6131
Paper 2

General Comments

The marks ranged from 0 to 118. It seemed as if the syllabus was not fully covered. Logical reasoning skills proved to be a challenge to most candidates.
It was still noticed that in questions that require method some candidates are still either writing answers only without showing working, or deleting the correct answers and replace them with wrong answers, which should be highly discouraged.

Most candidates were unable to round off their final answer to 3 s. f. or to the required degree of accuracy in some questions. Candidates are still encouraged to **write the full calculator display** before attempting to round off to the required degree of accuracy. However candidates are advised **not to round off their answers for questions on limits of accuracy.** They should write **their full calculator display**.

When candidates abandon their working and decide to start afresh, they are advised to clearly draw a line across the abandoned work. If they leave the old working together with the new working side by side, this is regarded as a choice and the work that is first seen is marked. Candidates should be discouraged from answering the question in two or more different ways, in that case the first method is marked even though it might be wrong.

Marks were awarded for correct substitution in a correct formula but not for writing a correct formula alone. Most candidates substituted in wrong formulae hence the need to know correct formulae such as gradient , midpoint, length of a line segment, magnitude of a vector, quadratic formula, sine and cosine rule as well as areas of a triangle, parallelogram, circle and square formulae is important.

Candidates should be encouraged to plot points clearly before joining the points when answering questions on graphs in order to gain plotting marks.

Candidates should be discouraged from writing in pencil (except when drawing) and should avoid rewriting over numbers as it makes it difficult to read those numbers. Candidates should be encouraged to remove eraser's deposits from the question paper.

Topics that require more attention are: **Set languages and notations, Coordinate geometry, Trigonometry (Area of a triangle, Sine and Cosine rules), Algebraic manipulation, application of fractions and directed numbers with respect to Algebra, Statistics and Probability**.
Candidates must read the instructions to each question before they start answering.

Comments on specific questions:

Question 1.

Generally the question was well answered by the majority of the candidates.
1(a - e) Well answered, but there were a few spelling errors in copying the words rational / irrational from the question such as "rotational or ration" this must be avoided at all times. Some candidates were solving the problems by giving numeral answers.

Answer

Question	Answer	Marks	Partial Marks
1 (a)	rational	1	c.a.o
(b)	rational	1	c.a.o
(c)	irrational	1	c.a.o
(d)	rational	1	c.a.o
(e)	rational	1	c.a.o

Question 2.

2 (a) Well answered, in some cases the candidates could not manipulate **the order of operations**.

2 (b) Poorly answered as most candidates were still substituting the values in part (a) rather than changing the subject of the formula. Common wrong answer seen $\frac{u-v}{t}$.

Answer

2 (a)	– 62	2	M1 for 8 + (–10)(7) o.e.
(b)	$a = \frac{v-u}{t}$	2	M1 for $v-u=at$ or $-at=u-v$

Question 3.

3 Moderately answered. Candidates calculated the volume using the given dimensions and then they found a lower bound of their answer to 174. The majority of those who calculated correctly ended up rounding their final answer to 3 s. f. **Candidates are advised not to round off the final answers in limits of accuracy. They should write the full calculator display.**

Answer

3	173.506875 (exact)	5	B1 for 3.05 seen B1 for 9.25 seen B1 for 6.15 seen M1 for 3.05 × 9.25 × 6.15 FT1 for multiplying **their** lower bound (method only)

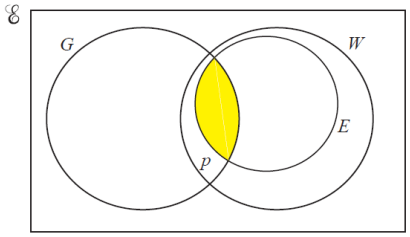
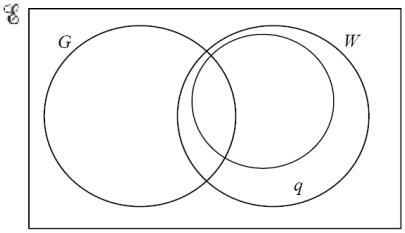
Question 4.

4 (a) Poorly answered. Very few candidates could get the correct set notation required.

4 (b) Moderately answered. Most candidates regarded house p as a set instead of house p as an element of a set.

4 (c - d) Moderately answered. Candidates found it hard to the use of brackets should be encouraged, especially when substituting negative numbers shade the correct region. Teachers should emphasise the set language and notations.

Answer

4 (a)	$E \subset W$	1	c.a.o
(b)	- p has gas and tap water but no electricity.	2	B1 for **any two correct** information mentioned.
(c)		1	c.a.o
(d)		1	c.a.o

Question 5

This whole question was poorly answered. Algebraic manipulation skills such as algebraic fractions and indices were not mastered.

