

Please check the examination details below before entering your candidate information

Candidate surname		Other names	
Centre Number		Candidate Number	

Pearson Edexcel Level 1/Level 2 GCSE (9–1)

Monday 11 November 2024

Morning (Time: 1 hour 30 minutes) **Paper reference** **1MA1/3H**

Mathematics
Paper 3 (Calculator)
Higher Tier

You must have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB or B pencil, eraser, calculator, Formulae Sheet (enclosed). Tracing paper may be used.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- If pencil is used for diagrams/sketches/graphs it must be dark (HB or B).
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
– *there may be more space than you need.*
- You must **show all your working**.
- Diagrams are **NOT** accurately drawn, unless otherwise indicated.
- **Calculators may be used.**
- If your calculator does not have a π button, take the value of π to be 3.142 unless the question instructs otherwise.

Information

- The total mark for this paper is 80
- The marks for **each** question are shown in brackets
– *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ►

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Answer ALL questions.

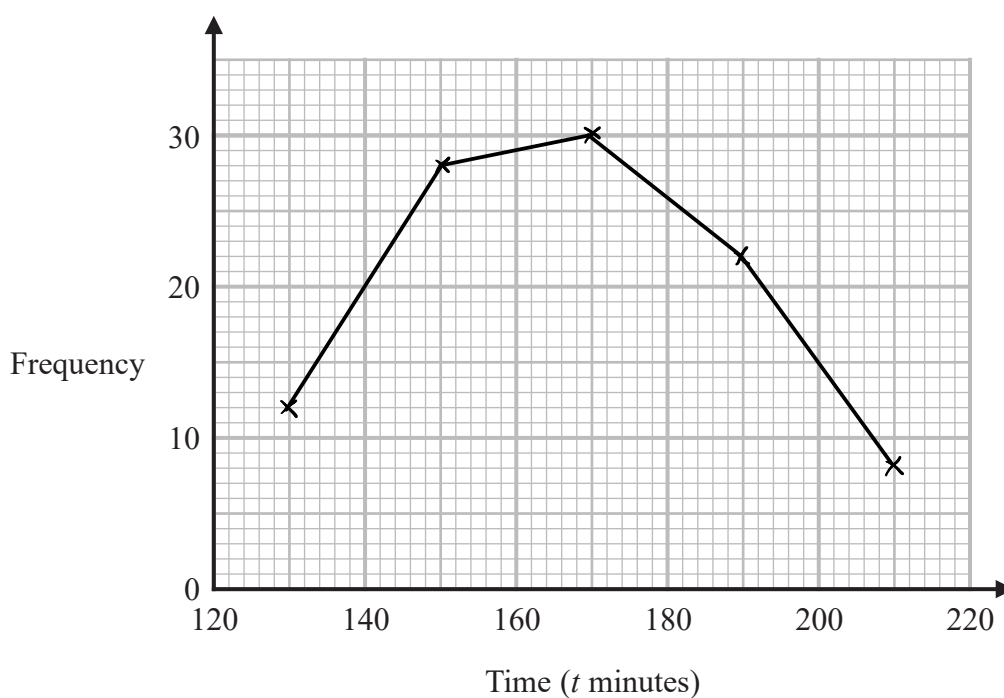
Write your answers in the spaces provided.

You must write down all the stages in your working.

- 1 The table shows information about the times, in minutes, 100 people took to complete a bike race.

Time (t minutes)	Frequency
$120 \leq t < 140$	12
$140 \leq t < 160$	28
$160 \leq t < 180$	30
$180 \leq t < 200$	22
$200 \leq t < 220$	8

On the grid below, draw a frequency polygon for this information.



(Total for Question 1 is 2 marks)



- 2 (a) Write 3.402×10^5 as an ordinary number.

340 200

(1)

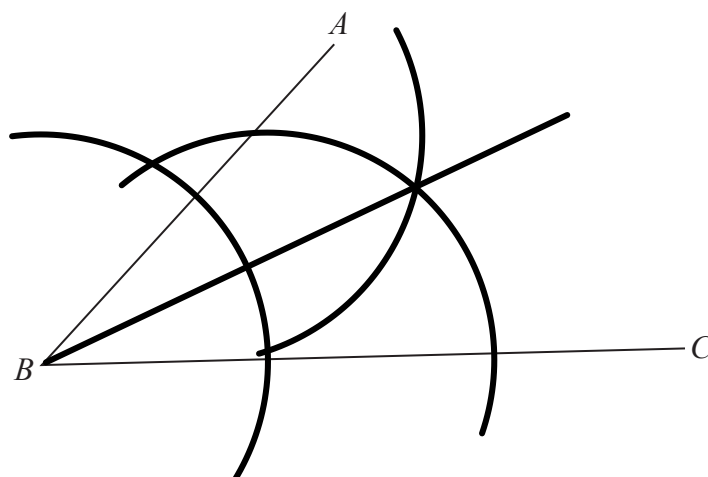
- (b) Write 0.8026 in standard form.

