GCSE EXAMINERS' REPORTS

GCSE (NEW)
MATHEMATICS – NUMERACY

NOVEMBER 2019

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MATHEMATICS – NUMERACY

GCSE (NEW)

November 2019

UNIT 1 FOUNDATION TIER

General Comments

The paper differentiated well, with different styles of questions and a graduation in the level of difficulty. Many candidates were able to attempt the questions towards the end of the paper.

Item level data is available to all centres by centre and for individual candidates with comparison of all candidates sitting these examinations. This report will focus on common errors and misconceptions to aid the interpretation of the data available rather than focus on whether each question was well answered or not.

In the OCW question, many candidates showed all their working and labelled calculations clearly, so the reader understood the stages of the work and were awarded OC1 and W1. Other candidates did not label the stages of their work.

Comments on individual questions/sections

Candidates need to be aware of the following points:

Q.1 This question was well answered with several achieving all 4 marks. Errors were often made in not understanding that extra adults were needed for children of age 2 and from ages 3 to 7 as the number of children for these categories were not a multiple of the number of adults needed. Candidates did not fully engage with the words '1 adult for up to …….'. There were a few candidates who actually just used the values of 3, 4 and 8 given in the question with then 1 for all the number of adults for each category. Some candidates did not always calculate the total number of adults needed or did this incorrectly so did not gain the final mark.

Q.2 Most candidates knew how to answer (a)(i); however, errors in adding time were often seen with a common incorrect answer of adding 110 minutes to 7:20 p.m. given as 8:40 p.m. If candidates used the method of adding on each individual time, errors were often made with the first calculation of 7:30 + 42 minutes and then 8:32 + 48 minutes. Some candidates misinterpreted the times given in the question: for example, for Act 1 is 42 minutes, candidates thought the time they needed to add was 1:42.

In (a) (ii), the common error was in selecting seats G15 and G16 in the Circle rather than the Stalls.

In part (b), candidates were able to answer (i) very well but in (ii) many candidates only gave either Blaenau Gwent or Merthyr Tydfil as their answer. Many listed the places rather than saying how many. In (iii), the common incorrect answer was 44%, although other answers were given too. Many candidates did not understand the concept of the range.

Q.3 It was disappointing to see candidates not being able to calculate 15% of 400. Many left their answer as £20, after calculating 10% and then 5% but forgot to add the values. Fractions of a quantity is not done well, with many candidates not even dividing by 5. For those that did, they often left their answer as £80, only finding 1/5 rather than 2/5. Most candidates understood that they needed to add what Cai's parents and grandparents gave and then found how many £30 were needed to make the total of £400. Candidates used a variety of methods with many just counting in 30s from their £220 up to £400.

Q.4 In part (a), many candidates were able to measure the length and width of the scale drawing; however, only some were able to make the connection of the scale used. Some gave the answer as 11 without units.

In part (b)(i), many candidates just stated the number of games won and lost by each club; however, many candidates did consider the fact that the clubs may have played teams better or worse than them and considered the fact that they did not know how good the players were. (ii) was very well answered. In part (c), the most common incorrect answer was a cylinder.

Q.5 In part (a), several candidates did give the correct answer; however, it is evident that changing units continues to be a difficult concept for these candidates. A common incorrect answer was given as 3200.

In part (b), many candidates only considered the number of tyres for 1 metre rather than 2 metres. Very few candidates showed the method of 200 cm ÷ 32 cm (or equivalent). Most showed the method of counting in 320s or 32s.

Q.6 In part (a), very few candidates correctly recalled that 1 mile ≈ 1.6 km or stated that 5 miles is equivalent to 8 km. Many candidates believed that 1 km was longer than 1 mile; it is important to aid learning to know which is the longer 1 km or 1 mile. Many candidates confused miles with metres and evaluated 20 x 1000 = 20000.

In part (b), a few candidates derived the correct answer by considering 10% and then 5% of £3600. However, a few of these candidates working in this way found 10% of £3600, but then considered £180 as double £360 rather than half, leading to an incorrect response of 20%. Many candidates only calculated £3600 - £180.

In part (c), those candidates that attempted the question either used a trial and improvement method or considered £5 or 500p divided by 3. Errors were sometimes made in arithmetic, but the most common reason for not being awarded all 3 marks for the question, after the first 2 marks had already been awarded, was for not giving the answer correct to the nearest centimetre. Several candidates only tried to calculate 500 × 3.

Q.7 Candidates engaged well with part (a); however, a common error was to use only the value of the USB lead and evaluate 5 x 3 = £15. In part (b), some candidates only considered one of the days rather than the 2 days. In part (c), the most common incorrect answer was 10/40 or ¼. Candidates did not consider the 27 customers that did not buy either the earphones or the USB lead.

Q.8 Part (c) was the least well answered part of this question.

There were errors in adding all the frequencies in part (b) and the reading of the frequency scale hindered some. There were some vague explanations in part (a), but in general candidates generally engaged well with these parts of the question. In part (c), many candidates did not identify the correct frequencies from the diagram to consider.

Q.9 A number of candidates work well to extrapolate from the conversion graph. There were errors with arithmetic, which led to unreasonable responses. Candidates seemed to have more difficulties in answering part (a) rather than (b), with a common incorrect response given as 2 rather than 20.

Q.10 A number of candidates made significant place value errors with calculating 20 × 1.10 and some candidates did not follow the details outlined in the question correctly. A common error was to consider waste water correctly as 80% of $20m^3$, that is $16m^3$, and then incorrectly thought that there was (20 – 16) $4m^3$ of fresh water even though the question stated that there was $20m^3$ of fresh water. Some candidates only calculated 20 × 1.10 and 20 × 1.50, leading to an incorrect answer of £52.

