

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)

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 $818.4 \div 1.2$

$$\frac{818.4 \times 10}{1.2 \times 10} = \frac{8184 \div 2}{12 \div 2} = \frac{4092 \div 2}{6 \div 2} = \frac{2046}{3}$$

$$\frac{2046 \div 3}{3 \div 3} = \frac{0682}{1} = 682$$

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

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

$$P(1) = P(2) = x$$

$$x + x + 0.1 + 0.3 + 0.05 + 0.25 = 1$$

$$2x + 0.7 = 1$$

$$-0.7 \quad -0.7$$

$$\frac{2x}{2} = \frac{0.3}{2}$$

$$x = 0.15$$

$$100 \times 0.15 \times \frac{500}{100} = 15 \times 5$$

$$\begin{array}{r} 2 \times 15 \\ \times 5 \\ \hline 75 \end{array}$$

$$\frac{75}{(3)}$$

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)?

$$P(2) > P(1)$$

Estimate of 2 > Estimate of 1

Estimate of 2 will be larger 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.

$$\frac{7 \times 3}{2 \times 3} - \frac{7}{6}$$

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

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

$$\frac{14 \div 2}{6 \div 2} = \frac{7}{3}$$

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

(2)

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

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

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

$$\frac{63 \div 7}{28 \div 7} = \frac{9}{4}$$

$$\frac{9}{4} = 2\frac{1}{4}$$

(3)

(Total for Question 3 is 5 marks)

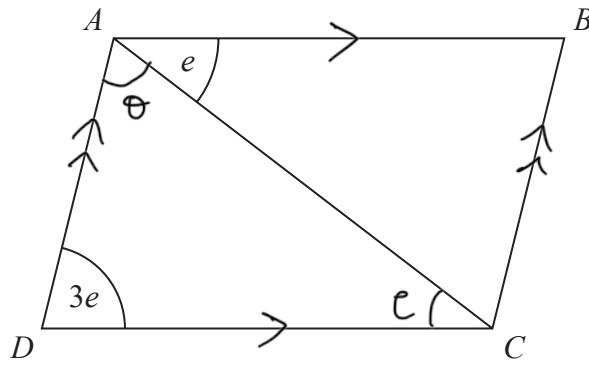
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4 $ABCD$ is a parallelogram.



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.

$$\hat{ACD} = e \quad (\text{Alternate angles are equal})$$

$$\theta + 3e + e = 180 \quad (\text{Sum of interior angles in a triangle} = 180^\circ)$$

$$\theta + 4e = 180$$

$$\theta = 180 - 4e$$

$$\hat{CAD} = 180 - 4e$$

$$180 - 4e$$

(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.

$$d = 4.96 \approx 5$$

$$s = 30.4 \approx 30$$

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

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

$$t = \frac{5 \div 5}{30 \div 5}$$

$$t = \frac{1}{6} \text{ hours}$$

$$60 \text{ minutes} \stackrel{\times 60}{=} 1 \text{ hour}$$

$$10 \text{ minutes} \stackrel{\times 60}{=} \frac{1}{6} \text{ hour}$$

..... 10 minutes
(3)

(b) Is your answer to part (a) an underestimate or an overestimate?

Give a reason for your answer.

4.96 rounded up to 5

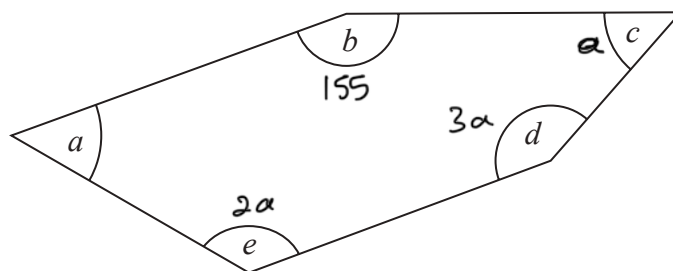
The answer is an overestimate because the number rounded up was the numerator.

