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OCR
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GCSE (9-1)

Examiners' report

MATHEMATICS

J560
For first teaching in 2015

J560/02 November 2019 series

Version 1

Contents

Introduction

Our examiners' reports are produced to offer constructive feedback on candidates' performance in the examinations. They provide useful guidance for future candidates. The reports will include a general commentary on candidates' performance, identify technical aspects examined in the questions and highlight good performance and where performance could be improved. The reports will also explain aspects which caused difficulty and why the difficulties arose, whether through a lack of knowledge, poor examination technique, or any other identifiable and explainable reason.

Where overall performance on a question/question part was considered good, with no particular areas to highlight, these questions have not been included in the report. A full copy of the question paper can be downloaded from OCR.

Paper 2 series overview

This non-calculator paper is the second of the three papers taken by Foundation candidates for the Mathematics GCSE (9-1) specification.

Most candidates found the first seven questions straight forward and many found the paper accessible for the first sixteen questions, after that the paper was quite challenging for many. Few attained a score above 65. The number of instances where no response was offered was very low except on Q13aiii (accuracy of the graph of $y = x^2$), 14b (trigonometric ratio), 16c (error in a solution involving substitution), 20(see below), 21b(ratio and angle properties), and particularly Q23 (equation in the form $y = mx + c$) that may have indicated that some ran out of time.

Five question parts (13aiii, 13b, 16a, b, and c) required candidates to identify & describe errors in working and a further question (20) asked for a description of an experimental method. Candidates demonstrated difficulty in expressing themselves clearly when written answers were required and many found these too tough a challenge.

On the more arithmetic solutions many made efforts to show their working clearly and presentation in the higher tariff questions such as Q8b, 10, and particularly Q15 continues to improve. There are still candidates whose methods are not always written clearly and some handwriting makes deciphering some words and figures difficult. Less arithmetical errors were made than was evident in previous series, however there were errors in methods of simplifying and many candidates still find operations with fractions and decimals difficult. Understanding of division and how to communicate it is still confusing for quite a number, e.g. in Q10, 5 ÷ 15 stated but 15 ÷ 5 written in the bus stop (or vice versa) was commonly seen.

In both Q9 (bearings) and Q17 (loci) it was evident that a few candidates appeared to not make use of the required geometrical instruments and this very much hampered their solutions.

Question 1 (a)

1 Work out.

(a) $89 + 14$

(a) ..... **[1]**

Usually well answered, most common methods seen were column addition or partitioning. The most common error was 93, this usually arose from forgetting to 'carry' the one when attempting column addition.

Question 1 (b)

(b) 17×21

(b) ..... **[2]**

Many used the grid method and often successfully but some made arithmetic or place value errors such as 10 x 20 = 2000 in their multiplications. Candidates should be reminded to show all their working, including the addition of the four values, so that a complete method can be credited when errors occur. When the grid method wasn't used a common incorrect response was to do 10 x 20 + 1 x 7.

Question 2 (a)

2 The table shows some temperatures, in °C.

Monday	Tuesday	Wednesday	Thursday	Friday
-5	-1	5	6	-3

(a) Find the difference between the temperatures on Thursday and Friday.

(a) ..... °C **[1]**

Question 2 (b)

(b) On Saturday the temperature was 7 °C higher than on Friday.

Find the temperature on Saturday.

(b) ..... °C **[1]**

Both parts to Q2 were answered well. Very little accompanying working was shown and this led to errors for some such as in (a) 3 from doing 6 − 3 instead of 6 − −3 and 8 from not counting zero as a value when counting on from −3 to 6. In (b) the main error came from unsuccessful attempts to add/subtract 7 and -3 leading to answers of -10 or 10. As in (a) some forgot zero when adding on which led to an answer of 5, others counted −3 rather than on from −3 which led to 3 as the answer.

Question 3 (a)

3 Complete each statement by writing the missing value in the box.

(a) $\frac{2}{5} = \frac{4}{\square}$ **[1]**

Question 3 (b)

(b) $2\frac{1}{3} = \frac{\square}{3}$ **[1]**

Question 3 (c)

(c) $7 \times 7 \times 7 \times 7 \times 7 = 7^{\square}$ **[1]**

Q3 was well understood and correctly answered in general. Common errors were in (a) giving a denominator of 5 or adding 2 to give a denominator of 7. In (b) a numerator of 2 from 2 x 1 or a numerator of 3 from 2 + 1 and (c) was rarely incorrect but miscounting led to 6 seen.

Question 4 (a)

4 Work out.

(a) $\frac{5}{6}$ of 18 kg

(a) ..... kg **[2]**

Some attempted to convert the $^5/_6$ to a percentage but struggled due to the nature of the fraction. Others thought 5 ÷ 6 was 1.2. Better attempts showed the need to divide 18 by 6; it wasn't uncommon to see 2 as the answer to this and therefore 10 as the final answer; others correctly found the 3 but added 5 instead of multiplying by it.

Question 4 (b)

(b) £5 – £1.49

(b) £ ..... **[1]**

A lot of good work seen. Most errors arose from using column subtraction where some found subtracting from 0 and 'borrowing' difficult. Subtraction by partitioning was generally successful. £4.51 and £2.61 were the most commonly seen incorrect responses and occasionally 3.49 from working out 5 – 1.50 but then subtracting rather than adding the 1p.

Question 4 (c)

(c) $0.15 \div 5$

(c) ..... **[1]**

Rare to see an answer other than figs 3 but placing the decimal point correctly was difficult for many with 0.3 the most commonly seen answer.

Question 5 (a)

5 **(a)** Write 0.3 as a fraction.

(a) ..... **[1]**

Question 5 (b)

(b) Write $\frac{1}{4}$ as a decimal.

(b) ..... **[1]**

Both parts were generally well answered. In (a) both correct answers $^{3}/_{10}$ and $^{30}/_{100}$ were seen, common errors were ⅓ and $^{3}/_{100}$. In (b) 0.4 was a common error.

