GCSE Examiners' Report

Mathematics

GCSE

November 2024

Introduction

Our Principal examiners' report provides valuable feedback on the recent assessment series. It has been written by our Principal Examiners and Principal Moderators after the completion of marking and moderation, and details how candidates have performed in each unit.

This report opens with a summary of candidates' performance, including the assessment objectives/skills/topics/themes being tested, and highlights the characteristics of successful performance and where performance could be improved. It then looks in detail at each unit, pinpointing aspects that proved challenging to some candidates and suggesting some reasons as to why that might be.[1]

The information found in this report provides valuable insight for practitioners to support their teaching and learning activity. We would also encourage practitioners to share this document – in its entirety or in part – with their learners to help with exam preparation, to understand how to avoid pitfalls and to add to their revision toolbox.

Further support

Document	Description	Link
Professional Learning / CPD	WJEC offers an extensive programme of online and face-to-face Professional Learning events. Access interactive feedback, review example candidate responses, gain practical ideas for the classroom and put questions to our dedicated team by registering for one of our events here.	https://www.wjec.co.uk/home/professional-learning/
Past papers	Access the bank of past papers for this qualification, including the most recent assessments. Please note that we do not make past papers available on the public website until 12 months after the examination.	Portal by WJEC or on the WJEC subject page
Grade boundary information	Grade boundaries are the minimum number of marks needed to achieve each grade. For unitised specifications grade boundaries are expressed on a Uniform Mark Scale (UMS). UMS grade boundaries remain the same every year as the range of UMS mark percentages allocated to a particular grade does not change. UMS grade boundaries are published at overall subject and unit level. For linear specifications, a single grade is awarded for the subject, rather than for each unit that contributes towards the overall grade. Grade boundaries are published on results day.	For unitised specifications click here: Results, Grade Boundaries and PRS (wjec.co.uk)

[1] ***Please note that where overall performance on a question/question part was considered good, with no particular areas to highlight, these questions have not been included in the report.***

Exam Results Analysis	WJEC provides information to examination centres via the WJEC Portal. This is restricted to centre staff only. Access is granted to centre staff by the Examinations Officer at the centre.	Portal by WJEC
Classroom Resources	Access our extensive range of FREE classroom resources, including blended learning materials, exam walk-throughs and knowledge organisers to support teaching and learning.	https://resources.wjec.co.uk/
Bank of Professional Learning materials	Access our bank of Professional Learning materials from previous events from our secure website and additional pre-recorded materials available in the public domain.	Portal by WJEC or on the WJEC subject page.
Become an examiner with WJEC.	We are potentially looking to recruit new examiners. These opportunities can provide you with valuable insight into the assessment process, enhance your skill set, increase your understanding of your subject and inform your teaching.	Become an Examiner | WJEC

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Executive Summary

The examination papers in GCSE Mathematics were generally of a similar standard to previous examination series. As is always the case, some questions were more demanding in some topics than in previous series, whereas others were less demanding. The Unit 2 higher tier paper was a little more demanding for the more able candidates compared with previous series.

What was noticeable this series, as well as in other recent series, is that many candidates in year 11 are still showing signs of having been impacted by the pandemic, and there are gaps in their knowledge and understanding, which then cause problems with more demanding topics and skills. This is especially true of candidates hoping to achieve the middle grades in the grade range (E to B). There are some areas of the subject content that are not well-understood year on year. This year was no exception. Topics such as factorising, converting units, circle theorems, constructions and perimeter, area and volume (including surface area) have a great need for improvement at all tiers. Topics that need attention at higher tier include probability of combinations of events, surds and similarity involving area and volume. Other topics that are specific to units and/or tiers are listed in the individual unit reports.

At intermediate tier and higher tier, there was more evidence than usual of candidates rounding answers prematurely in multi-step questions, resulting in incorrect answers.

