Cambridge Assessment International Education

Cambridge O Level

CANDIDATE NAME	

CENTRE NUMBER						CANDIDATE NUMBER				

5114564361

MATHEMATICS (SYLLABUS D) **4024/21**

Paper 2 **May/June 2024**

2 hours 30 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 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 **20** pages. Any blank pages are indicated.

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1 **(a)** The cost of a ticket to watch a basketball match is \$67.60 .

(i) The total money received from ticket sales for one match is \$1 183 000.

Find the number of tickets sold for this match.

..... [1]

(ii) The cost of one ticket at \$67.60 is 4% more than the cost of one ticket last year.

Calculate the cost of one ticket last year.

\$ ..... [2]

(b) The number of seats in the basketball stadium is 20 545.
The number of seats sold for the first match of the season is 19 340.

Calculate the percentage of the seats in the stadium that are sold.

..... % [1]

(c) A team plays 41 matches.
For the 41 matches, the mean number of seats sold per match is 16 440.
The total number of seats sold for the first 21 matches is 329 000.

Calculate the mean number of seats sold per match for the last 20 matches.

..... [3]

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(d) The table shows the salaries of three basketball players.

Basketball player	Salary ($)
Stephen	8.27×10^6
Joe	4.29×10^6
Tristan	3.64×10^7

(i) Find the difference between the salaries of Tristan and Stephen.

$ ..... [1]

(ii) The total Joe earns is his salary plus a bonus of $\$x$.
The total he earns is 102.5% of his salary.

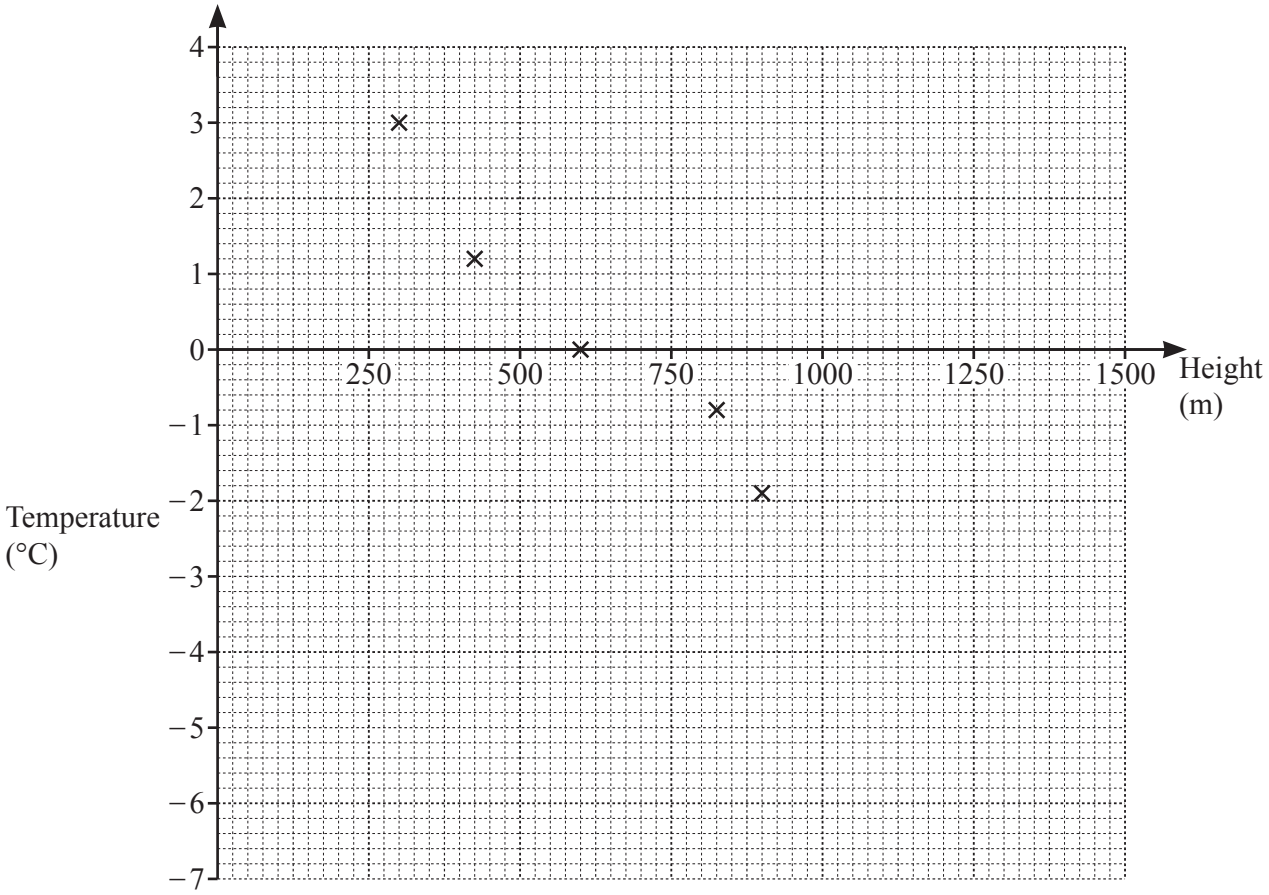
Calculate the value of x.

