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CAMBRIDGE INTERNATIONAL MATHEMATICS

0607/41

Paper 4 (Extended)

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.



Formula List

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

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 . $A = \pi rl$

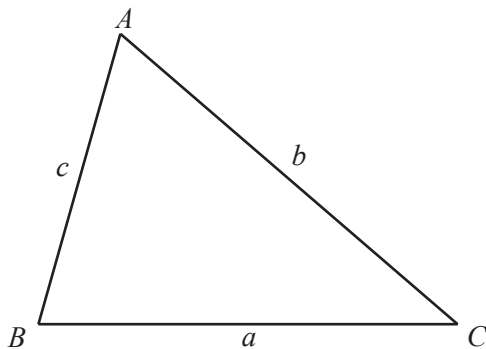
Curved surface area, A , of sphere of radius r . $A = 4\pi r^2$

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 . $V = \frac{4}{3}\pi r^3$



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

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

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

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]

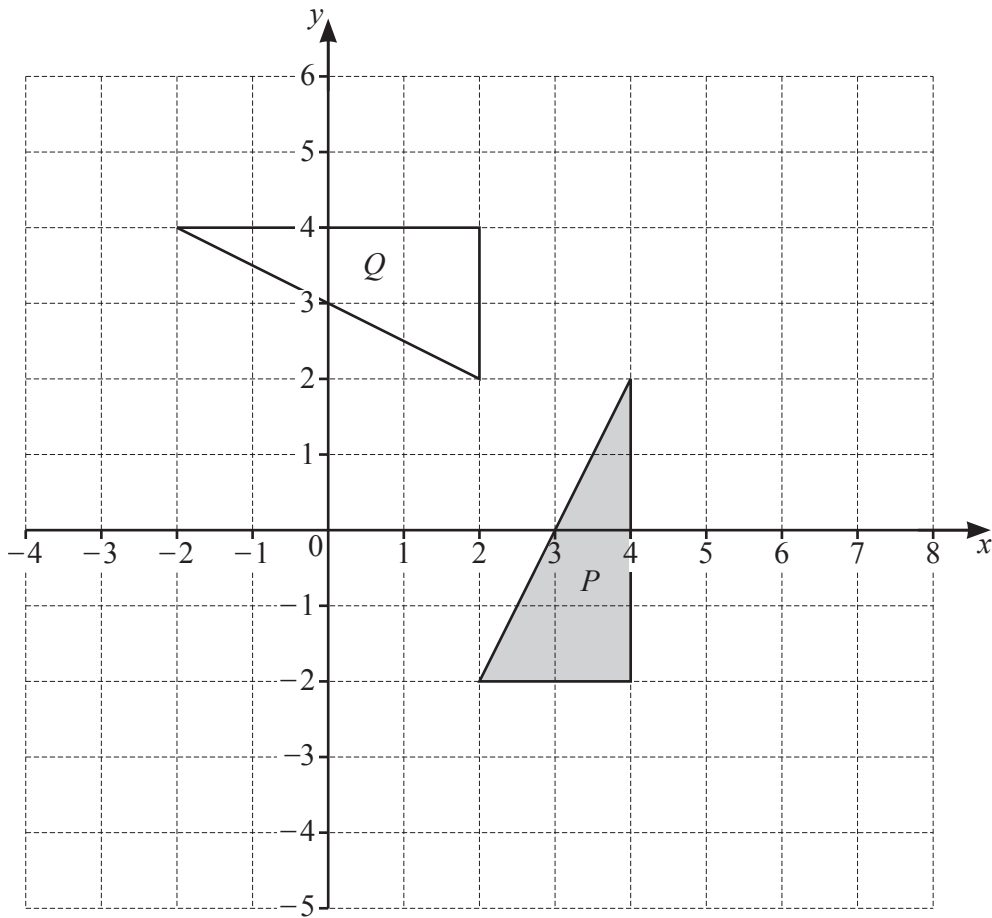
- (iii) A transformation maps triangle E onto triangle F .
Triangle F has a larger area than triangle E .

