

Please check the examination details below before entering your candidate information

Candidate surname mel @justmaths.co.uk		Other names
Centre Number	Candidate Number	
Pearson Edexcel Level 1/Level 2 GCSE (9–1)		
Wednesday 6 November 2024		
Morning (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 or B pencil, eraser, 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 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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Answer ALL questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1 Work out $818.4 \div 1.2$

$$\begin{array}{r} 818.4 \\ \times 10 \\ \hline 8184 \end{array} \quad \begin{array}{r} 1.2 \\ \times 10 \\ \hline 12 \end{array} = \begin{array}{r} 8184 \\ \times 12 \\ \hline \end{array}$$

12.
24.
36.
48.
60.
72.
84.
96.

$$\begin{array}{r} 0682 \\ 12 \overline{) 8184} \\ \underline{88} \\ 81 \\ \underline{84} \\ 4 \end{array}$$

682

(Total for Question 1 is 3 marks)



- 2 The table shows the probabilities that a biased dice will land on 3, on 4, on 5 and on 6

Number on dice	1	2	3	4	5	6
Probability	0.15	0.15	0.10	0.30	0.05	0.25

~ same ↑

Karim assumes that the probabilities that the dice will land on 1 and on 2 are the same.

Karim rolls the biased dice 500 times.

- (a) Assuming Karim is right, work out an estimate for the number of times the dice will land on 2

$$0.1 + 0.3 + 0.05 + 0.25 = 0.7$$

$$1 - 0.7 = 0.3$$

if 1 and 2 are the same $0.3 \div 2 = 0.15$

Land on a 2 is 15% of 500 = 50 + 25

$$10\% = 50$$

$$5\% = 25$$

75

(3)

Karim is wrong.

The probability that the dice will land on 2 is greater than the probability that the dice will land on 1

- (b) How does this information affect your answer to part (a)?

My answer would be greater than 75

(1)

(Total for Question 2 is 4 marks)



- 3 (a) Work out $3\frac{1}{2} - 1\frac{1}{6}$

Give your answer as a mixed number.

$$3\frac{1}{2} = \frac{7}{2}$$

$$\frac{7}{2} - \frac{7}{6}$$

$$1\frac{1}{6} = \frac{7}{6}$$

$$= \frac{21}{6} - \frac{7}{6} = \frac{14}{6}$$

$$\frac{7}{2} \begin{matrix} \times 3 \\ = \\ \times 3 \end{matrix} \frac{21}{6}$$

$$\frac{14}{6} = 2\frac{2}{6}$$

$$2\frac{2}{6} \text{ or } 2\frac{1}{3}$$

(2)

- (b) Show that $5\frac{1}{4} \div 2\frac{1}{3} = 2\frac{1}{4}$

$$5\frac{1}{4} = \frac{21}{4} \quad 2\frac{1}{3} = \frac{7}{3}$$

$$\frac{21}{4} \div \frac{7}{3}$$

$$= \frac{21}{4} \times \frac{3}{7} = \frac{63}{28}$$

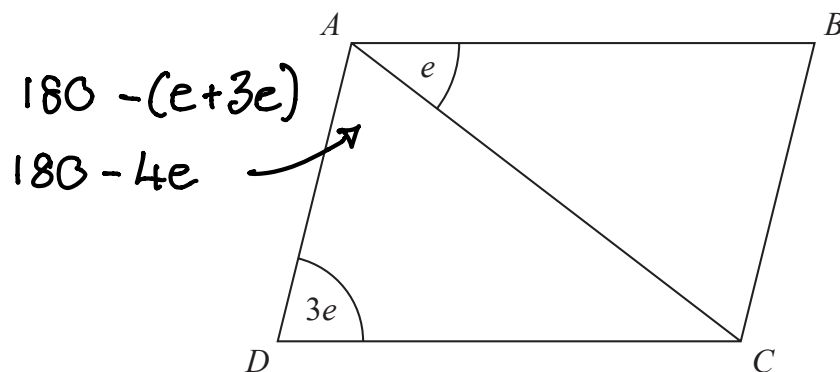
$$\frac{63}{28} \div 7 = \frac{9}{4} \text{ and } \frac{9}{4} = 2\frac{1}{4}$$

(3)

(Total for Question 3 is 5 marks)



4 $ABCD$ is a parallelogram.



