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OCR
Oxford Cambridge and RSA

GCSE (9-1)

Examiners' report

MATHEMATICS

J560
For first teaching in 2015

J560/03 Summer 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 3 series overview

This is the third of three papers taken by Foundation tier candidates for the GCSE (9-1) Mathematics specification.

Calculators appear to have been used successfully by many candidates although some marks were lost due to arithmetic errors when attempting simple calculations which could have been done using a calculator. It was also pleasing to see many candidates making use of a ruler and compasses and a protractor.

Working was shown in the majority of cases, allowing many candidates to gain method marks, even if they did not achieve an accurate answer. Examiners did note that, on some occasions, correct methods were used only to be disregarded and a fresh start made using an incorrect method. The method that leads to the answer is always marked, and if no answer is presented then the poorest method is marked. Candidates should delete any redundant working.

Working in shorter questions was often clear, although the multi-step questions, such as Q13 and Q14, regularly had working which was difficult to follow and was spread across the page.

Presentation has generally been good this year, and most handwriting was reasonably legible. However, the clarity of numbers is still an issue. For example, when candidates had written powers it was sometimes hard to tell whether the index was raised, and some numbers were poorly formed such as 4 and 9.

Candidates found the explanation questions much harder than numerical questions, for example Q17(b) and Q19(a). These were often answered incorrectly as although candidates showed some understanding of the situation and context they were unable to express themselves clearly.

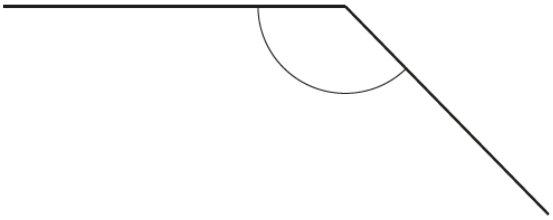
Generally, candidates were reasonably successful at numerical questions and data handling. They were less successful with algebraic and geometric questions and any 'Show that' questions where full and clear method was expected with no missing steps. Many candidates believe that there are 100 ml in 1 litre.

Topics where candidates generally appeared poorly prepared were: similar shapes, geometric constructions, solving quadratic equations by factorising, $y = mx + c$ and applying this to problems and using algebra to generalise situations.

Question 1 (a)

1 **(a)** Write down the mathematical name of this type of angle.
Choose from the list in the box.

acute	reflex	obtuse	right angle

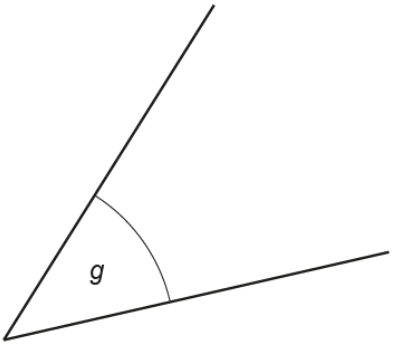


(a) ..... **[1]**

Obtuse was identified by the majority of candidates. Right angle was rarely chosen but there was a roughly equal split between 'acute' and 'reflex'.

Question 1 (b)

(b) Measure angle *g*.



(b) .....° **[1]**

Most candidates correctly measured the angle. 135° was a popular wrong answer with 55° also seen. Some candidates clearly estimated and a few said 'acute'.

Question 2 (a)

2 **(a)** Write 6 : 14 as a ratio in its simplest form.

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

This was very well done with the majority of candidates getting the mark. Lower ability candidates simply repeated the ratio or gave an incorrect ratio.

Question 2 (b)

(b) The ratio 20 : 50 can be written in the form 1 : n.

Find the value of n.

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

The majority of candidates achieved 0 marks or 2 marks, and the number of candidates getting each of these marks was roughly equal. A popular incorrect answer was 5, often without working. Some candidates did show working where the occasional error was made in cancelling. Many who did cancel divided by 2, then by 5 then by 2.

Question 3

3 Insert brackets to make each of these calculations correct.

$5 \times 3 - 1 = 10$

$3 + 6 - 2 \div 2 = 3.5$ **[2]**

The first pair of brackets was often correct, but many candidates did not succeed with the second pair. Candidates clearly placed brackets and then reconsidered. If they used a pen, they sometimes rewrote the calculation at the side to show clearly the change. Where brackets were scribbled out it was sometimes difficult to determine the intended answer.

Question 4

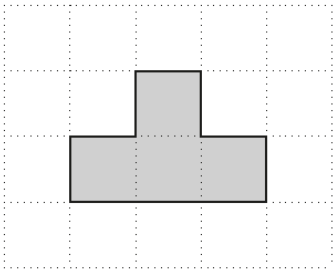
4 Work out 20% of 40.

..... **[2]**

This was often correct. Sometimes a full method was shown, but often candidates only wrote '10% = 4, 20% = 8'. This is satisfactory so long as the answer is correct. If an error is made no credit is given as no calculation is seen. On a calculator paper, the calculation 40 × 0.2 is expected, or the equivalent. Some candidates spoiled their method by adding their answer to 40.

Question 5 (a)

5 A shape is drawn on a one-centimetre grid.



(a) Find the perimeter of the shape.

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

Around two thirds of candidates answered correctly. Lower ability candidates confused the perimeter with the area and some counted the squares that touched the outside of the shape.

Question 5 (b)

(b) How many lines of symmetry does the shape have?

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

This was very well done by the majority of candidates. 2 was a common incorrect response.

Question 6 (a)

6 **(a)** These are the first five multiples of 15.

15 30 45 60 75

Write down the first five multiples of 30.

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

Most candidates answered this correctly. Some missed the first multiple and began at 60 or missed one in the list and some wrote 5, 10, 15, etc. Other incorrect responses were also seen.

