Results of Secondary 3 Mathematics in Territory-wide System Assessment 2017

The percentage of Secondary 3 students achieving Mathematics Basic Competency in 2017 is 79.9%.

Secondary 3 Assessment Design

The design of assessment tasks for S.3 was based on the documents *Mathematics Curriculum: Basic Competency for Key Stage 3 (Tryout Version)* and *Syllabuses for Secondary Schools – Mathematics (Secondary 1 – 5), 1999*. The tasks covered the three dimensions of the mathematics curriculum, namely **Number and Algebra**, **Measures**, **Shape and Space**, and **Data Handling**. They focused on the Foundation Part of the S1 – 3 syllabuses in testing the relevant concepts, knowledge, skills and applications.

The Assessment consisted of various item types including multiple-choice questions, fill in the blanks, answers-only questions and questions involving working steps. The item types varied according to the contexts of the questions. Some test items consisted of sub-items. Besides finding the correct answers, students were also tested in their ability to present solutions to problems. This included writing out the necessary statements, mathematical expressions and explanations.

The Assessment consisted of 148 test items (204 score points), covering all of the 129 Basic Competency Descriptors. These items were organized into four sub-papers, each 65 minutes in duration and covering all three dimensions. Some items appeared in more than one sub-paper to act as inter-paper links and to enable the equating of test scores. Each student was required to attempt one sub-paper only. The number of items on the various sub-papers is summarized in Table 8.7. These numbers include several overlapping items.

Table 8.7 Number of Items and Score Points for S.3

Subject	No. of Items (Score Points)				
	Paper 1	Paper 2	Paper 3	Paper 4	Total*
Mathematics					
Written Paper					
Number and Algebra	23 (32)	23 (32)	21 (27)	21 (26)	65 (85)
Measures, Shape and Space	18 (24)	19 (26)	21 (29)	20 (29)	65 (88)
Data Handling	6 (9)	5 (7)	5 (9)	6 (10)	18 (31)
Total	47 (65)	47 (65)	47 (65)	47 (65)	148 (204)

* Items that appear in different sub-papers are counted once only.

The item types of the sub-papers were as follows:

Table 8.8 Item Types of the Sub-papers

Section	Percentage of Score Points	Item Types
A	~ 30%	• Multiple-choice questions: choose the best answer from among four options
B	~ 30%	• Calculate numerical values • Give brief answers
C	~ 40%	• Solve application problems showing working steps • Draw diagrams or graphs • Open-ended questions requiring reasons or explanations

Performance of Secondary 3 Students Achieving Basic Competence in Territory-wide System Assessment 2017

Secondary 3 Number and Algebra Dimension

S.3 students performed satisfactorily in this dimension. The majority of students demonstrated recognition of the basic concepts of directed numbers, rational and irrational numbers, rate and ratio, formulating problems with algebraic language and linear inequalities in one unknown. Performance was only fair in items related to numerical estimation, using percentages and manipulations of polynomials. Comments on students' performances are provided with examples cited where appropriate (question number *x* / sub-paper *y* quoted as Q*x*/M*y*). More examples may also be found in the section ***General Comments***.

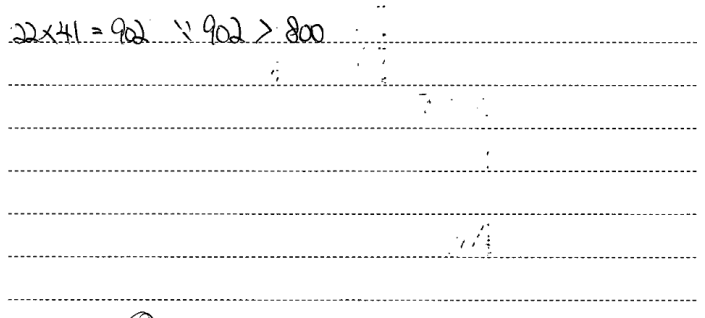
Number and Number Systems

- Directed Numbers and the Number Line: Students performed well. They were able to use directed numbers to represent the floors of a shopping mall. They could also demonstrate recognition of the ordering of integers on the number line and the basic operations of directed numbers.

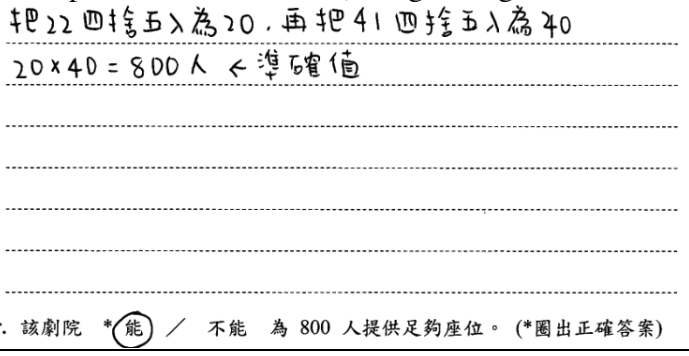
- Numerical Estimation: The majority of students were able to determine whether the value mentioned in a simple context was obtained by estimation or by computation of the exact value. They could judge the reasonability of the weight of copper from the expressions and results obtained. Nevertheless, some students were not able to estimate the number of seats in the theatre and judge whether the theatre has enough seats for 800 people according to the information given in the question.

Q45/M4
Exemplar Item (Estimate the number of seats in the theatre and judge whether the theatre has enough seats for 800 people) A theatre has 22 rows of seats, and each row has 41 seats. Estimate the number of seats in this theatre and judge whether the theatre has enough seats for 800 people. Based on the description above, give an approximation for each of the **UNDERLINED VALUES** respectively. Use these 2 approximations for estimation and briefly explain your estimation method.

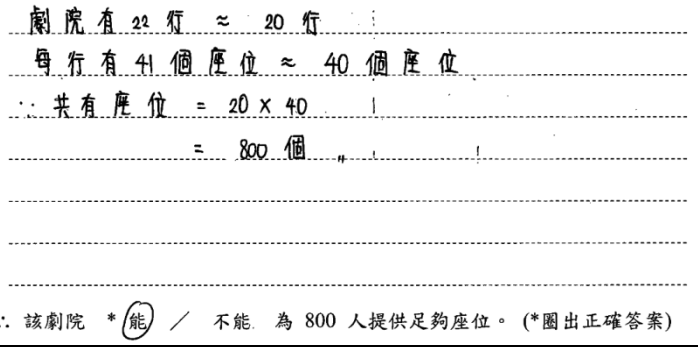
Example of Student Work (Without giving approximations for the underlined values)



Example of Student Work (Using wrong method to find the approximations)



Example of Student Work (Good performance)



- Approximation and Errors: The majority of students were able to convert numbers in scientific notation to integers and round a number to 3 significant figures. Many students were capable of representing a large number in scientific notation.

- Rational and Irrational Numbers: The performance of students was good. They were able to represent a fraction on a number line. They could also demonstrate recognition of the integral part of $\sqrt{a}$.

Comparing Quantities

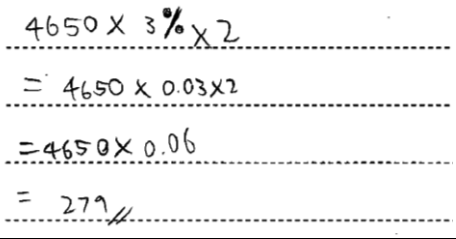
- Using Percentages: Students were able to find the profit obtained by selling goods and solve problems regarding depreciations. Nevertheless, they were quite weak in finding simple interest and compound interest.

Q40/M2
Exemplar Item (Find the profit) The cost of a jacket is $420. It is sold at a profit of 35%, find the profit.
Example of Student Work (Mixed up profit per cent and loss per cent, profit and selling price) 420 (1−35%) = 273元 ∴盈利是273元
Example of Student Work (Mixed up profit and selling price) 盈利 = 420 X (1+35%) = $567

Q41/M3
Exemplar Item (Find the new value after the depreciation) The value of a notebook computer was $8 400 two years ago and its depreciation rate is 25% per year. What is the value of the notebook computer this year?
Example of Student Work (Correct solution) the value of the notebook computer this year: $8400 X (1-25\%)^2$ = $4725

Q40/M1
Exemplar Item (Find the simple interest) Joseph deposits $4 650 in a bank at a simple interest rate of 3% p.a. Find the amount he will receive after 2 years.
Example of Student Work (Confused simple interest with compound interest) $4650 (1+3\%)^2$ = 4930 (corr. to 3 sign. fig.) ∴ he will receive $4930 after 2 years.

Example of Student Work (Considered the simple interest only, but not the amount)

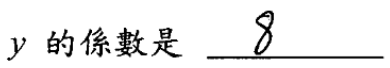
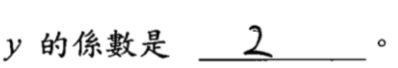


- Rate and Ratio: Students in general were able to use rate and ratio to solve simple problems. However, some students mixed up rate and ratio.

Observing Patterns and Expressing Generality

- Formulating Problems with Algebraic Language: The performance of students was quite good. They were able to distinguish the difference between $2x$ and x^2; substitute values into formulas and find the value of a variable and formulate equations from contexts. They were also capable of writing down the next few terms in Fibonacci sequence from several consecutive terms that were given. Many students could find the terms of the sequence from a given n^{th} term.

- Manipulations of Simple Polynomials: Students were weak in recognizing the terminologies of polynomials. Many students were not able to distinguish polynomials from algebraic expressions. Nevertheless, they did quite well in dealing with the additions, subtractions and expansions of simple polynomials.

Q25/M2
Exemplar Item (Terminologies of polynomials) Find the coefficient of y in the polynomial $5y^2-8y+4$.
Example of Student Work (Without considering the sign of the coefficient) 
Example of Student Work (Confused the coefficient with the degree) 

Q25/M4
Exemplar Item (Manipulations of polynomials) Simplify $(8x+3)+2x$.

