CARIBBEAN EXAMINATIONS COUNCIL

REPORT ON CANDIDATES' WORK IN THE SECONDARY EDUCATION CERTIFICATE EXAMINATION MAY/JUNE 2005

MATHEMATICS

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MAY/JUNE 2005

GENERAL COMMENTS

The General Proficiency Mathematics examination is offered in January and May/June each year, while the Basic Proficiency examination is offered in May/June only.

In May/June 2005 approximately 88 559 candidates registered for the General Proficiency examination, an increase of 3 773 over 2004. Candidate entry for the Basic Proficiency examination decreased from 7 861 in 2004 to 6964 in 2005.

At the General Proficiency level, approximately 39 per cent of the candidates achieved Grades I – III. This represents a 4 per cent increase over 2004. Seventeen per cent of the candidates at the Basic Proficiency level achieved Grades I – III compared with 20 per cent in 2004.

DETAILED COMMENTS

General Proficiency

In general, candidates continue to show lack of knowledge of basic mathematical concepts. The optional section of Paper 02 seemed to have posed the greatest challenge to candidates, particularly the areas of Relation, Function and Graphs; and Geometry and Trigonometry. Candidates did not access most of the marks awarded for higher order thinking. This indicates the inability to apply mathematical skills in novel situations.

Eleven candidates scored the maximum mark on the overall examination compared with six candidates in 2004. In addition, 351 candidates scored more than 95 per cent of the total marks.

Paper 01 – Multiple Choice

Paper 01 consisted of 60 multiple-choice items. This year, 167 candidates earned the maximum mark compared with 145 in 2004. Approximately 71 per cent of the candidates scored at least half the total marks for this paper.

Paper 02 – Essay

Paper 02 consisted of two sections. Section I comprised eight compulsory questions that totalled 90 marks. Section II comprised six optional questions: Two each in Relations, Functions and Graphs; Trigonometry and Geometry; Vectors and Matrices. Candidates were required to choose any two questions. Each question in this section was worth 15 marks.

This year, 14 candidates earned the maximum mark on Paper 02 compared with 16 in 2004. Approximately 20 per cent of the candidates earned at least half the maximum mark on this paper.

Compulsory Section

Question 1

This question tested candidates' ability to

- perform the basic operations on fractions
- solve problems involving invoices and shopping bills
- solve problems involving selling price, cost price and profit or loss.

The question was attempted by 99% of the candidates. The mean score was 7.82 out of 11.

Candidates were generally able to deduce unit price and quantity; calculate the difference between cost price and selling price to obtain profit or loss; obtain an appropriate LCM for the subtraction of two fractions and calculate 15% of a quantity.

However, some candidates experienced difficulty with writing a mixed number as an improper fraction, e.g. $1\frac{1}{9}$ was written as $\frac{11}{9}$; and applying the correct use of decimals to currency, e.g. \$16.242 was written as \$16.2 and \$37.50 to the nearest cent was written as \$37.5.

Recommendations:

Teachers need to

- Continue to reinforce operations on fractions at all levels.
- Encourage candidates to reflect on the stages in computations involving fractions when calculators are used.

Answers:

(a) $\frac{13}{15}$

(b) (i) A = \$37.50
B = \$16.95
C = 5

(ii) Profit

Question 2

The question tested candidates' ability to

- factorize using the distributive law, the difference of squares, and the method of grouping
- translate verbal phrases into algebraic symbols in forming expressions and equations
- use the distributive property to expand the product of two binomials.

The question was attempted by 99% of the candidates. The mean score was 4.63 out of 12.

Candidates were able to

collect terms in x and apply the distributive property in Part (b). They were also able to use the method of splitting and grouping to factorize the quadratic expression in (a) (iii); sum their three sets of points to 39 in Part (c) (ii).

Candidates experienced difficulty with differentiating between an expression and an equation; identifying the difference between two squares; differentiating between "twice" and "square": e.g. $2\ (x - 3)$ was written as $(x - 3)^2$; and translating verbal phrases into algebraic expressions: e.g. 3 points fewer than x points was written as $3 - x$ or as $3 < x$.

Recommendations:

- Help candidates to differentiate between expressions and equations.
- Remind candidates that marks allotted are usually in proportion to depth of response expected.

Answers:

(a) (i) $ab\ (5a + b)$ (ii) $(3k - 1)\ (3k + 1)$ (iii) $(2y - 1)\ (y - 2)$
(b) $bx^2 + 7x - 20$
(c) (i) $2\ (x - 3)$ (ii) $x + x - 3 + 2\ (x - 3) = 39$

Question 3

The question tested candidates' ability to

- identify the regions in a Venn diagram
- associate algebraic expressions with regions
- formulate simple linear algebraic equations
- solve simple linear equations in one unknown
- find the equation of a straight line given the gradient and a pair of coordinates
- show that two lines are parallel.

