EXAMINATIONS COUNCIL OF ESWATINI

Junior Certificate Examination

Additional Mathematics (519)

Examination Report for 2024

Paper 519

General Comments

This examination gave the candidates plenty of opportunity to display their mathematical skills. There were few good scripts with a significant number of candidates demonstrating expertise in the subject content. Very few candidates managed the demands of this paper. There was no evidence that candidates had time issues reaching the end. Some candidates omitted questions or parts of questions, but this appeared to be a consequence of a lack of knowledge or familiarity with a topic rather than time being insufficient. Marks ranged from 0 to 98. No candidate obtained 100. There were quite a few cases where candidates appeared to have misread their own handwriting, changing values between consecutive steps.

Candidates were particularly successful in the basic skills assessed in **Questions 1 (i)(a), (b), (ii) (b), (d), 2(a) (i) (b)(i), 3 (a), and 4(a)**. Questions in which candidates did not fare well were **Questions 1(i)(c) 2(a) (iii) 5(a)(ii), (d) , whole of questions 7 and 8**. Candidates did not give any response in **Questions 1(ii) a), 7, 8 and 9**. Most candidates were good at showing their working, especially where the question required it, and this made it easier to award method marks when answers were not correct or were inaccurate. This was particularly evident in **Questions 2(a)(iii), 5(c)(i), (ii), (iii), 7, 8(a)(ii)**. Candidates continued to loss marks due to truncating or rounding off prematurely within their working, or giving answers to less than the required three significant figures. This was observed in **Question 7**.

COMMENTS ON SPECIFIC QUESTIONS

Question 1

(i) (a) This offered candidates a comfortable start to the paper with most managing to subtract the two matrices. Common error committed was when they had to deal with directed numbers. Common incorrect answers: $\begin{pmatrix} -10 & 7 \\ 1 & -11 \end{pmatrix}, \begin{pmatrix} 10 & -7 \\ -3 & 11 \end{pmatrix}$

Correct answer: $\begin{pmatrix} \mathbf{-10} & \mathbf{7} \\ \mathbf{1} & \mathbf{5} \end{pmatrix}$

(b) This part was well done as most candidates were able to multiple the matrix by a scalar. There were a few though who failed to work out directed numbers. Common incorrect answer: $\begin{pmatrix} 3 & 6 & 12 \\ 0 & 3 & 9 \end{pmatrix}$

Correct answer: $\begin{pmatrix} \mathbf{-3} & \mathbf{6} & \mathbf{-12} \\ \mathbf{0} & \mathbf{3} & \mathbf{9} \end{pmatrix}$

(c) This was very poorly done. Many candidates found this question challenging and it was rare to award full marks. Some obtained correct entries but the order of the resulting matrix was incorrect. Others incorrectly multiplied the first row in the first matrix by -4 and the second row in the first matrix by 5. Common incorrect answers: $(41 \quad -23)$, $\begin{pmatrix} 16 & -20 \\ 10 & -15 \end{pmatrix}$

Correct answer: $\begin{pmatrix} \mathbf{41} \\ \mathbf{-23} \end{pmatrix}$

(d) This proved quite challenging for candidates. Quite a few simply squared each entry in the matrix. There was also a large number of candidates who got the method mark by placing matrix B side by side but failed to then multiply the matrices. Common incorrect answer: $\begin{pmatrix} 16 & 25 \\ 4 & 9 \end{pmatrix}$

Correct answer: $\begin{pmatrix} \mathbf{26} & \mathbf{-35} \\ \mathbf{-14} & \mathbf{19} \end{pmatrix}$

(ii) (a) This question was poorly done. Many candidates did not understand what was expected of them. Common incorrect answers: zero matrix, identity matrix, $\begin{pmatrix} 6 & -2 \\ 1 & -8 \end{pmatrix}$

Correct answer: $\begin{pmatrix} \mathbf{-6} & \mathbf{2} \\ \mathbf{-1} & \mathbf{8} \end{pmatrix}$

(b) The majority of candidates answered this question correctly but some had values of b and c swapped which was incorrect.

Correct answer: a = 2

b = 4

c = 6

d = -5

(c) Only a few candidates were able to gain full credit in this question. They failed to multiple the two matrices. Some did not attempt even to answer the question.

Correct answer: x = 3

y = 5

(d) This part was generally answered well with the majority of candidates able to write down the order of the matrix. Common incorrect answer: 2 by 1

Correct answer: 1 by 2

Question 2

(a) (i) Many correct answers were seen in this question. Most candidates were able to evaluate the function. Common incorrect answers: 2x – 1, Others only substituted x with the value 2 on the function: f(2) = 2(2) – 1 and no mark was awarded.

