Paper Reference

4 4 0 0 / 4 H

Paper Reference(s)

4400/4H

London Examinations IGCSE

Mathematics

Paper 4H

Higher Tier

Tuesday 11 May 2004 – Morning

Time: 2 hours

Materials required for examination
Ruler graduated in centimetres and millimetres, protractor, compasses, pen, HB pencil, eraser, calculator.
Tracing paper may be used.

Items included with question papers
Nil

Instructions to Candidates

In the boxes above, write your centre number and candidate number, your surname, initial(s) and signature.
The paper reference is shown at the top of this page. Check that you have the correct question paper.
Answer **ALL** the questions in the spaces provided in this question paper.
Show all the steps in any calculations.

Information for Candidates

There are 16 pages in this question paper. All blank pages are indicated.
The total mark for this paper is 100. The marks for parts of questions are shown in round brackets: e.g. **(2)**.
You may use a calculator.

Advice to Candidates
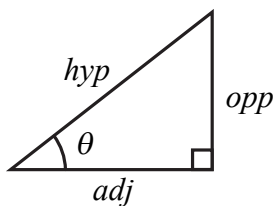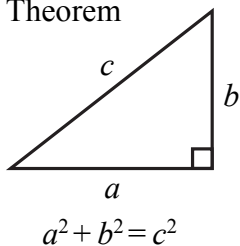
Write your answers neatly and in good English.

London Examinations
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Pythagoras'
Theorem

$a^2 + b^2 = c^2$

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 $= 4\pi r^2$

$\text{adj} = \text{hyp} \times \cos\theta$
$\text{opp} = \text{hyp} \times \sin\theta$
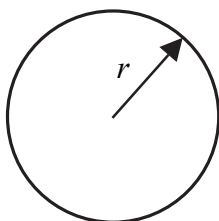$\text{opp} = \text{adj} \times \tan\theta$

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

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

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

In any triangle ABC

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

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

Area of triangle $= \frac{1}{2}ab\sin C$
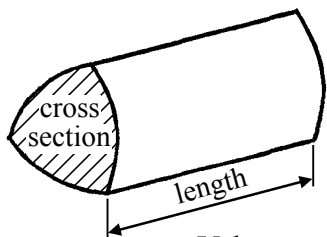
Volume of prism = area of cross section × length

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

Circumference of circle $= 2\pi r$

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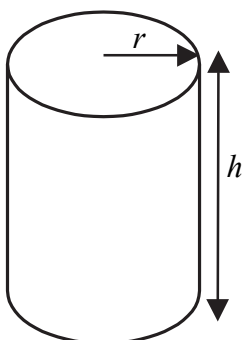
Volume of cylinder $= \pi r^2 h$

Curved surface area
of cylinder $= 2\pi rh$
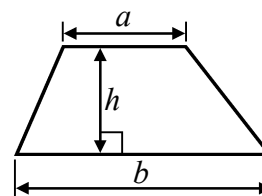
The Quadratic Equation
The solutions of $ax^2 + bx + c = 0$
where $a \neq 0$, are given by

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

Answer ALL TWENTY TWO questions.

Write your answers in the spaces provided.

You must write down all stages in your working.

1. Work out the value of $\dfrac{6.1+3.4}{5.7-1.9}$

....

(Total 2 marks)

Q1

2. Suhail cycles 117 km in 4 hours 30 minutes.
   Work out his average speed in km/h.

.... km/h

(Total 3 marks)

Q2

3. The word formula gives the time, in minutes, needed to cook a turkey.

   | Time = 40 × weight in kg + 20 |

   A time of T minutes is needed to cook a turkey with a weight of W kg.

   Write down a formula for T in terms of W.

....

(Total 2 marks)

Q3

4. The mean height of a group of 4 girls is 158 cm.

(a) Work out the total height of the 4 girls.

.... cm

(1)

Sarah joins the group and the mean height of the 5 girls is 156 cm.