Question 6 (b)

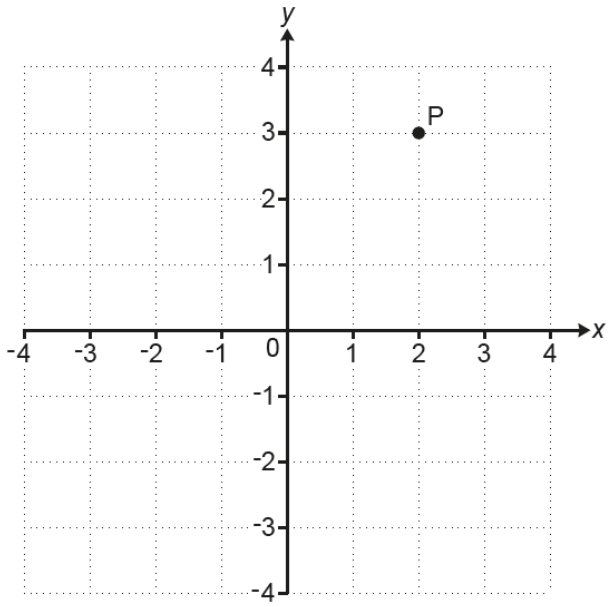
(b) Write down the lowest common multiple (LCM) of 15 and 30.

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

This was not answered as well as part (a). Slightly over half of the candidates did not get the mark. Many candidates confused LCM with HCF and 5 was often seen, usually following factor trees for 15 and 30.

Question 7 (a)

7 Point P is shown on this grid.



(a) Write down the coordinates of point P.

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

Almost all candidates scored this mark. The most common incorrect answer was (3, 2) with a very few giving (-2, -3) or (*x*3, *y*2).

Question 7 (b)

(b) Draw the line $x = -2$ on the grid. **[1]**

Approximately half of all candidates answered this question correctly. Among the incorrect answers were $y = -2$ drawn, a point marked at (-2, 0) or a line joining (-2, 0) to point P. Other lines were also seen.

Question 8

8 Find the value of $3g - h$ when $g = 4$ and $h = 5$.

..... **[2]**

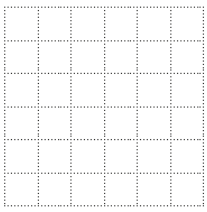
This question was generally very well done. Lower ability candidates tended to write 34 – 5 = 29, not understanding that adjacent values are multiplied. A minority of candidates gave the correct calculation, 3 × 4 – 5, but made an error in carrying out the calculation.

Question 9 (a)

9 Here are the first three patterns in a sequence.

(a) Draw Pattern 4 in the sequence.

Pattern 4



[1]

This was reasonably well understood with approximately half of the candidates drawing a 4 by 4 square pattern of dots. Rectangles were sometimes seen.

Question 9 (b)

(b) Without drawing it, work out how many dots there are in Pattern 8.
Explain how you decide.

..... dots because .....

.....

..... **[2]**

This first explanation was reasonably well done with approximately half of the candidates gaining full credit. A number of candidates did get 64 but were unable to properly explain their reasoning, giving answers such as 'Square it' without saying what 'it' was. Others gave 64 but gave the reason as 16 × 4 without justifying this method. Others incorrectly said 'Double the number in pattern 4'.

Exemplar 1

64 dots because It's a Squared ~~each Pattern has~~

~~the same number of dots~~ number

..... **[2]**

In this exemplar, the candidate has scored 1 mark for the correct value of 64. However, the explanation is incomplete. Identifying that the terms are all square numbers is a step to the solution but the full answer should state that the number of dots is the term number squared. 8 × 8 was not seen in the working space.

Question 9 (c)

(c) Pattern n has 196 dots.

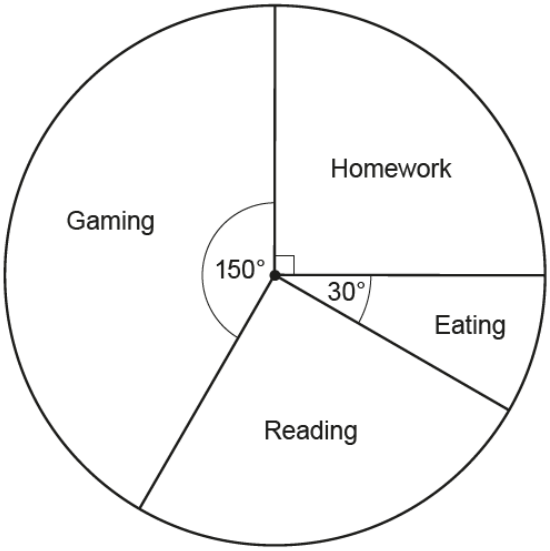
Find the value of n.

(c) $n =$ ..... **[1]**

Approximately half of the candidates answered this question correctly; some candidates gave 14 without working and some showed $\sqrt{196} = 14$. Common incorrect answers were 49, 98 and 194. Some candidates tried a method of trial and improvement showing sequences of square numbers, 10 × 10 = 100, 11 × 11 and so on. In these long methods, errors were frequently made.

Question 10 (a)

10 The pie chart shows how Jack spent his time one evening.



(a) On which activity did Jack spend most time?

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

The vast majority of candidates correctly answered 'Gaming' to score the mark.

Question 10 (b)

(b) Jack says

I spent $\frac{1}{3}$ of my time on Gaming.

Show that he is not correct.

..... **[2]**

This explanation was not responded to as successfully as question 9(b). Candidates often omitted steps or were careless with working and words. Candidates need to write complete explanations. Explanations such as 'He spends more than that', without justification, were common. Candidates needed to show and evaluate a calculation and compare the result with what was given. An answer of '$\frac{1}{3}$ of 360 is 120 so it's less' gained 1 mark whereas '$\frac{1}{3}$ of 360 is 120 so this is less than 150' gained full credit.

A common misconception was to suggest that because there were 4 activities, Jack must have spent $\frac{1}{4}$ of the time on Gaming.

Exemplar 2

360 ÷ 3 = 120 So he spends over $\frac{1}{3}$ of his time [2]

In this exemplar, the candidate has included one of the correct calculations to score M1. However, to gain the second mark a correct comparison has to be made with the given information. The inclusion of, 'because 150 is greater than 120' would have secured the mark.