Question 6

6 Write the following in order of size, smallest first.

5.9 0.61 5.977 5.099 5.98

.... **[2]**

smallest

Most candidates gained 1 or 2 marks for this question. Some used the technique of adding trailing zeros to make clear comparisons, however if they added just one extra zero onto the end of numbers with one or two decimal places 5.9 often became ordered incorrectly so a mark was lost. Others placed 5.9 at the end of an otherwise correct list. Some put 0.61 in last place by ignoring the place value of the first significant figure. The most common non-scoring error was placing the 5.xxx figs by considering the digits after the decimal point as 9, 98, 99 and 977.

Question 7 (a)

7 Work out the following, giving each answer as a fraction.

(a) $1\frac{3}{4}+\frac{1}{2}$

(a) ..... **[1]**

Many left their correct answer as $^{18}/_{8}$, however $^{8}/_{6}$ was far more commonly seen – this came from correctly converting from mixed to improper fractions but then numerators and denominator were added separately, $\frac{7}{4}+\frac{1}{2}=\frac{7+1}{4+2}$. Likewise, $1^{4}/_{6}$ was very common from a similar error but without converting the improper fraction. Better attempts showed use of a common denominator but often not knowing how to deal with the whole number resulted in $1^{5}/_{4}$. Some who converted to decimals first were relatively successful.

Question 7 (b)

(b) $\frac{3}{8} \div 2$

(b) ..... **[1]**

Most did not know how to approach this and the answer $\frac{1.5}{4}$ was extremely common. Some attempted to divide 3 by 8 and then by 2 but generally this didn't progress well.

Question 7 (c)

(c) $\frac{1}{3} \times \frac{1}{2}$

(c) ..... **[1]**

Better attempted than (b) however still a lot of confusion apparent. Many crossed multiplied leading to $^2/_3$; many found a common denominator and added leading to $^5/_6$; $^1/_5$ was also common from adding just the denominators.

Question 8 (a) (i)

8 Hannah saves an amount of money each week.
Here are the amounts, in pounds, that she saved in the first 5 weeks of 2019.

13 58 11 22 11

(a) Find

(i) the median of the five amounts,

(a)(i) £ ..... **[2]**

Question 8 (a) (ii)

(ii) the range of the five amounts.

(ii) £ ..... **[2]**

Both parts of (a) were very well answered with almost all candidates gaining at least M1 in (i) for ordering the data. A few candidates found the mean or gave an answer of 11 from not ordering. The vast majority identified 58 and 11 in (ii) and most got 47. However, after stating 58 – 11, a few subtracted the 8 and the 1 but then added 50 and 10 to give an answer of 67.

Question 8 (b)

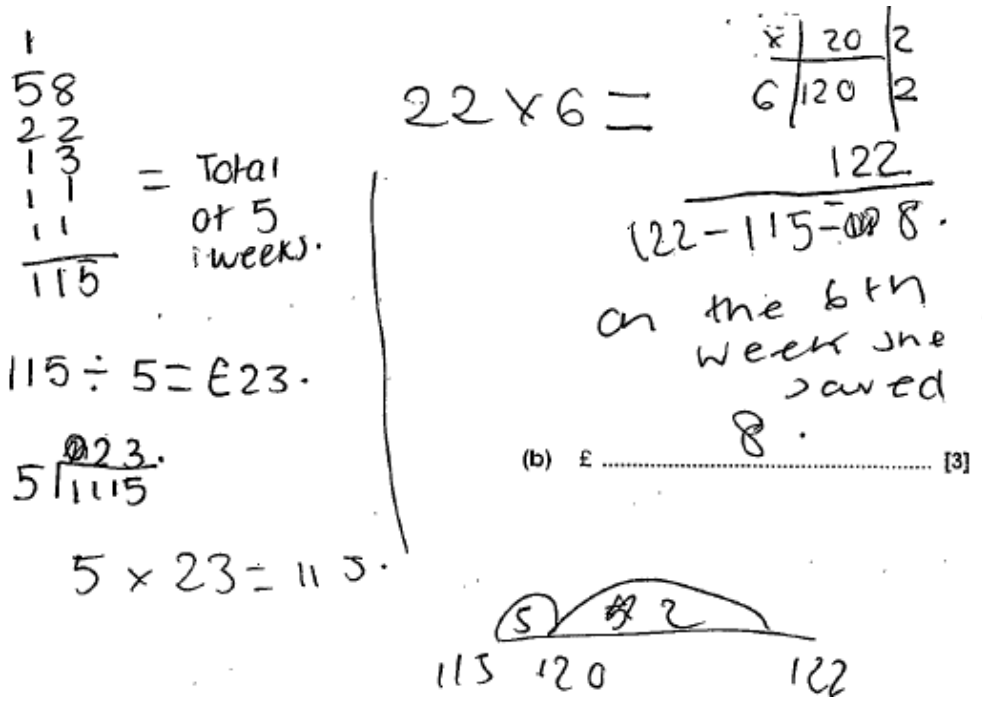
(b) In the 6th week, she also saved some money.
The mean amount that Hannah saved each week over the 6 weeks was £22.

How much did she save in the 6th week?

(b) £ ..... **[3]**

Many candidates correctly added the 5 values earning M1. Quite a few then did 115 ÷ 5 or attempted to add values on to reach a mean of £22 but without much success. Few continued on to do 22 x 6 and the full method of 6 x 22 -115 was not often seen.

Exemplar 1

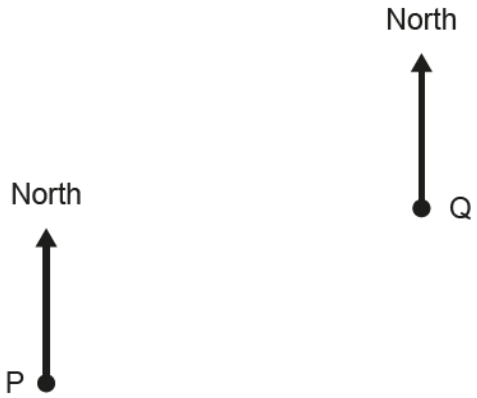


An error has been made in the grid method for 22 x 6 as 6 x 2 is calculated as 2 not 12. However, the full method of 6 x 22 – (13 + 58 + 22 + 11 + 11) is seen and so M2 is awarded.

