THE BRITISH INTERNATIONAL SCHOOL ABU DHABI

A NORD ANGLIA EDUCATION SCHOOL

Year 10 Maths

Topic 1–11

Revision Workbook

This booklet contains worksheets covering a selection of questions from Topics 1–11 as below. The majority of worksheets are focused on Topic 9–11 , but there are 1–2 worksheets for the first 8 topics included also. At the end of the booklet there are a few worksheets with questions on 'prior knowledge' topics that you have studied in Year 7–8–9 and which you will be required to know for upcoming tests.

Answers will be shared electronically by your teacher.

Topic 1: Percentages

Topic 2: Linear Equations

Topic 3: Circle Properties

Topic 4: Arcs and Sectors

Topic 5: Probability

Topic 6: Similarity

Topic 7: 3D Shapes Surface Area and Volume

Topic 8: Algebraic Manipulation

Topic 9: Powers and Roots

Topic 10: Graphical Representation of Data

Topic 11: Simultaneous Linear Equations

PRIOR KNOWLEDGE WORKSHEETS: Speed-Distance-Time, Density, Transformations

Percentages 1

C **1** A television has a price tag of £700
In the sale there is a 30% reduction.
What is the sale price?

Guided

30% of £700 = $\frac{\ldots\ldots}{100} \times 700$

= £.....

Sale price = £700 − £..... = £..... **(2 marks)**

C **2** A holiday usually costs £860
In a sale the price is reduced by 15%.
Work out the cost of the holiday in the sale.

£..... **(3 marks)**

B **3** Andy invested £6000 for 3 years in a savings account.
He was paid 4% per annum compound interest.
How much did Andy have in his savings account after 3 years?

Guided

Multiplier = 100% + 4%

= .....%

= ..... Write the percentage as a decimal.

Amount in account after 3 years = $(\ldots\ldots)^3 \times 6000$

= ..... Write down your full calculator display.

= £..... Round your answer to 2 decimal places.

(3 marks)

B **4** Chloe invests £8500 for 4 years at 3% compound interest.
How much interest will she have earned at the end of 4 years?

£..... **(3 marks)**

B **5** James bought a car for £12 000
The value of the car depreciates by 15% each year.
Work out the value of the car after 3 years.

This can be done in the same way as a compound interest question – see Q3. To find the multiplier subtract 15% from 100%.

£..... **(3 marks)**

Reverse percentages and compound interest

B 1 Linda bought a new car for £18 000
Each year, the car depreciated in value by 15%.
Work out the value of the car after 4 years.

Work out the multiplier as a decimal.

Guided

Multiplier $= 1 - \frac{15}{100} =$ .....

Value after 4 years $= 18000 \times (.....)^4$

$=$ .....

$=$ £.....

When working with money, answers must be given to 2 decimal places.

(3 marks)

B 2 Jalin invested £3200 in a savings account for 3 years.
He was paid compound interest at a rate of 3.5% per annum.
Work out how much was in the account after 3 years.

£..... **(3 marks)**

B 3 In a sale, normal prices are reduced by 35%.
The sale price of a DVD player is £403
Work out the normal price of the DVD player.

Exam questions similar to this have proved especially tricky – be prepared! ResultsPlus

Guided

Multiplier $= 1 - \frac{35}{100} =$ .....

EXAM ALERT

Normal price $= 403 \div$ .....

$=$ £.....

(3 marks)

B 4 Jill's weekly pay this year is £460
This is 15% more than her weekly pay last year.
Dave says, 'This means Jill's weekly pay last year was £391.'
Dave is wrong. Explain why.

(2 marks)

A 5 Pete invested £5100 for n years in a savings account.
He was paid 4.5% per annum compound interest.
At the end of the n years he had £6641.53 in the savings account.
Work out the value of n.

Choose some values for n and work out the amount in the savings account after n years.

$n =$ ..... **(2 marks)**

Straight-line graphs 2

D 1 On the grid draw the graph of $y = 2x + 5$ for values of x from -3 to 1

EXAM ALERT

Exam questions similar to this have proved especially tricky – be prepared! ResultsPlus

First draw a table of values. Next work out the values of y.

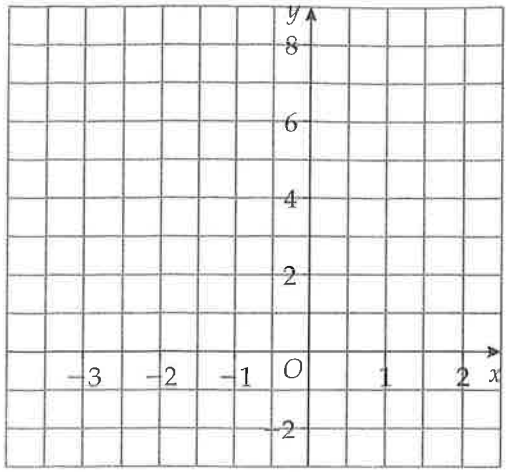
Guided

x	-3	-2	-1	0	1
y					

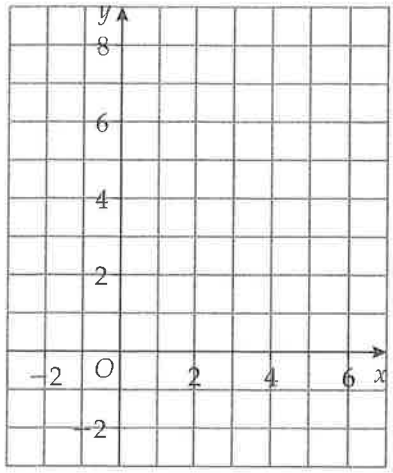
$x = -3$: $y = (2 \times -3) + 5$

$= \ldots\ldots\ldots\ldots$ **(3 marks)**

Plot your points on the grid. Join your points with a straight line using a ruler.



D 2 On the grid draw the graph of $x + y = 6$ for values of x from -2 to 6



(3 marks)

C 3 A straight line has equation $y = 4x + 5$
Write down (a) the gradient and (b) the coordinates of the y-intercept of this straight line.

Guided

(a) gradient = $\ldots\ldots\ldots\ldots$ **(1 mark)**

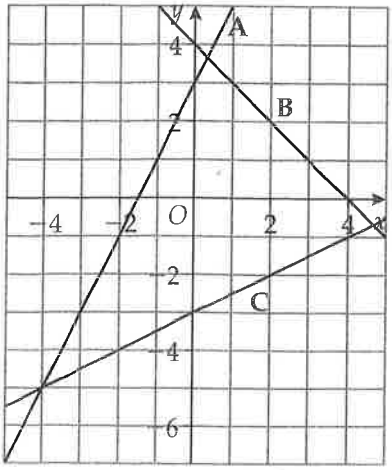
Use $y = mx + c$ where m is the gradient and c is the y-intercept.

(b) y-intercept = (0, $\ldots\ldots\ldots\ldots$) **(1 mark)**

B 4 Find the equation of

(a) line A (b) line B (c) line C

Work out the gradient and find the y-intercept for each line.



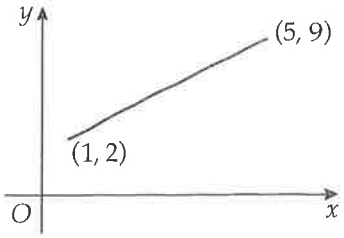
(a) $y = \ldots\ldots\ldots\ldots$ **(2 marks)**

(b) $y = \ldots\ldots\ldots\ldots$ **(2 marks)**

(c) $y = \ldots\ldots\ldots\ldots$ **(2 marks)**

Parallel and perpendicular

D **1** Work out the coordinates of the midpoint of the line joining (1, 2) and (5, 9).



Guided

Coordinates of midpoint = $\left(\frac{1+5}{2}, \frac{\ldots\ldots+\ldots\ldots}{2}\right)$

= (..... , ...) **(2 marks)**

D **2** Work out the coordinates of the midpoint of the line joining (−3, 1) and (7, 5).

..... **(3 marks)**

B **3** Write down the equation of a line parallel to the line with equation $y = 4x - 5$

Use $y = mx + c$ where m is the gradient and c is the y-intercept. Remember that parallel lines have the same gradient.

..... **(1 mark)**

B **4** Write down the equation of a line perpendicular to the line with equation $y = 2x + 6$

Guided

Gradient of $y = 2x + 6$ is .....

Gradient of perpendicular line is $-\frac{1}{\ldots\ldots}$

Equation is $y = -\frac{1}{\ldots\ldots}x +$ ..... **(1 mark)**

A **5** Find the equation of the line which is parallel to the line with equation $y = 3x - 2$ and which passes through the point (0, 4).

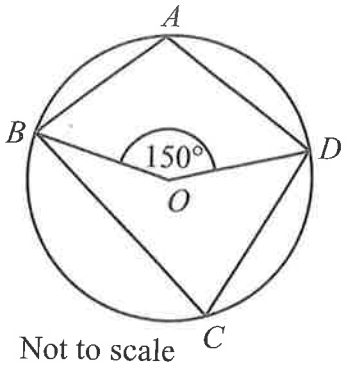
..... **(2 marks)**

A **6** A straight line, L, passes through the point with coordinates (4, 1) and is perpendicular to the line with equation $y = 2x - 5$
Find the equation of the line L.

..... **(3 marks)**

Circle Geometry

1 The diagram shows a circle, centre O. A, B, C and D are points on the circumference.



Not to scale

a) Work out the size of angle BCD. Give a reason for your answer.

.....

.....

[2]

b) Explain why angle $BAD = 105°$.

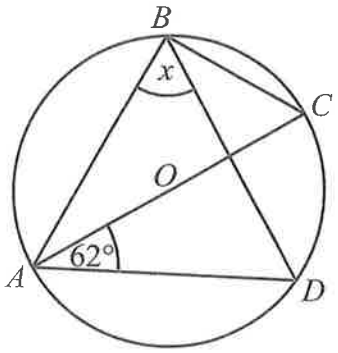
.....

.....

[1]

[Total 3 marks]

2 The diagram below shows a circle with centre O. A, B, C and D are points on the circumference of the circle and AOC is a straight line.



Not to scale

Work out the size of the angle marked x.

