

**EXAMINATIONS COUNCIL OF  
ESWATINI**

**JC**

**EXAMINATION REPORT**

**FOR**

**ADDITIONAL MATHEMATICS**

**YEAR**

**2021**

**JC ADDITIONAL MATHEMATICS****Paper 519****GENERAL COMMENTS**

The paper appeared accessible to candidates compared to previous year's paper. Candidates appeared to have had sufficient time to finish the paper. Some even had time to check their answers. Candidates were able to show their working in the appropriate space and then transfer their answer to the answer space.

The overall performance of candidates was generally very poor in spite of the paper appearing accessible. Most questions were not answered in many centres. Questions **1(a)(iv)**, **2(a)(ii)**, **2(b)(iii)**, **3(a)(ii)**, **4**, **6(a)**, **6(c)** and **9(a)(ii)** proved to be very challenging to the candidates. Marks ranged from Zero to 99. The highest mark was 99. This score was very rarely seen. Many candidates got marks from zero to 40 from several centres.

Candidates still do not follow instructions in some questions. A trend by candidates of prematurely rounding and truncation of numbers was quite common and this resulted in unnecessary loss of accuracy marks. Candidates should be encouraged to use the calculator correctly and only round-off the answer. Notably, lack of necessary working in some questions also led to loss of marks. For example, questions **4**. Candidates seemed to have a serious problem when adding, subtracting, multiplying and dividing directed numbers even though a scientific calculator was used in this paper. Candidates would show correct method but fail to simplify to obtain accuracy mark. For instance, in questions: **1**, **2(b)**, **3** and **6**. As a matter of fact, directed numbers are found in most topics, like functions, matrices, algebra, vectors and statistics. Candidates should be encouraged to use a scientific calculator when dealing with directed numbers.

**COMMENTS ON SPECIFIC QUESTIONS**

1. (a) (i) This question was very well done. Most candidates were able to add the matrices.

**Correct Answer:**  $\begin{pmatrix} 7 & 0 \\ 0 & 7 \end{pmatrix}$

(ii) This was well done. Most candidates were able to multiply by the scalar.

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

(iii) This question was poorly done. Some candidates substituted with the wrong matrices. Matrix Y was multiplied with matrix W instead of matrix X multiplying matrix W. Some would get the correct entries but the order of the resultant matrix, incorrect. For instance,

$\begin{pmatrix} -6 \\ -7 \end{pmatrix}$ .

**Correct Answer:**  $\begin{pmatrix} -6 & -7 \end{pmatrix}$

(iv) This 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 they simply squared each entry inside the brackets. Some were able to place matrix W side by side but failed to multiple out the matrices. Common incorrect answer:  $\begin{pmatrix} 16 & 25 \\ 4 & 9 \end{pmatrix}$

**Correct Answer:**  $\begin{pmatrix} 26 & 35 \\ 14 & 19 \end{pmatrix}$

(b) This question was fairly well done. The zero matrix must be a 2 by 2 matrix. Common incorrect answers: (0), zero matrix,  $\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$ , identity matrix.

**Correct Answer:**  $B = \begin{pmatrix} 0 & 0 \\ 0 & 0 \end{pmatrix}$

(c) (i) This was poorly done. Most candidates failed to form correct equations from the given matrices. Common incorrect answers:  $2 - 3x = 5$  and  $3 + 3y = 0$ ,  $2x - 3x = 5$  and  $3y + 3y = 0$ ,  $2x + 3 = 5$  and  $3y + 3 = 0$ .

**Correct answer:**  $2x - 3y = 5$  and  $3x + 3y = 0$

(ii) This question was very poorly done. Many candidates failed to use the methods of solving simultaneous equations. Some of the few that formed correct equations in (c)(i) then failed to solve the equations simultaneously.

**Correct Answer:**  $x = 1$  and  $y = -1$

2. (a) (i) This question was very well done. Quite a lot of candidates got this one correct.

