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MATHEMATICS (6880)

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Table of Contents

EGCSE MATHEMATICS

Paper 6880/01

Non-Calculator Structured Questions (Core and Extended)

General Comments

The overall performance for this paper was better than last year's. Candidates who got zero mark were less than last year as they were only six, and there was no candidate who got 60 this year, this shows that this year's candidates were a better cohort.

Questions which proved to easier for the candidates were: **14(a)** and **15(a)**, and those questions which proved to be difficult to the candidates were: **1, 2, 4(b), 9(a), 13(a), 14(b)** and **16(b)**.

It was observed that candidates failed to present their work correctly and they lacked the right mathematical language. Below is the list of things which were of concern.

- The presentation: Candidates failed to adhere to mathematics language and seem not to understand the meaning of an equal sign.
  For example, when calculating the mean candidates would write,
  $1+2+2+2+3+5+7+9=\frac{31}{8}=3.875$, which was mathematically wrong hence no method mark was awarded.
- Candidates did not know when to use a calculator.
  - Calculators are only used to evaluate the answer. Working must be shown first before using the calculator. Candidates wrote the answer only without showing the working, hence they were not awarded the method mark/s.
    For example, in **Q15(b),** candidates were supposed to write $c=3.142\times14.6$ first in order to get the method mark. The accuracy mark was then obtained after punching the calculator.
- Candidates truncated answers to 3 s.f or 2 s.f even if the number was exact.
  For example, in **Q12(c)** the correct answer was 2.5 but candidates wrote 3 as their answer.
  Also, in **Q12(d)** the correct answer was 3.875 but candidates gave the answer as 3.88.
- Candidates seemed not to read questions with understanding.
  For example, in Q**1** the correct answer was 2,3,7 but candidates gave $2\times3\times7$ as an answer.

Comments on specific questions

Question 1

Most candidates did not attempt this question very well.
They also confused prime numbers and factors and the number 1 was considered as a prime number. Most of them listed all the factors of 84 without considering the prime in the question.

***Common wrong answers* were as follows.**

(i) 1,2,3,4,6,7,12,21,28,42,84

(ii) 2, 3, 5, 7, 11….

(iii) 2×3×7

Expected response: 2, 3, 7

Question 2

Most candidates did not get this question correct. They were not able to differentiate between factors and multiples.

They failed to list multiples of 26 even though they had calculators.

Common wrong answer: 2

Expected response: 260.

Question 3

(a) This was a fairly done question.
Some candidates did not show the working.

***Common wrong answers*:** $\frac{5}{12}$, $1\frac{4}{35}$ from $\frac{31}{35}$

Expected response: $\frac{31}{35}$

(b) The performance was average.
Some candidates confused addition of fraction with multiplication of fractions.
For example, they took $\frac{\frac{9}{5}\times\frac{2}{3}}{15}$ to be equal $\frac{9\times3+2\times10}{15}$.

***Common wrong answers were*:** $\frac{18}{15}$, $1\frac{3}{5}$

Expected response: $1\frac{1}{5}$

Question 4

(a) It was fairly done.
Some candidates gave more than one solution.

***Common wrong answers*:** 27, 39

Expected response: 2

(b) It was poorly done.

***Common wrong answer*:** 16
Expected response: 27

Question 5

It was poorly done.

Most candidates got 192 from $\frac{8}{100}\times 8\times 300$. They failed to calculate the interest in 8 months. They took the 8 months as 8 years.

***Common wrong answer*:** 3750, 324, 16

Expected response: 316

Question 6

This was also poorly done.

Common wrong answers: triangle, trapezium

Expected response: parallelogram

Question 7

(a) This was fairly done.

***Common wrong answer*:** *14p+2q* , *16q* , $4p^2+2q$
Expected response: *-4p+2q*

(b) This question was poorly done.
Candidates had difficulties with directed numbers.

***Common wrong answer*:** $p=-34$
Expected response: $p=22$

Question 8

(a) It was poorly done.

***Common wrong answer*:** 150, 120, 30

Expected response: 100^0

(b) Candidates were able to use the property of 'vertically opposite angles', and they were awarded a mark for that.

Expected response: 100^0

(c) It was fairly done.

Candidates were able to use a correct property hence they got it correct

Expected response: 60^0

Question 9

(a) It was poorly done.

***Common wrong answer*:** {3,1}, 3,1 , (1,3)

Expected response: (3,1)

(b) **(i)** It was poorly done.

Almost all the candidates reflected on $x = 0$ (*y-axis*)

Expected response: reflection along *x-axis (y = 0)*

(ii) It was fairly done.

***Common wrong answers*:** translated by vector, $\begin{pmatrix} 3 \\ -2 \end{pmatrix}$ or $\begin{pmatrix} -3 \\ 2 \end{pmatrix}$

Expected response: translation by vector $\begin{pmatrix} 3 \\ 2 \end{pmatrix}$

Question 10

(a) **(i)** It was fairly done.

Candidates were able to bisect lines; others did not show arcs on both sides of the line while others draw the correct bisector line but did not cross the line.

(ii) candidates could not bisect an angle. For those who attempted, the line did not pass through the angle. They did not show arcs.

(b) Poorly done as well.
Candidates did not mark the point but only wrong the letter D which resulted in a loss of marks.

Question 11

(a) It was fairly done.

Candidates were dividing by 3.

***Common wrong answer*:** 21, -7, -23

Expected response: -21

(b) It was fairly done.

Some candidate treated this as an expression, giving *9x + 45.*

***Common wrong answer*:** 3.46, 17, -5

Expected response: 5

Question 12

(a) It was well done.

***Common wrong answer*:** 9

Expected response: 2

(b) It was fairly done.

***Common wrong answer*:** 9, 7

Expected response: 8

(c) It was fairly done.

Candidates were not able to differentiate between the mean and median

***Common wrong answer*:** 3 (from 2.5), 1.5

Expected response: 2.5

(d) It was fairly done.

Candidates were giving answers to 3 significant figures.

***Common wrong answer*:** 3.88, 4, 3.9, 2.5

Expected response: 3.875

Question 13

(a) It was poorly done.

***Common wrong answer*:** 3kg + 5kg = 50, 3x + 5x = 50

Expected response: 3x + 5y = 50

(b) It was fairly done.

Candidates were able to eliminate one variable, and they did not show how they got the 5 and 7.

***Common wrong answer*:** $x = -9 \quad y = 16.3$, $\frac{31-3y}{2} = x$ or make y the subject.

Expected response: $x = 5 \quad y = 7$

Question 14

(a) It was poorly done.

Most candidates removed the denominator 2 and were left with 5*a* - 7 = 3x which lead to 5*a* = 3*x* + 7. Others replaced the = sign with + sign.

***Common wrong answer*:** *a* = 4 (from 5*a* = 20*x*), $\frac{6x+7}{5}$ from (5*a* - 7 = 6*x*) and $\frac{3x+7}{\frac{5}{2}}$

Expected response: $\frac{6x+14}{5}$

(b) Poorly done.

Candidates had no idea of what was expected of them hence they left blank spaces. Some were shading, others would just draw arrows.

***Common wrong answer*:** arrow directed to the left or right with an open ball and all of the above

Expected response: close ball with an arrow directed to the left

Question 15

(a) It was well done.

***Common wrong answer*:** 29.2

Expected response: 7.3

(b) It was poorly done.

Candidates would

- Write the answer without showing working
- Use 3.14 or 3 for л
- Others were calculating area of a circle

Expected response: 45.87 (45.9)

(c) It was fairly done.

Most candidates were multiplying by 2 instead of squaring i.e ($r^2 = 7.3 \times 2$)

hence getting a wrong answer.

***Common wrong answer*:** 21.9, 45.9

Expected response: 167.44 (167)

Question 16

(a) It was poorly done.

- Most candidates were using calculators, then they would work backward making a lot of mistakes, hence earning no mark.
- Others gave a value eg. $6.4\times10^3 = 6.400$

Common wrong answer: 12.8×10^6, 12800000

Expected response: 1.28×10^7

(b) It was poorly done.

