RESUME OF MATHEMATICS

1. STANDARD OF THE PAPER:

The Chief Examiners for Mathematics (Core) 2 and Mathematics (Elective) 2 agreed that the standard of their respective papers compared favourably with that of the previous years.

2. PERFORMANCE OF CANDIDATES

The Chief Examiners for Mathematics (Core) 2 and Mathematics (Elective) 2 indicated that the performance of candidates was not encouraging. However that of mathematics (Core) 2 was slightly better than last years performance.

3. CANDIDATES' STRENGTHS:

(1) The Chief Examiner for Mathematics (Core) 2 cataloged some of the strengths of candidates as ability to:

(i) use venn diagram to solve probability problem,

(ii) simplify and express trigonometric expression in a surd form,

(iii) complete table of values of a quadratic relation and drawing the graph of the relation using a given scale and interval,

(iv) use a given mean to find the value of a variable of a statistical data, eavaluate a given binary operation defined on a set of real numbers,

(vi) find the midpoint of a given vector and expressing it as column vector .

The Chief Examiner for Mathematics (Elective) 2 itemized some of the strengths of candidates as ability to:

(i) find inverse and composite functions;

(ii) find the equation of a circle;

(iii) find the first term, common difference and the sum of the first ten terms of an Arithmetic progression (A.P);

(iv) find the values of an unknown variable in a polynomial expression;

(v) draw a cumulative frequency curve for a given distribution;

(vi) express polynomial functions in partial fraction.

4. CANDIDATES WEAKNESSES

1. The Chief Examiner for Mathematics (Core) 2 recorded some of the weaknesses of the candidates as difficulty in:

   (i) finding the values of a logarithmic expression;

   (ii) translating word/ story problem into mathematical statement and solving them;

   (iii) solving problems involving geometry such as, cyclic quadrilaterals, tangent and chord theorem;

   (iv) using completing the square method in solving a quadratic equation;

   (v) finding the product of two matrices;

   (vi) solving problems involving financial mathematics.

2. The Chief Examiner for Mathematics (Elective) 2 enumerated some of the weaknesses of candidates as difficulty in:

   (i) simplifying trigonometric expression;

   (ii) solving probability related problems;

   (iii) applying the laws of logarithms;

   (iv) finding the integration of a function using trapezium rule;

   (v) finding the angle between two vectors;

   (vi) resolving forces to find the values of an unknown forces;

   (vii) drawing histogram with unequal class interval.

5. SUGGESTED REMEDIES

The Chief Examiners for both subjects suggested that teachers should refrain from helping students in solving questions during examination period. Rather. They should encourage students to learn and understand the concepts of the mathematics topics in the syllabus. They recommended that teachers should make the teaching of mathematics lively and interesting for candidates to appreciate the topics in the syllabus.

MATHEMATICS CORE

1. STANDARD OF THE PAPER

The standard of the paper compared favourably with that of the previous years and the performance of candidates was slightly better than last year's performance.

2. SUMMARY OF CANDIDATE'S STRENGTHS

Candidate's strength were cataloged in the following areas as ability to:

(i) use Venn diagram to solve probability problem;

(ii) simplify and express trigonometric expression in a surd form;

(iii) complete table of values of a quadratic relation and drawing the graph of the relation using a given scale and interval;

(iv) use a given mean to find the value of an unknown variable of a statistical data;

(v) evaluate a given binary operation defined on a set of real numbers;

(vi) find the midpoint of a given vector and expressing it as a column vector.

3. SUMMARY OF CANDIDATES' WEAKNESSES

Candidates' weaknesses were recorded as difficulty in,

(i) finding the values of a given logaithemic expression;

(ii) translating word/story problem into mathematical statement and solving them.

(iii) solving problems involving geometry such as cyclic quadrilaterals, tangent and chord theorem;

(iv) using completing the square method in solving a quadratic equation;

(v) finding the product of two matrices;

(vi) solving problems involving financial mathematics.

