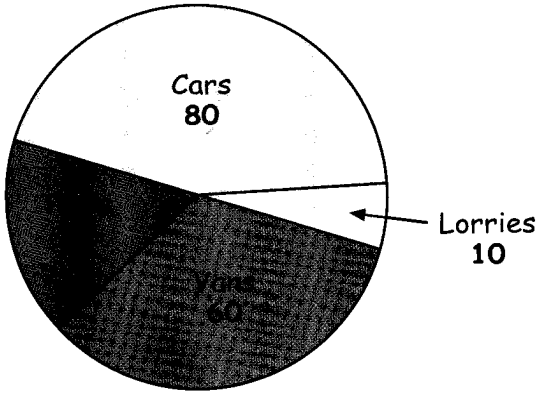
(c) Find the number of absentees on Tuesday.

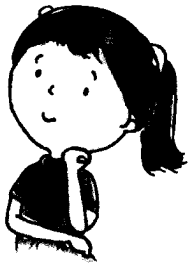
(d) On which day was the number of absentees the greatest?

(e) On which day was the number of absentees the smallest?

# Let's Try .. Pie Charts

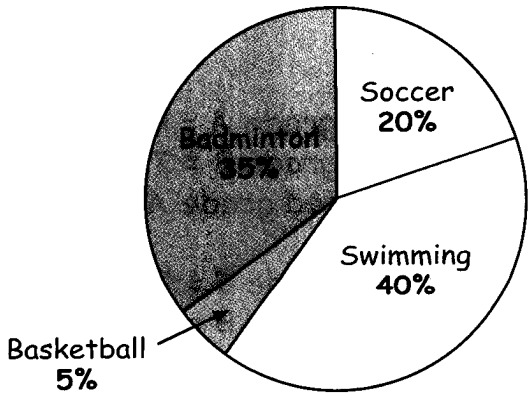
1. The pie chart shows the number of different vehicles parked in a carpark.



(a) How many vans were there in the carpark?
(b) How many cars were there in the carpark?
(c) Were there more taxis or lorries in the carpark?

2. The pie chart shows the result of the survey about the pupils' favourite sports in a school.

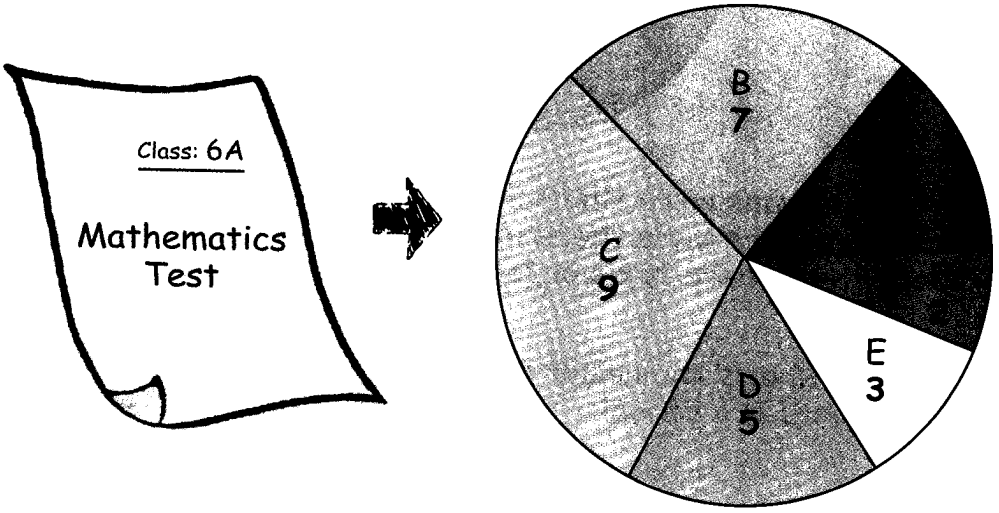



(a) What percentage of the pupils chose soccer as their favourite sport?
(b) What was the most popular sport in the school?
(c) Which was more popular, badminton or basketball?

# Let's Learn .. Word Problems

1. The pie chart shows the number of P6A pupils who scored the different grades in a Mathematics test.

   (a) Find the number of pupils who scored grade A or grade B.
   (b) How many more pupils scored grade C than grade B?
   (c) What was the total number of pupils in the class?
   (d) What percentage of the pupils scored grade C?




(a) Number of pupils who scored grade A = 4
Number of pupils who scored grade B = 7
The number of pupils who scored grade A or B = 4 + 7 = 11

(b) Number of pupils who scored grade C = 9
Number of pupils who scored grade B = 7
9 - 7 = 2
2 more pupils scored grade C than grade B.

(c) The total number of pupils in the class = 9 + 7 + 9 + 5 + 3 + 2
= 30

(d) $\frac{9}{30} \times 100\% = 30\%$

30% of the pupils scored grade C.

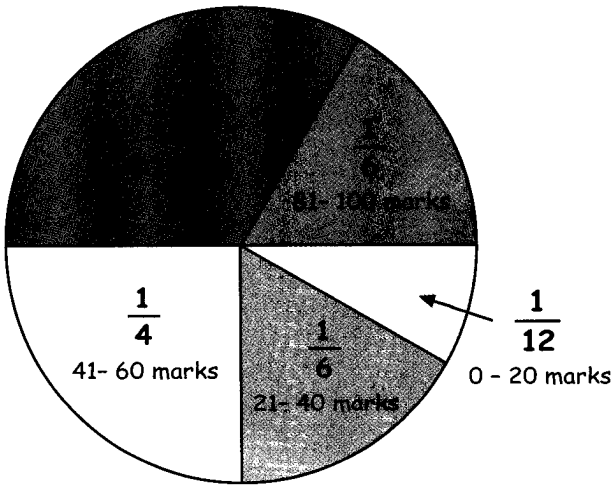
2. Class 6B had 24 pupils. The pie chart below shows the fraction of pupils who scored the different range of marks in a Mathematics test.

   (a) How many pupils scored above 80 marks?

   (b) How many pupils had marks in the range of 41 to 60?

   (c) What percentage of the class scored above 60 marks in this test?

   (d) If a pupil with 40 marks or below was considered to have failed, what fraction of the pupils failed this test?




(a) $24 \times \frac{1}{6} = 4$

4 pupils scored above 80 marks.

(b) $24 \times \frac{1}{4} = 6$

6 pupils had marks in the range of 41 to 60.

(c) $\frac{1}{3} + \frac{1}{6} = \frac{2}{6} + \frac{1}{6} = \frac{3}{6} = \frac{1}{2} = 50\%$

50% of the class scored above 60 marks in the test.

(d) $\frac{1}{6} + \frac{1}{12} = \frac{2}{12} + \frac{1}{12} = \frac{3}{12} = \frac{1}{4}$

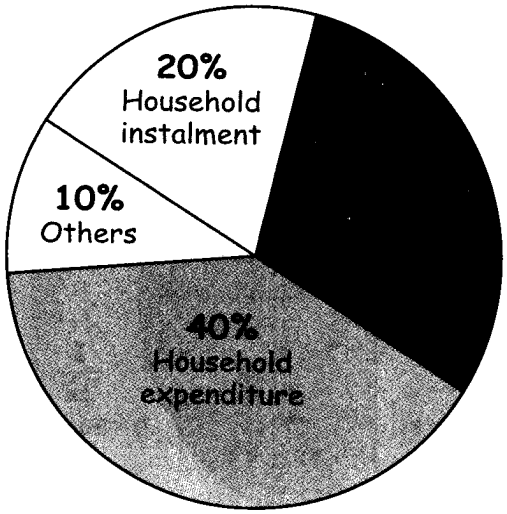
$\frac{1}{4}$ of the pupils failed this test.

3. Dr Lai's monthly income is $10 000. The pie chart below shows how his monthly income is used in percentage.

   (a) How much does he save every month?

   (b) What is the difference in percentage between household expenditure and savings?

   (c) What is the total percentage used in household instalment and household expenditure?





(a) $10 000 x 30% = $3000

Dr Lai saves $3000 each month.

(b) 40% - 30% = 10%

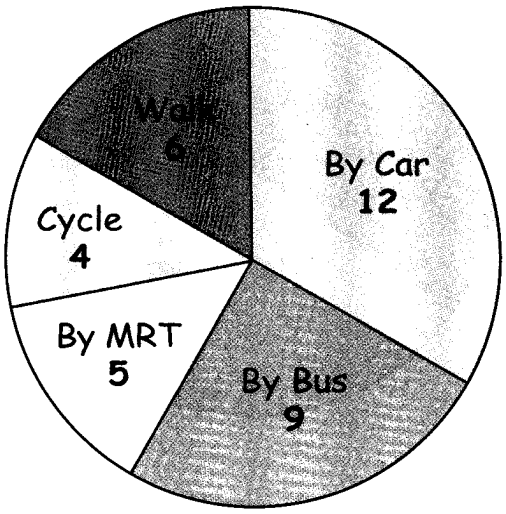
The difference in percentage between household expenditure and savings is 10%.

(c) 40% + 20% = 60%

The total percentage used in household instalment and household expenditure is 60%.

# Let's Try .. Word Problems

1. The pie chart shows how the pupils in Class 6D go to school.

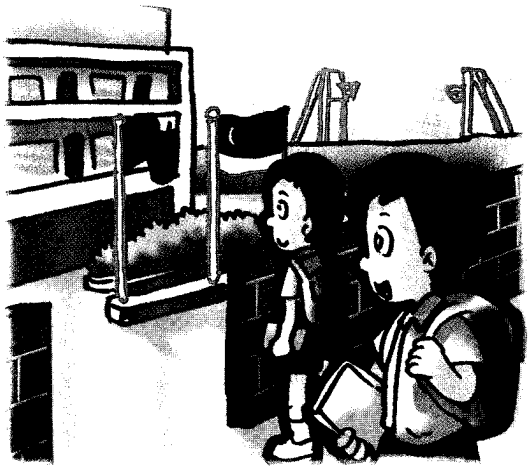



(a) How many more pupils go to school by car than by bus?

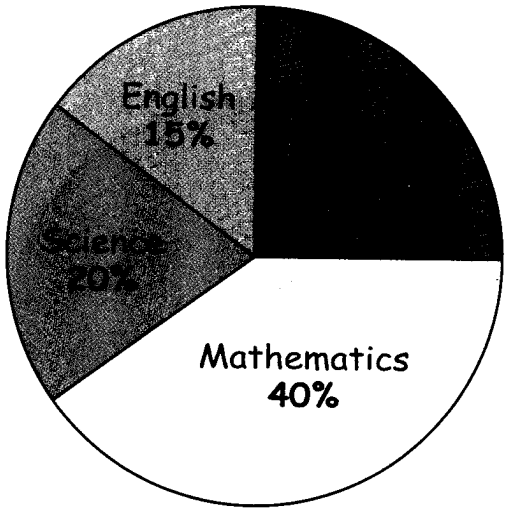
(b) What is the total number of pupils in Class 6D?

(c) What fraction of the pupils in Class 6D walk to school?

(d) What percentage of the pupils go to school by bus?



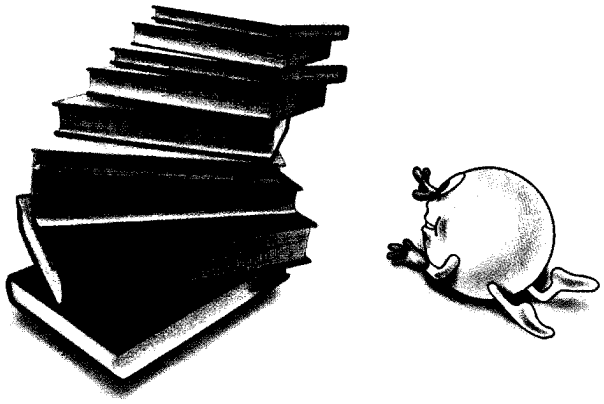
2. A survey was conducted on the subjects that the pupils liked most in a school. A total of 80 pupils participated in the survey. The pie chart shows the result.




(a) What percentage of the pupils liked English or liked Science most?

(a) What fraction of the pupils liked Mathematics most?

(c) How many pupils among them liked English most?



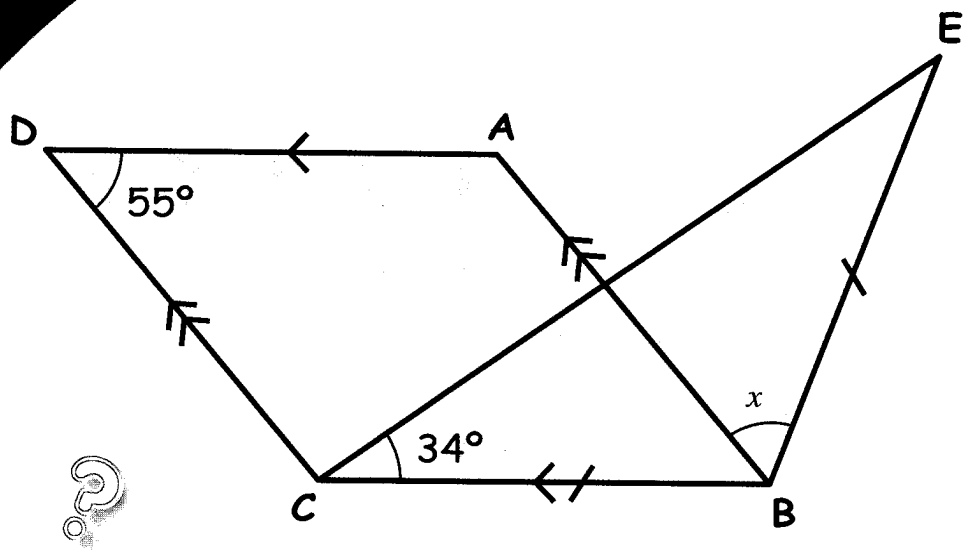
Carry out a survey to find out the number of pets that your classmates keep at home.

