

Please write clearly in block capitals.

Centre number

9 6 2 4 2

Candidate number

5 7 6 8

Surname

Shi

Forename(s)

Hongbin

Candidate signature

Zihui Eric S

I declare this is my own work.

INTERNATIONAL GCSE

MATHEMATICS EXTENSION

E

Paper 1E

Monday 09 November 2020

07:00 GMT

Time allowed: 2 hours

Materials

For this paper you must have:

- a calculator
- mathematical instruments.



Instructions

- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Fill in the boxes at the top of this page.
- Answer all questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 100.
- You may ask for more answer paper, graph paper and tracing paper. These must be tagged securely to this answer book.
- If your calculator does not have a π button, take the value of π to be 3.142

Advice

- Show all necessary working; otherwise marks for method may be lost.

For Examiner's Use	
Pages	Mark
2–3	7
4–5	6
6–7	10
8–9	8
10–11	2
12–13	0
14–15	2
16–17	3
18–19	9
20–21	7
22–23	5
24–25	6
26–27	4
28	4
TOTAL	75



N 0 V 2 0 9 2 6 0 1 E 0 1

IB/M/Nov20/E11

9260/1E

Answer all questions in the spaces provided.

- 1 Work out 1.8 as a fraction of 0.75

Circle your answer.

$$\frac{6}{25}$$

$$\frac{25}{6}$$

$$\frac{5}{12}$$

$$\frac{12}{5}$$

[1 mark]



- 2 A is the point $(1, 15)$ and B is the point $(20, 3)$

Circle the midpoint of AB.

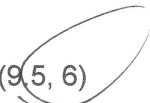
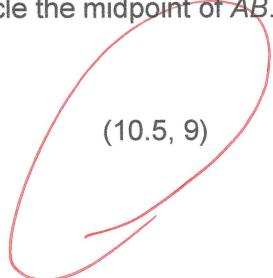
[1 mark]

$$(10.5, 9)$$

$$(9.5, 6)$$

$$(8, 11.5)$$

$$(7, 8.5)$$



- 3 Circle the correct statement.

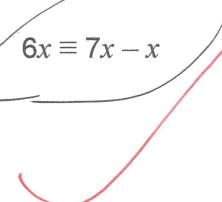
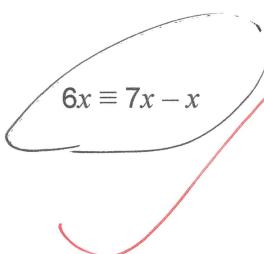
[1 mark]

$$5x + x \equiv 4 - x$$

$$6x \equiv 7x - x$$

$$4x \equiv 28$$

$$2x + 1 \equiv 3x$$



0 2

IB/M/Nov20/9260/1E

- 4 The equation of a straight line is $2y = x + 5$

Circle the gradient of the line.

Do not write outside the box

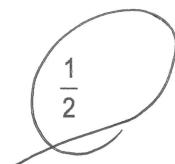
[1 mark]

1

5

$\frac{1}{2}$

$\frac{5}{2}$



- 5 (a) Factorise $x^2 - 5x + 6$

[2 marks]

$(x-2)(x-3)$

Answer

$(x-2)(x-3)$



- 5 (b) Factorise fully $a^3b^5 + 2a^2b^3$

[2 marks]

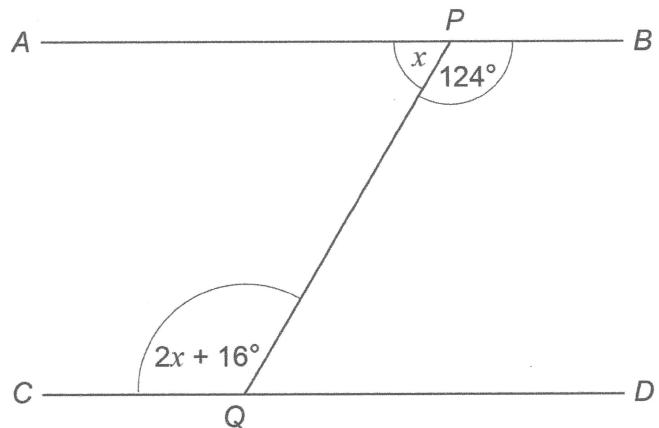
$a^2b^3(ab^2+2)$

Answer

$a^2b^3(ab^2+2)$



- 6 AB, CD and PQ are straight lines.



Is AB parallel to CD?

You must show your working.