All angles are measured in degrees.

Find an expression, in terms of e , for the size of angle CAD .
Give a reason for each stage of your working.

$$\begin{aligned}\angle CAD &= 180 - (e + 3e) \\ &= 180 - 4e\end{aligned}$$

Co-interior angles add up to 180°
(so $\angle BAC + \angle CAD + \angle ADC = 180$)

$$180 - 4e$$

(Total for Question 4 is 3 marks)



5 A car travelled 4.96 miles at an average speed of 30.4 miles per hour.

- (a) Work out an estimate for the time taken by the car.
Give your answer in minutes.

$$4.96 \rightarrow 5 \text{ miles}$$

$$30.4 \rightarrow 30$$

$$30 \text{ miles} = 1 \text{ hour}$$

$$30 \text{ miles} = 60 \text{ minutes}$$

$$\div 6$$

$$\div 6$$

$$5 \text{ miles} = 10 \text{ minutes}$$

10 minutes
(3)

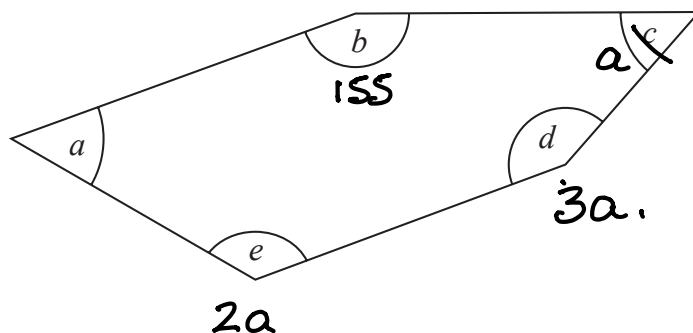
- (b) Is your answer to part (a) an underestimate or an overestimate?
Give a reason for your answer.

An overestimate, the car would actually travel further than 30 miles in 1 hour (30.4) and 10 minutes relates to travelling 5 miles not 4.96 which would take less time
(1)

(Total for Question 5 is 4 marks)



6 Here is a pentagon.



Angle a = angle c

Angle $b = 155^\circ$

Angle d is three times the size of angle c so $d = 3a$

Angle e is two times the size of angle c

so $e = 2a$

Work out the size of angle a

$$3 \text{ sides} = 180$$

$$4 \text{ sides} = 360$$

$$5 \text{ sides} = 540$$

$$540 = a + 155 + a + 3a + 2a$$

$$540 = 7a + 155$$

$$7a + 155 = 540$$

$$\begin{array}{r} 7a + 155 = 540 \\ -155 \quad -155 \\ \hline \end{array}$$

$$7a = 385$$

$$a = \frac{385}{7}$$

$$a = 55$$

$$\begin{array}{r} 540 \\ -155 \\ \hline 385 \end{array}$$

$$\begin{array}{r} 55 \\ 7 \overline{) 385} \\ \underline{35} \\ 35 \\ \underline{35} \\ 0 \end{array}$$