Angle DBC = ...°

Angle ABC = ...°

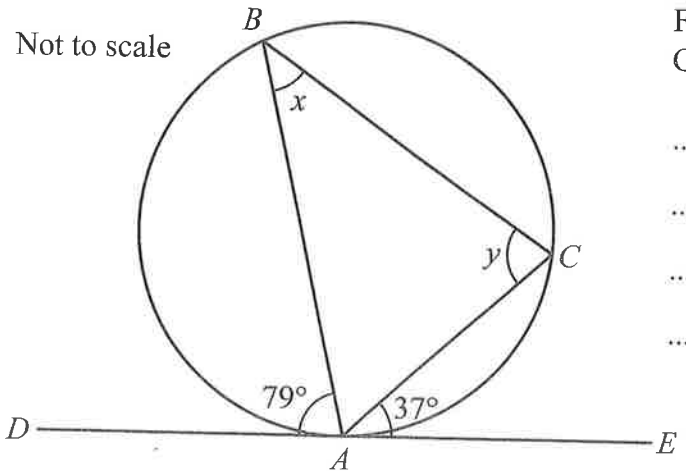
Angle x = ...° − .....° = ...°

x = ...°

[Total 3 marks]

3 Points A, B and C lie on the circumference of a circle and DE is the tangent to the circle at A. Angle $DAB = 79°$ and angle $EAC = 37°$.

Not to scale



Find the sizes of angles x and y.
Give a reason for your answers.

.....

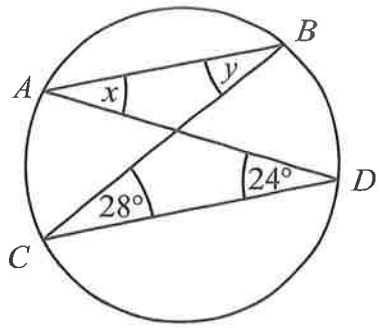
.....

.....

.....

[Total 3 marks]

4 A, B, C and D are points on the circumference of a circle. Angle BCD is 28° and angle ADC is 24°.



Not to scale

a) Find the sizes of angles x and y.

$x =$ ..... ° $y =$ ..... °

[2]

b) Give a reason for your answers.

.....

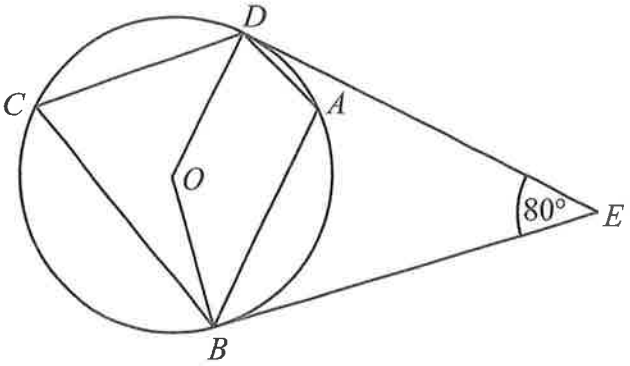
.....

[1]

[Total 3 marks]

5 In the diagram, O is the centre of the circle. A, B, C and D are points on the circumference of the circle and DE and BE are tangents. Angle DEB is 80°.

Not to scale



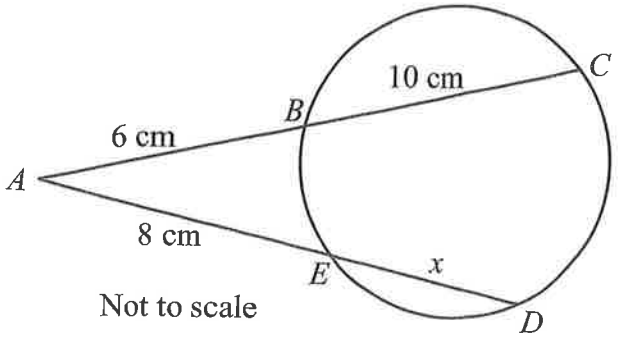
Work out the size of angle DAB.

..... °

[Total 4 marks]

6 Points B, C, D and E lie on the circumference of a circle. $AB = 6$ cm, $BC = 10$ cm, $AE = 8$ cm and $ED = x$.

Find the length of x.

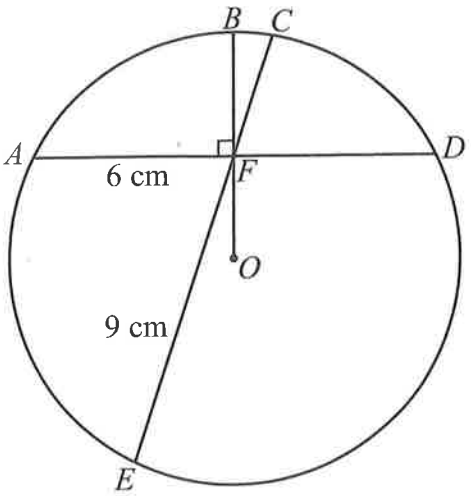


Not to scale

..... cm

[Total 2 marks]

7 Points A, B, C, D and E lie on the circumference of a circle with centre O. AFD and CFE are chords of the circle. $AF = 6$ cm and $EF = 9$ cm.



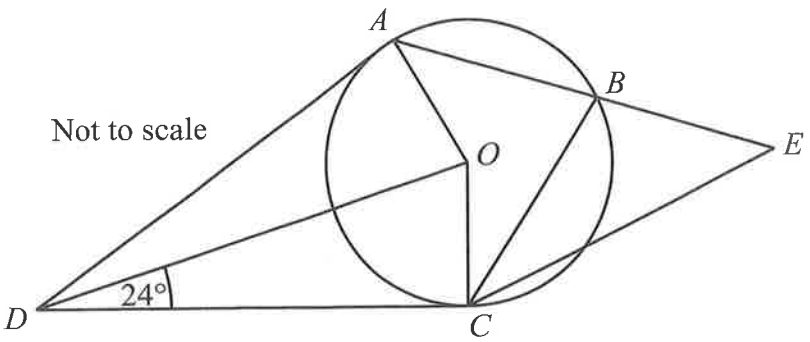
Not to scale

Find the length of CF.

..... cm

[Total 3 marks]

8 The diagram shows a circle with centre O. A, B and C are points on the circumference. AD and CD are tangents to the circle and ABE is a straight line. Angle CDO is 24°.



Find the size of angle CBE.

.....°

[Total 5 marks]

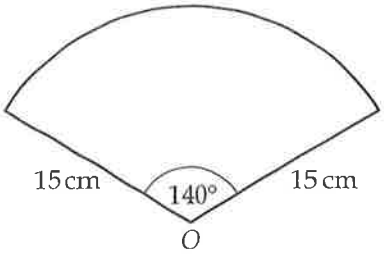
Exam Practice Tip

Make sure you know the rules about circles really, really well. Draw them out and stick them all over your bedroom walls, your fridge, even your dog. Then in the exam, go through the rules one-by-one and use them to fill in as many angles in the diagram as you can. Keep an eye out for sneaky isosceles triangles too.

Score ____ / **26**

Sectors of circles

A 1 The diagram shows a sector of a circle, centre O.
The radius of the circle is 15 cm.
The angle of the sector is 140°.



(a) Calculate the area of the sector.
Give your answer correct to 3 significant figures.

Guided

Area of sector = $\frac{\text{.....}}{\text{.....}} \times \pi \times \text{.....}^2$

= .....

= ..... cm^2 correct to 3 s.f. **(2 marks)**

(b) Work out the perimeter of the sector.
Give your answer correct to 3 significant figures.

The perimeter consists of the arc length plus the length of two radii.

..... cm **(3 marks)**

A 2 The diagram shows a sector of a circle, centre O.
The radius of the circle is 5 cm.
The angle at the centre of the circle is 70°.
Find the perimeter of the sector.
Leave your answer in terms of π in its simplest form.

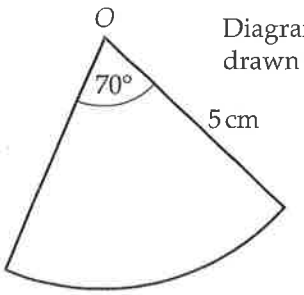
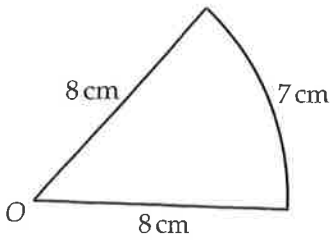


Diagram **NOT** drawn accurately

..... **(4 marks)**

A* 3 The diagram shows a sector of a circle, centre O, radius 8 cm.
The arc length of the sector is 7 cm.
Calculate the area of the sector.

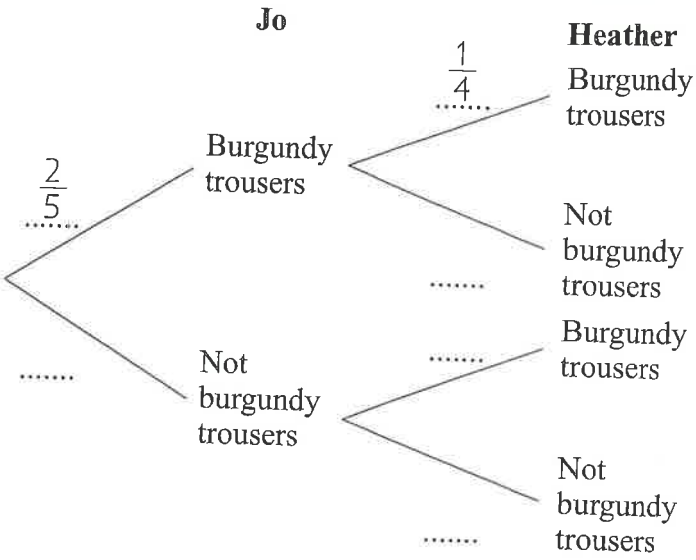


Use the arc length to find the angle of the sector.
Then use your angle to work out the area of the sector.

..... cm^2 **(4 marks)**

Tree Diagrams

1 Jo and Heather are meeting for coffee.
The probability that Jo will wear burgundy trousers is $\frac{2}{5}$.
There is a one in four chance that Heather will wear burgundy trousers.
The two events are independent.



a) Complete the tree diagram above. *[2]*

b) What is the probability that neither of them wear burgundy trousers?

Probability neither wear burgundy trousers = $\frac{3}{5} \times \frac{\ldots\ldots}{\ldots\ldots} = \frac{\ldots\ldots}{\ldots\ldots}$

.....

[2]

[Total 4 marks]

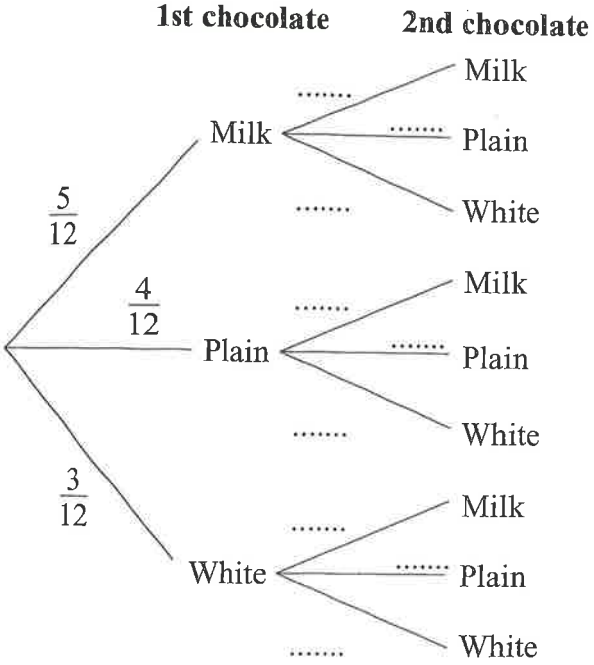
2 A couple are both carriers of a recessive gene that causes a hereditary disease.
If they have a child, the probability that the child will suffer from the disease is 0.25.
The couple plan to have two children.