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

2 **(a)** The temperature at midday was recorded at ten different heights on a mountain.
The results are shown in the table.

Height (m)	300	825	600	425	900	100	1250	1450	1125	1350
Temperature (°C)	3.0	−0.8	0.0	1.2	−1.9	3.5	−4.6	−6.4	−4.0	−3.8

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



[2]

(ii) Describe the type of correlation shown in the scatter diagram.

..... [1]

(iii) Draw a line of best fit on the scatter diagram. [1]

(iv) Another reading is taken at a height of 1000 m.

Use your line of best fit to estimate the temperature at this height.

..... °C [1]

(b) The table summarises the times taken by 80 adults to climb the mountain.

Time taken (h hours)	$5.5 < h \leqslant 6.5$	$6.5 < h \leqslant 7.5$	$7.5 < h \leqslant 8$	$8 < h \leqslant 8.5$	$8.5 < h \leqslant 10.5$
Frequency	8	15	20	23	14

(i) Calculate an estimate of the mean time.

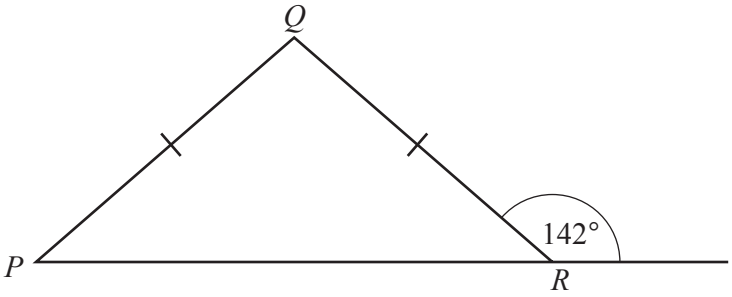
..... hours [3]

(ii) A histogram is drawn to show this information.
The height of the bar representing $5.5 < h \leqslant 6.5$ is 8 mm.

Calculate the height of the bar representing $8 < h \leqslant 8.5$.

..... mm [1]

3 **(a)**



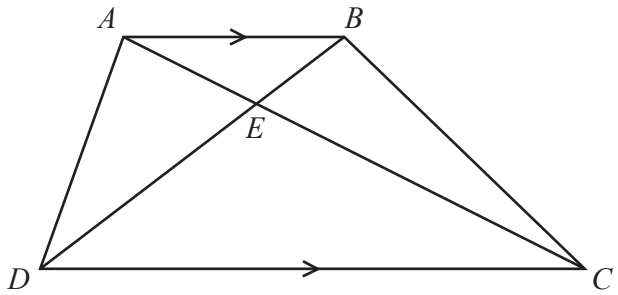
NOT TO SCALE

Triangle PQR is isosceles with $PQ = QR$.
The exterior angle of the triangle at R is 142°.

Calculate angle PQR.

Angle PQR = ... [2]

(b)



NOT TO SCALE

The diagonals of trapezium $ABCD$ meet at E.

Show that triangle ABE is similar to triangle CDE.
Give a reason for each statement you make.

.....

.....

.....

..... [3]

4 **(a)** Two of the factors of 50 are square numbers.
One of these square numbers is 1.

Find the other square number that is a factor of 50.

..... [1]

(b) $A = 2^{x-1} \times 3^{2y} \times 7$
$B = 2^{x+3} \times 3^{y} \times 5$

The numbers A and B are written as the product of their prime factors, where x and y are positive integers.

(i) Find the highest common factor (HCF) of A and B in terms of x and y.

..... [2]

(ii) Find the lowest common multiple (LCM) of A and B in terms of x and y.

..... [2]

5 **(a)** Two companies move boxes.
Company A charges \$0.50 for each box plus a fixed fee of \$125.
Company B charges only a fixed fee of \$350.

