3.0 PART ONE: ANALYSIS OF DIFFICULT QUESTIONS

3.1 MATHEMATICS ALT A (121)

In the year 2014 Mathematics Alternative A was tested in two papers. **'Paper 1 (121/1) and Paper 2 (121/2).** Each paper consisted of two sections: Section 1 (50 marks) compulsory short answer questions of not more than four marks each and Section II (50 marks), eight questions of 10 marks each where candidates answer any five.

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

This report is based on an analysis of performance of candidates who sat the year 2014 KCSE Mathematics Alt A.

3.1.1 CANDIDATES' GENERAL PERFORMANCE

The table below shows the performance of both papers in the last five years.

Table 9: Candidates' Performance in Mathematics Alt A for the last five years, 2010 – 2014

Year	Paper	Candidature	Maximum Score	Mean Score	Standard Deviation
2010	1	**356072**	100	26.21	20.63
	2		100	19.92	20.35
	Overall		**200**	**46.07**	**40.02**
2011	1	**409887**	100	21.36	21.66
	2		100	28.22	23.57
	Overall		**200**	**49.57**	**44.30**
2012	**1**	**433017**	100	29.46	23.98
	2		100	27.86	23.18
	Overall		**200**	**57.31**	**46.20**
2013	**1**	**444774**	100	28.12	24.67
	2		100	27.03	22.91
	Overall		**200**	**55.15**	**46.71**
2014	**1**	**481286**	100	24.54	20.77
	2		100	23.50	23.16
	Overall		**200**	**48.04**	**42.94**

From the table the following observations can be made:

(i) Both papers 121/1 and 121/2 shows a decline in the mean. The decline in mean is also noted in the overall performance.

3.1.2 INDIVIDUAL QUESTION ANALYSIS

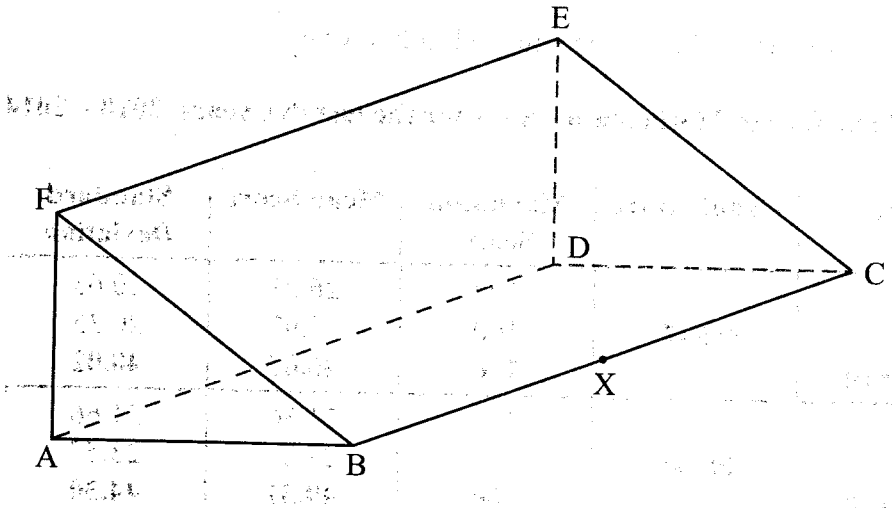
The following is a discussion of some of the questions in which the candidates had major weakness in, as a result of which these questions were poorly performed. The discussion is based on comments from the chief examiners reports and an analysis the students' responses and scores in the questions from sampled scripts.

3.1.2 Mathematics Alt. A Paper 1 (121/1)

The paper mainly covers Forms 1& 2 work of the syllabus. Below is a discussion of some questions in which students had weakness in.

Question 4

The figure below represents a triangular prism ABCDEF. X is a point on BC.