4. SUGGESTED REMEDIES

The Chief Examiner suggested that:

(i) teachers should encourage students to learn and understand the concepts of the topics in the syllabus;

(ii) teachers should make the teaching of mathematics lively and interesting for candidates to appreciate and take the lessons serious,

(iii) teachers should refrain from helping students in solving questions during examination period since it affect their performance.

1. **(a) Given that $log_{10}x = \bar{1}.3010$ and $log_{10}y = 1.6021$, find $log_{10}\sqrt{\frac{x}{y}}$**

In part (a), most candidates were able to use the laws of logarithm to rewrite $log_{10}\sqrt{\frac{x}{y}}$ as $\frac{1}{2}\,[log_{10}\,x - log_{10}\,y]$, while others could not apply the laws to simplify it. Having obtained the correct expression most candidates substituted the given values into the expression correctly but some were not able to simplify it. It was observed that some of the candidates could not differentiate between mantisa and characteristics so they added the terms together and had wrong answers. However few candidates showed mastery in solving the question.

(b) A man bought some shirts for GH¢720.00. If each shirt was GH¢2.00 cheaper, he would have received 4 more shirts. Calculate the number of shirts bought.

In part (b) was attempted by few candidates since most of them could not translate the story problem into required mathematical equation, hence their inability to solve the problem.

However, few candidates who were able to solve the problem wrote the required equation as $= \frac{720}{n} - 2 = \frac{720}{n+4}$. Which they manipulated to obtain the required quadratic equation as $n^2 + 4n - 1440 = 0$ and solve it for the correct answer.

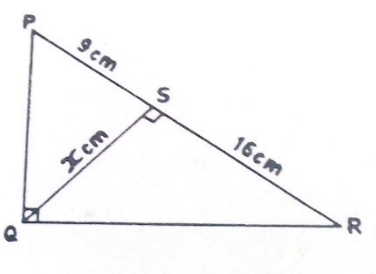
2. **(a) If $\sin 30° = \frac{1}{2}$, $\cos 45° = \frac{1}{\sqrt{2}}$ and $\tan 60° = \sqrt{3}$, without using Mathematical tables or calculator, simplify: $\frac{\sin 30° + \cos 45°}{\tan 60°}$.**

The part (a) was well answered by most candidates. Given that $\sin 30° = \frac{1}{2}$, $\cos 45° = \frac{1}{\sqrt{2}}$ and $\tan 60° = \sqrt{3}$, most candidates were able to substitute into the trigonometric expression. They used varied methods to simplify the expression and obtained the required answer with ease. Again it was observed that some could not simplify completely while others also used calculators to simplify and then leaving their answers in a decimal form.

(b) Three interior angles of a polygon are 160° each. If the other interior angles are 120° each find the number of sides of the polygon.

In part (b) most candidates could not translate the word problem into mathematical equation since they could not connect the known interior angles with the unknown interior angles and the sum of all the interior angles. They required equation as (3 x 160°) + (n – 3) 120° = (n – 2) 180°. Having derived the equation, candidates were expected to solve for the value of n.

3.



In the diagram, PQR = PSQ = 90°, $|PS| = 9cm, |SR| = 16cm$ *and* $|SQ| = x\ cm$. Find:

(a) the value of x;

(b) ∠QRS, correct to the nearest degree;

(c) $|PQ|$.

The question was poorly answered by most candidate since they could not analyse and deduce from the given diagram the correct trigonometric ratios to find the value of x. They were expected to deduce that $\tan\theta = \frac{x}{9}$ and $\tan\theta = \frac{16}{x}$. Since they were all expressed in terms of $\tan\theta$, they were expected to equate them and solve for the value of x

Obtaining the value of x would have enable the candidates to find $< QRS$ and $|PQ|$, but most of them could not solve for the value of x, hence their inability solve the related questions.

4. (a) **A trader purchased 10 dozen eggs at □ 300.00 per dozen. On getting to his shop, he found that 20 eggs were broken. How much did he sell the remaining eggs if he made a profit of 10%?**

In part (a), most candidates partially answered the question. They were able to find the cost price with ease but could not procees to find the selling price as expected. it was observed that most candidates could not apply the concept of finding percentage profit, to find the selling price. Candidates were expected to apply the concept of percentage profit as: $\left(\frac{x-3000}{3000}\right)$ x 100 = 10 and then solve for the value of x which is the selling price.