Find the number of boxes moved when Company A charges the same as Company B.

..... [2]

(b) The maximum mass a van can carry is exactly 770 kg.
The van carries boxes each of mass 4 kg, correct to the nearest kilogram.

Find the upper bound for the number of boxes this van can carry.

..... [2]

(c) A lorry contains boxes of three sizes S, M and L.
The ratio of the number of boxes $S : M = 2 : 7$.
The ratio of the number of boxes $S : L = 5 : 4$.
The lorry contains 72 boxes of size L.

Find the total number of boxes in the lorry.

..... [3]

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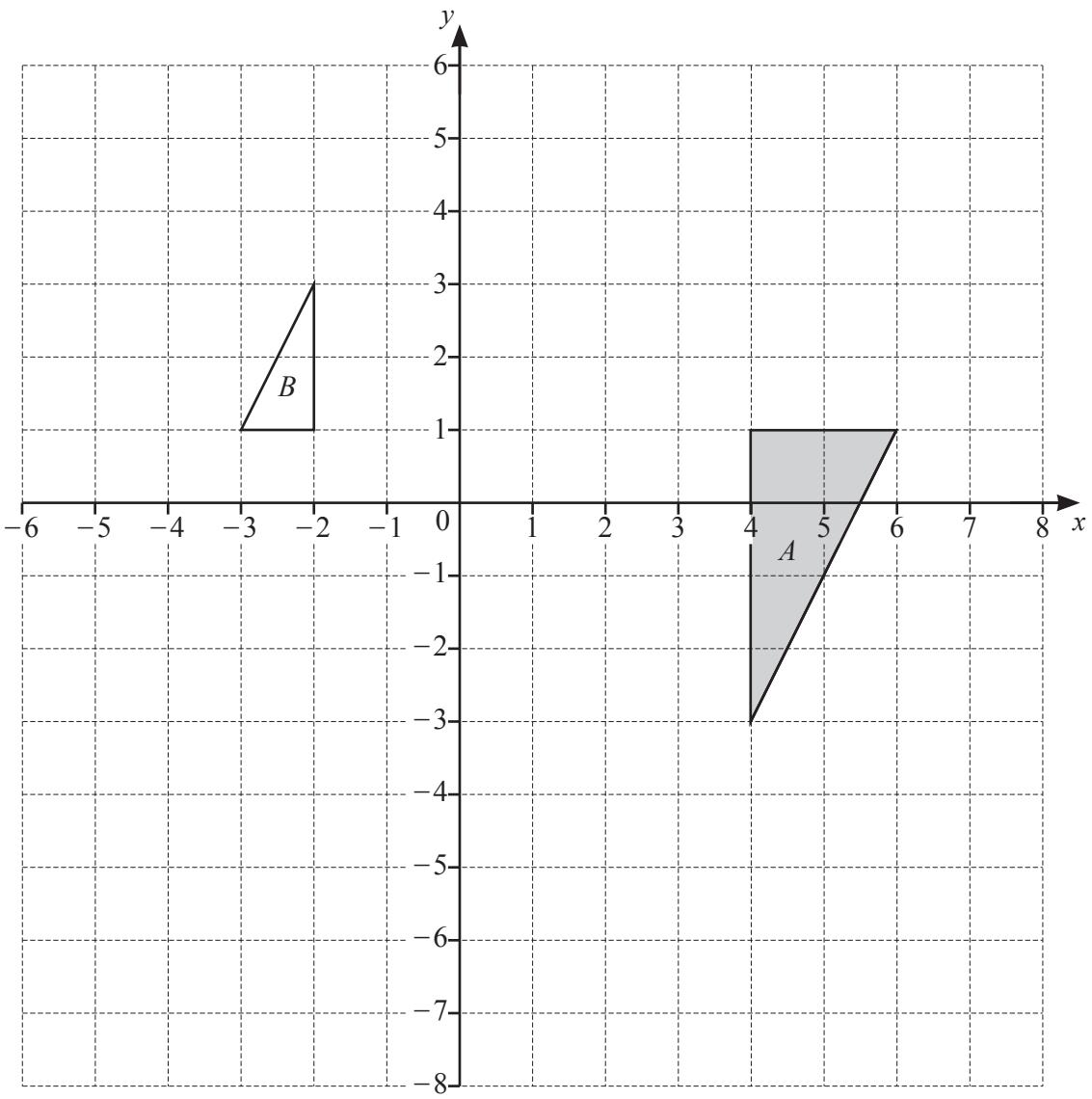


(a) Triangle A is mapped onto triangle P by a translation of $\begin{pmatrix} 1 \\ -3 \end{pmatrix}$.