(b) Work out Sarah's height.

.... cm

(3)

Q4

(Total 4 marks)

5. Plumbers' solder is made from tin and lead.
The ratio of the weight of tin to the weight of lead is 1 : 2

(a) Work out the weight of tin and the weight of lead in 120 grams of plumbers' solder.

tin .... g

lead .... g

(2)

(b) What weight of plumbers' solder contains 25 grams of tin?

.... g

(1)

Q5

(Total 3 marks)

6.
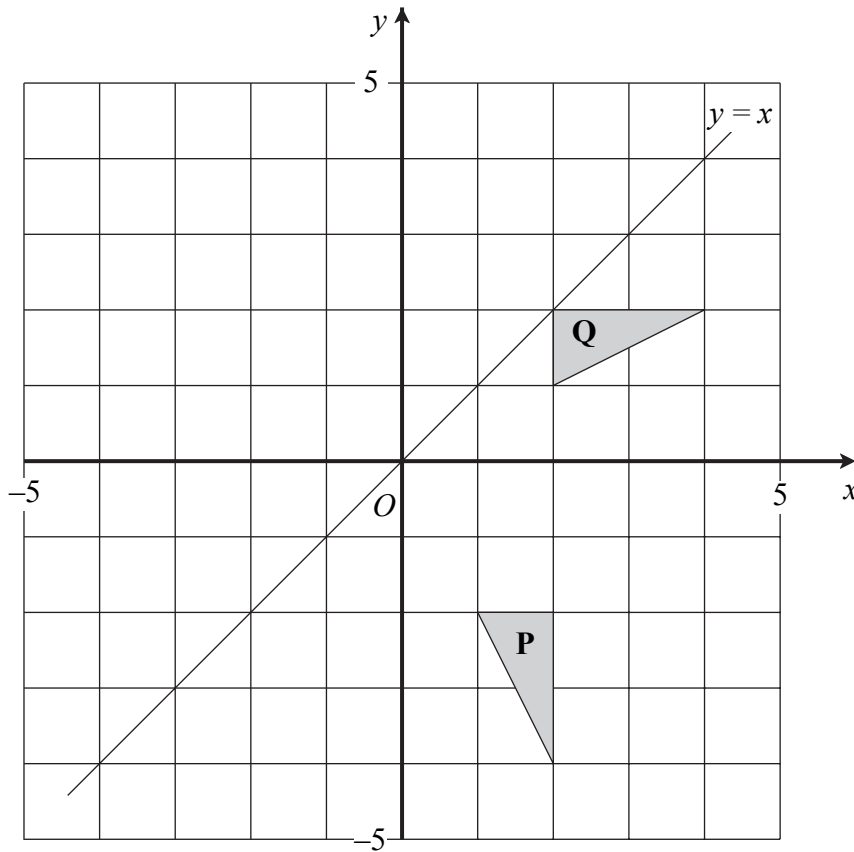
(a) Describe fully the single transformation which maps triangle **P** onto triangle **Q**.

....

....

(3)

(b) Reflect triangle **Q** in the line with equation $y = x$.

(2)

(Total 5 marks)

7. Work out $2\frac{2}{5} \times 1\frac{7}{8}$

Give your answer as a mixed number in its simplest form.

....

(Total 3 marks)

8. This formula is used in science.

$$v = \sqrt{2gh}$$

(a) Hanif uses the formula to work out an estimate for the value of v without using a calculator when $g = 9.812$ and $h = 0.819$

Write down approximate values for g and h that Hanif could use.

approximate value for g ....

approximate value for h ....

(2)

(b) Make h the subject of the formula $v = \sqrt{2gh}$

$h =$ ....

(2) Q8

(Total 4 marks)

9. (a) Simplify $n \times n \times n \times n$

....

(1)

(b) Simplify $p^2 \times p^5$

....

(1)

(c) Simplify $\dfrac{q^7}{q^3}$

....