What is also evident is how little time many candidates spent learning facts and rules in preparation for these examinations. These include metric to Imperial conversions, formulae for perimeter, area and volume of shapes.

There was also evidence of candidates not using the calculators to their full potential on the calculator-allowed papers. There is a difference between showing your working and using non-calculator methods to carry out calculations. Candidates should remind themselves of this difference before taking these examinations.

At foundation tier, some improvement was seen when calculating with time, finding perimeters of shapes and solving simple linear equations. Other topics that were well-understood or well-answered are listed in the individual unit reports.

Our digital resources website has many blended learning lessons and knowledge organisers, amongst other things: Mathematics - Educational Resources - WJEC
You can filter to help find what you want. Some examples of blended learning lessons and knowledge organisers are listed below, as they have been indicated as areas for improvement.

Areas for improvement	Classroom resources	Brief description of resource
Algebra: Expanding and Factorising	Mathematics - Educational Resources - WJEC factorising-expressions-intermediate.wjec.pdf	Algebra – knowledge organisers Knowledge organiser
	Expanding and factorising - Blended Learning	Blended learning lessons
Circle Theorems	Circle theorems - Blended Learning	Blended learning
	ko-the-circle-intermediate-wjec.pdf	Knowledge organiser
Probability	Probability - Blended Learning	Blended learning
	probability-foundation-and-intermediate.pdf	Knowledge organiser

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UNIT 1 FOUNDATION TIER

Overview of the Unit

The demand of the questions was comparable to those tested in previous papers, such that the paper was a suitable and fair test for foundation tier candidates.
Candidates found the later questions more challenging as they tested harder topics, frequently in multi-step questions.

The following questions were usually well-understood or well-answered:

- Marking the midpoint of a line (Q. 1(a))
- Best unit to use for distance from Swansea to Wrexham (Q. 3(b))
- Halving the size of a right angle (Q. 4(b))
- Writing a number correct to the nearest 100 (Q. 5(a))
- Continuing a linear sequence of numbers (Q. 5(b))
- Calculating the perimeter of a square and a hexagon (Q. 6)
- Solving simple linear equations (Q. 8(a), Q. 8(b))
- Writing positive and negative numbers in order of size (Q. 9(a))

Key areas for improvement include the following:

Number

- Basic number work (Q. 2(a), Q. 2(c), Q. 5(c), Q. 6)
- Negative numbers (Q. 9(b), Q. 9(c))
- Working with a function machine (Q. 11)
- Estimation: estimating numbers before multiplying them (Q.12)
- Problems using arithmetic (Q13(a))
- Ratios (Q.13(b))

Algebra

- Simplifying like terms (Q. 8(c))
- Solving a problem involving algebra (Q. (16))

Geometry and Measure

- Drawing a line perpendicular to a given line through a given point (Q. 1(b))
- Drawing a given angle accurately at a given point (Q. 4(a))
- Knowing the difference between perimeter and area (Q. 14)
- Calculating the size of an angle at a point (Q. 17)

Statistics

- Knowing to use numbers (fractions, decimals or percentages) as an answer for probability and not words (e.g. likely) (Q.7(a))

Comments on individual questions/sections

Question 1(b)
Some candidates confused parallel and perpendicular. Others joined *K* to each end of the line *MN* to make a triangle. Very many were unable to draw an angle of 90° with sufficient accuracy (± 2°).

Question 3(a)
Centimetres and milligrams were both common wrong answers.

Question 4(a)
Candidates were asked to draw $D\hat{E}F = 57°$. The full line *DE* needed to be drawn from *E* only, and not placed randomly along the line *EF*. Marking the point *D* only, without joining it to *E,* gained no marks.

Question 5(c)
Candidates who converted 10kg to grams before dividing by 4 found the calculation easier as they didn't need to deal with a remainder.

