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Principal Examiner Feedback

Summer 2010

GCSE

GCSE Mathematics (2381)

Higher Non-Calculator Paper (13H)

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1. PRINCIPAL EXAMINER'S REPORT – HIGHER PAPER 13

1.1. GENERAL COMMENTS

1.1.1. This was an accessible paper that gave candidates ample opportunity to demonstrate their understanding. Candidates were able to complete the paper in the time available and most candidates attempted all of the questions.

1.1.2. It was pleasing that most candidates showed sufficient working out to gain method marks when the final answer was incorrect.

1.1.3. The lack of basic numeracy skills at this level is a concern. Many candidates struggled to divide 300 by 6 and 360 by 5. Errors were frequently made when subtracting from 300 in question 8 and when subtracting from 3600 in question 12. In question 13, $200 \times 200 \times 200$ was often evaluated incorrectly. Candidates need to be encouraged to check the reasonableness of their answers.

1.2. REPORT ON INDIVIDUAL QUESTIONS

1.2.1. Question 1

The majority of candidates were able to work out the correct percentage. A variety of methods were used. Those who attempted to work out $\frac{120}{200} \times 100$ could not always complete the calculation correctly. Some candidates worked with equivalent fractions and some started with 10% = 20. Common errors were to find the percentage of girls or to give the answer as 0.6 or $\frac{3}{5}$.

1.2.2. Question 2

This question was answered very well. Most candidates were successful in part (a). Those that didn't get the correct answer of 22 were usually able to gain the method mark for 2×5 or 10 seen. Failure to add 10 and 12 correctly was surprisingly common, with the answer often given as 24 or 32. It was pleasing to see many candidates using an algebraic approach in part (b) and many of those who did not give the correct answer gained one mark for substituting the value of T to get 22 = 4w – 2. The most common incorrect answer was 5 due to candidates subtracting 2 from 22 and then dividing by 4. Some candidates substituted w = 22 rather than T = 22, resulting in an answer of 86.

1.2.3. Question 3

Three quarters of the candidates gained both marks for rotating the triangle 180^o about the point (1, 0). The most common error was for the triangle to be rotated 180^o about a point other than (1, 0) and quite often this point was the origin. Some candidates rotated it only 90^o about (1, 0). Those who gained no marks had frequently reflected the triangle in the x-axis. It was good to see rulers being used by many candidates to draw the triangle.

1.2.4. Question 4

This question was not well answered. Full marks were surprisingly rare and two fifths of the candidates gained no marks at all. Many candidates failed to identify the transformation as a translation. Some used words such as 'transformed' or 'moved' but many did not attempt to name the transformation and simply described the movement by using words or a vector. Many of those who attempted to use vector notation did so incorrectly, drawing a line between the two numbers or writing coordinates instead. Some of those who used words to describe the movement failed to gain a mark because they did not specify the horizontal direction, writing 'across 3 down 2' rather than 'right 3 down 2'.

1.2.5. Question 5

The vast majority of candidates gained all three marks for this question by reading from the distance-time graph correctly in part (a) and part (b) and completing the graph in part (c). Errors that were seen in (c) usually arose from candidates extending the horizontal line from (11 10, 40) to (11 20, 40) before continuing the journey home or from extending the horizontal line for a further 20 minutes.

1.2.6. Question 6

Part (a) was answered very well with most candidates able to make an accurate drawing of the cuboid. Only a few candidates drew a different cuboid or used the isometric paper incorrectly. Part (b) was also answered well. The most common error was to use all three of the given values to find the volume. Some candidates found the area of the wrong face.

1.2.7. Question 7

Just over half of the candidates were able to work out the volume of the prism correctly. The most common incorrect answer was 240, which resulted from the calculation $3 \times 4 \times 20$. Some candidates used the 5 cm length in their calculation and others misunderstood what they were being asked to work out and attempted to find the surface area instead.

1.2.8. Question 8

Those candidates who began by working out the number of boys and the number of girls were the most successful. Arithmetic errors, though, were quite common. The division of 300 by 6 to work out the number of boys was sometimes incorrect and a common error when working out the number of girls was to find $\frac{1}{10}$ of 300 rather than $\frac{3}{10}$ of 300. Mistakes were also made when subtracting the number of boys and girls from 300. Many candidates scored 2 marks by working out either the number of boys or the number of girls correctly and subtracting from 300. Candidates who chose to start by adding the two fractions had most problems. Some could not manage to add the fractions correctly and many of those who did add them correctly gave $\frac{7}{15}$ or $\frac{8}{15}$ as the final answer and didn't work out the number of adults.

