# Examiners’ Report
# March 2013

# GCSE Mathematics 5MB2H
# Higher (Non-Calculator)
# Paper 1

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## Introduction

Candidates made a good attempt at the paper and all questions seemed accessible to a good proportion of candidates.

Nearly all candidates used the spaces provided on the question paper effectively to show their working.

Questions involving several stages of working, for example questions 6, 8, and 11 were often not answered well. Candidates were not always able to carry out the required operations in the correct sequence.

It was disappointing to find that a significant proportion of higher level candidates on this non-calculator paper were unable to work out fairly straightforward calculations such as $40 \times £1.50$, $60\,000 \div 400$, $16\,000 \div 5$ and $122 \times 30$ with accuracy.

Candidates should be encouraged to use common sense checks on their answers. For example, a significant proportion of candidates gave the answer £42 for the calculation of $40 \times £1.50$. Candidates should be encouraged to reflect on their answers as, in this instance, they might have realised that something was wrong.

Many candidates showed clarity of expression when citing the reasons involved in questions on geometrical reasoning.

# Report on individual questions

## Question 1

This question appeared to be a good starter question. Well over 90% of candidates were able to complete the table and draw the graph accurately.

The most common error seen in part (a) was an incorrect value, usually −1, in the table corresponding to the value $x = -1$.

In part (b) the plotting of points was carried out accurately. Most, but not all, candidates used a ruler to join the points with a straight line. Lines usually extended over the full range of values for $x$, that is from $x = -2$ to $x = 4$. A small proportion of candidates did not use the table from part (a) but opted to use the gradient and $y$-intercept to draw the line. Unfortunately some of these candidates did not take account of the different scales on the $x$ and $y$ axes and consequently drew lines with a gradient of 4.

## Question 2

The vast majority of candidates knew what to do to answer this question and recorded their method clearly in the working space. Most candidates were awarded all three marks. A further few candidates demonstrated a correct method but did not give the correct answer because they were unable to calculate either 200 ÷ 5 or 40 × £1.50 correctly. These candidates scored two marks. Some weaker candidates multiplied 200 by 1.50 or 5 by 1.50.

## Question 3

Over three quarters of candidates added the fractions to give a correct answer to this question with a further 5% of candidates gaining one mark for their response. Candidates who scored one mark had often made a simple arithmetic error but showed the correct method of finding a possible common denominator and were able to write at least one of the two fractions given as an equivalent fraction with this denominator.

A small number of candidates resorted to adding the numerators and adding the denominators to give $\frac{4}{11}$ as their answer.

## Question 4

Under half of candidates scored full marks for their answer to this question. Of the two possible approaches to the problem, both were commonly seen.

Candidates using a method based on areas were usually able to make a start by finding the area of the wall or of a tile. However, many mistakes were made by candidates when attempting to change their units. For example, candidates often worked in metres to find the area of the wall but then converted 6 $m^2$ to 600 $cm^2$. Other candidates worked in centimetres but then either made an error in calculating 200 × 300 or subsequently in dividing 60 000 by 400. A significant number of candidates divided the area of the wall by 20 and a commonly seen incorrect answer was 30, derived from dividing 600 by 20.

Candidates who used the alternative method of finding the number of rows and columns of tiles needed, frequently added the 10 and 15 instead of multiplying them.

## Question 5

This question was answered well.

In part (a) over 80% of candidates gave a correct simplification of the expression, though a significant number of them left the answer in the form $3x - 1y$ or did not fully simplify their answer and wrote $3x + -y$.

A similar proportion of candidates gave a correct answer in part (b). The most commonly seen incorrect answer was $2 + 3x$.

The laws of indices were well known. The most common errors were to give $y^3$ as the answer to part (d) and $c^7$ in part (e).

## Question 6

Many candidates appeared to know what was required in this question and a number of candidates were able to give the correct amount of money Bill gives to the cats' home.

A significant number of candidates were able to either find 20% of £20 000 or to divide a quantity of money in the ratio 3:2 but were unable to carry out the two operations together in the order necessary to solve the problem correctly.
A significant number of candidates divided £20 000 or £4000 in the ratio 3:2, rather than £16 000. Other potentially correct solutions were spoiled by an inability to carry out the arithmetic accurately; for example the calculation of 16 000 ÷ 5 was often inaccurately done with the incorrect answers 320 and 32 commonly seen. In attempting to work out 20% of a quantity, some candidates did not get a correct answer and did not show sufficient method to gain the mark allocated to this.

