

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)

Time 1 hour 30 minutes

Paper reference **1MA1/1H**

Mathematics

PAPER 1 (Non-Calculator)

Higher Tier

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

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **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 not be used.**



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.

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Turn over ▶



Answer ALL questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1 Write 500 as a product of powers of its prime factors.

$$= 5 \times 5 \times 5 \times 2 \times 2$$

$$\text{or } 5^3 \times 2^2$$

(Total for Question 1 is 3 marks)



Nov '22

P1

✓

- 2 (a) Work out $1\frac{3}{5} + 2\frac{1}{4}$

Give your answer as a mixed number.

$$\frac{8}{5} + \frac{9}{4}$$

$$= \frac{32}{20} + \frac{45}{20} = \frac{77}{20}$$

$$3\frac{17}{20}$$

(2)

- (b) Show that $2\frac{2}{3} \div 6 = \frac{4}{9}$

$$\frac{8}{3} \times \frac{1}{6} = \frac{8}{18} = \frac{4}{9}$$

(2)

(Total for Question 2 is 4 marks)

- 3 Simplify $(2^{-3} \times 2^9)^2$

Give your answer as a power of 2

$$= (2^3)^2$$

$$= 2^6$$

(Total for Question 3 is 2 marks)

- 4 Work out 0.004×0.32

$$\begin{array}{r} 32 \\ \times 4 \\ \hline 128 \end{array}$$

$$0.00128$$

(Total for Question 4 is 2 marks)



- 5 A car factory is going to make four different car models A, B, C and D.

80 people are asked which of the four models they would be most likely to buy.

The table shows information about the results.

Car model	Number of people
A	23
B	15
C	30
D	12

*

The factory is going to make 40 000 cars next year.

Work out how many model B cars the factory should make next year.

$$B = \frac{15}{80} \times \frac{40000}{1} = \frac{60000}{8}$$

$$\begin{array}{r} 7500 \\ 8 \overline{) 60000} \end{array}$$

7500

(Total for Question 5 is 2 marks)



P 6 8 7 2 1 A 0 5 2 8

6 Rizwan writes down three numbers a , b and c

$$a:b = 1:3$$

$$b:c = 6:5$$

(a) (i) Find $a:b:c$

$$\begin{array}{l} a:b \\ 1:3 \end{array}$$

$$\begin{array}{l} b:c \\ 6:5 \\ = \end{array}$$

$$\textcircled{\times 2} \quad 2:6$$

$$2:6:5$$

(2)

(ii) Express a as a fraction of the total of the three numbers a , b and c

$$a=2$$

$$\frac{2}{\text{total}}$$

$$\frac{2}{13}$$

(2)

Emma writes down three numbers m , n and p

$$n = 2m$$

$$p = 5n$$

(b) Find $m:p$

$$p = 5 \times n$$

$$p = 5 \times 2m$$

$$p = 10m$$

so p is $\times 10$ bigger so

$$m:p$$

$$= 1:10$$

(2)

(Total for Question 6 is 6 marks)



7



$$\text{pressure} = \frac{\text{force}}{\text{area}}$$

A storage tank exerts a force of 10 000 newtons on the ground.

 $= F$

The base of the tank in contact with the ground is a 4 m by 2 m rectangle.

 $= 8 \text{ m}^2$

Work out the pressure on the ground due to the tank.

$$P = \frac{F}{A} = \frac{10000}{8}$$

$$\begin{array}{r} 1250 \\ 8 \overline{) 10000} \end{array}$$

1250

newtons/m²

(Total for Question 7 is 2 marks)



P 6 8 7 2 1 A 0 7 2 8

7

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- 8 Two numbers m and n are such that
 m is a multiple of 5
 n is an even number
the highest common factor (HCF) of m and n is 7

$$5 \times 7 = 35$$

Write down a possible value for m and a possible value for n .



