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1) Change the following to normal (or ordinary) numbers.

a) 4.3×10^4

c) 7.03×10^3

e) 1.01×10^4

b) 6.79×10^6

d) 9.2×10^2

f) 4×10^5



2) Change the following to normal (or ordinary) numbers.

a) 4.3×10^{-4}

c) 7.03×10^{-3}

e) 1.01×10^{-4}

b) 6.79×10^{-6}

d) 9.2×10^{-2}

f) 4×10^{-5}



3) Change the following to standard form.

a) 360

c) 520 000

e) 1 003

b) 8 900

d) 60000

f) 6 450 000



4) Change the following to standard form.

a) 0.071

c) 0.00076

e) 0.00009

b) 0.0008

d) 0.0928

f) 0.00000173



5) Work out the following, giving your answer in standard form.

a) $3\ 000 \times 5\ 000$

d) $5 \times 4 \times 10^3$

g) $7 \times 10^2 \times 3 \times 10^{-4}$

b) 240×0.0002

e) $\frac{8 \times 10^4}{4 \times 10^2}$

h) $2 \times 3.6 \times 10^{-5}$

c) $9 \times 1.1 \times 10^7$

f) $9 \times 10^2 \times 2 \times 10^{-5}$

i) $6 \times 4.1 \times 10^3$



1) Work out the following, giving your answer in standard form.

a) $(6 \times 10^2) \times (8 \times 10^4)$

c) $\frac{3 \times 10^3}{6 \times 10^{-5}}$

b) $(2 \times 10^5) + (3 \times 10^4)$

d) $(9.2 \times 10^5) \div (2 \times 10^2)$



2) A spaceship travelled for 5×10^3 hours at a speed of 9×10^4 km/h.

a) Work out the distance travelled by the spaceship.

Give your answer in standard form.

Another spaceship travelled a distance of 2×10^7 km, last month.

This month it has travelled 5×10^6 km.

b) Work out the total distance travelled by the spaceship over these past two months.

Give your answer as a normal (or ordinary) number.



3) Work out the following, giving your answer in standard form, correct to 2 significant figures.

a) $2.6 \times 10^3 \times 4.3 \times 10^4$

c) $\frac{9.435 \times 10^5}{3.28 \times 10^3}$

b) $(7.5 \times 10^5) \times (1.9 \times 10^{-2})$

d) $\frac{5.98 \times 10^8}{6.14 \times 10^{-2}}$



4) Work out the following, giving your answer in standard form correct to 3 significant figures.

a) $\frac{5.76 \times 10^7 + 3.89 \times 10^9}{7.18 \times 10^{-2}}$

c) $\frac{3 \times 10^8 \times 2 \times 10^7}{3 \times 10^8 + 2 \times 10^7}$

b) $\frac{7.2 \times 10^{-2} - 5.4 \times 10^{-1}}{9.25 \times 10^{-7}}$

d) $\frac{3 \times 3.2 \times 10^{12} \times 1.5 \times 10^{12}}{3.2 \times 10^{12} - 1.5 \times 10^{12}}$



5) A microsecond is 0.000 001 seconds.

a) Write the number 0.000 001 in standard form.

A computer does a calculation in 3 microseconds.

b) How many of these calculations can the computer do in 1 second?

Give your answer in standard form, correct to 3 significant figures.



6) 340 000 tomato seeds weigh 1 gram.

Each tomato seed weighs the same.

a) Write the number 340 000 in standard form.

b) Calculate the weight, in grams, of one tomato seed.

Give your answer in standard form, correct to 2 significant figures.



- 1) A car dealer is comparing his sales over the past two years.
In 2006, he sold 175 cars.
In 2007, he sold 196 cars.

Work out the percentage increase in the number of cars sold.



- 2) In September 2005, the number of pupils attending MathsWatch College was 1352.
In September 2006, the number of pupils attending MathsWatch College was 1014.

Work out the percentage decrease in the number of pupils attending MathsWatch College.



- 3) The usual price of a shirt is £32.50
In a sale, the shirt is reduced to £29.25

What is the percentage reduction?



- 4) Olivia opened an account with £750 at the MathsWatch Bank.
After one year, the bank paid her interest.
She then had £795 in her account.

Work out, as a percentage, MathsWatch Bank's interest rate.



- 5) Keith buys a house for £270 000 and sells it two years later for £300 000.

What is his percentage profit?

Give your answer to 2 significant figures.



- 6) Shelley bought some items at a car boot sale and then sold them on ebay.
Work out the percentage profit or loss she made on each of these items.

- a) Trainers bought for £15, sold for £20
- b) DVD recorder bought for £42, sold for £60.90
- c) Gold necklace bought for £90, sold for £78.30
- d) A DVD collection bought for £120, sold for £81.60



- 1) Henry places £6000 in an account which pays 4.6% compound interest each year.

Calculate the amount in his account after 2 years.



- 2) Sarah puts £8600 in a bank. The bank pays compound interest of 3.8% per year.

Calculate the amount Sarah has in her account after 4 years.



- 3) Mary deposits £10000 in an account which pays 5.6% compound interest per year.

How much will Mary have in her account after 5 years?



- 4) Susan places £7900 in an account which pays 2.4% compound interest per year.

How much interest does she earn in 3 years?



- 5) Harry puts money into an account which pays 6% compound interest per year.

If he puts £23000 in the account for 5 years how much interest will he earn altogether?



- 6) Laura buys a new car for £14600.

The annual rate of depreciation is 23%.

How much is the car worth after 3 years?



- 7) The rate of depreciation of a particular brand of computer is 65% per year. If the cost of the computer when new is £650 how much is it worth after 2 years?



- 8) Sharon pays £3500 for a secondhand car.

The annual rate of depreciation of the car is 24%

How much will it be worth four years after she has bought it?



- 9) Dave places £17000 in an account which pays 4% compound interest per year.

How many years will it take before he has £19122.69 in the bank?



- 10) A new motorbike costs £8900.

The annual rate of depreciation is 18% per year.

After how many years will it be worth £2705.66?



- 1) In a sale, normal prices are reduced by 20%.
The sale price of a shirt is £26
Calculate the normal price of the shirt.



- 2) A car dealer offers a discount of 15% off the normal price of a car for cash.
Emma pays £6120 cash for a car.
Calculate the normal price of the car.



- 3) In a sale, normal prices are reduced by 13%.
The sale price of a DVD recorder is £108.75
Calculate the normal price of the DVD recorder.



- 4) A salesman gets a basic wage of £160 per week plus a commission of 30% of the sales he makes that week.
In one week his total wage was £640
Work out the value of the sales he made that week.



- 5) Jason opened an account at MathsWatch Bank.
MathsWatch Bank's interest rate was 4%.
After one year, the bank paid him interest.
The total amount in his account was then £1976
Work out the amount with which Jason opened his account.



- 6) Jonathan's weekly pay this year is £960.
This is 20% more than his weekly pay last year.
Tess says "This means Jonathan's weekly pay last year was £768".
Tess is wrong.
- Explain why
 - Work out Jonathan's weekly pay last year.



- 7) The price of all rail season tickets to London increased by 4%.
- The price of a rail season ticket from Oxford to London increased by £122.40
Work out the price before this increase.
 - After the increase, the price of a rail season ticket from Newport to London was £2932.80
Work out the price before this increase.



1) Work out the value of $2\frac{4}{5} - 1\frac{3}{4}$

Give your answer as a fraction in its simplest form.



2) a) Work out $\frac{3}{8} + \frac{1}{4}$

Give your answer in its simplest form.

b) Work out $\frac{2}{3} \times \frac{4}{5}$



3) Work out the value of $3\frac{1}{4} \times 2\frac{2}{3}$

Give your answer as a fraction in its simplest form.



4) a) Work out $2\frac{17}{20} - 1\frac{2}{5}$

b) Work out $2\frac{2}{3} \times 1\frac{3}{4}$



5) a) Work out $\frac{2}{3} \div \frac{5}{6}$

Give your fraction in its simplest form.

b) Work out $2\frac{1}{3} - 1\frac{2}{5}$



6) There are 300 people at a concert.

$\frac{1}{6}$ of the 300 people are boys.

$\frac{3}{10}$ of the 300 people are girls.

The rest of the people are adults.

Work out how many people are adults.



1) Factorise and solve the following equations:

a) $x^2 + 5x + 6 = 0$

b) $x^2 + 9x + 20 = 0$

c) $x^2 + x - 6 = 0$

d) $x^2 + 5x - 24 = 0$

e) $x^2 - 6x + 8 = 0$

f) $x^2 - 3x - 28 = 0$

g) $2x^2 + 7x + 3 = 0$

h) $6x^2 + 11x + 3 = 0$

i) $3x^2 + 13x - 10 = 0$

j) $3x^2 - 34x + 63 = 0$



2) Lucy said that -1 is the only solution of x that satisfies the equation

$$x^2 + 2x + 1 = 0$$

Was Lucy correct?

Show working to justify your answer



3) Ben said that -5 is the only solution of x that satisfies the equation

$$x^2 + 10x + 25 = 0$$

Was Ben correct?

Show working to justify your answer

The Difference of Two Squares



1) Factorise

a) $x^2 - 16$

c) $y^2 - 9$

e) $x^2 - \frac{1}{4}$

b) $a^2 - b^2$

d) $x^2 - 1$

f) $x^2 - \frac{1}{9}$



2) Factorise

a) $x^2 - 4y^2$

c) $9x^2 - 16y^2$

e) $4x^2 - 25y^2$

b) $9a^2 - b^2$

d) $\frac{1}{4}x^2 - y^2$

f) $x^2 - \frac{1}{9}y^2$



3) Simplify

a) $\frac{y^2 - 4}{y + 2} \times \frac{5}{y + 5}$

b) $\frac{3}{2x + 1} \times \frac{4x^2 - 1}{x - 2}$

c) $\frac{12x^2 + 8x}{9x^2 - 4}$

d) $\frac{25a^2 - 16b^2}{10ab - 8b^2}$



4) Solve

a) $4x^2 - 16 = 0$

c) $49x^2 = 121$

b) $25x^2 = 1$

d) $9x^2 - 9 = 7$

Simultaneous Linear Equations



1) Solve

$$\begin{aligned}4x + 3y &= 6 \\5x - 3y &= 21\end{aligned}$$



2) Solve

$$\begin{aligned}4x + 3y &= 19 \\3x - 5y &= 7\end{aligned}$$



3) Solve

$$\begin{aligned}3x + 5y &= 13 \\2x + 3y &= 8\end{aligned}$$



4) Solve

$$\begin{aligned}x + 4y &= 5 \\4x - 2y &= 11\end{aligned}$$



5) Solve

$$\begin{aligned}2a + b &= 3 \\4a - 5b &= 20\end{aligned}$$



6) Solve

$$\begin{aligned}5x + 3y &= 4 \\3x + 4y &= 9\end{aligned}$$



7) Solve

$$\begin{aligned}6x - 2y &= 13 \\2x + 3y &= -3\end{aligned}$$



8) Solve

$$\begin{aligned}3a - 2b &= 14 \\4a + 3b &= 13\end{aligned}$$



9) Solve

$$\begin{aligned}5x + 4y &= 5 \\2x + 7y &= 29\end{aligned}$$



10) Solve

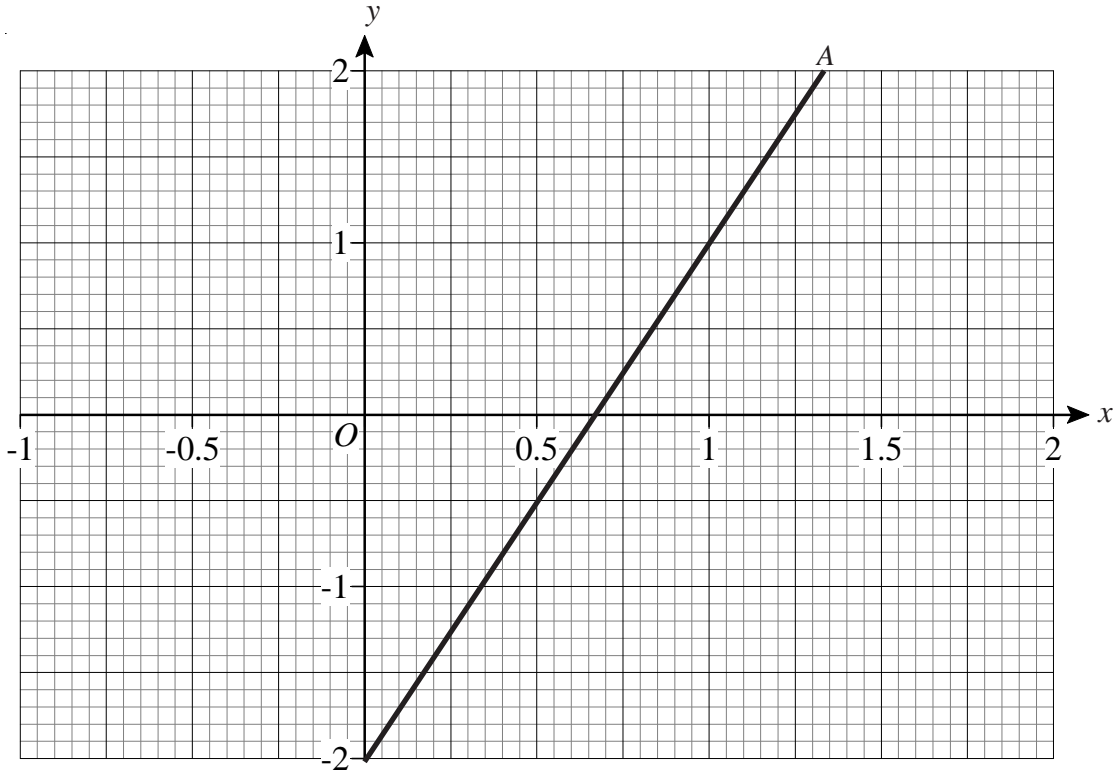
$$\begin{aligned}6x - 4y &= 39 \\2x + y &= 6\end{aligned}$$

Understanding $y = mx + c$

gradient \nearrow \nwarrow cuts the y-axis



- 1) a) Find the equation of line A on the grid below.
- b) Draw the line B, with equation $y = x - 1$.
- c) Draw the line C, with equation $y = 1 - 2x$.



- 2) A straight line passes through points (0, 4) and (3, 13).
What is its equation?



- 3) A straight line passes through points (0, 7) and (2, -1).
What is its equation?



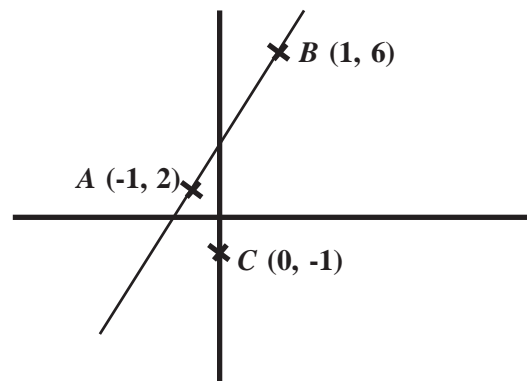
- 4) A straight line is parallel to $y = 3x - 2$ and goes through (1, 8).
What is its equation?



- 5) A straight line is parallel to $y = 2x + 5$ and goes through (5, 6).
What is its equation?



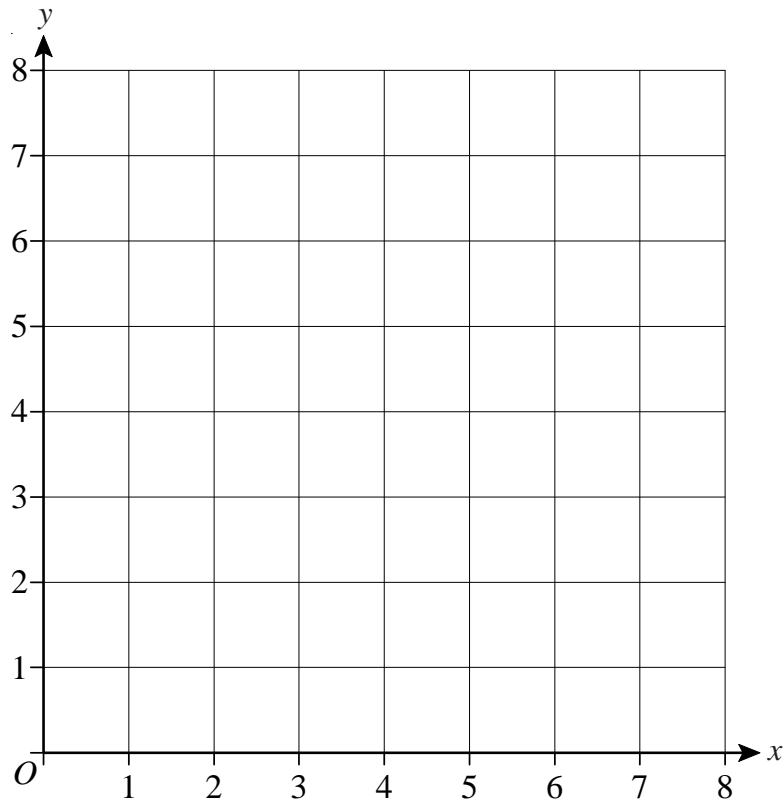
- 6) A is the point (-1, 2).
B is the point (1, 6).
C is the point (0, -1).
Find the equation of the line which passes through C and is parallel to AB.