8.026×10^{-1}

(1)

(Total for Question 2 is 2 marks)

- 3 Use ruler and compasses to construct the bisector of angle ABC .
You must show your construction lines.



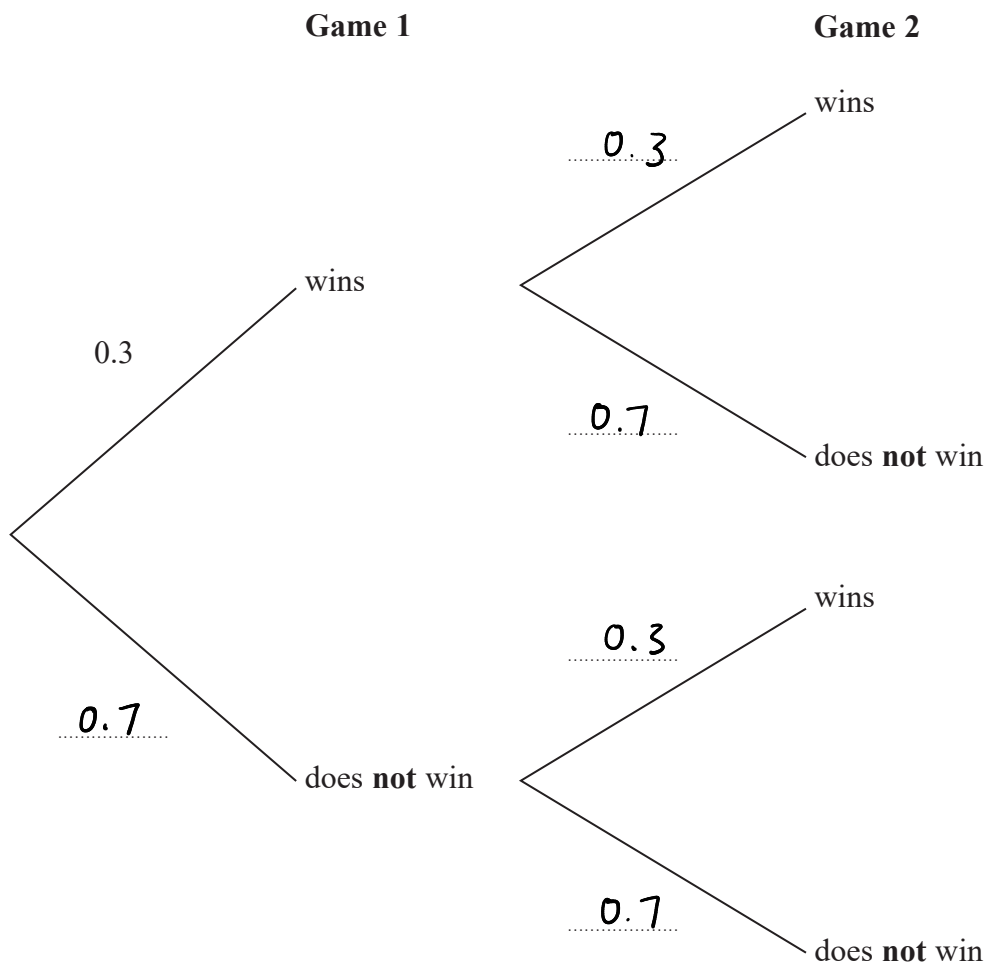
(Total for Question 3 is 2 marks)

4 Dan is playing cards.

The probability that he will win a game of cards is 0.3

Dan plays two games of cards.

(a) Complete the probability tree diagram.



(2)

(b) Work out the probability that Dan does **not** win either game.

$$0.7 \times 0.7 = 0.49$$

0.49

(2)

(Total for Question 4 is 4 marks)



5 Robyn buys a total of 240 pens and pencils, where

number of pens : number of pencils = 3 : 5

3 + 5 = 8 parts

Robyn pays 9p for each pen.
She sells each pen for 11p.

$$\frac{240}{8} = 30$$

Robyn pays 6p for each pencil.
She sells each pencil for 10p.

$$\text{pens : } 3 \times 30 = 90$$

Robyn sells all of the pens and pencils.

$$\text{pencils : } 5 \times 30 = 150$$

Work out Robyn's percentage profit.
Give your answer correct to 1 decimal place.
You must show all your working.

$$\begin{aligned} \text{Total cost} &= 9 \times 90 + 6 \times 150 \\ &= 1710 \quad (\pounds 17.10) \end{aligned}$$

$$\begin{aligned} \text{Revenue} &= 11 \times 90 + 10 \times 150 \\ &= 2490 \quad (\pounds 24.90) \end{aligned}$$

$$\begin{aligned} \text{Profit} &= 24.90 - 17.10 \\ &= \pounds 7.80 \end{aligned}$$

$$\begin{aligned} \% \text{ Profit} &= \frac{7.80}{17.10} \times 100 \\ &= \underline{\underline{45.6\%}} \end{aligned}$$

45.6 %

(Total for Question 5 is 5 marks)



P 7 5 1 6 2 A 0 5 2 4

- 6 The stem and leaf diagram shows the test scores of 23 students from School A.

