EXAMINATIONS COUNCIL OF ESWATINI

Eswatini General Certificate of Secondary Education

Mathematics (6880)

Examination Report for 2023

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EGCSE MATHEMATICS

Paper 6880/01

Non-Calculator Structured Questions (Core and Extended)

General Comments

The overall performance for this paper was poor (below average) than last year's performance (2022). There was only one candidate who got a mark above 50, and very few candidates got above 40 marks. Most of the candidates were clustered between 10-29 marks and nine candidates got a zero mark. There was a lot of questions that were left un- answered this year.

Questions which proved to be easier were:**10, 13, 16(a), 17(c), 19(a), 21(a)** and those which proved to be difficult were;**4(a), 5, 6, 8, 9, 12(b), 14, 15(b), 16(b), 17(a), 18, 19(c), 20(a), 21(b).**

Comments on specific questions

Question 1

Use the diagram to list the members of

(a) $P \cap Q$
(b) $P \cup Q$

Candidates confused U and ∩, as a result their answers were correct but in wrong answer spaces. It was fairly done.

Common wrong answers: **(a)** {1, 2, 3 } and {1, 3, 4, 6}

(b) {6}, {1, 4, 3 } and { 1, 3, 4, 6, 8, 9 }

Answer: **(a)** {6}

(b) {1, 3, 4, 6, 8, 9 }

Question 2

Evaluate $2^2 \times 3^2$.

Candidates did not understand the word **evaluate**.

Common wrong answers: 6^4, 6^2, $2\times2\times2\times3\times3$

Answer: 36

Question 3

Learners were given a number in words and asked to numerical form.
Seven hundred thousand, two hundred and thirty.
This question was fairly done. Some candidates use a comma to separate thousands.
Common wrong answers: 7000230, 700020030, 7000+200+30

Answer: 700230

Question 4

Round off the following numbers to the nearest 5.

This question proved to be difficult for the candidates.

(a) 12

Candidates had no idea what was expected of them. For those who had an idea, they were rounding off to the nearest 10.

Common wrong answers: 2.4, 17, 15

Answer: 10

(b) 104

In this question it was evident candidates were rounding off to the nearest 100, but for **(a)** the question favoured them as they were getting 10 even if they had rounded off to the nearest 10. As a result **(a)** was well done than **(b)**.

Common wrong answers: 100

Answer: 105

Question 5

Candidates were given numbers written in different forms and asked to arrange them in order.

They failed to arrange numbers with negative index. They confused 100^0 for 100 or 1000

Answer: 5^{-2} , 100^0, 5, $\frac{1}{5^{-2}}$

Question 6

Candidates failed to read the question with understanding, hence they treated it as a sharing problem.

Common wrong answers: 2025, $\frac{8}{17} \times 2020 = 2021$

Answer: E 1600

Question 7

Candidates were given percentage decrease and the original price, they were asked to calculate the new price.

Candidates had a problem of rounding off to one decimal place and also giving the amount to one decimal place, yet money is written to two decimal places. They also used E and c at the same time.

Common wrong answers: 375, 285.5, 235 (250-15), 6 $\frac{15\%}{100} \times 250$, 212.5

Answer: E212.50

Question 8

Most Candidates answered the question using simple interest, some used the long method for calculating compound interest and then they will round off the answers for each year resulting to a wrong answer. Very few used the formula.

Common wrong answers: E15400, E5900, E11880

Answer: E16162.60

Question 9

Candidates failed to read and understand the question. As result they could not get this question correct. They calculated 13% of 2600

Common wrong answers: E338, E600

Answer: E78

Question 10

Generally this question was fairly done. Candidates were able to measure the angle and the length although some answers were out of range.

Common wrong answers: **(a)** 7 cm, 7.4 cm

(b) 37^0, 137^0, 40.1^0

(c) actute, isosceles obtuse

Answer: **(a)** 7.3 cm

(b) 41^0

(c) acute

(d) Candidates did not construct, they measured 2cm and 5cm using a ruler.

Question 11

A majority of candidates got this question wrong, they were confusing rotational symmery and line of symmetry.

Common wrong answers: **(a)** 10 sides, 10 lines of symmetry, 10 symmetry

(b) 0, 3

(c) 1, 4

Answer: **(a)** 10

(b) 1

(c) 2

Question 12

(a) This question was fairly done

Common wrong answer: right-angled triangle, triangular

Answer: triangular prism.

(b) A majority of Candidates failed to sketch or visualise the solid, hence they found edges, vertices and faces of the shape.

Common wrong answers: 1, 3, 3; 3, 3, 3

Answer: 5, 9, 6

Question 13

Some candidates thought a straight angle is 90^0 (90-30=60).

Common wrong answers: 75^0, 30^0, 120^0

Answer: 150^0

Question 14

A triangle was drawn and its base was marked. The area of the triangle was given, candidates were asked to calculate the height of the triangle.

Candidates failed to connect formula for area of a triangle and the given 24 cm^2. They use ratios and others used trigonometric ratios.

Common wrong answers: 3 (from $\frac{24}{8}$), 192 (from 8×24)

Answer: 6 cm

Question 15

(a) Candidates showed no understanding of vectors and the use of vector notation and presentation, most candidates left blank spaces.

Common wrong answers: $\begin{vmatrix} 2 \\ -3 \end{vmatrix}$, $\begin{pmatrix} 2 \\ 3 \end{pmatrix}$

Answer: $\begin{pmatrix} 2 \\ -3 \end{pmatrix}$

(b) Candidates failed to present information correctly, i.e $-3^2 \neq (-3)^2$. And those who understood the above concept omitted the root sign ($\sqrt{}$).

Common wrong answers: 7.6, 21, -21, 4, $\begin{pmatrix} 3 \\ 7 \end{pmatrix}$

Answer: 7.62

Question 16

(a) Candidate did well in this section.

Common wrong answers: 33 cm, 36 cm

Answer: 30 cm

(b) Candidates had difficulty with find the area of a trapezium. They used area of a triangle.

Common wrong answers: 33 cm^2, 16.5 cm^2, 30 cm^2.

Answer: 28.5 cm^2.

Question 17

Candidates failed to remember that answers should be variables (name of animal), they were giving answers from frequency (number of animals).

(a) Most candidates could not this question correct

Common wrong answers: 9, warthog 9

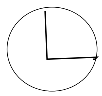
Answer: warthog

(b) Most candidates got it correct

Common wrong answers: 16, wildebeest, $\frac{2}{30}$, $\frac{2}{6}$

Answer: $\frac{16}{30}$

(c) It was well done

Common wrong answers: $\frac{6}{30} \times 180 = 36$, $\frac{6}{30} \times 100$, 

Answer: 72^0

Question 18

Candidates has difficulty with this question, they failed to use the basics about probability.

They gave any number as probability and did not give probability in the range ($0 \leq probability \leq 1$) as was expected.

Common wrong answers: **(a)** 0.7, -0.3, $\frac{1}{0.7}$, $\frac{0.3}{1}$

(b) $\frac{15}{15}$, $\frac{1}{15}$

(c) $\frac{0}{15}$, impossible, none, 0 oranges 0%

Answer: **(a)** 0.3

(b) 1

(c) 0

Question 19

(a) It was fairly done.

Some candidates confused 3*x* and x^3.

Common wrong answer: 3+10, $13x$, $\times 3 + 10$

Answer: $3x + 10$

(b) Most candidates did not get it correct.

Common wrong answers: wrong order, -8-6-1=-7, 7

Answer: { -8, -6, -1}

(c) It was poorly done

Common wrong answers: -8, $= x - 8$, $8 - x$

Answer: $(\mathrm{h}^{-1}x =)\ x - 8$

Question 20

Candidates did not perform well in this question.

***Common wrong answers*: (a)** -8, $-8x$, $y = 0$, (0,0)

(b) used $\frac{x_1 - x_2}{y_1 - y_2}$; $\frac{7}{4}$,0.57,

***Answer*: (a)** 0

(b) $\frac{4}{7}$

Question 21

(a) Candidates did well in this question.

Common wrong answers: 3.5, 0.5

Answer: 7.5

(b) Most candidates got this question wrong. Some candidates used quadratic formular and made a lot of errors, while others solved it as a linear equation (subtract 30 both sides).

Common wrong answers: $x^2 = 30x$

while others $(x + 5)(x + 6) = 0$, 0, 30

$\sqrt{x^2} = \sqrt{30x}$

Answer: 0 , -30

Question 22

Candidates couldn't answer this question. Those tried left the answer not simplified, while others multiplied by LCM before changing the division sign.

Common wrong answers: $1\frac{5}{7x}$, $\frac{12}{7x^2}$, $\frac{12}{49}$

Answer: $\frac{12}{7x}$

EGCSE MATHEMATICS

Paper 6880/02

Calculator Structured Questions (Core and Extended)

Key Message

This paper covered the core syllabus only, allowing only the core candidates to write it. It proved to be a challenging paper to most of the candidates. Most questions required the candidates to apply the concepts instead of recalling them. The highest raw mark scored was 80 and it was obtained by just one candidate. This score was followed by 72, then 71, which was also scored by one candidate respectively. There were eight candidates that scored zeros, including one candidate who did not attempt any of the questions, writing only their names on the cover page. Most candidates got raw marks in the range of 20 to 40.

The time allocated for this paper proved to be enough since most candidates were able to attempt all the questions.

A wide range of syllabus objectives were displayed in this paper, allowing candidates to also display their understanding of the concepts. Most questions required candidates to apply the concept instead of recalling them. This was seen in **Question 11** and **Question 12** where candidates were expected to form their own equations and solve them. In **Question 14(a)**, candidates were expected to draw their own Venn diagram, to show an understanding of the question before they answered the questions. There were no straight forward questions like ‘solve’, ‘factorise’, ‘simplify’ etc. This made the paper to be less accessible to candidates that are not mathematically inclined.

Work presentation by candidates showed a decline even in this year’s cohort. There was an increase in the number of candidates that gave correct answers without showing any working. This led to them losing both the method marks and the accuracy marks. Some candidates were using ‘trial and error’ in solving some questions which also led in loss of both method marks and accuracy marks. In **Question 11(b)**, candidates came up with the answer, then proved that it is correct, which also led to loss of marks. We still had candidates that approximated prematurely, which finally led to inaccurate answers, resulting a loss of accuracy marks. Some candidates even approximated exact answers e.g 6.375 to 6.38, and this led to a loss of accuracy marks. Teachers are advised to encourage candidates to write down the longer version of the answer before they round it off. Candidates must also be encouraged to show all necessary working for all questions.