5 (a) Poorly answered. Common wrong answers seen $6x^6y^5$ or $8x^6y^5$.

5 (b) Poorly answered. Candidates failed to factorise trinomial. Lack of cancelation rules was displayed.

5 (c) Poorly answered. Most candidates could not find the LCD of $(y-1)^2$ and $(y-1)$. Multiplying of the signs proved to be a challenge.

Answer

5 (a)	$8x^9y^6$	2	B1 for any two correct
(b)	$\frac{x-4}{x+3}$	3	M1 for $(x-4)(x+3)$ M1 for $(x+3)(x+3)$ o.e.
(c)	$\frac{2y-y^2}{(y-1)(y-1)}$	2	M1 for $\frac{y-y(y-1)}{(y-1)(y-1)}$ o.e.

Question 6.

6 (a) Moderately answered. Most candidates could not recognise that the area of a rectangle should be used to prove that some candidates could not 'show' but 'solve' instead.

6 (b) Fairly answered. Some candidates substituted in wrong quadratic formula $-b \pm \frac{\sqrt{b^2-4ac}}{2a}$.

Others could not round off correctly to 3 s. f. Most candidates gave both solutions as the answers, forgetting that the length is always positive.

Answer

6 (a)	$[150=](x+15)(x+4)$ $150 = x^2+19x+60$ $[150-60 = x^2+19x]$ $\therefore x^2+19x = 90$	M1 M1 B1	
(b)	x = 3.93	3	M1 for the correct $-b \pm \frac{\sqrt{b^2-4ac}}{2a}$ M1 for using a quadratic formula or completing the square correctly.

Question 7

Teachers should put more effort on matrices as most candidates did not master the specific objectives in this topic.

7 (a) Poorly answered. Most candidates could not find the products of 2×2 matrices.

7 (b) Moderately answered. Most candidates could find the determinant of matrix **C** but could not swap and change the signs of entries correctly hence failed to get the inverse matrix. Some candidates managed only to get $\begin{pmatrix} -1 & -3 \\ -8 & -10 \end{pmatrix}$. The application of directed numbers was failed by most candidates.

Answer

7 (a)	$\begin{pmatrix} 4 & 3 \\ 20 & -6 \end{pmatrix}$	2	B1 for any two correct entries.
(b)	$-\frac{1}{14}\begin{pmatrix} -1 & -3 \\ -8 & -10 \end{pmatrix}$ or $\begin{pmatrix} \frac{1}{14} & \frac{3}{14} \\ \frac{4}{7} & \frac{5}{7} \end{pmatrix}$ o.e.	2	B1 for det **C** = –14 **seen** or $\begin{pmatrix} -1 & -3 \\ -8 & -10 \end{pmatrix}$ **seen**

Question 8

8 (a) well answered.

There were only few cases where candidate could not collect the like terms correctly. However, the use of directed numbers should be re-emphasised.

8 (b) Well answered.

8 (c) Poorly answered.

Most candidates could make one of the variable the subject of the formula and substituted correctly but failed to expand. In most cases the middle term was omitted. Those who went as far as using a quadratic formula, they use "x" instead of "y".

Answer

8 (a)	5.8 or $\frac{29}{5}$ or $5\frac{4}{5}$	2	M1 for $12x - 7x = 37 - 8$ o.e.
(b)	5	4	M1 for $2(3x + 1) + 5(x - 2)$ [= 47] M1 for $6x + 2 + 5x - 10 = 47$ M1 for $11x = 55$
(c)	(2,3) or (–3,2)	6	B1 for $x = 5y - 13$ or $y = \frac{-13 - x}{-5}$ o.e M1 for correct substitution M1 for $26y^2 - 130y + 156 = 0$ o.e M1 for any correct method used to solve the quadratic equation M1 for $y = 3$ or $y = 2$ or for $x = -3$ or $x = 2$

Question 9

9 (a) Moderately answered. Triangle XYZ was used as a right-angled triangle and used Pythagoras theorem instead.

Most candidates could use the correct formula (sine rule), however the calculator skills to find an angle proved to be a challenge.

9 (b) Poorly answered. Most candidates substituted in wrong formulae.

9 (c) Poorly answered. Most candidates omitted sine in the area formula.

The common wrong answer was 345.

Answer

9 (a)	69.8°	2	B1 for $\frac{\sin y}{30} = \frac{\sin 46}{23}$ o.e
(b)	28.8	**FT** 2	M1 for $\frac{x}{\sin 64.2} = \frac{23}{\sin 46}$ o.e OR M1 for $x^2 = 23^2 + 30^2 - 2(23)(30)\cos 64.2$ o.e FT2 for using the sine or cosine rule correctly
(c)	a.r.t 311	**FT** 2	M1 for $\frac{1}{2} \times 28.8 \times 23 \sin 69.8$ OR M1 for $\frac{1}{2} \times 23 \times 30 \sin 64.2$ OR M1 for $\frac{1}{2} \times 30 \times 28.8 \sin 46$ o.e FT2 for the correct area formula used

Question 10

10 (a) (i) Well answered.