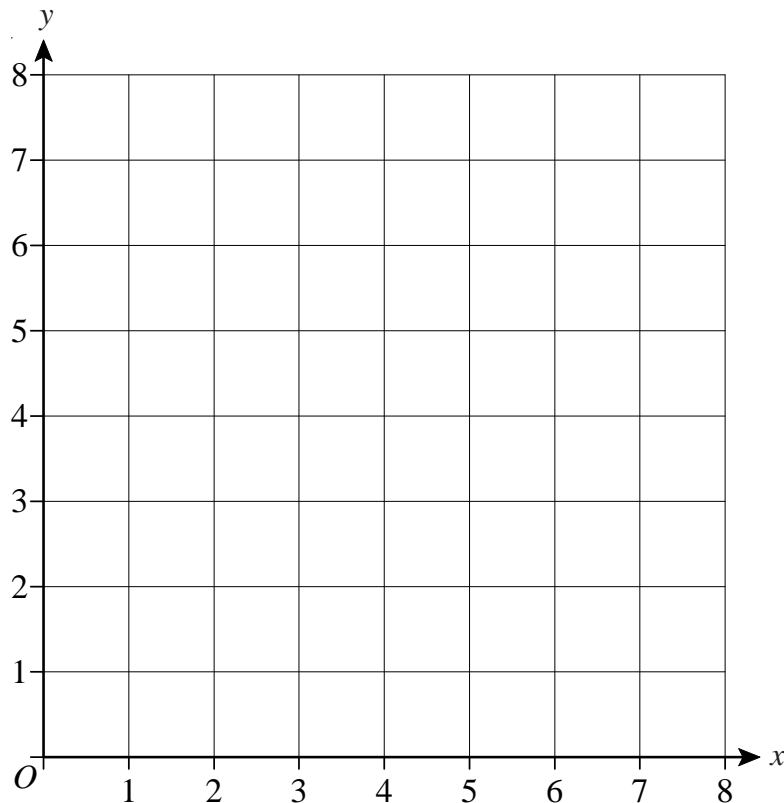
Regions



- 1) On the grid below, draw straight lines and use shading to show the region R that satisfies the inequalities $x > 1$ $y > x$ $x + y < 7$



- 2) On the grid below, draw straight lines and use shading to show the region R that satisfies the inequalities $y > x + 1$ $y < 5$ $x > 1$



Graphs of Cubic and Reciprocal Functions



1) a) Complete this table of values for

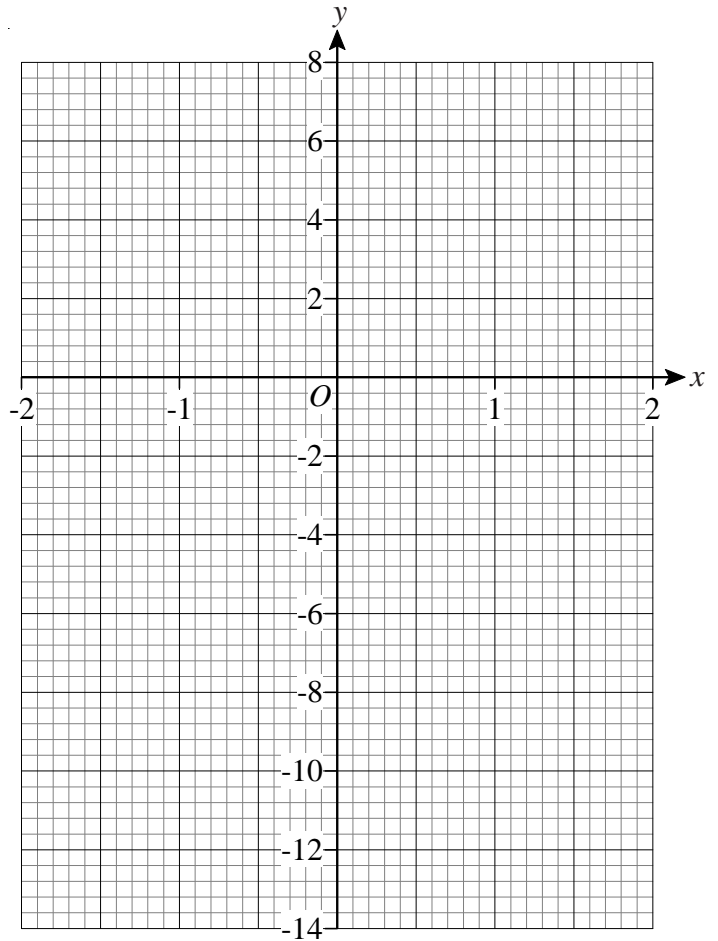
$$y = x^3 + x - 4$$

x	-2	-1	0	1	2
y	-14			-2	

b) On the grid, draw the graph of

$$y = x^3 + x - 4$$

c) Use the graph to find the value of x when $y = 2$



2) a) Complete this table of values for

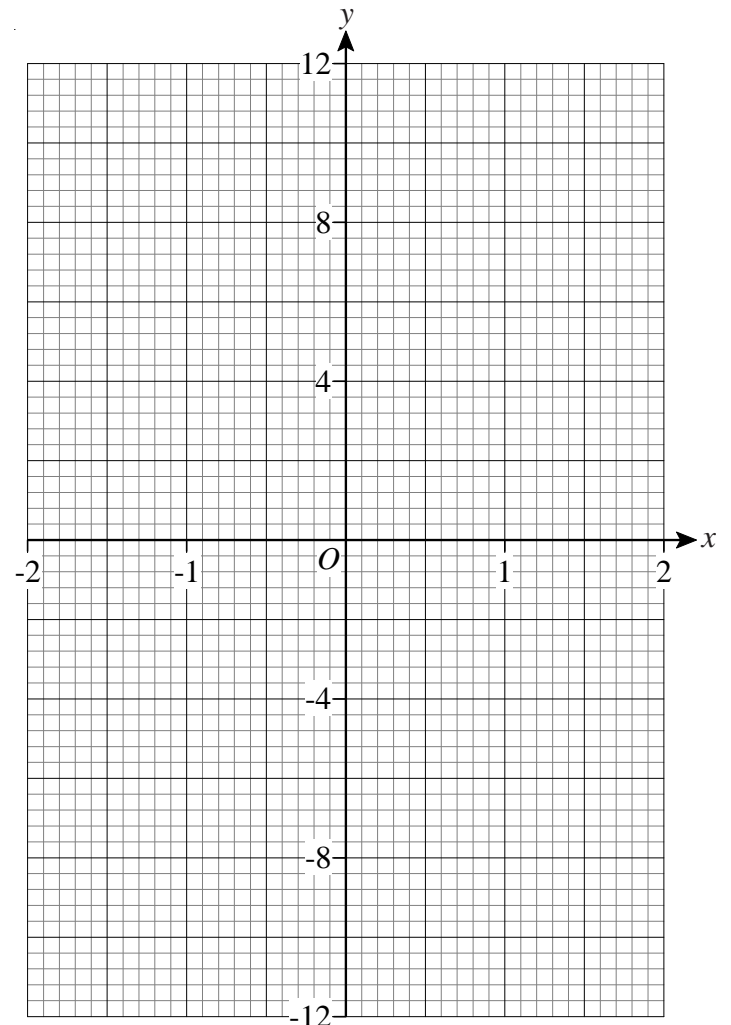
$$y = x^3 + 2x$$

x	-2	-1	0	1	2
y	-12		0		

b) On the grid, draw the graph of

$$y = x^3 + 2x$$

c) Use the graph to find the value of x when $y = -6$



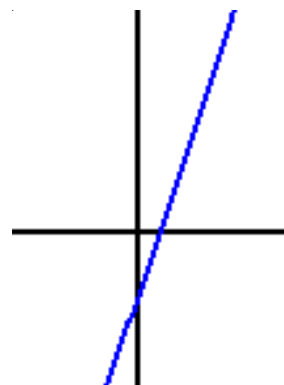
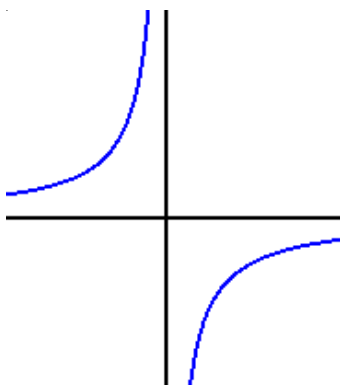
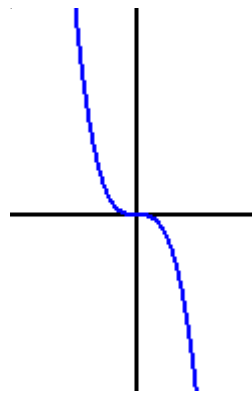
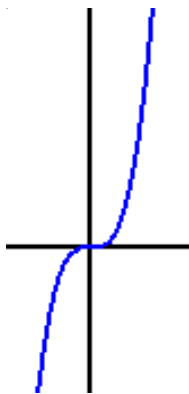
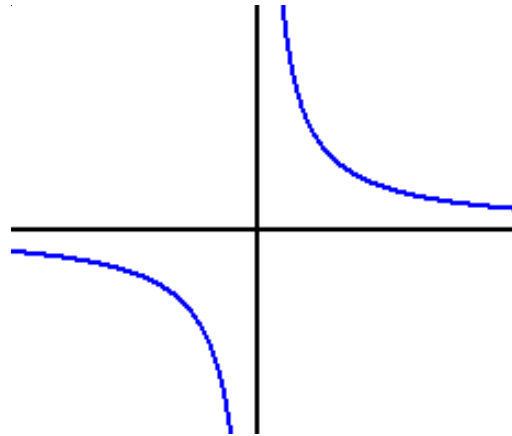
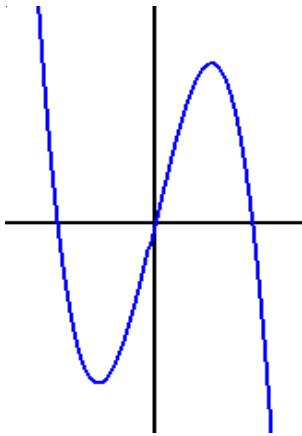
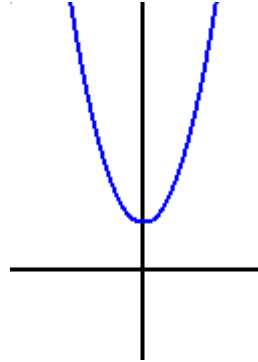
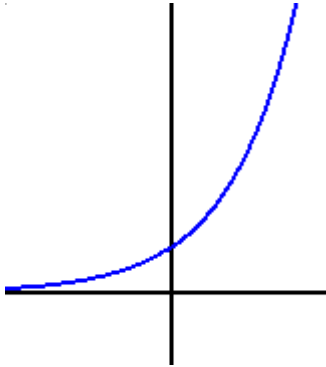
3) Sketch the graph of $y = 1 + \frac{1}{x}$

Recognise the Shapes of Functions



1) Match each of the functions below, with the correct sketch of its graph.

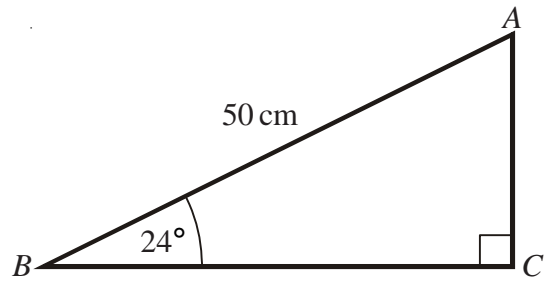
- a) $y = 3x^3$ b) $y = \frac{-2}{x}$ c) $y = 3x - 1$ d) $y = 2^x$
 e) $y = 2x^2 + 1$ f) $y = \frac{2}{x}$ g) $y = 5x - x^3$ h) $y = -2x^3$



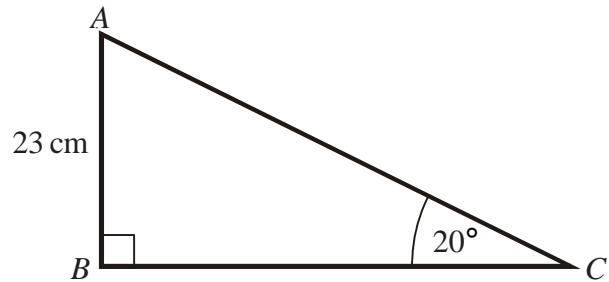
Trigonometry



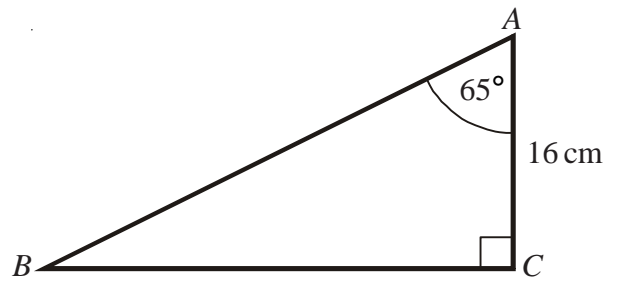
- 1) ABC is a right-angled triangle.
 $AB = 50$ cm.
 Angle $ABC = 24^\circ$
 Work out the length of BC .
 Give your answer correct to 1 decimal place.



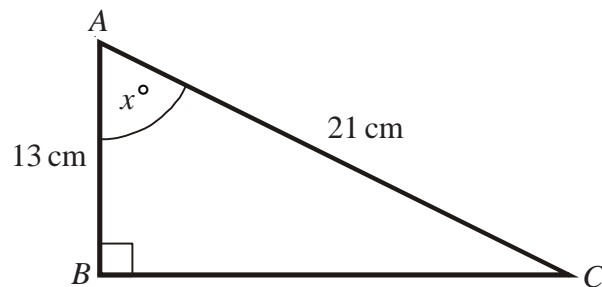
- 2) ABC is a right-angled triangle.
 $AB = 23$ cm.
 Angle $BCA = 20^\circ$
 Work out the length of AC .
 Give your answer correct to 1 decimal place.



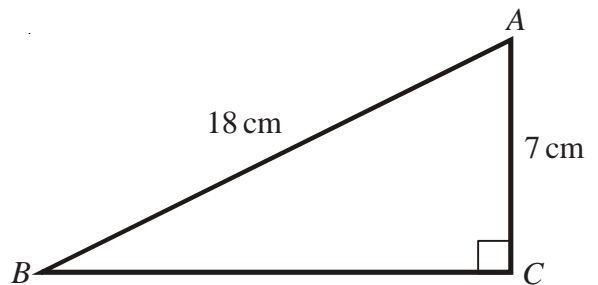
- 3) ABC is a right-angled triangle.
 $AC = 16$ cm.
 Angle $CAB = 65^\circ$
 Work out the length of BC .
 Give your answer correct to 1 decimal place.



- 4) ABC is a right-angled triangle.
 $AB = 13$ cm.
 $AC = 21$ cm.
 Work out the size of angle x .
 Give your answer correct to 1 decimal place.



- 5) ABC is a right-angled triangle.
 $AB = 18$ cm.
 $AC = 7$ cm.
 Work out the size of angle ABC .
 Give your answer correct to 1 decimal place.

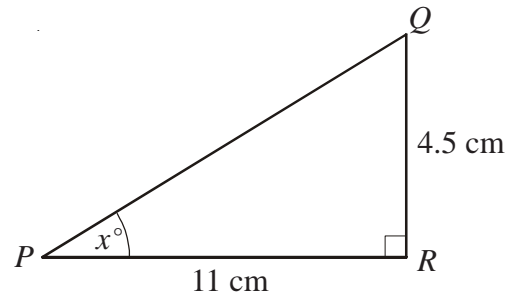


Trigonometry



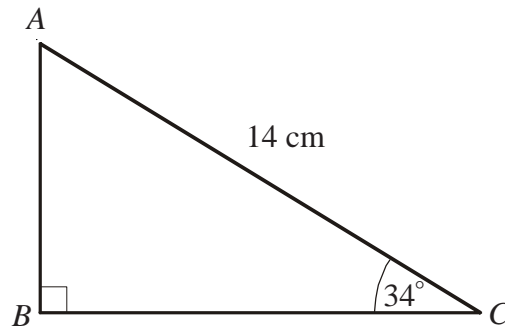
- 1) PQR is a right-angled triangle.
 $PR = 11$ cm.
 $QR = 4.5$ cm
 Angle $PRQ = 90^\circ$

Work out the value of x .
 Give your answer correct to 1 decimal place.



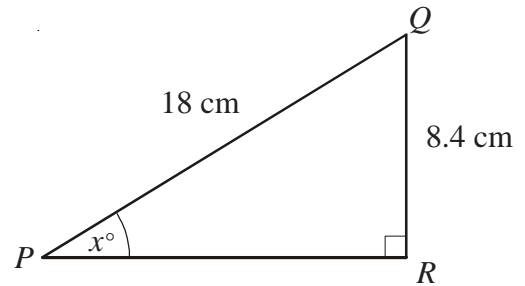
- 2) $AC = 14$ cm.
 Angle $ABC = 90^\circ$
 Angle $ACB = 34^\circ$

Calculate the length of BC .
 Give your answer correct to 3 significant figures.



