



# MATHEMATICS

3<sup>rd</sup>

Level

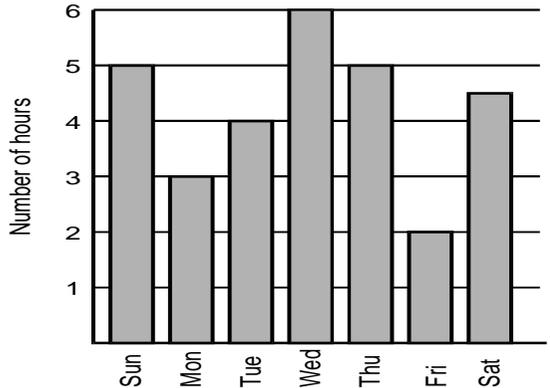
Block 3

# Graphs

## Exercise 1 (A)

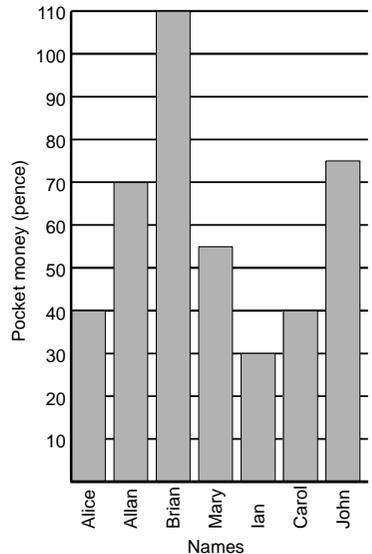
1) This graph shows the number of hours the sun shone on different days in a week.

- On which day did the sun shine longest?
- On which day did the sun shine for 3 hours?
- For how long did the sun shine on Sunday?

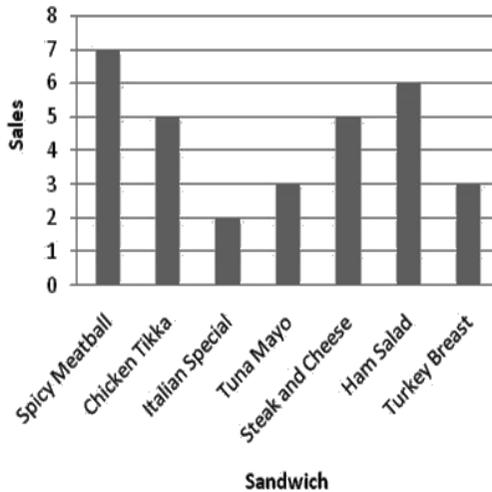


2) This graph shows the amount of pocket money given to various pupils.

- How much money was Ian given?
- How much money was Mary given?
- Which BOY received least money?
- How many pupils are shown on the graph?



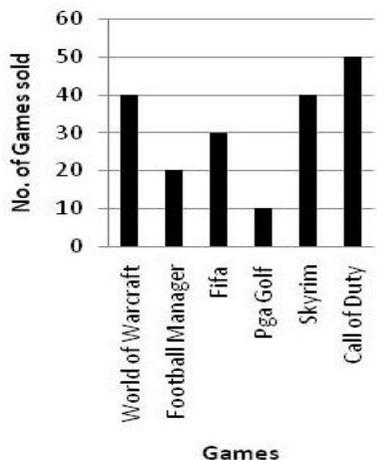
3) This graph shows which sandwiches were sold in Subway during Friday lunchtime.



- Which flavour sold 2 sandwiches?
- How many steak and cheese sandwiches were sold?
- Which sandwich was the most popular?
- How many sandwiches in total were sold?

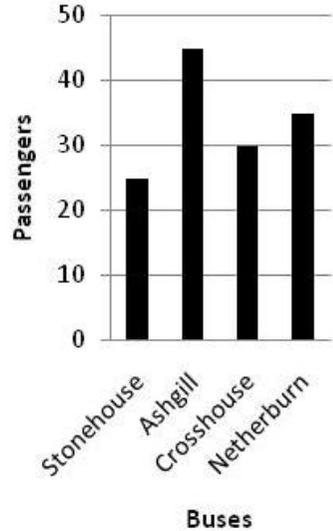
4) This graph shows the different X Box 360 games bought one week in HMV.

- How many Fifa games were bought?
- Which 2 games sold exactly 40 copies?
- Which game sold the least?
- What was the total sale of all these games?



5) In a survey the number of pupils coming to Larkhall Academy by school bus was recorded.

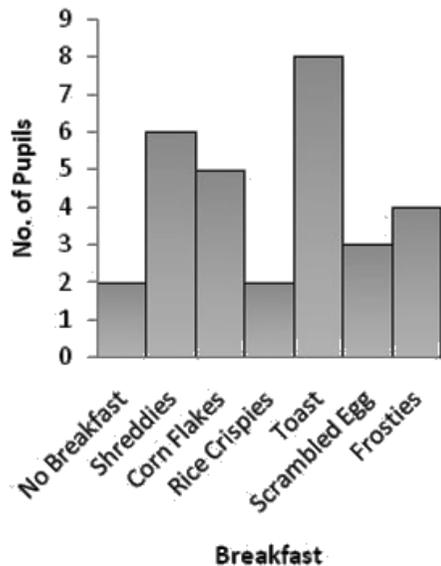
The information is shown on the graph below.



- a) How many pupils were on the bus from Ashgill?
- b) Which bus had the most pupils?
- c) How many pupils in total used the buses that day?
- d) The buses from Crosshouse and Netherburn were held up in traffic. How many pupils arrived late because of this?

6) A class of 1st year pupils were asked what they had for breakfast this morning. The histogram displays the information gathered

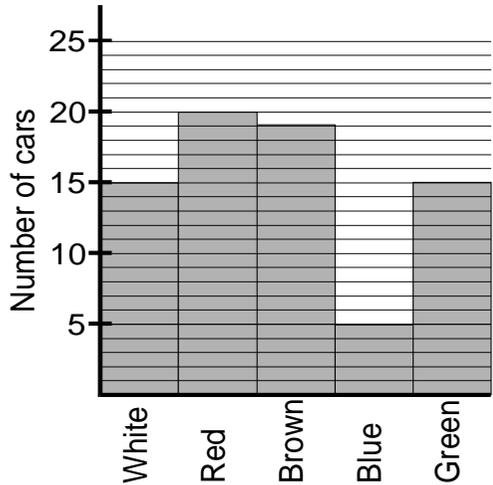
- a) How many pupils had Cornflakes?
- b) What was the most popular breakfast?
- c) How many pupils are in the class?
- d) How many pupils had cereal for breakfast?



## Exercise 1 (B)

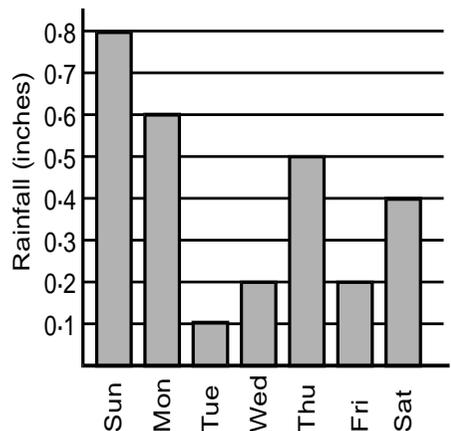
1) Here is a histogram showing the colour of cars passing a school.

- How many blue cars passed the school?
- What was the total number of cars passing the school?
- What number of cars were white?
- How many more brown cars were there than blue?
- How many of the cars were NOT blue?
- How many of the cars were green?

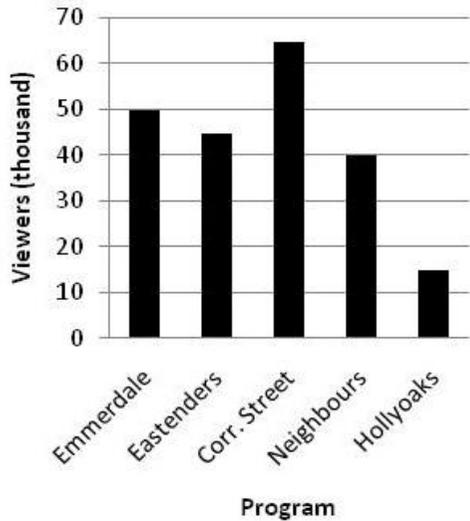


2) This graph gives the amount of rain which fell on each day of a week.

- Which day had the highest rainfall?
- Which day had the lowest?
- On what days did the same amount fall?
- Give the rainfall for each day?
- What was the total rainfall for the week?

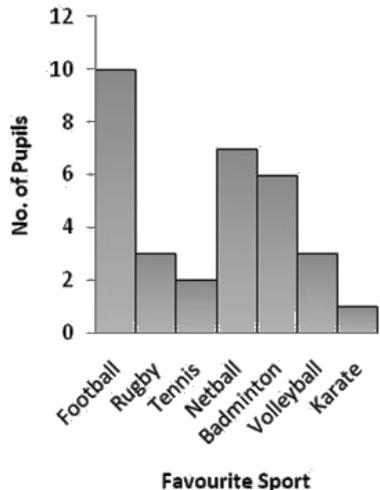


3) A survey was carried out and a bar chart is made of a large number of television viewers' favourite soap opera.



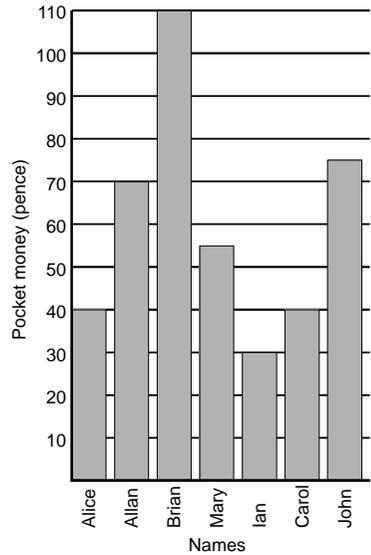
- a) How many people said their favourite soap was Emmerdale?
- b) How many people said their favourite soap was East Enders?
- c) What is the combined amount of people whose favourite was Hollyoaks and Neighbours?
- d) In total how many people took part in the survey?
- e) How many people said Coronation Street was not their favourite soap?

4) A histogram shows the favourite sports played by 1C1.

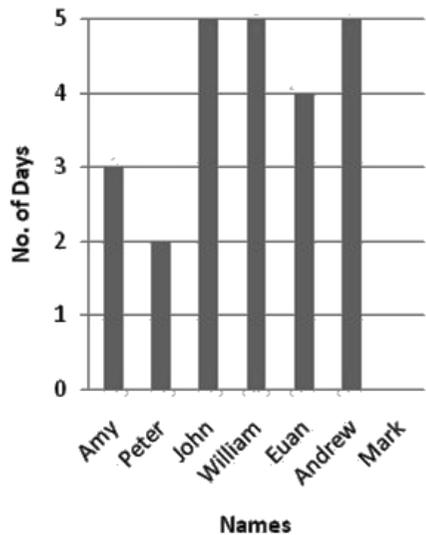


- a) How many pupils chose football as their favourite sport?
- b) How many preferred badminton?
- c) What was the total amount of pupils in the class?
- d) How many pupils chose a racket sport as their favourite?
- e) How many pupil's favourite sports are played using a ball?

- 5) This histogram shows the amount of pocket money given to various pupils.
- How much did Alice and Brian receive in total?
  - How many pupils received more than 60 pence?
  - What is the total amount of money of the 3 pupils who received the most pocket money?
  - What is the total of the 4 least?
  - What was the total amount received by all the pupils combined?



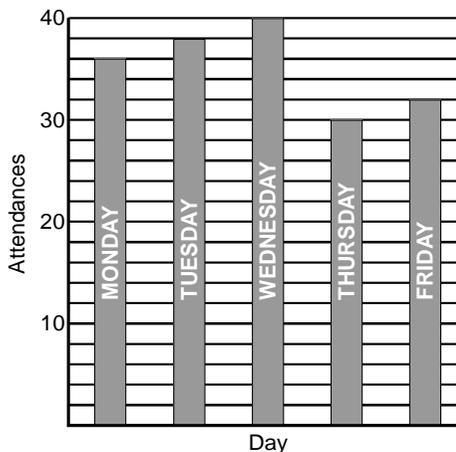
- 6) A bar chart is pictured showing the number of times pupils bought lunch from the school canteen in a normal week.
- How many times did Euan use the canteen?
  - What are the names of all the pupils who use the canteen every day?
  - How many days did Peter not use the canteen?
  - Make 2 suggestions why Mark never uses the canteen?