If the couple have two children, find the probability that at least one of them will have the disease.

.....

[Total 5 marks]

3 A box of chocolates contains 12 chocolates.
5 of the chocolates are milk chocolate, 4 are plain chocolate and 3 are white chocolate.
Two chocolates are chosen at random without replacement.



a) Complete the tree diagram above.

[2]

b) Calculate the probability that one milk chocolate and one white chocolate are chosen.

.....

[3]

c) Work out the probability that at least one plain chocolate is chosen.

.....

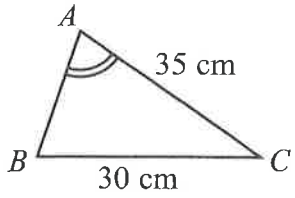
[3]

[Total 8 marks]

Score: ☐/**17**

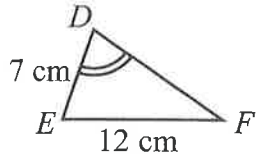
Similarity

1 Triangles *ABC* and *DEF* are mathematically similar. Angles *BAC* and *EDF* are equal. (B)



a) Work out the length of *AB*.

..... cm
[2]



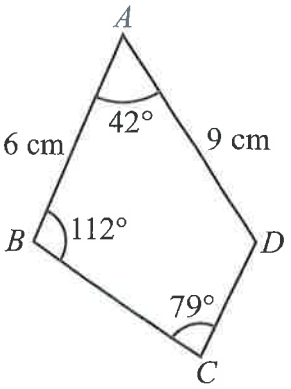
b) Work out the length of *DF*.

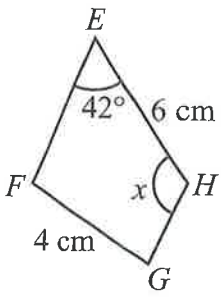
..... cm
[1]

Not to scale

[Total 3 marks]

2 The shapes *ABCD* and *EFGH* are similar quadrilaterals. (B)





Not to scale

a) Find the length of *BC*.

..... cm
[2]

b) Find the length of *EF*.

..... cm
[1]

c) Find the size of angle *x*.

..... °
[1]

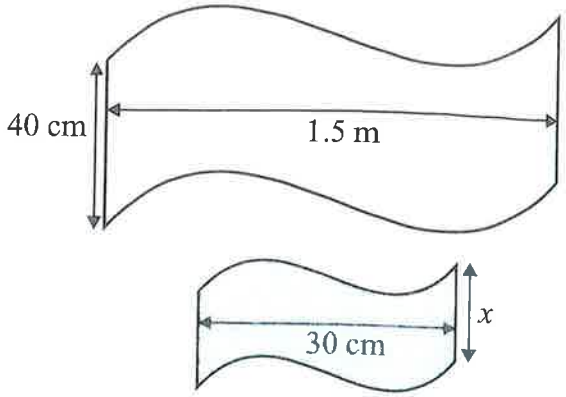
The area of quadrilateral *ABCD* is 36 cm^2.

d) What is the area of quadrilateral *EFGH*?

..... cm^2
[2]

[Total 6 marks]

3 Two mathematically similar banners are shown below. (B)



Not to scale

a) What is the length, in cm, of x?

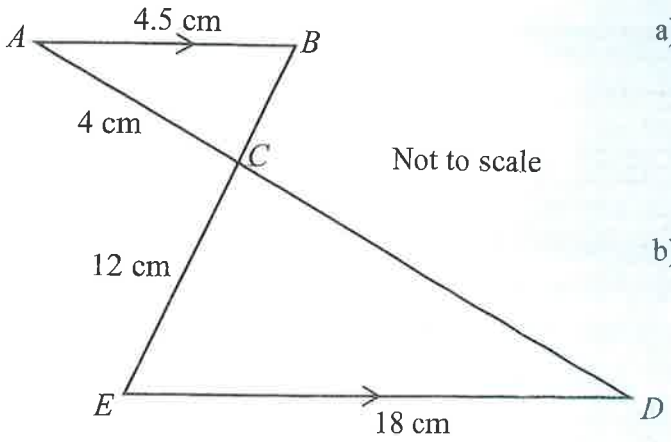
..... cm
[2]

b) The area of the unshaded banner is 0.6 m^2.
What is the area of the shaded banner?

..... m^2
[2]

[Total 4 marks]

4 *ABC* and *CDE* are similar triangles. (B)



Not to scale

a) Find the length of *BC*.

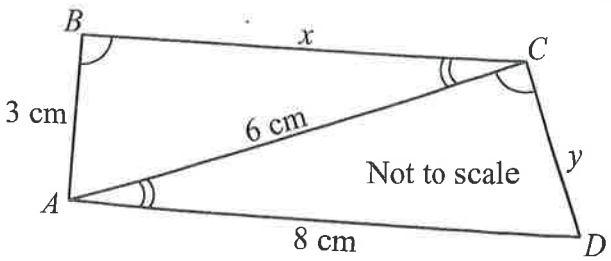
..... cm
[2]

b) Find the length of *AD*.

..... cm
[2]

[Total 4 marks]

5 The quadrilateral *ABCD* is made up of two similar triangles, *ABC* and *ACD*. $AB = 3$ cm, $AD = 8$ cm and $AC = 6$ cm. Angle *ABC* = angle *ACD* and angle *ACB* = angle *CAD*. (B)



Not to scale

a) Find the length of sides x and y.

$x =$ ..... cm

$y =$ ..... cm
[3]

b) The area of triangle *ABC* is 9 cm^2. What is the area of quadrilateral *ABCD*?

..... cm^2
[2]

[Total 5 marks]

Score: ☐/22

UNIT 3

Volumes of 3-D shapes

Remember to use the formula sheet to look up volume formulae.

A **1** A sphere has a radius of 6 cm.
Work out the volume of the sphere.
Give your answer as a multiple of π.

Guided

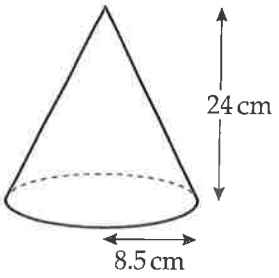
Volume of sphere $= \frac{4}{3}\pi \times r^3$

$= \frac{4}{3} \times \pi \times \ldots\ldots^3$

$= \ldots\ldots\ldots\ldots \pi \text{ cm}^3$

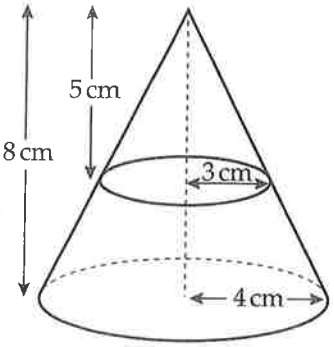
(2 marks)

A **2** A cone has a base radius of 8.5 cm and a height of 24 cm.
Work out the volume of the cone.
Give your answer correct to 3 significant figures.



..... cm^3 **(2 marks)**

A* **3** A cone has 5 cm cut off its top as shown.
The shape which is left is known as a frustum.
Calculate the volume of the frustum to 3 significant figures.



Guided

Volume of original cone $= \frac{1}{3}\pi r^2 h = \frac{1}{3} \times \pi \times 4^2 \times 8 = \ldots\ldots$

Volume of 'missing' cone $= \frac{1}{3}\pi r^2 h = \frac{1}{3} \times \pi \times \ldots\ldots^2 \times \ldots\ldots = \ldots\ldots$

Volume of frustum

= volume of original cone − volume of 'missing' cone

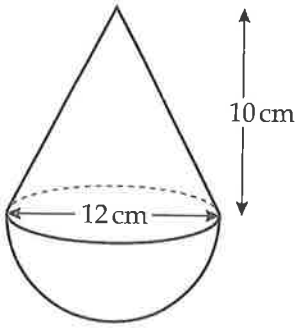
= ..... − .....

= ..... cm^3 correct to 3 s.f.

(4 marks)

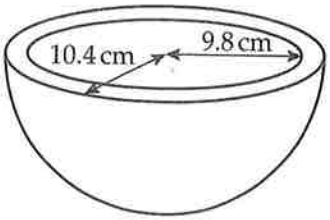
A* **4** A cone is joined to a hemisphere as shown in the diagram.
Work out the volume of the shape.
Give your answer as a multiple of π.

A hemisphere is half a sphere.



..... cm^3 **(4 marks)**

A* **5** A clay bowl is in the shape of a hollow hemisphere.
The external radius of the bowl is 10.4 cm.
The internal radius of the bowl is 9.8 cm.
Work out the volume of clay in the bowl.
Give your answer correct to 3 significant figures.



..... cm^3 **(3 marks)**

Surface area

A 1 A sphere has a radius of 10 cm.
Work out the total surface area of the sphere.
Give your answer correct to 3 significant figures.

Guided

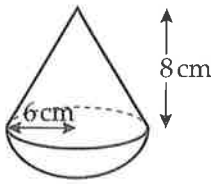
Surface area of a sphere $= 4\pi r^2$

$= 4 \times \pi \times .....^2$

$= .....$

$= ..... \text{ cm}^2$ correct to 3 s.f. **(2 marks)**

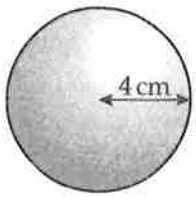
A 2 A solid shape is made from a cone on top of a hemisphere.
The base of the cone has a radius of 6 cm and a vertical height of 8 cm.
The hemisphere has a radius of 6 cm.
Work out the surface area of the shape.
Give your answer correct to 3 significant figures.



Use Pythagoras' theorem to work out the slant height of the cone, l.

..... cm^2 **(5 marks)**

A* 3 The radius of a sphere is 4 cm.
The radius of the base of a cone is 6 cm.
The surface area of the sphere is equal to the curved surface area of the cone.
Work out the slant height of the cone.



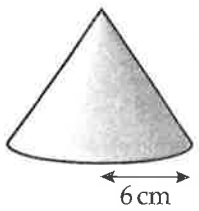


Diagram **NOT** drawn accurately

Guided

Surface area of sphere = curved surface area of cone

$4\pi r^2 = \pi rl$

$4 \times \pi \times .....^2 = \pi \times ..... \times l$

$\frac{.....}{.....} = l$

$l = \frac{.....}{.....} \text{ cm}$ **(4 marks)**

A* 4 The radius of a sphere is 3 cm.
The radius of the base of a cone is also 3 cm.
The surface area of the sphere is equal to the total surface area of the cone.
Work out the slant height of the cone.