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]

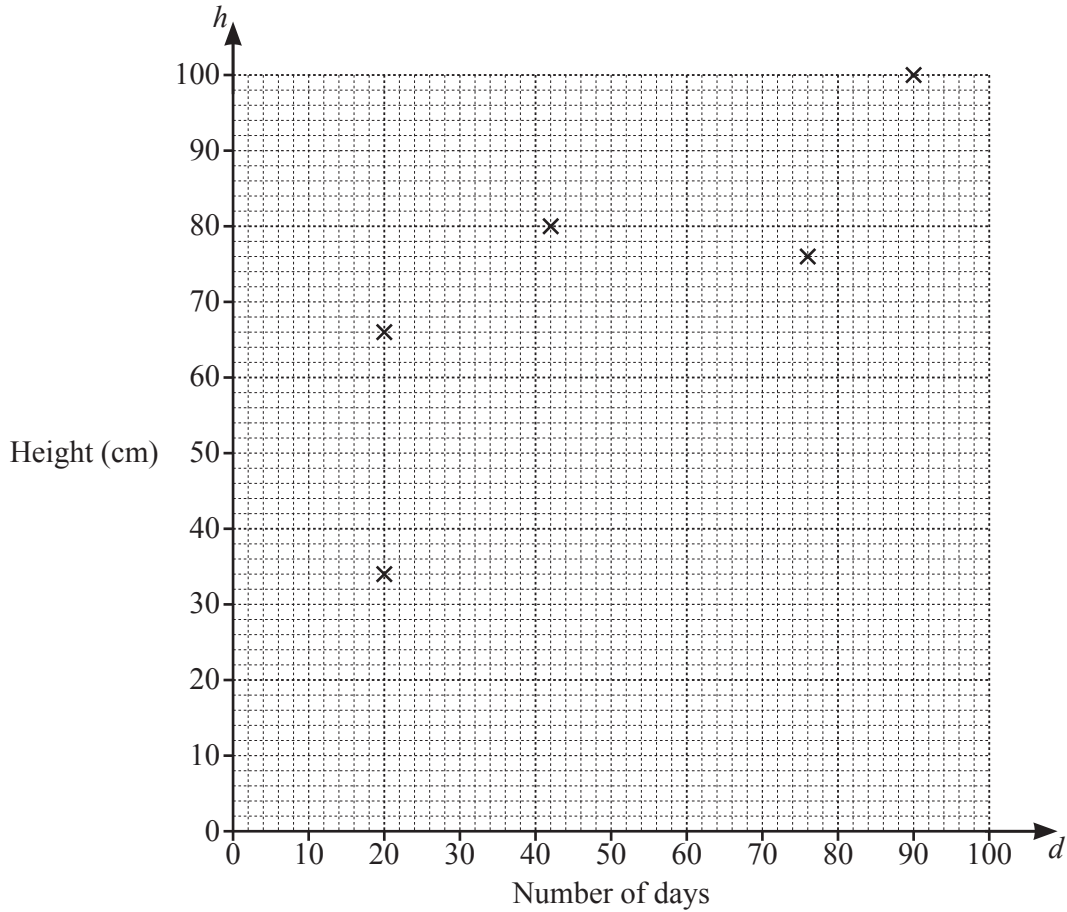
(ii) Stretch triangle P with the x -axis invariant and scale factor 2.