Approximately 93% of the candidates attempted this question. The mean score was 3.46 out of 11.

Most candidates were able to construct an equation in Part (a), in an attempt to find the value of the variable x. However, many were unable to correctly solve the equation.

Some candidates were not familiar with the use of the word "only", as such they were unable to correctly identify the region "drama only" represented by $7 + x$.

The majority of the candidates were able to substitute the values y, m and x into the equation of the straight line $y = mx + c$ in Part (b) (i).

Most candidates had the knowledge that parallel lines have the same gradient. However, most of them were unable to use the skills to show that gradients of the two lines were equal.

Candidates demonstrated a lack of basic computational skills and were unable to correctly manipulate the fractional gradient to find the value of c.

Transposing the equation $2x - 3y = 0$ into the form $y = mx + c$ posed a major challenge for the majority of the candidates.

Some candidates attempted to prove parallelism by plotting the graphs of the two lines. However, they were rarely able to plot correctly the points on the plane.

The following errors were identified in candidates' work.

(b) (ii) Finding the gradient using two points on the line:

When $x = 1$
$$2(1) - 3y = 0$$
$$2 - 3y = 0$$
$$2 = 3y$$
$$y = \frac{2}{3}$$

When $x = 0$
$$2(0) - 3y = 0$$
$$0 = 3y$$
$$0 = y$$

$$\text{Gradient} = \frac{y_2 - y_2}{x_2 - x_2}$$

$$= \frac{{}^{2}/_{3}}{1}$$

$$= \frac{2}{3}$$

Hence lines are parallel.

Recommendations:

- Teachers should use exercises that involve not only Universal set but the different regions and complements.
- Teachers should insist that candidates write the equation of the line after finding the values of the intercept and/or gradient.

Answers:

(a) (i) 6 (ii) 13

(b) (i) $y = \frac{2}{3}x + 7$

Question 4

The question tested candidates' ability to

- use scale factors in relation to the area of similar shapes
- compare the price of equal areas of pizzas or the areas that could be bought at the same cost
- use critical thinking in making judgements related to shopping.

The question was attempted by 94% of the candidates. The mean score was 4.56 out of 10.

Candidates generally knew how to calculate the cost of a whole medium pizza. They made reasonable conclusions based on the approaches taken to compare the sizes of the pizza.

Most candidates used either circumference or diameter to compare the sizes of the two circles. Some correctly used the areas but frequently arrived at the wrong conclusion even after calculating the area of the medium pizza to be 4 times the area of the small pizza.

In Part (b) of the question, the majority of candidates compared either areas only or prices only.

Recommendation:

- Candidates need to use the list of formulae on the question papers. The majority of candidates used p^2r, $2pr^2$, pd^2, $2pr$ as the formula for area of a circle.

Answers:

(a) The medium pizza is 4 times as large as the small one.
(b) The medium slice is the better buy.

Question 5

This question tested candidates' ability to

- locate the points on a grid to form a triangle
- locate the image of an object under a given transformation
- state a single transformation that maps an object to an image
- use and apply an appropriate trigonometric ratio in finding the angle of elevation in a given right-angle triangle.

Approximately 93% of the candidates answered this question. The mean score was 5.22 out of 12.

Some candidates were unable to plot a triangle accurately using the coordinate plane. A few had difficulty interpreting the scale of 1 cm to 1 unit and some inverted the axes.

A significant number of the candidates experienced difficulty reflecting in the line $x = 4$. Some used the line $y = 4$ for $x = 4$; some reflected in the x-axis, and others in the y-axis.

