GCSE EXAMINERS' REPORTS

GCSE (NEW)
MATHEMATICS

NOVEMBER 2019

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MATHEMATICS

GCSE (NEW)

November 2019

UNIT 1 FOUNDATION TIER

General Comments

The number of candidates sitting this paper was very much smaller than the number sitting the Summer series. The questions were a fair test for Foundation Tier candidates.

Candidates were confident with attempting questions at the beginning of the paper, and many maintained this effort even with the more challenging questions towards the end of the paper. These were the questions common to the Intermediate Tier paper and included more multistep questions.

Comments on individual questions/sections

Q.1 (a) A significant number of candidates found it difficult to mark the point B so that AB = 7·5 cm.

(b) Some candidates measured the lengths of the lines instead of the angle *x* marked on the diagram. Very many did not realise that the angle is acute so that the answer had to be less than 90°. The supplement of the correct angle was frequently given.

Q.2 (a) (i) Candidates found this standard addition calculation easy to engage with but there were errors in arithmetic.

(ii) The calculation needed to answer the question was usually set out appropriately as

$$\begin{array}{r} 419 \\ -\ \underline{145} \end{array}$$

But a common error was to subtract the smaller digit from the larger digit in each column, taking no account of the need to subtract the lower digits from the upper ones.

(iii) This was reasonably well answered with many candidates giving the correct answer of 20.

(b) A frequent wrong answer was writing the numbers in the following order:
6·4 6·9 6·49 6·94.
Those who wrote 6·4 as 6·40 and 6·9 as 6·90 found the question easier to answer correctly.

Q.3 Many drew the correct line of symmetry on the trapezium but then drew extra, incorrect lines. So, they were then awarded 0 marks for this part, losing the mark they had gained. The vertical lines of symmetry on the circles were more commonly drawn than the diagonal line which were frequently left out. Also, candidates sometimes lost a mark by not drawing the diagonal lines of symmetry carefully through the points of intersection of the circles.

Q.4 Both parts of this question were answered well.

Q.5 (a) This question was answered well.

(b) This proved to be more difficult than (a). Many candidates appeared not to realise that three of the four cards showed an odd number so it was 'likely' that Gareth chose a card with an odd number on it.

Q.6 (a) To answer this question, it was necessary to realise that the numbers given needed to be paired to give the same total. So, 3 and 9 needed to be paired, and 5 and 7. However, a very common wrong pairing was 3 with 7, and 5 with 9. Many candidates found this a difficult problem to solve.

(b) There were four possible combinations of three different multiples of 4 which added together to make 40. There were very many correct answers. However, anyone who included any number which was not a multiple of 4, immediately was given 0 marks. But 1 mark could be gained for writing three different multiples of 4 which did not add up to 40, or which were not all different but added up to 40.

Q.7 (a) There were many correct answers to both these equations. However, they weren't always clearly shown as $x = 8$ and $x = 14$.

(b) Very many candidates were unable to answer these questions. Combining letters and numbers proved very challenging. Many chose a number for n or m and calculated the answer, giving it as a number. Some wrote $m – 3$ on the working line, but then substituted a random number for m, working out the answer but getting 0 marks.

Q.8 Common wrong answers were 4^2 connected to 8, $\sqrt{100}$ connected to 50 and $1/5 \times 90$ connected to 45. However, there were many correct answers.

Q.9 This was the OCW question and involved a series of steps to find the total length of two rods. The given lengths had to be converted to feet by multiplying by 3, and that answer multiplied by 12 to convert to inches. Some candidates found the total length first and then converted from yards to inches. Others converted the lengths of both rods and then added those answers to find the total length.

The most common problem occurred when multiplying either 1½ or 4½ by 3 or by 12.

So, 1½ × 3 was worked out as 1 × 3 = 3, and then ½ was wrongly added to give 3½, instead of halving 3 to give 1½, which should then have been added to 3, to give 4½.

To gain the OC mark, the final answer needed to be written as a conclusion stating, for example, 'Length = …, or Total length = …'. Also, the working needed to be clearly labelled; e.g. 1 yard = 12 inches should be written, not just 1 = 12.

To be awarded W1, the calculations had to be shown clearly; e.g. 4 yards = 4 ×3 feet. Also, the final answer needed to include the units 'inches'.

Overall, this multistep question proved very challenging for many candidates.

Q.10 Very many wrongly gave the final answer as $x = 240°$. This gained 1 mark as it recognised the fact that the sum of the angles at a point is 360°. However, candidates did not divide by 4 to find $x = 60°$.

An answer of $x = 60°$ from wrong working of 180° − 120° gained 0 marks.

Q.11 There were different wrong answers to this question.

Two common incorrect answers were seen for Llanelli and Llanidloes which demonstrated a lack of understanding in using directed numbers:

- for Llanelli, thinking that going down by 1°C from −3°C would lead to a temperature of −2°C,
- for Llanidloes, thinking that going from −4°C to −1°C was a downward change of 3°C.

Q.12 Correct working had to be shown in this question if all three marks were to be gained. This working was very frequently omitted. But 1 mark was awarded for the correct answer alone and this was frequently awarded.

In order to allow a full comparison, candidates were required to have all three values in an equivalent form. A valid combination was allowed (e.g. showing 7% to be less than 0·3 followed by showing 0·3 to be less than 3/5), but this method was not seen.

The most common error in conversion was to write 7% as 0·7. Also, writing 3/5 as either a percentage or a decimal was very challenging for most candidates.

Q.13 (a) Many were able to work out −18 or + 20 but were unable to add these correctly.

Leaving the answer as −18x + 20y did not gain any marks.
Some wrongly wrote 3 **+** − 6 + 4 **+** 5 instead of 3 **×** − 6 + 4 **×** 5.

(b) To gain full marks the final answer had to be the expression 6g – 9f.
Very frequently, candidates worked out either 6g or -9f but not both. So, very many answers were given as 6g – 1f or 12g - 9f. Candidates did not seem to realise that the sign for a term was the sign to the left of the term.
Consequently, − 4f – 5f was mentally rewritten and calculated as 4f – 5f = -1f.

(c) The single mark for this question was for a final answer of the expression 12x – 20. This was a difficult question for very many candidates. Many did not multiply both 3x and -5 by 4. If the candidate had either shown the 12x and −20 as separate entities, rather than as the expression 12x – 20, or after giving the correct answer, they had lost the mark by going on to write 12x – 20 as −8x.

Q.14 This was a difficult question for most candidates though many were able to find a pair of numbers which satisfied one or other of the two conditions. The easier one was finding two numbers with a range of 8. Not many realised that if two numbers have a mean of 7, then their total must be 14.

Q.15 Not all candidates realised that to find x, they needed to use the sum of the angles in triangle ABC. Far more challenging, however, was to find the bearing of the point B from A. This appeared to be very difficult for many.

Q.16 (a) Many were able to answer this question correctly. However, a frequent mistake was not including the one person who spoke neither Welsh nor French to find the number who could not speak French.