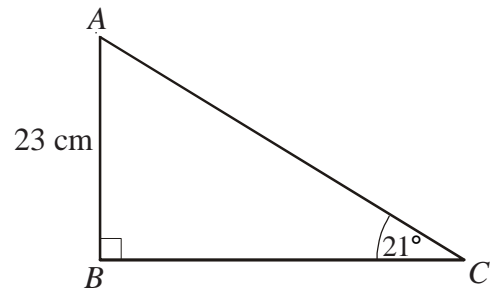
- 3) PQR is a right-angled triangle.
 $PQ = 18$ cm.
 $QR = 8.4$ cm
 Angle $PRQ = 90^\circ$

Work out the value of x .
 Give your answer correct to 1 decimal place.



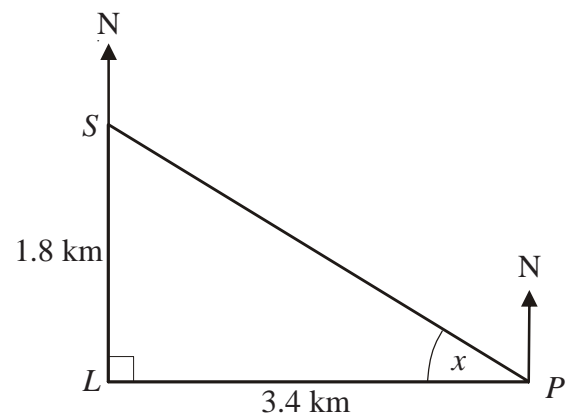
- 4) $AB = 23$ cm.
 Angle $ABC = 90^\circ$
 Angle $ACB = 21^\circ$

Calculate the length of AC .
 Give your answer correct to 3 significant figures.



- 5) A lighthouse, L , is 3.4 km due West of a port, P .
 A ship, S , is 1.8 km due North of the lighthouse, L .

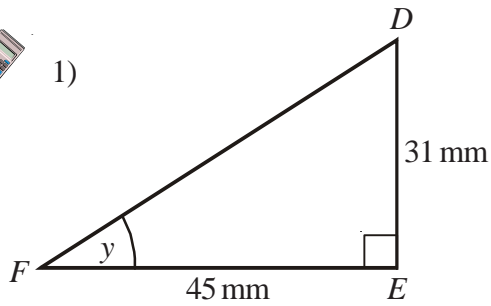
Calculate the size of the angle marked x .
 Give your answer correct to 3 significant figures.



Trigonometry



1)



DEF is a right-angled triangle.

$$DE = 31 \text{ mm}$$

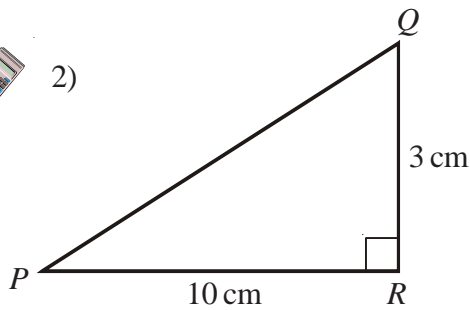
$$FE = 45 \text{ mm}$$

Calculate the size of angle y .

Give your answer correct to one decimal place.



2)



PQR is a right-angled triangle.

$$QR = 3 \text{ cm}$$

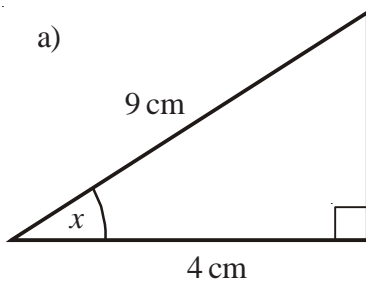
$$PR = 10 \text{ cm}$$

Work out the size of angle RPQ .

Give your answer correct to three significant figures.



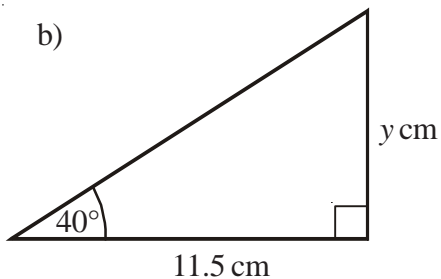
3) a)



Calculate the size of the angle marked x .

Give your answer correct to one decimal place.

b)



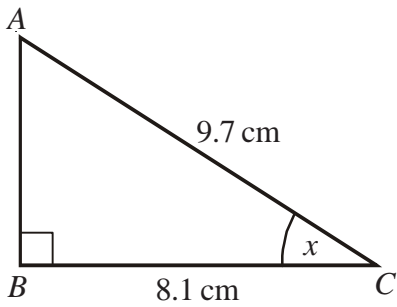
Calculate the value of y .

Give your answer correct to one decimal place.

Trigonometry



1)



ABC is a right-angled triangle.

$$AC = 9.7 \text{ cm}$$

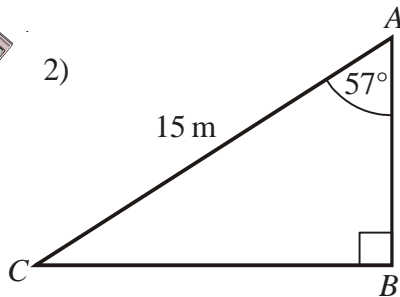
$$BC = 8.1 \text{ cm}$$

Calculate the size of the angle marked x .

Give your answer correct to three significant figures.



2)



ABC is a right-angled triangle.

$$AC = 15 \text{ m}$$

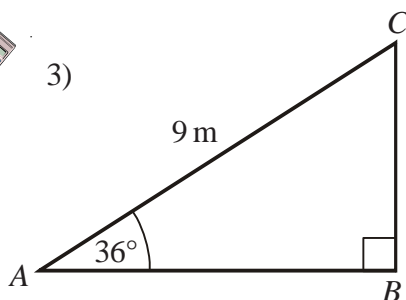
$$\text{Angle } CAB = 57^\circ$$

Calculate the length of AB .

Give your answer correct to three significant figures.



3)



ABC is a right-angled triangle.

$$AC = 9 \text{ m}$$

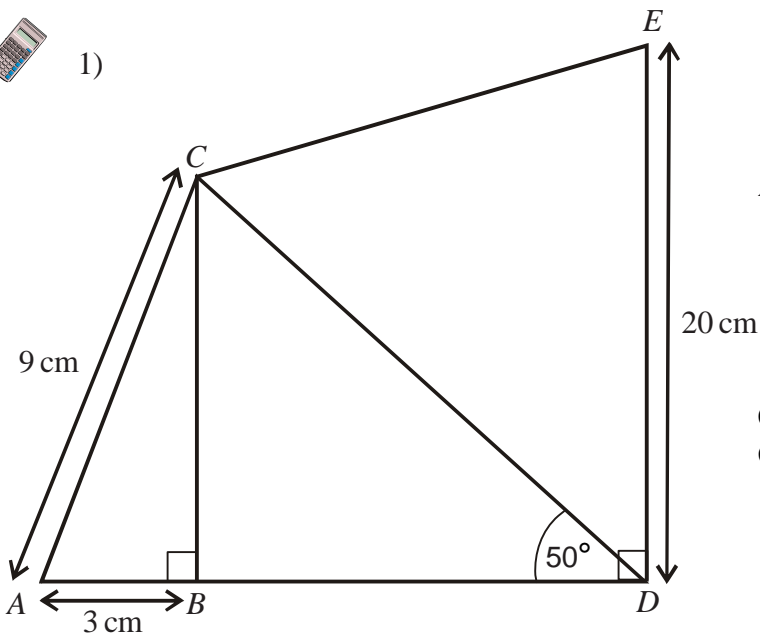
$$\text{Angle } CAB = 36^\circ$$

Calculate the length of AB .

Give your answer correct to three significant figures.



1)

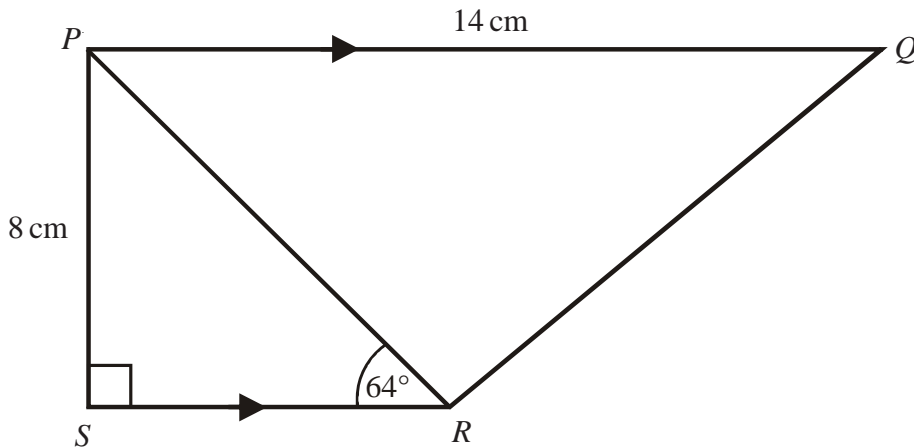


$AC = 9 \text{ cm}$
 $AB = 3 \text{ cm}$
 $DE = 20 \text{ cm}$
 Angle $ABC = \text{angle } CBD = \text{angle } BDE = 90^\circ$

Calculate the length of CD .
Give your answer to 3 significant figures.



2)



$PQRS$ is a trapezium.
 PQ is parallel to SR .
 Angle $PSR = 90^\circ$
 Angle $PRS = 64^\circ$
 $PQ = 14 \text{ cm}$.
 $PS = 8 \text{ cm}$.

Work out the length of PR .
Give your answer correct to 3 significant figures.



1)

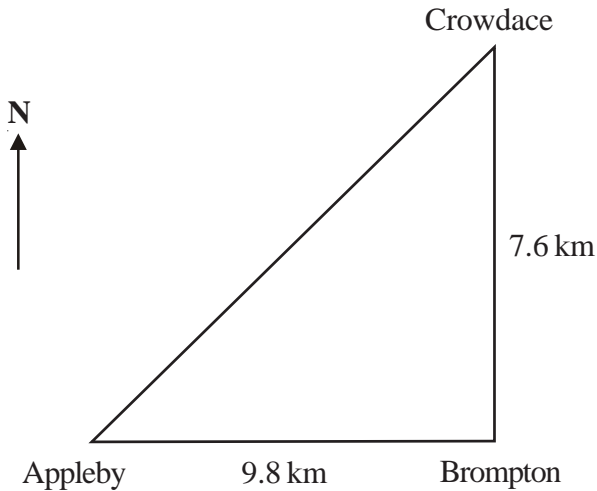


Diagram **NOT** accurately drawn.

Appleby, Brompton and Crowdace are three towns.

Appleby is 9.8 km due west of Brompton.

Brompton is 7.6 km due south of Crowdace.

- Calculate the bearing of Crowdace from Appleby.
Give your answer correct to 1 decimal place.
- Calculate the bearing of Appleby from Crowdace.
Give your answer correct to 1 decimal place.



2)

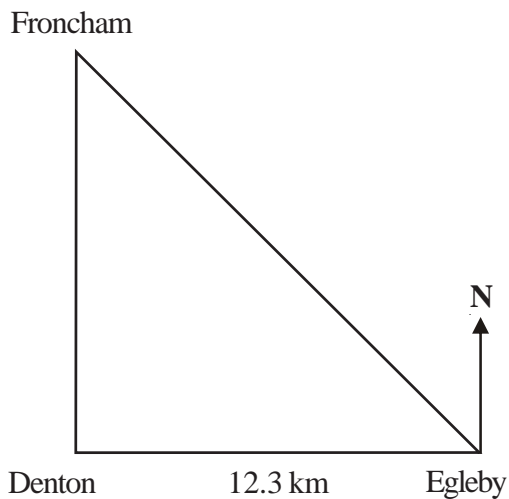


Diagram **NOT** accurately drawn.

Denton, Egleby and Froncham are three towns.

Egleby is 12.3 km due east of Denton.

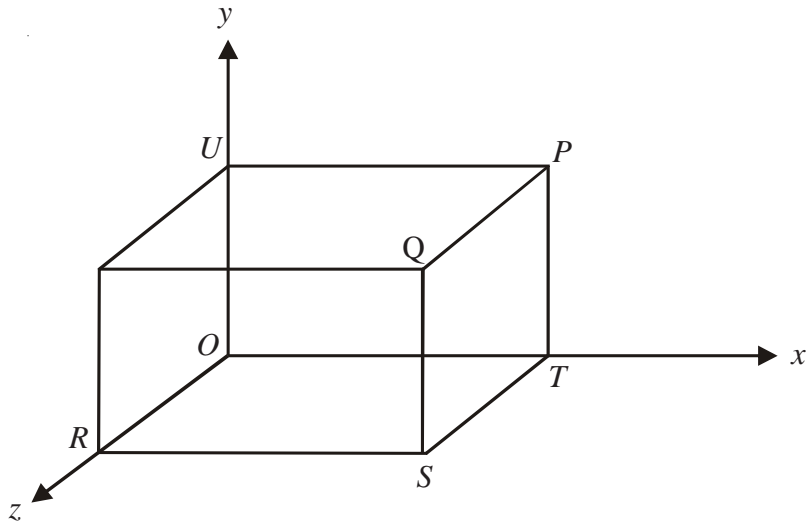
Froncham is due north of Denton and on a bearing of 320° from Egleby.

- Calculate the distance between Froncham and Egleby.
Give your answer correct to 1 decimal place.

3-D Coordinates



- 1) A cuboid lies on the coordinate axes.

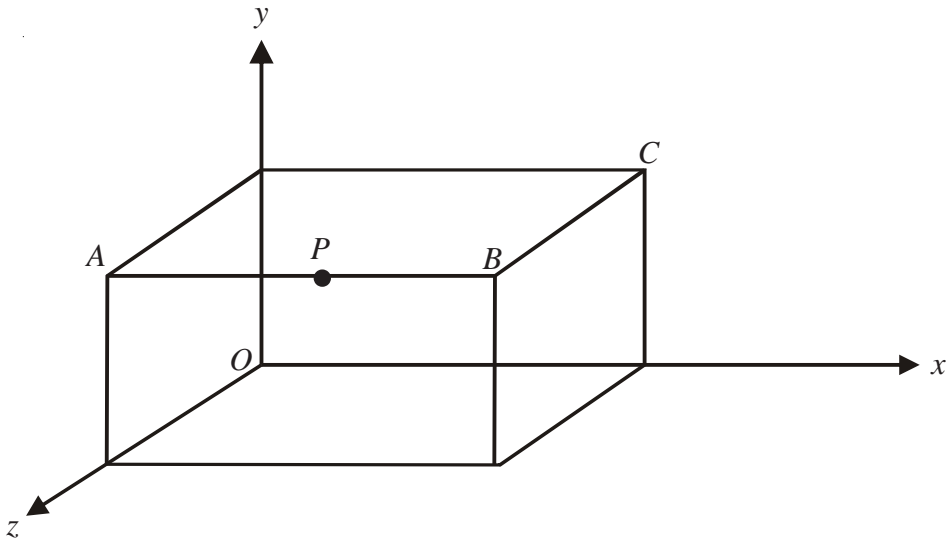


The point Q has coordinates $(5, 3, 4)$

- Write down the coordinates of the point P .
- Write down the coordinates of the point T .
- Write down the coordinates of the point S .
- Write down the coordinates of the point R .
- Write down the coordinates of the point U .



- 2) A cuboid lies on the coordinate axes.

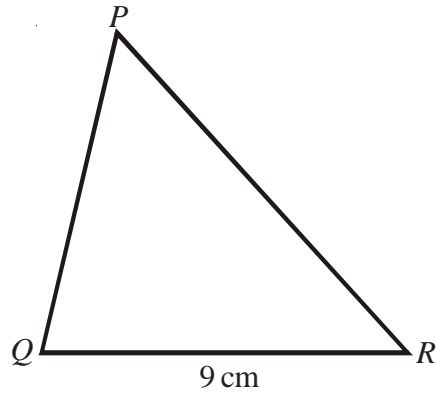
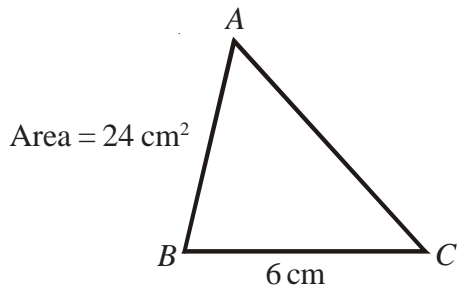


Point P lies half way between A and B and has coordinates $(3, 4, 5)$.

- Write down the coordinates of B .
- Write down the coordinates of C .



