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.

Turn over ▶

P68721A

B:1/1/1/1/

P 6 8 7 2 1 A 0 1 2 8

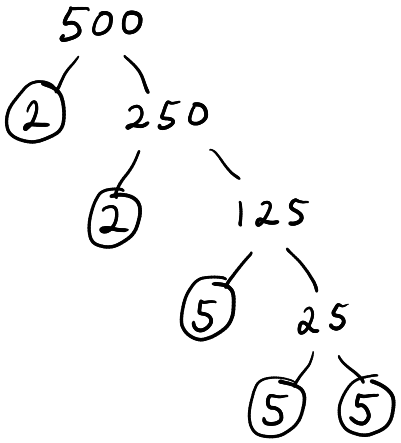
Pearson

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.



$2^2 \times 5^3$

(Total for Question 1 is 3 marks)

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

Give your answer as a mixed number.

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

$\frac{32}{20} + \frac{45}{20} = \frac{77}{20} = 3\frac{17}{20}$

$3\frac{17}{20}$

(2)

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

$\frac{8}{3} \div \frac{6}{1}$

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

(2)

(Total for Question 2 is 4 marks)

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3 Simplify $(2^{-5} \quad 2^{8})^{2}$

Give your answer as a power of 2

$(2^3)^2$

$2^{3\times 2}$

2^6

(Total for Question 3 is 2 marks)

4 Work out 0.004 0.32

$4 \times 10^{-3} \times 32 \times 10^{-2}$

128×10^{-5}

$1.28 \times 10^{2} \times 10^{-5}$

1.28×10^{-3}

(Total for Question 4 is 2 marks)

OR 0.00128

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.

$\frac{15}{80} = \frac{15000}{80000} = \frac{7500}{40000}$

7500

(Total for Question 5 is 2 marks)

6 Rizwan writes down three numbers a, b and c

$$a : b = 1 : 3$$
$$b : c = 6 : 5$$

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

$\times 2$ $a : b$ $1 : 3$ $\quad$ $b : c$ $6 : 5$

$2 : 6 \quad 6 : 5$

$2 : 6 : 5$

(2)

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

$2 + 6 + 5 = 13$

$\frac{2}{13}$

(2)

Emma writes down three numbers m, n and p

$$n = 2m$$
$$p = 5n$$

(b) Find $m : p$

when $m = 1 \quad n = 2$

$m : n$

$1 : 2$

when $n = 1 \quad p = 5$

$n : p$ $1 : 5$ $\times 2$

$2 : 10$

$m : n : p$

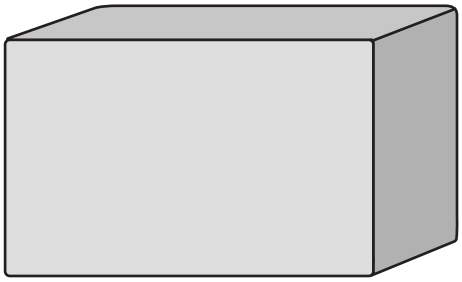
$1 : 2 : 10$

$1 : 10$

(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.

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

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

$4 \times 2 = 8\ m^2$

$\text{pressure} = \frac{10000}{8} = \frac{5000}{4} = \frac{2500}{2}$

$= 1250$

1250 newtons / m^2

(Total for Question 7 is 2 marks)

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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 both multiples of 7

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

m 5 x 7 = 35

n even multiple of 7 = 14, 28, 42 ...

