

GCSE Chemistry Mock Paper 2

Max time allowed: 2 hours

Max Marks: 120

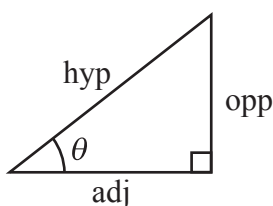
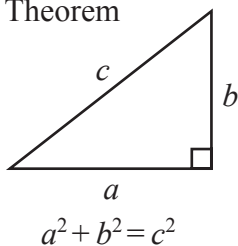
GCSE Maths Paper 1

Max time allowed: 2 $\frac{1}{2}$ hours

Max Marks: 120

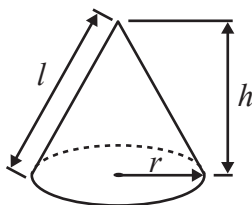
GCSE MATHEMATICS FORMULAE SHEET – HIGHER TIER

Pythagoras' Theorem



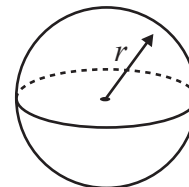
Volume of cone = $\frac{1}{3} \pi r^2 h$

Curved surface area of cone = $\pi r l$



Volume of sphere = $\frac{4}{3} \pi r^3$

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



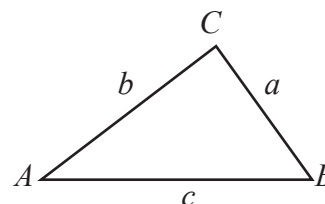
adj = hyp \times cos θ
opp = hyp \times sin θ
opp = adj \times tan θ

or $\sin \theta = \frac{\text{opp}}{\text{hyp}}$

$\cos \theta = \frac{\text{adj}}{\text{hyp}}$

$\tan \theta = \frac{\text{opp}}{\text{adj}}$

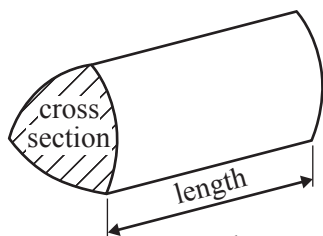
In any triangle ABC



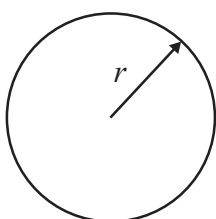
Sine rule: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine rule: $a^2 = b^2 + c^2 - 2bc \cos A$

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



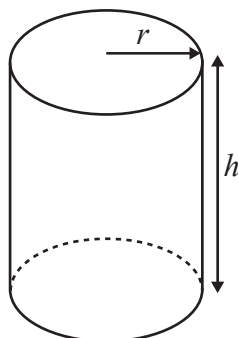
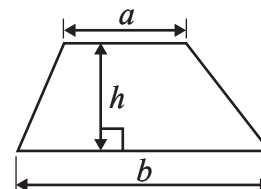
Volume of prism = area of cross section \times length



Circumference of circle = $2 \pi r$

Area of circle = πr^2

Area of a trapezium = $\frac{1}{2}(a + b)h$



Volume of cylinder = $\pi r^2 h$

Curved surface area of cylinder = $2 \pi r h$

The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$, where $a \neq 0$, are given by

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

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Answer ALL TWENTY ONE questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1 Here is a list of ingredients for making 24 Rocky Road Crunchy Bars.

Rocky Road Crunchy Bars	
Ingredients for 24 bars	
125 grams	butter
300 grams	chocolate
3 tablespoons	syrup
200 grams	biscuits
100 grams	marshmallows
2 teaspoons	icing sugar

Silvester wants to make 30 Rocky Road Crunchy Bars.

(a) Work out the amount of marshmallows he needs.

..... grams
(2)

Nigella makes some Rocky Road Crunchy Bars.
She uses 850 grams of chocolate.

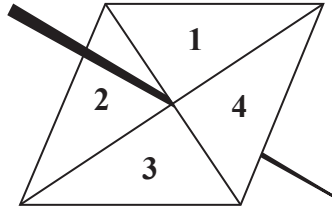
(b) Work out the number of Rocky Road Crunchy Bars she makes.

.....
(2)

(Total for Question 1 is 4 marks)



2 Here is a biased 4-sided spinner.



The spinner is spun.

The table shows the probability that the spinner lands on 1 and the probability that it lands on 2

Number	1	2	3	4
Probability	0.15	0.4		

(a) Work out the probability that the spinner will land on 1 or on 2

.....
(1)

The probability that the spinner will land on 3 is twice the probability that the spinner will land on 4

(b) Work out the probability that the spinner will land on 3

.....
(2)

Daljit is going to spin the spinner 160 times.

(c) Work out an estimate for the number of times the spinner will land on 2

.....
(2)

(Total for Question 2 is 5 marks)



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- 3 In a sale, normal prices are reduced by 35%
 The normal price of a bed is \$1200
 Work out the sale price of the bed.

\$

(Total for Question 3 is 3 marks)

- 4 The diagram shows a rectangle and a circle.

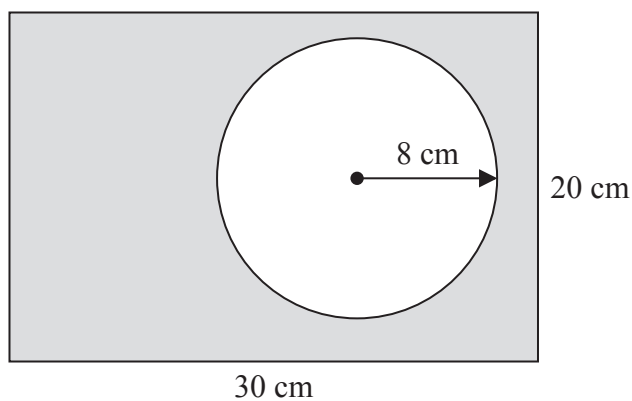


Diagram NOT accurately drawn

The rectangle has length 30 cm and width 20 cm.
 The circle has radius 8 cm.

Work out the area of the shaded region.
 Give your answer correct to 3 significant figures.

..... cm²

(Total for Question 4 is 4 marks)



5 $\mathcal{E} = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$
 $A = \{2, 3, 5, 7\}$
 $B = \{1, 3, 5, 7, 9\}$

(a) List the members of the set

(i) $A \cap B$

.....

