EXAMINATIONS COUNCIL OF ESWATINI

EGCSE

EXAMINATION REPORT

FOR

MATHEMATICS (6880)

YEAR

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EGCSE MATHEMATICS

Paper 6880/01

Non Calculator Structured Questions (Core and Extended)

General Comments

A majority of the candidates attempted all the questions. There was an improvement in terms of candidates showing working. There were very few cases where candidates simply wrote correct answers without showing any working as was the case in previous years.

Most questions were accessible to a majority of candidates as there were very few cases where candidates were leaving blank spaces. This year's paper seemed more accessible than the 2019 paper, even though seven candidates scored a zero compared to only one candidate who scored a zero in 2019. Forty candidates scored total marks whereas only sixteen candidates scored total marks in 2019.

Candidates should be encouraged to leave answers in their exact form instead of rounding to three significant figures as that results in the loss of marks.

Question 7 proved to be the easiest question as almost all the candidates were getting it correct. Other questions that presented less challenges were **Questions 19(a), 15(b) (i), 10(b) and 6(a).** Questions that proved to be challenging were **Questions 1(b), 9, 13, 16(b) (c) and 18(b).**

Comments on Specific Questions

Question 1

This question was accessible. Candidates were expected to round off a number to a specified degree of accuracy.

In **Question 1(a)** some candidates placed a zero at the end of resulting in 214.50. The correct response was 214.5.

Question 1(b) was not easily accessible. Candidates were expected to round off to the nearest 30.

Most candidates seemed to be clueless on what they were expected to do Question 1(b) resulting in them giving all sorts of answers and 230 being the most common. The correct answer was 210.

Question 2

This question was easily accessible. Candidates were required to evaluate the square root of a numerical expression.

Some candidates were writing ±10 or -10. The correct response was 10.

Question 3

This question was not easily accessible. Candidates were expected to express one quantity as a percentage of another.

Most candidates were finding 56% of 800mm resulting in $\frac{56}{100} \times 800$ = 448

The correct answer was 7%.

Question 4

This question was easily accessible. Candidates were required to solve a simple linear equation.

Most candidates failed to evaluate $\frac{54}{6}$. A reasonable number of candidates wrote 8 as an answer. The correct answer was 9.

Question 5

This question was not accessible. Candidates were expected to arrange numbers in order of size starting with the smallest.

Most candidates failed to express $\frac{-5}{4}$ as a decimal. Most of them wrote -0.125 resulting in a wrong arrangement. The correct answer was -10 $\frac{-5}{4}$ -1 $\frac{-4}{5}$ 2

Question 6

(a) This question was easily accessible. Candidates were required to find the value of a function given a value of *x.*

Some candidates left the answer as 10 – 7 or 3*x*. The correct answer was 3.

(b) This question was accessible. Candidates were expected to find the inverse of a function.

Some candidates left the expression in *y*. The correct answer was $\frac{x+7}{5}$.

Question 7

A majority of candidates performed very well in this question. Candidates were required to write the next two numbers in a sequence.

The correct answer was 15, 21.

Question 8

This question was not accessible. Candidates were expected to express a number in standard form.

Frequent incorrect responses were 4.51^{-4} and 4.51×10^{4}. The correct answer was 4.51×10^{-4}.

Question 9

(a) Most candidates performed very badly in this question. Candidates were required to solve a simple quadratic equation.

A majority of the candidates treated the expression on the left as a difference of two squares thus resulting in solutions +3 or -3. The correct answers were 0 or 9.

(b) This question was not well done. Candidates were required to solve an inequality.

Some candidates changed the inequality to an equation. Some failed to change the inequality sign after dividing by a negative resulting in the common wrong answer $p \le -2$. The correct answer was $p \ge -2$.

Question 10

(a) This question was easily accessible. Candidates were expected to multiply by a power of 10.

The correct answer was 3.75

(b) This question was well done. Candidates were expected to add decimals.

The correct answer was 0.8895

(c) This question was not easily accessible. Candidates were required to subtract simple fractions.

Some candidates had no idea on how fractions are subtracted. Quite a reasonable number of candidates subtracted the numerators to get the numerator and subtracted the denominators to get the denominator resulting in the answer $\frac{2}{2}$. The correct answer was $\frac{8}{35}$.

Question 11

This question was accessible. Candidates were required to change the subject of an equation.

Most candidates would do correct steps to the final correct answer and continue to divide resulting in their final wrong answer $2y + b$. The correct answer was $\frac{2y + ab}{a}$.

Question 12

This question was accessible. Candidates were expected to calculate the price after adding value added tax.

Some candidates would calculate the value added tax and leave it as an answer, 112. Others would calculate it and subtract from 800 resulting in the answer 688. The correct answer was 912.

Question 13

This question was not easily accessible. Candidates were required to divide fractions.

A majority of candidates divided the numerators to get the numerator and denominators to get the denominator resulting in the answer $\frac{3x^3}{y^{-1}}$ which they could not simplify further. The correct answer was $3x^3y$.

Question 14

(a) This question was well answered by a majority of the candidates. Candidates were expected to interpret a graph. However, some candidates used the wrong vertical scale resulting in the common wrong answer 159. The correct answer was 158.

(b) This question was not well done. Candidates were expected to read a scale accurately.
Most candidates failed to read accurately resulting in the common wrong answer 9. The correct answer was 8.6.