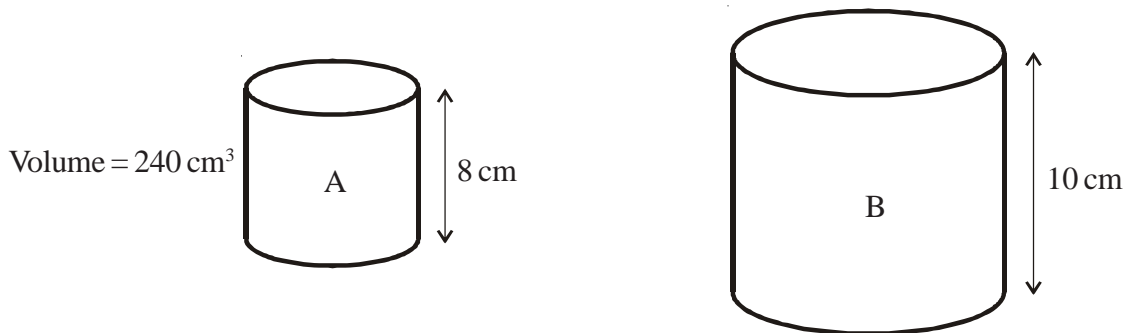
- 1) Triangle ABC is similar to triangle PQR .



The area of triangle ABC is 24 cm^2 .
Calculate the area of triangle PQR .



- 2) Cylinder A is mathematically similar to cylinder B.



The volume of cylinder A is 240 cm^3 .
Calculate the volume of cylinder B.



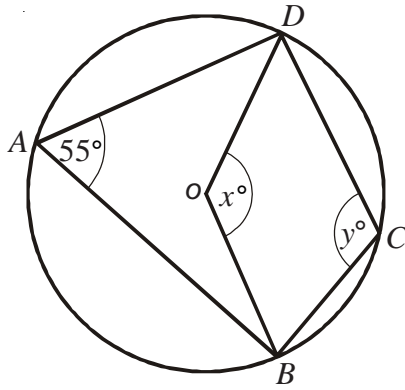
- 3) P and Q are two geometrically similar solid shapes.

The total surface area of shape P is 540 cm^2 .
The total surface area of shape Q is 2160 cm^2 .
The volume of shape P is 2700 cm^3 .

Calculate the volume of shape Q.



1)



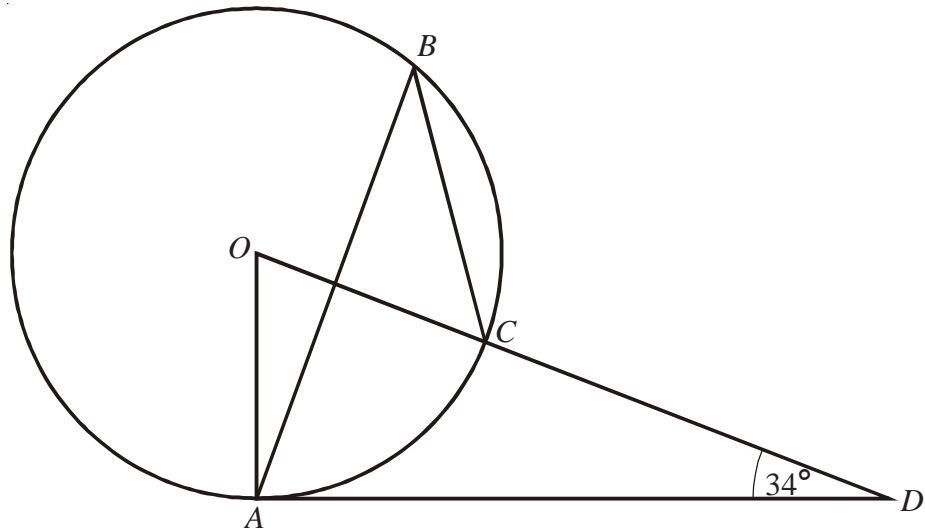
In the diagram, A , B , C , and D are points on the circumference of a circle, centre O .
 Angle $BAD = 55^\circ$.
 Angle $BOD = x^\circ$.
 Angle $BCD = y^\circ$.

- a) (i) Work out the value of x .
 (ii) Give a reason for your answer.

- b) (i) Work out the value of y .
 (ii) Give a reason for your answer.



2)



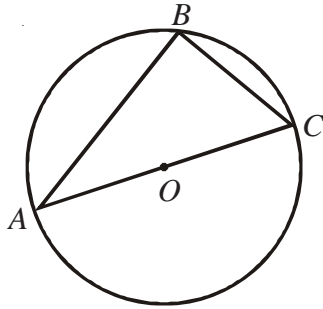
The diagram shows a circle centre O .
 A , B and C are points on the circumference.
 DCO is a straight line and DA is a tangent to the circle.
 Angle $ADO = 34^\circ$

- a) Work out the size of angle AOD .

- b) (i) Work out the size of angle ABC .
 (ii) Give a reason for your answer.

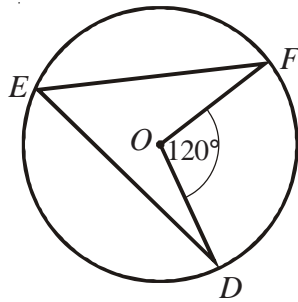


1)



A , B and C are points on the circumference of a circle centre O .
 AC is a diameter of the circle.

- a) (i) Write down the size of angle ABC .
(ii) Give a reason for your answer.



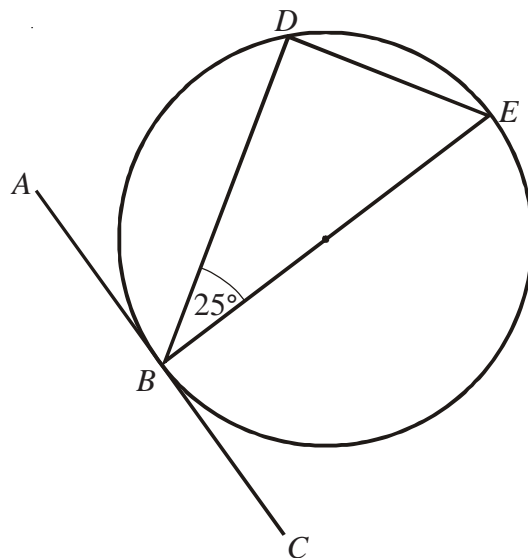
D , E and F are points on the circumference of a circle, centre O .
Angle $DOF = 120^\circ$.

- b) (i) Work out the size of angle DEF .
(ii) Give a reason for your answer.



- 2) B , D and E are points on a circle centre O .
 ABC is a tangent to the circle.
 BE is a diameter of the circle.
Angle $DBE = 25^\circ$.

- a) Find the size of angle ABD .
Give a reason for your answer.
- b) Find the size of angle DEB .
Give a reason for your answer.



Circle Theorems



- 1) In the diagram, A , B and C are points on the circumference of a circle, centre O . PA and PB are tangents to the circle. Angle $ACB = 72^\circ$.

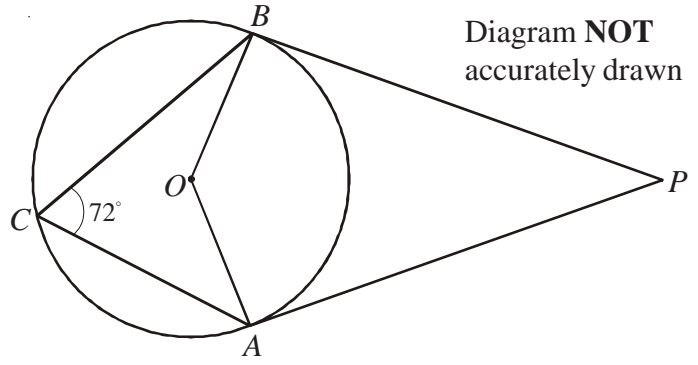


Diagram **NOT** accurately drawn

- a) (i) Work out the size of angle AOB .
(ii) Give a reason for your answer.
- b) Work out the size of angle APB .



- 2) P , Q , R and S are points on the circle. PQ is a diameter of the circle. Angle $RPQ = 32^\circ$.

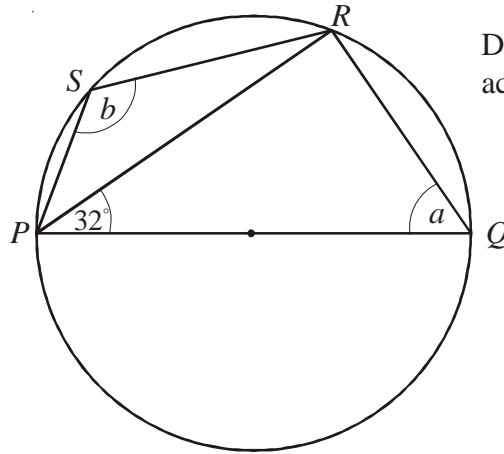


Diagram **NOT** accurately drawn

- a) (i) Work out the size of angle PQR .
(ii) Give reasons for your answer.
- b) (i) Work out the size of angle PSR .
(ii) Give a reason for your answer.



- 3) The diagram shows a circle, centre O . AC is a diameter. Angle $BAC = 31^\circ$. D is a point on AC such that angle BDA is a right angle.

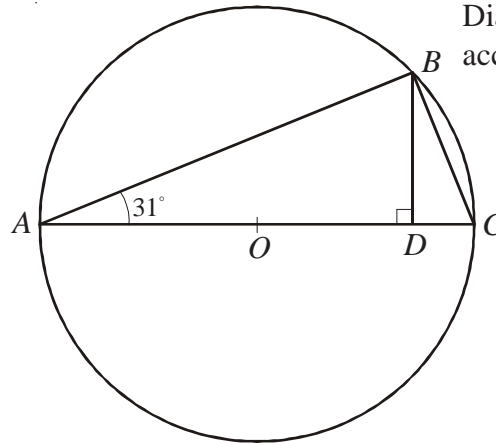


Diagram **NOT** accurately drawn

- a) Work out the size of angle BCA .
Give reasons for your answer.
- b) Calculate the size of angle DBC .
- c) Calculate the size of angle BOA .



- 4) A , B , C and D are four points on the circumference of a circle. ABE and DCE are straight lines. Angle $BAC = 21^\circ$. Angle $EBC = 58^\circ$.

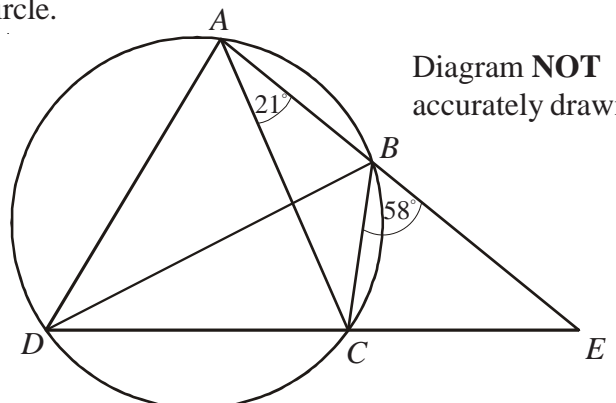


Diagram **NOT** accurately drawn

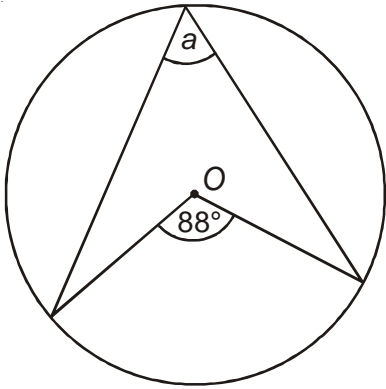
- a) Find the size of angle ADC .
- b) Find the size of angle ADB .

Angle $CAD = 69^\circ$.

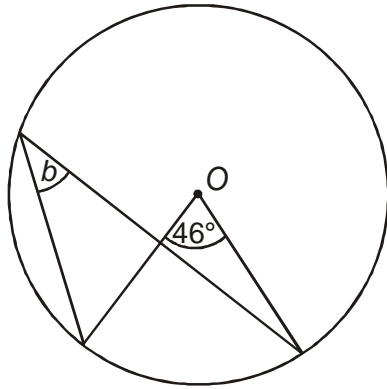
- c) Is BD a diameter of the circle?
You must explain your answer.



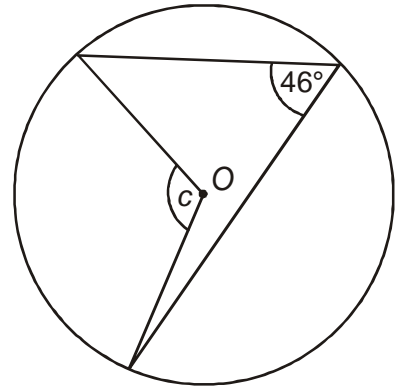
1) $a = \underline{\hspace{2cm}}$



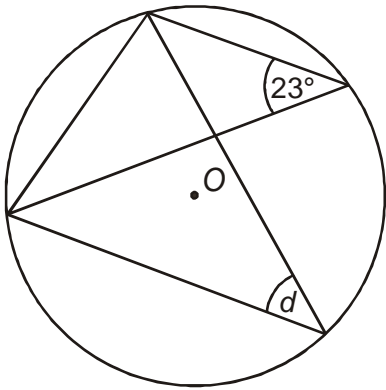
2) $b = \underline{\hspace{2cm}}$



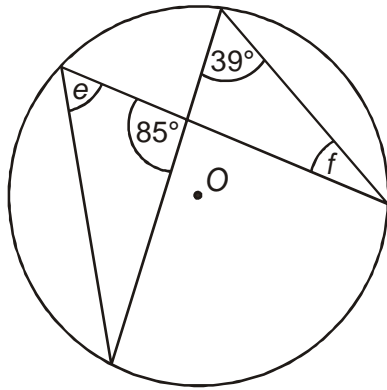
3) $c = \underline{\hspace{2cm}}$



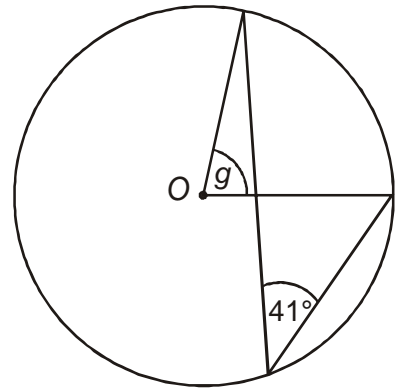
4) $d = \underline{\hspace{2cm}}$



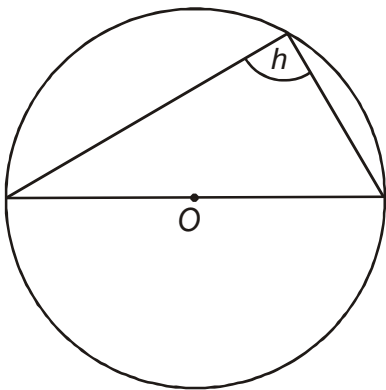
5) $e = \underline{\hspace{2cm}}$ $f = \underline{\hspace{2cm}}$



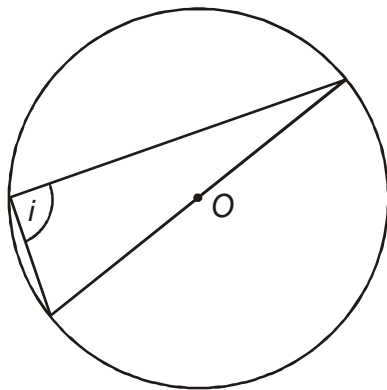
6) $g = \underline{\hspace{2cm}}$



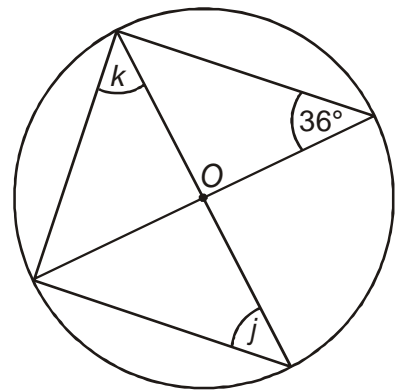
7) $h = \underline{\hspace{2cm}}$



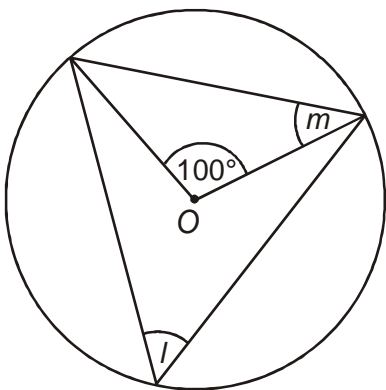
8) $i = \underline{\hspace{2cm}}$



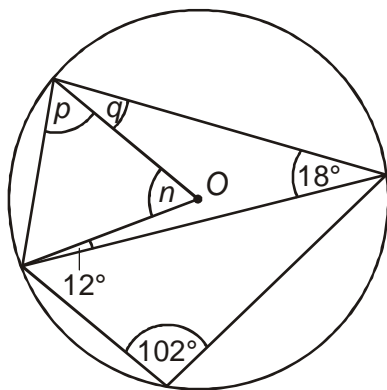
9) $j = \underline{\hspace{2cm}}$ $k = \underline{\hspace{2cm}}$