(ii) $A \cup B$

.....
(2)

(b) Find $n(A')$

.....
(1)

(Total for Question 5 is 3 marks)

6

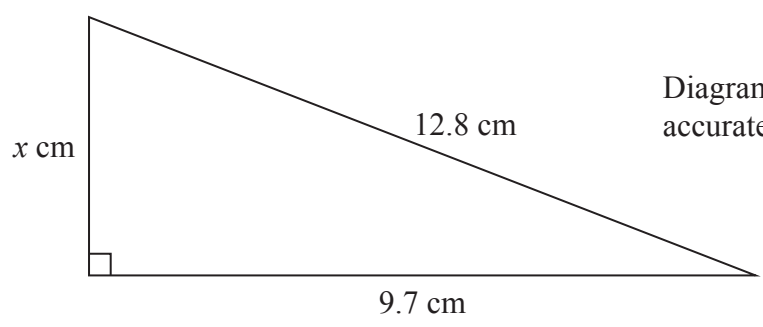


Diagram **NOT** accurately drawn

Work out the value of x .
Give your answer correct to 3 significant figures.

.....

(Total for Question 6 is 3 marks)



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7 (a) Expand $3(4p + 5)$

.....
(1)

(b) Factorise $6r + 14$

.....
(1)

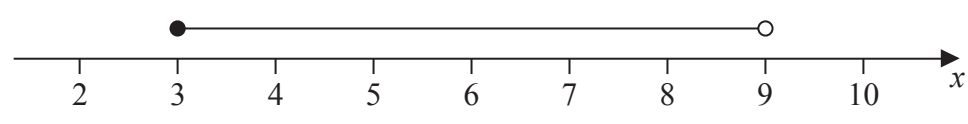
(c) Work out the value of $y^2 - 3y$ when $y = -5$

.....
(2)

(d) Simplify $\frac{w^5 \times w^8}{w^4}$

.....
(2)

(e) Write down the inequality shown on the number line.



.....
(2)

(Total for Question 7 is 8 marks)



8 The diagram shows a parallelogram $ABCD$.

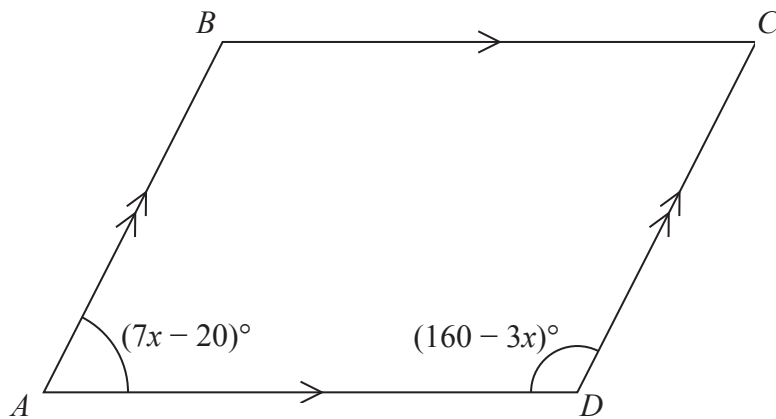


Diagram **NOT** accurately drawn

Angle $BAD = (7x - 20)^\circ$
Angle $ADC = (160 - 3x)^\circ$

Work out the value of x .
Show clear algebraic working.

$x = \dots\dots\dots$

(Total for Question 8 is 3 marks)

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9 The diagram shows the positions of two towns, A and B .

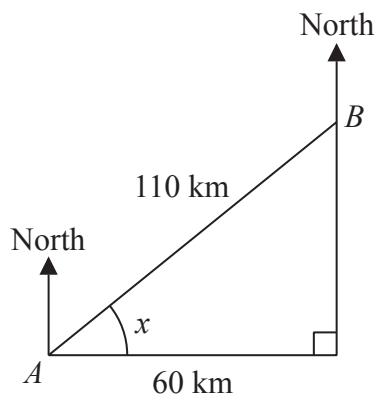


Diagram **NOT** accurately drawn

The distance from A to B is 110 km.
 B is 60 km east of A .

- (a) Work out the size of angle x .
Give your answer correct to 1 decimal place.

.....
(3)

- (b) Work out the bearing of B from A .
Give your answer correct to the nearest degree.

.....
(2)

The distance from A to B is 110 km correct to 2 significant figures.

- (c) (i) Write down the lower bound for the distance from A to B .

..... km

- (ii) Write down the upper bound for the distance from A to B .

..... km
(2)

(Total for Question 9 is 7 marks)



10 $m = 3^4 \times 5^3$
 $n = 3^3 \times 5^2 \times 11$

(a) Find the Lowest Common Multiple (LCM) of m and n .

.....
(2)

(b) Find the Highest Common Factor (HCF) of $5m$ and $3n$.

.....
(2)

(Total for Question 10 is 4 marks)

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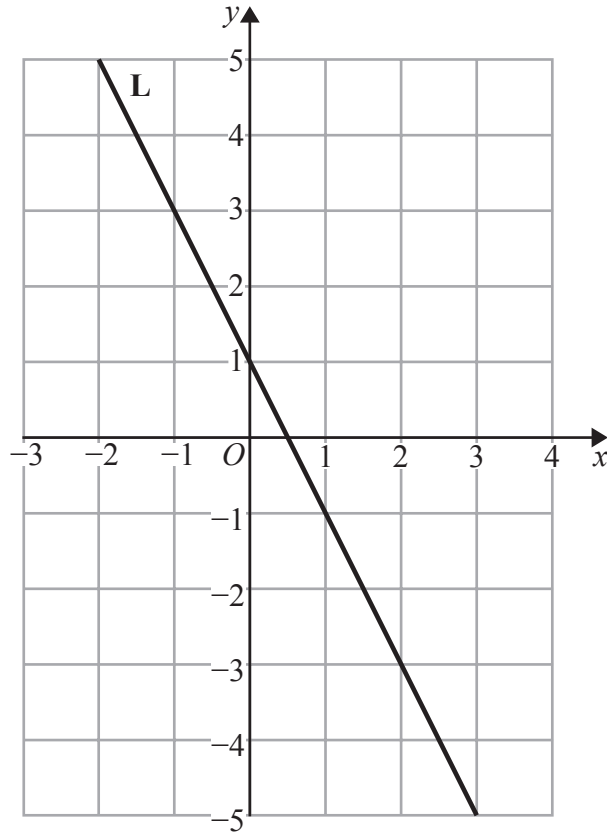


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11 Here is the straight line **L** drawn on a grid.



Find an equation for **L**.