(b) There are still a significant number who give the answer to a question about probability as a word associated with chance, e.g. unlikely. But encouragingly, of those who did give a numerical answer, very few used the wrong notation for a probability. The correct answer of 3/14 lost a mark if it was written in the wrong form, e.g. 3 out of 14, or 3:14.

Q.17 A mark was awarded for satisfying each one of the final three bullet points. Some were able to find the correct answer of 36, but a much larger number gave the answer as 12, which is not a square number and so was awarded two marks.

Q.18 There was little evidence of working in any of the parts of this question. Candidates found these questions involving different metric units to be challenging.

(a) This part was the most successfully answered part. Wrong answers seemed to be random choices of the given possible answers.

(b) A popular wrong answer was 815m. Candidates seemed to see m on the second number to be added and just wrote down those units.

(c) This was not answered well. A very popular wrong answer was 40 mm^3. Drawing a quick sketch of a cube and marking in the sides as 10 cm might have helped candidates to realise that it was necessary to multiply 4 by $10^3 = 1000$.

Q.19 This proved to be very challenging for many candidates. They found it difficult to deal with the multistep nature of the answer. The numbers given in the question were multiplied or added, apparently randomly. A common wrong answer was $6 \times 8 = 48$. Very many were unable to appreciate that they needed to find the length of FC from the rectangle before they could work out the area of the trapezium.

Q.20 (a) Many candidates had difficulty in adding the given probabilities. Frequently 0·2 was written as 0·02 and 0·3 was written as 0·03.

If they did work out the addition correctly, then several subtracted their answer from 2, giving an answer of 1·1, for example, instead of subtracting it from 1.

(b) Candidates needed to work out $0·3 \times 200$ to find the number of young people from the information given to them. This was difficult for many.

Summary of key points

It was particularly noticeable in the candidates' responses in this paper that their writing of 4 and 9 was not clear enough to differentiate easily between them. It is possible that marks were lost through this lack of clearly written numbers.

Some candidates found the following topics challenging:

- drawing a line of given length Q1(a),
- measuring an angle Q1(b),
- formation and simplification of expressions involving products and differences Q7(b),
- squaring and square rooting a number Q8,
- multiplying a whole number by a fraction Q9,
- writing a fraction as a decimal or a percentage Q12,
- bearings Q15,
- using areas to solve a problem Q19.

MATHEMATICS

GCSE (NEW)

November 2019

UNIT 1 INTERMEDIATE TIER

General Comments

The number of candidates entered was significantly lower than for the Summer series.

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

Some of the questions were very accessible, whilst others proved to be more challenging.

Candidates still perform poorly on those topics which have always caused them problems.

These include in particular; bearings, metric conversion, constructions and manipulation of algebraic fractions

Comments on individual questions/sections

Q.1 Two common incorrect answers were seen for 'Llanelli' and 'Llanidloes' which demonstrated a lack of understanding in using directed numbers.

For 'Llanelli', thinking that going down by 1°C from −3°C would lead to a temperature of −2°C.

For 'Llanidloes', thinking that going from −4°C to −1°C was a downward change of 3°C.

Q.2 Correct working had to be shown in this question if all three marks were to be gained. In order to allow a full comparison, candidates were required to have all three values in an equivalent form. A valid combination was allowed (e.g. showing 7% to be less than 0·3 followed by showing 0·3 to be less than 3/5), but this method was not seen. The most common error in conversion was to convert the 7% as 0·7.

Q.3 (a) Well answered although some left their answer as −18 + 20 or even had a final answer of −38.

Leaving the answer as −18x + 20y did not gain any marks.

(b) To gain full marks the final answer had to be the expression 6g – 9f.

A mark was sometimes lost as the candidate had either, shown the 6g and −9f as separate entities, or had expressed 6g – 9f as −3gf.

(c) Most of the candidates correctly found m to be 5.

An embedded answer of 5 was given credit as long as not then contradicted.

Embedded answers should not be encouraged, as in this question more than one candidate wrote, '3×5 – 7 = 8' followed by 'm = 8'.

(d) Again, to gain the mark, the final answer had to be the expression 12x – 20.

The mark was sometimes lost as the candidate had either, shown the 12x and −20 as separate entities, or had expressed 12x – 20 as −8x.

Q.4 In most cases the correct two numbers of 3 and 11 were given.

A mark was allowed if their two numbers only satisfied one of the two conditions.

Q.5 Whilst most of the candidates correctly found the size of angle x to be 40°, few gave the correct bearing (130°) of point B from point A.

The range and variation of incorrect values presented suggests that '*Use of bearings'* is not a topic well understood.

Q.6 (a) Extremely well answered.

(b) Pleasing to note that at this level most candidates recognise that the probability is to be expressed as a fraction rather that a description such as 'unlikely'.

Q.7 A mark was awarded for satisfying each one of the final three bullet points (no mark awarded for identifying a whole number between 1 and 40!).

The majority of candidates realised that 36 was the only number that satisfied all three conditions. The numbers 4 and 12 (less so the number 9) was given by those who gained two marks for satisfying two conditions.

Q.8 Metric conversions are not well answered, especially if they involve area or volume conversion.

(a) There was evidence of correctly writing 3·5(kg) as 3500(g) and then adding 534(g).

Having now got an answer of 4034 some candidates opted for the incorrect choice of 4·034 **g**.

(b) Here the popular incorrect answer was 113 cm as candidates simply added 35 to 78.

(c) 10 millimetres in 1 centimetre, so candidates mistakenly thought that 4 cm^3 equals 40 mm^3! Very, very, few candidates circled the correct value of 4000 mm^3.

Q.9 (a) Some misunderstood the question and attempted to find 60% of 300 rather than express 60 as a percentage of 300.

(b) Most candidates focused on the method of finding 40% of 360°.

A few used a ratio approach of sharing 360 in the ratio of 4(0) : 6(0).

A disappointingly significant number of candidates simply estimated the angle to be 135°.

Q.10 Candidates should be made aware of what is taken into consideration when awarding the OC and W mark.
Responses should be structured with explanations that are clear and logical to the reader.
A solution such as ‘ $91 \div 7 = 13$

$$\frac{(13 + 6)}{2} \times 6 = 63\text{'},$$

does not explain to the reader what is being calculated at each stage.

Explanations should be given at the point in the solution when they are presented (not a series of calculations followed at the bottom of the page with a detailed explanation).

Correct mathematical form is required.

We do not want to see, for example, ‘Area = 13 + 6 = 21 ÷ 2 = 10½ × 6 = 63’.

Units, where appropriate, should be shown.

Q.11 (a) Many an example was seen which demonstrated the wisdom of ‘showing all your working’.
e.g. seeing ‘0·2 + 0·3 + 0·25 + 0·15 = 0·45’ (having used 0·2 + 0·3 = 0·5 as 0·05.) followed by ‘1 − 0·45 = 0·55’.
This incorrect answer of 0·55 would gain a method mark as the error is in the arithmetic. However, an unsupported incorrect answer of 0·55 would gain no marks.