## Exercise 1(C)

1) Here is a bar chart showing class attendances for a week.

- Which day had the best attendance?
- Which day had the lowest attendance?
- How many were present each day?
- What was the total attendance for the week?
- What was the average attendance?

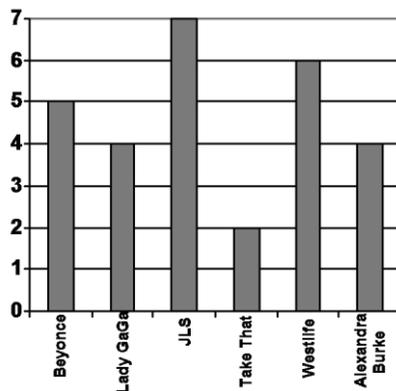


2) A school class wrote down the titles of 6 CDs.

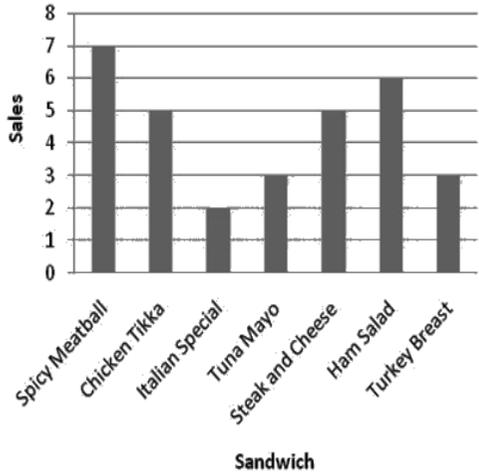
Each pupil was asked to vote for their favourite CD.

The bar graph shows the number of votes each CD received.

- How many voted for each CD?
- How many votes were there altogether?
- What percentage of pupils voted for each CD?



3) This graph shows which sandwiches were sold in Subway during Friday lunchtime.



a) What was the sale of the following sandwiches?

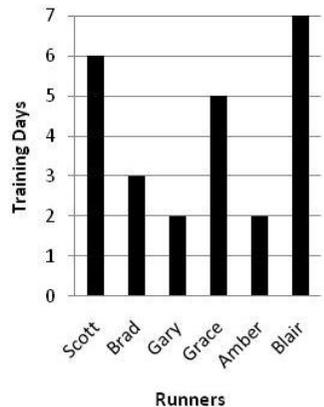
- i) Spicy Meatball
- ii) Turkey Breast
- iii) Tuna Mayo
- iv) Chicken Tikka
- v) Steak and Cheese
- vi) Ham Salad
- vii) Italian Special

b) What was the total amount of sandwiches sold?

c) What percentage of people bought the following sandwiches?

- i) Spicy Meatball
- ii) Turkey Breast
- iii) Tuna Mayo
- iv) Chicken Tikka
- v) Steak and Cheese
- vi) Ham Salad

4) A group of runners were asked how many days they trained each week. The information is shown in the graph.



a) How many trained 4 days or more?

b) Who trained the least?

c) List the runners who trained less than 5 days?

d) What is the total number of training days?

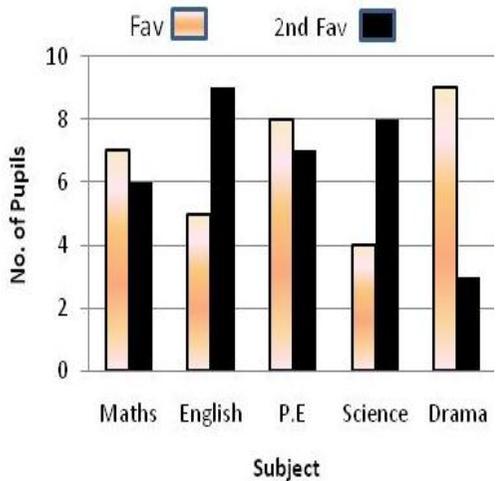
e) Calculate each runner's percentage of the total.

f) If you add up all the percentages what total should you reach?

g) Now add all the percentages together

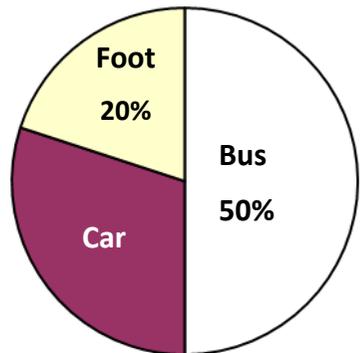
5) This Bar chart was made following a survey of an S1 class asking the pupils their favourite subject and their 2nd favourite subject.

- a) How many pupils are in the class (careful)?
- b) How many pupils chose as their favourite subject?
- c) How many pupils chose Maths as their 2nd favourite subject?
- d) How many pupils chose PE as their favourite or their 2nd favourite subject?
- e) How many pupils did not choose Drama as either their favourite or their 2nd favourite subject?
- f) Calculate the percentages of pupils for all the favourite subjects.
- g) Calculate the percentages of pupils for all the 2nd favourite subjects.
- h) Does the total of (f) and (g) come to 200?



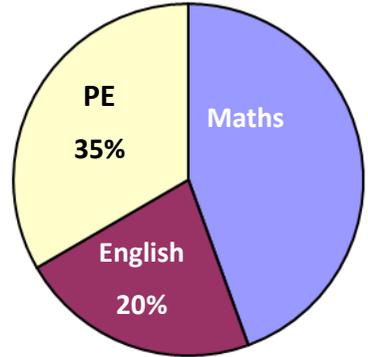
### Exercise 2 (A)

- 1) This pie chart shows how a group of pupils come to school.
  - a) What is the most popular method of travelling to school?
  - b) What is the least popular method of travelling to school?
  - c) What percentage of pupils travel to school by car?



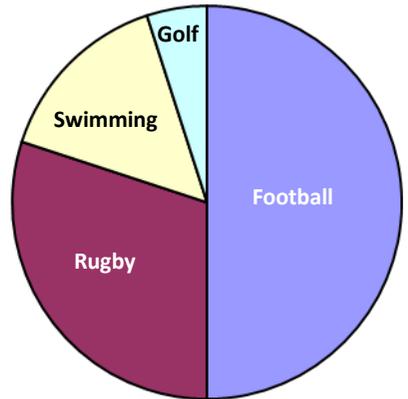
2) This pie chart shows the favourite subjects of some pupils

- a) Put the subjects in order of most to least
- b) What percentage of pupils said Maths was their favourite subject?



3) This pie chart shows pupils favourite sport

- a) What sport is the least popular?
- b) Which sport did half of the pupils say was their favourite?
- c) 150 pupils were surveyed, how many said football was their favourite sport?

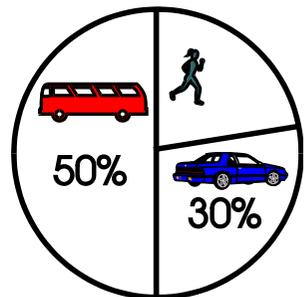


### Exercise 2 (B)

1) This pie chart shows how a group of pupils come to school.

What percentage of pupils come by

- a) bus
- b) car
- c) walking?
- d) What are the benefits of walking to school?



- 2) This pie chart shows the favourite sport of some pupils.

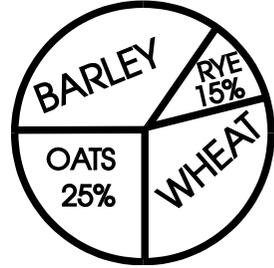
What percentage of pupils have swimming as their favourite sport?



- 3) This pie chart shows the different ingredients of a breakfast cereal.

There is the same amount of barley and wheat in the cereal.

What percentage of the cereal is barley?



- 4) The pie chart shows the holiday arrangements for a group of people.

- a) What percentage went touring if touring had 10% fewer people than seaside?  
 b) If camping and at home have the same percentage then what is the percentage



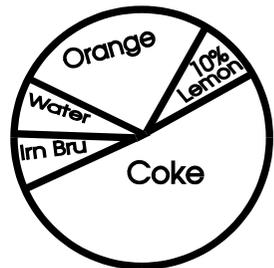
- 5) This pie chart shows the favourite drink of a group of first year pupils.

Water, Irn Bru and Lemon were equally popular.

Coke was the favourite drink of half the pupils in the group.

What percentage of pupils has the following drinks as their favourite?

- a) Irn Bru                      b) Coke                      c) Orange



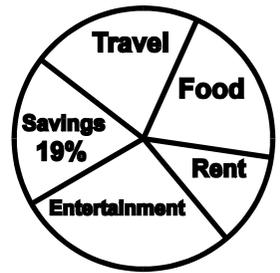
6) This pie chart shows how a family use their income.

They use 19% of their money for savings.

They spend  $\frac{1}{4}$  of their income on entertainment.

They also spend  $\frac{1}{5}$  of their income on travel.

They spend twice as much on food as on rent.



a) Write down the percentages spent on:

i) entertainment    ii) travel.

b) Write down the total percentage for entertainment, travel and savings.

c) Therefore write down the total percentage for food and rent.

d) Now calculate the percentage for:

i) rent                      ii) food.

### Exercise 3 (A)

1) The teachers and pupils in a school were asked to state which TV channel they preferred. The results were:

BBC1	30%
BBC2	10%
ITV	40%
Channel 4	.....%

a) Write down the percentage of people who preferred Channel 4.

b) On your Worksheet show this information on Pie Chart 1.

2) The information below shows the percentages of pupils with 1, 2, 3 or 4 brothers/sisters in their family.

1	40%
2	25%
3	15%
4	.....%

a) Write the percentage of pupils who come from a family with 4 brothers/sisters.

b) On your Worksheet show this information on Pie Chart 2.

**3)** The information below shows how a pupil spends her time during a Maths lesson.

Working	50%
Talking	10%
Listening	30%
Getting ready	5%
Packing up	.....%

- a)** Write down the percentage of time she spends packing up.
- b)** On your Worksheet show this information on Pie Chart 3.

**4)** The information below shows the percentages of where pupils went on their summer holidays.

Spain	35%
Tenerife	25%
Lanzarotte	20%
America	10%
Portugal	.....%
Other	.....%

The percentages for Portugal and Other were the same.

- a)** Write down the percentage for Portugal and Other.
- b)** On your Worksheet show this information on Pie Chart 4.

### Exercise 3 (B)

1) How do you get to school each day?

a) Collect raw data from class.

Copy out the table and complete using the raw data.

Method of Transport	Bus	Car	Foot
Number/Frequency			

b) Copy and complete the following table using the instructions given.

Method	Frequency	Fraction of total	Angle
Bus			
Car			
Foot			
<b>Total</b>			

Instructions

- Find the total for each method of transport
- Find the fraction of each by dividing by the total frequency
- Multiply the fraction by  $360^\circ$

c) Plot the information on a pie chart

2) A survey of types of cars using a car park is made with the following results:

Ford	Vauxhall	Nissan	Other
60	40	30	50

Show this information on a pie chart.

3) A survey was carried out to find out what 72 pupils did at the end of 5th year.

- 16 went into 6th year
- 24 went into employment
- 20 went to college
- 12 were unemployed

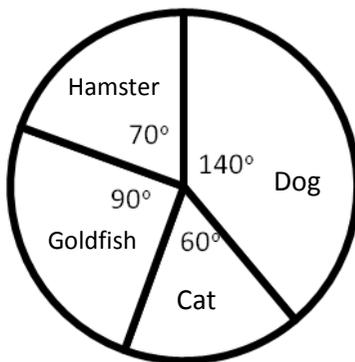
Show this information on a pie chart.

### Exercise 3 (C)

- 1) The pie chart illustrates what type of pets pupils have.

There are 840 pets in total.

