

- 1 (a) (i) In a camera magazine, 63 pages are used for adverts.
The ratio number of pages of adverts : number of pages of reviews = 7:5 .

Calculate the number of pages used for reviews.

Answer(a)(i) [2]

- (ii) In another copy of the magazine, 56 pages are used for reviews and for photographs.
The ratio number of pages of reviews : number of pages of photographs = 9:5 .

Calculate the number of pages used for photographs.

Answer(a)(ii) [2]

- (iii) One copy of the magazine costs \$4.90 .
An annual subscription costs \$48.80 for 13 copies.

Calculate the percentage discount by having an annual subscription.

Answer(a)(iii) % [3]

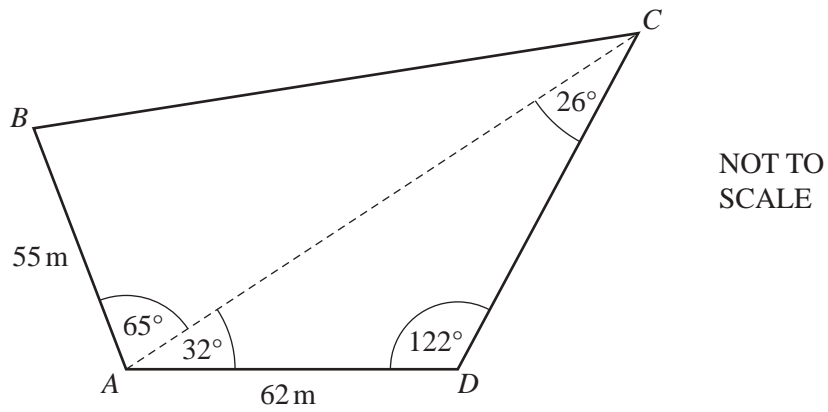
- (b) In a car magazine, 25% of the pages are used for selling second-hand cars, $62\frac{1}{2}\%$ of the **remaining** pages are used for features, and the other 36 pages are used for reviews.

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Work out the total number of pages in the magazine.

Answer(b) [4]

- 2 A field, $ABCD$, is in the shape of a quadrilateral.
A footpath crosses the field from A to C .



- (a) Use the sine rule to calculate the distance AC and show that it rounds to 119.9 m, correct to 1 decimal place.

Answer(a)

[3]

- (b) Calculate the length of BC .

Answer(b) $BC = \dots\dots\dots$ m [4]

(c) Calculate the area of triangle ACD .

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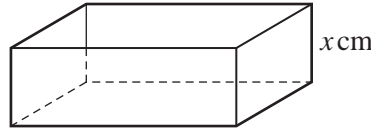
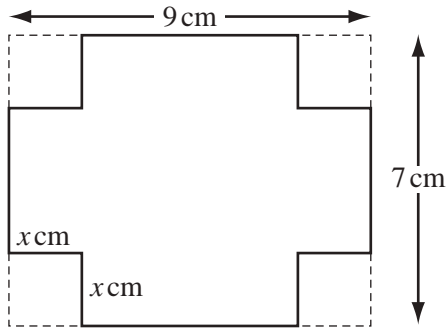
Answer(c) m^2 [2]

(d) The field is for sale at \$4.50 per square metre.

Calculate the cost of the field.

Answer(d) \$ [3]

- 3 A rectangular metal sheet measures 9 cm by 7 cm.
A square, of side x cm, is cut from each corner.
The metal is then folded to make an open box of height x cm.



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- (a) Write down, in terms of x , the length and width of the box.

Answer(a) Length =

Width = [2]

- (b) Show that the volume, V , of the box is $4x^3 - 32x^2 + 63x$.