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

Key:

3 | 0 represents 30

$$\text{Median} = 57$$

$$\begin{aligned} \text{range} &= 79 - 30 \\ &= 49 \end{aligned}$$

23 students from School B did the same test.

Their median score was 56

The range of their scores was 47

Compare the distribution of the test scores of the students from School A with the distribution of the test scores of the students from School B.

The median score for class A was higher

The range of scores for class A was higher

(Total for Question 6 is 4 marks)

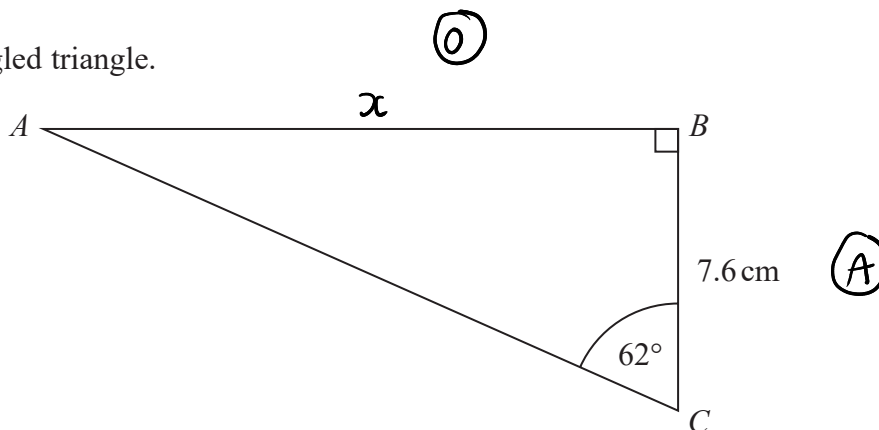


- 7 Jana used her calculator to find the value of a number t .
The answer on her calculator began 10.2
Complete the error interval for t .

$$10.2 \leq t < 10.3$$

(Total for Question 7 is 2 marks)

- 8 ABC is a right-angled triangle.



Calculate the length of AB .
Give your answer correct to 1 decimal place.

$$\tan x = \frac{0}{A}$$

$$\tan 62 = \frac{x}{7.6}$$

$$x = 7.6 \tan 62$$

$$= 14.3$$

$$14.3 \text{ cm}$$

(Total for Question 8 is 2 marks)



9 (a) Simplify fully $2x^3y^5 \times 7x^2y$

$$14x^5y^6$$

(2)

(b) Simplify $(m^2)^{-3}$

$$m^{-6}$$

(1)

(Total for Question 9 is 3 marks)

10 In a sale, the normal prices are reduced by 15%
Amina buys a dress in the sale for £46.75

Work out the normal price of the dress.

$$85\% \text{ of original price} = 46.75$$

$$0.85x = 46.75$$

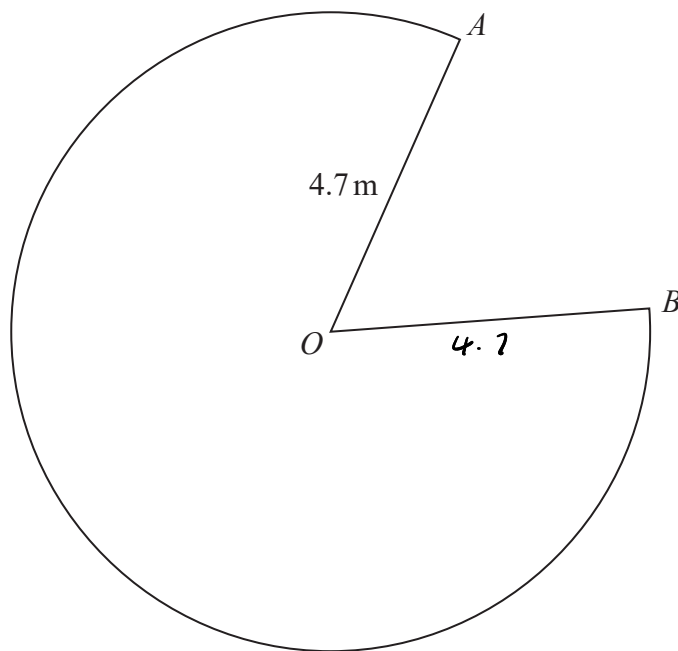
$$x = \frac{46.75}{0.85}$$

$$£ 55$$

(Total for Question 10 is 2 marks)



11 OAB is a sector of a circle with centre O and radius 4.7 m .



The sector has a perimeter of 34.3 m .

Find the size of the reflex angle AOB .

Give your answer correct to the nearest degree.

$$\begin{aligned}\text{Arc length} &= 34.3 - 2(4.7) \\ &= 24.9\text{ m}\end{aligned}$$

$$\begin{aligned}\text{Circumference of circle} &= 2\pi(4.7) \\ &= 29.53\text{ m}\end{aligned}$$

$$\frac{24.9}{29.53} \times 360 = 303.5457^\circ$$

..... 304

(Total for Question 11 is 3 marks)

12 Rudi invests £4500 in a savings account.

He gets compound interest at a rate of

2.4% for the first year

1.8% for each extra year.