(1)

(d) Simplify $\dfrac{t^4 \times t^7}{t^8}$

....

(1) Q9

(Total 4 marks)

10.

P

7.6 cm

4.7 cm

Diagram **NOT** accurately drawn

Q ———————— R
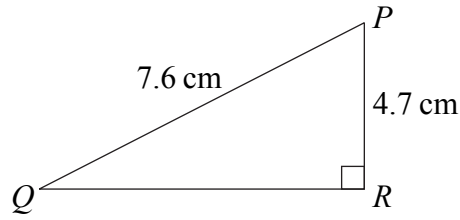
Triangle *PQR* is right-angled at *R*.
PR = 4.7 cm and *PQ* = 7.6 cm.

(a) Calculate the size of angle *PQR*.
Give your answer correct to 1 decimal place.

..............................°

(3)

The length, 7.6 cm, of *PQ* is correct to 2 significant figures.

(b) (i) Write down the upper bound of the length of *PQ*.

.... cm

(ii) Write down the lower bound of the length of *PQ*.

.... cm

(2)

(Total 5 marks)

Q10

11. Solve $4(x-3) = 7x-10$

x = ...

(Total 3 marks)

Q11

12.

5 cm **P** *y* cm   *x* cm **Q** 15 cm

8 cm   12 cm
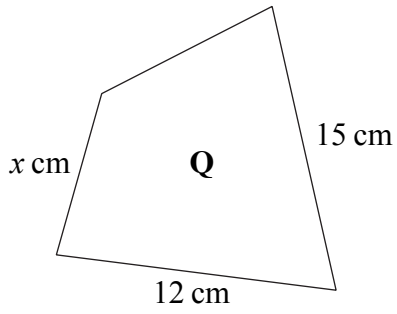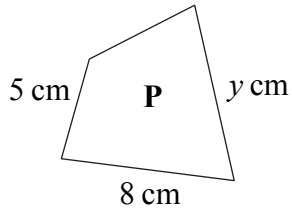
Diagram **NOT** accurately drawn

Quadrilateral **P** is mathematically similar to quadrilateral **Q**.

(a) Calculate the value of *x*.

x = ...

(2)

(b) Calculate the value of *y*.

y = ...

(2)

The area of quadrilateral **P** is 60 cm^2.

(c) Calculate the area of quadrilateral **Q**.

.... cm^2

(2)

Q12

(Total 6 marks)

13.
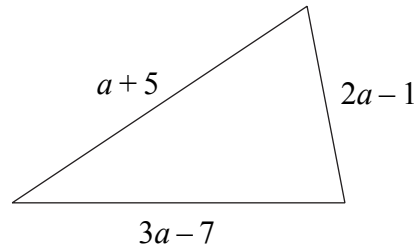
The lengths, in cm, of the sides of a triangle are $(a + 5)$, $(3a - 7)$ and $(2a - 1)$.
The perimeter of the triangle is 24 cm.
Work out the value of a.

$a =$ ....

(Total 3 marks)

14. Here is a fair 3-sided spinner.
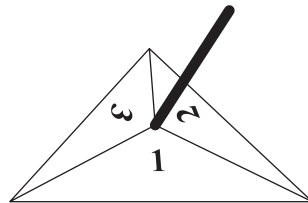
Its sides are labelled 1, 2 and 3 as shown.

(a) Aisha is going to spin the spinner twice.
    Work out the probability that it will land on 1 both times.

....

(2)

(b) Harry is going to spin the spinner 3 times.

   (i) Complete the probability tree diagram.

First spin	Second spin	Third spin	Outcome

$\frac{1}{3}$

Even ....

.... Even ....

.... Even

.... Even   EEE

.... Odd   EEO

.... Odd

.... Even ....

.... Odd ....

.... Odd

.... Even ....

.... Even ....

.... Odd ....

.... Odd

.... Even ....

.... Odd ....