Example of Student Work (Good performance)

$10x+3$

- Laws of Integral Indices: Many students performed quite well in using laws of integral indices to simplify algebraic expressions. However, some students misunderstood the laws and simplified the expressions with careless mistakes.

Q41/M2

Example of Student Work (Has mistakenly taken $(a^m)^n = a^{m^n}$)

(a) $a^{-4} \cdot a^7$
$= a^{-4+7}$
$= a^3$

(b) $(a^{-4} \cdot a^7)^2$
$= a^{-16} \cdot a^{49}$
$= a^{33}$

Example of Student Work (Has mistakenly taken $a^m \cdot a^n = a^{mn}$)

(a) $a^{-4} \cdot a^7$
$= a^{-28}$

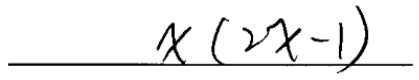
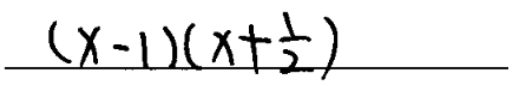
(b) $(a^{-4} \cdot a^7)^2$
$= a^{-28 \cdot 2}$
$= a^{-56}$

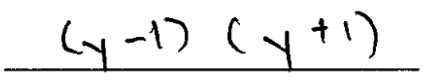
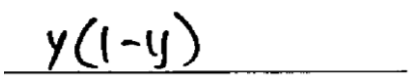
Example of Student Work (Correct solution)

a. $a^{-4} \cdot a^7$
$= \frac{1}{a^4} \cdot a^7$
$= \frac{a^7}{a^4}$
$= a^3$ //

b. $(a^{-4} \cdot a^7)^2$
$= (\frac{1}{a^4} \cdot a^7)^2$
$= (\frac{a^7}{a^4})^2$
$= (a^3)^2$
$= a^6$ //

- Factorization of Simple Polynomials: Students were able to demonstrate recognition of factorization as a reverse process of expansion. They performed quite well in factorizing simple polynomials by using grouping terms, perfect square expressions and the difference of two squares. There was room for improvement in using the cross method to factorize expressions.

Q27/M1
Exemplar Item (Factorize the expression by using the cross method) Factorize $2x^2 - x - 1$.
Example of Student Work (The constant was neglected)   
Example of Student Work (The coefficients and constant were only half of the original expression)   

Q27/M3
Exemplar Item (Factorize the expression by using the difference of two squares) Factorize $1 - y^2$.
Example of Student Work (Without considering the signs of the coefficient and constant)   
Example of Student Work (Mistakenly took $y(1-y) = 1-y^2$)   

Algebraic Relations and Functions

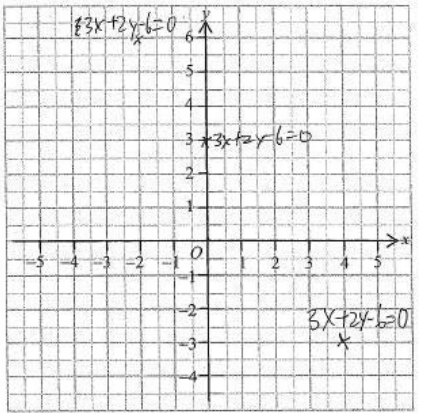
- Linear Equations in One Unknown: The majority of students were able to formulate equations from simple contexts and demonstrate understanding of the meaning of roots of equations. They were also capable of solving simple equations.
- Linear Equations in Two Unknowns: Students in general could plot graphs of linear equations in 2 unknowns according to the values in the table and formulate simultaneous equations from simple contexts. They were aware that the root obtained by the graphical method may not be exact. Their performance was quite good in solving linear simultaneous equations by algebraic methods.

Q44/M4

Example of Student Work (Though the 3 points were plotted correctly on the rectangular coordinate plane, a straight line was not drawn to represent the graph of the equation)

$3x+2y-6=0$

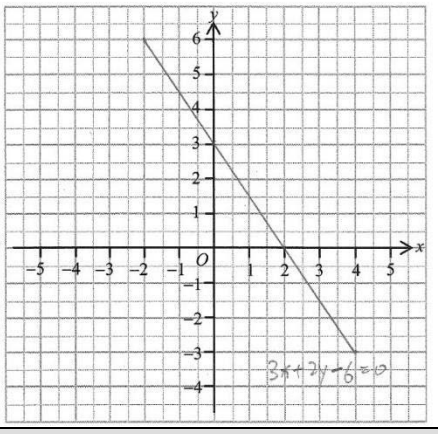
x	y
–2	6
0	3
4	-3



Example of Student Work (Did not extend at two ends)

$3x+2y-6=0$

x	y
–2	6
0	3
4	-3

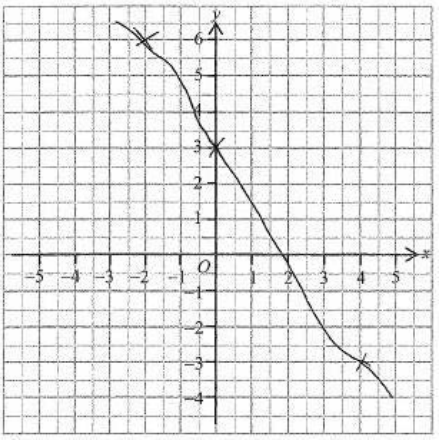


Q46/M3

Example of Student Work (Did not use a ruler to draw the graph)

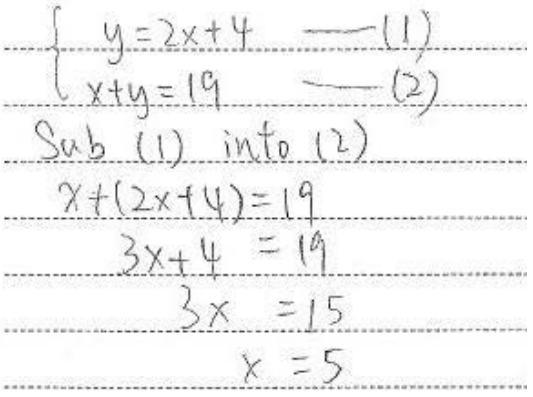
$3x+2y-6=0$

x	–2	0	4
y	6	3	-3

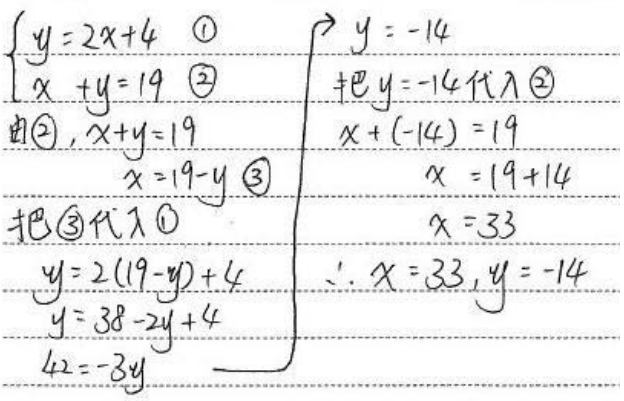


Q47/M2

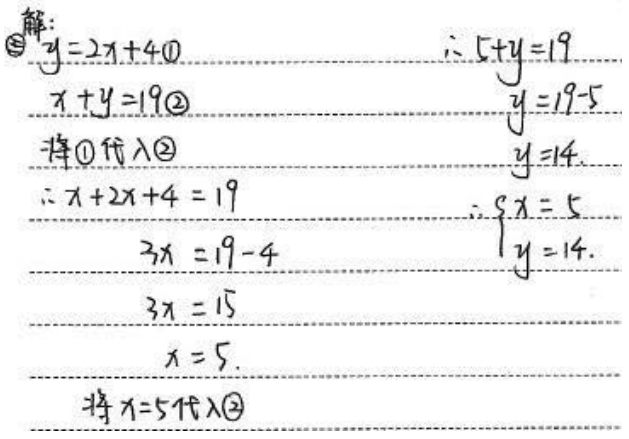
Example of Student Work (Solving simultaneous equations – only *x* was solved)



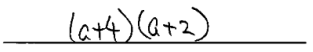
Example of Student Work (Solving simultaneous equations – although the student knew how to use the method of substitution, mistakes occurred in the computation)



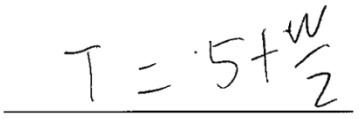
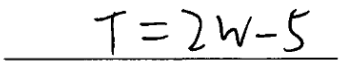
Example of Student Work (Correct solution)



- Identities: More than half of the students were able to distinguish identities from equations. Their performance was fair in using perfect square expressions to expand simple algebraic expressions.

Q29/M1
Exemplar Item (Expand algebraic expressions by using perfect square expressions) Expand $(a+8)^2$.
Example of Student Work (Mistakenly took $(a+c)^2 = a^2 + c^2$) 
Example of Student Work (Not able to demonstrate the recognition of expansion) 

- Formulas: The majority of students were able to find the value of a specified variable in the formula. However, there was room for improvement in manipulation of algebraic fractions and performing change of subject in simple formulas.

Q29/M3
Exemplar Item (Change of subject) Make T the subject of the formula $W = 5 + \frac{T}{2}$.
Example of Student Work (Mistakenly thought that change of subject was just a direct exchange of *T* and *W*) 
Example of Student Work (A bracket was omitted) 

- Linear Inequalities in One Unknown: The performance of students was good. They were able to demonstrate good recognition of the properties of inequalities. They used inequality signs to compare numbers, formulate inequalities from contexts and represent inequalities on the number line.

Secondary 3 Measures, Shape and Space Dimension

S.3 students performed quite well in this dimension. They were able to perform simple calculations regarding areas and volumes, solve problems about transformation and symmetry, congruence and similarity, angles related with lines and rectilinear figures and quadrilaterals. However, more improvement could be shown in items related to coordinate geometry and deductive geometry. Comments on students' performances are provided with examples cited where appropriate (question number *x* /sub-paper *y* quoted as Q*x*/M*y*). More items may also be found in the section ***General Comments***.