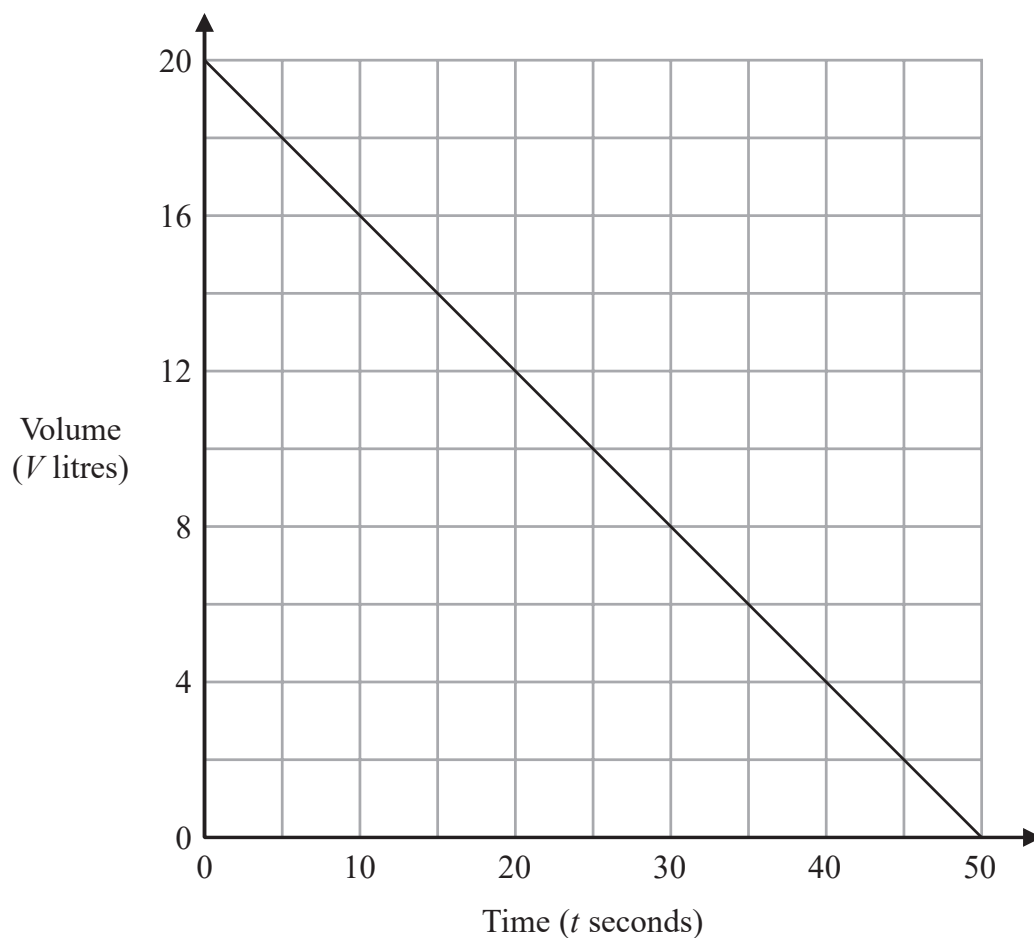
55

(Total for Question 6 is 4 marks)



P 7 5 1 5 8 A 0 7 2 4

- 7 The graph shows the volume of water, V litres, in a tank at time t seconds.

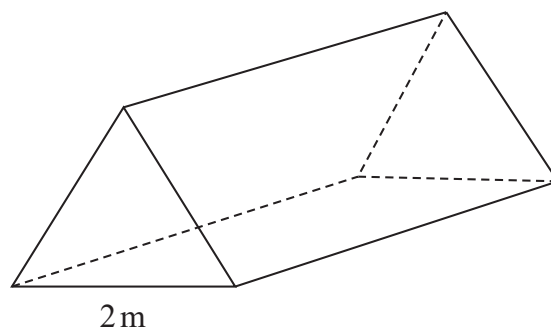


What does the gradient of this graph represent?

The rate at which the water leaves the tank.
in litres per second.

(Total for Question 7 is 1 mark)

- 8 The diagram shows a solid triangular prism on a horizontal floor.



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

The face in contact with the floor is a rectangle of width 2 m.

The pressure on the floor due to the prism is 80 newtons/m²

The force exerted by the prism on the floor is 720 newtons.

Work out the length of the prism.

$$\text{Pressure} = 80 \text{ N/m}^2$$

$$\text{Force} = 720 \text{ N}$$

$$\text{Area} = ?$$

$$80 = \frac{720}{\text{Area}}$$

$$\begin{aligned} \text{so Area} &= \frac{720}{80} \\ &= 9 \text{ m}^2 \end{aligned}$$