(Total for Question 11 is 2 marks)

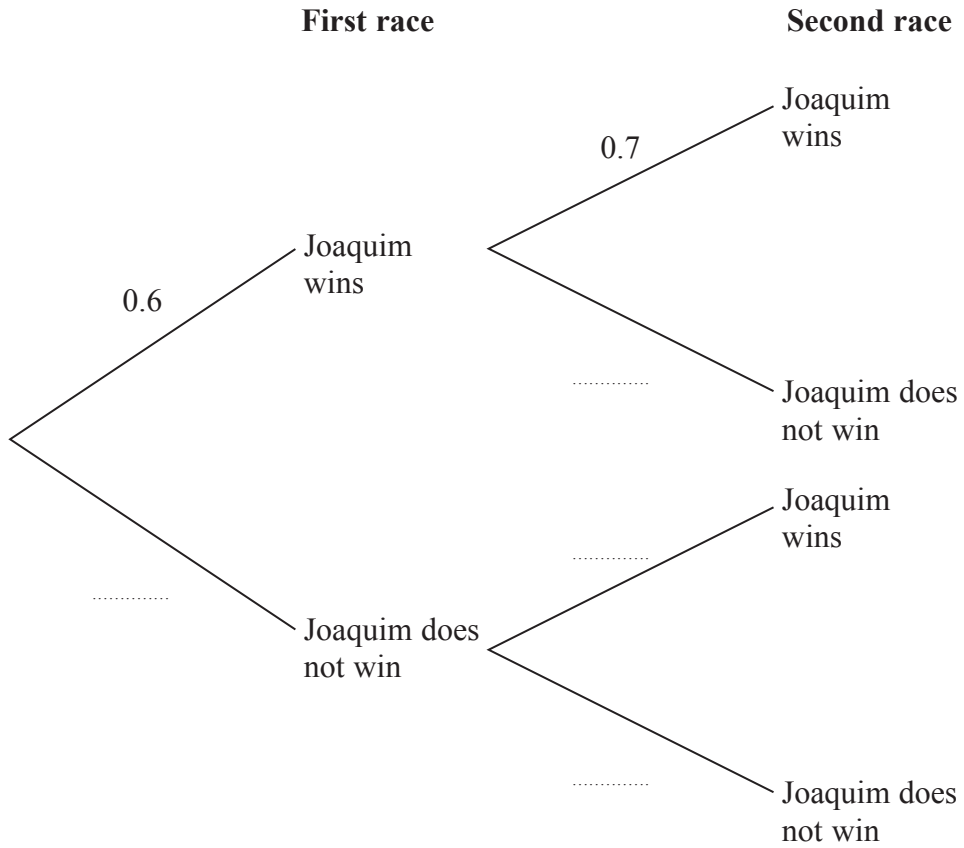


12 Joaquim takes part in two cycle races.

The probability that he wins the first race is 0.6

The probability that he wins the second race is 0.7

(a) Complete the probability tree diagram.



(2)

(b) Work out the probability that Joaquim wins both races.

(2)

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Joaquim takes part in a third cycle race.
The probability that Joaquim wins the third race is 0.2

(c) Work out the probability that he wins exactly one of the three races.

.....
(3)

(Total for Question 12 is 7 marks)



13 P is inversely proportional to the square of q .
When $q = 2$, $P = 12.8$

(a) Find a formula for P in terms of q .

.....
(3)

(b) Find the value of P when $q = 8$

.....
(1)

(Total for Question 13 is 4 marks)

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14 $ABCDE$ and $AWXYZ$ are two mathematically similar pentagons.

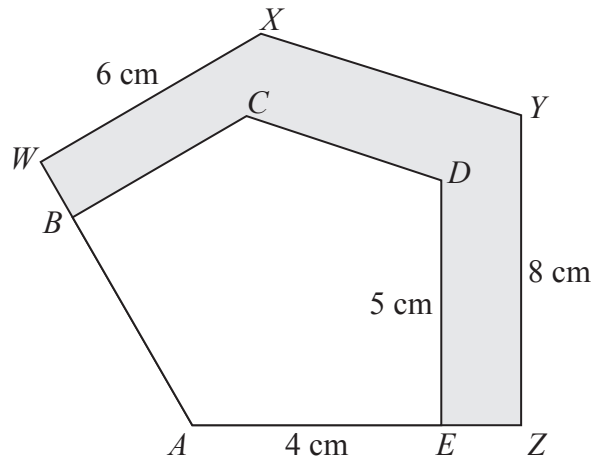


Diagram NOT accurately drawn

$AE = 4$ cm $WX = 6$ cm $DE = 5$ cm $YZ = 8$ cm

(a) Calculate the length of AZ .

..... cm
(2)

(b) Calculate the length of BC .

..... cm
(2)

The area of pentagon $AWXYZ$ is 52.48 cm²

(c) Calculate the area of the shaded region.

..... cm²
(3)

(Total for Question 14 is 7 marks)



15 (a) Factorise $y^2 - 2y - 48$

.....
(2)

(b) Solve $\frac{4}{e-3} = 5$

$e =$
(2)

(c) Simplify fully $\frac{3}{x+1} - \frac{2}{x-1}$

.....
(3)

(Total for Question 15 is 7 marks)



