Please check the examination details below before entering your candidate information

Candidate surname	Other names

Pearson Edexcel International GCSE

Centre Number	Candidate Number

Tuesday 7 January 2020

Morning (Time: 1 hour 30 minutes)	Paper Reference **4MB1/01R**

Mathematics B

Paper 1R

You must have: Ruler graduated in centimetres and millimetres, protractor, compasses, pen, HB pencil, eraser, calculator. 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.*
- **Calculators may be used**.

Information

- The total mark for this paper is 100.
- 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.
- Check your answers if you have time at the end.
- Without sufficient working, correct answers may be awarded no marks.

Turn over ▶

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1/1/1/1/

P 6 0 4 9 8 A 0 1 2 4

Pearson

Answer all TWENTY NINE questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1 Express $7\frac{1}{2}$ minutes as a fraction of 24 hours.

Give your answer in its simplest form.

First convert $7\frac{1}{2}$ minutes into hours

$7\frac{1}{2} \div 60 = 0.125$ hr

Next divide by 24 hours

$\frac{0.125}{24} = \frac{1}{192}$

$\frac{1}{192}$

(Total for Question 1 is 2 marks)

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2 The *n*th term of a sequence is given by the expression $2n^2 - 5$

Find the first term of the sequence and the third term of the sequence.

Substitute $n=1$ and $n=3$ into the nth term

$n=1$

$2(1)^2 - 5 = -3$

$n=3$

$2(3)^2 - 5 = 13$

First term = -3

Third term = 13

(Total for Question 2 is 2 marks)

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3 Solve $\frac{1}{x} - \frac{1}{3} = \frac{1}{2}$

$\frac{1}{x} - \frac{1}{3} = \frac{1}{2}$

$+\frac{1}{3}$ $+\frac{1}{3}$

$\frac{1}{x} = \frac{1}{2} + \frac{1}{3}$

$\frac{1}{x} = \frac{(3)1}{(3)2} + \frac{(2)1}{(2)3}$

$\frac{1}{x} = \frac{3}{6} + \frac{2}{6}$

$\frac{1}{x} = \frac{5}{6}$

$\square^{-1}$ $\square^{-1}$

$x = \frac{6}{5}$

$x = \frac{6}{5}$

(Total for Question 3 is 2 marks)

4 Factorise completely $2x^2 - 6xy + 5wx - 15wy$

Factorise the two parts of the equation separately and combine.

$2x^2 - 6xy = 2x(x - 3y)$

$5wx - 15wy = 5w(x - 3y)$

$2x(x-3y) + 5w(x-3y) = (2x+5w)(x-3y)$

$(2x+5w)(x-3y)$

(Total for Question 4 is 2 marks)

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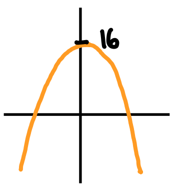
5 The function g where $g: x \mapsto 16 - x^2$ is defined for all values of x.
Write down

(i) the maximum value of g(x),



16

(ii) the range of g.

All the values $g(x)/y$ can take.

$g(x) \leq 16$

(Total for Question 5 is 2 marks)

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6 Find the value of $\dfrac{2 \times 10^{-98}}{16 \times 10^{50}}$

Give your answer in standard form.

Rules of indices:
$x^a \times x^b = x^{a+b}$
$x^a \div x^b = x^{a-b}$
$(x^a)^b = x^{ab}$

$\frac{2}{16} \times \frac{10^{-98}}{10^{50}} = \frac{1}{4} \times 10^{-98-50}$

$= 0.25 \times 10^{-148}$

$= 2.5 \times 10^{-149}$

2.5×10^{-149}

(Total for Question 6 is 2 marks)

7 Given that $y = \dfrac{x^4}{4} - \dfrac{4}{x^4}$

find $\dfrac{dy}{dx}$

This question requires you to differentiate once for the first derivative.

The general rule for differentiation is "bring down the power and subtract one from the power."

First rewrite y.

$y = \frac{1}{4}x^{4} - 4x^{-4}$

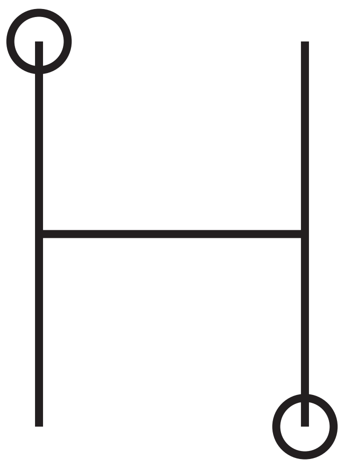
$\frac{dy}{dx} = (4)\frac{1}{4}x^{4-1} - (-4)4x^{-4-1}$

$\frac{dy}{dx} = x^3 + 16x^{-5}$

$\dfrac{dy}{dx} =$ $x^3 + 16x^{-5}$

(Total for Question 7 is 2 marks)

8



Write down

(a) the number of lines of symmetry of the figure,

A line of symmetry divides a shape into 2 identical halves.

0

(1)

(b) the order of rotational symmetry of the figure.

The number of times a shape appears identical during a 360° turn.

2

(1)

(Total for Question 8 is 2 marks)

9 Find the range of values of x for which

$$x - 10 < 3x + 4 \leqslant 20 - 5x$$

$x - 10 < 3x + 4$

$-10 < 2x + 4$

$-14 < 2x$

$-7 < x$

$3x + 4 \leqslant 20 - 5x$

$8x + 4 \leqslant 20$

$8x \leqslant 16$

$x \leqslant 2$

$-7 < x \quad x \leqslant 2$

(Total for Question 9 is 3 marks)

---

10 A factory produces 2500 plates. There are large plates and small plates.

There are 800 large plates which have a mean weight of 600 grams.
The small plates have a mean weight of 450 grams.