Answer(b)

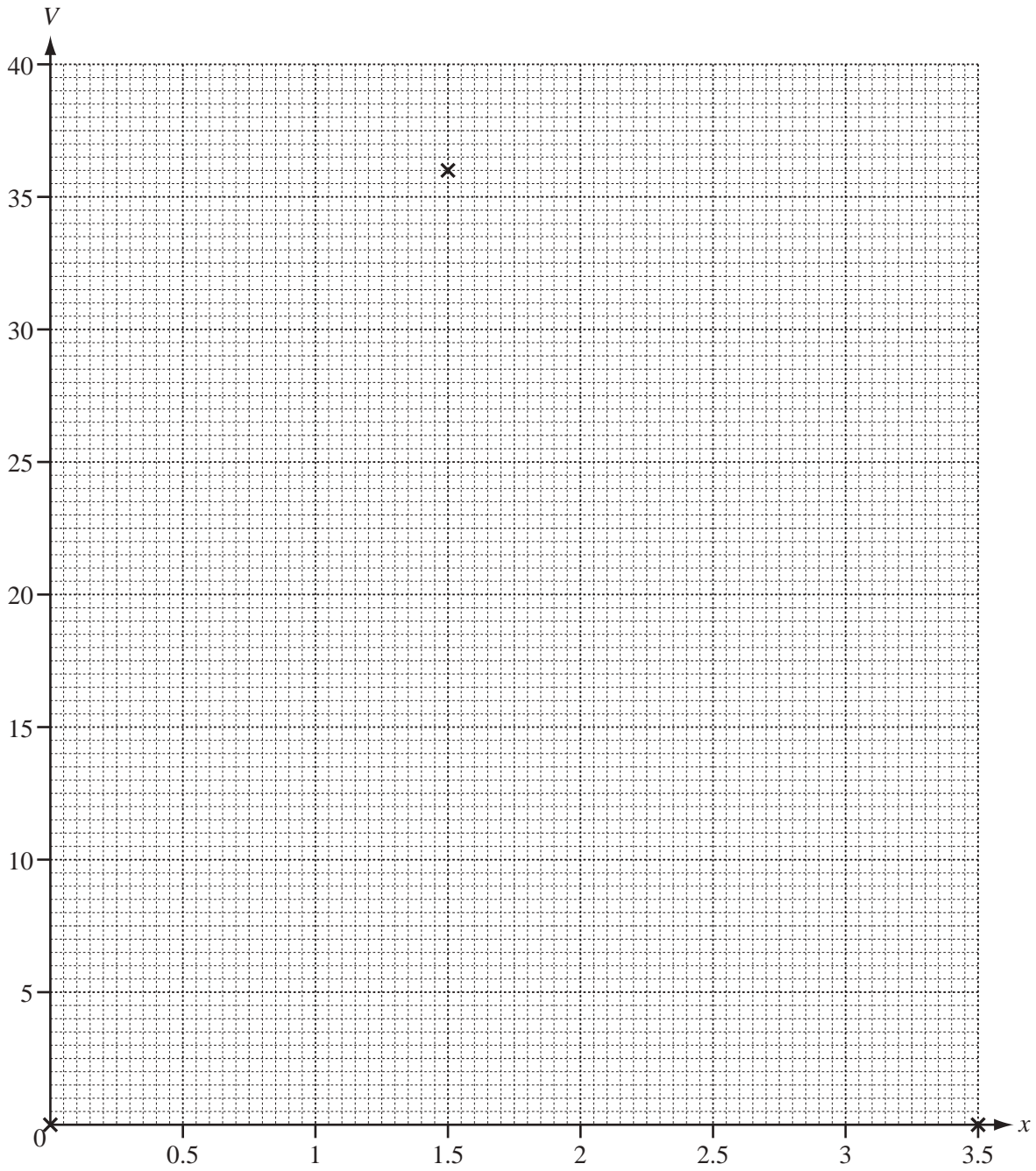
[2]

- (c) Complete this table of values for $V = 4x^3 - 32x^2 + 63x$.

x	0	0.5	1	1.5	2	2.5	3	3.5
V	0		35	36	30		9	0

[2]

- (d) On the grid opposite, draw the graph of $V = 4x^3 - 32x^2 + 63x$ for $0 \leq x \leq 3.5$.
Three of the points have been plotted for you.