1.2.9. Question 9

Although just under two fifths of the candidates answered this question correctly a similar proportion failed to gain any marks. There was much confusion over interior and exterior angles. Many candidates divided 360 by 5 at some stage but often they went on to subtract the result from 180 or 360. Some candidates divided 540 by 5 but did not subtract the result from 180.

1.2.10. Question 10

Many candidates completed the table correctly in part (a) with only the weakest failing to get at least one of the three values correct. The most common error was in working out the y- value for $x = -3$. Most candidates were able to plot their points correctly in part (b) and many joined them up with a smooth curve. Candidates need to be reminded that a quadratic graph has a turning point as it was quite common to see (–1, –3) and (0, –3) joined with a straight line. Some candidates did not attempt to draw a smooth curve and joined their points with line segments and some didn't join their points at all. Part (c) was answered well by those candidates who realised they needed to use their graph to solve the equation. Many candidates, though, tried to solve it algebraically or simply guessed.

1.2.11. Question 11

Part (a) was answered very well with almost three quarters of the candidates giving a correct expression. Most gave the answer as $4x$, some wrote $x + x + x + x$ and a few wrote $2x + 2x$. Quite a few of the candidates who failed to gain this mark had simplified $x + x + x + x$ to x^4. Candidates were much less successful in part (b) and those who had not written $4x$ in (a) rarely gained any marks. Many did not realise that they needed to use their answer from part (a) and the area was often expressed in terms of x rather than in terms of P.

Some who got as far as $x = \frac{p}{4}$ were unable to square correctly and wrote $A = \frac{p^2}{4}$.

1.2.12. Question 12

The vast majority of candidates were able to gain at least 1 mark for working out the depreciation after 1 year and just over half went on to work out the correct value of the car after two years. Many, though, simply doubled the first year's depreciation and subtracted the result from 4000, leading to the most common incorrect answer of 3200. Some candidates correctly calculated 10% of 4000 as 400 and then found 10% of this to get 40. It was not uncommon for candidates to make errors with the final subtraction, e.g. 3600 – 360 = 3340. Those who attempted to work out 4000×0.9^2 were presumably more used to doing this type of calculation with a calculator and were usually unsuccessful. Only a very few candidates didn't understand that depreciation is decreasing and added on to 4000.

1.2.13. Question 13

In part (a) just over a quarter of the candidates identified the two expressions which could represent volumes. A similar proportion failed to identify either of them. Part (b) was answered poorly and the most common answer was, perhaps not surprisingly, 800. Some candidates converted the units on the diagram of the cube but didn't know what to do after that. Some of those who knew what to do were unable to work out $200 \times 200 \times 200$ correctly and it was not uncommon to see the answer to this calculation given as 80 000 or even 800. Some candidates did not know that 100 cm = 1 metre.

1.2.14. Question 14

Solution by elimination was the most common method attempted and many fully correct answers were seen. Candidates who found *x* first seemed to be the more successful. The start of the process was generally correct and most errors occurred when one equation was subtracted from another as candidates had difficulty subtracting a negative number. Nevertheless, many candidates showed a correct process to eliminate one of the variables with only one arithmetic error and then substituted their found value correctly to gain two method marks. Those candidates who tried rearranging and substituting usually found the algebra too difficult to deal with. Many candidates used trial and error, in some cases after failed attempts at an algebraic solution, and were often able to find at least one of the values.

1.2.15. Question 15

Many candidates knew that they were looking for the equation of a straight line and wrote '$y = mx + c$' but were then unable to proceed much further. Some that did make progress forgot to write the final answer as an equation and wrote '4*x* – 2' on the answer line. Most errors were made in working out the gradient. The change in *y* was often incorrect and some used the difference in x as the numerator in the gradient calculation. A few candidates drew a right-angled triangle on the diagram which helped them to work out the change in *y* and the change in x. Candidates who gained one of the three marks usually did so for giving an answer of the form $y = mx - 2$, where m was incorrect. Some candidates identified the graph as quadratic.