Question 6
Most candidates knew how to find the perimeter of both the hexagon and the square. However, some found multiplying 7·5 by 4 challenging and added 7·5 four times. A frequent wrong answer was 28·5.
To be awarded the OC mark, candidates needed to label their working, indicating which calculation referred to which shape. They needed to write a clear conclusion. For the W mark, all working need to be shown written in correct mathematical form. Units (cm) needed to be included in the final answer.

Question 8c
Many candidates forgot that the + or – sign is attached to the term immediately after it. Consequently, instead of working out −8k + 5k = −3k, they wrongly calculated this as 8k + 5k = 13k. This was then wrongly assigned a − sign. So, a frequent wrong answer was 17k −13k = 4k.

Question 9b
As the number line was marked with negative numbers, the answer needed to be read to the left from −4, giving the answer −4·6. A frequent wrong answer was −5·4.

Question 11
Some candidates could calculate the numerical values for the input and output, but most were unable to write the correct output when the input was *n,* usually omitting the necessary brackets.

Question 13
The whole of this question needed careful reading; mistakes were made about the relative ages. In Q.13(b), not all candidates who wrote down the required ratio 27 : 30 were able to simplify it.

Question 15
Most candidates were able to plot the points given in the question. Of those, many were also able to identify the point (9, −1) but not the other three possible vertices.

Question 18

The formula for the area of a trapezium is given at the beginning of the paper. However, the parallel sides were very frequently wrongly identified as 8cm and 10cm. The diagram was not in its usual orientation which confused most candidates. This was another question where perimeter was frequently wrongly calculated instead of area.

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UNIT 1 INTERMEDIATE TIER

Overview of the Unit

Overall, the questions were comparable with those asked on previous papers that have been sat, and the paper was a suitable and fair test for the candidates at the intermediate level.

As expected, some questions proved more challenging than others. Some candidates continue to lose marks because of incorrect numerical evaluations or from giving unsupported (no workings) incorrect answers. These are common issues from series to series.

The following topic areas were generally well-understood or well-answered:

- Estimating and approximating solutions to numerical calculations (Q. 2)
- Collecting like terms (Q. 3(a))
- Solving numerical problems using given criteria (Q. 4(a))
- Interpreting ratios (Q. 4(b))
- Forming and solving linear equations (Q. 7)
- Expressing numbers as the product of their prime factors (Q. 10)
- Drawing and interpreting graphs of $y = ax^2 + bx + c$ (Q. 11(b))
- Completing the branches on a tree diagram (Q. 15(a))

Key areas for improvement include the following:

Algebra

- Forming algebraic expressions (Q. 1)
- Factorising and solving quadratic equations. (Q. 16)
- (See also Q. 13)

Geometry and Measure

- Area and volume (Q. 5, Q. 9)
- Finding the coordinates of points identified by geometrical information (Q. 6)
- Solving problems involving algebra, average speed, distance and time (Q.13)
- Converting between metres and miles (Q. 17)
- Using angle properties of circles (Q. 18)

Statistics

- Solving pie charts problems (Q. 12)

Comments on individual questions/sections

Question 1

Many candidates gained 1 mark for writing the expression with omitted brackets as $5 \times n + 4$. Forming an expression from the given information in the number machine was difficult for many candidates, though many found evaluating expressions with numbers easier.

Question 5
Many correct methods were seen in this question. Many candidates used incorrect methods, such as trying to find the perimeter. Arithmetic errors in multiplying two-digit numbers (e.g., 16 × 12) were commonly seen. This was the OCW question. Candidates should present their response in a structured way and use appropriate labels to be awarded the OC mark. All workings should be shown, and correct mathematical form was required for the W mark. Many candidates did not label their stages of working. Common mathematical form errors included the incorrect use of the '=' sign and giving incorrect or no units for their final answer.

Question 6
Many candidates successfully plotted the three given coordinates. Identifying the fourth vertex (9, –1) was often seen, but finding the other three possible vertices was challenging for many candidates.

