Cambridge IGCSE™

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

CAMBRIDGE INTERNATIONAL MATHEMATICS

Paper 4 (Extended)

0607/41

October/November 2021

2 hours 15 minutes

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 graphic display calculator where appropriate.
- You may use tracing paper.
- You must show all necessary working clearly and you will be given marks for correct methods, including sketches, even if your answer is incorrect.
- 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 your calculator value.

INFORMATION
- The total mark for this paper is 120.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **20** pages.

2

Formula List

For the equation $ax^2 + bx + c = 0$ $\qquad x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Curved surface area, A, of cylinder of radius r, height h. $\qquad A = 2\pi rh$

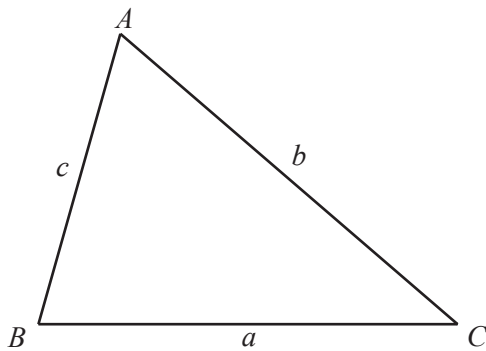Curved surface area, A, of cone of radius r, sloping edge l. $\qquad A = \pi rl$

Curved surface area, A, of sphere of radius r. $\qquad A = 4\pi r^2$

Volume, V, of pyramid, base area A, height h. $\qquad V = \dfrac{1}{3}Ah$

Volume, V, of cylinder of radius r, height h. $\qquad V = \pi r^2 h$

Volume, V, of cone of radius r, height h. $\qquad V = \dfrac{1}{3}\pi r^2 h$

Volume, V, of sphere of radius r. $\qquad V = \dfrac{4}{3}\pi r^3$

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

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

$$\text{Area} = \frac{1}{2}bc \sin A$$

3

Answer **all** the questions.

1 Amir, Bibi and Caitlyn are each given $1500 to invest.

(a) Amir invests his $1500 in an account which pays compound interest.
The interest rate is 3% per year for 5 years, after which it is 2% per year.

Find the value of Amir's investment at the end of 11 years.

$ .... [3]

(b) Bibi invests her $1500 in an account which pays r% per year **simple** interest.
At the end of 11 years, the investment is worth $1962.

Calculate the value of r.

$r =$ .... [3]

(c) Caitlyn invests her $1500 in an account which pays t% per year **compound** interest.
At the end of 11 years, the investment is worth $1968.13 .

Calculate the value of t.

$t =$ .... [3]

2 **(a)** In **part (a)** enlargements and stretches have scale factors greater than 1.

(i) A transformation maps triangle *A* onto triangle *B*.
Triangle *A* is congruent to triangle *B*.

Tick all the possible transformations it could be.

Transformation	Tick (✓)
Rotation	
Reflection	
Translation	
Enlargement	
Stretch	

[1]

(ii) A transformation maps triangle *C* onto triangle *D*.
The angles of triangle *C* are the same as the corresponding angles of triangle *D*.

Tick all the possible transformations it could be.