Question 9 (a)

9 The scale drawing shows the positions of two boats, P and Q.

Scale: 1 cm represents 4 km



(a) Find the actual distance between boat P and boat Q.

(a) ..... km **[2]**

Most measured the distance correctly but many made errors multiplying their measurement by 4. Often the whole number of centimetres was correctly multiplied by 4 but then the decimal part was just added on, e.g. 5.5 x 4 = 20.5.

Question 9 (b)

(b) Measure the bearing of boat Q from boat P.

(b) .....° **[1]**

There was a significant number that did not attempt this part and measuring the angle was rarely successful. A number of answers around 115^0 were seen suggesting the protractor was misread. Of those who managed to identify and measure the correct angle only very few wrote it as a three-figure bearing.

Question 9 (c)

(c) A lighthouse is

- 18 km from boat P
- on a bearing of 200° from boat Q.

On the scale drawing, mark a possible position of the lighthouse with a cross. **[2]**

Many earned M1 for a correct distance from P however very few gained full marks due to the difficulty candidates find in measuring a bearing.

Question 10

10 A man running at a constant speed of 5 metres per second takes 66 seconds to complete a particular distance.
A horse completes the same distance running at a constant speed of 15 metres per second.

Find the difference, in seconds, in the times taken by the man and by the horse to run this distance.

..... seconds **[3]**

Those that thought logically about this speed/distance/time situation by considering the inverse proportionality of the problem i.e. the horse is travelling 3 times faster, therefore will achieve the distance 3 times quicker, were usually successful. Others correctly found the distance the man travelled by doing 5 x 66 and a few went on to find the horse's time of 22 seconds, but usually this was then given as the final answer. Often, there was a lot of arithmetic seen and many mixed up when they should be doing division & when multiplication, so 66 x 3 and $^{66}/_{5}$ were seen frequently. Other less successful answers either involved the difference between 66 x 5 and 66 x 15 (990 – 330 = 660) or they showed '3 times faster' so did 66 x 3 = 198 and 198 – 66 = 132.

Question 11 (a)

11 **(a)** Alice buys a picture for £180 and later sells it for £216.

Find the percentage profit that she made.

(a) ..... % **[3]**

All percentage questions on the paper seemed to cause some problems. Here most achieved the M1 for £36 from 216 - 180 but then were not clear how to reach a percentage. Some divided this by 100 or went on to a method which would find 36% of 180. $^{Profit}/_{Cost}$ x100 was rarely seen, it was given as $^{36}/_{100}$ or $^{36}/_{216}$. Those who made the correct step of stating $^{36}/_{180}$ struggled to turn it into a percentage by using cancelling. Those who reached 20% mostly did so by realising 10% of 180 is 18 and built up to the 36.

Question 11 (b)

(b) Rashid wants to increase £345 by 17% in one step by using a decimal multiplier.

Write the decimal multiplier to complete Rashid's calculation.

345 × ..... **[1]**

This was rarely correct. Most gave 0.17 or sometimes 1.7 but many did not attempt this part.

Question 12 (a)

12 In an exam, Adam scored the following marks.

Paper 1	17 out of 20
Paper 2	19 out of 25

(a) Show that he scored a higher percentage in Paper 1 than Paper 2. **[2]**

Many knew to express their answer as a fraction with the numbers given as a first step but did not recognise that multipliers of 5 and 4 could be used to change them to fractions over 100. Some converted successfully, however most struggled with this. Where attempts at percentages were seen most dealt with $^{17}/_{20}$ better than $^{19}/_{25}$. $^{19}/_{25}$ as 75% was a common wrong answer due to rounding errors. Many attempted a build-up method with 20 being easier to split up into parts, e.g. 50% = 10 marks, 25% = 5 marks and 5% = 1 mark and so building up to 17. Those who did the same with 25 got 50% = 12.5, 25% = 6.25 and 5% = 1.25 but were often inconsistent with their decimal places. Some approached the problem by considering the lost marks as a measure of how well a student had done. Stating Paper 1 was better because only 3 marks were lost and paper 2 worse as 6 were lost, however no one using this method compared the percentage lost.

Question 12 (b)

(b) The two marks are added together.

Work out Adam's overall percentage for the two papers.

(b) ..... % **[3]**

Few candidates gained full marks, many stated $^{36}/_{45}$ but couldn't convert this to a percentage. In an attempt to change $^{36}/_{45}$ to $^{x}/_{100}$ they were unable to find a number to multiply 45 by to get 100. A few successfully counted up in 4.5s to get the 80% but more found 10%, 20% etc. to arrive at 80%. Those who attempted the "lost mark" method in (a) mostly subtracted 36 from 45 and worked with the 9 lost, giving either 100 – 9 = 91% or 45 ÷ 9 = 5 leading to an answer of 95%. A further common error was to combine the two percentages from (a) and work out $^{(85 + 76)}/_{200}$.

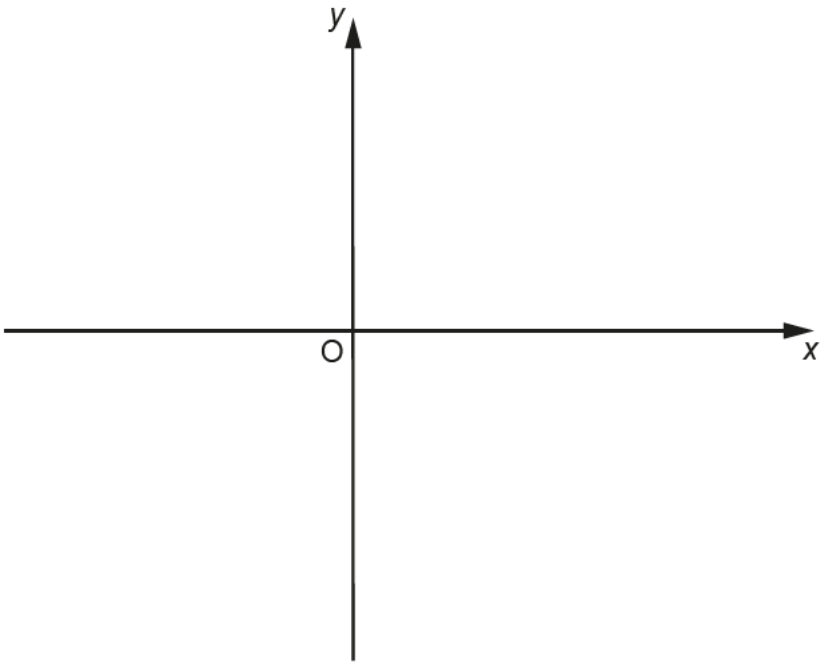
Question 13 (a) (i)

13 (a) (i) Sketch the graph of $y = 2$.