Question 10 (c)

(c) The pie chart represents 5 hours.

Find the time, in hours and minutes, that Jack spent reading.

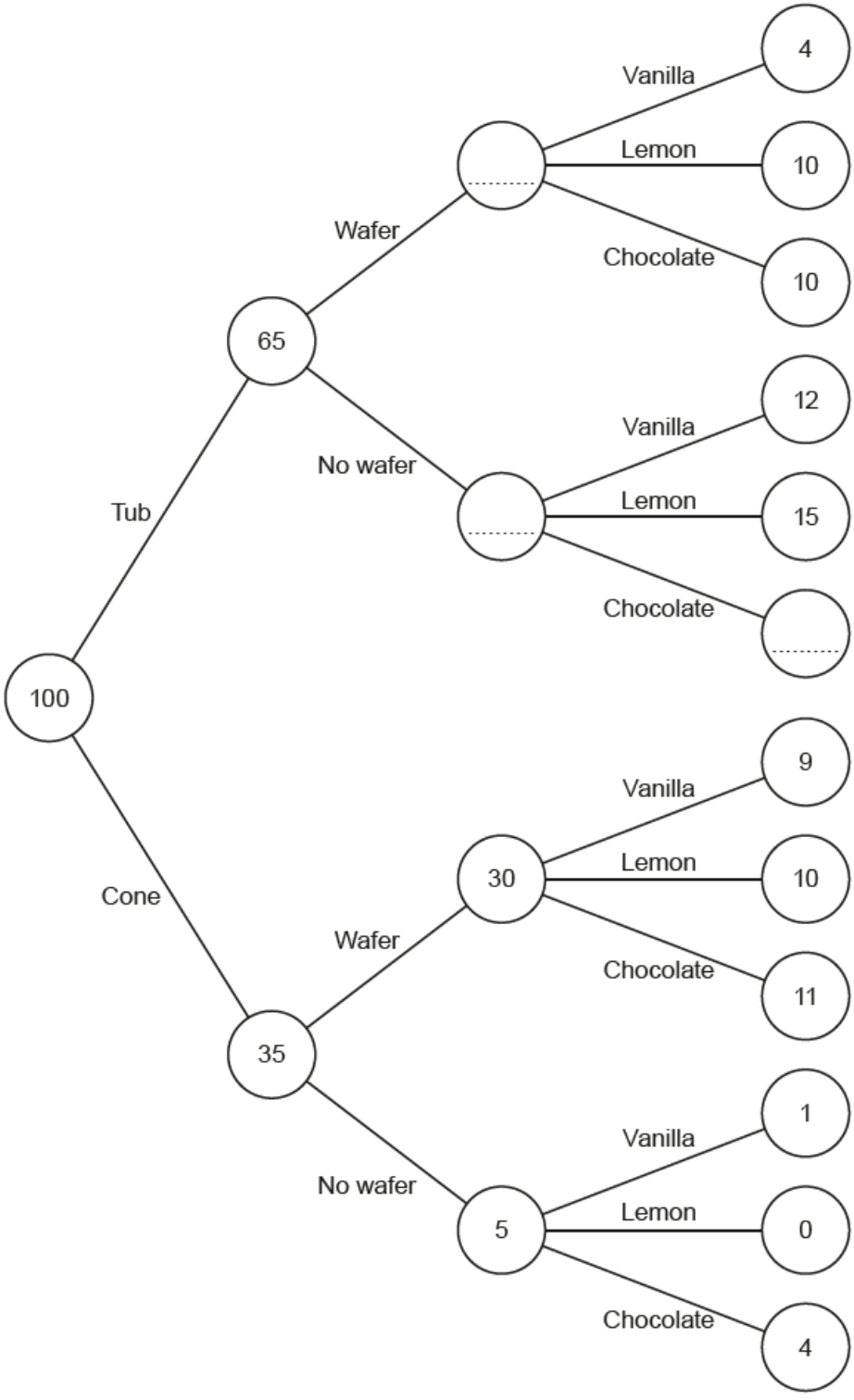
(c) ..... h ..... min **[4]**

Higher ability candidates answered this question with very little work, identifying that 'Reading' accounted for 90° or $\frac{1}{4}$ of 5 hours. They then found $5 \div 4 = 1.25$. At this stage 1 h 25 min was a common incorrect answer. Other candidates tried a variety of methods. Few candidates showed efficient working, such as $\frac{1}{4} \times 5 = 1.25$. Many gained one mark for identifying the angle for 'Reading'.

Question 11 (a)

11 Megan's Cafe sells ice cream.
Customers choose to have a tub or a cone, and a wafer or no wafer.
They can choose vanilla, lemon or chocolate ice cream.

This frequency tree shows the number of people making some of the choices.



(a) Anaya buys an ice cream.

One choice she can make is

a cone, no wafer and vanilla.

How many different choices can she make?

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

Many correct answers were seen. The most common incorrect answer was 11. It was clear from responses that many candidates were not aware that the number of endpoints represented the number of choices.

Question 11 (b)

(b) Complete the frequency tree. **[2]**

The vast majority of candidates gained marks in this question. Lower ability candidates sometimes scored 1 mark for one correct value.

Question 11 (c)

(c) Which flavour of ice cream was most popular?
Show how you decide.

(c) ..... **[3]**

Many candidates gained full marks in this question. Some listed the numbers to be added and most summed these correctly. The total for 'Chocolate' was followed through from the diagram. Some lower ability candidates included lists of choices.

Question 12

12 Solve.

$4x + 5 = 35$

$x =$ ..... **[2]**

Most candidates gained both marks for the question. A variety of methods were seen. Very few used a 'flow chart' method and most tried to rearrange, sometimes marred by slips such as 35 – 5 = 40. Lower ability candidates attempted to use a form of trial and improvement, often without success.