## Question 7

Over half of all candidates scored full marks for their answers to this question. Only a few candidates failed to gain any marks for their responses.

Part (a) of the question was answered well with the majority of candidates able to give a correct expression for the $n^{th}$ term of the sequence. Frequently seen incorrect answers included $4n + 2$ and $2n + 4$. The former response was awarded some credit.

In responses to part (b), a surprising number of candidates gave the incorrect answer of 30 instead of -30. This might have been avoided if candidates had copied down the expression and substituted 10 into the expression given before attempting any evaluation. When this was clearly done, it attracted a mark for a correct method.
A surprising number of candidates gave one of the incorrect answers 195 ($20 \times 10 - 5$) or 150 ($(20 - 5) \times 10$). Other candidates subtracted 5 from 20, then repeated the operation. Unfortunately nearly all of them did this only nine times, resulting in the incorrect answer of −25. Some had probably counted and found that they had 10 numbers written down but had not checked that they had subtracted 5 ten times.

## Question 8

Unfortunately many candidates did not read the detail in this question. Instead they assumed that the triangle joined the point at the centre of the pentagon to two of the vertices and so assumed angle *APB* was 72°. Other candidates assumed the exterior angle of the pentagon was 60°. Of those candidates who worked out 360 ÷ 5, many then used 72° as an interior angle of the pentagon rather than an exterior angle. They did not seem to realise that the interior angle must be greater than 90°. A minority of candidates used the formula $(n - 2) \times 180°$ to work out the sum of the interior angles as a first stage in solving the problem. Candidates who did use this method were usually successful in completing the problem and giving a correct answer.

One third of candidates scored full marks for their answers, but examiners were unable to give any credit to around 45% of the candidates.

## Question 9

Most candidates completed the factorisation in part (a) of this question successfully.

The 'expand and simplify' in part (b) was also completed well and candidates who did not score both marks were often able to get one mark for a correct expansion of either $7(2x + 1)$ or $6(x + 3)$. A significant number of candidates expanded one of the brackets correctly but not the other. It is a pity that more candidates did not check this aspect of their working. Some candidates who scored one mark then attempted to expand $(14x + 7)(6x + 18)$.

Part (b)(ii) was completed less successfully. About one in seven candidates scored the mark in this part for either showing that $20x + 25$ was a multiple of 5 by factorising it or for explaining that both $20x$ and 25 are multiples of 5 when $x$ is a whole number. Some candidates successfully explained that $20x$ is a multiple of 5 but forgot to mention the 25. More often than not candidates approached this part of the question by substituting a value or values for $x$ into the expression and then showing or stating that their result was divisible by 5. Candidates should be advised that this is not sufficient to show the expression is always a multiple of 5.

## Question 10

This question was well answered. The majority of candidates were awarded both marks. A further few candidates scored one mark for a convincing attempt at the correct side elevation. This was given where errors consisted of lengthening or shortening some of the sides but where the shape had two vertical lines, two horizontal lines and one sloping line in the correct order. A minority of candidates attempted to sketch a three-dimensional representation of the prism. Examiners were unable to award these candidates any marks.

## Question 11

This question proved to be a good discriminator. Some candidates attempted to find the total surface area of the solid but most candidates (around three-quarters) gained some credit for making at least some progress towards finding the volume of the solid. Attempts to calculate the area of cross-section of the solid were often either incomplete or contained errors. Most candidates tried to build up the cross-sectional area from triangles and rectangles or from a rectangle and a trapezium. The most common errors seen involved multiplying 4 by 10 for the area of the trapezium or omitting the division by 2 when working out the area of a triangle. Relatively few candidates employed the slightly easier approach of subtracting the area of two triangles from a 14 by 10 rectangle.

Some candidates used a method of finding the volume of a cuboid measuring 8 by 10 by 30 first. A significant proportion of these candidates made little progress beyond this and those who tried rarely went on to get the correct answer.

