

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 be used.
- If your calculator does not have a π button, take the value of π to be 3.142 unless the question instructs otherwise.

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.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.







Turn over 🕨







Available in the course in a box or for purchase separately.

	Answer ALL questions.		
	Write your answers in the spaces provided.		
	You must write down all the stages in your working.		
	(a) Expand and simplify $(x + 5)(x - 9)$		
	(b) Factorise fully $9x^2 + 6x$ (2)		
	$\frac{3x(3x+2)}{(2)}$		
2	(a) Use your calculator to work out $\frac{29^2 - 4.6}{29^2 - 4.6}$		
	$\sqrt{35-1.9^3}$		
	while down an the figures on your calculator display.		
	157.668255		
	(2)		
	(b) Write your answer to part (a) correct to 4 significant figures.		
	157.7		
	(1)		
	(Total for Question 2 is 3 marks)		



3 The scatter graph shows information about the marks a group of students got in a Science test and in a Maths test.

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4 The table gives information about the times taken, in seconds, by 18 students to run a race.

Time (t seconds)	Frequency	mid	820
5 < 1 ≤ 10	1	7.5	7.5
$10 < t \le 15$	2	12.5	25
$15 < t \le 20$	7	17.5	122.5
$20 < t \le 25$	8	22.5	180
Tokul	18	TX	335

Work out an estimate for the mean time.

Give your answer correct to 3 significant figures.

335 - 18 = 18.6

18.6 seconds

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(Total for Question 4 is 3 marks)



5	Write 37 cm ³ in mm ³			
				37000
-			(Total for Question	on 5 is 1 mark)
6	Nimer was driving to a ho He looked at his Sat Nav a	tel. at 1330		
		Time	13 30	
		Distance to destination	65 miles	
	Nimer arrived at the hotel	at 1448		
Work out the average speed of the car from 1330 to 1448				
	You must show all your working. $\neg \bigcirc$			
	to mons.			
	65 + 78 = & moles/mon			
		= = × 00		
		= 50 mp		
				50
			(Table Oracle	
	(Total for Question 6 is 4 marks)			
		na annaí - Cuch i co-staotaith ann an annar ar tart an annar an tart		
distant				

l,

(a) Write 32460000 in standard form. 7 DO NOT WRITE IN THIS AREA 3.246×10 (1)(b) Write 4.96×10^{-3} as an ordinary number. 0.00496 (1)Asma was asked to compare the following two numbers. $A = 6.212 \times 10^8$ and $B = 4.73 \times 10^9$ She says, "6.212 is bigger than 4.73 so A is bigger than B." (c) Is Asma correct? You must give a reason for your answer. She has not accounted for powers No. 08 10 7 109 > 108 (1)DO NOT WRITE IN THIS ARE (Total for Question 7 is 3 marks) 6

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The diagram shows a regular pentagon and a parallelogram. 8



Work out the size of the angle marked x. You must show all your working.

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Show all your working. 180-117 = 63Geterior angle of pertagon = 77. Treaterior angle = 180-72 = 108. $\chi = 0.108-63$ $\chi = 4.5^{\circ}$.

45

0

(Total for Question 8 is 4 marks)





P 5 8 8 7 6 R A 0 8 2 4





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 13 Liquid A and liquid B are mixed together in the ratio 2:13 by volume to make liquid C.

Liquid A has density 1.21 g/cm³ Liquid B has density 1.02 g/cm³

A cylindrical container is filled completely with liquid C. The cylinder has radius 3 cm and height 25 cm.

Work out the mass of the liquid in the container. Give your answer correct to 3 significant figures. You must show all your working.

 $V = 25 \times \pi \times 3^{2}$ $v = 225 \pi \cdot$ 2+3=15 $225\pi \div 15 = (5\pi \cdot)$ $15\pi \times 2 = 30\pi$ $(5\pi \times 3 = 195\pi \cdot)$ $1.21 \times 30\pi + 1.02 \times 195\pi = 739 \text{ g}.$

739

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g

(Total for Question 13 is 4 marks)



14 A group of people went to a restaurant. Each person chose one starter and one main course.

starter	main course
soup	lasagne
prawns	curry

the number of people who chose soup : the number of people who chose prawns = 2:3

Of those who chose soup,

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the number of people who chose lasagne : the number of people who chose curry = 5:3

Of those who chose prawns,

the number of people who chose lasagne : the number of people who chose curry = 1 : 5

What fraction of the people chose curry? You must show how you get your answer.