Question 13

13 Delroy drives 240 miles.
His car averages 40 miles per gallon of petrol.
Petrol costs £1.30 per litre.

1 gallon is 4.5 litres.

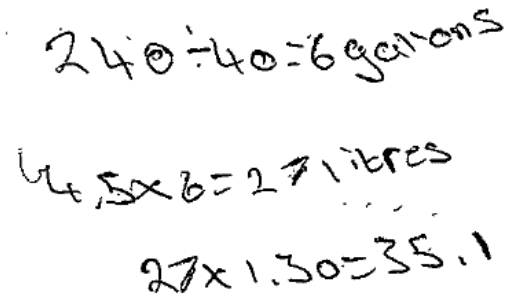
How much does Delroy spend on petrol for this journey?

£ ..... **[4]**

It was pleasing to see well over half of the candidates gaining full marks for this question and many of the others gaining part marks for the methods they showed. Most could work out that 6 gallons were used. A small number of lower ability candidates gained a 'Special Case' mark for finding the product of a number of litres and 1.3.

The most common misconception shown was when candidates found the number of litres needed (27) but then proceeded to divide by £1.30 instead of multiplying by £1.30.

Exemplar 3



£ 35.10 **[4]**

In this exemplar, the candidate has provided a concise and clear solution. There is minimum annotation but this does allow the candidate to communicate clearly the units they are using. Annotation was not required for the marks but its usage is good practice.

Question 14

14 Joan makes cups of tea and coffee at a lunch club.
Each cup requires 250 ml of boiling water.
She has a kettle that boils up to 1.7 litres of water each time.

She boils 10 litres of water in an urn.
She then uses the kettle to boil the rest of the water she needs.

Find the least number of times that Joan needs to boil the kettle to make 56 cups.
Show how you decide.

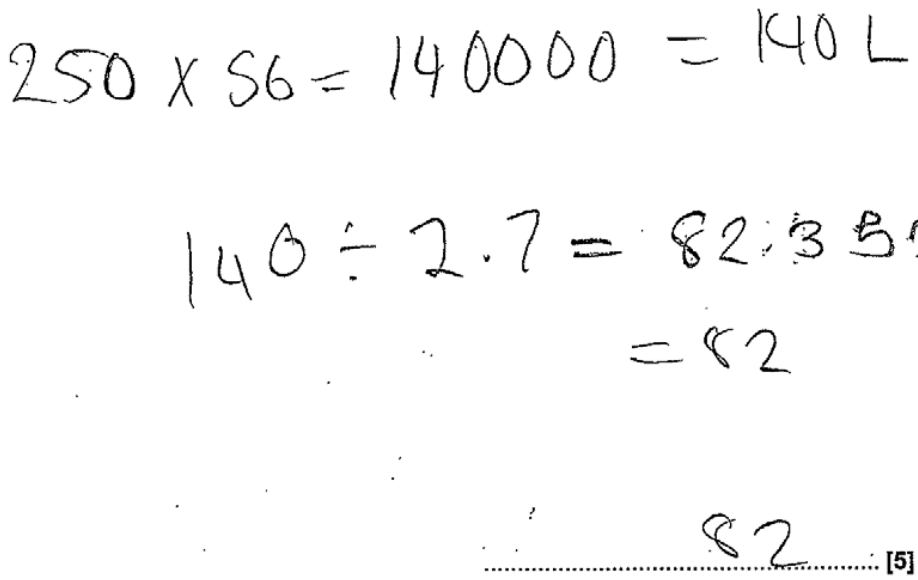
..... **[5]**

Just over a quarter of the candidates gained full marks in this question and around a third gained no marks. A great many methods were seen. A small number of candidates misread the question and ignored the urn completely in their answer. They were rewarded accordingly to a maximum of 4 marks.

Some very good and well organised responses were seen and this made the examiners' task of rewarding correct work much easier. Other candidates clearly worked through a number of processes before embarking on one that led to the answer, without crossing out redundant working. This made it very hard to follow. Others showed very little working with just some values jotted down.

It is vital that candidates show clear working, preferably annotated, for 'Show that' questions. It is also important that they learn the correct relationship between metric units. A significant number of candidates stated that '1 litre = 100 ml'.

Exemplar 4



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

In this exemplar, the candidate has ignored the use of the urn in their solution. The layout makes clear the method used. The candidate has included an extra 0 in the original multiplication. The subsequent division is by 1.7. A mark of B2 for the correct figures in the answer is scored.

Question 15 (a)

15 (a) 50 sweets weigh 200 g.

If each sweet weighs the same, work out the weight of 7 sweets.

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

Many good answers, sometimes without working, were seen with around three quarters of candidates gaining a mark, mostly 2 marks. Where working was seen it was usually correct though many candidates did not use units in the working. Some candidates reached '4' but were unsure how to proceed.

A common wrong answer was 1.75, arising from 50 ÷ 200 × 7.

Question 15 (b)

(b) *b* is directly proportional to *a*.
b is 10 when *a* is 8.

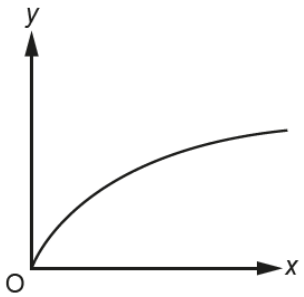
Work out *b* when *a* is 9.

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

The majority of candidates scored 0 in this question. The most common incorrect answer was 11.

Question 15 (c)

(c) A graph is drawn below.



Explain how you know that y is not directly proportional to *x*.

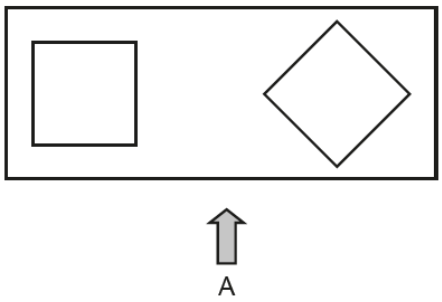
.....

