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MATHEMATICS **0580/42**

Paper 4 Calculator (Extended) **February/March 2025**

2 hours

You must answer on the question paper.

You will need: Geometrical instruments

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You should use a scientific calculator where appropriate.
- You may use tracing paper.
- You must show all necessary working clearly.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.
- For π, use either your calculator value or 3.142.

INFORMATION

- The total mark for this paper is 100.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **16** pages.

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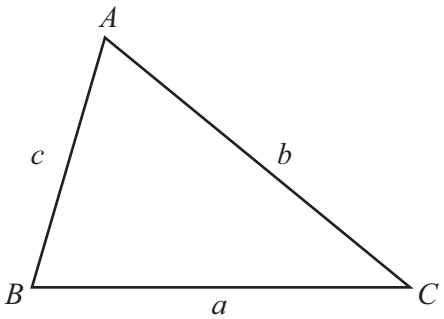
List of formulas

Area, A, of triangle, base b, height h.	$A = \frac{1}{2}bh$
Area, A, of circle of radius r.	$A = \pi r^2$
Circumference, C, of circle of radius r.	$C = 2\pi r$
Curved surface area, A, of cylinder of radius r, height h.	$A = 2\pi rh$
Curved surface area, A, of cone of radius r, sloping edge l.	$A = \pi rl$
Surface area, A, of sphere of radius r.	$A = 4\pi r^2$
Volume, V, of prism, cross-sectional area A, length l.	$V = Al$
Volume, V, of pyramid, base area A, height h.	$V = \frac{1}{3}Ah$
Volume, V, of cylinder of radius r, height h.	$V = \pi r^2 h$
Volume, V, of cone of radius r, height h.	$V = \frac{1}{3}\pi r^2 h$
Volume, V, of sphere of radius r.	$V = \frac{4}{3}\pi r^3$
For the equation $ax^2 + bx + c = 0$, where $a \neq 0$,	$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

For the triangle shown,



$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc\cos A$$

$$\text{Area} = \frac{1}{2}ab\sin C$$

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1 Write down a factor of 28 that is a prime number.

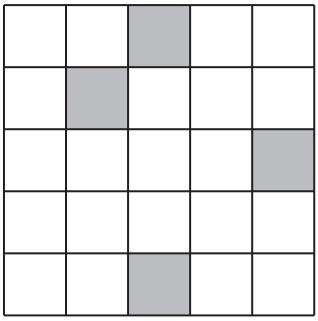
..... [1]

2 Simplify.

$$4y^2 + 3y - y^2 + 2y$$

..... [2]

3



Shade **two** more small squares to make a pattern with two lines of symmetry. [1]

4 Calculate $\dfrac{20.24 - \sqrt[3]{30}}{6.5}$.

Give your answer correct to 1 decimal place.

..... [2]

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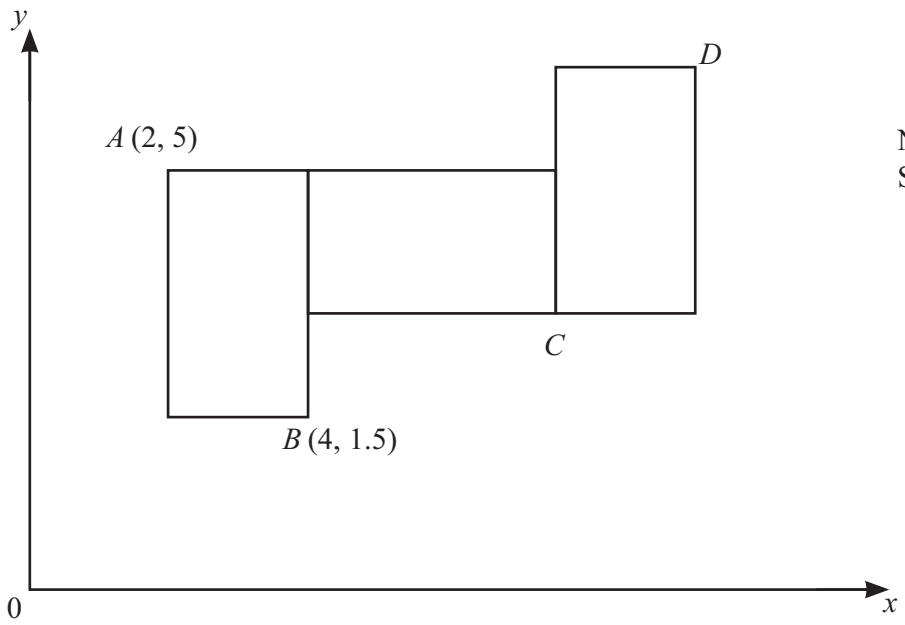

A pattern is formed by 3 congruent rectangles.
Each rectangle is a rotation of 90° around one vertex of the rectangle next to it.
The point A has coordinates $(2, 5)$.
The point B has coordinates $(4, 1.5)$.

