Results of Secondary 3 Mathematics in TSA 2014

The territory-wide percentage of S.3 students achieving Mathematics Basic Competency in TSA 2014 was 79.9%. The proportion achieving basic competency in 2014 was almost the same as that of last year.

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 160 test items (218 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. Each student was required to attempt one sub-paper only. The number of items on the various sub-papers is summarized in Table 8.4. These numbers include several overlapping items that appear in more than one sub-paper to enable the equating of test scores.

Table 8.4 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(30)	23(30)	22(31)	23(33)	72(97)
Measures, Shape and Space	21(30)	21(29)	21(27)	20(26)	70(95)
Data Handling	6(8)	6(9)	6(10)	6(9)	18(26)
Total	50(68)	50(68)	49(68)	49(68)	160(218)

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

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

Table 8.5 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 S.3 Students with Minimally Acceptable Levels of Basic Competence in TSA 2014

S.3 Number and Algebra Dimension

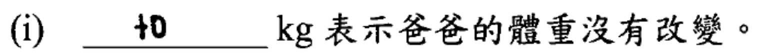
S.3 students performed steadily in this Dimension. The majority of students demonstrated recognition of the basic concepts of directed numbers, formulating problems with algebraic language and linear inequalities in one unknown. Performance was only satisfactory in items related to rate and ratio, manipulations and factorization of simple polynomials. Comments on students' performances 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.***

Number and Number Systems

- Directed Numbers and the Number Line: Students were able to handle the simple operation of directed numbers. They could also demonstrate recognition of the ordering of integers on the number line. However, some students could not use directed numbers to correctly describe real life situations. They did not realize that zero is neither positive nor negative.

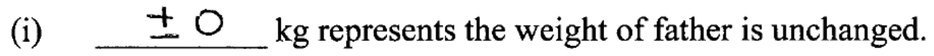
Q21/M1

Example of Student Work (Use directed numbers to represent the changes of the weights – mistakenly took zero as positive)



(i) +0 kg 表示爸爸的體重沒有改變。

Example of Student Work (Use directed numbers to represent the changes of the weights – mistakenly took zero as positive or negative)

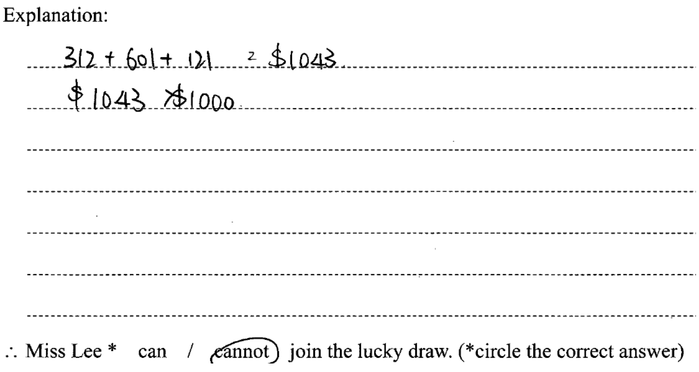


(i) ± 0 kg represents the weight of father is unchanged.

- Numerical Estimation: The majority of students were able to determine whether the value mentioned in a simple context is obtained by estimation or by computation of the exact value. Quite a number of students could estimate values with reasonable justifications. Nevertheless, some students were not able to judge the reasonability of answers by the given information of the question.

Q47/M3

Example of Student Work (Estimate the total amount that Miss Lee paid for the items – The student did not give an approximation for the price of each of the items. The conclusion is also incorrect.)



Explanation:

312 + 601 + 121 = $1043

$1043 > $1000

∴ Miss Lee * can / [✓ cannot] join the lucky draw. (*circle the correct answer)

Example of Student Work (Rounding off the prices of all items)

理由：

售價 = 310 + 600 + 120

= 1030元

∵ 1030元是似估了的售價，它是把貨品的售價四捨五入至个位，而1030元

> 1000元

∴李小姐 *[✓ 能夠] ／ 不能夠 參加抽獎。 (*圈出正確答案)

Example of Student Work (Good performance)

Explanation:

She should use a round down method to estimate the

total amount of items and whether she can join the

lucky draw.

Estimation: 300 + 600 + 100

≈ $1000

∵ The estimation = $1000, and the method is round down,

we know that the actual amount must be bigger than the estimation.

∴ Miss Lee * [✓ can] / cannot join the lucky draw. (*circle the correct answer)

- Approximation and Errors: When students were asked to round off a number, they usually confused rounding a number to 3 decimal places with 3 significant figures. Only half of the students were able to represent a large number in scientific notation.

Q22/M3
Exemplar Item (Round off a number to 3 decimal places) Round off 0.005 816 to 3 decimal places.
Example of Student Work (Mistakenly rounded off the number to 3 significant figures) 0.0058 2
Example of Student Work (Mistakenly rounded off the number to 2 decimal places) 0.01

Q22/M1
Exemplar Item (Use scientific notation to represent a number) The distance between Hong Kong and Los Angeles is about 11 700 km. Use scientific notation to represent this number.
Example of Student Work (Could not represent the number in scientific notation) 117×10^2 **km**
Example of Student Work (Could not represent the number in scientific notation) 11.7×10^3 **km**

- Rational and Irrational Numbers: The majority of students were able to demonstrate recognition of the integral part of $\sqrt{a}$, though some students could not recognize the position of fractions represented on the number line.

Comparing Quantities

- Using Percentages: Students did quite well in solving problems regarding selling prices, growths and depreciations. Nevertheless, their performance was fair when they were asked to find the loss per cent. Some students confused the formulae of finding simple interest with that of compound interest.

Q42/M4
Exemplar Item (Find the cost price and the loss per cent) A guitar is sold for $1 200 at a loss of $300. Find the **cost price** and the **loss per cent** of the guitar.
Example of Student Work (Mistakenly used $\frac{\text{selling price-cost price}}{\text{cost price}} \times 100\%$ to calculate the loss per cent) 成本 1200 + 300 = $1500 // 虧蝕百分率 $\frac{1200-1500}{1500} \times 100\%$ = −20% //

Example of Student Work (Mistakenly used $\frac{\text{cost price-selling price}}{\text{selling price}} \times 100\%$ to calculate the loss per cent)

結他的成本：$1200 + $300

= $1500。

結他的虧蝕百分率：

$$\frac{\$1500 - \$1200}{\$1200} \times 100\%$$

= 25%。

Example of Student Work (Correct solution)

設結他的成本為 x，亏蝕百分率為 y

$1200 + 300 = x$

$x = \$1500$

$1500 \times (1 - y) = 1200$

$y = 20\%$

∴ 成本為 $1500，亏蝕百分率為 20%

Q43/M4

Exemplar Item (Find the simple interest and the amount)

Mandy deposits $3500 in a bank at a simple interest rate of 3% p.a. Find the **interest** and the **amount** she will receive after 4 years.