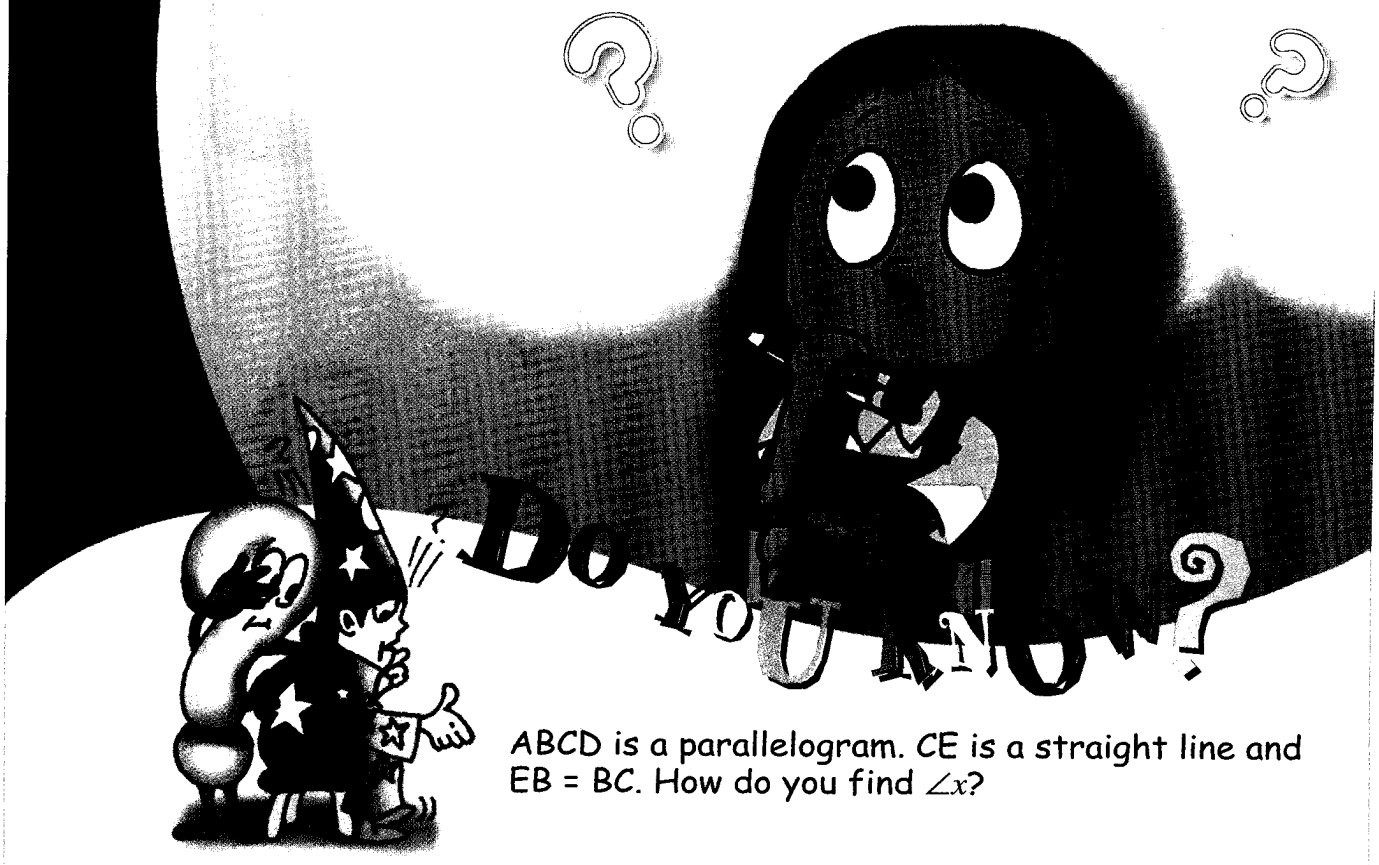
Record your results in the table below.

| Number of pets | Number of pupils |
|---|---|
| 0 | |
| 1 | |
| 2 | |
| 3 | |
| 4 | |
| more than 4 | |

Using the data that you have collected, draw a pie chart with the help of your computer.

# 11 Angles in Geometrical Figures



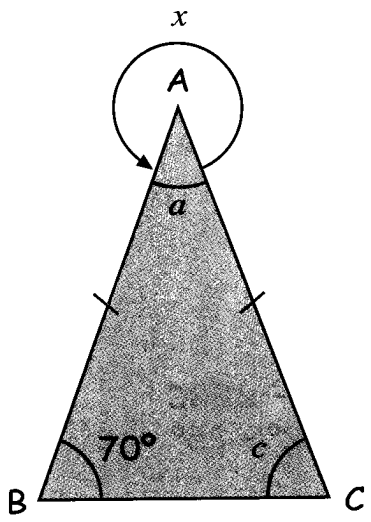




ABCD is a parallelogram. CE is a straight line and EB = BC. How do you find $\angle x$?

# Let's Learn .. Angles in Geometrical Figures

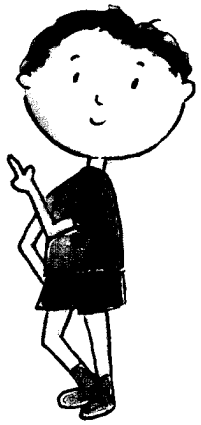
In each of the following examples, the figure is not drawn to scale.

1. In the figure, ABC is an isosceles triangle and $\angle ABC = 70°$. Find $\angle x$.



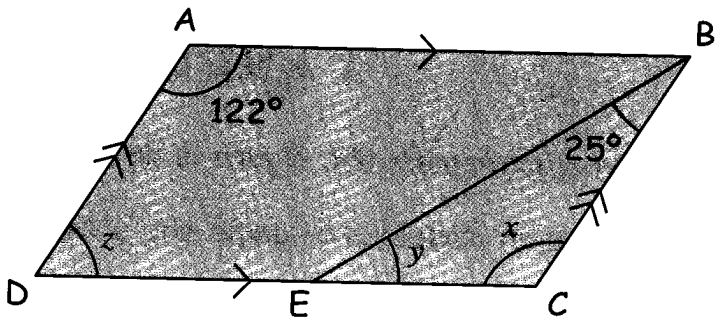

Since ABC is an isosceles triangle, we have
$\angle c = \angle ABC = 70°$

Consider the three angles in the triangle,
$\angle a + \angle ABC + \angle c = 180°$
$\angle a = 180° - \angle ABC - \angle c$
$= 180° - 70° - 70°$
$= 40°$



Since $\angle a$ and $\angle x$ are angles at a point,
$\angle a + \angle x = 360°$
$\angle x = 360° - \angle a$
$= 360° - 40°$
$= 320°$

2. In the figure, ABCD is a parallelogram, $\angle BAD = 122°$ and $\angle EBC = 25°$. Find $\angle x$, $\angle y$ and $\angle z$.




In the parallelogram ABCD, $\angle BAD$ and $\angle x$ are opposite angles.

$\angle x = \angle BAD = 122°$

In triangle EBC,

$\angle EBC + \angle y + \angle x = 180°$

$\angle y = 180° - \angle x - \angle EBC$

$= 180° - 122° - 25°$

$= 33°$

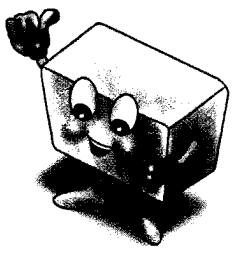
In parallelogram ABCD, $\angle z$ and $\angle BAD$ are angles between 2 parallel lines.

$\angle z + \angle BAD = 180°$

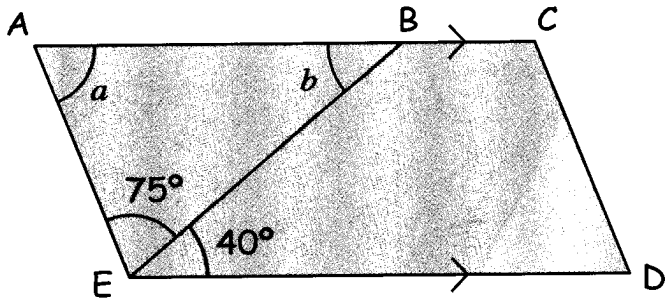
$\angle z = 180° - \angle BAD$

$= 180° - 122°$

$= 58°$



3. In the figure, BCDE is a trapezium, ABC is a striangle line. $\angle BED = 40°$ and $\angle AEB = 75°$. Find $\angle a$ and $\angle b$.




In trapezium BCDE, $\angle CBE$ and $\angle BED$ are angles between 2 parallel lines.

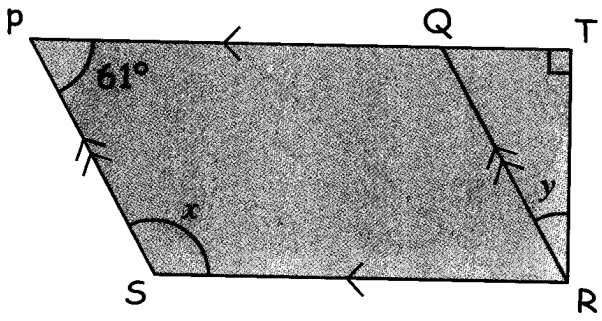
$$\angle CBE + \angle BED = 180°$$
$$\angle CBE = 180° - \angle BED$$
$$= 180° - 40°$$
$$= 140°$$

$$\angle b = 180° - \angle CBE$$
$$= 180° - 140°$$
$$= 40°$$

In triangle AEB,

$$\angle a + \angle b + \angle AEB = 180°$$
$$\angle a = 180° - \angle b - \angle AEB$$
$$= 180° - 40° - 75°$$
$$= 65°$$

4. In the figure, PQRS is a parallelogram and $\angle QPS = 61°$. PQT is a straight line and $\angle QTR$ is a right angle. Find $\angle x$ and $\angle y$.




In parallelogram PQRS, $\angle QPS$ and $\angle PSR$ are angles between two parallel lines.

$\angle QPS + \angle PSR = 180°$.

$61° + \angle x = 180°$

$\angle x = 180° - 61°$

$= 119°$

In parallelogram PQRS, $\angle x$ and $\angle PQR$ are opposite angles.

$\angle PQR = \angle x$

$= 119°$

PQT is a straight line, $\angle PQR$ and $\angle TQR$ are angles on a line.

$\angle PQR + \angle TQR = 180°$

$\angle TQR = 180° - 119°$

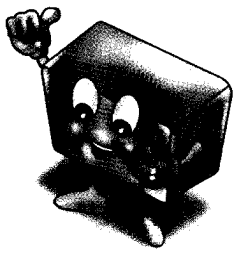
$= 61°$

$\angle QTR$ is a right angle.

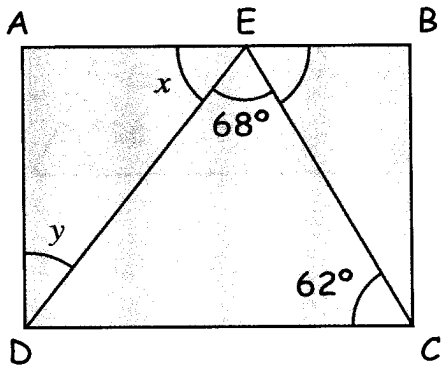
$\angle TQR + \angle y = 90°$

$\angle y = 90° - 61°$

$= 29°$



5. In the figure, ABCD is a rectangle. $\angle DEC = 68°$ and $\angle ECD = 62°$. Find $\angle x$ and $\angle y$.




METHOD 1

In triangle DEC,

$\angle EDC + \angle DEC + \angle ECD = 180°$

$\angle EDC = 180° - \angle DEC - \angle ECD$

$= 180° - 68° - 62°$

$= 50°$

In rectangle ABCD, $\angle ADC$ is a right angle.

$\angle EDC + \angle y = 90°$

$\angle y = 90° - \angle EDC$

$= 90° - 50°$

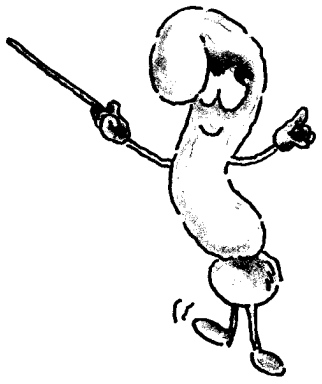
$= 40°$

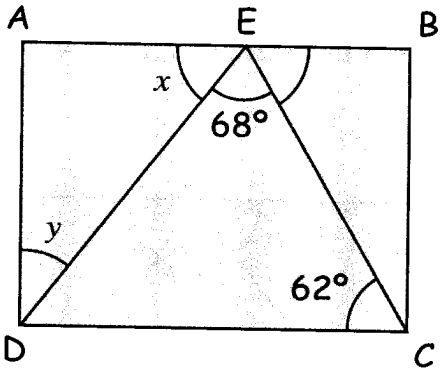
In a right-angled triangle AED, $\angle x + \angle y = 90°$

$\angle x = 90° - \angle y$

$= 90° - 40°$

$= 50°$






METHOD 2

In rectangle ABCD, $\angle DCB$ is a right angle.

$$\angle DCE + \angle ECB = 90°$$
$$\angle ECB = 90° - \angle DCE$$
$$= 90° - 62°$$
$$= 28°$$

In right-angled triangle EBC, $\angle EBC$ is a right angle.

$$\angle BEC + \angle ECB = 90°$$
$$\angle BEC = 90° - \angle ECB$$
$$= 90° - 28°$$
$$= 62°$$

$$\angle x + \angle DEC + \angle CEB = 180°$$
$$\angle x = 180° - \angle DEC - \angle CEB$$
$$= 180° - 68° - 62°$$
$$= 50°$$

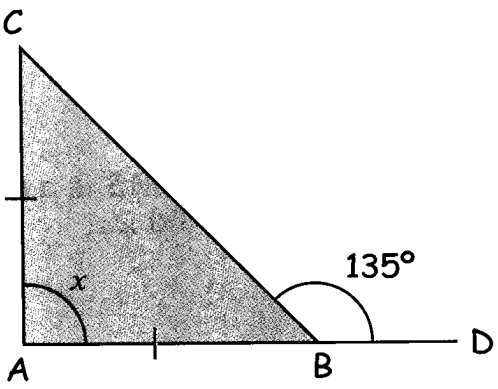
$\angle EAD$ is a right angle.

$$\angle x + \angle y = 90°$$
$$\angle y = 90° - \angle x$$
$$= 90 - 50°$$
$$= 40°$$

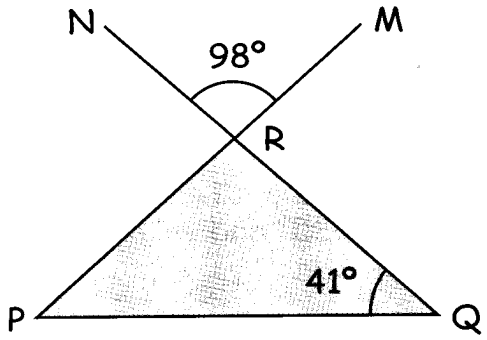
# Let's Try .. Angles in Geometrical Figures

In each of the following questions, the figure is not drawn to scale.

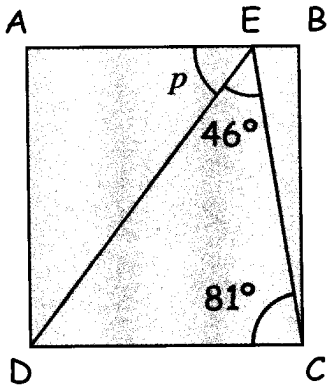
1. In the figure, ABD is a straight line, AB = AC and $\angle CBD = 135°$. Find $\angle x$.