Q.11 This question was reasonably well answered, with the correct stages of working seen. However, there were errors in arithmetic, particularly in calculating 2.5 × 3.40. Some candidates only subtracted 3.40 from 12.40 and then divided by 3.

Q.12 Some candidates decided to consider 1000g of each type of pasta, but errors were made in calculations. Some candidates only compared strozzapreti pasta and rigatoni pasta considering 500g and did not know however to compare then with fusilli pasta. However, as the last question on the paper, this was well answered by candidates.

Summary of key points

- Candidates need to know metric conversions.
- Knowledge of conversion facts, as stated in the specification, is essential.
  For example: 1 kg ≈ 2.2 pounds and 1 mile ≈ 1.6 km.
- Candidates need to give answers to the accuracy stated in the question.
  For example, when accuracy correct to the nearest cm the final accuracy mark will only be awarded if this requirement is met.
- The method of finding a fraction of a quantity needs to be learned by candidates.
- Candidates need to remember when working with time, that there is only 60 minutes in an hour and that the usual method for adding values cannot be used with time.

MATHEMATICS – NUMERACY

GCSE (NEW)

November 2019

UNIT 1 INTERMEDIATE TIER

General Comments

The paper differentiated well, with different styles of questions and a graduation in the level of difficulty.

Item level data is available to all centres by centre and for individual candidates with comparison of all candidates sitting these examinations. This report will focus on common errors and misconceptions to aid the interpretation of the data available rather than focus on whether each question was well answered or not.

A few candidates did not attempt to answer multiple-choice questions.

Comments on individual questions/sections

Candidates need to be aware of the following points:

Q.1 In part (a) a number of candidates correctly recalled that 1 mile ≈ 1.6 km or stated that 5 miles is equivalent to 8 km. However, a few candidates incorrectly recalled facts, incorrectly stating that 1 km was 1.6 miles, it is important to aid learning to know which is the longer 1 km or 1 mile. A few candidates seemed to confuse miles with metres. They stated correctly that 1km = 1000m but then went on to evaluate 20 x 1000 = 20000km.

In part (b) a number of candidates derived the correct answer by considering 10% or 50% of £3600. However, a few of these candidates working in this way found 10% of £3600, but then considered £180 as double £360 rather than half, leading to an incorrect response of 20%.

A number of candidates started by calculating £3600 - £180, and then considered a fraction or percentage. These candidates ended with an answer of 95%.

In part (c) candidates either used a trial and improvement method or considered £5 or 500p divided by 3. Errors were sometimes made in arithmetic, but the most common reason for not being awarded all 3 marks for the question, after the first 2 marks had already been awarded, was for not giving the answer correct to the nearest centimetre.

Q.2 Candidates engaged well with this question, which was reasonably well answered. A common error in part (a) was to use the USB lead only value and evaluate 5 x 3 = £15. There were however, many errors in the arithmetic in part (d), sometimes with multiplications correct but the final addition was not.

Q.3 Part (c) was the least well answered part of this question.

There were errors in adding all the frequencies in part (b) and some vague explanations in part (a), but in general candidates generally engaged well with these parts of the question. In part (c), many candidates did not identify the correct frequencies from the diagram to consider.

Q.4 A number of candidates work well to extrapolate from the conversion graph. There were errors with arithmetic, which led to unreasonable responses. An error seen in part (a) was to misread the graph and evaluate 23 x 1.15 = 26.45 (using 1mph = 1.15 knots).

Q.5 A number of candidates made significant place value errors and some candidates did not follow the details outlined in the question correctly. A common error was to consider waste water correctly as 80% of $20m^3$, that is $16m^3$, and then incorrectly thinking that there were (20 – 16) $4m^3$ of fresh water even though the question stated that there were $20m^3$ of fresh water.

Q.6 This question was reasonably well answered, with the correct stages of working seen. However, there were errors in arithmetic.

Many candidates showed all their working and labelled calculations clearly, so the reader understood the stages of the work and were awarded OC1 and W1. Other candidates did not label the stages of their work.

Q.7 A number of candidates did not give groups with no overlap or gaps in response to question 1. However, many candidates did state appropriate categories for the second question.

Q.8 Some candidates thought part (a) of the question was the Pythagoras' Theorem question!

In part (a) many candidates gave the length of one or both of the diagonals but made no further progress. The statement '120%' caused issues for a number of candidates, who did not understand how a percentage could be greater than 100.

A number of candidates did see the kite as triangles and attempted to calculate the area in part (b), however there were many errors.

Q.9 Many candidates decided to consider 50g of each type of pasta, some candidates compared strozzapreti pasta and rigatoni pasta considering 500g and did not know however to compare then with fusilli pasta. However, there were many correct responses.

Part (b)(i) was reasonably well answered, although some candidates overlooked the recipe was for 4 people. Part (b)(ii) was not well answered due to candidates not knowing that 1 kg ≈ 2.2 pounds.

Part (c) was disappointing, as many candidates did not know or use the fact that 1 km = 1000 m and 1 m = 100 cm. However, a number of candidates did know these facts, but did not know how to express their answer in standard form.

Q.10 This question was not well answered. Candidates seem unaware of a method to split the money earned into the correct amounts for the bands of the different rates of income tax. Many candidates thought that the upper tax rate of 35% could be applied to the total earnings of 600 000 pesos. The more successful candidates split the amounts of money using a number line to start.