$l =$ ..... cm **(4 marks)**

Factorising Quadratics

1 Fully factorise the expressions below.

a) $x^2 + 4x - 32$ (B)

.....

[2]

b) $3x^2 - 4x - 4$ (A)

.....

[2]

[Total 4 marks]

2 The expression $5x^2 - 19x + 18$ is an example of a quadratic expression. (A)

a) Fully factorise the expression $5x^2 - 19x + 18$.

.....

[2]

b) Use your answer to part a) to solve the equation $5x^2 - 19x + 18 = (x - 2)^2$.

.....

[4]

[Total 6 marks]

3 The shape on the right is made from a square and a triangle.

The sides of the square are $(x + 3)$ cm long
and the height of the triangle is $(2x + 2)$ cm.
The area of the whole shape is 60 cm^2.

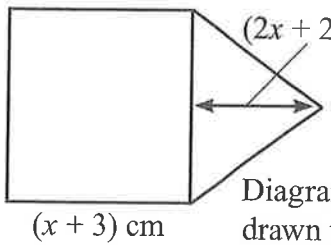


Diagram NOT drawn to scale

a) Show that $2x^2 + 10x - 48 = 0$. (A)

[4]

b) Solve the equation $2x^2 + 10x - 48 = 0$ to find a value for x. (A*)

Don't forget, a length can't have a negative value.

$x =$ .....

[3]

[Total 7 marks]

Exam Practice Tip

In the exam, you can check that you've factorised an expression properly by expanding the brackets back out. You should get the expression that you started with. If you don't then something must have gone wrong somewhere down the line and you'll need to give it another go. Sorry about that.

Score

17

Quadratic equations

B **1** Solve

(a) $x^2 + 8x = 0$

Guided

EXAM ALERT

$x^2 + 8x = 0$

$x(x + \ldots\ldots) = 0$

$x = 0$ or $x + \ldots\ldots = 0$

$x = \ldots\ldots$

(2 marks)

(b) $x^2 - 6x - 27 = 0$

Exam questions similar to this have proved especially tricky – be prepared! ResultsPlus

$x^2 - 6x - 27 = 0$

$(x + \ldots\ldots)(x - \ldots\ldots) = 0$

$x + \ldots\ldots = 0$ or $x - \ldots\ldots = 0$

$x = \ldots\ldots$ or $x = \ldots\ldots$

(3 marks)

B **2** Solve

(a) $x^2 - 7x + 10 = 0$

$x = \ldots\ldots$ **(3 marks)**

(b) $x^2 + 10x + 9 = 0$

$x = \ldots\ldots$ **(3 marks)**

A **3** (a) Solve $2x^2 + 13x + 21 = 0$

Guided

$2x^2 + 13x + 21 = 0$

$(2x + \ldots\ldots)(x + \ldots\ldots) = 0$

$2x + \ldots\ldots = 0$ or $x + \ldots\ldots = 0$

$x = \ldots\ldots$ or $x = \ldots\ldots$

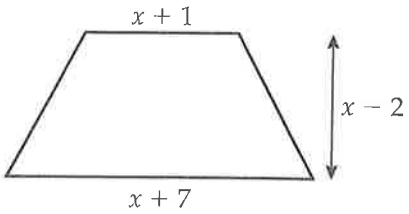
(3 marks)

(b) Solve $9x^2 - 25 = 0$

Use the difference of two squares.

$x = \ldots\ldots$ **(2 marks)**

A **4** The diagram shows a trapezium.
All measurements on the diagram are in centimetres.
The area of the trapezium is 72 cm^2.



(a) Show that $x^2 + 2x - 80 = 0$

Use information from the diagram to form an equation for the area. Then rearrange the equation to the form given.

(3 marks)

(b) Work out the lengths of the parallel sides of the trapezium.

Solve the quadratic equation from (a) and use the positive value of x to find the lengths of the parallel sides.

$\ldots\ldots$ cm

$\ldots\ldots$ cm **(4 marks)**

A* **5** Solve $6x(x + 2) = 5 - x$

Expand the brackets then gather all the x terms onto the left-hand side of the equation.

$x = \ldots\ldots$ **(4 marks)**

Indices 1

C **1** Write as a power of 7

(a) $7^3 \times 7^{10}$

Guided $7^3 \times 7^{10} = 7^{3+10} =$ ..... **(1 mark)**

(b) $7^{15} \div 7^9$

Guided $7^{15} \div 7^9 = 7^{15-9} =$ ..... **(1 mark)**

(c) $\dfrac{7^{12}}{7^4 \times 7}$

Guided $\dfrac{7^{12}}{7^4 \times 7} = \dfrac{7^{12}}{7^4 \times 7^1} = \dfrac{7^{12}}{7^{\cdots}}$

$=$ ..... **(2 marks)**

(d) $(7^5)^4$

Guided $(7^5)^4 = 7^{5 \times 4} =$ ..... **(1 mark)**

C **2** Write as a power of 5

(a) $5^8 \times 5^4$ ..... **(1 mark)**

(b) $\dfrac{5^{12} \times 5}{5^4 \times 5^3}$ ..... **(2 marks)**

(c) $(5^2)^3$ ..... **(1 mark)**

C **3** $6^8 \times 6^3 = 6^5 \times 6^x$
Find the value of x.

Use the index laws to simplify each side of the equation.

$x =$ ..... **(2 marks)**

B **4** Simplify 4^0

..... **(1 mark)**

A **5** Write $9^3 \times 27^2$ as a single power of 3

Guided $9^3 \times 27^2 = (3^{\cdots\cdots})^3 \times (3^{\cdots\cdots})^2$

$= 3^{\cdots\cdots} \times 3^{\cdots\cdots}$

$=$ ..... **(2 marks)**

A **6** Write $8^6 \div 4^3 \times 2^5$ as a single power of 2

..... **(2 marks)**

Indices 2

B **1** Work out the value of (a) 4^{-2} (b) $49^{\frac{1}{2}}$

Guided

(a) $4^{-2} = \frac{1}{4^2}$

$= \frac{\ldots\ldots}{\ldots\ldots}$ **(1 mark)**

(b) $49^{\frac{1}{2}} = \sqrt{49}$

$= \ldots\ldots\ldots$ **(1 mark)**

B **2** Work out the value of

(a) $27^{\frac{1}{3}}$ (b) 9^{-1} (c) 4^{-3} (d) 8^{0}

..... **(1 mark)** ..... **(1 mark)** ..... **(1 mark)** ..... **(1 mark)**

A* **3** Work out the value of (a) $8^{\frac{2}{3}}$ (b) $\left(\frac{9}{16}\right)^{-\frac{3}{2}}$

Guided

(a) $8^{\frac{2}{3}} = \left(8^{\frac{1}{3}}\right)^2$

$= (\ldots\ldots)^2$

$= \ldots\ldots\ldots$ **(1 mark)**

(b) $\left(\frac{9}{16}\right)^{-\frac{3}{2}} = \left(\left(\frac{16}{9}\right)^{\frac{1}{2}}\right)^3$

$= \left(\frac{\ldots\ldots}{\ldots\ldots}\right)^3$

$= \frac{\ldots\ldots}{\ldots\ldots}$ **(2 marks)**

A* **4** Work out the value of

(a) $49^{-\frac{1}{2}}$ (b) $64^{\frac{2}{3}}$ (c) $\left(\frac{81}{16}\right)^{-\frac{3}{4}}$

..... **(1 mark)** ..... **(1 mark)** ..... **(2 marks)**

A* **5** Work out the value of $\frac{\sqrt{3}}{9} \times \sqrt{27}$

Write each number as a power of 3 and then use the index laws.

..... **(2 marks)**

Surds

A **1** Simplify (a) $\sqrt{48}$ (b) $\sqrt{300}$

Guided

(a) $\sqrt{48} = \sqrt{16} \times \sqrt{\ldots\ldots}$

$= \ldots\ldots\sqrt{\ldots\ldots}$ **(1 mark)**

(b) $\sqrt{300} = \sqrt{\ldots\ldots} \times \sqrt{\ldots\ldots}$

$= \ldots\ldots\sqrt{\ldots\ldots}$ **(1 mark)**

A **2** Rationalise the denominator of $\frac{10}{\sqrt{2}}$

Guided

$\frac{10}{\sqrt{2}} = \frac{10}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}}$

$= \frac{\ldots\ldots\sqrt{2}}{\ldots\ldots}$

$= \ldots\ldots\sqrt{2}$ **(2 marks)**

A* **3** Expand and simplify $(2 - \sqrt{3})(5 + \sqrt{3})$

Guided

$(2 - \sqrt{3})(5 + \sqrt{3}) = 10 + 2\sqrt{3} - \ldots\ldots\sqrt{3} - \ldots\ldots$

$= \ldots\ldots - \ldots\ldots\sqrt{3}$ **(2 marks)**

Use **FOIL** (**F**irst terms, **O**uter terms, **I**nner terms, **L**ast terms) to expand the brackets.

A* **4** Expand and simplify $(7 - \sqrt{5})(2 + \sqrt{5})$

..... **(2 marks)**

A* **5** Expand and simplify $(3 - \sqrt{2})^2$

..... **(2 marks)**

A* **6** Rationalise the denominator of $\frac{12 - 5\sqrt{3}}{\sqrt{3}}$

Give your answer in the form $a + b\sqrt{3}$ where a and b are integers.

..... **(3 marks)**

Algebraic expressions

C **1** Simplify

(a) $m^3 \times m^9$ (b) $p^{10} \div p^2$ (c) $(t^4)^5$

Guided

(a) $m^3 \times m^9 = m^{3+9}$

$= m$.....

(1 mark)

(b) $p^{10} \div p^2 = p^{10-2}$

$= p$.....

(1 mark)

(c) $(t^4)^5 = t^{4 \times 5}$

$= t$.....