Example of Student Work (Mistakenly used the formula for finding the amount of compound interest)

~~本利和 = 3500 × 3% × 4~~

~~= $420~~

本利和 = $3500(1+\overset{3\%}{\cancel{0.03}})^4$

= $3939.3

Q41/M3

Exemplar Item (Find the compound interest and the amount)
Calvin deposits $2 000 in a bank at an interest rate of 5% p.a. compounded yearly. Find the **amount** and **interest** he will receive after 2 years.

Example of Student Work (Confused compound interest with simple interest)

本利和：

$2000(1+\frac{5}{100})^2$

$=\$2205$

利息：

$\frac{2000\times2\times5}{100}$

$=\$200$

- Rate and Ratio: The performance of students was only fair when using ratio to solve real-life problems, with some of them confusing ratio with rate. Nevertheless, students performed well when they had to use rate to solve simple problems.

Q42/M2

Exemplar Item (Find the weight of copper in the alloy by using ratio)
An alloy is made of two metals, tin and copper, in the ratio 3 : 22 by weight. If the weight of the alloy is 50 kg, find the weight of copper in the alloy.

Example of Student Work (Could not understand the problem)

$50\times\frac{3}{22}$

$=6.82$

銅在合金中佔了 6.82 kg

Example of Student Work (Correct solution)

設銅的重量為 x kg

$\frac{22}{3+22}=\frac{x}{50}$

$3x+22x=1100$

$x=44$

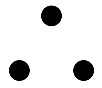
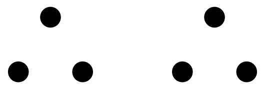
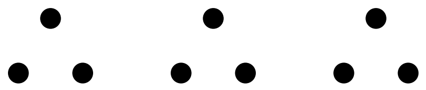
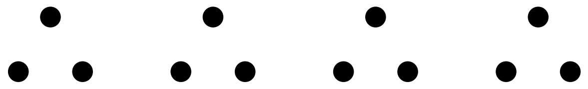
∴銅在該合金中的重量為 44 kg。

Observing Patterns and Expressing Generality

- Formulating Problems with Algebraic Language: Students could distinguish the difference between $3x$ and $3 + x$; x^2 and $2x$. They were able to translate word phrases/ contexts into algebraic languages, substitute values into formulas and find the value of a variable and formulate simple equations from simple contexts. They could also write down the next few terms in sequences from several consecutive terms that were given. Nevertheless, some students could not intuitively find the n^{th} term of a simple number sequence and find the terms of the sequence from a given n^{th} term.

Q25/M3

Exemplar Item (Find the n^{th} term of a number sequence)
Figure 1 to Figure 4 consist of 3, 6, 9 and 12 dots respectively.

Figure 1	
Figure 2	
Figure 3	
Figure 4	

According to the above pattern, how many dots does Figure n consist of ? (Express the answer in terms of n)

Example of Student Work (Could not find the n^{th} term of the number sequence correctly)

$n+3$

Example of Student Work (Could not find the n^{th} term of the number sequence correctly)

3^n

- Manipulations of Simple Polynomials: Quite a number of students could not distinguish polynomials from algebraic expressions. They were weak in the recognition of terminologies such as number of terms and coefficients. There was room for improvement in dealing with the manipulations of simple polynomials.

Q25/M4

Exemplar Item (Find the coefficient of a term in a polynomial)

Find the coefficient of y^6 in the polynomial $3y^4 - 5y^6$.

Example of Student Work (The sign '–' was neglected)

y^6 的係數是 5 。

Q26/M2

Exemplar Item (Simplify the polynomials)

Simplify $(3h-4k)+(2h-7k)$.

Example of Student Work (The student confused addition with multiplication of polynomials)

$6h^2+13hk-28k^2$

Example of Student Work (The student confused addition with multiplication of polynomials)

$8hk$

- Laws of Integral Indices: Students performed quite well in simplifying algebraic expressions by laws of integral indices.

Q45/M1

Example of Student Work (Has mistakenly taken $(x^m)^n = x^{m+n}$ in part (b))

(a) $\frac{w^{11}}{w^8}$

$= w^{11-8}$

$= w^3$ #

(b) $\frac{x^{11}}{(x^2)^4}$

$= \frac{x^{11}}{x^{2+4}}$

$= \frac{x^{11}}{x^6}$

$= x^5$ #

Example of Student Work (Has mistakenly taken $\frac{x^m}{x^n} = x^{m+n}$)

解:

a) $\frac{w^{11}}{w^8}$	b) $\frac{x^{11}}{(x^2)^4}$
$= \frac{w^{11+8}}{1}$	$= \frac{x^{11}}{x^8}$
$= w^{19}$ //	$= \frac{x^{11+8}}{1}$
	$= x^{19}$ //

- Factorization of Simple Polynomials: Student performance was fair in factorizing simple polynomials by taking out common factors and by using the perfect square expressions. Students were weak in using the difference of two squares and the cross method.

Q28/M1

Exemplar Item (Factorize the expression by using the cross method)

Factorize $2x^2 - 5x + 2$.

Example of Student Work (The coefficients are the half of the original only)

$(x-2)(x-\frac{1}{2})$

Q28/M3

Exemplar Item (Factorize the expression by using the difference of two squares)

Factorize $1-25x^2$.

Example of Student Work (Could express the polynomials in the form of $a^2 - b^2$, but $a^2 - b^2 = (a-b)(a-b)$ was not applied)

$1-(5x)^2$

Example of Student Work (Mistakenly took $a^2 - b^2 = (a-b)^2$)

$(1-5x)^2$

Algebraic Relations and Functions

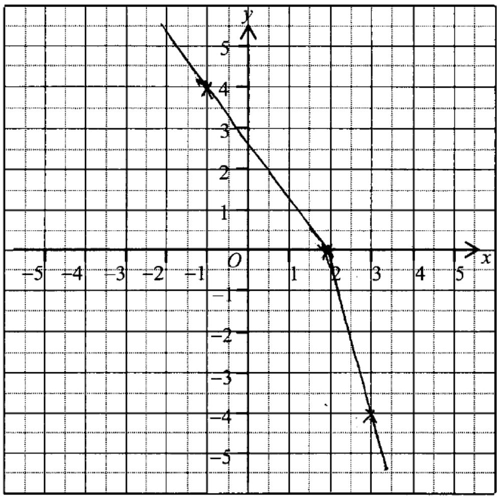
- Linear Equations in One Unknown: Students were able to solve simple equations, but they were weak in recognition of the meaning of roots of equations.
- Linear Equations in Two Unknowns: Student performance was fair in plotting graphs of linear equations in 2 unknowns. They could use graphical methods and algebraic methods to solve linear simultaneous equations. Besides, they were also able to formulate simultaneous equations from simple contexts.

