

Please check the examination details below before entering your candidate information

Candidate surname

Other names

Centre Number

Candidate Number

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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 ►

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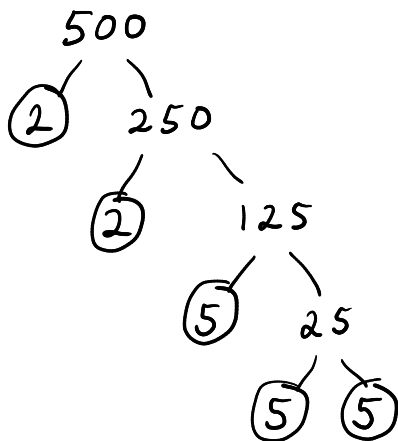

Pearson

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)

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

Give your answer as a mixed number.

$$\begin{array}{c} 4 \times 8 \\ 4 \times 5 \end{array} \frac{8}{5} + \frac{9 \times 5}{4 \times 5}$$

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

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

(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)



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

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 $0.004 \cdot 0.32$

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

$$128 \times 10^{-5}$$

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

$$1.28 \times 10^{-3}$$

(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 $a:b:c$

$$\begin{array}{cc} \times 2 & \begin{array}{c} a:b \\ 1:3 \end{array} & b:c \\ & \begin{array}{c} 2:6 \\ 6:5 \end{array} & \end{array}$$

$$\frac{2:6:5}{(2)}$$

(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 $m = 1$ $n = 2$

$$\begin{array}{c} m:n \\ 1:2 \end{array}$$

when $n = 1$ $p = 5$

$$\begin{array}{c} n:p \\ 1:5 \end{array} \times 2$$
$$2:10$$

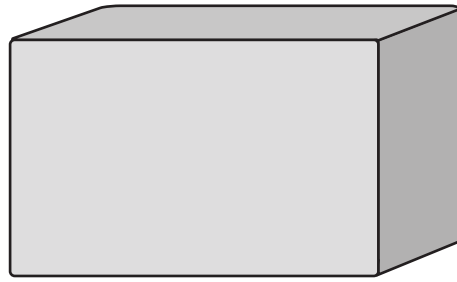
$$\begin{array}{c} m:n:p \\ 1:2:10 \end{array}$$

$$\frac{1:10}{(2)}$$

(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.

$$4 \times 2 = 8 \text{ m}^2$$

$$\text{pressure} = \frac{10000}{8} = \frac{5000}{4} = \frac{2500}{2} = 1250$$

..... 1250 newtons/m²

(Total for Question 7 is 2 marks)



P 6 8 7 2 1 A 0 7 2 8

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 .

$$m \quad 5 \times 7 = 35$$

$$n \quad \text{even multiple of } 7 = 14, 28, 42 \dots$$

$$m = \dots 35$$

$$n = \dots 14$$

(Total for Question 8 is 2 marks)