Question 9
Although the formula is given for area of a trapezium on the formula page, this question was not well answered. Many candidates incorrectly thought that 8 cm and 10 cm were the parallel sides. The correct units were often missing or incorrect, causing candidates to lose the final U mark.

Question 12
Some candidates thought that the total number of pupils in Ysgol Afan was 254.
Some candidates thought there were 60 Year 9 pupils in Ysgol Twyn.
Many candidates did not express their probability using appropriate notation.

Question 13
The question involved two steps with the inclusion of x, which caused difficulties.
Common errors included expanding brackets incorrectly (e.g., $2x + 3x + 6 = 78$) or equating the sum of the expressions stated in the question to 78 (e.g. $x + x + 6 = 78$).
More often than not, candidates did not form an equation, but used a trial and improvement method to find the value of x. For these candidates, only the final B1 mark was available.

Question 16
Candidates found part (a) challenging, with many struggling to show the correct steps leading to the given equation. In part (b), some candidates factorised correctly but then did not proceed to solve the equation. Many candidates tried to solve the equation by trial and improvement. Usually, this method led to no marks being awarded, as candidates did not realise that there were two solutions. Candidates needed to appreciate that one of the solutions would lead to a negative length. Stating 'x can't be negative' was not acceptable as, for this case, some values of x could be negative.

Question 17
This question involved multiple conversions: from standard form to an ordinary number, metres to kilometres, and kilometres to miles. Many candidates made errors in place value and conversions, sometimes using 1000 metres = 1 mile.

Question 18
Many candidates were unfamiliar with the angle properties of circles. Some candidates successfully worked with the isosceles triangle in the diagram, but few knew how to relate angle *BAD* to angle *DOB* to solve the problem fully.

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UNIT 1 HIGHER TIER

Overview of the Unit

This was a fair test of the higher tier specification. As usual, candidates' performances reflected the increased demand when moving through the paper. The majority of the entries were appropriate for this tier, however there were a few candidates who did not attempt several of the later questions.

The following topic areas were generally well-understood or well-answered:

- Calculating coordinates and sketching a quadratic graph (Q. 1)
- Finding a product of primes in index form (Q. 3)
- Finding a missing length, given two similar 2-D shapes (Q. 5)
- Completing the branches on a tree diagram (Q. 6(a))
- Factorising and hence solving a quadratic equation (Q. 7(b))

Key areas for improvement include the following:

Number

- Recognising prime numbers (Q. 3)
- Using correct place values when multiplying decimals (Q. 6(b) and Q. 17)
- Knowing how to write down the reciprocal of a fraction (Q. 14)
- Developing fluency in manipulating surds (Q. 15)

Algebra

- Using the formula for speed in order to construct an algebraic equation (Q. 4).
- Drawing a straight line, given an equation of the form $y = mx + c$ (Q. 10(a))
- Understanding and constructing equations for proportional relationships (Q. 11)
- Understanding that, in order to generalise and prove that a statement is true for all integers, it is insufficient to demonstrate that it is true for two or three specific values (Q. 13)
- Recognising and knowing how to factorise the difference of two squares (Q. 16)

Geometry and Measure

- Learning and using unit conversion facts (Q. 8)
- Understanding, learning and using all of the circle theorems (Q. 9)
- Using the properties of trigonometric graphs to identify angles (Q. 18(a))

Probability

- Recognising that a probability cannot exceed 1 (Q. 6(b) and Q. 17)
- Understanding how to calculate probabilities of combinations of events (Q. 17)

Comments on individual questions/sections

Question 2
Having found the correct numbers of pupils in the relevant categories, some candidates then multiplied probabilities instead of finding appropriate totals. OCW marks were often lost due to lack of labelling of steps, including when presenting a final answer.

Question 4
Constructing the correct linear equation proved challenging (with some candidates inappropriately producing and attempting to solve a quadratic equation). Algebraic errors included incorrect use of brackets.