Q.11 Part (a) was answered correctly by many of the candidates starting by giving the correct bounds. Other candidates seem to have little knowledge of bounds.

In part (b) the most common, and incorrect answer, was found by calculating 30% and adding this on; instead of correctly considering the value as 70% of last years' value.

Q.12 In part (a), 78 seconds and 80 seconds were the most common incorrect responses.

In part (b), 106 seconds was the most common incorrect response.

In part (c) a number of candidates incorrect read the median on the cumulative frequency diagram to the nearest 'dot' plotted, reading the median incorrectly as 60 seconds. Otherwise, those candidates with understanding of how to read the diagrams given answered this part of the question well.

A common incorrect response in part (d)(i) was 78 seconds and in part (d)(ii) was 80 seconds.

Q.13 Candidates either understand mathematically similar figures, or they incorrectly work with differences by adding or subtracting. This topic always seems to challenge the knowledge and understanding of candidates entered for Intermediate Tier. Part (b) was not well answered at all. In both parts division by 1.2 caused problems.

Summary of key points

- Candidates need to know that 1 km = 1000 m and 1 m = 100 cm.
- Knowledge of conversion facts, as stated in the specification, is essential.
  For example: 1 kg ≈ 2.2 pounds and 1 mile ≈ 1.6 km.
- Candidates need to give answers to the accuracy stated in the question.
  For example, when accuracy correct to the nearest cm the final accuracy mark will only be awarded if this requirement is met.
- When suggesting groups for collecting data there must not be any gaps or overlaps.
- Candidates should think about the reasonableness for their answer by referring back to the question.
- Candidates need to be aware of how to work with percentages greater than 100.
- Candidates need to develop a strategy in order to apply different income tax rates across bands.

MATHEMATICS – NUMERACY

GCSE (NEW)

November 2019

UNIT 1 HIGHER TIER

General Comments

The majority of candidates appeared to have had sufficient time to attempt all the questions, and the paper differentiated well. Candidates generally performed well on questions at the lower end of the paper, but some of the arithmetic involved in the A and A* questions did cause problems to some and may have resulted in these candidates failing to complete the paper.

This report will focus on common errors and misconceptions to aid the interpretation of the item level data available to all centres.

Comments on individual questions/sections

Candidates need to be aware of the following points:

Q.1 This question was not answered well by a significant number of candidates. Most of the errors were with the first of the two questions. There was discontinuity in the age range that some candidates chose, mainly to do with the labelling of the first 2 groups e.g. <18 then 19-29. Some also had overlaps in their groups e.g. 40 – 50, 50 – 60, whilst those that had groups that ended with e.g. 41 – 50, 50+ were also given no credit. Better responses were seen with the second question. Most candidates chose to use the groups 'very unhappy', 'unhappy' etc, although some did use a sliding scale from 1 to 10, for example, giving appropriate labels to the extremes of this scale.

Q.2 (a) The most common incorrect work seen in this question involved the use of Pythagoras, as these candidates thought that the diagonals of the kite were the sloping sides. Most correct work was from the calculation of 120% of 40, and then comparing this with 50cm, while some calculated that 50cm was 125% of 40cm before stating 'Yes, the kite can fly'. The misinterpretation of the answer caused some to lose the last mark in this question also.

(b) More success was seen in this part compared with 2a, with many gaining full marks. Credit was given to those who showed a correct method for calculating the areas of at least 2 of the 4 triangles and were able to decide what length of tail would be appropriate for the kite. Not many candidates knew the formula for the area of a kite, but it was pleasing to see that arithmetic errors for their more inefficient methods were few and far between.

Q.3 (a) Most candidates showed the method of calculating how many pounds (lbs) of tomatoes were needed for 20 people (2 x 0.88 x 5), but the majority did not know how to convert from lbs into kg, and therefore only gained 1 out of the 3 marks available. Some arithmetic errors were also seen with for example 1.76 x 5.

(b) Like in 3a, many candidates did not know how to convert between units, even in this question where a simple metric conversion was needed (albeit in 2 steps). There were also errors in writing their answer in standard form, but more success was gained in this question compared with 3a. For those who used an incorrect conversion, a special case mark was available for those who could write their answer correctly in standard form.

Q.4 For those candidates who knew how income tax bands work, the vast majority went on to gain full marks for the maths involved in this question. However, those that were unfamiliar with income tax tended only to gain the ocw marks that were linked to this question.

Some thought that the 200 000 pesos needed to be taken away from Agata's pay meaning that she would only be taxed at the standard rate as her taxable pay would be in this bracket. Others just thought that as her pay was above 500 000 then she would need to pay 35% of 600 000 (ignoring the personal allowance).

The calculations needed in each tax band were straightforward, and many were able to give correct answers without showing much working which was not penalised due to their simple nature.

As regards the OCW marks linked to the question, most candidates labelled their work appropriately, gave a suitable conclusion and included appropriate units for their answers. The percentage calculations were quite straightforward, and because of this, those that chose to state the answers rather than show the methods involved were not necessarily penalised.

Q.5 (a) The majority of candidates were able to give us the appropriate bounds for all the measurements that were needed in this question, and many went on to gain full marks. Errors were mainly from those that used only 1 of the smaller boxes rather than 5, and others who did not use the upper bound of the garage height in their calculation. Some credit was gained by those who used bounds in the correct sense without giving us the correct values of the bounds, provided their bounds were within the range specified in the mark scheme.