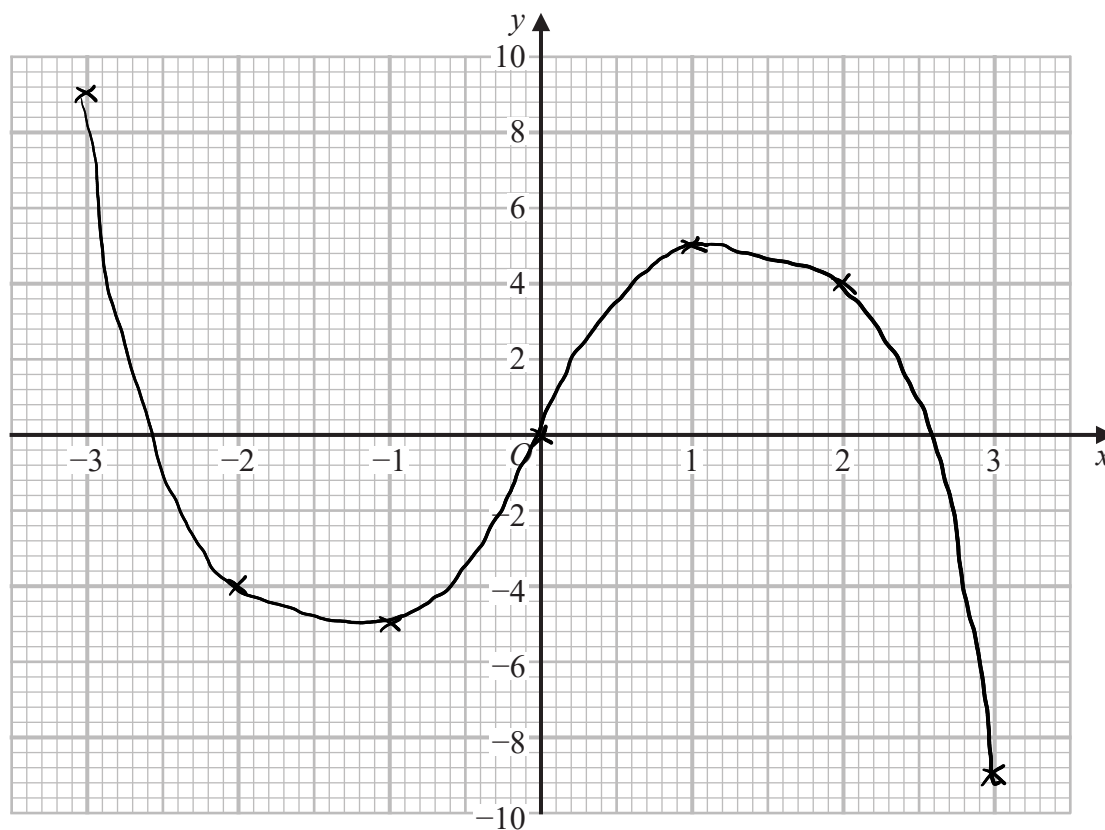


9 (a) Complete the table of values for $y = 6x - x^3$

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



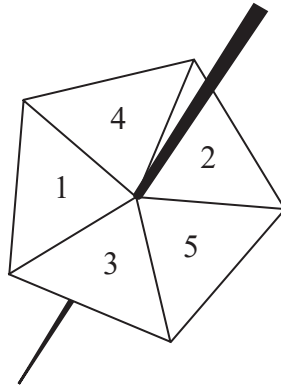
(2)

(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.