(b) Answered reasonably well, although an answer of 0·3/200 was seen quite often.

Q.12 (a) The mark for mentioning ‘reflection’ was often gained, but not the mark for indicating the line ‘x = −2’.

‘Flipped over’, ‘turned around’, ‘mirror image’ etc. were all descriptors that did not gain the mark.

(b) (i) Not as well answered as expected. Many drew a triangle with a vertex at the point (5,−6).

(ii) Few wrote down the correct column vector.

Q.13 (a) Although an embedded implied answer of 10 was allowed in this instance (36 × 10 = 360) it is noted that a clear answer of ‘10 sides’ may be required on such questions in the future. Especially if a ‘follow through’ calculation is to be undertaken where a clear first answer must be identified.

(b) 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 use of either approach.

Q.14 (a) This type of question is never answered as well as one would expect considering it is basically substituting the numbers 1, 2 and 3 into a simple expression.

Candidates can cope with substituting a value of x into a quadratic expression as a first step when asked to draw a quadratic curve.

(b) The common incorrect answer was n + 6. Some candidates were careless in losing a mark for writing 6n + 1 instead of 6n – 1.

Q.15 (a) Well answered.

(b) The question was set with the intention that two basic facts would lead to the correct conclusion. $2{\cdot}1^5$ would be a number with five decimal places **and** $2{\cdot}1^5 > 2^5 > 32$.
This making 40·84101 the only possible choice.
It seems these facts were not considered by most of the candidates.

(c) '*The use of index notation for positive unit fractional indices'* is part of the Intermediate tier specification.

The question was set with the intention that two basic facts would lead to the correct conclusion. $\sqrt{12{\cdot}96}$ would be a number between 3 and 4 **and** the final digit for $\sqrt{12{\cdot}96}$ could not be a 3. This making 3·6 the only possible choice.

Alas for the vast majority of candidates $(12{\cdot}96)^{½}$ was taken to be 12·96 ÷ 2.

Q.16 When asked to construct, using only a ruler and a pair of compasses, candidates should be aware that the correct construction arcs must be seen.

Markers are well able to spot spurious arcs.

(a) The question was testing the candidates' ability to construct an angle of 60°.

A basic simple construction which was awarded a <u>method</u> mark. If this method mark was not gained there was no further independent mark for simply drawing a line 7 cm long.

(b) Many of the candidates simply drew a perpendicular line from point A to the line LM and then drew a plethora of random arcs crisscrossing the line in an attempt to show a proper construction method had been carried out. It was easy for markers to identify when an acceptable method had been properly carried out!

Q.17 (a) A similar type of question was included in the Specimen Assessment Materials and also on previous examination papers.

It was disappointing therefore that so few correct answers were given.

Most candidates assumed that the branches regarding '*Bersham Heritage Centre*' were to be labelled 0·28, 0·72, 0·28 and 0·72.

(b) A follow through answer using the values on their tree diagram was allowed.

Some candidates are still not sure on how to deal with independent events.

More of a worry is the fact that they seem unconcerned with an answer for a probability that is greater than 1 (e.g. $0{\cdot}7 + 0{\cdot}6 = 1{\cdot}3$).

Q.18 Very few gave the correct response to all five formulae.

Many thought that the formula '$4d + \pi r^2$' could be an 'area' formula.

Probably deceived by the 2nd term being the area of a circle.

Q.19 (a) Some factorised correctly but then did not proceed to solve the equation.

Many tried to solve by 'trial and improvement'. None were successful as they did not realise that there were two solutions.

(b) The correct method for clearing all three fractions had to be seen as being attempted before any marks were awarded.

The solution of linear equations with fractional coefficients is a challenging topic for candidates at this level.

Q.20 Many candidates did not recognise that this was a question concerning values expressed correctly to a given unit of measurement.

(a) There were a few who gave the correct answer of 40·5 mm. Some still think that 40·49 is an acceptable answer. It is not!

(b) Most candidates simply gave an answer of 50 mm.

Another incorrect answer was 50·5 mm.

(c) Most candidates simply gave an answer of 24 mm.

Another incorrect answer was 23·5 mm.

Summary of key points

- It's good practice to show all your working even if not specified in the question.
- When solving algebraic equations, give a clear answer rather than leave you answer embedded in the equation.
- Construction using only a ruler and a pair of compasses is still a challenge to many of the candidates.
- Metric conversions especially for volume and area is problematic for most candidates at this level.
- OCW questions require, in particular,
  - an explanation at each step of the response of what is being done,
  - a structured, clear and logical lay out,
  - that all workings and calculations are shown,
  - that correct mathematical form is used, and
  - that units, where appropriate, are always given.

MATHEMATICS

GCSE (NEW)

November 2019

UNIT 1 HIGHER TIER

General Comments

Candidates' performances reflected the increased demand of later questions in the paper. Only rarely were questions not attempted, demonstrating that candidates had been appropriately entered for this tier. Whilst there were plenty of excellent performances across all topics, there were some candidates who experienced significant difficulty in attempting algebraic questions, and lack of fluency in applying circle theorems was also a concern.

Comments on individual questions/sections

Q.1 (a)&(b) Almost all candidates showed that they knew the relationship between the exterior angles and number of sides of a regular polygon, with the majority producing the correct answer in part (a). Part (b) was a little less successful, with some candidates presenting a single interior angle as their final answer.

Q.2 (a) Most knew that the transformation was a reflection. Fewer correctly stated the equation of the line, sometimes inappropriately presenting the pair of coordinates (-2,3) as part of the answer.

(b) (i) The majority correctly translated the entire triangle, with a few individuals confusing the horizontal and vertical directions. (ii) Again, most correctly stated the required vector, with some penalised for not writing it in the appropriate form (which needed to be as a column vector).

Q.3 (a) Most achieved both marks here. Occasionally, the first term was given as -6 (presumably by substituting 0 instead of 1 for n).

(b) This was well answered. A few candidates wrote +1 instead of -1 in their expression for the nth term. (Weaker candidates often gave an answer of n+6.)

Q.4 Part (a) was almost always correctly answered. However, parts (b) and (c) were far less successful: it was disappointing that many thought that 2.1 and 12.96 should be multiplied by 5 and ½ respectively.

Q.5 There were plenty of correctly constructed solutions seen to both parts of this question. However, in part (a), some failed to show construction arcs, which suggested that they had used a protractor (for which they gained no credit). Others demonstrated that they knew how to construct the required 60° angle, but did not complete the triangle for the second mark. Part (b) was often done well using a variety of legitimate methods (based on the properties of a rhombus or a kite).

Q.6 (a) Almost all knew to subtract 0·7 from 1 to obtain the probability of 0·3. A good proportion subsequently knew that they needed to divide 0·28 by 0·7 in order to obtain the next missing probability value, but not all of them could do so correctly. Given that there have been plenty of similar questions on previous papers, it was disappointing that many candidates lost marks for placing the incorrect values of 0·28 and 0·72 on the tree diagram.