(b) Thirty five coloured balls were shared among four teams such that one team takes all the red balls. If the remainder is shared to the other teams in the ratio 4:3:2 and the smallest share was 6 balls, how many red balls were there?

The part (b) was poorly answered by most candidates since they could not apply ratio to solve simple linear equation. Candidates were expected to derive the equation as $\frac{2}{9}$ x (35 – r) = 6 , but unfortunately they messed up with the analysis.

5. (a) The probabilities that Mensah will pass a Mathematics and Economics tests are $\frac{3}{4}$ and $\frac{5}{8}$ respectively. If the probability that he passes at least one of the subjects is $\frac{7}{12}$, what is the probability that he passes both subjects?

The part (a) of the question was answered correctly by most candidates. They were able to draw two intersecting sets and labelled them properly. They used Venn diagram to find the probability of passing both subjects with ease.

It was also observed that some used De morgan's theory to solve the problem.

(b) In a class of 30 students, 25 offer Biology, 21 offer Physics and each students offers at least one subject. If a prefect is elected from the class, what is the probability that she offers one subject only?

In part (b), most candidates showed mastery in using Venn diagram to solve the problem. Even though most of them answered it correctly, it was observed that some candidates did not label the Venn diagram while others labelled one of the sets and left the other unlabeled.

6. **A publisher 30.000 copies of a book at GH¢2.00 each and sold them for GH¢ 2.76 each. The publisher agrees to pay the author 10% of the selling price for the first 6,000 copies sold and $12\frac{1}{2}$ % of the selling price for all copies sold in excess of 6,000. If 25,380 copies of the book were sold,**

(a) calculate, correct to the nearest Ghana Cedi, the:

(i) total amount received by the author;

(ii) net profit the publisher makes after he has paid the author.

(b) **find, correct to one decimal places, the publisher's net profit as a percentage of the total receipt.**

most candidates performed poorly because they failed to analyse the problem and solve it systematically. Candidates were expected to use the concept of percentages and arithmetic to obtain the required answer.

7. **A bag of food aid is released from an aeroplane when it is 1000 m above a military camp. h metres, of the bag above the camp at time seconds is given by the relation h = 1000 – $5t^2$**

(a) **Copy and complete the following table for the relation h = 1000 – $5t^2$.**

t (s)	**0**	**1**	**3**	**5**	**7**	**9**	**11**	**13**	**15**
h (m)				**875**			**395**		**-125**

(b) **Using a scale of 2 cm to 2 seconds on the t – axis and 2 cm to 100m on the h-axis, draw a graph of the relation h = 1000 – $5t^2$ for $0 \leq t \leq 15$.**

(c) **Use the graph to find, correct to one decimal place, the:**

(i) **time the bag takes to reach the ground;**

(ii) **time the bag takes to drop through the first 650 m;**

(iii) **height of the bag above the camp after falling for 7.5 seconds.**

Most candidates showed mastery in copying and completing the table of the values for the given relation with ease. They plotted the ordered pairs correctly and drew a smooth curve depicting the exact graph as expected. Again relating the same principle to triangle RQM, It implies that $< RQM + < QRM$ = y, from the diagram $< RQM = 40°$ and $< QRM$ 20°

Therefore: 40° + 2°0 = y

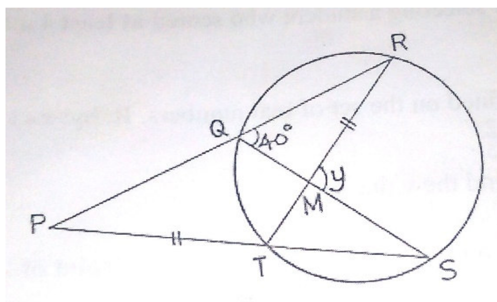
$\Rightarrow$ y = 60°

In part (b), candidates were specifically asked to illustrate the given information in a diagram, but unfortunately most of them could not do it, and their performance was poor. Candidates were expected to draw the diagram and show all the relative positions as:

From the diagram , candidates were expected to deduce that $< NMY\ and <$ NLM are angles in alternate segments and therefore < NM,Y = < NLM = 65°. Hence

$< MLX = 180° - 65° = 115°$. Again <LMX and <LNM are angles in alternate segments. However, some candidates could not use the given sale to draw the graph of the relation. Since some of the candidates were stereotyped and facy about Ox and Oy axes they could not adapt to the t- axis and h- axis as indicated in the question. It was also observed that some candidates plotted the points correctly but could not draw a smooth curve which affected the answers obtained for the related questions. It was also realized that some candidates found it difficult to use their graphs plotted correctly to solve the related problems.

8. (a)



In the diagram, ∠ RQS = 40°. $|RT| = |PT|$ and ∠RMS = y.

(a) Find the value of y.

(b) XY is a tangent to a circle LMN at the point M. XLN is a straight, ∠NXM = 34° and ∠NMY = 65°.

(i) Illustrate the information in a diagram.

(ii) Find the value of:

(α) ∠ *MLX*;

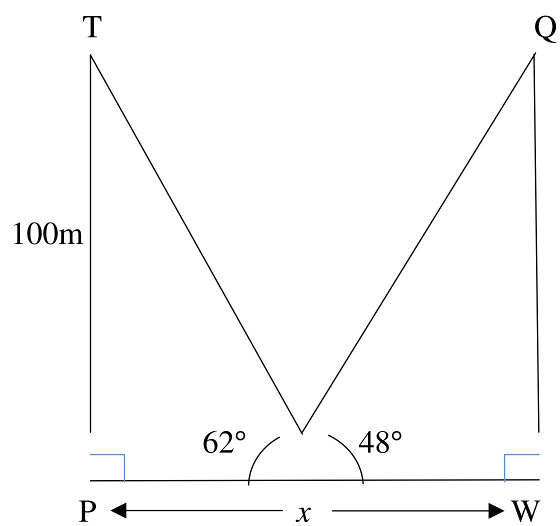
(β) ∠ *LNM*.

Most candidates who answered the question in part (a) demonstrated that their understanding of geometrical concepts was woefully inadequate. They could not apply the cyclic quadrilateral theory and other geometrical principals to solve the problem. Candidates were expected to deduce from the diagram that angles subtended by a chord $\overline{RS}$ in a segment are equal. Therefore from the diagram <RQS = $< RTS$ = 40°. Again they were expected to state that Δ TRP is an isosceles triangle and therefore their base angles are equal. ie <TRP = < TPR.

Using the principle that an exterior angle of a triangle is equal to the sum of its two opposite interior angles then: <TRP + < TPR = <RTS = 40°,

Therefore: < TRP = 20°

Represent it in a diagram and then apply the appropriate trigonometric concepts to solve the problem. Candidates were expected to illustrate the information in a diagram as:



Once the correct diagram has been drawn solving the question becomes so easy. In order to find $|QW|$, $|PX|$ can be found so easily and then subtracted from $|PW|$ to obtain $|XW|$. Once $|XW|$ is found, $|QW|$ would be obtained with ease.

That is: $|PX| = \frac{100}{tan62°} \Longrightarrow |PX| = 53.17$m.

And $|XW| = |PW| - |PX|$

$\Longrightarrow |XW| = 80° – 53.17 = 26.83$m.

∴ $|QW| = 26.83\tan 48° = 30$m (to the nearest metre).

But ∠LMX = 180° – 34 °– 115 = 31°

Therefore LNM = 31. Or considering ∠XNM, the sum of the two opposite is equal to its exterior angle. That is:

$$\angle NXM + \angle XNM = \angle NMY$$

$$\angle XNM = 65° - 34° = 31°$$

Therefore∠LNM = ∠XNM = 31°.

It is pertinent to note that the concept of geometry can be varied and applied logically to achieve the same result, therefore candidates are expected to spend more time in learning the principles and theories of geometry.

9. (a) If T = WP [M2 – (M – S)2], express M in terms of T, W, P and S.