[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]

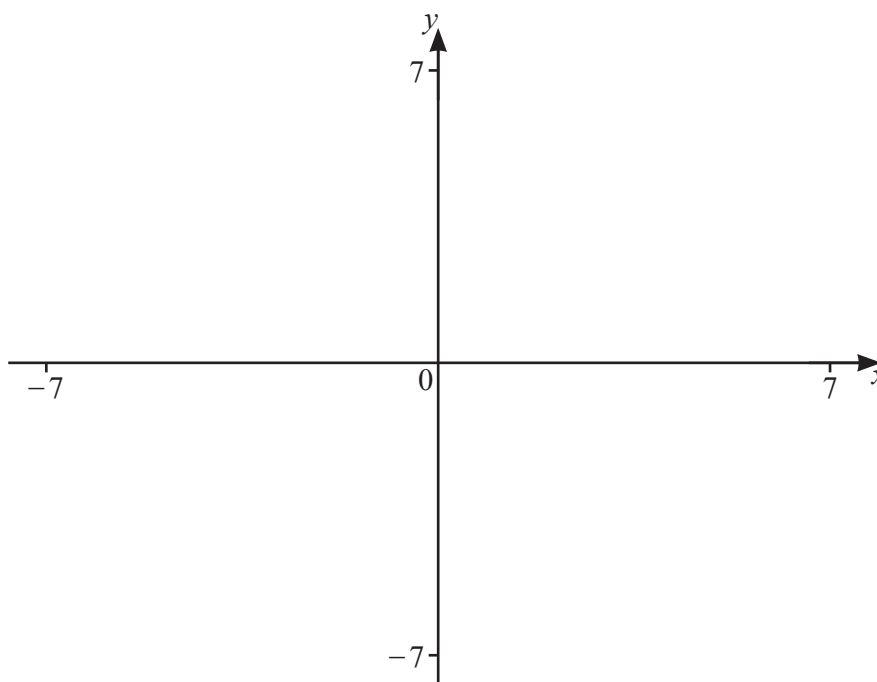
(iv) the mean.

..... [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]



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

(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]

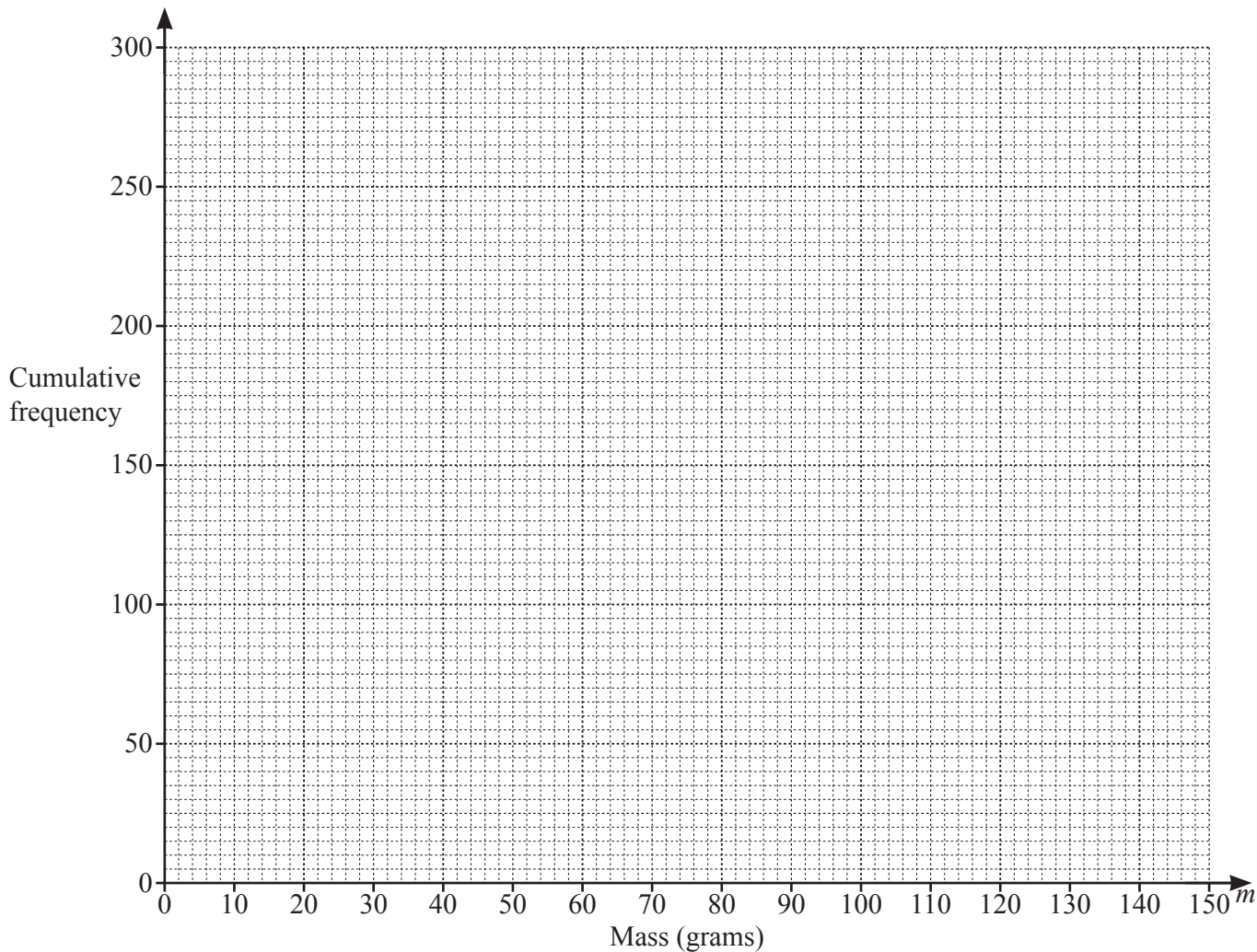
(e) Solve $f(x) = -x$.

