MATHEMATICS SYLLABUS D (MAURITIUS)

Paper 4029/01
Non-calculator

Key messages

- All working should be shown, and answers must be clearly written in the appropriate answer space.
- As this is a non-calculator paper, accuracy in basic number work is essential. Fluency in computational skills is highly beneficial.
- Candidates are encouraged to pay close attention to instructions given within each question. For example, in **Question 23** candidates are expected to give the final answer as a surd in its simplest form.

General comments

The overall performance on this paper was generally good, with many candidates demonstrating sound understanding of most aspects of the syllabus. The majority of candidates attempted all questions. However, incorrect simplification was frequently observed, particularly in **Questions 9**, **10**, and **16**.

The questions that proved to be most challenging to candidates were **Questions 4**, **11(b)**, **12(b)**, **14**, **15(d)**, **20(b)** and **21(b)**. The questions that were very often not attempted were **Questions 12(b)**, **13**, **15(c)**, **15(d)**, **17(b)**, and **23**.

Comments on specific questions

Question 1

(a) Candidates generally demonstrated competence in recording the correct frequencies for the corresponding colours. A minority, however, confused frequency with relative frequency and calculated the latter instead. The Tally column was often left blank, though the correct frequencies were nonetheless provided.

(b) In several cases, although the vertical axis was appropriately labelled as Frequency, candidates plotted relative frequency values derived from their tables. Full credit was not awarded for this approach, as the question required a bar chart. Common errors included omitting gaps entirely between bars or using unequal spacing.

Question 2

(a) This question was generally very well answered. The most common incorrect response observed was 0.76.

(b) Candidates attempted this part fairly well. The most frequent incorrect response observed was –40.

Question 3

Few candidates obtained full credit for this question. Most candidates indicated the sizes of the angles they had calculated directly on the diagram, and this approach proved more successful in securing partial credit than simply presenting calculations in the working space without clearly identifying the angles involved.

Common incorrect answers included:
- 40°, derived from 90° – 50°.

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- 60°, derived from 180° – (70° + 50°).

Question 4

This question was generally well answered, with most candidates identifying the correct answer of 28. To gain full credit, candidates were required to consider both conditions: the number must be a multiple of 7 and must round to 30 when rounded to the nearest multiple of 10. The most common incorrect response observed was 35, which is a multiple of 7 but rounds to 40.

Question 5

Most candidates attempted this question well. However, a common error was the omission of the percentage sign when writing 84.5%. Some candidates attempted conversions but incorrectly approximated $\frac{7}{9}$.

Additionally, some cases were recorded where the given numbers were arranged in descending order rather than in ascending order.

Question 6

This question tested candidates' knowledge of solving equations. Many candidates fell prey to arithmetic slips when isolating like terms. The errors most frequently observed were related to incorrect signs, in particular rearranging the equation as $6x - 4x = 9 - 3$ instead of $6x - 4x = 9 + 3$.

Question 7

Errors in handling directed numbers were evident in both parts of this question. While most responses were correct, a significant number of candidates reversed the inequality signs in both parts.

- **Part (a)**: The most common incorrect response for this part was $3 < x < 8$
- **Part (b)**: frequently seen incorrect answers were $x > 9$ and 9.

Question 8

(a) This part was generally answered correctly, with most candidates writing the coordinates of point A in the answer space. A few, however, gave incorrect responses such as (1, –2) or (x = –2, y = 1) instead.

(b) Many candidates achieved full credit for identifying $p = 6$. Some wrote (6, –1) as their answer, which was accepted for full credit. Candidates who gained partial credit typically substituted correct values into a formula for the gradient, but others used an incorrect formula and did not make any progress that gained credit.

(c) This question proved challenging for candidates, and the correct coordinates of point D were rarely obtained. Some candidates were awarded partial credit either for their $p - 6$ and/or for their $y-$value being -3. The most common incorrect answer was $(-3, 0)$.

Question 9

(a) This question assessed candidates' knowledge of ratio. Most candidates began correctly with 60 : 72 : 36, but a large number did not simplify fully to reach the required simplest form.