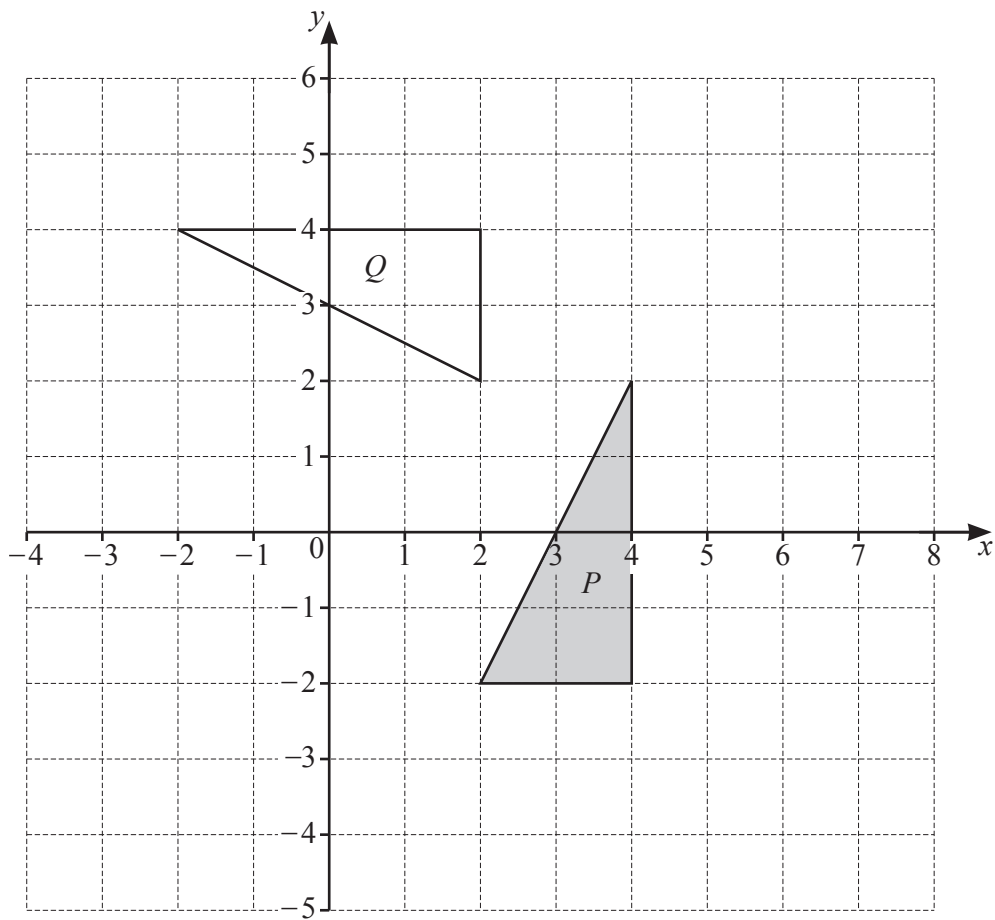| Transformation	Tick (✓)
Rotation	
Reflection	
Translation	
Enlargement	
Stretch	

[1]

(iii) A transformation maps triangle *E* onto triangle *F*.
Triangle *F* has a larger area than triangle *E*.

Tick all the possible transformations it could be.

Transformation	Tick (✓)
Rotation	
Reflection	
Translation	
Enlargement	
Stretch	

[1]

(b)

(i) Describe fully the **single** transformation that maps triangle P onto triangle Q.

....

.... [3]
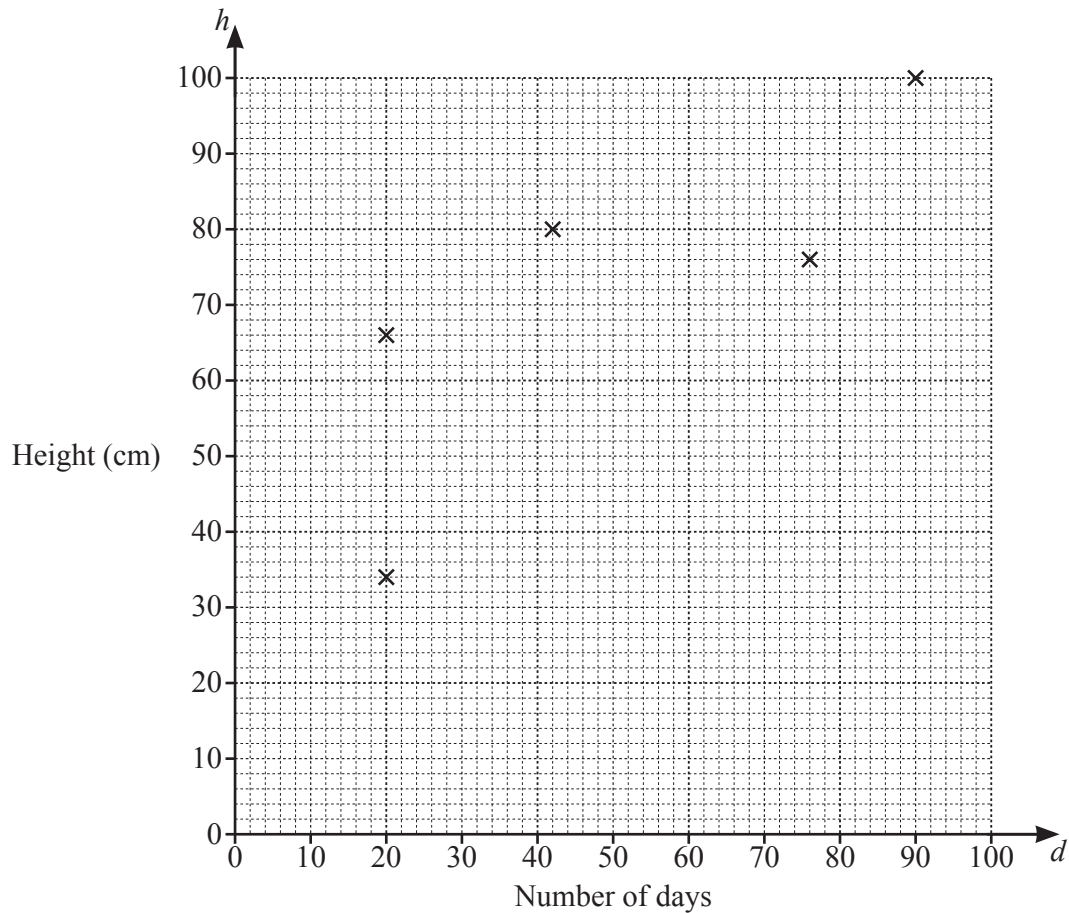
(ii) Stretch triangle P with the x-axis invariant and scale factor 2. [2]