Even
7 ? $\Rightarrow$ so = 14, 28 etc

$m =$ 35
 $n =$ 14

(Total for Question 8 is 2 marks)

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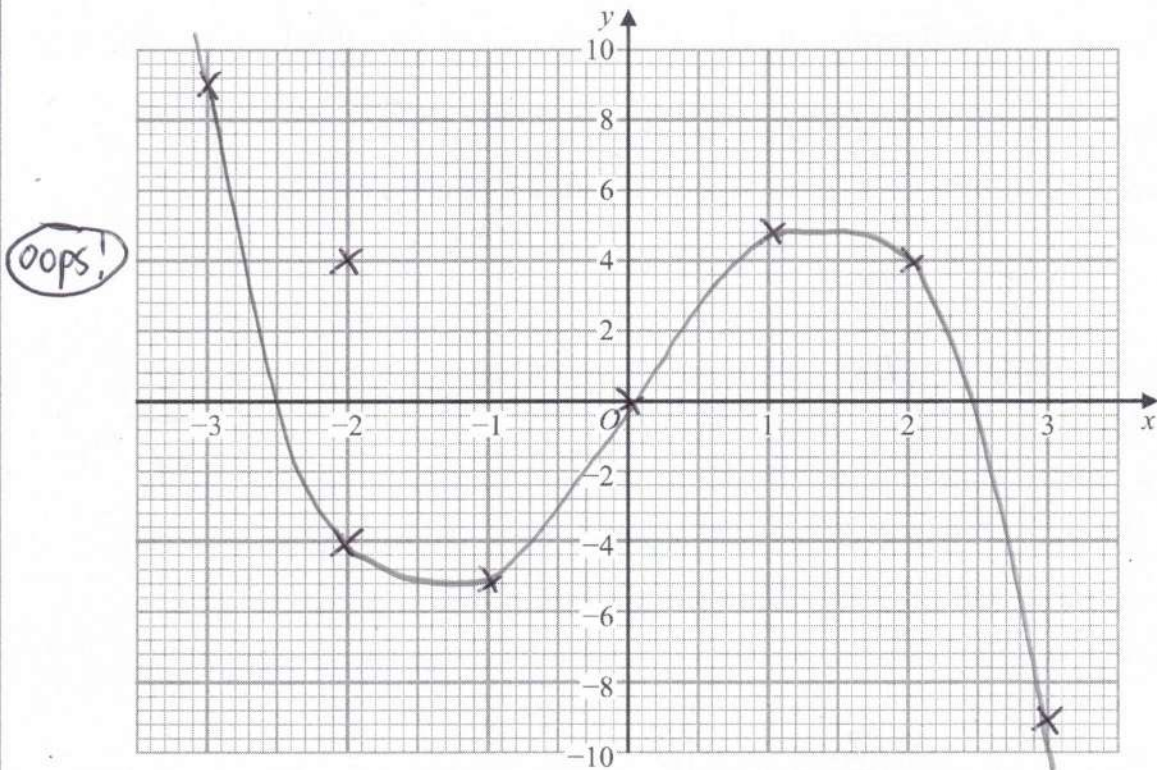
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- 9 (a) Complete the table of values for $y = 6x - x^3$

x	-3	-2	-1	0	1	2	3
y	9	-4	-5	0	5	4	-9

(2)

- (b) On the grid, draw the graph of $y = 6x - x^3$ for values of x from -3 to 3



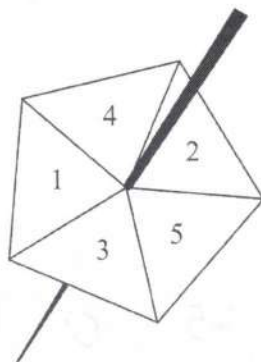
(2)

(Total for Question 9 is 4 marks)



P 6 8 7 2 1 A 0 9 2 8

10 Lina spins a biased 5-sided spinner 40 times.



Here are her results.

Score	1	2	3	4	5
Frequency	6	8	9	7	10

Lina is now going to spin the spinner another two times.