[3]

- (e) The volume of the box is at least 30 cm^3 .
Write down, as an inequality, the possible values of x .

Answer(e) [2]

- (f) (i) Write down the maximum volume of the box.

Answer(f)(i) cm^3 [1]

- (ii) Write down the value of x which gives the maximum volume.

Answer(f)(ii) [1]

- 4 (a) One angle of an isosceles triangle is 48° .

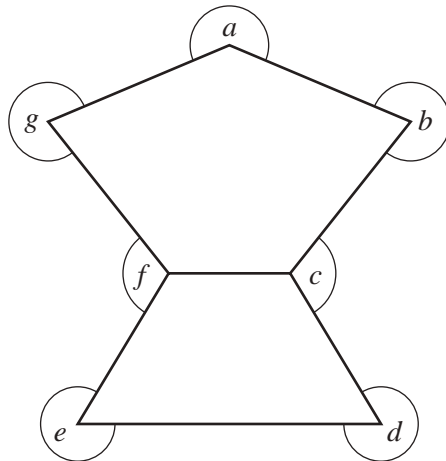
Write down the possible pairs of values for the remaining two angles.

Answer(a) and
..... and [2]

- (b) Calculate the sum of the interior angles of a pentagon.

Answer(b) [2]

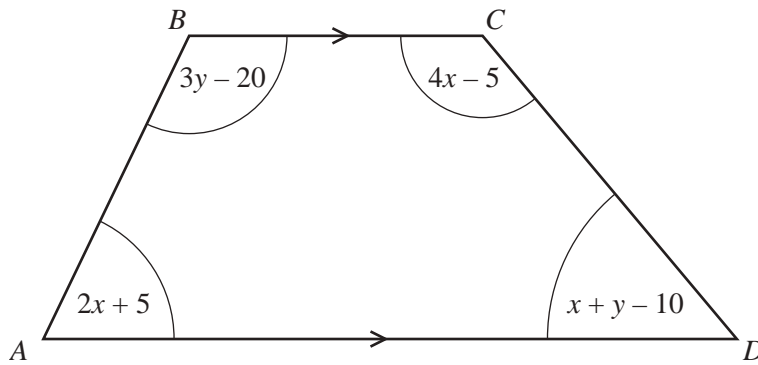
- (c) Calculate the sum of the angles a, b, c, d, e, f and g shown in this diagram.



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Answer(c) [2]

- (d) The trapezium, $ABCD$, has four angles as shown.
All the angles are in degrees.



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- (i) Show that $7x + 4y = 390$.

Answer(d)(i)

[1]

- (ii) Show that $2x + 3y = 195$.

Answer(d)(ii)

[1]

- (iii) Solve these simultaneous equations.

Answer(d)(iii) $x = \dots\dots\dots$

$y = \dots\dots\dots$ [4]

- (iv) Use your answer to **part (d)(iii)** to find the sizes of all four angles of the trapezium.

Answer(d)(iv) $\dots\dots\dots$, $\dots\dots\dots$, $\dots\dots\dots$, $\dots\dots\dots$ [1]