(b) A point X is between two towers TP and QW and are all on the same horizontal ground..

The angles of elevation of the tops T and Q from X are 62 and 48 respectively, $|TP|$= 100 m and $|PW|$ = 80m.

(i) Illustrate the information in a diagram.

(ii) Calculate, correct to the nearest metre $|QW|$.

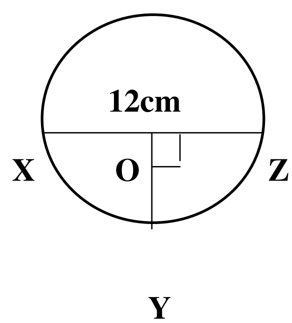
In part (a), most candidates were able to express M in terms of T,W and S. Initially they expanded the term (M-S)2 and then manipulated to obtain the required relation : M = $\frac{T+WPS^2}{2SWP}$.

It was also observed that most candidates did not see that the expression in the main brackets was difference of two squares so they did not make any attempt to apply the concept of difference of two squares to solve the problem.

Most candidates who answered the part (b) performed poorly because they could not draw the required diagram as expected. Their inability to solve the question was dues to the fact that they did not analyse the problem so as to

10. **(a) If (x – 1) $\log_{10}4$ = $x\log_{10}16$, without using Mathematical tables or calculator, find the value of x.**

(b)



In the diagram, XZ is a chord which is 12 cm long. If the perpendicular distance from the midpoint of the chord to a point Y on the circumference of the circle is 4cm, calculate, correct to one decimal place, the sector OXYZ. [Take $\pi = \frac{22}{7}$]

Most candidates answered the question in part (a) unfortunately they could not apply the laws of logarithm to transform the logarithmic equation to a linear equation and solve for the value of x.

In part (b), most candidates did not attempt to answer the question. However few candidates who attempted it used a wrong approach to solve it. They quickly affirmed that O was the center of the circle and therefore used the sector method to solve it. Their analysis was wrong and they were expected to find the angle at the centre before they use the sector method.

11. The distribution of marks scored by some students in a test is as follows:

Marks	**1**	**2**	**3**	**4**	**5**
Number of students	**p +2**	**P -1**	**2p -3**	**P + 4**	**3p - 4**

(a) If the mean mark is $3\frac{5}{22}$, find the value of p.

(b) Find the:

(i) interquartile range

(ii) probability of selecting a student who scored at least 4 marks in the test.

The question was well answered by most candidates. They were able to find the value of P so easily by applying the concept of finding mean.

Again, their approach of finding the interquartile range and the probability was in the right direction.

12. (a) The operation * is defined on the set of real numbers, R, by: $x * y = \frac{x+y}{2}$, x, y ∈R.

(i) Evaluate $3 * \frac{2}{5}$.

(ii) If $8 * y = 8\frac{1}{4}$, find the value of y.

(b) In Δ ABC, $\overrightarrow{AB} = \begin{pmatrix} -4 \\ 6 \end{pmatrix}$ and $\overrightarrow{AC} = \begin{pmatrix} 3 \\ -8 \end{pmatrix}$. If P is the midpoint of $\overrightarrow{AB}$, express $\overrightarrow{CP}$ as a column vector.

In part (a) the question was well answered by most candidates. They were able to substitute the given values into the binary operation and evaluate it. Again they substituted the given value and the variable into the binary operation and equated it to the given value. They showed mastery in manipulating it to find the value of the variable (y). Candidates performance in part (b) was also quite good. They were able to apply the concept of finding midpoint of a vector and then use it to express $\overline{CP}$ as a column vector.

It was observed that those who could not do it was as a result of weakness in their manipulative skills.

13. (a) Using completing the square method, solve correct to two decimal places, the equation 3y2 – 5y + 2 = 0

(b) Given that M = $\begin{pmatrix} 1 & 2 \\ 4 & 3 \end{pmatrix}$, N = $\begin{pmatrix} m & x \\ n & y \end{pmatrix}$ and MN = $\begin{pmatrix} 2 & 1 \\ 3 & 4 \end{pmatrix}$, find the matrix N.