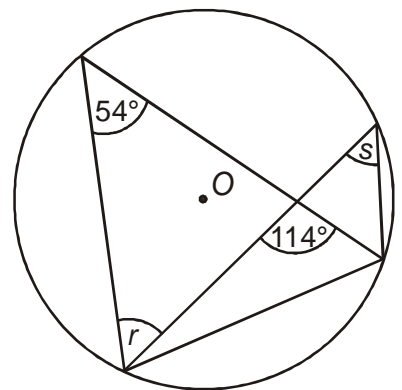
10) $l = \underline{\hspace{2cm}}$ $m = \underline{\hspace{2cm}}$



11) $n = \underline{\hspace{2cm}}$ $p = \underline{\hspace{2cm}}$ $q = \underline{\hspace{2cm}}$

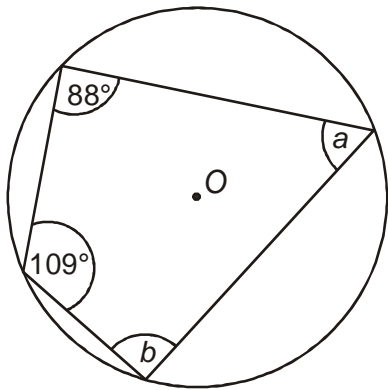


12) $r = \underline{\hspace{2cm}}$ $s = \underline{\hspace{2cm}}$

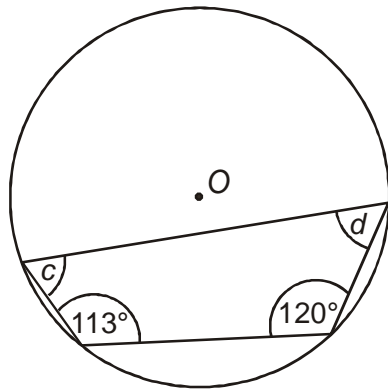




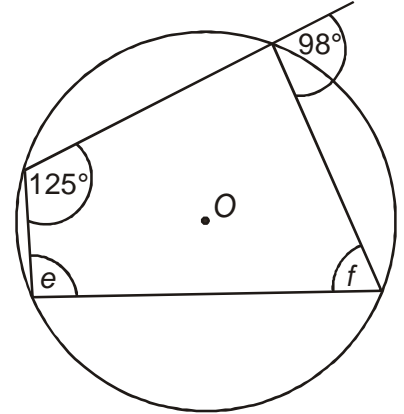
1) $a = \underline{\hspace{1cm}}$ $b = \underline{\hspace{1cm}}$



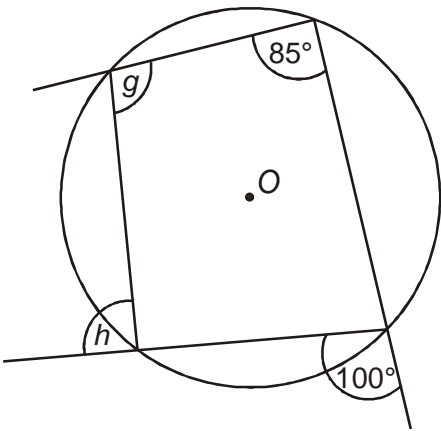
2) $c = \underline{\hspace{1cm}}$ $d = \underline{\hspace{1cm}}$



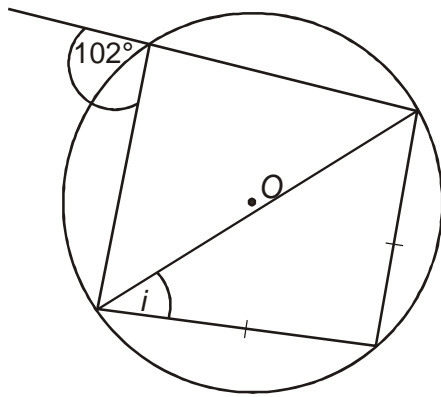
3) $e = \underline{\hspace{1cm}}$ $f = \underline{\hspace{1cm}}$



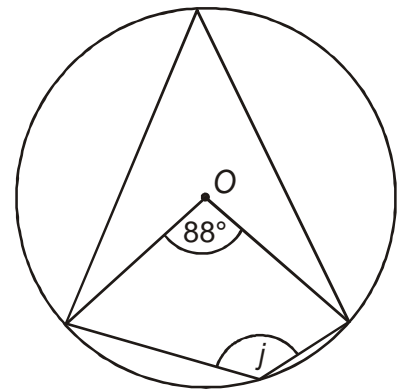
4) $g = \underline{\hspace{1cm}}$ $h = \underline{\hspace{1cm}}$



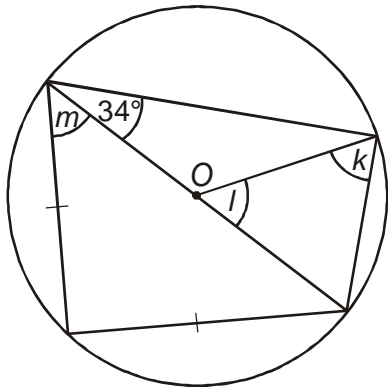
5) $i = \underline{\hspace{1cm}}$



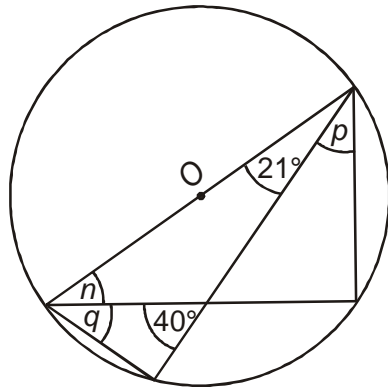
6) $j = \underline{\hspace{1cm}}$



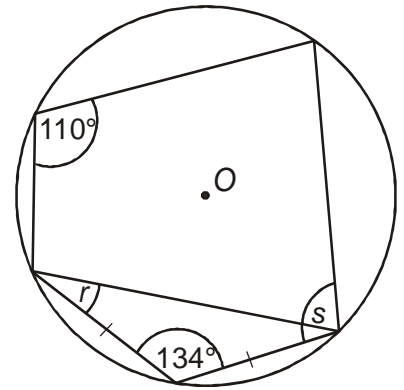
7) $k = \underline{\hspace{1cm}}$ $l = \underline{\hspace{1cm}}$ $m = \underline{\hspace{1cm}}$



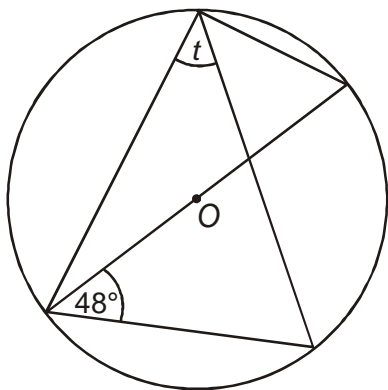
8) $n = \underline{\hspace{1cm}}$ $p = \underline{\hspace{1cm}}$ $q = \underline{\hspace{1cm}}$



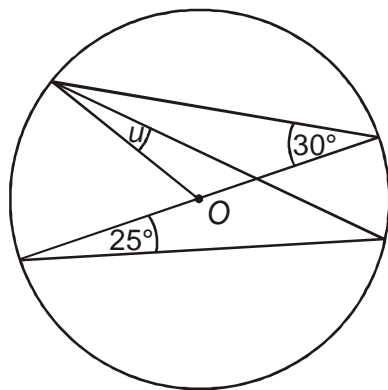
9) $r = \underline{\hspace{1cm}}$ $s = \underline{\hspace{1cm}}$



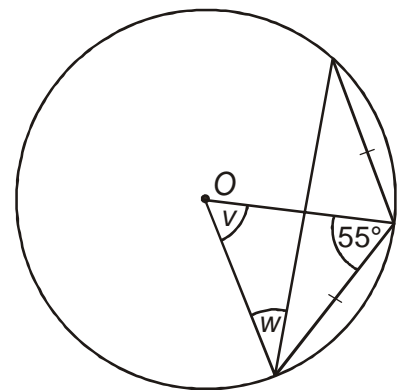
10) $t = \underline{\hspace{1cm}}$



11) $u = \underline{\hspace{1cm}}$

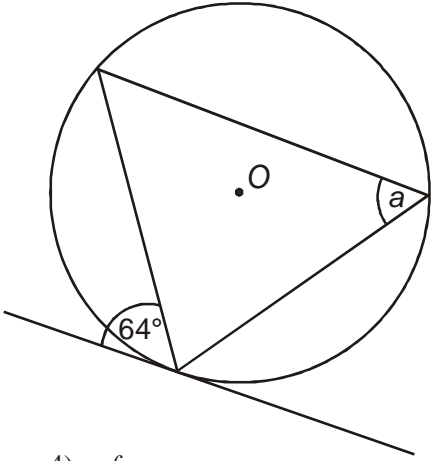


12) $v = \underline{\hspace{1cm}}$ $w = \underline{\hspace{1cm}}$

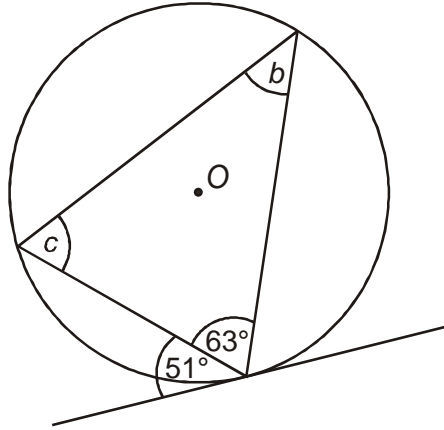




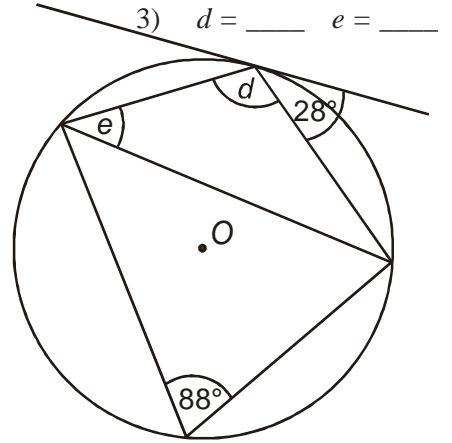
1) $a = \underline{\hspace{2cm}}$



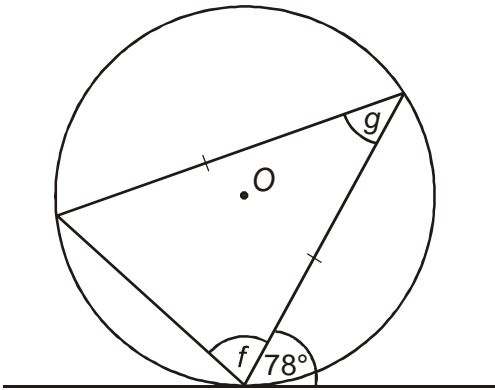
2) $b = \underline{\hspace{2cm}}$ $c = \underline{\hspace{2cm}}$



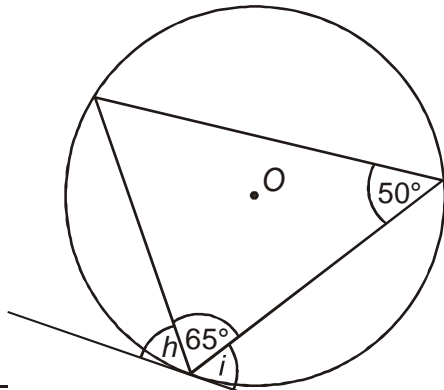
3) $d = \underline{\hspace{2cm}}$ $e = \underline{\hspace{2cm}}$



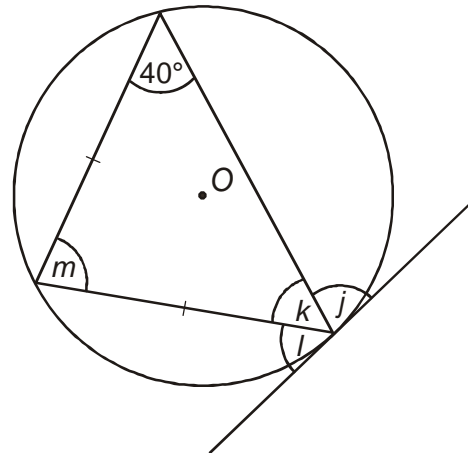
4) $f = \underline{\hspace{2cm}}$ $g = \underline{\hspace{2cm}}$



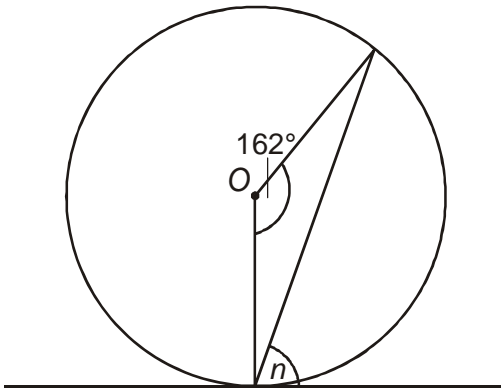
5) $h = \underline{\hspace{2cm}}$ $i = \underline{\hspace{2cm}}$



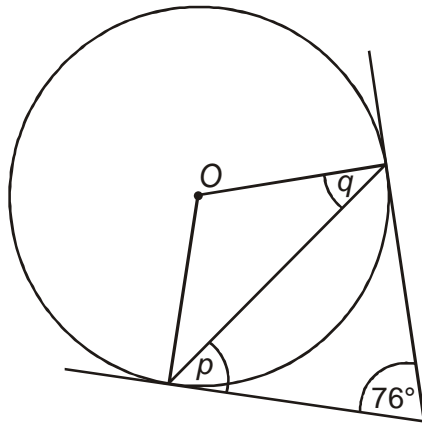
6) $j = \underline{\hspace{2cm}}$ $k = \underline{\hspace{2cm}}$ $l = \underline{\hspace{2cm}}$ $m = \underline{\hspace{2cm}}$



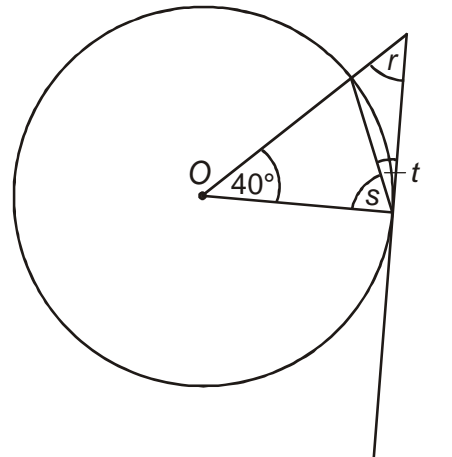
7) $n = \underline{\hspace{2cm}}$



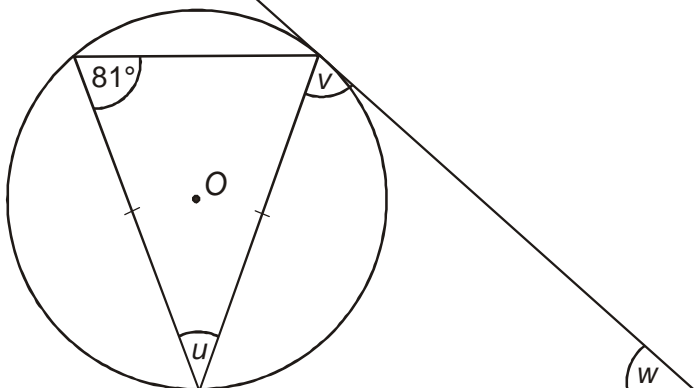
8) $p = \underline{\hspace{2cm}}$ $q = \underline{\hspace{2cm}}$



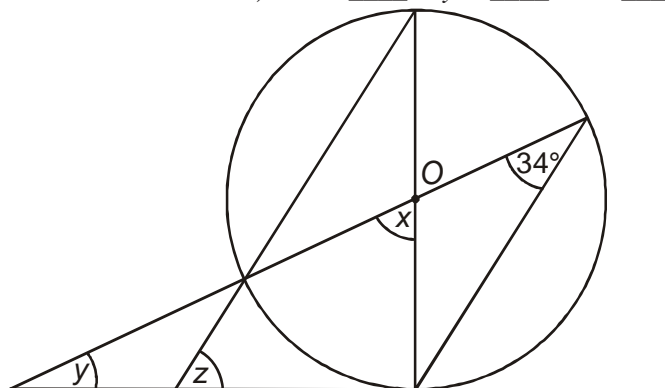
9) $r = \underline{\hspace{2cm}}$ $s = \underline{\hspace{2cm}}$ $t = \underline{\hspace{2cm}}$



10) $u = \underline{\hspace{2cm}}$ $v = \underline{\hspace{2cm}}$ $w = \underline{\hspace{2cm}}$



11) $x = \underline{\hspace{2cm}}$ $y = \underline{\hspace{2cm}}$ $z = \underline{\hspace{2cm}}$