- (a) Work out an estimate for the probability that she gets a score of 5 both times.

$$\frac{10}{40} \times \frac{10}{40}$$

$$\frac{1}{16}$$

(2)

Derek is going to spin the spinner a large number of times.

- (b) Work out an estimate for the percentage of times Derek can expect to get a score of 1

$$\frac{6}{40} = \frac{3}{20} = \frac{15}{100}$$

$$15$$

%

(2)

(Total for Question 10 is 4 marks)

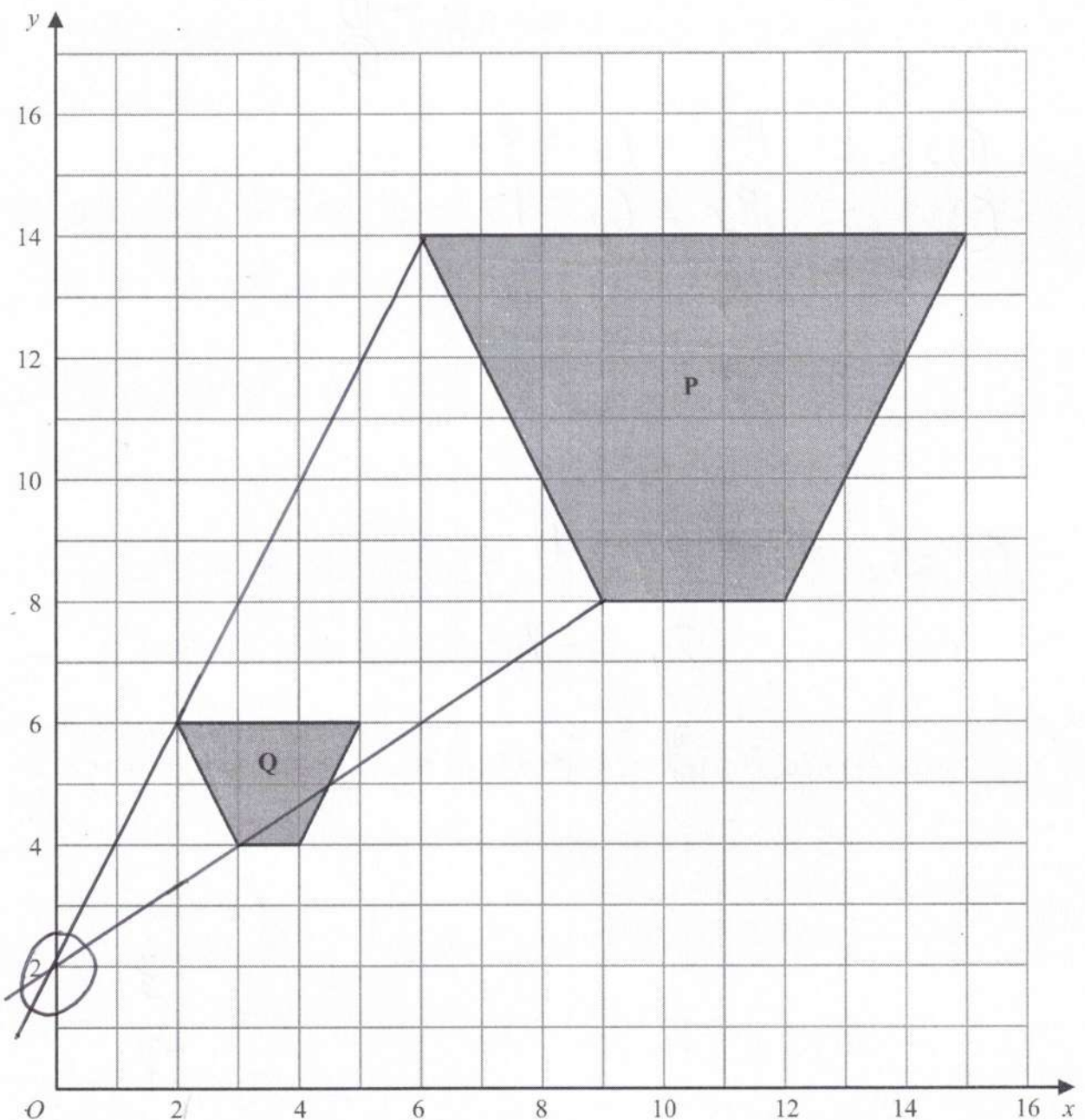


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11



Describe fully the single transformation that maps shape P onto shape Q.

