

**EXAMINATIONS COUNCIL OF
ESWATINI**

JC

EXAMINATION REPORT

FOR

ADDITIONAL MATHEMATICS

YEAR

2022

JC ADDITIONAL MATHEMATICS**Paper 519****Key messages**

It is very important for candidates to avoid premature rounding and truncation of numbers in workings as this often leads to an inaccurate answer and the loss of the accuracy mark. Candidates should be encouraged to read questions carefully to ensure that the answers they give are in the required format and answer the question set. Candidates should also be reminded to write digits clearly and distinctly. Candidates should not expect the Examiner to select the correct answer if presented with a choice of answers by the candidate for the same question. It is essential that candidates are also encouraged to use a scientific calculator when dealing with directed numbers and must have their calculator set in degrees mode.

General comments

The overall performance of candidates was generally very poor. Marks ranged from Zero to 99. The highest mark was 99. This score was rarely seen. Many candidates got marks ranging from zero to 30 from several centres. Candidates who did well consistently showed their working, formulas used and calculations performed to reach their answer.

The questions that proved particularly easy were questions **1(a) (b) (i) (ii), 3(c) (i), 7(a) (i) and 8(a)**. Many candidates got these questions correct. **Questions 2(c), 4, 5, 6(c), 7(a)(ii) and 9** proved to be very challenging to the candidates. Many candidates in many centres did not even attempt to answer these questions.

There was no evidence that candidates were short of time, as almost most of them attempted the last few questions. It was noted that some omissions appeared to be on a certain question in an entire centre. For example, **question 4** (Probability) and **5** (Trigonometry). Many candidates lost marks in **questions 2, 5 and 6(a) and (c)**, due to lack of showing necessary working. Candidates should show full working with their answers to ensure that method marks are considered.

COMMENTS ON SPECIFIC QUESTIONS

1. (a) Many candidates were successful with this first question and gave the correct answer. The common incorrect answer was a 1 by 3 matrix.
Correct Answer: any 3 by 1 matrix

- (b) (i) This was well done. Most candidates were able to multiply the matrix by the scalar. There were just a few who failed to work out directed numbers. Their entire entries were positive. **Common incorrect answer:** $(\begin{smallmatrix} 6 & 6 & 3 & 3 & 0 & 15 \end{smallmatrix})$
Correct Answer: $(\begin{smallmatrix} 6 & -6 & 3 & -3 & 0 & 15 \end{smallmatrix})$

- (ii) This question was well done. Quite a number of candidates were able to add entries that are in the same position. Very few failed to add directed numbers. For example, $-7 + (-2) = -5$ and $2 + (-1) = 3$.
Correct Answer: $(\begin{smallmatrix} 6 & 0 & -5 & 5 & 1 & -9 \end{smallmatrix})$

- (iii) This question was very poorly done. Many candidates failed to multiply the matrices. They multiplied elements in the same position, while other omitted the negative signs.
Common incorrect answers: $(\begin{smallmatrix} 3 & 3 & -4 & 5 \end{smallmatrix}), (\begin{smallmatrix} -10 & -8 & 11 & 7 \end{smallmatrix}), (\begin{smallmatrix} 10 & 11 & 8 & 7 \end{smallmatrix}), (\begin{smallmatrix} 2 & -4 & 3 & 6 \end{smallmatrix})$
Correct answer: $(\begin{smallmatrix} -10 & 11 & -8 & 7 \end{smallmatrix})$

(c) This question was fairly well done. A large number of candidates got this correct, but there was also a large number of candidates who got the value for x correct and the value for y incorrect. Many would show $-2y = -8$ or $-y = -4$ but failed to get the correct answer.

Common incorrect answer: $y = -4$.

Correct Answer: $x = 3$ and $y = 4$

2. (a) This was poorly done. Many candidates removed the denominator correctly but failed to collect like terms and factorise correctly. Quite a number of the candidates also did not put brackets on the two term denominator and that led to 3 on the right hand side of the equation just multiplying b instead of $(b - 2)$.

Correct Answer: $b = \frac{m+6}{3+n}$

(b) This question was very poorly done. Many candidates changed the inequality sign to an equal sign ($=$) or to a less than sign ($<$) and this made them to lose marks. Others were able to multiply both sides by the LCM = 10 but failed to remove brackets correctly. A lot of candidates that were able to remove brackets and collect like terms to reach $-11x \leq -33$ did not reverse or change the inequality sign since they were now dividing by a negative in order to solve for x .