[3 marks]

$$180^\circ - 124^\circ = 56^\circ$$

$$2x + 16^\circ = 128^\circ$$

$$128^\circ \neq 124^\circ$$

∴ Not parallel

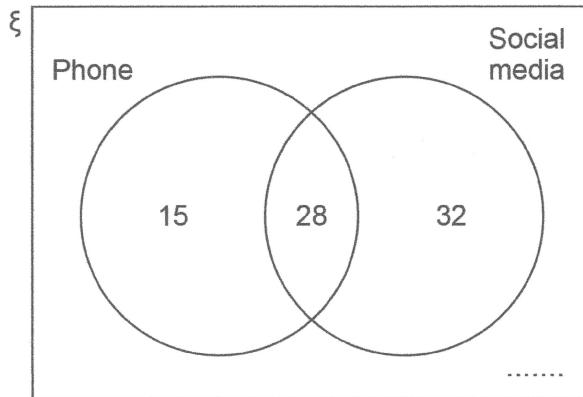


0 4

7

79 students were asked how they communicate with friends.

The Venn diagram shows some of the results.



One of the 79 students is chosen at random.

- 7 (a) Write down the probability that the student uses both the phone and social media.

[1 mark]

Answer $P(\text{Phone} \cap \text{Social Media}) = \frac{28}{79}$

- 7 (b) Work out the probability that the student uses neither the phone nor social media.

[2 marks]

$P(\text{Neither}) = \frac{4}{79}$

Answer $\frac{4}{79}$

6
6

Turn over ►



0 5

- 8 Rashid started with 3000 shares in a company.

His number of shares increased by 4%

He then sold 20% of his shares.

How many shares does he have now?

[3 marks]

$$(3000 \times 104\%) \times 80\% = 2496$$

Answer

2496

- 9 Show that $3\frac{1}{3} \div \frac{5}{9}$ simplifies to an integer.

You must show your working.

[3 marks]

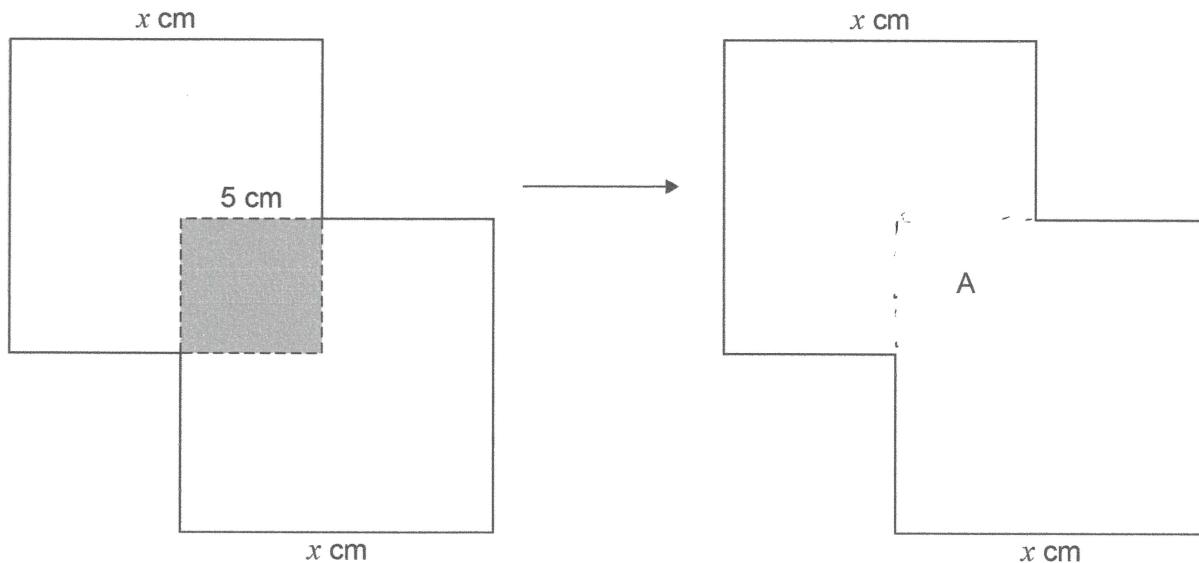
6



0 6

- 10 Shape A is made by overlapping two squares with side length x cm
 The overlap is a square with side length 5 cm

Not drawn
accurately



The perimeter of shape A is 90 cm

Work out the value of x .

[4 marks]

$$\begin{aligned}4x + 4(x-5) &= 90 \\4x + 4x - 20 &= 90 \\x &= \frac{55}{4}\end{aligned}$$

Answer $x = \frac{55}{4}$

10

10

Turn over ►



0 7

IB/M/Nov20/9260/1E

11 (a) Write $\frac{1}{64}$ in the form 2^a where a is an integer.