(b) As with reverse percentage questions that have been asked in previous series, a substantial number of candidates do not understand when there is need to work in reverse. In this question therefore, quite a number calculated 1.3 x 56 rather than 56 / 0.7. I feel that candidates in general are getting better at answering these questions though.

Q.6 (a)&(b) The vast majority knew how to calculate the range from both a box and whisker plot and a cumulative frequency diagram.

(c) In this question, candidates had to compare the median times from both diagrams and then decide whether there had been an improvement in the median time to answer the phone. Most gave us the correct median time for 2018 from the box and whisker plot. More errors were seen in reading the median time for the cumulative frequency diagram. A number of candidates gave the answer of 60, possibly being distracted by the plot at 60 (at a cumulative frequency of 42, and it was the middle plot on the graph), rather than reading across from a cumulative frequency of 40 and then down to the median time of the acceptable answers of 56 to 57 seconds.

Some also misinterpreted the reduction in median time as not being not an improvement, thinking that the greater the time the better.

(d) (i) Most knew that the 75% mark in the data was the upper quartile on the box and whisker plot, and gave us the correct reading for this. Some thought that we were asking for the median, possibly because it was about ¾ of the way between the lower whisker and upper whisker.

(ii) Many correct responses were seen, and some credit was given to those who knew that they needed to calculate ¾ of 80. 80 itself was a common wrong answer, possibly because it was the reading for the 3rd plot of the 4 on the graph.

Q.7 The two parts of this question involved the topic of similar shapes, and were more testing than in recent series. The question lacked diagrams with measurements, and the arithmetic for those who went down the scale factor route was also more challenging. Those who calculated a scale factor usually divided 24 by 20 arriving at a decimal of 1.2. In part a, they then had to divide 18 by this, which for some caused difficulty. A simpler arithmetical approach was used by some, where they used the scale factor from the larger shape to the smaller shape of 20/24 and then calculated 20/24 x 18 by simplifying either fraction, 20/24 or 18/24. Those who coped well in part (a) generally went on to succeed in part (b) too, but the opposite was also true with many failing to score in both parts.

Q.8 (a) Candidates needed to realise that they needed to use the table of frequency densities to calculate the number of people in each age group, and then use these to calculate an estimate the percentage of people aged 60 and over. Those who knew how to start the question tended to go on to gain the majority of the marks, but many multiplied the mid-points of the groups (rather than the group widths) with the frequency densities. Arithmetic errors were also seen with 2.4 x 15 causing the most difficulty. It was pleasing to see that most candidates who worked correctly with frequencies knew how to calculate the percentage required, even if some made errors and lost the accuracy mark.

(b) Some careless errors were seen in this straightforward question. Candidates were given the frequency densities in the question, so they just needed to draw the histogram. Many candidates failed to label the vertical axis, causing the loss of a mark, while others did not take enough care with the widths of their bars. It was also evident that some candidates were not sure what a histogram is, and drew a frequency diagram using the frequencies they had just calculated in part (a).

(c) This question was not answered well. A number of candidates did know a method for selecting a random sample from a list of random numbers. For those candidates who showed an understanding of the method, there were 2 typical errors seen. Some forgot to state that they had to number the passengers, where others incorrectly stated they would choose numbers less than or equal to 40. This is insufficient, as they needed to say they would reject 00 if it appeared. A better approach is to say they would only select numbers between 01 and 40.

Q.9 (a) This question again was not answered well on the whole. A suitable tangent needed to be drawn in order for candidates to gain any marks in this question, and many either did not draw a tangent, or drew a line that was not appropriate. Some candidates who drew a suitable tangent found the scale on the horizontal axis difficult to work with, while others gained no further credit for giving the ‘difference in x’ divided by the ‘difference in y’.

(b) Many candidates calculated an appropriate estimate for the area under the curve. Some used the trapezium rule, but substantially more calculated the area of each of the 5 trapeziums separately and then summed their answers. The conversion from metres to miles caused problems to many, as after dividing by 1000 some chose to divide by 1.6, which without a calculator proved difficult. More success may have been seen if they had chosen to multiply by 5 and divide by 8. Some candidates did not know what was required in this question though which was disappointing.

(c) The majority of candidates knew that Pythagoras was needed in this question, and most used it correctly on the first triangle they chose to work with. Many though attempted to write their first calculated length in the form $a\sqrt{b}$ rather than stop at the square of this length, carrying this value then into the second triangle. The more efficient 1-step method was rarely seen, although this I feel would have resulted in less errors if it had been adopted by more of the candidates.

Some good surd work was seen, but in the main it was evident that the majority of candidates did not have a good understanding of this topic.

Q.10 (a) There were 3 methods that candidates could use to arrive at the sector angle, and we did see all 3 used. They could equate the arc length of the sector to the circumference of the base of the cone, or equate the area of the sector to the curved surface area of the cone, or equate the ratio of the circumferences of the full circles (or their areas) to the ratio of the sector angle and 360 degrees. Many candidates could not work out a correct strategy though, with many gaining just 1 of the marks on offer, usually for a correct expression for the arc length or sector area.

(b) Candidates had to write the correct expression for the area of the sector in order to start gaining marks in this question. Many did this, but most struggled to simplify this to $240\boldsymbol{\pi}$. If candidates had written 24^2 as 24 x 24, possibly more would have been able to cancel these with 36 or 360 more proficiently. Provided the correct expression for the sector area had been given, candidates could gain a mark for 1200 minus 'their $240\boldsymbol{\pi}$' provided it was in its simplest form.