(a) Draw a net of the prism. (2 marks)

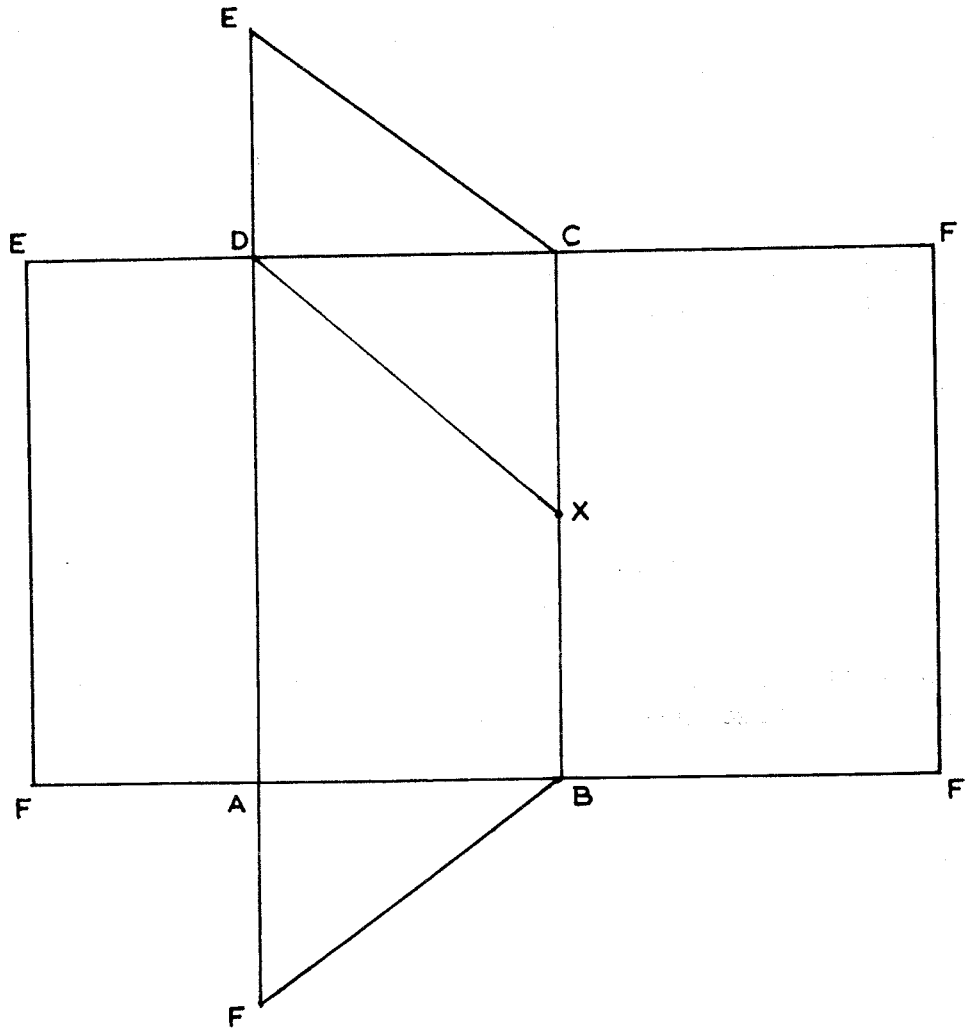
(b) Find the distance DX. (1 mark)

The question tested on drawing of a net of solid.

Weaknesses

Most candidates could not draw the net with accurate measurements of the length and angles. Instead they drew rough sketches. Some candidates shown complete lack of knowledge of drawing of nets solids.

Expected response



(b) DX = 5.3 ± 0.1

Advice to teachers
Students should be well guided on drawing of nets of solids and solids from nets with emphasis on using the correct measurements.

Question 7

The area of a sector of a circle, radius 2.1 cm, is 2.31 cm^2. The arc of the sector subtends an angle θ, at the centre of the circle. Find the value of θ in radians correct to 2 decimal places.
(2 marks)

Question tested on radian measure. Candidates were required to use angle in radian measure in finding the area of a sector.

Weaknesses
Most candidates could not convert the degrees to radians.

Expected response

$$= \frac{\theta}{2\pi} \times \pi \times 2.1 \times 2.1 = 2.31$$

$$\theta = \frac{2.31 \times 2}{2.1 \times 2.1}$$

$$= 1.05^{c}$$

Advice to teachers
Emphasize on conversion of degree to radians and vice versa. Use angles in radians when calculating area of sector and length of arc should also be emphasized.

Question 8

Expand and simplify $(x + 2y)^2 - (2y - 3)^2$. (2 marks)

The question tested on expansion of algebraic expressions.