Q46/M1

Example of Student Work (Has mistakenly marked the point (0, 2) on the position of (2, 0))

$2x + y - 2 = 0$

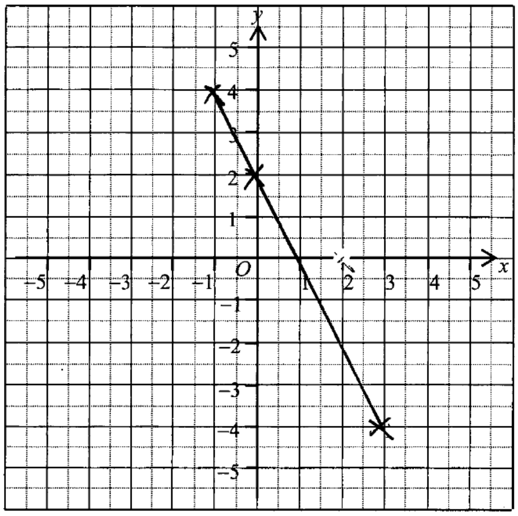
x	− 1	0	3
y	4	2	-4



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

$2x + y - 2 = 0$

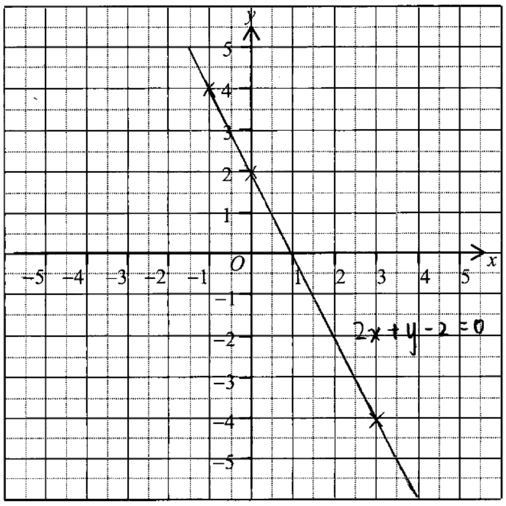
x	− 1	0	3
y	4	2	-4



Example of Student Work (Good performance)

$2x + y - 2 = 0$

x	-1	0	3
y	4	2	-4



Q44/M3

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

$\begin{cases} x = 2y+3 \text{ ———— } ① \\ x-y-10=0 \text{ ———— } ② \end{cases}$

② : $x - y - 10 = 0$

$x = 10 + y$ —— ③

③×2 : $x = 10 + y$

$2x = 20 + 2y$ —— ④

④ - ① : $x = 18$

By substituting $x = 18$ into ①,

$2y + 3 = 18$

$y = 7.5$.

$\therefore x = 18$,

$y = 7.5$. //

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

$\begin{cases} x = 2y+3 \ \ldots(1) \\ x - y - 10 = 0 \ \ldots(2) \end{cases}$

sub (1) into (2)

$(2y+3) - y - 10 = 0$

$3 - y - 10 = 0$

$3 - y = 10$

$y = -7$

sub $y = -7$ into (1)

$x = 2y+3$

$x = 2(-7)+3$

$x = -11$

Example of Student Work (Good performance)

$\begin{cases} x = 2y+3 \ -① \\ x - y - 10 = 0 \ -② \end{cases}$

把①代入②,

$2y+3-y-10=0$

$y=7$

把$y=7$代入①,

$x=2(7)+3$

$x=17$

$\therefore x=17$ //

$\therefore y=7$ //

- Identities: About half of the students were able to distinguish equations from identities. In the expansion of simple algebraic expressions, their performance was fair in using the difference of two squares and the perfect square expressions.

Q29/M4
Exemplar Item (Expand simple algebraic expressions by using the difference of two squares) Expand $(3y-1)(3y+1)$.
Example of Student Work (Has mistakenly taken $(a-b)(a+b)=(a-b)^2$ as an identity) $9y^2-6y+1$, $(3y-1)^2$
Example of Student Work (The student could apply $(a-b)(a+b)=a^2-b^2$, though mistakes were found in computation) $6y^2-1$

- Formulas: The majority of students could find the value of a specified variable in the formula. Quite a number of students were able to simplify algebraic fractions. The performance was fair in performing change of subject in simple formulas.

Q30/M4
Exemplar Item (Change of subject) Make D the subject of the formula $C=2D+9$.
Example of Student Work (Mistakes occurred in the computation) $D=\frac{C+9}{2}$
Example of Student Work (Could not demonstrate good recognition in change of subject) $2D=C-9$

- Linear Inequalities in One Unknown: Students could use inequality signs $\geq$, $>$, $\leq$ and $<$ to compare numbers and formulate inequalities from simple contexts. They demonstrated good recognition of the properties of inequalities. Their performance was fair in solving simple linear inequalities.

S.3 Measures, Shape and Space Dimension

S.3 students performed quite well in this Dimension. They could find areas and volumes in 2-D and 3-D figures, angles related with lines and rectilinear figures. They also performed well in estimation in measurement, transformation and symmetry, and problems related to quadrilaterals. However, more improvement could be shown in items related to coordinate geometry as well as deductive geometry. Comments on students' performances are provided below 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 performance of students was good. They were able to find the range of measures from a measurement of a given degree of accuracy, choose an appropriate measuring tool and technique as well as appropriate unit and the degree of accuracy for real-life measurements. They could choose an appropriate method to reduce errors in measurements. Quite a number of students could estimate measures with justification.

Q47/M2

Example of Student Work (Estimate the height of the wall – great discrepancy was found between the estimation and the actual situation)

1.5 × 4 = 6
∴ The wall is 6 m height.
In the picture, seems ~~the~~ michael is $\frac{1}{4}$ of the wall.