(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

Angle e is two times the size of angle c

$$d = 3c \Rightarrow d = 3a$$

$$e = 2c \Rightarrow e = 2a$$

Work out the size of angle a

$$(n-2) \times 180$$

$$n = 5$$

$$(5-2) \times 180$$

$$3 \times 180$$

$540^\circ \Rightarrow$ sum of interior angles in a pentagon

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

$$7a + 155 = 540$$

$$-155 \quad -155$$

$$7a = 385$$

$$\div 7 \quad \div 7$$

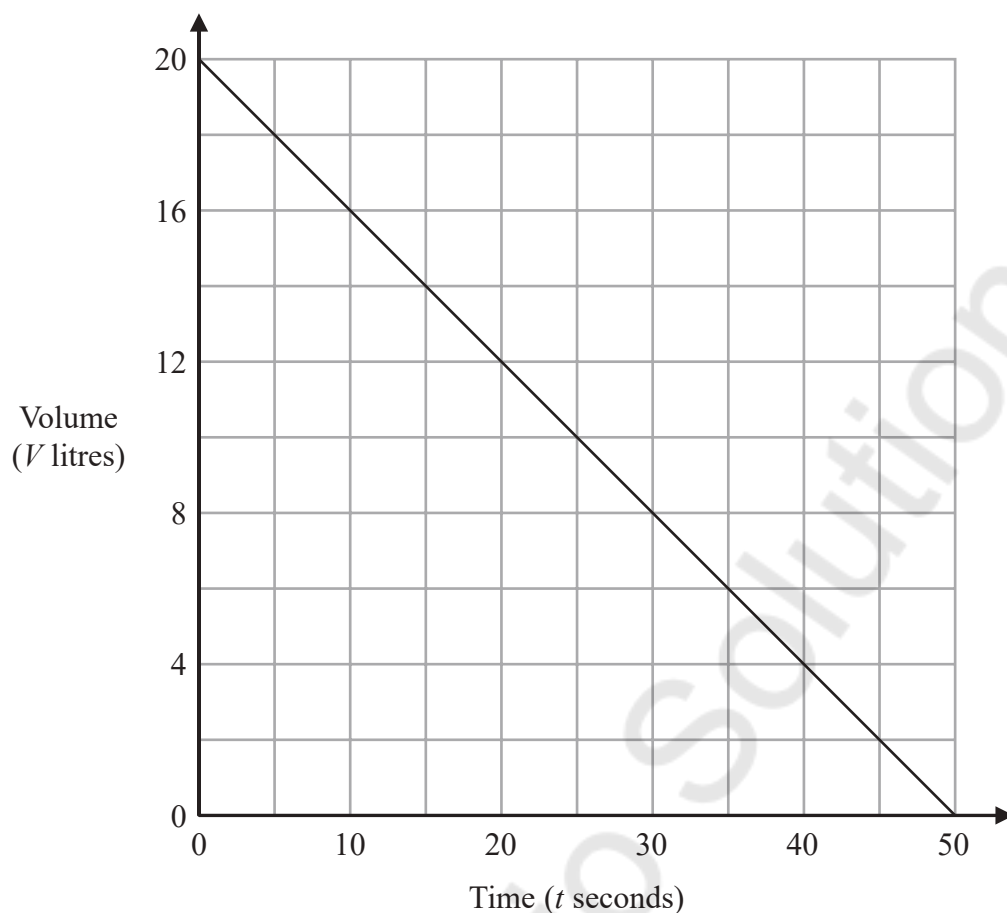
$$a = 55^\circ$$

$$a = 55^\circ$$

(Total for Question 6 is 4 marks)



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 of change of volume

(Total for Question 7 is 1 mark)

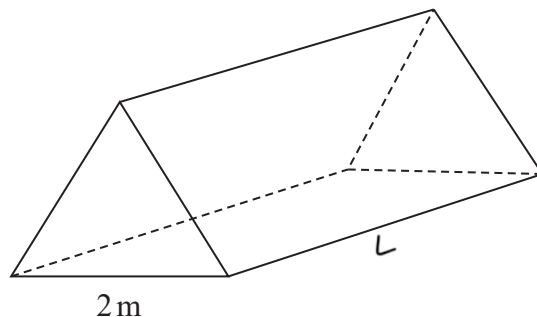


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8 The diagram shows a solid triangular prism on a horizontal floor.