Most candidates were using calculators, then they will work backward making a lot of mistakes hence getting no method mark.

***Common wrong answer*:** 4985000, 498.5×10^4

Expected response: 4.985×10^6

EGCSE MATHEMATICS

Paper 6880/02

Calculator Structured Questions (Core and Extended)

Key Message

Candidates must show workings for all answers, especially answers that are worth more than one mark. They must also give their answers to the required level of accuracy.

General Comments

This paper was written by core candidates only. This led to a very few number of candidates scoring close to 90. There were several candidates who scored above 40.

Generally, all questions were attempted by candidates and were accessible to all since there were no questions that were left unattended by candidates. Time allocated for this component of the paper proved to be enough since most candidates were able to finish.

This paper provided a wide range of syllabus objectives. These objectives allowed candidates to prove how well they understood some of the concepts. Most of the questions required candidates to recall concepts and use them directly other than applying them to real life situations. There were no 'show' questions and there were no 'prove' questions. The type of questions made the paper easily accessible to the core candidates.

The presentation of solutions showed a decline. There was an increase in the number of candidates that gave correct answers without showing any working, and this led to the candidates losing both the method marks and the accuracy marks. There were also several candidates that showed premature approximations, which led to inaccurate answers, causing them to lose the accuracy marks. Candidates were also not using their calculators fully, yet this was a calculator based component. This also led to them losing a lot of marks due to inaccurate mental calculation, which could have been avoided. This was seen especially when candidates were solving problems that involved directed numbers and changing percentages into decimals. Most candidates also had a problem in rounding off their answers correctly, which led to a loss of accuracy marks.

Candidates must be encouraged to show all necessary working clearly, as well as use a suitable level of accuracy. They should also be encouraged to use their calculators fully during this paper.

Questions that were easily accessible to most candidates were **Question 3(b)**, **Question 5(b)**, **Question 4(c)**, **Question 9(b)**, **Question 11(b)(ii)**, **Question 14(b)**, **Question 15(b)(i)**, and **Question 15 (b)(ii)**. Questions that proved to be the most challenging to candidates were **Question 1(b)(ii)**, **Question 5(a)**, **Question 7 (a)**, **Question 8(a)**, **Question8(b)**, **Question 10(a)**, **Question 10 (c)(i)**, **Question 13(b)**, and **Question 15(a)**.

Generally, most candidates gave a wide range of good responses, indicating that they understood the syllabus objectives, and that they had prepared well for this component, which also seemed easier than the one for the previous session.

Comments on Specific Questions

Question 1 *The equation of a straight line is* $y = 4x - 3$

(a) *State*

(i) *the gradient of the line.*

This question was well answered by most candidates. A few candidates were confusing the gradient and the y intercept.

Common wrong answers: 4*x*, *y* = 4

Expected response: 4

(ii) *the y – intercept of the line.*

This part of the question was also well answered by most candidates.

Common wrong answers: 3, *y* = 3, *y* = – 3

Expected response: – 3

(b) *On the grid draw*

(i) *the horizontal line passing through (2,5)*

Most candidates were able to draw the correct line. Some candidates drew a vertical line through (2,5). Other candidates just plotted the coordinate (2,5). A few candidates drew a sloping line through (2,5)

Common wrong answers: the line *x* = 5

Expected response: the line *y* = 5

(ii) *the line x + y = 8.*

This line was a challenge to most candidates. A few candidates were able to draw the correct line. The challenge came from the fact that *y* was not made the subject of the formula, hence it was a challenge for them to substitute. They were only able to find either (8,0) or (0,8) as one of the coordinates.

Common wrong answers: the line *x* = 8, the line *y* = 8, any sloping line passing through (8,0) or through (0,8).

Expected response: A line passing through (0,8) and (8,0).

Question 2

One of the solutions for the equation $x^2 + kx + 11 = 0$ *is* $x = 4$. *Find the value of* k.

This question was fairly done. Most candidates were able to substitute the 4 into the equation. They had a challenge when they had to simplify the equation and solve for the *k*. Some candidates squared the 4 to get 8 instead of 16. The ones that got the 16 failed to collect like terms i.e they got 4*k* = 27 instead of 4*k* = – 27.

Common wrong answers: 6.75, – 6.25, $\frac{x^2 - 11}{4}$.

Expected response: – 6.75.

Question 3

Candidates were given triangle PQR, with point D on PQ such that angle DRQ = 90°, PD = DR = 6 cm and angle RPQ = 30°.

Calculate

(a) *angle PDR.*

Most candidates had a challenge in identifying triangle *PRD* as an isosceles triangle, which made it difficult for them to identify angle *PRD* as 30° also.
The most common wrong working was 30° + 90° = 120°, which coincidentally gave the correct answer. Candidates did not get the marks because the method used was not correct.

Common wrong answers: 60°, 45°, 150°

Expected response: 120°

(b) *the length of DQ.*

This part of the question proved to be a challenge to most candidates. Some candidates used the Pythagoras rule yet the two sides given were not for the required triangle. The common wrong working was $\sqrt{6^2 + 6^2} = 8.49$. Some even added the 6 cm and the other 6 cm to give 12 cm, which was the correct answer, but again, did not get any marks since the method used was wrong. Other candidates attempted to use the trigonometric ratio, but had a challenge in using it correctly. Since they did not have the correct angles, they ended up using $sin\,90°, cos 90°$. Some candidates even decided to measure the side with a ruler giving them 6.8 cm.

Expected response:12 cm

Question 4

f(x) = 2 – 3x

Find

(a) f(– 4)

This question was fairly well answered. Most candidates were able to substitute – 4 correctly. Most of them were able to get the correct answer. A few candidates had a challenge in dealing with the directed numbers, even though they had calculators. Other candidates equated the function to – 4 and solved.

Common wrong workings: 2 – 3(– 4) = 2 – 12 = – 10,

2 – 3x = – 4, x = 2

Expected response: 14

(b) *x when* f(x) = 8

This part of the question was a challenge to most candidates. Most of them substituted the 8 into the function, finding the output, instead of solving the equation. The few that equated the function to 8 had a challenge in solving, because there were negative numbers that were involved.

Common wrong workings: $2 - 3x = 8$, $3x = 6$, $x = 2$

$$2 - 3(8) = 2 - 24 = -22$$

Expected response: – 2.

(c) *An expression for* $f^{-1}(x)$.

Finding the inverse function proved to be difficult for most candidates. Most of them left the question unanswered. Most of the few candidates that attempted the question got wrong answers due to the negative numbers. Other candidates tried to use the flow chart, but the first machine was wrong since it had +2, which led to a wrong solution.

Expected response: $\frac{2-x}{3}$

Question 5 *Factorise completely.*

(a) $16x + 20$

This question was well done by most candidates.

Common errors included partial factorisation e.g. $2(8x+10)$. A few candidates divided the expression by 4, to get $4x + 5$.

Expected response: $4(4x + 5)$

(b) $3p^2 - 48$

Candidates were only able to do partial factorisation which gave them $3(p^2 - 16)$. Most of them did not realize the difference of two squares thereafter. Most of the few that realized the difference of two squares had a challenge in applying it correctly.

Common wrong answers: $3(p^2 - 16)$, $3p^2 - 16$, $3(p - 16)(p + 16)$

Expected response: $3(p - 4)(p + 4)$

(c) $12x^3 + 8x^2$

This part of the question proved to be a challenge to most candidate due to the powers of the variable. Most candidates were able only to do partial factorisation.

Common wrong answers: $2(6x^3 + 4x^2)$, $2x(6x^2 + 4x)$, $4(3x^3 + 2x^2)$, $4x(3x^2 + 2x)$

Expected response: $4x^2(3x + 2)$

Question 6 *Solve*

(a) $15 - 2x < 19$

Most candidates were not able to solve this inequality. Most decided to write it as an equation, then solved it correctly, unfortunately, they lost all the marks. The few candidates that solved the inequality had a challenge with the sign change since they had to divide by a negative number.

Common wrong answers: $x < -2$, $x < 2$, $x = 2$, $x = -2$, $x < -17$

Expected response: $x > -2$.