[2 marks]

Answer

2^{-6}

11 (b) Work out $(5^4)^{10} \div 125$ as a single power of 5

[3 marks]

Answer

5^{37}



0 8

IB/M/Nov20/9260/1E

12

Coach A and coach B each have less than 30 passengers.

Do not write outside the box

There are the same number of adults on each coach.

On coach A the ratio of adults to children is 3 : 2

On coach B the ratio of adults to children is 5 : 4

Work out the total number of passengers.

[3 marks]

$$\cancel{A: 6:4}$$

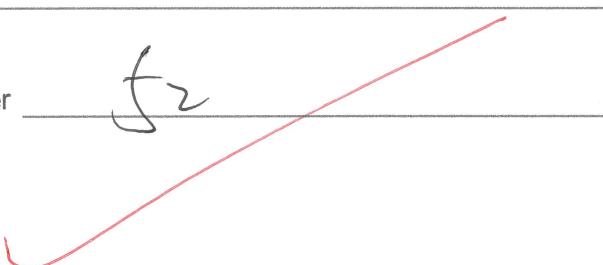
$$\cancel{B: 5:4}$$

$$\cancel{A: 15:10 \quad B: 10:8}$$

$$\cancel{15x:10x \quad 10x:8x}$$

Answer

52



Turn over for the next question

8
3

Turn over ►



0 9

IB/M/Nov20/9260/1E

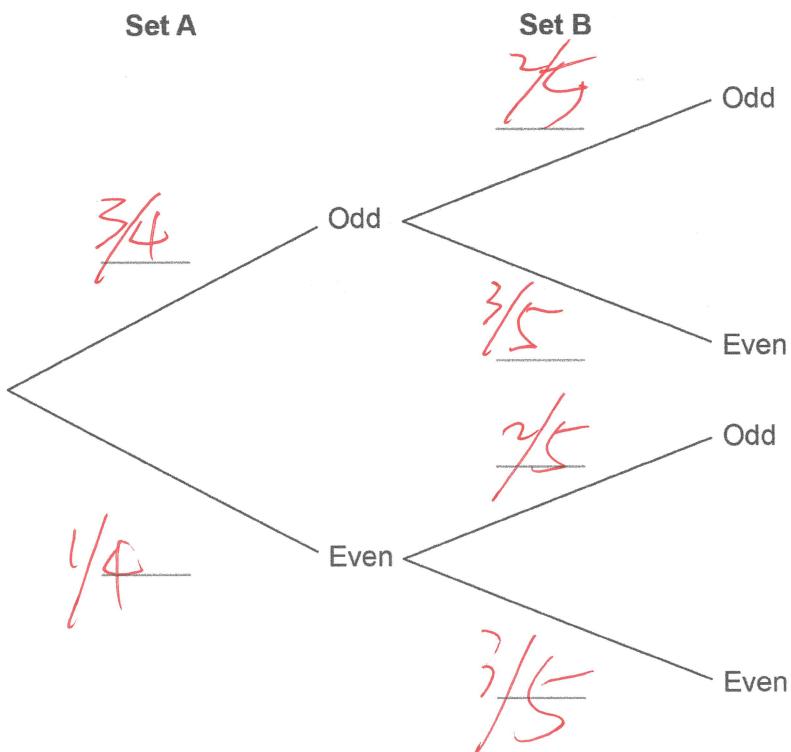
13 Set A = {2, 3, 5, 7}

Set B = {1, 4, 6, 8, 9}

One number is chosen at random from each set.

13 (a) Complete the tree diagram.

[2 marks]



13 (b) Work out the probability that exactly one of the numbers is odd.

[3 marks]

Answer

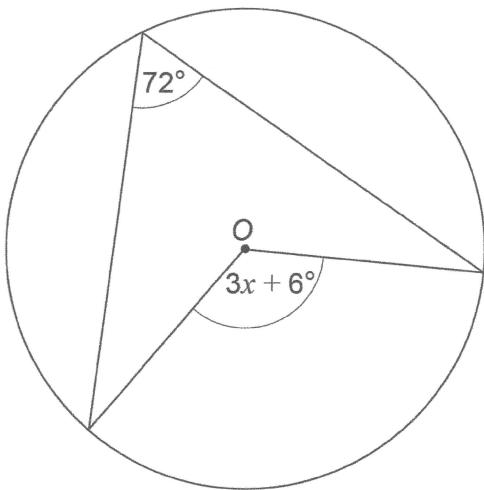
$$\frac{11}{20}$$



14

O is the centre of the circle.

Do not write
outside the
box



Not drawn
accurately

Work out the value of x .