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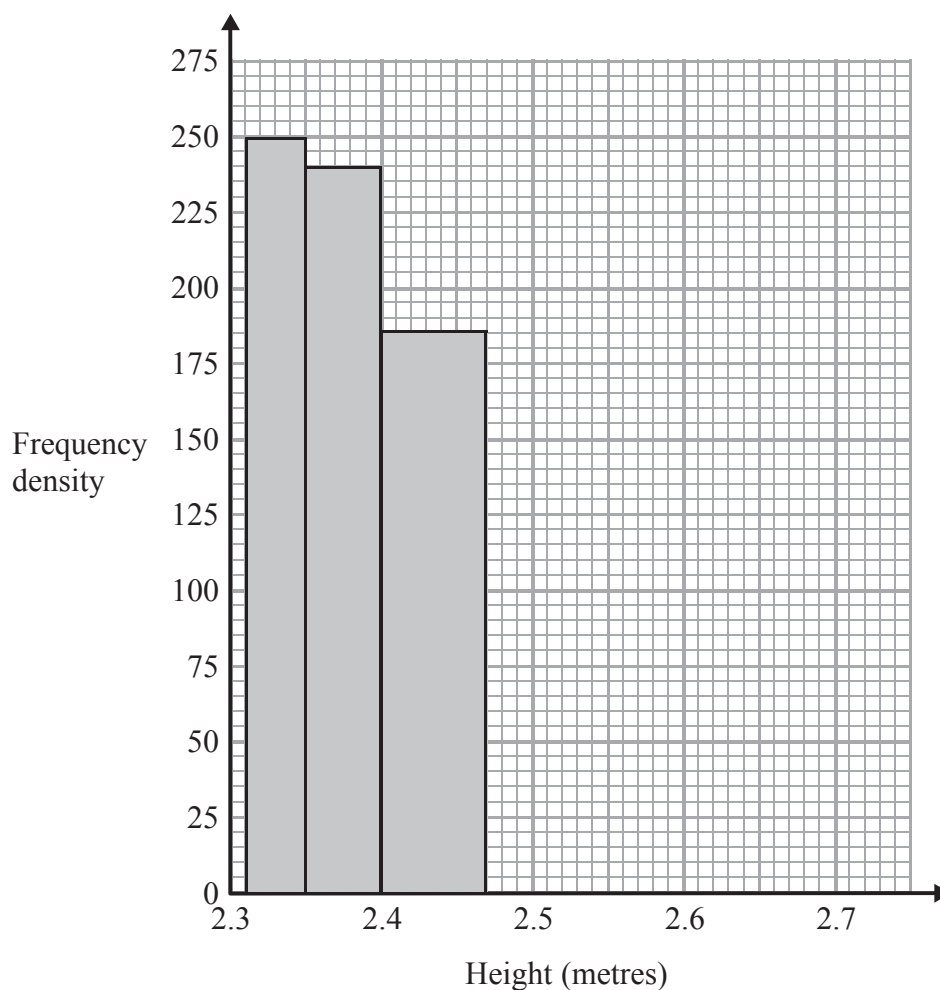
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16 The table shows information about the heights, in metres, of 45 of the world's tallest men.

Height (h metres)	Number of men
$2.31 < h \leq 2.35$	10
$2.35 < h \leq 2.40$	12
$2.40 < h \leq 2.47$	13
$2.47 < h \leq 2.72$	10

(a) Use the information in the table to complete the histogram.



(2)

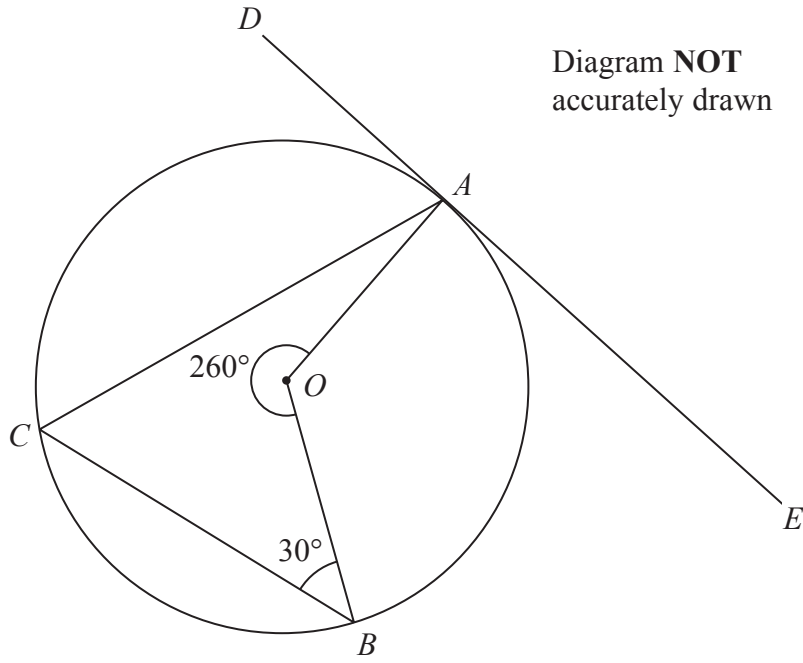
(b) Find an estimate for the number of these men with height between 2.32 metres and 2.34 metres.

(1)

(Total for Question 16 is 3 marks)



Diagram **NOT**
accurately drawn



A , B , and C are points on the circumference of a circle, centre O .
 DAE is a tangent to the circle.

(a) Work out the size of angle ACB .

.....
(2)

(b) Work out the size of angle CAD .

.....
(2)

(Total for Question 17 is 4 marks)

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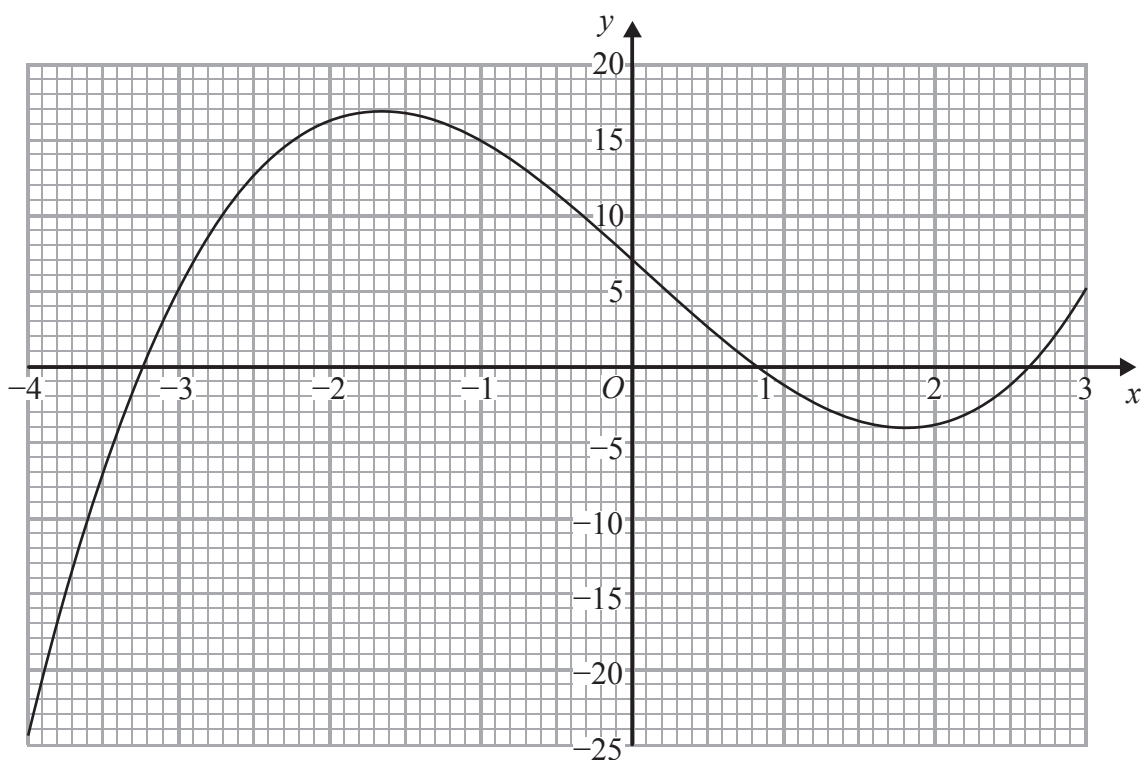


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18 Here is the graph of $y = x^3 - 0.2x^2 - 9x + 7$ for $-4 \leq x \leq 3$



(a) Use the graph to find an estimate for the solution of the equation $x^3 - 0.2x^2 - 9x + 7 = -5$

.....