Question 15

(a) This question was answered well by a majority of candidates. They were required to name a solid. However, those who were not able to give the expected response gave incorrect responses such as rectangular pyramid, cube board, cube etc. The correct answer was cuboid.

(b) **(i)** A majority of the candidates performed well in this question. They were expected to find the area of a square. The correct answer was 16.

(ii) This question was not accessible. Candidates were required to calculate the total surface area of a cuboid.
Most candidates treated this solid as a cube and multiplied 16 by 6 resulting in 96. Other common wrong answers were 80 from finding the volume instead of area. The correct answer was 112.

(iii) This question was accessible. Candidates were expected to calculate the volume of a cuboid.

Some candidates multiplied $4 \times 5 \times 5$ resulting in the answer 100. Another common wrong response was 64 from finding the volume of a cube. The correct answer was 80.

Question 16

(a) A majority of candidates performed well in this question. Candidates were required to express a sector as a fraction of a circle. However, some candidates did not simplify the answer to the expected form of $\frac{1}{6}$.

(b) This question was not easily accessible. Candidates were expected to calculate the length of an arc.

A majority of the candidates used the formula for the area of a sector. Some candidates who used the correct formula rounded off their answer to three significant figures resulting in the common wrong answer 31.4. The correct answer was 31.42.

(c) This question was not easily accessible. Candidates were required to calculate the perimeter of a sector.

The correct answer was 43.42.

Question 17

(a) **(i)** This question was accessible. Candidates were required to find the probability of one event or another.

Some candidates simplified the fraction and in most instances they were not successful. Some candidates just left their answers as $\frac{5}{60} \, or \, \frac{15}{60}$. The correct response was $\frac{20}{60}$.

(ii) This question was easily accessible. Candidates were expected to find the probability of an event.

The correct answer was $\frac{52}{60}$.

(b) A majority of candidates performed well in this question. Candidates were expected to calculate a sector angle.

Some candidate multiplied by 100% instead of 360˚. The correct answer was 72˚.

Question 18

(a) This question was accessible. Candidates were expected to describe a transformation.

The correct answer was Translation of vector $\begin{pmatrix} -5 \\ -3 \end{pmatrix}$. Those who were not able to give the expected response gave the incorrect response translocation, which was very common.

(b) This question was not well done. Candidates were required to enlarge a triangle.

Most candidates transformed correctly without labels. The correct answer was a triangle with vertices P(3,3), Q(9,3), R(6,12).

Question 19

(a) A majority of candidates performed well in this question. Candidates were expected to construct a triangle given three sides.

Some candidate interchanged YZ and XZ while others constructed correctly and then erased the arcs.

(b) Most candidates were not able to answer this question correctly. Candidates were expected to measure an acute angle.

A majority of the candidates could not use a protractor properly and this resulted in them giving the common wrong answer 84˚. The correct answer was 96˚.

EGCSE MATHEMATICS

Paper 6880/02

Calculator Structured Questions (Core and Extended)

General Comments

The paper provided a wide range of syllabus objectives. It also included syllabus objectives that allowed candidates to prove how much they understand some of the concepts. There were also 'show' questions, which proved to be a challenge to most candidates.

Some candidates gave good responses, showing that they were well prepared for the examination. However, there were also a number of candidates who were unable to tackle the assessment objectives, perhaps due to insufficient revision.

The standard of presentation was generally well done by most of the candidates. There was also an improvement in providing workings for most of the questions, before writing down the answers. There were a few instances whereby some candidates did not provide any working but still produced correct answers. This led to the loss of both method and accuracy marks. Teachers are advised to encourage candidates to show all necessary working clearly, as well as use a suitable level of accuracy. There were a number of cases where candidates displayed premature rounding off, which resulted in them losing the accuracy marks.

It was also noted that the number of candidates with premature rounding off increased, and a number of them were writing their answers to 2 significant figures instead of the 3 significant figures, as stated in the instructions. This led to them losing a number of accuracy marks.
Some candidates also had challenges in dealing with negative numbers, even though they had calculators.

Questions that presented the least difficulty were **Question 1(a), Question 4(a), Question 7(a), Question 8(a), Question 10(a)** and **(c), Question 11(a),** and **Question 13(a)(ii).**
Those that proved to be the most challenging were **Question 3, Question 5(b) and (c), Question 6, Question 8(c), Question 9(b), Question 11(b),** and **Question 13(b).**
Candidates were able to attempt all questions, indicating that the time allocated to this component is enough. Some candidates however missed **Question 13(b)** because it was at

the back of the question paper. They wrongly assumed that **Question 13(a)** was the last question.

Comments on Specific Questions

Question 1

(a) *You are given that* $\mathbf{W} = \begin{pmatrix} -5 & 2 & 1 \\ 3 & -4 & 7 \end{pmatrix}$.

(i) *State the order of matrix **W**.*

(ii) *Work out −2**W.***

(i) This part of the question was well done by most candidates. It proved to be one of the easiest questions.

Common wrong answers: 3 × 2, 2 rows and 3 columns, (2,3).

Correct Answer: 2 by 3

(ii) This part was well done by most candidates.

A few candidates multiplied the matrix by 2 instead of −2.

Some candidates got −4 instead of −14 when they multiplied 7 by −2.