(a) Work out the value of Rudi's investment at the end of 3 years.

$$4500 \times 1.024 \times 1.018^2 = \underline{\underline{4775.38}}$$

$$\pounds \underline{4775.38}$$

(3)

Bruna buys a car for £7500

The value of the car depreciates by $x\%$ each year.

At the end of 2 years the value of the car is £4107

(b) Work out the value of x .

$$\begin{aligned} 7500 \times y^2 &= 4107 \\ y^2 &= 0.5476 \\ y &= 0.74 \end{aligned}$$

$$1 - 0.74 = 0.26$$

$$0.26 \times 100 = 26\%$$

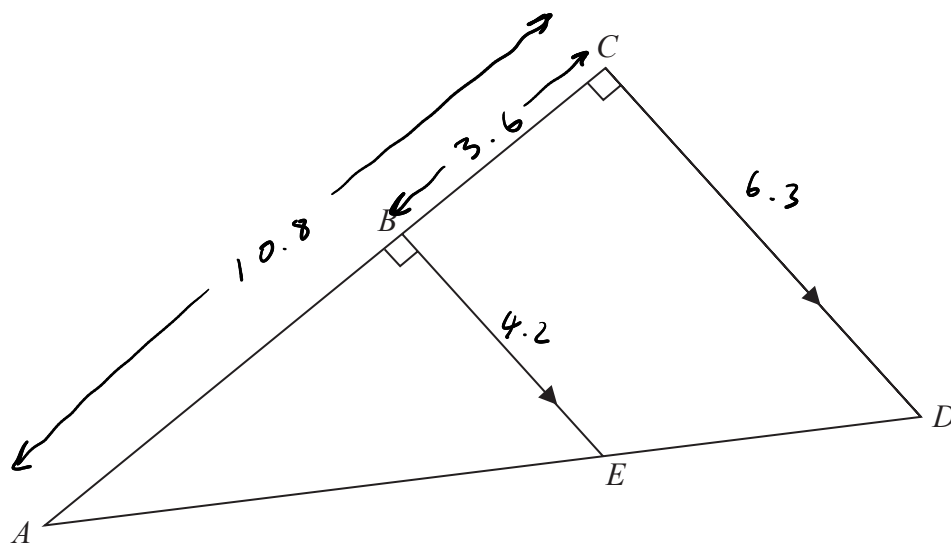
$$x = \underline{26}$$

(3)

(Total for Question 12 is 6 marks)



- 13 ABC and AED are straight lines.
 BE and CD are parallel.



$BE = 4.2$ cm
 $CD = 6.3$ cm
 $AC = 10.8$ cm

$$4.2 \times SF = 6.3$$

$$SF = 1.5$$

Work out the area of trapezium $BCDE$.

$$\frac{10.8}{3} = 3.6$$

$$BC = 3.6$$

$$AB = 7.2$$

$$\text{Area of } BCDE = \frac{1}{2} (4.2 + 6.3) \times 3.6$$

$$= 18.9 \text{ cm}^2$$

..... 18.9 cm^2

(Total for Question 13 is 3 marks)

- 14 Prove algebraically that $0.4\dot{6}\dot{2}$ can be written as $\frac{229}{495}$

$$\begin{aligned}
 0.4\dot{6}\dot{2} &= x \\
 4.\dot{6}\dot{2} &= 10x \\
 462.\dot{6}\dot{2} &= 1000x \\
 458 &= 990x \\
 x &= \frac{458}{990} = \frac{229}{495}
 \end{aligned}$$

(Total for Question 14 is 3 marks)