$m =$ 35

$n =$ 14

(Total for Question 8 is 2 marks)

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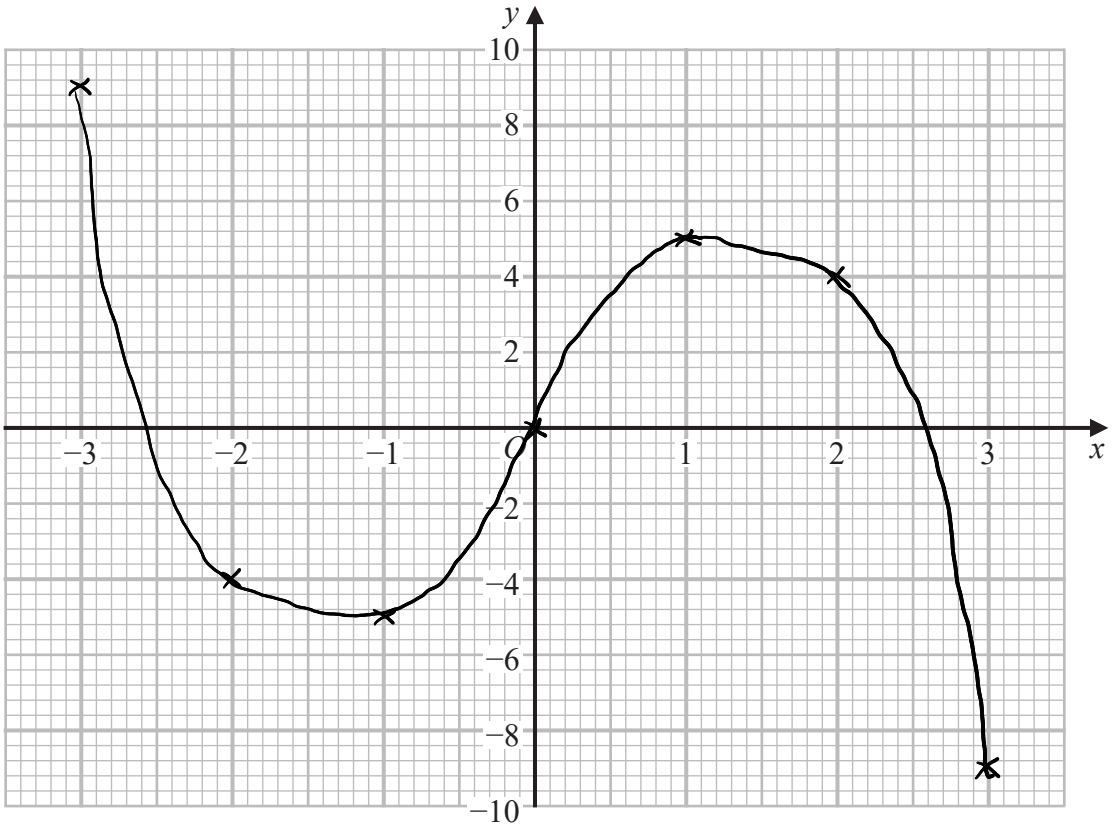
9 (a) Complete the table of values for $y = 6x - x^3$

x	−3	−2	−1	0	1	2	3
y	9	−4	−5	0	5	4	−9

(2)

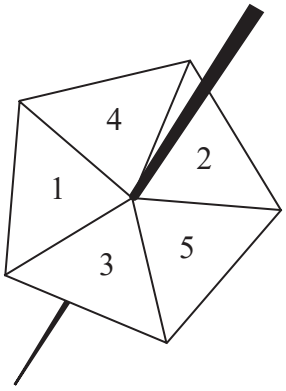
(b) On the grid, draw the graph of $y = 6x - x^3$ for values of x from −3 to 3



(2)

(Total for Question 9 is 4 marks)

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.