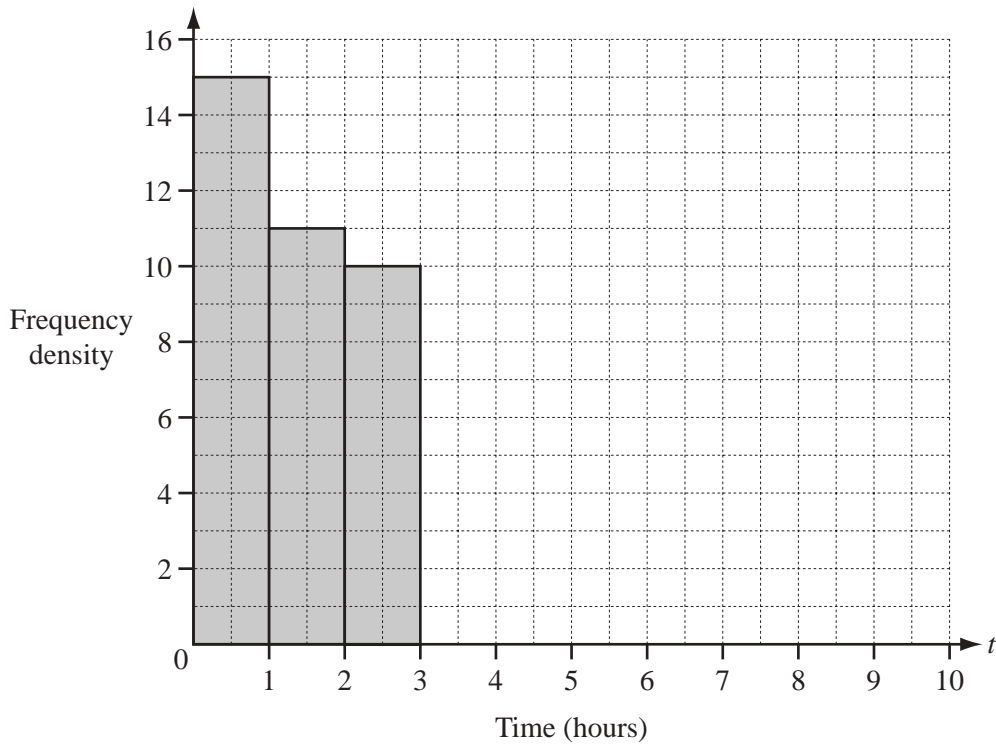
- 5 (a) 80 students were asked how much time they spent on the internet in one day.
This table shows the results.

Time (t hours)	$0 < t \leq 1$	$1 < t \leq 2$	$2 < t \leq 3$	$3 < t \leq 5$	$5 < t \leq 7$	$7 < t \leq 10$
Number of students	15	11	10	19	13	12

- (i) Calculate an estimate of the mean time spent on the internet by the 80 students.

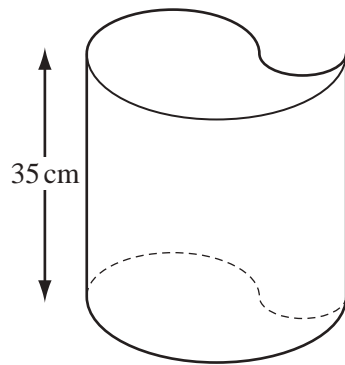
Answer(a)(i) hours [4]

- (ii) On the grid, complete the histogram to show this information.



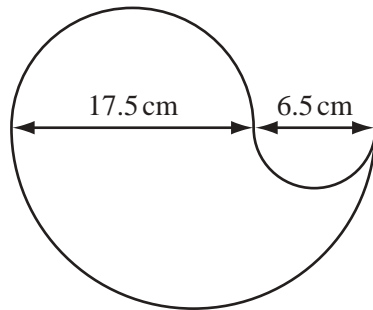
[4]

- 6 Sandra has designed this open container.
The height of the container is 35 cm.



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The cross section of the container is designed from three semi-circles with diameters 17.5 cm, 6.5 cm and 24 cm.



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- (a) Calculate the area of the cross section of the container.

Answer(a) cm² [3]

- (b) Calculate the external surface area of the container, including the base.

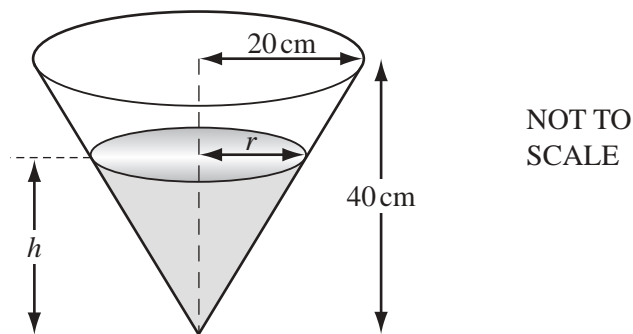
Answer(b) cm² [4]

- (c) The container has a height of 35 cm.