[2 marks]

$$5x + 6^\circ = 144^\circ$$

$$5x = 138^\circ$$

$$x = 27.6^\circ$$

Answer

46

Turn over for the next question

2
7

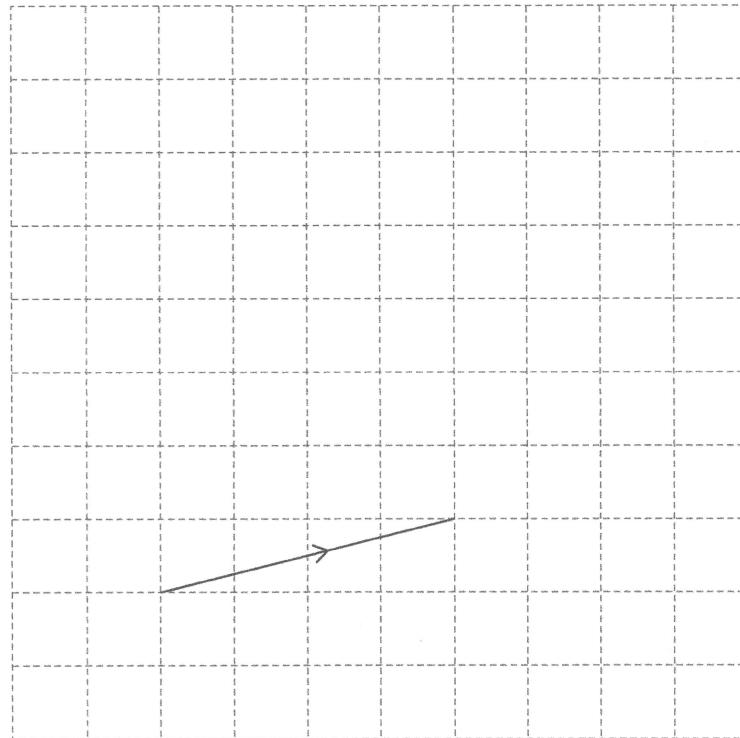
Turn over ►



1 1

IB/M/Nov20/9260/1E

- 15 (a) Vector $\begin{pmatrix} 4 \\ 1 \end{pmatrix}$ is shown on the grid.



On the grid, draw a vector that represents

$$\begin{pmatrix} 4 \\ 1 \end{pmatrix} + \begin{pmatrix} 2 \\ 3 \end{pmatrix} = \begin{pmatrix} 6 \\ 4 \end{pmatrix}$$

[2 marks]



1 2

*Do not write
outside the
box*

- 15 (b) Vector $\begin{pmatrix} -2 \\ 1 \end{pmatrix}$ is shown on this grid.



On this grid, draw a vector that is

parallel to $\begin{pmatrix} -2 \\ 1 \end{pmatrix}$

and

three times the length of $\begin{pmatrix} -2 \\ 1 \end{pmatrix}$

[2 marks]

Turn over for the next question

0
—
4

Turn over ►



1 3

$$16 \text{ (a)} \quad M = \begin{pmatrix} 1 & -4 \\ -3 & 2 \end{pmatrix}$$

Work out M^2

[2 marks]

Answer

$$\begin{pmatrix} 13 & -12 \\ -9 & 16 \end{pmatrix}$$

$$16 \text{ (b)} \quad \begin{pmatrix} a & 3 \\ 2 & -1 \end{pmatrix} \begin{pmatrix} 4 \\ 5 \end{pmatrix} = 6 \begin{pmatrix} 3 \\ b \end{pmatrix}$$

Work out the values of a and b .

[3 marks]

$$a = \frac{3}{4} \quad b = \frac{1}{2}$$



17

Tariq played in 15 basketball matches.

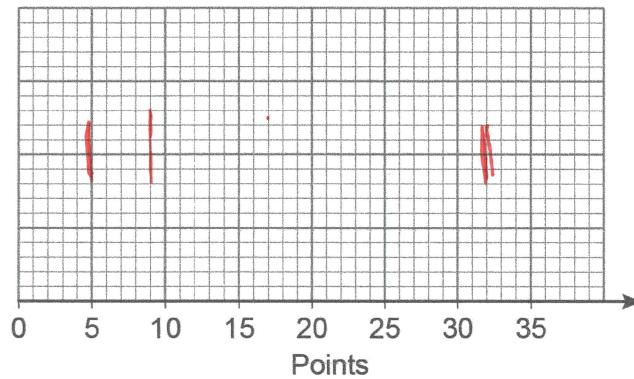
The stem-and-leaf diagram shows the number of points he scored in each match.

Key: 2 | 5 represents 25 points

0	5	7	8	9
1	1	4	6	7
2	3	5	9	
3	2			

Draw a box plot to represent the data.