**Correct Answer:**  $m = 17$ ,  $n = 23$

(ii) This was very poorly done. Very few candidates got this one correct. Some candidates gave the answer as an expression or just an output. They failed to describe the function using function notation.

Common incorrect answers:  $3x$ ,  $x + 4$ , add 3

**Correct Answer:**  $f(x) = 3x - 4$  or  $f: x \rightarrow 3x - 4$

(b) (i) This question was very well done. Many candidates were able to evaluate the function correctly.

**Correct answer:** -17

(ii) This was fairly well done. Candidates did not know what to do with the w. Some did not attempt to answer the question.

Common incorrect answers:  $g(w) = \frac{3wx+1}{2}$ ,  $x = \frac{3g(w)+1}{2}$

**Correct answer:**  $g(w) = \frac{3w+1}{2}$

(iii) This was fairly well done. A number of candidates could not form the equation. Some of those that formed the equation failed to solve it correctly. There were also those who evaluated function  $f$ , as if they were asked to find  $f(3)$ . Even though some candidates formed the equation and solved it correctly, very few were able to express the answer to 2 significant figures.

**Correct Answer:**  $x = 0.86$

3. (a) (i) This question was fairly well done. A large number of candidates got this correct, but there is also a large number getting the question wrong. Common incorrect substitutions:

$$\left(3\frac{7}{3} - 2\right)^2, \left(3 \times \frac{7}{3} - 2\right).$$

**Correct Answer:** 25

(ii) This question was very poorly done. This was one of the most challenging questions for candidates. Common incorrect method was placing the factor side by side and then expanded the double brackets,  $(3a - b)(3a - b)$ . This made it even more complicated with  $a$  appearing in two terms after factorizing. Some were able to introduce the square root sign both sides and made  $a$  the subject but their answer incorrectly written,  $a = \frac{\sqrt{R+b}}{3}$ .

**Correct Answer:**  $a = \frac{\sqrt{R+b}}{3}$

(b) (i) This was fairly well done. Many candidates got this one correct but there were also many who got it incorrect. Common incorrect method was failing to change addition sign to subtraction sign in the second factor since there was a subtraction/negative sign before the second brackets. There were a few who were able to remove brackets correctly but failed to work out directed numbers.

Common incorrect answers:  $21n - 8$ ,  $9n - 4$ .

**Correct answer:**  $9n - 8$

(ii) This question was well done. Most candidates got this one correct. There were also a few who correctly placed the factor side by side but failed to simplify correctly.

Subtracting directed numbers proved to be a problem too. Common incorrect answers:

$$(9p^2 - q^2), 9p^2 + 6pq + q^2$$

**Correct answer:**  $9p^2 - 6pq + q^2$

(c) This was fairly well done. Most candidates were able to get correct answer. Some substituted the inequality sign with an equal sign and then solved. Others failed to reverse the inequality sign after dividing by a negative. Common incorrect answers:  $x = 1$ ,  $x \geq 1$

**Correct answer:**  $x \leq 1$

4. The whole of this question was generally very poorly done. Many candidates in many centres did not answer this question.

(a) (i) This was poorly done. Most candidates used incorrect trigonometric ratio. The few that used the correct ratio failed to give the answer to three significant figures. Common incorrect answers: 9.80, 14.3, 10.

**Correct Answer:** 10.0cm

(ii) This was fairly well done. Most of the few candidates that answered the question got this one correct. Common incorrect answer:  $135.6^\circ$

**Correct answer:**  $44.4^\circ$

(iii) This was poorly done. Many candidates got this one incorrect. Common incorrect answer:  $51.3^\circ$

**Correct answer:**  $6.9^\circ$

(iv) This question was very poorly done. It proved to be very difficult for most candidates. Even the good candidates failed to obtain full marks. Incorrect trigonometric ratios were used. The few that used the correct methods prematurely rounded off or truncated numbers and this resulted in unnecessary loss of accuracy marks. Common incorrect answers: 2, 2.7

**Correct answer:** 2.69cm

(b) This was fairly well done. Most candidates failed to use the correct trigonometric ratio. Some only drew a sketch. The angle of depression was placed at the wrong position.