(1 mark)

C **2** Simplify

(a) $g \times g^6$ (b) $k^9 \div k^3 \times k^2$ (c) $(y^3)^7$

..... **(1 mark)** ..... **(1 mark)** ..... **(1 mark)**

C **3** Simplify

(a) $\dfrac{x^5 \times x^4}{x^6}$ (b) $\dfrac{y^{12}}{y^3 \times y}$ (c) $\left(\dfrac{z^6}{z^3}\right)^2$

..... **(2 marks)** ..... **(2 marks)** ..... **(2 marks)**

B **4** Simplify

(a) $5e^7f^2 \times 3e^4f^5$ (b) $\dfrac{28x^6y^5}{7xy^3}$ (c) $(2m^5p)^4$

Guided

(a) $5e^7f^2 \times 3e^4f^5 = 5 \times 3 \times e^{7+4} \times f^{2+5}$

$=$ .....e.....f..... **(2 marks)**

(b) $\dfrac{28x^6y^5}{7xy^3}$ $= 28 \div 7 \times x^{6-1} \times y^{5-3}$

$=$ .....x.....y..... **(2 marks)**

(c) $(2m^5p)^4$ $= 2^4m^{5\times4}p^{1\times4}$

$=$ .....m.....p..... **(2 marks)**

B **5** Simplify

(a) $6cd^8 \times 4c^5d^2$ (b) $\dfrac{40a^9c^2}{8a^3c}$ (c) $(5b^3d^2)^3$

..... **(2 marks)** ..... **(2 marks)** ..... **(2 marks)**

A **6** Simplify

Use the index law $a^{-n} = \dfrac{1}{a^n}$

(a) $\left(\dfrac{1}{2x^3}\right)^{-2}$ (b) $\left(\dfrac{25}{64b^2c^8}\right)^{-\frac{1}{2}}$

..... **(2 marks)** ..... **(2 marks)**

Mean, median and mode

C 1 Here are the numbers of texts received by 10 adults in one day.

2 4 7 6 25 24 16 5 4 3

(a) Write down the mode.

Guided

The mode is .....

The mode is the value that appears most often.

(1 mark)

(b) Work out the median.

Guided

2 3 4 ....

First write out all the numbers in order.

Median = $\frac{\text{..... + ...}}{2}$

= .....

(2 marks)

(c) Work out the mean.

Add up all the numbers **before** dividing by 10.

Guided

The total of all values = 2 + 4 + 7 + 6 + 25 + 24 + 16 + 5 + 4 + 3

= .....

Mean = $\frac{\text{.....}}{10}$

= .....

Parts (a) to (c) of this question are grade F or below. Part (d) is grade C and is the tricky bit. There is more than one possible answer to this, which is why you must give a reason.

(2 marks)

(d) Which of these three averages best describes this data? Give a reason for your answer.

Guided

The average that best describes this data is ..... because .....

..... **(1 mark)**

C 2 There are 6 boys and 2 girls in a room.
The mean of all their ages is 15
The mean of the girls' ages is 16.5
Work out the mean of the boys' ages.

Guided

Total of the ages of all 8 children = 8 × 15 = ...

Total of the ages of the 2 girls = 2 × ..... = ...

Total of boys' ages = ... − .....

= .....

Mean of boys' ages = $\frac{\text{.....}}{6}$

= .....

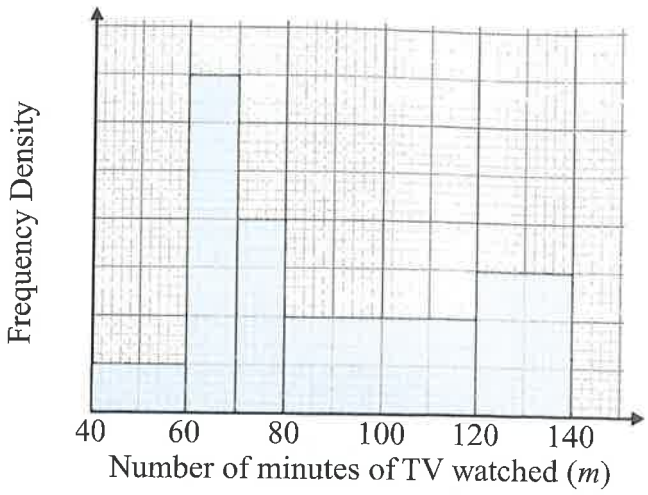
(3 marks)

C 3 The mean weekly wage of 5 women is £280
The mean weekly wage of 7 men is £316
Work out the mean weekly wage of all 12 people.

£..... **(3 marks)**

Histograms and Frequency Density

1 The histogram shows the number of minutes some pupils watched television for one evening.



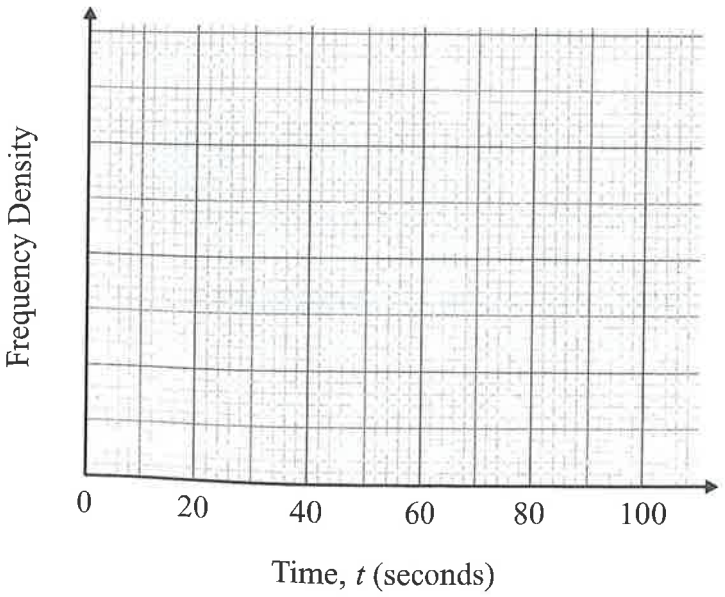
Number of minutes of TV watched (m)	Frequency
$40 \leq m < 60$	20
$60 \leq m < 70$	
$70 \leq m < 80$	
$80 \leq m < 120$	
$120 \leq m < 140$	

Use the histogram to complete the frequency table.

Start by finding the frequency density for the first interval.

[Total 2 marks]

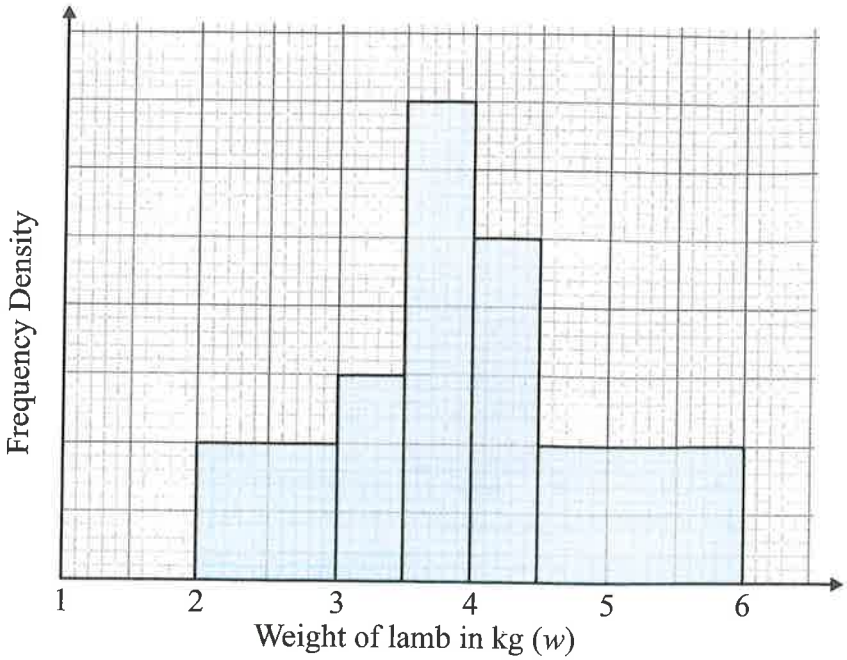
2 100 Year 11 pupils were each given a potato. The table below gives some information about how long it took the pupils to peel their potato.



Time, t (s)	Frequency
$0 < t \leq 20$	15
$20 < t \leq 30$	35
$30 < t \leq 40$	30
$40 < t \leq 60$	15
$60 < t \leq 100$	5

[Total 3 marks]

3 The histogram shows the weights, w kg, of some newborn lambs. (A)
All the lambs weighed between 2 kg and 6 kg.



a) What percentage of the lambs weighed less than 3.5 kg?

..... %

[3]

b) 45 lambs weighed between 4 kg and 4.5 kg.
What was the total number of lambs that were weighed?

.....

[2]

c) Lambs with a weight greater than 3.2 kg are considered healthy.
Calculate an estimate of the number of lambs that were born a healthy weight.

.....

[3]

[Total 8 marks]

Score: ☐/**13**

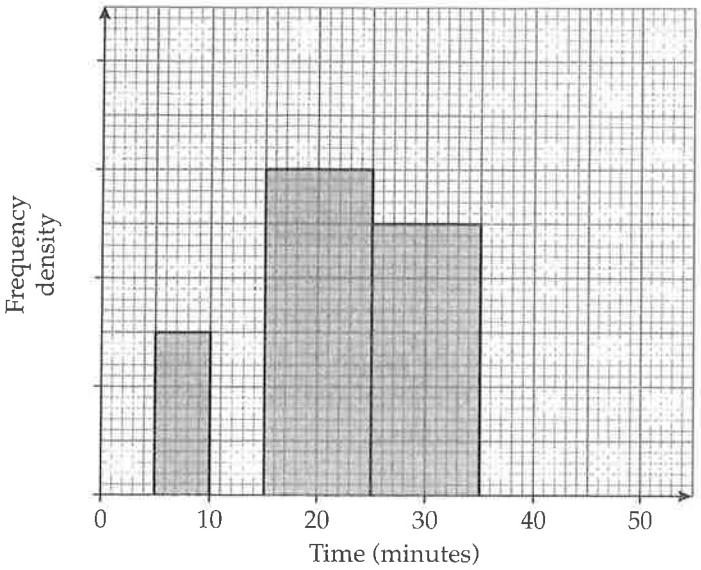
☹☐ 😐☐ 😉☐

Histograms

A 1 Sam asks some students how long they took to finish their science homework. The table and histogram show some of this information.

Guided

Time (minutes)	Frequency
$5 < x \leqslant 10$	... × 5 = ...
$10 < x \leqslant 15$	20
$15 < x \leqslant 25$	... × ... = ...
$25 < x \leqslant 35$	50
$35 < x \leqslant 50$	15



(a) Use the information in the histogram to complete the table.

Guided

Frequency density of $25 < x \leqslant 35$ class $= \dfrac{\text{frequency}}{\text{class width}}$

$= \dfrac{50}{10} =$ .....

Use this information to put a scale on the *y*-axis.

Frequency = frequency density × class width

Use this formula to complete the table.

(2 marks)

(b) Use the information in the table to complete the histogram.

Use the frequency density to draw in the missing bars.