[4 marks]



2
9

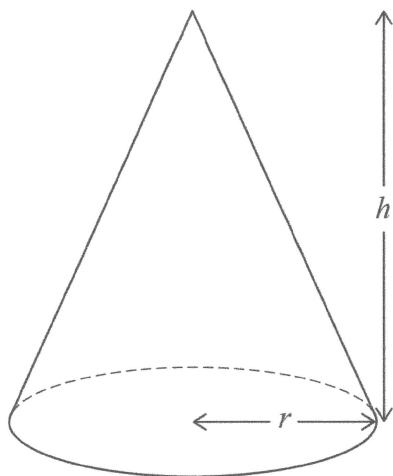
Turn over ►



1 5

IB/M/Nov20/9260/1E

18

A cone has base radius r and perpendicular height h Do not write
outside the
box

$$\text{Volume of a cone} = \frac{1}{3} \pi r^2 h$$

The volume of the cone is $72.9\pi \text{ cm}^3$

$$h:r = 12:5 \Rightarrow h=12x \quad r=5x$$

Work out the value of r .

$$\frac{1}{3} \pi (5x)^2 \times 12x = 72.9\pi$$

[4 marks]

Answer

~~7.2~~ 4.5

cm



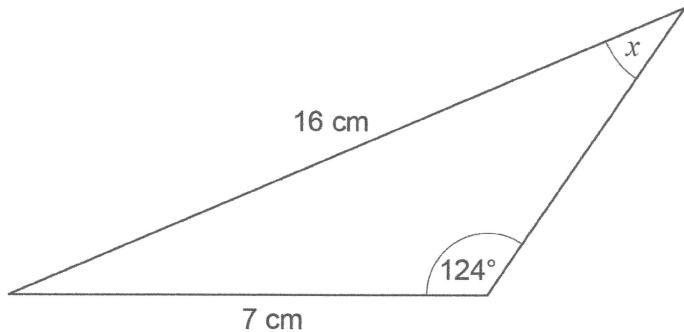
1 6

Do not write
outside the
box

19

Work out the size of angle x .

Not drawn
accurately



$$\frac{\sin x}{7} = \frac{\sin 124^\circ}{16}$$

[3 marks]

Answer ~~21.266~~ °

20

Circle the expression that is equivalent to

$$\frac{3a^2 + 3a}{3a}$$

[1 mark]

$$3a^2$$

$$a^2 + 3$$

$$a + 1$$

$$a + 3$$

8
8

Turn over ►



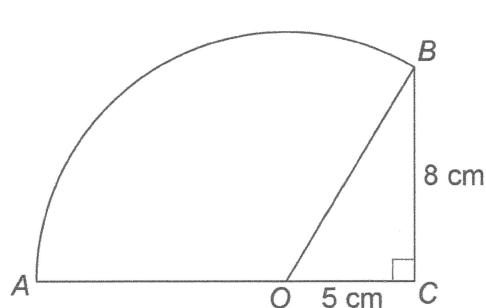
1 7

IB/M/Nov20/9260/1E

- 21 A design is made by joining right-angled triangle OCB to the sector of a circle AOB .

AOC is a straight line.

$OC = 5 \text{ cm}$ and $CB = 8 \text{ cm}$



Not drawn
accurately

Work out the total area of the design.

[5 marks]

$$\begin{aligned} DB &= \sqrt{89} & \angle AOB &= \tan^{-1}\left(\frac{8}{5}\right) = 122^\circ \\ \text{Sector } AOB &= \left(\frac{\sqrt{89}}{2}\right)^2 \pi \times \frac{122}{360} \\ &= \frac{542.9}{180} \pi \\ S_{\text{area}} &= \frac{542.9}{180} \pi + 20 \end{aligned}$$

Answer 114.7539 cm^2



22 (a) $f(x) = x^2 + 5$ with domain $x < 0$

Solve $f(x) = 14$

[2 marks]

$$\cancel{14^2 + 5 = 209}$$

$$x^2 + 5 = 14$$

$$x_1 = 3, x_2 = -3.$$

$$x = \cancel{-20} + \cancel{-3}$$

22 (b) $g(x) = 7x$

Circle the expression for $g^{-1}(x)$

$$y = 7x$$

$$x = 7y$$

$$y = \frac{x}{7}$$

[1 mark]

$\frac{x}{7}$

$\frac{1}{7x}$

$\frac{7}{x}$

$-7x$

22 (c) $h(x) = \frac{1}{2}x^3$

Circle the expression for $h(2x)$

~~$\frac{1}{2}8x^3$~~

$$(2x)^3 \frac{1}{2} 4x^3$$

x^3

x^6

$4x^3$

$4x^6$

[1 mark]



Turn over ►



1 9

IB/M/Nov20/9260/1E

23

Here are the first four terms of a quadratic sequence.