Example of Student Work (Good performance)

家強的身高佔了三格梯子，则一格梯子的高度为
$\frac{1.5}{3}$ = 0.5 m，牆壁的高度接近8格梯子，所以牆壁的
高度 ≈ 0.5 × 8
≈ 4 m

Example of Student Work (Good performance)

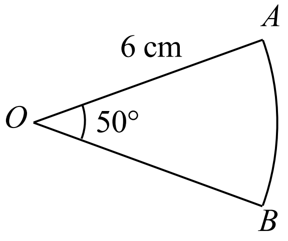
I estimate the height of the wall is 4 m. as the lader contains 8 stairs, and Michael's heigh is 1.5 m which equals to 3 stair's heigh, that means each stair's height is 0.5 m, and there are 8 stair in the lader, So the height of the lader is 4 m, as the lader's height is simular to the wall, So I estimate the height of the wall is 4 m also

- Simple Idea of Areas and Volumes: Students did quite well in using the formulas for circumferences and areas of circles. Their performance was fair in using formulas for the surface areas and volumes of solids.
- More about Areas and Volumes: Quite a number of students could use formulas to calculate arc lengths, areas of sectors, volumes of pyramids and surface areas of spheres. They were able to use relationships between the sides and volumes of similar figures to solve problems. Almost half of the students could distinguish among formulas for volumes by considering dimensions.

Q42/M3

Exemplar Item (Calculate the arc length)

In the figure, the radius of sector OAB is 6 cm and $\angle AOB = 50°$. Find the length of $\overset{\frown}{AB}$. Correct the answer to 3 significant figures.



Example of Student Work (Used the formula incorrectly)

$\overset{\frown}{AB} = \pi 6^2 \times \frac{50°}{360°}$

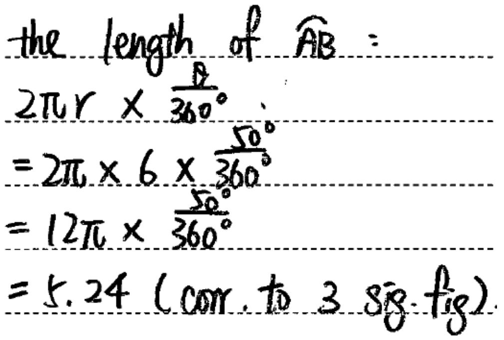
$= \overset{1}{\cancel{36}}\pi \times \frac{\overset{5}{\cancel{50°}}}{\cancel{360°}\,\cancel{36}\,1}$

$= 5\pi$

$= 15.7$ cm (準確至3位有效數字)

$\therefore \overset{\frown}{AB}$ 的長度是15.7 cm

Example of Student Work (Missing the unit)



the length of $\widehat{AB}$:

$2\pi r \times \frac{\theta}{360^\circ}$

$= 2\pi \times 6 \times \frac{50^\circ}{360^\circ}$

$= 12\pi \times \frac{50^\circ}{360^\circ}$

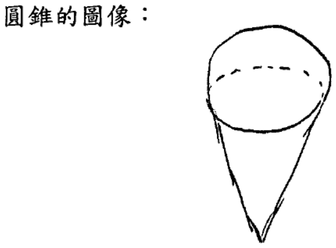
= 5.24 (corr. to 3 sig. fig.)

Learning Geometry through an Intuitive Approach

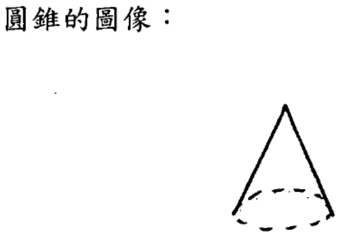
- Introduction to Geometry: Students could generally identify polygons, types of angles and 3-D solids from given nets. Quite a number of students were able to sketch a diagram of a cone and the cross-section of a given solid. However, they performed poorly in the recognition of regular polygons.

Q33/M1

Example of Student Work (Sketch a diagram of a cone – a hemi-sphere was drawn in the upper part of the diagram)



Example of Student Work (Sketch a diagram of a cone – the student didn't use solid curves and dotted curves appropriately)



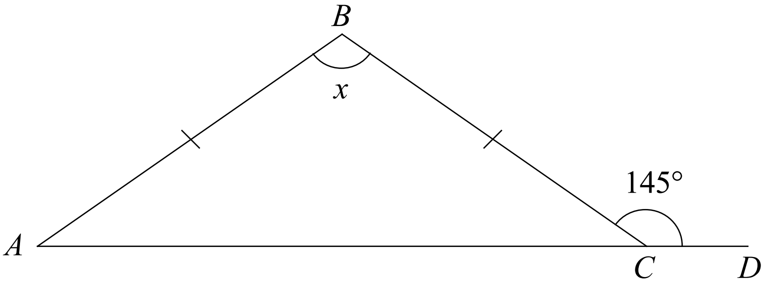
- Transformation and Symmetry: Students' performance was good. They demonstrated recognition of basic concepts, but their performance was only fair when they identified the image of a figure after a single transformation.

- Congruence and Similarity: Students could apply the properties of congruent and similar triangles to find the sizes of angles and the lengths of sides in general. They were able to identify whether 2 triangles are congruent or similar. Nonetheless, some students could not demonstrate recognition of the conditions for similar triangles.
- Angles related with Lines and Rectilinear Figures: Students' performance was satisfactory. They could solve simple geometric problems. However, some students presented their working steps poorly. Mistakes happened frequently in the calculation process.

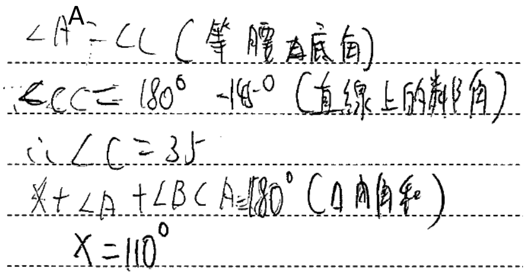
Q48/M4

Exemplar Item (Find the size of an angle)

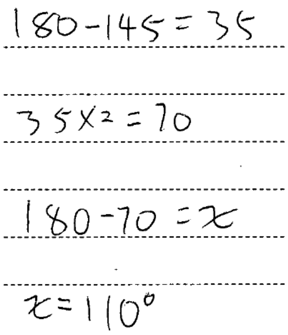
In the figure, ACD is a straight line. $BA = BC$ and $\angle BCD = 145°$. Find x.