13 20



15 Prove algebraically that the sum of the squares of any two consecutive even numbers is always a multiple of 4 Sums are and attacks

$$n^{2} + (6+2)^{2} =$$

$$n^{2} + n^{2} + 4n + 4 =$$

$$n^{2} + 4n + 4 =$$

$$n \text{ even so } 2n^{2} \text{ divides by } 4.$$

$$4n + 4 \text{ divides by } 4.$$

$$= Divis Jble by 4.$$

(Total for Question 15 is 3 marks)

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16 y is inversely proportional to the square of x.

$$y = 8 \text{ when } x = 2.5$$

Find the negative value of x when $y = \frac{8}{9}$

$$y = \frac{k}{x^2}$$

$$g = \frac{k}{2.5^2}$$

$$g = \frac{k}{2.5^2}$$

$$k = 8 \times 6 \cdot 25$$

$$k = 50$$

$$y = \frac{50}{x^2}$$

$$\frac{g}{q} = \frac{50}{x^2}$$

$$\frac{g}{x^2} = \frac{50 \times 9}{x^2}$$

$$\chi^2 = 50 \times 9$$

$$\chi^2 = 50 \times 9$$

$$\chi^2 = -\frac{15}{2}$$
(Total for Question 16 is 3 marks)









 $AB = 3.4 \,\mathrm{cm}$ $AC = 6.2 \,\mathrm{cm}$ $BC = 6.1 \,\mathrm{cm}$

D is the point on BC such that

size of angle
$$DAC = \frac{2}{5} \times \text{size of angle } BCA$$

Calculate the length DC.

Give your answer correct to 3 significant figures. You must show all your working.

$$3.4^{2} = 6.1^{2} + 6.2^{2} - 2 \times 61 \times 6.2 \times \cos(BCA) -$$

$$(1.56 = 37 \cdot 21 + 38 \cdot 44 - 75 \cdot 64 \cos(BCA) -$$

$$75.64 \cos(BCA) = 37 \cdot 21 + 38 \cdot 44 - 11 \cdot 56$$

$$75.64 \cos(BCA) = 64 \cdot 09 -$$

$$\cos(BCA) = \frac{64 \cdot 09}{75.64} -$$

$$BCA = \cos^{-1}(\frac{6409}{7564}) -$$

$$BCA = \cos^{-1}(\frac{6409}{7564}) -$$

$$BCA = \frac{2}{5}\cos^{-1}(\frac{5409}{7564}) -$$

$$\frac{36}{10}(0Ac) - \frac{6 \cdot 2}{56} - \frac{6 \cdot 2}{56} - \frac{100}{5564} - \frac{100}{5664} - \frac{100}{5$$

$$DC = 1.95$$

1.95 cm

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(Total for Question 18 is 5 marks)





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P 5 8 8 7 6 R A 0 1 7 2 4

3.2

(Total for Question 19 is 3 marks)

m/s

20 Here are the first five terms of a sequence.

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Find an expression, in terms of n, for the nth term of this sequence.

$$0 \qquad -1 \qquad 0 \qquad 3 \qquad 8 \qquad 1S$$

$$-1 \qquad 2 \qquad 3 \qquad 5 \qquad 7$$

$$An^{2} + fn + C \quad .$$

$$Discerence \quad cs \qquad 2 \quad so \qquad A = 2 \div 2 = 1 \quad .$$

$$Discerence \quad cs \qquad 2 \quad so \qquad A = 0 \quad .$$

$$Min \qquad n^{2} + fn \quad .$$

$$n = 1 \qquad 1^{2} + fn \quad .$$

$$n = 1 \qquad 1^{2} + fn \quad .$$

$$n = 1 \qquad 1^{2} + fn \quad .$$

$$n = 1 \qquad 1^{2} + fn \quad .$$

$$n = 1 \qquad 1^{2} + fn \quad .$$

$$n = 1 \qquad .$$

$$P = -1 \qquad .$$

$$(Total \text{ for Question 20 is 2 marks})$$
21 When a biased coin is thrown 4 times, the probability of getting 4 heads is $\frac{16}{81}$
Work out the probability of getting 4 tails when the coin is thrown 4 times.
$$\left(f(h_{1}))^{4} = \frac{16}{81}$$