[2]

Question 13 (a) (ii)

(ii) Sketch the graph of $y = x + 1$.



[2]

Attempts to sketch the graphs in both parts were many and varied, including vertical lines in (i), lines with negative gradient in (ii) and a few quadratics seen. In (i) only a few completely correct answers, of those who drew horizontal lines many did not identify the intercept as 2 but often the line was labelled $y = 2$. A common error was to draw $x = 2$ or a straight line with a positive gradient. Another incorrect answer was just putting a cross at (0,2). In (ii) again many straight lines were seen, some with a positive gradient but also ones with a negative gradient. As with (i) the intercept was rarely identified. Occasionally a candidate plotted points for $y = x+1$ on numbered axes but did not join them with a line.

Question 13 (a) (iii)

(iii) Ceri says that the graphs of $y = 2$ and $y = x + 1$ cross at the point (2, 3).

Explain the error in her answer.

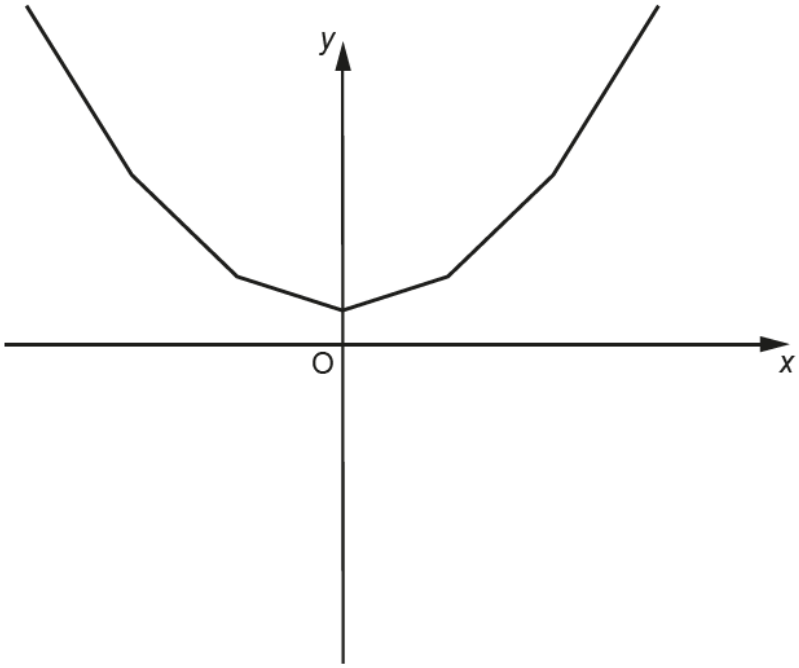
.....

..... **[1]**

This part was often not attempted and a correct answer was rarely seen. Most could not identify the error and many did not differentiate between whether they were describing a line, a point, a meeting point, the x or y axes or x or y co-ordinates. Answers were not specific enough – e.g. "because its +1 not +3" – does not make clear what "it" refers to. Others referred to one line or the other, but not where they meet – e.g. $y = 2$ will cross at (0,2) on the y-axis.

Question 13 (b)

(b) Oliver has sketched the graph of $y = x^2$ below.



Make two comments about the accuracy of his sketch.

1 .....

.....

2 .....

.....

[2]

Providing comments about the graph proved challenging for many candidates. It was clear that many answered this without considering what the correct graph should look like. The most common scoring response was that it should be a 'smooth curve'. Few correctly stated it was symmetrical and rarely was it identified that the graph should go through the origin. Correct terminology wasn't used often and examples of non-scoring comments were:

* The graph was described as **not**: proportionate, a single line, on a line, the same lines, correlated, having any points on the graph.

* The graph was described **as**: accurate, going off the graph, too curvy, only goes through y, equal on both sides, equal to $y = x^2$, they meet in the middle, positive as it is U shape, had no correlation.

Question 14 (a) (i)

14 (a) Write each of the following ratios in their simplest form.

(i) 8 : 10

(a)(i) ..... : ..... **[1]**

Very well done. Some went a step too far after 4 : 5 and gave a final answer of 2 : 2.5.

Question 14 (a) (ii)

(ii) 300 ml : 2.1 litres

(ii) ..... : ..... **[3]**

Many who successfully converted to ml did not fully simplify, stopping at 100 : 700 or 75 : 525. Very few took the other approach of converting 300ml to 0.3l, but those that did often stopped at 0.3 : 2.1. Others made errors in converting 2.1 litres to ml, 210ml being the most common. These candidates often scored a method mark for a step towards simplification by stating 30 : 21. When no conversion was attempted, it was common to see both sides divided by 2 and often an error was made with 2.1 resulting in an answer of 150 : 1.1 or 150 : 1.

Question 14 (b)

(b) The ratio $\sin 30° : \tan 45°$ can be written in the form $1 : n$.

Find the value of n.

(b) $n =$ ..... **[3]**

Virtually none were able to show the value of either function, very rarely a candidate attempted to list a table of sin/cos/tan 30/45/60 and a correct answer was seen on a very small number of occasions. Most either did not attempt this part or just used the 30 and 45 completely ignoring the sin and tan.