Calculate the capacity of the container.
Give your answer in litres.

Answer(c) litres [3]

- (d) Sandra's container is completely filled with water.
All the water is then poured into another container in the shape of a cone.
The cone has radius 20 cm and height 40 cm.



- (i) The diagram shows the water in the cone.

Show that $r = \frac{h}{2}$.

Answer(d)(i)

[1]

- (ii) Find the height, h , of the water in the cone.

[The volume, V , of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

Answer(d)(ii) $h =$ cm [3]

7 (a) The co-ordinates of P are $(-4, -4)$ and the co-ordinates of Q are $(8, 14)$.

(i) Find the gradient of the line PQ .

Answer(a)(i) [2]

(ii) Find the equation of the line PQ .

Answer(a)(ii) [2]

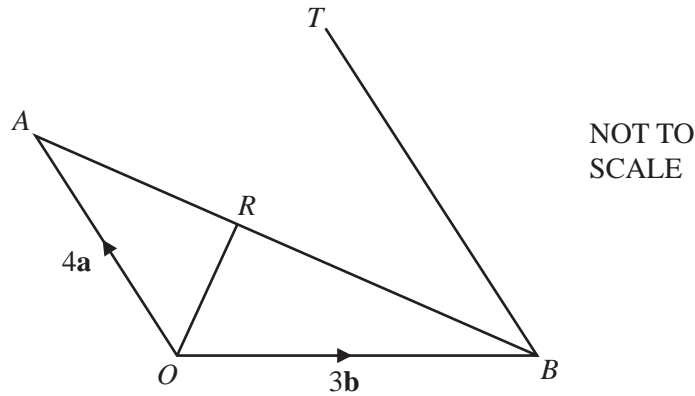
(iii) Write \vec{PQ} as a column vector.

Answer(a)(iii) $\vec{PQ} = \begin{pmatrix} \\ \end{pmatrix}$ [1]

(iv) Find the magnitude of \vec{PQ} .

Answer(a)(iv) [2]

(b)



In the diagram, $\vec{OA} = 4\mathbf{a}$ and $\vec{OB} = 3\mathbf{b}$.

R lies on AB such that $\vec{OR} = \frac{1}{5}(12\mathbf{a} + 6\mathbf{b})$.

T is the point such that $\vec{BT} = \frac{3}{2}\vec{OA}$.

(i) Find the following in terms of \mathbf{a} and \mathbf{b} , giving each answer in its simplest form.

(a) \vec{AB}

Answer(b)(i)(a) $\vec{AB} = \dots\dots\dots$ [1]

(b) \vec{AR}

Answer(b)(i)(b) $\vec{AR} = \dots\dots\dots$ [2]

(c) \vec{OT}

Answer(b)(i)(c) $\vec{OT} = \dots\dots\dots$ [1]

(ii) Complete the following statement.

The points O , R and T are in a straight line because $\dots\dots\dots$
 $\dots\dots\dots$ [1]

(iii) Triangle OAR and triangle TBR are similar.

Find the value of $\frac{\text{area of triangle } TBR}{\text{area of triangle } OAR}$.

Answer(b)(iii) $\dots\dots\dots$ [2]

- 8 (a) Rearrange $s = ut + \frac{1}{2}at^2$ to make a the subject.