Weaknesses
Most candidates had problems with the expansion of the first term involving two unknowns. Others had difficulty in subtraction of the terms in the second bracket after expansion.

Expected response

$$(x+2y)^2-(2y-3)^2$$

$$=(x^2+4xy+4y^2)-(4y^2-12y+9)$$

$$=x^2+4xy+12y-9$$

Advice to teachers
Thorough revision on expansion and opening of brackets is necessary.

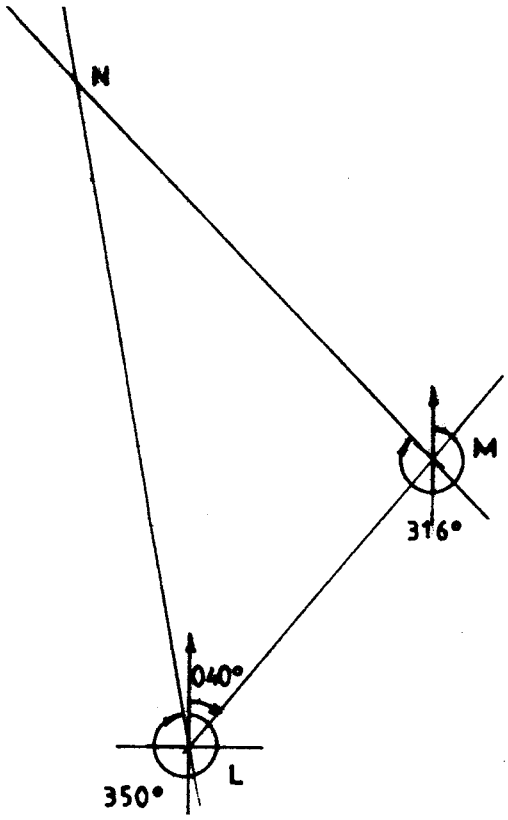
Question 9

A plane leaves an airstrip L and flies on a bearing of 040° to airstrip M, 500 km away. The plane then flies on a bearing of 316° to airstrip N. The bearing of N from L is 350°. By scale drawing, determine the distance between airstrips M and N. (4 marks)

The question tested on scale drawing and bearings.

Weaknesses
Most candidates were measuring the bearings from the East instead of from the North. Other candidates had north lines not parallel.

Expected response



Distance MN = 6.8×100
= 680 km

Advice to teachers
Give more practice on drawing of parallel lines and understanding of bearings.

Question 16

Points A $(-2, 2)$ and B $(-3, 7)$ are mapped onto A′ $(4, -10)$ and B′ $(0, 10)$ by an enlargement. Find the scale factor of the enlargement. (3 marks)

The question tested on determination of scale factor of an enlargement.

Weaknesses
Most candidates did not attempt the question. Those who attempted could not relate the object and image distances in order to calculate the scale factor.