Question 15

15 Angie is planning a presentation evening.
She writes down her costs and income.

Costs	Income
10 staff each working 6 hours at £8 per hour Food: 60 meals at £8.95 each Prizes: 12 prizes at £19.99 each	60 guests each paying £5 Sponsorship £1000

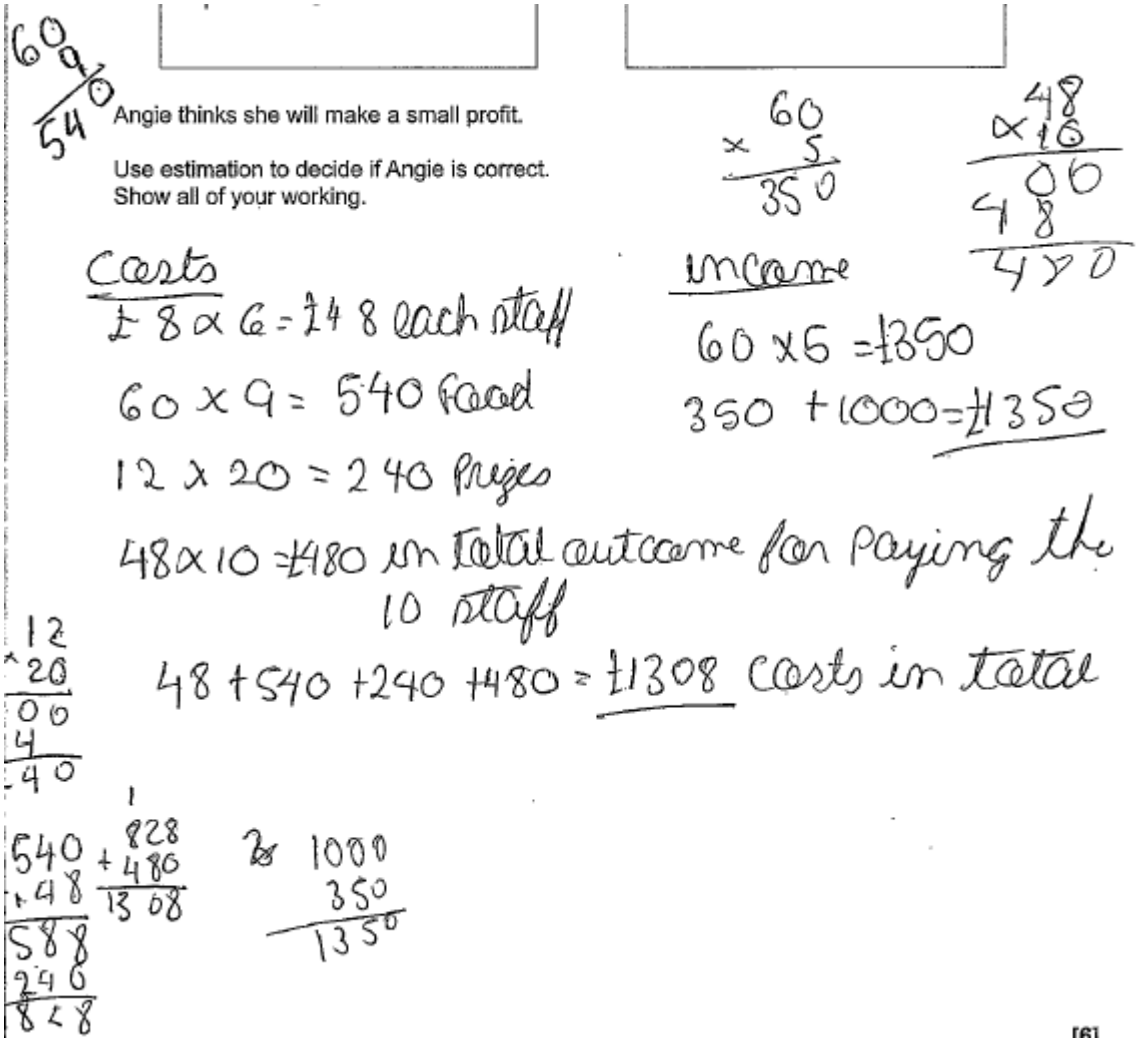
Angie thinks she will make a small profit.

Use estimation to decide if Angie is correct.
Show all of your working.

..... **[6]**

Generally, working was well set out and clear to follow. Most earned the method mark for staff costs of 6 x 8 x 10 = 480 and income of 60 x 5 + 1000 = 1300. Those who understood estimation went on to score well but a substantial number of candidates ignored, to some extent, the instruction to estimate and there were many attempts to accurately use 8.95 and 19.99. Some began with 60 x 9 and 20 x 12 but then subtracted small amounts to compensate for the extra 5p and 1p. Others performed long multiplications to get to exact costs. Not using any estimation meant they were unable to achieve more than 2 marks. Candidates who realised that they were required to estimate scored well with the odd arithmetical error in adding up the costs. Some rounded £8.95 to 10 and so lost the A mark.

Exemplar 2



The costs have been listed clearly and correct estimations of £9 for £8.95 and £20 for £19.99 have been used. Therefore:

M1 is awarded for 10 x 6 x 8

M1 is awarded for use of rounding 8.95 to 9 (or 19.99 to 20)

M1 is awarded for 60 x 9 (or 12 x 20).

Although the candidate has calculated 10 x 6 x 8 correctly as £480, when transferring this to their addition of costs they have used 48 rather than 480 and so the A mark is lost.

M1 is awarded for 1000 + 60 x 5, although an error has been made in calculating 60 x 5 as 350, the correct method is seen.

There is no decision as to whether Angie is correct so the B mark is not earned.

Question 16 (a)

16 Martina has answered some questions on algebra.
In each question, she has made an error.

Describe her error and give the correct answer to each problem.

(a) Question 1 Simplify. $2a \times a \times a$

Martina's answer $4a$

Martina's error is .....

.....

Correct answer = ... **[2]**

Question 16 (b)

(b) Question 2 Simplify. $\frac{x^{10}}{x^2}$

Martina's answer x^5

Martina's error is .....

.....