Questions that proved to be difficult for most candidates were **Question 2**, **Question 4(c)**, **Question 9(d)**, **Question 6(a)**, **Question 8(b) and (c)**, **Question 10(b)(ii)**, **Question 11(b)**, **Question 12(b)**, **Question 14(a)** and **Question 14(b)(ii)(iii).** Questions that proved to be easy for most candidates were **Question 1(b)**, **Question 7(c)**, **Question 8(a)**, **Question 9(a)(b)(c)**, **Question 10(b)(iii)**, and **Question 10(c)(i)**.

Generally, candidates need to be advised to read questions fully, with understanding, before they attempt to answer.

Comments on Specific Questions.

Question 1

(a) *Work out* $\dfrac{(3.33-22,22)^2+1.11}{3.33-2.22\times 1.11}$. *Write your full calculator display*.

This question was fairly done by some candidates. Most candidates showed a lack of skill on calculator usage. They failed to use brackets to separate the numerator and the denominator as they punched the operations in the calculator. Some candidates worked out the numerator and the denominator separately, working out the denominator wrongly by subtracting first. A few that worked out the numerator and the denominator correctly decided to round off prematurely, leading to less accurate final answer. Candidates that were using the CASIO calculator gave the exact answer as a fraction, not as a decimal as expected.

Common wrong answers:

- $(3.33-2.22)^2+1.11\div 3.33-2.22\times 1.11=-0.898766666$
- $\dfrac{(3.33-2.22)^2+1.11}{(3.33-2.22)\times 1.11}=1.900900901$
- $\dfrac{2.34}{0.866}=2.702078522$

Expected Response: 2.705128205

(b) *Write your answer to* ***part (a)*** *above correct to three significant figures.*

This part of the question was generally well answered by most candidates using their answers from **part (a)** above. A few candidates were truncating their answers either to 3 significant figures or to 3 decimal places.

Common Wrong Answers: 2.70, 2.705

Expected Response: 2.71

Question 2

Simplify $x^2 \div y^{-3}$.

This question proved to be a challenge to most candidates. They had a challenge in dealing with the negative index. Most candidates used the rule of multiplication when the bases are the same.

Common wrong answers:

- xy^5
- $\dfrac{x^2}{y^{-3}}$
- $\dfrac{x^2}{y^3}$

Expected Response: x^2y^3

Question 3

Find the 7th term in each of the following sequences.

1	2	3	4	…	7
3	2	1	0	…	*a*
4	9	16	25	…	*b*
7	11	17	25	…	*c*

This question was fairly done. Most candidates did not read the question fully though, resulting in them giving the 5th or the 6th terms instead of the 7th term. A few candidates were not able to notice that $c = a + b$, but were able to find c by adding even numbers to the previous term.

Common Wrong Answers:

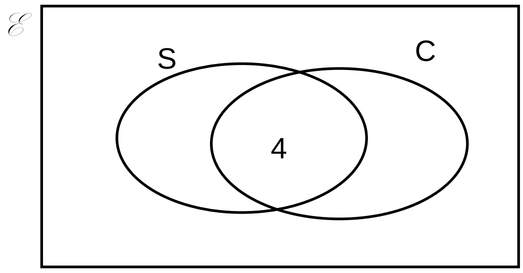
- $a = -1$, $b = 36$, $c = 35$
- $a = -2$, $b = 49$, $c = 47$

Expected Response: $a = -3$, $b = 64$, $c = 61$

Question 4

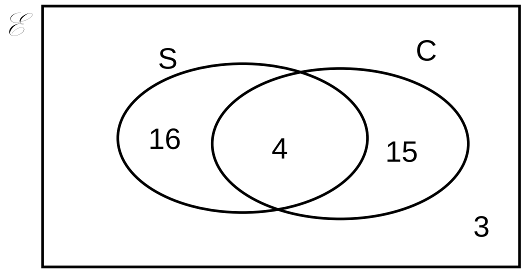
A group of 30 people were asked which sport, out of cricket and soccer, they liked. 16 of them liked soccer. 3 did not like any of the sports. 15 liked cricket.

(a) *Complete the Venn diagram to illustrate this information*.

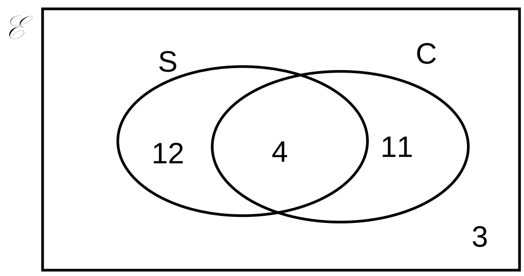


This question was fairly done by most candidates. Some candidates failed to note that the 4 in the intersecting region was also included in the 16 and in the 15. A few candidates decided to put individual elements in the Venn diagram other than writing the number of elements in the respective regions.

Common Wrong Answer:



Expected Response:



(b) *State the number of people who liked exactly one of the two sports.*

This question was fairly answered. Most candidates gave the number of people in the region $S \cap C'$ or the number of people in the region $S' \cap C$ only, instead of adding the number of people in both regions.

Common Wrong Answers: 12, 11, 15, 16, 31, 27

Expected Response: 23

(c) *Find* n$(S' \cup C')$.

This part of the question proved to be a challenge to most candidates. Most treated the union sign as an intersection sign.

Common Wrong Answers: 4, 3, {11,12}, {15,16}

Expected Response: 26

(d) *Use set symbols to describe the set of people who liked at least one of the two sports.*

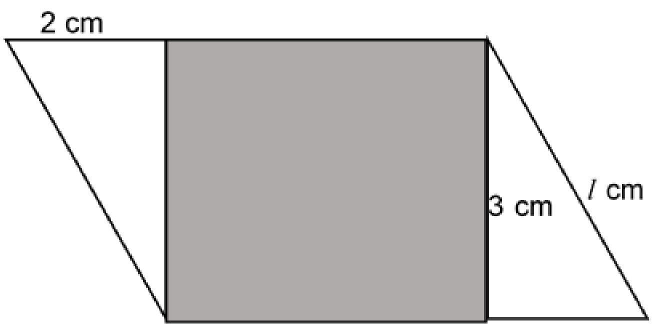
The expected response was rarely seen in this question. Most candidates had challenges in differentiating between the union and the intersection signs. Some were even creating their own symbols. Most candidates just gave any set notation that involved S, C and a union or intersection sign.

Common Wrong Answers: $S \cap C$, $(S \cup C)'$ $n(S \cup C)$

Expected Response: $S \cup C$

Question 5

The diagram shows a parallelogram and a shaded square.



(a) *Find the area of the unshaded part of the parallelogram*.

This question was fairly well done. Most candidates were able to find the correct area of the shaded part. They were able to find the area of the parallelogram then subtracted the area of the square. Most of the candidates found the area of one triangle then multiplied by two. A few candidates had a challenge in finding the area of the triangle because they were not using the correct formula. Some felt compelled to use all the given information, including the *l*, hence they were using the formula area = *l* x *b* x *h* = 2 x 3 x *l* = 2 x 3 x 1 = 6 which earned zero marks because of the wrong formula.

Common wrong Answer: 3 cm^2, 12 cm^2, 9 cm^2

Expected response: 6 cm^2

(b) *Calculate the value of* l.

This part was also fairly well done. Most candidates were able to use the Pythagoras theorem to find the value of l. Some candidates used the formula wrongly, like subtracting where they were supposed to add. Some did not find the square root for the final answer. Some failed to punch $\sqrt{3^2+2^2}$ correctly in the calculator leading to wrong answers. A few candidates tried to use trigonometry.

Common Wrong Answers: 3.317 from $\sqrt{11}$, 2.646 from $\sqrt{7}$, 13

Expected Response: $\sqrt{13}$ = 3.61

Question 6

Candidates were given a diagram of a solid box that was made of a square prism and a square based pyramid that was attached to the prism. The square was 2 cm by 2 cm, the length of the prism was 4 cm, and the heights of the triangles of the pyramid was 2 cm.

(a) *Write down the name of the solid that forms the top part of the box*. Candidates could not detach the top of the box to see it as a solid, leading to them failing to give the name of the top solid.

Common wrong Answers: Prism, Triangular prism, Triangular pyramid, cone, cuboid, triangle.

Expected Response: Square-based Pyramid

(b) *Complete an accurate net of the box on the grid below. Part of the net has been drawn for you*.

Drawing the net of the solid was a challenge to most candidates, especially since part of it was already drawn. Candidates wanted to fit everything around the part that was already drawn, which then compromised the size of the net. Some came up with a cross-like design which could not fit on the given grid. Some candidates transferred the solid as is into the grid instead of drawing a net. The few candidates that drew all the rectangles and triangle forgot to draw the square at the base of the solid.

Expected Response: A net with four of 4 cm x 2 cm rectangle, four triangles of height 2 cm and base 2 cm, and a 2 cm x 2 cm square.

(c) *Calculate the total surface area of the box*.

This part of the question was poorly done, partly because candidates could not draw the net of the solid correctly. Some candidates found the surface area of the nets they had drawn. Some candidates had no idea how to calculate surface area, some even used formulas that involved pi.

Common Wrong Answers: 32 cm^2, 40 cm^2, 48 cm^2

Expected Response: 44 cm^2

Question 7

You are given triangles P and Q in the grid below.

{Triangle P is at (-1,-1), (1,3) and (-2,3), triangle Q is at (1,1),(-3,1) and (-3,-2).}

(a) *Describe a single transformation that maps Triangle P onto triangle Q*.