Enlargement scale factor = $\frac{1}{3}$

centre (0, 2)

(Total for Question 11 is 2 marks)



P 6 8 7 2 1 A 0 1 1 2 8

11

Turn over ►

12 Solve the simultaneous equations

$$5x + 2y = 11$$

$$4x + 3y = 6$$

- ①

- ②

$$\textcircled{1} \times 3 = 15x + 6y = 33$$

$$\textcircled{2} \times 2 = 8x + 6y = 12$$

$$\begin{array}{r} 15x + 6y = 33 \\ 8x + 6y = 12 \\ \hline 7x = 21 \end{array}$$

$$x = 3$$

$$\textcircled{1} \Rightarrow 15 + 2y = 11$$

$$2y = -4$$

$$y = -2$$

$$x = 3$$

$$y = -2$$

(Total for Question 12 is 4 marks)

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13 p is inversely proportional to t

Complete the table of values.

t	100	25	20	2
p	1	4	5	50

$$5 = \frac{100}{t}$$

$$p = \frac{k}{t}$$

$$1 = \frac{k}{100}$$

$$k = 100$$

$$p = \frac{100}{t}$$

$$\frac{100}{25}$$

$$\frac{100}{2}$$

(Total for Question 13 is 3 marks)



- 14 The table shows information about the weights, in grams, of some potatoes.

width

20

10

10

20

Weight (w grams)	Number of potatoes
$50 < w \leq 70$	20
$70 < w \leq 80$	50
$80 < w \leq 90$	60
$90 < w \leq 110$	30

Area

height
(fd)