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

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

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

(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

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

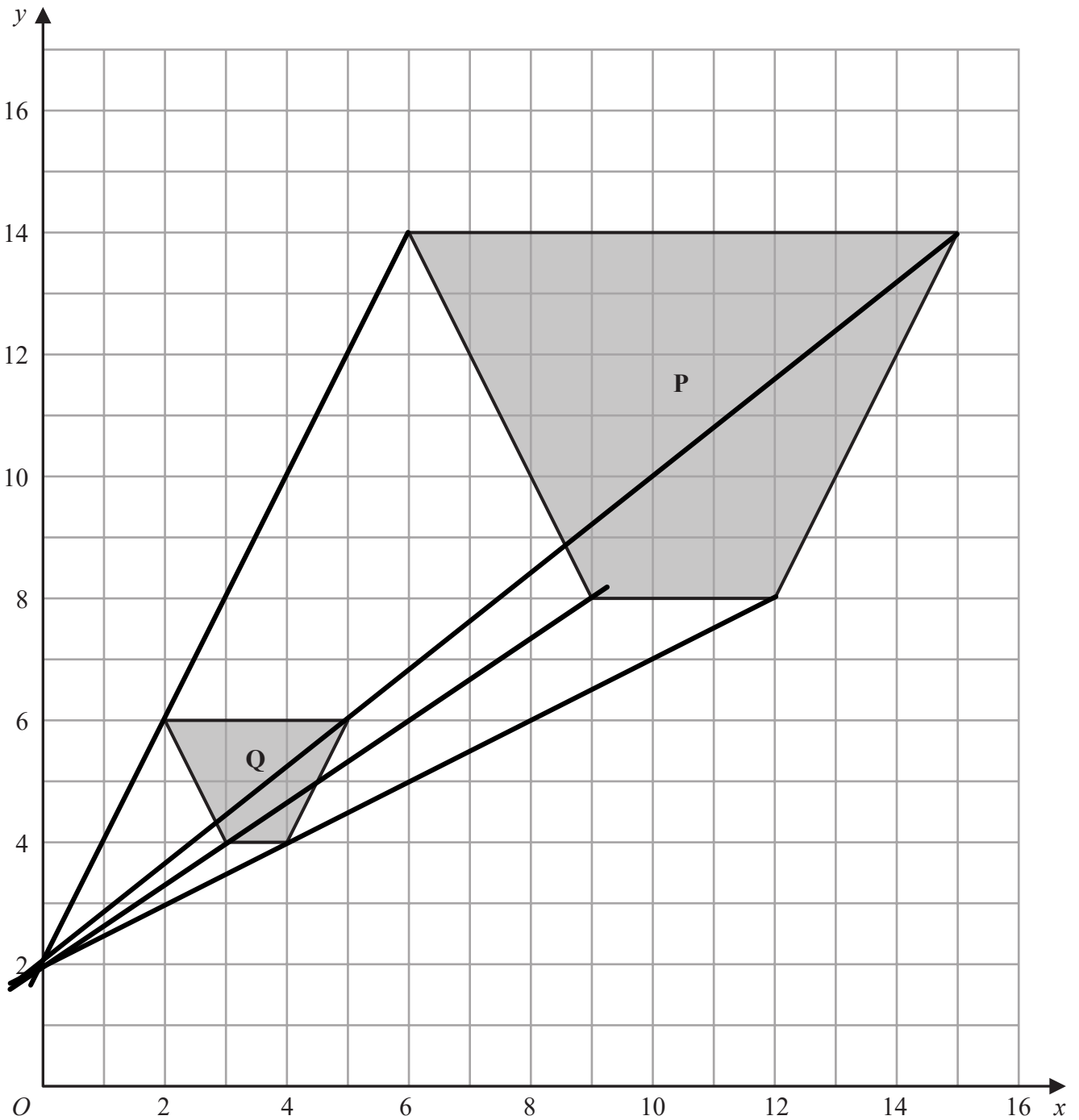
$$15\%$$

(2)

(Total for Question 10 is 4 marks)



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

12 Solve the simultaneous equations

$$\begin{array}{r} 5x + 2y = 11 \quad \times 4 \\ 4x + 3y = 6 \quad \times 5 \end{array}$$

$$20x + 8y = 44$$

$$20x + 15y = 30$$

$$-7y = 14$$

$$y = -2$$

$$5x + 2(-2) = 11$$

$$5x - 4 = 11$$

$$5x = 15$$

$$x = 3$$

$$x = \underline{\quad 3 \quad}$$

$$y = \underline{\quad -2 \quad}$$

(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.

$$F.d = \frac{\text{Freq}}{\text{width}}$$

Weight (w grams) ^{width}	Number of potatoes
$50 < w \leq 70$ 20	20
$70 < w \leq 80$ 10	50
$80 < w \leq 90$ 10	60
$90 < w \leq 110$ 20	30