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

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.

$$p = \frac{F}{A}$$

$$A = 2 \times L = 2L$$

$$p = 80$$

$$F = 720$$

$$80 = \frac{720}{2L}$$

$$160L = 720$$

$$\frac{16L}{8} = \frac{72}{8}$$

$$\frac{2L}{2} = \frac{9}{2}$$

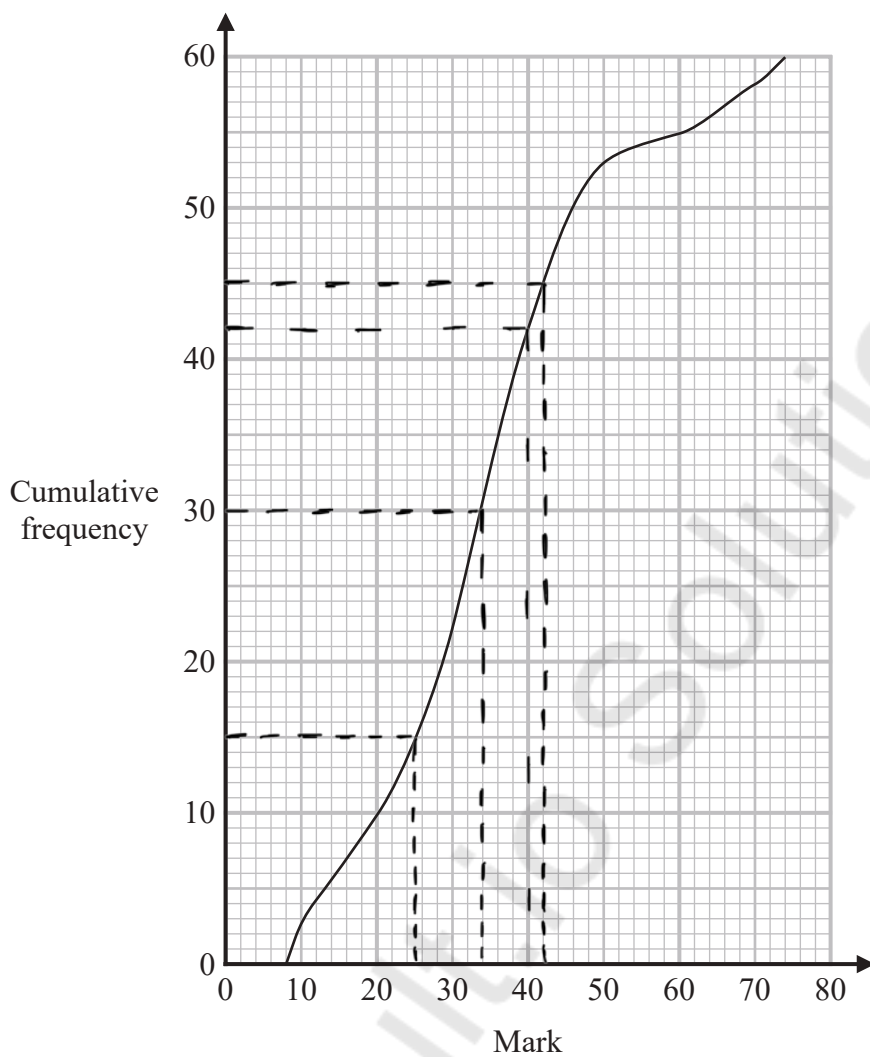
$$L = 4.5 \text{ m}$$

..... 4.5 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.

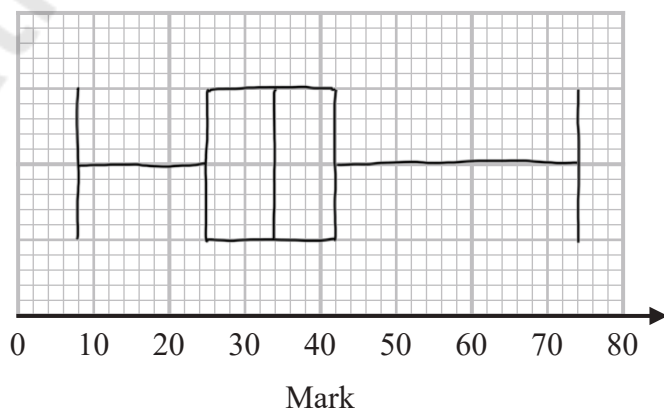


For these 60 students
 the highest mark was 74
 the lowest mark was 8

$$Q_3 = \frac{3}{4} \times 60 = 45^{\text{th}}$$

$$Q_1 = \frac{1}{4} \times 60 = 15^{\text{th}}$$

(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.

$$60 - 42 = 18$$

$$\frac{18}{60} \text{ Passed}$$

$$\frac{18 \div 6}{60 \div 6} \times 100 = \frac{3}{10} \times 100 = 30\%$$

Yes Sian is correct.
Only 30% of the 60 students passed the test.