(b) Most knew to multiply the values from the appropriate branches of the tree diagram (and incorrect values were followed through). Some however thought they should add these probabilities, or made place value errors in obtaining an answer which was greater than 1.

Q.7 Only a very few candidates gained all 3 marks in this question, with the last two expressions causing particular difficulty. Notably, successful candidates often showed some written working in deconstructing each term of the given expressions. A very few candidates need reminding to use the terminology given in the question (namely 'length', 'area', ….) rather than trying to identify the expression (e.g. a 'circle'), or listing the number of dimensions in each case.

Q.8 (a) This was generally well done, with some occasional errors in sign. A small number of candidates solved the equation by using the quadratic formula, meaning that they could not access the marks for 'factorising'.

(b) Plenty of accurate solutions were seen here, although it was a concern at this level that a significant number were unable to clear the fractions accurately, sometimes even disregarding the denominators altogether.

Q.9 Many gained all 3 marks here, although there were some notable errors. Common incorrect answers to parts (b) and (c) were 50.5 mm and 23.5 mm respectively, from failing to account for the error in measurement for each individual component in the calculation.

Q.10 There were plenty of well-structured and accurate solutions to this question. One very widespread error, however, was to take the vertical height of the cone as the 'slant height', rather than recognising the need to Pythagoras' Theorem. Despite the clear instruction in the question to 'express any areas in terms of π', a significant number of candidates undertook laborious, unnecessary and often inaccurate calculations in using 3.14 for π. It was also frustrating that many mis-quoted the formulae for the surface areas, despite the fact that they were printed at the start of the paper.

For the OCW requirement of the question, most candidates understood the necessity of labels (to indicate which shape was being considered). However, as before, some lost the mark for 'accuracy in writing' due to multiple errors such as mis-using the 'equals' sign (e.g. $4\times\pi\times8^2 = 256\pi/2 = 128\pi$) or even omitting the 'equals' sign altogether between multiple stages of a calculation. A very small number of candidates continue to write extensive - and unnecessary - worded descriptions of each calculation and should aim to be more concise.

Q.11 Some excellent solutions were seen here. The question did not explicitly require the candidate to find an expression for I in terms of d, but those who set out to do so were generally most successful in answering the whole question. A minority appeared to mis-read ‘inverse proportion’, proceeding instead as if it was direct proportion. Others missed the fact that d was ‘squared’, and proceeded instead as if I was inversely proportional to d (or even to √d). Others incorrectly used direct proportion. Having found a formula, it was a concern that many were unable to evaluate 0.5^2, or to divide by 0.5 or by 0.5^2.

Q.12 The overall response here was disappointing. Many candidates seemed to recognise that the first mark involved applying the alternate segment theorem, but too many could not do so correctly e.g. stating angle ACD to be 2x (as if lines AC and DE were parallel) or stating angle ADF to be 2x (as if it was a reflection of angle CDE). Some were penalised for writing ‘alternate angles’ or ‘opposite angles’ instead of ‘alternate segment’. Not many were able to proceed further using the cyclic quadrilateral, with even fewer being able to quote fully that ‘opposite angles in a cyclic quadrilateral (add to 180°)’. Candidates should be encouraged to routinely quote theorems as part of a geometric proof.

Q.13 For part (a), plenty of candidates did earn full marks, coping well with the required expansions of brackets. Errors, however, were widespread, and were often caused by sign errors or by attempting to multiply both of the ‘double’ brackets by ‘-3’ rather than just one of them. Even amongst the best solutions, it was very common to see ‘= 6x+3’ written at the end of each line – candidates need to realise that this is not appropriate (even though not penalised on this occasion).

In part (b), most understood that the aim was to use the simplified expression from part (a), though some insisted on ‘starting again’. There were occasional sign errors or even answers coming from -6/3 instead of -3/6. A notable minority did not attempt this part, sometimes despite after succeeding in part (a).

Q.14 (a) As usual, this was often well done, though there were some place value errors in multiplying the recurring decimal by a power of 10. Another (less common) error was to treat the given decimal as if it were entirely recurring, namely 0·475475475…..

(b) It was encouraging that the correct answer was the most common choice, but nevertheless a concern that many thought that the power of -3/4 should be multiplied by 16 to get an answer of -12 (which is an echo of Q4(b) and (c)). For ‘multiple choice’ questions, candidates should be encouraged to make good use of the working lines (for written calculations), as those who do are often most successful.

Q.15 There was a mixed response to this question on manipulating surds. Whilst there were some excellent solutions, common errors included giving 2√5 to be √10 or mis-handling $(\sqrt{5})^3$. Of those who reached a final answer, most recognised that the inclusion of √5 meant that it was ‘irrational’. Some lost the final mark for stating that 7+4√5 became 11√5.

Q.16 (a) There were many good solutions seen here, which is encouraging at this late stage of the paper. The majority of meaningful attempts seen involved evaluating the areas of four separate shapes rather than using the formal version of the trapezium rule. It is worth noting that a method using the formal trapezium rule led to calculations that were far less error-prone than the method of considering four shapes. It was somewhat frustrating that the formula for the area of a (single) trapezium was not always given correctly (despite being printed at the start of the paper). One concern was that some candidates did not use the relationship $y = 16 – x^2$ in order to find the relevant y values, opting instead to read off the graph, and often doing so incorrectly e.g. giving 17 (instead of 16) as the first value.

(b) Many excellent explanations were seen here, showing an understanding that – in this particular case – increasing the number of strips meant that less of the area under the graph was omitted. Some, however, ticked the correct box but did not earn the mark as they stated e.g. that adding more numbers must mean a bigger answer. Almost no candidates indicated that the area would decrease, but a surprising number thought that the area would be unchanged by using more strips.

Q.17 Whilst there were some fully correct simplifications here, it was surprising that, having successfully factorised the quadratic expression in the numerator, a few failed to factorise the (linear) denominator and therefore could not eliminate any sets of brackets. Some candidates attempted to 'force' (2x – 8) to be a factor of the numerator (and therefore a common factor of both numerator and denominator), but this was often done incorrectly.

Only very few were penalised for further incorrect 'simplification' after obtaining the correct expression (usually for thinking that the '2' could be 'cancelled').

Q.18 The majority knew how to multiply pairs of fractions and add the results in order to combine probabilities, usually doing so accurately. Most candidates unnecessarily calculated both the probabilities mentioned in the question, rather than using the fact that they must have a total of 1 – this was a pity as it increased the potential to make errors. It continues to be the case that only a very few candidates 'cancel' fractions within a product before multiplying – it is worth pointing out that this can be a useful approach as it reduces the size of the numbers being multiplied. Only very few failed to take account of the non-replacement aspect of the question. If given, the conclusion was usually correct, though very occasionally inconsistent with the candidate's calculations.

Summary of key points

Numerical skills required attention in places
e.g.

- knowing that using a power of ½ is equivalent to finding a square root, and that it is not the same as multiplying by ½ (Q4c and Q14b);
- knowing that ÷0·5 is equivalent to ×2, and furthermore that $\div 0{\cdot}5^2$ is equivalent to $\times 2^2$ (Q11);
- manipulating surds (Q15);
- knowing how to 'cancel' fractions before multiplying in order to deal with smaller numbers (Q18).