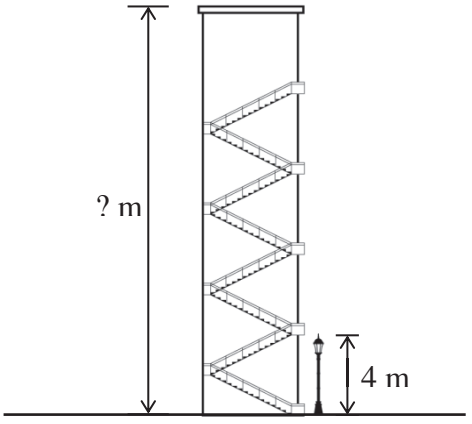
Measures in 2-D and 3-D Figures

- Estimation in Measurement: The majority of students were able to find the range of measures from a measurement of a given degree of accuracy, choose an appropriate unit and the degree of accuracy for real-life measurements and estimate measures with justification. Most of the students were able to select the appropriate ways to reduce errors in measurements.

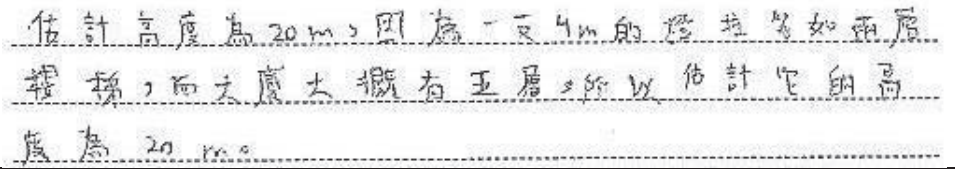
Q44/M3

Exemplar Item (Estimate the height of a building)

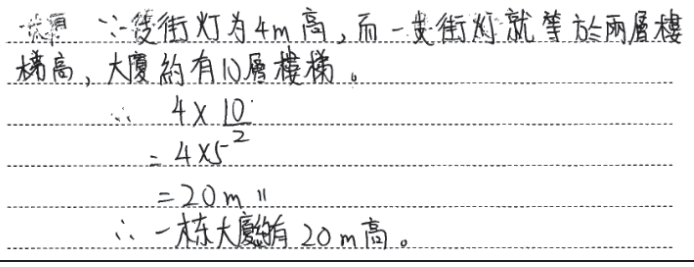
The figure shows a building and a lamppost. The height of the lamppost is 4 m . Estimate the height of the building and explain your estimation method.



Example of Student Work (Evidence of using estimation strategies, but the explanation contained errors)



Example of Student Work (Estimated with reasonable justification)



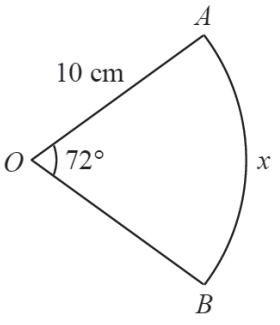
- Simple Idea of Areas and Volumes: The performance of students was quite good. They were able to find the circumferences and areas of circles, surface areas and volumes of solids.

- More about Areas and Volumes: Many students were capable of calculating arc lengths, areas of sectors, volumes of spheres and the total surface areas of pyramids. Almost half of the students were able to use relationships between the sides and volumes of similar figures to solve problems and distinguish among formulas for areas of plane figures by considering dimensions.

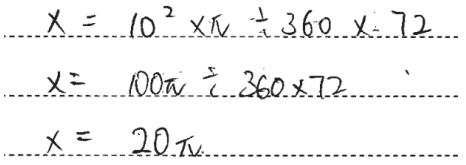
Q42/M3

Exemplar Item (Find the arc length)

In the figure, the radius of sector OAB is 10 cm and $\angle AOB = 72°$. If the arc length of the sector is x, find x. Express the answer in terms of π.

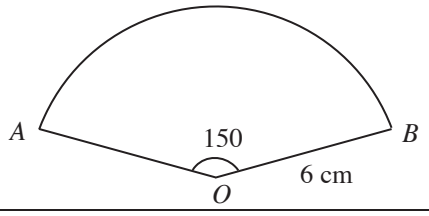


Example of Student Work (Has mistakenly calculated the area of the sector)



Q42/M1

Exemplar Item (Find the area of a sector)
In the figure, the radius of sector OAB is 6 cm and $\angle AOB = 150°$. Find the area of the sector. Give the answer correct to the nearest $0.1\ cm^2$.



Example of Student Work (Has mistakenly calculated the arc length of the sector)

$2\pi(6) \times \frac{150°}{360°}$
$= 12\pi \times \frac{5}{12}$
$= \pi \times 5$
$= 5\pi$
$= 15.7\ cm$ //

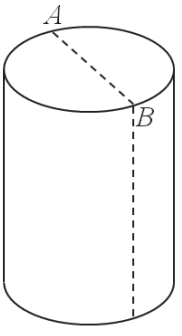
Learning Geometry through an Intuitive Approach

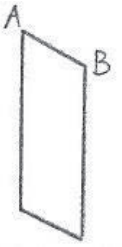
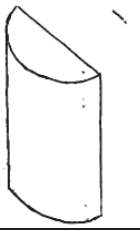
- Introduction to Geometry: The majority of students were able to identify cuboids, acute angles and 3-D solids from given nets. They could sketch the diagram of a pyramid with square base and the cross-section of a simple solid. However, they were weak in determining whether a polygon is equilateral.

Q32/M4

Exemplar Item (Sketch the cross-section of a solid)

A right cylinder is placed horizontally as shown. It is cut vertically along the line AB. In the **ANSWER BOOKLET**, sketch the cross-section obtained.



Example of Student Work (Mistakenly thought that the cross-section is a parallelogram) 
Example of Student Work (Not able to demonstrate the recognition of cross-section) 

- Transformation and Symmetry: Students did well in this area. They were able to determine the number of axes of symmetry and the order of rotational symmetry from a figure. They could also identify the image of a figure after a single transformation.

- Congruence and Similarity: The majority of students were able to apply the properties of congruent and similar triangles to find sides and angles. They could identify the reasons for congruent triangles and those for similar triangles. Nonetheless, their performance was only fair in recognition of the conditions for congruent and similar triangles.

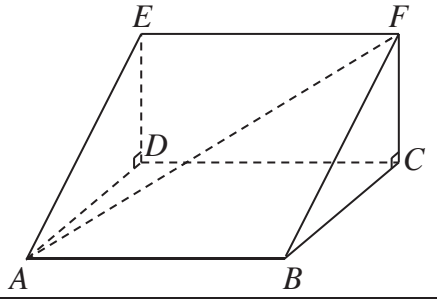
- Angles related with Lines and Rectilinear Figures: Students were able to demonstrate recognition of interior angles of polygons and corresponding angles. They were still strong in solving geometric questions involving numerical calculations. They were also capable of applying the formula for the sums of the interior angles of convex polygons to solve problems.

- More about 3-D figures: Students were able to identify axes of rotational symmetries of cubes, the nets of right prisms and match 3-D objects with various views. Students fared better when naming the projection of an edge on a horizontal plane than naming the angle between a line and a horizontal plane. Moreover, they were quite weak in recognizing the planes of reflectional symmetries of cubes.

Q34/M4

Exemplar Item (Name the angle between a line and a plane)

The figure shows a triangular prism. $ABCD$ and $CFED$ are rectangles. $ABCD$ is a horizontal plane and $CFED$ is a vertical plane. Name the angle between AF and the plane $ABCD$.



Example of Student Work (Not able to identify the correct angle)

(1) ∠FAB

(2) ∠ACB

(3) ∠FAD

(4) ∠FBA

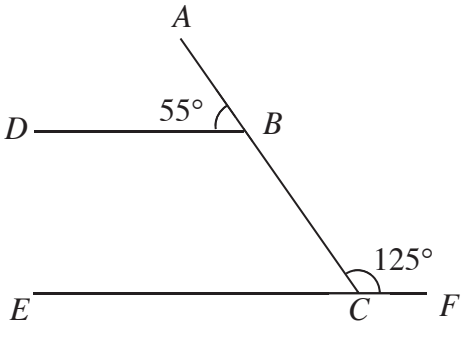
Learning Geometry through a Deductive Approach

- Simple Introduction to Deductive Geometry: More than half of the students were able to write the correct steps of a geometric proof, but many of them could not provide sufficient reasons or complete the proof correctly. Besides this, quite a number of students were able to identify angle bisectors of a triangle.

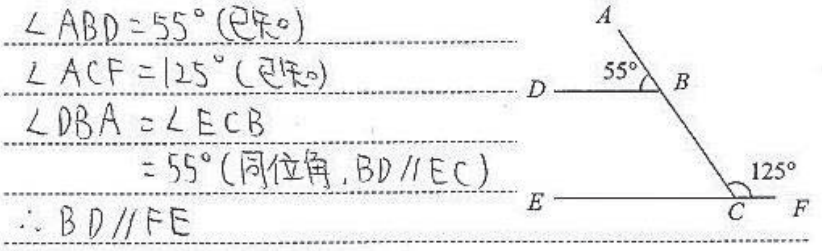
Q46/M1

Exemplar Item (Geometric proof)

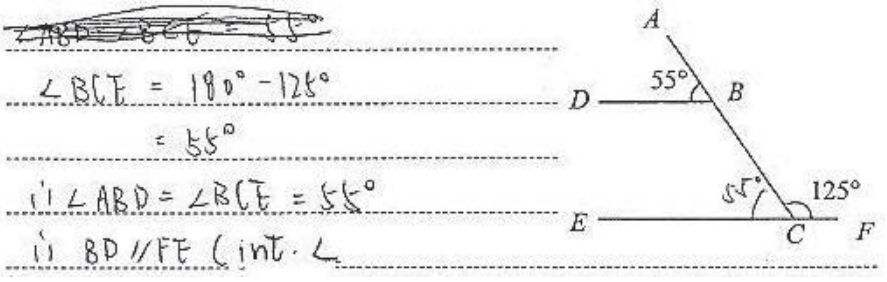
In the figure, ABC and ECF are straight lines. $\angle ABD = 55°$ and $\angle ACF = 125°$. Prove that $BD \parallel FE$.