Common wrong answers: $\begin{pmatrix} 10 & -4 & -2 \\ -6 & 8 & -4 \end{pmatrix}$, $\begin{pmatrix} -10 & 4 & 2 \\ 6 & -8 & 14 \end{pmatrix}$

Correct Answer: $\begin{pmatrix} 10 & -4 & -2 \\ -6 & 8 & -14 \end{pmatrix}$

(b) You are given that **A** = $\begin{pmatrix} 3 & -2 \\ 1 & q \end{pmatrix}$, **B** = $\begin{pmatrix} 2 & m \\ 3 & 5 \end{pmatrix}$ and **C** = $\begin{pmatrix} 4 & -2 \\ -1 & -11 \end{pmatrix}$.

Find the value of m and the value of q, given that 2**A** – **B** = **C**.

This question was well answered by most candidates. Some candidates did not do the matrix additions to come up with the equations to solve and find the value of the value of the variables, instead, they solved by trial, which seemed to be a common method to such questions.

Common wrong answers: q = −8 or q = −6, m = 2

Correct Answer: q = −3 and m = −2

Question 2

Show that

(a) $4\frac{1}{3} - 2\frac{3}{5} = 1\frac{11}{15}$

(b) 2.35 + 4.2 × 1.07 – (3.02 + 0.173) = 3.651

This question was fairly done by some candidates. A number of candidates showed that they are lacking in the concepts of how to answer 'show' questions. Candidates tried to explain in words all the steps that were supposed to be shown mathematically. This led to them losing some marks, because some sentences did not make mathematical sense.

(a) Common wrong answer: $4\frac{1}{3} - 2\frac{3}{5} = 1\frac{11}{15}$

$$\frac{13}{3} - \frac{13}{5} = \frac{26}{15}$$

$$65 - 39 = 26$$

26 = 26.

Correct Answer: $4\frac{1}{3} - 2\frac{3}{5} = \frac{13}{3} - \frac{13}{5} = \frac{65-39}{15} = \frac{26}{15} = 1\frac{11}{15}$

(b) Common wrong answer: Candidates were not following the BODMAS rule correctly, except for working out brackets first.

2.35 + 4.2 ×1.07 – (3.02 + 0.173) = 6.55 × 1.07 – 3.193 = 7.0085 – 3.193

Correct Answer: 2.35 + 4.494 – 3.193 = 6.844 – 3.193 = 3.651.

Question 3

You are given that $a = 2.7 \times 10^4$, $b = 7.5 \times 10^5$ and $c = 6.3 \times 10^6$.

Evaluate the expression, giving your answer in standard form, $\frac{a+b}{c}$.

This question was poorly done by most candidates, even though they had calculators to use. Those that were able to use the calculator were not able to write the answer in standard form. They transferred the answer from the calculator wrongly by using the wrong index of 10, this led to them losing marks.

Common wrong answers: 1.23×10^{11}, 1.2×10^{-1}

Other candidates just collected like terms and simplified, leading to a wrong answer.

$$\frac{2.7+7.5}{6.3}\times\frac{10^4\times10^5}{10^6}=1.619\times\frac{10^9}{10^6}=1.619\times10^3$$

Correct Answer: 1.23×10^{-1}

Question 4

Candidates were given a line segment, vector (v), on a grid.

(a) Write down v as a column vector.

(b) Calculate the length of v.

(a) This part of the question was well done by most candidates. There were a few candidates which were moving in the opposite direction, or else, using the wrong sign for a direction.

Common wrong answer: $\begin{pmatrix}6\\-4\end{pmatrix}$, $\begin{pmatrix}4\\-6\end{pmatrix}$, $\begin{pmatrix}-4\\6\end{pmatrix}$

Correct Answer: $\begin{pmatrix}-6\\4\end{pmatrix}$

(b) Most candidates showed lack of knowledge on how to find the length of a vector.

Others even attempted to count the squares, or even, measuring with a ruler. Some did not even attempt to answer the question. Those who used the correct formula gave their answer to 2 significant figures, thus losing the accuracy mark.

Common wrong answers: 7, 7.2

Correct Answer: 7.21

Question 5

(a) Factorise $x^2 - 81$.

This question was well done by most candidates. Some decided to change it to a quadratic equation and solve for the x.

Common wrong answers: $x-9$, $(x-9)^2$, $(x-81)(x+81)$, $x(x+9)(x-9)$.

Correct Answer: $(x-9)(x+9)$

(b) You are given the equation $(2x-y)(m-5) = m(x-1)$.

Find the value of m when x = 4 and y = −2.

This question proved to be a challenge to most candidates. They had a challenge in substituting the −2 into the y that already had a negative sign in front. Most candidates ended up substituting a 2 instead of −2, for the y. They came up with expressions like

(2(4) −2)(m −5) = m(4 − 1), (2(4)−(-2)(m – 5) = 4m – 1.

A few candidates decided to open up the brackets first, and tried to make m the subject. They had a challenge in doing that because of the negative signs inside the brackets, and they ended up with a wrong expression of m, leading to a wrong answer, even after substituting correctly in their expressions.

Common wrong answer: m = 10

Correct Answer: $m = \frac{50}{7}$

(c) The function $h(x) = 2x - 1$.

Solve for x when h(x) =5.