$$\text{Area} = 2 \times \text{length}$$

$$9 = 2 \times \text{length}$$

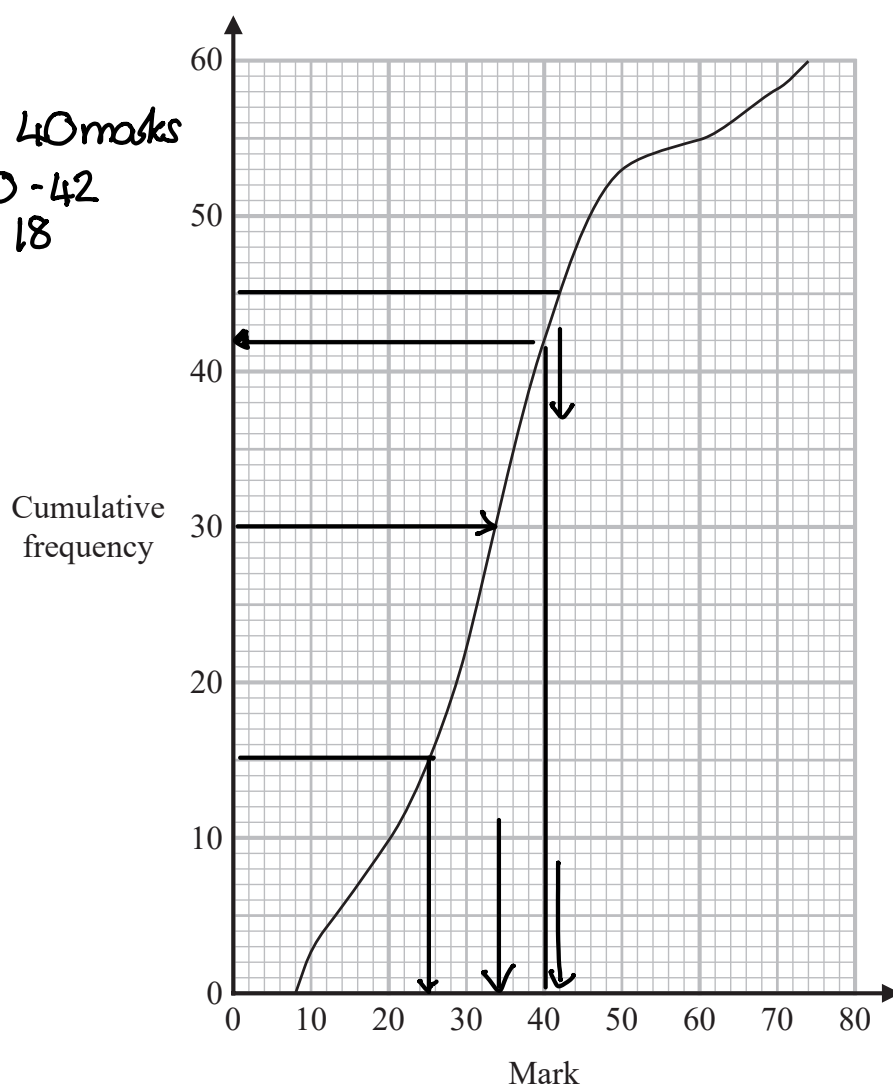
$$\begin{aligned} \text{so length} &= 9 \div 2 \\ &= 4.5 \end{aligned}$$

$$4.5 \text{ m}$$

(Total for Question 8 is 3 marks)

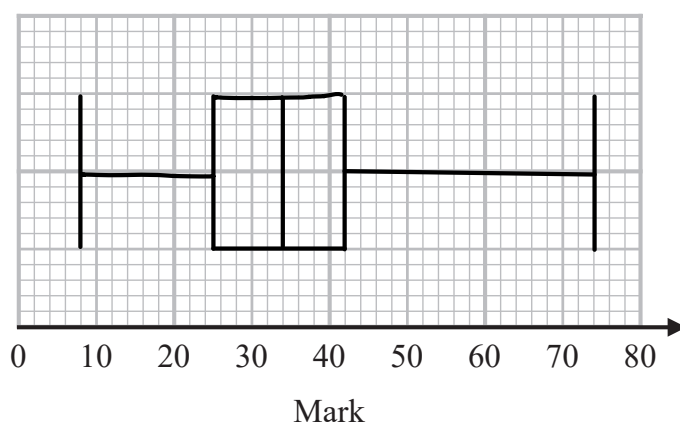
- 9 The cumulative frequency graph gives information about the marks that 60 students got in a test.

$$\begin{aligned} \text{over 40 marks} \\ &= 60 - 42 \\ &= 18 \end{aligned}$$



For these 60 students
the highest mark was 74
the lowest mark was 8

- (a) On the grid below, draw a box plot for the distribution of the marks.



(3)



The pass mark for the test was 40

Sian says,

“30% of the 60 students passed the test.”

(b) Is Sian correct?

You must show how you get your answer.

$$60 - 42 = 18 \text{ from graph}$$

$$30\% \text{ of } 60 = 18$$

Sian is correct.