Question 7(c)
Candidates needed to explicitly explain that a length cannot be negative. (In this particular case, stating that x could not be negative was insufficient.)

Question 8
Whilst some candidates used the efficient method of 32 000÷1600, far too many clearly did not know how to convert from km to miles, often stating 1 mile to be 1000 m.

Question 9
There was some confusion between circle theorems, together with widespread incorrect applications such as equating opposite angles in a cyclic quadrilateral.

Question 10(a)
Very few candidates were able to correctly draw all three straight lines on the grid. If two lines were correct, it was possible to follow through for the final mark, but the directions of the inequalities needed to be observed in order to gain credit.

Question 11
Confusion between direct and inverse proportion was seen in both parts of the question. The final mark was sometimes lost in part (b) for not formally stating a formula (which was a requirement given in the question).

Question 12
Too many candidates failed to engage with Pythagoras's theorem in order to find the slant height of the cone. Using 8 cm as the slant height was a common error, which unfortunately meant the loss of the first 4 marks (with the last 2 marks then still available). Some candidates fell at the final hurdle by not correctly simplifying the surd.

Question 13
Many started well by expanding the brackets. However, only a few gave a convincing conclusion for the final mark. (No credit was given for a solution which involved only trials of specific integers e.g. $n = 1, 2, 3$.)

Question 14
With very few gaining all three marks, a significant number of candidates were more successful in obtaining $\frac{1}{8}$ than $\frac{3}{4}$. It was a concern that adding the two fractions then caused some difficulty when trying to obtain a final answer.

Question 15
Expanding the brackets was often successful, with occasional sign errors, but obtaining the single term $9\sqrt{3}$ was rarely done correctly. Subsequent collection of terms tended to be inaccurate.

Question 16
It was disappointing that so few candidates recognised the difference of two squares in order to factorise the numerator, with many undertaking non-valid 'cancelling'.

Question 17
Only a minority of candidates used either of the most efficient methods (0·7 + 0·3 × 0·7 or 1 – 0·3 × 0·3). It was a concern that some presented an answer of 1·4 (from 2 × 0·7) as a probability, without questioning its validity.

Question 18(a)
Correct pairs of angles were seen, but too many made incorrect use of the graph e.g. calculating 90° + 58° and 270° – 58°.

Question 18(b)
Incorrectly transformed graphs included sketches of y = cosx + 1 for part (i) and y = cosx – 1 for part (ii). There was occasional carelessness in omitting appropriate minus signs when labelling axes.

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UNIT 2 FOUNDATION TIER

Overview of the Unit

Overall, the paper was comparable with the previous papers that have been sat and was a suitable and fair test for candidates at foundation tier.

Candidates found most of the early questions accessible, but many showed limited knowledge of the topics in the questions common with the intermediate tier.

As with previous series of this paper, there was evidence of candidates not using their calculators to carry out calculations, despite this being a calculator-allowed paper. Although non-calculator methods can yield correct responses, they often increase the difficulty of questions and result in unnecessary errors. Candidates should be encouraged to use a calculator wherever possible on Unit 2 but must remember to show their working where appropriate.

The following topic areas were generally well-understood or well-answered:

- Completing calculations (Q. 1).
- Writing a number in figures (Q. 2a).
- Vocabulary of probability (Q. 3a).
- Converting between fractions, decimals and percentages (Q. 6).
- Finding the median (Q. 9a)
- Probability of a single event (Q. 14a).

Key areas for improvement include the following:

Number

- Listing the factors of a number (Q. 2b)
- Manipulating periods of time (Q. 5)
- Using number properties to complete a Venn diagram (Q. 18)

Algebra

- Solving two-step linear equations (Q. 15(a))
- Solving linear equations with variables on both sides (Q. 15(b))

Geometry and Measure

- Using angle properties (Q. 11)
- Transformations (Q. 17)

Statistics

- Calculating the mean (Q9(b)(i))
- Finding the expected number of times an event will occur (Q.14(b))

Comments on individual questions/sections

Question 2(b)
Many candidates gave the largest possible number using the four digits, ignoring the requirement for the number to also be a multiple of 5.