Work out the coordinates of point C and point D.

C (..... , ...)

D (..... , ...)

[3]

6 Each week Nisha is paid \$12 per hour for the first 40 hours that she works.
She is paid 30% more per hour for any extra hours that she works.
One week Nisha works for 45.5 hours.

Calculate how much she is paid that week.

\$ ..... [3]

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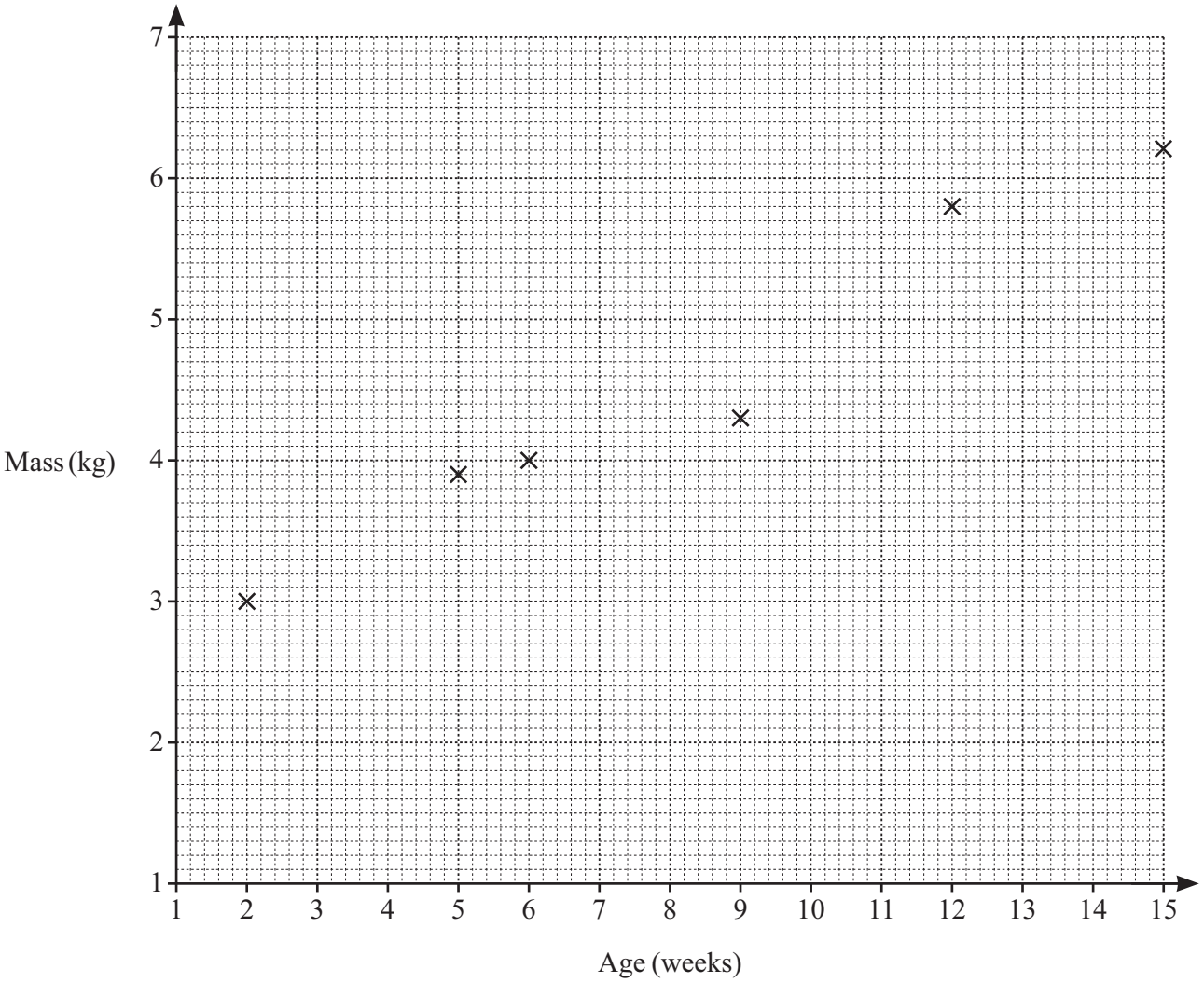
7 The table shows the age and mass of each of 10 babies.