.... Odd ....
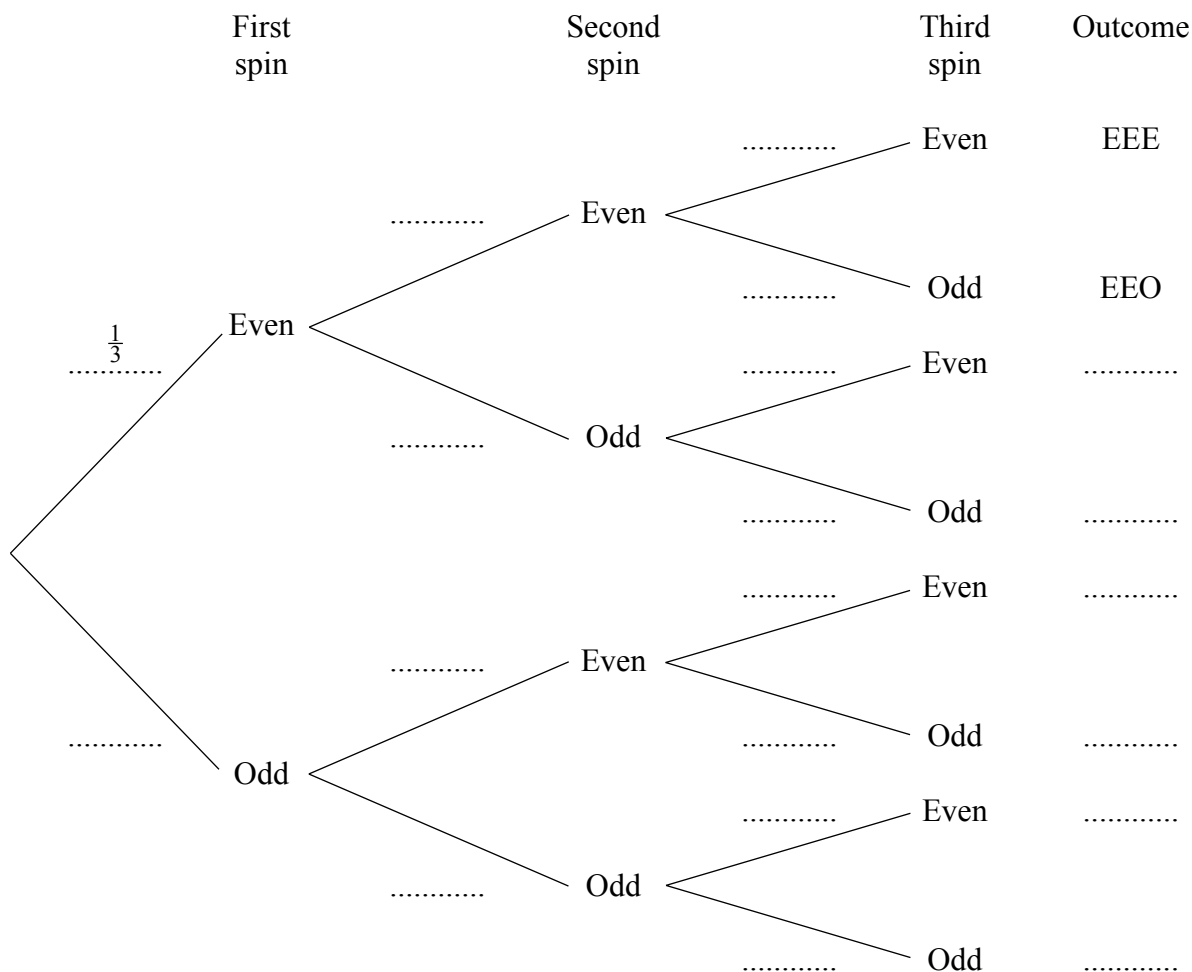
   (ii) Work out the probability that the spinner will land on an odd number 3 times.

....

   (iii) Work out the probability that the spinner will land on an even number exactly once.