- 15 Make p the subject of the formula $t = \frac{2(2p-3)}{5-2p}$

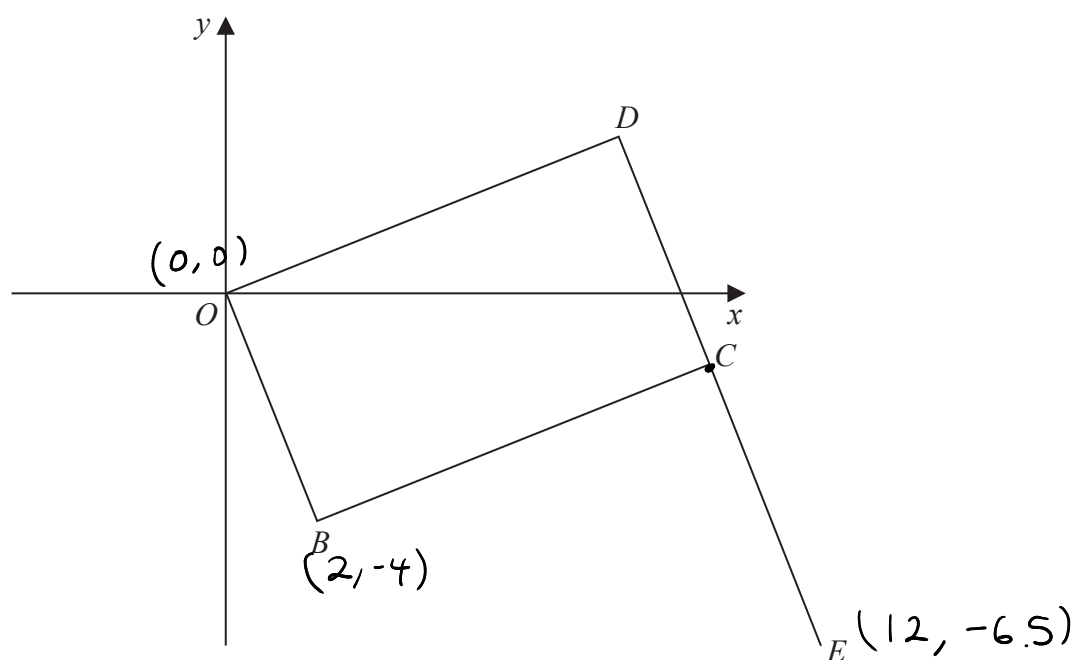
$$\begin{aligned}
 t(5-2p) &= 2(2p-3) \\
 5t - 2pt &= 4p - 6 \\
 5t + 6 &= 4p + 2pt \\
 5t + 6 &= p(4 + 2t) \\
 \frac{5t + 6}{4 + 2t} &= p
 \end{aligned}$$

$$p = \frac{5t + 6}{2t + 4}$$

(Total for Question 15 is 4 marks)



- 16 $OBCD$ is a rectangle.
 DCE is a straight line.



B has coordinates $(2, -4)$

E has coordinates $(12, -6.5)$

Work out the coordinates of D .

You must show all your working.

$$\text{Gradient of } OB = \frac{-4}{2} = -2$$

$$\text{Gradient of } BC = \frac{1}{2} \quad (\text{perpendicular lines})$$

$$\text{Equation of } OD: \quad y = \frac{1}{2}x$$

$$\text{Equation of } DE: \quad y = -2x + c$$

$$-6.5 = -2(12) + c$$

$$c = 17.5$$

$$y = -2x + 17.5$$

D is where OD and DE meet

$$\frac{1}{2}x = -2x + 17.5$$

$$2.5x = 17.5$$

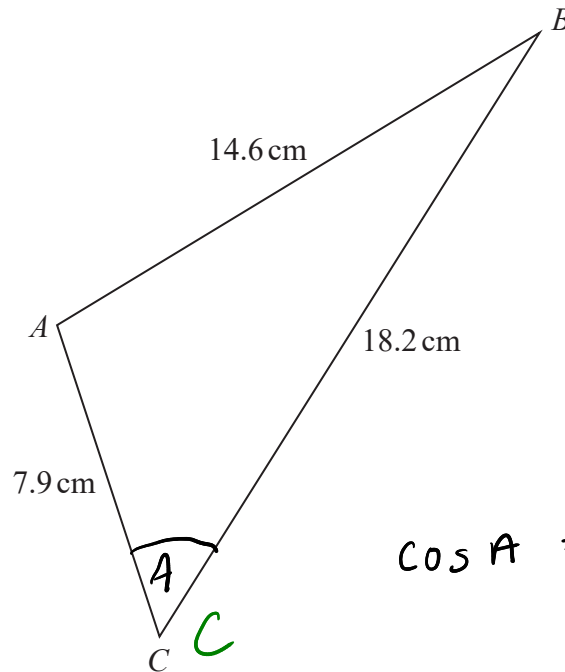
$$x = 7$$

$$(7, 3.5)$$

$$y = \frac{1}{2}(7) = 3.5$$

(Total for Question 16 is 5 marks)

17 Here is triangle ABC .



Work out the area of triangle ABC .
Give your answer correct to 3 significant figures.

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

$$\cos A = \frac{18.2^2 + 7.9^2 - 14.6^2}{2(7.9)(18.2)}$$

$$\cos A = 0.627$$

$$\underline{A = 51.1^\circ}$$

$$\begin{aligned} \text{Area} &= \frac{1}{2} ab \sin C \\ &= \frac{1}{2} (7.9)(18.2) \sin (51.1) \\ &= \underline{56.0 \text{ cm}^2} \end{aligned}$$

..... 56.0 cm^2

(Total for Question 17 is 4 marks)



18 Maria wants to find an estimate for the number of frogs in a lake.

On Saturday she catches 40 of the frogs.
She puts a tag on each frog and releases them.

On Monday she catches 55 of the frogs.
11 of the frogs have tags.

- (a) Work out an estimate for the total number of frogs in the lake.
You must show all your working.

$$\frac{40}{x} = \frac{11}{55}$$

$$\frac{40}{x} = \frac{1}{5}$$

$$200 = x$$

$$\begin{array}{r} 200 \\ (3) \end{array}$$

- (b) State one assumption you have made.