Lack of fluency in algebraic manipulation was a concern e.g. in questions 8 and 13.

Recognising geometrical situations and using associated terminology continue to be widespread problems. This was particularly apparent in question 12 (in terms of applying and also formally stating relevant circle theorems).

Some candidates apparently lacked familiarity with the formulae provided at the start of the paper.

MATHEMATICS

GCSE (NEW)

November 2019

UNIT 2 FOUNDATION TIER

General Comments

The number of candidates entered for this paper was lower than that of previous examinations at this level.

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

Candidates found most of the questions on the earlier questions accessible, though as expected they found the questions which are common with the Intermediate tier more challenging.

As in previous series, there was evidence that some candidates were not familiar with the whole of the Foundation specification content. There was also evidence of candidates not using their calculators to carry out calculations despite this being a calculator-allowed paper.

Comments on individual questions/sections

Q.1 This was the most attempted question on the paper. In general, candidates were successful at completing the first two calculations (multiplications) but found the last two calculations (divisions) noticeably more challenging, especially the last calculation where candidates needed to find the divisor.

Q.2 (a) This part was answered correctly by about half of the candidates. Incorrect responses were typically as the result of candidates who confused factors and multiples.

(b) This part was answered slightly less well than (a). Many of the candidates who answered it correctly found it useful to write the factors in pairs to help them find the missing factor.

Q.3 Candidates at Foundation tier continue to find it difficult to use the 'greater than' and 'less than' symbols. Many of the candidates who were awarded both marks for this question used the 'space for working' to help record their answers to the calculations before deciding which symbol they needed to write in the boxes.

Q.4 This was the OCW question. Candidates were typically awarded 0, 1 or 3 marks in this question (excluding the OCW marks). Some candidates were able to calculate the perimeter of the triangle but could go no further. Those who read the question carefully and realised that the square has the same perimeter as the triangle typically went on to get all 3 marks. Some candidates misread the question and thought that the perimeter of the triangle was 14cm, instead of the length of each side being 14cm, and this led them to an incorrect answer of 3.5cm, obtained from dividing 14cm by 4.

For the OC mark, candidates were expected to show the two steps needed to solve the problem and use labels, such as perimeter and side length.

For the W mark, candidates were expected to show at least one of the two calculations which they needed to carry out, use the equal sign correctly, and use the correct units. It was common for candidates to work with incorrect units (cm^2) in this question.

Q.5 In this question, candidates had to complete the table showing conversions between fractions, decimals and percentages. Candidates found it considerably easier to complete the second row, where they needed to write 1/10 as a percentage and decimal, than to complete the third row, where they needed to write 8% as a fraction in its simplest form and as a decimal. It was common for candidates to write 8% as 0.8 and 8/25.

Q.6 (a) This part was answered correctly by approximately 80% of candidates. Those who got it incorrect typically multiplied 5.4 by 2, instead of squaring it.

(b) This part was answered considerably less well than (a). Many of the candidates who got this part incorrect calculated the square root of 2.56/4, instead of just 2.56, obtaining the incorrect answer of 0.8.

Q.7 The four parts of question 7 were each multiple-choice questions.

(a) This part was answered correctly by about half of candidates, with pentagon and rhombus the most frequently seen incorrect responses.

(b) Approximately 90% of candidates were able to correctly identify the shape as a cuboid.

(c) Less than half of candidates were able to identify an angle of 181º as a reflex angle, with an obtuse angle the most popular incorrect response.

(d) Just over a quarter of candidates were able to identify a parallelogram as having rotational symmetry of order 2.

Q.8 (a) Over three-quarters of candidates were able to correct plot point R. Candidates seemed to be more successful at plotting coordinates than in previous series, with fewer candidates plotting the reversed coordinate of (-2, 5).

(b) Approximately 70% of candidates were able to correctly write the coordinates of point P. Nearly all of the candidates who gave an incorrect answer wrote the coordinates in reverse.

Q.9 This substitution question was only attempted by less than three-quarters of candidates.

Candidates who knew that 7A means 7×A typically went on to substitute correctly and get both marks. Some candidates gave an incorrect answer of 717 from trying to answer the question like a code and just replacing the A with 43 but not multiplying it by 7, instead writing it as 743.

Q.10 (a) In this part, it was clear that many candidates didn't know what square numbers are. Some candidates displayed an awareness of square numbers but were unable to find which three square numbers added to 30. The condition that the three numbers needed to add to 30 was often ignored or misread by candidates. Some candidates realised the correct square numbers were 1, 4 and 25 but wrote their final answers as 1^2, 2^2 and 5^2 on the answer line – this was condoned, and they were awarded full marks.

(b) This part was attempted by more candidates than (a), however very few candidates were awarded full marks. It was clear that candidates found it much easier to write four numbers which had a mode of 7 than to write four numbers which had a median of 6. Some candidates ignored or misread the condition for the four numbers to be odd.

Q.11 (a) This part wasn't particularly well answered, with many candidates simply multiplying 1176 by 12½, obtaining an answer of 14700. Some candidates attempted to use the partition method and typically made numerical errors.

(b) In this part, some candidates just evaluated the numerator and denominator and left the answer as a fraction – they weren't awarded any marks. There were a few unrounded answers and rounding errors seen, but many of candidates who could evaluate the question correctly were awarded both marks.

Q.12 The angle 'f' should be found first, and then the angle 'g' can then be found using the candidate's value for 'f'.

Some candidates mistakenly thought that the triangle was an isosceles triangle, with either the base angles being equal (52º). Follow through marks were available for candidates who followed the correct method with these incorrect angles.

Q.13 Most candidates found all three of the missing digits.

Q.14 (a) About half of candidates circled the correct answer of 1/12.

(b) Approximately a third of candidates answered this part correctly. It was common for candidates to circle B (the probability of selecting a blue card), as opposed to selecting a card which was 'not blue' as the question asked.

(c) This was answered worse than both (a) and (b). The most common wrong answer was ¼, obtained by candidates who realised there were four options so the answer must be ¼.

Q.15 Candidates found this question very challenging.
Some candidates wrote 6 hours and 15 minutes to 6·15 hours and started by finding 2/5 of 6·15 (3·69). Follow through marks were available for these candidates. It was very rare to see a fully correct answer. A few candidates did everything correctly but missed out on full marks by not presenting their final answers in hours and minutes as the question specified.

Q.16 (a) Candidates engaged better with this than they have with ratio questions in previous series. The most common error was not to give their ratio in its simplest form – 540:180 was seen quite often as a final answer.

(b) It was unusual to see a fully correct answer for this part. One mark was awarded for a correct numerator (445) and one mark for a correct denominator (720), if the given fraction was less than one. 1/445 was a common incorrect answer.

Q.17 (a) Very few candidates correctly solved the equation and found x to be 36. It was common for candidates to attempt to solve this equation by trial and improvement, or to simply guess a value. Some candidates attempted to expand the bracket on the LHS of the equation, but they needed to keep it as an equation in order to be awarded the first B1 mark.