(3)

(Total for Question 9 is 6 marks)

10 (a) Work out $25^{\frac{1}{2}} \times 8^{\frac{1}{3}}$

$$25^{\frac{1}{2}} = \sqrt{25} = 5$$

$$5 \times 2 = 10$$

$$8^{\frac{1}{3}} = \sqrt[3]{8} = 2$$

10

(2)

(b) Find the value of $\left(\frac{1}{32}\right)^{\frac{3}{5}}$

$$\left(\sqrt[5]{\frac{1}{32}}\right)^3 = \left(\frac{1}{2}\right)^3$$

$$\sqrt[5]{32} = 2 \quad = \frac{1^3}{2^3}$$

$$= \frac{1}{8}$$

$\frac{1}{8}$

(2)

(Total for Question 10 is 4 marks)



P 7 5 1 5 8 A 0 1 1 2 4

11 Kate was asked to factorise $x^2 + 5x + 6$ in the form $(x + a)(x + b)$

Kate says,

“The sum of a and b must be 6 and the product of a and b must be 5”

(a) Explain what is wrong with Kate's statement.

The sum of a and b must be 5 and the product must be 6

(1)

(b) Factorise fully $2m^2 - 2$

$$2(m^2 - 1)$$

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

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

(2)

(c) Factorise fully $ax + bx - ay - by$

$$x(a + b) - y(a + b)$$

$$= (a + b)(x - y)$$

$$(a + b)(x - y)$$

(2)

(Total for Question 11 is 5 marks)



12 A, B and C are three solid spheres.

Sphere A has a volume of 64 cm^3

Sphere B has a volume of 125 cm^3

$$\begin{array}{ccc} & \text{A} & \text{B} & \text{C} \\ V & 64 \text{ cm}^3 & 125 \text{ cm}^3 & \end{array}$$

The radius of sphere C is 50% of the radius of sphere B.

Work out the ratio of the surface area of sphere A to the surface area of sphere C.

Give your answer in the form $a:b$ where a and b are integers.

$$\text{Volume SF } A \rightarrow B = \frac{125}{64}$$

$$\text{so Length SF } A \rightarrow B = \sqrt[3]{\frac{125}{64}} = \frac{5}{4}$$

Lengths
if B = 1

$$\begin{array}{ccc} & \text{A} & \text{B} \\ & \frac{4}{5} = 0.8 & 1 \end{array}$$

$$\begin{array}{ccc} & \text{C} & \\ & \frac{1}{2} = 0.5 & \end{array}$$

$$\begin{aligned} A &= 1 \div \frac{5}{4} \\ &= \frac{4}{5} \end{aligned}$$

$$\text{Length SF } A \rightarrow C = \frac{0.8}{0.5} = \frac{8}{5}$$

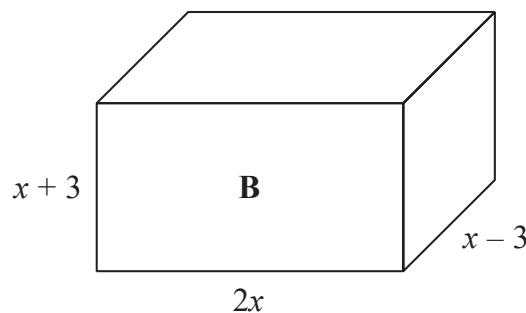
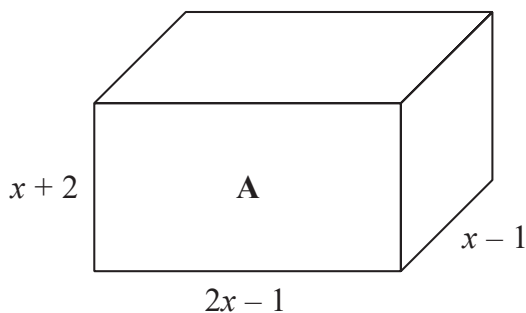
$$\text{so area SF} = \frac{64}{25}$$

$$\text{and } A : C = 64 : 25$$

(Total for Question 12 is 4 marks)



13 Here are two cuboids.



All lengths are measured in centimetres.

The volume of cuboid A is 142 cm^3 greater than the volume of cuboid B.

Work out the value of x .