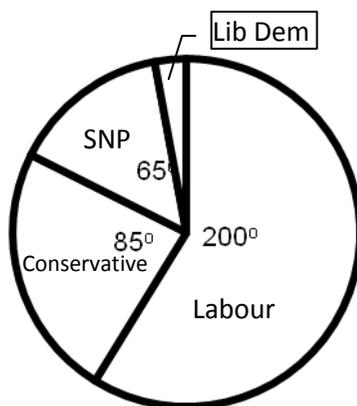
Find the number of each type of pet.



- 2) The votes cast in the 2010 General election in South Lanarkshire are shown. There were 19 568 votes cast in total.

a) What percentage of the vote did each party receive?

b) By how many votes did Labour win?



- 3) A survey was carried out in a school to find out pupils favourite TV programs.

The results were as follows:

X Factor	35%
Britain's Next Top Model	10%
Dr Who	25%
Sponge Bob Square Pants	17%
The Simpson's	13%

Show this information on a pie chart.

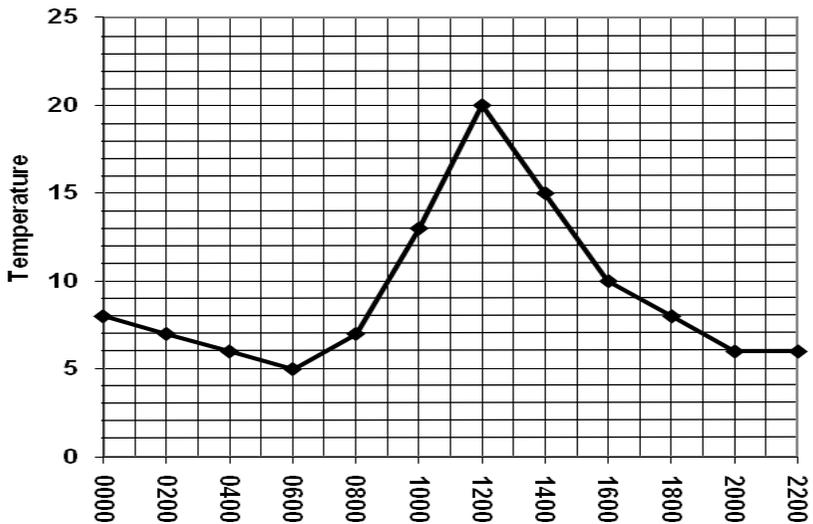
4) A survey was carried out in a school to find out pupils favourite food. The results were as follows:

Pasta	22%
Chicken	17%
Pizza	29%
Curry	14%
Fish	8%
Steak	.....%

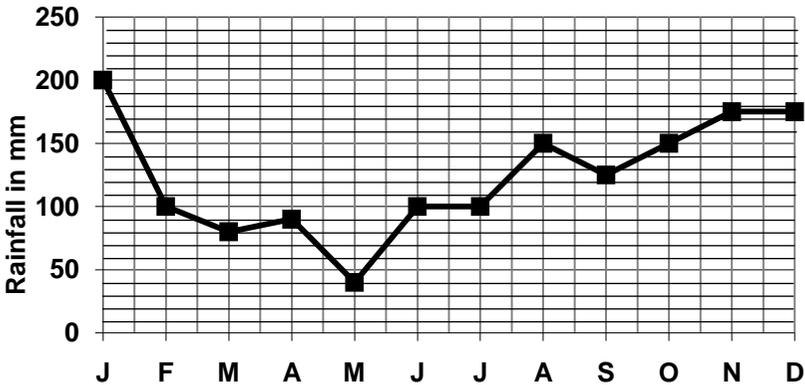
Show this information on a pie chart.

### Exercise 4(A)

- 1) The graph shows the temperature measured over a 24 hour period.
  - a) What was the highest temperature recorded?
  - b) What was the lowest temperature recorded?
  - c) What was the temperature at 12 noon?
  - d) How much did the temperature drop between 1 pm and 8 pm?

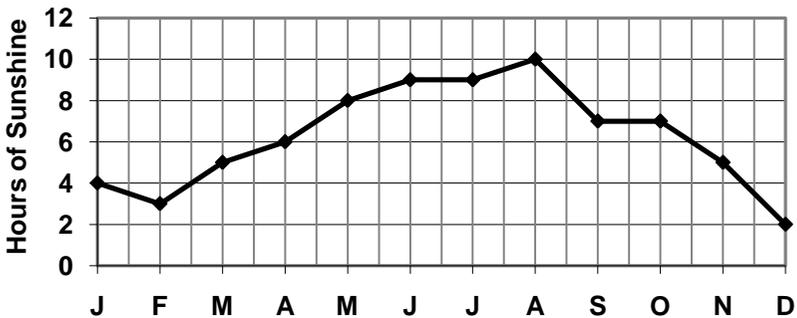


2) The graph shows the average monthly rainfall in Scotland.



- Which month was the driest month of the year?
- Which month was the wettest month of the year?
- What was the rainfall in July?
- What was the total rainfall from January to March?

3) The graph shows the average number of hours of sunshine per day during the year in Glasgow.



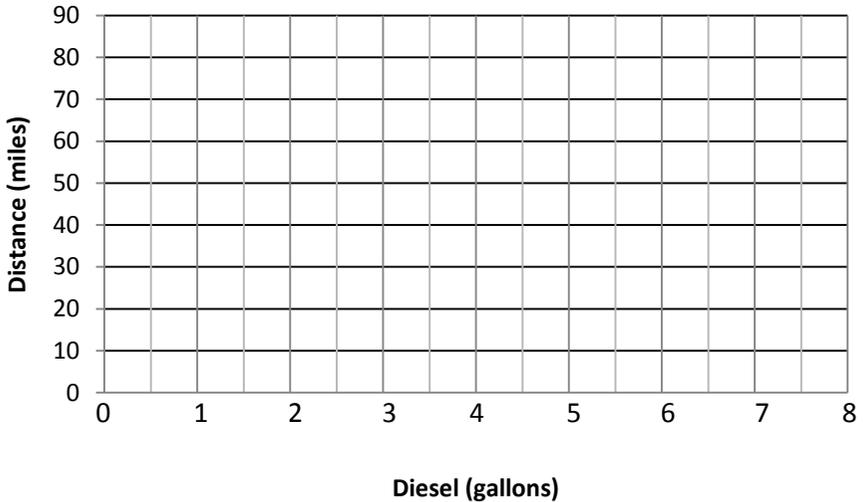
- Which month was the sunniest?
- In which month was there 8 hours of sunshine?
- Between which two months was the biggest increase?

4) A lorry travels 10 miles on every 1 gallon of diesel.

a) Complete the table below:

<b>Diesel (gallons)</b>	1	2	3	4	5	6	7	8
<b>Distance (miles)</b>								

b) Copy the set of axes below, plot the points from the table and draw a straight line through them with your ruler.

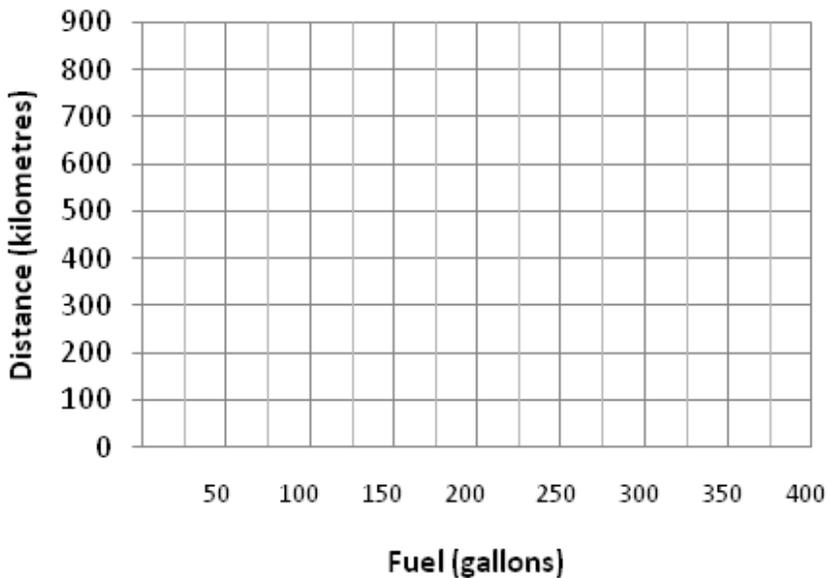


5) An aeroplane travels an average distance of 2 kilometres on 1 gallon of fuel.

a) Complete the table below

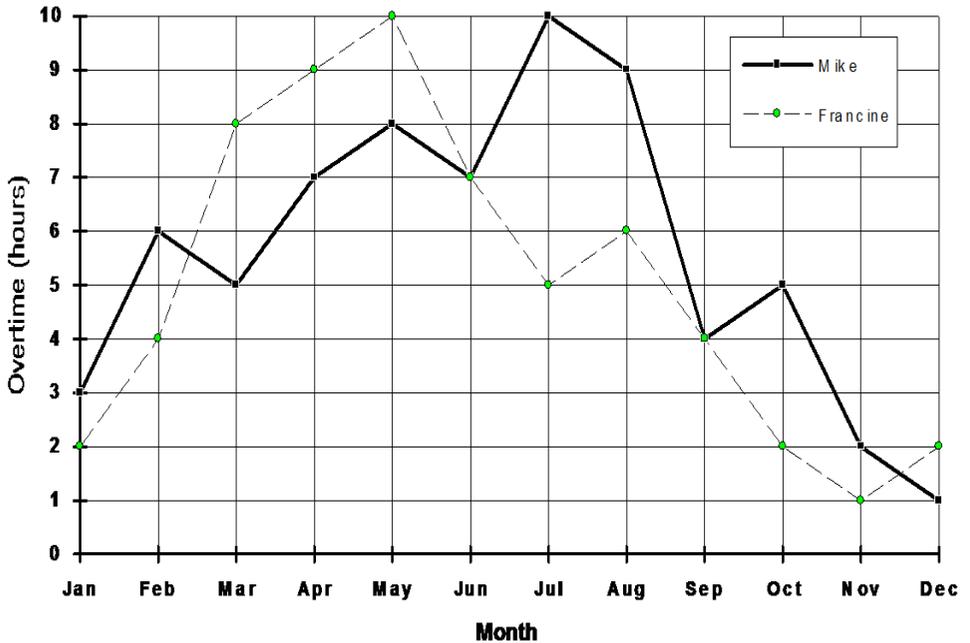
<b>Fuel (gallons)</b>	50	100	150	200	250	300	350	400
<b>Distance (kms)</b>	<b>100</b>		<b>300</b>					

b) Copy the set of axes below, plot the points from the table and draw a straight line through them with your ruler.



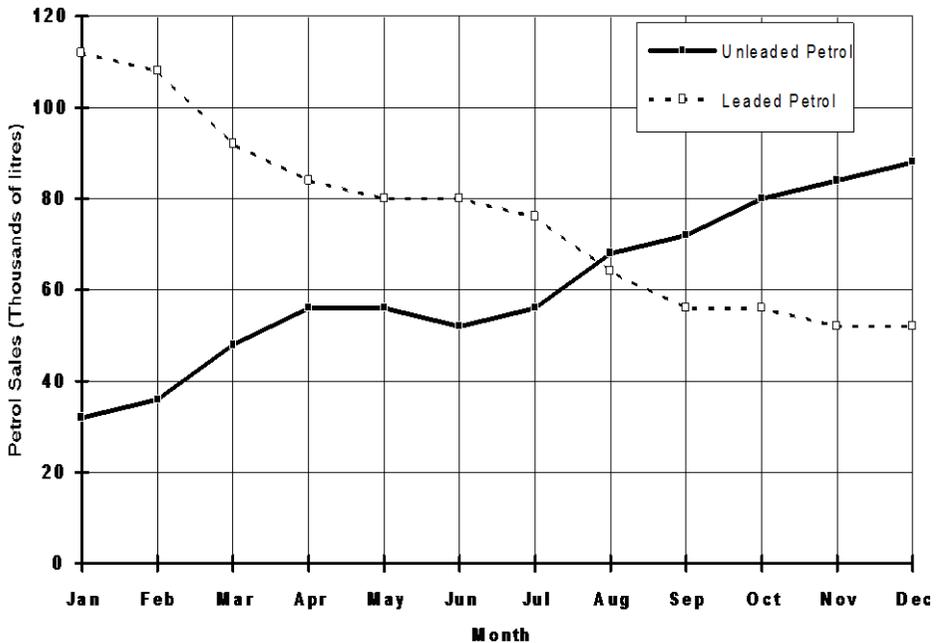
### Exercise 4(B)

- 1) Francine and Mike work for the same company but have different patterns of overtime during the year.