Calculate the mean weight, in grams, of all 2500 plates.

The equation for mean: mean = sum of weights ÷ number of plates

To find the mean weight of all 2500 plates, find the total weight of both the large and small plates and divide by 2500.

Weight of large plates:

$\frac{\text{total weight}}{800} = 600$

total weight $= 600 \times 800$

$= 480{,}000\text{g}$

Weight of small plates:

$\frac{\text{total weight}}{2500 - 800} = 450$

$\frac{\text{total weight}}{1700} = 450$

total weight $= 765{,}000$

Mean weight of all plates:

$\frac{480{,}000 + 765{,}000}{2500} = 498\text{g}$

498 grams

(Total for Question 10 is 3 marks)

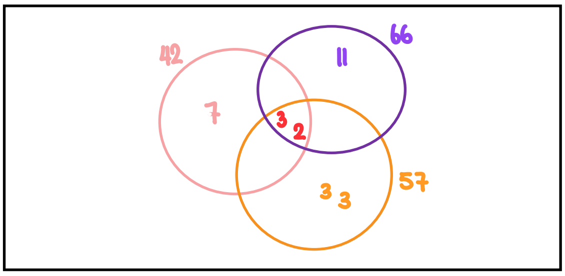
P 6 0 4 9 8 A 0 5 2 4

11 Find, showing your working clearly,

(i) the lowest common multiple (LCM) of 42, 54 and 66

(ii) the highest common factor (HCF) of 42, 54 and 66

You can find both the LCM and HCF from a prime factor Venn diagram.



(i) The LCM is the product of all prime factors:

LCM = 11 × 3×2 × 3×3 × 7
= 4158

(ii) The HCF is the product of only the common prime factors.

HCF = 3×2
= 6

(i) LCM = 4158

(ii) HCF = 6

(Total for Question 11 is 3 marks)

---

12 During a week, 500 trains will arrive at a station.
Each train will be late, on time or early.
The probability of a train arriving late is 0.85
The probability of a train arriving on time is 0.07

Calculate an estimate for the number of trains that will arrive early during the week.

First calculate the probability of a train arriving early.

1 − 0.85 − 0.07 = 0.08

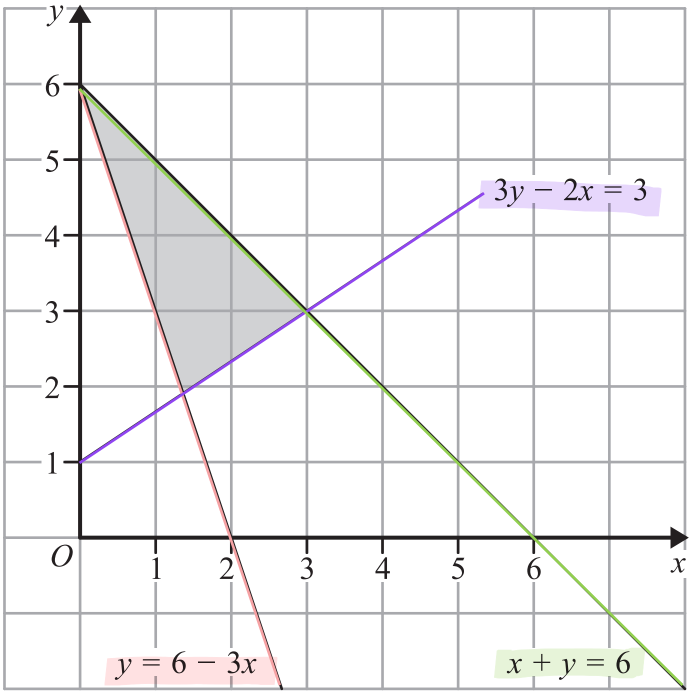
Next calculate the number of early trains.

500 × 0.08 = 40

40 trains

(Total for Question 12 is 3 marks)

13



Write down the three inequalities that define the shaded region in the diagram.

The shaded region is above the line $3y-2x=3$ so $3y-2x \geq 3$

The shaded region is below the solid line $x+y=6$ so $x+y \leq 6$

The shaded region is above the solid line $y=6-3x$ so $y \geq 6-3x$

$3y-2x \geq 3$

$x+y \leq 6$

$y \geq 6-3x$

(Total for Question 13 is 3 marks)

14

$$P = \{ a, b, c, d \}$$

Write down all of the subsets of P that have 2 elements.

a	b	c	d
a	b	~~c~~	~~d~~
a	~~b~~	c	~~d~~
a	~~b~~	~~c~~	d
~~a~~	b	c	~~d~~
~~a~~	b	~~c~~	d
~~a~~	~~b~~	c	d

$\{a,b\}, \{a,c\}, \{a,d\}, \{b,c\}, \{b,d\}, \{c,d\}$

(Total for Question 14 is 3 marks)

15 Simplify fully $\frac{x}{6}(7x - 3) - \frac{x}{3}(5x - 9)$

$$\frac{x}{6}(7x-3)-\frac{x}{3}(5x-9)=\left(\frac{7x^2}{6}-\frac{3x}{6}\right)+\left(-\frac{5x^2}{3}+\frac{9x}{3}\right)$$

$$=\frac{7x^2-3x}{6}+\frac{-5x^2+9x}{3}$$

$$\times\frac{2}{2}$$

$$=\frac{7x^2-3x}{6}+\frac{-10x^2+18x}{6}$$

$$=\frac{-3x^2+15x}{6}$$

$$=\frac{\cancel{3}(-x^2+5x)}{\cancel{3}(2)}$$

$$=\frac{-x^2+5x}{2}$$

$\frac{-x^2+5x}{2}$

(Total for Question 15 is 3 marks)

---

16 *ABCD* is a rectangle with perimeter 28 m.