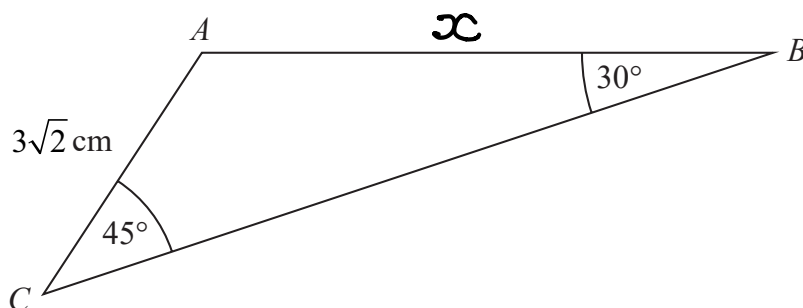
$$\begin{aligned}
 (x+2)(x-1)(2x-1) &= 2x(x+3)(x-3) + 142 \\
 (x^2 - x + 2x - 2)(2x-1) &= (2x^2 + 6x)(x-3) + 142 \\
 (x^2 + x - 2)(2x-1) &= 2x^3 - 6x^2 + 6x^2 - 18x + 142 \\
 2x^3 - x^2 + 2x^2 - x - 4x + 2 &= 2x^3 - 18x + 142 \\
 \cancel{2x^3} + x^2 - 5x + 2 &= \cancel{2x^3} - 18x + 142 \\
 &\quad + 18x \\
 x^2 + 13x - 140 &= 0 \\
 (x-7)(x+20) &= 0 \\
 \text{so } x=7 \text{ or } x=-20 & \text{ (not valid)}
 \end{aligned}$$

$$x = \underline{\quad 7 \quad}$$

(Total for Question 13 is 5 marks)



14 ABC is a triangle.



Work out the length of AB .

$$\frac{\sin 45}{x} = \frac{\sin 30}{3\sqrt{2}}$$

$$\sin 45 = \frac{\sqrt{2}}{2}$$

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

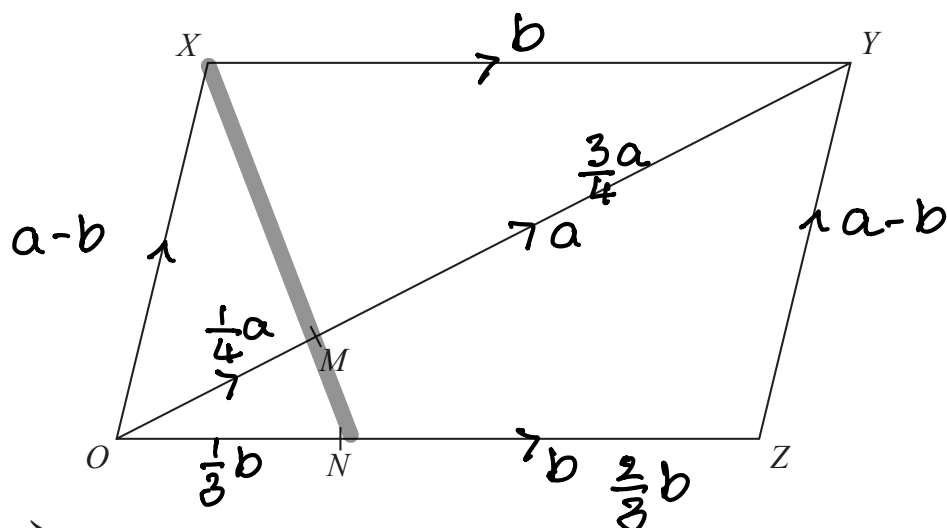
$$x = \frac{3\sqrt{2} \times \sin 45}{\sin 30}$$

$$= 3\sqrt{2} \times \frac{\sqrt{2}}{2} \div \frac{1}{2} = \frac{6}{2} \times \frac{2}{1} = 6$$

6 cm

(Total for Question 14 is 3 marks)

15 $OXYZ$ is a parallelogram.



$$\vec{OY} = \mathbf{a} \text{ and } \vec{OZ} = \mathbf{b}$$

M is the point on OY such that $OM:MY = 1:3$

N is the point on OZ such that $ON:NZ = 1:2$

Work out the ratio $XN:MN$

You must show all your working.