Age (weeks)	9	12	15	2	5	6	9	7	1	11
Mass (kg)	4.3	5.8	6.2	3.0	3.9	4.0	4.6	4.5	2.5	5.3

(a)



Complete the scatter diagram.
The first six points have been plotted for you. [2]

(b) What type of correlation is shown in the scatter diagram?

..... [1]

(c) On the scatter diagram, draw a line of best fit. [1]

(d) Use your line of best fit to find an estimate of the mass of a 14-week old baby.

..... kg [1]

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8 The scale drawing shows the positions of boat A and boat B.
The scale is 1 cm represents 0.5 km.

Scale: 1 cm to 0.5 km

(a) Find the actual distance between boat A and boat B.

..... km [2]

(b) Lighthouse L lies to the east of boats A and B.
L is 4.4 km from boat A and 3.3 km from boat B.

Using a ruler and compasses only, construct and label the position of L. [3]

9 **(a)** Write 0.007 09 in standard form.

..... [1]

(b) Work out $\left(4 \times 10^4\right)^2$.
Give your answer in standard form.

..... [2]

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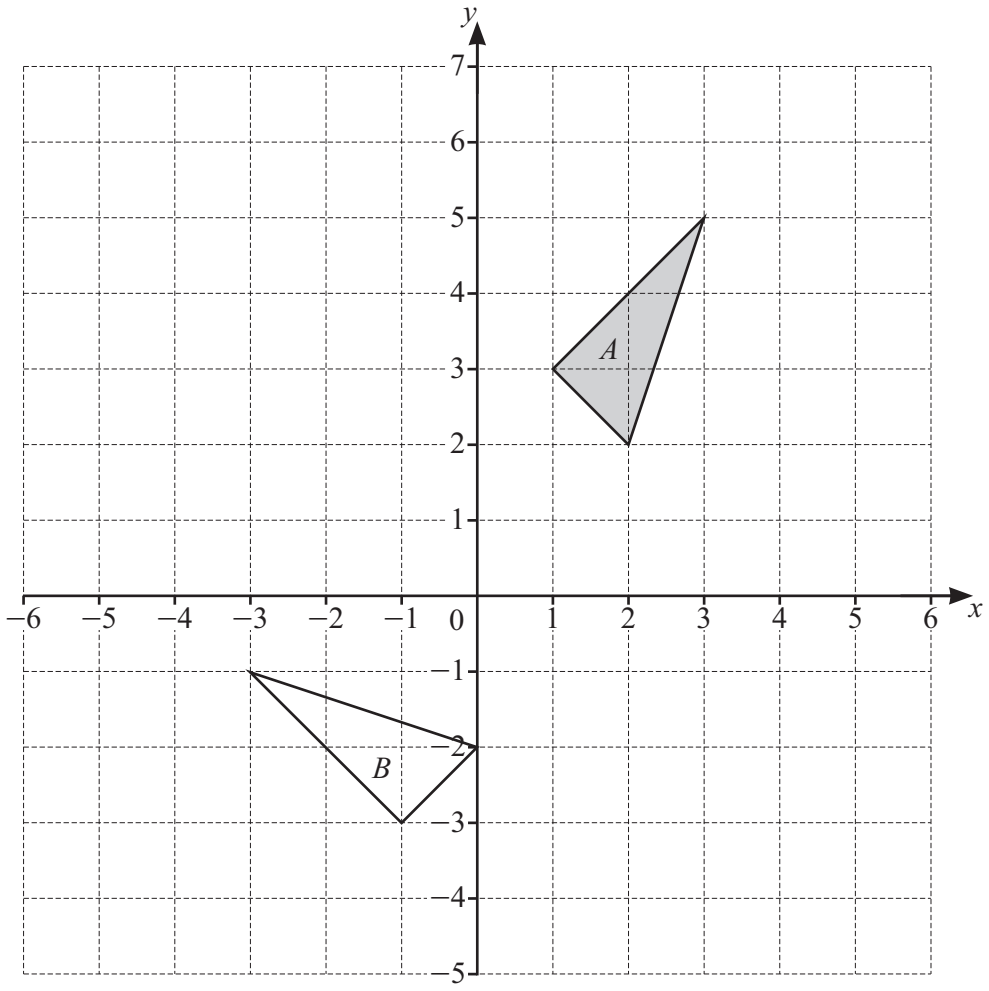

(a) Draw the image of

(i) triangle A after a reflection in the line $y = 1$ [2]

(ii) triangle A after a translation by the vector $\begin{pmatrix} -6 \\ 1 \end{pmatrix}$. [2]

(b) Describe fully the **single** transformation that maps triangle A onto triangle B.