1.2.16. Question 17

In part (i) just over two fifths of the candidates knew that $6^{\circ} = 1$. Common incorrect answers were 0 and 6. Candidates were slightly more successful in part (ii) where the most common incorrect answer was 32. Only the most able candidates gained any marks in part (iii). A common incorrect answer was $\frac{9}{4}$ as candidates understood the need to cube root and square but did not know how to deal with the negative power. Candidates who changed $\frac{27}{8}$ to either a mixed number or a decimal usually gained no marks.

1.2.17. Question 18

This question was not answered very well. Candidates who rearranged the given equation to get $x^2 - 4x - 12 = 0$ often went on to find both solutions, usually by factorising. Errors, though, were sometimes made with the signs in the brackets and some candidates wrote $(x-6)(x+2)$ on the answer line rather than the values of x. Those that attempted to solve $x^2 - 4x - 12 = 0$ by using the formula or by completing the square were generally much less successful. Many candidates attempted to solve the given equation using one of these three methods without first rearranging it. These attempts were almost always unsuccessful. Trial and improvement was used a great deal and frequently resulted in one mark for one of the solutions, most often $x = 6$. Many of the candidates who got no marks did so because they tried to solve the equation in the same way that they would solve a linear equation.

1.2.18. Question 19

Only a very small number of candidates were able to give fully correct solutions. Few used the alternate segment theorem. Those who got as far as angle $PTQ = 58°$ often did so by working with the isosceles triangle OPT and then using the angle at the centre and the angle at the circumference. Reasons were often incorrect or not given. Those who went down the longer route to find angle *PQT* usually failed to give all the necessary reasons. A minority of candidates used three letters to identify angles and even less could use the correct terminology for their reasoning. Many candidates had little idea how to approach this question and assumed incorrectly that angle $TPQ = 58°$ or thought that angle $QTB =$ angle *ATP* and just worked with the straight line.

2. STATISTICS

2.1. MARK RANGES AND AWARD OF GRADE

Unit/Component	Maximum Mark (Raw)	Mean Mark	Standard Deviation	% Contribution to Award
5381F/05	30	19.2	5.8	20
5381H/06	30	20.3	6.5	20
5382F/07	25	14.0	4.1	15
5382H/08	25	14.6	4.9	15
5383F/09	25	13.2	4.6	15
5383H/10	25	13.5	5.2	15
5384F/11F	60	30.6	12.1	25
5384F/12F	60	36.1	12.4	25
5384H/13H	60	32.8	10.7	25
5384H/14H	60	36.8	11.7	25

GCSE Mathematics Grade Boundaries for 2381- June 2010

The table below gives the lowest raw marks for the award of the stated uniform marks (UMS).

Unit 1 - 5381

	A*	A	B	C	D	E	F	G
UMS (max: 55)				48	40	32	24	16
Paper 5381F				24	20	16	12	8
UMS (max: 80)	72	64	56	48	40	36		
Paper 5381H	29	25	19	13	9	7		

Unit 2 Stage 1 - 5382

	A*	A	B	C	D	E	F	G
UMS (max: 41)				36	30	24	18	12
Paper 5382F				19	15	12	9	6
UMS (max: 60)	54	48	42	36	30	27		
Paper 5382H	23	19	14	10	9	8		

Unit 2 Stage 2 - 5383

	A*	A	B	C	D	E	F	G
UMS (max: 41)				36	30	24	18	12
Paper 5383F				18	15	12	9	6
UMS (max: 60)	54	48	42	36	30	27		
Paper 5383H	22	18	14	10	6	4		

Unit 3- 5384

	A*	A	B	C	D	E	F	G
5384F_11F				44	34	24	15	6
5384F_12F				50	40	30	20	10
5384H_13H	53	43	33	24	14	9		
5384H_14H	59	48	37	27	15	9		

	A*	A	B	C	D	E	F	G
UMS (max: 139)				120	100	80	60	40
5384F				94	74	54	35	16
UMS (max: 200)	180	160	140	120	100	90		
5384H	111	91	71	51	29	18		

UMS BOUNDARIES

Maximum Uniform mark	**A***	**A**	**B**	**C**	**D**	**E**	**F**	**G**
400	360	320	280	240	200	160	120	80

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