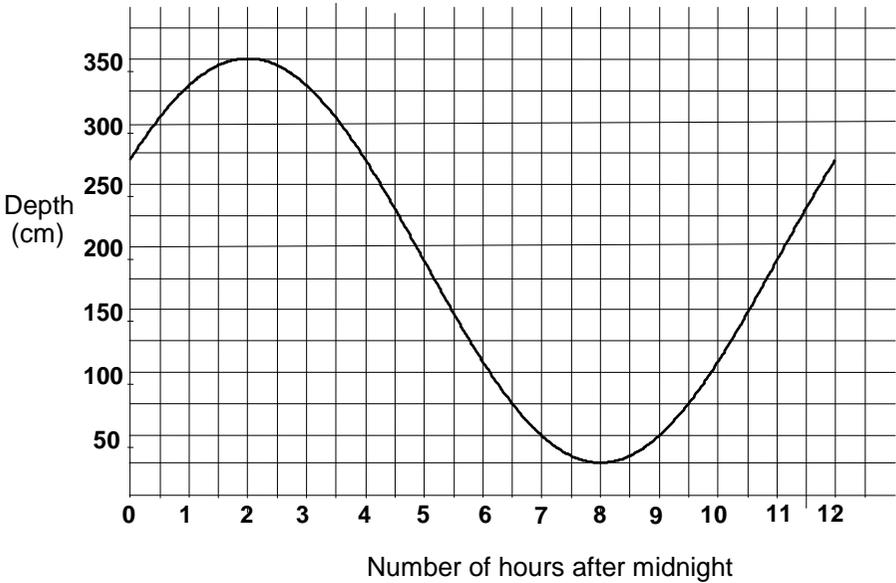
- In which months was Francine's overtime more than Mike's?
- In which months was their overtime the same?
- How much overtime did each work from January to December?

2) This graph shows the monthly sales of petrol at the Green Giant filling station.



- a) What were the sales of leaded petrol in May?
- b) Estimate the sales of unleaded petrol in May?
- c) Estimate as best you can the total sales of petrol in October.
- d) Write a few sentences about the two line graphs, giving reasons for the way they look.

- 3) The graph below shows the depth of water, measured in centimetres, in a certain harbour for up to 12 hours after midnight.



- During which hours was the depth of water increasing?
- During which hours was the depth of water decreasing?
- What was the maximum depth of water?
- What was the minimum depth of water?
- What was the depth of water at 6 am?
- What was the depth of water at 5 am?
- What was the depth of water at 10.30 am?
- At what times was the depth of water 200 cm?
- At what times was the depth of water 3.25 m?
- Write a sentence explaining what happens to the depth of water during the 12 hour period shown on the graph.

4) The annual rainfall in Glasgow and Edinburgh is shown in the table.

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Glasgow	150	160	130	100	65	50	50	59	75	80	105	110
Edinburgh	175	170	150	100	55	55	58	59	70	90	115	135

- On the same diagram draw a line graph of each set of data
- Which is the driest month in each city?
- Which month was the rainfall the same for both cities?
- Describe the overall trend of the graphs

5) The table shows male and female life expectancy from 1900 to 2000

Date	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990	2000
Male	45	50	60	60	55	55	60	70	75	75	78
Female	50	55	60	65	65	75	78	78	79	80	80

- On the same diagram draw two line graphs to show male and female life expectancy.
- By how much did female life expectancy increase from 1950 to 2000?
- What was the smallest difference in years between male and female life expectancy?
- Why do think the life expectancy of males dropped between 1940 and 1950?
- Describe the overall trend of the graphs. Discuss why you think the change in life expectancy is so great between 1900 and 2000.

### Exercise 4(C)

- 1) Mr and Mrs Jones decide to hire a car for a week.

The car hire company charges **£110 per week** plus **8 pence per mile**.

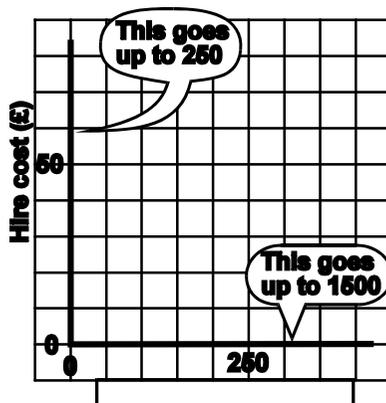
- a) Copy and complete the table below to show the hire costs for different distances:

Number of miles	0	250	500	750	1000	1250	1500
Cost in £							

- b) Draw the axes for a line graph in your jotter to show the information in your completed table

Remember to label the axes

(only one has been done for you).



- c) Plot the points and draw a line through them.

Use your completed graph to answer (d) and (e).

- d) How much will it cost to hire the car for the following distances travelled:

i) 200 miles

ii) 700 miles

iii) 950 miles?

- e) How many miles are travelled if the hire cost was £190?

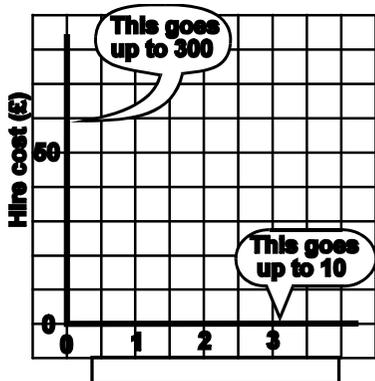
2) A Pop Group hires a recording studio for a fixed price of £180 for up to 5 days, plus £20 per day for each additional day.

a) Copy and complete the table below to show the hire costs for different numbers of days:

Number of days	1	2	3	4	5	6	7	8	9	10
Hire cost (£)					180					

b) Draw the axes for a line graph in your jotter to show the information in your completed table

Remember to label the axes  
(only one has been done for you).



c) Plot the points and therefore draw the graph.

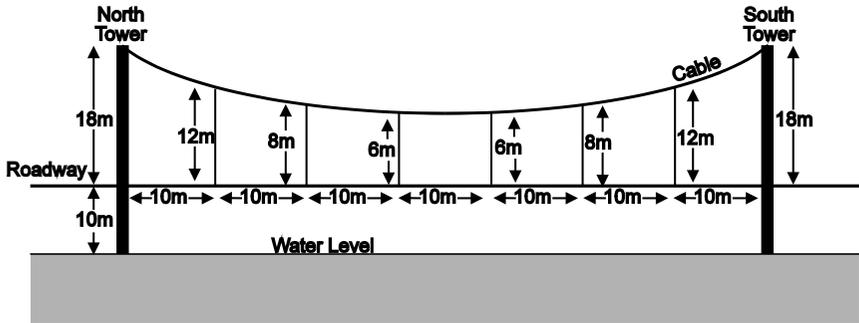
d) How much would it cost to hire the studio for:

- i) 12 days
- ii) 20 days?

e) How many days would the studio have been hired for if the bill was:

- i) £300
- ii) £420?

3)



Look at this drawing of a suspension bridge.

There are uprights every 10 metres as you go across the bridge.

- How far is it from the North Tower to the South Tower?
- How high is the top of the North Tower above the road?
- How high is the top of the South Tower above the water level?
- Copy and complete this table. It shows the height of the cable above the water level.

Distance from North Tower (metres)	0	10	20	30	40	50	60	70
Height of cable above water level(metres)	28	22						

- Draw a suitable set of axes in your jotter, remembering to extend the axes the correct distance.
- Plot the points in your table on your graph.
- Draw a curve through all the points you have marked.  
It should look like the curve of the cable in the picture at the top of this page.
- Use your curve to estimate the height of the cable at the following distances from the North Tower:
  - 5m
  - 12 m
  - 65 m
- What do you notice about your answers to (i) and (iii) in part (h)? Why is this?
- At what distances from the North Tower is the height of the cable
  - 26 metres
  - 17 metres



- 5) The table below show the depth of the water in a tidal river from 6 am to 6 pm on a certain day.

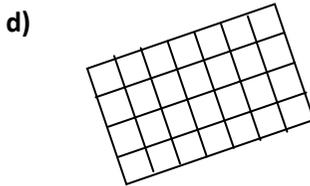
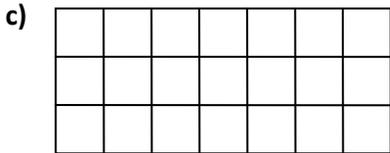
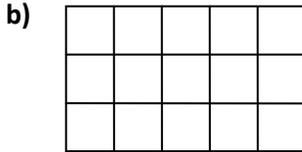
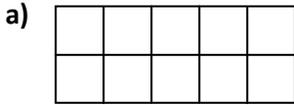
Time	6am	7am	8am	9am	10am	11am	12 noon	1pm	2pm	3pm	4pm	5pm	6pm
Depth (m)	7.9	6.8	5.3	3.6	2.3	1.8	2.2	3.2	4.7	6.4	7.6	8.2	7.9

- a) Draw a set of axes in your jotter, remembering to extend the axes the correct distance.
- b) Plot the points in the table on your graph.
- c) Draw a curve through all the points you have marked.
- d) Use your graph to estimate the depth of water at:  
i) 7.30 am                      ii) 8.30 am                      iii) 1.30 pm
- e) At what times is the depth of water  
i) 3 metres                      ii) 7.4 metres?
- f) At what time is the depth  
i) a minimum                      ii) a maximum?
- g) Find, as accurately as you can, the earliest time after 6 am when a yacht whose mast requires a clearance of 5.2 metres under a bridge 10 metres above the bed of the river.

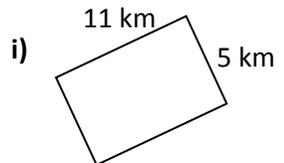
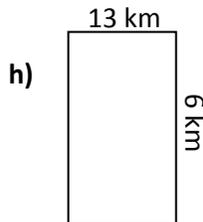
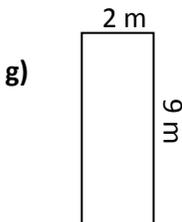
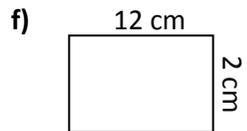
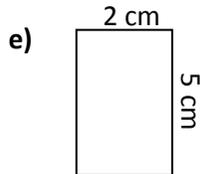
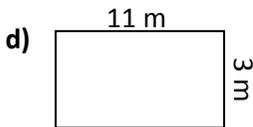
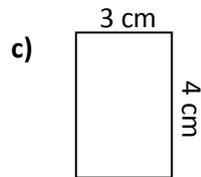
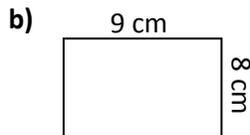
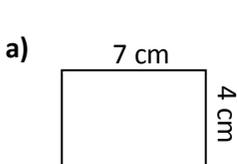
# Area and Volume

## Exercise 1 (A)

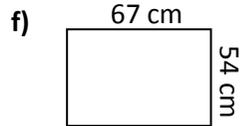
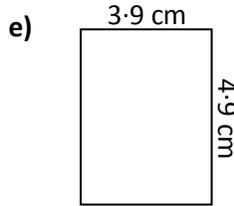
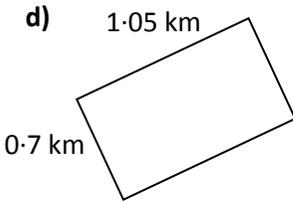
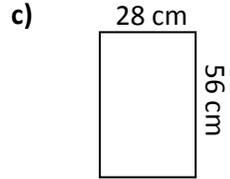
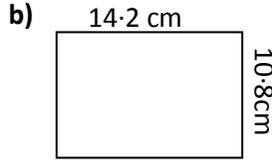
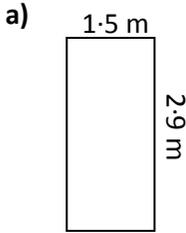
1) Count the number of squares in each of the following to find the area of the rectangles.