$\frac{10}{40} = \frac{1}{4}$

$\frac{1}{4} \times \frac{1}{4} = \frac{1}{16}$

$\frac{1}{16}$

(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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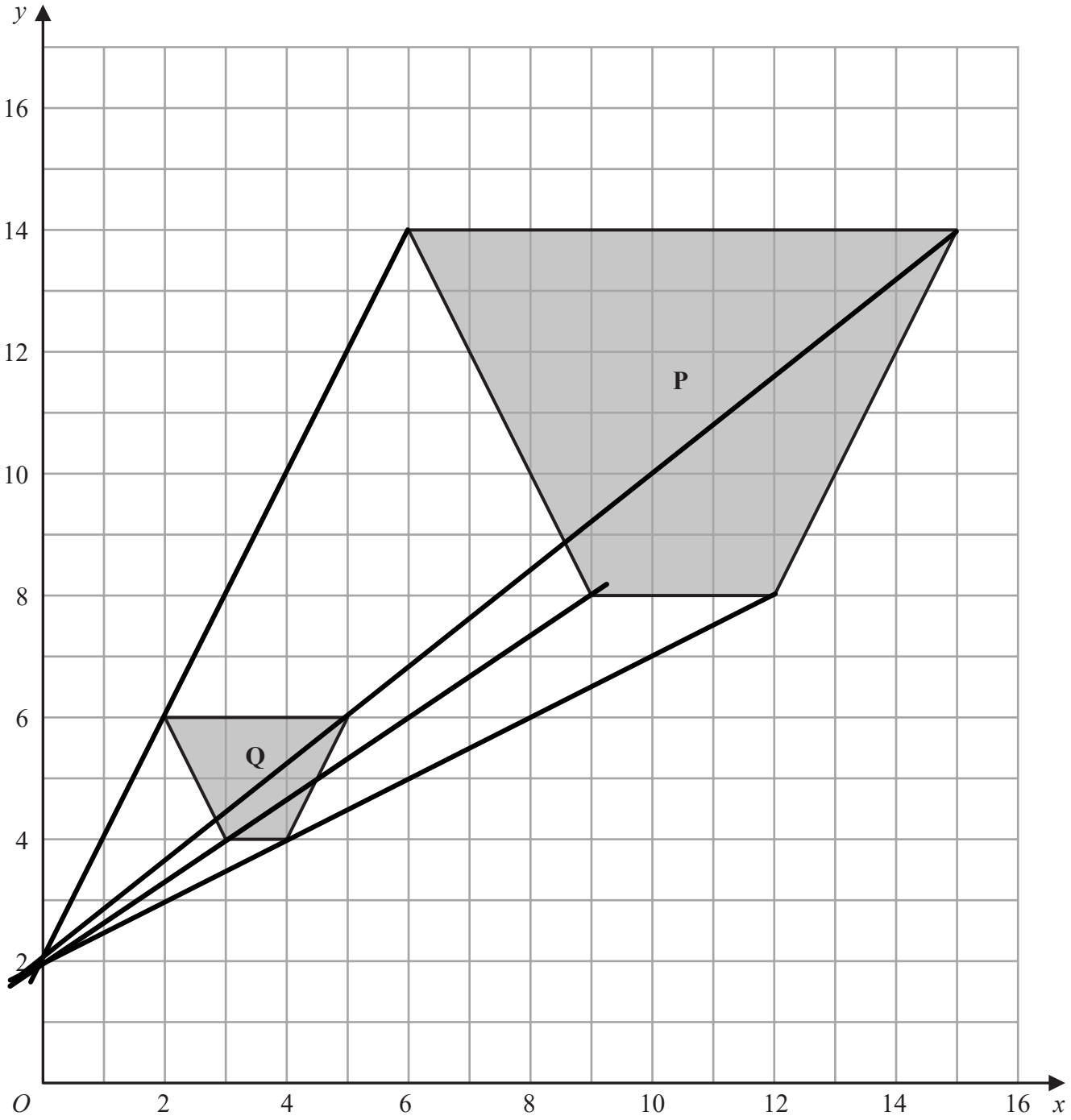
11



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)

12 Solve the simultaneous equations

$5x + 2y = 11$ ×4
$4x + 3y = 6$ ×5

$20x + 8y = 44$
$20x + 15y = 30$

$-7y = 14$
$y = -2$

$5x + 2(-2) = 11$
$5x - 4 = 11$
$5x = 15$
$x = 3$

$x =$ 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

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

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

$k = 100$

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

or $pt = 100$

(Total for Question 13 is 3 marks)