Question 3(b)
As there were four cards, candidates needed to give three 7s for the chance to be likely. Most candidates gave four 7s which would be certain.

Question 6
Three of the four conversions were well answered. Writing 15% as a fraction in its simplest form was the most challenging conversion for candidates. As the denominator of 20 was given in the question, candidates could not give the unsimplified conversion of 15/100, but many just gave an answer of 15/20 instead.

Question 7
This was poorly answered by candidates. The question refers to Lewis choosing four numbers, but many candidates gave just two or three numbers. Some candidates picked up one mark for finding a third of 99 but didn't engage with the rest of the question.
Very few fully correct responses were seen, but those candidates who found four numbers which satisfied the three conditions typically picked up the OC and the W marks for structuring their answers well and showing their workings.

Question 10
Some candidates said that Abby was correct, even though the question told them that she was incorrect. A few candidates said that she should have divided by 2 instead of 4. Very few correct responses were seen to this question.

Question 11(a)
Some candidates didn't show awareness that there are 180 degrees in a triangle, with 360 sometimes seen. Those candidates who did work with 180 degrees, often subtracted 62 from 180 to get an incorrect answer of 118. Others demonstrated some awareness of the properties of an isosceles triangle but divided 118 by 2 to get an incorrect answer of 59.

Question 11(b)
Few candidates were able to find angle QRS, so very few correct responses were seen. Candidates who engaged with the question often gave an answer of 107, obtained by subtracting 115, 60 and 78 from 360.

Question 12
Candidates on foundation tier are often competent at finding the perimeter of a rectangle, but the unstructured nature of this question caused difficulties for candidates.
Few candidates were able to come up with two rectangles which satisfied Owen's conditions, and those who did often confused area and perimeter.

Question 17
Both parts (a) and (b) were poorly answered. In both parts, it was common for candidates to draw multiple triangles. It was surprising in part (a) how many candidates simply translated the triangle, instead of rotating it. In part (b), most candidates simply reflected the triangle in the x-axis or y-axis, whilst some reflected into all four quadrants. Few correct responses were seen in either part.

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UNIT 2 INTERMEDIATE TIER

Overview of the Unit

Overall, the paper was a suitable and fair test for the candidates at the intermediate level. Some questions proved more challenging than others, while some candidates lost marks because of incorrect numerical evaluations or for giving unsupported incorrect answers. This is a common issue from series to series. Unit 2 is designed to assess the use of a calculator. Although non-calculator methods can yield correct responses, non-calculator methods can often increase the difficulty of the question and result in unnecessary errors. Candidates should be encouraged to use a calculator as much as possible in Unit 2, but they must remember to show their working where appropriate.

The following topic areas were generally well-understood or well-answered:

- Using angle properties of isosceles triangles and quadrilaterals (Q. 1)
- Calculating the perimeter of a rectangle (Q. 2)
- Finding a fraction and percentage of a quantity (Q. 3(a))
- Calculating theoretical probabilities based on equally likely outcomes (Q. 5)
- Solving simple linear equations (Q. 6(a))
- Solving a problem using the mode and mean (Q. 12)

Key areas for improvement include the following:

Number

- Using Venn diagrams to solve problems involving even numbers, factors and primes (Q. 9)
- Solving problems using ratios and money (Q.10)

Algebra

- Solving linear equations involving brackets and variables on both sides (Q. 6(a))
- Extracting common factors (Q. 6(b))
- Forming and solving two simultaneous linear equations set in a real-life context (Q.18)

Geometry and Measure

- Order of rotational symmetry (Q. 4)
- Regular polygons (Q. 13)
- Intersecting loci problems involving constructions (Q. 15)
- Solving problems involving the surface area and volume of a cylinder (Q.17)

Statistics

- Problems involving probability (Q. 7)
- Relative frequency (Q. 16)

Comments on individual questions/sections

Question 4
The common incorrect answer was to reflect the two shapes in one of the bold lines. A few candidates, intending to show rotational symmetry of order 2, mistakenly shaded in extra squares or made one of the three shapes incorrect.

