RESUME OF MATHEMATICS

1. STANDARD OF THE PAPERS

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

2. PERFORMANCE OF CANDIDATES

The Chief Examiners for Mathematics (core) 2 and Mathematics (Elective) 2 stated that the performance of candidates was encouraging.

3. CANDIDATES' STRENGTHS

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

- (i) convert mixed numbers to improper fraction and then applying the concept of BODMAS to simplify the expression without using mathematical tables or calculator;
- (ii) find the values for which a rational function is not defined;
- (iii) solve equation involving a binary operation;
- (iv) complete the table of values for a quadratic relation and using it to draw the graph of the relation;
- (v) solve problem involving direct variation;
- (vi) find unknown variables in a given data and illustrating the data on a pie chart.

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

- (i) finding the first derivative of a function from first principles
- (ii) finding the inverse of a function.
- (iii) handling the Concept of Arithmetic Progression.
- (iv) addition and multiplication Rules in Probability
- (v) finding the acceleration of a particle using Newtons' 2nd Law of Motion.
- (vi) finding the determinants and inverse of 2x2 matrix.
- (vii) resolving forces and presenting them in component form.
- (viii) finding the resultant of forces.

4. CANDIDATES' WEAKNESSES

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

- (i) solving problems involving geometry and trigonometry;
- (ii) solving a three – set problem when the information given is in a set notation form;

(iii) using the concept of vectors to find the coordinates of points and the midpoint of a given vector;
(iv) solving problems involving longitude and latitudes;
(v) constructing the locus of points equidistant from two intersecting lines;
(vi) applying the concept of probability of selecting an item with replacement.

(2) The Chief Examiner for Mathematics (Elective)2 itemized some of the weaknesses of candidates as difficulty in:
(i) simplifying Rational expressions
(ii) using numbers instead of variables in establishing the properties of a binary operation
(iii) making use of the rubrics of questions.
(iv) expressing column vectors in the form ($a\mathbf{i} + b\mathbf{j}$).
(v) premature approximation
(vi) concept of Binomial Probability
(vii) finding the force that moves a body along an inclined plane.
(viii) applying the concept of Permutation and Combination in finding the probability of selecting an item.

5. <u>SUGGESTED REMEDIES</u>

The Chief Examiners for both subjects suggested that teachers should take the necessary steps to make the teaching of mathematics more practical and also relate to real life problems. This will help the students to appreciate the topics being taught.
They also recommended that, teachers should stop specializing in teaching some topics which they are familiar with.

MATHEMATICS (CORE)

1. STANDARD OF THE PAPER

The standard of the paper compared favourably with that of the previous years. The performance of candidates was encouraging.

2. A SUMMARY OF CANDIDATES STRENGTHS

The Chief Examiner enumerated some of the strengths of candidates as ability to:

(1) convert mixed numbers to improper fraction and then applying the concept of BODMAS to simplify the expression without using mathematical tables or calculators;
(2) find the values for which a rational function is not defined;
(3) solve equation involving a binary operation;
(4) complete the table of values for a quadratic relation and use it to draw the graph of the relation;
(5) solve problems involving direct variation;
(6) find unknown variables in a given data and illustrate the data on a pie chart.

3. A SUMMARY OF CANDIDATES WEAKNESSES

Candidates' weaknesses were listed as difficulty in:

(1) solving problems involving geometry and trigonometry;
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(6) applying the concept of probability of selecting an item with replacement.

4. SUGGESTED REMEDIES

(1) Teachers should take the necessary steps to make the teaching of mathematics more practical and also relate it to real life problems. This will help the students to appreciate the topics being taught.
(2) Teachers should stop specializing in teaching some topics which they are familiar with.

Question 1

(a) **Simplify, without using mathematical tables or calculators,** $\dfrac{4\frac{1}{4}-3\frac{1}{2}+3\frac{1}{8}}{3\frac{2}{5}\text{of }1\frac{1}{4}\div 2\frac{5}{6}}$

(b) **If two numbers are selected at random, one after the other, with replacement from the set A = {5, 6, 7, 8, 9}, find the probability of selecting at least one prime number.**