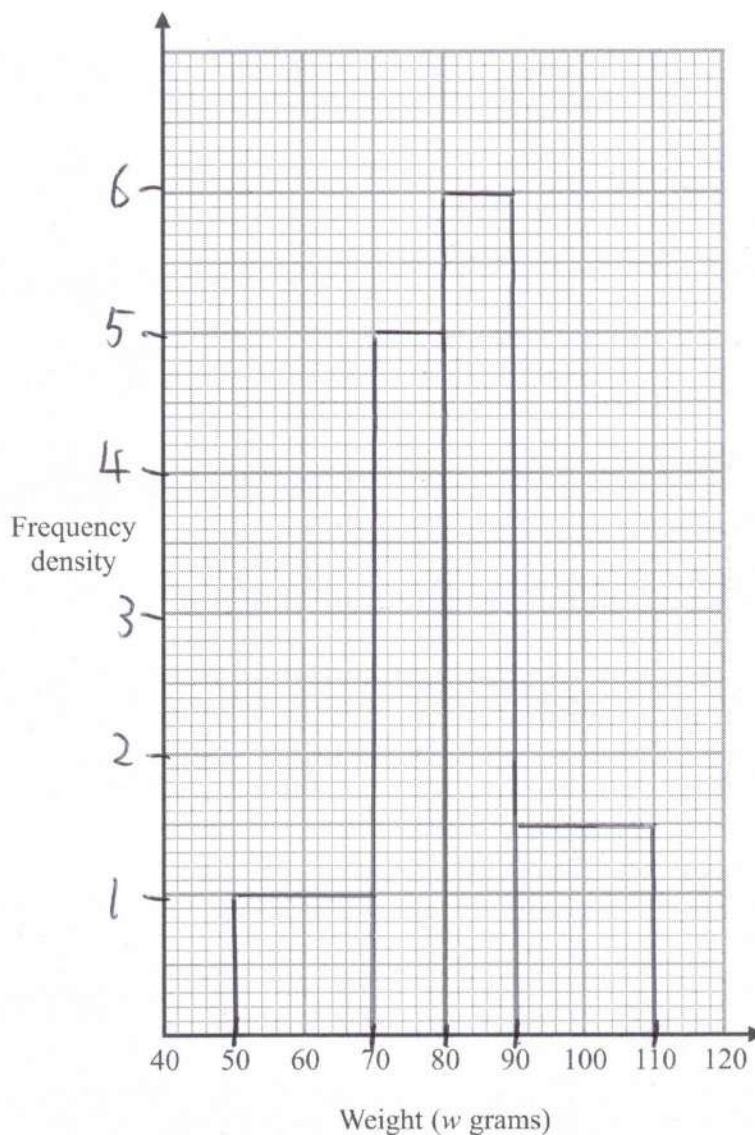
1

5

6

1.5

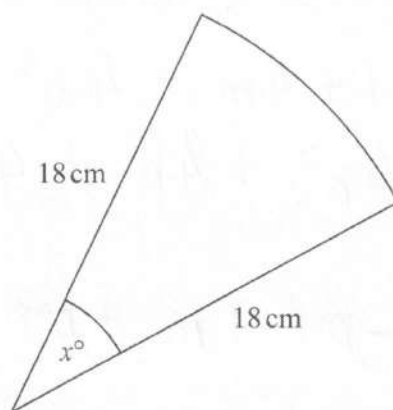
On the grid, draw a histogram for this information.



(Total for Question 14 is 3 marks)



- 15 The diagram shows a sector of a circle of radius 18 cm.



The length of the arc is 4π cm.

Work out the value of x .

$$\text{arc} = 2\pi r \times \frac{x}{360}$$

$$4\pi = 2\pi \times \frac{18x}{360}$$

$$2 = \frac{18x}{360} = \frac{x}{20}$$

$$x = 2 \times 20$$

$$x = 40$$

(Total for Question 15 is 3 marks)



16 (a) Prove that

$$(2m+1)^2 - (2n-1)^2 = 4(m+n)(m-n+1)$$

$$\begin{aligned} \text{LHS} &\Rightarrow 4m^2 + 1 + 4m - 4n^2 - 1 + 4n \\ &= 4m^2 - 4n^2 + 4m + 4n \end{aligned}$$

$$\begin{aligned} \text{RHS} &\Rightarrow 4(m^2 - \cancel{mn} + m + \cancel{mn} - n^2 + n) \\ &= 4(m^2 - n^2 + m + n) \\ &= 4m^2 - 4n^2 + 4m + 4n \end{aligned}$$

$$\text{LHS} = \text{RHS}$$

(3)

Sophia says that the result in part (a) shows that the difference of the squares of any two odd numbers must be a multiple of 4

(b) Is Sophia correct?

You must give reasons for your answer.

Yes, LHS has " $2m+1$ " and " $2n-1$ " which are odd
and $\text{RHS} = 4 \times \underline{\hspace{2cm}}$ which is multiple of 4

(1)

(Total for Question 16 is 4 marks)



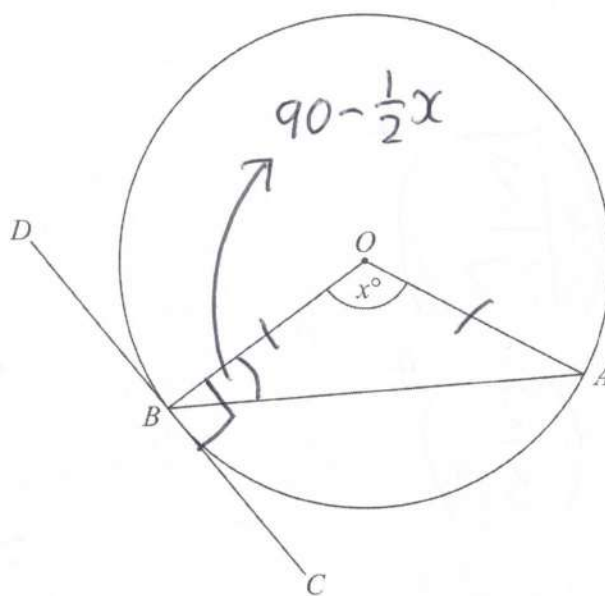
17 Work out the value of $\left(\frac{8}{27}\right)^{\frac{4}{3}}$