Common incorrect method and answers: $\frac{4x+18 \leq 15x-15}{10}$, $x = 3$, $x \leq 3$

Correct Answer: $x \geq 3$

(c) This was also very poorly done. A large number of candidates failed to first rearrange the terms in the two equations such that both x and y terms are on one side of the equations and constant terms on the other side before using the elimination method. There were just a few who did not attempt to answer the question.

Correct Answer: $x = 2$ and $y = 0$

3. (a) This question was fairly well done. The majority of candidates failed to realize that the expression $x^2 - 225$ was a difference of two squares which needed to be factorised to $(x - 15)(x + 15)$. The few that factorised correctly wrote 15 as both values of p and q and that scored one mark, yet the factor $(x - 15)$ needed to be further worked out to $(x + (-15))$ since subtraction is the same as adding its opposite. Common incorrect answers: $p = (x - 15)$ and $q = (x + 15)$, $p = -112.5$ and $q = 112.5$

Correct Answer: $p = -15$ and $q = 15$

(b) (i) This was poorly done. Candidates seemed to have no understanding of the term range. Many wrote the set $\{1, 1, 4, 4, 9, 9\}$ which was incorrect since a member is only written once in a set.

Correct Answer: 1, 4, 9

(ii) This was fairly well done. Common incorrect answers were square roots, even numbers, triangular numbers or prime numbers.

Correct Answer: square numbers

(iii) This question was poorly done. Most candidates failed to describe using function notation. Common incorrect answers: $f(x) \rightarrow x^2$, x^2 , $x \times x$.

Correct Answer: $f(x) = x^2$ or $f: x \rightarrow x^2$

(c) (i) This part was answered reasonably well by many candidates. Many candidates showed correct working by substituting x with -2 in function f which gained a mark when the answer was incorrect.

Correct Answer: 9

(ii) This question proved challenging for most candidates, but a reasonable number of fully correct solutions were seen. A majority of candidates incorrectly evaluated the functions instead of equating the two functions and solve for the value of x .

Correct Answer: $x = 1$

4. Generally, the whole of this question was poorly answered. Candidates seemed to be unfamiliar with probability expressed as a decimal. Many of them changed the decimals to equivalent common fractions. Some showed probabilities greater than 1. A large number of candidates in many centres also did not attempt this question.

(a) Most of those candidates who attempted this part answered correctly.

Correct answer: 0.2

(b) This question was poorly done. Common incorrect answer: $-0.32, 0.32$

Correct answer: 0.6

(c) This part of the question was challenging. Candidates seemed to have no understanding of a tree diagram. The sum of the probabilities in each branch was greater than 1. Some wrote negative probabilities. There were some excellent answers seen.

Correct answers: $a = 0.6; b = 0.4$
 $c = 0.2; d = 0.6$
 $e = 0.32; f = 0.08$

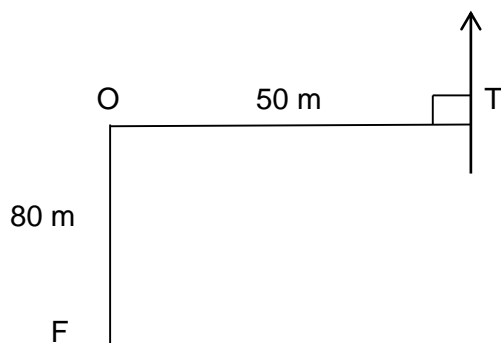
(d) This was not quite so well answered. Some multiplied their e by 0.12 instead of adding e and 0.12.

Correct answer: 0.44

5. This question generally proved to be the most challenging question on the paper and a significant number did not attempt it.

(a) This was fairly well answered. Many candidates drew point O 50m due east instead of west of a tall tree at point T . Some sketches were incorrectly labelled while others had no labeling at all and that resulted in a loss of marks.