$$\vec{OX} = \mathbf{a} - \mathbf{b} = \vec{ZY}$$

$$\vec{XN} = -(\mathbf{a} - \mathbf{b}) + \frac{\mathbf{b}}{3}$$

$$= -\mathbf{a} + \mathbf{b} + \frac{\mathbf{b}}{3} = \frac{4}{3}\mathbf{b} - \mathbf{a} = \frac{4}{3}\mathbf{b} - \frac{3}{3}\mathbf{a}$$

$$\vec{MN} = \frac{1}{3}\mathbf{b} - \frac{1}{4}\mathbf{a} = \frac{4}{12}\mathbf{b} - \frac{3}{12}\mathbf{a} = \frac{1}{12}(4\mathbf{b} - 3\mathbf{a})$$

$$\vec{XN} = \frac{1}{3}(4\mathbf{b} - 3\mathbf{a}) \quad \vec{MN} = \frac{1}{12}(4\mathbf{b} - 3\mathbf{a})$$

$$\frac{4}{12} \quad \frac{1}{12}$$

$$\text{so } 4:1$$

$$4:1$$

(Total for Question 15 is 4 marks)



- 16 (a) Rationalise the denominator of $\frac{15}{\sqrt{5}}$
Give your answer in its simplest form.

$$\frac{15}{\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}}$$

$$= \frac{15\sqrt{5}}{5}$$

$$\frac{3\sqrt{5}}{1}$$

(2)

- (b) Write $\frac{\sqrt{75} - 2}{1 + 2\sqrt{3}}$ in the form $\frac{a - b\sqrt{3}}{c}$ where a , b and c are integers.

$$\sqrt{75} = \sqrt{25} \times \sqrt{3}$$

$$= 5\sqrt{3}$$

$$\frac{5\sqrt{3} - 2}{1 + 2\sqrt{3}} \times \frac{1 - 2\sqrt{3}}{1 - 2\sqrt{3}}$$

$$= \frac{5\sqrt{3} - 10\sqrt{3}\sqrt{3} - 2 + 4\sqrt{3}}{1 - 2\sqrt{3} + 2\sqrt{3} - 4\sqrt{3}\sqrt{3}}$$

$$= \frac{9\sqrt{3} - 30 - 2}{1 - 12} = \frac{9\sqrt{3} - 32}{-11}$$

$$\text{or } \frac{32 - 9\sqrt{3}}{11}$$

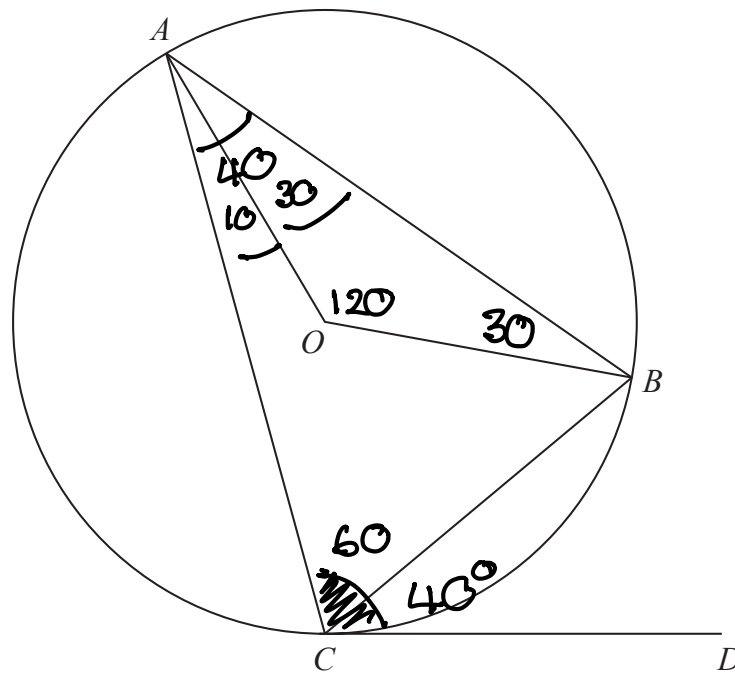
$$\frac{32 - 9\sqrt{3}}{11}$$

(4)

(Total for Question 16 is 6 marks)



17 A , B and C are points on a circle, centre O .



CD is a tangent to the circle.

Angle $BCD = 40^\circ$

Angle $OAB = 3 \times \text{angle } OAC$

Work out the size of angle ACD .