....

(9)

(Total 11 marks)

Q14

15. In a sale, normal prices are reduced by 12%.
The sale price of a computer is £726

Work out the normal price of the computer.

£ ....

(Total 3 marks)

Q15

16.
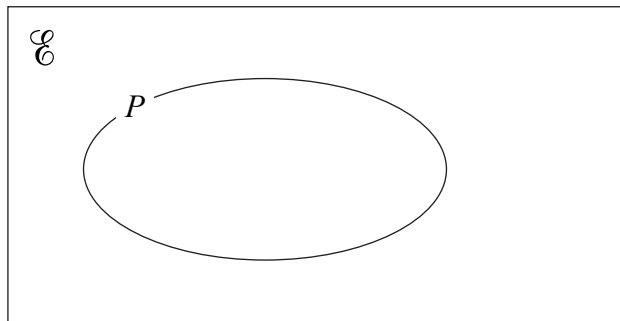
Set *P* is shown on the Venn Diagram.
Two sets, *Q* and *R*, are such that

$$R \subset P$$

$$Q \cap R = \varnothing$$

$$P \cup Q = P$$

Complete the Venn Diagram to show set *Q* and set *R*.

(Total 3 marks)

Q16

17. Convert the recurring decimal $0.3\dot{2}$ to a fraction.

....

(Total 2 marks)

Q17

18. (a) Complete the table of values for $y = x^3 - 3x^2 + 2$

x	–2	–1	0	1	2	3	4
y		–2					

(2)