(b) Few candidates were able to write an expression for the total cost of the bananas and apples. Many candidates gave an answer of 8x, misreading (or ignoring) that apples cost 2x pence each.

Q.18 Few candidates gained all 3 marks as it was clear that they weren't familiar with corresponding and alternate angles. Most marks in this question were gained there was an opportunity to gain a follow through mark for angle 'b' from an incorrect angle 'a', if candidates knew that angles on a straight line add up to 180º.

Summary of key points

- Make use of the calculator at all times. After all, this is the 'calculator-allowed' paper. Marks were lost due to some poor non-calculator arithmetic e.g.
  - (i) Q1. Many candidates used the working lines for their calculations, often making numerical errors.
  - (ii) Q11(a). Trying to find 12.5% of 1176 by partitioning.

- Candidates are expected to know different types of numbers, such as evens and odds, prime numbers, square numbers. It is clearly that many candidates do not know them or are confusing them during exams.

- Candidates are expected to able to solve problems involving time. Many candidates struggle to interpret times and write them incorrectly as decimals e.g. writing 6 hours 15 minutes as 6.15 hours.

- See the comment (Q5) regarding the requirement for gaining the mathematical *'Organisation and Communication'* mark, and the mathematical '*Accuracy in Writing'* mark. Too many candidates aren't clearly presenting their calculations, and not including units in their final answers.

- There are still some topics in the Foundation tier in which candidates demonstrate little knowledge or understanding, especially those in common with the Intermediate tier. In this paper, the algebra questions (questions 9 and 16) were answered poorly.

MATHEMATICS

GCSE (NEW)

November 2019

UNIT 2 INTERMEDIATE TIER

General Comments

The number of candidates entered was significantly lower than for the Summer series.

The paper contained some challenging questions but also some very accessible questions.

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

Candidates still perform poorly on those topics which have always caused them problems.

These include in particular; significant figures, estimated mean (out of context) from a frequency table, interpreting graphs such as $y = ax + b$, reverse percentages, and density.

Dealing with questions involving 'time' also causes problems.

Comments on individual questions/sections

Q.1 (a) The digits 7056 were seen on a number of occasions.
They arose from the fact that some candidates equated 12½ to 12 × ½.

(b) Giving an answer to so many significant figures is more problematic for many candidates than when asked for so many decimal places.

Some common errors were, giving their answer to 2 decimal places (191·73) or simply just writing down the first two digits (19).

(c) There is always a better response when asked to give an answer to a certain number of decimal places. This question was well answered.

Q.2 The angle '*f*' should be found first. The angle '*g*' can then be found using the candidate's value for '*f*'.

Some candidates mistakenly thought that the triangle was an isosceles triangle, with either the base angles being equal or that angles '*f*' and '*g*' were equal. This led to some marks still being awarded, but never all three marks.

Q.3 Most candidates found all three of the missing digits.

Q.4 (a) Most candidates circled the correct answer of 1/12.

(b) A common error was to misinterpret the question as asking for the probability of selecting a blue card (and thus circling the 'B'), as opposed to selecting a card which was **not** blue. The '**not**' was in bold on the question paper.

(c) The most common wrong answers were ¼ (as there were four options) or, 1/120 (because of the 120° on the diagram).

Q.5 Candidates should be made aware of what is taken into consideration when awarding the OC and W mark.

Responses should be structured with explanations that are clear and logical to the reader.
A solution such as ' 2 × 375 ÷ 5 = 150
375 – 150 = 225
So 3h 45m
does not explain to the reader what is being calculated at each stage.
Explanations should be given at the point in the solution when they are presented (not a series of calculations followed at the bottom of the page with a detailed 22explanation).
Correct mathematical form is required.
We do not want to see, for example,
'Planning = 2 × 375 = 750/5 = 150 – 375 = 225min.'
Units, where appropriate, should be shown.
As far as correctly answering the question, those who converted the initial time of 6 hours and 15 minutes into 375 minutes were more successful than those who attempted to work with 6·25 hours.
A number of candidates converted 6 hours and 15 minutes to 6·15 hours. These candidates were able to gain some follow through marks.

Q.6 (a) The most common error was not to give their ratio in its simplest form.

A few candidates reversed the ratio.

(b) One mark was awarded for a correct numerator (445) and one mark for a correct denominator (720). BUT the fraction had to be less than 1.

Q.7 To gain all 4 marks the **two** possible correct positions of P had to be shown.
3 marks were awarded if only one correct position of P was shown.
A tolerance of ± 2 mm was allowed for line BP (= 8 cm). Any point P within this tolerance was awarded 2 marks as an interpretation of the scale of the given line AB was required.
A tolerance of ± 2° was allowed for angle ABP (= 115°). A point P within this tolerance was awarded 1 mark as all that was required was the accurate use of a protractor.

Q.8 (a) (i) Most of the candidates correctly found x to be 36.
An embedded answer of 36 was given credit as long as not then contradicted.
Embedded answers should not be encouraged, as in this question more than one candidate wrote, '36 / 9 = 4 followed by 'x = 4'.

(ii) In most cases, bracket was correctly expanded '12x + 8 = 12' for 1 mark.
Followed by correctly collecting the terms to give '12x = 4' for 1 mark.
The third and final mark was usually not gained for one of two reasons.
'12x = 4' became 'x = 12/4 =3' or 'x = 4/12 = 1/3' became '0·3'.
Candidates should realise that not all answers are whole numbers and also be aware that 1/3 is not equal to 0·3.

(b) (i) Those candidates who understood the concept of factorising scored well on this question.

(ii) Candidates found it difficult to deal with the 2nd term.
Having taken the common factor of 'f' outside the bracket they were in a quandary as to what was left as a second term inside the bracket.
Some common incorrect answers were 'f (f – 0)' and 'f (f – f)'.

Q.9 Many candidates gained all 3 marks as they were familiar with corresponding and alternate angles, as well as angles on a straight line.
There was an opportunity to gain a follow through mark for angle 'b' from an incorrect angle 'a'.

Q.10 The mark scheme allowed,
1 mark (B1) for any correct substitution and evaluation.
1 mark (B1) for two correct evaluations using x in the range 3·55 ≤ x ≤ 3·75
with 'one answer < 37' AND 'one answer > 37'.
1 (crucial) method mark (M1) for two correct evaluations
using x in the range 3·55 ≤ x ≤ 3·65 **with** 'one answer < 37' AND 'one answer > 37'.
If this is not shown then no further marks were permitted.
1 mark (A1) for a final correct answer BUT only if the previous M1 mark awarded.

Some candidates substituted x = 3·6 and x = 3·7 into the expression and then simply looked at which evaluation was the closest to 37. This does not gain a method mark (M1) nor the final mark (A1) even if 3·6 given as an answer.

Others, not only lost the final A1 mark, but wasted valuable time by giving an answer to a greater degree of accuracy than was asked for.