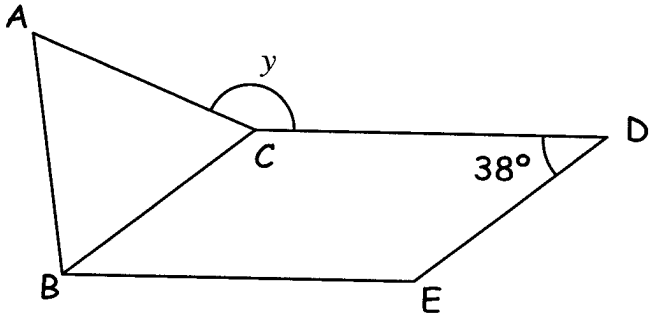

2. In the figure, PQR is a triangle. PRM and QRN are straight lines. $\angle PQR = 41°$ and $\angle MRN = 98°$. Find $\angle RPQ$.



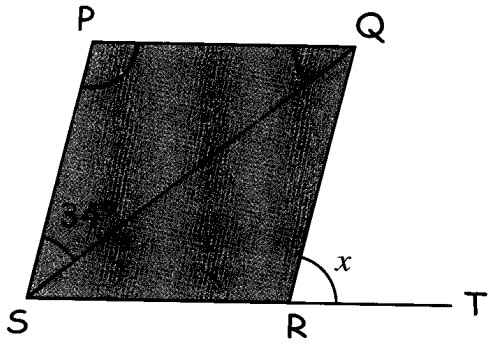

3. In the figure, ABCD is a square. E is a point on AB. $\angle DEC = 46°$ and $\angle DCE = 81°$. Find $\angle p$.



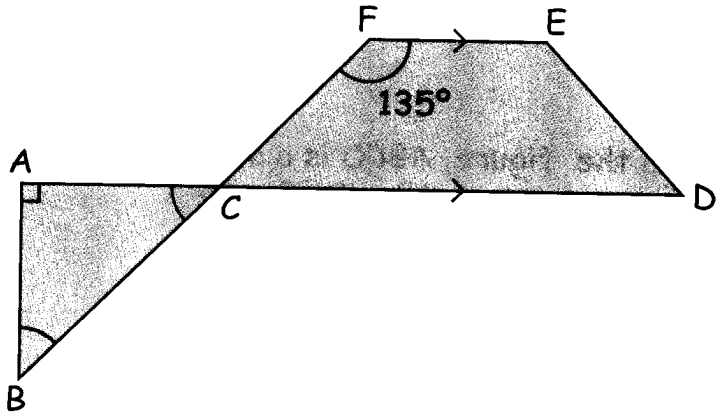
4. In the figure, ABC is an equilateral triangle and BCDE is a parallelogram. $\angle EDC = 38°$. Find $\angle y$.




5. In the figure, PQRS is a rhombus and SRT is a straight line. $\angle PSQ = 34°$. Find $\angle x$.



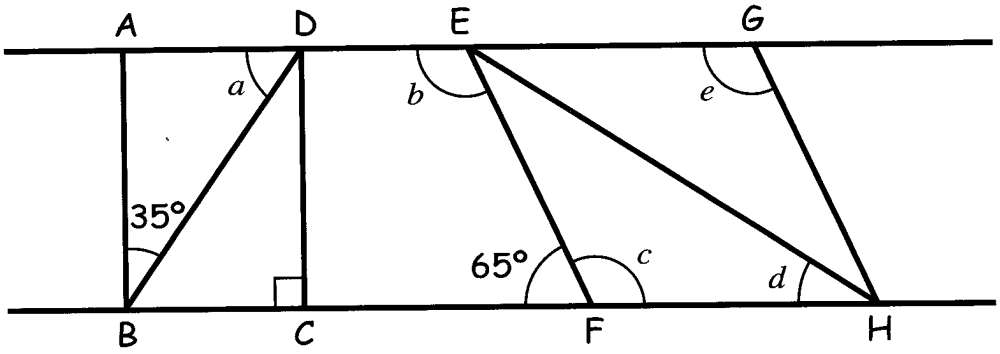

6. In the figure, CDEF is a trapezium. BCF and ACD are straight lines. $\angle CFE = 135°$ and $\angle CAB$ is a right angle. Find $\angle ACB$ and $\angle ABC$.

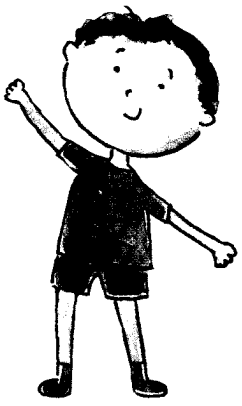


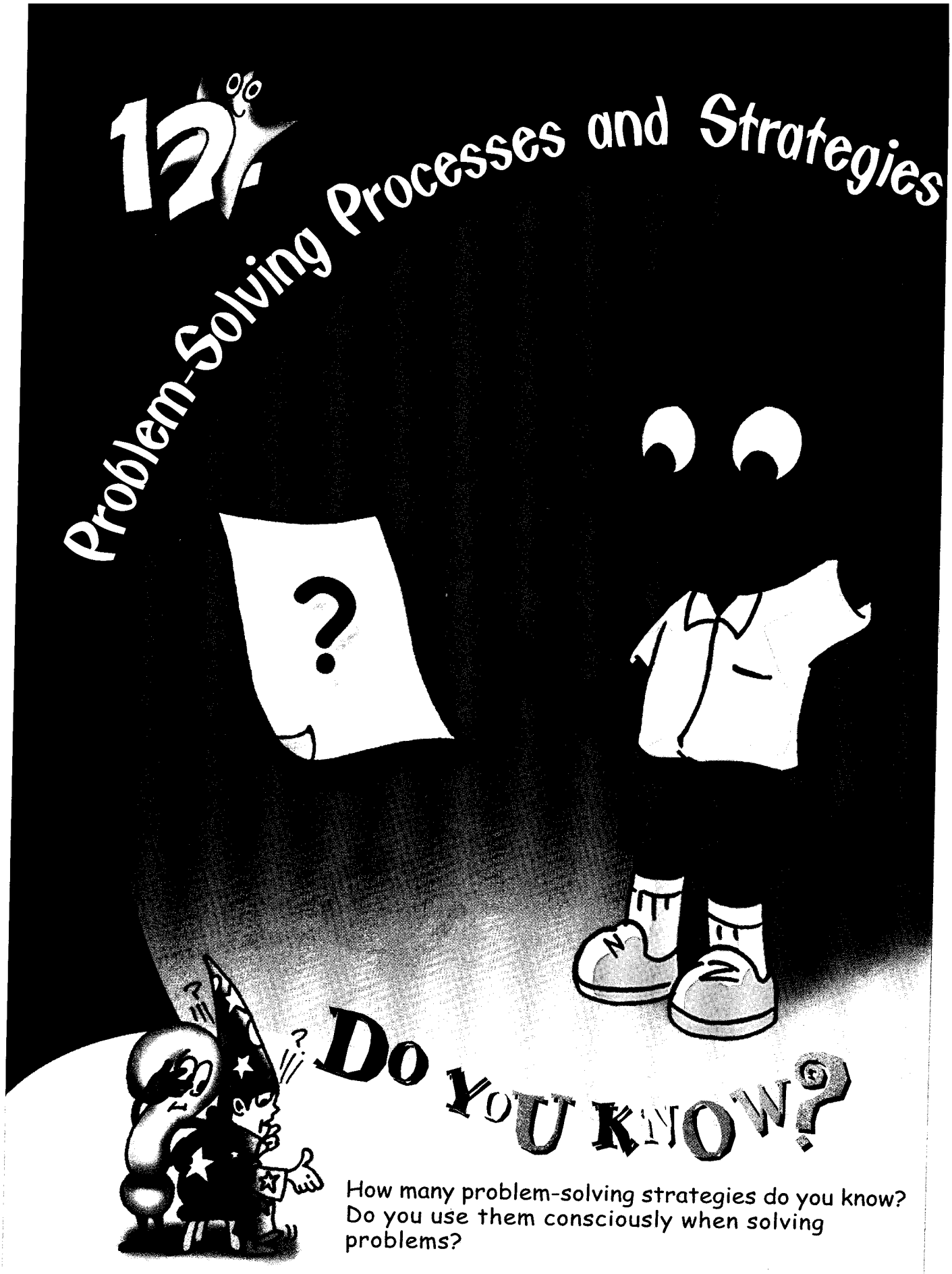

A few geometric figures are drawn within 2 parallel lines.

The name of each figure is listed below:
rectangle ABCD, trapezium DCFE and rhombus EFHG.

Find the unknown angles:
$\angle a$, $\angle b$, $\angle c$, $\angle d$ and $\angle e$.




12
Problem-Solving Processes and Strategies
?
DO YOU KNOW?
How many problem-solving strategies do you know? Do you use them consciously when solving problems?

# Let's Learn .. Problem-Solving Processes

How do we solve a problem?

Generally, we follow the 4-step process given below.

**STEP 1** **Understand the problem**

- What is the final goal of the problem?
- What are the knowns and unknowns?

**STEP 2** **Devise a plan**

- Find the connections among the knowns, the unknowns and the final goal.
- Consider possible actions or strategies.

**STEP 3** **Carry out the plan**

- Carry out the necessary actions or calculations.
- Modify your plan and choose a new strategy if necessary until the problem is solved.

**STEP 4** **Look back**

- Check that the solution is reasonable and satisfies all the conditions.
- Are there alternative ways to solve the problems?

1. The ratio of the amount of money Mary had to the amount of money John had was 1 : 3 at first. After Mary got $30 from her grandmother and John spent $10 on a book, they had the same amount of money. How much money did Mary have at first?

Let's follow the 4-step problem-solving process described in the previous section to solve this problem.

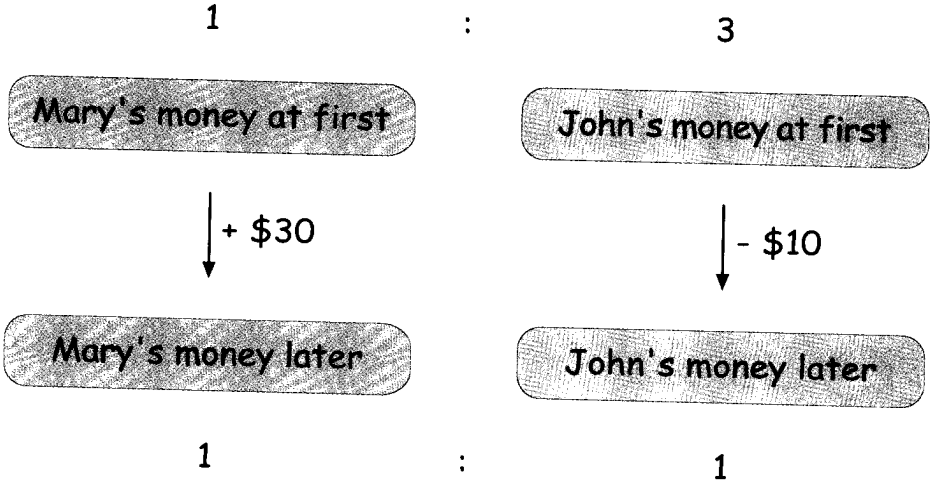

**Understand the problem**

1. What is the final goal of the problem?
   To find the amount of money Mary had at first.

2. What are the knowns and unknowns?
   (a) The ratio of the amount of money Mary had to that John had at first was 1 : 3.
   (b) Mary got $30 more.
   (c) John spent $10.
   (d) After that, the ratio became 1 : 1.


**Devise a plan**

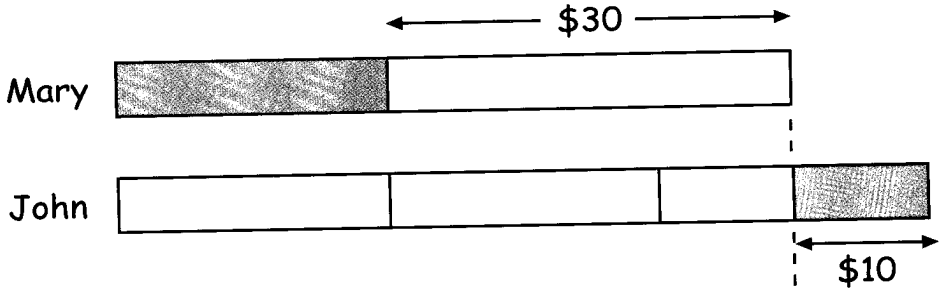
1. Find the connections among the knowns, the unknowns and the final goals.



2. Consider possible actions or strategies.
   To solve a problem involving ratio, we can use a model.

STEP 3 **Carry out the plan**

Take the amount of money Mary had at first as 1 unit, then John's is 3 units. We draw a model as shown below:




From the model, it is obvious that $30 + $10 is 2 units.

That is, 2 units ⟶ $30 + $10 = $40.

So 1 unit ⟶ $40 ÷ 2 = $20.

Mary had $20 at first.

STEP 4 **Look back**

Mary had $20 at first. Then John had $20 x 3 = $60 at first.

After Mary got another $30, she had
$30 + $20 = $50.
After John spent $10, he had
$60 - $10 = $50.
Both Mary and John had $50 then. This shows that the solution we got is correct.

Can you find any alternative ways to solve the problem?

2. The Lee family spent $1500 in June. They spent 10% of the sum on utilities, 70% on groceries and the rest on transport. In July, the Lee family spent the same amount of money on utilities, $100 less on groceries and 20% of the total spending on transport.

What is the percentage decrease in the Lee family's spending in July compared to June?
Give your answer correct to 2 decimal places.

Once again, let's follow the problem-solving process we have just learnt.