The length of *AB* is 8 m.

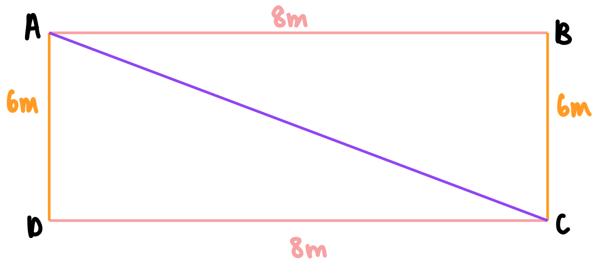
Calculate the length, in m, of the diagonal *AC* of the rectangle.

$AD + BC = 28 - 2(8)$

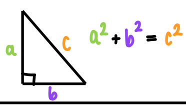
$AD + BC = 12$

$AD = 6m$

$BC = 6m$



Pythagoras's theorem:



$AD^2 + BC^2 = AC^2$

$6^2 + 8^2 = AC^2$

$\sqrt{6^2 + 8^2} = AC$

$10 = AC$

10 m

(Total for Question 16 is 3 marks)

17

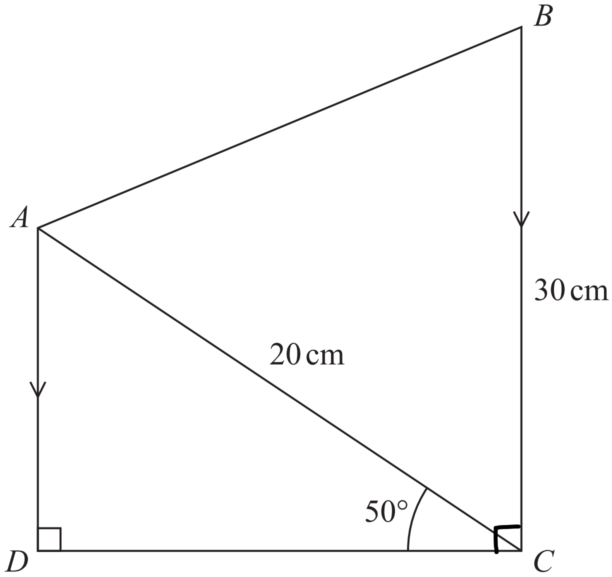


Diagram **NOT** accurately drawn

The diagram shows the trapezium *ABCD* in which *AD* and *BC* are parallel.

$AC = 20$ cm $\quad BC = 30$ cm $\quad \angle ACD = 50°$ $\quad \angle ADC = 90°$

Calculate the area, in cm^2 to 3 significant figures, of the trapezium *ABCD*.

Area of a triangle = $\frac{1}{2}ab\sin C$

Here you can first find $\angle ACB$.

$90 - 50 = \angle ACB$

$40 = \angle ACB$

Next find the Area of triangle 1 using $\frac{1}{2}ab\sin C$.

where $a = 20$, $b = 30$, $C = 40$

Area of triangle 1 $= \frac{1}{2} \times 20 \times 30 \times \sin 40$

$= 192.83...$

Next find DC using $S^O_H C^A_H T^O_A$. Since we have an angle $\angle DCA$ and hypotenuse AC and want to find the adjacent, use $\cos\theta = \frac{\text{adjacent}}{\text{hypotenuse}}$

where $\theta = 50°$, $A = DC$, $H = 20$

$\cos 50 = \frac{DC}{20}$

$12.85... = DC$

Now find the area of triangle 2 using $\frac{1}{2}ab\sin C$

where $a = 20$, $b = 12.8...$, $C = 50$

Area of triangle 2 $= \frac{1}{2} \times 20 \times 12.8... \times \sin 50$

$= 98.48...$

Combine for total area

$192.83... + 98.48... = 291.31...$

≈ 291 cm^2

..........291.......... cm^2

(Total for Question 17 is 3 marks)

18 Express $\dfrac{\sqrt{35}+3\sqrt{5}-2\sqrt{7}-6}{\sqrt{5}-2}$

in the form $m+\sqrt{n}$, where m and n are integers.
Show your working clearly.

This questions requires you to rationalise the denominator and then simplify.

$$\frac{\sqrt{35}+3\sqrt{5}-2\sqrt{7}-6}{\sqrt{5}-2}\times\frac{\sqrt{5}+2}{\sqrt{5}+2}$$

$$=\frac{5\sqrt{7}+15-2\sqrt{35}-6\sqrt{5}+2\sqrt{35}+6\sqrt{5}-4\sqrt{7}-12}{5-2\sqrt{5}+2\sqrt{5}-4}$$

$$=\frac{\sqrt{7}+3}{1}$$

$$=\sqrt{7}+3$$

$\sqrt{7}+3$

(Total for Question 18 is 3 marks)

19 Given that 1 mile = 1.609 kilometres and 1 gallon = 4.546 litres,

change 35 miles per gallon into litres per 100 kilometres.
Give your answer correct to 3 significant figures.