Correct answer:



(b) Few candidates were unable to give the correct answer. Some failed to use the Pythagoras rule incorrectly. Common incorrect answers: 62.4m, 30m

Correct answer: 94.3m

(c) This question was very poorly done. A small, but significant number of candidates omitted this question and only a few candidates gained full marks. Some used the correct ratio $\tan^{-1}\left(\frac{80}{50}\right) = 58^\circ$ which was angle OTF but then failed to calculate the bearing of F from T. Common incorrect answers: 58° , 148°
Correct answer: 212°

(d) This was poorly done. Very few candidates obtained the correct answer.
Correct answer: 42.4m

(e) This question was poorly done. Many candidates failed to get the correct answer. Some used incorrect trigonometric ratios such as $\tan 18^\circ = \frac{50}{x}$.
Correct answer: 52.6m

6. (a) This was fairly well done. While more candidates gained the mark for correct substitution in this part, working it out to the correct answer was found challenging.
Correct answer: 7

(b) (i) This was not quite so well answered. The negative before the brackets gave candidates a challenge in removing the brackets. Common incorrect answers: $-12 - 15x$, $-12 - 5x$, $-12 - 5$.
Correct answer: $-12 + 15x$

(ii) While there was a good response to this question, many candidates lost marks for failing to change the operation sign (+) inside the bracket as they remove brackets. Others removed brackets correctly but were unable to collect like terms. Common incorrect answers: $2x^2 + x + 6$, $2x - x - 6$, $2x^2 - 4 - 3x - 6$
Correct answer: $2x^2 + x - 6$

(c) This proved to be one of the most challenging questions. Very few got it correct. Most candidates incorrectly cross multiplied by the denominator which led to the denominator eliminated in the next step of simplifying the algebraic expression. Others failed to correctly remove brackets in the numerator since there was a minus sign before the brackets. Common incorrect answers: $6x - 10$, $6x + 2$, $\frac{6x+2}{(x+3)(2x-1)}$
Correct answer: $\frac{6x-10}{(x+3)(2x-1)}$

(d) (i) There were many correct answers seen from candidates who could correctly remove the brackets. A lot of incorrect answers were from candidates who failed to remove brackets correctly, such as $6y - 8 = 7$, $6y - 4 = 7$, $6y - 8 = 14$
Correct answer: $y = 2.5$

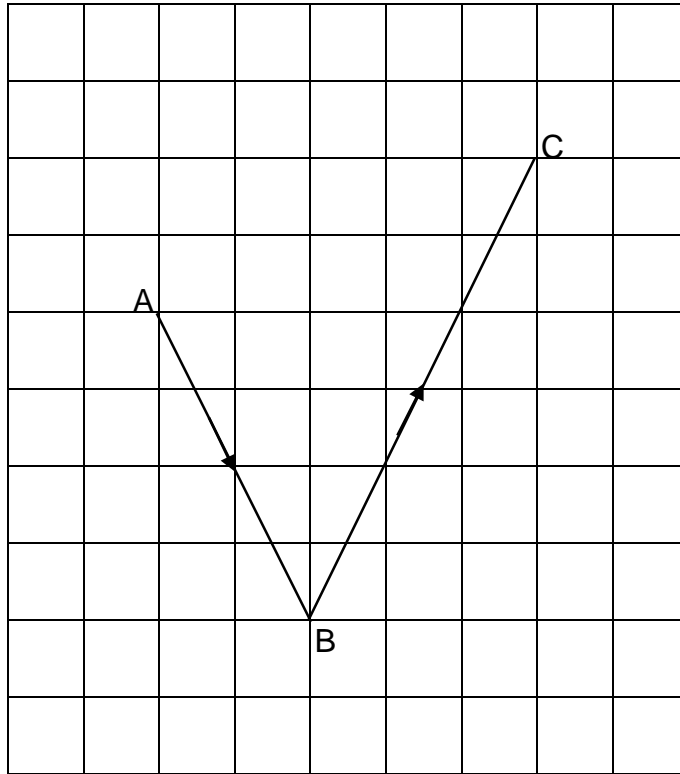
(ii) This question was fairly well done. A large number of candidates got this correct, but there was also a large number of candidates who got it incorrect because not all the terms in the equation were multiplied by the LCM as they remove the denominator. After incorrectly removing the denominator, candidates had $4m - 6 - m = 3$. Others did not put brackets in the two term numerator which led to LCM multiplying only $2m$ instead of $(2m - 3)$.

Correct answer: $m = 6$

7. The whole of this question was generally poorly done. Some candidates continued to incorrectly express column vectors as fractions, $\left(\frac{x}{y}\right)$.