(b) $\frac{t-2}{4} + \frac{t+5}{3} = 7$

This question was fairly done by most candidates. Some candidates were not able to remove the fraction properly, they only multiplied the left hand side by the LCM, leaving out the right hand side. Some of the candidates that were able to remove the brackets correctly had a challenge in collecting like terms, since it involved negative numbers, e,g $-6 + 20 = -14$ or $-6 + 20 = 26$ / -26.

Common wrong answers: 14, 1, $\frac{58}{7}$

Expected response: 10

(c) *$(x + 5)(x - 4) = 0$.*

This question was a challenge to most candidates. They were not able to realise that the quadratic equation was already factorised. Instead of equating the factors to zero and solving for the variable, they decided to open up the double brackets to get a new quadratic equation, and in the process they made a lot of mistakes. They tried to solve their own equation by factorisation, some even tried the quadratic formula.

Common wrong answers: 5 and -4

Expected response: -5 and 4

Question 7

A ship leaves port F on a bearing of 065° and sails for 160 km to port G. It then leaves port G on a bearing of 130° and sails 110 km to port H.

(a) *Make a scale drawing of the journey. Use a scale of 1cm to represent 20 km.*

This question was well done by most candidates. They were able to construct the scale drawing accurately, using the correct scale. A few candidates had challenges with the North line, resulting in them measuring the 130° at the end of the first line, but their distances were correctly calculated and measured.

(b) *Use the scale drawing to find*

(i) *the actual distance between port F and port H.*

This part of the question was fairly done. Most candidates were able to measure the distance *FH* form their diagrams and multiplied their answers by 20, to convert it to kilometres. A few candidates added the distance *FG* to *GH* to get *FH*. Some even used the Pythagoras theorem to try and find *FH*, which led to wrong solutions since the triangle was not right angled.

Common wrong workings: 160 + 110 = 270 km, $\sqrt{160^2+110^2}=194.2$

Expected response: 228 km to 232 km

(ii) *the bearing of port F from port H.*

Most candidates with correct diagrams were able to get this correctly. Their challenge was measuring the bearing in the anti-clockwise direction. A few candidates just added the two bearings that were given.

Common wrong working: 65° + 30° = 195°

Expected response: 269° t0 271°

Question 8

(a) *List all the factors of 48.*

This question was well answered by most candidates. The common mistake was leaving out some of the factors, like 1 and 48. Some candidates decided to write multiples instead of factors.

Expected response: {1, 2, 3, 4, 6, 8, 12, 16, 24, 48}

(b) *Find the highest common factor of 28 and 48.*

This part of the question was also well answered. A few candidates made the mistake of listing the multiples of 28, instead of the factors.

Expected response: 4

Question 9 $a=\begin{pmatrix}6\\1\end{pmatrix}$ *and* $b=\begin{pmatrix}-4\\3\end{pmatrix}$

Work out

(a) $2\underline{a}-3\underline{b}$

This was fairly answered. Candidates were able to multiply the vector by the scalar. They had a challenge in multiplying **b** by the 3, they did not know how to deal with the negative sign.

Common wrong working: $\begin{pmatrix}12\\2\end{pmatrix}-\begin{pmatrix}12\\-9\end{pmatrix}=\begin{pmatrix}0\\11\end{pmatrix}$

Expected response: $\begin{pmatrix}24\\-7\end{pmatrix}$

(b) $|\underline{a}|$

A few candidates were able to answer this question correctly. Most candidates showed lack of knowledge on how to answer such question, hence they left the question unanswered.

Common wrong working: $\begin{pmatrix}6\\1\end{pmatrix}\begin{pmatrix}6\\1\end{pmatrix}=\begin{pmatrix}36\\1\end{pmatrix}$

Expected response: 6.08.

Question 10

(a) *State the order of the matrix* $\begin{pmatrix}3 & 4 & -5\\-1 & 0 & 2\end{pmatrix}$.

This was well answered by most candidates.

Common wrong answer: 3 by 2

Expected response: 2 by 3.

(b) *Write down the single matrix that represents* $\begin{pmatrix}1 & 0\\0 & 1\end{pmatrix}\begin{pmatrix}3 & 7 & 1\\0 & 4 & -5\end{pmatrix}$

This part of the question was well done by most learners though they had to do the actual multiplication, for them to come up with the correct answer. They were not able to note that they were multiplying by an identity matrix which was not going to change the matrix. In the process of multiplying out, some candidates made mistakes causing them to lose marks.

Expected response: $\begin{pmatrix}3 & 7 & 1\\0 & 4 & -5\end{pmatrix}$

(c) *Work out*

(i) $\begin{pmatrix}-3 & 0\\2 & 1\end{pmatrix}+\begin{pmatrix}-1 & 3\\-2 & 0\end{pmatrix}$

This question was well answered by most candidates except a few that had challenges with addition of directed numbers

Expected response: $\begin{pmatrix}-4 & 3\\0 & 1\end{pmatrix}$

(ii) $\begin{pmatrix}7 & 1\\4 & -5\end{pmatrix}\begin{pmatrix}1 & -4\\0 & 3\end{pmatrix}$

This part of the question was fairly done by most candidates. A few candidates showed lack of the concept by multiplying corresponding entries. Other candidates multiplied correctly but wrote the entries at the wrong position, hence losing all the marks.

Common wrong answers: $\begin{pmatrix} 7 & -4 \\ 0 & -15 \end{pmatrix}$, $\begin{pmatrix} 7 & 4 \\ -25 & -31 \end{pmatrix}$

Expected response: $\begin{pmatrix} 7 & -25 \\ 4 & -31 \end{pmatrix}$,

Question 11

(a) ***(i)*** *Find 23.4% of 725.*

This question was generally well answered by all the candidates. Most candidates had a challenge of rounding off the answer yet the answer was exact, and they were not supposed to round it off. This resulted in them losing the accuracy marks.

Common wrong working: $\frac{23.4}{725} \times 100 = 3.23$

Common wrong answers: 169.7, 169, 170

Expected response: 169.65

(ii) *Express* $\frac{5}{9}$ *as a percentage.*

This part was fairly answered by most candidates. The candidates had a challenge in rounding off the answer correctly, resulting in them losing the accuracy mark.

Common wrong answers: 55.5, 55, 56, 0.555

Expected response: 55.6

(b) ***(i)*** *Work out 0.06 × 5.86 giving your answer correct to the nearest tenth.*

Candidates were able to get the answer, and yet again, they had a challenge in rounding off the answer to the given accuracy.

Common wrong answers: 0.40, 0.400, 0.35, 0.351

Expected response:0.4.

(ii) *Write 2736 correct to the nearest 25.*

Most candidates had a challenge in answering this question. They seemed not to have an accurate idea of what was expected of them. They were trying to round it off to the nearest power of ten. Some candidates tried to add or to subtract the 25 from the given value. Others used different wrong methods that led to wrong answers.

Common wrong answers: 2730, 2700, 2750

Expected response: 2725

Question 12

Candidates were given a compound shape that was made of rectangles. The lengths of the sides were given, except for two, which they were supposed to find.

(a) *Calculate the perimeter of the figure.*

Most candidate proved to know how to find the perimeter. The main challenge was that two of the sides were not given, and they had to find them first. Most candidates decided to add only the given sides, leading to a wrong answer, and they lost both marks. The few candidates that found the missing sides made mistakes in the addition, leading to loss of the accuracy mark.

Common wrong answers: 42, 47, 53

Expected response: 52

(b) *Convert your answer to part (a) to mm*.

This part was well answered by most candidates, using their wrong answers from part **(a)**. Common wrong working was multiplying their answer from part **(a)** by 100 or by 1000.

Expected response: 520

(c) *Calculate the area of the figure.*

This part proved to be a challenge for most candidates. Most candidates used wrong formulae, such as the formula for finding the area of a triangle. Some even used the formula for the area of a circle. Other candidates used the formula for finding the volume of a cuboid. The few candidates that had an idea on how to find the area were not sub diving the shape correctly because there were either overlaps or sometimes some pieces were left out. This then led to a variety of wrong answers.