First convert 35 miles per gallon to gallons per mile by using the inverse.

$$\left(\frac{35 \text{ miles}}{1 \text{ gallon}}\right)^{-1} = \frac{1 \text{ gallon}}{35 \text{ miles}} = 1 \text{ gallon per } 35 \text{ miles}$$

Now convert to litres and km

$$\frac{1 \text{ gallon} \times 4.546}{35 \text{ miles} \times 1.609} = \frac{4.546 \text{ litres}}{56.315 \text{ km}}$$

Now convert to the form n litres : 100 km

$$\times \frac{100}{56.315} \left(\begin{array}{c} 4.546 : 56.315 \\ 8.072... : 100\text{km} \end{array} \right) \times \frac{100}{56.315}$$

8.072... litres ≈ 8.07 litres

8.07 litres per 100 kilometres

(Total for Question 19 is 4 marks)

DO NOT WRITE IN THIS AREA

P 6 0 4 9 8 A 0 1 1 2 4

20 $\mathbf{A} = \begin{pmatrix} -2 & 3 \\ 5 & -7 \end{pmatrix}$

(a) Find $\mathbf{A}^2$

Rule for multiplying a 2×2 matrix by a 2×2 matrix:

$$\begin{pmatrix} a_1 & b_1 \\ c_1 & d_1 \end{pmatrix}\begin{pmatrix} a_2 & b_2 \\ c_2 & d_2 \end{pmatrix} = \begin{pmatrix} a_1a_2+b_1c_2 & a_1b_2+b_1d_2 \\ c_1a_2+d_1c_2 & c_1b_2+d_1d_2 \end{pmatrix}$$

$$\begin{pmatrix} -2 & 3 \\ 5 & -7 \end{pmatrix}\begin{pmatrix} -2 & 3 \\ 5 & -7 \end{pmatrix} = \begin{pmatrix} -2(-2)+3(5) & -2(3)+3(-7) \\ 5(-2)+-7(5) & 5(3)+-7(-7) \end{pmatrix}$$

$$= \begin{pmatrix} 4+15 & -6-21 \\ -10-35 & 15+49 \end{pmatrix}$$

$$= \begin{pmatrix} 19 & -27 \\ -45 & 64 \end{pmatrix}$$

$$\begin{pmatrix} 19 & -27 \\ -45 & 64 \end{pmatrix}$$

(2)

$\mathbf{B} = \begin{pmatrix} -1 & 2 \\ -3 & 5 \\ 4 & -3 \end{pmatrix}$

(b) Find **BA**

$$\begin{pmatrix} -1 & 2 \\ -3 & 5 \\ 4 & -3 \end{pmatrix}\begin{pmatrix} -2 & 3 \\ 5 & -7 \end{pmatrix} = \begin{pmatrix} (-1)(-2)+(2)(5) & (-1)(3)+(2)(-7) \\ (-3)(-2)+(5)(5) & (-3)(3)+(5)(-7) \\ (4)(-2)+(-3)(5) & (4)(3)+(-3)(-7) \end{pmatrix}$$

$$= \begin{pmatrix} 12 & -17 \\ 31 & -44 \\ -23 & 33 \end{pmatrix}$$

$$\begin{pmatrix} 12 & -17 \\ 31 & -44 \\ -23 & 33 \end{pmatrix}$$

(2)

(Total for Question 20 is 4 marks)

21 The weights of 710 passengers boarding buses at a bus station were recorded.

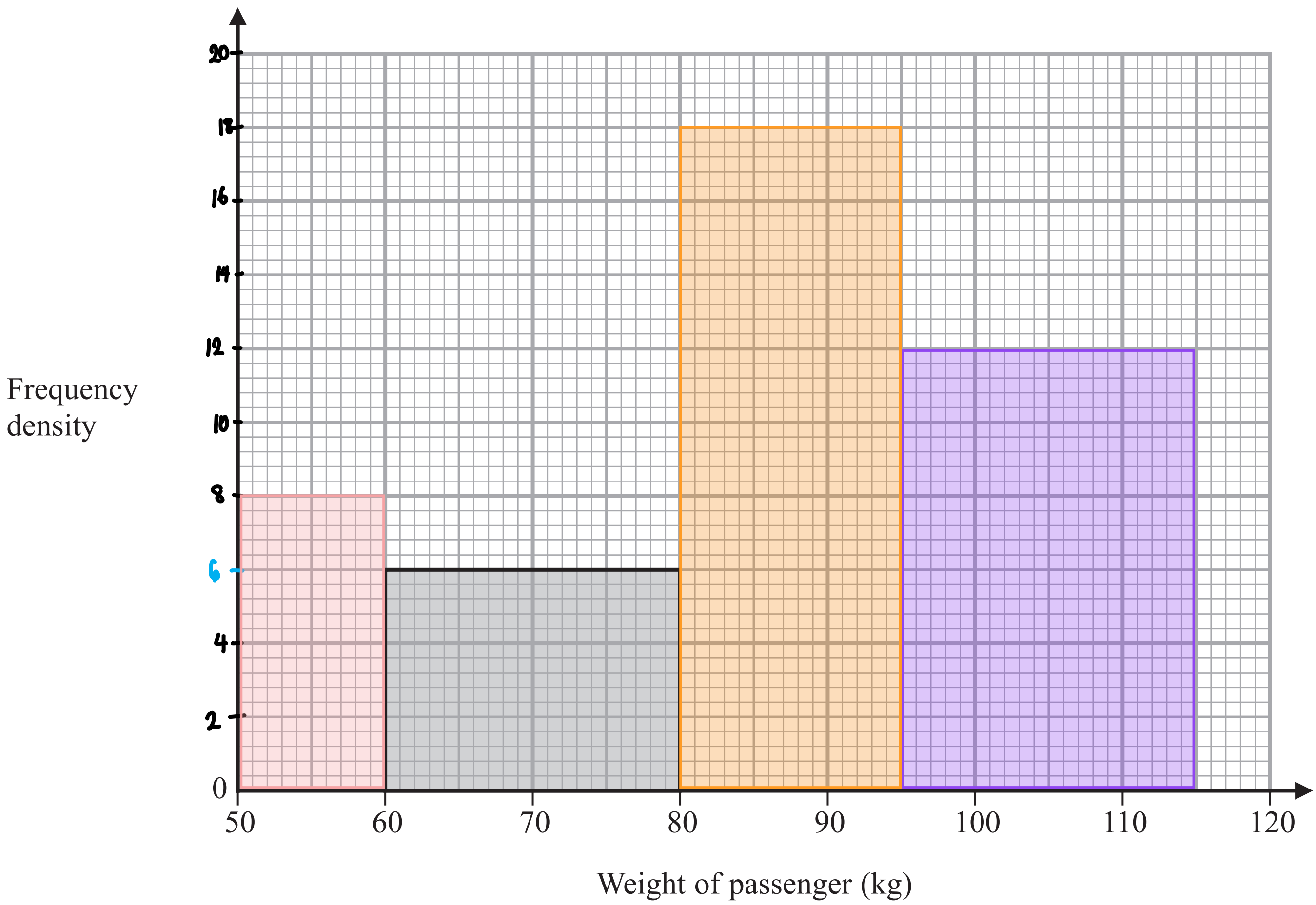
The incomplete table and histogram give information about these passengers.