Do not write
outside the
box

3 10 21 36

Work out an expression for the n th term.

[3 marks]

$$\begin{array}{cccc} 3 & 10 & 21 & 36 \\ \swarrow & \downarrow & \searrow & \downarrow \\ 7 & 11 & 15 & \\ \swarrow & \downarrow & \searrow & \\ 4 & & 4 & \end{array}$$

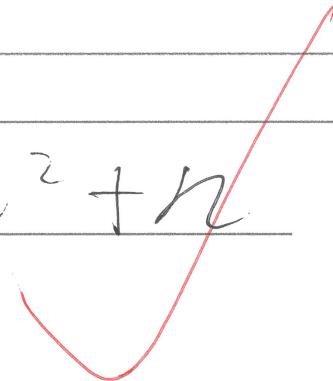
$$2n^2$$

$$\begin{array}{cccc} 3 & 10 & 21 & 36 \\ 2, 8, 18, & 32 \\ \swarrow & \downarrow & \searrow & \\ 1 & 2 & 3 & 4 \\ \swarrow & \downarrow & \searrow & \\ (& 1 & 1 &) \end{array}$$

$$2n^2 + n$$

Answer

$$2n^2 + n$$



2 0

IB/M/Nov20/9260/1E

24

Expand and simplify fully $(x - 5)(x + 4)^2$

[4 marks]

Do not write
outside the
box

$$\begin{aligned}
 &= (x - 5)(x^2 + 8x + 16) \\
 &= x^3 + 8x^2 + 16x - 5x^2 - 40x - 80 \\
 &= x^3 + 3x^2 - 24x - 80
 \end{aligned}$$

Answer

$$\cancel{x^3 + 3x^2 - 24x - 80}$$

Turn over for the next question



 7

Turn over ►



2 1

25

The population of a town increases by $r\%$ each year.

The population of the town was

16 000 at the start of 2014

28 000 at the start of 2018

Work out the value of r .

[3 marks]

$$16000 \times (1+r\%)^4 = 28000$$

$$r = 15.01633169\% \quad \cancel{.}$$

Answer

$$15.01633169$$


2 2

IB/M/Nov20/9260/1E

26

A curve has a minimum point at $(10, 7a + b)$ where a and b are constants.

The equation of the curve is $y = x^2 - 4ax + 6a^2$

By completing the square, work out the values of a and b .

You must show your working.

[4 marks]