.....

..... [3]

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11 **(a)** Midhil invests $1500 at a rate of 4.2% per year compound interest.

Calculate the value of the investment at the end of 5 years.

$ ..... [2]

(b) Hitanshi invests some money at a rate of x% per year compound interest.
At the end of 11 years the value of the investment has doubled.

Calculate the value of x.

$x =$ ..... [3]

12 A cone has sloping edge 12 cm and base radius 5 cm.

Calculate the **total** surface area of the cone.

..... cm^2 [2]

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13 The table shows the first 5 terms of sequences A, B and C.

	1st term	2nd term	3rd term	4th term	5th term	nth term
Sequence A	5	12	31	68	129	
Sequence B	$\frac{10}{3}$	$\frac{9}{4}$	$\frac{8}{5}$	$\frac{7}{6}$	$\frac{6}{7}$	
Sequence C	4	8	16	32	64	

Complete the table to show the nth term of each sequence.

[6]

14 $\mathrm{f}(x) = 5 - 4x$

(a) Find $\mathrm{f}(-3)$.

..... [1]

(b) Find $\mathrm{f}(3 - 2x)$.
Give your answer in its simplest form.

..... [2]

(c) Find $\mathrm{f}^{-1}(x)$.

$\mathrm{f}^{-1}(x) =$ ..... [2]

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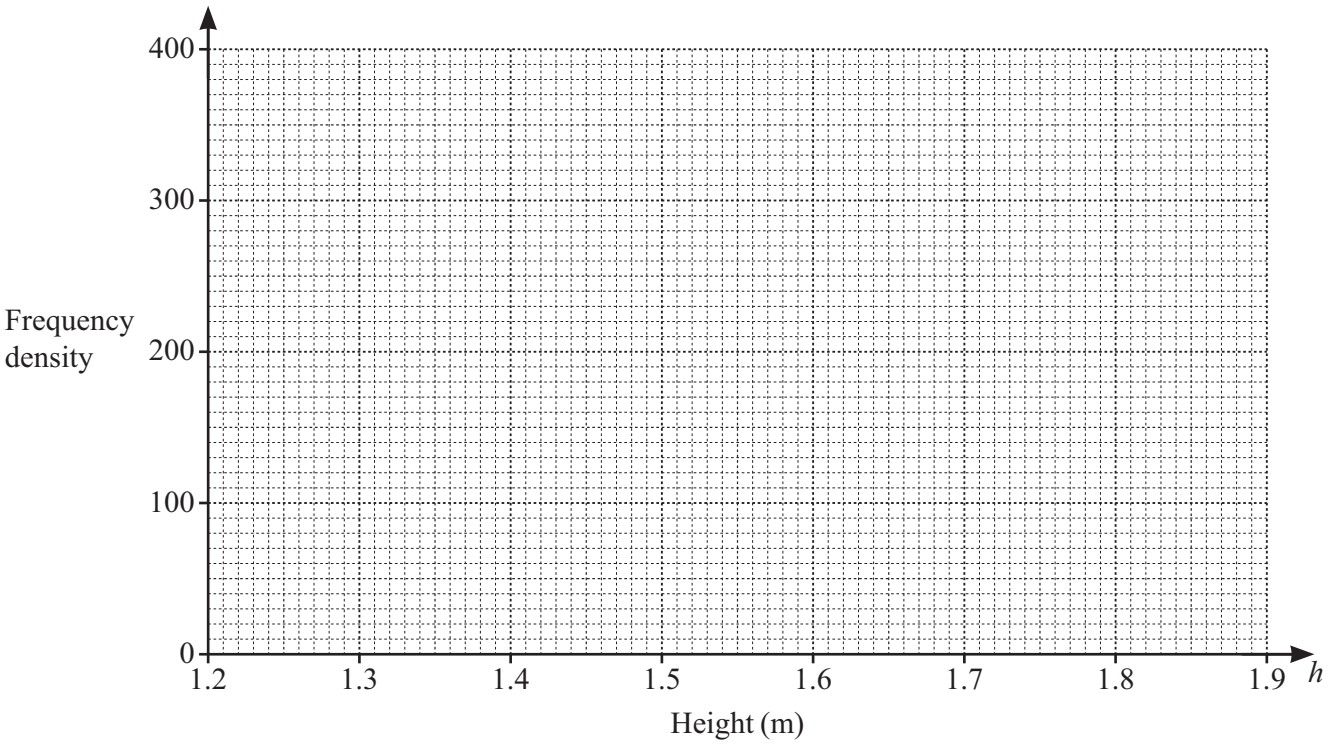
15 Virat records the height of each of 80 sunflowers.
The results are shown in the table.