STEP 1 **Understand the problem**

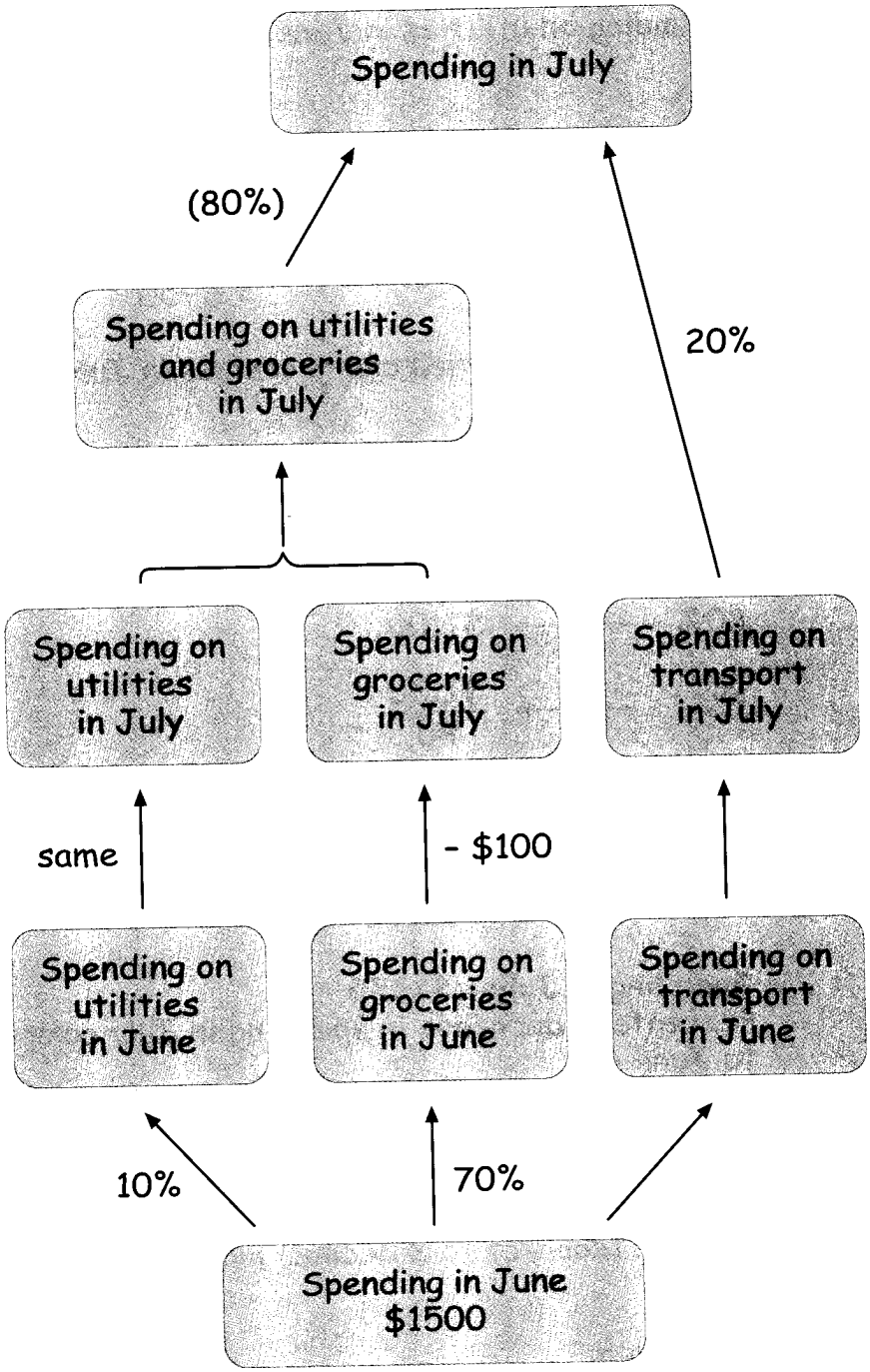
1. What is the final goal of the problem?
   Find the percentage decrease in the Lee family's spending in July compared to June.

2. What are the knowns?
   Spending in June: $1500.
   Percentage of spending on utilities in June: 10%.
   Percentage of spending on groceries in June: 70%.
   Percentage of spending on transport in July: 20%.
   Spending on utilities in July is same as in June.
   Spending on groceries in July is $100 less than in June.

STEP 2 **Devise a plan**

Let's try to link the knowns and the final goal.

The work flow is shown as follows:


Spending in July
(80%)
20%
Spending on utilities and groceries in July
Spending on utilities in July
Spending on groceries in July
Spending on transport in July
same
- $100
Spending on utilities in June
Spending on groceries in June
Spending on transport in June
10%
70%
Spending in June $1500

STEP 3 **Carry out the plan**

Spending on utilities in June = $1500 x 10%
= $150

Spending on groceries in June = $1500 x 70%
= $1050

Spending on groceries in July = $1050 - $100
= $950

Spending on utilities and groceries in July
= $150 + $950
= $1100

Percentage of spending on utilities and groceries in July = 100% - 20% = 80%

80% ⟶ $1100

1% ⟶ $\frac{\$1100}{80}$

100% ⟶ $\frac{\$1100}{80} \times 100$

= $1375

Spending in July = $1375.
Percentage decrease in spending in July compared to June is

$$\frac{\$1500 - \$1375}{\$1500} \times 100\%$$

= 8.33% (correct to 2 decimal places)

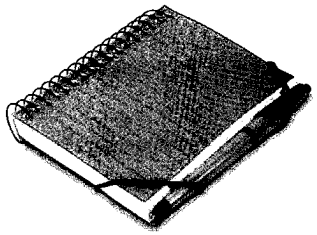
STEP 4 **Look back**

Try to do it yourself.

# Let's Try .. Problem-Solving Processes

Follow the 4-step problem-solving process that you have just learnt to solve the following problems. Write down the procedure.

1. 6 pens cost the same amount as 8 notebooks. Each pen costs $0.40 more than each notebook. How much does each notebook cost?



2. John had 200 cards. He gave 20% of the cards to Peter and $\frac{1}{4}$ of the remainder to Jane. Then he gave some cards to Mary. He had 70 cards left at last. What percentage of the cards John had at first were given to Mary?

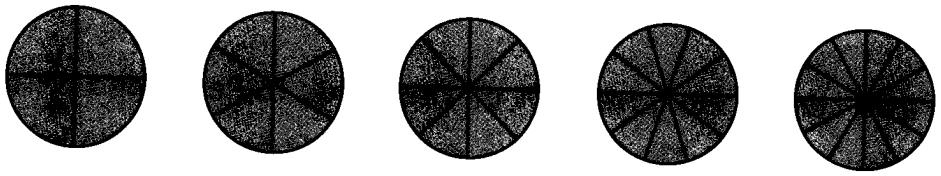
3. Mr Chan paid $200 for some 5-kg bags of rice and received a change of $8. Each 5-kg bag of rice cost $6. He later packed all the rice into smaller bags of 2 kg each and sold all the 2-kg bags of rice at $3.35 each. How much money did he receive by selling the rice?

# Let's Learn ... Problem-Solving Strategies

To solve a problem, it is essential to choose a suitable strategy. In this section, we will introduce some strategies used often in problem-solving:

## Look for patterns

1. Study the following figures. Each circle is divided into the different number of parts. How many parts are there in the 38th figure?



1st 2nd 3rd 4th 5th .....

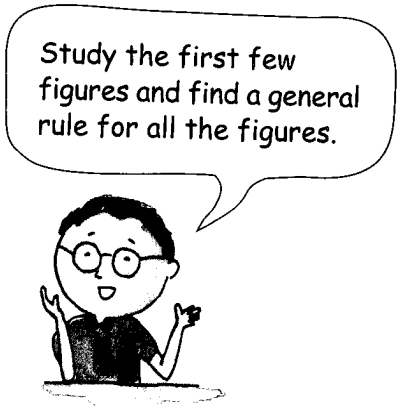
Count the number of parts in each figure. We have:

| Figure | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Number of parts | 4<br>= 2 + 2 x 1 | 6<br>= 2 + 2 x 2 | 8<br>= 2 + 2 x 3 | 10<br>= 2 + 2 x 4 | 12<br>= 2 + 2 x 5 |

From the table, we see that the number of parts forms a pattern. For the 5th figure, the number of parts is 2 + 2 x 5.

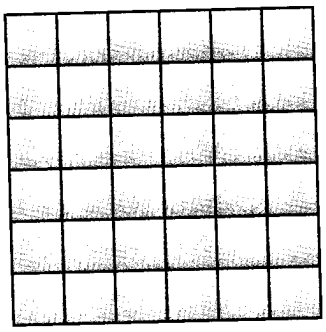
For the 38, the figure we have
2 + 2 x 38
= 2 + 76
= 78

There are 78 parts in the 38th figure.



**Make a systematic list**

2. Peter uses 36 square paper cards to make up different rectangles. What is the smallest possible perimeter of the rectangle he can make?



To find the smallest perimeter of the rectangle he can make, we have to list all the possible rectangles he can make and find the perimeter of each.

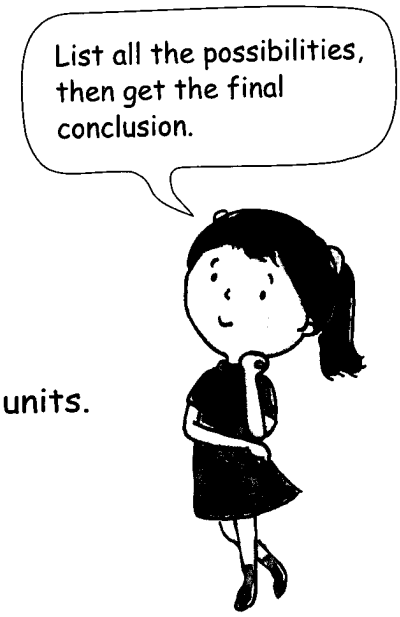
Note that the length and breadth of each rectangle he makes must be factors of 36.

Since,

$36 = 1 \times 36,$
$= 2 \times 18,$
$= 3 \times 12,$
$= 4 \times 9,$
$= 6 \times 6;$

so we have all the possible rectangles as follows:

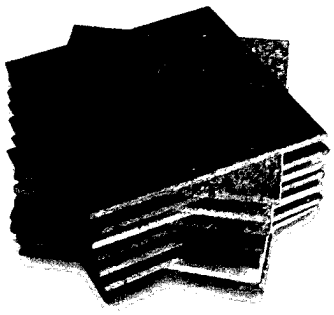
| Length | Breadth | Perimeter |
|---|---|---|
| 36 | 1 | 74 |
| 18 | 2 | 40 |
| 12 | 3 | 30 |
| 9 | 4 | 26 |
| 6 | 6 | 24 |




Hence, the smallest possible perimeter is 24 units.

## Guess and Check

3. A room is covered exactly by 156 pieces of 1-metre square tiles. The length of the room is 1-m longer than its breadth. What is the length of the room?



Since $10 \times 11 = 110$ is less than than 156, so the breadth of the room must be more than 10 m.

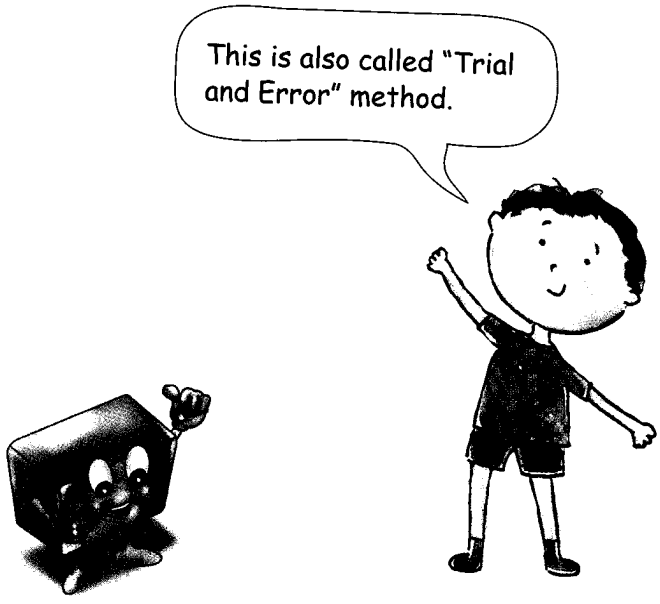
Suppose the breadth of the room is 11 m, then the length of the room is $11 + 1 = 12$ m, and the area of the room is $11 \times 12 = 132$ m$^2$ which is less than 156 m$^2$.

So we try a bigger number.

Suppose the breadth of the room is 12 m now, then the length of the room is $12 + 1 = 13$ m. Hence, the area of the room is $12 \times 13 = 156$ m$^2$.

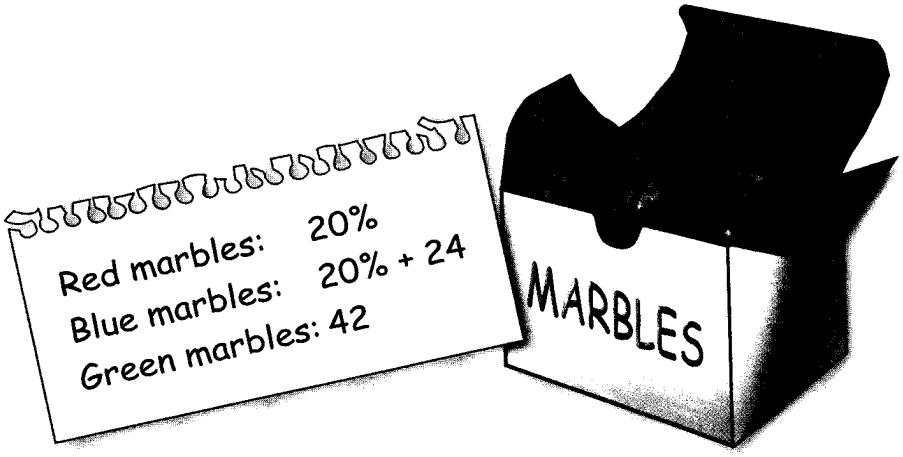
We have got the answer!

The breadth of the room is 12 m and the length of the room is 13 m.

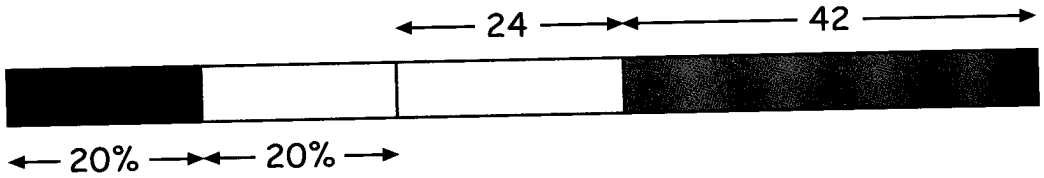


**Use a model**

4. Peter has some marbles. 20% of them are red. There are 24 more blue marbles than red marbles. The remaining 42 marbles are green. How many marbles does Peter have?




Based on the above information, we can draw a model as shown below.