Weight of passenger (w kg)	Number of passengers	Class width	frequency density = $\frac{\text{frequency}}{\text{class width}}$
$50 \leqslant w < 60$	80	10	$\frac{80}{10} = 8$
$60 \leqslant w < 80$	120	20	$\frac{120}{20} = 6$
$80 \leqslant w < 95$	270	15	$\frac{270}{15} = 18$
$95 \leqslant w < 115$	240	20	$\frac{240}{20} = 12$

(a) Complete the table.   total : 710

(1)

(b) Complete the histogram.



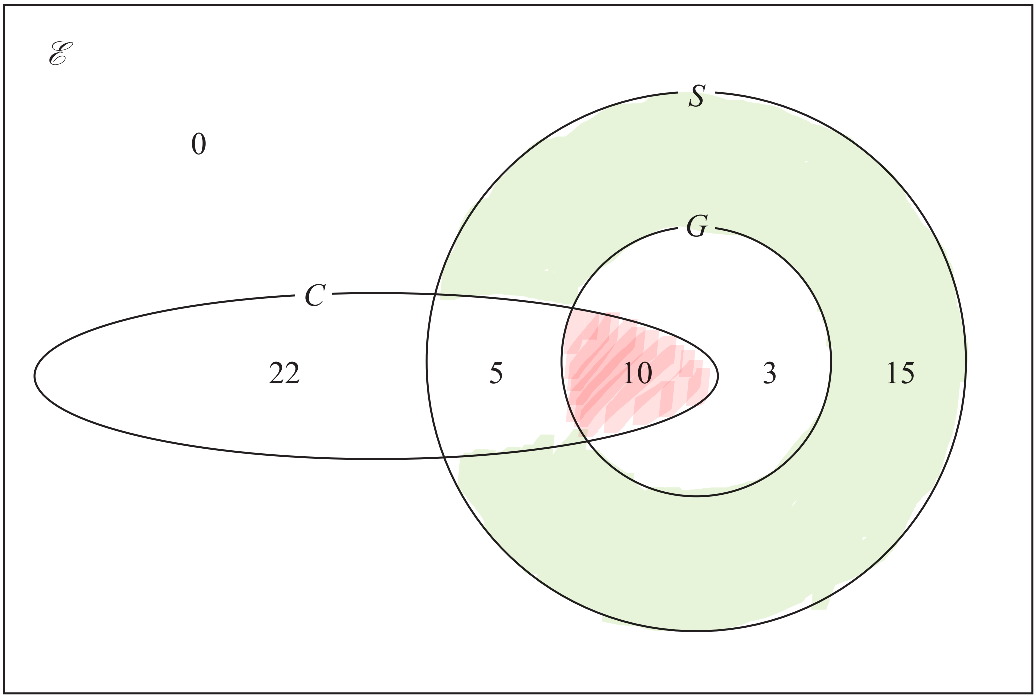
(3)

(Total for Question 21 is 4 marks)

P 6 0 4 9 8 A 0 1 3 2 4

22 In a survey of 55 farmers who keep animals, the numbers of farmers who keep cattle (C), goats (G) and sheep (S) were recorded.

The Venn diagram shows information about the results of the survey.
The numbers shown in the Venn diagram are the **number** of farmers in the given subset of $\mathscr{E}$.



(a) (i) Find $n(C \cap G \cap S)$

10

(ii) Describe the members of the subset $C \cap G \cap S$

Farmers who keep cattle, sheep and goats

(2)

(b) (i) Find $n(C' \cap G' \cap S)$

15

(ii) Describe the members of the subset $C' \cap G' \cap S$

Farmers who keep sheep but not goats and not cattle

(2)

(Total for Question 22 is 4 marks)

23 A particle is dropped from rest and falls a distance of s metres in time t seconds.

In the first 4 seconds after it has been dropped, the particle falls a distance of 96 metres.

At time 5 seconds after it has been dropped, the particle is at the point A.
At time 6 seconds after it has been dropped, the particle is at the point B.

Given that s is directly proportional to the cube of t,

calculate, in metres, the distance AB.