(b) Few fully correct solutions to this part were seen. A common incorrect method seen was $\frac{18}{13} \times 5$ and $\frac{18}{13} \times 8$ instead of $\frac{18}{3} \times 5$ and $\frac{18}{3} \times 8$. Candidates who were unable to calculate the proportion for the difference in ratio were unable to make progress towards the correct final answer.

Question 10

This question was generally well answered, with the majority of candidates arriving at the correct solution. However, several common errors were noted:

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- Some candidates left their answers as $\frac{70}{15}$ or $\frac{14}{3}$, thereby gaining only partial credit.
- A few candidates correctly set up the calculation of $\frac{7}{5} \div \frac{3}{10}$, but instead of multiplying $\frac{7}{5}$ by $\frac{10}{3}$, they mistakenly took the reciprocal of $\frac{7}{5}$ rather than $\frac{10}{3}$.
- Others correctly wrote $\frac{7}{5} \times \frac{10}{3}$ but then attempted to introduce a common denominator unnecessarily, leading to errors in this redundant step.

Question 11

(a) This part tested candidates' knowledge of transformations. While many correctly identified the single transformation as a translation, some introduced new and incorrect terms with unusual names. A few candidates wrongly referred to the transformation as 'translocation.' Difficulties were also observed in determining the translation vector, with common incorrect answers such as $\begin{pmatrix} 5 \\ 4 \end{pmatrix}$ and $\begin{pmatrix} -4 \\ -5 \end{pmatrix}$.

(b) Correctly drawing the image after the rotation was rare. Although the orientation was generally accurate, the positioning was frequently incorrect. Candidates were awarded partial credit for these misplaced images. A common error was placing the image of shape A in the blank space below **part (b)** at the bottom of the page rather than within the given grid. Additionally, a few candidates mistakenly rotated shape A in an anticlockwise direction about the origin.

Question 12

(a) (i) Most candidates were able to complete the given table with the correct values. The table proved helpful in guiding candidates towards the correct answer.

(ii) Many candidates provided a fraction with the correct numerator of 3 but an incorrect denominator, as they counted all the values in the table rather than the relevant outcomes. Common incorrect probabilities included $\frac{3}{24}$ and $\frac{3}{25}$.

(b) Few candidates were successful in answering this part. A common incorrect response was $\frac{1}{16}$.

This error stemmed from candidates not reading the question carefully and continuing to use the same sample space from **part (a)**, rather than constructing a new sample space based solely on the outcomes of spinner A.

Question 13

This percentage question proved challenging for many candidates. The majority correctly calculated the bonus of $22 and recorded this value in the answer space. However, some candidates incorrectly proceeded to calculate 5% of the bonus, which was not required. Only the stronger candidates demonstrated a complete method, successfully arriving at the required value of $440.

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Question 14

The difficulty in this question proved to be in providing the correct reasons to support answers. Some candidates omitted the question while others did not state reasons or did not state reasons fully. To gain full credit, correct reasons needed to be associated with the appropriate angles. A recurring issue was the inability to clearly explain the solution step by step.

Question 15

(a) The missing value $y = 12$ was well calculated by many candidates.

(b) Few candidates scored full marks by drawing a smooth cubic curve passing through all the 7 points. Many candidates plotted most of the points without drawing a curve, and a few used line segments to join from point to point, instead of a smooth curve. Most candidates used crosses to show their points clearly, but a few plotted big dots instead.

(c) Many different answers were seen for this part of the question, with a minority of candidates giving a correct solution. The value had to be picked from the graph drawn.

(d) This part was found to be very challenging by most candidates.

Very few candidates were able to rearrange the given equation to $x^3 - 4x^2 + 12 = 8 - x$ and draw the line $y = 8 - x$ accurately on the grid and read the roots correctly from the points of intersection.

A minority of candidates attempted the rearrangement and gained partial credit for drawing a line with either an intercept of 8 or a gradient of -1.

It was common to see the line $y = 8$ drawn on the grid instead of $y = 8 - x$, as required.