3 The table shows the number of days, *d*, since planting and the heights, *h* cm, of some plants.

Number of days (*d*)	20	20	42	76	90	24	86	98	10	56
Height (*h* cm)	34	66	80	76	100	50	86	94	40	54

(a) Complete the scatter diagram.
The first five points have been plotted for you.

[2]

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

.... [1]

(c) Find the equation of the regression line for *h* in terms of *d*.

h = ... [2]

(d) Use your regression line to estimate the height of a plant that was planted 28 days ago.

.... cm [1]

(e) A plant was planted 140 days ago.

Explain why you should not use the equation of the regression line to estimate the height of this plant.

.... [1]

4 The table shows a set of data.

x	Frequency
5	16
6	18
7	25
8	11
9	6
10	4
Total	80

(a) When x represents the number of emails Essa receives each day, find

   (i) the median,

.... [1]

   (ii) the range,

.... [1]

   (iii) the upper quartile,

.... [1]

   (iv) the mean.

.... [2]

(b) When x represents the height of a seedling, correct to the nearest centimetre, explain why you cannot work out the range of the heights.

....

.... [1]

5
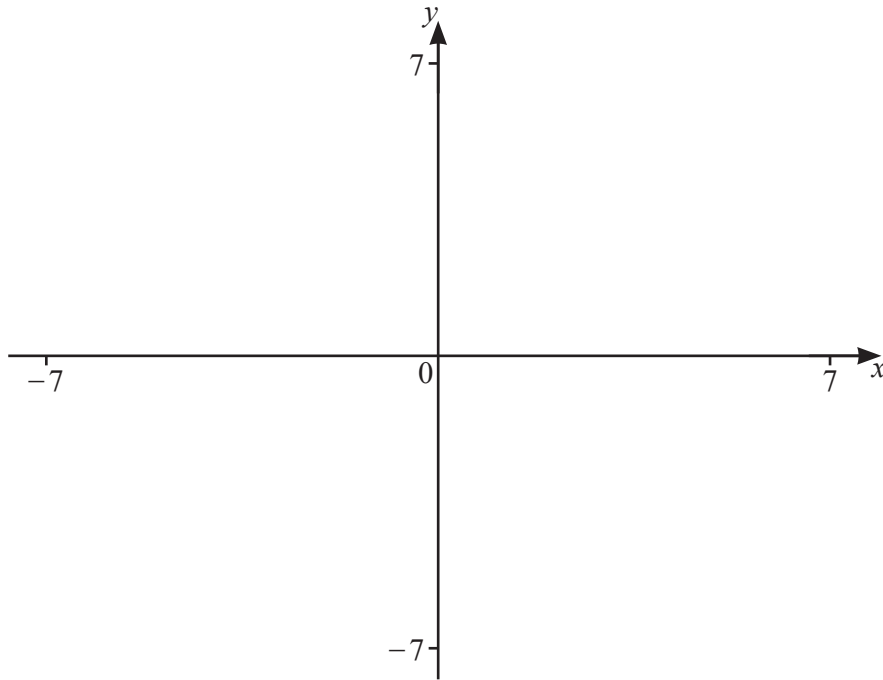
$$f(x) = \frac{(2x^2 + 3)}{(x+1)(2-x)} \quad \text{for } -7 \leqslant x \leqslant 7$$

(a) On the diagram, sketch the graph of $y = f(x)$. [3]

(b) Write down the equation of each asymptote parallel to the y-axis.