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

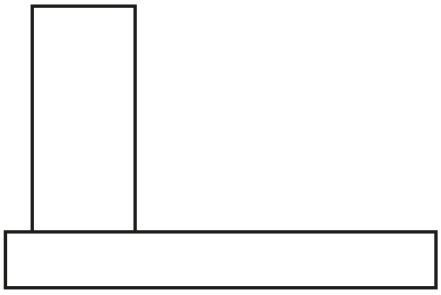
Very many correct answers were seen with most candidates saying 'Because it curves' or 'It should be a straight line' to gain the mark. Some wrote confusing statements and scored no marks.

Question 16

16 This is the plan view of a 3D object.



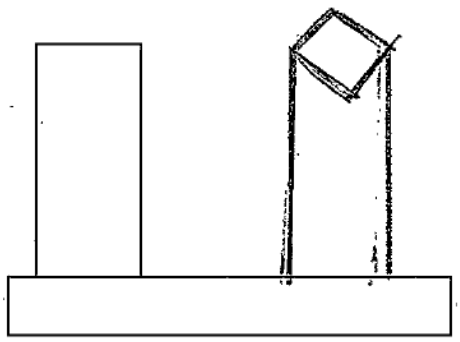
Complete the diagram below to show the front view of the 3D object from A.



[2]

Candidates did not do as well on this question, but it was pleasing to see that most candidates did use a ruler. The most common incorrect answer was to draw an oblique face on the top of a column or to miss out the leading edge. Many did not draw their column wide enough. Some less able candidates drew one or two holes in the given column on the elevation.

Exemplar 5



[2]

This exemplar highlights a common error, drawing an oblique top to the column. The column was narrower than the existing one to the left of it, with no 'leading' edge and so scored B0 B0.

Question 17 (a)

17 A grain of salt weighs 6.48×10^{-5} kg on average.
A packet contains 0.35 kg of salt.

(a) Use this information to calculate the number of grains of salt in the packet.

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

Candidates were unclear about the processes needed to solve this question and around two thirds did not score a mark. Many attempted to change the weight of a grain of salt from standard form and a few were successful. The most common incorrect method was to multiply the two values together. A number of candidates included the value $\frac{81}{1250000}$ for 6.48×10^{-5}, which is the value given by many calculators, and then rarely made any further progress.

Question 17 (b)

(b) Explain why your answer to part **(a)** is unlikely to be the actual number of grains of salt in the packet.

.....

.....

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

The explanations were not well constructed. Some candidates clearly had an understanding that the weight of a grain of salt was an average and scored a mark for saying this. Too many candidates used 'it' in their explanations without defining what 'it' was. A significant minority said or implied that no one could count all the grains.

Candidates should practise writing explanations and then have them read to their peers, anonymously, to see whether they are understood.

Question 18

18 Tom researches the weights of plant seeds.

- One poppy seed weighs 3×10^{-4} grams.
- 250 pumpkin seeds weigh 21 grams.
- One sesame seed weighs 3.64×10^{-6} kilograms.

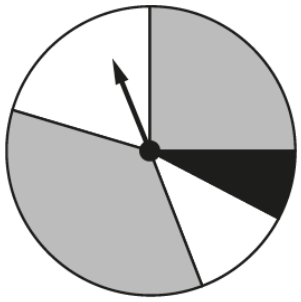
Write the three types of seed in order according to the weight of one seed.
Write the lightest type of seed first.
You must show how you decide.

..... , ... , ...**[4]**
lightest

This standard form question was not well understood by candidates. Many realised that the weights had to be in the same form to compare but few were able to do this successfully. Many could write the weight of a poppy seed as 0.0003 but some marred this by writing 0.000.3. When dealing with pumpkin seeds, many candidates worked out 250 ÷ 21 (seeds per g) rather than 21 ÷ 250 (g per seed), and a significant number gave the weight as 21 g ignoring the fact that this was for 250 seeds. Some candidates thought that there were 100 g in 1 kg, which led to errors with calculating the sesame seed weight. Very few candidates worked in standard form.

Question 19 (a)

19 **(a)** This spinner has two grey sections, two white sections and one black section.



Vlad says

The probability of the spinner landing on black is $\frac{1}{5}$.

Explain why Vlad is not correct.

.....

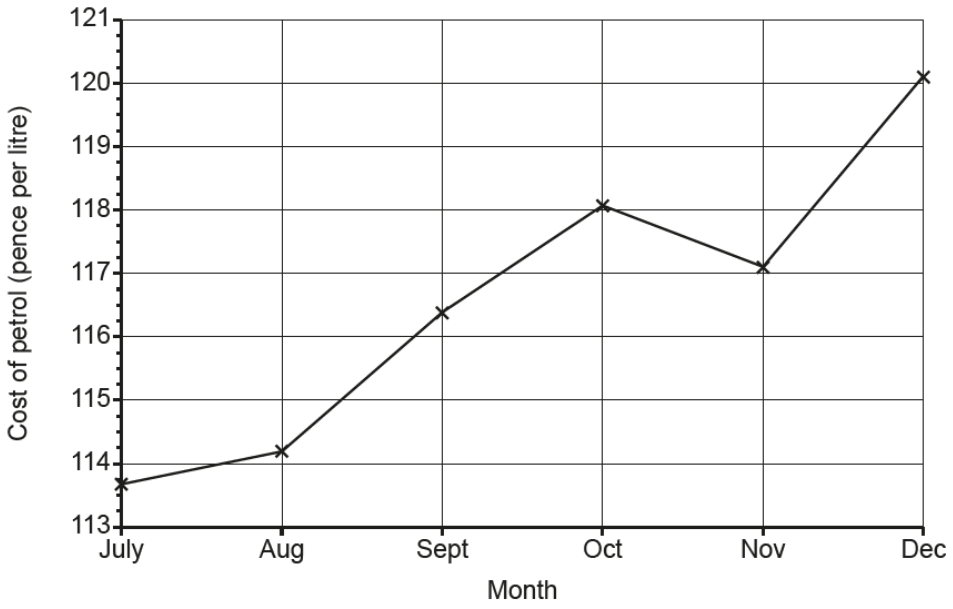
.....