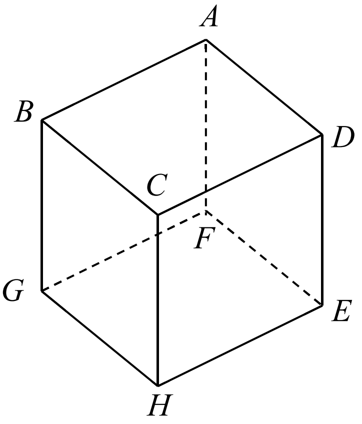
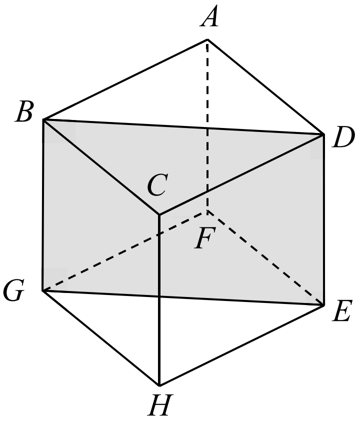
Example of Student Work (The notation $\angle C$ could cause confusion)


∠A = ∠C (等腰△底角)
∴∠C = 180° − 145° (直線上的鄰角)
∴∠C = 35
x + ∠A + ∠BCA = 180° (△內角和)
x = 110°

Example of Student Work (Poor presentation)


180 − 145 = 35
35 × 2 = 70
180 − 70 = x
x = 110°

- More about 3-D figures: Students were able to identify axes of rotational symmetries of cubes, the nets of right prisms and matching 3-D objects with various views. More than half of the students could name the angle between 2 planes. Nevertheless, they were still weak in the recognition of the projection of an edge on a plane and the planes of reflectional symmetries of cubes.

Q36/M2
Exemplar Item (Find the planes of reflectional symmetries of a cube) Figure I shows a cube *ABCDEFGH*. In Figure II, *BGED* is a plane of reflectional symmetry of the cube. Apart from the plane *BGED*, name **ONE OF THE OTHER** planes of reflectional symmetry containing vertex *B*.  Figure I  Figure II
Example of Student Work (The plane was labelled in an incorrect order) ABEHi
Example of Student Work (Has mistakenly chosen a plane of the cube) BCHG

Learning Geometry through a Deductive Approach

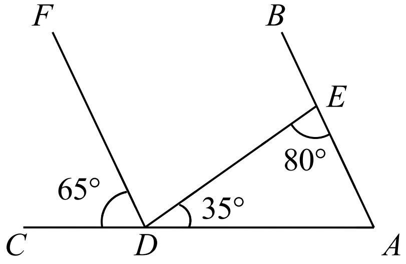
- Simple Introduction to Deductive Geometry: Many students were able to identify medians of a triangle. More than half of the students could write some correct steps for the geometric proofs, but most of them could not provide reasons or complete the proof correctly.

Q46/M3

Exemplar Item (Geometric proof)

In the figure, AEB and ADC are straight lines. $\angle CDF = 65°$, $\angle ADE = 35°$ and $\angle AED = 80°$.

Prove that $AB \,//\, DF$.



Example of Student Work (Could not provide sufficient reasons, without using "Corresponding angles equal" to show *FD* // *BA*)

$\angle FDC = 65°$

$\angle BAD + 80° + 35° = 180°$ (△內角和)

$\angle BAD = 65°$

$\therefore \angle BAD = \angle FDC = 65°$

$\therefore FD \,//\, DA$

Example of Student Work (Incorrect logical reasoning in the proof – used the conclusion *AB* // *DF* as a reasoning)

$\angle AED = 80° = \angle FDE$ (錯角; AB//DF)

$\angle EAD = 180° - 80° - 35°$ (△內角和)

$\angle EAD = 65°$

$\angle CDF = 65° = \angle EAD$ (同旁內角, AB//DF)

$\therefore AB \,//\, DF$

Example of Student Work (Good performance)

$\angle FDE + 65° + 35° = 180°$ (adj. ∠ on a st. line)

$\angle FDE = 80°$

$\angle BED + 80° = 180°$ (adj. ∠ on a st. line)

$\angle BED = 100°$

$\therefore \angle BED + \angle FDE = 180°$

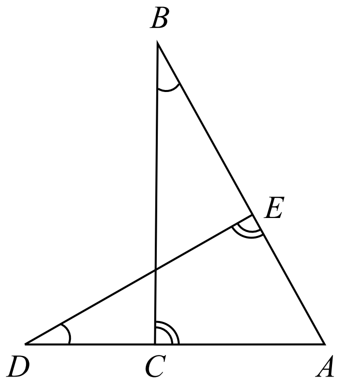
$\therefore AB \,//\, DF$ (int. ∠s supp.)

Q48/M1

Exemplar Item (Geometric proof)

In the figure, *AEB* and *ACD* are straight lines, $\angle ABC = \angle ADE$ and $\angle ACB = \angle AED$.

Prove that $\triangle ABC \sim \triangle ADE$.



Example of Student Work (Incorrect conclusion)

解：

$\angle ABC = \angle ADE$ (已知)

$\angle ACB = \angle AED$ (已知)

$\angle BAC = \angle EDA$ (公共角)

$\therefore \triangle ABC \cong \triangle ADE$ (S.S.S)$_{//}$

Example of Student Work (Could not provide appropriate reasons to support the argument)

$\frac{DE}{BA} = \frac{DA}{BC} = \frac{EA}{AC}$

$\therefore \triangle ABC \sim \triangle ADE$ (相似△对應边)

- Pythagoras’ Theorem: Quite a number of students could use Pythagoras’ Theorem and the converse of Pythagoras’ Theorem to solve simple problems.

- Quadrilaterals: Students performed well. They could use the properties of rectangles and parallelograms in numerical calculations.

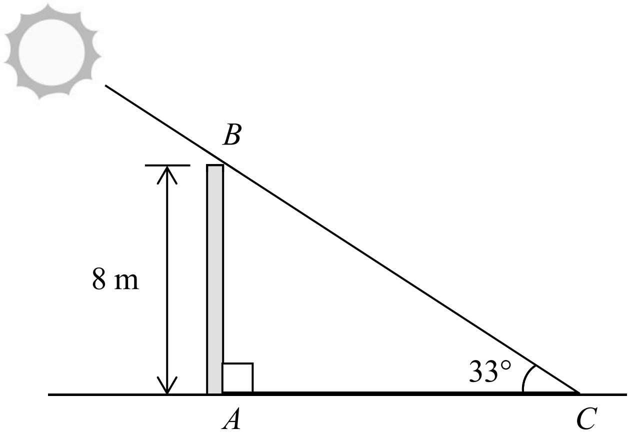
Learning Geometry through an Analytic Approach

- Introduction to Coordinates: Students could grasp the basic concepts. However, they did not do well in items related to a single transformation including reflection.

- Coordinate Geometry of Straight Lines: Students could use the formula for finding slopes of straight lines and the mid-point formula. However, their performance was only fair in finding the distance between two points and applying the conditions for perpendicular lines.