$$f(h_{2}) = \frac{1}{3}$$

$$f(h_{2}) = \frac{1}{3}$$

$$\left(g(e_{1})^{4} = \frac{1}{81}\right)$$

$$(Total for Question 21 is 2 marks)$$



22 Show that $\frac{7x-14}{x^2+4x-12} + \frac{x-6}{x^3-36x}$ simplifies to ax where a is an integer. DO NOT WRITE IN THIS AREA $\frac{7 \times -14}{x^{2} + 4 \times -12} \div \frac{x - 6}{x^{3} - 36 \times}$ $\frac{7 \times -14}{x^{2} + 4 \times -12} \times \frac{x^{3} - 36 \times}{x^{0} - 06}$ $\frac{7 \times -14}{(x^{2} + 4 \times -12)(x - 6)}$ $\frac{7 \times -14}{(x^{2} + 4 \times -12)(x - 6)}$ $\frac{1}{2e^{2}+4e^{2}x^{2}}$ $\frac{1}{7x^{2}+4e^{2}x^{2}-2}$ $\frac{1}{7(2e^{-2})(x-6)}$ $\frac{1}{7x-1}(x-6)$ $\frac{1}{7x-1}(x+6)$ $\frac{(7 \times -14)(x^{3} - 36x)}{(x^{2} + 4x - 12)(x - 6)}$ $\frac{7(x - 2) \times (x^{2} - 36)}{(x - 2)(x + 6)(x - 6)}$ $\frac{7(x - 2)(x + 6)(x - 6)}{7(x - 2)(x + 6)(x - 6)}$ $\frac{7(x - 2)(x + 6)(x - 6)}{(x - 2)(x + 6)(x - 6)}$ DO NOT WRITE IN THIS AREA 72. DO NOT WRITE IN THIS AREA (Total for Question 22 is 4 marks)

5 8 8 7 6 R A 0 1

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The diagram also shows a hollow cone with vertex O. The cone is formed by joining OA and OB.



Volume of cone = $\frac{1}{3}\pi r^2 h$ Curved surface area of cone = πrl

The cone has volume 56.8 cm³ and height 3.6 cm.

Calculate the size of angle *AOB* of sector *OACB*. Give your answer correct to 3 significant figures. You must show all your working.

$$56.8 = \frac{1}{3} \pi r^{2} \times 3.6$$

$$56.8 = 1.2 \pi r^{2}$$

$$r^{2} = \frac{56.8}{1.2\pi}$$

$$r = \sqrt{\frac{142}{3\pi}}$$

$$l = \sqrt{\frac{142}{3\pi}}$$

$$l = \sqrt{\frac{142}{3\pi} + 3.6^{2}}$$

$$(= \sqrt{\frac{142}{3\pi} + \frac{324}{25}}$$

$$l = \sqrt{\frac{142}{3\pi} + \frac{3550 + 972\pi}{755}}$$

$$l = \frac{1}{5} \sqrt{\frac{3550 + 972\pi}{3\pi}}$$

5 8 8 7 6 R A 0

2 0

A B

 $TTrl = \frac{AOB}{360} \pi r^{2}$ $rl = \frac{AOB}{360} \pi r^{2}$ $\sqrt{\frac{11}{15}} \times \frac{1}{5} \sqrt{\frac{3550 \pi r^{2}}{3\pi}} = \frac{AOB}{360} \times \frac{142}{3\pi}$ $\frac{1}{15} \frac{1}{15} \sqrt{\frac{504100 + (38024\pi)}{540}} = \frac{71}{540} AOB$ DO NOT WRITE IN THIS AREA DO NOT WRITE IN THIS AREA 1 $AOB = \frac{36}{71} \sqrt{504100 + 138024 \pi}$ AOB = 264°. 264 0 (Total for Question 23 is 5 marks)

P 5 8 8 7 6 R A 0 2 1 2 4

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 $\overrightarrow{OY} = \mathbf{b}$

P is the point on *OX* such that OP: PX = 1:2*R* is the point on *OY* such that OR: RY = 1:3

Work out, in its simplest form, the ratio ZP:ZRYou must show all your working.

$$2R = Q - \frac{1}{4}b$$

$$2P = Q - \frac{1}{4}b + \frac{1}{3}Q$$

$$2P = \frac{1}{3}Q - \frac{1}{4}$$

$$2P = \frac{1}{3}Q - \frac{1}{4}$$

$$2P = \frac{1}{3}(2R)$$

$$2P : 2R = 4:3$$

4:3

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(Total for Question 24 is 5 marks)

TOTAL FOR PAPER IS 80 MARKS



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3.6 Quadratic and C	Cubic Graphs		+		
3.7 Turning Points of Quadratic Graphs					
3.8 Circle Graphs a	nd Tangents		+		