This part of the question was poorly done. Most candidates found h (5) instead of h(x) =5.

Common wrong answer: x = 9

Correct Answer: x = 3

Question 6

Candidates were given a diagram with a pair of parallel lines, and three transversals. Some angles were marked with small letters. They were asked to state the type of each pair of angles given.

This question was poorly done by most candidates. They were not able to name the pair of angles correctly. Some were not using the mathematical terms, instead, they used their properties. Some even used the sizes of the angles, giving acute, obtuse, etc. A few that knew the answers came up with the wrong spellings,

(a) **Common wrong answer:** Z-angles, Alternative angles
Correct Answer: Alternate

(b) **Common wrong answer:** supplementary angles, U-angles
Correct Answer: Co-interior

(c) **Common wrong answer:** F-angles
Correct Answer: Corresponding

(d) **Common wrong answer:** Opposite angles, X-angles
Correct Answer: Vertically opposite / Directly opposite

Question 7

Candidates were given a diagram of regular eight sided polygon.
This question was generally well answered by most candidates.

(a) Write the name of this polygon.
Well answered. Candidates came up different spellings.
Correct Answer: Octagon

(b) State the order of rotational symmetry of the polygon.

his part was fairly answered. Some candidates were stating the number of lines of symmetry.

Common wrong answer: 4

Correct Answer: 8

(c) **(i)** Calculate the sum of the interior angles of the polygon.

This part proved to be a challenge to most candidates. They used the wrong formula for finding the sum of the interior angles.

Common wrong workings: 8 × 180, 6 × 360, $\frac{6 \times 180}{8}$

Common wrong answers: 1440, 2160, 135

Correct answer: 1080

(ii) Calculate the size of each exterior angle of the polygon.

This part was fairly done by most learners. A few candidates gave the interior angle.

Common wrong answer: 135

Correct Answer: 45

Question 8

E = {5,6,7,8,9,10,11,12}

A = {5,6,7}

B = {5,6,8,9}

(a) Represent these sets in a Venn diagram.

This part of the question proved to be very easy for the candidates. Most of them were able to fill in the Venn diagram correctly. A few candidates repeated the common elements, instead of writing them once.

(b) List the elements of,

(i) $(A \cup B)'$

This part was generally well answered.

Correct Answer: {10,11,12}

(ii) $A \cap B'$

This part was fairly done. A few candidates could not locate the region, hence they gave wrong answers.

Correct Answer: {7}

(c) Find $n(A')$.

This part of the question was poorly done by most candidates. They assumed they were still supposed to list, yet they had to give the number of elements in the set. Other candidates listed the number of elements, then added them together to find the number of elements.

Common wrong answers: {8,9,10,11,12}, 8 +9 +10 +11 +12 = 50

Correct Answer: 5

9 **(a)** Solve for x in the following equations.

(i) $\frac{x+2}{2} - \frac{7x+2}{3} = 4$

This question was a challenge to most candidates, because of the negative sign in between the two terms. They were able to show the intention to multiply by the lowest common multiple in order to remove the fraction. They had a challenge when opening the brackets, leading to a wrong expression, which also led to a wrong answer.

Common wrong working: $3(x+2) - 2(7x+2) = 24$

$$3x + 6 - 14x + 4 = 24$$

$$-11x = 14$$

Common wrong answers: 2 and $-\frac{14}{11}$

Correct Answer: −2

(ii) $x^2 - 2x - 24 = 0$

This question was generally well answered by most candidates. They used either factorisation or the quadratic formula. The quadratic formula was the popular method, though some candidates wrote it wrongly, others had a short division line. This led to wrong answers.

Common wrong workings: $\frac{-2\pm\sqrt{100}}{2}$, $\frac{2\pm\sqrt{-96}}{2}$, $2\pm\frac{\sqrt{100}}{2}$, $2\pm\sqrt{\frac{100}{2}}$

Common wrong answers: −6 and 4

Correct Answer: 6 and −4

(b) Solve the equations simultaneously.

$2x - y = 5$

$x + 2y = -5$

This question proved to be a challenge to most candidates. This was as a results of the combination of negative terms and positive terms in the equations.

Candidates were able to balance the terms, for elimination. The challenge was when they had to either add or subtract the two equations. Some attempted substitution, and they encountered the same challenge of opening brackets with a negative number. They got a variety of answers.

Correct Answer: x = 1 and y = −3

Question 10

Candidates were given a distribution of a number of goals scored by each of 30 teams on a weekend.

(a) An incomplete frequency table was given to candidates, with variables p and q.

Find the values of p and q.

This part of the question was well done by most candidates.

Correct Answers: p = 7, q = 4

(b) Find the number of teams which scored at least 2 goals.

This part was a challenge to most candidates. The term ‘at least’ was a big challenge, they were not able to figure out which direction of 2 they should count from. They ended up counting from any direction. Some decided just to stick with the 2 goals.

Common wrong answers: 8, 20, $\frac{18}{30}$

Correct Answer: 18

(c) State the number of modal goals scored.

This was generally well answered by most candidates. A few candidates gave the highest frequency, instead of the number with the highest frequency.

Common wrong answer: 8

Correct Answer: 2

(d) Find the median.

This part was fairly done. Some candidates gave the median position. Other candidates gave the median of the frequencies.