Cumulative Frequency

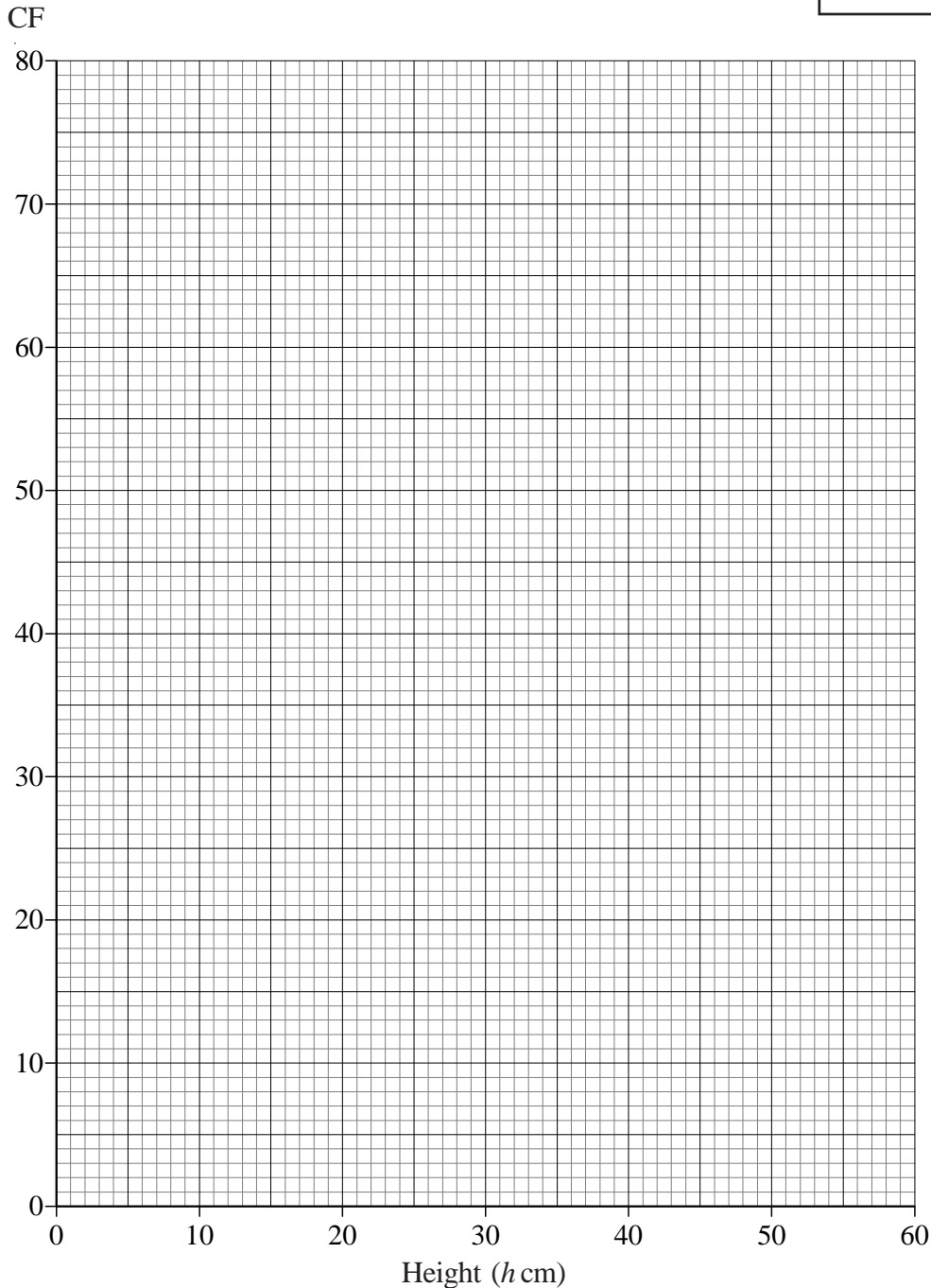


1) The heights of 80 plants were measured and can be seen in the table, below.

Height (h cm)	Frequency
$0 < h \leq 10$	2
$10 < h \leq 20$	5
$20 < h < 30$	19
$30 < h \leq 40$	38
$40 < h \leq 50$	13
$50 < h < 60$	3

a) Complete the cumulative frequency table for the plants.

Height (h cm)	Cumulative Frequency
$0 < h \leq 10$	2
$0 < h < 20$	
$0 < h < 30$	
$0 < h \leq 40$	
$0 < h \leq 50$	
$0 < h \leq 60$	



b) Draw a cumulative frequency graph for your table.

c) Use your graph to find an estimate for

- the median height of a plant.
- the interquartile range of the heights of the plants.

d) Use your graph to estimate how many plants had a height that was greater than 45cm.

Cumulative Frequency



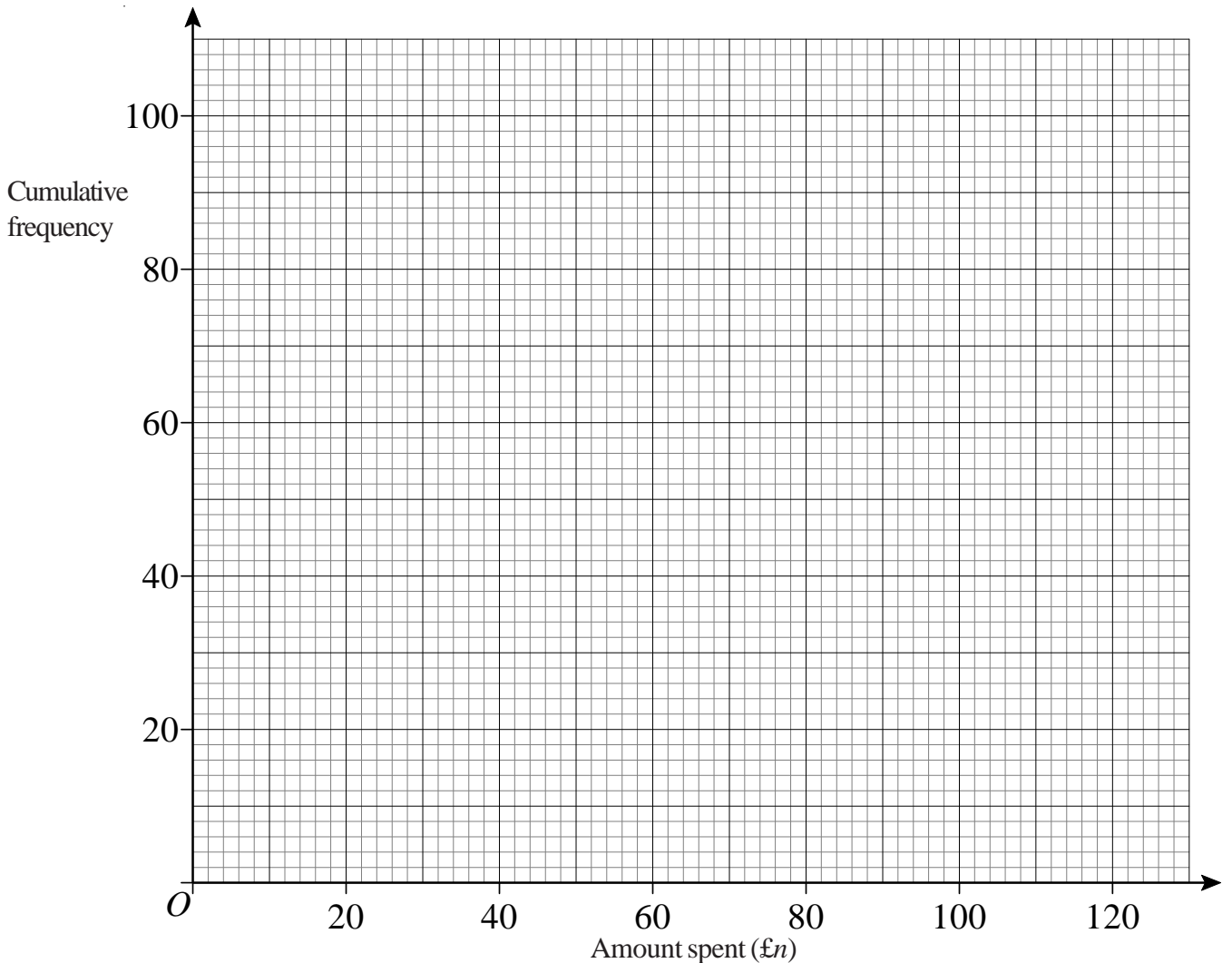
1) The table shows information about the amount spent by 100 customers in a supermarket.

Amount spent (£ n)	Frequency
$0 < n < 20$	17
$20 < n < 40$	23
$40 < n < 60$	36
$60 < n < 80$	14
$80 < n < 100$	8
$100 < n < 120$	2

a) Complete the cumulative frequency table for this information.

Amount spent (£ n)	Cumulative frequency
$0 < n < 20$	17
$0 < n < 40$	
$0 < n < 60$	
$0 < n < 80$	
$0 < n < 100$	
$0 < n < 120$	

b) On the grid, draw a cumulative frequency graph for your table.



- c) Use your graph to find an estimate for the median amount spent.
- d) Use your graph to find an estimate for the interquartile range of the amount of money spent.

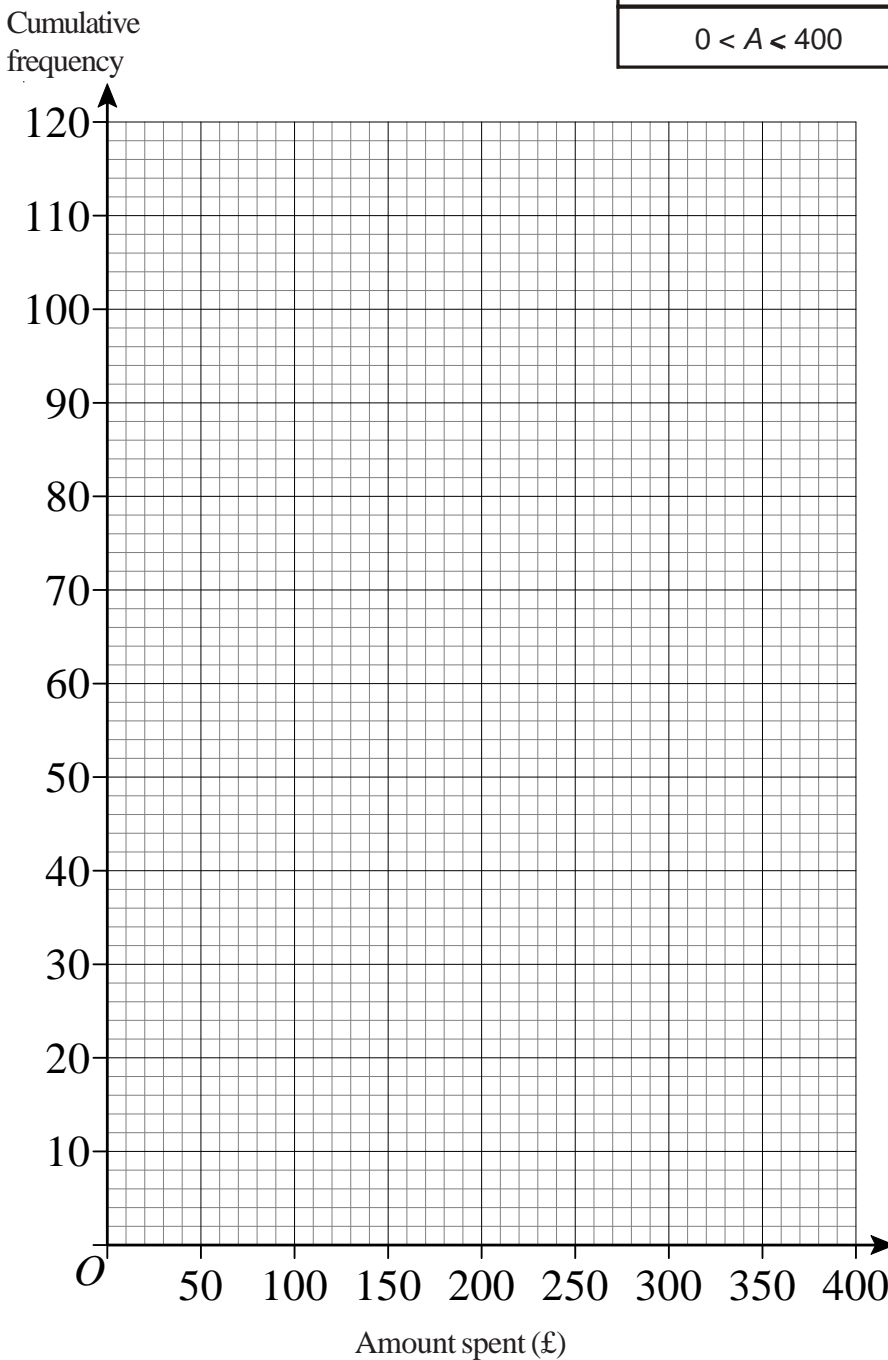
Cumulative Frequency



- 1) Fred did a survey about the amount of money spent by 120 men at Christmas. The cumulative frequency table gives some information about the amounts of money spent by the 120 men.

Amount (£A) spent	Cumulative frequency
$0 < A < 100$	12
$0 < A < 150$	26
$0 < A < 200$	42
$0 < A < 250$	64
$0 < A < 300$	93
$0 < A < 350$	112
$0 < A < 400$	120

- a) On the grid, draw a cumulative frequency diagram.



- b) Use your cumulative frequency diagram to estimate the median.
- c) Use your cumulative frequency diagram to estimate the interquartile range of the amount of money spent.
- d) Use your cumulative frequency diagram to estimate the number of men who spent more than £330.

Cumulative Frequency

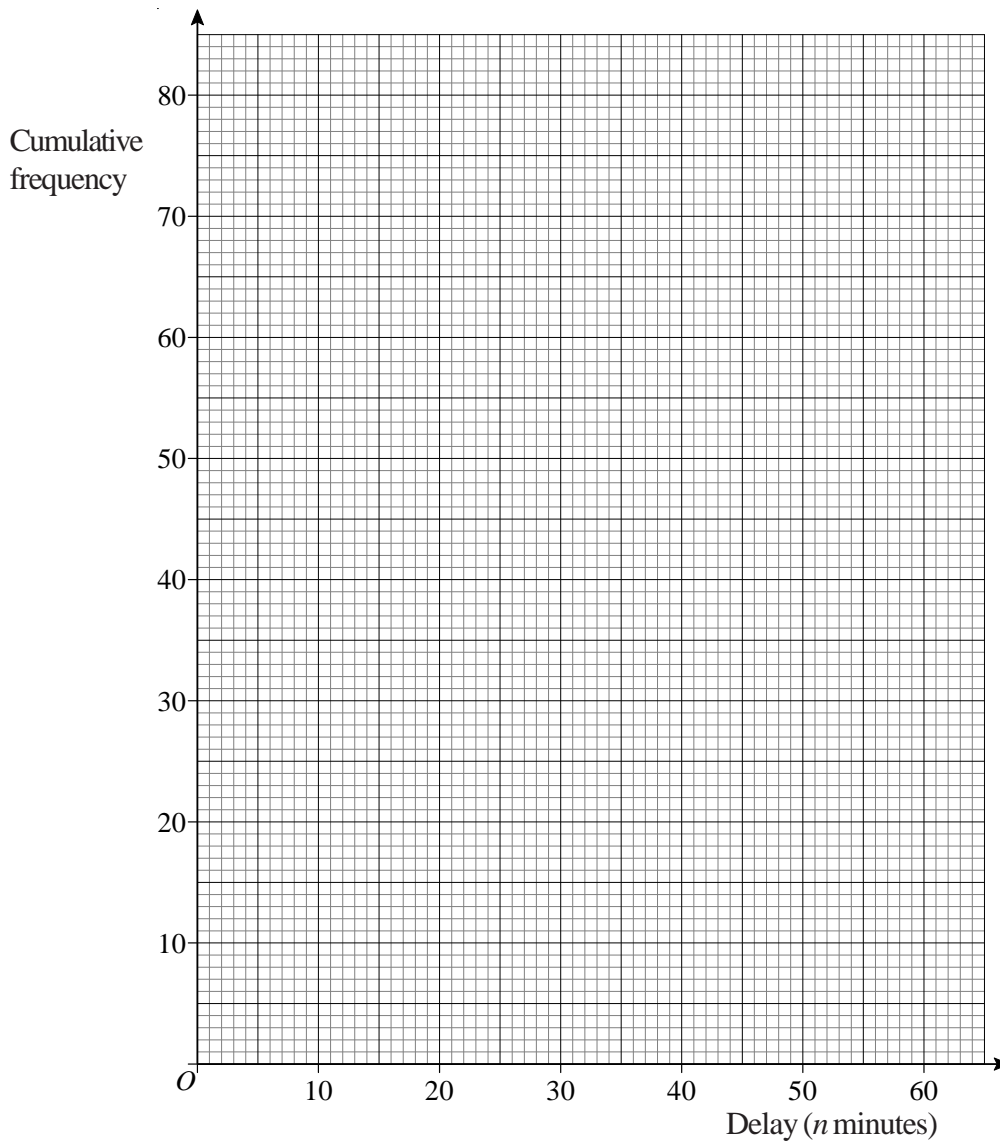


- 1) The table gives some information about the delay, in minutes, of 80 trains.
a) Complete the cumulative frequency table.