From the model, we can see that

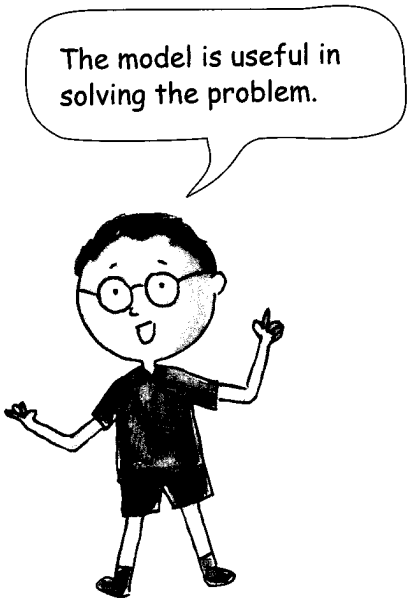
$60\% \longrightarrow 24 + 42 = 66$

$1\% \longrightarrow \frac{66}{60}$

$100\% \longrightarrow \frac{66}{60} \times 100$

$= 110$

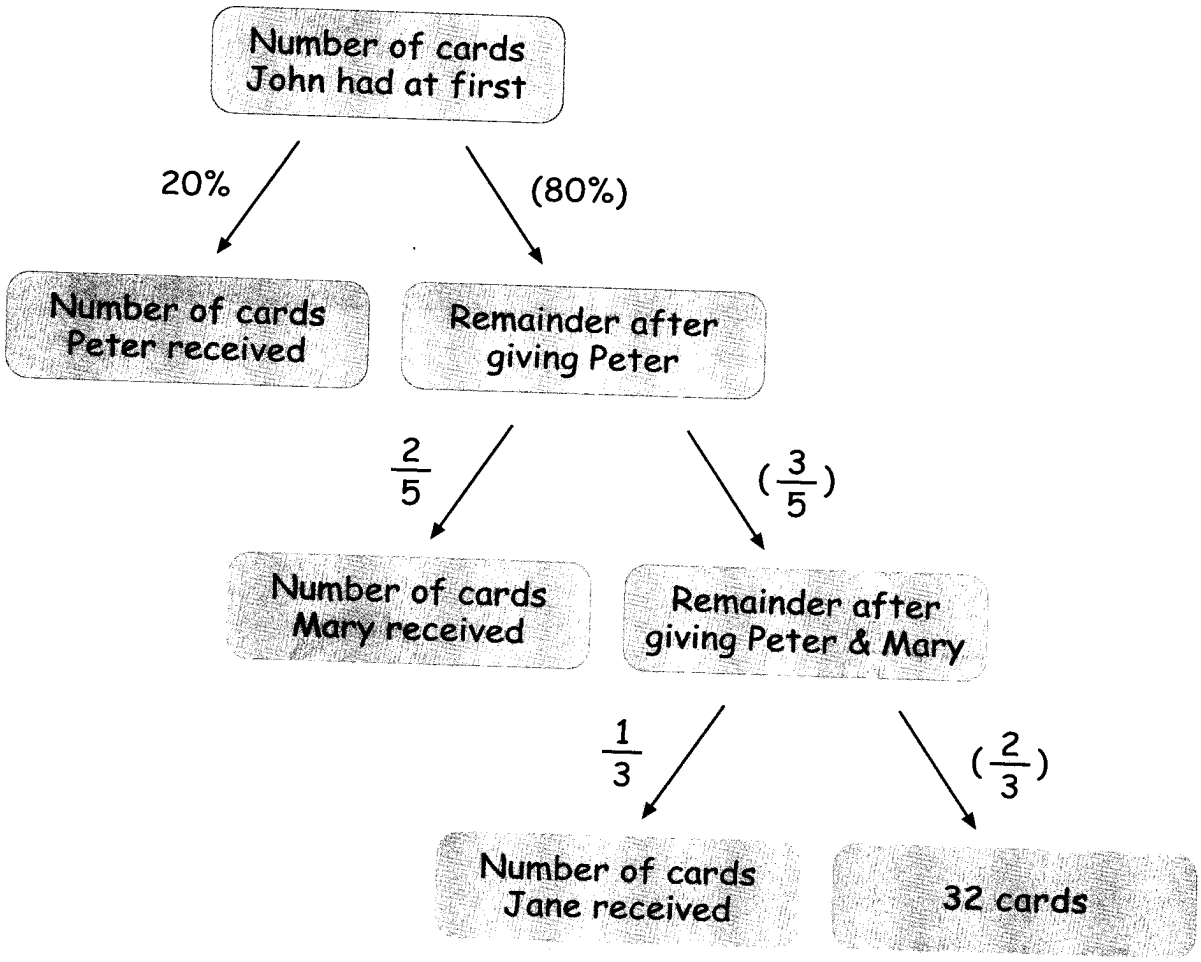
Peter has 110 marbles.



**Draw a diagram and work backwards**

5. John shared his cards with some friends. He gave 20% of his cards to Peter and $\frac{2}{5}$ of the remainder to Mary. Then he gave $\frac{1}{3}$ of the rest of the cards to Jane and he had 32 cards left at last. How many cards did John have at first?

To solve this problem, we draw a diagram and work backwards from the information provided at the last step until we find the number of cards John had at first. The process is shown as below.



Now we can solve the problem easily.

$1 - \frac{1}{3} = \frac{2}{3}$

$\frac{2}{3} \longrightarrow 32$

$\frac{3}{3} \longrightarrow \frac{32}{2} \times 3 = 48$

John had 48 cards left after he gave some cards to Peter and Mary.

$1 - \frac{2}{5} = \frac{3}{5}$

$\frac{3}{5} \longrightarrow 48$

$\frac{1}{5} \longrightarrow \frac{48}{3} = 16$

$\frac{5}{5} \longrightarrow 16 \times 5 = 80$

John had 80 cards left after he gave some cards to Peter.

100% - 20% = 80%

80% ⟶ 80

1% ⟶ 1

100% ⟶ 100

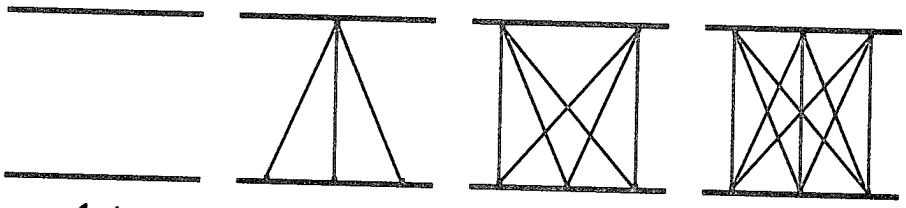
John had 100 card at first.


# Problem-Solving Strategies

**Use suitable strategies to solve the following problems.**

1. There are two whole numbers. Their sum is 12. Their product is 35. Find the two numbers.

2. Study the figures below. How many lines are there between the two horizontal lines in the 26th figure?




3. Mr Tan drove from Town A to Town B at a speed of 40 km/h. After 30 minutes, Mrs Tan also drove from Town A for Town B at a speed of 60 km/h and she caught up with Mr Tan just when they both reached Town B. How far apart were the two towns?

4. Four children shared some cards in a box. They took the cards one after another. The first child took $\frac{1}{2}$ of the cards. The second took $\frac{1}{2}$ of the remainder. The third took $\frac{2}{5}$ of those left and the fourth got the rest of the 6 cards. How many cards were there in the box at first?


No calculator is allowed.

## Section A

For each question, four options are given. One of them is the correct answer.

1. 20 000 + 600 + 70 = ☐

   (1) 26 0 070
   (2) 26 070
   (3) 20 670
   (4) 2670

2. Which one of the following mixed numbers is the smallest?

   (1) $2\frac{1}{4}$

   (2) $2\frac{3}{10}$

   (3) $2\frac{1}{3}$

   (4) $2\frac{2}{5}$

3. Which one of the following letters does not have a line of symmetry?

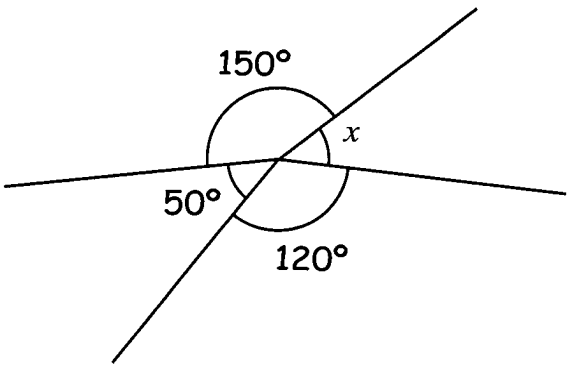
(1) C

(2) D

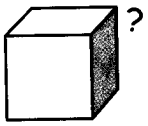
(3) S

(4) E

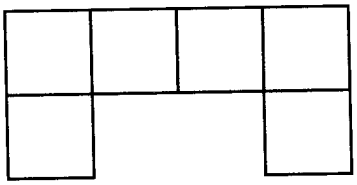
4. The figure is not drawn to scale. Find $\angle x$ in the figure.



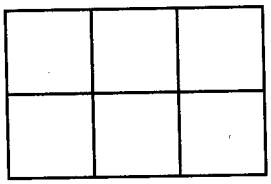

(1) 30°
(2) 40°
(3) 50°
(4) 60°

5. Which one of the following figures is a net for the cube  ?

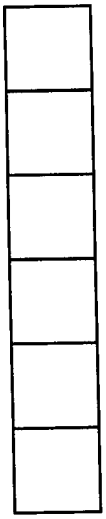
(1)



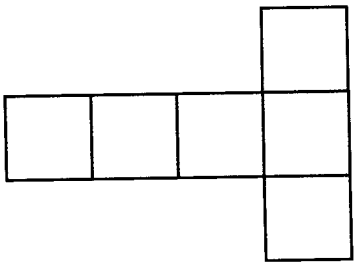
(2)



(3)



(4)



6. The length of a rectangle is twice its breadth. If its breadth is $x$ cm, find its perimeter.

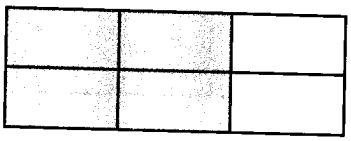
(1) $3x$ cm
(2) $4x$ cm
(3) $5x$ cm
(4) $6x$ cm

7. There are 20 pupils in a class. On Monday, 3 pupils were absent. What percentage of the pupils in the class were absent on that day?

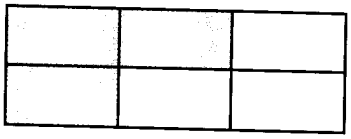
(1) 3%
(2) 6%
(3) 12%
(4) 15%

8. Which one of the shaded areas represents the product of $\frac{1}{2} \times \frac{2}{3}$?

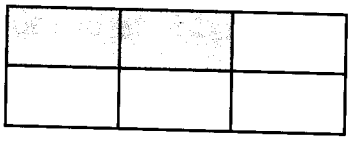
(1)



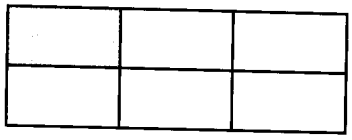
(2)



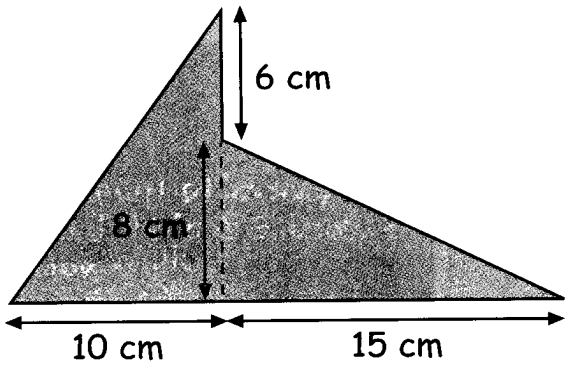
(3)



(4)



9. Find the area of the shaded figure.




(1) 100 $cm^2$
(2) 130 $cm^2$
(3) 175 $cm^2$
(4) 260 $cm^2$

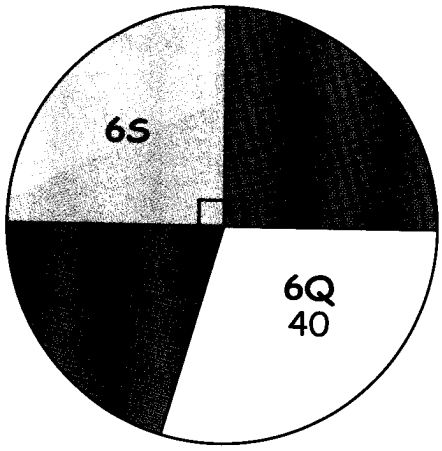
10. At the beginning of the year, the ratio of the number of boys to the number of girls in a class was 5 : 4 and there were 15 boys. In the middle of the year, the number of girls in the class increased by 2 and the number of boys didn't change. What is the new ratio of the number of boys to girls in the class?

(1) 15 : 14
(2) 15 : 17
(3) 5 : 6
(4) 10 : 3

11. A beaker contained 1.5 $\ell$ of orange juice. It was used to fill up 3 glasses with capacity of 350 ml each. Find the volume of orange juice left in the beaker.

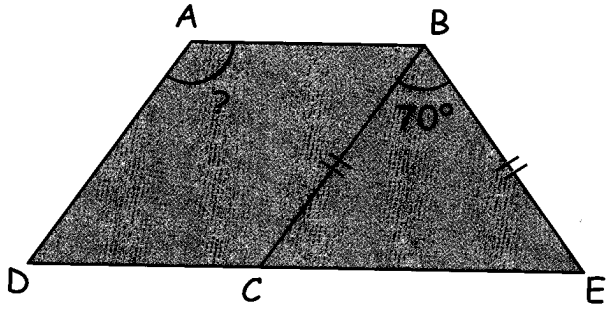
(1) 350 ml
(2) 450 ml
(3) 500 ml
(4) 550 ml

12. The pie chart shows the number of pupils in 4 classes. Find the number of pupils in Class 6R.



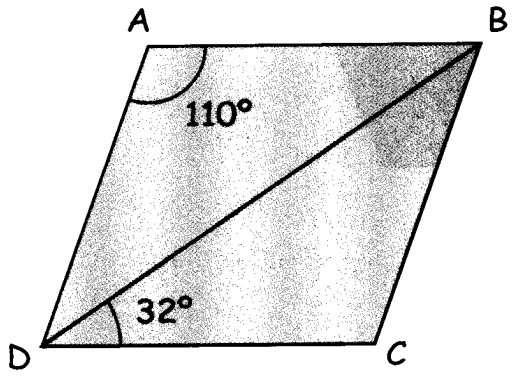

(1) 40
(2) 35
(3) 30
(4) 20

13. The figure is not drawn to scale. ABCD is a parallelogram. DCE is a straight line. BC = BE. Find ∠BAD.




(1) 140°
(2) 130°
(3) 125°
(4) 110°

14. The figure is not drawn to scale. In the parallelogram ABCD, $\angle BAD = 110°$ and $\angle BDC = 32°$. Find $\angle DBC$.