Question 6(a)(iii)
Candidates should be discouraged from presenting embedded answers, as they are usually later contradicted. Common errors were seen in the first step of solving the equation, where problems arose dealing with –25 – 5 or $3p - 8p$. Follow through marks were available when candidates continued to solve their equations correctly.

Question 6(b)
Factorising simple expressions proved challenging to many candidates. $-5w^2$ was a common incorrect answer.

Question 7
This question was poorly answered. The incorrect answer 2 was common, as some candidates subtracted 1 yellow counter from the numerator of 3. Some candidates showed trialling evidence with sequences like $\frac{1}{3}$, $\frac{2}{4}$, $\frac{3}{5}$, $\frac{4}{6}$… but did not proceed correctly.

Question 10
Many candidates correctly calculated the number of 50p coins needed but then failed to use this information to find the total value of the coins. Some candidates incorrectly divided £19.20 by 13.

Question 13
Two methods were available; making use of the fact that the sum of an exterior angle and the interior angle is 180°, using the formula '(number of sides – 2) × 180'.
Few candidates made correct full use of either approach. 9 sides was a common incorrect answer.

Question 14
A very accessible six marks for those who were familiar with using Pythagoras's theorem and trigonometric relationships in right-angled triangles. It appeared, however, that many candidates had not covered this part of the specification.

Question 15
A correctly shaded region was rarely seen. Candidates who drew arcs by hand clearly did not use a pair of compasses to construct and bisect the angle. In some cases, it was evident that a protractor and ruler were used, with retrospective arcs added. Candidates must show the placement of the pair of compasses when drawing intersecting arcs. Additionally, the angle bisector must be formed correctly, with the line reaching the intersection of the arcs.

Question 16
Many candidates could not provide the best estimate or explain correctly why the final reading should give the best estimate. Many answered 0.033 because it represented the point with the greatest relative frequency.

Question 17
Finding the height of a cylinder given the surface area was extremely challenging for many candidates. Some were awarded marks for calculating the area of the solid's cross-section, but many did not realise that the circumference was needed as part of the method. Some did not use π at all in their calculations.

Question 18
Candidates needed to form the second equation from the information provided in the question and solve the simultaneous equations using a valid algebraic method, as specified. As this was a calculator paper, no marks were awarded to those who used trial and improvement to find the values of x and y. Many candidates find this topic very challenging.

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UNIT 2 HIGHER TIER

Overview of the Unit

Overall, the paper was a suitable and fair test for the candidates at the higher tier. It was comprised of mainly standard topics assessed in these units. However, it was AO3 questions that caused the most difficulty for candidates, whether they were asked earlier or later in the paper.

The following topic areas were generally well-understood or well-answered:
- Using trial and improvement to solve equations (Q. 2)
- Finding five numbers to have a specific mean and mode (Q. 3)
- Pythagoras and right-angled trigonometry (Q. 5)
- Solving simultaneous equations with larger coefficients (Q. 9)
- Expanding and factorising brackets (Q. 14)

Key areas for improvement include the following:

Number
- Calculating using ratios and money (Q. 1)

Algebra
- Correctly evaluating the b^2 term in the discriminant of the quadratic formula when b is negative (Q. 15)
- The *n*th term of a quadratic sequence (Q. 16)
- Changing the subject of a formula, where the subject appears twice (Q. 19)

Geometry and measure
- Properties of interior and exterior angles of a regular polygon (Q. 4)
- Constructing loci that include constructions (Q. 6)
- Solving problems involving the surface area and volume of a cylinder (Q. 8)
- Enlargements with a negative scale factor and the centre being within the shape (Q. 10)
- Similarity involving areas and volumes (Q. 11)
- Circle theorems (Q. 13)