Height (h m)	$1.2 < h \leq 1.5$	$1.5 < h \leq 1.6$	$1.6 < h \leq 1.7$	$1.7 < h \leq 1.9$
Frequency	12	20	34	14

(a) Calculate an estimate of the mean height.

..... m [4]

(b) Draw a histogram to show the information in the table.



[3]

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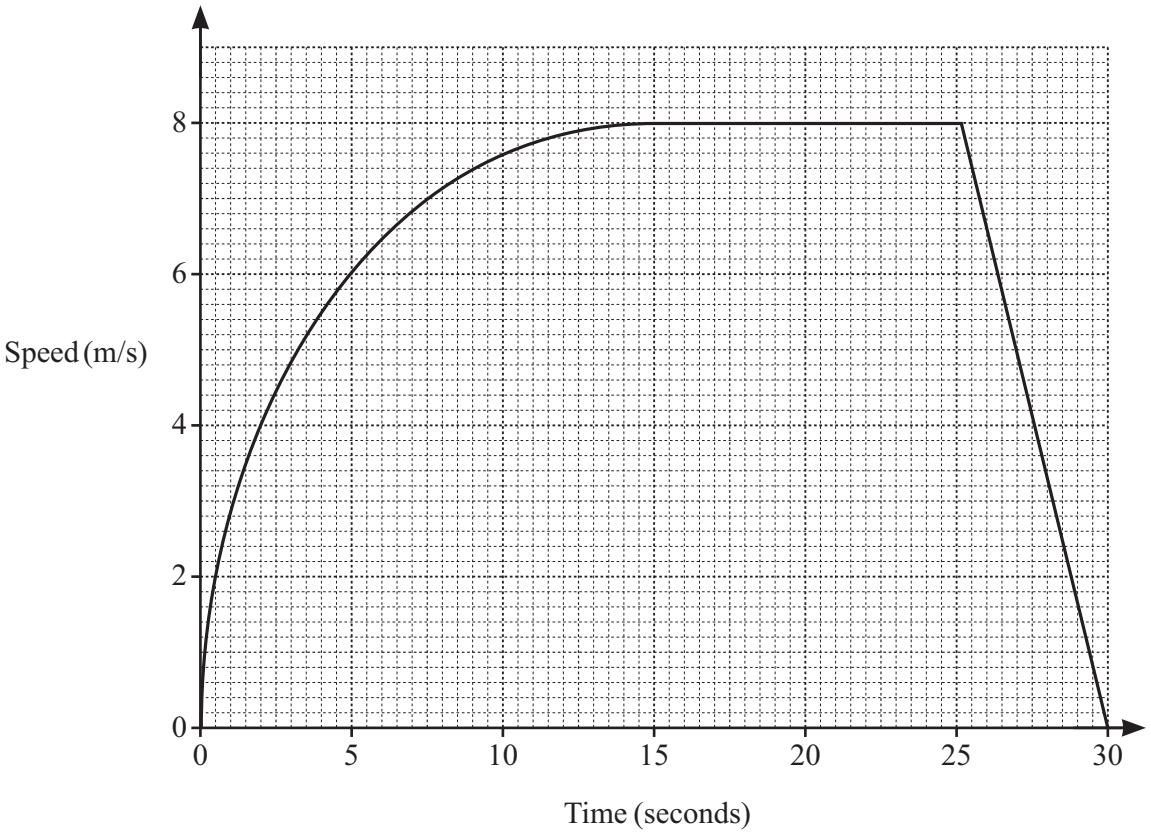
16 The graph shows the speed of a cyclist during a journey of 30 seconds.



(a) Write down the acceleration of the cyclist between 15 seconds and 25 seconds.

..... m/s^2 [1]

(b) By drawing a tangent, find an estimate for the acceleration of the cyclist at 7.5 seconds.

..... m/s^2 [2]

(c) Work out the average speed of the cyclist between 15 seconds and 30 seconds.