Correct answer = ... **[2]**

Question 16 (c)

(c) Question 3 $s = ut + \frac{1}{2}at^2$

Find s when $u = 0$, $t = 5$ and $a = 6$.

Martina's solution $s = 0 \times 5 + \frac{1}{2} \times 6 \times 5^2$

$s = 0 + 15^2$

$s = 225$

Martina's error is .....

.....

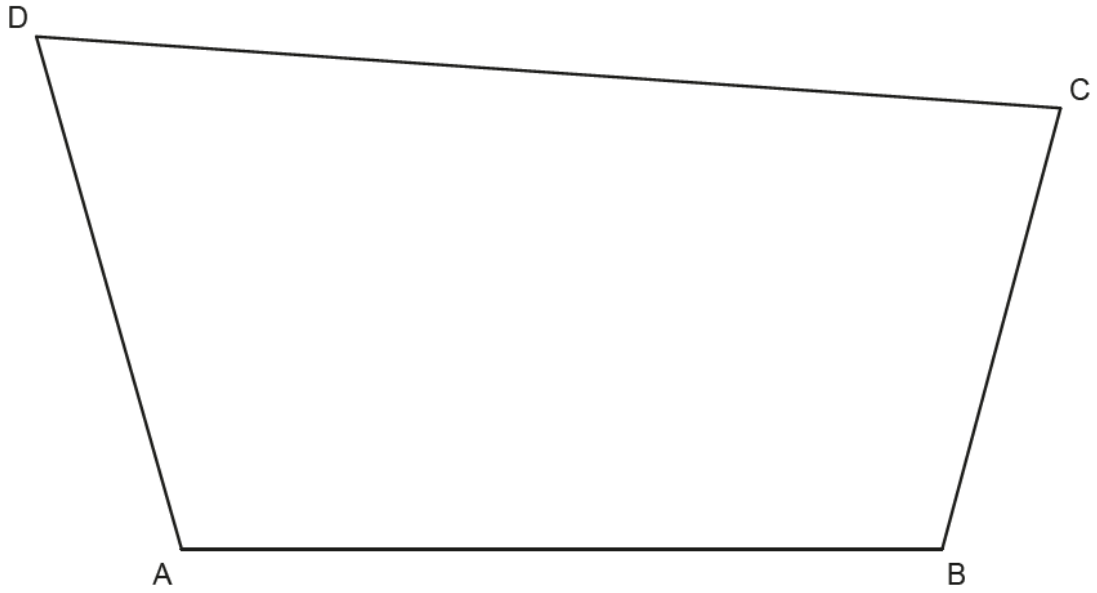
Correct answer = ... **[2]**

In all three parts many found it difficult to describe the errors clearly, others stated what Martina should have done rather than describing her error. In (a) the correct answer was often given, errors included a^4, $2a^2$ and $2a + a^2$. Many who scored in (a) also did well in (b). While the correct answer was often seen, others thought it should be x^{20}, x^5/x^1, $5x$ or just 5. Only a minority obtained the correct answer in (c) and fewer gave a scoring description of the error. Most who attempted an explanation thought it had something to do with 5^2 or 15^2 or not using the ½. A number stated BIDMAS but did not elaborate on this enough to score. This part was often not attempted.

Question 17

17 The diagram shows the scale drawing of a garden ABCD.

Scale: 1 cm represents 5 m



A tree is to be planted in the garden so that it is

- at least 10 m from AB

and

- closer to CD than CB

and

- at least 15 m from D.

Using a ruler and compasses only, construct and shade the region in which the tree can be planted.

[6]

Candidates found it difficult to attain more than 2 or 3 marks as the perpendicular bisector was rarely attempted. The closest some got was to join corner C down to corner A as can be seen in **Exemplar 3**. The most common mark given was for the arc centre D, usually within the tolerance to earn 2 method marks as was awarded in the **exemplar**. Fewer realised they needed a line parallel to AB (this mark was awarded in the **exemplar**), often this construction was given as arcs, radius 2cm at A and B. A few candidates appeared to lack geometrical instruments which hampered their solutions. Some drew a few circles or arcs within ABCD and many had no constructions with either a scribbled region, a rectangle or a tree drawn somewhere in the centre. There were a number who did not attempt this question.

Exemplar 3

Angie thinks she will make a small profit.

Use estimation to decide if Angie is correct.
Show all of your working.

Costs

£8 × 6 = £48 each staff

60 × 9 = 540 food

12 × 20 = 240 Prizes

48 × 10 = £480 in total outcome for paying the 10 staff

48 + 540 + 240 + 480 = £1308 costs in total

Income

60 × 5 = £350

350 + 1000 = £1350

[6]

Question 18

18 Solve by factorising.

$$x^2 + 9x + 20 = 0$$

$x =$ ..... or $x =$ ..... **[3]**

Very few factorised at all. Those that demonstrated some understanding attempted to find two numbers with a product of 20 and a sum of 9, of these many were successful in finding the factor pairs of 4 and 5 but then didn't present the quadratic in factorised form. In the few cases where $(x + 4)(x + 5)$ was stated, rarely did the candidate continue to solve $x + 4 = 0$ or $x + 5 = 0$. A few attempted a grid method but transferal to factors using brackets was rarely seen. Others started their grid with x and +9 horizontally and x vertically and got no further. Many started off trying to rearrange the equation to get, e.g. the x^2 on one side with the x's on the other or they factorised the first 2 terms. Some thought they could simplify the quadratic by merging the x^2 and $9x$ terms to give $9x^2$, this often led to one of the solutions being $x = 1$.

Question 19

19 On a plane, $\frac{2}{5}$ of the passengers were British.

30% of the British passengers were men.
There were 36 British men on the plane.

Find the total number of passengers on the plane.