2) Work out the area of the following rectangles (do not use a calculator)



3) Work out the area of these rectangles (you can use a calculator)



### Exercise 1 (B)

1) Work out the area of the following squares and rectangles (remember to include units in your answer)

a) 4 cm by 8 cm

b) 9 cm by 7 cm

c) 2.5 m by 2.5 m

d) 3.6 km by 5 km

e) 24 cm by 16 cm

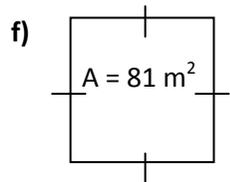
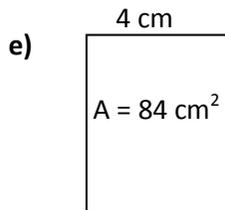
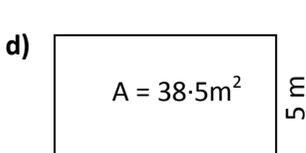
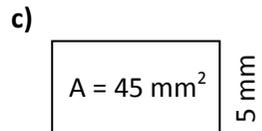
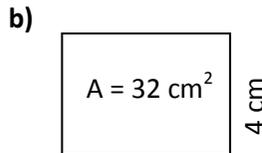
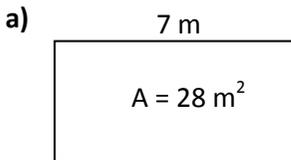
f) 1.25 m by 1.25 m

g) 100 m by 3.2 m

h) 4.9 m by 97.2 cm

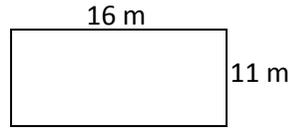
i) 6 mm by 7.2 m

2) Find the length or breadth of these rectangles:



- 3) Anna has a rectangular piece of grass in her garden.

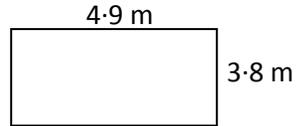
She wishes to turf it at a cost of **£1.65 per m<sup>2</sup>**.



Find the cost of turfing her garden.

- 4) Ross decides to paint one wall of his bedroom blue.

**One tin of paint covers 8 m<sup>2</sup>**.

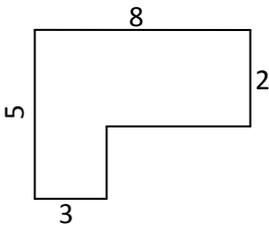


- a) How many tins will he need?  
b) If a tin costs £10.65 how much will it cost him?

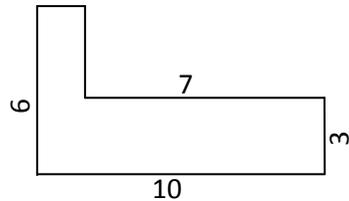
### Exercise 1 (B)

Find the area of the following shapes, all lengths are in metres.

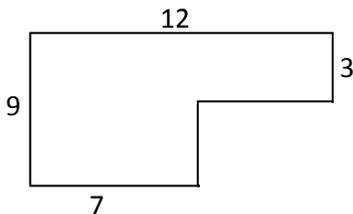
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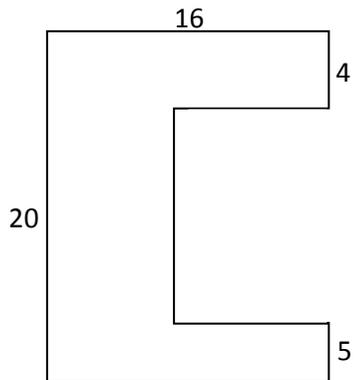
2)



3)

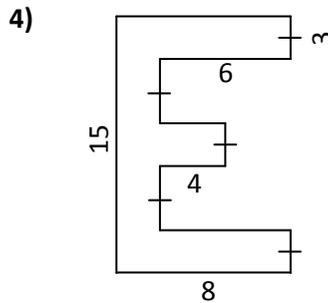
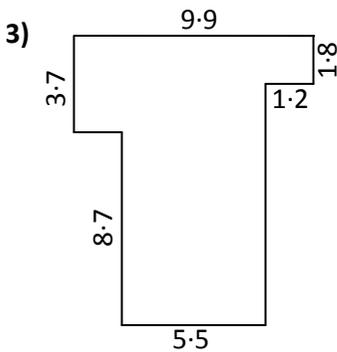
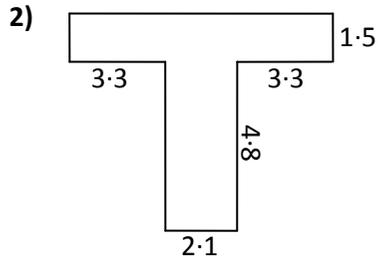
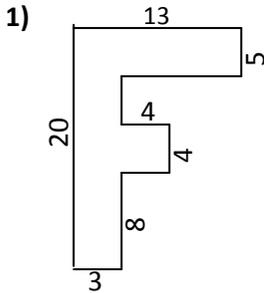


4)



### Exercise 1 (C)

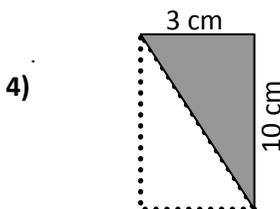
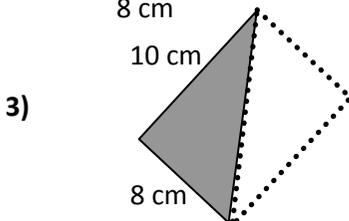
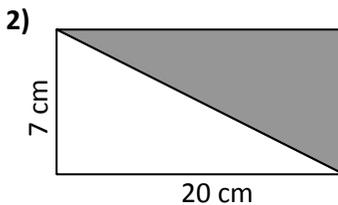
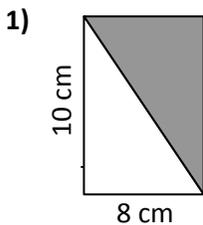
Find the area of the following shapes, all lengths are in metres.



### Exercise 2 (A)

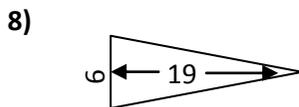
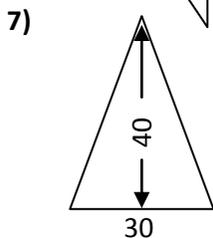
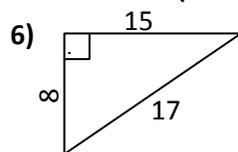
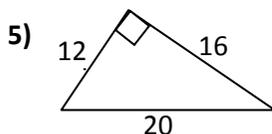
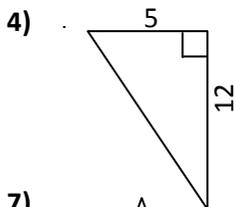
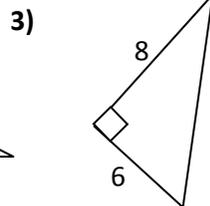
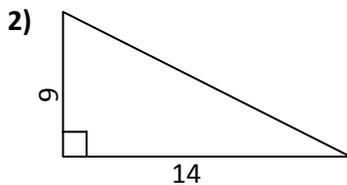
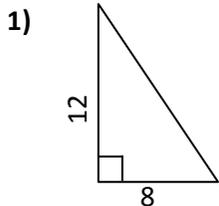
Calculate the area of the rectangles below.

The shaded areas are  $\frac{1}{2}$  of the total area of the rectangles. Calculate the shaded areas. Can you notice a rule for calculating the area of a right angled triangle?



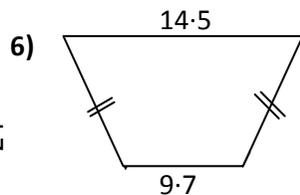
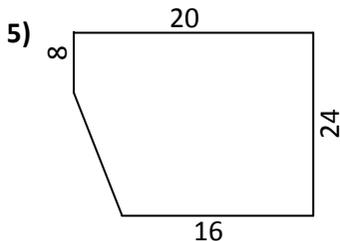
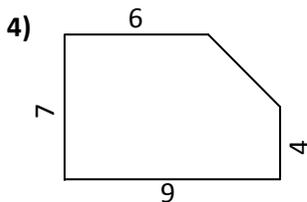
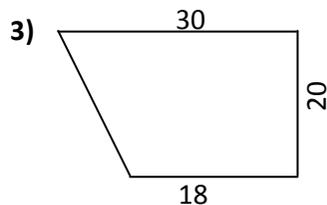
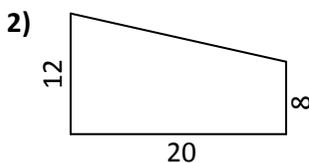
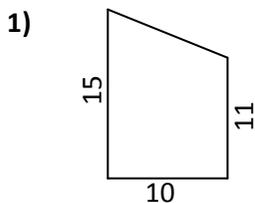
### Exercise 2 (A/B)

Using the rule you have discovered (Area of Triangle =  $\frac{1}{2} \times \text{base} \times \text{height}$ ), find the area of



### Exercise 2(B/C)

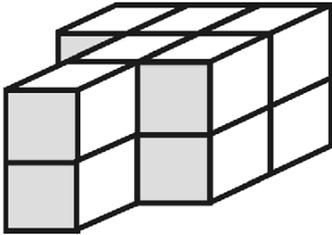
Work out the area of these shapes (lengths are in cm)



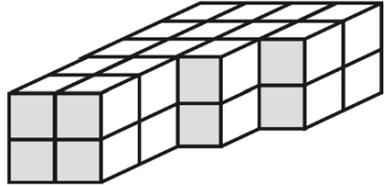
### Exercise 3(A)

Find the volume of these shapes by counting the 'cubes'.  
(some of the cubes are hidden)

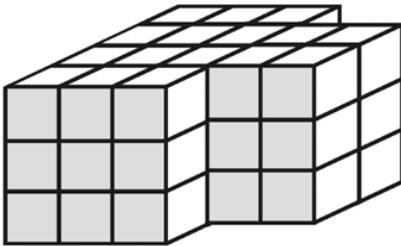
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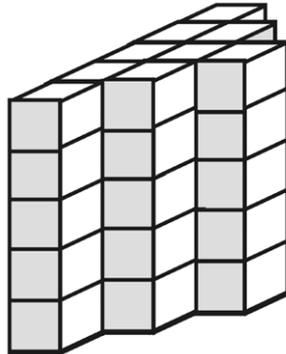
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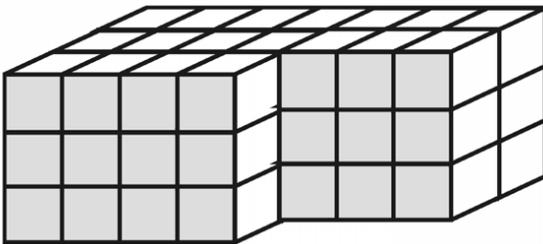
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4)

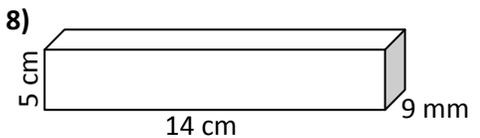
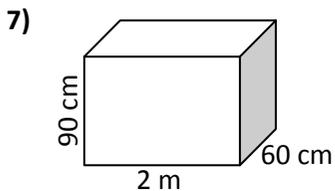
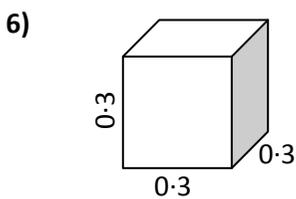
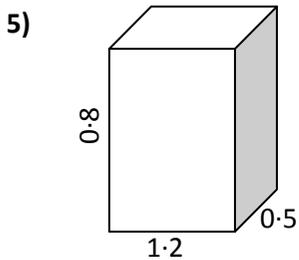
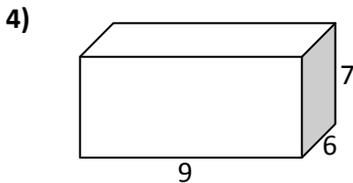
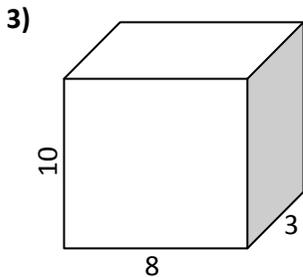
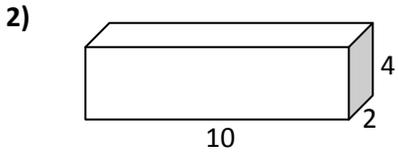
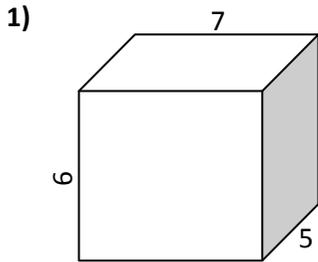


5)



### Exercise 3(B)

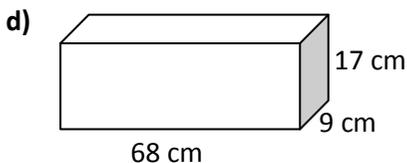
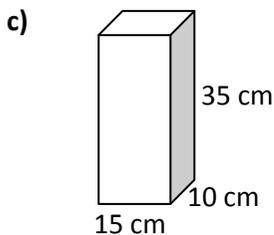
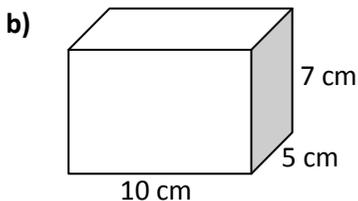
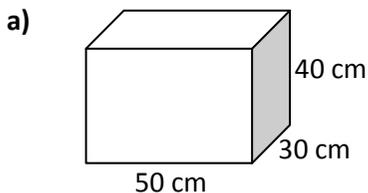
Find the volume of these cubes or cuboids  
(all lengths are in metres unless otherwise stated).