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

Only a small number of candidates answered this question successfully. Some candidates measured the angle for black and showed that it was less than the expected 72° (if the probability had been correct). Some simply stated that the black area was less than one fifth of the area of the disk. Many explanations said that the areas were not equal and did not score the mark. Other candidates said 'It's too small' without defining what was too small.

Question 19 (b)

(b) The graph shows the cost of a litre of petrol for the last six months of 2017.



Explain why this graph is misleading.

.....

.....

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

Some candidates gained a mark in this explanation. Many noted that the vertical scale did not start at zero or that the vertical scale started at 113.

The most common error was to misinterpret the question. Many responses suggested that the divisions between points on the vertical axis could not easily be read, or there were no horizontal grid lines from these. Others said it only started from July, that there was no line of best fit, the price went down in November or the values were hard to read. Some complained that the graph had no title and others that the price should be in pounds.

Question 20

20 Sophie is organising a raffle.

- Each raffle ticket costs 50p.
- She sells 400 tickets.
- The probability that a ticket, chosen at random, wins a prize is 0.1.
- Each winning ticket receives a prize worth £3.

Sophie says

I expect the raffle to make over £100 profit.

Show that Sophie is wrong.

.....

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

This probability question also appears on the final Higher tier paper. It was quite well understood with the vast majority of candidates scoring at least one mark and with over a quarter of candidates scoring all 4 marks. Most candidates gained a mark for working out that £200 would be taken, although units were not always used and occasionally a value of £20 000 was seen, scoring no mark. The most common incorrect method was to find 10% of £200 rather than of 400 tickets and so many got an incorrect value for the profit.

Question 21

21 A bag contains some counters.

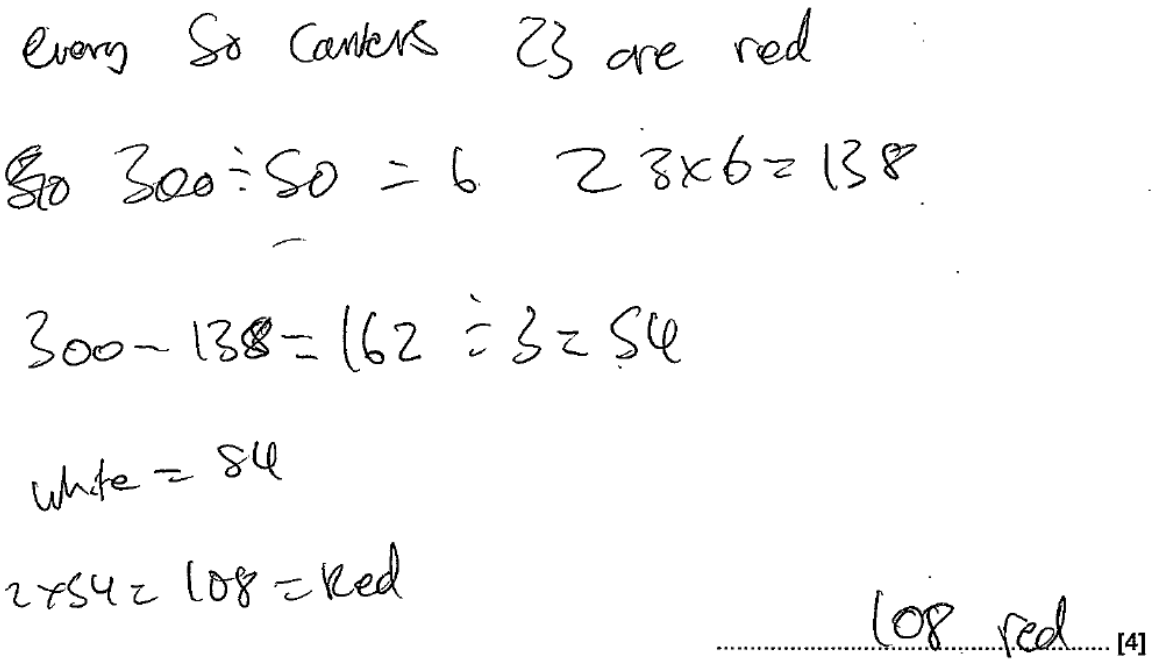
- There are 300 counters in the bag.
- There are only red, white and blue counters in the bag.
- The probability of picking a blue counter is $\frac{23}{50}$.
- The ratio of red counters to white counters is 2 : 1.

Calculate the number of red counters in the bag.

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

This question also appears on the final Higher tier paper. It was quite well responded to and around half of the candidates scored at least 1 mark. Around a third of candidates scored all 4 marks. Most candidates used the expected method. Many found that there were 138 blue counters. This was sometimes done by steadily increasing the numerator and denominator of the fractions such as $\frac{23}{50} = \frac{46}{100} = \ldots$. Candidates who took this approach sometimes made errors in the process. A number of candidates scored 2 marks for finding that there were 162 counters that were red or white but some made errors in the subtraction from 300. A small number of candidates confused the number of reds with the number of whites. The most common error at this stage was to divide 162 by 2 instead of 3, the total of the ratio.