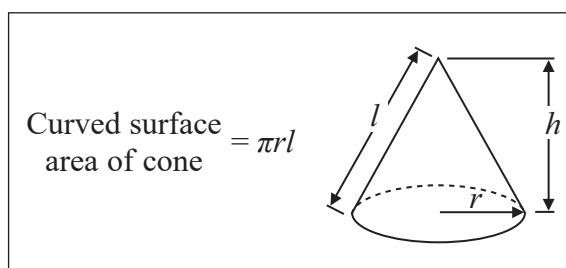
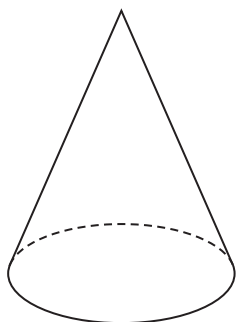
All of the tags stayed on the frogs
(none fell off)

(1)

(Total for Question 18 is 4 marks)



19 The diagram shows a cone.



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DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

The radius of the base of the cone is $\frac{3}{4}$ of the height of the cone.

$$r = \frac{3}{4}h$$

The total surface area of the cone is $54\pi \text{ cm}^2$

Work out the height of the cone.

$$\pi r^2 + \pi r l = 54\pi$$

$$\begin{aligned} r^2 + h^2 &= l^2 \\ \left(\frac{3}{4}h\right)^2 + h^2 &= l^2 \\ \frac{25}{16}h^2 &= l^2 \\ l &= \frac{5}{4}h \end{aligned}$$

$$\pi \left(\frac{3}{4}h\right)^2 + \pi \left(\frac{3}{4}h\right) \left(\frac{5}{4}h\right) = 54\pi$$

$$\frac{9}{16}h^2 + \frac{15}{16}h^2 = 54$$

$$\frac{3}{2}h^2 = 54$$

$$h^2 = 36$$

$$\underline{\underline{h = 6 \text{ cm}}}$$

6

..... cm

(Total for Question 19 is 4 marks)



20 Solve the simultaneous equations

$$\begin{aligned}y^2 &= 3x^2 + 4 \\ y + 2x &= 7\end{aligned}$$

Give your solutions correct to 3 significant figures.

$$y = 7 - 2x$$

$$(7 - 2x)^2 = 3x^2 + 4$$

$$(7 - 2x)(7 - 2x) = 3x^2 + 4$$

$$49 - 14x - 14x + 4x^2 = 3x^2 + 4$$

$$4x^2 - 28x + 49 = 3x^2 + 4$$

$$x^2 - 28x + 45 = 0$$

$$x = \frac{-(-28) \pm \sqrt{(-28)^2 - 4(1)(45)}}{2(1)}$$

$$x = 26.3$$

$$x = 1.71$$

$$\begin{aligned}y &= 7 - 2(26.3) \\ &= -45.6\end{aligned}$$

$$\begin{aligned}y &= 7 - 2(1.71) \\ &= 3.58\end{aligned}$$

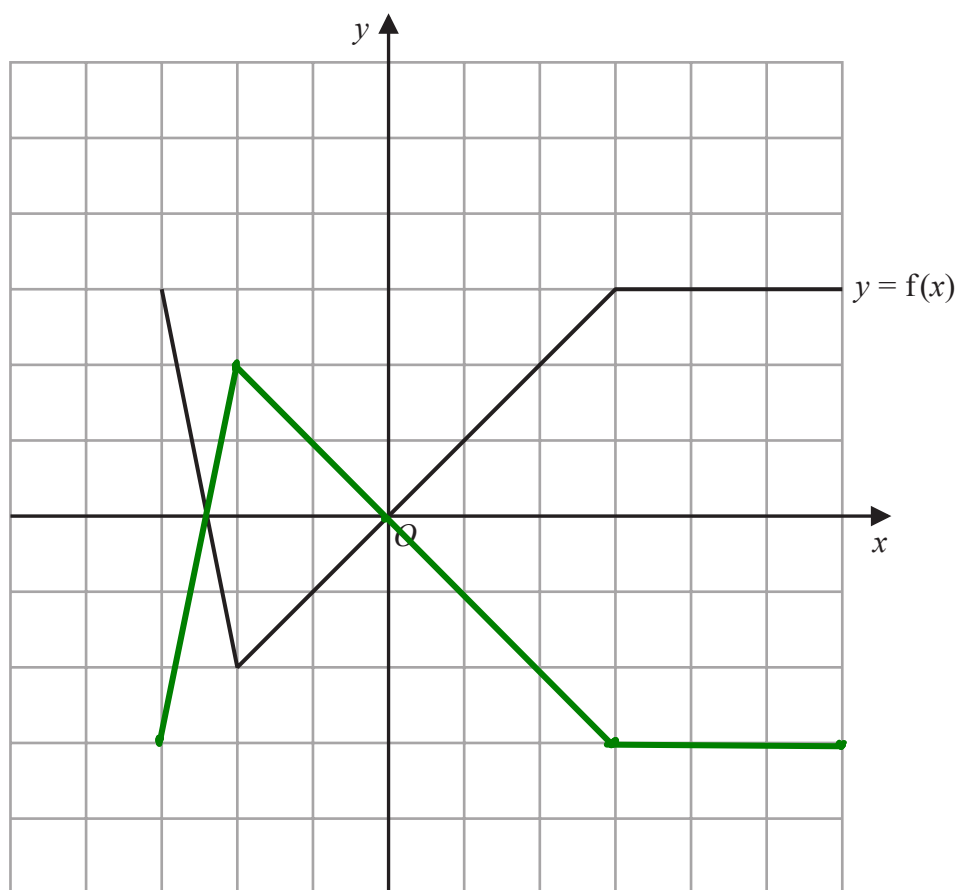
$$x = 26.3 \quad y = -45.6 \quad \text{or} \quad x = 1.71 \quad y = 3.58$$