Common wrong answers: 15.5, 8, 4.5

Correct Answer: 2

(e) Calculate the mean number of goals scored.

This part was fairly answered. A few learners multiplied 0 and 5 to get 5, which led to a wrong numerator of 66 instead of 61. Other candidates divided by 6 instead of total frequency, which was 30. Others decided to round off the answer to 2 goals goals because 2.03 goals is not realistic.

Correct Answer: 2.03

(f) A team is chosen at random.

Find the probability that the team scored

(i) 2 goals or fewer.

This was generally well answered. A few candidates did not count 0 as fewer goals.

Common wrong Answer: $\frac{15}{30}$

Correct Answer: $\frac{20}{30}$

(ii) At least 4 goals.

Generally well answered.

Common wrong answers: $\frac{4}{30}$

Correct Answer: $\frac{6}{30}$

Question 11

A piece of cheese is to be cut from a cylindrical block of cheese with centre O, radius 5cm and length 20cm.

The piece has a uniform cross section

The cross section is sector AOB

The sector angle is 40°

A diagram of the cylindrical block was given.

(a) Calculate the number of identical pieces that can be cut from the complete cylindrical cheese.

This question was well done by most candidates. There were candidates that used the diagram to divide the circular end into four equal parts.

Common wrong answers: 4, infinity

Correct answer: 9

(b) Calculate

(i) the area of sector AOB

This question was fairly done by most candidates. Some candidates calculated the area of the circular end of the cylinder instead of the cross section of the piece of cheese. A few candidates used the wrong formula for the area of a circle.

Common wrong answers: 78.5, 87.3, 785

Correct answer: 8.73

(ii) the total surface area of each piece of cheese.

This question was poorly done by most candidates. Most candidates were not able to find the area of the curved part and some missed the area of the rectangles.

Other candidates found the surface area of the cylinder

Common wrong answers: 87.2

Correct answer: 287.3

(iii) the volume of each piece of cheese.

This part of the question was fairly done. Some candidates found the volume of the cylinder.

Common wrong answer: 1570

Correct answer: 175

Question 12

A straight line passes through the points A (2,2) and B (3,5)

(a) Find the gradient of line AB.

This question was fairly done by most candidates. A few mixed up the formula for the gradient by using $\frac{x_2 - x_1}{y_2 - y_1}$.

Common wrong answer: $\frac{1}{3}$

Correct answer: 3

(b) Find the equation of the line AB.

This part of the question was poorly done. Most candidates were not able to find the equation of the line. They did not show knowledge of how to use y = mx + c, in order to find the equation. Candidates that had an idea were unable to find the correct value of the y-intercept.

Correct answer: $y = 3x - 4$

(c) Write down the equation of the line parallel to the line AB passing through point (0, −3).

This part of the question was poorly done. Some candidates used properties of perpendicular lines and some did not know what to do with the coordinate.

Correct answer: $y = 3x - 3$

Question 13

(a) There are three towns A, B, C

Town A is 20km away from town B

The bearing of town B from town A is 120°

Town C is also 20km away from town B on a bearing of 220°

This question was fairly done by most candidates. They showed improvement in dealing with questions on bearings. They were able to draw the scales as well as interpret correctly the information.

(i) Use a scale of 1cm to 4km to show the positions of the three towns.

This part of the question was fairly well done. Most candidates were able to show the positions of the three towns using the given scale. A few of them measured the bearing anticlockwise getting a reflection of the correct diagram. A few had a challenge drawing the north pole at B and measuring the 220° angle,

(ii) Measure the length AC in cm

This part of the question was well done.

Common wrong answer: 9.8cm to 10cm

Correct answer: 6.2cm to 6.6cm

(iii) Find the actual distance between town A and town C.

This part of the question was well done. Candidates were able to multiply their answer from part (ii) by 4. There were a few who added distance AB and BC to get 40km. Other candidates used Pythagoras rule to find AC

Common wrong answers: 40km, 28.3km

Correct answer: 24.8km to 26.4km

(iv) Measure the bearing of town C from town A.

This part of the question was poorly done. Candidates could not identify the angle to be measured. Those that could do so measured it in the anticlockwise direction.

Correct answer: 169° to 172°

(b) Town G is due South-West of Town H.

Find the bearing of Town H from Town G.

This part of the question was poorly done by most candidates. They could not identify the bearing of Town H from G, instead they identified the position of G from H.

Common wrong answers: 135°, 225°, 315°

Correct answer: 045°

EGCSE MATHEMATICS

Paper 6880/03

Calculator Structured Questions (Extended)

General Comments

The paper was a typical extended mathematics paper. The depth of question was similar to previous years. As much as there were challenging questions, the language used was rather straight forward.

There was more emphasis on concepts of mathematics rather than on language interpretations. What made a question difficult was not the way it was asked but rather the mathematics content it required.

In Question 7 the language was simple but the responses showed that the question was difficult. A great improvement was observed in the use of completing the square when solving quadratic equations.

General usage of words and their meanings in science sometimes conflict. In the general, acceleration only refers to an increase in velocity. This then means acceleration is always positive. If one comes out with a negative answer for acceleration, the negative sign is just ignored.

Comments on Specific Questions

Question 1

(a) This question was not done well as expected. For extended syllabus learners reversed percentages should be easy.

Common errors.

Increasing E102 000 by 12%: 1.12 × 102 000 = E114 240.