## Exercise 4(B)

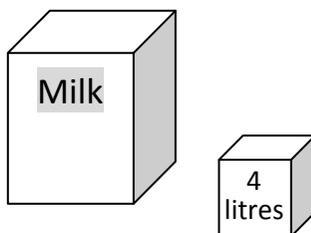
- 1) Calculate the volume of each cuboid in  $\text{cm}^3$ .

Write the volume in millilitres and calculate how many litres of liquid each of the following containers could hold.



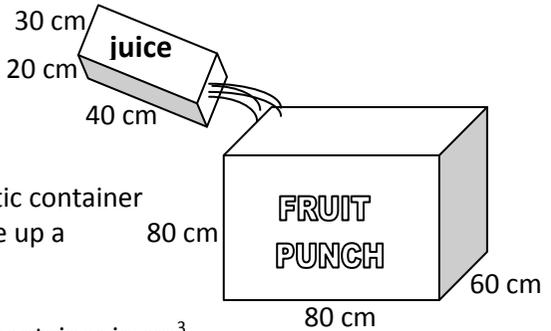
- 2) A container, in the shape of a cuboid, holds milk.

- a) Calculate its volume in  $\text{cm}^3$
- b) How many litres can it hold?
- c) How many 4 litre packets can be filled from the box when it is full ?



3) A carton of orange juice is in the shape of a cuboid measuring 30cm, by 20cm, by 40cm.

- a) Calculate its volume in  $\text{cm}^3$ .
- b) How many litres can it hold?

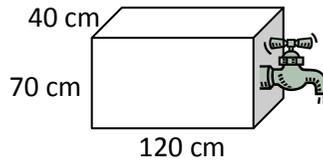


The carton is poured into a plastic container in the shape of a cuboid to make up a fruit punch.

- c) Calculate the volume of the container in  $\text{cm}^3$
- d) How many litres can the container hold ?
- e) How many cartons need to be poured in to fill the container ?

4) This tank is full of olive oil.

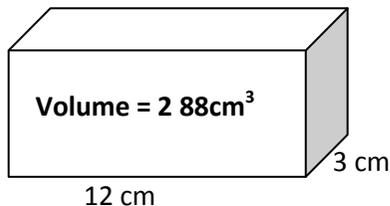
- a) Calculate its volume in  $\text{cm}^3$
- b) How many litres can it hold ?



It is discovered the tank is left in the sunlight and the oil has spoiled, therefore the tap is opened and the oil pours out at a rate of 6 litres/minute.

- c) How long will it take for the tank to empty?

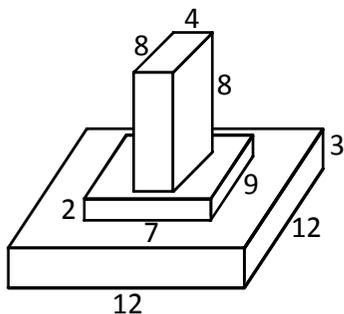
5) Calculate the length of the missing edge of the cuboid.



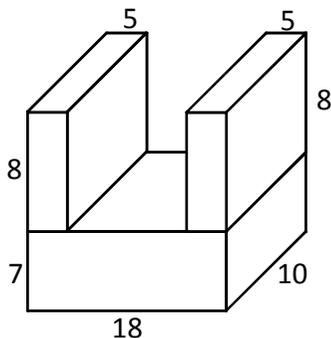
### Exercise 5(C)

Find the volume of these compound 3D shapes. (all sizes in centimetres)

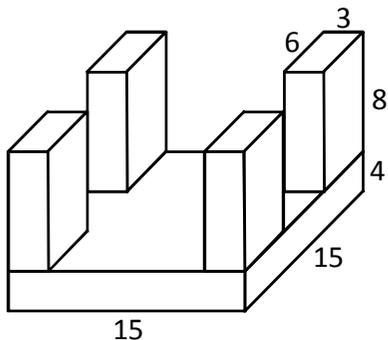
1)



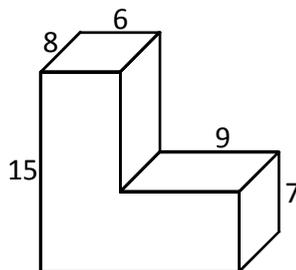
2)



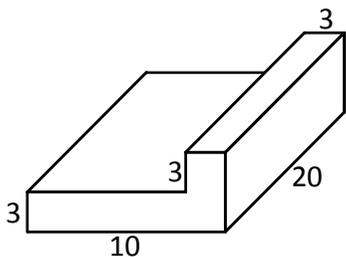
3)



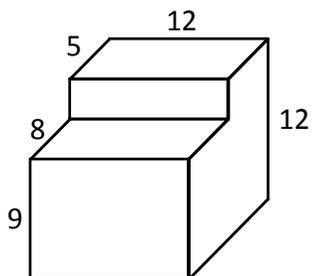
4)



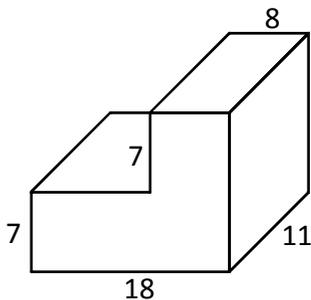
5)



6)



7)



# Negative Numbers



## Exercise 1 (A)

1) Draw a Celsius thermometer and mark a scale on it from  $-10^{\circ}$  to  $+10^{\circ}$ . Use your drawing to write the following temperatures as positive or negative numbers:-

- |                                      |                                     |
|--------------------------------------|-------------------------------------|
| a) $10^{\circ}$ above freezing point | b) $7^{\circ}$ below freezing point |
| c) $3^{\circ}$ below zero            | d) $5^{\circ}$ above zero           |
| e) $8^{\circ}$ below zero            | f) freezing point.                  |

2) Write down, in words, the meaning of the following temperatures:-

- |                         |                         |                          |
|-------------------------|-------------------------|--------------------------|
| a) $-2^{\circ}\text{C}$ | b) $+3^{\circ}\text{C}$ | c) $4^{\circ}\text{C}$   |
| d) $-10^{\circ}$        | e) $8^{\circ}\text{C}$  | f) $0^{\circ}\text{C}$ . |

3) Which is colder  $-8^{\circ}\text{C}$  or  $-4^{\circ}\text{C}$ ?

4) Is  $-1^{\circ}\text{C}$  colder or warmer than  $-2^{\circ}\text{C}$ ?

5) Which is colder  $-5^{\circ}\text{C}$  or  $-10^{\circ}\text{C}$ ?

6) Which of these temperatures is lowest?  $-6^{\circ}\text{C}$ ,  $-4^{\circ}\text{C}$ ,  $-8^{\circ}\text{C}$ .

7) Which of these temperatures is highest?  $-10^{\circ}\text{C}$ ,  $-2^{\circ}\text{C}$ ,  $-3^{\circ}\text{C}$ .

8) Is  $4^{\circ}\text{C}$  higher or lower than  $-6^{\circ}\text{C}$ ?

9) Here are some pairs of temperatures.  
Write down the higher temperature of each pair.

- |   |   |  |
|---|---|--|
| a) $0^{\circ}\text{C}$ , $5^{\circ}\text{C}$      | b) $0^{\circ}\text{C}$ , $-5^{\circ}\text{C}$ | c) $-8^{\circ}\text{C}$ , $-3^{\circ}\text{C}$ |
| d) $12^{\circ}\text{C}$ , $-16^{\circ}\text{C}$ . |   |  |

- 10)** What temperature is 5 degrees higher than  $2^{\circ}\text{C}$ ?
- 11)** What temperature is 5 degrees lower than  $2^{\circ}\text{C}$ ?
- 12)** What temperature is 10 degrees lower than  $-3^{\circ}\text{C}$ ?
- 13)** What temperature is 10 degrees higher than  $-3^{\circ}\text{C}$ ?
- 14)** Use positive or negative numbers to describe the following quantities
- a)** 5 seconds before blast-off of a rocket.
  - b)** 5 seconds after blast-off of a rocket.
  - c)** 50p in your purse.
  - d)** 50p owed.
  - e)** 1 minute before the train leaves the station.
  - f)** A win of £50 on premium bonds.
  - g)** A debt of £5
  - h)** Walking forwards 5 paces
  - i)** Walking backwards five paces
  - j)** The top of a hill which is 200 m above sea level.
  - k)** A ball thrown down a distance of 5 m.
- 15)** At midnight the temperature was  $-2^{\circ}\text{C}$ . One hour later it was  $1^{\circ}$  colder. What was the temperature then?
- 16)** At midday the temperature was  $18^{\circ}\text{C}$ . Two hours later it was  $3^{\circ}$  warmer. What was the temperature then?
- 17)** A rock climber started at +200m and came a distance of 50m down the rock face. How far above sea level was he then?

## Exercise 2 (A)

- |               |               |                |                 |
|---------------|---------------|----------------|-----------------|
| 1) $2 - 3$    | 2) $7 - 9$    | 3) $14 - 19$   | 4) $12 - 15$    |
| 5) $6 - 11$   | 6) $9 - 16$   | 7) $18 - 25$   | 8) $3 - 24$     |
| 9) $22 - 38$  | 10) $39 - 54$ | 11) $4 - 37$   | 12) $8 - 47$    |
| 13) $58 - 72$ | 14) $59 - 95$ | 15) $80 - 138$ | 16) $243 - 437$ |

## Exercise 2 (B)

Find the next two numbers in each sequence.