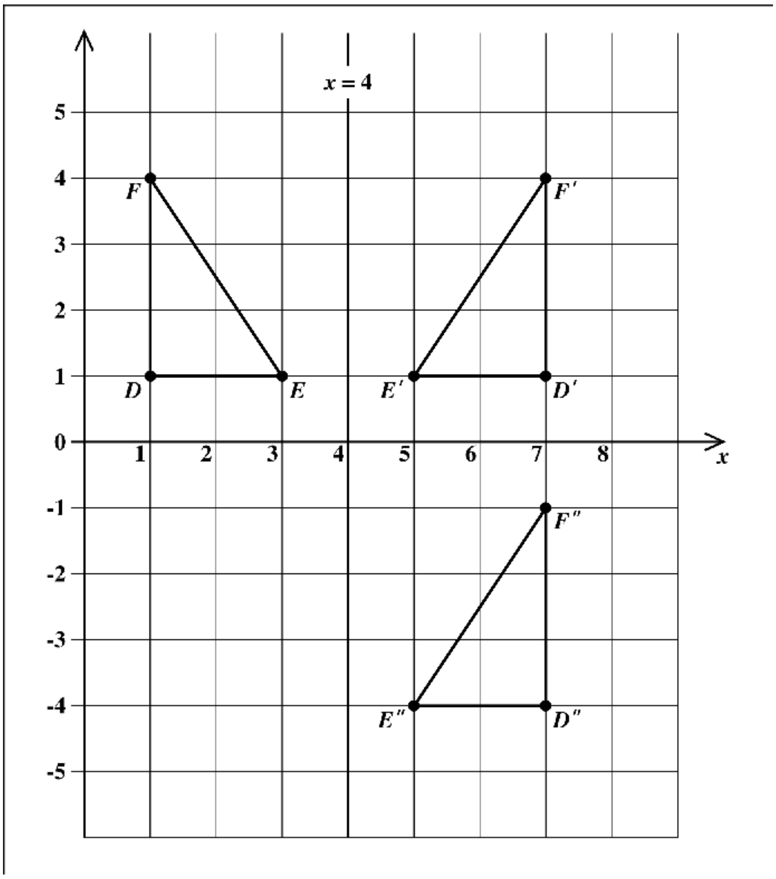
A few candidates preferred to use algebraic methods to locate the image of an object under the given translation. However, they multiplied the matrices instead of adding the column vectors. In general, the candidates showed mastery of translation, however, some had great difficulty interpreting the zero component of the vector and hence used their own vector to translate the figure.

In Part (b), most candidates were not familiar with the glide reflection and hence ended up describing the transformations instead of giving a single transformation that would map the object onto the image.

Part (c) was very challenging for many of the candidates. Identifying the angle of elevation was the major problem. Some candidates made their solutions much more complex than was necessary and attempted various methods in arriving at their answers. The sine and cosine rules were quite popular in calculating the required angle even though the triangles were right-angled.

Answers:

(a) (b) (c) angle of elevation of the sun = 42°



Question 6

This question tested candidates' ability to

- calculate unknown angles in given polygons by recognizing the relationship between angles formed by parallel lines
- find the values for simple, composite and inverse functions given values in their respective domains.

The question was attempted by 92% of the candidates. The mean score was 4.17 out of 12.

Part (a) of this question was poorly done. The candidates seem to lack knowledge of the relationship between parallel lines and the angles formed by them. They also had difficulty distinguishing the various shapes within the figure. A significant number of candidates indicated that the 108° was included in the quadrilateral ABCD.

It was evident, however, that candidates had no difficulty in determining the sum of angles in the triangle, quadrilateral or the polygon.

The performance in Part (b) was far better. For the most part, the candidates were comfortable with the concept of finding the value of the function given values in the domain. They knew substitution was required in determining the function $g(x)$. However, the response was less than clear as many included the g in their answers.

E.g. $g(x) = x^2$ implies that
$g(3) = g(9)$
$g(-3) = -3\,g$
$(-3)^2 = -9$

Finding inverses and computing composite functions also posed problems for candidates. A significant number of candidates determined the product, $[(fg(x) = (\frac{1}{2}x + 5) * (x^2)]$ or the sum of both functions, $[(fg(X) = (\frac{1}{2}X + 5) + (x^2)]$, instead of finding the function of a function, $(fg(x) = \frac{1}{2}[x^2] + 5)$. While most candidates realized that they had to interchange the variables in order to establish the inverse, most had difficulty with transposition. This underscores the difficulty with Algebra that is demonstrated generally.

Recommendations:

- Regular revision of the Euclidean Geometry should help as this was previously done in the lower forms. There is no alternative but to ensure that the students clearly understand functions. They also need to practise finding inverses and composite functions. The need to practise algebra and computation on an ongoing basis cannot be overstated.

Answers:

(a)	(i)	$x = 43°$	(ii)	$y = 162°$		
(b)	(i)	$g(3) + g(-3) = 18$	(ii)	$f^{-1}(6) = 2$	(iii)	$fg(2) = 7$

Question 7

This question tested candidates' ability to

- draw the cumulative frequency curve to represent data given the cumulative frequency table and a scale for each axis
- use the ogive to estimate
  - the number of persons in the sample having heights below a certain value
  - the median height
  - the height that 25% of the persons are less than
  - the probability that a person chosen at random had a height less than a given value.

About 77% of the candidates attempted the question. The mean score was 3.62 out of 12.