Statistics
- Relative frequency (Q. 7)
- Identifying all possible permutations in the context of probability (Q. 18)

The following are general areas for improvement across all strands:
- Questions involving the need to explain their answers (Q.1 OCW)
- Reverse problems involving formulae (Q. 8, Q. 20)
- Accuracy within answers, and not rounding prematurely (Q. 12, Q. 20)

Comments on individual questions/sections

Question 1
Many candidates did not appreciate the difference between the number of the coins and the value of the coins. This, in turn, meant they did not engage with the whole question which had an impact on the OCW marks.

Question 4
Some candidates failed to realise the need to evaluate the external angle. If they correctly found the external angle to be 9°, they invariably gained all 3 marks. 360° – 171° was often seen as an incorrect initial step.

Question 6
Some candidates did appreciate the need to initially construct the arcs for a 60° angle, but failed to bisect it correctly or they did not connect their line to the construction arcs. Some candidates attempted to draw a perpendicular bisector. Some candidates did not draw the constructions at the correct location.

Question 7a
Many candidates did not know the meaning of relative frequency. Some incorrectly indicated 0.033, along with a reason that this was the highest relative frequency, whilst others found the mean of the 5 relative frequencies.

Question 7b
Many candidates gained only M1 from one of the listed bullet points in the marking scheme. Place value errors were also common, either from incorrectly reading the scale of the relative frequency graph e.g. reading 0.033 as 0.33, or from incorrectly converting 2.6p into pounds.

Question 8
Some candidates only considered one circular face, whilst still correctly identifying the curved surface area as πdh. Others incorrectly considered the volume of the cylinder.

Question 10
Some candidates struggled with the centre of enlargement being within the shape.

Question 11
Some candidates did not cube the linear scale factor before multiplying it with the volume.

Question 12
Many candidates did find the correct volume but failed to round it correctly to 3 s.f.

Question 13
Many candidates did not use the alternate segment theorem, but instead incorrectly used the property of parallel lines and alternate angles on lines *AD* and *FD*.

Question 14
The majority of candidates expanded the expression before factorising it as described in the alternative method, instead of realising it was the difference of two squares.

Question 15
Some candidates did not rearrange the quadratic to equal zero before using the quadratic formula. The b term was negative which resulted in an incorrect discriminant for some candidates when evaluating b^2.

Question 16
Many candidates identified the second difference, but then failed to halve this to get the $3n^2$ quadratic term.

Question 18
Few candidates realised it was the complement of the six different permutations of choosing one of each colour. Many candidates tried to work out all the possible correct permutations but failed to identify them all.

Question 19
Common errors were:
- not squaring the h when squaring the LHS,
- not including the brackets when clearing the denominator,
- ignoring the square root if clearing the denominator as a first step.

Question 20a
Some candidates failed to rearrange the cosine rule correctly. Some candidates also incorrectly took the length CG as 6 cm by failing to add the radius of the circle.

Question 20b
Many candidates knew how to find the area of the triangle. They were less successful in finding the area of the major sector. Many simply worked out the area of the circle or the area of the minor sector.

Supporting you

Useful contacts and links

Our friendly subject team is on hand to support you between 8.30am and 5.00pm, Monday to Friday.
Tel: 02922 404251
Email: mathematics@wjec.co.uk
Qualification webpage: GCSE Mathematics and GCSE Mathematics Numeracy (wjec.co.uk)

See other useful contacts here: Useful Contacts | WJEC

CPD Training / Professional Learning

Access our popular, free online CPD/PL courses to receive exam feedback and put questions to our subject team, and attend one of our face-to-face events, focused on enhancing teaching and learning, providing practical classroom ideas and developing understanding of marking and assessment.

Please find details for all our courses here: https://www.wjec.co.uk/home/professional-learning/

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