This question was fairly well done by most candidates. They were able to state the name of the transformation as rotation. The challenge they had was identifying the correct centre. They also had a challenge in giving the direction. They confused anticlockwise for −90°, some even wrote both anticlockwise and −90°. A number of candidates were leaving out the brackets when writing their coordinate for the centre, which led to a loss of marks. A few candidates were naming more than one transformation or even describing the rotations with properties of translation, reflection or enlargement e.g. rotation through scale factor…rotation by vector…

Common Wrong Answer: Rotation, centre 0.0, −90° anticlockwise

Rotation, centre (−1,−1), 90°

Expected Response: Rotation, centre (0,0), 90° anticlockwise

(b) Reflect triangle P in x = 3. Label the image R.

Most candidates were able to reflect triangle P in the line x = 3. A few were misplacing the reflection of (−1,−1) to (6,−1) instead of (7,−1). Some were reflecting in the wrong x-line like x = 2 and x = 1.

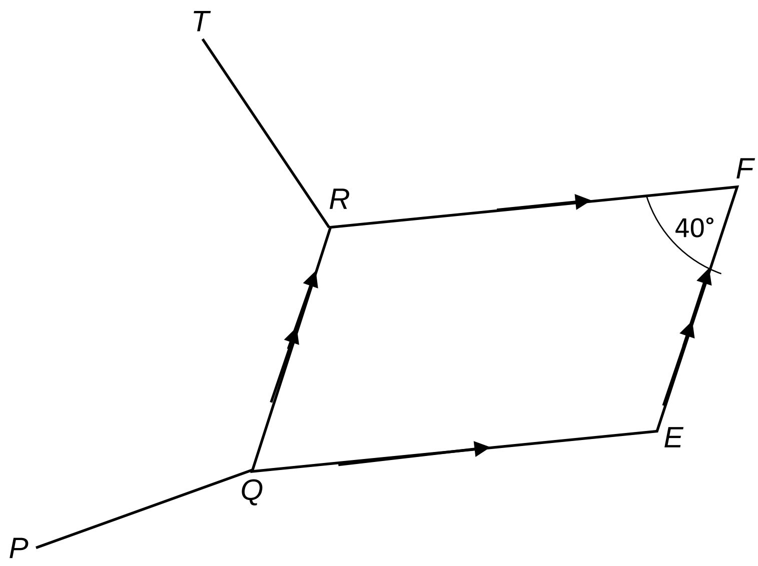
Expected Response: A triangle at (5,3), (8,3) and (7,−1).

(c) *Translate triangle P by vector* $\begin{pmatrix} 3 \\ -5 \end{pmatrix}$. *Label the image S.*

This part of the question was well done by most candidates. They were able to translate triangle P using the given vector correctly. A few candidates would miss (2,−6) for (3,−6)

Expected Response: A triangle at (1,−2), (4,−2) and (2,−6)

Question 8



In the diagram PQRT is part of a regular hexagon. QEFR is a parallelogram. Angle EFR = 40°.

Calculate

(a) angle QRF,

This question was fairly done by most candidates. They used the concepts of the sum of angles in a parallelogram. A few candidates used the fact that those are co-interior angles and they are supplementary. Some candidates assumed that angle QRF is equal to angle EFR since they are in a parallelogram. Some assumed that the sum of the angles in a parallelogram is 180°.

Common Wrong Answers: 40, $\frac{180-(40\times 2)}{2}=50$, 180 – (40 + 40) =100, 40 + 40 = 80.

Expected Response: 140°

(b) the size of each interior angle of the regular hexagon,

This part was poorly done. Most candidates did not relate hexagon to 6 sides, they were using 5 sides or 8 sides. Most were not even calculating the interior angle but the exterior angle. A few were even calculating the sum of the interior angles of a regular hexagon.

Common Wrong Answers: 60°, 720°, 140°

Expected Response: 120°

(c) *angle TRF*.

This part of the question was also poorly done. This was due to the fact that candidates did not find the correct answer for **part (b)**, some even got answers that are way bigger than 360°. Some even tried to extend line RF and line QR to identify corresponding angles, which did not help much. The few candidates who got the correct answer in **part (b)** could not identify the angle in the diagram that is an interior angle of a regular hexagon, making it difficult for them to use the fact that angles around a point add up to 360°.

Common wrong Answers: 140°, 40°, 220°

Expected Response: 100°

Question 9

The table shows travelling times for four buses moving from Bhunya to Manzini.

	Bus **A**	Bus **B**	Bus **C**	Bus **D**
Leaves Bhunya	0830	0855	0915	0925
Passes Luyengo	0856	0921	0941	0951
Passes Luyengo	0902	0931	0951	1001
Arrives in Manzini	0936	1001	1021	1031

Lunga leaves home at 0850. He takes 20 minutes to walk to bus station at Bhunya.

(a) *Find the time when he reaches the bus station*.

This question proved to be easy to most candidates, it was very well answered. A few candidates had a challenge of changing the 0870 to 0910

Common Wrong Answers: 0915, 0870, 0930, 09 hrs 10 min

Expected Response: 0910

(b) *State the earliest bus he would catch to Manzini.*

This part was also well done by most candidates. They were able to state the earliest bus to Manzini. A few candidates gave the time for the bus instead of the name of the bus.

Common Wrong Answers: 0915, Bus A, Bus B

Expected Response: Bus C

(c) Calculate the total time taken by bus A to travel from Bhunya to Manzini.

This part of the question was fairly well done. Most candidates were able to subtract the times to get 0106. A few candidates had a challenge in giving the time in hours and minutes.

Common Wrong Answers: 1:06 minutes, 1 hour 6 seconds

Expected Response: 1 hour 6 minutes

(d) *The average speed of bus A between Malkerns and Manzini is 50 km/h. Calculate the distance travelled by the bus between Malkerns and Manzini.*

This part was poorly done by most candidates. They were able to calculate the time taken to travel between Malkerns and Manzini. They failed to change the 34 minutes to hours because they did not see the need to do so. The few candidates that were able to change the minutes to hours rounded off their answers prematurely which affected the final accuracy mark. Most candidates were also not using the correct formula to calculate distance, they were dividing the speed by the time instead of multiplying the speed by the time.

Common Wrong Answers:

- 50 x 34 = 1700
- $\frac{50 \times 34}{1000}$ = 1.7
- $\frac{50}{34} = 1.47$
- $50 \times \frac{60}{34} = 88.2$
- 50 x 0.57 = 28.5

Expected Response: $50 \times \frac{34}{60} = 28.3$

Question 10

Candidates were given a graph of f(x) = x^2 – 2x – 3. The x-axis were numbered from −3 ≤ x ≤ 5 and the y-axis were numbered from −5 ≤ y ≤ 6. The scale used was 1 unit to 5 divisions to 1 cm in both axis.

(a) *Use the graph to complete the table of values for the function y = f(x).*

x	−2	−1.5	−1	0	1	2	3	3.5	4
y = f(*x*)	5		0	−3	−4	−3	0		5

This part of the question was fairly done. Some candidates used the expression of the graph to find the value of y, and they got the exact answers of 2.25. Some failed to get the correct answers since the *x* values are given as decimal, hence getting −3.75 and 3.75 respectively. Most candidates read the values from the given graph. The scale proved to be not so friendly to the candidates, resulting in them getting values that are out of range.

Common Wrong Answers: −3.75 and 3.75, 2.1 and 2.4, −2.5 and 2.5

Expected Response: 2.2 to 2.3 (for both values)

(b) **(i)** *Write down the equation of the line of symmetry of the graph.*

This part was fairly done. Some candidates were able to identify the line but had a challenge in writing it as an equation.

Common Wrong Answers: y = 1, f(*x*) = 1, *y* = *x* = 1, *y* = x^2 – 2*x* – 3, *x* = 1,−4

Expected Response: *x* = 1

(ii) *Find the values of x for which f(x) = 1.5*.

This was poorly done by most candidates. They did not draw the line *y* = 1.5 on the grid that was supposed to help them identify the points of intersection. Some candidates decided to substitute x = 1.5 into f(x).

Some decided to repeat their answers from **part (a)** above.

Common Wrong Answers: 2.25 and −2.25, −3.75 and 3.75

Expected Response: (3.3 to 3.4) and (−1.4 to −1.3)

(iii) *Write down the coordinates of the lowest point of the graph*.

This question was generally well answered by most candidates. A few candidates had a challenge in reading the coordinate accurately and correctly.

Common Wrong Answers: (−4,1), (−1,−4), (1,4)

Expected Response: (1,−4)

(c) **(i)** *Complete the table of values for the equation* $y = -\frac{3}{2}x$.

x	−2	0	3
y	3		

This question was fairly done by most candidates.

Common Wrong Answer: 0 and 4.5

Expected response: 0 and −4.5

(ii) *On the grid, draw the line* $y = -\frac{3}{2}x$.

Candidates were able to draw the line through the correct coordinates. A few had a challenge in plotting (3,−4.5), they were plotting (3,−4) or (3,−5) or (3.5,−4), which led to lines that were not correct. A few candidate drew lines with a positive gradient, passing through (0,0) and (3, 4.5). A few candidates used free hand to draw the line and some were trying to draw curves.

Expected Response: A line with a negative gradient passing through (−2,3), (0,0) and (3,−4.)

(iii) *Write the coordinates of the two points where the line* $y = -\frac{3}{2}x$ *crosses the graph y = f(x).*

This was generally well done. A few candidates failed to read the coordinates properly, especially the coordinate that involved decimals.

Common Wrong Answers: (−2,3), (−3,2), (2.2, −1.5), (1.5,2.2), (−1.4,2.5)

Expected Response: (2,−3) and (−1.5,2.2 to 2.3)

Question 11

Three farmers bought goats at an agricultural auction. Mr Dlamini bought x goats. Mr Matse bought

4 times as many goats as Mr Dlamini. Mr Nkambule bought 3 more goats than Mr Matse.

(a) *Write down an expression in terms of x for*

(i) *the number of goats Mr Matse bought*.

This part of the question was generally well done. A few candidates wrote equations instead of expressions. Some even wrote numbers in place of the expressions.

Common Wrong Answers: $x + 4$, $y = 4x$, $0 = 4x$, $x = 4x$, $x = 4$, 52

Expected Response: $4x$

(ii) *the number of goats Mr Nkambule bought*.

This part of the question was fairly well done, even by candidate that got **part (i)** wrong. They just took whatever they had in **part (i)** and added a three.