(3)

(Total for Question 9 is 6 marks)

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

$$\sqrt{25} \times \sqrt[3]{8}$$

$$5 \times 2 = 10$$

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

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

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

$$\frac{1}{2^3} = \frac{1}{8}$$

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

(2)

(Total for Question 10 is 4 marks)



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 product of a and b must be 6 not 5

The sum of a and b should be 5 not 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 $ax + bx - ay - by$

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

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

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

(2)

(Total for Question 11 is 5 marks)



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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

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.

$$V_A = 64$$

$$V_B = 125$$

$$A : B$$

$$64 : 125$$

Volume

$$64^{1/3} : 125^{1/3}$$

lengths

$$4 : 5$$

lengths (radius)

$$A : B : C$$

$$4 : 5 : \frac{5}{2}$$

lengths (radius)

$$4^2 : 5^2 : \left(\frac{5}{2}\right)^2$$

Area (surface)
Area

$$16 : 25 : \frac{25}{4}$$

$$A : C \Rightarrow A : C$$

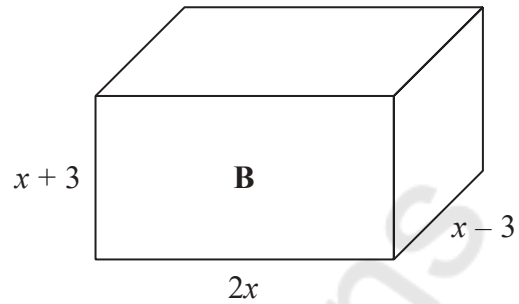
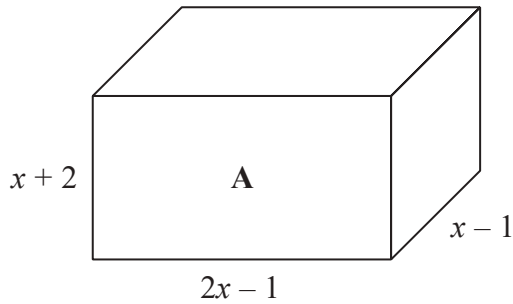
$$16 : \frac{25}{4} \Rightarrow 64 : 25$$

$$64 : 25$$

(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 .

$$V_A = 142 + V_B$$

$$V_A = (x+2)(2x-1)(x-1)$$

$$V_B = 2x(x+3)(x-3)$$

$$V_A = (2x^2 - x + 4x - 2)(x-1)$$

$$(2x^2 + 3x - 2)(x-1)$$

$$V_B = 2x(x^2 - 9)$$

$$V_B = 2x^3 - 18x$$

$$2x^3 - 2x^2 + 3x^2 - 3x - 2x + 2$$

$$V_A = 2x^3 + x^2 - 5x + 2$$

$$2x^3 + x^2 - 5x + 2 = 142 + 2x^3 - 18x$$

$$x^2 - 5x + 18x + 2 - 142 = 0$$

$$x^2 + 13x - 140 = 0$$

$$x^2 + 20x - 7x - 140 = 0$$

$$x(x+20) - 7(x+20) = 0$$

$$(x-7)(x+20) = 0$$

$$\therefore \underline{x = 7}, \quad x = -20$$

rejected

$$\begin{array}{l} -140 \\ 140, -1 \\ 70, -2 \\ 35, -4 \\ 28, -5 \end{array}$$

$$\boxed{20, -7}$$

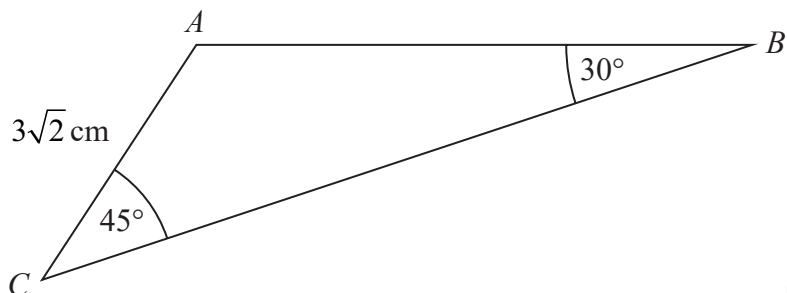
$$x = \dots 7 \dots$$

(Total for Question 13 is 5 marks)



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14 ABC is a triangle.