Delay (n minutes)	Frequency
$0 < n < 20$	16
$20 < n < 30$	27
$30 < n < 40$	22
$40 < n < 50$	10
$50 < n < 60$	5

Delay (n minutes)	Cumulative Frequency
$0 < n < 20$	
$0 < n < 30$	
$0 < n < 40$	
$0 < n < 50$	
$0 < n < 60$	

- b) On the grid below, draw a cumulative frequency graph for your table.



- c) Use your graph to find an estimate for
- the median delay.
 - the interquartile range of the delays.
 - the number of trains delayed for more than 53 minutes.

Cumulative Frequency



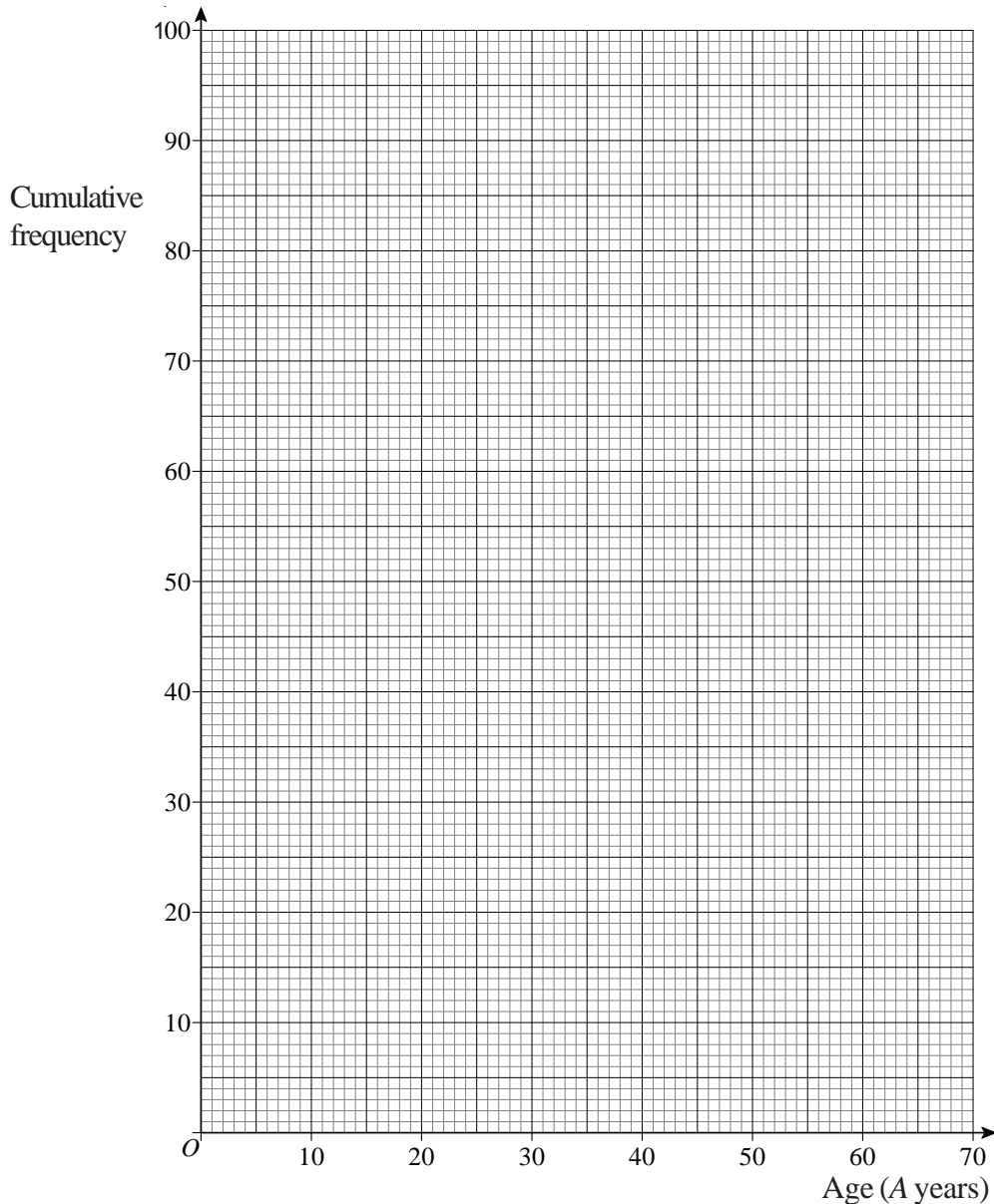
- 1) There are 100 teachers at Sam's school.
Sam found out the age of each teacher.

The table gives information about her results. a) Complete the cumulative frequency table

Age (A years)	Frequency
$20 < A < 30$	25
$30 < A < 40$	36
$40 < A < 50$	22
$50 < A < 60$	11
$60 < A < 70$	6

Age (A years)	Cumulative Frequency
$20 < A < 30$	25
$20 < A < 40$	
$20 < A < 50$	
$20 < A < 60$	
$20 < A < 70$	

- b) On the grid, draw a cumulative frequency graph for your table.



- c) Use your graph to find an estimate for the median age.
d) Use your graph to find an estimate for the number of these teachers who are **older** than 56 years old.

Cumulative Frequency



1) This table shows information about the time, m minutes, it takes to show each of 120 films.

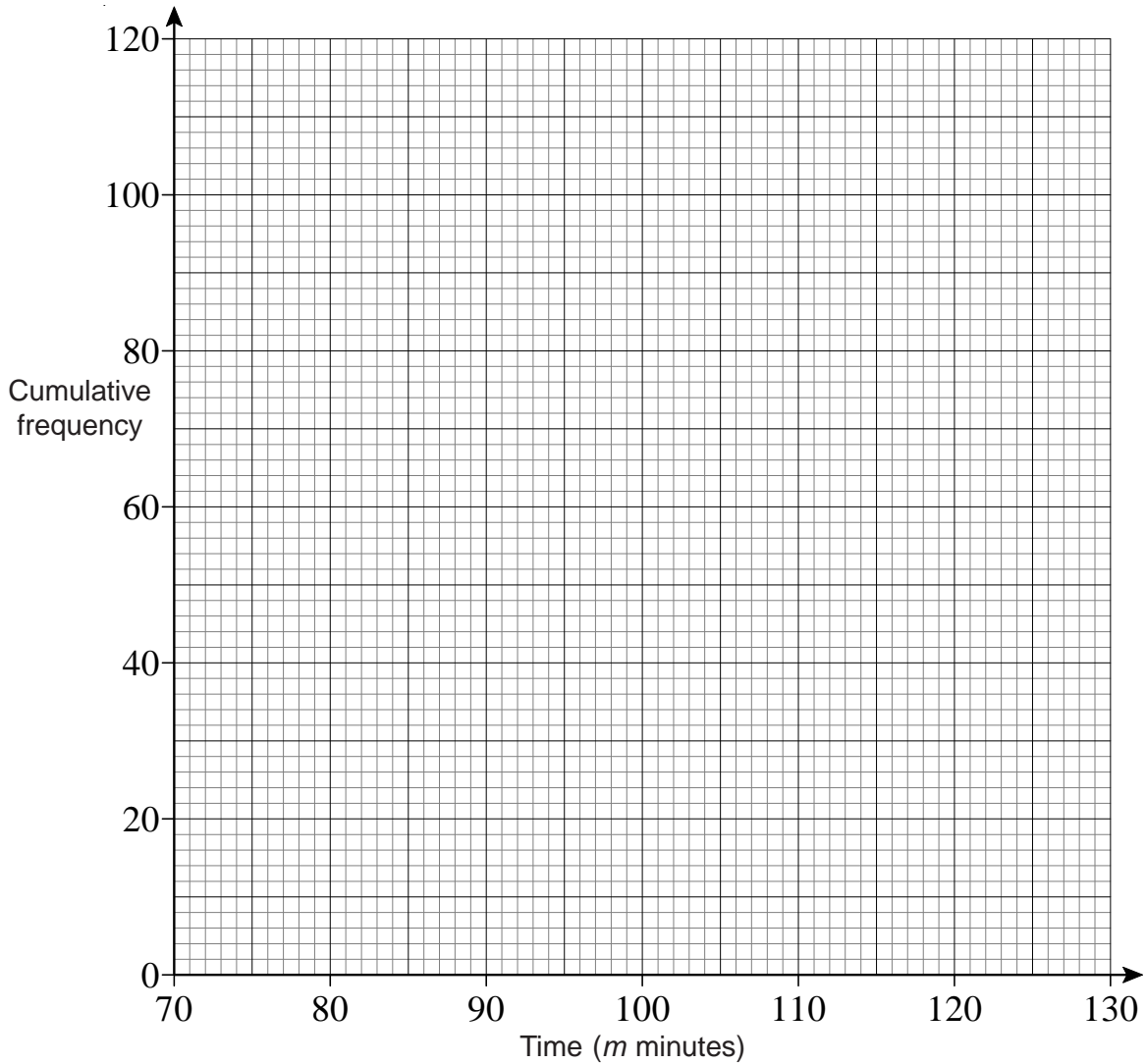
Time (m minutes)	Frequency
$70 < m < 80$	3
$80 < m < 90$	13
$90 < m < 100$	34
$100 < m < 110$	32
$110 < m < 120$	26
$120 < m < 130$	12

a) Write down the modal class interval.

b) Complete this cumulative frequency table.

Time (m minutes)	Cumulative frequency
$70 < m < 80$	3
$70 < m < 90$	
$70 < m < 100$	
$70 < m < 110$	
$70 < m < 120$	
$70 < m < 130$	

c) On the grid, draw a cumulative frequency graph for your cumulative frequency table.



d) Use your graph to find an estimate for the median.

e) Use your graph to find an estimate for the interquartile range of times.

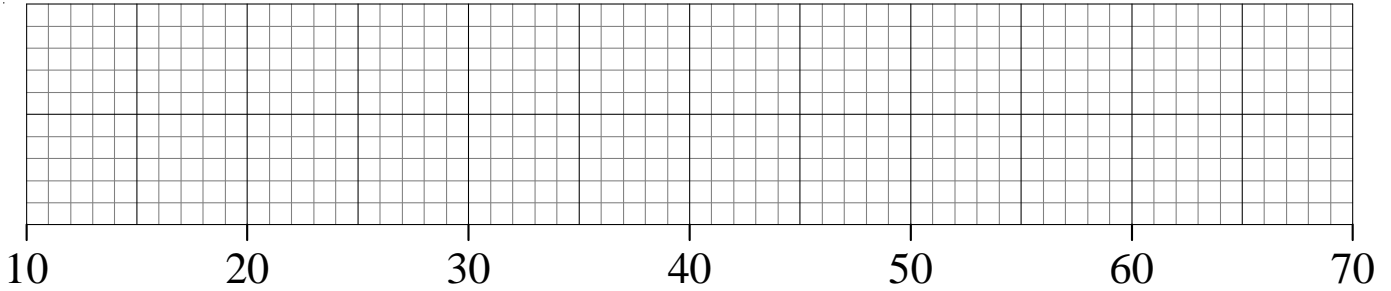
f) Use your graph to find an estimate for the number of films which take longer than 115 minutes to show.



1) The ages of 20 teachers are listed below.

22, 22, 24, 25, 27, 27, 28, 29, 29, 29, 34, 35, 41, 43, 44, 49, 55, 57, 58, 58

a) On the grid below, draw a box plot to show the information about the teachers.



b) What is the interquartile range of the ages of the teachers?



2) A warehouse has 60 employees working in it.

The age of the youngest employee is 16 years.

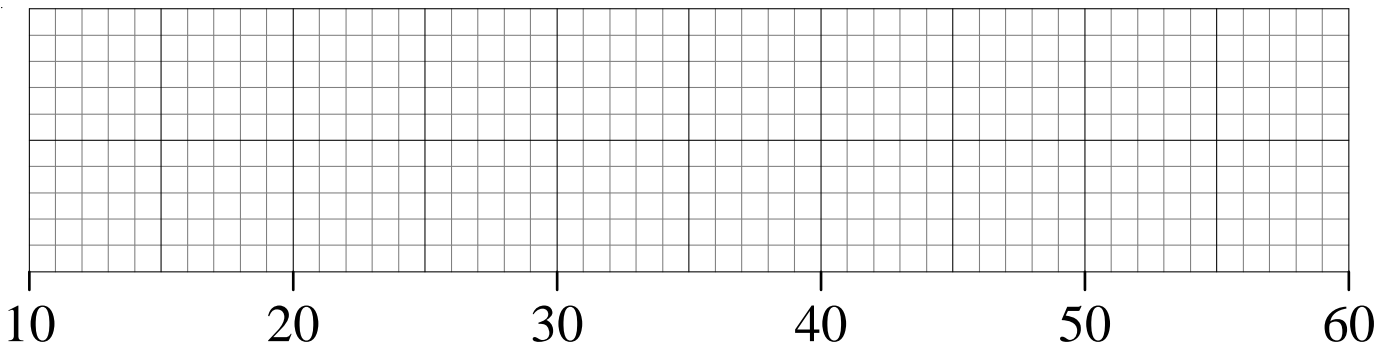
The age of the oldest employee is 55 years.

The median age is 37 years.

The lower quartile age is 29 years.

The upper quartile age is 43 years.

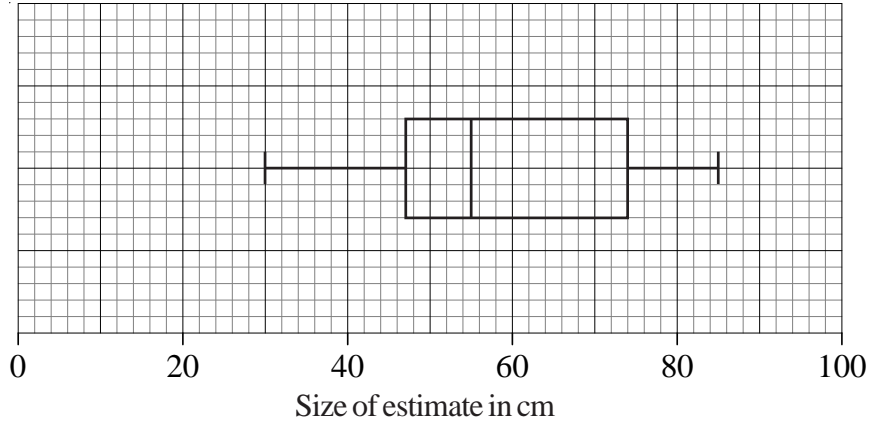
On the grid below, draw a box plot to show information about the ages of the employees.



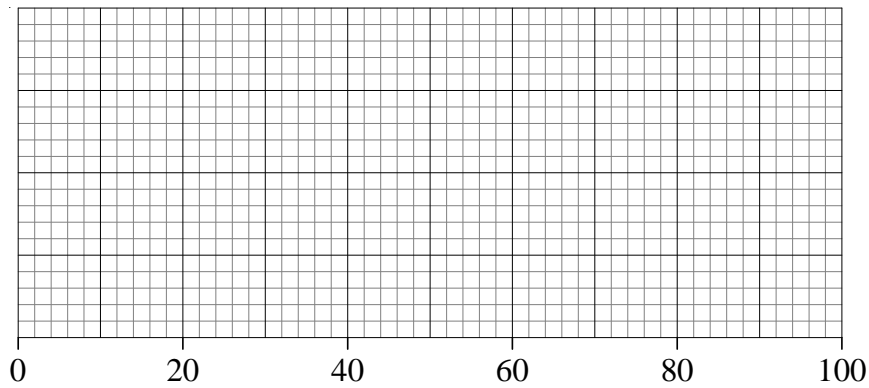


- 1) Terry drew a line of length 60 cm.
He asked some children to estimate the length of the line he had drawn.
He recorded their estimates.
The box plot gives some information about these estimates.

Children's estimates



Adults' estimates



- Write down the median of the children's estimates.
- Write down the interquartile range of the children's estimates.

Terry then asked some adults to estimate the length of the line he had drawn.
The table gives some information about the adults' estimates.

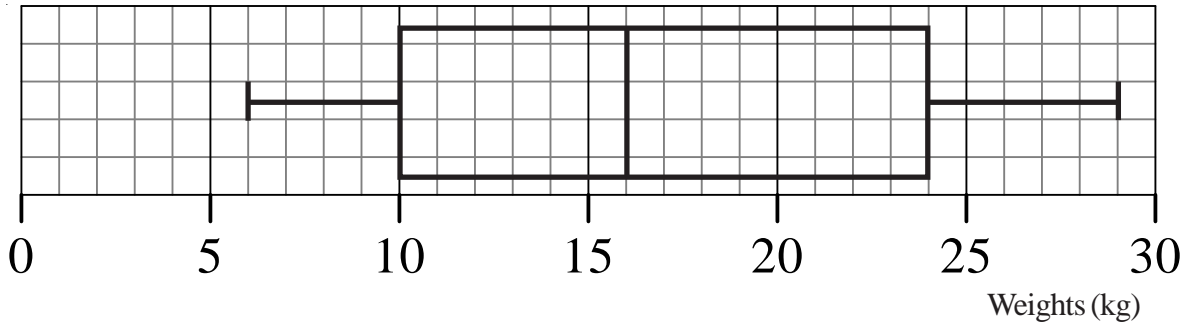
	Length
Lowest estimate	20 cm
Lower quartile	45 cm
Median	62 cm
Upper quartile	75 cm
Highest estimate	95 cm

- On the grid above, draw a box plot to show this information.
- Use the two box plots to compare the distribution of the children's estimates with the distribution of the adults' estimates.