$$y' = 2x - 4a$$

$$2x - 4a = 0$$

$$\cancel{x} = 2a$$

$$20 - 4a = 0$$

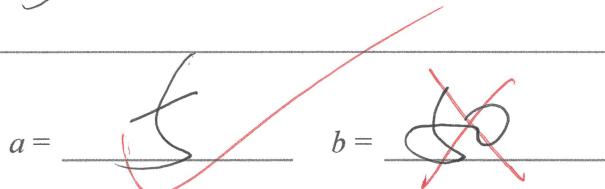
$$4a = 20$$

$$a = 5$$

$$y = x^2 - 20x + \cancel{75} \rightarrow 150$$

$$= 100 - 200 + 150$$

$$b = \cancel{50}$$



Turn over for the next question

5
7

Turn over ►



2 3

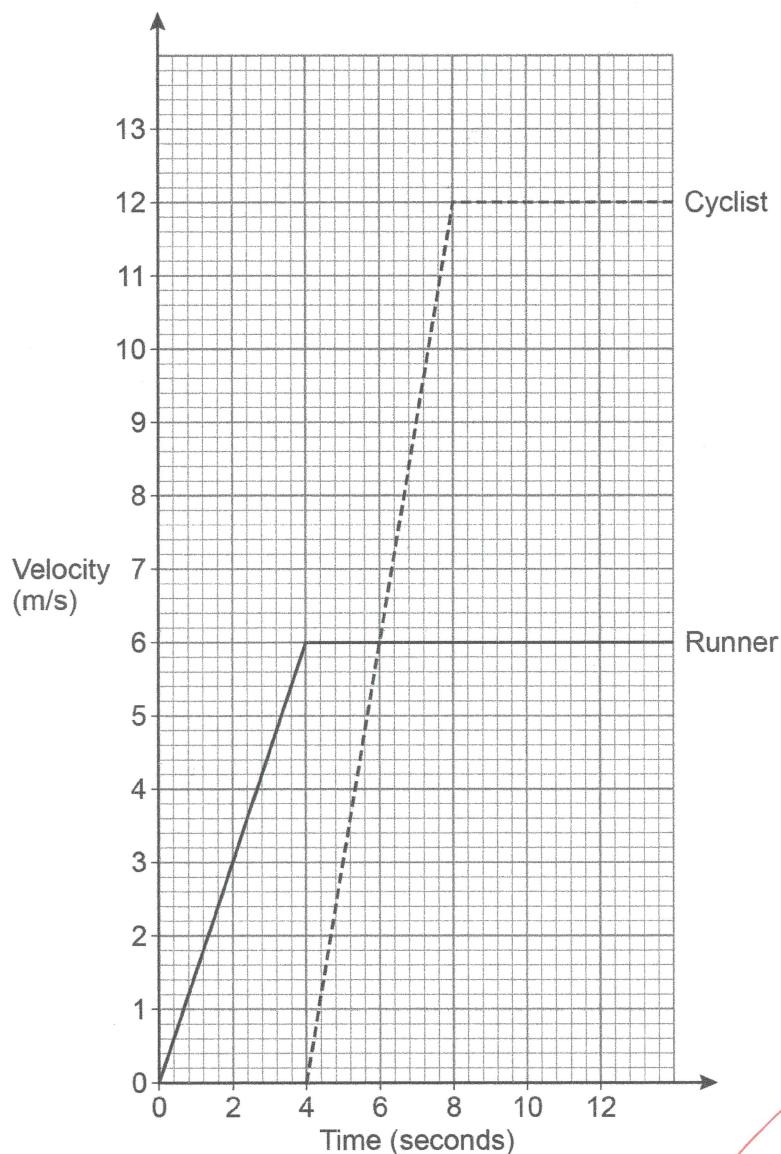
27

A runner and a cyclist

start from the same point
travel in the same direction.

The cyclist starts 4 seconds after the runner.

Their velocity-time graphs are shown.



27 (a) Circle the acceleration, in m/s^2 , of the **runner** during the first 4 seconds.

[1 mark]

$\frac{2}{3}$

$\frac{3}{2}$

3

$\frac{1}{3}$



2 4

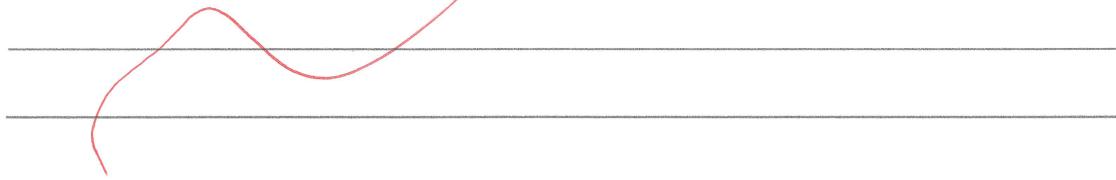
- 27 (b) Show that the cyclist overtakes the runner 10 seconds after the runner starts.

[3 marks]

$$R: 4x6 \frac{1}{2} + 6 \times 6 = 48 \text{ m}$$

$$C: 2x12 \frac{1}{2} + 2 \times 12 = 36 \text{ m.}$$

Not overtaken.



- 28 The equation of a curve is $y = 2x^3 + x$

Work out the gradient of the tangent to the curve at the point where $x = 7$

[3 marks]