Part (a)

Most candidates showed knowledge of the axes although several of them did not pay attention to the given scales for each axis. They also failed to recognise the emphasis placed on the condition that the horizontal scale should start at 150 cm.

Candidates were not competent at assigning numbers to the axes. Some used the given class intervals; others, the class midpoint, the lower or upper class limit and the lower or upper class boundaries. Even though candidates would have chosen the incorrect class intervals, they were able to plot a cumulative frequency using their interval.

Part (b) presented the greatest difficulty.

In (b) (i) and (ii), depending on the numbering on the axes used in Part (a), candidates were unable to read off correctly from their graph. Although the appropriate lines were drawn, they did not read the values indicated correctly.

Candidates were aware that the median had something to do with 'the middle'. Some simply worked out ½ x 400 = 200.

Other responses included the average of any two values, the calculation of the mean, and the middle value of the highest value on their graph.

About 25% of the candidates drew appropriate lines at 170 cm and at 200 cm but were not successful in reading off the corresponding values asked for. A few drew lines at 50 to find the median.

For (b) (iii), candidates worked out as 25% x 400 = 100. Difficulty arose in reading off horizontally at 100.

Almost all the candidates who attempted (b) (iv) knew the answer had to be out of 400. Only about 10% obtained the correct answer. Many used the given height 162 and gave their answers as $\frac{162}{400}$. A few wrote answers that were greater than 1.

Answers:

(b) (i) 270 ± 5 (ii) 167 ± 1 cm (iii) 162.5 cm (iv) $\frac{95}{400}$ or $\frac{19}{80}$

Question 8

This was the *Critical Thinking* question which was designed to test candidates' ability to:

- identify number pattern from data given
- expand binomial expression
- simplify algebraic expression
- recognise an identity and prove same.

The question was attempted by approximately 90% of the candidates. The mean score was 5.45 out of 10.

Part (a) of the question was well done by most candidates. Candidates were able to successfully identifying the number pattern for 6^3 and 10^3 (Parts (i) and (ii) respectively), but had difficulty in obtaining the solution for the abstract n^3 (Part (iii).

In some cases, candidates calculated the value of 6^3 and 10^3 without using the pattern. They also assumed that since there were four spaces between 10^3 and n^3 and therefore substituted n as 14 and arrived at the correct solution.

Part (b) of the question was poorly done by candidates. The majority of candidates who attempted Part (b) had difficulty in expanding $(a - b)^2$ but were successful in expanding $ab\,(a + b)$. For the expansion of $(a - b)^2$ most candidates gave $a^2 - b^2$ or $(a - b)\,(a + b)$ as their solution.

There were instances where candidates gave numerical values for a and b and then substituted their values into the identity to prove the identity.

Recommendations:

- Teachers need to reinforce the differences between $a^2 - b^2$ (the difference of two squares) and $(a - b)^2$ (the square of the difference of two terms).
- Encourage more practice in multiplying a binomial expression by a linear expression.
- Encourage more practice in proving algebraic identities.

Answers:

(a) (i) $4 \times 7^2 + 3 \times 6 + 2 = 216$
(ii) $8 \times 11^2 + 3 \times 10 + 2 = 1000$
(iii) $(n - 2) \times (n + 1)^2 + (3 \times n) + 2$

Optional Section

Question 9

The question tested candidates' ability to

- write a quadratic expression in the form $a(x + h)^2 + k$
- deduce the minimum value of a quadratic function and the value of the domain for which this minimum value occurs
- solve a quadratic equation
- sketch the graph of a quadratic function.

Approximately 32% of the candidates attempted the question. The mean score was 4.13 out of 15.

Most candidates recognized the given equation as quadratic and set out to solve it by an acceptable method. Candidates, however, faltered in the following areas:

– The coefficients 5, 2 and –7 of $5x^2 + 2x - 7$ were substituted for a, b and c in $a(x + b)^2 + c$.

– When using the formula to solve $5x^2 + 2x - 7 = 0$, candidates used $x = -2 \pm \sqrt{\frac{4 + 140}{10}}$ and proceeded to divide only the discriminant by 10.

– To sketch the curve $y = 5x^2 + 2x - 7$, some candidates generated a table of values instead of simply using the roots, the y-intercept and the minimum point.

Answers:

(a) $5\left(x + \frac{1}{5}\right)^2 - 7\frac{1}{5}$

(b) (i) $-7\frac{1}{5}$ (ii) $-\frac{1}{5}$

(c) $x = -\frac{7}{5}$, 1

Question 10

The question tested candidates' ability to

- read and interpret speed-time graph and to calculate
  - acceleration over a given period of time
  - distance covered over a given period of time
- read and interpret distance-time graph and to calculate average speed and describe specific situation of an athlete being at rest over a specific period of time.
- write equation of a straight line parallel to the *y*-axis
- write a set of inequalities representing a given region identified by a set of given equations of lines (on graph).