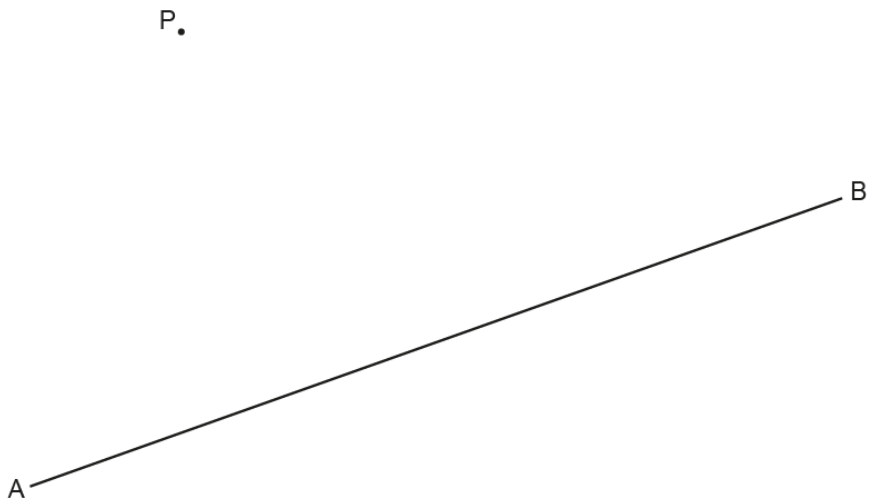
Exemplar 6



This exemplar shows a response with a clear layout, which makes the method easy to follow. Despite the slip in the first line, saying 'red' rather than 'blue', the candidate recovers and gives the correct final answer. It is recommended that candidates use careful annotations to aid their solutions.

Question 22

22 Construct the perpendicular from the point P to the line AB.
Show all of your construction lines.



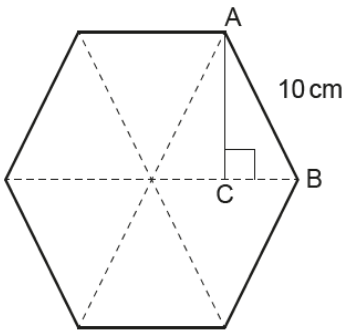
[2]

Many of the candidates who attempted this question had the use of compasses, a ruler and a pencil. A small number knew a valid construction, some attempted multiple constructions and a very small number sketched arcs.

This construction was clearly not understood by the vast majority of candidates and the common incorrect response was to bisect the line. Some candidates just drew the perpendicular and some did this accurately enough to score one mark. It was clear that many candidates did not understand the terminology used in the demand as a common misunderstanding was to join point P to the midpoint of line AB.

Question 23 (a)

23 The diagram shows a regular hexagon made from six equilateral triangles.
Each side is 10 cm.
The angle ACB is a right angle.



Not to scale

(a) Show that AC = 8.66 cm, correct to 3 significant figures. **[4]**

A small number of candidates realised that this question required the use of Pythagoras' theorem, identified CB as 5 cm and showed the process clearly. A number of candidates reached $\sqrt{75}$ then gave the answer 8.66 without giving a more accurate answer and so did not score the final mark.

Many candidates did not attempt the question.

Question 23 (b) (i)

(b) **(i)** Show that the area of triangle ACB is 21.7 cm^2, correct to 3 significant figures. **[2]**

A small number of candidates realised that the value for AC (8.66) was the height of the triangle ABC and so used the formula $A = \frac{1}{2}bh$ with 5 and 8.66 to calculate the area required. Again, few who did use the correct method went on to show a value to 2 decimal places.

This question was not answered well and around half of candidates made no attempt.

Question 23 (b) (ii)

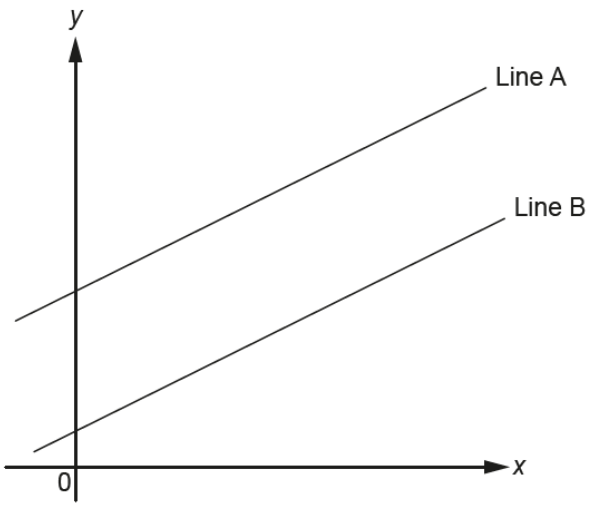
(ii) Find the area of the hexagon, giving your answer to an appropriate degree of accuracy.

(ii) ..... cm^2 **[2]**

A minority of candidates realised that they could use the value for the area of triangle ACB given in part (b)(i) and scored 1 or 2 marks on this question. Those scoring 1 mark worked out the area but did not round it. A common incorrect method was to find the perimeter of the hexagon or to show 21.7 × 6 thinking that the triangle ACB made up one sixth of the hexagon.

Question 24

24 The graph shows two parallel lines, Line A and Line B.



Not to scale

Line A has equation $y = 6x + 7$.
Line B passes through the point (4, 26).

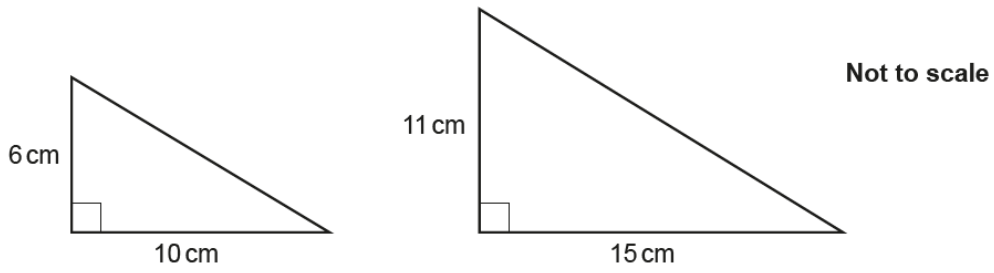
Find the equation of Line B.

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

Just over half of the candidates attempted this question. Very few correct answers were seen. Candidates did not demonstrate any clear understanding of the topic and few indicated that the two lines would have the same gradient. A common incorrect answer was $y = 4x + 26$.

Question 25

25 Are these two triangles mathematically similar?
Show how you decide.



..... because .....