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

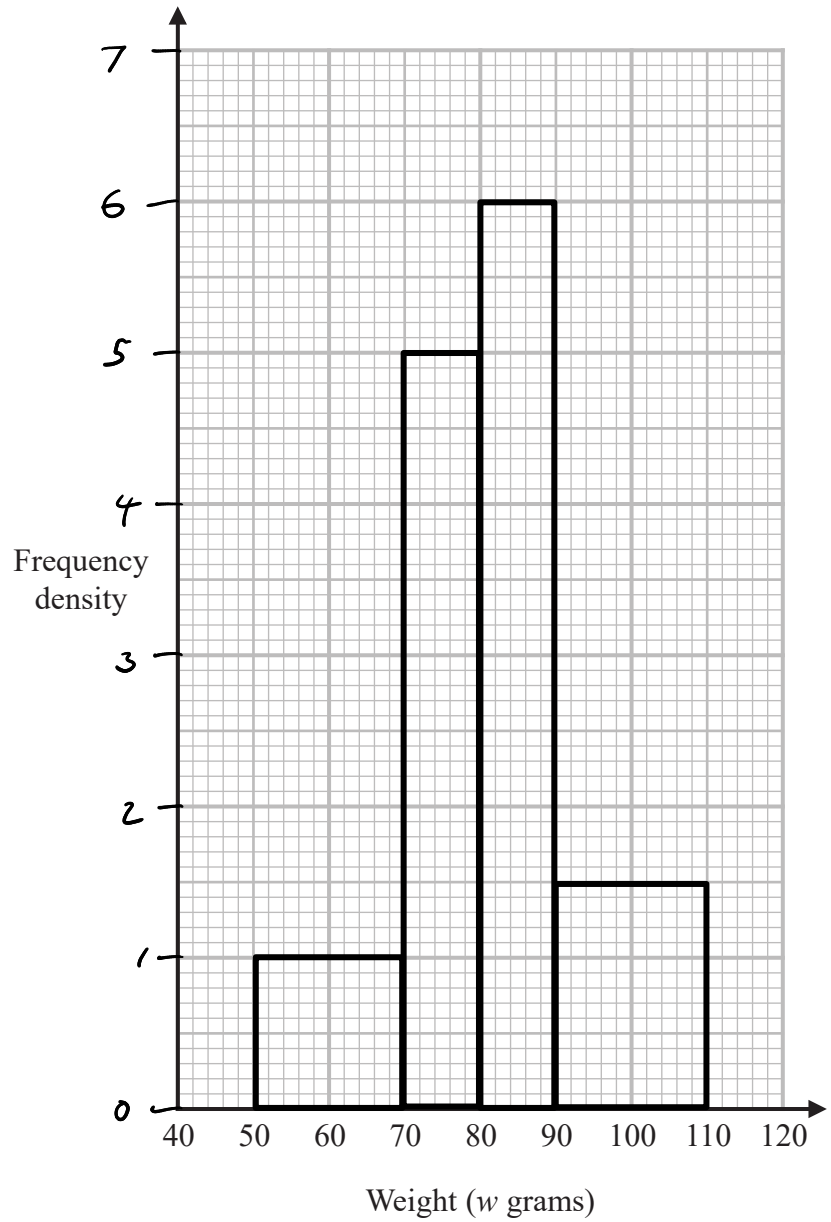
F.d = Freq / width

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

width: 20, 10, 10, 20

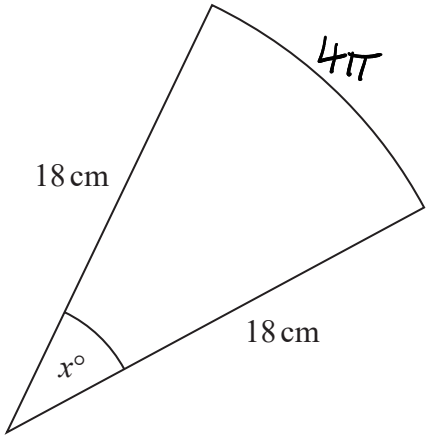
F.d.: 1, 5, 6, 1.5

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.