(2)

(b) By drawing a suitable straight line on the grid, find an estimate for the solution of the equation $x^3 - 0.2x^2 - 4x + 7 = 0$

.....

(3)

(Total for Question 18 is 5 marks)



19 The diagram shows a solid cone.

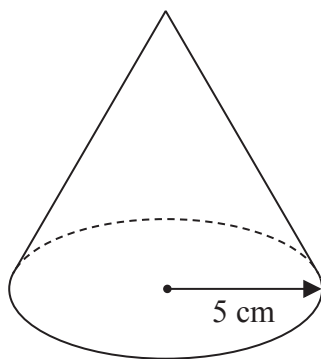


Diagram **NOT**
accurately drawn

The radius of the base of the cone is 5 cm.
The total surface area of the cone is $90\pi \text{ cm}^2$

Work out the volume of the cone.
Give your answer as a multiple of π .

..... cm^3

(Total for Question 19 is 5 marks)

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20 $(3 + \sqrt{c})(2\sqrt{c} - 3) = 1 + k\sqrt{c}$
where c and k are prime numbers.

(a) Find the value of c and the value of k .

$c = \dots\dots\dots$ $k = \dots\dots\dots$
(3)

$$p^m = \frac{1}{p \times \sqrt[3]{p^2}}$$

(b) Find the value of m .

$m = \dots\dots\dots$
(3)

(Total for Question 20 is 6 marks)



- 21 A rectangular piece of card has length $(3x - 13)$ cm and width $(x - 2)$ cm.
A square, with sides of length 25 cm, is removed from each corner of the card.

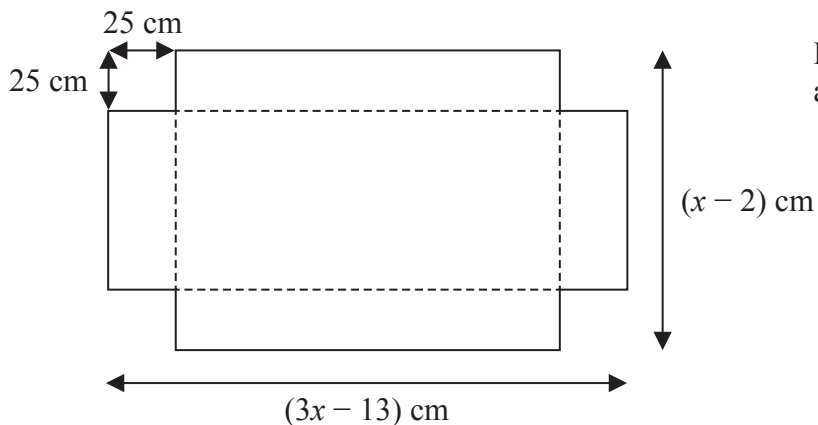


Diagram **NOT** accurately drawn

The card is then folded along the dashed lines to make an open box with height 25 cm as shown below.

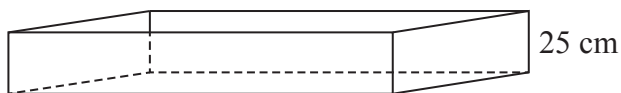


Diagram **NOT** accurately drawn

- (a) Show that the length of the open box is $(3x - 63)$ cm.

(1)

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The volume of the open box is $81\,900\text{ cm}^3$

- (b) Find the value of x .
Show clear algebraic working.

$$x = \dots\dots\dots$$

(5)

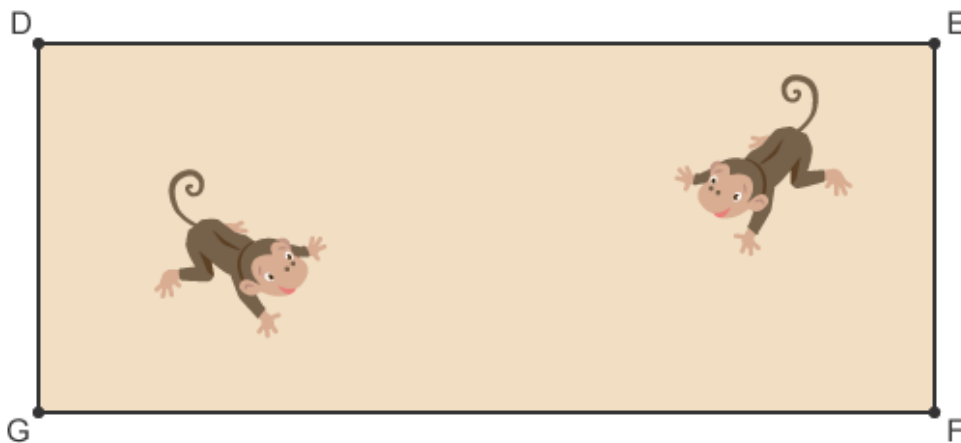
(Total for Question 21 is 6 marks)

Loci and constructions

Loci are a set of points with the same property. Loci can be used to accurately construct lines and shapes. Bearings are three figure angles measured clockwise from North.

Question 22

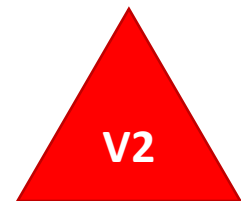
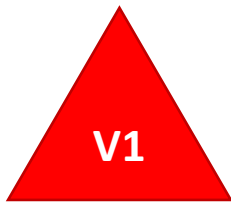
Visitors must stand at least 2 m away from the walls of the monkey enclosure at the zoo. How would you draw an accurate diagram to show where the visitors must not stand, using a scale of 1 cm:1 m?