Q.11 The majority of candidates were able to gain marks in this question either by calculating the volume of the block, or by calculating the mass of the cuboid. A correct equation then had to be formed in order to progress, either for the volume of the block in terms of its constituent parts or for the mass of the cone. The majority of candidates were not able to do this though, but those who did tended to work well with the rearrangement needed in order to find the height of the cone.

Summary of key points

- Candidates need to know how to convert between all the metric units of measurement and be proficient in the use of the three metric to imperial conversions stated in the course specification without a calculator.
- It is important that candidates are taught how income tax bands work, as this topic will be assessed in GCSE Numeracy.
- Candidates need to master solving 3-D Pythagoras questions without the use a calculator, realising the need to only find the square of the first side to be calculated.
- Candidates need to be able to form complex equations for questions graded at A and A* (especially those involving arc length or sector area) and be able to solve them using efficient arithmetical means.

MATHEMATICS – NUMERACY

GCSE (NEW)

November 2019

UNIT 2 FOUNDATION TIER

General Comments

The paper differentiated well, with different styles of questions and a graduation in the level of difficulty. The paper contained questions that were accessible to the whole range of ability.

The questions that were common with the Intermediate tier allowed candidates of all abilities to score marks, despite the content being the top-grade range for this paper. It was very pleasing to see that many candidates coped well with a number of common questions, especially questions 10 and 11.

As commented on in previous series, a calculator paper is designed to assess the use of the calculator. Although non-calculator methods can yield correct responses, they often increase the difficulty of the question and result in unnecessary errors. Candidates should be encouraged to use a calculator as much as possible on Unit 2, but must remember to show their working where appropriate.

Item level data is available to all centres by centre and for individual candidates with comparison of all candidates sitting these examinations. This report will focus on common errors and misconceptions to aid the interpretation of the data available.

Comments on individual questions/sections

Candidates need to be aware of the following points:

Q.1 (a) Many correct answers were seen in this first question. A common error was to misinterpret the display on their calculator, by writing £389.07 for the cost of the calculators instead of £389.70. A number of candidates benefited from the follow through B1 mark for a correct total using their values.

(b) A number of different methods were shown to calculate 25% of the total. Some used efficient methods using a calculator, such as $\times$ 0·25 or $\div$ 4. Some decided to use non-calculator methods, which in many cases increased the difficulty of the question and resulted in unnecessary errors. Many prematurely approximated whilst dealing with 10%, 20% and 5% for example, which resulted in these candidates losing the A (accuracy) mark.

(c) Many correct answers were seen. It was pleasing to see many candidates interpreting the display on their calculator correctly and knowing to round down as appropriate. Many methods were used, many used a calculator efficiently to calculate £164 $\div$ £12.99 or equivalent. Common answers given were 12.6 or 13. These responses gained B1. Many non-calculator methods were used including long division and repeat addition. Candidates should be encouraged to use their calculators where appropriate.

Q.2 (a) Many candidates successfully substituted the correct values into the formula. Many correct answers were seen, however, a common incorrect answer seen was £140.09 or £140.091 where candidates did substitute correctly and showed $143 \times 0.65 + 50 \times 0.98$ but did not appreciate the hierarchy of operations (BIDMAS error). These responses gained M2A0.

(b) This question assessed the quality of organisation, communication and accuracy in writing. Many candidates showed their working with very few errors in their mathematical form gaining W1, but very few candidates managed to attach labels to the different parts of the working. Many candidates managed to score full marks for an answer of 39 large letters. Some candidates just gave embedded answers ($143 \times 0.65 + 39 \times 0.98$ = £119.47) with no other workings. This response gained 4 marks for the mathematical content, but OC0 and W0 for the communication.

(c) Many correct responses were seen. The common incorrect answers were 25.5cm, where candidates just added the length and width, or 157.5cm^2, which was the area.

(d) Many candidates could identify the correct nets. A well answered question.

Q.3 (a) Many candidates thought that Tili was heavier because "kg is heavier than lb". This response gained E0. In order to gain E2, a full explanation was needed including an appropriate calculation referring to a kg $\leftrightarrow$ lb conversion. Some candidates successfully converted 14.5kg into lb, and some converted 22lb into kg. Some candidates gained E1 for a partial explanation, such as stating that 1kg was approximately 2·2lb. Candidates should be encouraged to learn the conversions listed in the specification.

(b) (i) Many candidates read the bar chart correctly and gave the amount that Gelert and Tili ate each day separately and not as a total as the question asked. These candidates gained B1 for sight of 250g and 350g.

(ii) Many candidates knew what was required but lost marks as they incorrectly converted 18kg to g or 600g to kg. Many candidates thought that 18kg = 1800g. Follow through marks were available here for using their total from 3(b)(i) to calculate the number of days and for using their incorrect conversions for 18kg or 600g. Candidates who did not engage in converting units at all and gave $18 \div 600$ as a method gained B0 M1 A0.

Q.4 (a) Many correct answers were seen.

(b) Many candidates were able to write 10,538 in figures. A few candidates made place value errors.

(c) This question was not well answered. Many candidates gained only the first B1 for identifying 2252 steps from the table. Many candidates did not appreciate that the total number of steps taken was the difference between the steps at the end and the beginning of the run. Candidates should be encouraged to check whether their answers are sensible. Many candidates thought that Evan ran hundreds or even thousands of miles in his 36-minute run!

Q.5 Many candidates were able to engage with this question. Both methods were seen, and a correct conclusion was given.

Q.6 (a) This question was generally well answered with many correct responses seen.

(b) This question was generally well answered with many correct responses seen. Of the errors, selecting 36 bottles was the most common.