(b) On the grid, draw the graph of $y = x^3 - 3x^2 + 2$

(2)
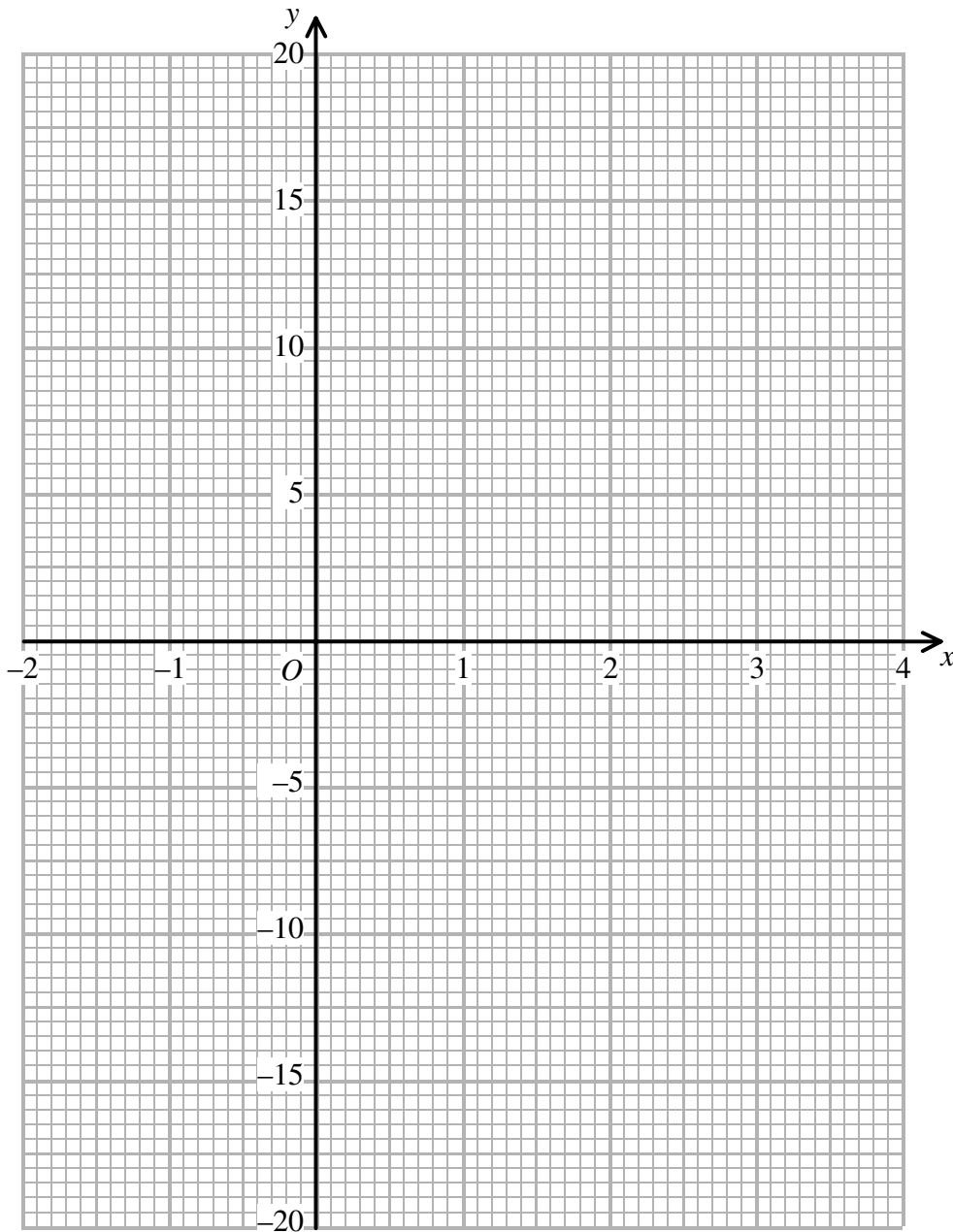
12

(c) Use your graph to find estimates, correct to 1 decimal place where appropriate, for the solutions of

(i) $x^3 - 3x^2 + 2 = 0$

....

(ii) $x^3 - 3x^2 - 4 = 0$

....

(4)

(Total 8 marks)

19. (a) Expand and simplify $(3p - 2q)(2p + 5q)$

....
(2)

(b) Simplify $(2x^2y^4)^3$

....
(2)

(c) Simplify $(a^4b^{-3})^{-2}$

....
(2)

(d) Simplify $(27p^6)^{\frac{1}{3}}$

....
(2)

(Total 8 marks)

Turn over

20.
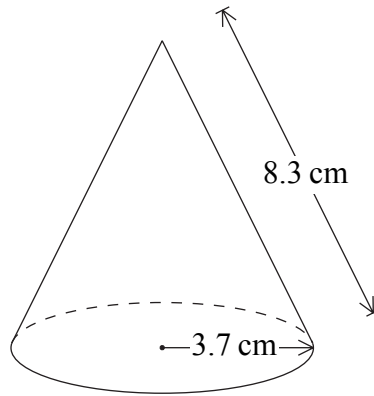
Diagram **NOT** accurately drawn

The diagram shows a solid cone.
The radius of its base is 3.7 cm and the slant height is 8.3 cm.

(a) Calculate the total surface area of the cone.
Give your answer correct to 3 significant figures.

.... cm^2

(2)

(b) Calculate the volume of the cone.
Give your answer correct to 3 significant figures.

.... cm^3

(4)

Q20

(Total 6 marks)

21. Solve the simultaneous equations

$$2x + y = 6$$

$$x^2 + y^2 = 20$$

....

(Total 7 marks)

22.
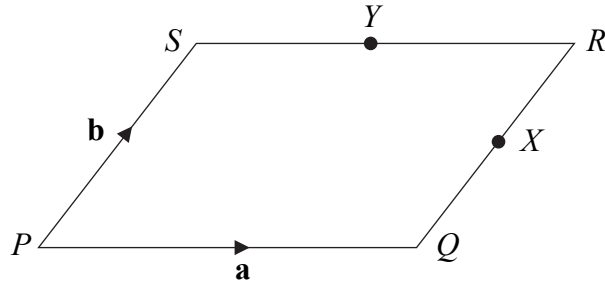
PQRS is a parallelogram.