Expected response: 110

Question 13

The number of days each of 45 pupils was absent in a term were shown in a frequency table, given all the frequencies.

(a) *Find the*

(i) *mode*

This question was fairly answered. A few candidates gave the highest frequency as the mode. Some were confused by the fact that the mode was zero, so instead they wrote the mode as none, and they lost the mark. Other candidates gave the median as the mode.

Common wrong answers: 12, 2, none

(ii) *median*

Candidates had a challenge in finding the median. They were able to find the median position but had a challenge in identifying the median. The common wrong working was arranging the frequencies in order then identified the number in the middle, which was 9, as the median.

Common wrong answer: 9

Expected response: 2

(iii) *mean.*

This part of the question proved to be a challenge to most candidates. Generally, candidates were struggling to calculate the statistics from a frequency table. Most candidates were not able to find the mean. They added their frequencies and divided their answer by the number of frequencies, leading to a wrong answer. A few candidates that used the correct method made a mistake of $0\times12=12$, which led to a wrong numerator, eventually leading to a wrong answer. These candidates lost all the marks.

Common wrong working: $\frac{12+9+11+8+5}{5}=9$, $\frac{12+9+22+24+20}{45}=\frac{87}{45}=1.93$

Common wrong answers: 9, 1.93, $\frac{75}{5}=15$, 1.6, 1.66

Expected response: $\frac{75}{45}=1.67$

(b) *A pie chart is to be drawn to show the information in the above frequency table.*

Calculate the sector angle which represent pupils who were absent for 2 days.

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

Common wrong workings: $\frac{11}{45}\times100=24.4$, $\frac{2}{45}\times360=16$, $\frac{2}{11}\times360=65.5$

Expected response: $\frac{11}{45}\times360=88$

(c) *Draw a bar chart to represent the information in the frequency table.*

(A grid was given for the bar chart and candidates were supposed to come up with their own scale.)

This part of the question was well done by most candidates. The challenge that most candidates had was coming up with a scale, since it was not given. Most candidates used a non-uniform scale since they wanted bigger bars, using only the frequencies that were given. Some candidates were confused on how to draw the zero bar, and they ended up not drawing it, starting from the bar of 1 day. A few candidates had their frequencies on the horizontal axis, yet their bars were vertical. A few other candidates drew pie charts instead, from the fact that the previous question was on sector angles.

Question 14

A man took 2 hours 25 minutes to travel from Town A to Town B. It arrived at 1410 hours.

(a) *Work out the time at which the train departed from Town A.*

This question was a challenge to most candidates. They were aware that they had to subtract 2 hours 25 minutes from 14h10. The main challenge was subtracting 25 minutes from 10 minutes. They ended up subtracting the time like normal decimals, taking 1 hour to be 100 minutes.

Common wrong answers: 11 85, which led to 12 15.

Expected response: 11 45

(b) *The distance from Town A to Town B is 105 km.*

Calculate the average speed of the train.

This part of the question was an uphill to most candidates. They had a challenge in converting 2 hours 25 minutes to hours. They ended up getting 2.25 hours. Some even decided to change the time to minutes, making it even harder to get the speed in km/h. The few candidates that changed the time correctly had a challenge of premature approximation. They ended up dividing by 2.4 instead of $2\frac{5}{12}$, which gave an inaccurate answer, leading to loss of the accuracy mark.

Common wrong workings: $\frac{105}{2.25} = 46.67$, $\frac{105}{2\ 25} = 0.4667,$ $\frac{105}{145} = 0.724$

Expected response: 43.4

Question 15

A basket contains 3 green apples and 2 red apples. A boy picks an apple at random from the basket.

(a) *Find the probability that the apple is green.*

This is one of the questions that was accessible to most candidates. It was well done.

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

Expected response: $\frac{3}{5}$

(b) *He replaces the apple and picks an apple at random for a second time.*

(i) *Draw a possibility space diagram to show all possible outcomes of the two picks. (A grid was provided)*

This is one of the questions that gave a challenge to most candidates. They seemed not to know what was expected of them. They came up with different diagrams, some even had tree diagram

which were also wrong. The few that had an idea labelled the axis with 1 to 5, then green apples on one axis and red apples on the other axis. Correct diagrams were rarely seen in this question.

(ii) *Find the probability that the first apple is green, and the second apple is red.*

This part was also a challenge to most learners, even the few that had correct space diagrams could not use it to find the answer. They could not deal with the event as independent but treated them as mutually exclusive.

Common wrong working: $\frac{2}{5}+\frac{3}{5}=1$

Expected response: $\frac{6}{25}$

EGCSE MATHEMATICS

Paper 6880/03

Calculator Structured Questions (Extended)

General Comments

All candidates were able to go through all the questions in the paper which means the time allocated for the paper was enough.

From the candidate's responses, it can be deduced that almost all candidates had gone through almost all the topics in the syllabus. However, **Q12** proved that similarity was not covered by a majority of the candidates. Very few candidates were leaving questions not attempted.

Questions that proved to be easy for the candidates in this component **were Q1, Q2(b), Q5, Q8, Q9, Q13, Q14(b), Q18 and Q19.**

Q2(a), Q7(a), (b), Q10(a), (b), Q11, Q12, Q14(a), Q16, Q17, Q21(a), (b) and Q22(a) proved to be difficult for the candidates.

This paper was of the same difficulty as the previous year's paper. The general overall performance was below average for majority of candidates than expected. Less than 10 candidates scored a total of 76 marks. Although there were few 70's, many were in the range 30 – 50 marks and about 5 zeroes recorded. The candidates were a better cohort compared to the previous year's cohort.

Lack of skill on the use an electronic calculator was evident in **Q2, Q5 (b) and Q8** despite the objectives in the mathematics syllabus clearly requiring learners to be able to use an electronic calculator.

Writing of incorrectly rounded answers without showing any working was common in **Q1** and **Q18 (d)** which lead to a loss of marks. Candidates should be encouraged to always show all the working.

Rounding off exact answers contributed to the loss of marks, for example, **Q1, Q10 (b)** and **Q18 (d)**. Learners should be discouraged from rounding off exact answers and also to avoid truncating or rounding their answers straight from the calculator to less than 3 significant figures. In fact, they should be advised to display a long version of their answers first before rounding it off.

The use of 3.14 instead of 3.142 or calculator π for π was noted in **Q7 (a)** and **(b)**.

Comments on specific questions

Question 1

Candidates were required to calculate 12.5% of 55 km.

This question seemed relatively easy for the candidates, however most of the candidates failed to score all the required marks since they rounded off the exact 6.875 to either 6.88 or 6.9 straight from their calculator without displaying it down first or even showing working.

Common wrong Answers: 6.88 **or** 6.9

Expected response: 6.875

Question 2

(a) Candidates were expected to work out

$\sqrt{0.4^{0.4} \times 1.3^{1.3}} + 2.17^{0.2}$, giving their full calculator display.

The response of candidates to this question was not impressive. Very few gave the correct answer, 2.154953448. Most of them gave their answer as 2.338544262 from $\sqrt{0.4^{0.4}} \times 1.3^{1.3} + 2.17^{0.2}$.

Common wrong answer: 2.338544262.

Expected response: 2.154953448.

(b) Candidates were expected to write their answer to **(a)** correct to 3 decimal places. This question was well answered by most candidates. Very few rounded their answer to 3 significant figures instead of 3 decimal places.

Common wrong answers: 2.15 **or** 2.34.

Expected response: 2.154953448.

Question 3

Candidates were required to work out $1\frac{4}{5} \div \frac{3}{7}$, showing all working, without using a calculator.

Some candidates changed $1\frac{4}{5}$ to $\frac{9}{4}$ instead of $\frac{9}{5}$.

Those candidates who correctly had $\frac{9}{5} \times \frac{7}{3}$ failed to correctly multiply 9 and 7 and the ended up having $\frac{62}{15} = 4\frac{2}{15}$ .Some worked out $\frac{9}{5} \times \frac{7}{3}$ as $\frac{3 \times 9 \times 5 \times 7}{15}$ and ended up having $\frac{945}{15} = 63$.