..... **[5]**

Most found this question too difficult. Those who made an attempt often found it a challenge to structure their answer. Rarely a candidate began with stating '$^2/_5$ of 30%' but mostly did not continue to evaluate this. It was most commonly attempted as a two-stage problem, however for some, the order in which the information was given caused confusion about how to deal with the $^2/_5$ and the 30%. Those who earned marks made attempts to build up from 36 British men towards 100% of British passengers. Some correctly getting to 120 often thought they now had the total number of all passengers. Those successfully stating 10% of 36 as 12 or identifying 70% as 84 often didn't add the number of British men and British women together. This can be seen in **Exemplar 4** where 84 has been correctly found but is then identified as 100% and so given as the total number of British passengers. Others used the 30% to get to 90% = 108 but, again, did not complete to find the total number of British passengers. A common error was to give 10% as 3.6 rather than 12. Some gained the final M1 A1FT by correctly calculating $^5/_2$ x their total British passengers. This is seen in the **exemplar** where their total British passenger value of 84 is multiplied by 5 and divided by 2 to arrive at a correct follow through value of 210. However, others made the error of finding $^2/_5$ of their total British passenger value.

Exemplar 4

Angie thinks she will make a small profit.

Use estimation to decide if Angie is correct.
Show all of your working.

Costs

£8 × 6 = £48 each staff

60 × 9 = 540 food

12 × 20 = 240 Prizes

48 × 10 = £480 in total outcome for paying the 10 staff

48 + 540 + 240 + 480 = £1308 costs in total

Income

60 × 5 = £350

350 + 1000 = £1350

[6]

Question 20

20 A bag contains 100 pencils that are either red or green.

Describe a method you could use to estimate the number of red pencils in the bag without looking into the bag or having more than one of the pencils out of the bag at any one time.

.....

.....

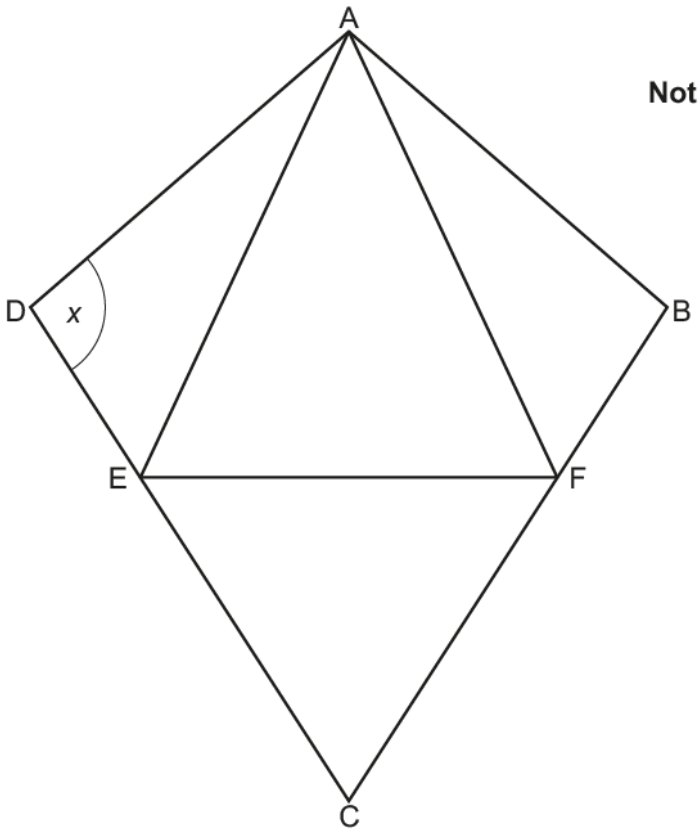
.....

..... **[4]**

This was a new style of question for Foundation candidates and was not attempted by over 25% of them. The most popular answer was to state, e.g. 'there's 100 pencils so 50/50 chance' or they assumed that ½ were red & ½ were green. Others thought it would be sufficient to just say: use probability, find a probability, use a probability tree, find a ratio, separate the pencils into red & green, estimate. Very few understood that they had to explain how to go about creating an experiment. Scoring responses made a good start 'pick a pencil out of the bag…' however very few of these declared 'replacement' so the first mark was rarely awarded. The second mark was most commonly awarded, although many ignored the question statement 'without looking into the bag or having more than one pencil out of the bag at any one time' and so wanted to take out a bunch of pencils in one go rather than one pencil at a time. The final two marks were rare and if awarded were usually for recognising e.g. no. of reds x10 after 10 trials stated.

Question 21 (a)

21 The diagram shows a kite, ABCD.
AFE and CEF are equilateral triangles.



(a) Write down a mathematical name for quadrilateral AFCE.

(a) ..... **[1]**

The majority of correct answers recognised the shape as either a rhombus or kite, although both parallelogram and trapezium were also seen. The most common incorrect answer was diamond. A few thought it was a net of a three-dimensional shape, e.g. a triangular pyramid.

Question 21 (b)