Expected response

$|AB| = \sqrt{(-3+2)^2+(7-2)^2} = \sqrt{26}$

$|A'B'| = \sqrt{4^2+(-20)^2} = \sqrt{416}$

Scale factor $= \frac{|A'B'|}{|AB|} = \frac{\sqrt{416}}{\sqrt{26}}$

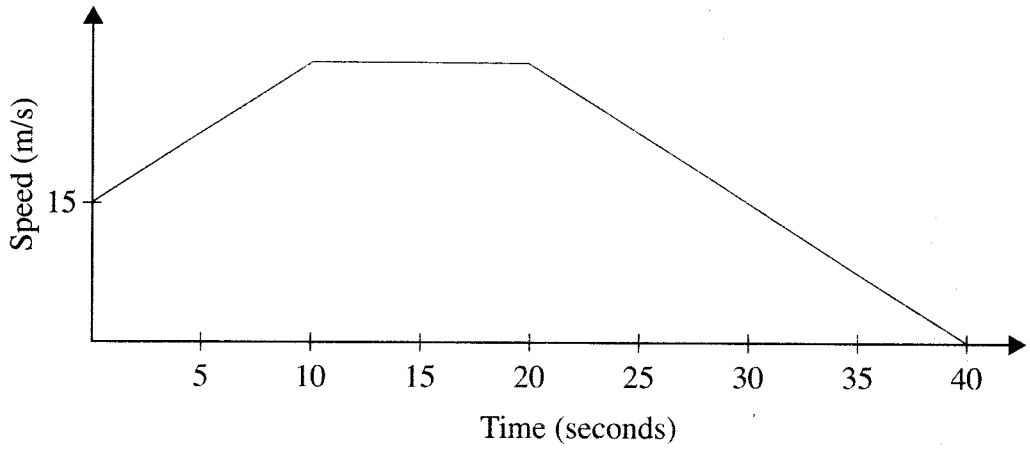
$= 4$

Advice to teachers

From the candidates responses, it was evident that concept of scale factor of an enlargement by calculation has not been taught well. It is important to teach this concept well.

Question 19

The figure below represents a speed time graph for a cheetah which covered 825 m in 40 seconds.



(a) State the speed of the cheetah when recording of its motion started. (1 mark)

(b) Calculate the maximum speed attained by the cheetah. (3 marks)

(c) Calculate the acceleration of the cheetah in:

(i) the first 10 seconds; (2 marks)

(ii) the last 20 seconds. (1 mark)

(d) Calculate the average speed of the cheetah in the first 20 seconds. (3 marks)

The question was on linear motion, calculation of speed and acceleration

Weaknesses

The question was unpopular with most candidates omitting it. Those who attempted it could not obtain the distance from the area under the curve.

Expected response

(a) 15 m/s

(b) maximum speed

$$\frac{1}{2}(15+h)\times 10+\frac{1}{2}(10+30)h=825$$

$$75+5h+20h=825$$
$$25h=750$$
$$h=30 \text{ m/s}$$

(c) (i) $=\frac{30-15}{10}$

$=1.5 \text{ m/s}^2$

(ii) $=\frac{0-30}{20}=-1.5 \text{ m/s}^2$

(d) $\left[\frac{1}{2}(15+30)\times 10+10\times 30\right]\div 20$

$=(225+300)\div 20$

$=26.25 \text{ m/s}$

Advice to teachers
Revise thoroughly with the students on this topic.

3.1.3 Mathematics Alt. A Paper 2 (121/2)

Candidates performed better in section I than section II in 121/2. Questions 17 and22 were very popular in section II and were also performed well by candidates who chose them.

Question 15

The gradient of a curve is given by $\frac{dy}{dx}=x^2-4x+3$. The curve passes through the point (1,0). Find the equation of the curve. (3 marks)

The question tested on integration, finding the equation of a curve.

Weaknesses
Differentiating between indefinite and definite integral was a problem. Substituting for C was also a problem to some candidates. Other candidates did not grasp the concept and thought of it as equation of a straight line.