Common wrong answers: 4.2 or $4\frac{2}{15}$ or 63.

Expected response: $4\frac{1}{5}$.

Question 5

Candidates were given **a** = $\begin{pmatrix} 4 \\ -3 \end{pmatrix}$ and **b** = $\begin{pmatrix} 7 \\ 4 \end{pmatrix}$ and asked to work out;

(a) 5**a,**

(b) **a – b .**

In both parts, the candidate's answers had no brackets or writing the answer as either a fraction or coordinate.

Common wrong answers: (a) $\begin{matrix}20\\-15\end{matrix}$ **or** $\frac{20}{-15}$ **or** $\left(\frac{20}{-15}\right)$ **or** (20, – 15)

Expected response: **(a)** $\begin{pmatrix}20\\-15\end{pmatrix}$

Common wrong answers: (b) $\begin{matrix}-3\\-7\end{matrix}$ **or** $\frac{-3}{-7}$ or $\left(\frac{-3}{-7}\right)$ **or** (– 3, – 7)

or $\begin{pmatrix}-3\\-17\end{pmatrix}$ for those who failed to handle directed numbers.

Expected response: **(b)** $\begin{pmatrix}-3\\-7\end{pmatrix}$

Question 6

(a) Candidates were asked to factorise fully $9p^2q - 12q^2p^3$.

This part was not well done. The factorization was incomplete.

Common wrong answers: *pq* (9*p* – 12p^2q) **or** 3*pq* (3*p*-4p^2q) **or** p^2q (9 – 12pq)

or 3p^2 (3*q* – 4q^2p).

Expected response: 3p^2q (3 – 4*pq*)

(b) Candidates were required to simplify 3*x* – 4(5 – 9*x*).

This part was also not well done. Some failed to multiply – 4 (– 9*x)* resulting to

3*x* – 20 – 36*x* = – 33*x* – 20.

Some treated it as double brackets (3*x* – 4) (5 – 9*x*) and ended up with a wrong quadratic expression.

Common wrong answer: – 33*x* – 20

Expected response: 39*x* – 20.

Question 7

(a) The question required candidates to calculate the area of a sector AOB with sector angle 42˚ and radius 5cm.

This is one of the questions that seemed very challenging to the candidates. Some calculated area of o full circle leading to 78.5 yet some calculated arc length instead of sector area. Others

used $\frac{1}{2}\pi r^2$ or $\frac{1}{4}\pi^2$ resulting to 39.3 or 19.6. There are still those candidates who used 3.14 for π instead of 3.142 or calculator π hence lost the accuracy mark.

Common wrong answers: 78.5 **or** 39.3 **or** 19.6 **or** 13.7.

Expected response: 9.16

(b) Calculating perimeter of the sector was not possible for most candidates. Most candidates could not get the correct answer 13.7 but only calculated the arc length and did not add the two radii. Some used the 9.16 obtained in (a) and added it to the two radii.

Common wrong answer: 3.67 **or** 19.16.

Expected response: 13.7

Question 8

Candidates were given $P = 3t - 7s$ and asked to find the value of P when $t = -2$ and $s = -4$. This question was well done. Most of the candidates were able to get the correct answer, 22 with a very few who gave – 34 as their answer by failing to evaluate – 6 – – 28 even though they were allowed to use their calculators.

Common wrong answer: – 34

Expected response: 22

Question 9

Candidates were expected to apply BODMAS to work out 12 ÷ 4 – 2 – 3 × 2 + 7, showing their working clearly and without the use of a calculator.

This question was well answered by most candidates. Candidates seemed to know the correct order of operation.

However, the correct answer 2 was very common even for candidates who did not follow the correct order of operation but simply used the calculator.

Some introduced brackets as follows: (12 ÷4) – 2 – (3 ×2 + 7) and ended up with

3 – 2 – (6 + 7) resulting to – 12.

Common wrong answer: – 12

Expected response: 2

Question 10

(a) Most candidates found this question challenging. They used a wrong limit of accuracy i.e. 15.05 – 7.05 = 8

Some had 15 – 8 =7 then find the upper bound for the 7 and giving 7.5 as their answer. Those who had correct limits of accuracy for the given 15 and 7, used the wrong ones to find the upper bound for the difference between them. i.e. subtracted 8.5 from 15.5 to get 7.

Common wrong answers: 7.5 **or** 7 **or** wrong 8 from 15.05 – 7.05

Expected response: 8

(b) Candidates were supposed to calculate the lower bound for area of a rectangle with given dimensions given correct to the nearest cm.

This part was poorly done. Candidates simply calculated area of the rectangle i.e., 15 × 8 = 120 then gave the lower bound for the 120 which is 119.5 as the answer.

Those who used the correct limits 14.5 × 7.5 rounded the exact answer obtained from their calculators to 109 hence lost the accuracy mark.

Common wrong answers: 119.5 or 109

Expected response: 108.75

Question 11

Candidates could not calculate the required angle using the necessary angle properties of a circle. The correct answer 79˚ was very rare but $B\hat{D}C$ = 57˚ was very common. They failed to identify $A\hat{B}C$ as 44˚ (angle at circumference) using angle $A\hat{O}C$ = 88˚ (angle at centre).

Common wrong answer: 57˚.

Expected response: 79˚.

Question 12

Candidates were given the areas of two similar jars as 34 and 76.8 then asked to calculate the height of the larger jar when the height of the smaller one was 8cm.

This question was one of the most poorly done (proved to be very difficult). Candidates failed to relate ratio of areas to ratio of sides. Most candidates used the ratio of the areas as they were instead of first finding their square roots. i.e.

34 : 76.8

8 : *x*

Otherwise, the good candidates got the 12.0 from $\frac{8\sqrt{76.8}}{\sqrt{34}}$.

Common wrong answer: 18.07

Expected response: 12.0

Question 13

(a) Candidates were expected to correctly apply Pythagoras rule to calculate one of the shorter sides sides of a right angled triangle. This was generally well done.

Very few had $\sqrt{17^2+13^2}$ instead of $\sqrt{17^2-13^2}$. However the correct answer 10.95 was occasionally truncated to 10.9.

Common wrong answer: 21.4

Expected response: 11.0

(b) Candidates were supposed to apply the tan ratio to calculate an angle in a right angled triangle. This was well answered. Very few had $\tan^{-1}(\frac{15}{13}) = 49.1^{\circ}$. Use of very long methods gave a wrong answer 41.0 since answers obtained were prematurely rounded.

Question 14

(a) This part was fairly done although the correct answer was either seen without working or seen with wrong working i.e. $\frac{78+x}{6}=16$

Common wrong workings: $\frac{202+3x}{6} = 16$ or $\frac{78+x}{6}=16$

Correct working: $\frac{202+3x}{16}=16$

$x = 18$

(b) **(i)** This was well done.

Common wrong answers: 2 or $\frac{2}{20}$

(ii) This part was poorly done. Some candidates would write 9 without a denominator **or** $\frac{3}{16}$ **or** $\frac{1}{16}\times\frac{2}{16}\times\frac{6}{16}$

Expected response: $\frac{9}{16}$

Question 15

Candidates were asked to find the equation of a straight line, given the gradient and one of the points it passes through.

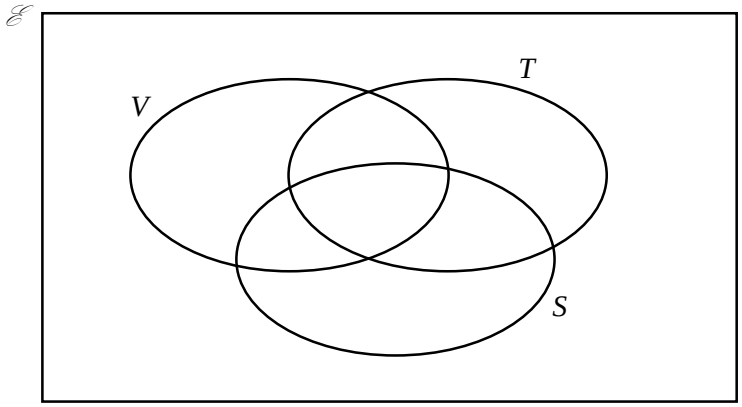
This question was generally well done. However, some candidates did not calculate the y intercept but took the y coordinate of the given coordinate as the intercept and gave their answer as $y = 2x + 17$. Others calculated the y intercept correctly but failed to write to write the equation of the line.