Write down any circle theorems that you use.

Given $BCD = 40$ $BAC = 40$ alternate segment theorem

let $OAC = x$ so $OAB = 3x$

$$4x = 40$$

$$x = 10 \quad 3x = 30$$

$OBA = 30$ 2 angles in an isosceles are equal

$$BOA = 180 - 30 - 30 = 120$$

$ACB = 60^\circ$ angle at the centre is twice that at the circumference

$$\text{so } ACD = 60 + 40 = 100$$

(Total for Question 17 is 4 marks)



18 $f(x) = \frac{5x-3}{4}$

(a) Find $f^{-1}(x)$

$$y = \frac{5x-3}{4}$$

$$4y = 5x-3$$

$$\cancel{5x} = \frac{4y+3}{5}$$

$$f^{-1}(x) = \frac{\overbrace{4x+3}}{5} \quad (2)$$

For all values of x

$$g(x) = (x-1)^2 \text{ and } h(x) = 1-2x$$

(b) Work out the value of $gh(5)$

$$\begin{aligned} h(5) &= 1-2 \times 5 \\ &= -9 \end{aligned}$$

$$\begin{aligned} g(-9) &= (-9-1)^2 \\ &= -10^2 \\ &= 100 \end{aligned}$$

$$gh(5) = 100 \quad (2)$$

(Total for Question 18 is 4 marks)



- 19 In the semi-finals of a chess tournament,
player A will play player B
and player C will play player D.

The two winners will then play each other in the final.

The probability that player A will win against player B is 0.6

The probability that player A will win against player C is 0.5

The probability that player A will win against player D is 0.3

The probability that player C will win against player D is 0.2

Work out the probability that player A will win the chess tournament.

$$\begin{array}{cc} A & v & B \\ 0.6 & & 0.4 \end{array}$$

$$\begin{array}{cc} C & v & D \\ 0.2 & & 0.8 \end{array}$$

Final

$$A v C = 0.6 \times 0.2 = 0.12$$

$$\text{so } 0.12 \times 0.5 = 0.060$$

$$A v D = 0.6 \times 0.8 = 0.48$$

$$\text{so } 0.48 \times 0.3 = 0.144$$

$$\begin{array}{r} 48 \\ \times 3 \\ \hline 144 \\ 2 \end{array}$$

$$\begin{aligned} P(A \text{ wins}) &= 0.060 + 0.144 \\ &= 0.204 \end{aligned}$$

$$0.204$$

(Total for Question 19 is 4 marks)



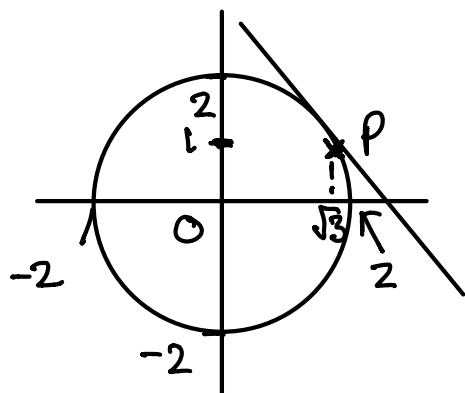
20 C is the circle with equation $x^2 + y^2 = 4$

$$r^2 = 4 \quad r = 2$$

Find an equation of the tangent to C at the point $(p, 1)$ where $p > 0$

Give your answer in the form $y + \sqrt{a}x = b$ where a and b are integers.

You must show all your working.



at $P(p, 1)$
 $x \quad y$

$$p^2 + 1^2 = 4$$

$$p^2 = 3$$

$$p = \sqrt{3} \quad \text{so } P = (\sqrt{3}, 1)$$

gradient of $OP = \frac{1}{\sqrt{3}}$ so tangent $= -\sqrt{3}$

$$y = -\sqrt{3}x + c \quad \left(\begin{matrix} x \\ y \end{matrix} \right) (\sqrt{3}, 1)$$

$$1 = -\sqrt{3} \times \sqrt{3} + c$$

$$c = 1 + 3 = 4$$

so $y = -\sqrt{3}x + 4$

$$y + \sqrt{3}x = 4$$

$$y + \sqrt{3}x = 4$$

(Total for Question 20 is 4 marks)

TOTAL FOR PAPER IS 80 MARKS