Expected response

$$y = \int (x^2 - 4x + 3)\, dx$$

$$= \frac{1}{3}x^3 - 2x^2 + 3x + c$$

$$0 = \frac{1}{3} - 2 + 3 + c$$

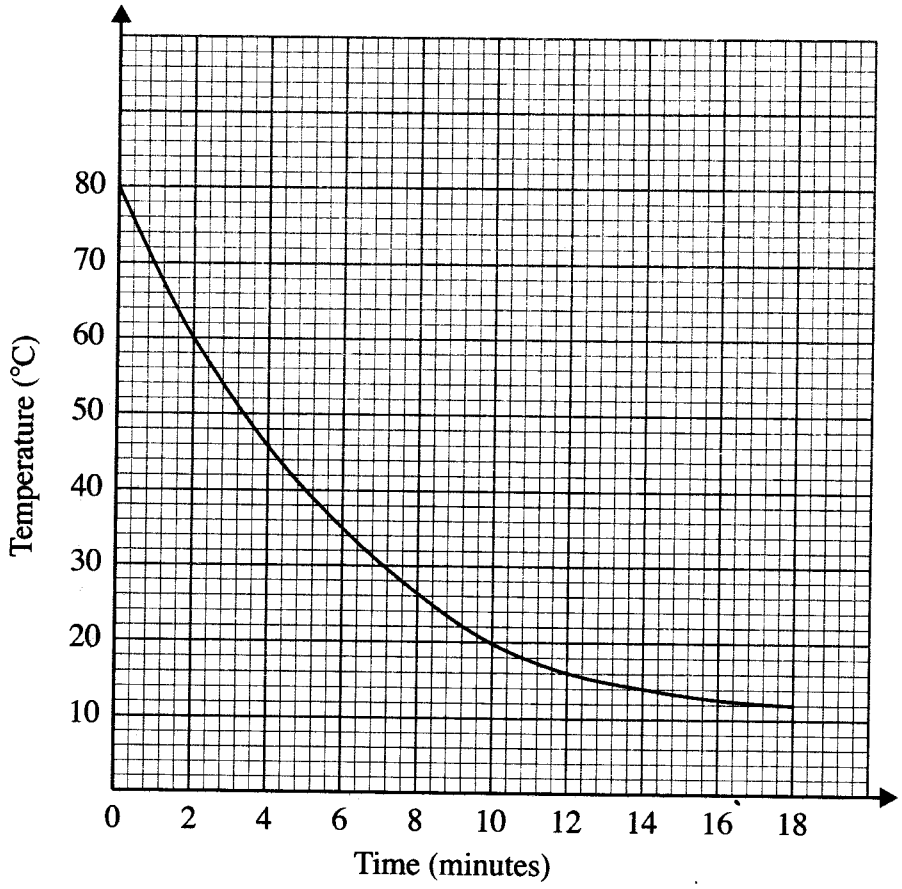
$$\therefore c = -\frac{4}{3}$$

$$\therefore y = \frac{1}{3}x^3 - 2x^2 + 3x - \frac{4}{3}$$

Advice to teachers
More practice on integrals is necessary.

Question 16

The graph below shows the rate of cooling of a liquid with respect to time.



Determine the average rate of cooling of the liquid between the second and the eleventh minutes.
(3 marks)

The question tested on determination of average rate of change from a graph.

Weaknesses
Some candidates read off all the corresponding values of time between the second and eleventh minutes and found the average. This was an indication of lack of knowledge of the concept being tested. Accuracy of reading the coordinates and interpreting cooling was also a challenge to many.

Expected response

Temperature at the 2nd minute = 60°
Temperature at the 11th minute = 18°

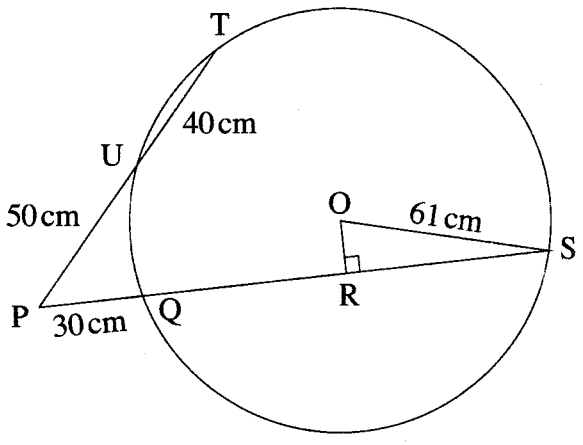
Average rate of cooling

$$= \frac{60 - 18}{2 - 11}$$
$$= \frac{42}{|9|}$$
$$= 4\frac{2}{3} \ {}^{0}C/\min$$

Advice to teachers
Explore the various rates of change and how they relate to gradient.

Question 18

In the figure below OS is the radius of the circle centre O. Chords SQ and TU are extended to meet at P and OR is perpendicular to QS at R. OS = 61 cm, PU = 50 cm, UT = 40 cm and PQ = 30 cm.



(a) Calculate the length of:

(i) QS; (2 marks)

(ii) OR. (3 marks)

(b) Calculate, correct to 1 decimal place:

(i) the size of angle ROS; (2 marks)

(ii) the length of the minor arc QS. (3 marks)

The question tested on theory of intersecting chords.

Weaknesses

Most candidates lacked knowledge on theory of intersecting chords.

Expected response

a) (i) $(50 + 40)(50) = 30(30 + x)$

$4500 = 900 + 30x$

$30x = 3600$

$QS = x = 120$ cm

(ii) $RS = \frac{1}{2}QS$

$= \frac{1}{2}(120) = 60$ cm

$OR = \sqrt{61^2 - 60^2}$

$= 11$ cm

b) (i) $\text{Sin}\,\theta = \frac{60}{61}$

$\theta = 79.6°$

(ii) Angle at the centre

$= 2 \times 79.6$

$= 159.2°$

Length of minor arc QS

$= \frac{159.2}{360} \times 2\pi \times 61$

$= 169.5$ cm

Advice to teachers

Give more practice on intersecting chords both internally and externally.