(c) Quite a number of candidates started to find the number Salmanazars needed but failed to show a full method (e.g. 30 × 2 but then did not ÷ 12 or 30 × 1.5 but then did not ÷ 9) . 2·5 Salmanazars was a common incorrect response. Some candidates left their answer embedded in working, but then selected an incorrect number of Salmanazars, for example with sight of 12 × 5 = 60, but 12 selected as the responses, which is incorrect.

Q.7 Some candidates successfully identified the ages of the 5 pupils correctly as 10, 12, 17, 18 and 18. A common error was to state two youngest was to be 8 and 10, rather than 10 and 12. In further working the need to subtract 2 years was sometimes omitted.

Q.8 (a) (i) The correct response of 18 friends was often seen.

(ii) Although the question asks for a fraction, many candidates just calculated the number of friends. A final answer of 12 friends gained M1A0.

(b) Some correct responses were seen, however, several candidates seemed unsure what was being asked by expressing a ratio in its simplest terms. Some candidates found it difficult as the numbers were odd, and just halved all three numbers.

Q.9 (a) This question was not well answered, with very few correct answers seen. 1: 100 000 was the most common incorrect answer. Again, candidates should be encouraged to learn metric conversions (e.g. km to cm).

(b) Many candidates had difficulty converting 25 minutes to hours. However, many candidates did know to calculate distance divided by time, with 0.88 being a common incorrect answer, from 22 ÷ 25 instead of the correct calculation of 22 ÷ (25/60).

Q.10 (a) A number of different descriptions of no correlation were offered by candidates here. ‘No relationship’, ‘no correlation’, 'none' and ‘no connection’ were accepted. Descriptions such as 'scattered ', 'random', ‘neutral’, ‘no pattern’, ‘varied correlation’ or ‘mixed correlation’ were not accepted for B1.

(b) A number of candidates engaged well with interpreting the scatter diagram. Many correct entries in the table seen. Mistakes were often due to misreading the scale, especially on the Number axis.

Q.11 (a) It was pleasing to see many correct responses for this last question. Candidates engaged well with the concept of two different offers, with many correct answers seen for the cost of at least one of the offers.

(b) Many candidates gained E1 in this question by explaining that even number of pizzas gives 50% off which is better than 35%, or that the offer means that 5 pizzas are bought instead of 10. Some candidates showed calculations, even though the question specifically says not to.

Summary of key points

- Candidates should be encouraged to use a calculator as much as possible on Unit 2 but must remember to show their working where appropriate.
- Candidates need to be confident in calculating percentages with a calculator.
- Candidates should understand and use the hierarchy of operations e.g. BIDMAS when using a calculator.
- Reading scales on graphs and diagrams is an important skill, especially when considering the value of each little square along an axis is involved (question 10).
- Candidates should be encouraged to learn the important conversion facts needed for the GCSE Mathematics – Numeracy examination which are listed in the specification. These include conversion between metric and Imperial units: km - miles; cm, m - inches, feet; kg - lb; litres - pints, gallons. Candidates will be expected to know the following approximate equivalences: 8km $\approx$ 5 miles, 1kg $\approx$ 2·2 lb, 1 litre $\approx$ 1·75 pints.
- Candidate knowledge of working with time is not always sound, such as changing a time given in minutes to hours. Even simple fractions of an hour are not recognised.
- Candidates should check their final answers to see if what they have given is sensible in the context of the question. Some candidates thought that Evan (in question 4(c)) ran thousands, or even millions, of miles in 36 minutes and some thought that Coleen (in question 7) was in her late seventies.

MATHEMATICS – NUMERACY

GCSE (NEW)

November 2019

UNIT 2 INTERMEDIATE TIER

General Comments

The paper differentiated well, with different styles of questions and a graduation in the level of difficulty.

Item level data is available to all centres by centre and for individual candidates with comparison of all candidates sitting these examinations. This report will focus on common errors and misconceptions to aid the interpretation of the data available rather than focus on whether each question was well answered or not.

A few candidates did not attempt to answer multiple-choice questions.

Comments on individual questions/sections

Candidates need to be aware of the following points:

Q.1 Many candidates were able to engage with this question. Both methods were seen.

Q.2 Part (a) was generally well answered with many correct responses seen.

Part (b) was generally well answered with many correct responses seen. Of the errors, selecting 36 bottles was the most common.

In part (c) quite a number of candidates gave the correct response, however 2.5 salmanazars was a common incorrect response. Some candidates left their answer embedded in working, but then selected an incorrect number of salmanazars, for example with sight of $12 \times 5 = 60$, but 12 selected as the responses, which is incorrect.

Q.3 Many candidates identified the ages of the 5 pupils correctly as 10, 12, 17, 18 and 18. A common error was for the two youngest was to give 8 and 10, rather than 10 and 12. In further working the need to subtract 2 years was sometimes omitted.

Q.4 In part (a)(i) the correct response of 18 friends was often seen. However, in (a)(ii) candidates had been asked for a fraction, here again many candidates just calculated the number of friends.

In part (b), many correct responses were seen, however a number of candidates seemed unsure what was being asked by expressing a ratio in its simplest terms.

Q.5 Part (a) was not really well answered, with 1 : 100 000 being the most common incorrect answer.

In part (b) many candidates had difficulty converting 25 minutes to hours. However, many candidates did know to calculate distance divided by time, with 0.88 being a common incorrect answer, from 22 ÷ 25 instead of the correct calculation of 22 ÷ (25/60). A number of candidates converted 25 minutes to hours but then lost accuracy by rounding this value.