$$\begin{aligned} & \left(\sqrt[3]{\frac{8}{27}} \right)^4 \\ &= \left(\frac{2}{3} \right)^4 \\ &= \frac{16}{81} \end{aligned}$$

(Total for Question 17 is 2 marks)



P 6 8 7 2 1 A 0 1 7 2 8



A and B are points on a circle, centre O .
 DBC is the tangent to the circle at B .
 Angle $AOB = x^\circ$

Show that angle $ABC = \frac{1}{2}x^\circ$

You must give a reason for each stage of your working.

$$\begin{aligned} \triangle OBA \text{ is isosceles so } \angle OBA &= \frac{180 - x}{2} \\ &= 90 - \frac{1}{2}x \end{aligned}$$

DC is a tangent to OB
 so $\angle OBC = 90^\circ$

$$\begin{aligned} \angle ABC &= 90 - (90 - \frac{1}{2}x) \\ &= \frac{1}{2}x \quad \text{as req'd} \end{aligned}$$

(Total for Question 18 is 3 marks)



19 Solve $\frac{1}{x} - \frac{1}{x+1} = 4$

Give your answer in the form $a \pm b\sqrt{2}$ where a and b are fractions.

$$1(x+1) - 1(x) = 4(x)(x+1)$$

$$x+1 - x = 4x^2 + 4x$$

$$0 = \underset{a}{4x^2} + \underset{b}{4x} - \underset{c}{1}$$

$$x = \frac{-4 \pm \sqrt{16 + 16}}{8}$$

$$= -\frac{1}{2} \pm \frac{\sqrt{32}}{8}$$

$$(\sqrt{32} = \sqrt{16} \times \sqrt{2} = 4\sqrt{2})$$

$$= -\frac{1}{2} \pm \frac{4\sqrt{2}}{8}$$

$$= -\frac{1}{2} \pm \frac{1}{2}\sqrt{2}$$

(Total for Question 19 is 5 marks)



20 Alfie has 11 cards.

He has

3 blue cards
7 green cards
and 1 white card.

Alfie takes at random 2 of these cards.

Work out the probability that he takes cards of different colours.

Different = 1 - both same

$$BB = \frac{3}{11} \times \frac{2}{10} = \frac{6}{110}$$

$$gg = \frac{7}{11} \times \frac{6}{10} = \frac{42}{110}$$

$$\left. \begin{array}{l} BB \\ gg \end{array} \right\} = \frac{48}{110}$$

ww = impossible

$$1 - \frac{48}{110} = \frac{62}{110}$$

(Total for Question 20 is 3 marks)

