3.2 MATHEMATICS ALT B (122)

In the year 2019 Mathematics Alt B was tested in two papers. **Paper 1 (122/1)** and **Paper 2 (122/2)**. Each paper consisted of two sections: Section 1 (50 marks) short answer questions of not more than four marks each and Section II (50 marks), a choice of eight questions of 10 marks each where candidates answer any five.

Paper 1 (122/1) tested mainly Forms 1 and 2 work while Paper 2 (121/2) tested mainly forms 3 and 4 work of the syllabus.

This report is based on an analysis of performance of candidates who sat the year 2019 KCSE Mathematics Alt B.

3.2.1 CANDIDATES' GENERAL PERFORMANCE

Table 9: Candidates' Performance in Mathematics Alt B for the last five years 2015 - 2019

Year	Paper	Candidature	Maximum score	Mean Score	Standard Deviation
2015	1		100	9.35	11.76
	2	1387	100	7.26	12.53
	Overall		200	16.58	22.72
2016	1		100	9.37	11.28
	2	1457	100	8.02	10.6
	Overall		200	17.18	20.67
2017	1		100	7.07	8.58
	2	1486	100	13.39	13.26
	Overall		200	20.20	20.26
2018	1		100	9.13	10.61
	2	1161	100	8.38	11.14
	Overall		200	17.44	20.36
2019	1		100	5.9	8.79
	2	1126	100	7.3	9.75
	Overall		200	12.97	16.62

From the table it is observable that the subject registered a decline in performance compared to previous years. The subject has continuously registered very low means.

3.2.2 INDIVIDUAL QUESTION ANALYSIS

The following is a discussion of some of the questions in which the candidates had major weakness in. This discussion is based on analysis of candidates answer scripts and chief examiners report.

3.2.3 Mathematics Alt. B Paper 1 (122/1)

Question 4

Simplify $\left(\dfrac{33y^4 \times 9y^5}{11y^{12}}\right)^{1/3}$.

The question tested on simplification of indices.

Weaknesses

Inability to use the laws of indices to simplify the expression.

Expected response

$$= \left(27\frac{y^9}{y^{12}}\right)^{\frac{1}{3}}$$
$$= \left(3^3 y^{-3}\right)^{\frac{1}{3}}$$
$$= 3y^{-1}$$

Advice to teachers

Emphasize on laws of indices and their use.

Question 6

A line $y + 6x + c = 0$ passes through $(4, -2)$ and is perpendicular to the line $py + 4x - 10 = 0$. Determine the values of c and p.

(4 marks)

The question tested equations of straight line and relationship between gradients of perpendicular lines.

Weaknesses

Candidates were unable to interpret the given lines and find the gradient of the perpendicular line.

Expected response

$$y = -6x - c$$
$$-2 = -6(4) - c$$
$$-2 = -24 - c$$
$$c = -22$$

$$m_1 = -6$$
$$m_1 \times m_2 = -1$$
$$-6 \times m_2 = -1$$
$$m_2 = \frac{1}{6}$$
$$py + 4x - 10 = 0$$
$$py = -4x + 10$$
$$y = \frac{-4}{p}x + \frac{10}{p}$$
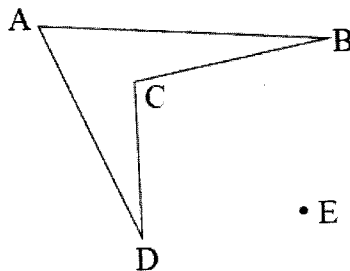$$\frac{-4}{p} = \frac{1}{6}$$
$$p = -24$$

Advice to teachers

Emphasis should be made on finding the gradients, equations of a straight line and gradients of perpendicular lines.