Guided

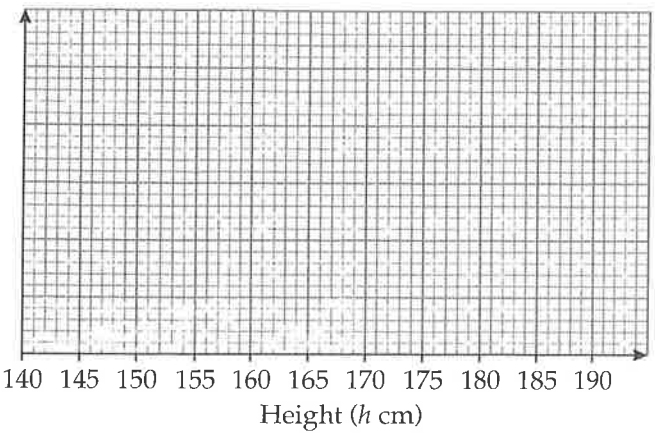
Frequency density of $10 < x \leqslant 15$ class $= \dfrac{20}{\ldots\ldots} =$ .....

Frequency density of $35 < x \leqslant 50$ class $= \dfrac{\ldots\ldots}{\ldots\ldots} =$ ..... **(2 marks)**

A* 2 The table gives information about the heights, in centimetres, of some students.

Height (h cm)	$145 < h \leqslant 155$	$155 < h \leqslant 160$	$160 < h \leqslant 175$	$175 < h \leqslant 190$
Frequency	30	20	75	45

(a) Use the table to draw a histogram. **(3 marks)**



(b) Estimate the number of students who are taller than 170 cm.

..... **(3 marks)**

Quartiles and Comparing Distributions

1 Liz sells earrings. The prices in pounds of 15 pairs of earrings are given below. (B)

6 3 4 8 10 11 5 7 4 12 8 9 5 7 11

a) Find the lower and upper quartiles of the prices above.

Start by writing the prices in ascending order.

Lower quartile = ... Upper quartile = ...

[2]

b) Liz reduces all her prices by 50p. Will the interquartile range of the new prices be less than, greater than or the same as the interquartile range of the old prices? Give a reason for your answer.

.....

.....

[1]

[Total 3 marks]

2 The data below shows the number of strawberries collected from each plant during one harvest of two strawberry patches. (B)

Patch A:	8	13	19	22	8	18	14	16	9	14	12
Patch B:	14	19	11	13	15	11	13				

a) For each patch, work out the interquartile range for the number of strawberries from each plant.

Patch A: ..... Patch B: .....

[4]

b) Give one comparison between the plants in Patch A and the plants in Patch B, based on your results in part a).

.....

.....

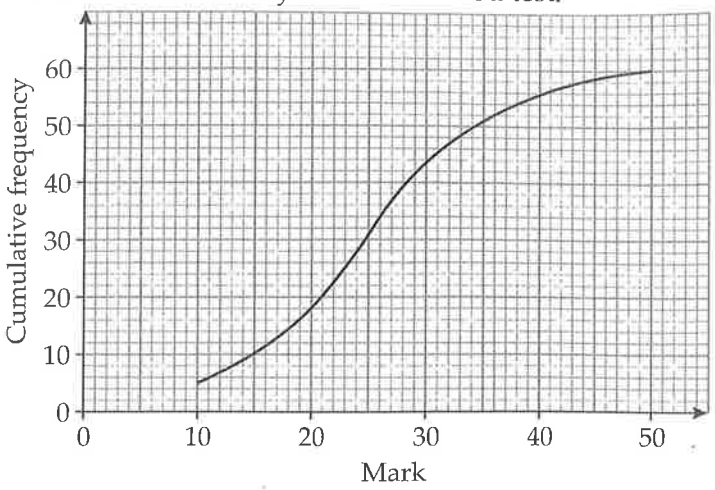
[1]

[Total 5 marks]

Score: ☐/**8**

Cumulative frequency

B 1 The cumulative frequency graph shows the marks scored by 60 students in a test.



(a) Use the graph to find an estimate for the median test score.

Draw a line at $\frac{1}{2} \times 60 = 30$ on the y-axis. Then you can read off the median from the x-axis.

..... **(2 marks)**

(b) Use the graph to find an estimate for the interquartile range of the scores.

Guided

Interquartile range = upper quartile − lower quartile

= ..... − .....

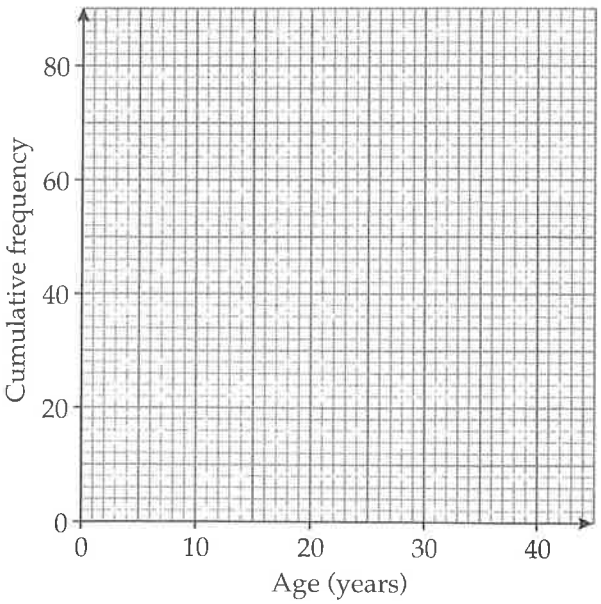
= .....

Take readings from the graph at $\frac{1}{4} \times 60 = 15$ for the lower quartile and $\frac{3}{4} \times 60 = 45$ for the upper quartile.

(2 marks)

B 2 The table gives information about the ages of the 80 people at a party.

Age (t years)	Cumulative frequency
$15 \leqslant t < 20$	10
$20 \leqslant t < 25$	42
$25 \leqslant t < 30$	63
$30 \leqslant t < 35$	75
$35 \leqslant t < 40$	80



(a) On the grid, draw a cumulative frequency graph to show this information.

(2 marks)

(b) Use your graph to find an estimate for the interquartile range of the ages.

..... **(2 marks)**

(c) Helen says that 20% of the people at the party were older than 27
Is Helen correct? You must give a reason for your answer.

.....

..... **(2 marks)**

Cumulative Frequency

1 120 pupils in a year group sit an examination at the end of the year. Their results are given in the table below. (B)

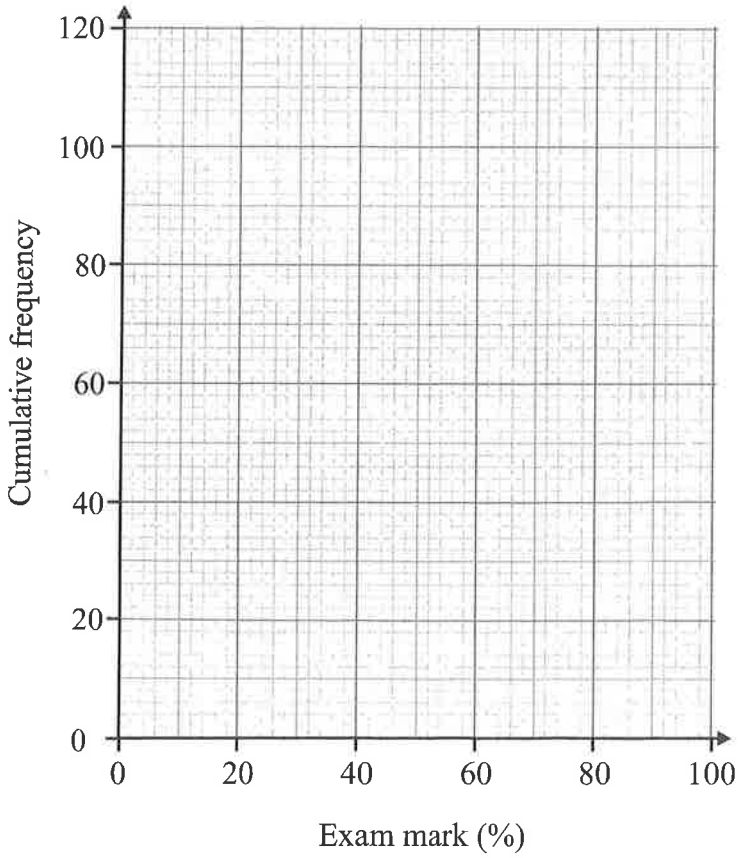
Exam mark (%)	$0 < x \leq 20$	$20 < x \leq 30$	$30 < x \leq 40$	$40 < x \leq 50$	$50 < x \leq 60$	$60 < x \leq 70$	$70 < x \leq 80$	$80 < x \leq 100$
Frequency	3	10	12	24	42	16	9	4

a) Complete the cumulative frequency table below.

Exam mark (%)	≤ 20	≤ 30	≤ 40	≤ 50	≤ 60	≤ 70	≤ 80	≤ 100
Cumulative Frequency								

[1]

b) Use your table to draw a cumulative frequency graph on the graph paper.



[2]

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

..... %

[1]

d) Use your graph to find an estimate for the inter-quartile range.

..... %

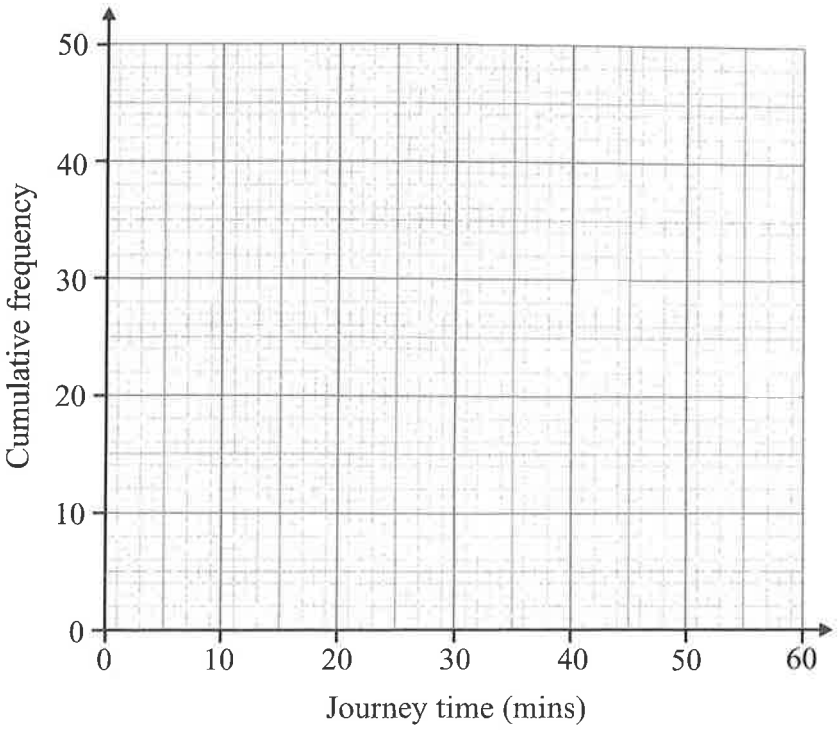
[2]

[Total 6 marks]

2 The cumulative frequency table below gives information about the length of time it takes to travel between Udderston and Trundle on the main road each morning.