Draw triangle P. [2]

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

.....

..... [3]

(c) Transformation M is a reflection in the line $y = -1$.
Transformation R is a rotation 90° clockwise about (1, 1).
RM(B) = Q.

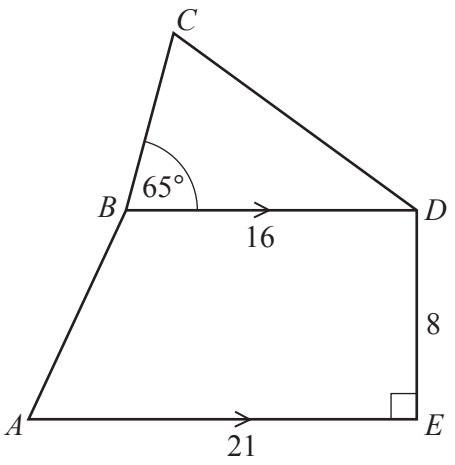
Draw triangle Q. [3]

7 **(a)** A cuboid has dimensions 5 cm by 12 cm by h cm.
The volume of the cuboid is 480 cm^3.

Calculate the value of h.

$h =$ ..... [2]

(b)



NOT TO SCALE

$ABCDE$ is a pentagon.
AE is parallel to BD.
$AE = 21$ cm, $BD = 16$ cm and $DE = 8$ cm.
Angle $DEA = 90°$ and angle $CBD = 65°$.

(i) Calculate angle BAE.

Angle $BAE =$ ..... [3]

(ii) The area of pentagon $ABCDE$ is $200\ \text{cm}^2$.

Calculate the length of BC.

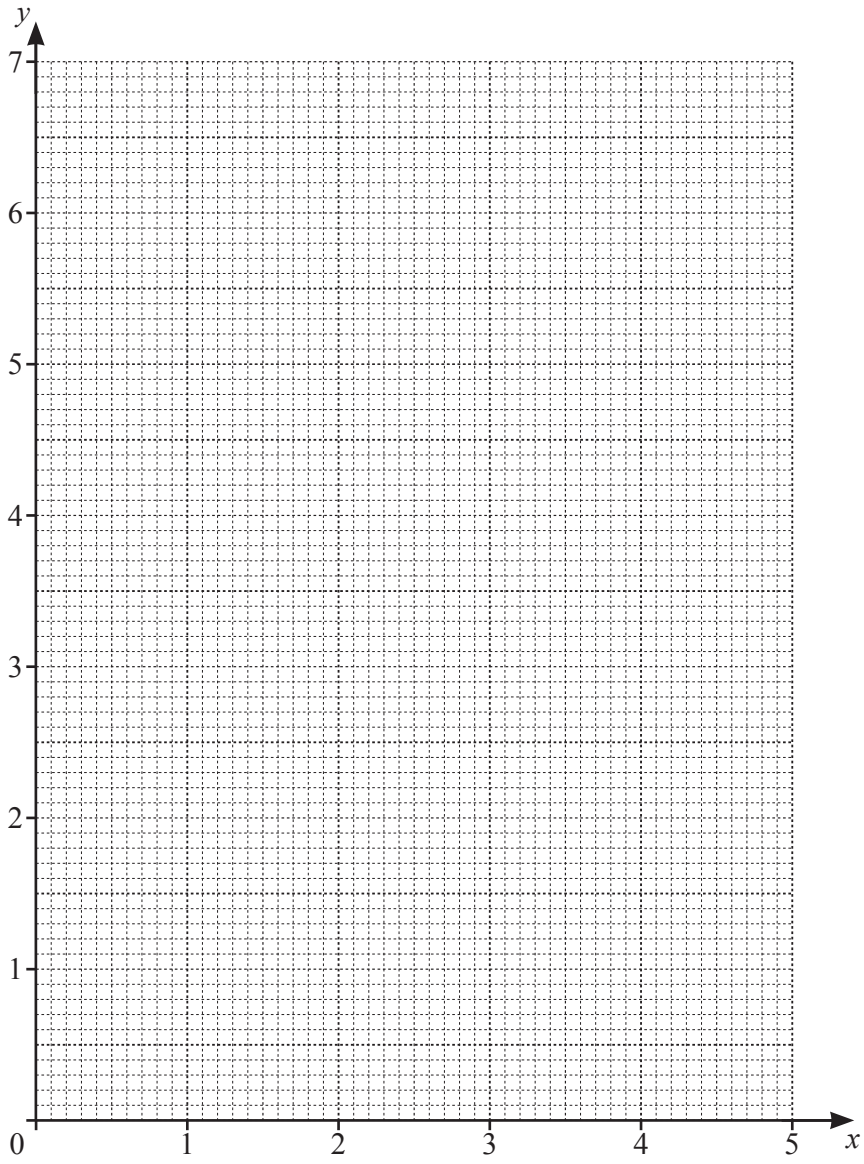
$BC =$ ..... cm [5]