Question 23

You are designing a road that pass in between two volcanos V1 and V2.

- a) Draw your suggested locus of the road.



- b) Find the bearing of V1 from V2.

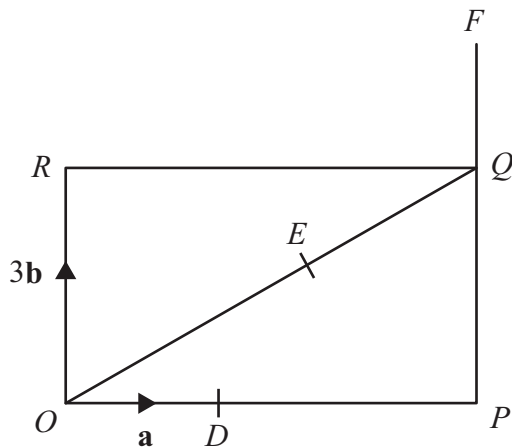


Diagram **NOT**
accurately drawn

$OPQR$ is a rectangle.

D is the point on OP such that $OD = \frac{1}{3} OP$.

E is the point on OQ such that $OE = \frac{2}{3} OQ$.

PQF is the straight line such that $QF = \frac{1}{3} PQ$.

$$\overrightarrow{OD} = \mathbf{a} \quad \overrightarrow{OR} = 3\mathbf{b}$$

(a) Find, in terms of \mathbf{a} and \mathbf{b} ,

(i) \overrightarrow{OQ}

(ii) \overrightarrow{OE}

(iii) \overrightarrow{DE}

(3)



(b) Use a vector method to prove that DEF is a straight line.

(2)

(Total for Question 24 is 5 marks)

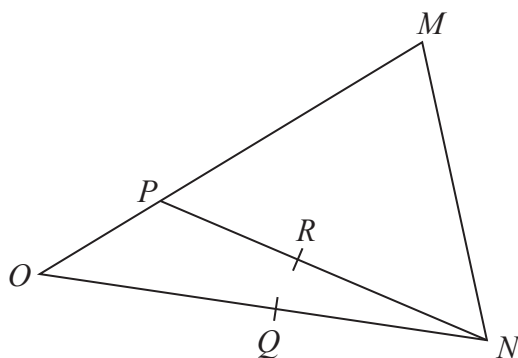


Diagram NOT
accurately drawn

OMN is a triangle.

P is the point on OM such that $OP = \frac{1}{4} OM$

Q is the midpoint of ON

R is the midpoint of PN

$$\vec{OP} = \mathbf{p} \quad \vec{OQ} = \mathbf{q}$$

(a) Find, in terms of \mathbf{p} and \mathbf{q} ,

(i) \vec{MN}

(ii) \vec{PR}

.....

.....

(2)

(b) Use a vector method to prove that QR is parallel to OP

(2)

(Total for Question 25 is 4 marks)

Q	Working	Answer	Mark	Notes
1 (a)	e.g. $\frac{100}{24} \times 30$	125	2	M1 For $\frac{100}{24}$ (=4.16(66..)) or $\frac{30}{24}$ or 1.25 or $\frac{24}{100} = \frac{30}{x}$ oe
				A1
(b)	e.g. $\frac{850}{300} \times 24$ or $850 \div \frac{300}{24}$ oe	68	2	M1 Complete method to find number made
				A1 cao
				Total 4 marks

2 (a)	$0.15 + 0.4$	0.55	1	B1
(b)	$\frac{1 - (0.15 + 0.4)}{3}$ or $\frac{0.45}{3}$ (= 0.15)	0.3	2	M1
				A1
(c)	160×0.4	64	2	M1
				A1
				Total 5 marks

3	$\frac{35}{100} \times 1200$ oe or 420	780	3	M1	[Award M2 for $1200 \times (1 - 0.35)$]	
	1200 - "420"			M1		dep
				A1		SC M1 for 1620
Total 3 marks						

4	30×20 or 600	399	4	M1	For area of rectangle
	$\pi \times 8^2$ or 201.(0619298...) or 64π			M1	Indep for area of circle eg $\pi \times 8^2$ or 201.(0619298..) or 64π
	$30 \times 20 - \pi \times 8^2$			M1	
				A1	Accept 398 -399.1
Total 4 marks					

5	(a)(i)	{3, 5, 7}	2	B1
	(a)(ii)	{1, 2, 3, 5, 7, 9}		B1
	(b)	6	1	B1
Total 3 marks				

6	12.8 ² – 9.7 ² or 163.84 – 94.09 or 69.75	8.35	3	M1 For squaring and subtracting [$a = \cos^{-1}\left(\frac{9.7}{12.8}\right)$ (= 40.7...) and $\sin 40.7.. = \frac{x}{12.8}$ or $\tan 40.7.. = \frac{x}{9.7}$]
	$\sqrt{12.8^2 - 9.7^2}$			M1dep For square root [$x = 12.8 \sin 40.7..$ or $x = 9.7 \tan 40.7..$]
				A1 Allow 8.35 - 8.352
				Total 3 marks

7	(a)		12p + 15	1	B1
	(b)		2(3r + 7)	1	B1
	(c)	(-5) ² – 3 × -5 oe	40	2	M1 or +25 or +15 A1
	(d)	$\frac{w^{13}}{w^4}$ or $w \times w^8$ or $w^5 \times w^4$	w^9	2	M1 For $\frac{w^{13}}{w^4}$ or $w \times w^8$ or $w^5 \times w^4$ A1
	(e)				2
					Total 8 marks

8	$160 - 3x + 7x - 20 = 180$ or $2(160 - 3x) + 2(7x - 20) = 360$ oe	10	3	M1 For a correct equation
	e.g. $4x = 180 - 140$ or $-3x + 7x = 180 + 20 - 160$ or $4x = 40$ or $14x - 6x = 360 - 320 + 40$ oe			M1 For isolating the terms in x in a correct equation
				A1 Dep on at least M1
				Total 3 marks

9	(a)	$\cos x = \frac{60}{110}$ or $\cos x = 0.545(4545\dots)$		3	M1
		$(x =) \cos^{-1}\left(\frac{60}{110}\right)$			M1
			56.9		A1 56.9 – 57
	(b)	$90 - 56.9(4426885\dots)$ oe	033	2	M1ft for complete method, ft from (a) if "(a)" < 90, 90 – their x A1ft accept (0)33 – (0)33.1 or ft
	(c)(i)		105	2	B1
	(c)(ii)		115		B1 Accept $114.\dot{9}$
					Total 7 marks