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

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

$$\frac{36\pi x}{360} = 4\pi$$

$$\frac{x}{10} = 4$$

$$x = 40$$

$x =$ 40

(Total for Question 15 is 3 marks)

16 (a) Prove that

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

$(2m+1)(2m+1) - (2n-1)(2n-1)$

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

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

$4m^2 + 4m + 1 - 4n^2 + 4n - 1$

$4m^2 + 4m - 4n^2 + 4n$

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

$4((m+n)(m-n) + (m+n))$

$4(m+n)(m-n+1)$

(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 $(2m+1)^2 - (2n-1)^2$ is the difference between the squares of odd numbers and $4(m+n)(m-n+1)$ is a multiple of 4

(1)

(Total for Question 16 is 4 marks)

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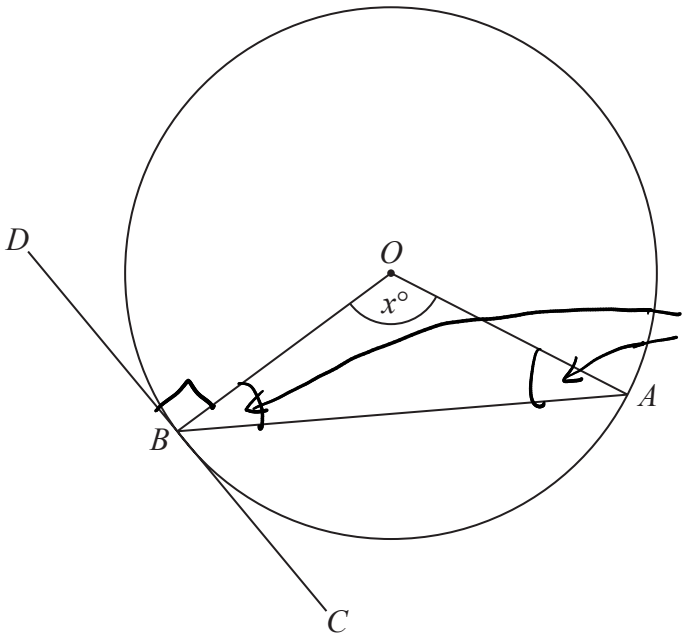
17 Work out the value of $\left(\frac{8}{27}\right)^{\frac{4}{3}}$ ← power of 4 ← cube root

$\left(\frac{2}{3}\right)^4 = \frac{16}{81}$

$\frac{16}{81}$

(Total for Question 17 is 2 marks)

18



$180-x$
2

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

Show that angle $ABC = \frac{1}{2}x°$

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

OBC and DBO = 90° Tangent meets radius at 90°

OAB = OBA = $\frac{180-x}{2}$ Angles at the base of an isosceles triangle are equal

$$ABC = 90 - \left(\frac{180-x}{2}\right)$$

$$= 90 - 90 + \frac{x}{2}$$

$$= \frac{x}{2}$$

(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.

$$\frac{x+1}{x(x+1)} - \frac{x}{x(x+1)} = 4$$

$$\frac{1}{x(x+1)} = 4$$

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

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

$$0 = 4x^2 + 4x - 1$$

$a = 4 \quad b = 4 \quad c = -1$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

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

$$= \frac{-4 \pm \sqrt{32}}{8}$$

$\sqrt{32} = \sqrt{16}\sqrt{2}$
$= 4\sqrt{2}$

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

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

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

(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.