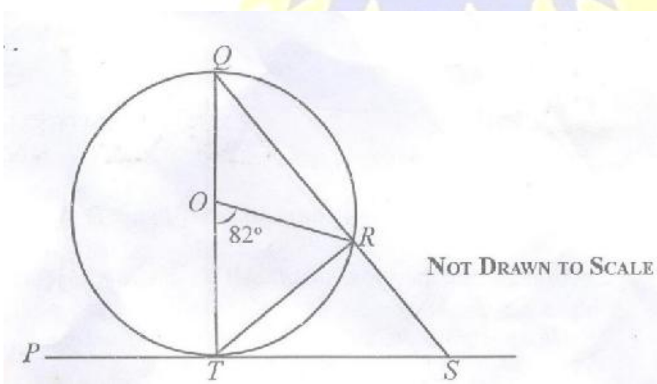
(a) The part (a) of the question was attempted by most candidates. They converted the mixed fractions into improper fraction, simplified correctly, both the numerator and denominator i.e. $\frac{31}{8}$and $\frac{6}{4}$. They later multiplied the numerator by the reciprocal of the denominator to obtain $\frac{31}{12}$. Incidentally they left the answer in improper fraction instead of converting it into a mixed fraction as $2\frac{7}{12}$.

In the Part (b) of the question, only a few candidates could construct a table to illustrate the selection process to obtain the sample space and then determine the required probability. Again few candidates used the analytical method to find the required probability. Indications were that the most candidates lacked the requisite knowledge to deal with the problem.

Question 2

(a) **Given that** $\cos x = \frac{3}{5}$ **,** $0° < x < 90°$**, calculate , without using mathematical tables or calculator,** $\frac{3\tan x}{2\sin x+3\cos x}$

(b)



In the diagram, *PS* is a tangent to the circle of centre *O*. If *QS* is a straight line and ∠*TOR* = 82°, find ∠*RST*.

Given that cos x= $\frac{3}{5}$, candidates were able to find tan x = $\frac{4}{3}$ and sin x = $\frac{4}{5}$ with ease. They also substituted these values into the given expression and simplified it correctly.

The only problem was that the final answer was left in the form $\frac{20}{17}$ instead of $1\frac{3}{17}$
The answers provided by candidates to part (b) of the question revealed their lack of knowledge in geometry as such most candidates performed poorly in answering the question. Candidate could not apply the geometric concepts of isosceles triangles, a line which is tangent to a circle and the relationship between interior and exterior angles of a triangle.

Question 3

(a) **For what values of x is the expression $\frac{5}{x^2+2x-8}$ not defind?**

(b) **Three times the age of Felicia is four more than the age of Asare. In three years, the sum of their ages will be 30 years. Find their present ages.**

The part (a) of the question was answered correctly by most candidates. They demonstrated that they understood the conditions under which a rational expression was undefined by equating the denominator to zero and solving the resultant quadratic equation ie$x^2+ 2x- 8 = 0$ to obtain $x = 2$ and $x = -4$

In part (b), candidates could not translate word problem into mathematical equation. The phrase "in three years" was not properly factored into their equation. Candidate were expected to analyse the problem as follows:
Let Felicias' age be x

In three years her age will be:$x + 3$

Let Asare's age be y

In three years his age will be$y + 3$

$\therefore$ The sum of their age : $(x + 3) +(y + 3) = 30$

$\Longrightarrow x + y = 24.$ (1)

Three times the age of Felicia is four more than the age of Asare could also be expressed as $3x – y = 4$.(2). To obtain the required answer, the two equations should be solved simultaneously. Candidates rather added 3 to $3x$ to obtain $3x + 3$ as Felicia's age and $y + 4 +3$ as Asare's age in three years, which is contrary to the requirements of the question.

Question 4

If P, Q and $R$are sets such that n $(P) = 20$, n$(Q) = 16$, n$(R) = 21$, n$(P\cap Q) = 7$, n$(P\cap R) = 8$, n$(Q \cap R) = 5$ and n$(P\cap Q \cap R) = 3$,

(a) **represent this information on a Venn diagram**

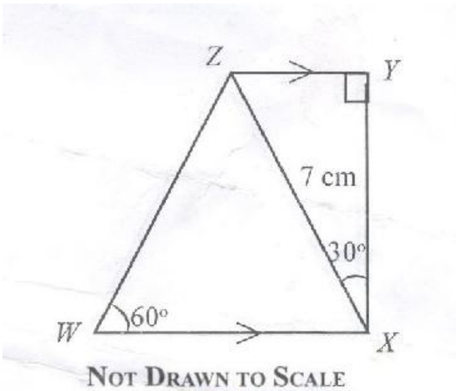
(b) **find:**

(i) **n$(P\cup Q\cup R)$;**

(ii) **the probability of $(P \cup Q)^1\cap R)$**

Most candidates were able to draw three intersecting sets and labelled them properly as *P*,*Q* and *R*. In recording the entries in appropriate regions. Candidates failed to make the necessary adjustments to the given data and produced wrong entries for the Venn diagram. This affected their presentation in finding the required answers.