10 (a) (ii) Moderately answered although some candidates used 9 cm as the length of the side instead of 18 cm.

10 (a) (iii) Poorly answered.

Majority of candidates could not get subtract the area of the circle from the area of the square, and those who did subtract, they did not halve their answers.

The common answer seen was 70 or 69.5.

10 (b)(i - iii) Moderately answered. Most of candidates got the angle sizes correctly, but they failed to give the correct reasons.

Answer

10 (a) (i)	81π or 254 - 255	2	M1 for $\pi \times 9^2$ o.e
(ii)	324	2	M1 for 18^2 o.e
(iii)	a.r.t 35	**FT** 2	M1 for $(324 - 254.4690049)$ o.e FT2 for $\frac{1}{2}$ [their **(a)(ii)** – their **(a)(i)**]
(b) (i)	48° Angles in the same segment/chord. Angle subtended by the same arc	2	
(ii)	90° Angle in a semi-circle	2	
(iii)	90 Angles between tangent and radius/ diameter of a circle.	2	

Question 11

11 (a) Most candidates got wrong the magnitude of a line formula.

11 (b) Most candidates got the midpoint formula wrong, instead of adding the coordinates, they subtracted.

11 (c) Most candidates could not understand what the question required. The fact which is to be shown should never be used anywhere before that fact is established.

11 (d) Poorly answered. Most candidate could not work out the perpendicular height and some candidates mistaken the parallelogram for a rhombus.

Answer

11 (a)	$4\sqrt{5}$	3	M2 for $\sqrt{(-4)^2+(-8)^2}$ o.e. M1 for $\sqrt{(-5-(-1)^{\ 2}+(-2-6)^2}$ o.e
(b)	(−3, 2)	2	M1 for $\left(\frac{-5-1}{3},\frac{-2+6}{2}\right)$ o.e
(c)	M1 for correct substitution in the gradient formula M1 for correct substitution in the gradient formula B1 for $m_{MS}=-\frac{1}{2}$ o.e. B1 for $m_{PQ}=2$ o.e. **FT**1for m_{MS} from **their (b)** E1 for $-\frac{1}{2}\times 2=-1$ [$\therefore MS \perp PQ$]	4	
(d)	60 units^2	**FT** 4	M1 for $\lvert MS\rvert=\sqrt{(-3-3)^2+(2+1)^2}$ o.e A1 for $\lvert MS\rvert=\sqrt{45}$ o.e. M1 for $\sqrt{80}\times\sqrt{45}$ o.e FT 4 for **their (a)** x **their** $\lvert MS\rvert$

Question 12

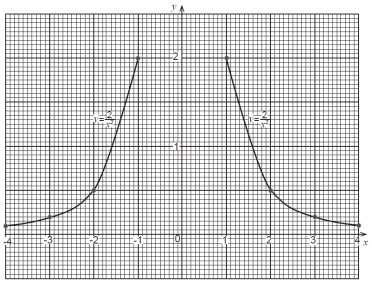
12 (a) Well answered although common wrong answers seen were all negative because candidates did not use the brackets.

12 (b) Well answered. Some candidates had difficulty in reading the scale properly. Candidates should be advised that the graph should be smooth and not ruled.

12 (c) (i) Well answered. But scale reading remained a challenge.

12 (c) (ii) Moderately answered. Candidates should be encouraged to read instruction thoroughly before answering the question. In answering this question, candidates used algebra to get the solutions rather than reading from the graph.

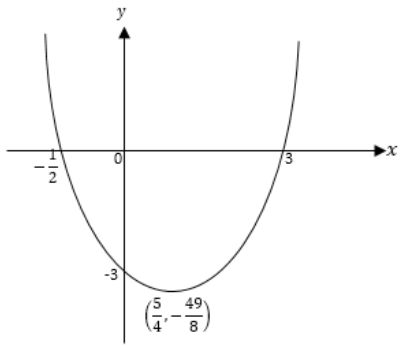
Answer.

12 (a)	0.1, 0.2, 0.5, 2	4	B1 for each correct value in the correct position.
(b)		4	P3 for all 8 points plotted correctly. P2 for 6 – 7 points plotted correctly. P1 for 4 – 5 points plotted correctly. C1 for a smooth curve.
(c) (i)	Correct line	1	L1 for line $y = \frac{1}{4}$ drawn correctly
(ii)	x = – 2.8 or 2.8 [Allow ±0.1]	2	B1 for each answer correct.