Probability 2 different = 1 − Prob 2 Same.

$P(B, B) = \frac{3}{11} \times \frac{2}{10} = \frac{6}{110}$

$P(G, G) = \frac{7}{11} \times \frac{6}{10} = \frac{42}{110}$

$P(W, W) = 0$

$P(2 \text{ same colour}) = \frac{6}{110} + \frac{42}{110} = \frac{48}{110}$

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

$\frac{62}{110}$

(Total for Question 20 is 3 marks)

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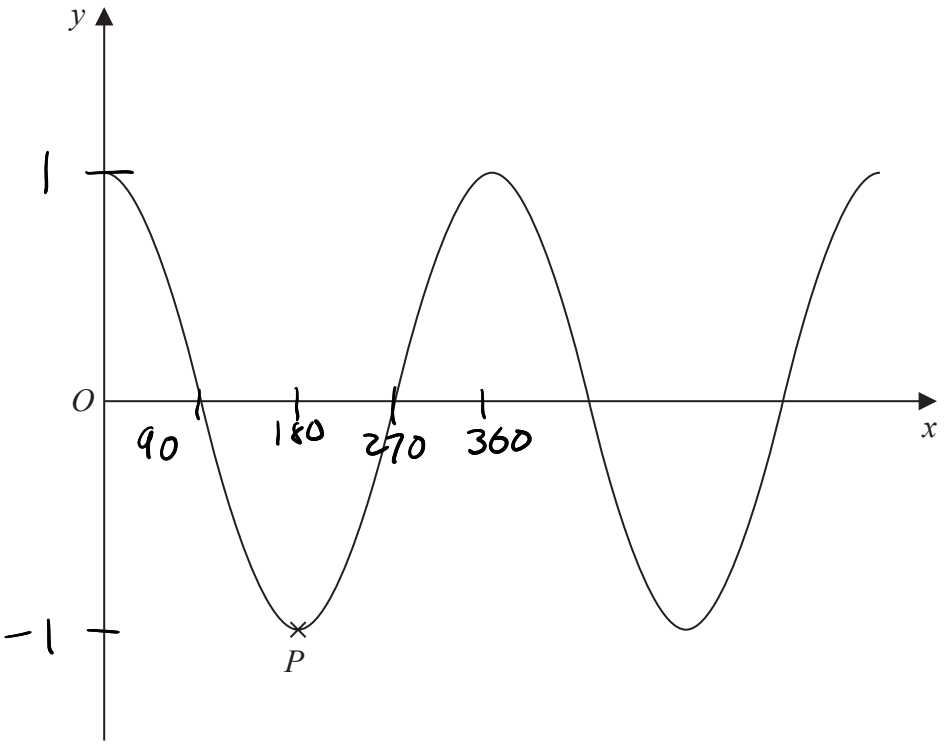
21



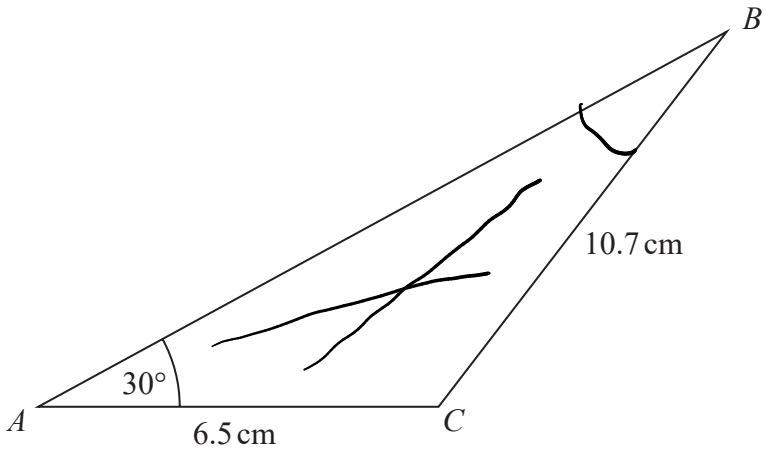
The diagram shows a sketch of part of the curve with equation $y = \cos x°$
P is a minimum point on the curve.