$x =$ [1]

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

Mass (m grams)	$0 < m \leq 25$	$25 < m \leq 50$	$50 < m \leq 75$	$75 < m \leq 100$	$100 < m \leq 125$	$125 < m \leq 150$
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 n th term of a sequence is $\frac{n(n+1)(2n+1)}{6}$.

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 n th term.

(i) 11 8 5 2

Next two terms,

n th term [3]

(ii) -2 -2 0 4 10 18

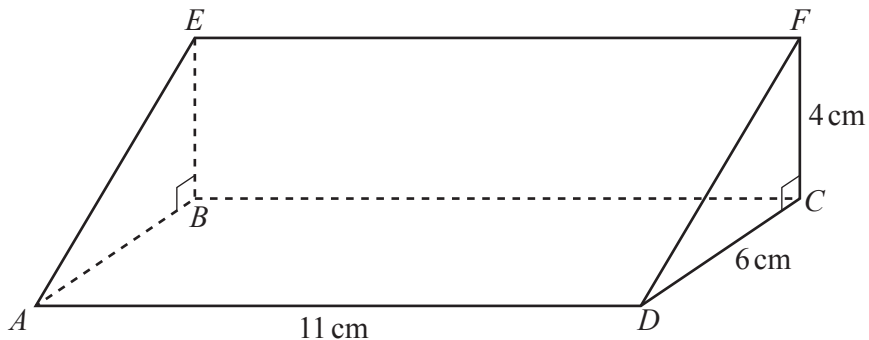
Next two terms,

n th term [3]

(iii) 3 5 9 17 33

Next two terms,

n th term [3]



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]