Question 16

(a) A good number of candidates successfully tackled the expansion and simplification of surds, arriving at the correct answer of $11 + 13\sqrt{2}$. However, some terms of the expansion caused difficulty for candidates, particularly $4\sqrt{2} \times \sqrt{2}$.

(b) In rationalising the denominator, many candidates did not multiply both the numerator and denominator by the required conjugate. Candidates who correctly applied the appropriate conjugate surds were generally successful and gained full credit.

Question 17

(a) Many candidates were able to construct the correct equation required to solve for the length of PR. However, errors frequently occurred at the cross-multiplication stage or during simplification, leading to values other than the correct one. Although many candidates did arrive at 10.5 cm, a common mistake was leaving the answer in its unsimplified form of $\frac{63}{6}$. Another common incorrect response was 10 cm, derived from PQ = 9 cm = 6 + 3, therefore PR = 7 + 3.

(b) Very few candidates answered this part correctly. A frequent error was not squaring the scale factor, which led to the common incorrect answer of 24. This arose from the mistaken method $\frac{area\ of\ \triangle PQR}{16} = \frac{3}{2}$.

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Question 18

This question proved challenging for candidates, and very few correct answers were seen. A common difficulty was the inability to recall or correctly apply the formulas for the volume of a cylinder and the volume of a hemisphere. However, these are listed on page 2 of the question paper.

Among the candidates who progressed as far as $r = 9$, many substituted into $2\pi r^2$ rather than $3\pi r^2$, leading to the frequent incorrect answer of 162π.

Question 19

(a) Many correct answers were seen, though a few candidates made arithmetic slips. Most began their response with $(2^4)^{-\frac{3}{4}}$ or $(4^2)^{-\frac{3}{4}}$ or $\frac{1}{(16)^{\frac{3}{4}}}$. Some were unable to simplify these correctly to reach the required answer, with common incorrect responses being 8 or –8. It was also evident that several candidates did not distinguish between the instructions to simplify and to evaluate.

(b) More incorrect answers were seen in this part than in **part (a)**, with arithmetic mistakes being very common. Many candidates began with $(3^2)^2$ but instead of simplifying it to 3^4, some incorrectly cancelled the two 2s in the indices and obtained 3^1. Other candidates simply added the indices, producing the incorrect answer $3^{\frac{1}{2}}$.

Question 20

(a) Many candidates were familiar with the method for finding the inverse function, and a good number of correct answers were seen. Common errors included giving the answer in terms as $\frac{y-3}{a}$, instead of $\frac{x-3}{a}$. Another frequent mistake was a sign error during rearrangement, leading to $\frac{3-x}{a}$. A small number of candidates incorrectly assumed that the inverse function was simply the reciprocal of the original function, leading to answers such as $\frac{1}{ax+3}$.

(b) Candidates were expected to determine the unknown values *a* and *b* by either through factorisation or completing the square. However, composite functions were not well understood, and very few candidates provided the correct values for both values *a* and *b*.

Question 21

(a) (i) This part was generally well answered, with nearly all candidates demonstrating a sound understanding of vectors. Occasional incorrect responses included expressions such as $\frac{1}{2} \times a$.

(ii) Candidates were required to determine the vector $\overrightarrow{NM}$, with the correct answer being $\frac{3}{2}b - \frac{1}{2}a$. In many scripts, the working showed $\frac{3}{4}(2b) - \frac{1}{2}a$, but the correct vector route along the diagram was not specified.

(b) This part was often either not attempted or only partly attempted. Candidates struggled to express the information given in mathematical terms, which limited their progress.

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Question 22

(a) In this part, candidates were expected to demonstrate every step clearly to ensure completeness of the proof. Candidates had to indicate $4 \times 60 = 240$ to reach $\frac{240}{x}$ but many candidates did not demonstrate use of 60 appropriately and were unable to gain this mark. It was evident from some scripts that multiplication posed a hurdle, with working such as $4 \times 60 = 60 + 60 + 60 + 60 = 240$ ..