Of those candidates who produced a fully correct method, a significant number made an error in their arithmetic, for example in adding areas or in multiplying 122 by 30. In a non-calculator paper particularly, candidates would be well advised to spend more time in checking their calculations.

Weaker candidates sometimes randomly multiplied a few of the dimensions given and showed little understanding of either area or volume.

## Question 12

Candidates generally showed a good understanding in their answers to this question.

Most candidates changed each number into ordinary form before putting them in order. The number of zeros involved inevitably led to many careless errors particularly with the numbers $30 \times 10^{-6}$, $-2.5 \times 10^{-4}$ and $0.0052 \times 10^{6}$. Nevertheless, nearly three-quarters of candidates were awarded at least two of the three marks available. Just under a quarter of candidates scored full marks. Candidates not awarded any marks usually showed no intermediate working.

Some candidates failed to realise that the one negative number must be the smallest of the five numbers listed.

## Question 13

This question was generally well answered.

Around three-quarters of candidates gave the correct coordinates of the point *C* in part (a) of this question.

Part (b) was also well answered with the majority of candidates gaining at least one of the two marks available. Nearly two-thirds of the answers seen were fully correct. The candidates who scored one mark usually got two of the coordinates correct. The most common error was to give the $x$ coordinate as 4. Little working was seen.

## Question 14

Most candidates made a good attempt at this question and even the weaker candidates often successfully found the size of angle *CDB.* Nearly all candidates scored some marks for their answers to this question. Candidates generally communicated well by marking angles on the diagram and by writing their method and reasons in the working space provided. More and more candidates are stating their reasons clearly in questions like this and so candidates often gained at least three marks for their responses. It was heartening to see more candidates using the phrase 'alternate angles' rather than 'Z angles'. The reason expressed least clearly related to the angle between a tangent and a radius. This reason is often stated in such forms as 'tangent to a circle' or 'tangent = $90^\circ$' rather than 'the tangent to a circle is perpendicular (or $90^\circ$) to the radius (or diameter)'.

Some candidates wrongly assumed that triangle *BCD* was isosceles and gave a final answer of either $45^\circ$ or $27^\circ$.

## Question 15

This question proved to be a good discriminator of the more able candidates. Most candidates gained some credit for their answers to part (a) by giving an equation in the form $y = 3x + c$. A significant proportion of these candidates did not realise the significance of the phrase 'passes through the origin' and many different values of $c$ were seen. Some candidates wrote '$y = 3x + 0$'. This answer was, of course, awarded full marks.

In part (b), about one quarter of candidates realised that the gradient of the line perpendicular to **L** was $-\frac{1}{3}$ and were awarded at least one mark. The most common error in this part of the question was to give −3 as the gradient of the line.

Weaker candidates gave an expression rather than an equation in one or both parts of the question.

One in eight candidates gave a fully correct answer to both parts of this question to score all four marks available.

## Question 16

This question proved to be the most challenging question on the paper for many candidates. One in six candidates gave a fully correct answer.

Some candidates simplified $(\sqrt{5} - 1)(\sqrt{5} + 1)$ without showing sufficient intermediate working. A good proportion of candidates knew that $\sqrt{5})^2 = 5$, but it was not uncommon to see $(\sqrt{5})^2 = 2\sqrt{5}$. Examiners were surprised to see many candidates leave their answer in the form $\frac{(5-1)}{4}$, or perhaps more often, in the incorrect form $\frac{(5-1)}{2}$.

## Question 17

This question was well answered by the more able candidates. Around a quarter of candidates were awarded full marks. Around a further fifth of candidates received some credit for a correct factorisation of the numerator or the denominator or both, usually the numerator. Many candidates invented their own version of simplifying algebraic fractions by crossing off elements common to the numerator and the denominator, for example $x^2$. These candidates clearly have little depth in their understanding of equivalent fractions.

## Summary

Based on their performance on this paper, candidates are offered the following advice:

- check arithmetic carefully
- compare answers to calculations with what might be expected
- read the question carefully to check understanding of any diagrams given
- use the order of statements in a question to help you decide on the order of calculations required to answer the question
- make sure all lengths are in the same units before areas or volumes are calculated.

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