Working out the equivalent of 88% but not adding the answer to E102 000.

12: 102 000

88 :x

$12x$ = 102 000 × 88

x = 748 000

(b) It was still common for candidates to treat compound interest as simple interest. Some candidates only calculated the interest and not the total amount.

Common errors:

Calculating the total amount using simple interest:

3 × 0.09 × 600 000 + 600 000 = 762 000.

Calculating simple interest only: 3 × 0.09 × 600 000 = 162 000.

Calculating repeated percentage reductions on

E600 000: 600 000 × 0.91^3 = 452142.60.

Using 1.9 instead of 1.09 in the compound interest formula:

600 000 × 1.9^3 = 3 465 600.

Leaving out the decimal point in the answer: 77 710 740 or 7 771 074

Answers **(a)** E850000, **(b)** E 777 017.40

Question 2

(a) This part was not well attempted. There were many errors. There was also a lot of taking the longer route to the answer. They would try to obtain an algebraic expression of fg(x) before substituting -1.

A much shorter route was to find g (-1) to get answer 1 and then finding f(1) to get -5.

Common errors:

Taking the composite function as a product of the two functions and not a fuction of a function: fg(x) =($4x^2$ – 9)(2x + 3).

Substituting -1 into each function and finding the product of the answers:

f(-1) = $4(-1)^2$ – 9 = -5, g(-1) = 2(-1) +3 = 1 and then -5 × 1 =-5

Adding f(-1) and g(-1): -5 +1 = -4.

(b) **(i)** In this part some candidates were confusing gf(x) with gf(x).

Common erros:

Finding fg(x) instead of gf(x): $4(2x+3)^2 - 9$.

Simplifying gf(x) wrongly: gf(x) = $2(4x^2 - 9) + 3 = 8x^2 - 18 + 3 = 8x^2 - 21$.

Substititing -1 for x into their various expressions.

(ii) Many candidates were getting this part wrong. Some were getting the correct answer the wrong way.

Common errors: $\frac{4x^2-9}{2x+3}$ simplified as if it was $\frac{4x^2}{2x} - \frac{9}{3} = 2x - 3$

(c) Most candidates were able equate the two functions but had problems simplifying.

Common errors

Failing to collect like terms correctly: $4x^2 - 2x - 6 = 0$ was common.

Not completing the square correctly.

Dividing by a term containing the unknown thus losing one solution:

$4x^2 - 9 = 2x + 3$ factorising to get

$(2x + 3)(2x - 3) = 2x + 3$ dividing both sides by $2x + 3$ to remain with

$2x - 3 = 1$

$x = 2$ losing the solution $x = -1\frac{1}{3}$

Only dividing the discriminant by 2a in the quadratic formula: $2 \pm \frac{\sqrt{196}}{8}$

Answers **(a)** -5, **(b)(i)** $8x^2 - 15$, **(ii)** $2x - 3$, **(c)** $x = \frac{-3}{2}$ or $x = 2$

Question 3

This question was well attempted. There were, however, candidates who took the numbers in the venn diagram as elements of the sets rather number of elements.

(a) Some candidates did not realise that in the 9 women who had used both Q and R, the 4 that used all three is included.

Common error:

$d = 9$ from 9 women had used both Q and R

$e = 8$ from 8 women had used both P and R

$f = 20$ from 20 women had used R

(b) **(i)** Some candidates took the 6 outside the union of the 3 sets to be an alement and not the number of elements.

Common error:

1

{ 6 }

(ii) Again some candidates looked at the numbers as elements of the sets.

Common errors:

Listing 15, 8 and 5

Counting 15, 8, and 5 to get 3

(i) In this part there was also a lot of misinterpretations.

Common errors:

Finding the probability of those that had used Q only among all those that had used Q: $\frac{15}{32}$

Finding the probabilty of those that had used Q as a fraction of the whole survey: $\frac{32}{54}$

(ii) A good number of candidates failed to notice that this was a conditional probability question and that there were two ways in which the choice could be made.

Common errors:

Not realising that this a conditional probability: $\frac{15}{54}\times\frac{6}{54}$

Finding only the probability that the first one had used Q and the second had used none

$\frac{15}{54}\times\frac{6}{53}$ only and not $\frac{15}{54}\times\frac{6}{53}+\frac{6}{54}\times\frac{15}{53}$

Answers **(a)** d = 5, e = 4, f = 7, **(b)(i)**6, **(ii)** 28 **(c)(i)** $\frac{23}{54}$ **(ii)** $\frac{10}{159}$

Question 4

(a) There were quite a number of correct responses to this part.

Common error:

Factoring out -7 from -14 wrongly: $x(y + 2)$ $-7(y - 2)$

(b) Generally candidates know the contents of the quadratic formula but still have problems using it. There was also quite a number of candidates who completed the square correctly and accurately.

Common errors:

Evaluating the discriminant wrongly: $\frac{-2\pm\sqrt{2^2-4\times3\times-7}}{2\times3}$ as $\frac{-2\pm\sqrt{4-84}}{6}=\frac{-2+\sqrt{80}}{6}$

Dividing only the discriminant by 2*a*: $\frac{-2\pm\sqrt{2^2-4\times3\times-7}}{2\times3}$ as $-2\pm\frac{\sqrt{88}}{6}$

Not completing the square correctly

Trying to factorise.