(1) 35°
(2) 38°
(3) 45°
(4) 70°

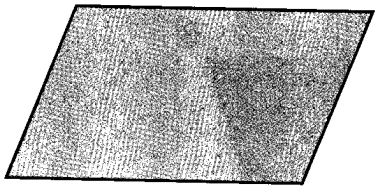
15. The table shows the parking rates at a car park. Mr Hashim parked his car from 8.30 a.m. to 11.00 a.m. How much must he pay for the parking?

| | |
|---|---|
| First hour | $2.00 |
| Next hour or part thereof | $1.20 |

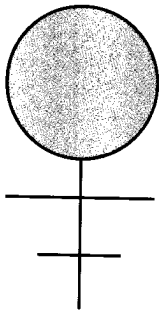
(1) $3.20
(2) $3.60
(3) $4.00
(4) $4.40

16. Which figure below is a symmetric figure?

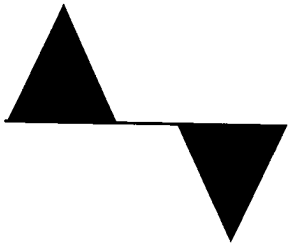
(1)



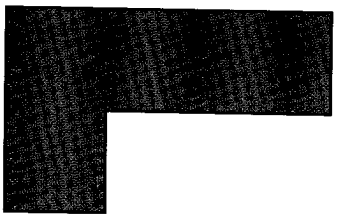
(2)



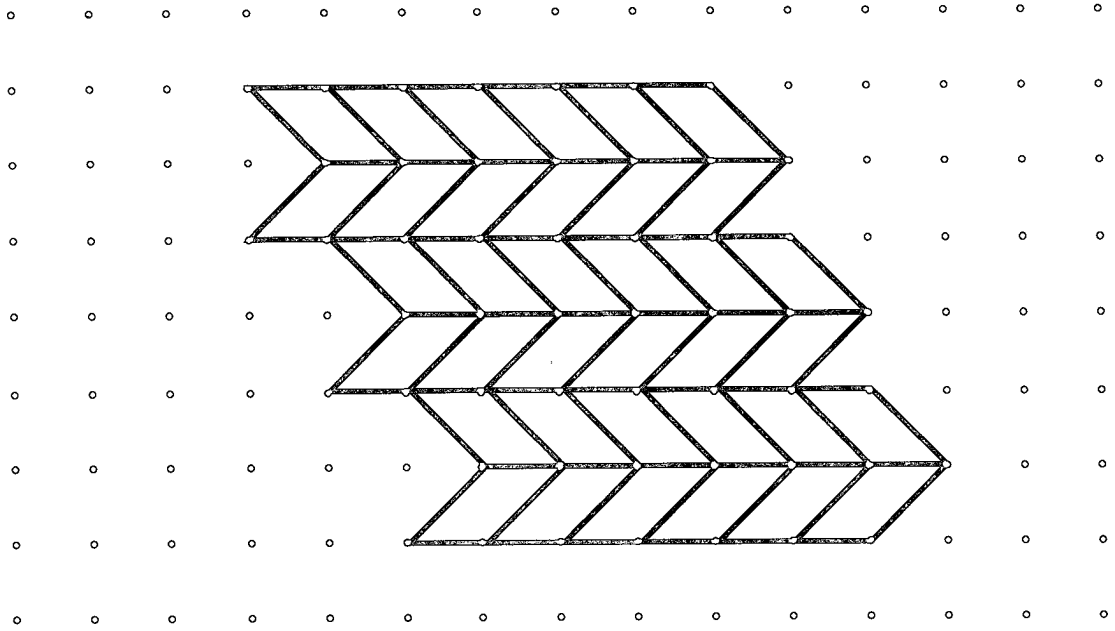
(3)

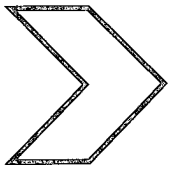


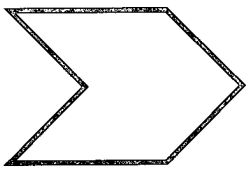
(4)



17. Study the following tessellation. What is the unit shape?



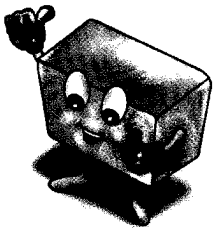
(1) 

(2) 

(3) 

(4) 

## Section B



Answer the following questions.

18. In the number 35 167, what is the value that the digit 5 stands for?

19. Write down the greatest 6-digit number using all the digits 2, 5, 7, 4, 1 and 3.

20. Find the value of $38.205 \times 100$.

21. Find the value of $102 - (27 + 45) \div 6$.

22. Find the value of $\frac{3}{5} \div \frac{14}{15}$.

23. If Q is in the direction North-East of P, what is the direction of P from Q on the 8-point compass?

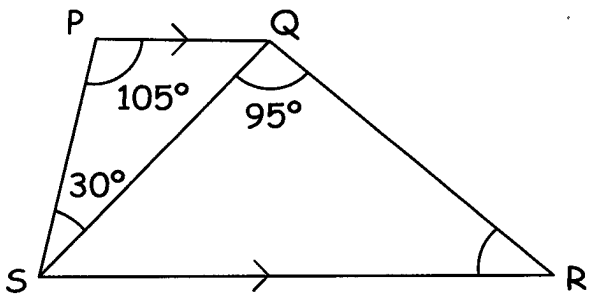
24. James walks an average distance of 1.6 km a day. Find the total distance he walks in 7 days.

25. Find the missing number in this number sequence:

    33, 28, 23, 18, ☐

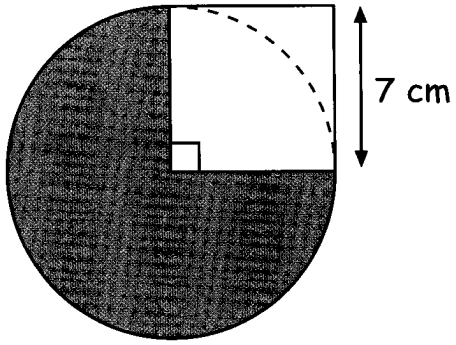
26. Express 30 cm as a percentage of 5 m.

27. The figure is not drawn to scale. PQRS is a trapezium.
Find $\angle SRQ$.

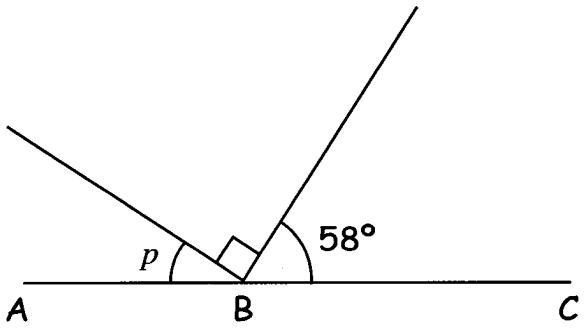



28. The figure below shows a square covering one quarter of a circle.
Find the area of the shaded part.

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



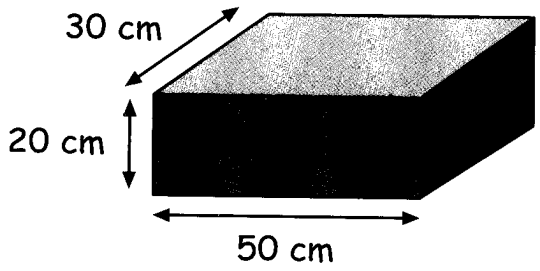

29. The figure is not drawn to scale. ABC is a straight line. Find $\angle p$.



30. Simplify $8x + 17 - 3x - 11$.

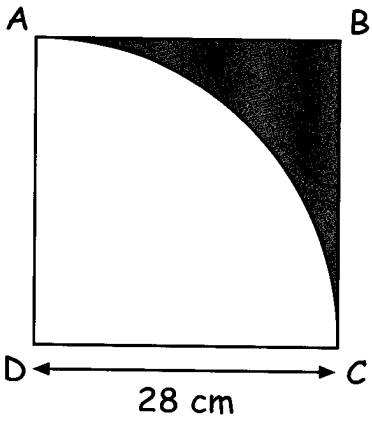
31. Ridzuan used 15% of his savings of $220 to buy a pair of shoes. How much did he pay for the shoes?

32. The solid shown below is a cuboid which measures 50 cm by 30 cm by 20 cm. Find the volume of this solid.



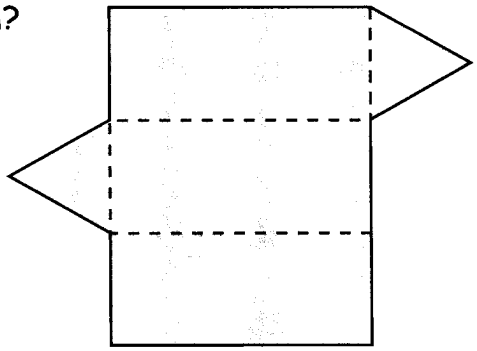

33. ABCD is a square. Find the area of the shaded part.

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



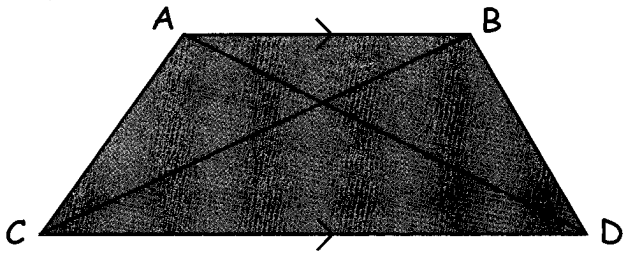

34. 3 apples and 2 oranges cost $1.70. If the cost of each orange is 40 cents, what is the cost of an apple?

35. Is the following figure a net of a prism?



36. When Peter came to the jetty at 12.25 p.m. to catch a boat, the boat had already left the jetty 40 minutes earlier. At what time did the boat leave the jetty?

37. In the figure, AB is parallel to CD.



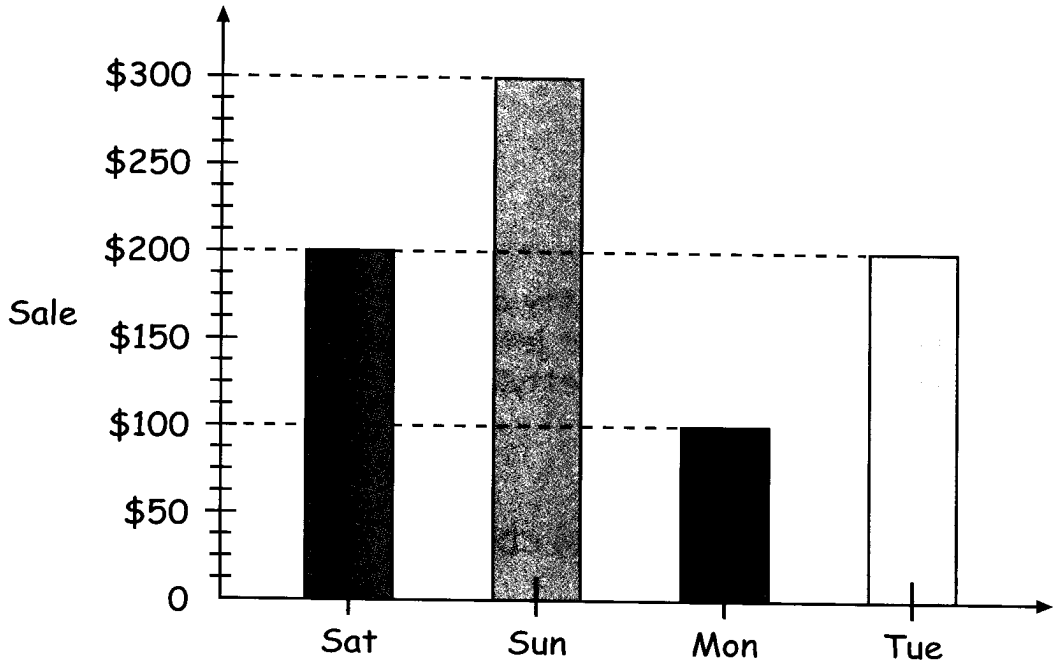

(a) What can you say about the area of triangle ACD and the area of triangle BCD?
(b) Give a reason for your statement.

38. A School clerk booked tickets for 4 teachers and 51 pupils at a discount of 10%. How much did the clerk pay altogether?

**School Holiday Tour**

Teacher: $50 per person
Pupil : $30 per person

39. The bar chart shows the sales per day made by an ice-cream vendor from Saturday to Tuesday.

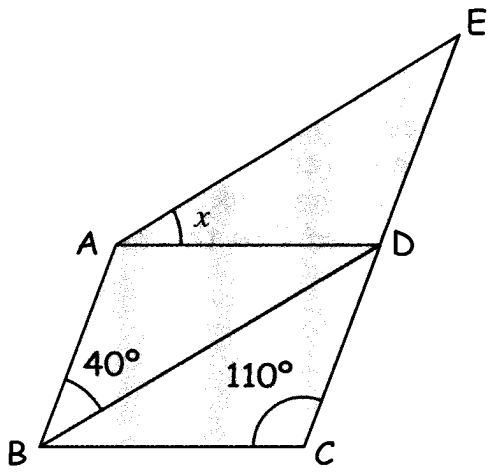



(a) What was the total sales from Saturday to Tuesday?
(b) What percentage of the total sales was made on Sunday?

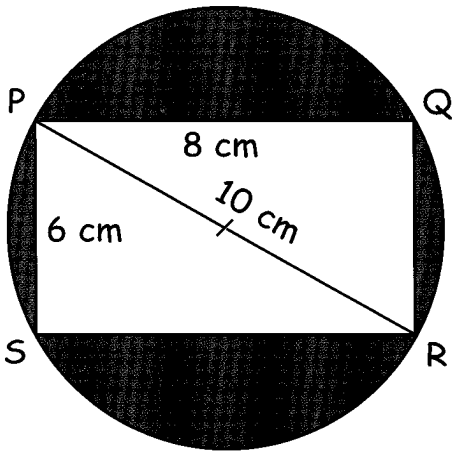
40. An odd number can be represented by $2x + 1$, where $x$ is a whole number. Find the odd number when $x = 65$.

41. The ratio of the number of pupils in Class 6P to the number of pupils in Class 6Q is 5 : 6.
The ratio of the number of pupils in Class 6Q to the number of pupils in Class 6R is 3 : 4.
(a) Find the ratio of the number of pupils in Class 6P to Class 6Q to the number of pupils in Class 6R.
(b) The number of pupils in Class 6R is 40. How many pupils are there in Class 6P.

42. The figure is not drawn to scale. ABCD and ABDE are parallelograms. Find $\angle x$.



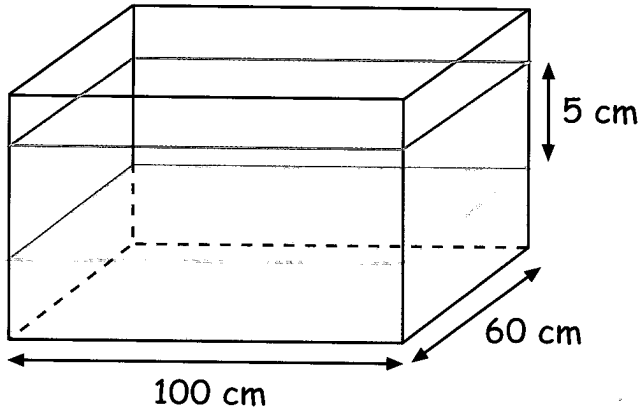

43. In the figure, PQRS is a rectangle and PR is a diameter of the circle. Find the area of the shaded part. (Take $\pi = 3.14$)




44. The average of 5 numbers is 7. The average of 3 of these numbers is 5. Find the average of the other 2 numbers.

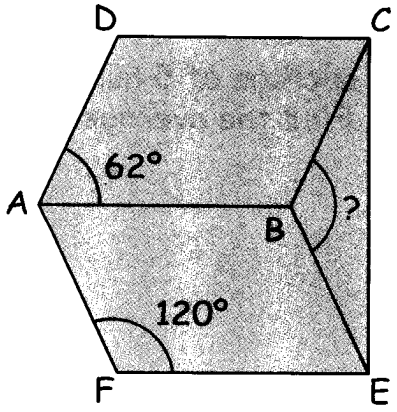
45. After drinking 40% of the orange juice in a bottle, the volume of the remaining orange juice is 120 ml. Find the original volume of orange juice in the bottle.