Trigonometry

- Trigonometric Ratios and Using Trigonometry: Students demonstrated good recognition of the ideas of sine, cosine and tangent ratios. Their performance was satisfactory in recognition of the idea of gradient, the angle of elevation and the angle of depression. Almost half of the students were able to solve simple 2-D problems involving one right-angled triangle.

Q49/M2
Exemplar Item (Find the length of a right-angled triangle) In the figure, a vertical pole is 8 m tall. The angle between the ray *BC* and the ground is 33°. Find the length of the shadow *AC* of the pole. Correct the answer to 1 decimal place. 
Example of Student Work (Poor presentation) $\tan 33^\circ = \frac{8}{AC}$ $AC = \frac{8}{\tan 33^\circ}$ $AC = 12.3$ m (準確至一位小數) $\therefore AC = 12.3$ m (準確至一位小數
Example of Student Work (Good performance) In $\triangle ABC$, $\angle BAC = 90^\circ$ $\tan 33^\circ = \frac{8}{AC}$ $AC = \frac{8}{\tan 33^\circ}$ $AC = 12.3189197...$ m $AC = 12.3$ m (cor. to 1 d.p.) $\therefore$ The length of the shadow AC of the pole is 12.3 m. (cor. to 1 d.p.)

S.3 Data Handling Dimension

The performances of S.3 students were satisfactory in this Dimension. They did well in items related to using simple methods to collect data, organizing the same set of data by different grouping methods, constructing simple statistical charts and interpretation of information, and calculating the probability. However, performance was weak when students were asked to choose appropriate diagrams to present a set of data and find the mean from a set of grouped data. 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***.

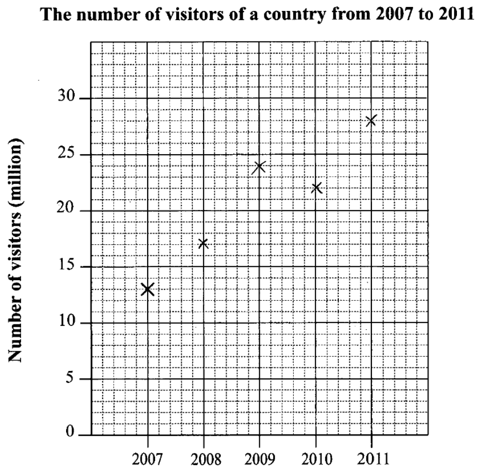
Organization and Representation of Data

- Introduction to Various Stages of Statistics: Students were able to demonstrate recognition of various stages of Statistics. They could use simple methods to collect and organize data. Moreover, about half of the students could distinguish discrete and continuous data.

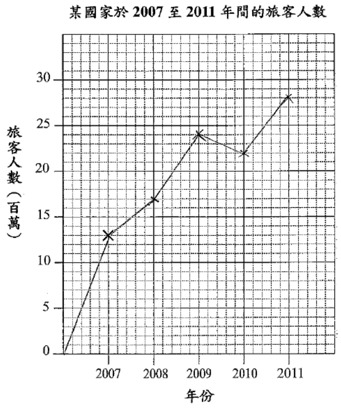
- Construction and Interpretation of Simple Diagrams and Graphs: Students could construct broken line graphs to represent a set of data and interpret simple statistical charts in general. They were able to compare the presentations of the same set of data by using statistical charts and read information from graphs. Nonetheless, many students were not able to choose appropriate diagrams/graphs to present a set of data.

Q49/M1

Example of Student Work (Construction of broken line graphs – without joining the points by line segments)



Example of Student Work (Construction of cumulative frequency polygons – the student mistakenly extended one end of the cumulative frequency polygon)



Analysis and Interpretation of data

- Measures of Central Tendency: Students could find the mean and median from a set of ungrouped data, though their performance was weak when a set of grouped data was provided. Students could identify sources of deception in cases of misuse of averages, but they could not give a complete explanation.

Q50/M2

Exemplar Item (Find the mean from a set of grouped data)

The table below shows the heights of 50 Secondary One students.

Height (cm)	140 – 144	145 – 149	150 – 154	155 – 159
Frequency	14	24	8	4

Find the mean height of the 50 Secondary One students.

Example of Student Work (Mistakenly considered the mean of frequencies)

Mean =

$$\frac{14+24+8+4}{4}$$

$= 12.5$ //

Example of Student Work (Without considering of the frequencies)

$\frac{140+144}{2} = 142$

$\frac{145+149}{2} = 147$

$\frac{150+154}{2} = 152$

$\frac{155+159}{2} = 157$

$$\frac{142+147+152+157}{4}$$

$= 149.5$

∴ 該 50名中一學生身高的平均數為 149.5 cm.

Q47/M4

The following are the marks of Michael in the past 5 mathematics tests (the full mark of each test is 100):

100, 100, 30, 50, 20

It is given that the mode of the marks is 100. Hence Michael said to his mother, 'I got full marks in more than half of the 5 tests.'
Is Michael's saying misleading? Explain your answer.

Example of Student Work (Insufficient and irrelevant explanation)

理由：

有,因為該次測驗的平均數是(100+100+30+50+20)÷5
= 60
和滿分100分相距甚遠。

∴我認為少輝的說法 *[✓ 有] / 沒有 誤導成份。 (*圈出正確答案)

Example of Student Work (Good performance)

Explanation:

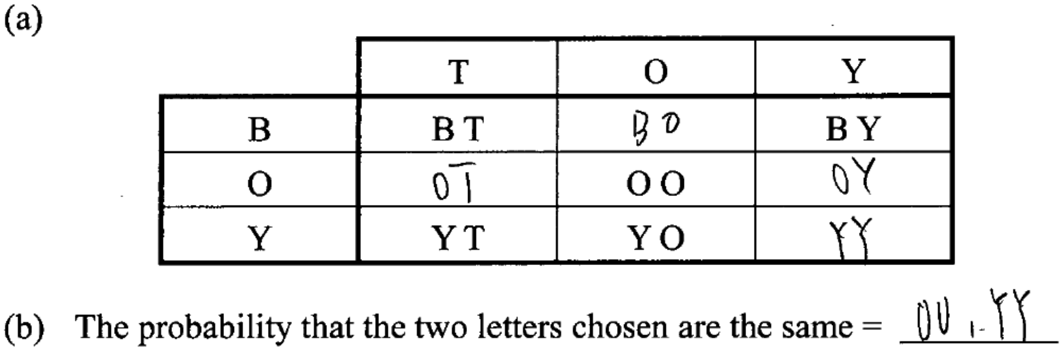
Mode is only the datum with the highest frequency. It doesnot necessary mean more than half of the 5 tests. He has to get 100 marks for 3 times in order to say he got full marks in more than half of the 5 tests (5 ÷ 2 = 2.5 times).
However, he has only got 2 full marks.