Question 8

Construct the image of quadrilateral ABCD under an enlargement scale factor –2, centre of enlargement E.   (2 marks)
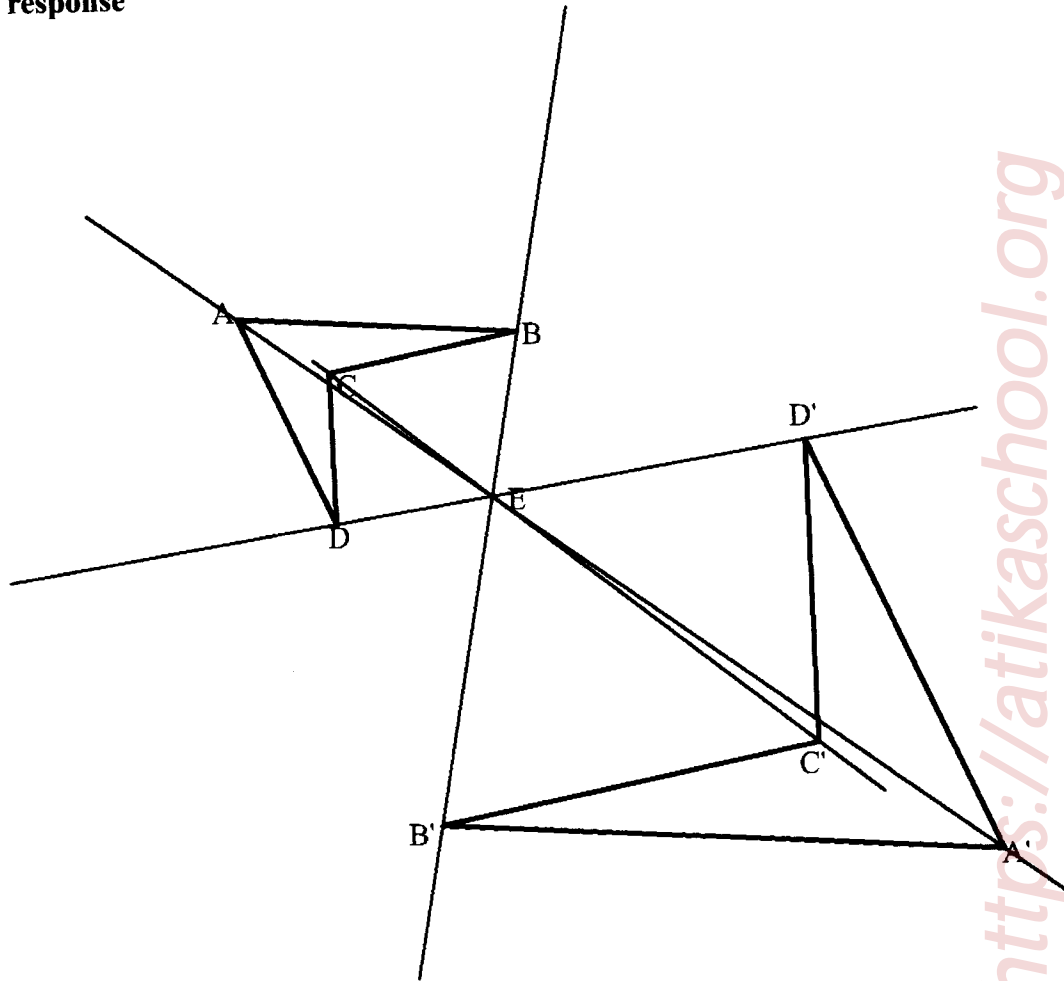

The question tested on construction of an image given the object, centre and scale factor of an enlargement.

Weaknesses

Most candidates were not able to obtain the image.