(b) In this part, candidates were required to show five to six correct steps to reach the given quadratic equation. Marks were awarded for writing the correct equation, eliminating fractions accurately, expanding correctly, and simplifying.

(c) Solving by factorisation proved to be challenging for candidates. Many scripts showed the use of the quadratic formula instead. Where a question specifies the method that must be used, credit is not awarded for solutions that use an alternative method.

(d) Correct answers were rarely seen in this part. Common incorrect responses included 40 (from $240 \div 6$) and 30 (from $240 \div 8$).

Question 23

Many candidates found working with 3-dimensional figures very challenging. The question required an answer as a surd in its simplest form. This added to the complexity of the question. The statement 'the perpendicular height of the triangle BEC is 11 cm' was misunderstood by many candidates. Candidates were expected to use Pythagoras' Theorem to obtain $\sqrt{72}$ and multiply this by two to obtain the final answer $12\sqrt{2}$. Many candidates did not multiply by two, instead stopping prematurely at $\sqrt{72}$.

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MATHEMATICS SYLLABUS D (MAURITIUS)

Paper 4029/02
Calculator

Key messages

To do well in this paper, candidates need to:
- be familiar with the whole syllabus including all the new content,
- know which formulas are given in the question paper and which they are required to recall,
- understand how to use a calculator correctly and efficiently to answer questions accurately,
- understand and use correct mathematical notation,
- draw accurate graphs and diagrams,
- give clear descriptions using correct mathematical terminology,
- set out their work in clear, logical steps.

General comments

The introduction of additional shorter questions to the assessment alongside those that are multi-part is relatively new to candidates. Some very good scripts were seen in which candidates demonstrated a clear knowledge of the wide range of topics tested.

The standard of presentation varied considerably. Successful candidates showed clear logical steps leading to their answers. However, some responses lacked clear working and contained incoherent calculations. When candidates make errors in their working, they should cross their work out and start again rather than attempting to write over their original work.

Errors arising from premature truncation or rounding of decimals within methods were common and frequently prevented candidates from arriving at correct final values. As the general requirement is to give answers correct to three significant figures, candidates should work with values to at least 4 significant figures throughout their working.

Candidates should be reminded about the formula sheet found at the front of the paper. A small number of candidates misquoted formulas or used incorrect versions, such as using an incorrect quadratic formula.

Subsequent incorrect methods following an initially correct method were also frequent.

Some candidates found the ‘show that’ questions and multi-stage problem solving questions challenging and omitted parts of these questions.

Comments on specific questions

Question 1

This was usually correctly answered. Occasionally the answer 16.17 was seen.

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Question 2

(a) This question required correct ordering of the given scores to find the median. Many candidates chose the middle terms from the unsorted list of scores, so incorrect answers involving 21 and 10 were common.

(b) Many correct answers were seen. The most common incorrect answer was $10 \leqslant x \leqslant 35$.

Question 3

Successful candidates used the correct conversion. Incorrect approaches included using 1 kg = 100 g or 1 g = 1000 kg.

Question 4

(a) Many candidates correctly constructed the triangle and accurately located point C.

(b) The required angle was usually well measured. A small number of candidates read the wrong scale of their protractor, resulting in an obtuse angle measurement.

Question 5

(a) Most candidates correctly calculated the interest. However, some continued one step further to calculate the amount of money in the account at the end of three years, so a common incorrect final answer was \$433.60.

(b) Only a minority of candidates answered this part correctly. \$4.8 was a common incorrect answer, coming from calculating the difference over 3 years.

Question 6

Many candidates found this question challenging. Although many candidates used the scale correctly, they did not complete the required conversion to reach a correct final answer. The most common incorrect length was 415 000.

Question 7

Successful candidates factorised the expression correctly. Less successful responses often contained sign errors or incomplete factorisation.

Question 8

Many candidates correctly expanded and simplified the expression. However, some changed the signs of the terms when re-arranging, resulting in incorrect answers such as $17x + 3$ or $7x + 13$.