In part (a), most candidates could not use the completing the square method to solve the given quadratic equation. However, few candidates showed mastery in using the completing the square method to solve

ELECTIVE MATHEMATICS

1. GENERAL COMMENTS

The standard of the paper, compared favourably with those of previous years. The questions were unambiguous and within the scope of the Elective Mathematics syllabus

2. SUMMARY OF CANDIDATES' STRENGTH

Some candidates are commended for being able to

- integrate rational function by means of algebraic substitution;
- express rational expression in partial fractions and also
- resolve forces into components.

3. SUMMARY OF CANDIDATES WEAKNESSES

Most candidates were unable to

- integrate rational function by means of substitution
- calculate binomial probability
- draw cumulative frequency curve as well as histogram of unequal intervals
- simplify trigonometric expression
- resolve forces into components.
- deal effectively with vectors.

4. SUGGESTED REMEDIES

- Candidates need to intensively and extensively read and digest relevant materials.
- Effective teaching and learning to ensure that various aspects of the Elective mathematics syllabus are completely covered before examinations.
- Both teachers and candidates should take note of the above weaknesses so that with the guidance of teachers, candidates could solve problems involving these weaknesses and be able to overcome them.

1. (a) **The function f and g are defined on the set of real numbers, R by $f(x) = 2x - 1$, $g(x) = 5x$. Find g of-1**

   (b) **The point (-3, b) lies on the curve $2y = 2x^3 + x^2 - 4x + 3$, find the value of b.**

   The question was attempted by almost all candidates. Most candidates responded correctly to the question. Only few candidates could not answer the question correctly. For example, in finding the f-1 (x) some candidates solve it the following way:

   Let y = f (x)

$y = 2x - 1$

$y + 1 = 2x$

$\therefore x = \frac{y+1}{2}$

Interchanging *x* and y:

$\therefore y = \frac{x+1}{2}$

For the (b) part, a number of candidates did not answer it at all.

2. Evaluate: $\int_0^2 \frac{x}{\sqrt{1+x}}\,dx$.

Only few candidates evaluated this problem correctly. Most candidates who attempted this question had no idea of integration by substitution

3. (a) Given that $log_{10}c =$ z, express $log_{10}\sqrt{\left(\frac{10_a}{b^5c}\right)}$ in terms of x, y and z.

(b) The radius of a circle is 12cm. Find, leaving the answer in terms of π, the rate at which the area is increasing when the radius is increasing at the rate of 0.2cm s^{-1}.

Most candidates attempted this question with the majority successfully solving it correctly in both (a) and (b). only few candidates did not know what to do in both (a) and (b). only few candidates did not know what to do in both (a) and (b).

4. If $2x^2 - 7x - 15$ is a factor of $6x^3 - 13x^2 - px - q$, where p and q are constants, find the values of p and q.

Most candidates attempted this question with a few answering the question correctly. However most of the candidates could not factorize the quadratic expression $2x^2 - 7x - 15$.

5. Twenty percent (20%) of tricycles produced by a company is defective. If 5 tricycles are selected at random, calculate the probability that:

(a) none is defective;

(b) at least two are defective.

Almost all candidates attempted this question with very few scoring full marks. How ever ,most candidates couldn't solve the (a) part correctly but failed to solve the (b) part.

6. The table shows the life span of some batteries manufactured by a company.

Battery life span (days)	26 – 30	31 – 35	36-40	41- 45	46 - 50	51 -55
Frequency	**4**	**7**	**13**	**8**	**6**	**2**

(a) Draw a cumulative frequency curve for the distribution.

(b) Using the curve in (a), find the interquartile range.

This question was attempted by majority of candidates. However, most of them could only draw the cumulative frequency table without drawing the curve.

7. A triangle *PQR* has vertices P(2, -3), Q(5,1) and R(4,8). Calculate angle *PQR*.

Very few candidates exhibited good knowledge in using scalar (Dot) product or the cosine rule in determining the angle PQR. Most of the candidates who attempted the question did not know what to do.