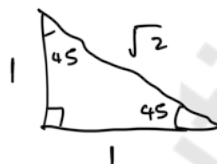


Work out the length of AB .

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

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

$$AB = 3\sqrt{2} \times \frac{1}{\sqrt{2}} \times \frac{2}{1}$$



$$\sin 45 = \frac{1}{\sqrt{2}}$$

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

6

..... cm

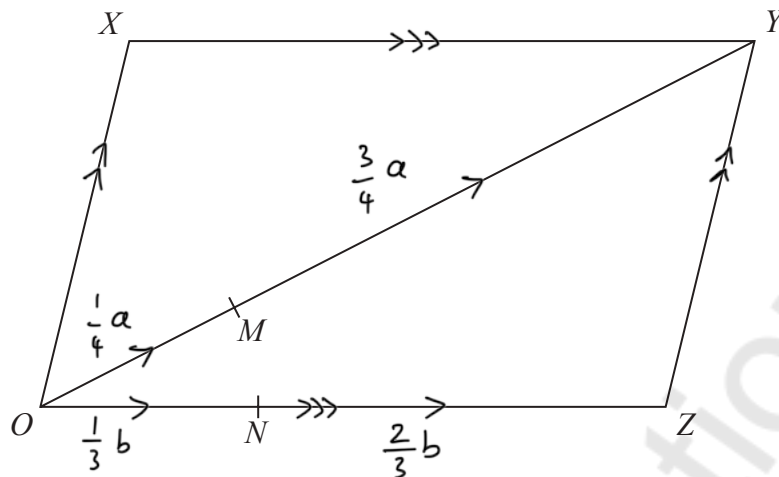
(Total for Question 14 is 3 marks)

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

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.

$$\vec{OX} + \vec{ON} = \vec{XN}$$

$$\vec{MO} + \vec{ON} = \vec{MN}$$

$$\vec{ZY} = \vec{ZO} + \vec{OY}$$

$$\vec{ZY} = -\vec{OZ} + \vec{OY}$$

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

$$\vec{ZY} = \vec{OX}$$

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

$$-\vec{OX} + \vec{ON} = \vec{XN}$$

$$-\vec{OM} + \vec{ON} = \vec{MN}$$

$$-(\mathbf{a} - \mathbf{b}) + \frac{1}{3}\mathbf{b} = \vec{XN}$$

$$-\frac{1}{4}\mathbf{a} + \frac{1}{3}\mathbf{b} = \vec{MN}$$

$$-\mathbf{a} + \mathbf{b} + \frac{1}{3}\mathbf{b} = \vec{XN}$$

$$-\frac{1}{4}\mathbf{a} + \frac{1}{3}\mathbf{b} = \vec{MN}$$

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

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

$$4\vec{MN} = \vec{XN}$$

$$\frac{4}{1} = \frac{\vec{XN}}{\vec{MN}}$$

$$4 : 1$$

(Total for Question 15 is 4 marks)



16 (a) Rationalise the denominator of $\frac{15}{\sqrt{5}}$

Give your answer in its simplest form.