About 51% of the candidates attempted this question. The mean score was 2.90 out of 15.

In Part (a), candidates knew that they had to find the area under the graph in order to obtain the distance travelled/covered. However, many candidates used "distance = speed x time", to find the distance covered instead of calculating the actual area under the curve using only the trapezium rule or area of triangle + area of rectangle.

In Part (b), the candidates knew that somehow acceleration was related to velocity and time but the majority used the wrong formula. Candidates seemed to have been unsure of the correct units to be used.

The horizontal line in the distance-time graph was associated with "something constant or stationary", but were unable to describe the athlete's situation as "at rest".

Some responses given by candidates were

- athlete was moving at constant speed
- running on the spot
- run parallel to the finish line
- kept on a straight track
- distance did not climb.

In Part (c), candidates had difficulty recognising that equations of lines could simply be 'read off' from the graph. The majority of them tried to calculate the 'given' equations of lines using different methods.

Recommendation:

Real life situations should be used to enhance the teaching and learning of Relations, Functions and Graphs.

Answers:

(a) (i) $2\frac{2}{3}$ m/s (ii) 900 m

(b) (i) 6 km/h (ii) athlete stopped (iii) 8 km/h

(c) (i) $x = 6$
(ii) $x \leq 6$

$$y \geq -\frac{5}{8}x + 5$$

$$y \leq \frac{1}{6}x + 5$$

Question 11

This question tested candidates' ability to

- solve geometrical problems involving similar triangles and to find areas of similar triangles
- use geometry and trigonometry to find angles and distances in a composite diagram involving two triangles conjoined to form a trapezium.

The question was attempted by approximately 25% of the candidates. The mean score was 1.96 out of 15.

The area of good performance in this question was the calculation of angle $S\hat{J}M$.

At least one candidate approached the first part of the question by determining the height of D PQX with QX as base and then applying the basic sine ratio to find angle $P\hat{X}Q$.

A few candidates correctly solved Part (b) of the question by drawing perpendiculars from S to MJ and from J to MK and then proceeded to use basic trigonometric ratio.

In Part (e), the majority of candidates generally did not know the relationship between the areas of similar triangles. The fewer candidates who knew were unable to apply the relationship between the areas of similar triangles in calculating the area of Δ YXZ.

In responding to this question, many candidates rounded off the values unnecessarily which resulted in significant deviations from the expected answers.

Recommendation:

- The teacher should use physical or mathematical models to develop an understanding of the relationship between the areas of similar figures.

Answers:

(a) (i) $P\hat{X}Q = 53°$ (ii) Area = 54 cm^2

(b) (i) a) $S\hat{J}M = 22°$ b) $J\hat{K}M = 34°$

(ii) MJ = 92.7 m JK = 62.1 m

Question 12

The question tested candidates' ability to

- draw a sketch of the earth showing the location of two places when given their latitude and longitude
- label on diagram, the equator and the meridian of Greenwich
- calculate the shortest distance between two places measured along their common circle of latitude
- calculate the shortest distance between two places measured along their common circle of longitude.

About 11% of the candidates attempted this question. The mean score was 5.03 out of 15.

Most candidates who attempted this question were able to

- draw and recognise the relative position of the equator and the meridian
- represent the earth as a sphere/circle
- determine the location of places when given their position (degrees latitude and longitude)
- use correct formula in order to find/calculate the arc length (distance).

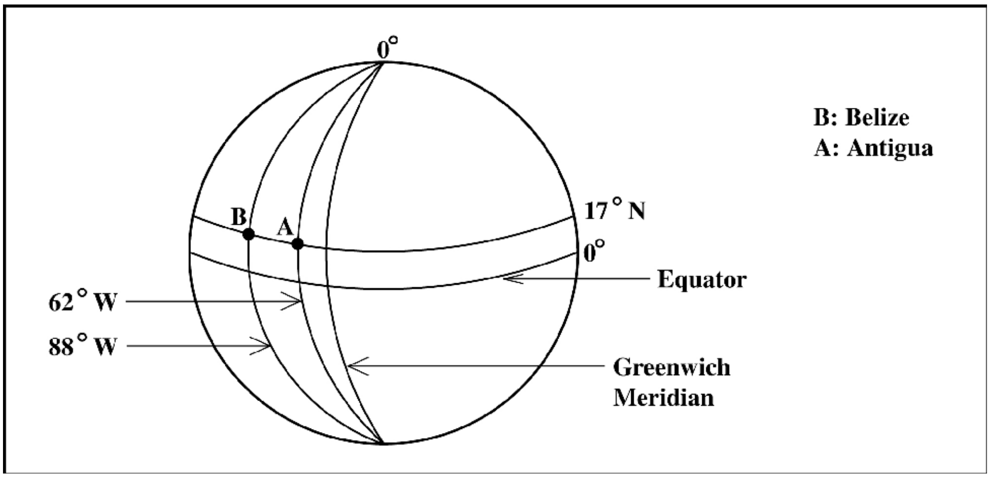
However, quite a number of candidates had difficulty in identifying and using the radius of the circle of latitude 17°N, whereas others knew which formula to use but were unable to manipulate the given information in the formula.