Q.6 There were many correct responses in part (a).

Candidates engaged well with part (b), with many correct entries in the table seen. Mistakes were often due to misreading the scale.

Q.7 Candidates engaged well with the concept of two different offers, with many correct answers seen for the cost of at least one of the offers. Many candidates demonstrated good skills in arithmetic, labelling calculations and writing units in responses. However, some candidates did not pay attention to their organisation in answering this question that assessed organisation, communication and writing.

Q.8 Although there were many correct responses in part (a)(ii), Part (a)(i) proved to be more demanding for candidates.

In part (b), candidates find the concept of money exchange with fixed currency available quite difficult. Many candidates progressed as far as calculating £291.50 but did not engage with the notes available and the fact that no more than this amount could be purchased. Many candidates obtained the number of notes needed but then failed to calculate how much was actually paid.

Q.9 Plan view is not well understood.

The cost of the concrete in part (b)(i) was often seen as correct, although errors were seen in converting 66000cm^3 to litres. Candidates do not all know that 1 litre is equivalent to 1000cm^3. Many candidates found it challenging to work out the builder's charge for 20 minutes, not instantly seeing this as 1/3 of an hour. Perhaps this is due to not visualising an analogue clock face. However, many candidates did make reasonable progress through the stages of working out the total cost of making the step.

In part (b)(ii) candidates found calculating the area of the cross-section challenging. Having calculated an area, a number of candidates then made errors in deciding what to calculate using the given fact, that the volume of the step was 66000cm^3. Units were not considered in thinking through the calculation required and deciding whether to multiply or divide their area by 66000cm^3, or divided the 66000cm^3 by their area.

Q.10 In part (a)(i), the correct answer for the group was often selected, but surprisingly a common incorrect selection was 'can't tell'.

In part (a)(ii), we have a mix of candidates, those who know how to calculate an estimate of the mean and those who don't.

Candidates find it difficult to work with circles and cylinders. So responses here were mixed in part (b), those not able to apply any knowledge of the volume of a cylinder and those who can, but without really sound knowledge. Errors with using the diameter rather than radius were seen, even though the radius was given. There were, of course, those candidates who completely filled the mug, ignoring that fact that the level of the tea was 2cm below the top of the mug. A few candidates calculated the volume using the internal height correctly, then subtracted 2cm from this volume, with no regard to the fact they were subtracting a length from a volume.

Q.11 Candidates found part (a) demanding. Errors including calculating the area of the face of a wheel and dividing the distance by this! Also, the mix of units confused some candidates who did not know there are 100cm in 1 metre.

Many candidates find density difficult to understand. However, in part (b) there were some clear and accurate responses, with candidates selecting the appropriate information from the tables and then calculating the mass.

Q.12 Firstly in part (a)(i), candidates needed to work out the height of the gate, then work with consistent units in applying Pythagoras' Theorem. Calculating the height, even though the diagram was given, caused many candidates an issue. Then many candidates did not realise that Pythagoras' Theorem could be applied. This part of the question was not well answered.

Candidates found part (b) challenging, as there was a lot to think about. Firstly candidates needed to use the ratio to calculate the costs of the different planks, then consider how many of each plank was needed. This breakdown of the process required was not seen clearly in many candidates work, although many candidates did start correctly by dividing £8.55 by 5. The actually mathematical skills required to answer this question are not demanding. What candidates found demanding was to think through the order of the processes required to answer the question.

Summary of key points

- Candidates have difficulty in recalling some basic facts, such as 1m = 100cm, 1 km = 1000m and 1 litre = 1000 cm^3.
- Candidate knowledge of working with time is not always sound, such as changing a time given in minutes to hours. Even simple fractions of an hour are not recognised.
- Candidate find any work involving circumference of areas of circles in context demanding. The basic knowledge of area and circumference is required, and this does seem to be a weakness for many candidates.
- Candidates have good skills in finds percentages of quantities with the use of a calculator.

MATHEMATICS – NUMERACY

GCSE (NEW)

November 2019

UNIT 2 HIGHER TIER

General Comments

The majority of candidates appeared to have had sufficient time to attempt all the questions, and the paper differentiated well.

This report will focus on common errors and misconceptions to aid the interpretation of the item level data available to all centres.

Comments on individual questions/sections

Candidates need to be aware of the following points:

Q.1 The majority of candidates used the correct method to change $550 into pounds, and went on to give the fewest number of £10 and £20 notes. Some though forgot to do the last step of working backwards to give the cost of £290 in dollars. Those candidates whose first step of converting into pounds was incorrect generally gained no marks in this question.

Q.2 (a) Many correct plan views were drawn. Some candidates did not attempt the question, not knowing what a plan view was. Incorrect responses mainly involved the drawing of the side elevation, or a rectangle without the 'step line' shown.

(b) (i) Many fully correct calculations were seen. For the cost of the concrete, some candidates either did not see the need to convert the volume of concrete needed into litres or did an incorrect conversion, while some used 39(pence) in their calculation and then converted incorrectly into pounds. For the labour cost, many did not recognise 20 minutes as being a 1/3 of an hour. Rather than calculating 1/3 of 27 for the cost of the 20 minutes, some worked up from the cost for 1 minute, while others incorrectly thought that 20 minutes was 0.3 of an hour.

(ii) Less success was seen on this second part of 2b. A number of candidates did not show an understanding of how to calculate the length of the step. Some did not realise that the given volume of 66000 cm^3 was the key to the correct strategy. Others made errors with the calculation for the cross-sectional area, with some even treating the cross-section as one rectangle.