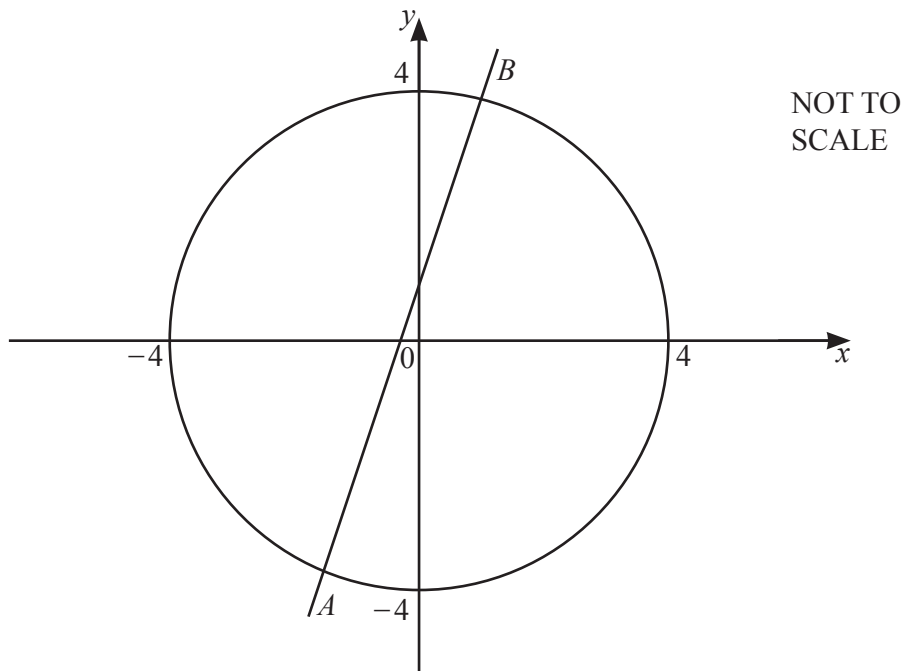
(d) Calculate angle FAC .

Angle $FAC = \dots\dots\dots$ [2]

(e) The volume of a mathematically similar prism is 445.5 cm^3 .

Calculate the total surface area of this similar prism.

$\dots\dots\dots \text{ cm}^2$ [3]



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 $g(x) = 25$.

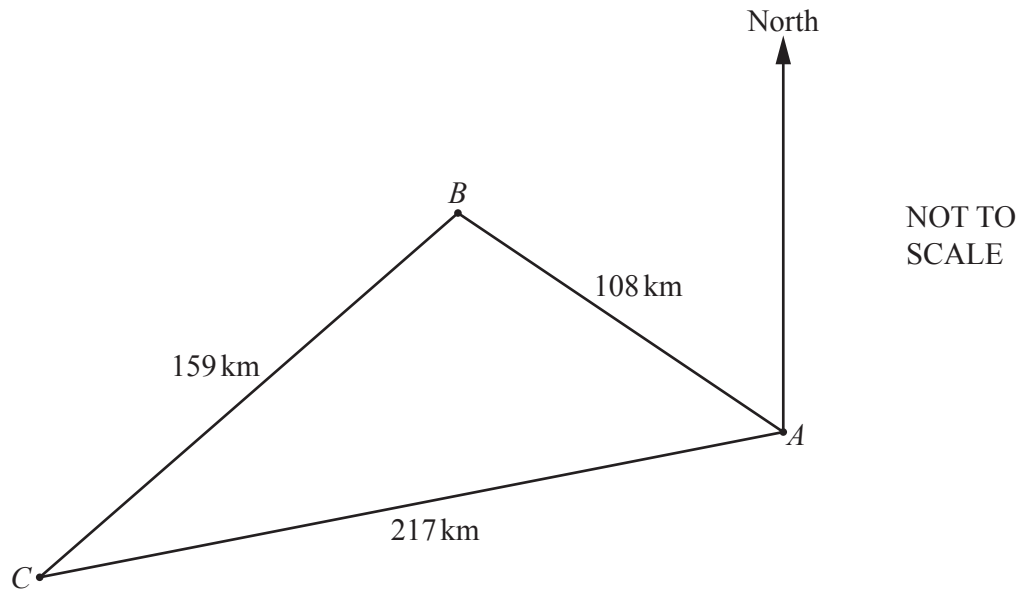
$x = \dots\dots\dots$ or $x = \dots\dots\dots$ [2]

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

..... [2]

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

..... [1]



A , B and C are three ports.