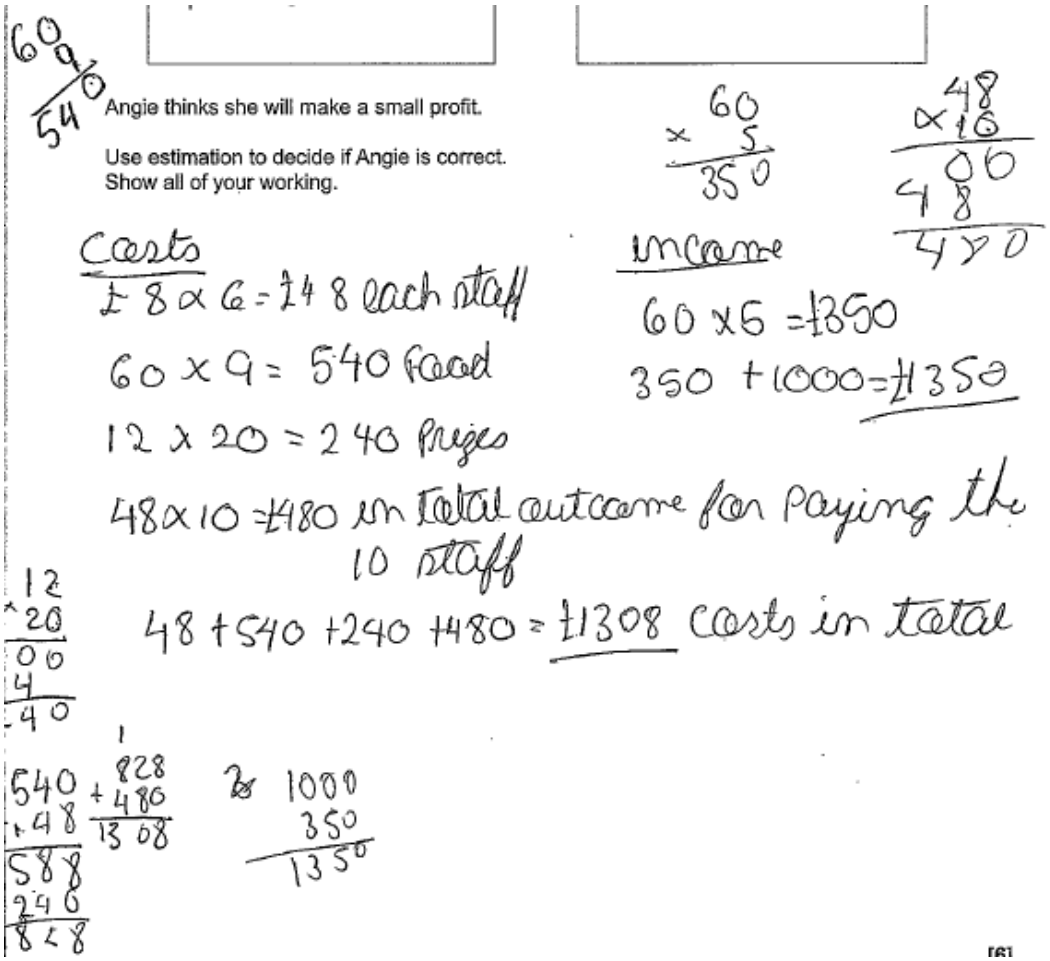
(b) The ratio of angle DAE : angle EAF = 1 : 4.

Work out angle *x*.
Write on the diagram the values of any other angles you use in your working.

(b) *x* = ... ° **[4]**

Almost a third of candidates made no attempt at this part and most found it problematic to use the concept of ratio in a question about angles, many ignored the ratio given. Those gaining marks added information to the diagram to help them progress and most frequently a mark was earned for a 60° angle placed correctly on the diagram. Further angles were rarely transferred from the workspace to the diagram and most did not clearly specify which angle they were working on. A common misconception was to assume the total of angle DAE and EAF to be 180 degrees then split this into 5 parts of 36 to get DAE as 36°. Another common error was to assume that *x* was 90°. Occasionally *x* was measured with a protractor.

Exemplar 5



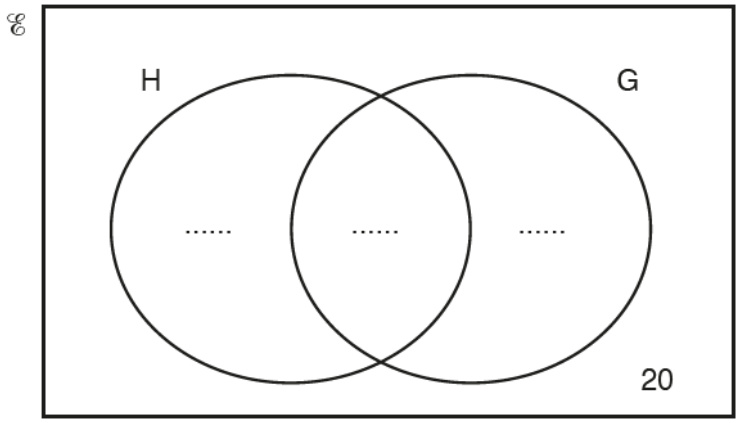
The candidate has identified angles of the equilateral triangle EAF to be 60° and so a method mark is scored. They have used the ratio to set up the division 60 ÷ 4 = 15. However, they have not identified 15 as angle DAE either in the workspace or on the diagram so this implies just M1 rather than M2. Instead they have taken this 15 to be the value of *x* which is incorrect so no further marks are earned.

Question 22 (a)

22 In a group of 100 students

- 59 study History (H)
- 62 study Geography (G)
- 20 do not study either subject.

(a) Complete the Venn diagram.



[3]

Some candidates scattered many calculations around the Venn diagram and until values were placed onto the diagram it was impossible to identify valid working. It was rare to see all three values correctly placed. A few more correctly placed 41 in the intersection but often the other two values were either reversed, were 59 and 62, or were a result of incorrect subtractions. It was more common that 41 was not seen but either H or G with a correct total was evident, e.g. 21 in the intersection and 38 in the outer region of H. The other way of scoring B1 for a total sum of 80 in the three regions was awarded quite a few times. The most common error was to put 59 in outer H and 62 in outer G with assorted values, 0 or no entry in the intersection.

Question 22 (b)

(b) One of the 100 students is selected at random.

Find the probability that this student studies exactly one of the two subjects.

(b) ..... **[2]**

Those with correct diagrams in (a) usually gave the correct answer here. The follow through marks were occasionally awarded but since most had 59 and 62 on their diagrams then *their*18 + *their*21 was >100 and so a mark was not available. Others who had *their*18 + *their*21 >100 either subtracted the two values or put the sum of their values on the denominator of their probability. The special case mark for 80/100 was awarded occasionally. A common error was to give the fraction of $^{\text{their intersection value}}/_{100}$.

Question 23

23 A straight line with gradient 4 passes through the point (1, 5).

Find the equation of the line in the form $y = mx + c$.

..... **[3]**

Rarely were full marks gained and almost half of the cohort did not attempt this question at all. For those that attempted something, many used the gradient correctly and used $4x$ in their equation but often did not substitute (1,5) correctly so a common incorrect answer was $y = 4x + 5$. Others went on to spoil the method as they did not substitute for the y to find c, but did $y = 4 \times 1 + 5$, leading to $y = 9$ as a final answer. Others misremembered which of m and c was the gradient and which the intercept.

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