Common Wrong Answers: $x + 4 + 3$, $y = 4x + 3$, $0 = 4x + 3$, $x = 4x + 3$,

$x = 4 + 3$, 55

Expected Response: $4x + 3$

(b) *Altogether the farmers bought 120 goats. Form an equation and find the number of goats Mr Matse and Mr Nkambule each bought*.

This part proved to be difficult for most candidates, even the ones that got the expressions in **part (a)** correct could not form a correct equation. Some of the candidates even used trial and error in solving this question, and came up with correct answers, even without the correct equation, unfortunately, they did not get full marks.

Common Wrong Workings:

- $4x + 4x + 3 = 120$

  $x = 14.625$

  Matse = 58, Nkambule =61

- $4x + 3 = 120$

  $x = 29.25$

  Matse =117. Nkambule = 120

- $4x = 120$

  $x = 30$

  Matse =120, Nkambule = 123

Expected Response:

- $x + 4x + 4x + 3 = 120$

  $x = 13$

  Matse = 52, Nkambule = 55

Question 12

Mrs Zwane bought 2 cases of juice and 3 cases of spring water, all for E504. Mrs Shongwe bought 3 cases of the same juice and 4 cases of spring water, all for E708. Let x be the cost of 1 case of juice and y be the cost of 1 case of spring water.

(a) *Form equations in x and y for each woman's purchase*.

This part of the question was fairly done. Most candidates were able to come up with correct equations. Some candidates came up with expressions instead of equations, others even used their own variables or even swapped the given variables.

Common Wrong Answers:

$2x+3y$	$x+y=504$	$x^2+y^3=504$
$3x+4y$	$x+y=708$	$x^3+y^4=708$

Expected Response:

$$2x+3y=504$$
$$3x+4y=708$$

(b) *Solve the equations to find the cost of 1 case of juice and the cost of 1 case of spring water*.

This part was not well done by most candidates. Candidates had a challenge in solving a pair of simultaneous equations. Most candidates attempted elimination over substitution. Candidates were subtracting the equations before balancing the coefficients which led to another equation with both variable, and then they did not know what to do next. A few that attempted to balance the coefficients only multiplied the coefficients and left the constants on the right hand side of the equations.

Expected Response: $x = 108$, $y = 96$

Question 13

Solve for a, b and c.

$$2\begin{pmatrix} a & -2 \\ 1 & a \end{pmatrix} + \begin{pmatrix} 7 & -3 \\ b & b \end{pmatrix} = \begin{pmatrix} 27 & -7 \\ 18 & c \end{pmatrix}$$

This question was fairly done, most candidates had correct answers, especially for the *a* and **b**. Some candidates had correct answers even though there was no single working shown. Some candidates were solving by trial instead of forming equations and solving them, leading to wrong solutions. A few candidates that tried to form the equation came up with wrong ones e.g. 1 + *b* =18, *a* + *b* = *c.* Some even attempted to multiply the matrices on the left hand side, which led to more complicated equations. Candidates were expected to form equations first, then solve for the variables. The expected equations were: $2a + 7 = 20$, $2a + b = 18$ and $2a + b = c$.

Common Wrong answers: $a = 20$, $b = 17$ $c = 26$

Expected Response: $a = 10$, $b = 16$, $c = 36$

Question 14

(a) *A group of 20 music lovers were asked which music genre they liked between choral and rock music. All who liked rock also liked choral. 17 liked choral. 10 liked rock. A music lover was chosen at random. Find the probability that the music lover*, generally, Generally, this question was poorly done by most candidates. Candidates were supposed to be able to sketch their understanding in a Venn diagram of their own choice, and most candidates could not do that, leading to the poor performance. Some candidates were also failing to give their answers as a probability, but as ordinary numbers. Some even decided to add the 10 and the 17 to get a total of 27 music lovers. Most candidates were also interchanging the answers from one part to the other, as if they knew the answers but forgotten the position for each.

(i) *liked both genres*,

This part was poorly done.

Common Wrong Answers: 10, 3, $\frac{3}{20}, \frac{27}{20}, \frac{7}{20}, \frac{17}{20}, \frac{20}{27}$

Expected Response: $\frac{10}{20}$

(ii) *liked exactly one of the two genres*,

This part was also poorly done. Candidates added both the 10 and the 17 to get 27.

Common Wrong Answers: 7, 10, $\frac{3}{20}, \frac{27}{20}, \frac{10}{20}, \frac{17}{20}, \frac{20}{27}$ d

Expected Response: $\frac{7}{20}$

(iii) *did not like any of the two genres*.

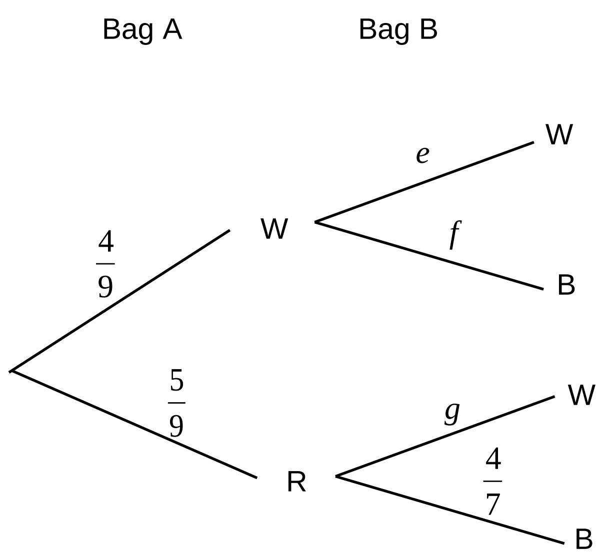
This part was poorly done by most candidates.

Common Wrong Answers: 0, 3, $\frac{0}{20}, \frac{10}{20}, \frac{7}{20}, \frac{17}{20}, \frac{3}{27}$

Expected Response: $\frac{3}{20}$

(b) *Bag A has 4 white balls and 5 red balls. Bag B has 3 white balls and 4 blue balls.*

A ball is picked from each bag at random.



(i) *State the values of e, f and g.*

This part of the question was well done by most candidates. Some candidates did not write the probability as fractions but as whole numbers. Some were able to fill in the tree diagram correctly, then transferred the answers wrongly to the answer space, surprisingly.

Common Wrong Answers: $e = 3, \frac{4}{9}, \frac{4}{7}$, $f = 4, \frac{3}{9}, \frac{3}{7}$ $g = 7, \frac{4}{7}, \frac{5}{9}$

Expected Response: $e = \frac{3}{7}$ $f = \frac{4}{7}$ $g = \frac{3}{7}$

(ii) *Find the probability that both balls are of the same colour.*

This was poorly done by most candidates. They were not able to interpret the tree diagram correctly. The few that were able to do so were adding along the branches instead of multiplying.

Common Wrong Workings:

$\frac{4}{9}+\frac{3}{7}=\frac{7}{16}$ $\frac{4}{9}+\frac{3}{7}=\frac{55}{63}$

Expected Response:

$\frac{4}{9}\times\frac{3}{7}=\frac{12}{63}$

(iii) *Find the probability that at least one ball is white*.

This was also poorly done. Candidates could not interpret 'at least' the correct way, they interpreted it as 'exactly one', so they dealt with WB and RW.

Common Wrong Answers: $\frac{4}{9},\frac{31}{63},\frac{55}{63}$

Expected Response: $\frac{43}{63}$

(iv) *State the probability that one ball is red*.

This part was fairly done, though some candidates used a long method which gave them $\frac{45}{63}$.

Common Wrong Answers: 0, $\frac{5}{16},\frac{9}{16}$

Expected Response: $\frac{5}{9}$

Question 15

In the following distribution, the numbers are arranged in ascending order.

8 10 p q 17 18 r 23

The mean, mode and median of the distribution are stated.

Mean = 15 Mode = 10 Median = 16

Find the values of p, q and r.

This question was well done by most candidates. They were able to give the answers without showing any workings. Some missed the point that the numbers were arranged in ascending order, so they had the answers jumbled up. Some just took the given values of the mean, the mode and median as they are and fit them in the sequence, in ascending order, which worked perfectly well for the *p* and the *q*.

Common Wrong Answers: p = 15, 12 q = 10, 12, 16 r = 10, 15, 16, 20, 21

Expected Response: p =10, q = 15, r = 19

EGCSE MATHEMATICS

Paper 6880/03

Calculator Structured Questions (Extended)

General Comments

The candidates' performance reflected that the paper was challenging for most of the candidates. Only about two candidates managed to score a total of 80 marks. About 10 candidates scored zero out of 80. There were a lot of single digit scores recorded for this paper. Several candidates scored below 30 for most of the centres.

The time allocated for the paper was enough since all the candidates went through almost all the questions.

Questions that proved to be difficult for the candidates are **Q1, Q2(b), Q4, Q6(b), Q10, Q13(a), Q13(c), Q14(a), Q15(b), Q17, Q18(a), Q18(b), Q19(b), Q19(c), Q20(b)** and **Q20(c)**.

Questions that were easily accessible for candidates were **Q2(a), Q3, Q5(a), Q6(a),Q7,Q8, Q12(c), Q13(b),Q15(a)** and **Q19(a)**.

The candidates demonstrated a great improvement in their work presentation since they showed almost all the necessary working and non-exact answers were first presented in their long versions before being rounded incorrectly.
However, lack of skill on the use of the electronic calculator was still a problem. This was evident in **Q4** and **Q5(b)**.
The failures to follow the question's instructions led to loss of most of the marks. In Q21, the candidates were told which method of solving to use but decided to use other methods and this led to

a loss of all the marks. This was also seen in **Q3, Q11 (a)** and **Q14 (b)**. Candidates should be advised to read questions carefully before answering.

Most candidates lost several marks on questions **Q2(b), Q4** and **Q15(b)** which required them to round off answers to a given level of accuracy. They showed lack of rounding off skills.

<u>Comments on specific questions</u>

Question 1

Candidates were required to write down irrational numbers from the list of numbers; $7^{0.5}$, $\sqrt[3]{8}$, 2π , $\frac{3}{5}$ and 32.5% . Only a few candidates identified both $7^{0.5}$ and 2π as irrational numbers. Most candidates wrote either $7^{0.5}$ or 2π and others gave more than the two correct required ones hence this question was poorly done.