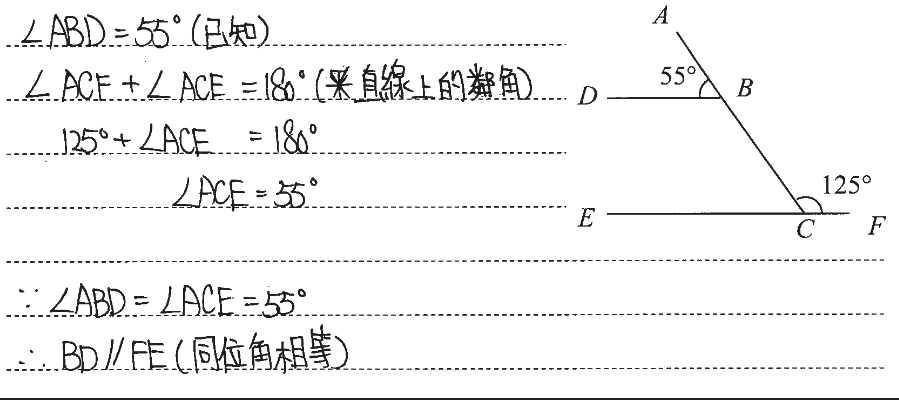
Example of Student Work (Incorrect logical reasoning in the proof – mistakenly used BD // FE and obtained the value of $\angle ECB$, hence showed BD // FE)



Example of Student Work (Not able to provide sufficient reasons)



Example of Student Work (Good performance)



- Pythagoras' Theorem: Students were able to use Pythagoras' Theorem and the converse of Pythagoras' Theorem to solve simple problems.
- Quadrilaterals: Students performed well. They were able to use the properties of parallelograms in numerical calculations.

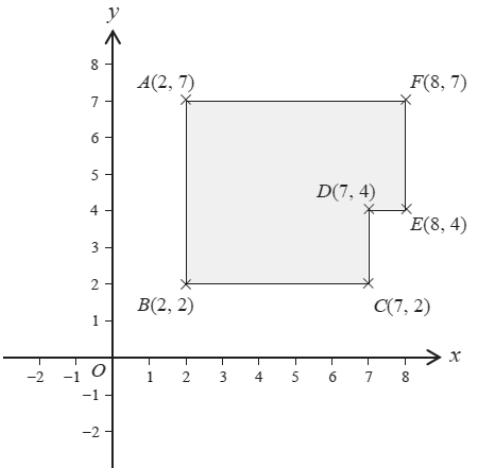
Learning Geometry through an Analytic Approach

- Introduction to Coordinates: Students were able to grasp the basic concepts of the rectangular coordinate system, they were fair in problems regarding polar coordinates. They performed better in translation than in reflection. The performance of students was fair only in calculating areas of simple figures.

Q42/M4

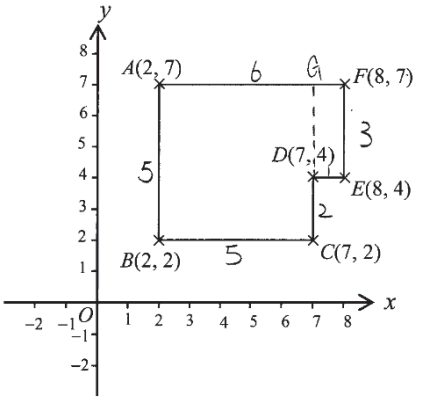
Exemplar Item (Calculating areas of simple figures)

Find the area of the polygon *ABCDEF* in the figure.



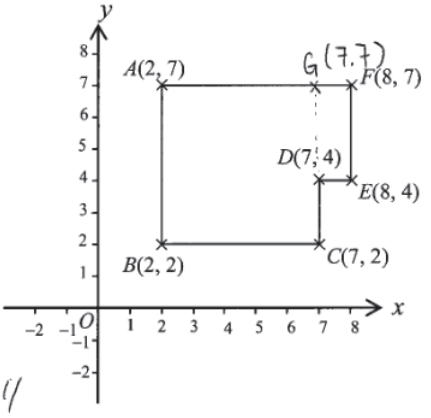
Example of Student Work (Wrong unit)

Draw the diagram as shown
Area of AGCB = 5×5
= 25cm²
Area of GFED = 1×3
= 3cm²
Area of ABCDEF = 25+3
= 28cm² //



Example of Student Work (Good performance)

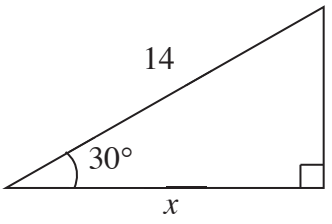
Let us cut a point G (7,7)
that AF ⊥ GD,
Area of AGCB = (7-2)(7-2)
= 25
Area of GDFE = (7-4)(8-7)
= 3
Area of ABCDEF = 25+3
= 28 (sq. units) //



- Coordinate Geometry of Straight Lines: Many students were able to use the formula of finding slopes, distance formula and the mid-point formula. Their performance was only fair in applying the conditions for parallel lines and perpendicular lines.

Trigonometry

- Trigonometric Ratios and Using Trigonometry: Students were able to grasp the basic concepts of trigonometric ratios. They were fair in recognition of the angle of elevation. They did quite well in solving simple 2-D problems involving one right-angled triangle.

Q37/M2
Exemplar Item (Finding the side) Find the value of x in the figure. (Correct to 3 significant figures) 
Example of Student Work (Has mistakenly taken $x = 14\tan30°$) $x =$ 8.083
Example of Student Work (Has mistakenly taken $x = 14\sin30°$) $x =$ 7
Example of Student Work (Has mistakenly taken $x = 14 \div \cos30°$) $x =$ 16.2 cm

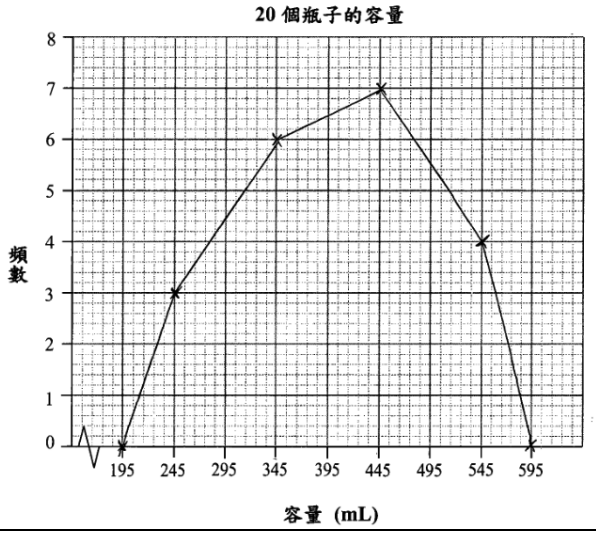
Secondary 3 Data Handling Dimension

The performances of S.3 students were quite good in this dimension. They were able to use simple methods to collect data, organize the same set of data by different grouping methods, interpret statistical charts, choose appropriate diagrams/graphs to present a set of data, calculate probabilities and find mean and median from a set of ungrouped data. However, performance was weak when students were asked to construct histograms, distinguish discrete and continuous data and identify sources of deception in cases of misuse of averages. Comments on students' performance are provided below with examples cited where appropriate (question number *x* / sub-paper *y* quoted as Q*x*/M*y*). More examples may also be found in the section ***General Comments***.

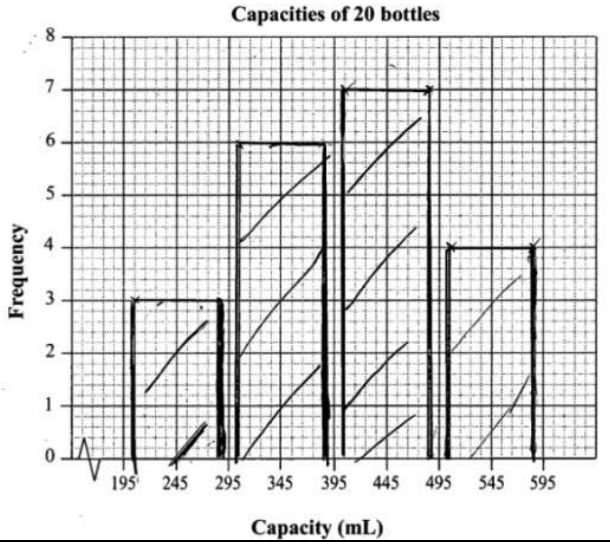
Organization and Representation of Data

- Introduction to Various Stages of Statistics: Students were able to demonstrate recognition of various stages of statistics, use simple methods to collect data and organize the same set of data by using different grouping methods. However, many students could not distinguish between discrete and continuous data.

- Construction and Interpretation of Simple Diagrams and Graphs: Many students were not able to construct histograms correctly and compare the presentations of the same set of data by using statistical charts. Nonetheless, students in general were able to read relevant information from diagrams and choose appropriate diagrams/graphs to present a set of data.

Q47/M4
Example of Student Work (Construct histograms – Confused histograms with frequency polygons) 

Example of Student Work (Construct histograms – Confused histograms with bar charts)



Analysis and Interpretation of data

- Measures of Central Tendency: The majority of students were able to find the mean and median from a set of ungrouped data. In the case of grouped data, more than half of the students could find the mean if a table was given with guidance. However, more than half of the students were not able to identify sources of deception in cases of misuse of averages.

Q45/M1
Exemplar Item (Identify sources of deception) Tom is a basketball player. In the past 5 competitions, he got the following scores: 6, 10, 8, 12, 42 It is given that the mean score of Tom in the 5 competitions is 15.6 . Hence Tom said, 'My score was higher than 15 in more than half of these 5 competitions.' Do you agree with Tom's saying? Explain your answer.