(a) (i) This question was attempted by the majority of candidates and many gave the correct column vector. Common incorrect answers: $(-4 \ 2), (-2 \ 4)$
Correct answer: $(2 \ -4)$

(ii) This was poorly done. Many candidates incorrectly drew $(5 \ 2)$. Others lost a mark because they drew a correct line without an arrow.
Correct answer:



(iii) Most candidates were successful with this question and gave the correct answer. The few incorrect answers that were seen were as a result of candidates finding $\frac{1}{2}\vec{AB}$ instead of $\frac{1}{2}\vec{BA}$.

Correct answer: $(-1 \ 2)$

(b) (i) Although most candidates gave the correct answer, a considerable number of candidates only gained the mark for correct substitution in this part, working it out to the correct answer was found challenging. Adding and subtracting directed numbers proved to be a challenge.

Correct answer: $(3 \ -5)$

(ii) This part was found particularly well done, with few candidates unable to recognise the notation for the magnitude of a vector. Some used incorrect formula for the magnitude of a vector $(\sqrt{6^2 - 3^2})$. Others lost accuracy marks for truncating the answer or incorrect rounding off. **Common incorrect answers:** 7, 6.7, 6.70.

Correct answer: 6.71

(iii) Only a minority of candidates could clearly show that the two vectors are parallel. There had to be a comparison of expressing one vector as a scalar multiple of the other, not just writing a scalar to one vector. **Common incorrect answers:** $\mathbf{a} = 3\mathbf{c}$, $\mathbf{c} = \frac{1}{3}\mathbf{a}$, $3\mathbf{a}$

Correct answer: $\mathbf{c} = 3\mathbf{a}$ or $\mathbf{a} = \frac{1}{3}\mathbf{c}$

(iv) This question was fairly well done. While more candidates gained the mark for the correct ratio, a considerable number of candidates failed to give the correct answer. Candidates simple transferred the given column vectors for \mathbf{c} and \mathbf{a} , and wrote then in ratio form. **Common incorrect answers:** 1:3, $(\begin{smallmatrix} 6 \\ -3 \end{smallmatrix}) : (\begin{smallmatrix} 2 \\ -1 \end{smallmatrix})$

Correct answer: 3:1

8. (a) Nearly all candidates answered this part correctly.

Correct answer: 5

(b) (i) Most candidates were able to get the correct answer.

Common incorrect answers: 68, 17

Correct answer: 32

(ii) This part was well answered with nearly all candidates getting the correct answer.