Question 5



In the diagram, *WXYZ*is a trapezium, $|XZ|$ = 7 cm,$< ZYX = 90°$, $< ZWX = 60°$ and $< ZXY$ = 30°. Calculate, correct to the nearest whole number, the area of *WXYZ*.

Few candidates were able to determine $|ZY|$ = 3.5, $|XY|$ =6.0621 and $|WX|$ = 7 correctly using appropriate trigonometric relation. Most of them correctly recalled the formula for finding the area of a trapezium i.e. A =$\frac{1}{2}$ (a + b) h. Substituting the values into the formula to determine the area of *WXYZ* was quite easy for those who applied the correct concept in solving the problem. Some candidates failed to approximate their answer to the nearest whole number as required.
It is pertinent to note that, most candidates did not answer this question because they lack the requisite knowledge of plain geometry to solve the problem

Question 6

(a) **If *p* varies directly as t^3 and *p* = 9.6 when *t* = 4, find *t* when *p* = 150**

(b) **A farmer has 1 hectare of land. One half of the land was used for planting oranges,$\frac{1}{3}$of the reminder was used for planting mangoes while plantain was planted on the rest.**

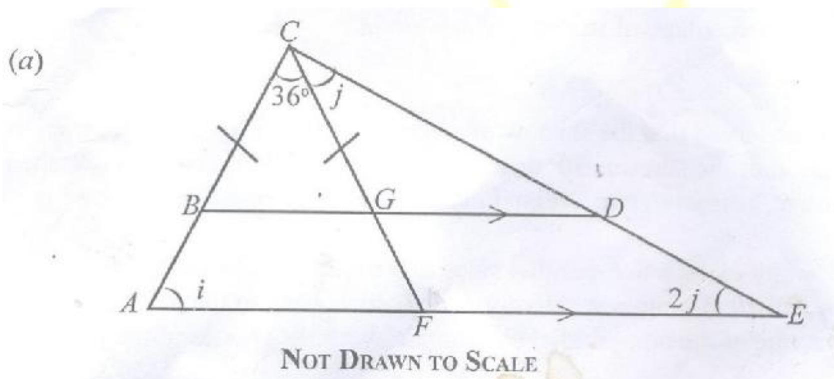
- **(i)** **Express the area of land used for mangoes as a fraction of that used for plantain.**
- **(ii)** **If a labourer was given a week to weed the orange plantation and he completes $\frac{1}{5}$ of it on the first day, what area, in square metres, was left? [Take 1 hectare = 10,000m^2]**

The Part (a) was solved by most candidates with ease. Candidates stated the general equation for the direct variation ie $p = kt^3$.
They substituted the given values into the equation and solved for the value of ***t***. it was observed that few candidates could not find the clue root of t, and this affected their final answer.

In Part (b), most candidates performed poorly because they failed to analyse the question in order to find the fraction of land used for planting various crops.
It was observed that most candidates lacked the basic concept of converting hectares to metres, even though they were given clues and the question was also straight forward.

Question 7

(a)



In the diagram, *ACE* is a triangle, *CF* is a straight line, *BD*// *AE* and *BC*│= │*CG*│. If <*BCG* =36°,<*BAF* = i, <*GCD* = j and <*DEF* = 2j, find the values of i and j.

(b) **An aeroplane files from *P* to *Q* in 1 hour at a speed of 120km/min., where *P* and *Q* on the parallel of latitude 60° N. If the aeroplane files along this parallel of latitude, calculate, correct to three significant figures, the difference in longitudes of *P* and *Q* are on the parallel of latitude 60°*N*. If the aeroplane flies along this parallel of latitude, calculate, correct to three significant figures, the difference in longitudes of *P* and *Q*.**

[Take $\pi = \frac{22}{7}$, radius of the earth = 6400km]

The part (a) of the question was answered by most candidates. They used appropriate plain geometric concepts regarding parallel lines, transversal, isosceles triangle and sum of angles of a triangle to find i and j correctly. Their performance was very encouraging.