Correct answer: 3

(ii) Whilst many candidates seemed to know that they had to equate the two functions, many failed to collect like terms and then find the value of x. Common incorrect answers: 1, 3, -1, $\frac{1}{5}$

Correct answer: $\frac{3}{5}$ oe

(iii) Candidates found this question very challenging with many failing to obtain full marks. This was a discriminating question as even the good candidates were unable to get full credit. They were able to substitute function g and obtain the inequality 2 – 3x > 10 and solved the inequality correctly, getting $x < -2\frac{2}{3}$ but failed to then find the maximum integer value of x. Common incorrect answers: $x < -2\frac{2}{3}$, $\frac{-22}{3}$

Correct answer: -3

(b) (i) The majority of candidates were able to answer this question correctly.

Correct answer: 9

(ii) This question was poorly well answered. Some were able to see that 3 was added, but failed to then express y in terms of m. Common incorrect answers: 11, +3 , 8 + 3

Correct answer: m + 3

Question 3

(a) Most candidates answered this part correctly. Common incorrect answers: $\frac{3}{5}$, $\frac{5}{8}$

Correct answer: $\frac{3}{8}$ oe

(b) (i) This question was well answered. Many candidates were able to complete the probability tree diagram. Very few candidates did not attempt this question. Common wrong answers: having $\frac{5}{8}$ on all the branches of the tree diagram or $\frac{3}{5}, \frac{3}{5}, \frac{5}{8}, \frac{3}{5}$

Correct answer: $\frac{3}{8}, \frac{3}{8}, \frac{5}{8}, \frac{3}{8}$

(ii) This part question proved challenging for candidates, with few scoring full marks. Some candidates added the probabilities along the branches instead of multiplying. Others gave the probability of either both black socks and both white socks without adding the two probabilities. Common incorrect answers: $\frac{25}{64}, \frac{9}{64}, \frac{17}{64}$

Correct answer: $\frac{34}{64}$ *oe*

(iii) Candidates found this question challenging with many giving one probability that the socks are of different colours. Common incorrect answer: $\frac{15}{64}$,

Correct answer: $\frac{30}{64}$ *oe*

Question 4

(a) This question was generally well answered. Common wrong answer: 17, 27, 19

Correct answer: 5, 27, 18

(b) This was fairly well done. Whilst most candidates used the graph correctly to find the correct answer, there was also a large number of candidates who were unable to take the correct reading from the graph due to failing to find the correct value of the small division. Common wrong answers 40, 40.1, 40.5, 40.2

Correct answer: 41 or 42

(c) This was fairly well done. Whilst most candidates used the graph correctly to find the correct answer, there was also a large number of candidates who were unable to take the correct reading from the graph due to failing to find the correct value of the small division. Common wrong answers 130, 130.5, 132

Correct answer: 130.5 to 131.5

Question 5

(a) (i) This question was fairly well answered. Most candidates were able to remove brackets correctly but failed to collect like terms. There was also a large number of candidates who were unable to remove brackets correctly. They multiplied only the first term inside the brackets. Others multiplied 3 by the second b which was outside the brackets which was wrong. Common incorrect answers: 6a – 2b, 6a – 6b, 6a – 3b – 3b

Correct answer: 6a – 4b

(ii) This proved to be a challenging question for many candidates. Candidates continue to incorrectly cross multiply by the denominators which led to the denominator eliminated in the next step of simplifying the algebraic expression. Some had correct denominator but failed to remove brackets correctly in the numerator since there was a minus sign before the brackets. Common incorrect answers: 35 – x, $\frac{-35-x}{2x(x-5)}$, $\frac{6x-7x+35}{-x-5}$

Correct answer: $\frac{35-x}{2x(x-5)}$

(b) (i) Many good responses were seen in this question with candidates factorizing correctly. There were a few candidates who applied the difference of two squares method which was incorrect. Common incorrect answers: (x – 4y)(x + 4y), x(x-8xy), $x^2(1 – 8y)$, $(x^2-4y)(x^2 +2y)$

Correct answer: x(x – 8y)

(ii) Although many candidates understood how to factorise the LHS expression, with considerable success, many failed to then transfer the correct value of *a* and b. Hence, this part was poorly well answered. Common incorrect answers: a = -3 and b = 16, a = 16 and b = -3

Correct answer: a = 16 and b = 3 or a = -3 and b = -16

(c) (i) While there were quite a number of correct answers, many candidates removed brackets correctly but failed to collect like terms and solve correctly. There was evidence that this was due to challenges candidates had in working out directed numbers. Others would incorrectly just multiply the first term inside brackets as they remove brackets. Common incorrect answers: $\frac{-11}{4}, \frac{11}{4}, \frac{-31}{4}$