$s = kt^3$

First find the value of k

$k = \frac{s}{t^3}$

$k = \frac{96}{(4)^3}$

$k = \frac{3}{2}$

Next find the distance after 5 and 6 seconds

$s = \frac{3}{2} \times (5)^3$

$= 187.5\text{m}$

$s = \frac{3}{2} \times (6)^3$

$= 324\text{m}$

Find distance AB

$324 - 187.5 = 136.5\text{m}$

136.5 m

(Total for Question 23 is 4 marks)

24 The scale of a map is 1 : 40 000
The actual area of a field is 2.4 km^2

(a) Calculate the area, in cm^2, of the field on the map.

Cube root volume scale factor
Square root area scale factor
Length Scale Factor
Area scale factor
Square length scale factor
Cube length scale factor
Volume scale factor

$\times 40{,}000$
$1 : 40{,}000$
$1.5 \times 10^{-9}\ \text{km}^2 : 2.4\ \text{km}^2$
$\div (40{,}000)^2$

$\text{km} \xrightarrow{\times 10^5} \text{cm}$
$\text{km}^2 \xrightarrow{\times 10^{10}} \text{cm}^2$
$1.5 \times 10^{-9} \times 10^{10} = 1.5\ \text{cm}^2$

..........1.5.......... cm^2
(3)

Given that n is an integer, the scale of another map is 1 : n
The length of a road shown on this map is 8 cm.
The actual length of this road is 2 km.

(b) Find the value of n.

First convert 2km to cm

$\times 100{,}000$
km : cm
2km : 200,000 cm

Now, write as a ratio and divide by the same number for 1:n format.

map : actual
8cm : 200,000cm
$\div 8$ 1 : 25,000 $\div 8$

n = ..25,000..........
(2)

(Total for Question 24 is 5 marks)

25 Given that $w = \sqrt{\dfrac{x - y - 3w^2}{5x + y - 1}}$

express x in terms of y and w.
Give your answer as a single fraction.

$$w = \sqrt{\frac{x-y-3w^2}{5x+y-1}}$$

$\square^2$ $\square^2$

$$w^2 = \frac{x-y-3w^2}{5x+y-1}$$

$\times(5x+y-1)$ $\times(5x+y-1)$

$$w^2(5x+y-1) = x-y-3w^2$$

Expand

$$5xw^2+yw^2-w^2 = x-y-3w^2$$

$+3w^2$ $+3w^2$

$$5xw^2+yw^2+2w^2 = x-y$$

$+y$ $+y$

$$5xw^2+yw^2+2w^2+y = x$$

$-5xw^2$ $-5xw^2$

$$yw^2+2w^2+y = x-5xw^2$$

factorise

$$yw^2+2w^2+y = x(1-5w^2)$$

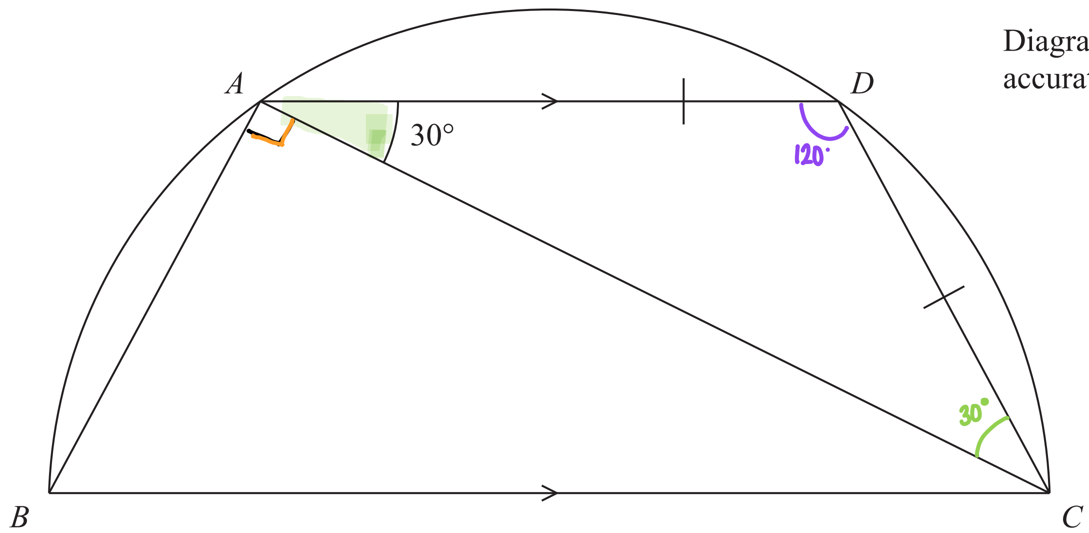
$\div 1-5w^2$ $\div 1-5w^2$

$$\frac{yw^2+2w^2+y}{1-5w^2} = x$$

$x = \dfrac{yw^2+2w^2+y}{1-5w^2}$

(Total for Question 25 is 5 marks)

26



The diagram shows part of a circle through the points A, B, C and D.

AD is parallel to BC, $AD = DC$ and $\angle CAD = 30°$

Giving your reasons, prove that BC is a diameter of the circle.