Answers **(a)** (y + 2)(x – 7) **(b)** -1.90 or 1.23

This was the most poorly attempted question.

Question 5

(a) **(i)** The ratio $\overrightarrow{OA}:\overrightarrow{AD}$ = 1 : 2, was often interpretted wrongly.

Common errors:

Taking AD and OA to be equal: -4**b** + 8**a**

- Taking 4**a** to be $\overrightarrow{OD}$: -4**b** + $\frac{8}{3}$**a**
- Finding $\overrightarrow{DB}$ instead of $\overrightarrow{BD}$: 4**b** – 12**a**
- Writting in column vector form: $\begin{pmatrix}12a\\-4b\end{pmatrix}$

(ii) $\overrightarrow{AZ}$ could be found taking the route $\overrightarrow{AO}+\overrightarrow{OB}+\overrightarrow{BZ}$ = -4**a** + 4**b** + $\frac{1}{4}$ (12**a** – 4**b**).

The other route could be $\overrightarrow{AD}+\overrightarrow{DZ}$ = 8**a** $\frac{-3}{4}$(12**a** – 4**b**)

Common errors:

$\frac{1}{3}$ (12**a** – 4**b**) instead of $\frac{1}{4}$ (12*a* – 4**b**)

$\frac{3}{4}$ (12**a** – 4**b**) instead of $\frac{-3}{4}$ (12**a** – 4**b**)

(b) This was the worst part of the paper in terms of responses.

Common errors:

No attempt at all

Writting a lot of vectors in terms of a and B without reference to $\overrightarrow{AZ}$ or $\overrightarrow{ZY}$ or $\overrightarrow{AY}$

Working out correctly but not making the conclusion.

Answers **(a)(i)** 12**a** – 4**b** **(ii)** 3**b** – **a** **(b)** stating of two of vectors AY, AZ or ZY and concluding either $\overrightarrow{AY}$ = 4$\overrightarrow{AZ}$ or $\overrightarrow{ZY}$ = 3$\overrightarrow{AZ}$ or $\overrightarrow{AY}$ = $\frac{4}{3}\overrightarrow{ZY}$

Question 6

In general, this question was very well tackled.

(a) The sine formula was used correctly in general. Many candidates, however, only ended with the answer for the acute angle. It would seem that candidates were using different makes of calculators thus getting different answers. To evaluate $\sin^{-1}\left(\frac{125\sin 25}{61}\right)$, the common make of calculator, the sharp D.A.L. gives the correct answer for punching in the following sequence punching $\sin^{-1}$then (then 125 then sin25 then / then 61 then) then =

The answer would be 59.9999..

It seems that some calculators are very strict with the order of operations.

When the above sequence is followed, some calculators evaluated $125\sin\left(\frac{25}{61}\right)$ giving the answer 63.4.

(b) The cosine formula was well attempted.

Common errors:

Simplifying 6746 – 6710cos115 as (6746-6710) cos115 to get 36 cos115

AD = -2.535

Positive value for cos115 thus getting 6746 – 6710cos115 = 6746 – 2835.768 = 3910.2315.

AD = 62.5

Use of the Pythagoras rule to get $AD^2 = 61^2 + 55^2$

AD = 82.134

Sine instead of Cosine to get 6746 -6710sin115

AD = 25.78

(c) There were also many correct responses to this part.

Common errors:

Taking triangle ABD as right angled to get Area = $\frac{1}{2}\times 61\times 55$

Area = 1667.5

Use of 97.9 in place of 61 to get $\frac{1}{2}\times 97.9\times 55\sin 115$

Area = 2440

Answers **(a)** 120° , **(b)** 97.9 (c) 1520

Question 7

This question was one of most poorly attempted questions.

(a) The candidates were expected to write the inequality $60x + 80y \le 24000$.

Common errors:

Writing an equation instead of inequality.

$60x + 80y = 24000$

Substituting x = 60 and y = 80 in $3x + 4y \le 1200$

$3\times 60 + 4\times 80 \le 24000$

(b) Many candidates still have problems reducing word statements into symbolic statements.

Common errors:

$x \ge 50$ and $x \ge y$

(c) The region was made wrong by wrong responses to **(b)**.

Common errors:

Solid line for x > y

Region $x \ge 50$ resulting in the wrong wanted region.

Correct lines but choosing the wrong region.

(d) The correct answer came out even when the region was wrong. They worked out the answer algebraically. Keeping *x* constant at 200, the three inequalities reduce to $y \ge 50$, 200 >y and $y \le 150$,the one equation that refers to a maximum value the last one hence the answer 150.

Answers **(a)** $60x + 80y \leq 24000$,

(b) $y \geq 50$ and x > y

(c) Solid line through (0,50) and (400,50)

Solid line through (0,300) and (400,0)

Broken line through (0,0) and (300,300)

Region enclosed by these lines only

(d) 150

Question 8

This question was fairly well attempted

(a) Some candidates were finding the median value instead of finding the modal interval.

Common error:

6

(b) There were a few errors in this part

Common errors:

Multiplying the upper bounds by the frequency.

Dividing 200 by 8, the number of intervals.

(c) As much as there were a number of wrong responses there seemed to be no common mistakes.

(d) Many candidates were able to construct cumulative frequency diagram correctly.