Common wrong answers: $y = 2x + 17$ or $L = 2x + 7$

Expected response: $y = 2x + 7$

Question 16

The question required candidates to shade the region $(V \cap S')\ \cup (T \cap V)$ in the following given Venn diagram.



This question was poorly done as very few candidates were able to identify both regions correctly. Most candidates would shade only one region, yet some were shading the region

$(V \cap S') \cap (T \cap V)$ instead of $(V \cap S')\ \cup (T \cap V)$, i.e. they treated the union between these sets as an intersection.

Common Wrong Answers: shading of either $V \cap S'$ **or** $(T \cap V)$ **or** $(V \cap S') \cap (T \cap V)$

Question 17

(a) Candidates were given a trapezium *P* on a grid and asked to map it onto trapezium *Q* using matrix $M = \begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix}$.

This part of the question was fairly answered even though some had 3 correct coordinates and would mistakenly plot (- 3, – 2) as (– 2, – 3). Others were reflecting figure *P* either on the *x*- axis or on the *y*-axis hence a wrong description in (b).

Common wrong Answers: figure *Q* with coordinates (- 1, – 1), (- 1, – 3), (- 2, – 3) and (- 3, – 1)

Or figure *Q* with coordinates (- 1, 1), (- 1, 3), (- 3, 1) and (- 2, 3)

Or figure *Q* with coordinates (1, – 1), (1, – 3), (3, – 1 and (2, – 3)

Expected response: figure *Q* with coordinates (- 1, – 1), (- 1, – 3), (- 3, – 2) and (- 3, – 1)

(b) Candidates were expected to describe fully the transformation represented by matrix

$M = \begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}$.

This part was fairly done. Some candidates were able to identify the transformation correctly as a reflection but would match it with a wrong mirror line, $y = x$ or y axis or

x axis instead of y = – x. Some identified it as a rotation of 180˚.

Common wrong answers: reflection in the line $y = x$ **or** reflection in the y axis **or** reflection in the x axis.

Question 18

Candidates were given the distribution 9 2 5 2 1 7 3 2 and

required to find the

(a) mode,

(b) range,

(c) median,

(d) mean.

This question proved to be the easiest and was well done by most candidates.

Common wrong Answers:

(b) range = 9 – 2 (first – last) = 7

(c) median = 4.5 (median position) or $\frac{2+1}{2}$ = 1.5 without rearrangement in order of

size or correct exact answer, 2.5 would be rounded to 3 i.e. $\frac{2+3}{2}$ = 3

(d) $\frac{31}{8}$ = 3.88 or 3.9 instead of 3.875(exact)

Expected response:

(a) 2

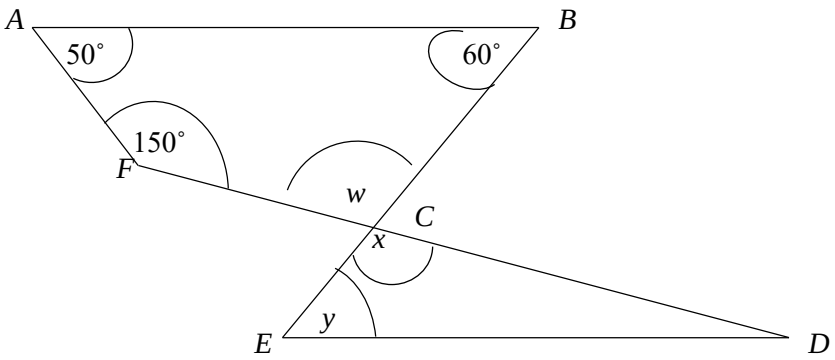
(b) 8

(c) 2.5

(d) 3.875

Question 19

Candidates were given the diagram



and asked to calculate angles *w*, *x* and *y*.

This was the easiest question as most candidates got it correct even those who eventually got low marks (overall).

Common wrong Answers: *w* = 120, AB treated as parallel to *CF* $\therefore A\hat{B}C$ supplementary to $B\hat{C}F$ (interior angles)

Expected response: *w* = 100˚, *x* = 100˚ and *y* = 60˚.

Question 20

(a) Candidates were asked to form an equation to represent the information about John buying 3 kg of peaches and 5 kg of mangoes for E50 from a fruit shop and assuming that 1 kg of peaches is E*x* and 1 kg of mangoes is E*y*.

This was fairly done even though some could not write the equation well.

Common wrong answers: 3kg + 5kg = 50 **or** x + *y* = 50 or 3*x* +5*y* or 3*p*+5*m*=50

or 3*x*+5*y* $\leq$ or $\geq$ 50 or E3*x*+E5*y* = 50

Expected response: 3*x* +5*y* = 50

(b) The question required candidates to solve the simultaneous equations;

$2x + 3y = 31$

$5x - 3y = 14$

Some of the candidates who attempted to solve by elimination correctly but their answers were prematurely rounded to *x* = 6.4 and *y* = 6.1 or even truncated to *x* = 6.42 or 6.4 and *y* = 6.04 or 6 and some committing a lot of arithmetic errors during the elimination of one of the variables.

Those candidates who tried solving using the matrix method struggled in finding the correct inverse and those who tried substitution failed to handle the fractions obtained.

Common wrong answers: x = 6.42 or 6.4 and y = 6.04 or 6

Expected responses: *x* = 6.43, *y* = 6.05

Question 21

(a) Finding the inverse of $\begin{pmatrix} 3 & x \\ 4 & -1 \end{pmatrix}$ was not very easy for the candidates. Most candidates had difficulties in finding the determinant of the matrix but remembered to write $\begin{pmatrix} -1 & -x \\ -4 & 3 \end{pmatrix}$ as the inverse. Some got the correct determinant but could not use it correctly to write the inverse.

Common wrong answers: $-3-4x\begin{pmatrix} -1 & -x \\ -4 & 3 \end{pmatrix}$ **or** $\frac{1}{-7x}\begin{pmatrix} -1 & -x \\ -4 & 3 \end{pmatrix}$ **or** $\frac{1}{-3-4x}\begin{pmatrix} -3 & 4 \\ x & 1 \end{pmatrix}$

Expected response: $\frac{1}{-3-4x}\begin{pmatrix} -1 & -x \\ -4 & 3 \end{pmatrix}$

(b) Candidates were required to show the inequality $-2 \geq t$ on a given number line.

This was not easy for the candidates as most of the candidates could not properly interpret the inequality because of the way it was presented and these candidates would have the correct shaded circle at – 2 with an arrow to the right. Some were drawing a correct arrow without a circle or a correct arrow with an unshaded circle. Some candidates were shading regions.

Expected response: shaded circle at – 2 with an arrow to the left.

Question 22

(a) Candidate were asked to write an equation connecting *p* and *q*, when $p = 1$, $q = 3$ given that *p* varies inversely with q^2. This question was challenging to the candidates since candidates failed to use their correct *k* value to write the equation. Most of them did not find the value of the constant using the given *p* and *q* values.

Common wrong answers: $p = \frac{k}{q^2}$ or $p \propto \frac{k}{q^2}$ or $p \propto \frac{1}{q^2}$

Expected response: $p = \frac{9}{q^2}$

(b) Candidates were required to find the value of p when $q = 2$ using same statement in **(a)**. This part was well answered by most candidates' even those who had no *k* value above knew they had to calculate it and use it to answer this question.

Common wrong answers: none

Expected response: $p = \frac{9}{4}$

EGCSE MATHEMATICS

Paper 6880/04

Calculator Structured Questions (Core and Extended)

General Comments

The paper was very challenging to most candidates. Only one candidate managed to correctly answer all the questions. The candidates who scored grades in the upper quarter of the marks comprised of ten percent of the total candidature. There were however, several candidates who still scored no points in this examination. Questions that proved difficult for most candidates were: Question **2(b),5(a), 5(c), 7a, 7b,8b, c(i), (ii), 9c, 13a, b(i), (ii),** and **14(b)**. Some of these questions required only substitution, but candidates made mistakes in punching the correct calculator buttons. They would find a square instead of a cube of a number.