In part (b) most candidate hardly attempted the question. It appeared as an unfamiliar area to them. Candidates were expected to solve the problem as follows:

(i) the distance covered by the plane gives the time and speed

i.e. $d = 120 \times 60$

$= 7200$ km.

(ii) the length of the arc PQ on the parallel of latitude 60° N . ie

$D = \frac{\theta}{360} \times 2\pi R \cos 60.$

(iii) equating(i) to (ii) to determine the value of θ ie difference in longitudes P and Q.

It was noted that, the performance of the few candidate who answered the question was not encouraging.

Question 8

(a) **Using ruler and pair of compasses only, construct a quadrilateral, *PQRS*, such that│*PQ*│= 8cm, │*SQ*│=10.2cm, │*QR*│=7.5cm, □*QPS* =75° and *PS*//*QR*.**

(b) **(i) Draw locus, l_1,of points equidistant from *SR* and *QR*;**

(ii) Draw locus, l_2, of points equidistant from *P* and *Q*

(c) **Measure │*TQ*│, where *T* is the point of intersection of l_1 and l_2.**

Most candidates attempted this question. They constructed the three given sides and the angle correctly. It was observed that some of the candidates could not construct the locus, l_1, of points equidistant from *SR* and *QR* as well locus, l_2, of points equidistant from P and *Q*. The construction of the loci involved bisecting an angle and one side of the quadrilateral following the instruction, but some of the candidates refused to strictly adhere to the laid down principles in constructing the two loci. Few candidates exhibited mastery in constructing the given quadrilateral as expected.

Question 9

(a) **Copy and complete the table values for the relation $y = x^2 - 5x + 5$ for $-1 \leq x \leq 6$**

x	-1	0	1	2	3	4	5	6
y		5	1				5	

(b) **Using scales of 2cm to represent 1 unit on the *x* – axis and 2cm to represent 2 units on the *y*-axis, draw the graph of $y = x^2 - 5x + 5$ for $-1 \leq x \leq 6$.**

(c) **Use the graph to find the:**

(i) minimum value of *y*;

(ii) roots of $x^2 - 5x + 5 = 0$

(iii) solution of $x^2 + 2x + 5 = 7x + 2$.

Most candidates answered this question very well. They copied and completed the table of values for the given relation with ease. They went ahead to plot x and y values and then finally drew the graph of the relation. Even though some of the candidates could not obtain a smooth curve but all the plotted points were correct. This affected the estimated values they read from the graph.

Question 10

The table shows the distribution of 40 students in a class according to their clubs and the corresponding sectoral angles.

Club	**No. of students**	**Sectoral angle**
Debating	**10**	**90°**
Cultural	***x***	**(7*y*) °**
Literacy	**14**	**(18*x*) °**
Red Cross	***y***	**81°**

(a) **Find the value of *x* and *y*.**
(b) **Illustrate the data on a pie chart**
(c) **Find the percentage of students who were in the cultural club**

From the given information candidates were able to obtain the two equations i.e. $x + y = 16$ and $18x + 7y = 189$ and solved them simultaneously.

In an attempt to solve these equations some candidates simply wrote ‘‘solving the equations simultaneously’’ and then put down the answers as $x = 7$ and $y = 9$, without showing detailed workings. This affected the marks that most candidates obtained. Alternatively, candidates were expected to find the value of y as: $\frac{y}{40} \times 360 = 81$

$$9y = 81$$

$$y = 9$$

Once the value of y is obtained, it is so easy to find the value of *x*.

Question 11

(a) **It was observed that the shadow of a vertical pole was 6m longer when the angle of elevation of the sun was 30° than when it was 60°. By means of a sketched diagram, calculate correct to two decimal places, the height of the pole.**

(b) **The length of each non- parallel sides of a trapezium is 18m while the parallel sides are 32m and 20 m long, respectively. Calculate, correct to the nearest degree, the angle which one of the non-parallel sides makes with the shorter of the parallel sides**

Candidates were required to sketch a diagram in part (a) to illustrate the information and apply relevant trigonometric ratio to obtain two equations: $\tan 60 = \frac{h}{x}$ = (1) and $\tan 30 = \frac{h}{x+6}$ = (2). These equations were to be solved to obtain the value for the height of the pole.

Also in part (b) a diagram was required to illustrate the information. This would help the candidates to solve the problem so easily. Unfortunately it was observed that sketch a diagram that would have helped them to solve the problem.

Most candidates performed poorly in this question, due to their inability to analyse the question as expected.