Common errors:

Using ruled lines instead of free hand.

Plotting the cumulative frequency against interval mid-values.

Getting the first point wrong often (1.00,6).

(i) The candidates were aware that they had to match a cumulative frequency value with an amount of money.

Common error:

Not finding 20% of 200 but taking the 20 to be the actual 20th percentile to get answer 3.

(ii) Some candidates, though having a good idea of interquartile range, made a number of errors.

Common errors:

Finding the UQ position,150, and the LQ position,50, correctly but subtracting to get 100. They would then match 100 with an amount of money. This landed them on the median.

***Answers*:** **(a)** $7.50 \le x < 9.00$,

(b) 6.60

(c) 116 and 176

(d) ploting cumulative frequency against upper bounds and joining them with a smooth curve.

(e) **(i)** number from 4.2 to 4.6

(ii) number from 2.8 to 3.4

Question 9

(a) **(i)** This part was very well done. Though not common, there was some mixing up of coordinates, plotting (-6, -2) as (-2, -6) and (-2, -4) as (-4, -2)

(ii) Almost all candidates noticed that the transformation was an enlargement.

Common errors:

Scale factor 2 instead of -2

Rotation and enlargement instead of a single enlargement with a negative scale factor.

(iii) This part depended on the description in part (ii).

(b) Reflecting in slanting lines is still a problem with many candidates.

Common errors:

Reflecting in x-axis or y-axis.

The line from (1,3) to (2,1) just touching triangle E but no reaching (2,1).

(c) **(i)** There was a wide range of responses in this part.

Common error:

Some candidates were drawing a triangle in the working space on page 13 instead of drawing on the grid.

(ii) Many candidates drew triangle H correctly.

Common error:

After getting the correct image many candidates did not match corresponding points in order to determine the transformation. They instead looked at the overall figure and came out with the answer; reflection in x = 3.

Answers **(a)** **(i)** triangle with points (-2,-2), (-6,-2) and (-2,-4)

(ii) enlargement, centre (0,0) SF -2,

(iii) -2

(b) triangle (1,1), (1,3) and (2,1)

(c) **(i)** triangle (3,1), (5,1) and (5,2)

(ii) shear, x-axis invariant, scale factor 2

Question 10

Generally, this question was well answered. The usage of the words acceleration and deceleration has to be made very clear to learners. Acceleration refers to both an increase and a decrease in velocity or speed. Deceleration, however, only refers to the decrease in speed. It would seem that a number of candidates understand that acceleration is always an increase hence always positive. All decrease in speed is deceleration.

(a) Some candidates had problems with the last part of the journey. They managed to get the first two parts correct. These parts were a straight line from (0,0) to (10,20) and straight line from (10,20) to (20,20).

Common errors:

To some candidates, coming to rest meant there was no change in speed.

The line from (20,20) went to (25,20)

For some candidates, acceleration always means an increase in velocity, speed in our case.

The line from (20,20) went to (25,24) the upper end of the graph.

There were also candidates who ended their journey at (28,0), the lower end of the graph paper.

(b) Some candidates were not accurate when drawing their straight lines. This made them to get wrong answers to this part of the question.

(c) Almost all candidates knew that the product of speed and time gives the distance. This is true only when the speed is constant. In this case the area under the graph would give a more accurate answer.

Common error:

Distance = highest speed reached × total journey time = 25 × 20 = 500

(d) Again a number of candidates were not working out their answers from the graph but used their knowledge of acceleration as change in velocity divided by the time taken.

Common errors:

$\frac{20}{25}$ 20 being the speed reached and 25 the total time taken.

$\frac{20}{5}$ not realising that the change in speed is negative.

Correctly working out and getting the -4 but stating 4 as the answer.

Answers **(a)** straight lines from (0,0) to (10.,20) to (20,20) to (25,0)

(b) 6

(c) 350

(d) -4

Question 11

(a) This was also one of the poorly attempted questions. Candidates were expected to square both sides of the equation first.

Common errors:

Getting $3p^2$ on the left after squaring both sides resulting in $\sqrt{\frac{r}{2}}$

Introducing the square root sign on the right hand side and then squaring both sides to get

$p^2 + r = 3p$

Not fully simplifying the answer thus getting $\sqrt{\frac{-r}{-8}}$ or $\sqrt{\frac{r}{9-1}}$

(b) There was a lot of guesswork in this part. It seemed the candidates took the 3 in the 2by2 matrix as the x and 2 as the y value. They would then prove equality.

$$\begin{pmatrix} 3 & 2 \\ 4 & -1 \end{pmatrix}\begin{pmatrix} 3 \\ 2 \end{pmatrix} = \begin{pmatrix} 13 \\ 10 \end{pmatrix}$$

There was also a lot of post multiplying: $\begin{pmatrix} 13 \\ 10 \end{pmatrix}\begin{pmatrix} -1 & -2 \\ -4 & 3 \end{pmatrix}$

(c) **(i)** Many candidates worked out the value of k, 7, correctly but wrote their final answer as $P = kr^3$.

(ii) Some candidates used wrong methods to get the answer 5.

Answers **(a)** $p = \pm\sqrt{\frac{r}{8}}$ **(b)** $x = 3$ and $y = 2$ **(c) (i)** $p = 7r^3$ **(ii)** 5