∴ Michael's saying * [✓ **is**] / **is not** misleading. (*circle the correct answer)

Probability

- Simple Idea of Probability: Students performed well. They were able to find the empirical probability and the theoretical probability by listing.

Q50/M1
Exemplar Item (Calculate the theoretical probability) A letter is randomly chosen from each of the two words ‘BOY’ and ‘TOY’ respectively. (a) Some of the possible outcomes are given in the table provided in the **ANSWER BOOKLET**. Fill in the remaining ones in the blanks. (b) Find the probability that the two letters chosen are the same.
Example of Student Work (Listed the letters only, without calculating the probability)

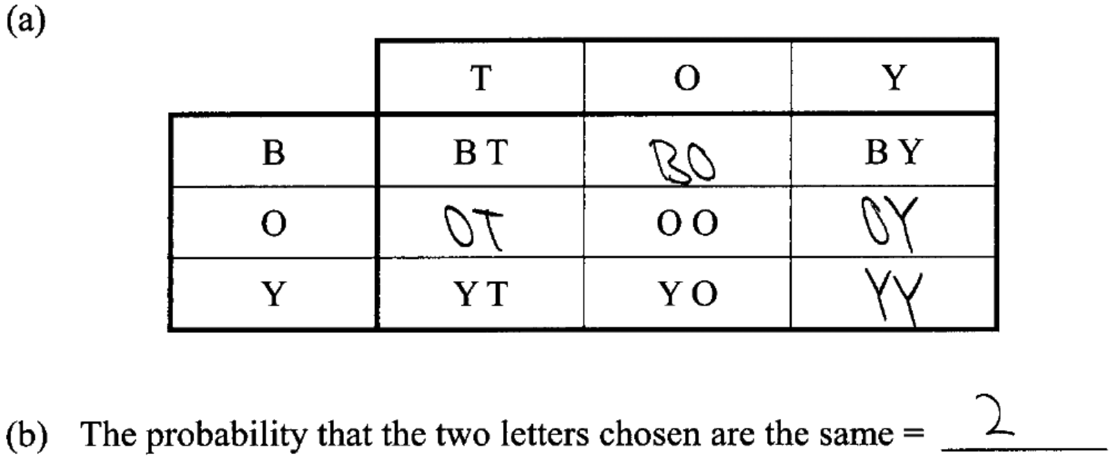


(a)

	T	O	Y
B	B T	BO	B Y
O	OT	O O	OY
Y	Y T	Y O	YY

(b) The probability that the two letters chosen are the same = OO , YY

Example of Student Work (Listed the number of outcomes that the two letters chosen are the same, without calculating the probability)



(a)

	T	O	Y
B	B T	BO	B Y
O	OT	O O	OY
Y	Y T	Y O	YY

(b) The probability that the two letters chosen are the same = 2

General Comments on S.3 Student Performances

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

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

Directed Numbers and the Number Line

- Demonstrate recognition of the ordering of integers on the number line (e.g. Q21/M2).
- Add, subtract, multiply and divide directed numbers (e.g. Q21/M3).

Approximation and Errors

- Convert numbers in scientific notation to integers or decimals (e.g. Q2/M1).

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. Q2/M3).

Rate and Ratio

- Use rate and ratio to solve simple real-life problems (e.g. Q24/M4).

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/M2).
- Translate word phrases/contexts into algebraic languages (e.g. Q3/M1).
- Substitute values into some common and simple formulas and find the value of a specified variable (e.g. Q24/M1).
- Formulate simple equations/inequalities from simple contexts (e.g. Q3/M4).
- Describe patterns by writing the next few terms in arithmetic sequences, geometric sequences, Fibonacci sequence or sequences of polygonal numbers from several consecutive terms of integral values (e.g. Q24/M2).

Factorization of Simple Polynomials

- Demonstrate recognition of factorization as a reverse process of expansion (e.g. Q5/M4).

Linear Equations in One Unknown

- Solve simple equations (e.g. Q6/M3).

Linear Equations in Two Unknowns

- Demonstrate recognition that graphs of equations of the form $ax + by + c = 0$ are straight lines (e.g. Q6/M1).
- Formulate simultaneous equations from simple contexts (e.g. Q7/M1).

Formulas

- Substitute values of formulas (in which all exponents are positive integers) and find the value of a specified variable (e.g. Q31/M2).

Linear Inequalities in One Unknown

- Use inequality signs $\geq$, $>$, $\leq$ and $<$ to compare numbers (e.g. Q30/M1).
- Demonstrate recognition of and apply the properties of inequalities (e.g. Q8/M4).
- Formulate linear inequalities in one unknown from simple contexts (e.g. Q8/M1).

Estimation in Measurement

- Find the range of measures from a measurement of a given degree of accuracy (e.g. Q9/M1).
- Choose an appropriate unit and the degree of accuracy for real-life measurements (e.g. Q9/M3).
- Reduce errors in measurements (e.g. Q10/M4).

Introduction to Geometry

- Demonstrate recognition of common terms in geometry (e.g. Q11/M4).
- Identify types of angles with respect to their sizes (e.g. Q12/M3).
- Make 3-D solids from given nets (e.g. Q12/M2).

Transformation and Symmetry

- Determine the number of axes of symmetry from a figure and draw the axes of symmetry (e.g. Q33/M3).
- Determine the order of rotational symmetry from a figure and locate the centre of rotation (e.g. Q12/M1).
- Name the single transformation involved in comparing the object and its image (e.g. Q13/M2).
- Demonstrate recognition of the effect on the size and shape of a figure under a single transformation (e.g. Q13/M1).

Congruence and Similarity

- Demonstrate recognition of the properties of congruent and similar triangles (e.g. Q34/M3).

Angles related with Lines and Rectilinear Figures

- Use the relations between sides and angles associated with isosceles/equilateral triangles to solve simple geometric problems (e.g. Q48/M4).

More about 3-D Figures

- Name axes of rotational symmetries of cubes (e.g. Q15/M4).
- Identify the nets of cubes, regular tetrahedra and right prisms with equilateral triangles as bases (e.g. Q15/M1).

Quadrilaterals

- Use the properties of rectangles and parallelograms in numerical calculations (e.g. Q37/M2).

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. Q16/M3 and Q38/M4).

Trigonometric Ratios and Using Trigonometry

- Find the sine, cosine and tangent ratios for angles between 0° to 90° and vice versa (e.g. Q17/M3).