Q.3 (a) In the first part of 3a, the majority of candidates chose the correct group for the median. The most common incorrect answer was 6 to 10. No obvious incorrect working was seen that led candidates to this answer. One possibility is that 6 to 10 was the middle option of the 5 that candidates had to choose from.

The second part of this question was a standard estimating the mean question. The majority of candidates performed well on this question, but there were some who used incorrect mid-points and a few who did not know the correct method.

(b) The majority of candidates answered this question well. Some used an incorrect formula, while some did not deal with the height of the liquid correctly.

Q.4 (a) The OCW marks were assigned to the first part of this question. Most candidates knew that the circumference of the wheel was equivalent to how far the wheel travels in 1 rotation. Many went on to calculate the correct number of rotations. Errors seen included not using consistent metric units in their calculations and not using the correct formula for the circumference of a circle. The vast majority of candidates were awarded the 'Accuracy of Writing' part of the OCW marks. Some did not label their work sufficiently to gain the 'Organisation and Communication' mark, even though nearly all gave a suitable conclusion to their work.

In the second part of the question, a number of candidates gave incorrect assumptions e.g. he didn't stop, he travelled at a constant speed. Of the assumptions that were accepted, the majority of candidates said 'he skated in a straight line', 'he skated all the way', or 'he went directly to Sab's house'.

(b) The vast majority of candidates answered this question well, gaining full marks. The errors seen were either in the incorrect calculation of the volume of each skateboard, or with not knowing how mass can be calculated given density and volume.

Q.5 (a) Most candidates showed a good understanding of how to calculate the length of the diagonal plank using Pythagoras' theorem. Less success was seen with the assumption, with some thinking they needed to reiterate the information given in the question e.g. the gaps between the planks were exact, or that all the planks were the same width. Another common incorrect assumption was that the diagonal plank was the longest.

(b) Less success was seen in this part involving using ratios. Most candidates were able to calculate the cost of the other 2 planks, but a number of them only added these individual costs rather than add the costs with 5 horizontal planks and 2 end planks included.

Q.6 It was important that candidates realised that the lower bound was what was required in this question. Those who did generally went on to gain full marks, although some used incorrect bounds and others interpreted the decimal answer incorrectly. There were also candidates that thought to arrive at the lower bound they should divide the lower bound of the maximum load by the lower bound of the mass of a bag. No credit was given to this type of working.

Q.7 Many candidates showed good work in this trigonometry question. It was interesting to see that some candidates chose to calculate the lengths of one or both hypotenuse and then use the sine or cosine rules in the obtuse-angled triangle. The use of the cosine rule required more work compared to the standard method involving two applications of the tan ratio on the right-angled triangles.

Q.8 In part (a), it was evident that candidates are starting to perform better at this type of proportionality question. The question was written such that candidates could work backwards from the time of 9.25 minutes to show that a greater volume of water could be pumped in that time, or that fewer engines were needed. Errors came from those that did not correctly realise which variables worked in direct and inverse proportion, and those that worked in the form of a table and altered all 3 variables at once rather than only 2 at a time.

Q.9 The majority of candidates used a multiplier of 1.96 in this question, but many thought that it was the scale factor rather than the area factor. Other errors involved the use of 96 or 0.96 as an area factor. Some credit was given to these provided they worked from these factors back to a scale factor. A number of fully correct solutions were seen however.

Q.10 (a) Many correct responses were seen in part (a) although a number of inefficient methods were observed.

(b) Many fully correct responses were seen. Some candidates lost track of the number of compounding periods needed as they multiplied the result of some of their trials by a power of 1.0102 rather than altering the power of n in the calculation 3000×1.0102^n. Others thought the power of 18 meant that £3600 would be achieved in 18 months rather than in 18 lots of 3 months.

Q.11 (a) This question was answered quite well on the whole. Most candidates used a correct method of calculating the area of the two triangles that formed the proposed fence going from A to C. Incorrect methods included those that thought they needed to use the formula ½ x base x height, and others whose method involved using the cosine rule to compare the lengths of AC from the two triangles.

(b) A significant number of candidates used the correct method of using the cosine rule to calculate the length of AF. Less success was seen when using this answer to calculate the number of fence posts needed. Usually, their answers were 1 short. Incorrect methods included the use of Pythagoras' theorem to calculate AF. Even when incorrect methods were used to calculate AF, merit was given to those who could use their length correctly to arrive at the number of fence posts needed.

Q.12 (a) Many correct answers were seen, but a number of candidates gave answers of 0.024 (from converting 2.4% into a decimal), and 0.2, which is the monthly rate as a percentage.

(b) This was the first time a question involving APR and loans has been asked at Higher Tier. Part (a) gave candidates a little help to access this part. The majority of candidates were able to use the formula correctly to give the monthly payments for a 30-year mortgage. Some went no further, but a significant number understood the correct strategy to use to calculate how much more it would cost to pay back the mortgage over 30 years (even though the monthly payments would be less) compared with 25 years.

This question I hope will be a useful teaching resource to educators both in schools and in colleges, contributing to an increased financial awareness in those leaving the education system.

Summary of key points

- Candidates need to be able to convert any number of minutes into a fraction of an hour.
- Candidates would benefit from using an efficient method for solving problems involving more than one right-angled triangle.
- Further practise is needed by candidates on questions that involve direct and inverse proportionality. Those that use a table method to solve these questions tend to make mistakes, and it is advisable to use the method shown in the mark scheme.
- Candidates need to be able to perform compound interest calculations efficiently, and not calculate amounts of interest that need to be then added on each time.

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