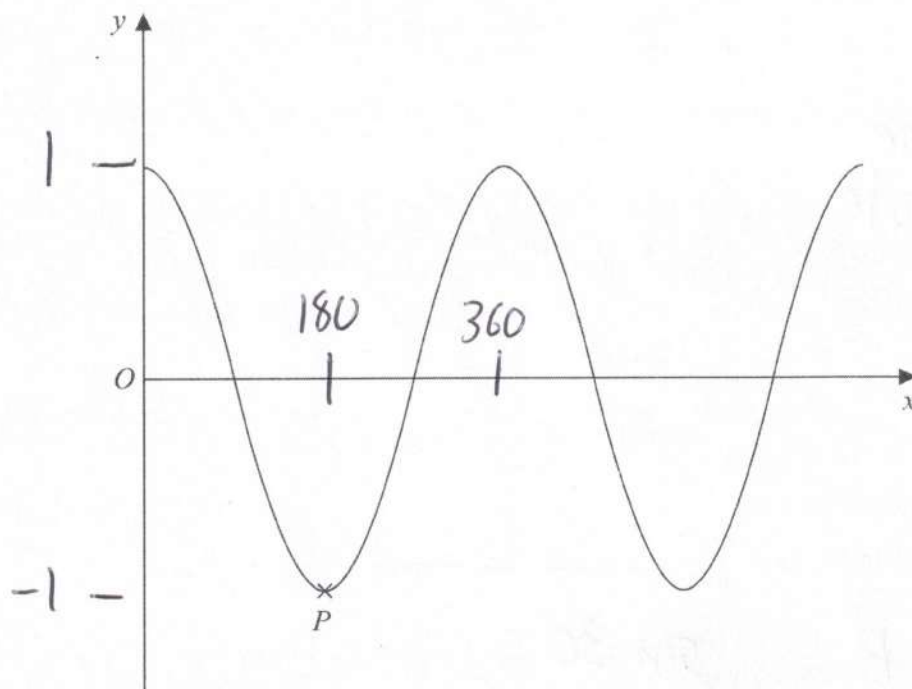
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21



The diagram shows a sketch of part of the curve with equation $y = \cos x^\circ$
 P is a minimum point on the curve.

Write down the coordinates of P .

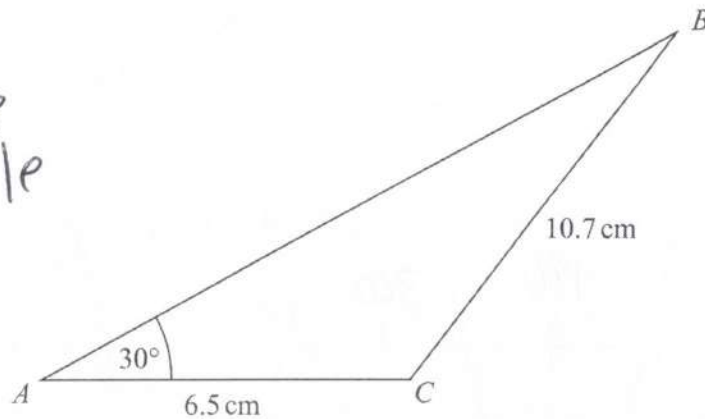
(180, -1)

(Total for Question 21 is 2 marks)



22 Here is a triangle ABC .

sine
rule



Work out the value of $\sin B$

Give your answer in the form $\frac{m}{n}$ where m and n are integers.

$$\frac{\sin B}{6.5} = \frac{\sin 30}{10.7}$$

$$\sin B = \frac{1}{2} \times \frac{6.5}{10.7}$$

$$= \frac{1}{2} \times \frac{65}{107}$$

$$\left(\times \frac{10}{10} \right)$$

$$= \frac{65}{214}$$

(Total for Question 22 is 4 marks)

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23 Here are the first five terms of a geometric sequence.

$$\sqrt{5} \quad 10 \quad 20\sqrt{5} \quad 200 \quad 400\sqrt{5}$$

(a) Work out the next term of the sequence.

$$\begin{aligned} r &= \frac{10}{\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}} \\ &= \frac{10\sqrt{5}}{5} \\ &= 2\sqrt{5} \end{aligned}$$

$$\begin{aligned} &400\sqrt{5} \times 2\sqrt{5} \\ &= 800 \times 5 \\ &= 4000 \end{aligned}$$

(2)

The 4th term of a different geometric sequence is $\frac{5\sqrt{2}}{4}$

The 6th term of this sequence is $\frac{5\sqrt{2}}{8}$

Given that the terms of this sequence are all positive,

(b) work out the first term of this sequence.
You must show all your working.