**Correct answer:** 71.4m

5 (a) (i) This was well done. Most candidates were able to multiply by 3 both sides and then divide by 2 both sides to obtain the correct answer. Common incorrect answers: 0.83, 2.5

**Correct answer:** 7.5

(ii) This question was fairly well done. Most candidates got this one correct. There was also a large number who failed to get all the marks. Some treated the question as a difference of two squares yet 160 is not a square number. Many candidates only showed one value, the positive square root of 160 ( $+\sqrt{160}$ ) instead of also showing the negative square root of 160 ( $-\sqrt{160}$ ). Common incorrect answers: 13,  $\sqrt{-160}$

**Correct answer:**  $p = -12.6$  or  $12.6$

(b) This was very poorly done. Most candidates cross multiplied by the denominator, resulting in the denominator being eliminated. This resulted to an answer of  $6y - 8$ . Other candidates would simple subtract the numerators and get  $\frac{2}{(y+2)(y-3)}$ . Directed numbers proved to be a

problem in this question too. Many candidates failed to simplify correctly after removing brackets in the numerator, resulting in  $\frac{6y+8}{(y+2)(y-3)}$  or  $\frac{6y+16}{(y+2)(y-3)}$ . Another common incorrect answer was  $\frac{6}{(y+2)(y-3)}$ .

**Correct Answer:**  $\frac{6y-8}{(y+2)(y-3)}$

- (c) (i) This question was well done. Many candidates were able to factorise correctly. Very few factorised incompletely. Candidates should be encouraged to factor out the highest common factor (HCF).

Common incomplete answer:  $2(2x - 14)$

**Correct answer:**  $4(x - 7)$

- (ii) This was fairly well done.

Common incorrect answers:  $(x + 4)(x - 3)$ ,  $(x + 4)(x + 3)$ ,  $x(x - 7) + 12$

**Correct answer:**  $(x - 3)(x - 4)$

6. (a) (i) This question was poorly done. Most candidates attempted it but could not get the correct answer. Common incorrect answers:  $\begin{pmatrix} 1 \\ 2 \end{pmatrix}$ ,  $\begin{pmatrix} 8 \\ -7 \end{pmatrix}$

**Correct answer:**  $\begin{pmatrix} -7 \\ 8 \end{pmatrix}$

- (ii) This was well done. Most candidates got this one correct. There was just a few who wrote the coordinates as a column vector or with *vas versa* coordinates.

Common incorrect answers:  $\begin{pmatrix} 2 \\ 4 \end{pmatrix}$ ,  $(4, 2)$

**Correct Answer:**  $(2, 4)$

- (b) (i) This question was well done. Many candidates were able to add the column vectors.

**Correct Answer:**  $\begin{pmatrix} 2 \\ 6 \end{pmatrix}$

- (ii) This was fairly well done. A large number of candidates got it correct but there were also many of them who got it wrong. A major challenge was on multiplying  $\underline{b}$  by the scalar. A few multiplied by a negative scalar and ended up with no operation sign to use with  $\underline{a}$ . Some multiplied by the negative scalar and then subtracted from  $\underline{a}$  instead of adding.

Common incorrect answer:  $\begin{pmatrix} 1 \\ 8 \end{pmatrix}$ ,  $\begin{pmatrix} 1 \\ 0 \end{pmatrix}$

**Correct answer:**  $\begin{pmatrix} 5 \\ 0 \end{pmatrix}$

- (iii) This was poorly done. Most candidates did not answer this question. Some of the few that answered it subtracted instead of adding the squares in the square root. Some were

not giving the answer correct to three significant figures. Very few got this one correct.