Example of Student Work (Stating 42 was an extreme value only, without further explain why the student didn't agree with Tom's saying)

Reason:

The mean will be easily affected by extreme data. Tom has the mean score — 15.6 is because of the extreme data, 42. Therefore the mean not accurate to determine if his score was higher than 15 in more than half of the 5 competitions.

∴ I * agree / (disagree) with Tom's saying. (*Circle the correct answer)

Example of Student Work (Good performance)

理由：

因為在5場比賽得分中只有1場是超過15分的，而另外4場的得分都比15分低

∴我 * 同意 / (不同意) 志傑的說法。 (*圈出正確答案)

Probability

- Simple Idea of Probability: The performance of students was quite good in calculating the empirical probability and the theoretical probability.

General Comments on Secondary 3 Student Performances

The overall performance of S.3 students was satisfactory. They did quite well in the Measures, Shape and Space Dimension and in the Data Handling Dimension. Performance was steady in the Number and Algebra Dimension.

The areas in which students demonstrated adequate skills are listed below:

Directed Numbers and the Number Line

- Use positive numbers, negative numbers and zero to describe situations like profit and loss, floor levels relative to the ground level (e.g. Q21/M1).
- Demonstrate recognition of the ordering of integers on the number line (e.g. Q21/M3).
- Add, subtract, multiply and divide directed numbers (e.g. Q21/M4).

Approximation and Errors

- Convert numbers in scientific notation to integers or decimals (e.g. Q2/M3).

Rational and Irrational Numbers

- Demonstrate, without using calculators, recognition of the integral part of $\sqrt{a}$, where a is a positive integer not greater than 200 (e.g. Q1/M4).
- Represent real numbers on the number line (e.g. Q23/M3).

Rate and Ratio

- Find the other quantity from a given ratio $a : b$ and the value of either a or b (e.g. Q23/M1).
- Use rate and ratio to solve simple real-life problems (e.g. Q41/M1).

Formulating Problems with Algebraic Language

- Distinguish the difference between $2x$ and $2 + x$; $(-2)^n$ and -2^n; x^2 and $2x$, etc. (e.g. Q3/M3).

Laws of Integral Indices

- Find the value of a^n, where a and n are integers (e.g. Q5/M1).

Linear Equations in One Unknown

- Formulate linear equations in one unknown from simple contexts (e.g. Q6/M3).

Formulas

- Substitute values of formulas (in which all exponents are positive integers) and find the value of a specified variable (e.g. Q29/M2).

Linear Inequalities in One Unknown

- Use inequality signs $\geq$, $>$, $\leq$ and $<$ to compare numbers (e.g. Q30/M4).
- Formulate linear inequalities in one unknown from simple contexts (e.g. Q8/M3).
- Represent inequalities, such as $x < -2$, $x \geq 3$, etc., on the number line and vice versa (e.g. Q9/M1).

Estimation in Measurement

- Find the range of measures from a measurement of a given degree of accuracy (e.g. Q9/M3).
- Estimate measures with justification (e.g. Q44/M3).
- Reduce errors in measurements (e.g. Q10/M3).

Simple Idea of Areas and Volumes

- Use the formulas for volumes of prisms and cylinders (e.g. Q41/M4).

Introduction to Geometry

- Use common notations to represent points, line segments, angles and polygons (e.g. Q12/M1).
- Identify types of angles with respect to their sizes (e.g. Q12/M2).
- Make 3-D solids from given nets (e.g. Q12/M4).

Transformation and Symmetry

- Determine the number of axes of symmetry from a figure and draw the axes of symmetry (e.g. Q11/M1).
- Name the single transformation involved in comparing the object and its image (e.g. Q13/M3).

- Identify the image of a figure after a single transformation (e.g. Q13/M4).

Congruence and Similarity

- Demonstrate recognition of the properties of congruent and similar triangles (e.g. Q33/M2).

Angles related with Lines and Rectilinear Figures

- Demonstrate recognition of the terminologies on angles with respect to their positions relative to lines and polygons (e.g. Q15/M3).
- Use the angle properties associated with intersecting lines/parallel lines to solve simple geometric problems (e.g. Q33/M1).
- Use the properties of angles of triangles to solve simple geometric problems (e.g. Q32/M3).
- Use the relations between sides and angles associated with isosceles/equilateral triangles to solve simple geometric problems (e.g. Q42/M2).

More about 3-D Figures

- Identify the nets of cubes, regular tetrahedra and right prisms with equilateral triangles as bases (e.g. Q16/M3).
- Match 3-D objects built up of cubes from 2-D representations from various views (e.g. Q16/M2).

Quadrilaterals

- Use the properties of parallelograms, squares, rectangles, rhombuses, kites and trapeziums in numerical calculations (e.g. Q35/M3).

Introduction to Coordinates

- Use an ordered pair to describe the position of a point in the rectangular coordinate plane and locate a point of given rectangular coordinates (e.g. Q36/M1).

Trigonometric Ratios and Using Trigonometry

- Find the sine, cosine and tangent ratios for angles between 0° to 90° and vice versa (e.g. Q36/M4).

Introduction to Various Stages of Statistics

- Use simple methods to collect data (e.g. Q19/M2).
- Organize the same set of data by different grouping methods (e.g. Q38/M2).

Construction and Interpretation of Simple Diagrams and Graphs

- Interpret simple statistical charts (e.g. Q38/M1).
- Choose appropriate diagrams/graphs to present a set of data (e.g. Q19/M1).

Measures of Central Tendency

- Find the mean, median and mode from a set of ungrouped data (e.g. Q38/M3).
- Find the modal class from a set of grouped data (e.g. Q39/M4).

Simple Idea of Probability

- Calculate the empirical probability (e.g. Q39/M1).

Other than items in which students performed well, the Assessment data also provided some entry points to strengthen teaching and learning. Items worthy of attention are discussed below:

Rate and Ratio

- Represent a ratio in the form $a : b$ (or $\frac{a}{b}$), $a : b : c$ (e.g. Q3/M1): Quite a number of students chose the correct answer, option C. However, more than 10% of students still chose options B. They might mistakenly have thought that the number of pigs was 16.

Q3/M1
On a farm, there are 24 cows and some pigs. The number of pigs is greater than that of cows by 16. Find the ratio of the number of cows to the number of pigs. A. 3 : 1 B. 3 : 2 C. 3 : 5 D. 5 : 3

Manipulations of Simple Polynomials

- Distinguish polynomials from algebraic expressions (e.g. Q4/M3): Only some students chose the correct answer, option D. Nearly 40% of students chose option A. They were not able to recognize this expression in fact is a polynomial.

Q4/M3
Which of the following is **NOT** a polynomial? A. w^2+w+3 B. w^2+3w C. $w^2+\frac{w}{3}$ D. $w^2+\frac{3}{w}$

- Demonstrate recognition of terminologies (e.g. Q4/M2): Only some of the students chose the correct answer, option A. However, option D was chosen by about 30% of students. They might have confused the degree with the constant of the polynomial.

Q4/M2
Find the degree of the polynomial $5x^3-17x^2+9x+6$. A. 3 B. 4 C. 5 D. 6

Linear Equations in One Unknown

- Solve simple equations (e.g. Q5/M2): The item showed the working steps from 1st line to 5th line for solving the given equation. Almost half of the students were able to determine a mistake was first made on 4th line. However, about 30% of students thought it was first made on 3rd line. The result revealed that those students could not grasp the steps in solving equations or they had problems with basic arithmetic.

Q5/M2
Martin solved the equation $8-3(1+x)=7-2x$ as follows: 1st line $\quad 8-3-3x=7-2x$ 2nd line $\quad 5-3x=7-2x$ 3rd line $\quad 5-x=7$ 4th line $\quad x=7-5$ 5th line $\quad x=2$ Determine on which line Martin first made a mistake. A. 1st line B. 2nd line C. 3rd line D. 4th line

Linear Equations in Two Unknowns

- Plot graphs of linear equations in 2 unknowns (e.g. Q44/M1 and Q44/M2): Two different items about plotting graphs of linear equations in 2 unknowns were set in the assessment in different sub-papers. Two equations are the same. The only difference among them is the design of the given table: the values of x and y were placed in two rows in one table and they were placed in two columns in the another one.

Q44/M1

Complete the table for the equation $3x + 2y - 6 = 0$ in the **ANSWER BOOKLET**.

x	y
–2	6
0	
4	

According to the table, draw the graph of this equation on the rectangular coordinate plane given in the **ANSWER BOOKLET**.

Q44/M2

Complete the table for the equation $3x + 2y - 6 = 0$ in the **ANSWER BOOKLET**.

x	–2	0	4
y	6		

According to the table, draw the graph of this equation on the rectangular coordinate plane given in the **ANSWER BOOKLET**.

- The result showed that the percentages of students answering the two items correctly were almost the same. Hence, the effect of the format of the table on students' performances still needs further exploration.

Identities

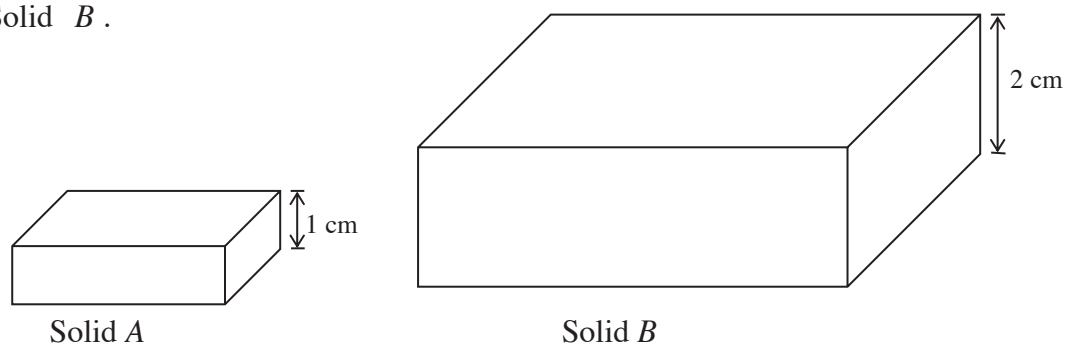
- Tell whether an equality is an equation or an identity (e.g. Q8/M2): More than half of the students chose the correct answer, option C. Each of the remaining options was chosen by more than 10% of students. For those who chose options A or B they

mistakenly thought that $a(x-b)=ax-b$ and $\frac{x-b}{a}=x-\left(\frac{b}{a}\right)$ are identities. For students who chose option D, they were not able to determine the difference between identities and equations.