F. d.

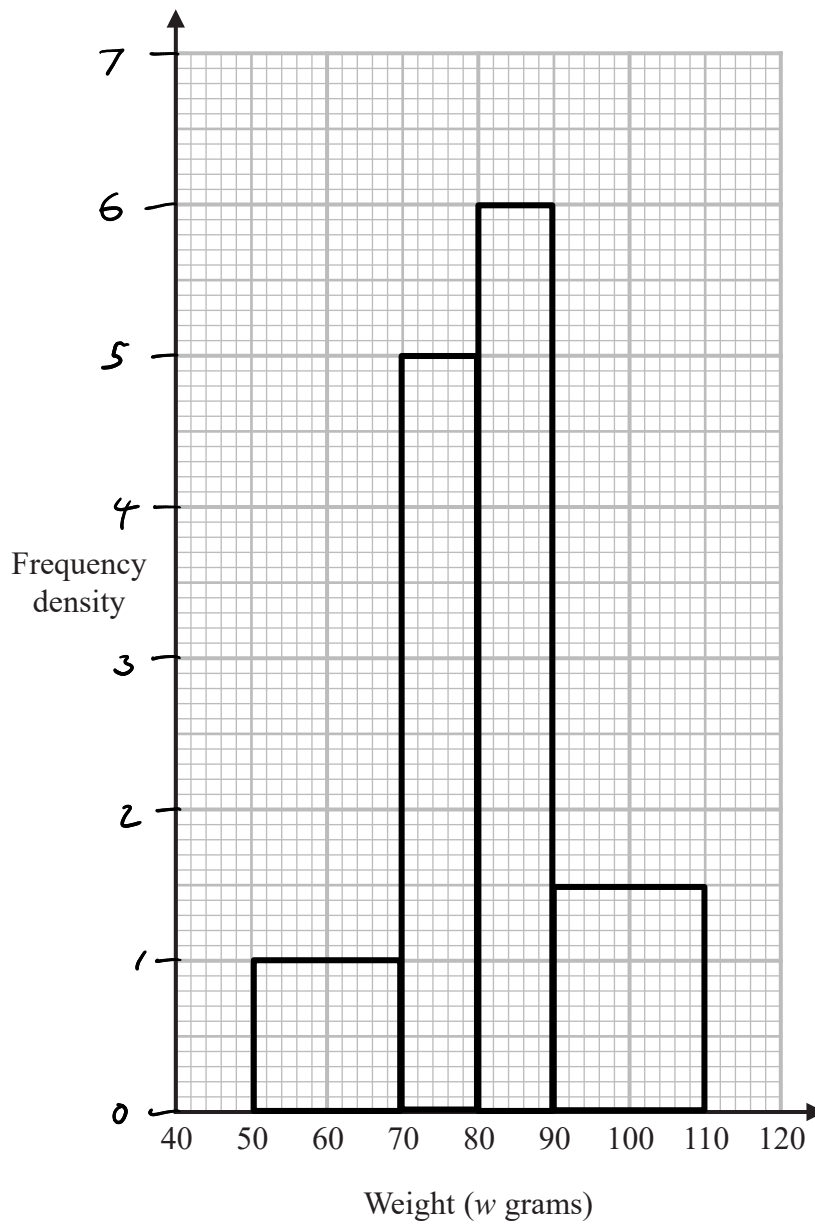
1

5

6

1.5

On the grid, draw a histogram for this information.



(Total for Question 14 is 3 marks)

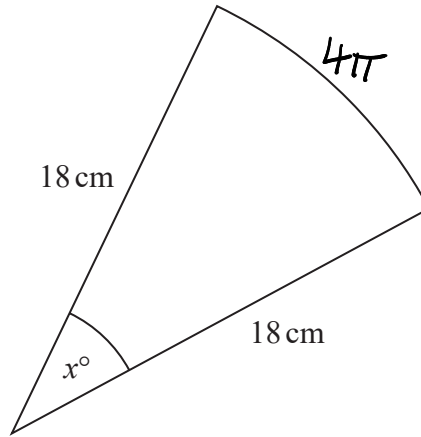
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15 The diagram shows a sector of a circle of radius 18 cm.



The length of the arc is 4π cm.

Work out the value of x .

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

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

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

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

$$\underline{x = 40}$$

$$x = \underline{40}$$

(Total for Question 15 is 3 marks)

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

16 (a) Prove that

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

$$\begin{aligned} & (2m+1)(2m+1) - (2n-1)(2n-1) \\ & 4m^2 + 2m + 2m + 1 - (4n^2 - 2n - 2n + 1) \\ & 4m^2 + 4m + 1 - (4n^2 - 4n + 1) \\ & 4m^2 + 4m + 1 - 4n^2 + 4n - 1 \\ & 4m^2 + 4m - 4n^2 + 4n \\ & 4(m^2 - n^2 + m + n) \\ & 4((m+n)(m-n) + (m+n)) \\ & \underline{4(m+n)(m-n+1)} \end{aligned} \quad (3)$$

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)