.....

.....

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

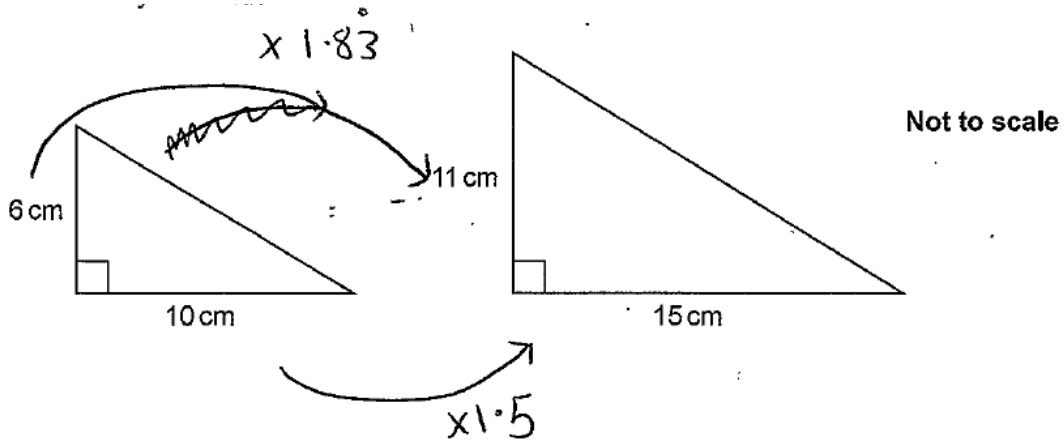
Many more candidates made an attempt at this question but the majority did not score a mark.

A small number of candidates showed the division of two corresponding sides and the resulting scale factor and commented that these were not the same and so the triangles could not be similar. Some showed the division of 15 by 10 to result in a scale factor of 1.5 and then multiplied 6 by 1.5 to achieve 9. They then commented that the 11 cm was not the 9 cm that was expected and so the triangles could not be similar.

A few candidates omitted some steps in this 'Show that' question and so did not score. Candidates must show full working in such questions.

Most candidates did not demonstrate a clear understanding of similar shapes. Many concluded that the triangles were similar as they had a right angle or that similar corresponding sides had a difference of 5. Others worked out areas and were unsure how to proceed and some used Pythagoras' theorem.

Exemplar 9



RHS ←
SSS
SAS
ASA

yes because it both have right angle on the side (RHS)

[3]

This exemplar demonstrates a typical response in that not all of the method was shown. Candidates must show all steps in 'Show that' questions in order to access all of the available marks. Multipliers are seen but not the working leading to them so no method marks are scored.

The candidate also supplies an alternative method, confusing similarity with congruence, and this is the method that leads to the answer. The answer demonstrates that a congruence test has been used so M0 A0.

Question 26 (a)

26 **(a)** A number, g, is given as 4.05, correct to 2 decimal places.

Complete the error interval for g.

(a) ..... $\leqslant g <$ ..... **[2]**

A small number of correct responses were seen, usually just stated and so no inference about methods can be made. There were few patterns seen in the incorrect responses.

Question 26 (b)

(b) A number, h, is given as 3, truncated to 1 significant figure.

Complete the error interval for h.

(b) $3 \leqslant h <$ ..... **[1]**

A small number of correct responses were seen. More candidates attempted this part than part (a) and they had slightly more success here.

Question 27

27 Solve by factorising.

$x^2 + 3x - 10 = 0$

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

Many candidates attempted to answer this question. A small number demonstrated understanding of the process of factorisation. Some candidates did produce correct factors $(x + 5)(x - 2)$ and gave the answers 5 and -2. These candidates scored the 2 method marks.

A very small number of candidates gave the correct answers with no working to score a Special Case mark. Some candidates attempted factorisation but made no progress or gave incorrect factors. Few equated their factors to zero.

Trial and improvement and attempts to rearrange the equation and solve as though this was a linear equation were common incorrect methods.

Question 28 (a) (i)

28 (a) Simplify.

(i) $h^3 \times h^{-3}$

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

Most candidates attempted this question and a small number of correct answers were seen. Common incorrect answers were h, h^6, 6 and h^{-6}.

Question 28 (a) (ii)

(ii) $\frac{f^9}{f^3}$

(ii) ..... **[1]**

Most candidates attempted this question and a reasonable number of correct answers were seen. A common incorrect answer was f^3.

Question 28 (b)

(b) The length of each side of a plastic cube is $2a$ millimetres.
The cube has mass $32a^2$ grams.

Find an expression for the density of the cube in its simplest form.
Give the units of your answer.

(b) density = ...

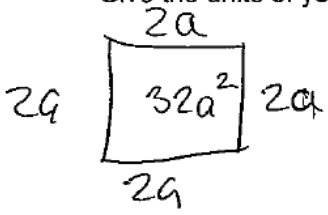
units ..... **[5]**

This question was attempted by just over half of the candidates. Those candidates who made a sensible attempt thought that the volume of the cube was 8. Many candidates seemed unaware of the formula for density and almost none could correctly define the units used.

Exemplar 10

(b) The length of each side of a plastic cube is $2a$ millimetres.
The cube has mass $32a^2$ grams.

Find an expression for the density of the cube in its simplest form.
Give the units of your answer.



density = $2a^4 \div 32a^2$

$$\frac{2a^4}{32a^2}$$

(b) density = $\frac{2a^4}{32a^2}$

units grams **[5]**

This exemplar demonstrates one of the more extensive attempts but also reveals poor understanding of the volume of the cube and an incorrect recall of the density formula. Here, the 'volume' appears to be the product $2a \times 2a \times 2a \times 2a$ and seems to be associated with perimeter. It is written $2a^4$. The candidate then seems to use the incorrect $\text{Density} = \frac{\text{Volume}}{\text{Mass}}$ and makes no attempt to simplify.

Where candidates wrote anything, 'grams' was a fairly common wrong unit.

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