$$r^2 = \frac{5\sqrt{2}}{8} \div \frac{5\sqrt{2}}{4} = \frac{\cancel{5\sqrt{2}}}{8} \times \frac{4}{\cancel{5\sqrt{2}}} = \frac{1}{2}$$

$$\text{so } r = +\sqrt{\frac{1}{2}} = \frac{1}{\sqrt{2}}$$

$$\begin{array}{cccc} \div r & & \div r & \div r \\ 4\text{th} & \rightarrow & 3\text{rd} & \rightarrow & 2\text{nd} & \rightarrow & 1\text{st} \end{array}$$

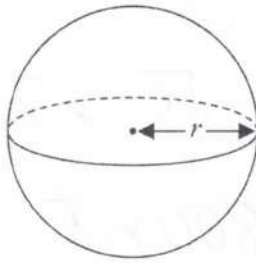
$$\begin{aligned} \frac{5\sqrt{2}}{4} \div r^3 &\Rightarrow \frac{5\sqrt{2}}{4} \times \sqrt{2}^3 = \frac{5 \times 4}{4} \\ &= 5 \end{aligned}$$

(3)

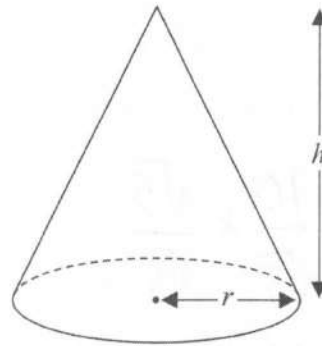
(Total for Question 23 is 5 marks)



24 Here is a solid sphere and a solid cone.



$$\text{Volume of sphere} = \frac{4}{3} \pi r^3$$



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

All measurements are in cm.

The volume of the sphere is equal to the volume of the cone.

(a) Find $r:h$

Give your answer in its simplest form.

$$\text{so } \frac{4}{3} \pi r^3 = \frac{1}{3} \pi r^2 h$$

$$4r^3 = r^2 h$$

$$4r = h$$

h is $\textcircled{\times 4}$ bigger

$$\text{so } r:h =$$

$$1:4$$

(2)

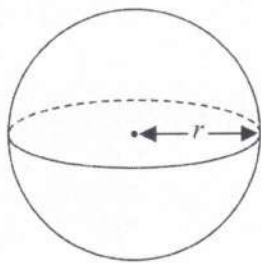
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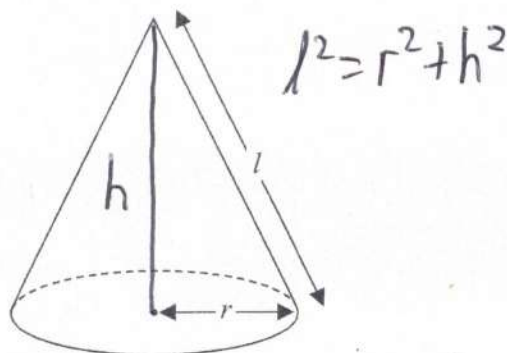
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Here is a different solid sphere and a different solid cone.



Surface area of sphere = $4\pi r^2$



Total Curved area of cone = $\pi r l + \pi r^2$

All measurements are in cm.

The surface area of the sphere is equal to the **total** surface area of the cone.

(b) Find $r:h$

Give your answer in the form $1:\sqrt{n}$ where n is an integer.

$$4\pi r^2 = \pi r l + \pi r^2$$

$$4r^2 = r l + r^2$$

$$(l = \sqrt{r^2 + h^2})$$

$$3r^2 = r(\sqrt{r^2 + h^2})$$

$$3r = \sqrt{r^2 + h^2}$$

$$9r^2 = r^2 + h^2$$

$$8r^2 = h^2$$

$$\sqrt{8} r = h$$

so $r:h$

$$= 1:\sqrt{8}$$

(4)

(Total for Question 24 is 6 marks)

TOTAL FOR PAPER IS 80 MARKS



P 6 8 7 2 1 A 0 2 5 2 8