Common incorrect answers:  $\sqrt{5}$ , 2,  $\left(\frac{-1}{2}\right)^2$ , 1.7

**Correct Answer:** 2.24

(c) Generally, this question was very poorly done. A large number of candidates did not answer the question. Many of the few candidates that answered it still failed to express the vectors in terms of  $\underline{p}$  and/or  $\underline{q}$ . They simple wrote the routes using capital letters such as  $\overrightarrow{AB} = \overrightarrow{AO} + \overrightarrow{OB}$ .

(i) This was very poorly done. Common incorrect answer:  $\underline{p}$ ,  $\overrightarrow{AB} = \overrightarrow{AO} + \overrightarrow{OB}$ , impossible.

**Correct answer:**  $\underline{q}$

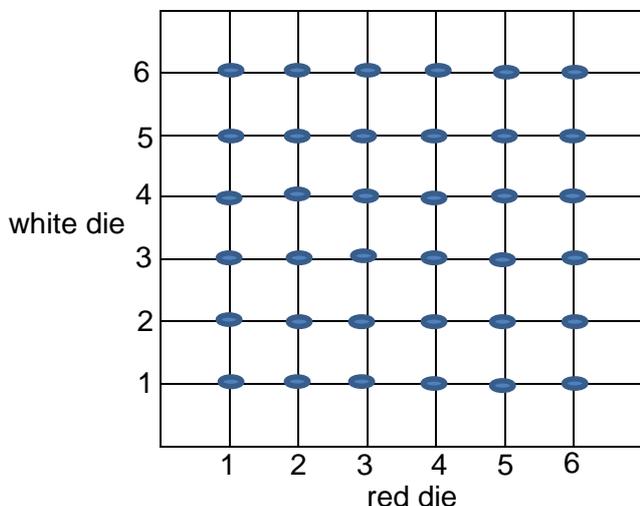
(ii) This was very poorly done.

**Correct answer:**  $\frac{1}{2}(\underline{p} + \underline{q})$

(iii) This was very poorly done. Some candidates did not simplify their answers.

**Correct Answer:**  $\frac{3}{2}\underline{q} - \frac{1}{2}\underline{p}$

7. (a) This question was fairly well done. Most candidates were able to label axes correctly and all 36 outcomes were marked. Very few showed outcomes ranging from 1 to 8. There were also many candidates that drew a tree diagram.



(b) (i) This was poorly done. Almost all those that had the correct diagram got it correct.

Common incorrect answers: 2,  $\frac{1}{36}$

**Correct Answer:**  $\frac{2}{36}$

(ii) This was very poorly done.

**Correct Answer:**  $\frac{9}{36}$

(iii) This was poorly done.