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Expected response

Advice to teachers

Emphasize more on obtaining images of an enlargement given the centre and scale factor.
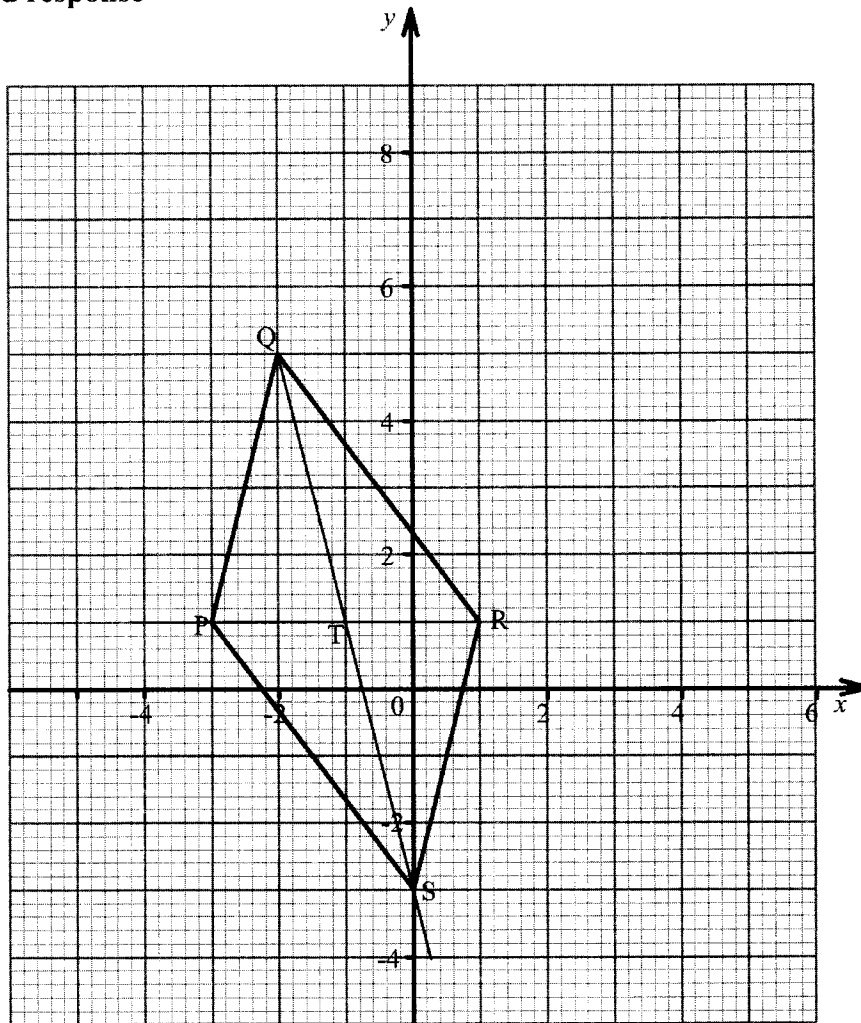
Question 13

A parallelogram PQRS has vertices P (a, b), Q (–2, 5), R (1, 1) and S(x, y). The diagonals intersect at T (–1, 1). Using the grid below, plot and state the coordinates of points P and S.

(4 marks)

The question tested on properties of a parallelogram. The candidates were required to use the properties to complete the parallelogram on the Cartesian plane.

Weaknesses

Inability to use the properties of a parallelogram to locate the missing points.

Expected response

$P(-3,1)$
$S(0,-3)$

Advice to teachers

Emphasize more on the properties of a parallelogram and drawing the parallelogram on the Cartesian plane.

Question 21

(a) Agnes donated 16⅔% of her maize produce to a charitable organisation. Janet donated 20% of her maize produce to the same charitable organisation. Their total donation was 15 200 kilograms. The following season, Agnes donated 12½% of her maize produce to the same charitable organisation while Janet donated 8⅓% of her maize produce to the same charitable organisation. Their total donation for the following season was 9 000 kilograms. Calculate the amount of maize produced by each of them, in tonnes.

(6 marks)

(b) On the grid provided below, solve graphically the following simultaneous equations,

$$2x = y - 1$$
$$x - 2y = 4$$

(4 marks)

The question tested on solving linear equations and application of linear equations in real life situations. The candidates were required to form and solve linear equations from the given real life situation.

Weaknesses
Inability to form the linear equations from the given situation.