.... [2]

(c) Write down the coordinates of the local minimum.

(....................... , ...) [2]

(d) Find the range of values of x for which the gradient of $f(x)$ is negative.

.... [3]

(e) Solve $f(x) = -x$.

$x =$ .... [1]

6 The masses of 300 apples are shown in the table.

Mass (m grams)	$0 < m \leqslant 25$	$25 < m \leqslant 50$	$50 < m \leqslant 75$	$75 < m \leqslant 100$	$100 < m \leqslant 125$	$125 < m \leqslant 150$
Frequency	4	26	60	88	106	16

(a) Draw a cumulative frequency curve to show these results.
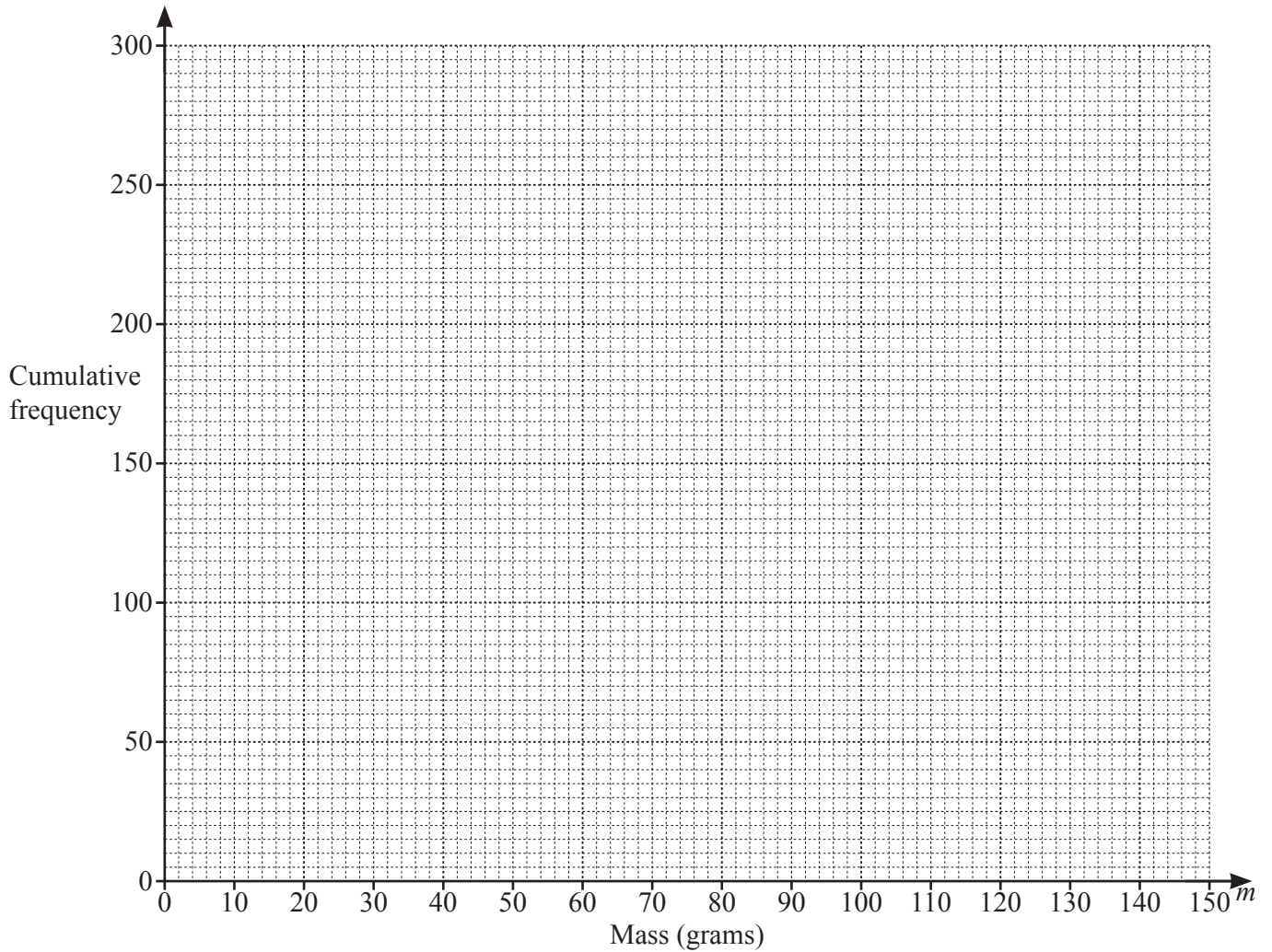
[4]

(b) Use your curve to find the interquartile range.