**Correct Answer:**  $\frac{6}{36}$

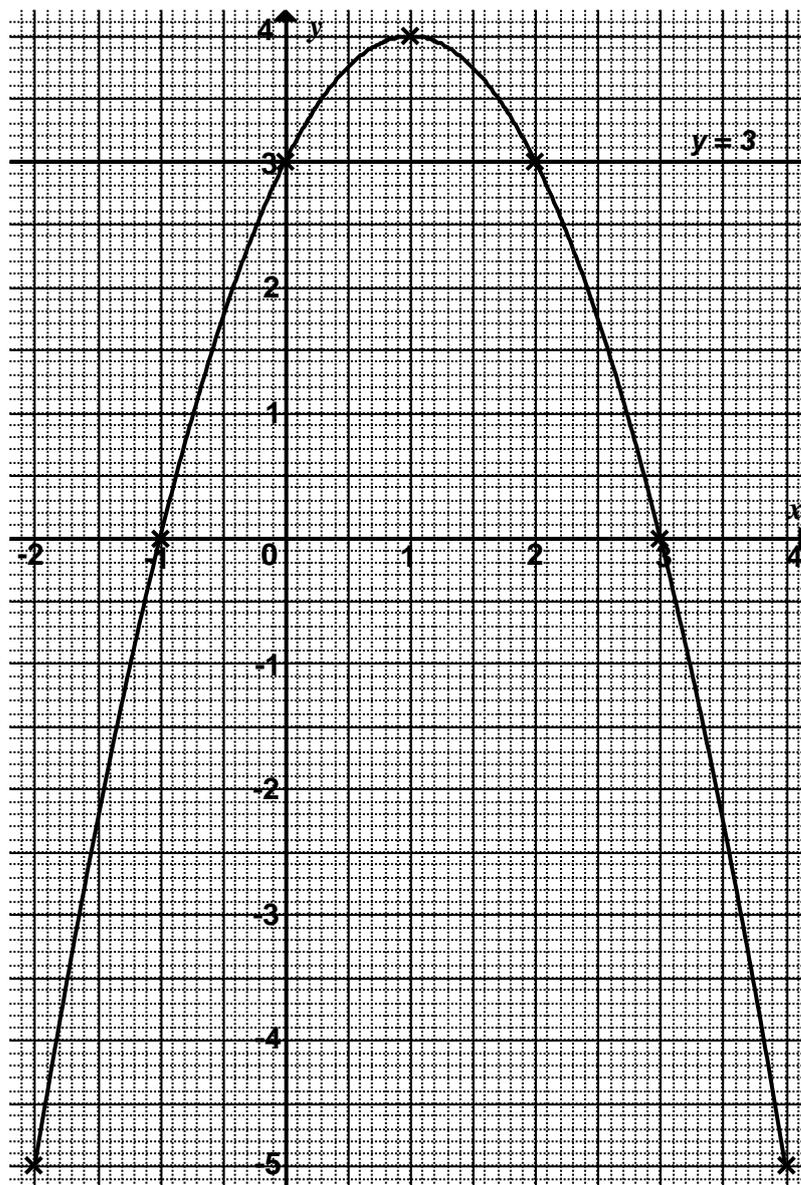
8. (a) This question was done. Many candidates were able to get the correct answer.

**Correct Answer:**  $p = 0$

$q = -5$

(b) This was well done. Quite a number of candidates were able to plot all points correctly and drew a smooth curve. Very few candidates continue to incorrectly join points using a straight line with a sharp turning point.

**Correct Answer:**



(c) This was fairly done. Most candidates got it correct but also a large number of candidates got it incorrect. Common incorrect answers:  $-5$ ,  $1$ ,  $(1,4)$ ,  $-5 \leq y \leq 4$

**Correct Answer:**  $4$

(d) This was fairly well done. Some candidates solved the equation algebraically instead of using the graph. Others did not draw the line  $y = 3$ . Common incorrect answers:  $x = -1$  or  $x = 3$ ,  $x = (0,3)$  or  $x = (2,3)$ .

**Correct answer:**  $x = 0$  or  $x = 2$

(e) This was well done. Most candidates got it correct. Quite a number did not know how to write the equation of a line. Common incorrect answers:  $1$ ,  $y = 1$ , drawing the line of symmetry without stating its equation.

**Correct Answer:**  $x = 1$

9. (a) (i) This was well done. Many candidates got this one correct.

**Correct Answer:** 4

(ii) This question was very poorly done. Very few candidates got this one correct.

Common incorrect answer: 19

**Correct Answer:** 47

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

**Correct Answer:** 1.9

(b) (i) This was well done. Many candidates were able to get this one correct.

**Correct Answer:** Frequency column: 4, 28

Cumulative column: 4, 53, 97

(ii) This was well done. Most candidates were able to write down the correct modal number of pairs of sneakers.

**Correct Answer:** 2

(c) This question was poorly well done. Common incorrect answers: 8,  $\frac{19}{100}$ , 19

**Correct Answer:**  $\frac{8}{100}$