8 **(a)** **(i)** Complete the table for $y = \frac{2^x}{5}$.

x	0	1	2	3	4	5
y	0.2	0.4	0.8	1.6	3.2	

[1]

(ii) On the grid, draw the graph of $y = \frac{2^x}{5}$ for $0 \leqslant x \leqslant 5$.



[3]

(iii) $2^{x+3} = 100$

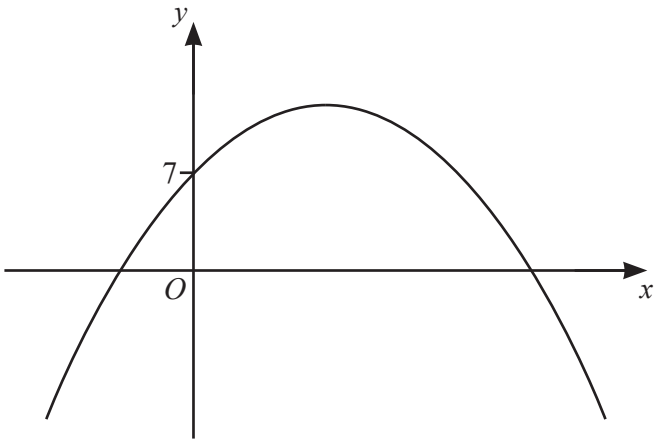
(a) Show that $\frac{2^x}{5} = \frac{5}{2}$.

[2]

(b) By drawing a suitable line on the grid, solve $2^{x+3} = 100$.

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

(b)



NOT TO SCALE

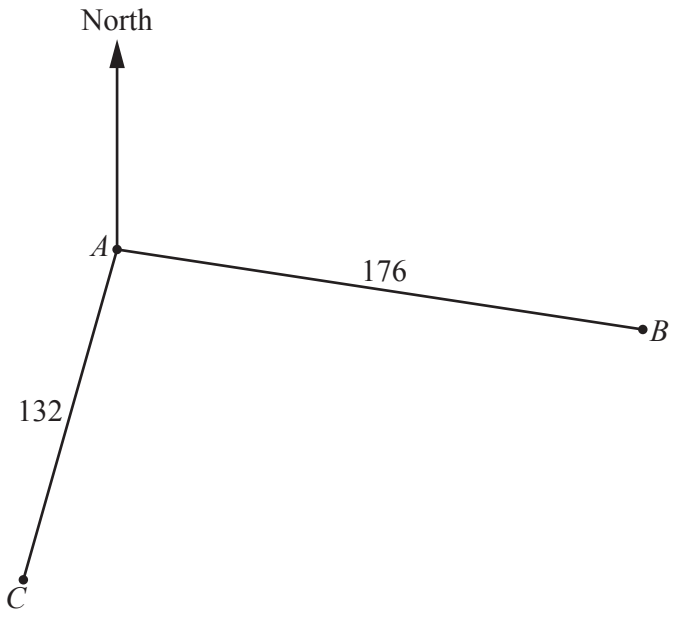
This is a sketch of the graph $y = a + bx - x^2$.
The graph crosses the x-axis at integer values of x.

Find the value of a and the value of b.

$a =$ .....

$b =$ ..... [3]

9



NOT TO SCALE

The diagram shows the positions of three ports A, B and C.
The bearing of port B from port A is 107°.
The bearing of port C from port A is 192°.
$AB = 176$ km and $AC = 132$ km.

(a) Find the bearing of A from B.

..... [1]

(b) Calculate BC.

$BC =$ ..... km [4]

(c) Boat B leaves port B at 10.00 am.
It sails directly to port A at an average speed of 48 km/h.

Boat C leaves port C at 10.15 am.
It sails directly to port A and arrives there 7 minutes before boat B.

Find the average speed of boat C in km/h.