(Total for Question 20 is 4 marks)



P 7 5 1 6 2 A 0 1 7 2 4

21 Here is the graph of $y = f(x)$

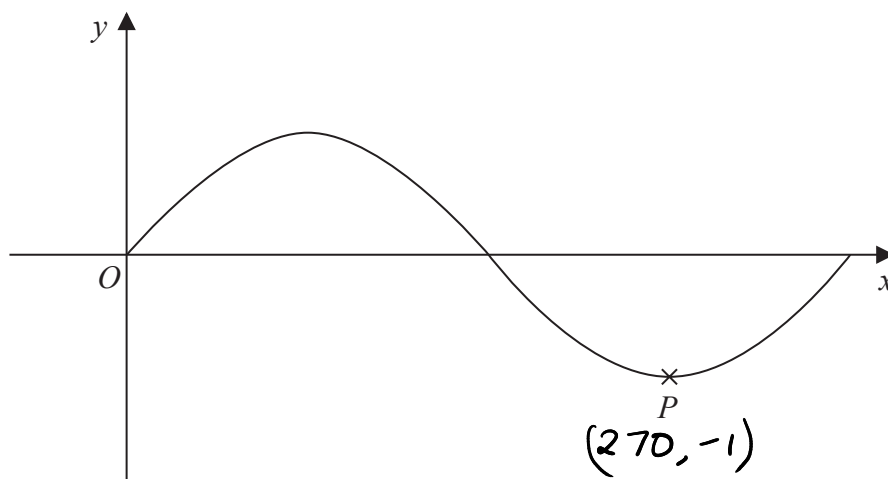


(a) On the grid, draw the graph of $y = -f(x)$

(1)



Here is a sketch of the graph of $y = \sin x^\circ$



The point marked P is a turning point on the graph.

The graph of $y = \sin x^\circ$ is translated to give the graph of $y = \sin(x + 180)^\circ + 4$

Following the translation the point P , shown on the graph above, moves to point R .

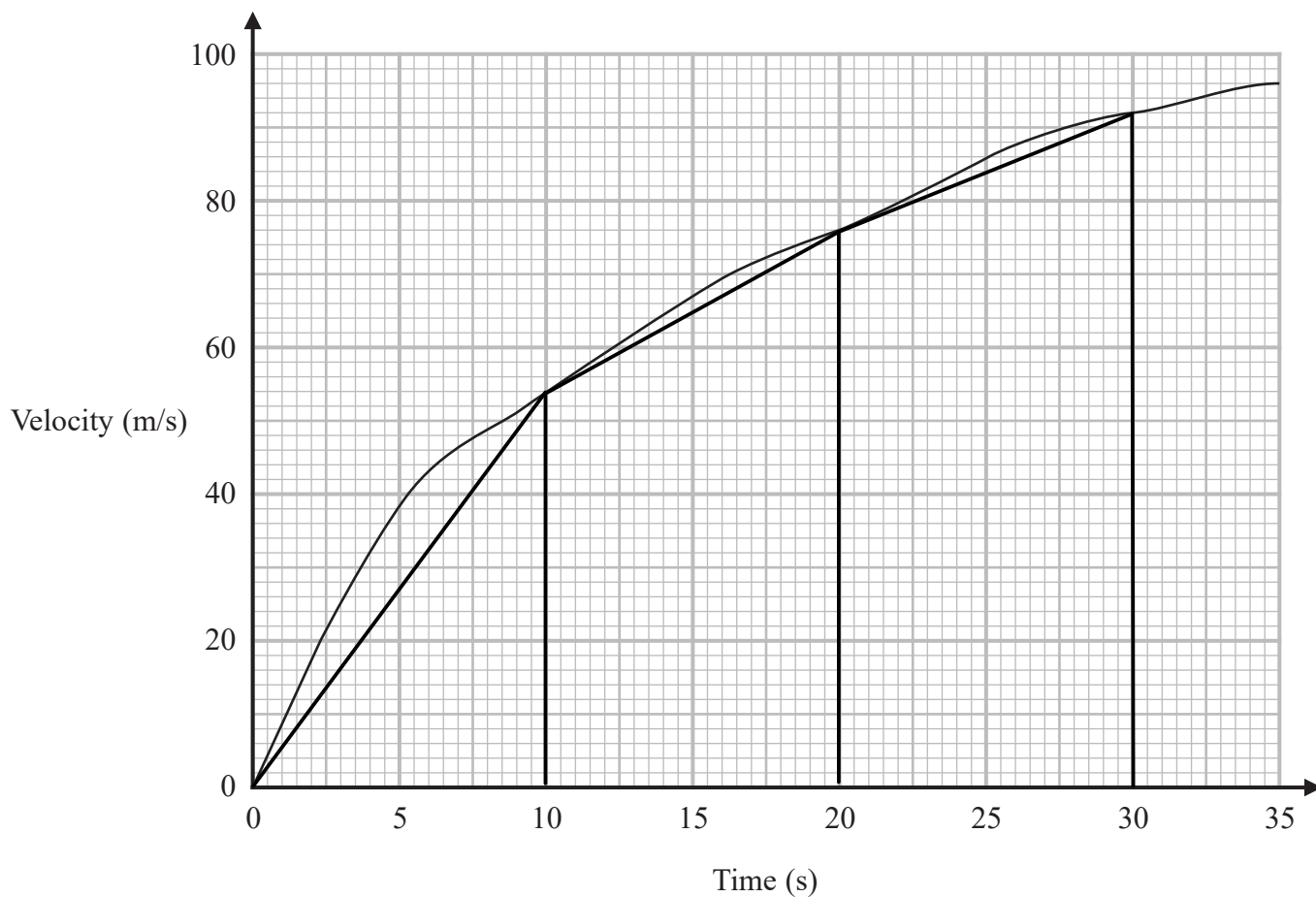
(b) Find the coordinates of R .