Box Plots



- 1) The box plot gives information about the distribution of the weights of bags on a plane.



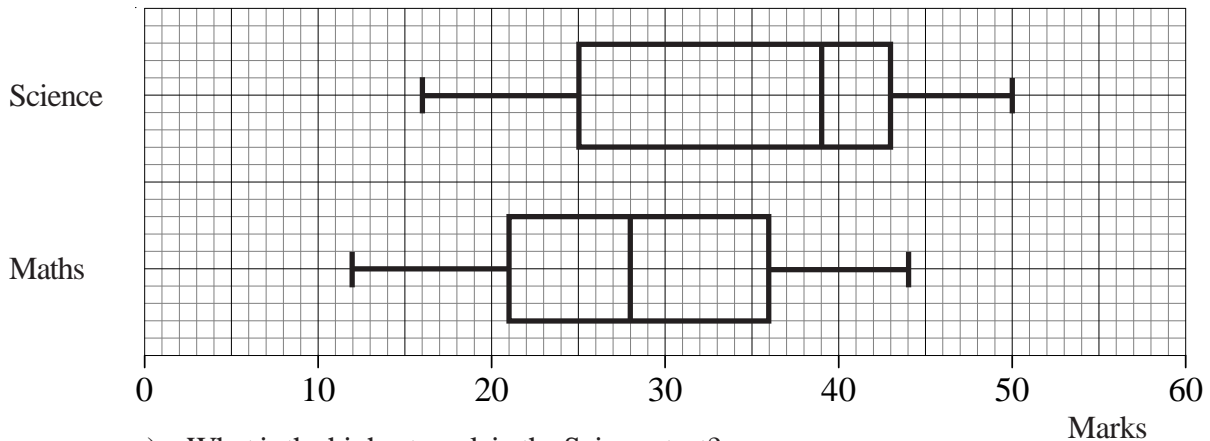
- a) Claude says that the heaviest bag weighs 24 kg.
He is **wrong**.
Explain why.
- b) Write down the median weight.
- c) Work out the interquartile range of the weights.

There are 240 bags on the plane.

- d) Work out the number of bags with a weight of 10 kg or less.



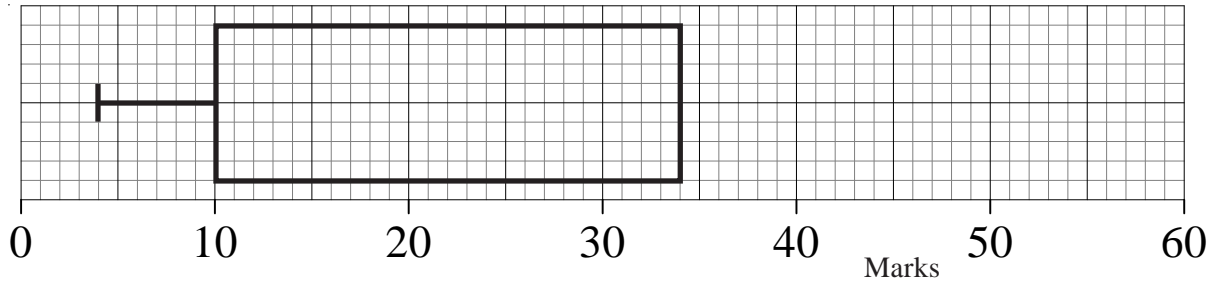
- 2) The box plots show the distribution of marks in a Science and Maths test for a group of students.



- a) What is the highest mark in the Science test?
- b) Compare the distribution of the marks in the Science test and marks in the Maths test.
- 1
-
- 2
-



1) The incomplete box plot and table show some information about some marks.

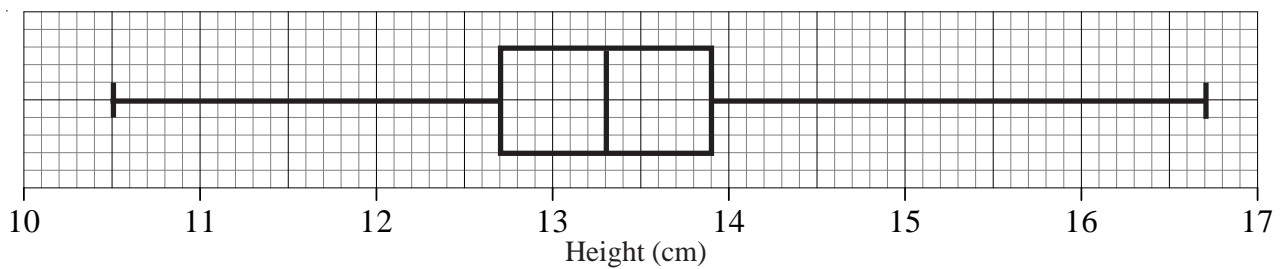


	Marks
Lowest mark	4
Lower quartile	
Median	30
Upper quartile	34
Highest mark	55

- Use the information in the table to complete the box plot.
- Use the information in the box plot to complete the table.



2) Kim measured the height, in cm, of each tomato plant in her greenhouse. She used the results to draw the box plot shown below.

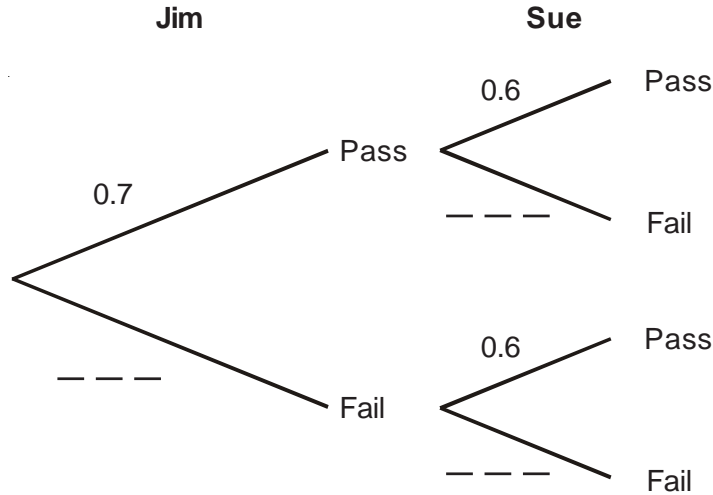


- Write down the median height.
- Work out the interquartile range.
- Explain why the interquartile range may be a better measure of spread than the range.

Simple Tree Diagrams



- 1) Jim and Sue each take a driving test.
The probability that Jim will pass the driving test is 0.7
The probability that Sue will pass the driving test is 0.6
a) Complete the probability tree diagram.

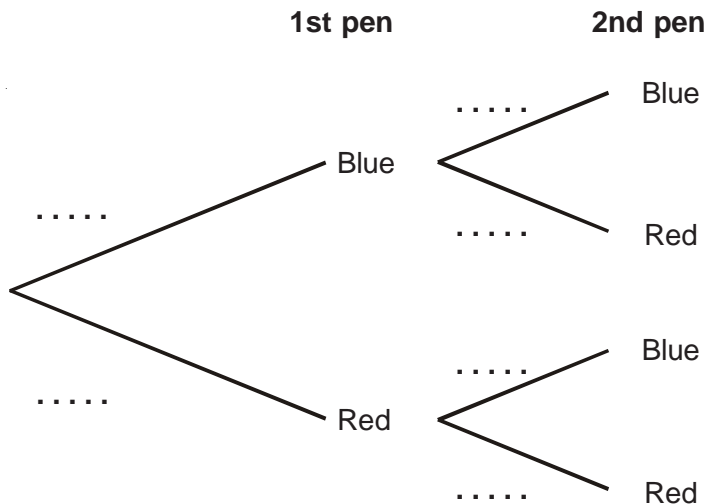


- b) Work out the probability that both Jim and Sue will pass the driving test.
c) Work out the probability that only one of them will pass the driving test.



- 2) Terri has 7 pens in a box.
2 of the pens are blue.
5 of the pens are red.
Terri takes at random a pen from the box and writes down its colour.
Terri puts the pen back in the box.
Then Terri takes at random a second pen from the box and writes down its colour.

- a) Complete the probability tree diagram.



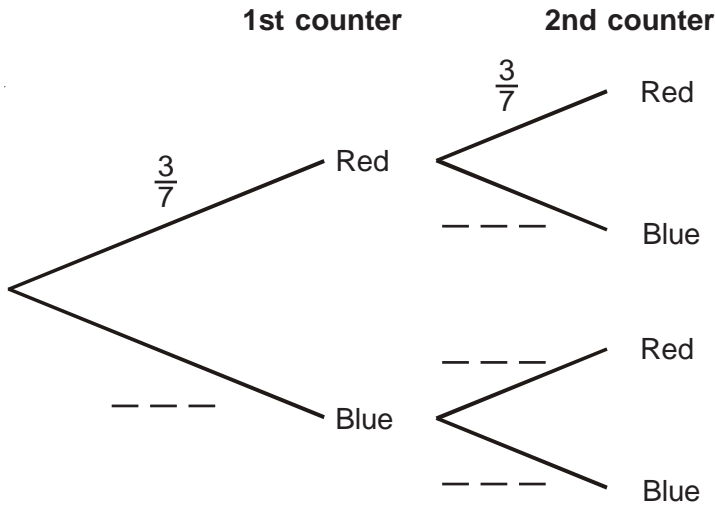
- b) Work out the probability that Terri takes exactly one pen of each colour from the box.

Simple Tree Diagrams



- 1) Tim puts 3 red counters and 4 blue counters in a bag.
He takes at random a counter from the bag.
He writes down the colour of the counter.
He puts the counter in the bag again.
He then takes at random a second counter from the bag.

a) Complete the probability tree diagram.

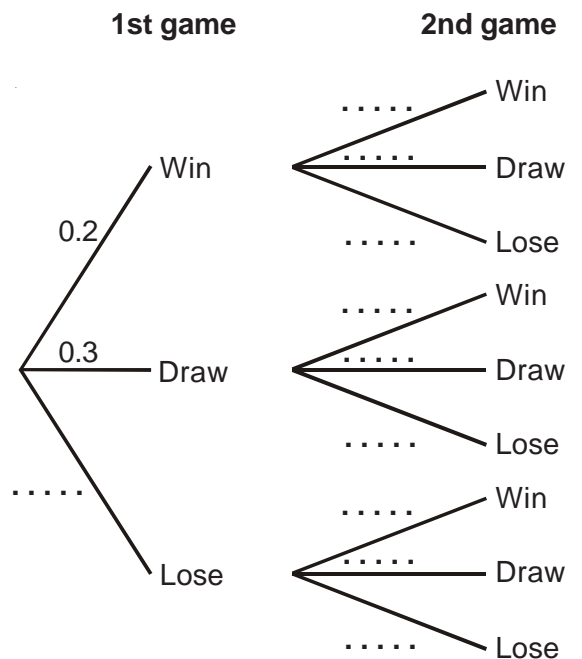


b) Work out the probability that Tim takes two red counters.



- 2) In a game of chess, a player can either win, lose or draw.
The probability that Jane wins any game of chess is 0.2
The probability that Jane draws any game of chess is 0.3
Jane plays 2 games of chess.

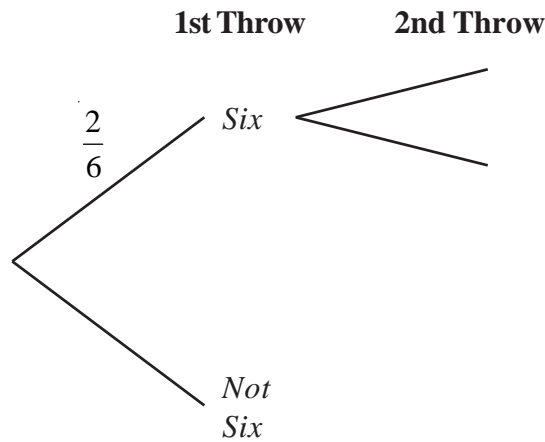
a) Complete the probability tree diagram.



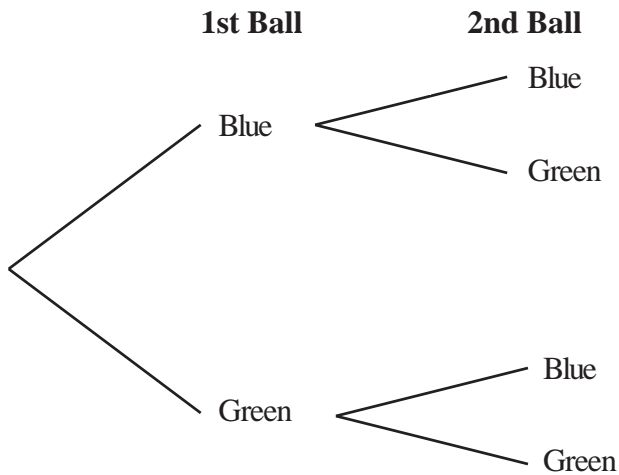
b) Work out the probability that Jane will win both games.



- 1) Lucy throws a biased dice twice.
 Complete the probability tree diagram to show the outcomes.
 Label clearly the branches of the tree diagram.



- 2) A bag contains 10 coloured balls.
 7 of the balls are blue and 3 of the balls are green.
 Nathan is going to take a ball, replace it, and then take a second ball.
 a) Complete the tree diagram.



- b) Work out the probability that Nathan will take two blue balls.
- c) Work out the probability that Nathan will take one of each coloured balls.
- d) Work out the probability that Nathan will take two balls of the same colour.



- 1) There are 5 red pens, 3 blue pens and 2 green pens in a box.
Jerry takes at random a pen from the box and gives the pen to his friend.
Jerry then takes at random another pen from the box.
Work out the probability that both pens are the same colour.






- 2) There are 3 red sweets, 2 blue sweets and 4 green sweets in a bag.
Jack takes a sweet at random.
He eats the sweet.
He then takes another sweet at random.

Work out the probability that both sweets are the same colour.



- 3) There are 13 buttons in a bag.
9 buttons are white.
4 buttons are black.
Carol takes a button at random from the bag, and keeps it.
She now takes another button from the bag.

Work out the probability that Carol takes a button of each colour.

-  1) A bag contains 7 green and 3 yellow balls.
A ball is taken from the bag at random and not replaced.
Another ball is taken from the bag at random.
- Draw a tree diagram to show all the possibilities.
 - What is the probability that both balls are different colours?
-  2) A box contains 5 red counters and 3 blue counters.
A counter is taken from the box at random and not replaced.
Another counter is taken at random.
- Draw a tree diagram to show all the possibilities.
 - What is the probability of choosing at least one blue counter?
 - What is the probability of choosing two counters of the same colour?
 - What is the probability of choosing two counters of different colours?
-  3) A box contains 4 red counters and 3 blue counters.
A counter is taken from the box at random and not replaced.
A second counter is taken from the box at random and not replaced.
A third counter is taken from the box.
- Draw a tree diagram to show all the possibilities.
 - What is the probability that all three counters are the same colour?
 - What is the probability that exactly two of the counters are red?

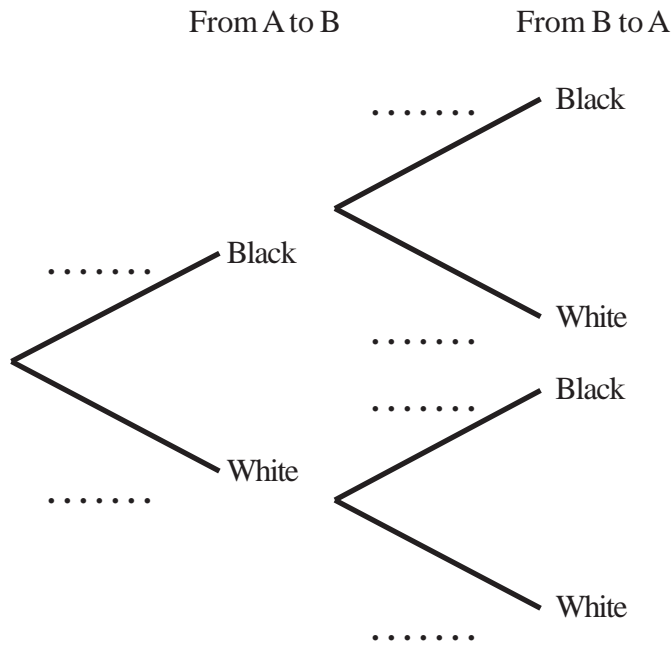
Harder Tree Diagrams



- 1) Sara has two boxes.
 There are 6 black and 4 white counters in box A.
 There are 7 black and 3 white counters in box B.

Sara takes at random a counter from box A and puts it in box B.
 She then takes at random a counter from box B and puts it in box A.

- a) Complete the probability tree diagram.



- b) Find the probability that after Sara has put the counters from box B into box A there will still be 6 black counters and 4 white counters in box A.