Recommendation:

- The use of a globe should be encouraged in classroom when teaching earth geometry. This will enhance candidates' understanding of equator, meridian, latitude and longitude concepts. Using the globe will also enhance candidates' understanding of East and West of Greenwich.

Answers:

(a)



(b) 2776 km
(c) 6140 km

Question 13

This question tested candidates' ability to use vectors to represent and solve problems in geometry.

The question was attempted by approximately 13% of the candidates. The mean score was 2.44 out of 15.

Candidates generally performed poorly on this question. The model mark was 0 and most candidates failed to secure more than 3 marks.

Generally candidates were able to correctly determine the expression for $\overrightarrow{AB}$ and identify correct routes to define different vectors. There were some unique approaches to solving Parts (c) and (d).

For Part (c), one candidate sought to find the dot product of $\overrightarrow{AP}$ and $\overrightarrow{AE}$ and went on to show that the angle between $\overrightarrow{AD}$ and $\overrightarrow{AE}$ was 0°, thus implying that AP and E are collinear.

For Part (d), most candidates attempted to prove that triangle ADE was isosceles by establishing two equal sides. However, one candidate used a vector approach to calculate the angles in the triangle and thus prove that ADE is isosceles.

In Part (e), the 'reversal' of vectors and changing the signs appeared to be a common area of concern.

In proving collinearity of AP and E, many candidates while establishing the scalar relationship between two vectors taken from AP, PE or AE did not state the fundamental fact that there was a common point.

Recommendation:

- Teachers need to use a more practical approach to teaching candidates about vectors so that the changing of direction as well as collinearity may be better understood.

Answers:

(a) (i) $\overrightarrow{AB} = 3x$ (ii) $\overrightarrow{BD} = -3\underline{x} - 3\underline{y}$ (iii) $\overrightarrow{DP} = \underline{x} + \underline{y}$

(d) $|\overrightarrow{AE}| = |\overrightarrow{DE}| = 3$ units

Question 14

This question was designed to test candidates' ability to

- evaluate the determinant of a 2 x 2 matrix
- identify a 2 x 2 singular matrix
- obtain the inverse of a non-singular 2 x 2 matrix
- use matrices to solve simple problems in Algebra
- determine the matrices associated with reflection, rotation and translation
- perform addition, subtraction and multiplication of matrices
- determine the 2 x 2 matrix representation of the single transformation which is equivalent to the composition of two linear transformations in a plane.

While approximately 27% of the candidates attempted this question, only one in ten responses were satisfactory. The mean score was 3.44 out of 15.

Generally, candidates were able to find the determinant, however, they only saw its relevance in obtaining the inverse matrix. Very few were aware of the association between the determinant and a singular matrix.

Both transposing and stating the inverse were generally well done. Unfortunately, only about 10% of the candidates attempting this part of the question were able to state the identity matrix. Hence, $M \times M^{-1} = I$ was not widely known.

Candidates seemed to have understood that they were required to use matrices to solve problems in algebra. However, many seemed confused by the term "pre-multiply".

About 5% of the candidates opted to use simultaneous equations and the process of elimination to solve (a) (iv).

Almost all the respondents attempted Part (b). Most were able to state satisfactorily the matrices for Parts (i), (ii) and (iii). However, Part (iv) proved to be the most difficult section of the question. It was poorly attempted and those who did encountered problems transposing matrices in the correct order. In some cases, candidates seemed to recognise what the outcome should be and simply stated rather than calculated.

In performing the combined translation NT(P), many sought to multiply NT first rather than perform the translation on P followed by the rotation.