(a) Show that angle $ABC = 107.2^\circ$ correct to 1 decimal place.

[3]

(b) The bearing of B from A is 305° .

(i) Using the sine rule, show that angle $BAC = 44.4^\circ$ correct to 1 decimal place.

[3]

(ii) Find the bearing of C from A .

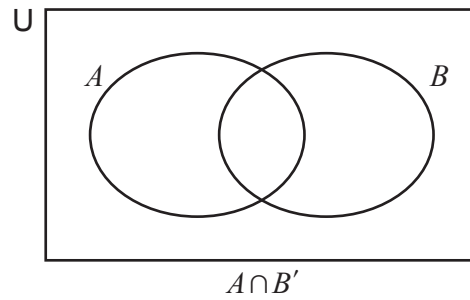
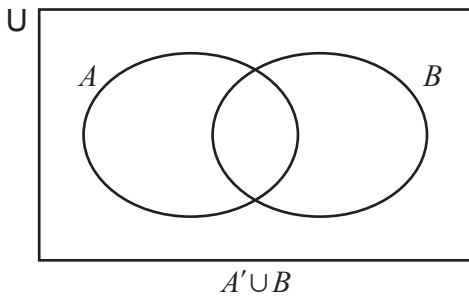
..... [1]

- (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 .

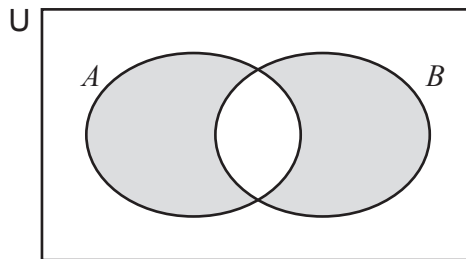
..... [5]

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



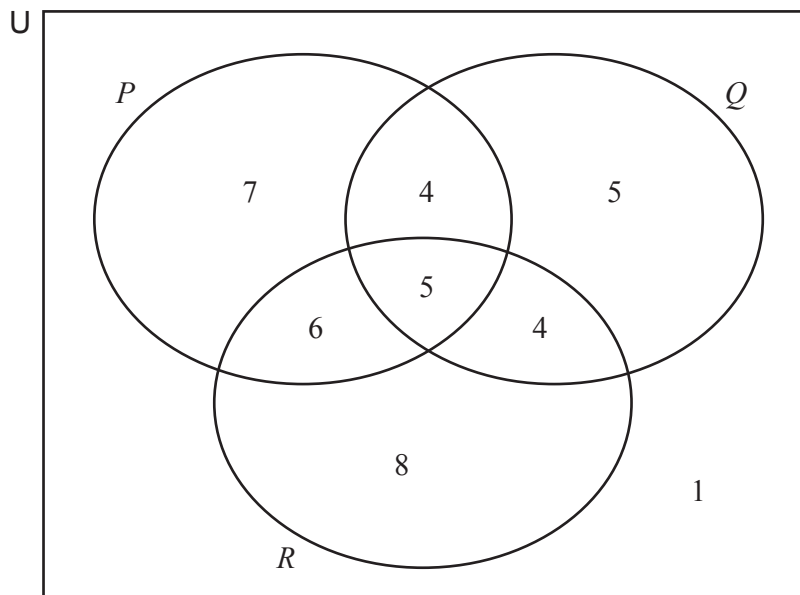
[2]

(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 $y = \frac{ax+b}{ex+f}$ to make x the subject.

$$x = \dots\dots\dots [4]$$

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

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

$$\text{Amplitude} = \dots\dots\dots$$

$$\text{Period} = \dots\dots\dots [2]$$

(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 $g(x)$.

$$g(x) = \dots\dots\dots [1]$$

(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.

$$h(x) = \dots\dots\dots [2]$$

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