.... [2]

(c) Apples with a mass below 80 g are used to make drinks.

Find the percentage of the 300 apples that are used to make drinks.

.... % [2]

7 **(a)** The nth term of a sequence is $\dfrac{n(n+1)(2n+1)}{6}$.

Find the first three terms of this sequence.

.... , ... , ... [2]

(b) For each of the following sequences:

- find the next two terms
- find an expression for the nth term.

(i) 11   8   5   2

Next two terms .... , ...

nth term .... [3]

(ii) −2   −2   0   4   10   18

Next two terms .... , ...

nth term .... [3]

(iii) 3   5   9   17   33

Next two terms .... , ...

nth term .... [3]

8
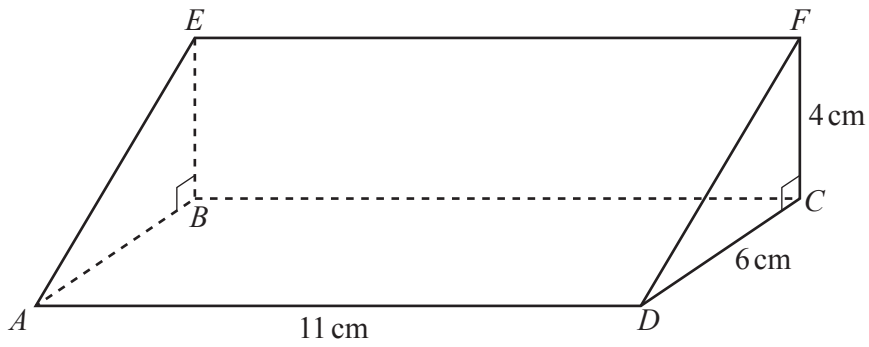
NOT TO SCALE

The diagram shows a right-angled triangular prism.
ABCD, *ADFE* and *BCFE* are rectangles.
AD = 11 cm, *DC* = 6 cm and the height *CF* = 4 cm.

(a) Calculate the volume of the prism.

.... cm^3 [2]

(b) Calculate the total surface area of the prism.

.... cm^2 [4]

(c) Calculate the length *AF*.

AF = ... cm [3]

(d) Calculate angle *FAC*.

Angle *FAC* = ... [2]

(e) The volume of a mathematically similar prism is $445.5 \, \text{cm}^3$.

Calculate the total surface area of this similar prism.

.... cm^2 [3]

9

NOT TO SCALE
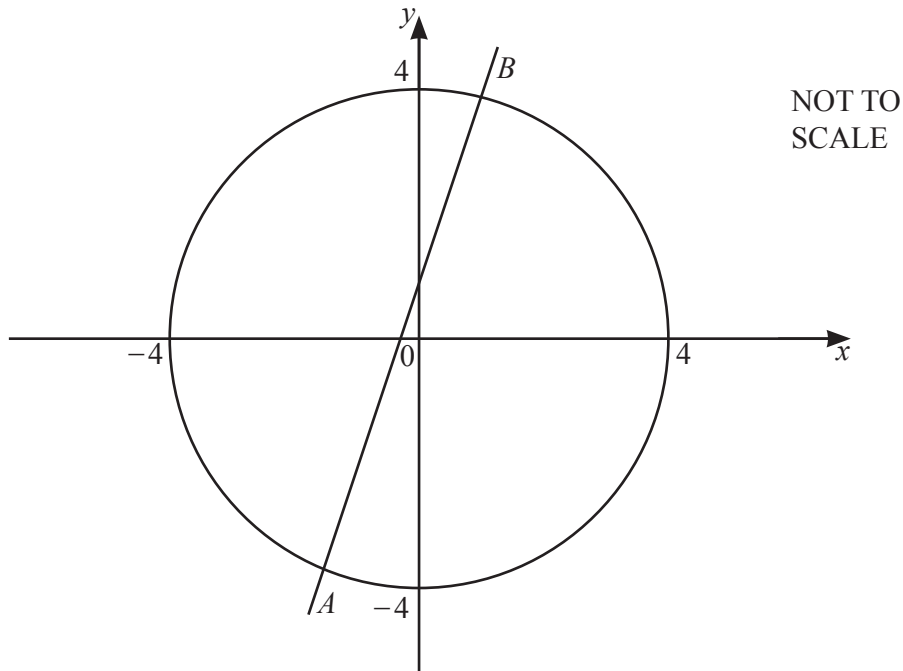
The equation of the circle is $x^2 + y^2 = 16$.
The equation of the straight line is $y = 3x + 1$.
The line crosses the circle at the points A and B.