- 180 from x
+ 4 to y

(90 , 3)
(3)

(Total for Question 21 is 4 marks)

22 Here is a velocity-time graph for an aeroplane.



Work out an estimate for the distance the aeroplane travelled in the first 30 seconds.
Use 3 strips of equal width.

$$\frac{1}{2}(10)(54) = 270$$

$$\frac{1}{2}(54 + 76)(10) = 650$$

$$\frac{1}{2}(76 + 92)(10) = 840$$

$$270 + 650 + 840 = 1760$$

$$\text{Area of triangle} = \frac{1}{2}bh$$

$$\text{Area of trapezium} = \frac{1}{2}(a+b)h$$

1760 m

(Total for Question 22 is 3 marks)



23 Sketch the graph of

$$y = x^2 - 6px - 7 \quad \text{where } p > 0$$

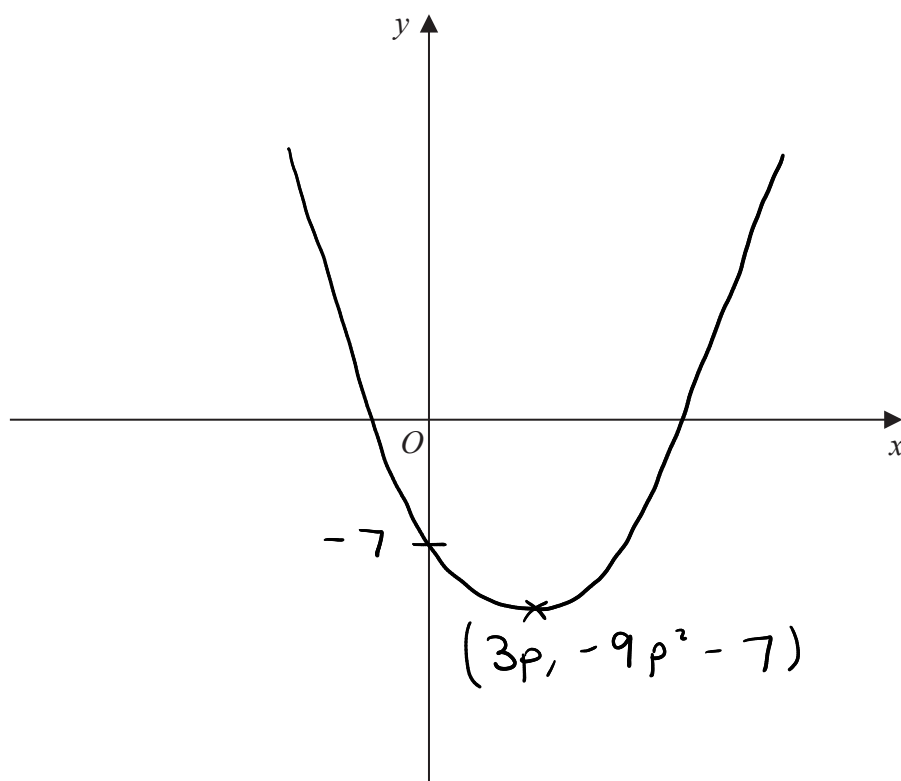
showing the coordinates of the turning point, in terms of p , and the coordinates of the intercept with the y -axis.

You must show all your working.

$$(x - 3p)^2 - 9p^2 - 7$$

Turning point $(3p, -9p^2 - 7)$

when $x=0$ $y=-7$



(Total for Question 23 is 5 marks)

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