46. A rectangular fish tank of length 100 cm and breadth 60 cm contained some water. After some more water was added into it, the water level in the tank rose by 5 cm. Find the volume of the water that was added into the tank. Give your answer in litres.



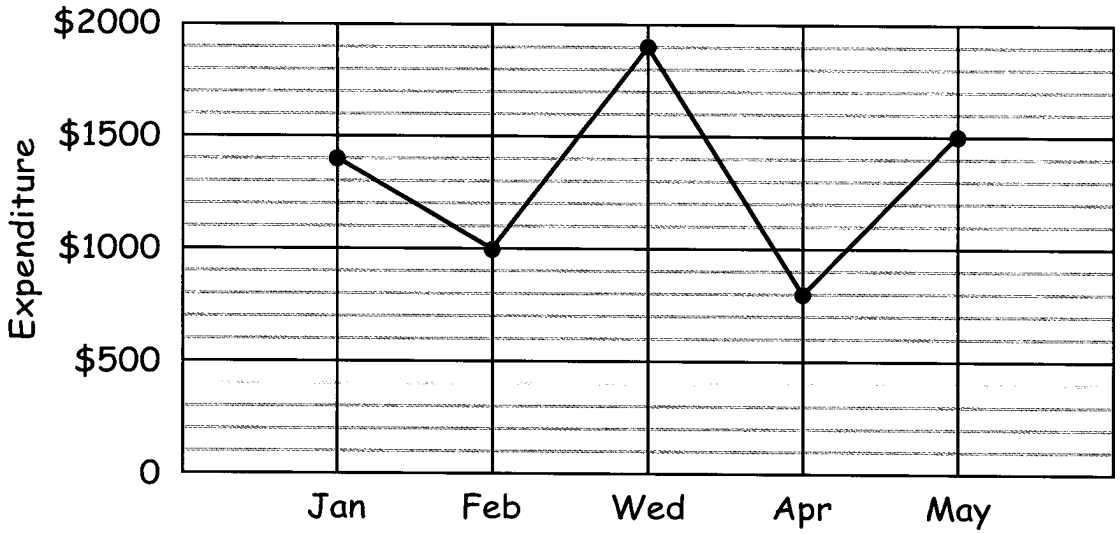

47. The hour hand of a clock is 10 cm long and its minute hand is 20 cm long.
    (a) Find the distance travelled by the tip of the hour hand for 6 hours.
    (b) Find the distance travelled by the tip of the minute hand for 45 min.
    (Take $\pi = 3.14$)

48. The figure is not drawn to scale. ABCD and ABEF are parallelograms. Find $\angle CBE$.



49. There are 50-cent coins, 20-cent coins and 10-cent coins in a coin box. The number of 50-cent coins is 5 more than 3 times the number of 20-cent coins.The number of 20-cent coins is 7 more than twice the number of 10-cent coins. The number of 10-cent coins is 15. Find
    (a) the number of 20-cent coins.
    (b) the number of 50-cent coins.

50. Mr Ragu's monthly incoming is $2500. The graph shows his monthly expenditure from January to May.




    (a) Find the difference between Mr Ragu's highest and lowest monthly expenditure during this period.
    (b) How much did he save in these 5 months?


Calculator is allowed. 

## Section A

For each question, four options are given. One of them is the correct answer.

1. $\square$ : 6 = 8 : 24. What is the number missing in the box?

   (1) 12
   (2) 2
   (3) 3
   (4) 8

2. Find the value of $11\frac{3}{4} + 3\frac{1}{5}$.

   (1) $14\frac{11}{20}$

   (2) $14\frac{13}{20}$

   (3) $14\frac{19}{20}$

   (4) $14\frac{17}{20}$

3. 100 000 is ▢ more than 87 650. What is the number missing in the box?

(1) 1235
(2) 2350
(3) 12 350
(4) 12 3500

4. Write $\frac{8}{15}$ as a ratio.

(1) 15 : 8
(2) 2 : 3
(3) 8 : 15
(4) 2 : 5

5. What is the area of a quarter circle with radius of 21 cm. (Take $\pi = \frac{22}{7}$)

(1) 132 $cm^2$
(2) 693 $cm^2$
(3) 1386 $cm^2$
(4) 346.5 $cm^2$

6. The usual price of a shirt is $36. Mr Tan bought it at a discount of 15%. How much did he pay for it?

(1) $5.40
(2) $21.00
(3) $30.60
(4) $35.85

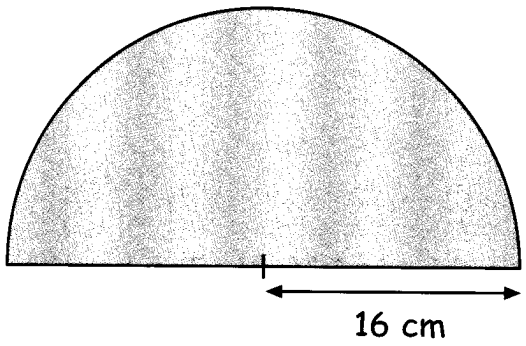
7. In the number 75 314, the digit 5 stands for

(1) 5
(2) 50
(3) 500
(4) 5000

8. There were 360 people at a party. 140 of them were ladies. The rest were men. What percentage of the people were men? Give your answer correct to 1%.

(1) 38%
(2) 39%
(3) 61%
(4) 62%

9. What is the perimeter of a semicircle with radius 16 cm? (Take $\pi = 3.14$)

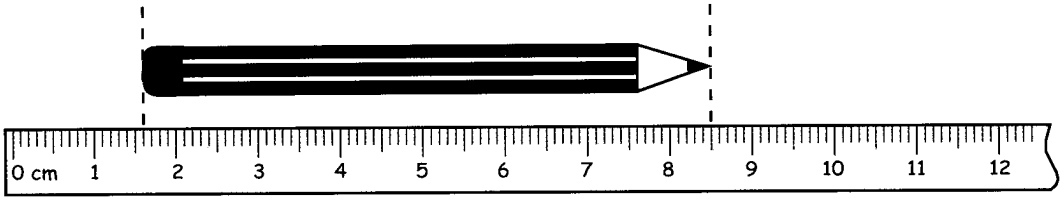



(1) 66.24 cm
(2) 82.24 cm
(3) 200.96 cm
(4) 401.92 cm

10. Round off the sum of 27 654 and 47 738 to the nearest 100.

(1) 74 000
(2) 75 000
(3) 75 300
(4) 75 400

11. What is the length of the pencil?




(1) 6.8 cm
(2) 6.9 cm
(3) 7.0 cm
(4) 8.5 cm

12. Arrange $\frac{5}{12}, \frac{1}{3}, \frac{5}{11}$ from the largest to the smallest. The answer is

(1) $\frac{1}{3}, \frac{5}{12}, \frac{5}{11}$

(2) $\frac{5}{12}, \frac{1}{3}, \frac{5}{11}$

(3) $\frac{5}{11}, \frac{5}{12}, \frac{1}{3}$

(4) $\frac{5}{12}, \frac{5}{11}, \frac{1}{3}$

13. Calculate $68 \times 1\frac{5}{6}$.

(1) $56\frac{2}{3}$

(2) $57\frac{2}{3}$

(3) $68\frac{2}{3}$

(4) $124\frac{2}{3}$

14. The volume of a cuboid is 5310 $cm^3$. The area of its base is 354 $cm^2$. Find its height.

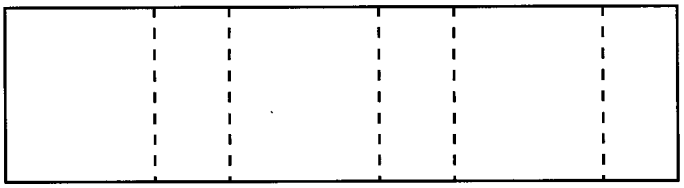
(1) 15 cm
(2) 16 cm
(3) 17 cm
(4) 18 cm

15. A plane flew 12 110 km in 14 hours. Find its speed.

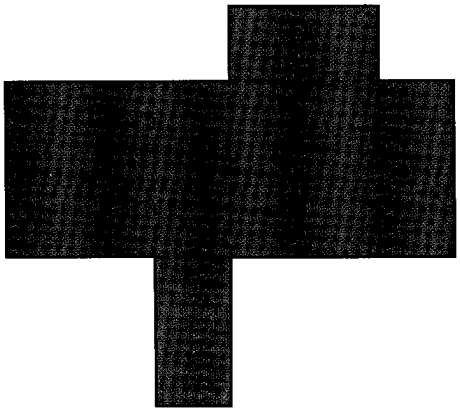
(1) 845 km/h
(2) 855 km/h
(3) 865 km/h
(4) 875 km/h

16. Which of the following is the net of a cuboid?

(1)

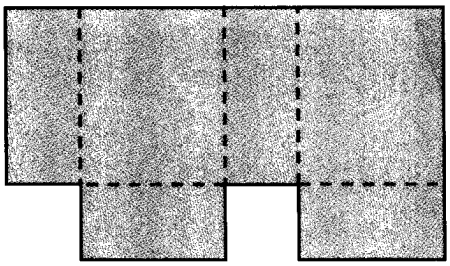


(2)



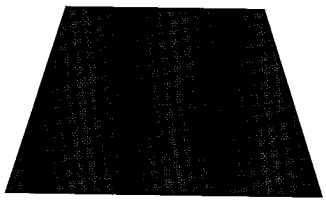
(3)

(4)

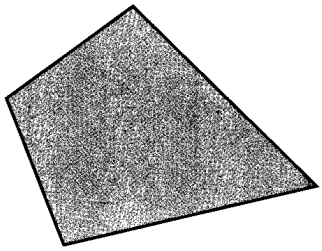


17. Which of the following figures is **not** a symmetric figure?

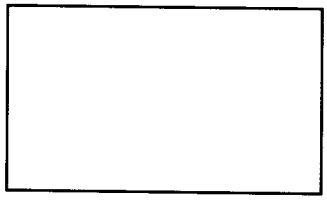
(1)



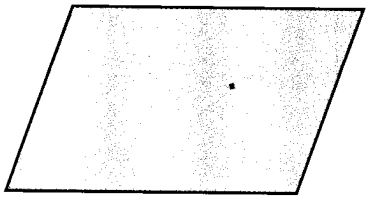
(2)



(3)

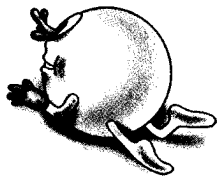


(4)

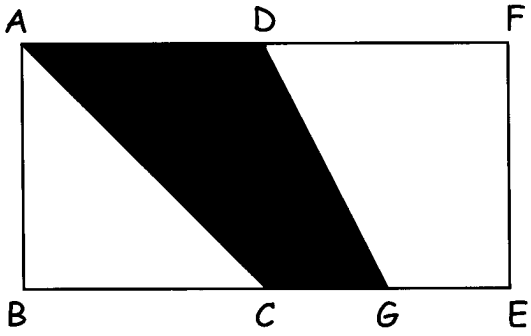


## Section B

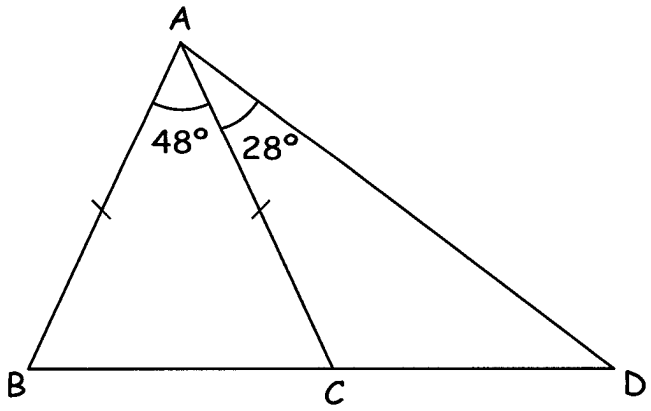
Answer the following questions.



18. In the figure, ABEF is a rectangle. ABCD and CEFD are two squares, and CG = GE. What fraction of the rectangle ABEF is shaded?




19. The figure is not drawn to scale. BCD is a straight line. AB = AC. Find ∠ADC.



20. $\frac{2}{7}$ of a number is 322. What is the number?

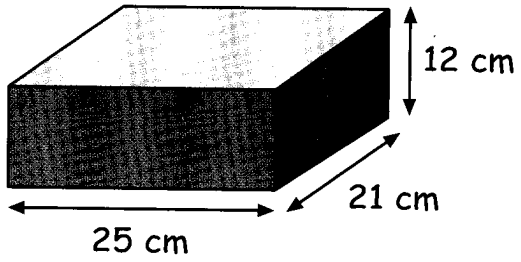
21. Express 650 ml as a percentage of 2 $\ell$.

22. Find the value of $\frac{2}{7} \div 4$ in its simplest form.

23. Express 75% as a fraction in the simplest form.

24. A number 3560 is increased by 15%. What is the new number?

25. What is the volume of the cuboid shown below?



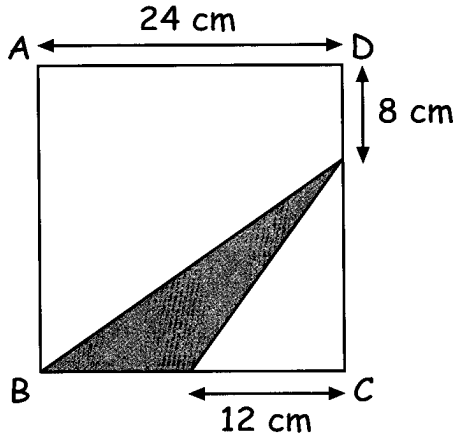

26. A train travelled at a speed of 96 km/h for $3\frac{1}{3}$ hours.
What was the distance travelled by the train?

27. The average of three numbers A, B and C is 65. If A = 70, B = 48, what is the value of C?

28. Express the ratio of 650 m to 2 km in the simplest form.

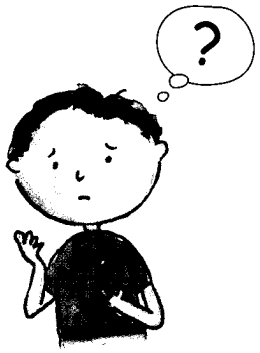
29. Simpifly $35m + 63 - 18m + 19$.