Q.11 (a) Well answered for both values.

(b) A disappointing response to finding the estimated mean.
A question which is normally well answered on the Numeracy papers.
Was it 'the horizontal table' or lack of content?

The four marks for calculating the estimated mean were rarely gained but a (very) generous mark was allowed for finding the difference between the actual mean (15·2) and the candidate's estimated mean if that estimated mean was derived in any(!) way from the table.

Q.12 (a) The value of y when x = 1 was correctly found by most of the candidates.

(b) The graph was accurately and neatly drawn in most cases. Pleasing to note that there were fewer 'straight line segment' drawings than seen on previous questions.

(c) Drawing the line y + x =4 was problematic for most of the candidates. The majority simply drew the line y = 4.

(d) A follow through mark was allowed if the candidates had a straight line that intersected a curve at exactly two points.

Q.13 Few candidates actually gave a number to start working with.
Those who did (especially if they chose 100), coped well with the question.
On the whole both presentation and understanding was poor, with often only one mark gained for a sight of 1·25 or 125%.

Q.14 A few candidates adopted a 'round the houses' multi-step approach which, although correct, was not necessary.
This approach has more potential of possible arithmetical errors arising, and marks are not awarded for a partial method.
Some candidates wrote MN = cos 27° × 13·5 rather than the correct mathematical form of MN = 13·5 × cos 27°.
Whilst there was no penalty for this, it did lead to some incorrect answers when the values were inputted into the calculator as MN = cos (27 × 13·5) giving us cos 364·5!

Q.15 For the simultaneous equation question all the working must be shown.
No marks are awarded for a 'trial and improvement' method or for any unsupported answers.
The first method mark (M1) is crucial. If not gained then no other marks are awarded.
To gain M1
(i) the equations must be correctly reformed such that one of the variables has equal coefficients in both. (One arithmetical error in one of the other terms is allowed.)
AND
(ii) there must be the intention to <u>appropriately</u> add or subtract the equations.
(This is determined by what the candidates have done to the numbers on the right.)

[There is of course an alternative method of substituting one variable from one equation into the other equation. This is rarely seen, but would be credited.]

Q.16 (a) Many gave the area of a circle but did not recognise the cylinder.

(b) Candidates were able to follow through whatever answer they had for a volume in 16(a).

Few knew the correct relationship between mass, volume and density.

Q.17 '*Knowledge and use of the form y = mx + c to represent a straight line where m is the gradient of the line, and c is the value of the y-intercept'* is part of the Intermediate specification. Few candidates were able to recall this information.

Q.18 Candidates did well on this final question on the Intermediate Tier paper.
Some excellent presentations, with a correct solution found for the length of side BC, then failed to gain the simple final mark as the candidate seemed to forget what the actual question was asking!

Summary of key points

- It's good practice to show all your working even if not specified in the question.
- Make sure you know the difference between 'significant figures' and 'decimal places'.
- Take care when expressing minutes as a decimal fraction of an hour.
- Understand what is required to justify the accuracy of a solution when finding a solution to a cubic equation using a 'trial and improvement' method.
- Know how to interpret the equation y = mx + c.
- OCW questions require, in particular,
    - an explanation at each step of the response of what is being done,
    - a structured, clear and logical lay out,
    - that all workings and calculations are shown,
    - that correct mathematical form is used, and
    - that units, where appropriate, are always given.

MATHEMATICS

GCSE (NEW)

November 2019

UNIT 2 HIGHER TIER

General Comments

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

The vast majority of candidates attempted all the questions. Furthermore, the overall quality of the responses gave a sense that the candidates had been entered at the correct tier, and that they had been exposed to the majority of the mathematics syllabus. The majority of the questions were answered well, including the ones at A and A* grade. None of the questions were poorly answered.

Comments on individual questions/sections

Q.1 Very well answered. Candidates were familiar with using the method of trial and improvement and how to achieve full marks on this question. Very few candidates failed to do the necessary check (in this case normally $x = 3{\cdot}65$) to determine the root being 3·6 to one decimal place. A few candidates decided to first rearrange the equation to $x^3 - 3x - 37 = 0$, and then solve the equation in the expected manner.

Q.2 (a) Almost every candidate answered this question on relative frequency correctly.

(b) This was the OCW question.
The majority of candidates who accessed this question fully (whether it was correct or not) offered a solution which was well explained and well presented. Work was labelled and each step was clearly and succinctly explained. Furthermore, candidates showed their working and made few errors within their mathematical form.
With regards to the mathematics, many candidates gained full marks. Common errors were incorrect mid-points, most often being 5, 15 and 25, rather than 4·5, 14·5 and 24·5. However, if a correct method was employed two of the first four marks could be gained. Candidates who failed to use mid-points failed to get started on the question and used the numbers in the table in a seemingly random way. For example, they chose three values from the 1st call interval, 5 from the 2nd, and 2 from the 3rd – they then simply found the mean of their 10 randomly chosen values. These candidates gained none of the first four marks.
Whether or not they had gained any of the previous four marks, candidates were often able to gain the final B1 for finding the actual mean to be 15·2 and identifying the difference in the means, provided that they had used the values from the table, in any shape or form, to estimate the mean.

Q.3 This question as a whole was well answered. Calculating the missing value, –5, in the table was almost always done correctly, which helped candidates in plotting points and sketching the quadratic graph. However, on the occasion the missing coordinate was incorrectly calculated, candidates did not seem to appreciate the need to revisit their calculation in order to produce a smooth parabola. Seldom were straight line segments seen when sketching the curve. Drawing the straight line $x + y = 4$ was the least well answered part of question 3. A notable number drew the horizontal line $y = 4$. These candidates lost 2 marks, but most then managed to redeem themselves by identifying the x values where the straight line met the curve.

Q.4 The majority of candidates were able to gain B1 for realising that the new number was 125% (or the multiplier, 1·25) of the original number. The candidates who then used a trial number were generally successful in obtaining the correct answer. Few candidates expressed the original number as a fraction of the new increased number to potentially gain 2 marks. 1 or 3 marks were the most common marks awarded.

Q.5 Full marks were awarded to the majority of the candidates. Occasionally the incorrect trigonometric function (usually sine) was used. Some candidates decided to calculate the opposite angle MLN (63°) and then correctly calculate 13·5×sin 63° whilst others employed the more circuitous route of using trigonometry to calculate side LM and then Pythagoras to calculate side MN.

Q.6 Well answered by the cohort. To gain the first method mark and hence any subsequent marks the candidate had to show an acceptable method which would eliminate one of the variables. The method of manipulating the coefficients was normally seen. Then an appropriate addition or subtraction of the constant terms was required. No marks were awarded for unsupported answers, as there was an instruction in the question for candidates to show all their working. This has become necessary as some calculators will now solve simultaneous equations. A trial and improvement method is also not acceptable when solving simultaneous equations.