Q8/M2
Which of the following is an identity? A. $2(x-6)=2x-6$ B. $\frac{x-6}{2}=x-3$ C. $x-6=-6+x$ D. $x-6=0$

More about Areas and Volumes

- Use the relationships between sides and surface areas/volumes of similar figures to solve related problems (e.g. Q11/M4): Almost half of the students chose the correct answer, option D. However, about 30% of students chose options A. Those students mistakenly took the ratio of the volumes of two similar solids as the ratio of their corresponding heights. Moreover, almost 10% of students chose C. They mistakenly took the ratio of the volumes of two similar solids as the ratio of the squares of their corresponding heights.

Q11/M4
In the figure, Solid A and Solid B are similar solids. Their heights are 1 cm and 2 cm respectively. The volume of Solid A is 6 cm^3. Find the volume of Solid B.      Solid A Solid B A. 12 cm^3 B. 18 cm^3 C. 24 cm^3 D. 48 cm^3

Transformation and Symmetry

- Demonstrate recognition of the effect on the size and shape of a figure under a single transformation (e.g. Q14/M2): Almost half of the students chose the correct answer, option A. However, option D was chosen by about 40% of students. As in previous years, many students thought that the shape of a figure will be changed after reflection.

Q14/M2

Will the size and shape of the above figure be changed after reflection?

	Size	Shape
A.	unchanged	unchanged
B.	changed	changed
C.	changed	unchanged
D.	unchanged	changed

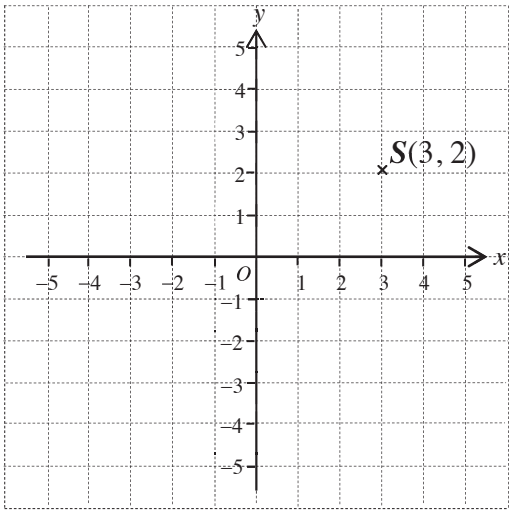
Introduction to Coordinates

- Match a point under a single transformation with its image in the rectangular coordinate plane (e.g. Q17/M3): More than half of the students chose the correct answer A, though there were about 20% of students who still chose option C. They confused reflecting a point about the *x*-axis with the *y*-axis.

Q17/M3

In the figure, $S(3, 2)$ is reflected about the *x*-axis to S'. Find the coordinates of S'.

A. (3, –2)
B. (–2, 3)
C. (–3, 2)
D. (–3, –2)

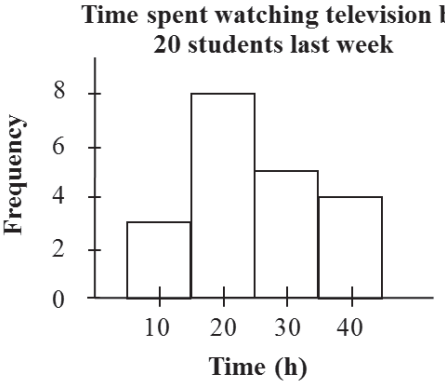


Construction and Interpretation of Simple Diagrams and Graphs

- Compare the presentations of the same set of data by using statistical charts (e.g. Q19/M3): Almost half of the students chose the correct answer, option B. However, option A was chosen by about 30% of students. They did not realise that the graph is incomplete. About 10% of students chose option C. They mistakenly thought that the values marked on the horizontal axes of frequency polygons are upper class boundaries.

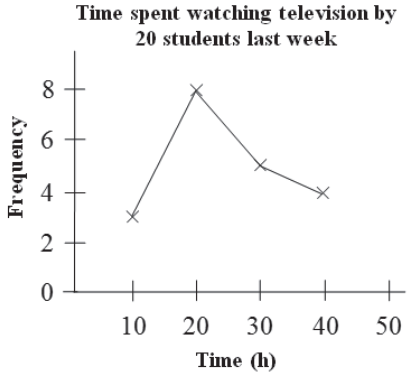
Q19/M3

The histogram below shows the time spent (h) watching television by 20 students last week:

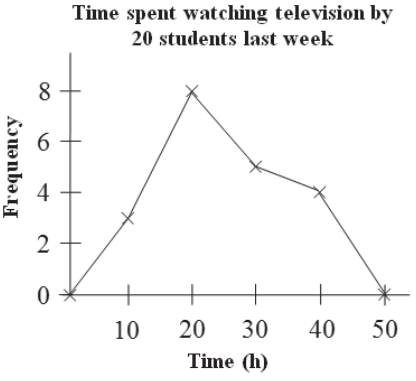


If the above data are presented by a frequency polygon, which of the following diagrams could be obtained?

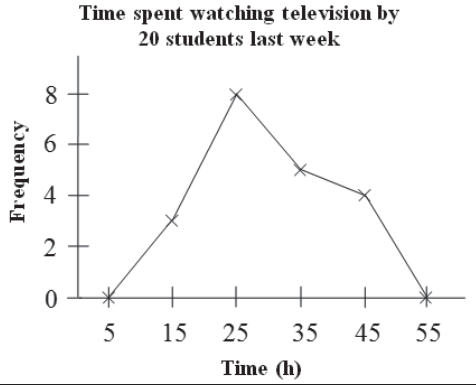
A.



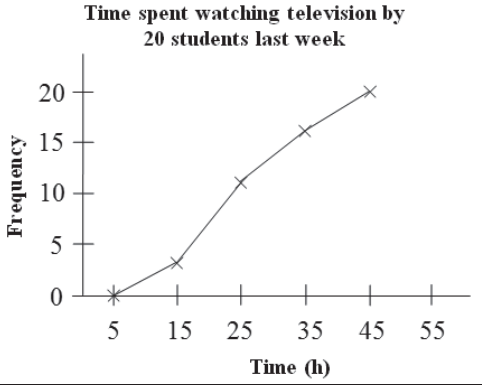
B.



C.



D.



Good Performance of Secondary 3 Students in Territory-wide System Assessment 2017

- Students with good performing demonstrated mastery of the concepts and skills assessed by the sub-papers. They were more able in numeracy skills and problem-solving skills, so they could solve various types of problems relating to directed numbers, percentages, numerical estimation, rate and ratio. Students had a thorough conceptual understanding of algebra and could observe patterns and express generality. They were able to deal with the basic operations, factorization and expansion of simple polynomials, and familiar with laws of indices and inequalities. They were capable of solving equations by using algebraic and graphical methods. They could also plot graphs of linear equations in 2 unknowns.

- Students with good performing were also capable of calculating the areas of simple plane figures and the surface areas and volumes of some solids. They were able to demonstrate good recognition of the concepts of transformation and symmetry, congruence and similarity, coordinate geometry, quadrilaterals, trigonometry, and Pythagoras' Theorem. In doing geometric proofs, they were able to write the correct steps and provide sufficient reasons to complete the proofs.

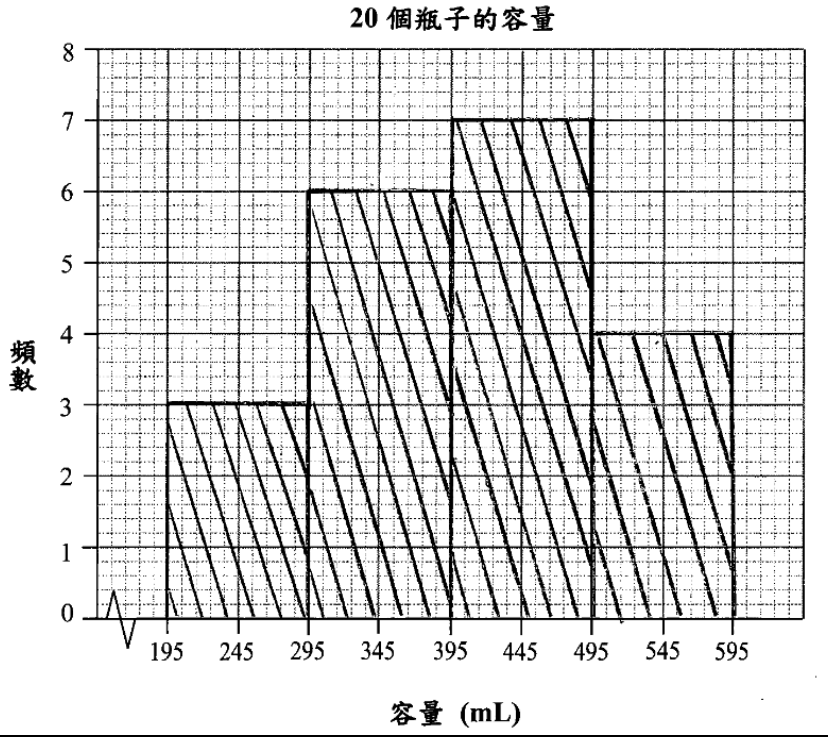
- Students with good performing had a good knowledge of the various stages of statistics. They were able to construct and interpret simple statistical charts, used statistical charts appropriately and read information from graphs. They were able to find the mean, median and mode/modal class, as well as identify sources of deception from a set of data. They could also grasp the basic concepts of probability.