Common wrong answer: $\sqrt[3]{8}$ and 32.5%

Expected response: $7^{0.5}$ and 2π

Question 2

The candidates were given a frequency table about an agriculture department of a school who collected information about the number of eggs laid each day for 3 weeks.

Number of eggs	5	6	7	8	9
Number of days	5	3	2	5	6

(a) The candidates were expected to state the mode. This part was well accessible for most candidates. However some wrote 5 (frequency) since it appeared more than once on the frequency table. A few of the candidates gave 6 (highest frequency) instead of the variable (9) having the highest frequency.

Common wrong answers: 5 and 6

Expected response: 9

(b) The candidates were required to calculate the mean number of eggs correct to 2 significant figures. The majority of the candidates failed to understand the requirement of rounding the answer to 2 significant figures but had 7.19 as their final answer. Some had $\frac{5+6+7+8+9}{5}$ or $\frac{5+6+7+8+9}{21}$ leading to $\frac{35}{5}$ or $\frac{35}{21}$ respectively instead of the expected $\frac{151}{21}$. Hence this part of the question was poorly done.

Common wrong answers: 7.19, 7, 1.67

Expected response: 7.2

Question 3

The candidates were expected to use a ruler and pair of compasses to construct triangle *ABC* in which *AB* = 5 cm, *BC* = 7 cm and *AC* = 6 cm. This question was well answered by most candidates although some of the triangles had no construction arcs or others had the triangle with labels mixed up. Very few candidates left this question unattended.

Common wrong answers: triangles without arcs or triangle with wrong labels or without labels.

Expected response: Correct triangle with construction arcs and correct labels.

Question 4

The candidates were required to evaluate $\sqrt{\frac{1}{3}b-\frac{1}{2}a}$, correct to 3 decimal places, given that $a = -8$ and $b = 3$. This was poorly done as most candidates failed to meet the demand of the question fully of rounding their answer to 2.236 (3 decimal places) but rather rounded it up to 2.24 (3 significant figures). Some were able to substitute the given values correctly but failed to evaluate and ended up having $\sqrt{-5}$ or $\sqrt{3}$ or $\sqrt{7}$ .Some punched their calculator wrongly as $\sqrt{\frac{1}{3}} \times 3 - \frac{1}{2} \times -8$ which yielded 5.732.

Common wrong answers: 2.24, 1.732, 2.646 and 5.732

Expected response: 2.236

Question 5

(a) Expanding and simplifying the expression; $2(y+1) - 4(x-2y) + 11x$ was generally well done by the majority of the candidates. However for some candidates, working out $-4 \times -2y$ yielded $-8y$ instead of $8y$ so that they eventually had $2y + 2 - 4x - 8y + 11x$. Few candidates had challenges in collecting like terms correctly after expanding.

Common wrong answer: $2 - 6y + 7x$.

Expected response: $10y + 7x + 2$

(b) The candidates were given the formula $V = 12\pi r^2$ and $V = 1740$ and required to find the value of *r*. This part was fairly done although many candidates ended up rounding their answer to 6.8 (2 significant figures). Some candidates were able to get $r = \sqrt{\frac{1740}{12\pi}}$ but failed to use the calculator correctly but instead punched $\frac{\sqrt{1740}}{12\pi} = 1.10647984$. Some prematurely rounded $\sqrt{\frac{1740}{12\pi}}$ to $\sqrt{46.2}$ instead of $\sqrt{46.1549335}$ hence their answer was 6.797 instead of 6.7937

Common wrong answers: 6.8, 6.797, 1.10647984

Expected response: 6.79

Question 6

Candidates were given the functions f(x) = 2x + 5 and g(x) = 1 – x.

(a) Evaluating f (11) was not a challenge. This was well answered by the majority of the candidates. Very few candidates left their answer as 22+5 (un simplified) and some gave it as f (27).

Common wrong answer: f (27)

Expected response: 27

(b) Evaluating the composite function gf (– 1) seemed too difficult for most of the candidates. Some left this part not answered (blank). Some tried finding gf (x) first failed to open brackets correctly and ended up with 1 – 2x + 5 instead of 1 – 2x – 5 thus obtained 8 after substituting as follows; 1 – 2 (– 1) + 5

Common wrong answer: 8

Expected response: – 2

(c) Most candidates were able to find $(g(3))^2$. Some candidates had the $(1 – 3)^2$ but failed to evaluate correctly to 4 but instead had $1^2 – 3^2 = – 8$.

Common wrong answer: – 8

Expected response: 4

Question 7

The question expected candidates to find the median of the following set of numbers 7, 3, 7, 8, 4, 5, 5, 10, 5. This was well done by most candidates although some did not arrange the numbers first and hence their median was 4. Some had their median position as $\frac{54+1}{2}$ obtained by adding all the variables together.

Common wrong answer: 4

Expected response: 5

Question 8

Most of the candidates were able to correctly solve the inequality; $2x – 3 \geq 11$. Very few candidates still replace the inequality sign with an equal sign hence their solution was x = 7.

Common wrong answer: $x \geq 4$, $x = 7$ or $x = 4$

Expected response: $x \geq 7$

Question 9

The candidates were required to solve the simultaneous equations:

$2x + 3y = 9$ and $x - y = 7$.This was fairly done .Some candidates failed to eliminate one variable correctly, they had $-\begin{pmatrix} 2x+3y=9 \\ 2x-2y=14 \end{pmatrix}$ which yielded $y = -5$ and $x = 12$. Those who tried solving these simultaneous equations using the matrix method either failed to correctly write the equations in matrix form or find or use the inverse correctly.

Common wrong answers: $x = 12$ and $y = -5$

Expected responses: $x = 6$ and $y = -1$

Question 10

The candidates were expected to find the number of sides of a polygon whose sum of interior angles is 1080. Only good candidates were able to correctly answer this question otherwise most had $\frac{1080}{180}$ leading to 6 as their answer.

Common wrong answer: 6

Expected response: 8

Question 11

This question was the most challenging to most candidates. Candidates were given the graph of the function $y = x^2 - 2x - 3$ on a grid.

(a) This part of the question required candidates to use the graph to solve $x^2 - 2x - 3 = 5$. Most of the candidates failed to use the graph to solve $x^2 - 2x - 3 = 5$ but tried solving $x^2 - 2x - 3 = 0$, even using the algebraic method not using the graph. This part was poorly done.

Common wrong answers: -1 and 3

Expected responses: -2 and 4

(b) Candidates were expected to find the equation of the straight line to be drawn on the graph to solve the equation $x^2 - 4x - 3 = 0$. This was the most poorly answered. The candidates had no idea what this question required because some tried to differentiate $x^2 - 4x - 3$ and came up with $\frac{dy}{dx} = 2x - 4$. Some candidates left this part blank.

Common wrong answers: none

Expected response: $y = 2x$

Question 12

Candidates were given a distance time graph showing the distance of an object from a point at a given time.

40

(a) Candidates were asked to calculate the speed of the object at 8 seconds. This part was well answered by most candidates. Very few had $\frac{40}{8}$ instead of $\frac{40}{10}$ or $\frac{32}{8}$.

Common wrong answer: 5

Expected response: 4

(b) Calculating the distance in the first 15 seconds was the most challenging to the candidates. This question as meant to be the easiest since candidates were expected to read the distance directly from the graph but instead they treated the graph as a speed time graph hence calculated the area under the graph as follows: $\frac{1}{2}(20+10)(40)=600$

Common wrong answer: 600

Expected response: 40

(c) Question expected candidates to calculate the average speed in the first 20 seconds. This part was fairly done by most candidates. However, some had $\frac{40}{10}$ instead of $\frac{40}{20}$

Common wrong response: 4

Expected response: 2

Question 13

Candidates were given $\vec{OA} = \begin{pmatrix} 9 \\ -12 \end{pmatrix}$, $\vec{OB} = \begin{pmatrix} 5 \\ 12 \end{pmatrix}$

(a) Candidates were required to work out $\vec{AB}$.This question proved to be difficult for almost 90% of the candidates since only the good students were able to calculate the required vector. Most candidates were adding the vectors $\begin{pmatrix} 9 \\ -12 \end{pmatrix} + \begin{pmatrix} 5 \\ 12 \end{pmatrix}$ to get $\begin{pmatrix} 14 \\ 0 \end{pmatrix}$ whilst others simply subtracted the two vectors $\begin{pmatrix} 9 \\ -12 \end{pmatrix} - \begin{pmatrix} 5 \\ 12 \end{pmatrix}$ to get $\begin{pmatrix} 4 \\ -24 \end{pmatrix}$. Some candidates were even seen wrongly multiplying the vectors $\begin{pmatrix} 9 \\ -12 \end{pmatrix}\begin{pmatrix} 5 \\ 12 \end{pmatrix}$ to get $\begin{pmatrix} 45 \\ -144 \end{pmatrix}$.

Common wrong answers: $\begin{pmatrix} 4 \\ -24 \end{pmatrix}$, $\begin{pmatrix} 14 \\ 0 \end{pmatrix}$ and $\begin{pmatrix} 45 \\ -144 \end{pmatrix}$

Expected response: $\begin{pmatrix} -4 \\ 24 \end{pmatrix}$

(b) The question required the candidates to calculate the magnitude of $\vec{OA}$. This question was fairly done with only a minority of the students who had $\sqrt{9^2 - 12^2}$ or $\sqrt{9^2 - (-12)^2}$ and got confused afterwards.

Common wrong answer: none

Expected response: 15

(c) The candidates were asked to find $\vec{MO}$ where M is the midpoint of $\vec{OB}$. The majority of the candidates found this question very challenging since they neglected the direction and simply computed $\vec{OM} = \frac{1}{2}\begin{pmatrix} 5 \\ 12 \end{pmatrix} = \begin{pmatrix} 2.5 \\ 6 \end{pmatrix}$.

Common wrong answer: $\frac{1}{2}\begin{pmatrix} 5 \\ 12 \end{pmatrix} = \begin{pmatrix} 2.5 \\ 6 \end{pmatrix}$

Expected response: $\begin{pmatrix} -2.5 \\ -6 \end{pmatrix}$

Question 14

A ship leaves port A and travels on a bearing of 200˚ for 240km to port B.

The ship then leaves port B and travels on a bearing of 315˚ for 300km to port C.