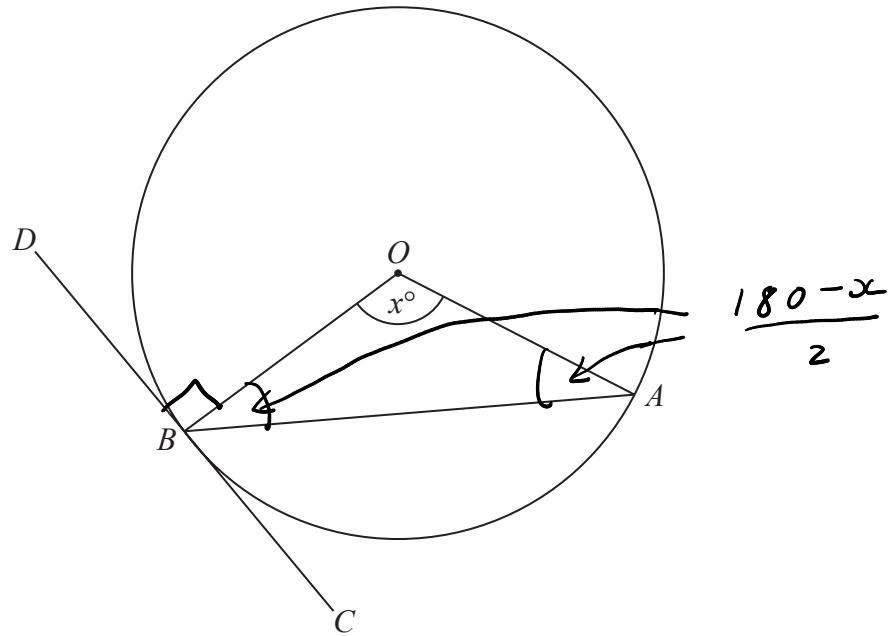
17 Work out the value of $\left(\frac{8}{27}\right)^{\frac{4}{3}}$ ← power of 4
← cube root

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

$$\frac{16}{81}$$

(Total for Question 17 is 2 marks)





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.

$\angle OBC$ and $\angle DBO = 90^\circ$ Tangent meets radius at 90°

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

$$\begin{aligned} \angle ABC &= 90 - \left(\frac{180-x}{2} \right) \\ &= 90 - 90 + \frac{x}{2} \\ &= \frac{x}{2} \end{aligned}$$

(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.

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

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

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

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

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

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

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

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

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

$$\begin{aligned} \sqrt{32} &= \sqrt{16\sqrt{2}} \\ &= 4\sqrt{2} \end{aligned}$$

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

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

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

(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 = $1 - \text{Prob 2 Same.}$

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

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

$$P(W, W) = 0$$

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

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

$$\frac{62}{110}$$

(Total for Question 20 is 3 marks)

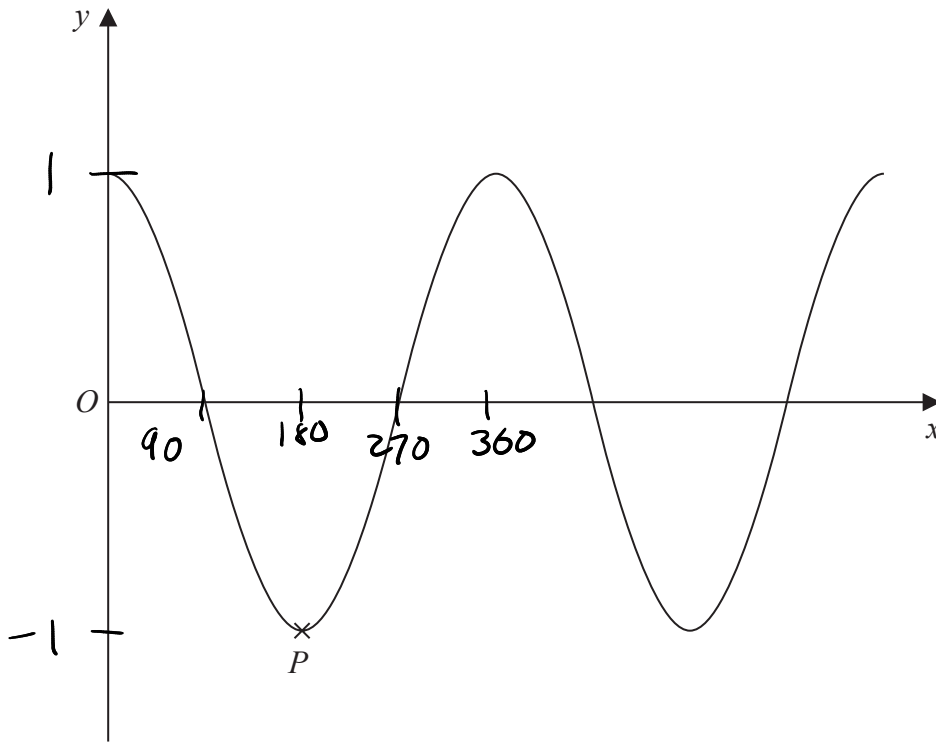
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21



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

Write down the coordinates of P .