Expected response

Let Agnes produce be x and Janet produce be y.

$$\frac{50}{300}x + \frac{20}{100}y = 15200$$

$$\frac{25}{200}x + \frac{25}{300}y = 9000$$

$$5x + 6y = 456000$$

$$3x + 2y = 216000$$

$$5x + 6y = 456000$$

$$9x + 6y = 648000$$

$$4x = 192000$$

$$x = 48000$$

$$5(48000) + 6y = 456000$$

$$6y = 216000$$

$$y = 36000$$

$$\text{Agnes produce} = \frac{48000}{1000} = 48 \text{ tonnes}$$

$$\text{Janet Produce} = \frac{36000}{1000} = 36 \text{ tonnes}$$

2x = y-1

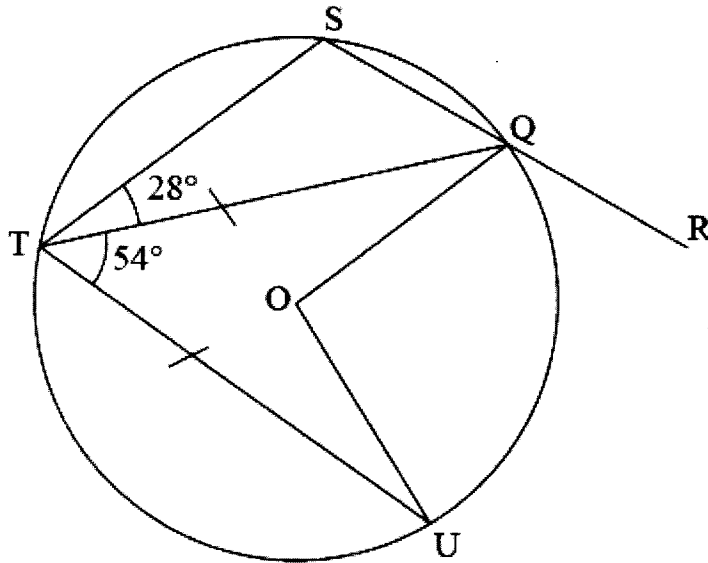| x	0	1
y	1	3

x - 2y = 4

x	0	4
y	-2	0

Advice to teachers

Emphasize on the formation and solution of linear equation from real life situations.

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Question 22

In the figure below, O is the centre of the circle and SQR is a straight line. Angle STQ = 28°, angle UTQ = 54° and UT = TQ.

Giving reasons, determine the sizes of:
(a) angle TQU;   (2 marks)
(b) angle TSQ;   (2 marks)
(c) angle TQS;   (2 marks)
(d) reflex angle UOQ;   (2 marks)
(e) angle UQR.   (2 marks)

The question tested on angle properties of a circle. Candidates were expected to determine various angles and state the properties used.

Weaknesses

Many candidates who attempted could not state correctly the properties used.

Expected response

a) $\angle TQU = \dfrac{180 - 54}{2} = 63°$

      Base angles of an isosceles triangle add up to 180°

b) $\angle TSQ = 180° - 63° = 117°$

      Opposite angle of a cyclic quadrilateral add up to 180°

c) $\angle TQS = 180° - (117° + 28°) = 35°$

      Angles in a triangle TSQ add up to 180°

d)   Reflex $\angle UOQ = 360° - 108° = 252°$

      Angles at a point add up to 360°

e) $\angle UQR = 180° - (35° + 63°) = 82°$

Angles on a straight line add up to 180°

Advice to teachers

Emphasize more on the angle properties of a circle.

3.2.4 Mathematics Alt. B Paper 2 (122/2)

Question 3

Use the quadratic formula to solve the equation $3x^2 - 8x^3 = 0$. (3 marks)

The question tested on solution of quadratic equation using factorization and quadratic formula.

Weaknesses

Inability to factorize and use the quadratic formula.

Expected response

$3x^2 - 8x - 3 = 0 \quad x(3x - 8x^2) = 0$

$x = 0 \quad or \quad 3x - 8x^2 = 0$

When $3x - 8x^2 = 0$

$$x = \frac{-3 \pm \sqrt{3^2 - 4 \times 3 \times 0}}{2 \times -8}$$

$$x = \frac{-3 \pm \sqrt{9}}{-16} = \frac{3}{8}$$

$$\therefore x = \frac{3}{8} \quad or \quad x = 0$$

Advice to teachers

Practice more on factorization and use of quadratic formula.

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Question 13

A triangular plot PQR is such that PQ = 74 m, PR = 40 m and angle RPQ = 82°. Determine, correct to 2 decimal places:

(a) the length RQ; (2 marks)

(b) the size of angle PQR. (2 marks)

The question tested on application of the sine and cosine rules to solve for sides and angles of triangles.