Opposite angles in an isoceles triangle are equal.
$\angle ACD = \angle CAD$
$\angle CAD = 30°$

Angles in a triangle add to 180°.
$\angle ADC = 180 - 30 - 30$
$\angle ADC = 120°$

Opposite angles in a trapezium are equal.
$\angle DAB = 120$

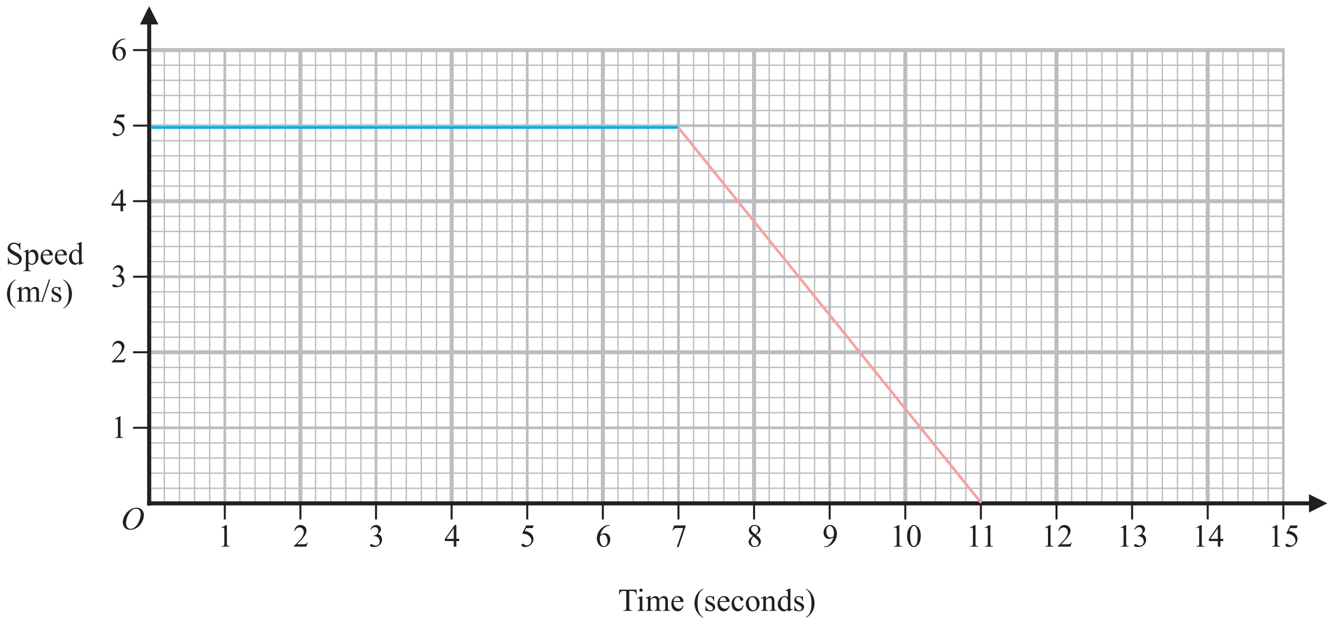
$\angle BAC = \angle DAB - \angle CAD$
$\angle BAC = 120 - 30$
$\angle BAC = 90°$
The opposite angle to the diamater of a semi-circle is 90° so BC is a diameter.

(Total for Question 26 is 5 marks)

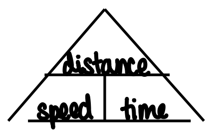
27 At time $t = 0$ seconds, a cyclist passed the point P on a straight horizontal road. The cyclist was moving with a constant speed of 5 m/s. The cyclist travelled a distance of 35 m at this speed to the point Q on the road.

On reaching Q, the cyclist decelerated at a constant rate, coming to rest at the point R on the road such that PQR is a straight line and $QR = 10$ m.

Represent, on the grid, the information for the journey of the cyclist from P to R as a speed-time graph.



First find the time taken to travel 35m and 5m/s

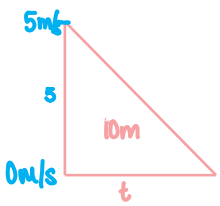


$t = \frac{d}{s}$

$t = \frac{35}{5}$

$t = 7s$

Since you know the distance travelled and that the area under the graph represents distance, you can work backwards from area to find time.



$\frac{1}{2} \times$ base $\times$ height = area of triangle

$\frac{1}{2} \times t \times 5 = 10$

$\frac{5}{2} \times t = 10$

$t = 4s$

(Total for Question 27 is 5 marks)

P 6 0 4 9 8 A 0 1 9 2 4

Turn over

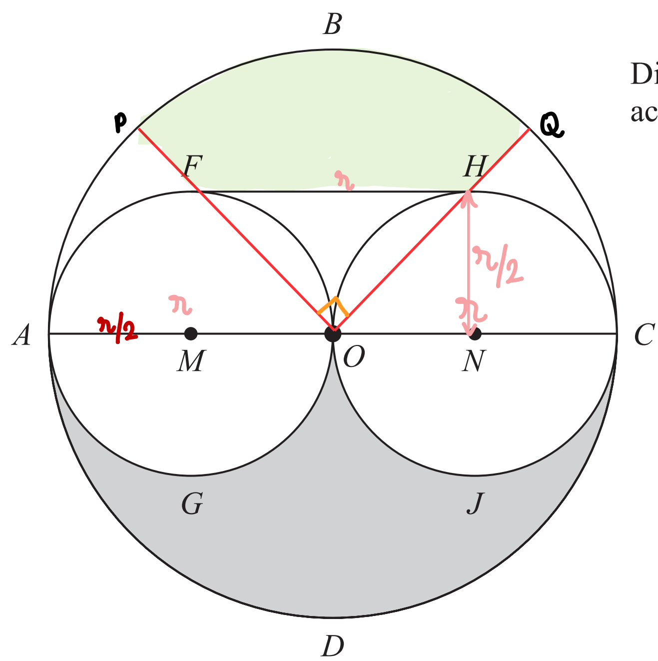


Diagram **NOT** accurately drawn

The diagram shows circle *ABCD* with centre *O*, diameter *AMONC* and radius *r*.