8. The resultant force of F_1 (150 N, 030°) and F_2 (x N, 120°) is R (y N,090°). Find, correct to two decimal places, the values of x and y

This question was well answered by most of the candidates who attempted it. However few of the resolution of forces. For example, some resolve the forces as follows:

F_1 (150N, 030°) = $\begin{pmatrix} 150Cos30° \\ 150Sin30° \end{pmatrix}$ and R $\begin{pmatrix} y\ Cos90° \\ y \sin 90° \end{pmatrix}$

F_2 (XN, 120°) = $\begin{pmatrix} x \cos 120° \\ x \sin 120° \end{pmatrix}$

9. (a) Simplify: $\frac{cos\theta + \sin\theta}{cos\theta - sin\theta}$ - $\frac{cos\theta - sin}{cos\theta + sin\theta}$ and express the answer in terms of tan θ.

(b) Find equation of the tangent to the curve y = 4x (x^2 – 12) at its maximum point

Only very few candidates attempted this question. Most of these candidates exhibited lack of understanding in applying trigonometric identities and simplification as well as diffectiation. As a result performed poorly in this question.

10. (a) **Express $\frac{x^2+1}{(x+2)^3}$ in partial fractions.**

This question was well answered by most of the candidates who attempted it, especially the (a) part. However the (b) part was poorly answered.

11. (a) **Given that f(x) $= \int \left(\frac{1}{x^2} + 2x - 3\right)dx$ and $f(2) = 2$, find $f(x)$.**

(b) **The thirteenth term of an Airhmetic Progression (A, P) is 27 and the seventh term is three times the second term, find the:**

(i) **first term;**

(ii) **common difference;**

(iii) **sum of the first ten terms.**

Relatively few candidates attempted this question. Only few of them solved the question correctly for both (a) and (b) parts. Of those who could not solve the question correctly, some could not (1) even find $\int \left(\frac{1}{x^2} + 2x - 3\right)$ dx

12. **There are are 11 girls and 9 boys in Form 10 girls and 9 boys in Form 1B in a school. Eight students are to be selected from each Form to take part in an essay competition. Find, correct to three decimal places, the probability that equal number of girls and boys will be selected from:**

(a) **Form 1A;**

(b) **each Form.**

Very few candidates attempted this question. Only few of them could answer (a) correctly. The (b) part was a big challenge.

13. **The table shows the frequency distribution of the ages of some patients in clinic.**

Ages (year)	11 – 20	21 -25	26 - 30	31- 35	36 - 40	41 - 50
	8	16	22	19	25	10

(a) **Draw a histogram for the distribution.**

(b) **Find, correct to two decimal places, the mean age of the patients.**

(c) **Find the probability of selecting a patient who is at most 25 years**

This question was attempted by most candidates. However most of them failed to draw the histogram correctly. They seem to have a challenge in drawing a histogram of unequal class intervals.

14. **(a)** **A uniform ladder rests at an angle of 60° with a rough horizontal ground and against a smooth vertical wall. The ladder weighs 60 kg and its length is 10m.**

(i) **Sketch the diagram.**

(ii) **Find the reactions at the wall and the ground.**

[Take g = 10 ms^{-2}]

(b) **A particle starts from rest with uniform acceleration and attains a speed of 48 m s^{-1} covering a distance of 400 m. Calculate:**

(i) **its acceleration;**

(ii) **the distance covered when its speed is 24 ms^{-1}.**

Very few candidates attempted this question. None could sketch the diagram in (a) partly correctly. It is part (b) that candidates could solve the question correctly.

15. **(a)** **A vector** ***pi + pj*** **where p and q are scalars has its magnitude twice that of the vector I + 3j and is parallel to the vector 3i – 4j. Find the vector.**

(b) **Find, correct to the nearest degree, the angel between the vectors a =** $\begin{pmatrix} -3 \\ 4 \end{pmatrix}$ **and b =** $\begin{pmatrix} -8 \\ -15 \end{pmatrix}$**.**

Just like question 14, only few candidates attempted this question. Of these candidates only few could find the angle between the vectors ***a*** and ***b*** – ie (b) part correctly. For the (a) part candidates were at a loss as what to do.