Question 9

Candidates who correctly interpreted the diagram and applied the exterior angle formula for polygons generally obtained the correct answer. Those who annotated their diagrams with calculated angles were more successful than those who only showed calculations.

A common error was interpreting the exterior angles as interior angles, leading to an incorrect answer of 228.

Question 10

(a) Many correct responses were seen. Common incorrect answers included $\begin{pmatrix} -17 \\ 10 \end{pmatrix}$ and $\begin{pmatrix} -9 \\ 12 \end{pmatrix}$ given as a final answer, coming from $3\begin{pmatrix} -3 \\ 4 \end{pmatrix}$.

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(b) Most candidates recognised that the sum of vectors **a** and **b** was required and correctly reached $\begin{pmatrix}5\\2\end{pmatrix}$. However, many used an incorrect method for the magnitude of a vector. Common incorrect answers were $\begin{pmatrix}5\\2\end{pmatrix}$, $\begin{pmatrix}-5\\-2\end{pmatrix}$ and $\begin{pmatrix}25\\4\end{pmatrix}$.

Question 11

Answers to this part were mostly correct. Occasional premature approximation was seen, such as using 63 instead of 62.5, leading to an answer of 1764.

Question 12

(a) This part was usually answered correctly. Incorrect responses included 372×10^6 and 3.72×10^{-8}.

(b) Many candidates obtained 0.034 from the calculator in their working. Weaker responses often included answers in standard form with incorrect powers of 10.

Question 13

(a) (i) This question was very well answered, with many correct responses seen.

(ii) Many candidates found the correct expression for the n^{th} term of this arithmetic progression. However, some candidates subsequently simplified their expression incorrectly. A common incorrect answer was $n + 5$.

(b) Many candidates correctly used the expression $T_n = \dfrac{5n-2}{(n+1)^2}$ and substituted 25 for n. Others extended the sequence to T_{25}. Weaker responses often included 676 as a denominator or 123 in the numerator.

Question 14

(a) Most candidates were familiar with writing numbers as a product of prime factors and used the ladder method in their workings. Common incorrect answers were $x = 2$ and $y = 1$.

(b) This question was generally well answered by candidates who had a correct solution to **part (a)**. A few incorrect answers of 30 were seen, resulting from using $x = 1$.

(c) Stronger candidates were able to obtain the correct answer. Many candidates did not attempt this part. The most common incorrect answer was 1.

Question 15

(a) This part was usually answered correctly. Incorrect responses included 2.6 as the upper bound and 2.4 as the lower bound.

(b) This part proved challenging. Some candidates gave an upper bound of 8.05 for the box. The most common mistake was finding the upper bound after calculating of the mass of the box and the bags of potatoes.

Question 16

(a) This question was challenging for many candidates, and it was common to see candidates using the simple interest formula. Some candidates were able to set up the correct exponential growth formula but did not proceed correctly to obtain the value of x. The value 17 115 was often seen in incorrect responses.

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(b) This question required candidates to find the number of years by trial and improvement. Many candidates found this challenging, and a significant proportion were not able to reach 10 years in their calculations. The use of logarithms was seen in some responses. The most common error was the use of simple interest, e.g. 17 115 ÷ 1646.16.

Question 17

(a) A few good sketches were seen. Some candidates drew a positive cubic curve with a maximum and a minimum while others drew a negative cubic curve. Many candidates omitted this part.

(b) Some good sketches were seen but some candidates did not label the values where the curve crossed the *y*-axis. Many candidates omitted this part.

Question 18

(a) Many correct answers were seen to this part. Incorrect answers included $\frac{x}{5}$ or -5.

(b)(i) Most of the candidates showed clear workings and reached the required result. However, some incorrectly used the point $B(0,-3)$ to calculate the gradient of line M.

(ii) This part was challenging. Many candidates correctly found the perpendicular gradient. A common error in finding the gradient of line N was to use the reciprocal of the gradient of line L, rather than the negative reciprocal. Many candidates then substituted the coordinates of *A* or *B* instead of the coordinates of the midpoint of AB.