Question 21

Each morning Gataro does one of the following exercises:
Cycling, jogging or weightlifting.
He chooses the exercise to do by rolling a fair die. The faces of the die are numbered 1, 1, 2, 3, 4 and 5.
If the score is 2, 3 or 5, he goes for cycling.
If the score is 1, he goes for jogging.
If the score is 4, he goes for weightlifting.

(a) Find the probability that:

(i) on a given morning, he goes for cycling or weightlifting; (2 marks)

(ii) on two consecutive mornings he goes for jogging. (2 marks)

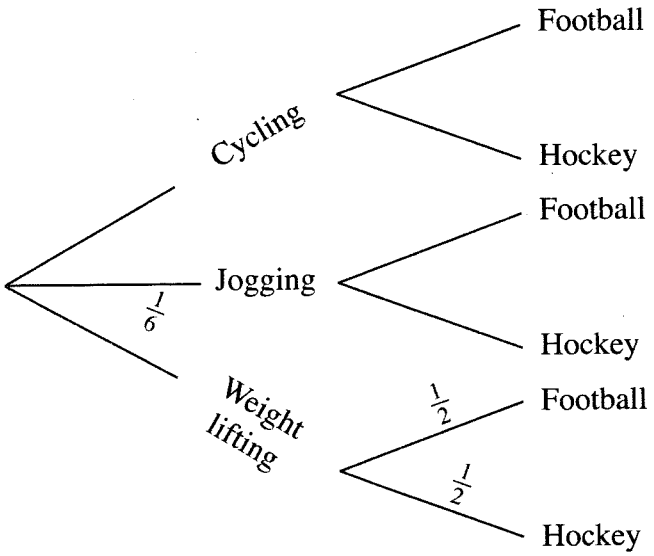
(b) In the afternoon, Gataro plays either football or hockey but never both games. The probability that Gataro plays hockey in the afternoon is:

$\frac{1}{3}$ if he cycled;

$\frac{2}{5}$ if he jogged and

$\frac{1}{2}$ if he did weightlifting in the morning.

Complete the tree diagram below by writing the appropriate probability on each branch. (2 marks)



(c) Find the probability that on any given day:

(i) Gataro plays football; (2 marks)

(ii) Gataro neither jogs nor plays football. (2 marks)

The question tested on probability theory and use of tree diagram.

Weaknesses

Most candidates could not identify the occurrence of 1 twice as two independent events. Lack of knowledge on laws of probability.

Expected response

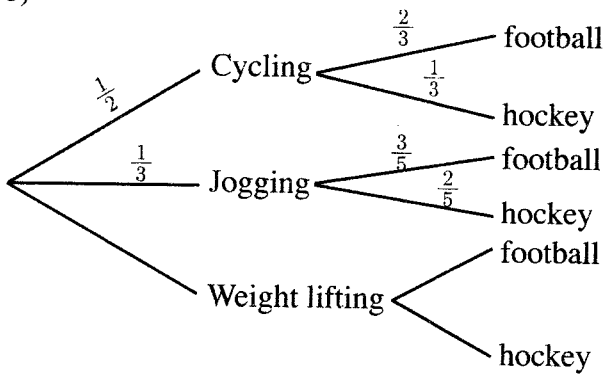
a) (i) $\frac{3}{6}+\frac{1}{6}$

$=\frac{2}{3}$

(ii) $\frac{2}{6}\times\frac{2}{6}$

$=\frac{1}{9}$

b)



c) (i) P(Gataro plays football)

$=\frac{1}{2}\times\frac{2}{3}+\frac{1}{3}\times\frac{3}{5}+\frac{1}{6}\times\frac{1}{2}$

$=\frac{37}{60}$

(ii) P(neither jogs nor plays football)

$=\frac{1}{2}\times\frac{1}{3}+\frac{1}{6}\times\frac{1}{2}$

$=\frac{1}{4}$

Advice to teachers

Clarify well to students on laws of probability and successive events