Question 12

The bearing of points *X* and *Y* from *Z* are 040° and 300°, respectively. If │*XY*│=19.5km and │*YZ*│=11.5km,

(a) **illustrate the information in a diagram,**

(b) **calculate , correct to the nearest whole number,**

- **(i)** **□*ZXY***
- **(ii)** **│*XY*│;**
- **(iii)** **bearing of *X* and *Y*.**

Candidates were asked specifically to illustrate the information given in the question by a diagram. Most of them disregarded this instruction. Those candidates who drew the diagram were able to apply the sin rule as:

$\frac{Sin\ 100}{19.5} = \frac{Sin\ YXZ}{11.5}$, to obtain angle *YXZ*. They went ahead to find other intermediary angles which enable them to solve the other related questions. However, some of them could not solve the problem as expected and therefore they could not find the bearing of *X* and *Y*.

Question 13

(a) **A binary operation □ is defined on the set of re[illegible]numbers, *R*, [illegible] m⊗n = *mn* – *n* – 2*m*, where *m*, *n* □ *R*. If 5 □*x* = 22, find the v[illegible]e of *x*.**

(b) **Given that P(2,-[illegible] a vertex of a triangle *PQR*, [illegible] = $\begin{pmatrix} 3 \\ 2 \end{pmatrix}$ and [illegible] = $\begin{pmatrix} -4 \\ -1 \end{pmatrix}$,**

- **(i)** **find**
  - **(*α*)** **[illegible]coordinates [illegible]Q and [illegible]**
  - **(*β*)** **[illegible]│**
- **(ii)** **If M is the midpoint of [illegible], find [illegible].**

In part (a) candidates used the binary operation [illegible] define[illegible] the preamble to find the value of *x* so easily.

In part (b) candidates expressed the vectors *PQ* and PR in terms of t[illegible]ir position vec[illegible]s to obtain the co-ordinates of the points *Q* and *R*. Unfortunately, some c[illegible]didates seeme[illegible]ot to know the difference between the components of a vector and the co[illegible]inates of a poi[illegible] Instead of leaving their final answer as *Q* (5,-1)and R (6, -2)they wrote it as [illegible] = $\begin{pmatrix} 5 \\ - \end{pmatrix}$ and [illegible] = $\begin{pmatrix} 6 \\ -2 \end{pmatrix}$.

Most candidates showed mastery in find the length or magnitude of [illegible] i.e.│[illegible]│. It was also observed that, most candidates f[illegible]d it difficult to find the midpoint (M) of [illegible], which also affected their solution in finding [illegible] .

MATHEMATICS ELECTIVE

1. STANDARD OF THE PAPER

The standard of the paper compared favourably with that of the previous years. Candidates' performance was good.

2. A SUMMARY OF CANDIDATES' STRENGTHS

Candidates' strengths were evident in the following areas:

(1) Finding the first derivative of a function from first principles
(2) Finding the inverse of a function.
(3) Handling the Concept of Arithmetic Progression.
(4) Addition and Multiplication Rules in Probability
(5) Finding the acceleration of a particle using Newtons' 2^{nd} Law of Motion.
(6) Finding the determinants and inverse of 2 x 2 matrix.
(7) Resolving forces and presenting them in component form.
(8) Finding the resultant of forces.

3. A SUMMARY OF CANDIDATES' WEAKNESSES

Candidates weaknesses were evident in the following areas:

(1) simplifying Rational expressions
(2) using numbers instead of variables in establishing the properties of a binary operation
(3) making use of the rubrics of questions.
(4) expressing column vectors in the form ($a\mathbf{i} + b\mathbf{j}$).
(5) premature approximation
(6) concept of Binomial Probability
(7) finding the force that moves a body along an inclined plane.
(8) applying the concept of Permutation and Combination in finding the probability of selecting an item.

4. SUGGESTED REMEDIES

(1) Teachers should ensure that students understand every topic in the syllabus very well.

(2) Teachers should give students enough exercises and assignments and guide them to solve them, assess them and give them feedback on their performance.

5. DETAILED COMMENTS

Question 1

A binary operation Δ is defined on the set of real numbers, R, by p Δ q = $p^2 - 2pq$.
(a) Determine whether or not Δ is commutative.
(b) Find the truth set of p Δ 4 = 9.

Most candidates attempted this question and performed quite well. In part (a) some candidates were using numerical illustrations as their main proof, which was unacceptable. In part (b) some candidates left the answers without expressing them as truth sets.