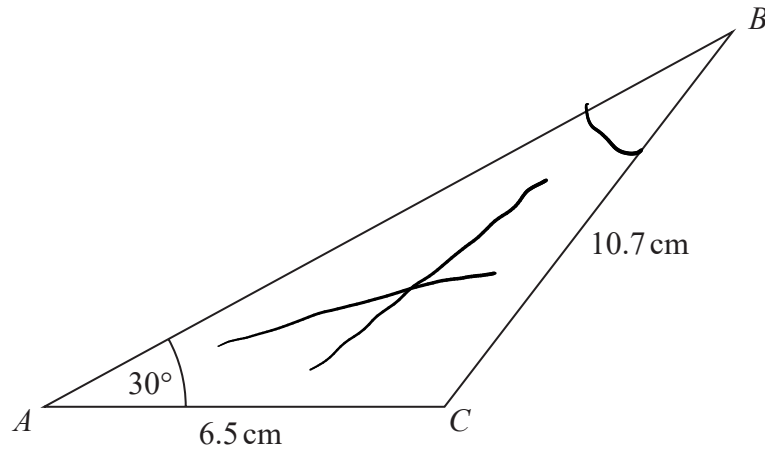
(180 , -1)

(Total for Question 21 is 2 marks)



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

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)

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

$$\sqrt{5} \quad \xrightarrow{\times 2\sqrt{5}} \quad 10 \quad \xrightarrow{\times 2\sqrt{5}} \quad 20\sqrt{5} \quad 200 \quad 400\sqrt{5}$$

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

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

$$800 \times 5$$

$$\frac{4000}{(2)}$$

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 $\times \frac{1}{\sqrt{2}}$

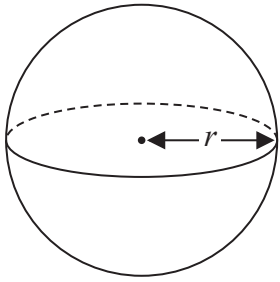
$$\frac{5\sqrt{2}}{4} \div \left(\frac{1}{\sqrt{2}}\right)^3$$

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

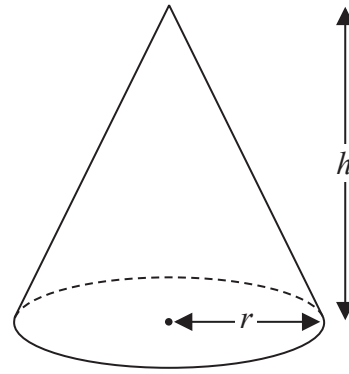
$$\frac{5}{(3)}$$

(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.

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

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

$$4r = h$$

when $r=1$ $h=4$

$$r : h$$

$$1 : 4$$

$$\frac{1:4}{(2)}$$

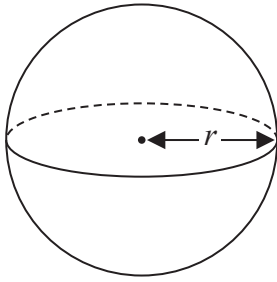
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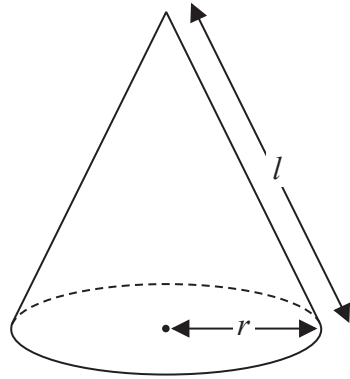
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Here is a different solid sphere and a different solid cone.



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



$$\text{Curved area of cone} = \pi r l$$

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.

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

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

$$4r = l + r$$

$$3r = l$$

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

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

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

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

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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