(a) Use substitution to show that the x-coordinates of the points A and B satisfy the equation $10x^2 + 6x - 15 = 0$.

[3]

(b) Solve the equation $10x^2 + 6x - 15 = 0$ to find the coordinates of the points A and B.
Show your working and give your answers correct to 2 decimal places.

A (..................... , ...)

B (..................... , ...) [4]

10 $f(x) = 3x - 2$ $g(x) = (x-3)^2$

(a) Find $f(g(1))$.

.... [2]

(b) Solve $g(x) = 25$.

$x =$ .... or $x =$ .... [2]

(c) Find $f^{-1}(4)$.

.... [2]

(d) Write down $f(f^{-1}(x))$.

.... [1]

11

North

NOT TO
SCALE

B

108 km

159 km

217 km

A

C
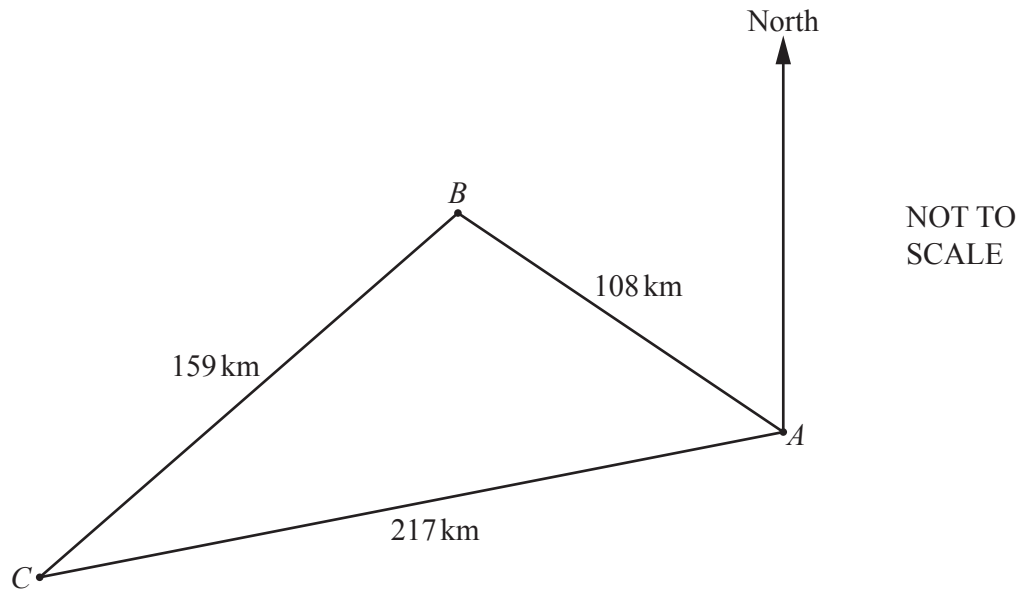
A, *B* and *C* are three ports.

(a) Show that angle *ABC* = 107.2° correct to 1 decimal place.

[3]

(b) The bearing of *B* from *A* is 305°.

    (i) Using the sine rule, show that angle *BAC* = 44.4° correct to 1 decimal place.

[3]

    (ii) Find the bearing of *C* from *A*.

.... [1]

(c) A ship leaves A at 22 50 and sails at a constant speed of 24 km/h towards C.

Calculate the time, correct to the nearest minute, when the ship is nearest to B.

.... [5]

12 **(a)** **(i)** For each Venn diagram, shade the given set.