This paper required candidates to be able to apply all the necessary methods in the EGCSE mathematics syllabus. Educators and candidates need to understand that the paper comprises of both the core and extended components of the EGCSE Mathematics examination syllabus. There were fewer blank spaces showing questions that were not attempted. Most questions were answered by all candidates. Candidates mainly demonstrated familiarity with the methods, even though they could not fully use them. An example is in the use of Trigonometric formulae. Candidates used mixed up formulae such as: Area= $\frac{1}{2}\times ABcosC$,where the sine was replaced with a cosine. There were many errors arising from inability to change the subject in a formula. Question requiring candidates to demonstrate understanding that there is a positive and a negative square root of a number, were not well answered. Only the positive values were given, and marks were consequently not awarded fully in such cases.

Candidates needed the skill of carefully reading and understanding questions. They lost some marks in a question where they just needed to multiply volume by 5 because they just saw volume and skipped the five in the question. There was evidence of the ability to use a variety of methods in answering some questions correctly, which indicated in-depth syllabus coverage. There was an improvement in the showing of working, as various relevant methods of attempting answers to questions were shown. Some candidates demonstrated good ability in using methods involving several steps and no errors were made. That shows strong Mathematical understanding and alertness in question answering. Such responses were seen in most of the centres, indicating a great improvement in content mastery.

Comments on Specific Questions

Question 1

(a) A majority of candidates were able to correctly solve the inequality.

Common wrong responses were: $x=2, x<-2, x<2, x>2$. The errors resulted because of candidates who, either replaced the inequality sign with an equal sign, or forgot to reverse the direction of the inequality sign after dividing by a negative number.

Expected response: $x>-2$**.**

(b) The question was well accessible for most candidates. The common wrong responses were: $\frac{7t}{7}=\frac{70}{7}; resulting \quad in \quad t=7$ Candidates seemed to have created a rule," a number divided by itself = the number" instead of 1. Another wrong answer resulted from wrong transposition of terms in equations. These include, not multiplying the right hand side by the LCM of the denominators and/or adding 14 instead of subtracting it both sides of equal sign. $7t+14=84; yieding \quad 7t=98; \quad and \quad t=14.$

Expected response: $t=10$

(c) The question expected candidates to use the zero factor principle to solve the already factored equation. However, some candidates expanded the brackets and tried solving the resulting quadratic equation using the quadratic formula and made mistakes. Common errors were; x=5 and x = -4.

Expected response: $x=-5, x=4$

Question 2

(a) A number of candidates were able to correctly answer this question. However, some would only focus on the total number of **green apples** in the basket eventually getting $\frac{1}{3}$ as a common wrong answer.

Expected response: $\frac{3}{5}$

(b) (i) Although candidates understood the requirements of the question, some drew diagrams with axes labelled with numbers instead of colours. Other axes had only red apples and the other only green green apples, yet the basket contained both colours. A few candidates drew a tree diagram.

(ii) A lot of candidates used their diagram and obtained the correct answer. The common wrong answers were; $\frac{3+2}{5}$ and $\frac{3}{5}\times\frac{2}{4}$. These were a result of adding the probabilities instead of

multiplying. Other candidates assumed the first apple was not replaced and applied conditional probability.

Expected response: $\frac{6}{25}$

Question 3

(a) This question was well done by most candidates. The errors in angles resulted from non-parallel north lines, reading from the wrong protractor scale and measuring the bearing of H from G from the line FG instead of the north line.

(c) (i) Candidates showed improvement with accuracy of measuring length. The most common wrong answer was: FH = FG + GH = 160 + 110=170km. They treated the scale measurement as vector addition. Some used trigonometric formulae to calculate FH.

Expected response: 11.4 x 20 = 228km

(ii) The most common wrong response was 90, which arose from measuring the bearing in an anticlockwise direction from the north instead of the clockwise direction.

Expected response: 270°

Question 4

(a) (i) The question expected candidates to substitute a negative number, then subtract a negative number. Those who made mistakes obtained a positive number after multiplying positive 2 by negative 2. When they subtracted the result they got the common error of -3 from (1 - -4 = -3).

Expected response: **5**

(ii) The candidates multiplied the functions to form gf(x), instead of substituting function **f** into function **g**. Errors in substitution and numerical evaluation of the resulting function resulted in the following common wrong answers; -1, 4, -4, $\frac{1}{4}$, $\frac{x}{4}$.

Expected response: $\frac{-1}{4}$

(iii) This question required candidates to find the inverse of function f and evaluate it when x=7.

Mistakes in changing the subject of a formula produced some errors. The errors made were: $x = 1 - 2y, making \quad y\ the\ subject \quad gave \quad y = \frac{x-1}{2}, then\ \frac{7-1}{2} = 3$. Candidates divided by +2 instead of negative 2.

***Expected response:*-3**

(b) Finding the inverse of the function, $h(x) = \frac{x+3}{2}$ proved easy to most candidates . The few common errors were a result of subtracting 3 before multiplying by 2. The common errors were $2y-3, \quad 2(x-3), \quad and \quad 2x+3.$

Expected response: $h(x)^{-1} = 2x-3$.

Question 5

(a) The question posed challenges for most candidates. They could not correctly interpret the reverse percentage. They were expected to allocate 120% to the given selling price of E540, then find the amount equivalent to 100%. They used percentage reduction to get $\frac{80}{100} \times 540 = E432$ as a common wrong answer.

Expected response: $\frac{100}{120} \times 540 = E450$

(b) (i) Candidates calculated 20% of 540 and obtained E108 as a common wrong answer.

Expected response: $\frac{120}{100} \times 495 = E594$

(ii) A great majority of candidates were able to access this question. Those who lost some marks subtracted 594 from 540 and got a negative percentage; $\frac{540-594}{540} \times 100 = -10\%$. Another wrong answer resulted from finding the correct increase in selling the price (54) and then dividing by 594 (the increased selling price) instead of diving by 540 (the original selling price). The common error was therefore, $\frac{54}{594} \times 100\% = 9.09\%$.

Expected response: $\frac{54}{540} \times 100 = 10\%$

(c) One of the most inaccessible question, where candidates calculated 27.5% of 9558.75 and got 2628.66 as a common error.

Expected response: $\frac{1058.75 \times 100}{27.5} = E48850$

(d) Most candidates struggled to get this one correct, because they divided by 20 instead of multiplying by 20. This was due to wrong alignment of ratio portions.

Expected response: $556.57 \times 20 = 11131.4$

Question 6

(a) (i) A majority of candidates who tried factorising by grouping were able to only express 17 as 15+2. They then obtained (x +15) (x +2) as a common wrong answer.

Expected response: $10x^2+17x+3=(5x+1)(2x+3)$

(ii) After factoring 2 as a common factor in the two terms, candidates obtained; $2(4x^2 – 9y^2)$ as a most frequently given wrong answer.

Expected response: $2(2x+3y)(2x-3y)$

(b) (i) When solving 3x – 9 =0, candidates subtracted 9 both sides of the equal sign, instead of adding. The resulting wrong answer was: -3.

Expected response: 3

(ii) The question proved moderately easy for 50% of the candidates. Some replace the inequality sign with an equal sign. The common wrong answers were: x=2, x<2 and x>5.

Expected response: $x \geq 2$ **. M –**

(iii) Candidates attempted to use the quadratic formula and completing the square instead of the easier and faster method of factorising. The resulting common wrong answer was x= –3 or x= –3.

The expected correct response was: (-3)(x–2) = 0 resulting to $x = 3$ or $x = 2$.

(iv) Most candidates managed to get one solution correct and could not write the other one. The common wrong answers were; 0.5 and -0.5.

Expected response: $\pm 4.12 \quad or \quad \pm\sqrt{17}$

(c) Candidates tried to make x the subject by first removing the square before diving by 2 and adding 9. The resulting wrong answers were: $\sqrt{y+9}=2x \quad or \quad \frac{\sqrt{y}+9}{2}$.