Answer(a) $a = \dots\dots\dots$ [3]

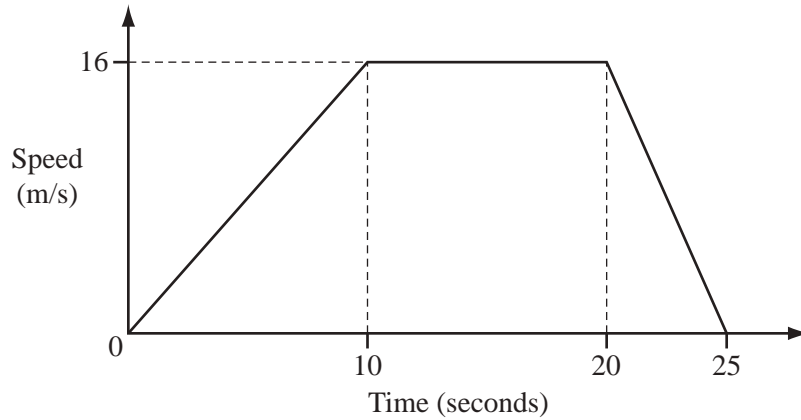
- (b) The formula $v = u + at$ can be used to calculate the speed, v , of a car.

$u = 15$, $a = 2$ and $t = 8$, each correct to the nearest integer.

Calculate the upper bound of the speed v .

Answer(b) $\dots\dots\dots$ [3]

(c) The diagram shows the speed-time graph for a car travelling between two sets of traffic lights.



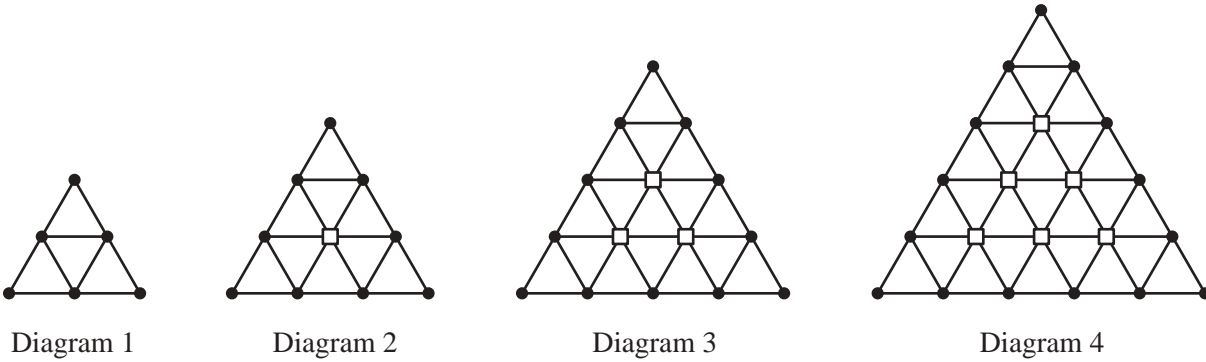
(i) Calculate the deceleration of the car for the last 5 seconds of the journey.

Answer(c)(i) m/s^2 [1]

(ii) Calculate the average speed of the car between the two sets of traffic lights.

Answer(c)(ii) m/s [4]

9 The first four diagrams in a sequence are shown below.



The diagrams are made from dots (●) and squares (□) joined by lines.

(a) Complete the table.

Diagram	1	2	3	4	5		n
Number of dots	6	9	12				
Number of squares	0	1	3				$\frac{1}{2}n(n - 1)$
Number of triangles	4	9	16				
Number of lines	9	18	30	45	63		$\frac{3}{2}(n + 1)(n + 2)$

[9]

(b) Which diagram has 360 lines?

Answer(b) [2]

(c) The **total** number of lines in the first n diagrams is

$$\frac{1}{2}n^3 + pn^2 + qn.$$

(i) When $n = 1$, show that $p + q = 8\frac{1}{2}$.

Answer(c)(i)

[1]

(ii) By choosing another value of n and using the equation in **part (c)(i)**, find the values of p and q .

Answer(c)(ii) $p = \dots\dots\dots$

$q = \dots\dots\dots$ [5]

Question 10 is printed on the next page.

10 (a) Simplify.

$$\frac{x^2 - 3x}{x^2 - 9}$$

Answer(a) [3]

(b) Solve.

$$\frac{15}{x} - \frac{20}{x+1} = 2$$

Answer(b) $x = \dots\dots\dots$ or $x = \dots\dots\dots$ [7]

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