10 (a)		111375	2	M1 For $3^a \times 5^b \times 11$ with $a = 4$ or $b = 3$
				A1 Accept $3^4 \times 5^3 \times 11$ oe
(b)		2025	2	M1 For $3^4 \times 5^a$ or $3^p \times 5^2$ (and no 11) or $n \times 3^3 \times 5^2$ where $n \neq 11$
				A1 Accept $3^4 \times 5^2$ oe
				Total 4 marks

11		$y = -2x + 1$	2	<p>M1 For $y = -2x + c$ ($c \neq 1$) or $y = mx + 1$ or for a correct method to find the gradient or $m = -2$ and $c = 1$ stated or $-2x + 1$ or $L = -2x + 1$</p> <p>A1 oe</p>
				Total 2 marks

12	(a)		Correct probabilities	2	B1 For 0.4 on LH branch B1 For 0.3, 0.7 and 0.3 on RH branches
	(b)		0.42	2	M1 For 0.6×0.7 A1 oe
	(c)	$0.6 \times "0.3" \times "0.8" + "0.4" \times 0.7 \times "0.8" + "0.4" \times "0.3" \times 0.2$ (= 0.144 + 0.224 + 0.024) oe		3	M2ft For a complete method M1ft for $0.6 \times "0.3" \times "0.8"$ or 0.144 $\left(\frac{18}{125}\right)$ or $"0.4" \times 0.7 \times "0.8"$ or 0.224 $\left(\frac{28}{125}\right)$ or $"0.4" \times "0.3" \times 0.2$ or 0.024 $\left(\frac{3}{125}\right)$
			0.392		A1cao $\frac{49}{125}$ oe
		Alternative method			
		$1 - [(0.6 \times 0.7 \times 0.2) + (0.4 \times 0.3 \times 0.8) + (0.6 \times 0.7 \times 0.8) + (0.6 \times 0.3 \times 0.2) + (0.4 \times 0.7 \times 0.2)]$			M2ft For complete method M1ft for 1 – (at least 2 correct products).
			0.392		A1cao $\frac{49}{125}$
					Total 7 marks

13 (a)	$P = \frac{k}{q^2}$	$p = \frac{51.2}{q^2}$	3	M1 Allow $Pq^2 = k$ or $q^2 = \frac{k}{p}$ Do not allow $P = \frac{1}{q^2}$
	$12.8 = \frac{k}{2^2}$ oe or $k = 12.8 \times 2^2$ or $k = 51.2$			M1 For correct substitution in a correct equation. Implies first M1 Award M2 if $k = 51.2$ stated unambiguously
				A1 Award 3 marks if answer is $P = \frac{k}{q^2}$ but k is evaluated in (a) or (b) SCB2 for $Pq^2 = 51.2$ or $q^2 = \frac{51.2}{p}$
(b)	$\frac{51.2}{8^2}$	0.8	1	B1ft ft equation in the form $P = \frac{k}{q^2}$ oe
				Total 4 marks

14	(a)	e.g. $\frac{8}{5}$ or 1.6 or $\frac{5}{8}$ or 0.625 or e.g. $4 \times \frac{8}{5}$ or $4 \div \frac{5}{8}$ oe or e.g. $\frac{AZ}{4} = \frac{8}{5}$ or $\frac{AZ}{8} = \frac{4}{5}$ oe	6.4	2	M1 For correct scale factor or correct expression for AZ or for a correct equation involving AZ oe
		A1 oe e.g. $\frac{32}{5}$			
	(b)	Eg $6 \div \frac{8}{5}$ or $6 \times \frac{5}{8}$ or $\frac{6 \times 4}{"6.4"}$ oe	3.75	2	M1 Correct expression for BC A1 oe
	(c)	$52.48 - \frac{52.48}{1.6^2}$	31.98	3	M2 For a fully correct method or M1 for $\frac{52.48}{1.6^2}$ or 20.5
					A1 Accept 32.0 or 32
					Total 7 marks

15	(a)		$(y - 8)(y + 6)$	2	M1 For $(y \pm 8)(y \pm 6)$ A1 cao
	(b)	$4 = 5(e - 3)$ or $4 = 5e - 15$ or $\frac{4}{5} = e - 3$			M1
			$\frac{19}{5}$	2	A1 $3\frac{4}{5}$ or 3.8
	(c)	$\frac{3(x-1) - 2(x+1)}{(x+1)(x-1)}$ or $\frac{3(x-1)}{(x+1)(x-1)} - \frac{2(x+1)}{(x+1)(x-1)}$		3	M1 oe e.g. $\frac{3(x-1) - 2(x+1)}{x^2 - 1}$
		$\frac{3x - 3 - 2x - 2}{(x+1)(x-1)}$ oe			M1
			$\frac{x-5}{(x+1)(x-1)}$		A1 oe e.g. $\frac{x-5}{x^2 - 1}$
					Total 7 marks

16	(a)	$\frac{10}{2.72 - 2.47}$ or 40		2	M1 Or bar of height 40 wrong width
			Correct bar		A1
	(b)		5	1	B1
					Total 3 marks

17	(a)	$0.5 \times (360 - 260)$ or 0.5×100	50	2	M1 For a complete method A1
	(b)	e.g. $360 - ("50" + 260 + 30)$ (= 20), $90 - "20"$ or $\frac{180-100}{2} + 30$		2	M1ft For a complete method.
			70		A1
					Total 4 marks

18	(a)		-3.4	2	M1 Line $y = -5$ drawn or clear attempt to take reading at $y = -5$ A1 Accept -3.35 to -3.45 inclusive
	(b)			3	M2 $y = -5x$ drawn. M1 for $x^3 - 0.2x^2 - 9x + 7 = -5x$ or $y = -5x$ oe
			-2.5		A1 dep on at least M1 (-2.45 - -2.55)
					Total 5 marks

19	$(\pi \times 5^2) + \pi \times 5 \times l$ $(25\pi) + 5\pi l$		5	M1	For a correct expression for total surface area
	$(l =) 13$			A1	For the correct slant height
	$(h =) \sqrt{13^2 - 5^2}$ or $\sqrt{144}$ or 12			M1	For the correct method to find h ft if first M1 scored
	$(V =) \frac{1}{3} \times \pi \times 5^2 \times 12 (= 314 - 314.3)$			M1	For the correct method to find V ft if first M1 scored
		100π		A1	
Total 5 marks					