Expected response: $\pm\sqrt{\frac{y+9}{2}}+3$**.**

Question 7

(a) Candidates assumed that the sum of exterior angles was 180. The common error was; $2xn=180\,instead \quad of \quad 2xn=360$.

(b) This question proved very difficult for 90% of the candidates. They came up with the correct statement connecting the sum of interior angles; $180(x-2)=3240$**.** A common wrong response that obtained was x= 20.

Question 8

(a) This question required candidates to calculate the volume of a sphere. However, some calculated the volume of a hemisphere. Others used the correct formula but punched 5^2 instead of 5^3 in the formula, $V = \frac{4}{3}\pi r^3 h$. A few candidates used 3.14 as pi instead of the calculator value. The common wrong responses were: 1047 and 523.

Expected response: *523.6.*

(b) This question was challenging for most candidates. They were required to multiply the volume of each ball by 5 then equate it to the volume of the cone. Making h the subject would then yield the expected answer. The majority of wrong answers were: h=5cm or h=104.7cm.

Expected response: *h= 25 cm.*

(c) (i) This part question was also not well done by most candidates. Although the radius of the cone was given in the question, candidates decided to use the height calculated in (b) in finding the volume of the cone. Wrong answers were: 5890, 1178 and 24504. The expectation was that, the ratio of radii would be used to find the ratio of volumes and apply the principle of volume of similar figures to find the height.

Expected response: $V = \frac{1}{3}\pi \times 15^3 \times 37.5$ = 8840.

(d) (ii) In this question; most candidates understood the requirements of the question. They divided their 5890 and 1178 by (a). The common wrong answers were: 3 and 16.

Expected response: $\frac{8835.73}{523.6} = 16.87 = 17 balls$ ***.***

Question 9

(a) majority of candidates found this question very accessible. Mistakes made resulted from giving a description of more than one transformation, yet the question required a **single** transformation. Common wrong answers were; Translation, centre (0, 4) OR Rotation centre, (4, 1) of +90.

Expected response: **A clockwise rotation of 90º, centre (4, 0)**

(b) A large group of the candidates gave the correct answer in this question. Some lost marks arose from reflecting in the line x= -1 instead of y= -1.

Expected response: a triangle with vertices, (1, -3), (3, -3),(2, -6)

(c) The mistake made by candidates was in arranging the matrices requires in transforming the figures wrongly. $\begin{pmatrix}1 & 3\\ 1 & 1\end{pmatrix}\begin{pmatrix}a & b\\ c & d\end{pmatrix} = \begin{pmatrix}-1 & 1\\ 1 & 1\end{pmatrix}$; they proceeded to find the unknown matrix as the transformation matrix. Wrong answers were: $\begin{pmatrix}-1 & 0\\ 0 & 1\end{pmatrix}$; or $\begin{pmatrix}1 & 1\\ 0 & 1\end{pmatrix}$.

The expected correct response was: $\begin{pmatrix}1 & -2\\ 0 & 1\end{pmatrix}$.

Question 10

(a) Most candidates understood that, only the cosine formula would work in calculating the size of any of the angles since all the sides of the triangle were. given with none of the angles. Some could not arrive at the given answer because of errors in order of operations, resulting in the step; $64 = 56.25\cos BAC$. When they realised that; $\cos BAC = \frac{64}{56.25}$ did not give them the angle, they simply wrote the expected answer, because it was given in the question. Others used the given angle to show that one of the sides will be equal to the one shown in the triangle. Educators are encouraged to advise their learners that, (you cannot use what you want to show in proving that it is true) Therefore the use of 17.79 was not expected before it was shown to be correct.

Expected response: $\cos BAC = 0.95216$, $angle\ BAC = 17.79^\circ$

(b) Several candidates were able to obtain the correct answer in this question. There were errors made in the sine formula. They would write the angle instead of the sine of the angle. Others only found the acute angle and did not proceed to obtain the corresponding obtuse angle. The common errors made were; $\frac{\sin B}{13.5} = \frac{17.79}{8}$, 30.04º, 131.2º and ,31.04º.

Expected response: *149.0º.*

(c) Most candidates obtained the correct answer. Some used the cosine instead of sine in the formula. A common wrong answer of 24 was given by those who did not divide by 2. Another large number of candidates used $A = \frac{1}{5}\times 13.5\times 6\cos 17.79$ *and* $\frac{1}{2}bh$ as their methods.

Expected response: *12.37.*

Question 11

(a) Candidates needed to understand that the probabilities in the second event would have their denominator reduced by 1. The common errors made was a result of not picking a clue from the probability given in the diagram. The common wrong answer was $\frac{6}{15}, \frac{9}{15}, \frac{5}{15}$.

Expected response: $\frac{6}{14}, \frac{9}{14}\frac{8}{14}$

(b) (i) Candidates lost marks because they added their correct branches instead of multiplying them. The popular incorrect answers were $\frac{8}{25}$ and $\frac{17}{210}$ ..

Expected respons: $\frac{12}{35}$

(ii) Many candidates correctly calculated the probabilities for the (female, male) branches, but further multiplied them instead of adding them to get the expected answer. The common wrong answer was $\frac{9}{35}$ and $\frac{81}{210}$.

Expected response: $\frac{18}{35}$

(c) The few candidates who understood the question gave answers where their 4 probabilities all had the same denominator. Those who had correct probabilities decided to add them instead of multiplying them, leading to wrong answers.

Expected response: $\frac{9}{15} \times \frac{8}{14} \times \frac{7}{13} \times \frac{6}{12} = \frac{6}{65}$

(d) The question required candidates to illustrate the understanding that all probabilities are given as numerical values. The most common wrong answer was the word, "impossible".

Expected response: *0*

Question 12

(a) (i) When estimating the median, the candidates stated the median position as the answer.The common wrong responses were; 30 and 50. In accurate scale interpretation was the reason behind the 50 as a wrong answer.

Expected response: 52

(ii) A majority of candidates could not score points in this question. Most candidates simply subtracted the lower quartile position from the upper quartile position. This yielded a popular wrong answer of 45 – 15 = 30.

Expected response: 55 – 41 = 14.

(iii) The candidates expressed 42 as a fraction of 100marks instead of 60marks. The error was $\frac{42}{100} \times 60 = 70\%$.

Expected response: $\frac{42}{60} \times 100 = 73.3\%$

(b) The question was fairly well done by most candidates. Most candidates correctly calculated the cumulative frequencies and came up with the expected answers.

Expected response: 8, 18, 4 and 8, 18, 2.

Question 13

(a) The tangent was correctly drawn by 40% of the candidates, but they made mistakes when using their picked points to calculate the gradient. The common wrong answers were 2, 1, 1.5 and -1.

About 10% of the candidates impressively drew correct tangents and proceeded to use the derivative function of the graph to get the correct gradient. These earned full marks.

Expected response: -2.

(b) **(i)** Most candidates drew the line x=2.5 instead of y=2.5. The common wrong answers were 0.1 and 0.5, which were read from the y-axis.

Expected response: *x= 0.7 or 0.8*.

(ii) The question required candidates to first rearrange the equation to; $\frac{1}{x^2} = 2x - 1$, then draw the line y =2x–1. A popular wrong answer of 0.9 arose from using the line y= x –2.

Expected response: *either 1 or 1.1*

Question 14

Only 20% of the candidates correctly answered this question. After forming the equation $(x+2)^2 = 81$ most candidates came up with the steps; x+2 =81 and x= 81 – 2, which gave x=79 as popular wrong answer. Others assumed that 81 was the area of the whole trapezium. Those who obtained -11and -7 as answers had errors in their methods of solving quadratic equations.

Expected response: $(x+2)^2 = 81$ resulting to x = *7*

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About 5% of the candidates answered the question correctly by using the value obtained in (a) to find all the lengths in the trapezium and the area. Some separated the trapezium into triangles and other geometric shapes and still obtained the correct answers. One of the common wrong answers was 216, resulting from forgetting to multiply by half.

Expected response: *108.*