(a) The question required candidates to draw an accurate diagram of the journey, using a scale of 1cm: 30 km. The candidates were able to convert the given distances in km to cm using the given scale. Although most of the candidates correctly drew the first part of the journey (200˚,240 km), they failed to draw the journey from *B* to C (315˚,300 km). The concept of bearings was lacking because the 200˚ and 315˚ bearings were measured in the anticlockwise direction and the north lines were not accurately drawn. Some of the candidates failed to draw the reflex angles.

Common wrong answer: none

Expected response: *AB*, (8 cm), *B* on a bearing of 200˚ from *A* and *BC*(10 cm) ,*C* on a bearing of 315˚from *B*.

(b) The candidates were required to measure the actual distance from port *A* to port *C*. This question was fairly done as most candidates were able to measure the distance accurately and convert it to km using the given scale. Few of the candidates tried to use trigonometry to find the distance when the question clearly stated that they should measure.

Common wrong answer: 200 + 300 = 540 km

Expected response: 288 – 300

Question 15

Candidates were told that the value of a house increase by 6% every year and at the start of 2018, the house was worth E876 000.

(a) Candidates were required to calculate the value of the house at the start of 2019. A large number of the candidates found this question very accessible. Very few candidates subtracted 6%of E876 000 from the E876 000 instead of adding it hence obtained E823 440.

Common wrong answer: E823 440

Expected response: E928 560

(b) Candidates were expected to calculate the value of the house at the start of 2017, giving their answer to the nearest cent. Candidate's response to this question was not impressive. The majority of the candidates simply calculated 94% of the E876 000 to get E 823 440. Quite a number of them arrived at $\frac{100}{106} \times \text{E876 000} = \text{E826 415.0943}$ and failed to round the answer to the required level of accuracy (nearest cent) hence got E826 415.10 instead of E826 415.09.

Common wrong response: E826 415.10, E823 440

Expected response: E826 415.09

Question 16

A book was bought in the USA for $30.50. The book was the sold in Eswatini for E452.20 when the exchange rate was $1 : E14.17. Calculate the profit made in Emalangeni.

This question was fairly attempted. Candidates understood the demand of this question but lost marks because of accuracy and presented the profit as 20.015 or 20.0 and did not round correct to 2 d.p. since this is money. Some calculated 30.50 × 14.17 = 432.185 and subtracted it from the E452.20 before it was rounded to 2d.p and got 20.015 which then rounds to 20.02 correct to 2 d.p. and did not earn the mark.

Common wrong answers: 20.015, 20.02 and 20.0

Expected Responses: 2 different answers were possible 20.01, 19.98 (those who first converted E452.20 to \$31.91 then subtracted it from \$30.50 to obtain \$1.41 profit then convert to Emalangeni using the given exchange rate .

Question 17

The question required the candidates to calculate the principal amount of an investment whose total value amounted to E7558.27 at the end of 3years when invested with a bank that paid 8% compound interest per annum. This question was not easily accessible to most candidates. Some used the correct formula, substituted correctly but failed to solve thereafter. Some took the given E7558.27 as the principal amount and used it to calculate total as follows: $7558.27(1+\frac{8}{100})^3$ to get E9 521.24. Those who attempted to reduce the money gradually in steps failed to understand that the 7558.27 1as the 108% not 100% which then resulted to a common wrong answer E5885.50.

Common wrong answers: E9521.24 and E5885.50

Expected response: E6 000

Question 18

Candidates were given that P varies directly as the cube of *x* and inversely as *y*.

(a) The candidates were expected to write an equation connecting *P* , *x* and *y*. The question was generally not well done. The constant k was commonly not seen and *x* cubed was occasionally interpreted as *x* squared otherwise the inverse proportion was well interpreted.

Common errors: $\frac{x^3}{y}$ or $\frac{kx^2}{y}$

Expected response: $\frac{kx^3}{y}$

(b) The question required candidates to explain what happens to the value of *P* if *x* is doubled and *y* is halved. This question posed challenges for most candidates. They did not know what to do and those who tried using their assigned *x* and *y* values failed to finally draw a conclusion from their workings.

Common wrong answer: none

Expected response: P increases 16 times.

Question 19

Candidates were given two triangles , triangle *A* with vertices (3,0) , (1,2) , (2,3) and triangle *R*(*A*) with vertices (– 3 ,0) , (–1,2) , (–2,3) on a grid.

(a) Candidates were expected to describe the single transformation *R* that maps triangle *A* onto triangle *R*(*A*). Most of the candidates correctly identified the transformation as a reflection but had challenges in describing the correct mirror line. Some described it as $y = 0$ or line y and others even gave a centre.

Common wrong answers: mirror line y or $y = 0$

Expected response: Reflection in the y axis or $x = 0$

(b) The question required the candidates draw triangle $ER(A)$ when $R(A)$ was mapped onto triangle $ER(A)$ by a transformation E represented by the matrix $\begin{pmatrix} -2 & 0 \\ 0 & -2 \end{pmatrix}$. This was poorly done as most candidates failed to pre -multiply the coordinates of $R(A)$ by the matrix $\begin{pmatrix} -2 & 0 \\ 0 & -2 \end{pmatrix}$. The coordinate (6,0) was mostly correctly plotted.

Common wrong error: $\begin{pmatrix} -1 & -2 & -3 \\ 2 & 3 & 0 \end{pmatrix}\begin{pmatrix} -2 & 0 \\ 0 & -2 \end{pmatrix}$

Expected response: Correct triangle at (4, –6), (2, –4) and (6,0).

(c) The candidates were expected to find the matrix representing a rotation of 180˚, centre (0,0). The correct matrix $\begin{pmatrix} -1 & 0 \\ 0 & -1 \end{pmatrix}$ was rarely seen. Some of the candidates mixed up the images of I and J and wrote $\begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix}$ instead of $\begin{pmatrix} -1 & 0 \\ 0 & -1 \end{pmatrix}$. Some did not bother answering this part and left it blank.

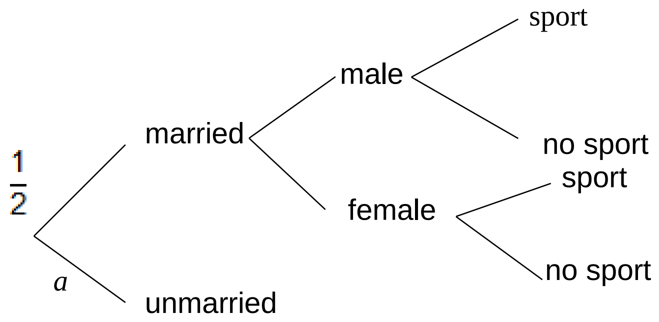
Common wrong error: $\begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix}$

Expected response: $\begin{pmatrix} -1 & 0 \\ 0 & -1 \end{pmatrix}$.

Question 20

In a certain community, people were interviewed to find out if the participated in any sport.
A person was chosen at random from the community. On the tree diagram, it was given that *the probability that the person was a married male is* $\frac{1}{3}$*, married female is* $\frac{2}{3}$*, married male participated in a sport is* $\frac{4}{5}$*, married male participated in no sport is* $\frac{1}{5}$ *, married female participated in a sport is* $\frac{3}{4}$ *and married female participated in no sport is* $\frac{1}{4}$.

Part of a tree diagram that shows the possible outcome was given as follows.



(a) Candidates were asked to find the value of *a*. Majority of the candidates gave correctly the value of *a* as $\frac{1}{2}$.

Expected answer: $\frac{1}{2}$

(b) Candidates were expected to calculate the probability that the person was married and did not participate in a sport. Most of the candidates identified the correct outcomes but did not know whether to multiply or add them i.e. wrote $\frac{1}{2}\times\frac{1}{3}\times\frac{1}{5}\times\frac{1}{2}\times\frac{2}{3}\times\frac{1}{4} = \frac{1}{30}\times\frac{1}{12}$ instead of $\frac{1}{2}\times\frac{1}{3}\times\frac{1}{5}+\frac{1}{2}\times\frac{2}{3}\times\frac{1}{4} = \frac{1}{30}+\frac{1}{12} = \frac{7}{60}$. Some had $(\frac{1}{3}\times\frac{1}{5}+\frac{2}{3}\times\frac{1}{4})$ and neglected the $\frac{1}{2}$ for married in the first branch.

Common wrong errors: $\frac{1}{30}\times\frac{1}{12}$ or $\frac{1}{3}\times\frac{1}{5}+\frac{2}{3}\times\frac{1}{4})$

Expected response: $\frac{1}{2}\times\frac{1}{3}\times\frac{1}{5}+\frac{1}{2}\times\frac{2}{3}\times\frac{1}{4} = \frac{7}{60}$

(c) The question required candidates to find the number of married people expected to participate in a sport, given that the community had 600 people. Most of the candidates could not comprehend what the question required them to do. Some left their answer as $\frac{23}{60}$.

Common errors: $\frac{23}{60}\times 300$ or $(1 - \frac{23}{60})\times 600 = 530$ or $\frac{23}{60}$

Expected response: 230

Question 21

Candidates were expected to solve by factorization, the quadratic equation $2a^2 - a - 15 = 0$.

This was fairly answered although some of the candidates solved the quadratic equation using a quadratic formula instead of factorisation hence lost of the marks. Few of them mixed the signs of the factors and used – 5 and 6 instead of 5 and – 6 .

Common wrong answers: $a = 2.5$ or $a = -3$

Expected response: $a = -\frac{5}{2}$ or $a = 3$

EGCSE MATHEMATICS

Paper 6880/04

Calculator Structured Questions (Core and Extended)

General Comments

The paper proved to be challenging to most candidates. Of the 8885 candidates who wrote this paper, less than 300 (3.3%) scored at least 100 marks in it. About 40% of the scores were below 20 marks. There were several candidates who scored no points in the examination. They lost marks even in questions that required the application of multiple methods. In questions such as **Question 10, 8b, 14a, 13a** and **15b(i)**, candidates struggled to effectively illustrate the deductive reasoning skills required of them. In question 15(b)(i), they were required to first solve a quadratic equation, then express the answer as coordinate points and align with the given labels in the graph. In most cases they scored partial marks.