Answers:

(a) (i) $|M| \neq 0, \therefore m$ non-singular

(ii) $M^{-1} = -\frac{1}{5}\begin{pmatrix} 15 & -5 \\ -7 & 2 \end{pmatrix}$

(iii) $MM^{-1} = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$

(iv) $x = 26, \ y = -11$

(b) (i) $R = \begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}$

(ii) $N = \begin{pmatrix} -1 & 0 \\ 0 & -1 \end{pmatrix}$

(iii) $T = \begin{pmatrix} -3 \\ 5 \end{pmatrix}$

(iv) $P'(6, -11)$
$P''(-3, -16)$

DETAILED COMMENTS

Basic Proficiency

The Basic Proficiency examination is designed to provide the average citizen with a working knowledge of the subject area. The range of topics tested at the basic level is narrower than that tested at the General Proficiency level.

Candidates continue to demonstrate a lack of knowledge of the fundamental concepts being tested at this level.

Approximately 16 per cent of the candidates achieved Grades I - III. This reflected a 4 per cent decline in performance compared with 2004 where 20 per cent of the candidates achieved Grades I - III.

Paper 01 – Multiple Choice

Paper 01 consisted of 60 multiple-choice items. No candidate earned the maximum mark on this paper. However, one candidate earned 59 out of 60 possible marks. Approximately 45 per cent of the candidates scored at least half the maximum mark for this paper.

Paper 02 – Essay

Paper 02 consisted of 10 compulsory questions. Each question was worth 10 marks. The highest score earned was 96 out of 100. This was earned by two candidates. Five candidates earned at least half the total marks on this paper.

<u>Question 1</u>

The question tested candidates' ability to

- divide chemicals
- write a rational number in standard form
- compare quantities in a given ratio
- solve problems involving percentages.

The question was attempted by 95% of the candidates. Less than 1% of the candidates scored the maximum mark. The mean score was 2.07 out of 10. Thirteen percent of the candidates scored 5 marks or more on this question.

The candidates were generally unable to express a number in standard form or to establish the relationship between the given ratio and the points. Most candidates answered (c) (ii) correctly, where they were required to give the least number of points to be scored by Team B, however a number of candidates had difficulty interpreting the word 'least'.

<u>Answers:</u>

(a) (i) 0.455 (ii) 4.55×10^{-2}
(b) 700
(c) (i) 54 (ii) 111 points

Question 2

The question tested candidates' ability to

- solve problems involving compound interest
- solve problems involving salaries and wages.

The question was attempted by 96% of the candidates, 2% of whom scored the maximum mark. The mean score was 3.02 out of 10. Twenty-seven percent of the candidates scored 5 marks or more on this question.

Candidates had difficulty calculating the compound interest. The majority correctly calculated the interest for the first year but did not proceed any further. A few candidates attempted to use the formula to determine the interest but gave the answer as the total value of the investment after two years instead of subtracting to find the interest.

The majority of the candidates were able to calculate the total weekly wage and quite a few correctly calculated the number of overtime hours worked. However, the candidates were not able to calculate the total wage earned for the week or the number of hours worked overtime when given the wage for the week.

Answers:

(a) $168

(b) (i) $640 (ii) $780 (iii) 51 hours

Question 3

The question tested candidates' ability to

- solve problems involving taxes
- solve problems involving hire purchase.

The question was attempted by 94% of the candidates, 4% of whom scored the maximum mark. The mean score was 3.23 out of 10. Thirty-three percent of the candidates scored at least 5 marks on this question.

Candidates had difficulty calculating the tax-free allowances, taxable income and interpreting the data in the table.

In Part (b), the majority of candidates were able to calculate the cash price and to find the hire purchase price of the car.

Answers:

(a) (i) $5 100 (ii) $26 900 (iii) $3 270
(b) (i) $7 392 (ii) $8 460 (iii) $1 068

Question 4

The question tested candidates' ability to

- solve linear equations in one unknown
- solve simultaneous linear equations in two unknows algebraically.

The question was attempted by 82% of the candidates, less than 1% of whom scored the maximum mark. The mean score was 1.29 out of 10. Ten percent of the candidates scored at least 5 marks on this question.

Most of the candidates were unable to eliminate a variable accurately, but chose an appropriate method to substitute the first value found to determine the second unknown.

Generally, candidates were unable to recognize and use the properties of an isosceles triangle or the sum of the angles in a triangle to determine the value of the angle at C. Further, candidates had difficulty solving a linear equation in one variable.

Answers:

(a) $x = 5$; $y = 2$
(b) (i) $(p + 3)°$ (ii) $<A = 58°$; $<B = 61°$; $<C = 61°$

Question 5

The question tested candidates' ability to

- substitute numbers for algebraic symbols in algebraic expressions
- simplify algebraic expressions
- solve a simple linear inequality in one unknown.