Question 13

It seemed as if many centres did not cover this specific objective, therefore teachers should pay more attention to this topic as candidates need to know how to sketch a graph and which information must be labelled on the diagram.

Answer.

13		5	B1 for $x = 3$ B1 for $x = -\frac{1}{2}$ B1 for the –3 indicated on the y-axis. B1 for $(\frac{5}{4}, -\frac{49}{8})$ o.e C1 for the curve **cutting both axes**.

Question 14

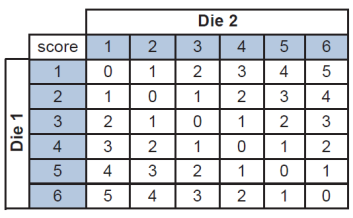
14 (a) (i) Moderately answered. Most candidates could not understand what the question require, instead of writing the score differences, they wrote possible outcomes.

14 (a)(ii - iv) Poorly answered.

14 (b) (i) Moderately answered. Most candidates could not understand that at each branch the sum of probability must be equal to 1.

14 (b)(ii - iii) Poorly answered. It seemed as if the candidates could not interpret the mathematics language used in these questions.

Answer.

14 (a) (i)		3	B1 for 1 – 2 wrong entries seen. B1 for 3 – 4 wrong entries seen. B0 for 5 or wrong entries seen
(ii)	$\frac{1}{6}$	FT 1	Accept simplified form
(iii)	$\frac{5}{18}$	FT 1	Accept simplified form

	Die 2					
score	1	2	3	4	5	6
Die 1 1	0	1	2	3	4	5
2	1	0	1	2	3	4
3	2	1	0	1	2	3
4	3	2	1	0	1	2
5	4	3	2	1	0	1
6	5	4	3	2	1	0

(iv)	$\frac{4}{9}$	FT 1	Accept simplified form
(b) (i)	$\frac{4}{6}, \frac{2}{6}, \frac{3}{5}, \frac{1}{5}, \frac{2}{4}, \frac{1}{4}, \frac{4}{4}$,0 o.e.	4	B1 for any two correct. (Accept the simplified form of the fractions)
(ii)	$\frac{2}{15}$ o.e	2	B1 for $\left(\frac{4}{6}\times\frac{2}{5}\times\frac{1}{4}\right)+\left(\frac{2}{6}\times\frac{1}{5}\times 1\right)+\left(\frac{2}{6}\times\frac{4}{5}\times\frac{1}{4}\right)$ o.e
(iii)	$\frac{4}{5}$ o.e	2	B1 for $1-\left(\frac{4}{6}\times\frac{3}{5}\times\frac{2}{4}\right)$ o.e **FT1** method only

Question 15

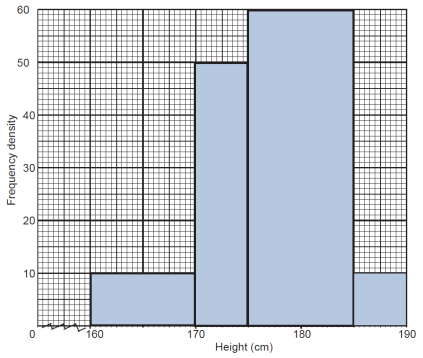
15 (a) Well answered

15 (b) Well answered. Mathematic language proved to be a challenge.

15 (c) Moderately answered. But scale reading remained a challenge.

15 (d) Moderately answered. Most candidates could not find the midpoints.

Answer.

15 (a)	$175 \le h < 185$	1	c.a.o
(b)	65	2	B1 for $\frac{650}{1000}\times 100$ o.e
(c)		4	B1 for each correct bar drawn
(d)	177	4	M3 for $\frac{(100\times165)+(250\times172.5)+(600\times180)+(50\times187.5)}{1000}$ M2 for $(100\times165)+(250\times172.5)+(600\times180)+(50\times187.5)$ M1 for midpoints 165,172.5, 180 and 187.5 Allow **1 slip only** on midpoints/frequencies.

POSITIVE SUGGESTIONS TO TEACHERS

- Ensure by all means that the syllabus is completed every year.
- Emphasise on reading and understanding of instructions before answering any question.
- Teach the calculator skills across the syllabus especially when substituting, making use of brackets, etc.
- Encourage candidates to ALWAYS write down the full calculator display before rounding.
- Emphasise on correct spelling of mathematical terms and concepts.
- Encourage candidates to practice geometrical terms and relationships more.

- Focus on the reading of the scales of the graphs as well as plotting of points.
- Encourage candidates to show their working and should avoid shortcuts.
- Limits of accuracy should never be rounded off.
- Emphasise on substitution of negative integers.
- Give learners more exercises for practice.
- Make use of the Examiner's Report to inform your teaching.