Weaknesses

Candidates were unable to use the sine and cosine rules correctly.

Expected response

(a)

$$(RQ)^2 = 40^2 + 74^2 - 2 \times 74 \times 40 \cos 82°$$

$$RQ = \sqrt{6252.1}$$
$$\qquad = 79.07$$

(b)

$$\frac{79.07}{\sin 82} = \frac{40}{\sin x}$$

$$\sin x = \frac{40 \sin 82}{79.07} = 0.5010$$

$$x = 30.07°$$

Advice to teachers
Emphasize on application of sine and cosine rules.

Question 14

The vertices of a trapezium ABCD are A(1,1), B(5,1), C(5,4) and D(1,3). The trapezium is

mapped onto $A'B'C'D'$ by transformation matrices $\mathbf{P} = \begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}$ followed by $\mathbf{Q} = \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$.

Find the coordinates of $A'B'C'D'$. (3 marks)

The question tested on use of matrices in transformation.

Weaknesses
Candidates were unable to follow the correct order in multiplication of matrices.

Expected response

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

$$\begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}\begin{pmatrix} 1 & 5 & 5 & 1 \\ 1 & 1 & 4 & 3 \end{pmatrix} = \begin{pmatrix} -1 & -5 & -5 & -1 \\ 1 & 1 & 4 & 3 \end{pmatrix}$$

Co-ordinates of A′B′C′D′ are

A′$(-1,1)$, B′$(-5,1)$, C′$(-5,4)$ and D′$(-1,3)$.

Advice to teachers
Emphasize on matrix multiplications.

Question 16

Two variables V and t are connected by the equation $V = t^2 - 2$ find the average rate of change of V between t = 2 and t = 5.
(3 marks)

The question tested on rate of change.

Weaknesses

Many candidates were unable interpret the question and obtain the values of V for the given value of t.

Expected response

$v = t^2 - 2$

At $t = 2$

$V = 4 - 2 = 2$

At t = 5

$V = 25 - 2$

$= 23$

Rate of change of V

$= \dfrac{23 - 2}{5 - 2}$

$= \dfrac{21}{3} = 7$

Advice to teachers

Practice more on the rates of change.

Question 17

At the beginning of a certain year, Amanda deposited Ksh 600 000 in a financial institution. The institution offered a compound interest at a rate of 10% p.a.

(a)   Calculate the accumulated amount on Amanda's deposit after 3 years.   (2 marks)

(b)   After 3 years, the interest was then compounded semi annually for 2 years.

       (i)   Calculate, to the nearest shilling, the accumulated amount on the deposit at the end of five years.   (4 marks)

       (ii)   Find the interest earned in the five years.   (2 marks)

(c)   Kipanga invested some money in the same financial institution as Amanda. The money earned 10% compound interest p.a. for 5 years. The interest earned by Kipanga was equal to the interest earned by Amanda.
Determine, to the nearest shilling, the amount of money invested by Kipanga.

                                                     (2 marks)

The question tested on application of compound interest in real life situation.

Weaknesses

Candidates were unable to apply the compound interest formula correctly especially for semi annually.

Expected response

(a) $A = 600\,000 \times 1.1^3$

        $= \text{Ksh } 798\,600$

(b)   (i) $n = 4$

          $r = \dfrac{10}{2} = 5\%$

          $A = 798\,600 \times (1.05)^4$

            $= \text{Ksh } 970\,703$

        (ii) $I = 970\,703 - 60\,000$

             $= \text{Ksh } 370\,703$

(c)

$$p \times (1.1)^5 - p = 370703$$

$$p\left[(1.1)^5 - 1\right] = 370703$$

$$p = \frac{370703}{(1.1)^5 - 1}$$

$$= \text{Ksh } 607\,202$$

Advice to teachers

Give more practice on application of compound interest in real life situations.

Conclusion

Application of learned concepts to real life situations was observed to be a challenge to many candidates.

To help learners understand the concepts, it is necessary to contextualize the learning to real life situations in the course of the teaching and learning.