The diagram also shows circle *AFOG*, with centre *M*, and circle *OHCJ*, with centre *N*.

(a) Find and simplify an expression, in terms of *r* and π, for the perimeter of the shaded region in the diagram.

Perimeter of a circle $= 2\pi r$

① Find perimeter of semicircle ADC

$ADC = 2\pi(r) \times \frac{1}{2}$

$ADC = \pi r$

② Find perimeter of semi-circle AGO.

$\Delta AFOG = \Delta OHCJ$

$AGO = \frac{1}{2} \times 2\pi\left(\frac{r}{2}\right)$

$AGO = \frac{\pi r}{2}$

$OJC = \frac{\pi r}{2}$

③ Add for perimeter of shaded region.

$\pi r + \frac{\pi r}{2} + \frac{\pi r}{2} = 2\pi r$

$2\pi r$

(3)

The line FH is the tangent to the circle $AFOG$ at the point F.
The line FH is also the tangent to the circle $OHCJ$ at the point H.

The point P on circle $ABCD$ is such that OFP is a straight line.
The point Q on circle $ABCD$ is such that OHQ is a straight line.

The region $FPBQH$ inside circle $ABCD$ is bounded by the straight line FP, the arc PBQ of circle $ABCD$ and the two straight lines QH and HF.

(b) Find and simplify an expression, in terms of r and π, for the area of $FPBQH$.

(a) You can find the area of FPBQH by first find the area of sector POQ and subtracting the area of triangle FOH.

Area of sector POQ:

Area of a sector $= \pi r^2 \times \frac{\text{Sector angle}}{360}$

$POQ = \pi \times (r)^2 \times \frac{90}{360}$

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

Area of FOH:

Area of a triangle $= \frac{1}{2} \times \text{base} \times \text{height}$

$FOH = \frac{1}{2} \times r \times \frac{r}{2}$

$FOH = \frac{1}{4}r^2$

Area FPBQH:

$FPBQH = \frac{1}{4}\pi r^2 - \frac{1}{4}r^2$

$= \frac{1}{4}r^2(\pi - 1)$

$\frac{1}{4}r^2(\pi-1)$

(4)

(Total for Question 28 is 7 marks)

29

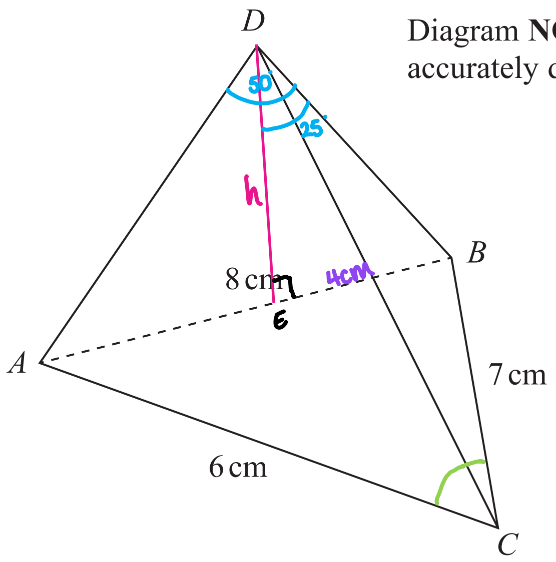


Diagram **NOT** accurately drawn

The diagram shows a pyramid *ABCD* with a horizontal triangular base *ABC*.
The face *ADB* of the pyramid is perpendicular to the base *ABC*.
In $\triangle ABC$, $AB = 8$ cm, $BC = 7$ cm and $CA = 6$ cm.

(a) Calculate the size, in degrees to 3 significant figures, of $\angle ACB$.

You can use cosin to find $\angle ACB$.

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

where $a = 8cm$

$b = 7cm$

$c = 6cm$

$A = \angle ABC$

$$\cos \angle ABC = \frac{(7)^2 + (6)^2 - (8)^2}{2(7)(6)}$$

$$\angle ABC = \cos^{-1}\left(\frac{(7)^2 + (6)^2 - (8)^2}{2(7)(6)}\right)$$

$= 75.522$

$\approx 75.5°$

$\angle ACB =$ ....75.5.......... °

(3)

P 6 0 4 9 8 A 0 2 2 2 4

In $\triangle ADB$, $AD = DB$ and $\angle ADB = 50°$

(b) Calculate the volume, in cm^3 to 3 significant figures, of the pyramid $ABCD$.

Volume of a pyramid $= \frac{1}{3} \times$ Base Area $\times$ height

∴ To find the total volume of the pyramid, you need the base area and the height.
To find the base area of $\triangle ABC$, you can use the equation for area using sin.

Area of a triangle $= \frac{1}{2} ab\sin C$

where $a = 6$cm
$b = 7$cm
$C = 75.522...$

$$\triangle ABC = \frac{1}{2} \times (6) \times (7) \times \sin(75.522..)$$
$$= 20.33...$$

To find the height, h, you can use trigonometry with triangle EDB.
Since you know the angle and the opposite and you want to find the adjacent, you can use tan.

$$\tan\theta = \frac{\text{opposite}}{\text{adjacent}}$$

where $\theta = 25$
$O = 4$cm
$A = h$

$$\tan 25 = \frac{4}{h}$$

$$h = \frac{4}{\tan 25}$$

$$h = 8.5780..$$

Volume of pyramid $= \frac{1}{3} \times 20.33... \times 8.570...$
$= 58.1394...$
≈ 58.1 cm^3

58.1 .... cm^3

(4)

(Total for Question 29 is 7 marks)

TOTAL FOR PAPER IS 100 MARKS

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