- |                     |                  |                   |                 |
|---------------------|------------------|-------------------|-----------------|
| 1) 10, 8, 6, 4      | 2) 12, 9, 6      | 3) 3, 2, 1, 0, -1 | 4) 4, 2, 0, -2  |
| 5) 12, 6, 0         | 6) -3, -2, -1    | 7) -8, -6, -4     | 8) 10, 6, 2     |
| 9) 15, 5, -5        | 10) -10, -6, -2  | 11) -7, -4, -1    | 12) 6, 2, -2    |
| 13) 2, 3, 5, 8      | 14) 12, 11, 9, 6 | 15) 0, 1, 3, 6    | 16) 4, 3, 1, -2 |
| 17) -10, -9, -7, -4 | 18) 5, 2, -1, -4 | 19) 24, 10, -4    | 20) -11, -7, -3 |

## Exercise 3 (A)

Calculate the following

- |                  |                  |                   |                  |
|------------------|------------------|-------------------|------------------|
| 1) $3 + (-2)$    | 2) $6 + (-4)$    | 3) $4 + (-7)$     | 4) $6 + (-6)$    |
| 5) $11 + (-9)$   | 6) $9 + (-10)$   | 7) $7 + (-16)$    | 8) $-4 + 3$      |
| 9) $-5 + (-5)$   | 10) $-4 + (-10)$ | 11) $-3 + (-12)$  | 12) $-5 + (-3)$  |
| 13) $-8 + (-10)$ | 14) $-10 + (-2)$ | 15) $-3 + (-3)$   | 16) $-5 + (-1)$  |
| 17) $-11 + (-9)$ | 18) $-7 + (-13)$ | 19) $-10 + (-10)$ | 20) $-12 + (-7)$ |
| 21) $-4 + (-4)$  | 22) $-4 + (-2)$  | 23) $-4 + 4$      | 24) $-9 + (-9)$  |
| 25) $-2 + 6$     | 26) $-3 + 10$    | 27) $-3 + 1$      | 28) $-5 + 6$     |
| 29) $-8 + 11$    | 30) $-6 + 1$     | 31) $-3 + 2$      | 32) $-7 + 3$     |
| 33) $-8 + 1$     | 34) $-7 + 2$     | 35) $-8 + 6$      | 36) $-7 + 10$    |
| 37) $-6 + 30$    | 38) $-100 + 1$   | 39) $-8 + 38$     | 40) $5 + (-4)$   |
| 41) $7 + (-3)$   | 42) $-10 + (-4)$ | 43) $6 + (-10)$   | 44) $8 + (-9)$   |
| 45) $-8 + (-12)$ | 46) $-5 + (-6)$  | 47) $-6 + (-2)$   | 48) $8 + (-14)$  |

### Exercise 3 (B)

Calculate the following

- 1)  $7 - (-5)$       2)  $9 - (-1)$       3)  $7 - (-9)$       4)  $6 - (-13)$   
5)  $9 - (-8)$       6)  $18 - (-1)$       7)  $5 - (-19)$       8)  $2 - (-15)$   
9)  $17 - (-15)$       10)  $29 - (-17)$       11)  $56 - (-9)$       12)  $68 - (-27)$   
13)  $86 - (-8)$       14)  $98 - (-1)$       15)  $59 - (-49)$       16)  $29 - (-115)$   
17)  $56 - (-34)$       18)  $99 - (-41)$       19)  $39 - (-39)$       20)  $79 - (-135)$   
21)  $-9 - (-16)$       22)  $-15 - (-21)$       23)  $-32 - (-41)$       24)  $-45 - (-67)$   
25)  $-92 - (-42)$       26)  $-115 - (-71)$       27)  $-232 - (-51)$       28)  $-345 - (-62)$

### Exercise 3(C)

Calculate the following

- 1)  $5 + (-2) + 1$       2)  $8 + (-6) + 4$       3)  $9 + (-2) + (-3)$       4)  $12 + (-7) + (-5)$   
5)  $-6 + 3 + 5$       6)  $-4 + 3 + (-2)$       7)  $-10 + (-1) + (-2)$   
8)  $1 + (-2) + (-3)$       9)  $-6 + (-3) + 5$       10)  $-4 + (-3) + (-2)$   
11)  $-10 + (-1) + 2$       12)  $-18 + 21 + (-23)$   
13) The table shows ordinary summer and winter temperatures for 8 cities

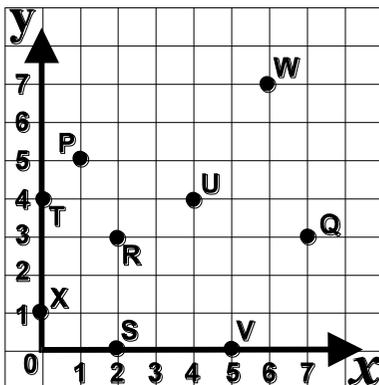
CITY	WINTER TEMPERATURE	SUMMER TEMPERATURE
London	4°C	18°C
Rome	7°C	25°C
Moscow	-9°C	18°C
Johannesburg	10°C	20°C
New York	-1°C	24°C
San Francisco	10°C	17°C
Sydney	11°C	21°C
Wellington(NZ)	8°C	17°C

- a) Which city has the lowest winter temperature?  
b) Which city has the highest winter temperature?  
c) Which cities have the lowest summer temperature?

- d) Which city has the highest summer temperature?
- e) The temperature in London goes up by 14 degrees between winter and summer. By how many degrees does it go up in:
- i) Rome                      ii) Moscow                      iii) New York?

### Exercise 4 (A)

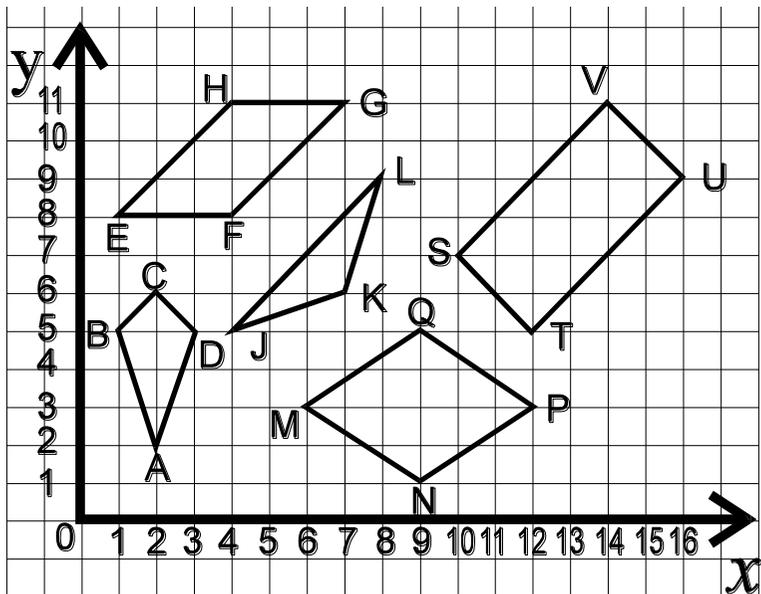
- 1) Write down the coordinates of P, Q, R, S, T, U, V, W and X



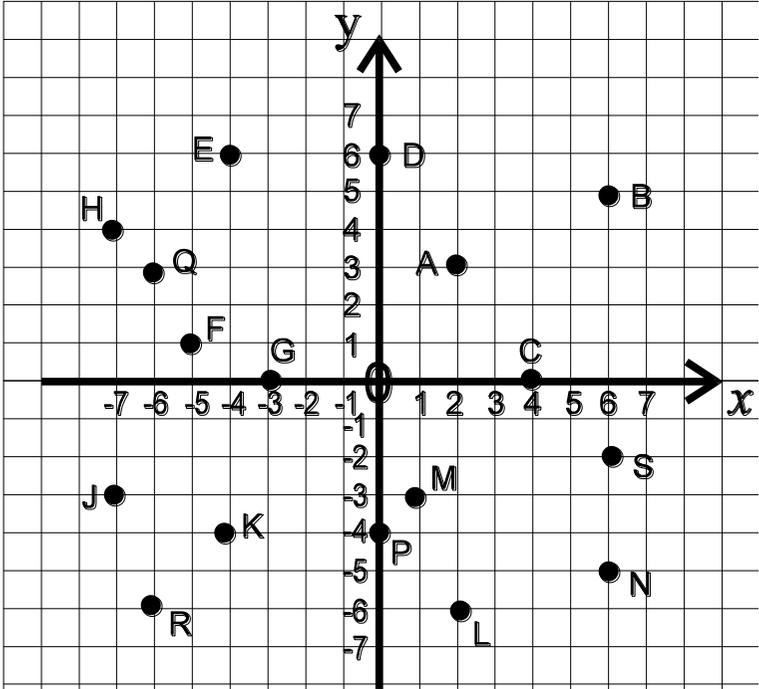
- 2) Draw a set of axes like the ones in question 1.
- a) Plot the points  $P(0, 6)$ ,  $Q(0, 2)$  and  $R(6, 2)$ . Join P to Q and Q to R.
- b) P, Q and R are three corners of rectangle PQRS. Plot the fourth corner S
- c) Write down the coordinates of S.
- d) Draw the diagonal lines PR and QS.
- Mark the point where these lines cross and call the point T.
- e) Write down the coordinates of T.

- 3) Draw a set of axes like the ones in question 1.
- Plot the points  $A(3, 1)$ ,  $B(1, 5)$  and  $C(3, 6)$ . Join A to B and B to C.
  - A, B and C are three corners of rectangle ABCD. Plot the fourth corner D
  - Write down the coordinates of D.
  - Plot the point which is at the centre of the rectangle. Call this point E.
  - Write down the coordinates of E.
- 4) Copy and complete the table below using the diagram.

Name of shape	Coordinates of the corners
Kite ABCD	$A(2, 2)$ $B(, )$ $C(, )$ $D(, )$
.....EFGH	$E(, )$

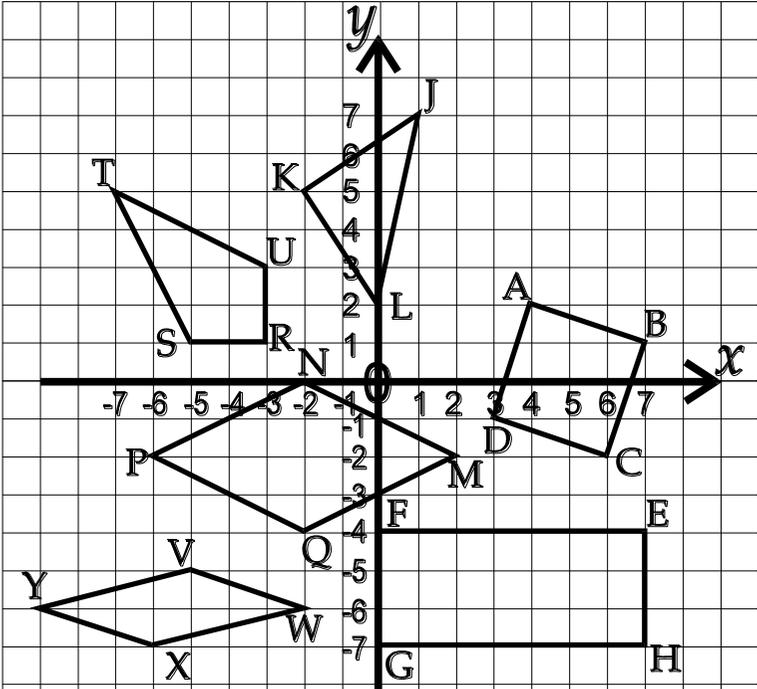


5) Write down the coordinates of all the points shown in the diagram below.



6) Copy and complete the table below using the diagram below.

Name of shape	Coordinates of the corners
Square ABCD	A(4, 2) B( , ) C( , ) D( , )
.....EFGH	E( , )



**For the following questions draw your own set of axes and scale each one from  $-5$  to  $5$ .**

- 7)** Plot the points  $A(-3, 4)$ ,  $B(-1, 4)$ ,  $C(1, 3)$ ,  $D(1, 2)$ ,  $E(-1, 1)$ ,  $F(1, 0)$ ,  $G(1, -1)$ ,  $H(-1, -2)$ ,  $I(-3, -2)$ .

Join the points in alphabetical order and join I to A.

- 8)** Plot the points  $A(4, -1)$ ,  $B(4, 2)$ ,  $C(3, 3)$ ,  $D(2, 3)$ ,  $E(2, 4)$ ,  $F(1, 4)$ ,  $G(1, 3)$ ,  $H(-2, 3)$ ,  $I(-3, 2)$ ,  $J(-3, -1)$ .

Join the points in alphabetical order and join J to A.

- 9)** Plot the points  $A(2, 1)$ ,  $B(-1, 3)$ ,  $C(-3, 0)$ ,  $D(0, -2)$ .

Join the points to make the figure ABCD. What kind of shape is this figure?

- 10)** Plot the points  $A(1, 3)$ ,  $B(-1, -1)$ ,  $C(3, -1)$ .

Join the points to make the figure ABC and describe ABC.