Correct answer: $\frac{31}{4}$ ***oe***

(ii) This question was generally not well answered. Most candidates were unable to clear the fraction. They multiplied by 5 both sides of the equation but the 5 on the LHS instead of cancelling out, multiplied each term inside the brackets obtaining 15y – 35 = 20. Common incorrect answer: 3.67

Correct answer: 9

(iii) This part was poorly well answered. A majority of candidates who got this one wrong failed to reverse the inequality sign after dividing by a negative. Others changed the inequality sign to an equal sign resulting to a loss of marks. Some lost marks when they reached the step $-9x > 2$ and divided by 2 both sides instead of -9. Common incorrect answers: $x > \frac{-2}{9}, x = \frac{-2}{9}$

Correct answer: $x < \frac{-2}{9}$ **oe**

(iv) This was fairly well done. Most of those who did not get full marks failed to write the negative value of x. They only wrote the positive value for x and were just awarded one mark instead of two. This was due to the fact that candidates would solve by taking 64 to the RHS and then introduce only the positive square root of 64 where 8 was written as both values of x. Common incorrect answers: x = (x – 8) or x=(x + 8), x = 8 or x = 8

Correct answer: x = -8 or x = 8

(d) This question was poorly well answered. Many candidates were able to clear the fraction but failed to remove the brackets correctly. While removing the brackets, they multiplied G by only the first term inside the brackets. In some candidates, this was caused by not putting brackets to the two term denominator, hence getting an incorrect answer.

Common wrong answers: t = -15a + 14G, t = $\frac{15a-14G}{-1}$

Correct answer: $\frac{14G-15a}{G}$

(e) Candidates found this question very challenging with many unsure of how to start. Only a small number managed a fully correct solution. Often they were able to gain some credit, for correct value of x but failed to work with fractions to obtain correct value for y. Common wrong answers: x = 1 and y = 0.5 ,

Correct answer: x = $1\frac{2}{5}$ **oe**

y = $\frac{-3}{10}$ **oe**

Question 6

(a) This question was answered correctly by most candidates. Common incorrect answers:

p = -7, q = -16, r = 9 or p = 39, q = 18 , r= 63

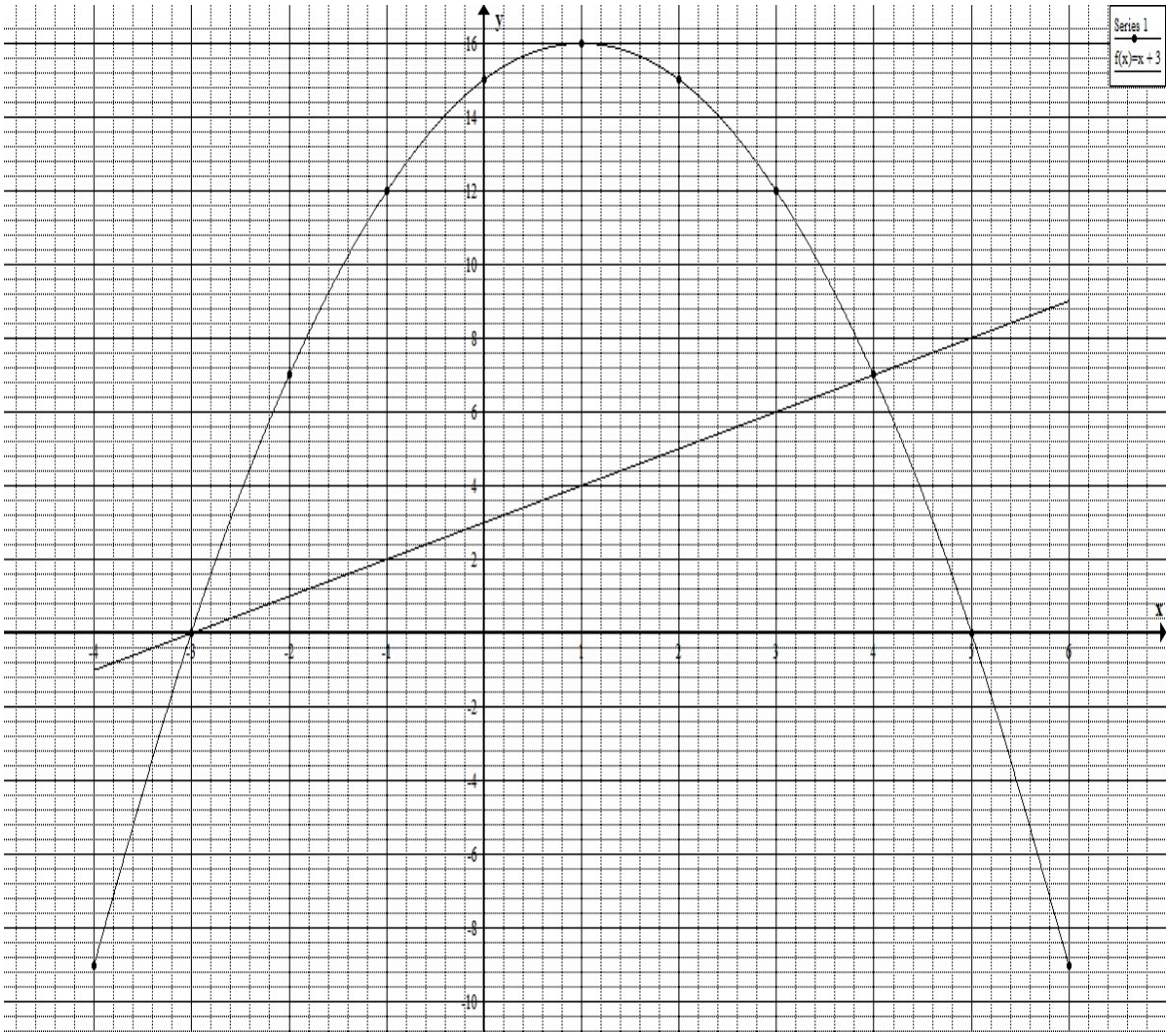
Correct answer: p = -9

q = 16

r = -9

(b) Many candidates answered this part reasonably well. All 11 points were plotted correctly and a smooth curve was drawn through all 11 points. Very few joined points with a straight lines resulting to loss of marks. Some candidates failed to come up with a scale that they could easy interpret. Hence, points were incorrectly plotted even though a smooth curve was drawn. Others had axes with uneven spaces between numbers. It became difficult to plot points for those who wrote the numbers on the axes in spaces instead of the horizontal and vertical lines.

Correct answer:



(c) (i) This problem proved challenging, with few scoring full marks. Some were able to draw curve and line correctly but failed to take the correct reading from the x-axis. After failing to draw the parabola, candidates solved for x algebraically resulting to loss of marks.

Correct answer: x = -2.3 to -2.4

Or x = 4.3 to 4.4

(ii) Whilst only a minority was able to get fully correct answers, many were unable to draw the line and solve the equation. Some had no line but correct solutions earning them no marks.

Correct answer: x = -3 or x = 4

(d) This was reasonably successful for many candidates with the majority scoring at least 1 mark for removing brackets correctly. Many candidates failed to simplify the expression. There was evidence of a challenge in working out directed numbers. Common incorrect answer:

$x^2 – 10x – 24$, $x^2 – 2x – 24$,

Correct answer: $x^2 + 2x – 24$

Question 7

The whole of this question proved very challenging for candidates. It was one of the non-response questions for a number of candidates. Some lost marks for premature rounding off. Others failed to give their answers to three significant figures since the answers were not exact.

(a) (i) This proved to be a difficult question for many candidates. Some candidates used the wrong trigonometric ratio or correct ratio substituted incorrectly for instance tan 39º = $\frac{11}{AH}$ not

tan 39º = $\frac{AH}{11}$. Quit a large number of the few candidates who used the correct trigonometric ratio correctly to obtain the correct answer, further subtracted their answer from 19cm which was incorrect. Common wrong answers: 5.4cm, 8.9cm, 72.8cm

Correct answer: 13.6cm

(ii) This part was very poorly well answered. Candidates were to subtract the answer in (a)(i) from 19cm and then use the Pythagoras rule. However, most candidates used the trigonometric ratios which were incorrect. Common incorrect answer: 17.5cm

Correct answer: 12.3cm

(iii) This question was fairly well answered. Some candidates were able to use any of the three trigonometric ratios to obtain the correct answer. There were also candidates who did not attempt this part.

Correct answer: 63.8º or 63.9º or to 64.0º

(b) (i) This question was a challenge to candidates. The wrong trigonometric ratio was used. Some did not write the answer to three significant figures. Common incorrect answer: 72.8m

Correct answer: 549m

(ii) Whilst some candidates were able to correctly use the tangent ratio to get 96.89087959, they failed to then add the 200m to find the height of the second building. The question was generally not well answered.

Correct answer: 297m

Question 8

This question generally proved to be challenge for many candidates. It was one of the non-response questions for some candidates.