Question 2

Find from first principles, the derivative of $f(x) = (x+3)^2$.

The question was attempted by most candidates and their performance was quite good. However there were few algebraic errors that led to wrong limits and wrong answers. Some candidates seemed to have differentiated the function and were ensuring that their answers agreed with what was required which made them arrive at wrong solution to the question.

Question 3

Given that $f(x) = \frac{x-2}{3}$ and $g(x) = \frac{3x-1}{x+2}$, find $f^{-1} \circ g^{-1}$

Most candidates attempted this question and did not perform well. After finding f (x) and g(x) many candidates left their results still in terms of y when they had in their earlier statements equated f and g to the same y. Some were either multiplying the f by g; or adding them together, instead of finding the inverse and the composite function for the inverse of the two.

Question 4

The 6th and 12th terms of a linear sequence (A.P.) are 17 and 41 respectively. Find the sum of the first 20 terms.

The question was attempted by most of the candidates and their performance was quite good. However few of the candidates seemed to have confused a Geometric Progression (G.P) with an Arithmetic Progression (A.P) as they treated the given sequence as a G.P when it was stated clearly that the sequence was an A.P

Question 5

(a) A fair die is tossed five times. Find the probability that an even number will be obtained three times.

(b) The probability that Mary will pass a class test is $\frac{3}{4}$ and the probability that Kofi will pass the same test is $\frac{3}{5}$. Find the probability that exactly one of them will pass the class test.

Candidates performance was generally average. The part (a) was poorly answered by most candidates. Candidate did not seem to have realized that it was the binomial probability distribution concept that was being required, Most candidates were using very unaccepted methods. The part (b) was fairly answered by most candidates.

Question 6

The deviations of a set of numbers from 45 are – 5,-3, -1,0,1,3,5 and 7.
Calculate the:

(a) mean of the numbers;

(b) variance of the numbers.

Candidates' performance was average. Candidates used the correct formulae to find the quantities that were required. Some of them however were finding the mean as $\tilde{x} = \frac{\Sigma d}{n}$ insteadof$\widetilde{x} =$ A+ $\frac{\Sigma d}{n}$ and thus arriving at the wrong answers for the question.

Question 7

The position vectors of *A* and *B* are a = 3i – j and b = 2i + 3j respectively. Find, correct to two decimal places │4a – 2b│.

This question was attempted by most candidates and their performance was quite good. Some few candidates however did not seem to have understood that │**4a – 2b**│ meant the magnitude of (**4a – 2b**). Most of them also failed to pay attention to the two decimal places that the answer was to be corrected to, as required in the rubrics of the question.

Question 8

Forces (in newtons) F_1 = -2i + j, F_2 = i + 3j, F_3 = 3i + 3j and F_4 = 5i + 2j act on a particle of mass 0. 20kg. Find, correct to two decimal places, the acceleration of the particle.

The question was well answered by most candidates and their performance was quite good. A few of them however expressed their results in the column vector form, which was not a bad idea but left the component in *i*'s and *j*'s, which was unacceptable. Also after getting the resultant force of$\sqrt{130}$ *N*, some candidates approximated it to 11.4 which gave the acceleration 57.00 ms^{-2}instead of 57.01 ms^{-2} which was also not acceptable. They should have worked with the$\sqrt{130}$ or approximated it to at least 3 decimal places since the final answer was to be corrected to 2 decimal places.

Question 9

(a) solve log_{10}**(5x + 2) –** log_{10} **(x – 1) = 2.**

(b) **(i)** **Write down the first four terms of the binomial expansion of $(1 – x)^6$in ascending powers of *x*.**

(ii) **Use the expansion in 9(b)(i) to find, correct to two decimal places, an approximate value of $(0.996)^6$**

This question was attempted by most of the candidates. In the part (a), few candidates seemed not to know how to clear the log_{10} properly. Some of the candidates did not even express the $\log_{10}$ terms as a single equation before dropping the $\log_{10}$. And after dropping the $\log_{10}$ some candidates could not arrive at the correct answer.

In the (b) part most candidates were able to handle the expansion properly. Some however did not seem to know how to carry out the expansion of the binomial expressions. Some candidate also used x = -0.004 and instead of x = 0.004, others also used the raw 0.996 in their expansions.

Some of them however did not seem to have a good knowledge of binomial expansions.