Journey Time (t mins)	$0 < t \leq 20$	$0 < t \leq 25$	$0 < t \leq 30$	$0 < t \leq 35$	$0 < t \leq 45$	$0 < t \leq 60$
Cumulative Frequency	7	22	36	45	49	50

a) On the graph paper below, draw a cumulative frequency graph for the table.



[2]

b) Use your graph to estimate the number of journeys that took between 27 and 47 minutes.

..... journeys

[2]

c) Use your graph to estimate the percentage of journeys that took longer than 40 minutes.

..... %

[2]

The median time for an evening journey from Udderston to Trundle is 22 minutes.

d) Give one comparison of the morning and evening journey times from Udderston to Trundle.

.....

.....

[2]

[Total 8 marks]

Score: ☐/**14**

Simultaneous equations 1

B **1** Solve the simultaneous equations
$x + 3y = 5$
$4x + 5y = 6$

Exam questions similar to this have proved especially tricky – be prepared! ResultsPlus

Guided

EXAM ALERT

$x + 3y = 5$ (1)

$4x + 5y = 6$ (2)

$\ldots\ldots x + \ldots\ldots y = \ldots\ldots$ (1) × 4

$- \quad 4x + \quad 5y = 6$ (2)

$\ldots\ldots y = \ldots\ldots$

$y = \ldots\ldots$

Substitute $y = \ldots\ldots$ into (1):

$x + 3 \times \ldots\ldots = 5$

$x + \ldots\ldots = 5$

$x = \ldots\ldots$

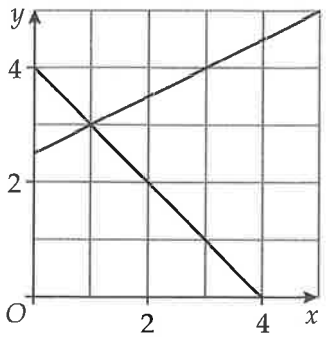
Solution is $x = \ldots\ldots, y = \ldots\ldots$ **(3 marks)**

A **2** Solve the simultaneous equations
$2x - 5y = -6$
$4x + 3y = 1$

$x = \ldots\ldots, y = \ldots\ldots$ **(3 marks)**

A **3** The graphs of the straight lines with equations $x + y = 4$ and $2y = x + 5$ have been drawn on the grid.
Use the graph to solve the simultaneous equations
$x + y = 4$
$2y = x + 5$

Write down the coordinates of the point where the straight lines intersect.



$x = \ldots\ldots, y = \ldots\ldots$ **(1 mark)**

A* **4** Three apples and two bananas have a total cost of £1.55
Four apples and three bananas have a total cost of £2.20
Work out the cost of one apple and the cost of one banana.

Set up a pair of simultaneous equations. Use *a* for apple and *b* for banana. Change the prices from pounds to pence.

$\ldots\ldots$ **(5 marks)**

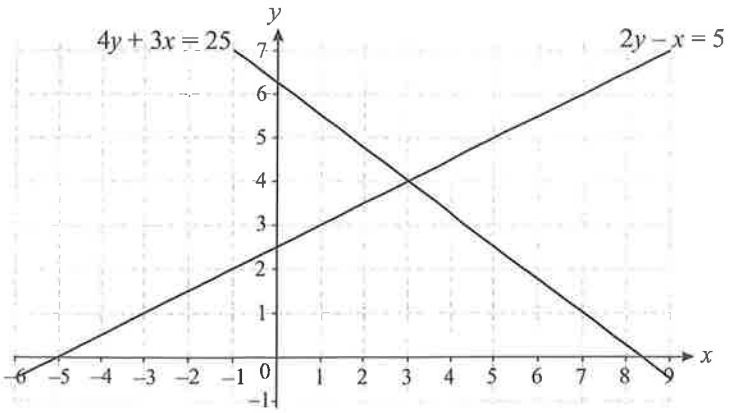
Simultaneous Equations and Graphs

1 The diagram below shows graphs of $2y - x = 5$ and $4y + 3x = 25$. (B)

Use the diagram to solve these simultaneous equations:

$2y - x = 5$
$4y + 3x = 25$

[2]



[2]
rks]

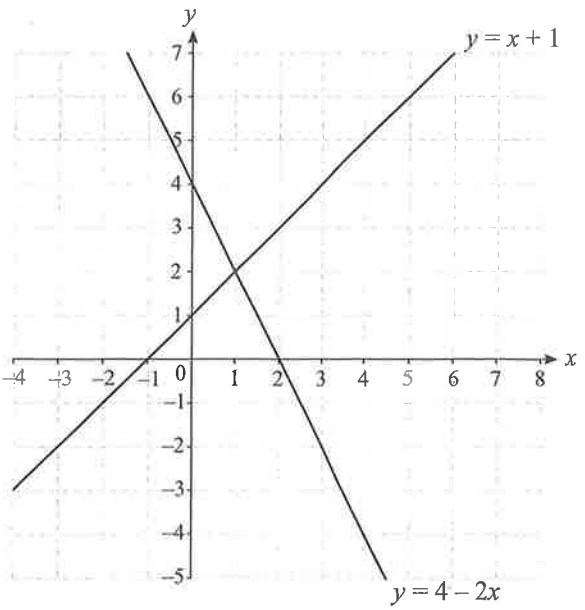
$x =$ ..... $y =$ .....

[Total 1 mark]

2 The diagram below shows graphs of $y = x + 1$ and $y = 4 - 2x$. (B)

a) Use the diagram to solve these simultaneous equations:

$y = x + 1$
$y = 4 - 2x$



$x =$ ..... $y =$ .....

[1]

b) By drawing another straight line, solve these simultaneous equations:

$y = x + 1$
$3y = x + 9$

$x =$ ..... $y =$ .....

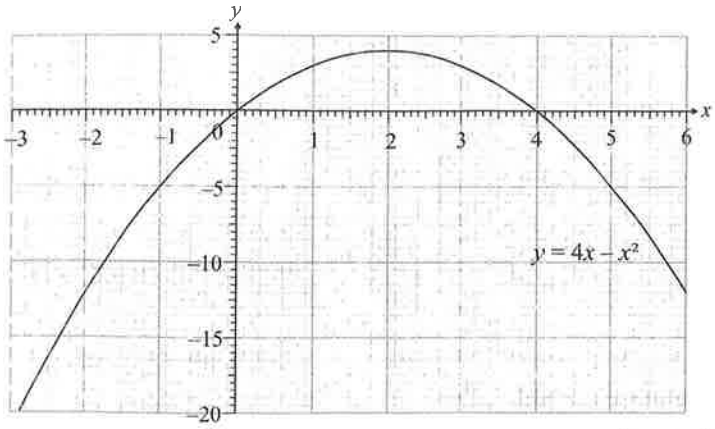
[2]

[Total 3 marks]

3 The diagram below shows part of the graph of $y = 4x - x^2$. (A)

Use the graph to solve these simultaneous equations.

$y = 5x - 2$
$y = 4x - x^2$



$x =$ ..... , $y =$ .....

and $x =$ ..... , $y =$ .....

[Total 3 marks]

Score: ___ / 7

Speed

D **1** The distance from London to Munich is 900 km.
A flight from London to Munich takes 3 hours.
Work out the average speed of the aeroplane.

Guided

Speed = $\frac{\text{distance}}{\text{time}}$

= $\frac{\ldots\ldots\ldots}{\ldots\ldots\ldots}$

= ..... km/h **(2 marks)**

C **2** Lottie drives at an average speed of 80 km/h.
Her journey takes $2\frac{1}{2}$ hours.
Work out the distance Lottie drives.

..... km **(2 marks)**

C **3** A train travelled 180 km in $1\frac{1}{2}$ hours.
Work out the average speed of the train.

..... km/h **(2 marks)**

C **4** An aeroplane travelled at an average speed of 600 km/h for 2 hours 15 minutes.
How far did the aeroplane travel?

Use the fact that 15 minutes is $\frac{1}{4}$ of an hour.

..... km **(2 marks)**

C **5** Jamil walked at an average speed of 6 km/h for 40 minutes.
How far did he walk?

Guided

Time = $\frac{40}{60}$ hour

Write the time as a fraction of an hour and simplify the fraction.

= $\frac{\ldots\ldots\ldots}{\ldots\ldots\ldots}$ hour

Distance = speed × time

= 6 × $\frac{\ldots\ldots\ldots}{\ldots\ldots\ldots}$

= ..... km **(2 marks)**

C **6** A car travels at an average speed of 90 km/h.
How far will the car travel in 20 minutes?

..... km **(2 marks)**

C **7** Jim leaves home at 14:30
He cycles 39 km to a friend's house at an average speed of 18 km/h.
At what time does he arrive at his friend's house?

..... **(2 marks)**

Density

C 1 (a) The mass of 3 m^3 of zinc is 21 390 kg.
Work out the density of zinc.

Guided

Density = $\frac{\text{mass}}{\text{volume}}$

Density = $\frac{\ldots\ldots\ldots}{\ldots\ldots\ldots}$

= ..... kg/m^3 **(2 marks)**

(b) The density of copper is 8960 kg/m^3.
Work out the mass of 1.5 m^3 of copper.

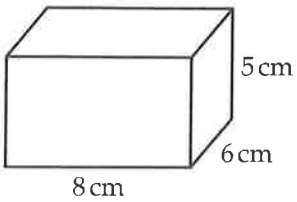
Guided

Mass = density × volume

Mass = ... × .....

= ..... kg **(2 marks)**

C 2 The diagram shows a solid cuboid.
The cuboid has length 8 cm, width 6 cm and height 5 cm.
The cuboid is made of wood.
The wood has a density of 0.54 grams per cm^3.
Work out the mass of the cuboid.



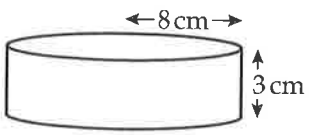
First find the volume of the cuboid.

..... grams **(3 marks)**

B 3 The density of gold is 19.3 grams per cm^3.
A gold ingot is in the shape of a cuboid.
The cuboid has length 20 cm, width 8 cm and height 1.5 cm.
Work out the mass of the gold ingot.
Give your answer in kilograms.

..... kg **(3 marks)**

B 4 A solid cylinder is made of wood.
It has a radius of 8 cm and a height of 3 cm.
The cylinder has a mass of 392 grams.
Work out the density of the wood.
Give your answer correct to 2 significant figures.