Q.7 (a) Although the responses were occasionally varied, on the whole, the candidates answered the question well.
The mark scheme allowed for candidates adopting either one of two methods to calculate the volume. One method was for finding the remaining cross-sectional area, after removing a circle from the rectangular face of the prism, and then multiplying by the height, 10 cm. However, the common method seen was to calculate the volume of the cuboid and cylinder separately, and then subtract to find the volume of the remaining prism. The most common error seen was to find the area of the circle and then not use it correctly, e.g. finding the volume of the cuboid and subtracting the area of the circle. These candidates failed to gain any marks. Others who failed to gain all three marks were able to gain SC1 for correctly calculating the volume of the cylinder.

(b) Candidates were then allowed a fresh start, and were required to find the mass of the object using their volume from 7(a). Common errors were to multiply by the density, 2·4 g/cm^3, but then not change their mass into kg, as required. Even the candidates who did convert the mass into kg, sometimes forgot to round their answer to the nearest kg. An alternative method was to convert the density from 2·4 g/cm^3 to 0·0024 kg/cm^3, and then multiply with the volume. An SC1 was available for candidates who employed the correct formula of density×volume but made a place value error in converting the 2·4 g/cm^3.

Q.8 This was a multiple choice question, where candidates were required to identify the gradient of a straight line whose equation was given in the form y = mx + c. A significant number gave the correct answer of 8, with 1/8 and –5 being the most common incorrect answer.

Q.9 This was the last question on the intermediate tier, with the majority of the candidates achieving the full 6 marks. The majority of the errors were made in the first part of the question when rearranging the area of the triangle formula. Candidates forgot to divide by ½ (multiply by 2) and therefore had an incorrect answer of 3·5 for the height of the triangle. The height was followed through to the second part of the question where it was used in Pythagoras's theorem. This was done successfully by the vast majority of the candidates.

Q.10 If candidates failed to expand and then correctly eliminate the '– k + k', then it would be impossible for them to factorise the resulting expression. The first B1 was given for $9k^2 - k + k - 25n^2$. Of those candidates who did then simplify the expression to $9k^2 - 25n^2$, a few left the expression as it was, whilst others gained a further B1 for either $(3k - 5n)(3k - 5n)$ or $(3k + 5n)(3k + 5n)$, which were sometimes shown as $(3k - 5n)^2$ or $(3k + 5n)^2$.

Q.11 (a) (i) The concept of proof posed problems for more candidates than the other questions. The key to showing the given quadratic was true for the given diagram was to unambiguously use the formula for the area of a trapezium. Some candidates did this in parts, but if they were able to use the formula correctly, they most often gained all 3 marks. However, there were many that started with the given quadratic, and then tried rearranging it, but without really getting anywhere. Others attempted to use the quadratic formula in part (i) in order to solve the quadratic equation.

(ii) This was answered better than part (i). However, candidates are still making the same common errors when using the quadratic formula. Although it is stated in the formula page, candidates write it down and use it incorrectly in their solutions. Substitution errors, especially when substituting in negative numbers, were seen. However, one slip in a substitution was still allowed to gain the method mark, but then no more marks were available. For this question, candidates were finally expected to use their positive solution to identify the lengths of the parallel sides in the original trapezium. They were allowed this mark provided they had gained at least M1, and chosen the positive root.

(b) Many candidates failed to realise that the area scale factor was required from squaring the linear scale factor. Too many candidates still simply multiplied the scale factor and the area together. Usually either zero marks or the full 2 marks were awarded to candidates.

A few candidates employed a different strategy of firstly finding the square root of the area, 36·8 cm², multiplying by 7, and then squaring the resulting product. These candidates gained M1, but then were often penalised with A0, as they had lost some accuracy by rounding their square root at the first step.

Q.12 Candidates usually gained either zero marks or the full 3 marks for this question. Candidates more often failed because they initially found the area of the sector rather than the arc length. Fewer candidates failed because of finding the circumference, but then failing to find the appropriate fraction of it for the arc length. A few candidates employed a two-step method of writing 42/360 as a percentage, and then multiplying this percentage with the circumference. Another approach was to divide 360 by 42 to give 8·5(714...) which was then divided into the circumference. Most candidates added 14 cm to the arc length.

Q.13 Many candidates realised the transformation was an enlargement and that the centre of enlargement was at the coordinate (4,4), each of these gaining a B1 mark. Also, many responses offered were two-step transformations which described rotations and enlargements about (4,4). It was the scale factor –2 that many candidates did not offer in their answer to gain the final B1 mark.

Q.14 Although this question on dependent events seemed quite straight-forward, and involved a context that should have been familiar to most Higher tier candidates, this question was not as well answered as expected.

(a) A fair percentage of the candidates did get part (a) correct, but there were many who calculated the probability of choosing 3 C's without replacement.

(b) In part (b), successful candidates did use the approaches as described in the mark scheme. These approaches were sometimes seen in a tree diagram or sample space diagram. If full marks were not awarded, many candidates gained a method mark attempting to find the probability of either three vowels or three consonants (but not both) and then subtracting that value from 1. Another common method mark was for recording the three possible ways of obtaining two vowels and one consonant, or vice versa, and furthermore, for the addition of the probabilities of the single permutations of two vowels and one consonant, and two consonants and one vowel.

Occasionally there was the sight of 9/12 x 3/11 x 10/10 which warranted M1 as the candidate was aware of P(V,C,'other') where 'other' could be either a consonant or a vowel. The 10/10 had to be seen in this case, otherwise 9/12 x 3/11 implied a draw of only two cards. However, 3 x 9/12 x 3/11 (x10/10), where the 10/10 was optional, was a correct solution.

Q.15 The majority of the candidates did not go past the first mark multiplying both sides by a^2b. From there the most common error was rewriting a^2b as $a^2 + b$.

Q.16 Candidates mainly answered two questions out of the three correctly. The final transformation of y=2f(x) seemed to be the most common correct answer. Many candidates were confused with the difference between the number being inside or outside of the bracket, ie f(–x) instead of –f(x), or f(x–1) instead of f(x)–1.

Q.17 Most candidates whilst using the cosine rule went as far as to find the square root of CD^2, and then squaring their answer to find the area of the square. Very few realised that the value of CD^2 represented the area of the square. Rounding errors were often present in solutions because the candidate would find the length CD, round it, and then square it again to find the area of the square. They were usually penalised by not gaining the final mark when subtracting the area of the triangle from the area of the square to find the shaded area to an appropriate degree of accuracy. Otherwise the question was well answered for the last question on the paper.

Summary of key points

Areas of the syllabus that require attention include:

- Expressing one value as a percentage of another,
- Calculating volumes of composite shapes or prisms (by adding or subtracting),
- Factorising the difference of two squares involving two different letters,
- Showing an equation to be true having been given a diagram with the relevant values shown,
- Solving quadratic equations using the formula,
- The relationship between the linear, area and volume scale factors,
- Enlargements using negative scale factors,
- Changing the subject of an equation involving squares and square roots.

WJEC
245 Western Avenue
Cardiff CF5 2YX
Tel No 029 2026 5000
Fax 029 2057 5994
E-mail: exams@wjec.co.uk
website: www.wjec.co.uk