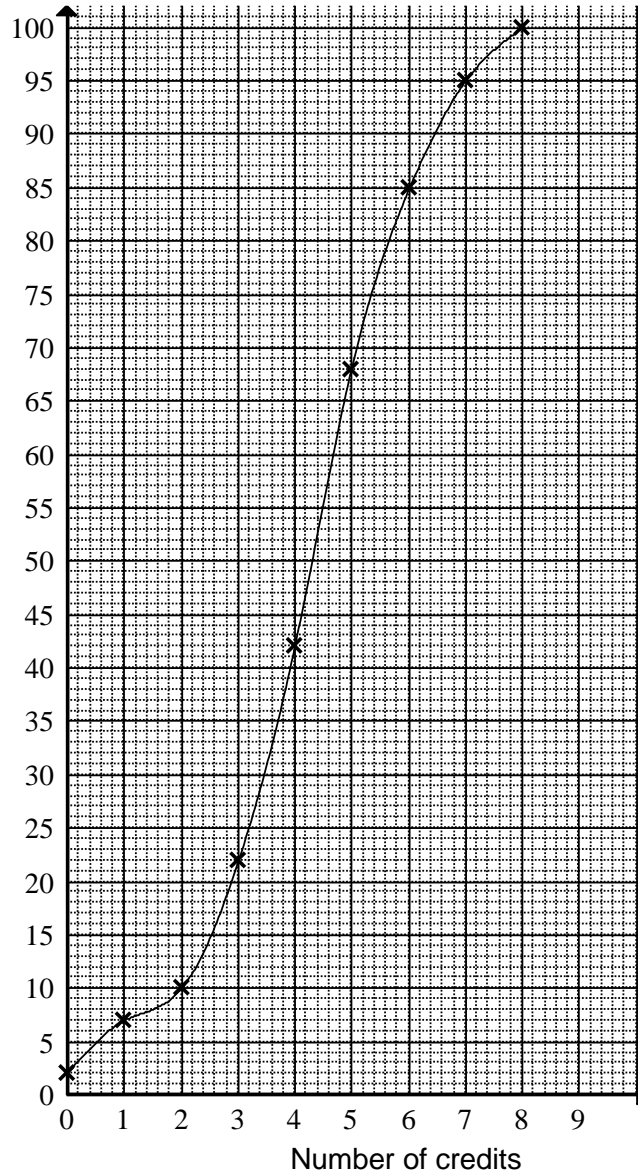
Common incorrect answer: 20%

Correct answer: 42%

(c) This question was fairly well done. Candidates should be encouraged to plot all points and avoid joining the points using straight lines but use free hand.

Correct answer:

c.f



(d) This was poorly well done. Most candidates only calculated the median position and gave it as their answer.

Correct Answer: 4.2 to 4.4

9. This question continues to prove to be a challenge to candidates year after year. Quite a number of candidates did not attempt this question. Some did not express their answers in terms of a and/or b. They wrote the routes using capital letters such as $\overrightarrow{AB} = \overrightarrow{AO} + \overrightarrow{OB}$. However, the best solutions showed good understanding of the context of the question and showed full working together with the answer written in its simplest form.

(a) This part was fairly well done. Some candidates were able to get the correct answer.

Correct answer: $b - a$

(b) This was poorly done. Most candidates did not realize that \overrightarrow{BM} was in the opposite direction of \overrightarrow{AB} . Common incorrect answers: $\frac{1}{2}(b - a)$, $:\frac{1}{2}\overrightarrow{AB}$

Correct answer: $\frac{1}{2}\mathbf{a} - \frac{1}{2}\mathbf{b}$

(c) This part was very poorly done. Some candidates lost accuracy mark because they did not simplify their answer.

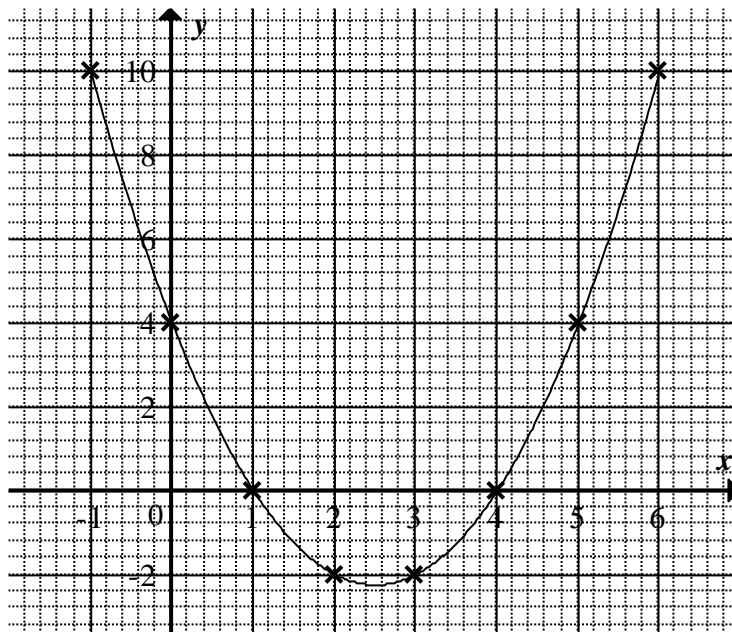
Correct answer: $\frac{1}{2}\mathbf{a} + \frac{1}{2}\mathbf{b}$

10. (a) This part was generally answered well although common errors $a = -2$, $b = 10$, $b = 2$ were seen.

Correct answer: $a = 10$
 $b = -2$

(b) This part was generally answered well with the majority of candidates able to plot all points and draw a smooth curve.

Correct answer:



(c) This was answered well by the majority of candidates.

Common incorrect answers: 2.5 $y = 2.5$,

Correct answer: $x = 2.5$

(d) Most candidates were able to find the values of x when $y = -2$, especially those who drew the curve correctly. Some gave one value for x and gained one mark. Instead of using the curve, others solved for x algebraically and failed to find the values for x .

Correct answer: $x = 2$ or $x = 3$