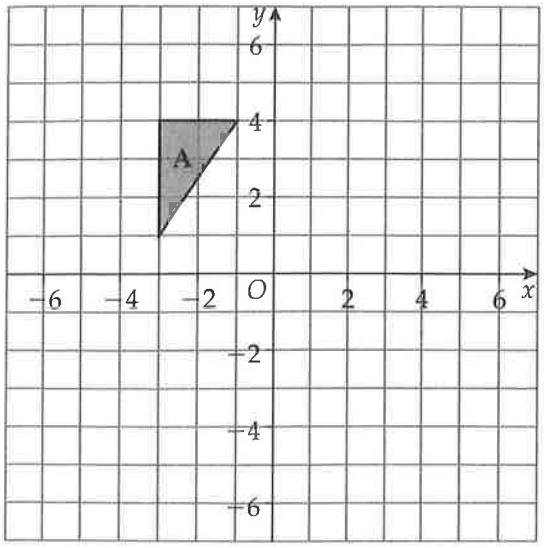
..... g/cm^3 **(3 marks)**

Translations, reflections and rotations

C 1 (a) On the grid, translate triangle **A** by $\begin{pmatrix} 4 \\ -3 \end{pmatrix}$.
Label the new triangle **B**.

$\begin{pmatrix} 4 \\ -3 \end{pmatrix}$ means 4 units to the right and 3 units down.

(2 marks)



(b) On the grid, rotate triangle **A** 180° about (0, 0).
Label the new triangle **C**.

Use tracing paper to help with the rotation.

(2 marks)

C 2 (a) Describe fully the single transformation that will map triangle **A** onto triangle **B**.

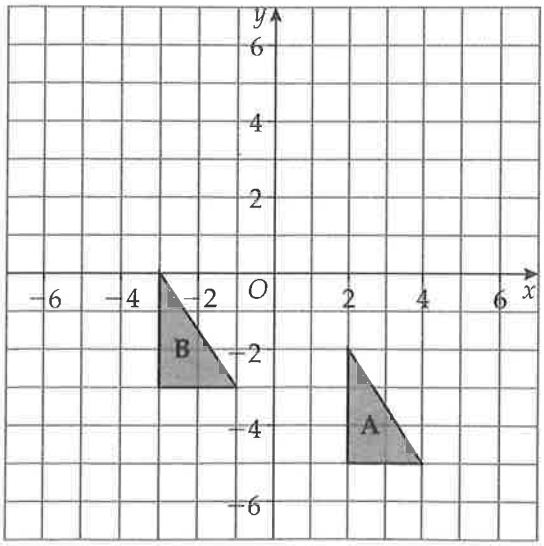
EXAM ALERT

Exam questions similar to this have proved especially tricky – be prepared! ResultsPlus

.....

.....

(2 marks)



(b) On the grid, rotate triangle **A** 180° about (1, 0).
Label the new triangle **C**.

(2 marks)

(c) On the grid, reflect triangle A in the line $y = 1$
Label the new triangle **D**.

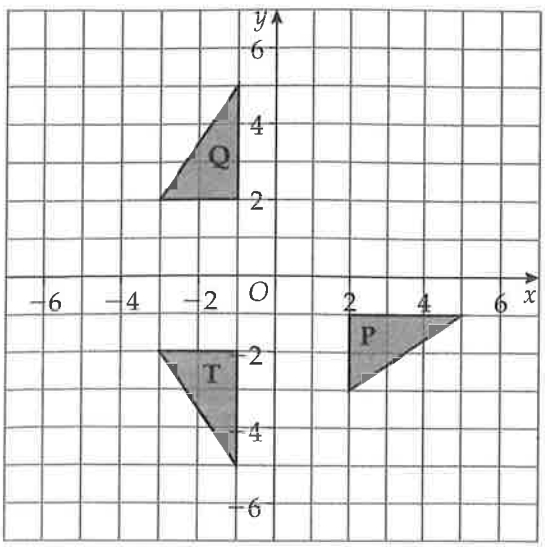
(2 marks)

C 3 (a) Describe fully the single transformation that will map triangle **P** onto triangle **Q**.

.....

.....

(2 marks)



(b) Describe fully the single transformation that will map triangle **P** onto triangle **T**.

.....

.....

(3 marks)

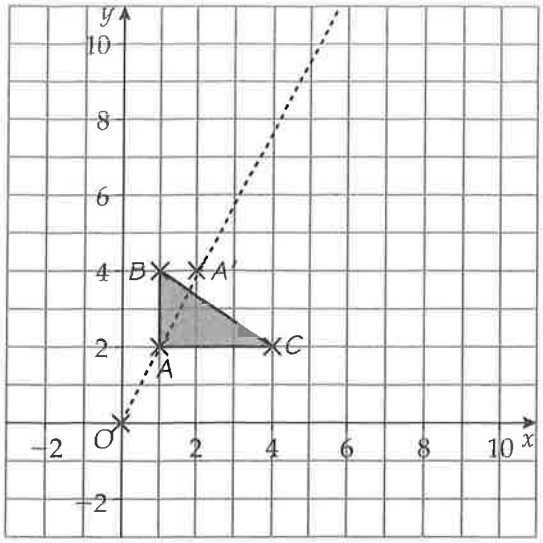
Enlargements

C **1** On the grid, enlarge the shape by a scale factor of 2, centre (0, 0).

Guided

Each point on the enlarged triangle will be twice as far from O as the corresponding point on the original triangle.

(3 marks)



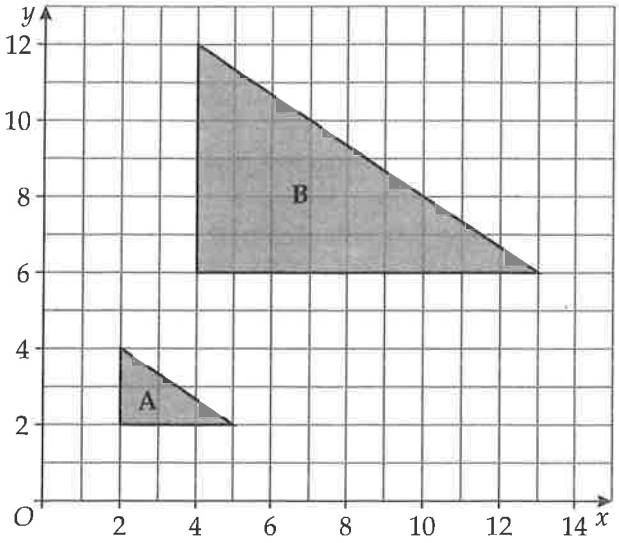
C **2** Describe fully the single transformation that maps triangle **A** onto triangle **B**.

.....

.....

Join corresponding vertices to find the centre of enlargement.

(3 marks)



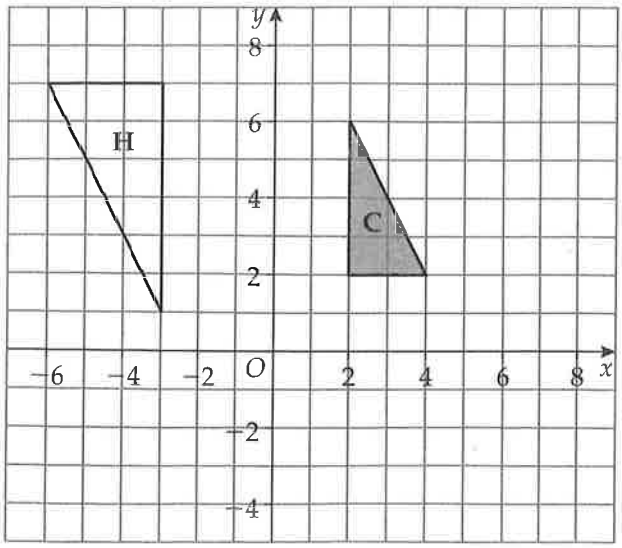
A* **3** (a) On the grid, enlarge triangle **C** by scale factor $-\frac{1}{2}$, centre (0, 0). Label the new triangle **D**.

For a negative enlargement, the image will be upside down on the other side of the centre of enlargement.

(3 marks)

(b) On the grid, enlarge triangle **C** by scale factor −2, centre (4, 4). Label the new triangle **E**.

(3 marks)



(c) Describe fully the single transformation that will map triangle **C** onto triangle **H**.

.....

.....

(3 marks)

Combining transformations

B 1 Triangle **A** is reflected in the line $x = 4$ to give triangle **B**.
Triangle **B** is reflected in the x-axis to give triangle **C**.
Describe fully the single transformation that will map triangle **A** onto triangle **C**.

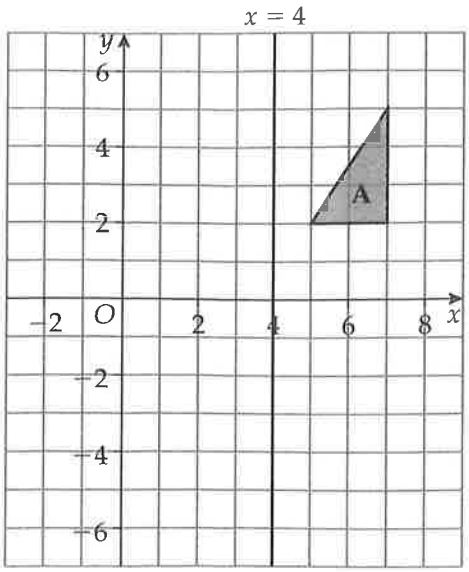
.....

.....

.....

(3 marks)

First carry out the two transformations on the diagram.



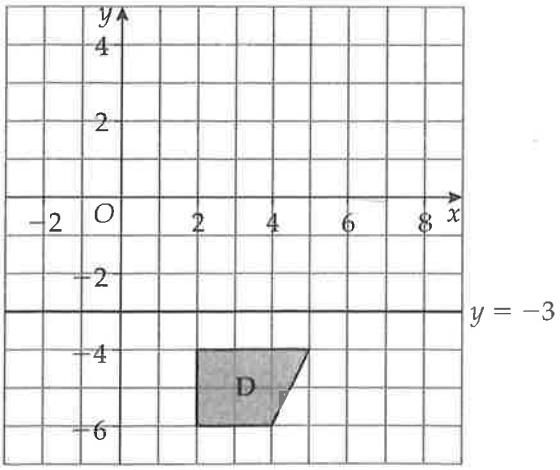
B 2 Shape **D** is reflected in the line $y = -3$ to give shape **E**.
Shape **E** is reflected in the x-axis to give shape **F**.
Describe fully the single transformation that will map shape **D** onto shape **F**.

.....

.....

.....

(3 marks)



A* 3 Triangle **P** is enlarged by scale factor 2, centre (0, 0) to give triangle **Q**.
Triangle **Q** is rotated 180° about (0, 0) to give triangle **R**.
Describe fully the single transformation that will map triangle **P** onto triangle **R**.

.....

.....

.....

(3 marks)