X is the midpoint of *QR* and *Y* is the midpoint of *SR*.

$\overrightarrow{PQ} = \mathbf{a}$ and $\overrightarrow{PS} = \mathbf{b}$.

(a) Write down, in terms of **a** and **b**, expressions for

(i) $\overrightarrow{PX}$

....

(ii) $\overrightarrow{PY}$

....

(iii) $\overrightarrow{QS}$

....

(3)

(b) Use a vector method to show that *XY* is parallel to *QS* and that $XY = \frac{1}{2}QS$.

(2)

Q22

(Total 5 marks)

TOTAL FOR PAPER: 100 MARKS

END

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IGCSE

IGCSE Mathematics (4400)
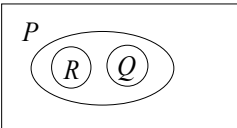
Mark Schemes for May 2004 examination session

Paper 4H (Higher Tier)

No		Working	Answer	Mark	Notes	
1		$\dfrac{9.5}{3.8}$		2	M1	for 9.5 or 3.8 seen
			2.5		A1	cao
2		4.5 oe seen		3	B1	
		$\dfrac{117}{"4.5"}$			M1	for $\dfrac{117}{time}$ eg $\dfrac{117}{270}$
			26		A1	cao
3			$T = 40W + 20$ oe	2	B2	B1 for T = linear expression in W
						B1 for $40W + 20$ oe
4	a		632	1	B1	cao
	b	5 x 156 or 780			M1	
		"780"–"632"			M1	(dep M1)
			148		A1	cao
5	a		40	2	B1	cao
			80		B1	cao
	b		75	1	B1	cao
6	a		Rotation	3	B1	not "turn"
			90°		B1	If 2 transfs given, B0B0B0
			(0, 0) or origin		B1	
	b		Correct image	2	B2	(B1 for 2 vertices correct)

No		Working	Answer	Mark	Notes	
7		$\frac{12}{5} \times \frac{15}{8}$ $\frac{180}{40}$ or simpler inc $\frac{9}{2}$ $4\frac{1}{2}$		3	M1 A1 A1	Not 2.4 x 1.875 Not 4..5 cao
8	a		10 & 0.8 or 9.8 & 1 or 10 & 1	2	B2	B1 for 9.8 & 0.8
	b	$v^2 = 2gh$ $\frac{v^2}{2g}$ oe		2	M1 A1	
9	a		n^4	1	B1	cao
	b		p^7	1	B1	cao
	c		q^4	1	B1	cao
	d		t^3	1	B1	cao
10	a	$\sin \angle PQR = \dfrac{4.7}{7.6} = 0.6184...$ 38.2		3	M1 M1 A1	for sin & $\dfrac{4.7}{7.6}$ or 0.6184… $\sin^{-1}(0.6184..)$ May be implied for 38.2 or better
	bi		7.65 7.55	2	B1 B1	Accept $7.64\dot{9}$ cao
11		$4x - 12 = 7x - 10$ $-12 + 10 = 7x - 4x$ or $-2 = 3x$ $-\frac{2}{3}$ oe		3	B1 M1 A1	for $4x - 12$ seen

No		Working	Answer	Mark	Notes
12	a	$\frac{12}{8}$ or 1.5 oe seen		2	M1
			7.5 oe		A1
	b	$15 \times \frac{2}{3}$		2	M1
			10		A1 cao
	c	$\left(\frac{3}{2}\right)^2$ or $\frac{9}{4}$ or 2.25 oe		2	M1
			135		A1 cao
13		$a + 5 + 3a - 7 + 2a - 1 = 24$		3	M1
		6a-3=24			M1
			4.5 oe		A1
14	a	$\frac{1}{3} \times \frac{1}{3}$ or all 9 combinations shown eg 2 way table or list		2	M1
			$\frac{1}{9}$		A1
	bi	$\frac{2}{3}$ on bottom LH branch		9	B1
		rest of probabilities correct			B1
		EOE, EOO, OEE, OEO, OOE, OOO			B1
	ii	$\frac{2}{3} \times \frac{2}{3} \times \frac{2}{3}$			M1
			$\frac{8}{27}$ oe		A1 ft if 0 < probs <1
	iii	$\frac{1}{3} \times \frac{2}{3} \times \frac{2}{3}$ in any order or $\frac{4}{27}$			M1
		3 correct paths identified			B1 may be implied by next M1
		"$\frac{4}{27}$"×3			M1 or add 3 correct paths
			$\frac{4}{9}$ oe		A1 ft if 0 < probs <1