(a) (i) Many good responses were seen in this part question. Common wrong answers: a – b,

a + b, -b + a.

Correct answer: b – a

(ii) Although there were some few clear, well set out workings and correct answers to this question, this proved to be a challenging question for many candidates. Most candidates failed to use the given ratio correctly, writing $\overrightarrow{BP} = \frac{1}{3}\overrightarrow{BA}$ instead of $\frac{1}{4}\overrightarrow{BA}$. Using the sum and difference of two vectors to express given vectors in terms of two coplanar vectors and simplifying vector expressions continued to prove to be a challenge for candidates year after year. There were also some few candidates who confused signs for vectors indicating direction resulting to loss of marks. Common wrong answers: a + ¾ $\overrightarrow{AB}$; b +⅓$\overrightarrow{AB}$, b + $\frac{-b+a}{4}$

Correct answer: $\frac{3}{4}$b + $\frac{1}{4}$a

(b) This question was fairly well answered. Most candidates were able to work out 2p – q without finding its magnitude. Some vectors were expressed as fractions $\left(\frac{1}{-2}\right)$. Few candidates lost the accuracy mark for truncating or incorrect rounding off the answer to the nearest whole number. Common wrong answers: 2, 2.2; 2.23

Correct answer: 2.24

(c) This was poorly well answered. Very few knew how to show that **u** is parallel to **v**. Common wrong answers: u = 2v ; -2u = v ; $\binom{2}{8} = 2\binom{-1}{-4}$, u = 2q

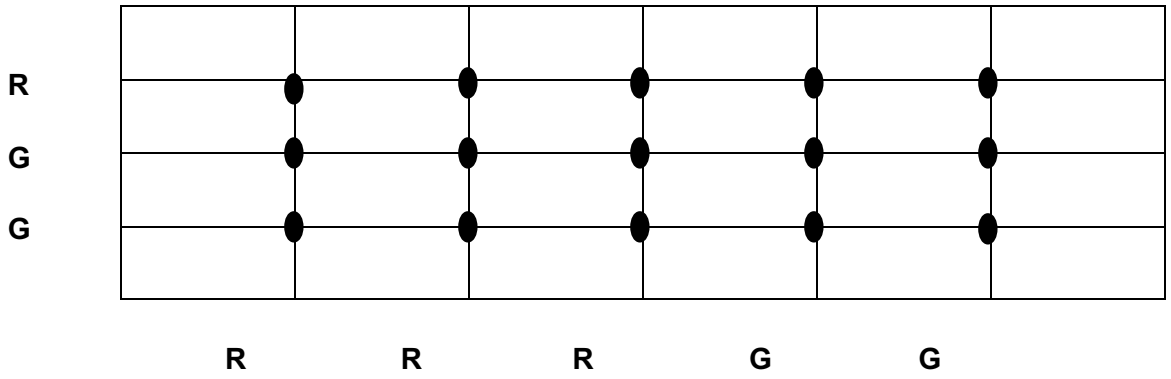
Correct answer: u = -2v or v = $\frac{-1}{2}u$

Question 9

This question was well answered, candidates got this question correct, however some candidates use tree diagram instead of possibility space diagram.

(a) This was well answered with the majority of candidates gaining full credit. Some candidates were able to show correct outcomes with no labels. Others wrote **Nonhlanhla** in one axis and **Musa** on the other side or just **GREEN** on one side and **RED** on the other side as their labels and earned no mark for labelling.,

Correct answer : Correct labels and 15 outcomes



(b) Well answered by those who got part (a). Understanding the term 'at least' was a challenge for most candidates. Common wrong answers: $\frac{3}{15}, \frac{4}{15}, \frac{8}{15}$

Correct answer: $\frac{11}{15}$

Recommendations

While many candidates did show clear working in multi-step questions, improvement is needed in setting out logical progression. There was some evidence of a lack of working resulting in the loss of possible method marks when answers were incorrect.

Handwriting needs attention for a significant number of candidates, particularly with clear figures to distinguish between, for example 1 and 7 or 4 and 9.

The use of a calculator should be encouraged when dealing with directed numbers and the calculator must set in degrees mode.

Particular attention to mathematical terms and definitions would help a candidate to answer questions. There is a need to explain the phrase ‘NOT TO SCALE’ to candidates. A majority of candidates lost marks for lack of understanding this phrase especially in **question 7.**

Attention should be made to the degree of accuracy required. Candidates should be encouraged to avoid truncation of numbers and premature rounding in workings as this often leads to inaccurate answers and loss of the accuracy marks.

- rder gates.