The examples of work by these students are illustrated as follows:

Students were able to construct simple statistical charts by using the given data.

Q47/M4

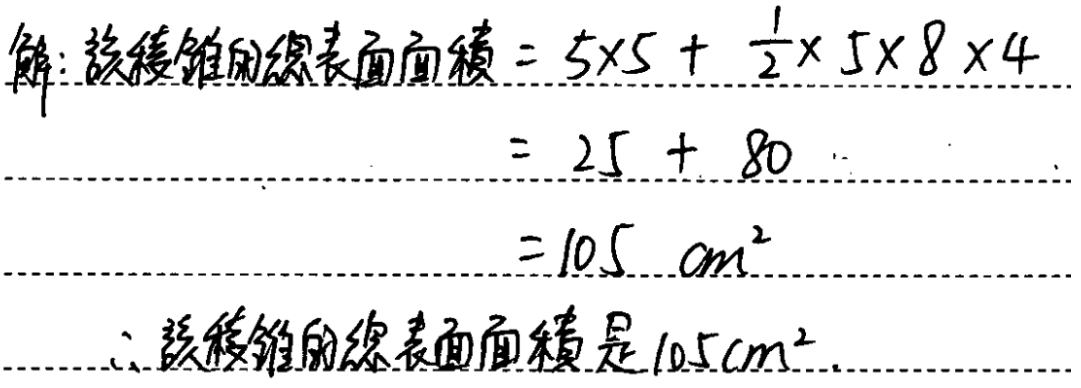
Example of Student Work (Construct simple statistical charts)



Students were able to solve the problem correctly with complete and clear presentation.

Q43/M1

Example of Student Work (Find the total surface area of the pyramid)



Students were able to make good use of the given conditions and solve the problem systematically.

Q44/M3

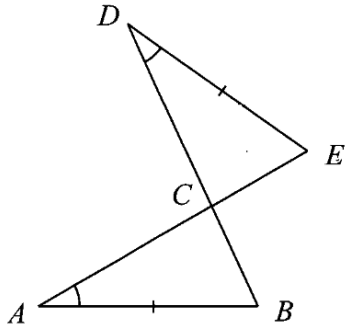
Example of Student Work (Estimate the height of the building)

Using the lamppost as a unit,
the height of the building can approximately fit 5 lampposts
∴ the height of the building ≈ 5 × height of lampposts
= 5×4
= 20 m //

Q46/M4

Example of Student Work (Geometric proof)

在 △ABC 和 △DEC 中,
AB = DE (已知)
∠DCE = ∠ACB (對頂角)
∠EDC = ∠BAC (已知)
∴ △ABC ≅ △DEC (A.A.S.) //



Some common weaknesses of high-achieving students were that:

- Some students were not familiar with the concepts of some terminologies such as coefficients and degree.
- Some students were not able to distinguish discrete and continuous data.
- Some students were not able to recognize that the shape of a figure will not be changed after reflection.

Overview of Student Performances in Mathematics at Secondary 3 Territory-wide System Assessment 2015-2017

The percentage of students achieving Basic Competency in the Territory-wide System Assessment this year was 79.9% which was about the same as last year.

The percentages of students achieving Basic Competency from 2015 to 2017 are listed below:

Table 8.9 Percentages of S.3 Students Achieving Mathematics Basic Competency from 2015 to 2017

Year	% of Students Achieving Mathematics Basic Competency
2015	79.9
2016	80.0
2017	79.9

The performances of S.3 students over the past three years in each dimension of Mathematics are summarized in the following table:

Table 8.10 Overview of Student Performances in Mathematics at S.3 Territory-wide System Assessment 2015-2017

Year / Number and Algebra	2015	2016	2017	Remarks
Strengths	• Students demonstrated recognition of the number line. They could also use directed numbers to describe real life situations. • Students were able to determine whether to estimate or to compute the exact value in a simple context. • Students were able to round off a number to a certain number of significant figures. They demonstrated recognition of scientific notation. • Students were able to solve simple selling problems and problems on depreciations. • Students were able to solve problems by using ratio. • Students were able to translate word phrases/contexts into algebraic languages. • Students were able to substitute values into formulas to find the unknown value. • Students were able to formulate equations from simple contexts.	• Students could use directed numbers to describe real life situations. They also recognized the ordering of integers on the number line. • Students could determine whether to estimate or to compute the exact value in a simple context. • Students were able to round off a number to a certain number of significant figures. • Students were able to solve simple selling problems by using percentages. • Students were able to solve problems by using rate and ratio. • Students were able to substitute values into formulas to find the unknown value. • Students could formulate equations from simple contexts. • Students demonstrated recognition of inequalities.	• Students did well in the operations of directed numbers. They demonstrated recognition of the number line. They could also use directed numbers to describe real-life situations. • Students were able to solve simple problems on depreciations. • Students were able to convert numbers in scientific notation to integers and round off a number to 3 significant figures. • Students were able to solve simple problems by using rate. • Students were able to solve a system of linear simultaneous equations by algebraic methods. • Students were able to substitute values into formulas to find the unknown values. • Students demonstrated recognition of inequalities.	• Students were good at answering simple and straightforward questions involving simple calculations. • Many students were not familiar with the concepts of some terminologies (e.g. constant terms of polynomials, simple interest and compound interest) and so they answered incorrectly. • Quite a number of students estimated values by rounding off only, without considering the actual requirement of the question. • Many students were not able to master some basic concepts of mathematics. For example, they were weak in dealing with fractions and using brackets in expressions. • Statements/conclusions were often omitted when students attempted the long questions in Section C.

Year / Number and Algebra	2015	2016	2017	Remarks
Weaknesses	• Students were quite weak in recognizing the concepts of profit, selling price and so many of them could not find the cost price correctly. • Many students confused compound interest with simple interest, as well as amount with interest. Consequently, they used the incorrect methods in solving problems. • Many students could not distinguish polynomials from algebraic expressions. • Students' performance was only fair in factorization and expansion of simple polynomials. • Without being given a table to assist calculation of coordinates, many students were not able to plot the graph of a linear equation correctly. • Students' performance was weak when they were asked to perform change of subject in simple formulas.	• Students mixed up simple interest and compound interest. Consequently, they used the incorrect methods in solving problems. • Students were weak in recognizing the terminologies of polynomials. • Students could not distinguish whether an equality is an equation or an identity. • Students were weak in manipulating algebraic fractions.	• Quite a number of students were not able to estimate values with reasonable justifications. • Students mixed up the formulas for finding simple interest and compound interest. • Quite a number of students were not able to distinguish polynomials from algebraic expressions. • Students were weak in recognizing the terminologies of polynomials. • Students' performance was only fair in change of subject in simple formulas.	

Year / Measures, Shape and Space	2015	2016	2017	Remarks
Strengths	• Students were able to find the range of measures from a measurement of a given degree of accuracy and choose an appropriate unit and the degree of accuracy for real-life measurements. • Students were able to find the areas of sectors and the volumes of pyramids. • Students were able to identify the relationship between simple 3-D solids and their corresponding 2-D figures. • Students were able to determine the order of rotational symmetry from a figure. • When the object and its image were given, students were able to identify the single transformation involved. • Students were able to demonstrate recognition of the conditions for congruent and similar triangles. • Students were able to use the angle properties associated with intersecting lines/parallel lines and the properties of triangles to solve simple geometric problems. • Students had good knowledge of the rectangular coordinate system.	• Students were able to choose an appropriate unit and the degree of accuracy for real-life measurements. • Students were able to select the appropriate ways to reduce errors in measurements. • Students were able to find the volumes of cones. • Students could identify the relationship between simple 3-D solids and their corresponding 2-D figures. They could also sketch simple solids. • When the object and its image were given, students could identify the single transformation involved. • Students could demonstrate recognition of terminologies on angles. • Students could use the angle properties associated with intersecting lines/parallel lines and the properties of triangles to solve simple geometric problems. • Students could recognize the axes of rotational symmetries of cubes. • Students had good knowledge of the rectangular coordinate system.	• Students were able to find the range of measures from a measurement of a given degree of accuracy and estimate measures with justification. • Students were able to select the appropriate ways to reduce errors in measurements. • Students were able to use the formulas of volumes of prisms, find the areas of sectors and the total surface areas of pyramids. • Students were able to identify the relationship between simple 3-D solids and their corresponding 2-D figures. • Students were able to demonstrate recognition of the concepts of transformation and symmetry. • Students were able to use the angle properties associated with intersecting lines/parallel lines and the properties of triangles to solve simple geometric problems. • Students were familiar with the properties of parallelograms. • Students had good knowledge of the rectangular coordinate system.	• Students could estimate measures. However, when they had to use their own words to explain the estimation methods, their explanations were very limited and incomplete. • Students did not understand the differences between some theorems, for instance, the difference between 'corr. $\angle$s equal' and 'corr. $\angle$s, $AB//CD$'. • Many students wrote the wrong units for the answers. • Many students used the mathematical symbols incorrectly.

Year / Measures, Shape and Space	2015	2016	2017	Remarks
Weaknesses	• Students were weak in abstract concepts (such as using relationship of similar figures to find measures). • Many students could not determine whether a polygon is equiangular. • Students could not demonstrate recognition of adjacent angles. • Quite a number of students could not identify the angle between a line and a horizontal plane. • Students in general could not complete the proofs of simple geometric problems related with angles and lines. • Quite a number of students could not identify perpendicular bisectors of a triangle.	• Students' performance was quite weak in finding the total surface areas of cylinders. • Students were weak in abstract concepts (such as distinguishing among formulas for volumes by considering dimensions). • Students could not demonstrate recognition of common terms in geometry. • Quite a number of students were not able to recognize straight angles and concave polygons. • Students could not demonstrate recognition of the conditions for congruent and similar triangles. • Students in general could not complete the proofs of simple geometric problems.	• Students in general were unable to use relationship of similar figures to find measures and distinguish among formulas for areas by considering dimensions. • Many students were not able to determine whether a polygon is equilateral. • Students were quite weak in recognizing the conditions for congruent and similar triangles. • Students were weak in identifying the planes of reflectional symmetries of cubes. • Students in general were not able to complete the proofs of simple geometric problems. • Many students were not able to name the angle between a line and a plane. • Students' performance was only fair in applying the conditions for two perpendicular lines.	