Question 10

(a) **Simplify:** $\frac{2+\sqrt{5}}{\sqrt{5}-1}$ - $\frac{\sqrt{5}-1}{2(2+\sqrt{5})}$

(b) **The equation of a tangent to a circle at point (-1,-1) is y = 2x + 1. If the coordinates of the centre of the circle is (m,5), where m is a constant, find the:**

(i) **value of m;**

(ii) **equation of the circle.**

Candidates' performance was average, The part (a) was poorly answered by most candidates. Most of them were unable to rationalize the denominators properly. Others who attempted using a common denominator for the two terms found themselves messing up, creating several algebraic inaccuracies, thus arriving at wrong answers to the question.

The part (b) was also poorly answered by most candidates. Candidates could not establish the relationship between the gradient of the tangent and the radius of the circle and therefore ended up with wrong solutions to this part of the question.

Question 11

(a) **Given that N =** $\begin{pmatrix} 3 & -5 \\ 4 & 2 \end{pmatrix}$**, find the image of the point (1, - 1) under the transformation by N^{-1}, the inverse of the matrix N.**

(b) **If $x^2 – 6x + 7 = m (2x – 3)$ has real equal roots, find the possible values of *m*.**

Candidates' performance was quite good. In the part (a) the main problem was that most candidates left the coordinates of the image point as column vectors. which was unacceptable.

In the part (b) candidates were expected to expand the m (2x -3) of the equations, re-group like terms and solve the discriminant $b^2 - 4ac = 0$. Most candidates attempted solving for ***m*** without any expansion at all.

Question 12

The table shows the distribution of marks in percentages, scored by some students in a class test.

Marks (%)	0 - 19	20 - 39	40 -59	60 - 79	80 - 99
Number of Students	7	24	36	17	7

(a) **Calculate, correct to the nearest whole number, the:**
- **(i)** **mean mark of the distribution.**
- **(ii)** **standard deviation of the distribution.**

(b) **Find, correct two decimal places, the probability of selecting a student who scored between 19% and 60%**

The question was well answered by most candidates and their performance was quite good in both part (a) and (b).Most candidates did not expressing the final answer to the right number of decimal places as demanded in the rubrics. In part (b) instead of finding the total number of candidates that had scores between 19% and 60%, and dividing by 91 ie$\frac{24+36}{91}$ which is equal to 0.66. correct to two decimal places, candidates were calculating 19% of the number of students and this was completely wrong.

Question 13

(a) **A box X contains 3 red and 2 yellow balls. Another box Y contains 4 white and 5 yellow balls. If a ball is picked at random from each box, find the probability that:**
- **(i)** **one is white and the other is red;**
- **(ii)** **they are of the same colour.**

(b) **Five women and 7 men applied for four vacancies in a job. Both women and men are equally qualified for the job. Find the number of ways of employing the people for the vacancies, if:**
- **(i)** **there is no restriction;**
- **(ii)** **at least two of them are women.**

This question was poorly answered by most candidates. They need to pay greater attention to this part of the syllabus. Most of the candidates who attempted this question could not write down any meaningful solution to it.

Question 14

(a) **A body is acted upon by the forces F_1 = (26 N, 150°), F_2 = ($6\sqrt{2}$ N, 045°)and F_3= (15N, 036°). Find the magnitude of the resultant force to these three forces.**

(b) **A body of mass 5 kg is placed on a plane inclined at an angle of 45° to the horizontal. If the coefficient of friction is $\frac{1}{2}$, calculate, correct to one decimal place, the minimum force required to move the body down the plane.**
[Take g = 10 ms^{-2}]

Candidates' performance in this question was average. The part (a) required the resolution of the forces before adding them to get their resultant and then finding the magnitude. Candidates went through these stages without much problem. A few of them however did not resolve the forces at all; they simply added them as they were given and continued to find the resultant, which was unacceptable. Candidates performance in part (b) was very poor. They could not calculate the minimum force required to move the body down the plane.

Question 15

The position vectors of points A and B are a = 4i + 7j and b = 3i + 5j
Find:

(a) **the scalars m and n such that ma + nb = 11i + 19j;**

(b) **2a + 7b│;**

(c) **the acute angle between a and b.**

This question was attempted by most candidates and their performance was quite good. In the part (a) some candidates could not write down the correct equations that could be solved simultaneously for the values of the scalars **m** and **n.**

In part (c) some candidates were finding the angle between lines instead of angle between vectors.