No	Working	Answer	Mark	Notes
15	0.88 seen $\dfrac{726}{0.88}$ 	 825	3	B1 M1 A1 cao
16			3	B3 B1 for each condition satisfied
17	$10x = 3.222...$	 $\dfrac{29}{90}$	2	M1 A1 cao
18 a		$-18,(-2),2,0,-2,2,18$	2	B2 for all correct (B1 for 4 or 5 correct)
b		Points plotted Curve	2	B1 $\pm$ ½ sq ft if at least B1 in (a) B1 ft if awarded B1 for points
c		$-0.7,1,2.7$	2	B2 ft if awarded $\geq$ B1 in (b) (B1 for 2 correct)
d	indication that $y = 6$ used or $x^3\text{-}3x^2+2 = 6$ or $y = 6$ seen 3.4		2	M1 eg line, mark on graph A1 ft if awarded $\geq$ B1 in (b)
19 a	$6p^2 + 15pq - 4pq - 10q^2$	 $6p^2 + 11pq - 10q^2$	2	M1 for 3 terms correct A1 cao
b		$8x^6y^{12}$	2	B2 (B1 for 2 of 3 parts correct)
c		$a^{-8}b^6$	2	B2 (B1 for one part correct) Accept $\dfrac{1}{a^8b^{-6}}$
d		$3p^2$	2	B2 (B1 for one part correct)

No		Working	Answer	Mark	Notes	
20	a	$\pi \times 3.7^2 + \pi \times 3.7 \times 8.3$		2	M1	
			139 to 140		A1	
	b	$8.3^2 - 3.7^2$ or 55.2		4	M1	
		$\sqrt{\text{"55.2"}}$ or 7.4296…			M1	dep on 1st M1
		$\frac{1}{3}\pi \times 3.7^2 \times$"7.43"			M1	
			107		A1	for 107 or better (106.512…)
21		$y = 6 - 2x$		7	M1	for making y (or x) the subject
		$x^2 + (6 - 2x)^2 = 20$			M1	for substitution
		$x^2 + 36 - 24x + 4x^2 = 20$			M1	for correct expansion
		$5x^2 - 24x + 16 = 0$			A1	
		$(5x - 4)(x - 4) = 0$			M1	
			$x = 4$ and $x = \frac{4}{5}$ oe		A1	cao
			$x = \frac{4}{5}, y = 4\frac{2}{5}$ oe			
			and $x = 4, y = -2$			
					A1	Must be in pairs One pair only, by trial & improvement, or without working, M0A0
22	ai		$\mathbf{a} + \frac{1}{2}\mathbf{b}$ oe	3	B1	
	ii		$\frac{1}{2}\mathbf{a} + \mathbf{b}$ oe		B1	
	iii		$\mathbf{b} - \mathbf{a}$ oe		B1	
	b	$\frac{1}{2}\mathbf{a} + \mathbf{b} - \mathbf{a} - \frac{1}{2}\mathbf{b}$		2	B1	
		or $\frac{1}{2}\mathbf{b} - \frac{1}{2}\mathbf{a}$				
			$\overrightarrow{XY} = \frac{1}{2}\overrightarrow{QS}$		B1	Or equivalent. Must use vector not'n dep on 1st B1