- 11)** Plot the points  $A(-2, -1)$ ,  $B(5, -1)$ ,  $C(5, 2)$ ,  $D(-2, 2)$ .

Join the points to make the figure ABCD and describe ABCD.

- 12)** Plot the points  $A(-3, 0)$ ,  $B(1, 3)$ ,  $C(0, -4)$ .

What kind of triangle is ABC?

## Exercise 4(B)

1) Draw a set of axes running from  $-8$  to  $8$  in each direction.

Plot these sets of points in your jotter joining them up as you go:

a)  $(-7, 3) \rightarrow (-7, 5) \rightarrow (-6, 4) \rightarrow (-5, 5) \rightarrow (-5, 3)$

b)  $(-4, 3) \rightarrow (-3, 5) \rightarrow (-2, 3)$

c)  $(-3\frac{1}{2}, 4) \rightarrow (-2\frac{1}{2}, 4)$

d)  $(-2, 5) \rightarrow (0, 5)$

e)  $(-1, 5) \rightarrow (-1, 3)$

f)  $(1, 5) \rightarrow (1, 3)$

g)  $(1, 4) \rightarrow (3, 4)$

h)  $(3, 5) \rightarrow (3, 3)$

i)  $(6, 5) \rightarrow (4, 5) \rightarrow (4, 4) \rightarrow (6, 4) \rightarrow (6, 3) \rightarrow (4, 3)$

j)  $(-1, 1) \rightarrow (-1, -1)$

k)  $(2, 1) \rightarrow (0, 1) \rightarrow (0, 0) \rightarrow (2, 0) \rightarrow (2, -1) \rightarrow (0, -1)$

l)  $(-2, -3) \rightarrow (-4, -3) \rightarrow (-4, -5)$

m)  $(-4, -4) \rightarrow (-2, -4)$

n)  $(-1, -3) \rightarrow (-1, -5) \rightarrow (1, -5) \rightarrow (1, -3)$

o)  $(2, -5) \rightarrow (2, -3) \rightarrow (4, -5) \rightarrow (4, -3)$

What sentence does this make?

**2)** Draw a set of  $x, y$  axes extending 4 units in all 4 directions.

**a)** Plot these points, and join them up:

$(3, 0), (1, 1), (0, 3), (-1, 1), (-3, 0), (-1, -1), (0, -3), (1, -1), (3, 0)$ .

**b)** Describe the shape you have drawn.

**c)** What are the coordinates of its centre?

**3)** A rectangular area is roped off for study.

Three of its vertices are at  $(-2, 2), (6, -2)$  and  $(4, -6)$ .

Plot these points on an  $x, y$  diagram (extending 6 units in all 4 directions), and complete the rectangle.

Write down the coordinates of:

**a)** the fourth vertex

**b)** the centre of the rectangle

**c)** the mid points of its sides.

For the next 10 questions plot the points A & B and then find the length of the line AB

**4)**  $A(2, 2), B(-4, 2)$     **5)**  $A(-2, -1), B(6, -1)$     **6)**  $A(-4, -4), B(-4, 2)$

**7)**  $A(1, -6), B(1, -8)$     **8)**  $A(3, 2), B(5, 2)$     **9)**  $A(5, -1), B(5, 6)$

**10)**  $A(-2, 4), B(-7, 4)$     **11)**  $A(-1, -2), B(-8, -2)$     **12)**  $A(-3, 5), B(-3, -6)$

**13)**  $A(-2, -4), B(-2, 7)$

For the next 10 questions the points A, B and C are three corners of a square ABCD. Plot the points, find D and state the coordinates of D.

**14)**  $A(1, 1), B(1, -1), C(-1, -1)$

**15)**  $A(1, 3), B(6, 3), C(6, -2)$

**16)**  $A(3, 3), B(3, -1), C(-1, -1)$

**17)**  $A(-2, -1), B(-2, 3), C(-6, 3)$

**18)**  $A(-5, -3), B(-1, -3), C(-1, 1)$

**19)**  $A(-3, -1), B(-3, 2), C(0, 2)$

**20)**  $A(0, 4), B(-2, 1), C(1, -1)$

**21)**  $A(1, 0), B(3, 2), C(1, 4)$

**22)**  $A(-2, -1), B(2, -2), C(3, 2)$

**23)**  $A(-3, -2), B(-5, 2), C(-1, 4)$

For questions 24–33 plot the points A, B and hence find C, the midpoint of the line AB.

State the coordinates of C.

Once you have tried the first 2 examples see if you can find out how to find the coordinates of C without drawing a diagram.

**24)** A(2, 2), B(6, 2)    **25)** A(2, 3), B(2, -5)    **26)** A(-1, 3), B(-6, 3)

**27)** A(-3, 5), B(-3, -7)    **28)** A(-1, -2), B(-9, -2)    **29)** A(2, 1), B(6, 2)

**30)** A(2, 1), B(-4, 5)    **31)** A(-7, -3), B(5, 3)    **32)** A(-3, 3), B(3, -3)

**33)** A(-7, -3), B(5, 3)

### Exercise 4(C)

**1)** The table below gives the names of various quadrilaterals. You are also given three of the four vertices. In each part:

- draw the quadrilateral (each one on a separate diagram)
- find the coordinates of the fourth vertex.

Square	ABCD	A(1, 3), B(3, -1), C(-1, -3)
Rectangle	EFGH	E(-5, 2), F(4, 5), G(6, -1)
Rhombus	JKLM	J(-2, 4), K(3, 1), L(-2, -2)
Rhombus	NPQR	N(-2, 1), P(-3, -4), Q(2, -3)
Kite	STUV	S(-3, 3), T(-1, 2), U(-3, -4)
Kite	WXYZ	W(-2, -5), X(-2, -1), Y(5, 2)
Parallelogram	ABCD	A(-6, -3), B(-3, 3), C(7, 3)
Parallelogram	EFGH	E(-1, 2), F(-4, -1), G(1, -2)
Parallelogram	EGHF	same coordinates as (h)
Parallelogram	EGFH	same coordinates as (h)

- 2)** Draw a set of  $x, y$  axes extending 8 units in all 4 directions.  
Plot the following points on the diagram. DO NOT JOIN UP THE POINTS

A(5, 6), B(-3, 6), C(-3, 0), D(-8, 0), E(-8, -6), F(5, -6),

G(0, -6), H(5,  $1\frac{1}{2}$ ), J( $\frac{1}{2}$ ,  $1\frac{1}{2}$ ), K( $\frac{1}{2}$ , -3)

- a)** Write down the following distances:  
AB, BC, CD, DE, EF, FG, FH, AH, HJ, JK, DO, OG.
- b)** How far is
- |                                  |                                    |
|----------------------------------|------------------------------------|
| <b>i)</b> A from the $x$ -axis   | <b>ii)</b> A from the $y$ -axis    |
| <b>iii)</b> C from the $y$ -axis | <b>iv)</b> G from the $x$ -axis    |
| <b>v)</b> H from the $x$ -axis   | <b>vi)</b> H from the $y$ -axis    |
| <b>vii)</b> E from the $y$ -axis | <b>viii)</b> J from the $x$ -axis? |
- c)** Is there any point in the diagram which is the same distance from the  $x$  and  $y$ -axes?
- d)** Write down the coordinates of any point (not in this diagram) which is the same distance from both axes.

- 3)** A is the point (-4, 2) and C is the point (2, 2).

AC is a diagonal of square ABCD.

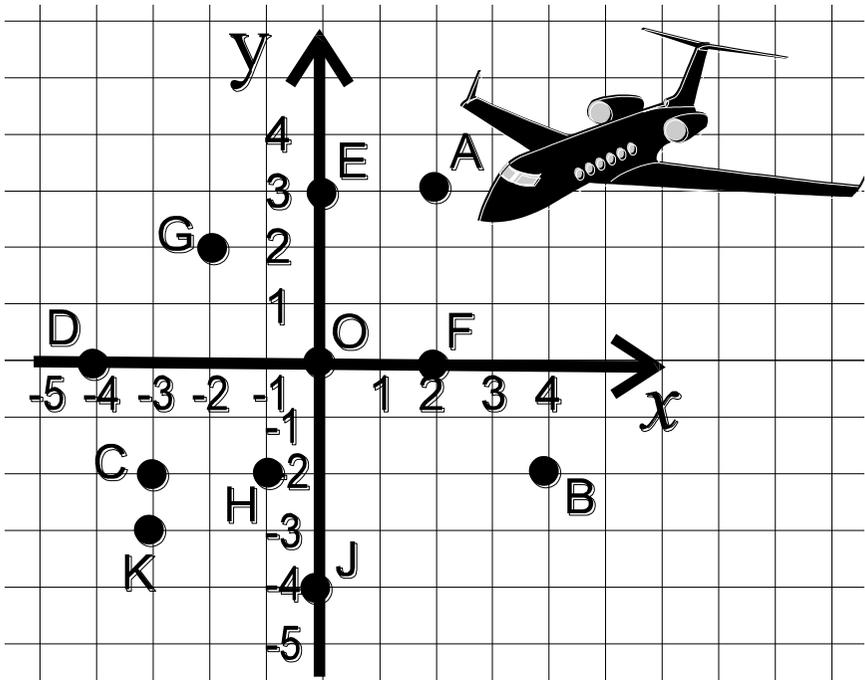
- a)** Find the coordinates of B and D. (B is above D)
- b)** Write down the length of both diagonals.
- c)** Write down the coordinates of the mid points of CD and AB.

- 4)** P is the point (-3, 1) and R is the point (2, -4).

PR is a diagonal of square PQRS.

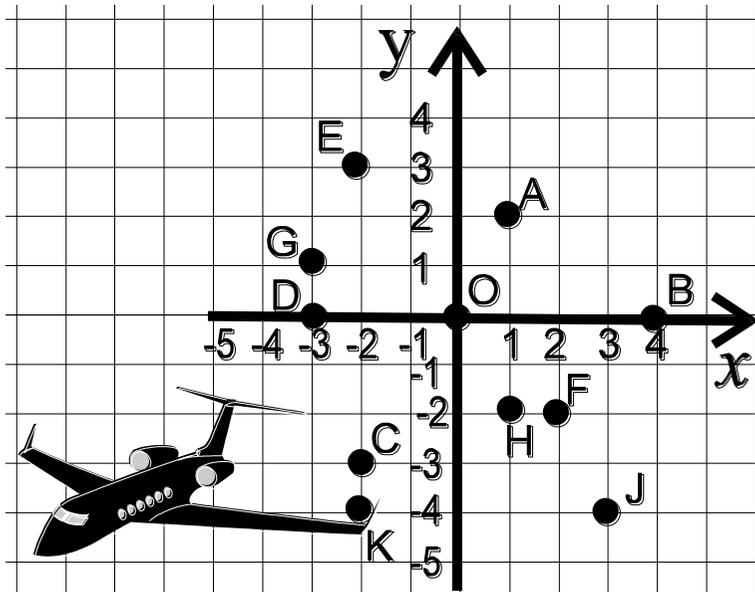
- a)** Find the coordinates of Q and S. (Q is above S)
- b)** Work out the perimeter of the square.
- c)** Write down the coordinates of the mid points of PS and PQ.

Questions 5 & 6 refer to the diagram below



- 5) Air traffic control must know the positions of aircraft at all times, so it makes use of radar and a coordinate grid. The control tower is at the origin.
- Which plane is the same distance from the tower as the Airbus at A(2, 3)?
  - The Boeing 747 at B(.....,.....) is twice the distance from the tower as .....  
What goes in the blank spaces?
  - Which plane has the same x-coordinate as the Cessna at C?
  - The DC-9 is due west of the tower. State its coordinates.
  - Three other planes lie North, South, East or West of the tower:  
– the Eagle, the Foxbat and the Jaguar.  
Identify each and give its coordinates.
  - Which two planes are just as far apart as the Gulfstream and the tower?

6) After some time these are the positions of the aircraft.



- a) Write down the coordinates of each plane
- b) List the planes which are:
  - i) closer to the tower than before
  - ii) further away from the tower than before
  - iii) still at the same distance from the tower.
- c) Which plane is travelling
  - i) fastest
  - ii) slowest?