The question was attempted by 86% of the candidates, less than 1% of whom scored the maximum mark. The mean score was 1.61 out of 10. Eleven percent of the candidates scored 5 marks or more on this question.

Most of the candidates correctly completed the substitution although there were errors in evaluating the expression. In Part (b), the candidates were able to determine the Lowest Common Multiple of the algebraic fractions but could not perform the subtraction. The majority of the candidates had difficulty solving the inequality and showing the solution set on a number line.

Answers:

(a) 18 (b) $\frac{x - 2}{8}$ (c) $x > -6$

Question 6

The question tested candidates' ability to

- draw and interpret graphs
- determine the gradient of a line
- determine the equation of a line.

The question was attempted by 73% of the candidates, less than 1% of whom scored the maximum mark. The mean mark was 1.68 out of 10. Thirteen percent of the candidates scored at least 5 marks on this question.

Most of the candidates experienced difficulty finding the gradient of the line and writing the equation of the line. While some of the candidates were able to complete the table and insert the missing values; they had difficulty drawing the quadratic graphs. Only a few candidates were able to identify the points of intersection.

Answers:

(a) (i) 1 (ii) $y = x - 1$

(b) (i)

x	1	4
y	0	3

(iii) (1, 0) and (4, 3)

Question 7

The question tested candidates' ability to

- solve simple problems involving distance, time and speed
- calculate the region enclosed by a rectangle
- calculate the volume of a cuboid.

The question was attempted by 87% of the candidates, less than 1 % of whom scored full marks. The mean mark was 1.47 out of 10. Five percent of the candidates scored at least 5 marks on this question.

Most of the candidates were able to calculate the time taken to travel from one point to the next, but very few candidates recognised that the time in minutes should have been converted to hours to calculate the average speed for the journey.

Candidates generally knew how to find the area of the rectangular base, but could not proceed to find the volume of water in the container. In (b) (iii), the majority of candidates could not convert between litres and cubic centimetres and were unable to determine the height of water in the container.

Answers:

(a) (i) 40 minutes (ii) 48 km/h

(b) (i) 3 000 cm^2 (ii) 45 000 cm^3 (iii) 28 cm

Question 8

The question tested candidates' ability to

- use instruments to draw and measure angles and line segments
- use instruments to construct a rectangle
- use Pythagoras' theorem to solve simple problems
- solve geometric problems.

The question was attempted by 70% of the candidates, 1% of whom scored the maximum mark. The mean mark was 2.06 out of 10. Fifteen percent of the candidates scored 5 marks or more on this question.

The majority of candidates were able to construct the line segment accurately and a small percentage accurately constructed the angle of 90 degrees. Most of the candidates who completed a rectangle were able to determine the length of the diagonal.

Very few candidates correctly calculated the length of the side BD, since they did not recognise that Pythagoras' theorem could be applied. Similarly, candidates did not know how to determine the scale factor for the enlargement.

Answers:

(a) (ii) 9.6 $\pm$ 0.1 cm
(b) (i) BD = 20 cm (ii) scale factor is 3

Question 9

The question tested candidates' ability to

- identify and describe a transformation given an object and its image
- use simple trigonomic ratios to solve problems based on measures in the physical world.

The question was attempted by 52% of the candidates, 2% of whom scored the maximum mark. The mean mark was 1.45 out of 10. Eleven percent of the candidates scored 5 marks or more on this question.

Some candidates recognised that the coordinates of the two points could be subtracted to obtain the column vector and a few candidates correctly obtained a value for the *y* value. However, the subtraction with the directed numbers proved challenging.

Even though candidates identified the correct ratios to be used in calculating the length of the flagpole and the angle of elevation, candidates either did not substitute the correct ratios or did not transpose correctly.

Answers:

(a) 10 16
(b) (i) FG = 8 cm (ii) angle of elevation is 53 degrees

Question 10

The question tested candidates' ability to

- interpret data given in a bar graph
- determine probability for simple events
- determine when it is appropriate to use mean, median or mode for a set of data.

The question was attempted by 94% of the candidates, 4% of whom scored the maximum mark. The mean mark was 4.14 out of 10. Forty percent of the candidates scored 5 marks or more on this question.

The majority of candidates were able to read the bar graph and interpret the data. However, some candidates had difficulty in calculating the median and could not determine which average was most appropriate. There was also some difficulty in expressing the required probability.

Answers:

(a)	12 children	(b)	29 children
(c)	The modal size is 5	(d)	The median shoe size is 6
(e)	(i) 14/50	(ii)	21/50
(f)	The mode – the size worn by the most children		