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

$$\frac{3\sqrt{5}}{(2)}$$

(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.

$$\frac{(\sqrt{75}-2)(1-2\sqrt{3})}{(1+2\sqrt{3})(1-2\sqrt{3})}$$

$$\frac{\sqrt{75} - 2\sqrt{75 \times 3} - 2 + 4\sqrt{3}}{1 - 12}$$

$$\frac{\sqrt{25 \times 3} - 2\sqrt{25 \times 3 \times 3} - 2 + 4\sqrt{3}}{-11}$$

$$\frac{5\sqrt{3} - 30 - 2 + 4\sqrt{3}}{-11}$$

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

$$\frac{-1(9\sqrt{3} - 32)}{-1 \times -11}$$

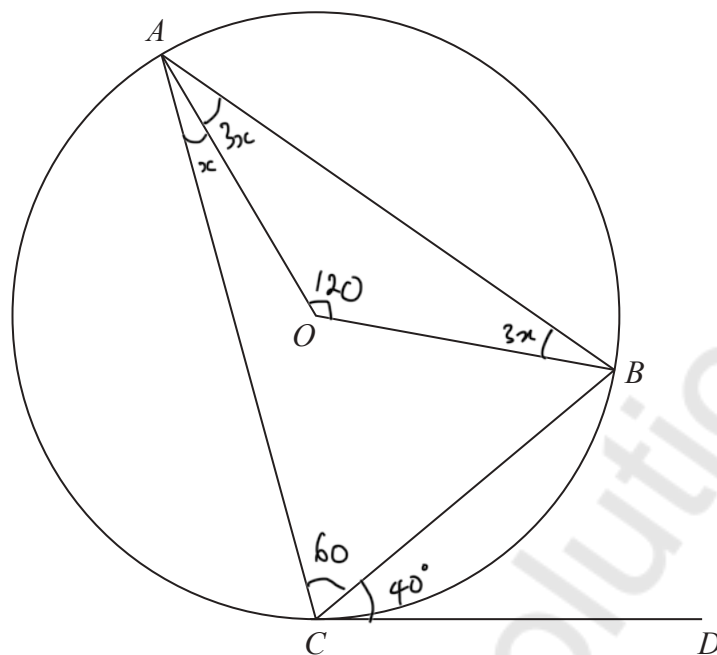
$$\frac{32 - 9\sqrt{3}}{11}$$

(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 $OAB = 3 \times$ angle OAC

Work out the size of angle ACD .

Write down any circle theorems that you use.

$\hat{BCD} = \hat{CAB}$ Angles in alternate segment are equal

$$3x + x = 40$$

$$4x = 40$$

$$x = 10$$

$$\hat{AOB} = 180 - 3(10) - 3(10) = 180 - 60 = 120^\circ$$

Base angles in isosceles triangle are equal

Sum of angles in a triangle is 180°

$\hat{ACB} = \frac{\hat{AOB}}{2}$ (Angle at Centre is twice the angle at the Circumference)

$$\hat{ACB} = \frac{120}{2} = 60^\circ$$

$$\hat{ACD} = 60^\circ + 40^\circ$$

100

(Total for Question 17 is 4 marks)



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

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

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

$$4x = 5y - 3$$

$$4x + 3 = 5y$$

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

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

For all values of x

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

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

$$h(5) = 1 - 2(5)$$

$$1 - 10$$

$$h(5) = -9$$

$$g(-9) = (-9-1)^2$$

$$g(-9) = (-10)^2$$

$$gh(5) = \frac{100}{1} \quad (2)$$

(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 $P(D \text{ win against } C) = 0.8$

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

$$P(A \text{ win AND } C \text{ win AND } A \text{ win Final}) \quad (1)$$

$$P(A \text{ win AND } D \text{ win AND } A \text{ win Final}) \quad (2)$$

$$0.6 \times 0.2 \times 0.5 = 0.06$$

$$0.6 \times 0.8 \times 0.3 = 0.144$$

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

$$\underline{0.204}$$

0.204

(Total for Question 19 is 4 marks)



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

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.

$$x^2 + y^2 = r^2 \quad \begin{matrix} (0, 0) \\ (p, 1) \end{matrix}$$

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

$$2 = \sqrt{(p-0)^2 + (1-0)^2}$$

$$4 = p^2 + 1$$

$$3 = p^2$$

$$p = \sqrt{3}$$

$$(\sqrt{3}, 1)$$

$$m_r = \frac{1-0}{\sqrt{3}-0}$$

$$m_r = \frac{1}{\sqrt{3}}$$

$$m_T = -\sqrt{3}$$

$$y = mx + c$$

$$1 = -\sqrt{3}(\sqrt{3}) + c$$

$$1 = -3 + c$$

$$c = 4$$

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

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

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

(Total for Question 20 is 4 marks)

TOTAL FOR PAPER IS 80 MARKS

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