20 (a)	$6\sqrt{c} - 9 + 2c - 3\sqrt{c}$ or $3\sqrt{c} - 9 + 2c$		3	M1	Accept $\sqrt{c}\sqrt{c}$ or $(\sqrt{c})^2$ instead of c
		$c = 5$ $k = 3$		A1 B1	
(b)	$\frac{1}{p \times p^{\frac{2}{3}}}$ or $p^{m+1+\frac{2}{3}} = 1$		3	M1	
	$\frac{1}{p^{\frac{5}{3}}}$ or $p^{-\frac{5}{3}}$ or $m+1+\frac{2}{3} = 0$			M1	
		$-\frac{5}{3}$		A1	$p^{-\frac{5}{3}}$ gains M2 only
Total 6 marks					

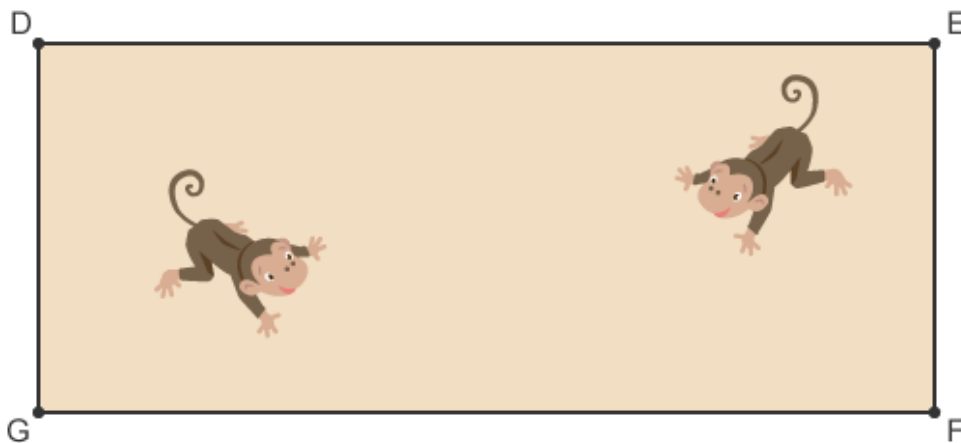
21	(a)		$3x - 13 - 50$	1	B1 or $3x - 13 - 25 - 25$
	(b)	$x - 52$		5	B1 or $x - 2 - 25 \times 2$
		$25(3x - 63)(x - 52) (= 81900)$			M1 For a correct expression for volume of box
		eg $3x^2 - 156x - 63x + 3276 (= 3276)$			M1 For brackets correctly expanded
		or $75x^2 - 3900x - 1575x + 81900 (= 81900)$			
		eg $3x^2 - 219x = 0$ or $3x(x - 73) = 0$ or $75x^2 - 5475x = 0$			M1 For correctly reducing to 2 term quadratic equation
		$(x = 0)$ or $x = 73$	73		A1 For $x = 73$ NB: A1 dependent on at least 2 method marks
					Total 6 marks

Loci and constructions

Loci are a set of points with the same property. Loci can be used to accurately construct lines and shapes. Bearings are three figure angles measured clockwise from North.

Question 22

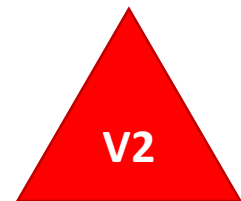
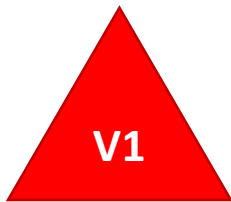
Visitors must stand at least 2 m away from the walls of the monkey enclosure at the zoo. How would you draw an accurate diagram to show where the visitors must not stand, using a scale of 1 cm:1 m?



Question 23

You are designing a road that pass in between two volcanos V1 and V2.

- a) Draw your suggested locus of the road.



- b) Find the bearing of V1 from V2.

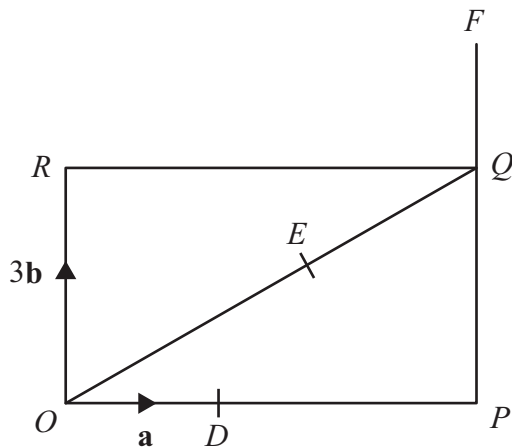


Diagram **NOT**
accurately drawn

$OPQR$ is a rectangle.

D is the point on OP such that $OD = \frac{1}{3} OP$.

E is the point on OQ such that $OE = \frac{2}{3} OQ$.

PQF is the straight line such that $QF = \frac{1}{3} PQ$.

$$\overrightarrow{OD} = \mathbf{a} \quad \overrightarrow{OR} = 3\mathbf{b}$$

(a) Find, in terms of \mathbf{a} and \mathbf{b} ,

(i) \overrightarrow{OQ}

(ii) \overrightarrow{OE}

(iii) \overrightarrow{DE}

(3)



(b) Use a vector method to prove that DEF is a straight line.

(2)

(Total for Question 24 is 5 marks)

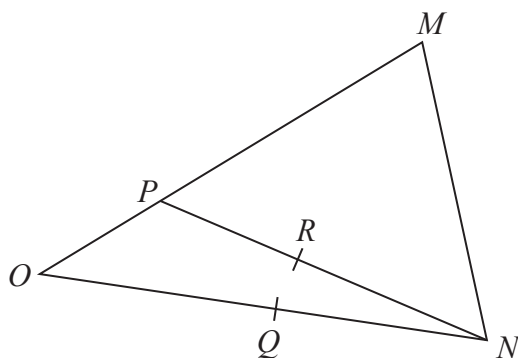


Diagram NOT
accurately drawn

OMN is a triangle.

P is the point on OM such that $OP = \frac{1}{4} OM$

Q is the midpoint of ON

R is the midpoint of PN

$$\vec{OP} = \mathbf{p} \quad \vec{OQ} = \mathbf{q}$$

(a) Find, in terms of \mathbf{p} and \mathbf{q} ,

(i) \vec{MN}

(ii) \vec{PR}

.....

.....

(2)

(b) Use a vector method to prove that QR is parallel to OP

(2)

(Total for Question 25 is 4 marks)