This paper required candidates to be familiar with all the necessary formulae used in shape and trigonometry. They needed to pay attention to key Mathematical phrases and correctly interpret their meaning. Coverage of syllabus content from the core component of the syllabus such as addition of fractions and operating with directed numbers was essential for effective answering of questions. Points were lost in combining steps. It is recommended that in changing the subjects in formulae, every step be shown separately.

The questions that proved most challenging to candidates were **Questions 4(a), (b)** (area of a sector and non- right angled triangle), **12,13(a)(b)** (finding depth, area and volume in similar solids, given length ratio), **10(b)** (compounded depreciation), **7(b)** (repeated mixed probability of combined events), 8(b)(equations of perpendicular lines), **5(b)** (total surface area of a cylinder from volume and diameter),**11(a)** (changing the subject in a formula involving a square root of an algebraic fraction) and question **16(c)(iii)** (using a cumulative frequency curve to calculate the percentage of learners who passed). The only questions that presented minimal difficulty to candidates were question 6(a)(order of a matrix), **7(a)** (probability of a single event) and **16(a)** (identifying the median in a cumulative frequency curve).

Educators are advised to consult examiner reports such as this one, to improve on the quality and tactics of tackling syllabus content. There was an improvement in the showing of working, as a variety of relevant methods of attempting answers to questions were used by candidates.

Comments on Specific Questions

Question 1

(a) A majority of candidates were able to get the correct prime factorisation. Some experienced difficulty when expressing the prime products in index form.

Common errors were: a result of interchanging the powers of 3 and 5. The arising wrong response was $5^3 \times 3^2$.

The expected correct response was $5^2 \times 3^3$

(b) Candidates who obtained the common incorrect answer of 5, 9, 9, 5 seem to have added the entries in the fourth row to numbers occupying the same position the fifth row (1+4=5, then 5+4=9). **The expected correct answer was; 5, 10, 10, 5.**

Question 2

(a) This question was challenging for a majority of candidates. They obtained a wrong error of; a=28 resulting from finding the seventh term instead of the 20th term. An incorrect c =31 was also obtained by treating the 20th term as a 7th term in the sequence labelled B in the question;(24+7=31) and b=18

The anticipated correct answer was: $a = 210, b = 18, c = 213$**.**

(b) Another hardly accessible question for candidates was this one. Several forms of expressions in terms of n were given as responses. These include; p=n(n+1) and p= n(n+3).

The expected final answer; $p = \frac{1}{2}(n+1)+3$**.**

Question 3

(a) This was one of the moderately accessible question. A large set of candidates divided the speed of 90km/hr by the distance instead of dividing the distance by the speed. This yielded an answer of $\frac{90}{6} = 15\min$. The other common error was an answer of 4.02, which resulted from the premature rounding of $\frac{6}{90}$ to 0.67. The answer was then outside the range of the expected accuracy.

The expected correct answer was $\frac{6}{90} \times 60 = 4 miutes$

(b) The question required candidates to calculate the area of the trapezium under the speed time graph. The most common incorrect answer of 70km arose from multiplying 10 by 7, as if the shape under the graph was a rectangle.

The popular incorrect answers were: $7 \times 10 = 70m \text{ and } 2 \times 10 + \frac{1}{2} \times 7 \times 10 = 55m.$

The expected correct answer was: $\mathbf{(2 \times 10) + \frac{1}{2} \times 5 \times 10 = 45m.}$

(c) About 75% of the candidates could not gain the full marks in this question. Of these only were those who converted only 105km to 105000m. These proceeded to divide only by 60. The resulting common error was 1750m/s.

The expected response was; $\frac{105000}{3600} = 29.2m/s$

Question 4

(a) About 80% of the candidates found this question challenging.

(i) The key to effectively answering this question was to realise that the shaded area comprised

of a sector and a triangle. Candidates seemed to have assumed the shaded part to be just a

circle. There were several answers with errors, such as 50.27 and 8.378.

The anticipated response was: $\frac{300}{360} \times \pi \times 16 + \frac{1}{2} \times 16 \sin 60 = 48.8$

(b) Whilst there were impressive responses from only 2% of the candidates, this question proved to be one of the most challenging to a majority of candidates. They were expected to use Pythagoras rule to find one side in the trapezium and add the arc-length of the sector. One of the frequently occurring incorrect response was; $8\pi + 8 + 5 + 4 = 25.13 + 17 = 42.13$.

The expected correct answer was: 38.9cm

Question 5

(a) The question proved to be slightly challenging for most candidates. The question required candidates to use the equation $V = \pi r^2 h$ and substitute the given volume of a cylinder, then calculate *h*. The mistake committed by most candidates was using the formula for volume of a cone $V = \frac{1}{3}\pi r^2 h$ and then using 13cm as the radius, yet it was a diameter. Another cohort of about 30% of candidates obtained a height of 29.3. This, they obtained from using their invented formula; $V = \pi d h$, where $h = \frac{1194.6}{13\pi}$=29.3.

The expected correct response was $h = \frac{1194.6}{6.5^2\pi}$=9.00.

(b) The question required candidates to find sum of the curved surface area of the cylinder and the two areas of its circular ends. A majority of candidates (90%) found this question very challenging. Several incorrect answers were noticed. These include $\pi \times 13 \times 9 + \pi \times 6.5^2 = 500$ (curved surface area + one circular end).Some still used the diameter in the place of a radius.

The expected correct response was: $\pi \times 13 \times 9 + 2\pi \times 6.5^2 = 633$.

Question 6

(a) Candidates found this question easy. The occasional incorrect responses were 3 by 1 and row matrix. **The expected correct response was: 1 by 3.**

(a)(i) Matrices involving decimals exposed some difficulties in some candidates, where numbers with 2 decimals would appear in the answer space. The most common mistake was in the order of the resulting matrix. Some gave a 3 by 2 matrix as an answer. Several incorrect answers such as: (7.5), $\begin{pmatrix}4\\3.5\end{pmatrix}$ and $(4.5 \quad 2.4 \quad 0.6)$ arose. **The expected correct response was: $(4 \quad 3.5)$.**

(ii) A majority of candidates could at least relate the information to the amount of money spent. They could not separate the users. **The expected response was: the amount of money spent by Lomasontfo and Xolile respectively.**

Question 7

(a) **(i)** Finding the probability of a single event proved easy for 70% of the candidates. One frequently noted wrong answer was $\frac{\text{desired outcome}}{\text{total possible outcomes}} = \frac{4}{6}$. The expected correct answer was: $\frac{\text{number of desired outcomes}}{\text{total possible outcomes}} = \frac{1}{6}$.

(ii) The candidates who could not give correct responses, assumed there were 4 prime numbers between 1 and 6. They included 1 as a prime number. Some wrong responses include: $\frac{4}{6}$, $\frac{2}{6}$ and 3. **The expected correct answer was: $\frac{3}{6}$**

(a) This was one question which was hardly answered correctly. It was most inaccessible to learners. Some wrong responses include $\frac{1}{216}$ (the probability of getting a six,3 times) and $\frac{2}{3} \times \frac{1}{6} = \frac{1}{9}$. The less than 2% who answered correctly demonstrated impressive methods and understanding of the probability of combined events. One such method was: $15 \times \left(\frac{1}{6}\right)^3$. **The expected correct answer was: $\frac{5}{216} + \frac{5}{216} + \frac{5}{216} = \frac{5}{72}$.**

Question 8

(a) **(i)** The question was accessible to about 40% of the candidates. The candidates who missed out from scoring points mostly obtained 13 as a wrong answer. They subtracted the squares of the sum of the x and y coordinates.

$Ac = \sqrt{(-3+3)^2 - (5+8)^2} = \sqrt{0+169} = 13$.

The expected correct response was:

$\boldsymbol{AC = \sqrt{(-3-3)^2 + (5-8)^2} = \sqrt{36+9} = \sqrt{45} = 6.71}$.

(ii) Although candidates demonstrated familiarity with the concept of finding the gradient, they still had a lot of errors. In their wrong responses they found the inverted form of the expected quotient; $\frac{\Delta x}{\Delta y} = \frac{-4-3}{13-8} = -1.4$.

The expected correct answer was: $\frac{\Delta y}{\Delta x} = \frac{13-8}{-4-3} = \frac{-5}{7}$

(iii) Several forms of mistakes emerged in the responses of candidates in finding the mid-point of a line segment. This question. One common error was subtracting the coordinate points instead of adding them. The resulting incorrect answer was: $\frac{-3-4}{2}, \frac{5-13}{2} = (0.5, 4)$.

The correct response was; $\frac{-4+(-3)}{2}, \frac{13+5}{2} = (-3.5, 9)$**.**

(b) This question proved inaccessible for 80% of the candidates. Those who remembered that gradients of perpendicular lines are negative reciprocals of each other, had an error in assuming that they share the same y-intercept. Some only recalled the reciprocal part of the gradient.

The resulting wrong responses were: $y = \frac{1}{2}x + 7, y = -0.5x + 7, y = 2x + 3$.

The anticipated corrected response was: $y = \frac{1}{2}x + 2$**.**

Question 9

(a) Candidates approached this question with much difficulty. They were required to add the expressions for the sides of a triangle and equate to the given expression for the perimeter. The error they committed was multiplying all the expressions instead of adding them. The resulting common error was: $3(x+2)(x-7) = 46 - 2x$

The expected response was

$$\begin{aligned} &3 + (x+2) + (x-7) = 46 - 2x \\ &2x - 2 = 46 - 2x \\ &4x = 48 \\ &x = 12 \end{aligned}$$

.

(b) Answers to this question were scares. Most candidates who attempted the question could identify the expression for the longest side of the triangle. However, their answers were incorrect because of their answer to (a). Some did not calculate the length. They simple produced the expressions; $x+2$ *and* $x-7$

The expected correct response was: 14

Question 10

(a) **Slightly more than** 35% of the candidates were able to interpret the question correctly. The frequently occurring incorrect response was, finding 11% of the value at the end of 2007.

The common error was therefore; $\frac{11}{100} \times 245000 = 26950$.