$A' \cup B$ $A \cap B'$
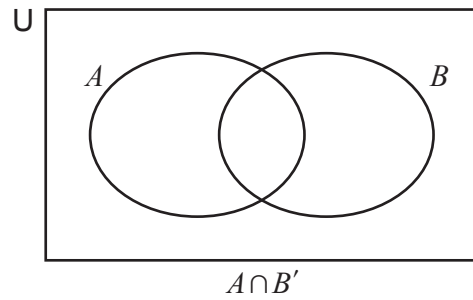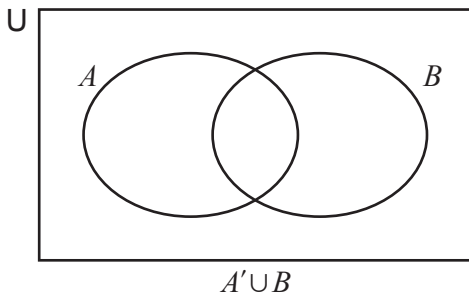
[2]

(ii) Use set language to describe the shaded set.
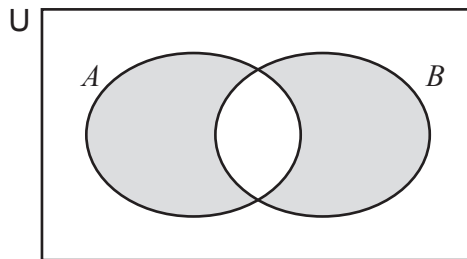
.... [1]

(b) 40 people are asked which of 3 television programmes, *P*, *Q* and *R*, they watch.
The results are shown in the Venn diagram.
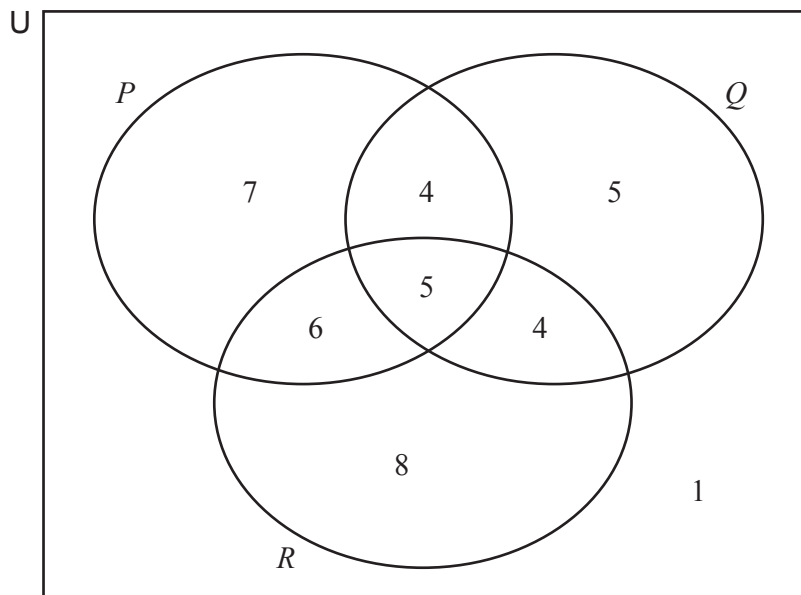
(i) Two of the 40 people are chosen at random.

Find the probability that they both watch exactly 2 of the 3 programmes.

.... [2]

(ii) Two of the people who watch programme *P* are chosen at random.

Find the probability that one of them watches both other programmes and one watches just one of the other programmes.

.... [3]

(iii) Three of the 40 people are chosen at random.

Find the probability that two of them watch only programme *Q* and one of them watches only programme *R*.

.... [3]

Question 13 is printed on the next page.

13 (a) Rearrange $y = \dfrac{ax+b}{ex+f}$ to make x the subject.

$$x = \text{...} \quad [4]$$

(b) $f(x) = 3\sin(2x)^\circ$

(i) Write down the amplitude and the period of $f(x)$.

$$\text{Amplitude} = \text{...}$$

$$\text{Period} = \text{...} \quad [2]$$

(ii) The graph of $y = f(x)$ is stretched with the x-axis invariant and scale factor 3 to give the graph of $y = g(x)$.

Find $g(x)$.

$$g(x) = \text{...} \quad [1]$$

(iii) The graph of $y = f(x)$ is translated through $\begin{pmatrix} -90 \\ 0 \end{pmatrix}$ to give the graph of $y = h(x)$.

Find $h(x)$, giving your answer in its simplest form.

$$h(x) = \text{...} \quad [2]$$