Question 19

(a) This part was mostly well answered, with the correct answer of 5 commonly seen.

(b) Many candidates correctly identified the required answer. Incorrect answers included *n*(7) or {7} or {7 , 5, 4}.

(c) Very few candidates found the correct probability. Many candidates calculated the probability without replacement, or some worked only for 2 students instead of 3. A probability of $\frac{9}{22}$ was commonly seen. Incorrect responses included $(\frac{9}{22}\times\frac{8}{21}\times\frac{7}{20})\times 3$ and $\frac{9}{55}$.

Question 20

Many correct solutions were seen. Some cases of candidates using direct proportion were seen. A few cases of misreads were noted where the candidates substituted 2 instead of –2.

Question 21

Stronger candidates were able to formulate and solve the quadratic equation correctly. Other candidates correctly attempted the removal of the fraction and/or correctly expanded a pair of brackets or double brackets. Common incorrect quadratic equations included $x^2-2x-6=0$ or $x^2-7x-19=0$.

Most candidates quoted the quadratic formula correctly from the formula sheet, but a short division line was occasionally noted. Many candidates used the quadratic formula correctly to find the two correct solutions. The most common errors seen when substituting into the formula were the use of a short division line or short square root, the use of –3 in place of –(–3) or -3^2 in place of $(-3)^2$ and the use of 21 in place of –21. Some candidates wrote $\sqrt{93}$ directly when they should have shown the substitution of values into the formula. Most candidates gave the answer to 2 decimal places, whilst a few made errors in rounding their final answers. A minority of candidates had incorrect working but used their calculator to find the correct solutions. Very few cases of using completing the square to solve the quadratic equation were seen.

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Question 22

(a) Many candidates answered this part correctly. Some candidates used alternative methods and rounded prematurely, resulting in inaccurate final answers, such as 367.

(b) Many candidates were able to use the cosine rule to show calculation of the required angle BDC. Since the answer was given, many candidates were not awarded full credit as they did not work with more significant figures before reaching angle $BDC = 61.5°$ or because they made numerical errors in their method. A few cases where candidates attempted an alternative method were seen, but candidates were not able to use the method correctly to reach the required result.

(c) The first part of this question required candidates to find CX. Successful candidates recognised that the shortest distance is the perpendicular from C to BD. Many candidates earned credit for correctly identifying the right angle on their diagram. The most common method was to use right-angled trigonometry to find the shortest distance. Approaches involving areas were less common but generally successful. Many candidates wrongly assumed that the perpendicular bisected BD, and Pythagoras' Theorem was often applied to one of the resulting right-angled triangles.

The second part of the question required candidates to find the average speed, using the distance CX previously found. Some candidates obtained the correct answer in km/h. A few candidates used CX as 545 m, rounding to 3 significant figures prematurely, and obtained a final answer of 5.109… which fell outside the acceptable range. Incorrect time conversions were often seen in the incorrect responses.

Question 23

Many well-structured solutions were seen. Candidates recognised the need to find the sum of partial areas before calculating the required percentage. A correct area for the minor sector was often seen. Many candidates then incorrectly calculated the area of the triangles using the area formula for a right-angled triangle, instead of the sine area formula. A common error at this stage was to use an angle of 50° instead of 115° in the sine area formula. Other errors included using an incorrect radius in one or other formula, swapping 7 and 10 when calculating the shaded percentage, attempting to find sector ACB as the shaded region, with angle $ACB = 65°$ in the working, and finding the small circle as a percentage of the big circle.

Question 24

(a) This part was usually correctly answered. The most common error was the omission of the product 0.7×40 giving 28.

(b) Many candidates were successful in estimating the mean score. Incorrect responses mostly used the frequency densities as frequency in their working to find the estimated mean, reaching an answer of 222.3. A few candidates made one or more slips, often when finding the frequency and/or the midpoint values of the intervals. Incorrect methods seen often involved the use of the class widths instead of midpoint values, using the upper bounds of the intervals instead of the midpoints, or dividing the total score by the number of intervals instead of the total frequency.

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