The expected correct response was: $\frac{9}{100} \times 245000 = E22050$ **.**

(b) This question proved very challenging for a large number of candidates. A diversity of errors emerged in this question. One of the errors was finding 111% of the value $(1+0.11)^3 \times 245000 = 335069.59$ .. This was the opposite of depreciation. Another error arose from partially answering the question, by finding only the value of the car after it depreciates for 3 years. This group forgot to answer the question on then finding the amount of insurance premium to be paid at the end of the 3 years; $(1-0.11)^3 \times 245000 = 172717.41$.

The expected correct response was: $(1-0.11)^3 \times 0.09 \times 245000 = E15544.57$ **.**

Question 11

(a) **(i)** The question required candidates to show that, making y the subject of the equation will yield the given quadratic equation. A large group of the candidates started by attempting to remove the square root before isolating the term with the square root. Numerical errors made yielded these wrong steps;

$x^2 = 2^2 + \sqrt{\frac{y+1}{2}}$ and $y = 2x^2 + 9$.

$y = 4x^2 - 15$

The expected correct response was:

$\boldsymbol{y = 2(x-2)^2 - 1 \text{ which yields } y = 2x^2 - 8x + 8 - 1}$. This step would then yield the given equation.

(ii) Most candidates managed to get this one correct from substituting x=3 in the equation they were expected to show in their answer for **(a) (i)**.

The correct answer was; 1

(b) **(i)** The question was a simple addition of algebraic fractions. However, it posed as a challenge to most candidates. The error was in multiplying each numerator by its corresponding denominator after getting the LCM of the denominators. The popular incorrect responses were: $\frac{2(x-4)}{3} \times 3 = \frac{x+3}{5} \times 5$ **.** The answers resulting from their wrong steps were; $x = 11 \text{ and } x = \frac{29}{7}$.

The expected response was: $\boldsymbol{x = 7}$

(ii) Half of the candidates were able to access this question. There was an improvement in the evaluation of the discriminant $(b^2 - 4ac)$. They still lost some marks because they continue to use a wrong quadratic formula with a short division line that divides only the discriminant. There were a few answers arising from the use of completing the square as an alternative method. One popular wrong answer was: $x = -17 \pm \frac{\sqrt{13489}}{10} = -28.6 \quad or -5.39$.

Other incorrect solutions arose from omitting the negative sign in the 17. Those answers were: 13.3 or -9.91.

The expected correct answers were: 9.91 or -13.3

(iii) Although candidates could recall the method of solving double inequalities, they still committed some mistakes. They treated division as subtraction. For them, $(6 \div 3 = 3\ just\ like\ 6 - 3 = 3)$. The popular wrong solution was: $\frac{-6}{3} \leq \frac{3x}{3} \leq \frac{6}{3}\ leading\ to;\ -3 \leq x \leq 3$.

The expected correct response was; $-2 \leq x \leq 2$.

(c) **(i)** In this question candidates were required to form a single fraction from $\frac{3x}{5} - \frac{x}{2}$. They subtracted the numerators from each other and expressed the answer as a fraction with the LCM of denominators as the new denominator. The wrong answers they produced were: $\frac{2x}{10}, \frac{1}{10}, x\ and -x$.

The expected correct response was: $\frac{6x-5x}{10} = \frac{x}{10}$.

(ii) This question proved to be a challenge for most candidates. They were required to factorise the numerator and denominator, then identify common factors to simplify their answer. They cancelled similar terms in the numerator and denominator, as if these terms were factors. The resulting wrong answer was: $\frac{a^2-25}{a^2+10a+25} = \frac{1}{10a}$.

The expected correct response was: $\frac{a^2-25}{a^2+10a+25} = \frac{a-5}{a+5}$.

Question 12

(a) When proving the similarity of 2 cuboids from given dimensions, the candidates merely restated the relationship between corresponding sides using the ratios. They forgot to reshuffle the sides, as a result the common wrong responses were; 9: 8 = 7:14 = 4:18 and $9 \times 7 \times 8, 8 + 18 + 7$. There were very good responses arising from calculating volume, then finding the ratio of lengths. From the ratio of lengths, the corresponding sides were calculated and shown to be proportional. Those who lost come credit for using this approach calculated only one pair of corresponding sides. This was inconclusive as a proof for similarity.

The expected correct response was; 7:14=1:2, 4:8=1:2, 9:18= 1:2

(b) The question required candidates to find the ratio of areas of 2 similar cuboids. However, most candidates produced the ratio of volume 1:8 as a common wrong answer.

The expected correct response was, 1:4.

Question 13

(a) (i) A majority of candidates found this question very inaccessible. Candidates were required to calculate the volume of water in each of three similar cuboid tanks. They were given the total amount of water and the ratio of their radii. Candidates could not realise that the radius was a length. The common error was to use the ratio of lengths (1:2:3) instead of finding and using volume ratio (1:8:27)**.**

The result was; $\frac{1}{6} \times 7200 = 1200$, $\frac{2}{6} \times 7200 = 2400$, $\frac{3}{6} \times 7200 = 3600$.

The expected correct response was: $\frac{1}{36}\times 7200=200$, $\frac{8}{36}\times 7200=1600$, $\frac{27}{36}\times 7200=5400$.

(b) A majority of candidates struggled with figuring out this question requirement. They calculated the depth of water transferred from the tank instead of the depth of water remaining after 7200 litres was transferred to other tanks.

The popular wrong response was; $\frac{7200\times 450}{10000}=324$.

The expected correct response was, to find the water remaining, then the base area of the tank. The correct answer came from dividing the amount of water remaining by the base area of the tank. $\frac{10000-7200}{22.22} = 126cm$

Question 14

(a) One of the most inaccessible question to this candidature was this one. In trying to show that angle *RPQ* was 37.9, Candidates used the same angle to find the given area. Students need to beware that when showing, the given information such as the area in this question should have been used to find the angle. The angle to be shown should not be used to in finding itself. The common wrong approach used was: $\frac{1}{2} \times 7 \times 8 \times \sin 37.9 = 17.2$.

The expected correct approach was: $\frac{1}{2} \times 7 \times 8 \times \sin RPQ = 17.2$.

$$\sin QPR = \frac{2\times 17.2}{56}$$

$$Q\hat{P}R = 37.9°$$

(b) The question proved to be a challenge to candidates. They assumed angle PRQ to be 90° . They then proceeded to use the sine formula to find the common wrong answer of 4.91.

$\frac{RQ}{\sin 37.9} = \frac{8}{\sin 90}$. Another group substituted sin instead of cos in the cosine formula.
$RQ = 4.91$

The expected response was to use the cosine formula to find RQ, which yielded:

$\boldsymbol{RQ = \sqrt{7^2 + 8^2 - 2 \times 7 \times 8cos37.9} = 4.96}$.

Question 15

(a) Several impressive factorisation methods were demonstrated in this question. Errors were made in signs and finding factors of negative numbers. The commonly emerging solutions were: $(3x-5)(2x+2), 6(x-1)(x-10)$. They were those who tried solving the expression as if it was a quadratic equation.

The expected response was: $(3x+2)(2x-5)$.

(b) **(i)** This question required candidates to equate their(a) factors to zero and solve for x. These values of x were then to be presented as coordinate points. $\left(\frac{5}{2}, -\frac{2}{3}\right)$ One of the common wrong answers was: About 80% of the candidates who were able to equate their factors to zero, could not find the correct x-coordinates of points L and M because of errors in transposing terms over the equal sign.

The anticipated correct response was: $\left(\frac{5}{2}, 0\right), \left(-\frac{2}{3}, 0\right)$.

(ii) A variety of methods were impressively used by candidates to find the turning point of the quadratic function curve. These were; differentiation, midpoint of the zeros of the function and the quadratic formula. About 60% of the candidates illustrated correct attempts at answering the question. The popular wrong answers were: $12x - 11, 0.9$ *and* $\frac{-11}{12}$.

The expected answer was: $\frac{11}{12}$.

(iii) A high number of candidates were challenged by this question. Wrong responses included, substitution of the given gradient (13) into the expression for the derivative of the function. The few noticed wrong answers were,12(13)-11=145 and 0.9. Those who correctly equated their derivative function to 13 were able to obtain,

the expected correct answer, which was: $12x - 11 = 13, x = 2$

Question 16

(a) This question proved particularly easy for most candidates.

The expected response was: 6, 16, 35.

(b) The accessibility to this question was moderately easy for most candidates. However, some used lower class boundaries and mid-class values to plot the cumulative frequency curve. There were those who produced bar graphs instead of the expected curve.

The expected solution was a curve joining plots of (upper class boundaries, cumulative frequencies)

(c) **(i)** More than 50% of the candidates could not accurately answer this question. They used the table, yet they were asked to use their graph. The frequently occurring wrong answer was, $80 \leq x \leq 90$.

The expected correct response was 82.

(ii) Less than 55% of the candidates answered this question correctly. The mistake made was, finding an interquartile range-position then their interquartile. This wrong method used was: IQR=U.Q position – L.Q position= 26.25-8.75=17.5. After this they located the corresponding mark of 82, which was the common wrong answer.

The expected solution was: IQR= U.Q – L.Q = 86 – 74 =12.

(iii) This question proved particularly challenging for 95% of the candidates. Some of the wrong solution include;28.6%,$\frac{38-10}{38} \times 100\% = 73.7\%$ and $\frac{76}{100} \times 35 = 26.6$.

The correct answer was; $\frac{25}{35} \times \mathbf{100\% = 71.4\%}$

Question 17

(a) Another hardly well answered question was this one. The erred answers given were 128° and $76°$. The 128 arose from assuming that angle *APC* and angle *ABC* are opposite angles of a kite. They then subtracted 52 from 180.The correct response anticipated candidates to realise that quadrilateral APCO was a kite, with supplementary opposite angles. This fact had to be combined with realising that angle ABC is half of angle AOC (the angle ant the centre).

The correct answer was: $\frac{180-52}{2} = \mathbf{60°}$

(b) A majority of candidates were able to notice that the angles ADC and ABC were opposite angles of a cyclic quadrilateral. The common wrong answers were 52° and 104° .

The correct answer was: 116°.

(c) A mix up and wrong application of angle properties of a circle resulted into a fair attempt at answering the question. The angles 52° and 38° were common wrong answers obtained from diving either 104 or 76 by 2. The expected correct response was: $\frac{180-128}{2} = \mathbf{26°}$