30. The figure below is not drawn to scale.
ABCD is a square. Find the area of the shaded triangle.

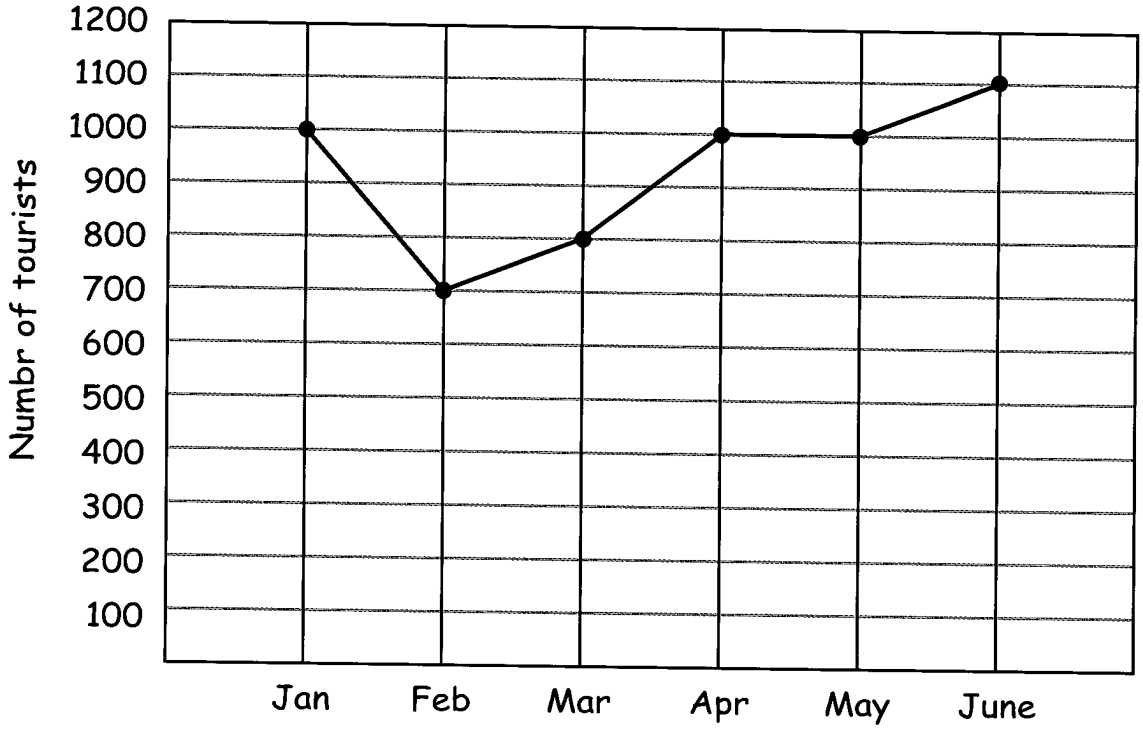



31. Peter gave $\frac{3}{8}$ of his cards to Mary and he had 70 cards left.
How many cards did Peter have originally?

32. If the area of a square is 576 $cm^2$, what is the perimeter of the square?



The line graph below shows the number of tourists who visited a museum in a period of 6 months. Answer Q33 and Q34.

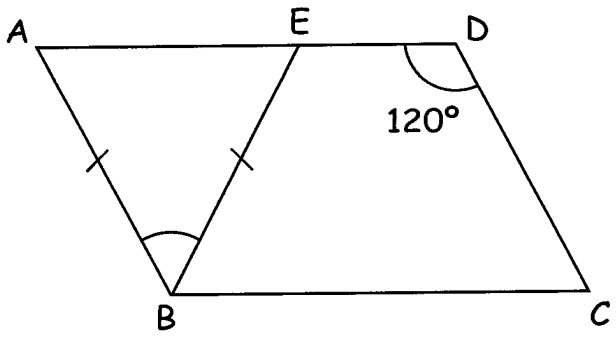



33. In which month, did the most number of tourists visit the museum?

34. What was the total number of tourists who visited the museum in the 6 months?

35. Peter and Mary shared some cards in the ratio 7 : 8. Given that Peter received 105 cards, how many cards were there altogether?

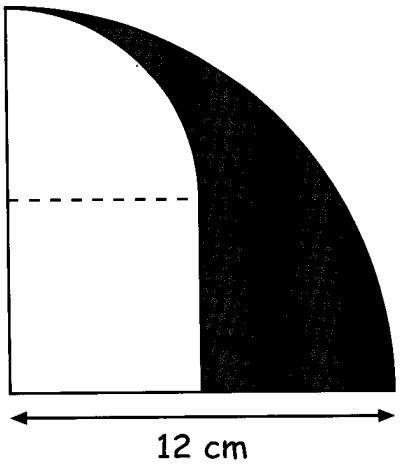
36. The figure shown is not drawn to scale. ABCD is a parallelogram. BA = BE and $\angle ADC = 120°$. Find $\angle ABE$.



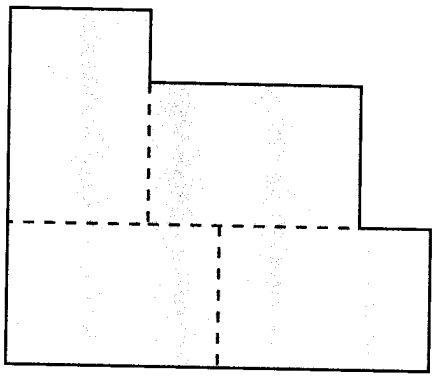

37. A sum of \$1635 is shared among Peter, John and Mary in the ratio of 3 : 5 : 7. How much does Mary get?

38. The total mass of John and his father is 90 kg. The mass of John is $\frac{5}{7}$ of the mass of his father. What is the mass of John?

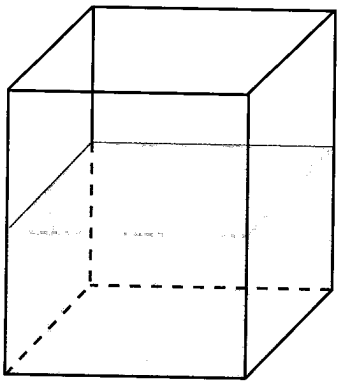
39. The figure shows a small quardrant and a square is removed from a big quadrant. Find
    (a) the perimeter of the shaded part,
    (b) the area of the shaded part.
    ( take $\pi = 3.14$)

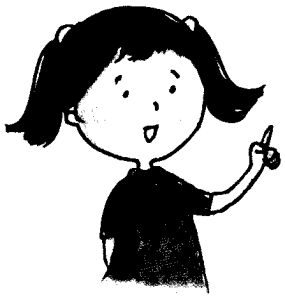


40. The figure is made up of four identical rectangles. Each rectangle meaures 24 cm by 16 cm. What is the perimeter of the figure?

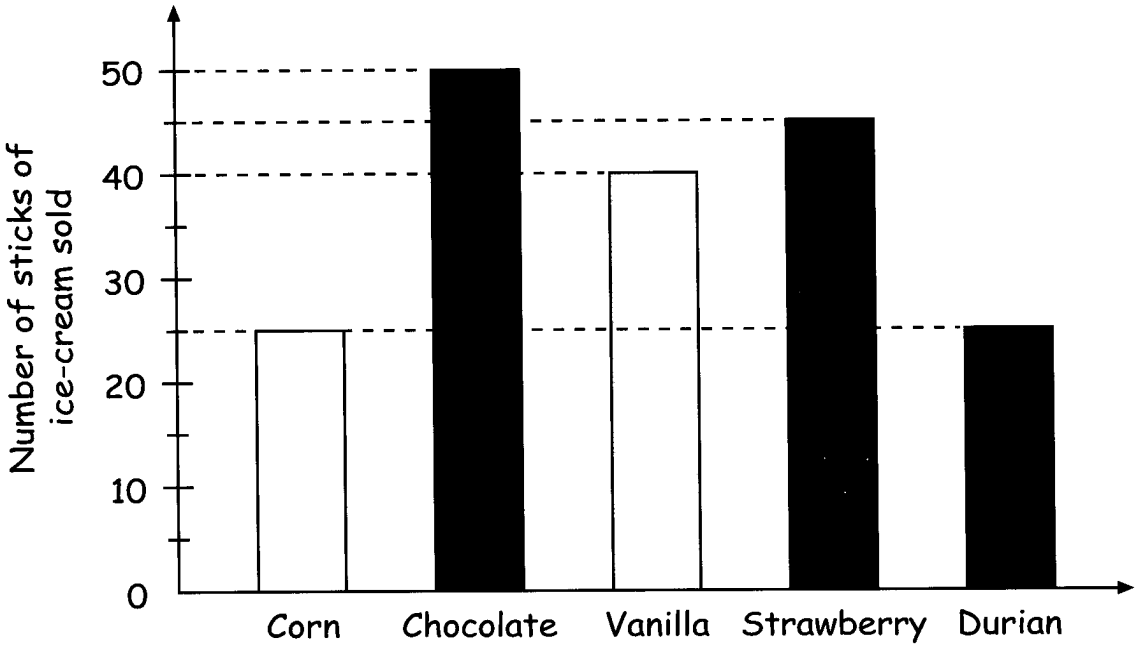


41. There ae 7.5 $\ell$ of water in a rectangular tank with a square base. The height of the water level is 12 cm. Find the length of the side of the square base of the tank.





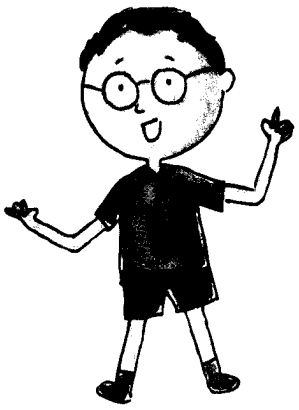
42. The graph shows the number of ice-cream sticks of the different flavours sold by Mr Tan on a particular day.




(a) How many sticks of vanilla ice-creams were sold that day?

(b) Which flovour of ice-cream did Mr Tan sell the most?

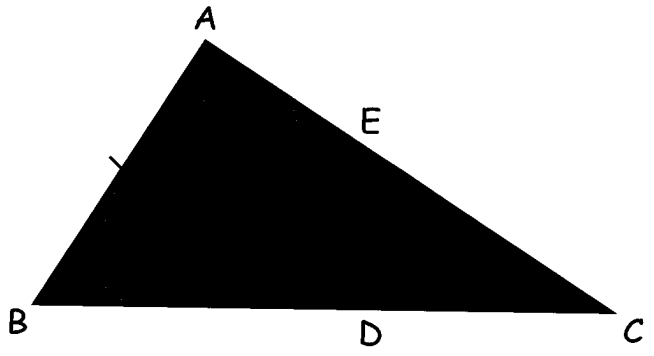
(c) What is the ratio of the number of sticks of corn ice-cream sold to the number of sticks of strawberry ice-cream sold that day?



43. Mr Tan and Mr Lee drove from Town A to Town B. They started at 8.00 a.m. together. Mr Tan drove 20 km/h faster than Mr Lee. When Mr Tan arrived at Town B at 11.00 a.m., Mr Lee had only completed 75% of the whole journey. What was the distance between Town A and Town B?

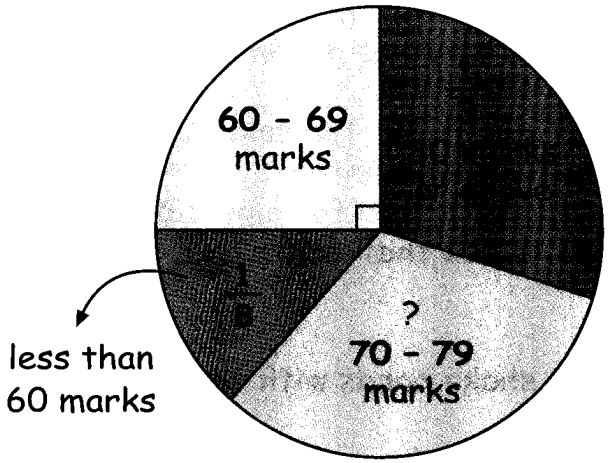
44. The ratio of the number of pupils in School A to the number of pupils in School B to the number of pupils in School C is 3 : 4 : 5. There are 896 more pupils in School C than in School A.
    (a) How many pupils are there in School C?
    (b) How many pupils are there in the three schools altogether?

45. The figure is not drawn to scale. BDC is a straight line. $\angle BAC$ is a right-angle and $AB = AD$. $\angle ABD = 58°$ and $\angle CDE = 92°$. Find
    (a) $\angle CAD$,
    (b) $\angle EDA$,
    (c) $\angle DEC$.



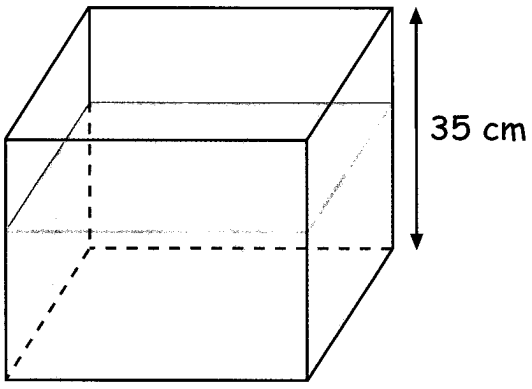

46. In a theatre, 35% of the audience are men. 28% are women and the remaining 222 are children.
    (a) How many people are there in total in the theatre?
    (b) How many men are there in the theatre?
    (c) How many fewer women than children are there in the theatre?

47. The pie chart below shows the the fraction of P6 pupils who scored the different range of marks in a Mathematics test. There were 39 pupils who scored less than 60 marks.




(a) What fraction of the pupils scored 70 to 79 marks?
(b) How many pupils took the test?
(c) How many pupils scored 80 marks and above?

48. A rectangular container with a square base is 35 cm high.
When 40 $\ell$ of water is poured into it, the container is $\frac{4}{7}$ full.
(a) What is the capacity of the container?




(b) How much more water is needed to fill the container completely?
(c) What is the area of the square base?
(d) What is the length of the side of the square base?
Give your answer correct to 1 decimal place.

49. Mr Tan, a computer sales man, is paid a basic salary of $500 per month. He is also paid 5% commission for each computer he sells. The selling price of each computer is $1340.
    (a) How much commission does Mr Tan get from selling a computer?
    (b) The number of computers he sold on a month was $x$. Express the total earnings of Mr Tan in that month in terms of $x$.
    (c) In a particular month, Mr Tan sold 32 computers. What was his total earnings for that month?
    (d) If Mr Tan was paid $2845 for a particular month, how many computers did he sell that month?

50. Members in a group shake hands with each other once only. For example:
    If there are 2 members in the group, there is 1 handshake taken place.
    If there are 3 members in the group, there are 3 handshakes taken place.
    (a) Copy and complete the following table.

| Number of members | Number of handshakes |
|---|---|
| 2 | 1 |
| 3 | 3 |
| 4 | |
| 5 | |
| 6 | |
| 7 | |

    (b) If the total number of handshakes is 21, how many members are there in the group?