Write down the coordinates of P.

(180 , −1)

(Total for Question 21 is 2 marks)

22 Here is a triangle ABC.



Work out the value of $\sin ABC$

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

$\sin 30 = \frac{1}{2}$

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

$\sin ABC = \frac{0.5}{10.7} \times 6.5$

$= \frac{1}{21.4} \times 6.5$

$= \frac{6.5}{21.4}$

$= \frac{65}{214}$

$\frac{65}{214}$

(Total for Question 22 is 4 marks)

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

$\sqrt{5}$ (×2√5) 10 (×2√5) $20\sqrt{5}$ 200 $400\sqrt{5}$

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

$400\sqrt{5} \times 2\sqrt{5}$

800×5

4000

(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.

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

$r^2 = \frac{1}{2}$

$r = \frac{1}{\sqrt{2}}$

Term to term rule $\times \frac{1}{\sqrt{2}}$

$\frac{5\sqrt{2}}{4} \div \left(\frac{1}{\sqrt{2}}\right)^3$

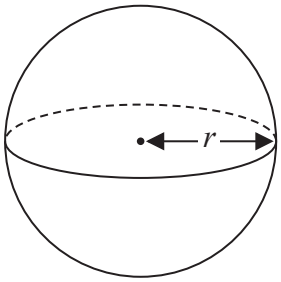
$\frac{5\sqrt{2}}{4} \div \frac{1}{2\sqrt{2}} = \frac{5\sqrt{2}}{4} \times 2\sqrt{2}$

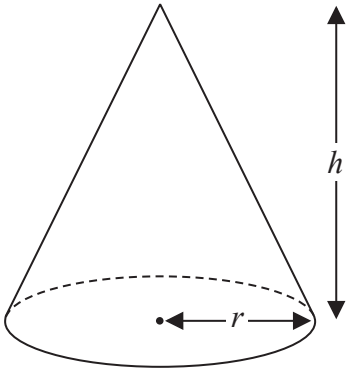
5

(3)

(Total for Question 23 is 5 marks)

24 Here is a solid sphere and a solid cone.





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

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.

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

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

$4r = h$

when $r = 1$ $h = 4$

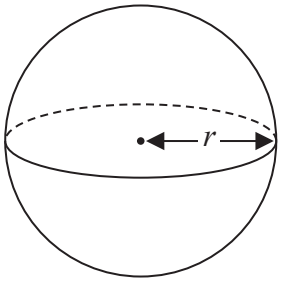
$r : h$

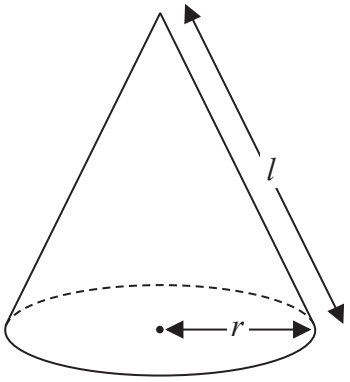
$1 : 4$

$1 : 4$

(2)

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





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

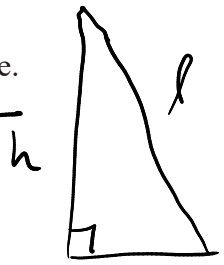
Curved area of cone = πrl

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.



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

$4r^2 = rl + r^2$

$4r = l + r$

$3r = l$

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

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

$8r^2 = h^2$

$\sqrt{8}r = h$

when $r = 1$ $h = \sqrt{8}$

$r^2 + h^2 = l^2$

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

$1 : \sqrt{8}$

(4)

(Total for Question 24 is 6 marks)

TOTAL FOR PAPER IS 80 MARKS

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