..... m/s [3]

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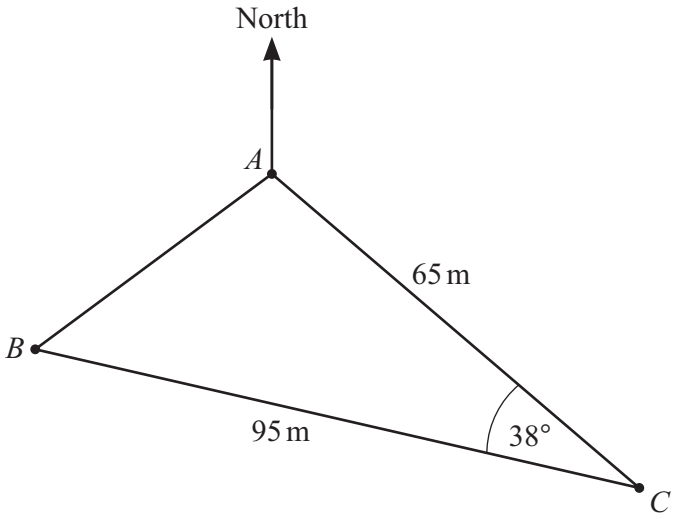

NOT TO SCALE

The diagram shows three points A, B and C on horizontal ground.
The bearing of C from A is 145° and angle ACB = 38°.
AC = 65 m and BC = 95 m.

(a) Find the bearing of B from C.

..... [2]

(b) Show that AB = 59.3 m, correct to 1 decimal place.

[3]

(c) Angle BAC is obtuse.

Work out the bearing of B from A.

..... [4]

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18 **(a)** Factorise.

$$18a^2 - 98$$

..... [2]

(b) Expand and simplify.

$$(x+4)(2x-1)(x-2)$$

..... [3]

19 Solve the equation $2 + 5\cos x = 0$ for $0° \leq x \leq 360°$.

$x =$ .....or $x =$ ..... [3]

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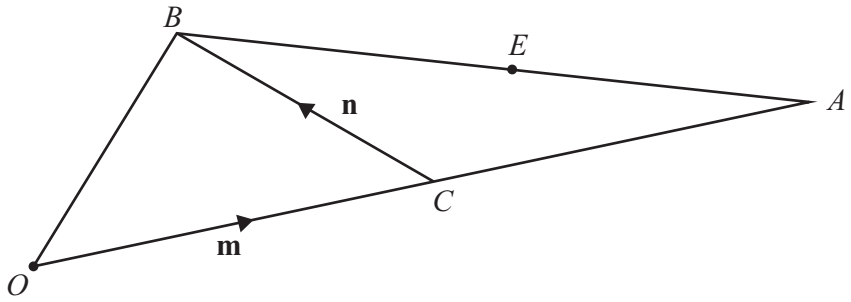
20 A piece of metal has volume 1240 cm^3, correct to the nearest 20 cm^3.
The mass of the piece of metal is 7800 g, correct to the nearest 100 g.

Calculate the lower bound of the density of the metal.
[Density = mass ÷ volume.]

..... g/cm^3 [3]

21



NOT TO SCALE

OAB is a triangle.
C is the midpoint of *OA*.
$\overrightarrow{OC} = \mathbf{m}$ and $\overrightarrow{CB} = \mathbf{n}$.
E lies on *AB* and $AE : EB = 4 : 5$.

Find, in terms of **m** and **n**, the position vector of *E*.
Give your answer in its simplest form.

..... [4]

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22 The line $y = 4x + 12$ intersects the curve $y = 2x^2 - x - 3$ at point P and point Q.

Find the coordinates of P and Q.
You must show all your working and give your answers correct to 2 decimal places.

(....., ...)

(....., ...)
[6]

Question 23 is printed on the next page.

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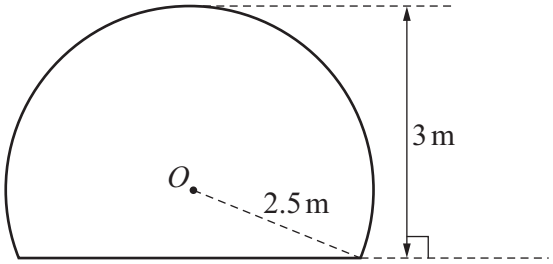

NOT TO SCALE

The diagram shows the major segment of a circle, centre O, radius 2.5 m.
The segment is the cross section of a tunnel with height 3 m.
The length of the tunnel is 800 m and it has the same cross section throughout its length.

Calculate the volume of the tunnel.

..... m^3 [7]

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