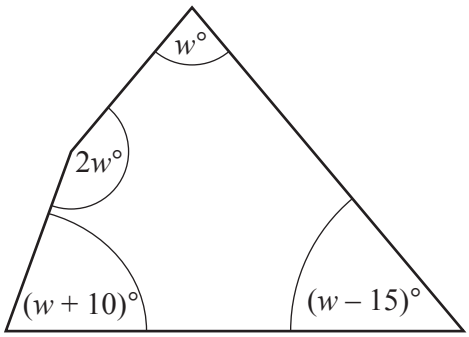
..... km/h [5]

10 **(a)** $r = \dfrac{4p + 3t}{2}$

Find the value of p when $r = 10$ and $t = -2$.

$p =$ ..... [3]

(b)



NOT TO SCALE

The diagram shows a quadrilateral.

Form an equation in w and solve it to find the size of the **largest** angle in the quadrilateral.

Largest angle = ... [4]

(c) Simplify $\dfrac{2k^2-5k-3}{k^2-9}$.

..... [3]

(d) Solve $\dfrac{2}{x+3}+\dfrac{5}{x-2}=1$.

Show all your working and give your answers correct to 2 decimal places.

$x =$ ..... or $x =$ ..... [6]

11 **(a)** On any day in January, the probability the temperature at a weather station is above 14 °C is 0.35 .

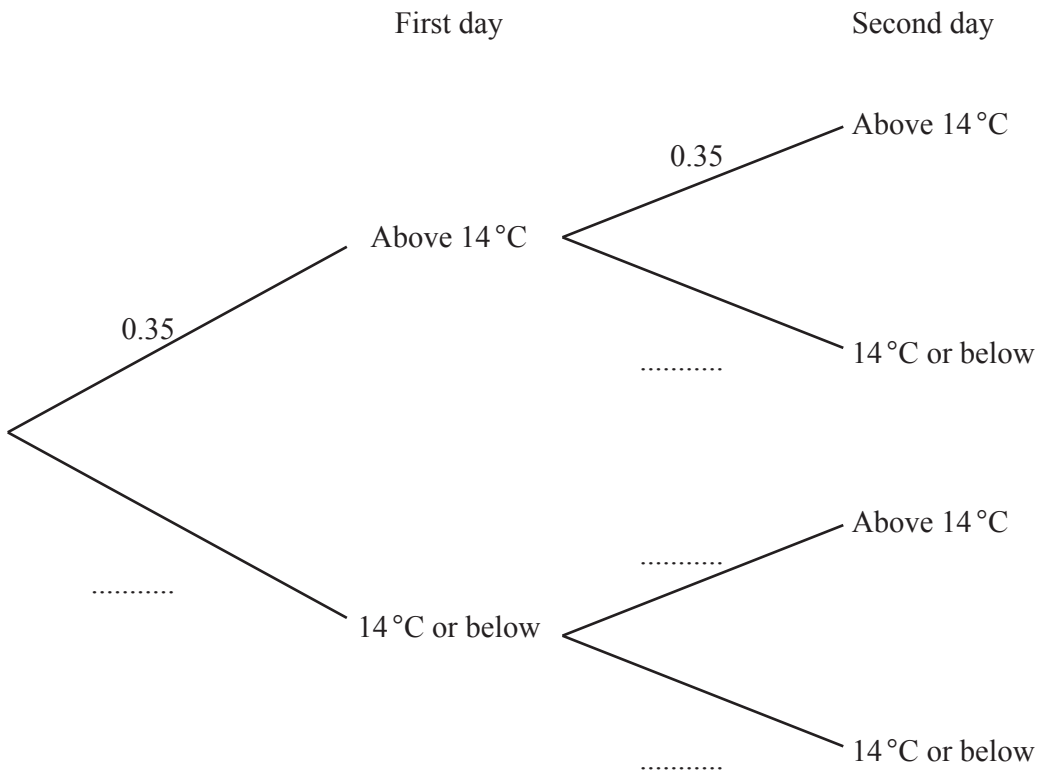
(i) There are 31 days in January.

Find the number of days in January when you would expect the temperature to be above 14 °C.

..... [1]

(ii) The temperature on two consecutive days in January is recorded.

(a) Complete the tree diagram.



[2]

(b) Find the probability that the temperature is above 14 °C on both days.

..... [1]

(c) Find the probability that the temperature is above 14 °C on only one of the two days.

..... [2]

(b) In a group of 14 children:

- 8 wear red T-shirts
- 1 wears a green T-shirt
- 5 wear blue T-shirts.

Two children are chosen from the group at random.

Find the probability that they wear different coloured T-shirts.

..... [3]

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