$$\frac{d}{dx}(2x^3 + x) \Big|_{x=7} = 6x^2 + 1$$

$$x=7, y=693 \quad = 295$$

$$y = ax + b \quad y - y_1 = k(x - x_1)$$

$$295x + b \quad y - 693 = 295(x - 7)$$

$$y = 295x - 2065 + 693$$

$$y = 295x - 1372$$

Answer $y = 295x - 1372$

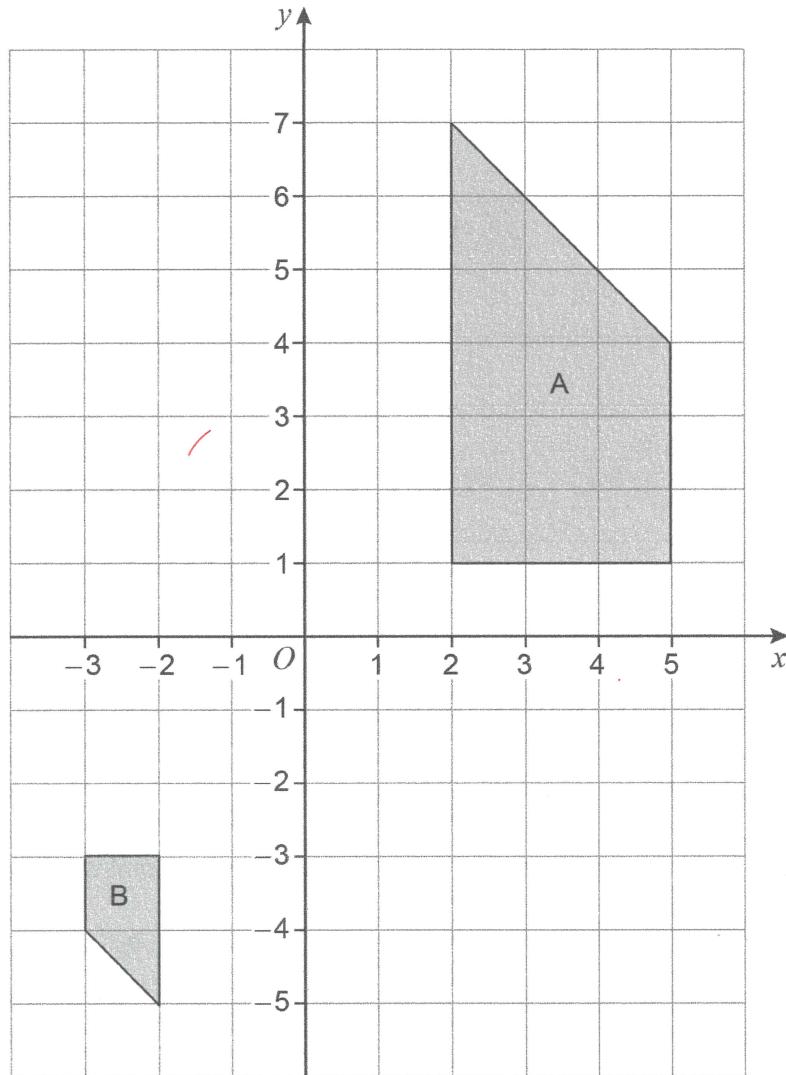
6
7

Turn over ►



29

Describe the single transformation that maps shape A to shape B.



[3 marks]

Disenlargement 3 times.
Rotate axis

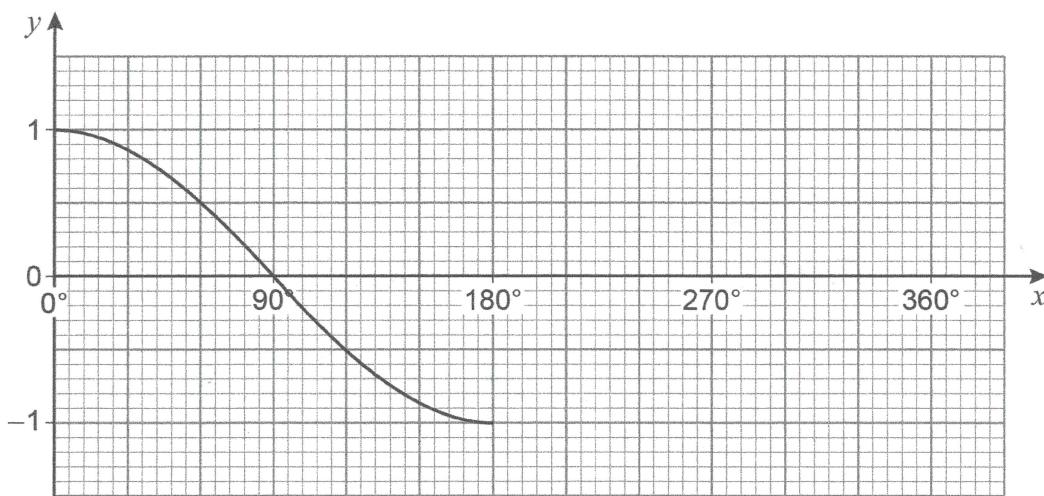


2 6

30

Here is the graph of $y = \cos x$ for values of x from 0° to 180°

Do not write outside the box



Solve $\cos x = 0.5$ for values of x from 0° to 720°

[3 marks]

Answer _____

60°, 300°, 420°, 660°

Turn over for the next question

6

Turn over ►



2 7

- 31 Prisha drives 15.5 kilometres, correct to the nearest 500 metres.
The journey takes 14 minutes, correct to the nearest minute.

Work out the upper bound of her average speed in km/h
You **must** show your working.

[4 marks]

$$Sp = \frac{\text{Distance}}{\text{Time}} \rightarrow 15.75 \text{ km/h}$$

$$15.75 \text{ km} / 13.5 \text{ min} = 1.17 \text{ km/h}$$

Answer

km/h

END OF QUESTIONS