Year / Data Handling	2015	2016	2017	Remarks
Strengths	• Students could use simple methods to collect data. • Students could read information from diagrams and interpret the information. • Students could choose appropriate diagrams/graphs to present a set of data. • Students were able to calculate the theoretical probability by listing.	• Students could use simple methods to collect data. • Students could organize the same set of data by different grouping methods. • Students could construct and interpret simple statistical charts. • Students were able to compare the presentations of the same set of data by using statistical charts. • Students could identify sources of deception in misleading graphs/accompanying statements.	• Students were able to use simple methods to collect data. • Students were able to interpret simple statistical charts. • Students were able to choose appropriate diagrams/graphs to present a set of data. • Students were able to find mean and median from a set of ungrouped data. • Students' performance was quite good in calculating probabilities.	• Many students mixed up different types of statistical graphs. • Students were willing to describe the sources of deception in cases of misuse of averages, but in general, they were not able to give sufficient explanations.
Weaknesses	• Students' performance was only fair in distinguishing discrete and continuous data. • Students in general could not construct stem-and-leaf diagrams correctly. • Many students could not compare the presentations of the same set of data by using statistical charts. • Quite a number of students were not able to find averages from a set of grouped data.	• Students could not read upper quartiles from diagrams/graphs. • Without providing the table or tree diagram for guidance, quite a number of students were not able to calculate the theoretical probability.	• Students' performance was only fair in distinguishing discrete and continuous data. • Students in general were not able to construct histograms correctly. • Quite a number of students were not able to identify sources of deception in cases of misuse of averages.	

Comparison of Student Performances in Mathematics in Primary 3, Primary 6 and Secondary 3 in 2017

The percentages of P.3, P.6 and S.3 students achieving Basic Competency from 2004 to 2017 are as follows:

Table 8.11 Percentages of Students Achieving Mathematics Basic Competency

Year / Level	% of Students Achieving Mathematics BC													
	2004	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
P.3	84.9	86.8	86.9	86.9	86.9	#	87.0	87.0	87.3	87.5	87.4	87.6	89.9$^{\Delta}$	88.2$^{\nabla}$
P.6	--	83.0	83.8	83.8	84.1	#	84.2	84.1	^	84.2	^	84.0	^	84.0
S.3	--	--	78.4	79.9	79.8	80.0	80.1	80.1	79.8	79.7	79.9	79.9	80.0	79.9

\# Due to Human Swine Influenza causing the suspension of primary schools, the TSA was cancelled and no data has been provided.

^ The 2012, 2014 and 2016 P.6 TSA were suspended. As participation in the 2012, 2014 and 2016 P.6 TSA was on a voluntary basis, not all P.6 students were involved and hence no territory-wide data is provided in this report.

$^{\Delta}$ The 2016 P.3 level assessment was conducted as part of the 2016 Tryout Study. The BC attainment rate was calculated using the data from some 50 participating schools.

$^{\nabla}$ The 2017 P.3 level assessment was conducted as part of the 2017 Research Study, which was extended to all primary schools in the territory.

A comparison of strengths and weaknesses of P.3, P.6, and S.3 students enables teachers to devise teaching strategies and tailor curriculum planning at different key stages to adapt to students' needs. The dimensions of Mathematics Curriculum at each key stage belong to different dimensions as shown below:

Table 8.12 Dimensions of Mathematics Curriculum for Primary 3, Primary 6 and Secondary 3

	Primary 3	**Primary 6**	**Secondary 3**
Dimension	Number	Number	Number and Algebra
		Algebra	
	Measures	Measures	Measures, Shape and Space
	Shape and Space	Shape and Space	
	Data Handling	Data Handling	Data Handling

The following table compares student performances in Mathematics in Primary 3, Primary 6 and Secondary 3 in 2017:

Table 8.13 Comparison of Student Performances in Mathematics in Primary 3, Primary 6 and Secondary 3 in 2017

Dimension \ Level	P.3	P.6	S.3
Number	• Students were able to recognize the places and the values of digits in a whole number. • Students performed arithmetic calculations with numbers up to 3 digits. However, some of them neglected the computational rule of doing 'multiplication before addition'. • Students were capable of solving application problems involving mixed operations by presenting correct working steps. A few students confused multiplication with division; the minuend with the subtrahend. • Students understood the concept of fractions as a part of one whole and recognized the relationship between fractions and the whole. They were able to compare fractions. • Students were able to solve application problems involving the addition or the multiplication of money.	• Students were capable of recognizing the place values in whole numbers and decimals. • Students could perform arithmetic operations on whole numbers, fractions and decimals. • Some students neglected the computation rule of "performing multiplication/division before addition/subtraction" when carrying out mixed operations. • Students could understand the concept of a fraction as parts of one whole and compare fractions. • Students could solve application problems and show the working steps. • Some students were weak in presenting solutions to application problems involving fractions or percentages. • Students were capable of choosing appropriate mathematical expressions for finding an estimate.	• Students were able to perform the operations of directed numbers and use directed numbers to describe real-life situations. • Students could use rate and ratio to solve simple problems. • Students could judge the reasonableness of answers from computations. They tried to explain their estimation strategies. However, some of their explanations were incomplete or contained mistakes. • Students did well in using percentages to solve simple problems on selling and depreciations. Some students confused the formula of finding simple interest with that of compound interest.
Algebra	N.A.	• Students were capable of using symbols to represent numbers. • Students were capable of solving equations involving at most two steps in the solutions. • Students were capable of solving problems by simple equations.	• Students were able to substitute values into formulas and find the value of unknowns. • Students were weak in recognizing the terminologies of polynomials. • Students' performance was quite good in addition, subtraction and expansion, and fair in factorization of polynomials. • Students were able to use the properties of inequalities to solve problems. They performed satisfactorily when they applied the laws of integral indices.

Level / Dimension	P.3	P.6	S.3
Measures	• Students were capable of reading the price tags and using Hong Kong money. A few students' performance was only fair in money exchange. • Students could find the correct dates and days of a week from a calendar and tell time on a clock face and a digital clock. • Students were able to measure and compare the length and weight of objects. However, some students were comparatively weak in reading the capacity of containers. • Students were able to choose appropriate tools to measure the length and weight of objects, and the capacity of containers. • Students in general could record the length and weight of objects with appropriate units.	• Students could write the correct dates and days of a week. • Students were capable of applying the '24-hour time' but some students could not measure the time duration of activities. • Students were capable of recording the length, weight and capacity with appropriate units. • Students were capable of measuring and comparing the capacity of containers. • Students could apply the formula for finding the circumference. • Students could calculate the perimeter and area of simple 2-D shapes as well as the volume of cubes and cuboids. • Students could apply the speed formula to solve problems.	• Students were able to choose an appropriate unit and the degree of accuracy for real-life measurements. They could select the appropriate ways to reduce errors in measurements. • Students were able to calculate arc lengths, areas of sectors, volumes of pyramids and prisms. • Quite a number of students were able to estimate measures and give reasonable explanations. • Students were weak in abstract concepts (such as distinguishing among formulas for areas by considering dimensions).

Dimension \ Level	P.3	P.6	S.3
Shape and Space	• Students were able to identify pyramids/cones, prisms/cylinders and spheres. Some of them could not classify prisms and pyramids; cylinders and cones. • Students were capable of identifying different 2-D shapes. • Students were good at identifying straight lines, curves and parallel lines. A few students were not able to recognize perpendicular lines. • Students could recognize right angles and compare the size of angles. • Students were able to recognize the four directions, namely, north, east, south and west.	• Students could recognize cones, pyramids, cylinders, prisms and spheres. • Students were capable of identifying 2-D shapes in different orientations and recognizing their characteristics. • Students could recognize the eight compass points.	• Students were not able to demonstrate recognition of some common terms in geometry (e.g. equilateral polygons, straight angles). • Students could identify the relation between simple 3-D solids and their corresponding 2-D figures. They could also sketch simple solids. • Some students could not name the angle between a line and a plane. • Students were not familiar with the conditions for congruent and similar triangles. • Students had good knowledge of the rectangular coordinate system. However, their performance was fair only when they had to find areas of simple figures. • Students performed satisfactorily in applications of trigonometry. • Students could deal with simple symmetry and transformation. • Students performed quite well in writing proofs by using the conditions for congruent and similar triangles. When angles and lines were related, many students were not able to correctly provide reasons or complete the proofs.

Dimension \ Level	P.3	P.6	S.3
Data Handling	• Students were good at reading pictograms with one-to-one representation. They could retrieve data from the pictogram to answer simple questions. • Students were able to construct pictograms using one-to-one representation by referring to the given raw data.	• Students were capable of reading pictograms and bar charts, including those of greater frequency counts. • Students could extract the information provided in statistical graphs in order to answer questions. • Students could construct pictograms and bar charts with suitable titles. • Students were capable of finding the average of a group of data and solving simple problems of averages.	• Students recognized the basic procedures of statistical work and the data collection methods. • Quite a number of students were not able to distinguish between discrete and continuous data. • Students could interpret simple statistical charts and choose appropriate diagrams / graphs to present a set of data. • Some students were not able to construct histograms. • Some students were not able to identify sources of deception in misleading graphs or in cases of misuse of averages. • Some students were not able to calculate the mean from grouped data, but they performed well in the cases of ungrouped data. • Students' performance was quite good in calculating the probabilities.