Introduction to Various Stages of Statistics

- Use simple methods to collect data (e.g. Q19/M4).

Construction and Interpretation of Simple Diagrams and Graphs

- Interpret simple statistical charts including stem-and-leaf diagrams, pie charts, histograms, scatter diagrams, broken line graphs, frequency polygons and curves, cumulative frequency polygons and curves (e.g. Q39/M3).

Simple Idea of Probability

- Calculate the theoretical probability by listing (e.g. Q50/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:

Approximation and Errors

- Round off a number to a certain number of significant figures (e.g. Q1/M4): Quite a number of students chose the correct answer, option D. However, over 20% of students chose option B. They confused rounding off a number to 3 significant figures with rounding off a number to 3 decimal places.

Q1/M4
Round off 0.004 596 to 3 significant figures. A. 0.00 B. 0.005 C. 0.004 6 D. 0.004 60

Manipulations of Simple Polynomials

- Distinguish polynomials from algebraic expressions (e.g. Q3/M3): Almost half of the students chose the correct answer, option A. However, over 20% of students chose option B. They did not realize that the algebraic fraction in option B is not a polynomial.

Q3/M3
Which of the following is a polynomial? A. $x^3 + x$ *B.* $\dfrac{x}{x^3 + 1}$ C. $\sqrt{x^3 + x}$ D. $3^x + x$

- Demonstrate recognition of terminologies such as degree, ascending/descending orders, coefficients, number of terms, unlike terms and like terms, constants and variables (e.g. Q4/M2): Almost half of the students chose the correct answer, option B. However, options C and D were chosen by about 20% of students respectively. The result reflected that students were weak in the recognition of concepts about number of terms, constants and degree.

Q4/M2
The number of terms of the polynomial $2x^5 + x + 4$ is A. 2. B. 3. C. 4. D. 5.

- Add or subtract polynomials of at most 4 terms (e.g. Q4/M3): Half of the students chose the correct answer, option C. However, over 20% of students chose option D. They were weak in the usage of brackets and therefore mixed up the manipulations of polynomials.

Q4/M3
Simplify $(3x^2 - 2x) - x$. A. 0 B. $x^2 - x$ C. $3x^2 - 3x$ D. $-3x^3 + 2x^2$

Linear Equations in Two Unknowns

- Plot graphs of linear equations in 2 unknowns (e.g. Q46/M1 and Q46/M2): Two different items about plotting graphs of linear equations in 2 unknowns were set in the assessment in different sub-papers. One of the equations is $2x + y - 2 = 0$, while the another one is $x + 2y - 2 = 0$. The required values of x and y in the table were both equal to – 4 and 4.

Q46/M1

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

x	– 1	0	3
y		2	

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

Q46/M2

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

x		2	
y	3	0	– 1

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

- According to the facilities, it was apparent that students did better in finding the values of y in Q46/M1 than finding the values of x in Q46/M2. Hence, the facility of plotting the graph of the equation in Q46/M1 is higher.

Identities

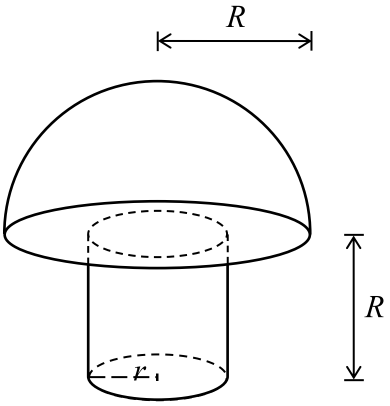
- Tell whether an equality is an equation or an identity (e.g. Q8/M2): Only half of the students realized that $x + 16 = 16 + x$ is an identity. Around 30% of the students chose option D.

Q8/M2
Which of the following is an identity? A. $x + 16 = 0$ B. $x + 16 = 16 + x$ C. $x^2 + 16 = 2(x + 8)$ D. $x^2 + 16 = (x + 4)^2$

More about Areas and Volumes

- Distinguish among formulas for lengths, areas and volumes by considering dimensions (e.g. Q11/M3): Almost half of the students chose the correct answer, option A. However, options C and D were chosen by about 20% of students respectively.

Q11/M3



The solid in the figure is formed by a hemisphere and a cylinder. The radius of the hemisphere is R. The base radius and height of the cylinder are r and R respectively.

Which of the following could be expressed by $\frac{\pi}{3}R(3r^2 + 2R^2)$?

A. Volume of the solid

B. Height of the solid

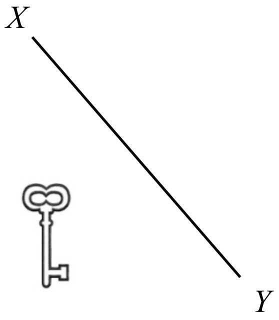
C. Curved surface area of the solid

D. Total surface area of the solid

Transformation and Symmetry

- Identify the image of a figure after a single transformation (e.g. Q13/M4): When the axis of reflection was not placed horizontally or vertically, students could not identify the position of the image in general. Only half of the students chose the correct answer, option D. Each of the remaining options was chosen by over 10% of students.

Q13/M4



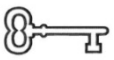
Find the image of the above key after reflecting along the line *XY*.

A.

B.

C.

D.



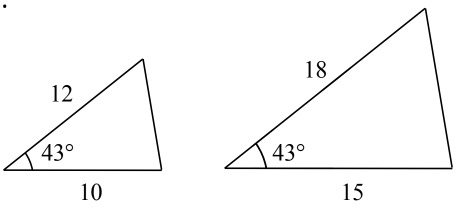
Congruence and Similarity

- Demonstrate recognition of the conditions for congruent and similar triangles (e.g. Q14/M2): In general students were not able to demonstrate good recognition of the conditions for similar triangles. Only half of the students chose the correct answer, option B. Around 20% of students mistakenly thought that the pair of triangles in option A were not similar triangles.

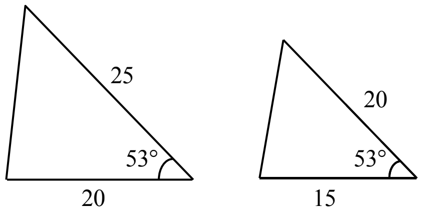
Q14/M2

Which of the following pairs of triangles **CANNOT** be similar?

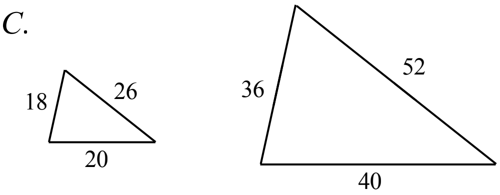
A.



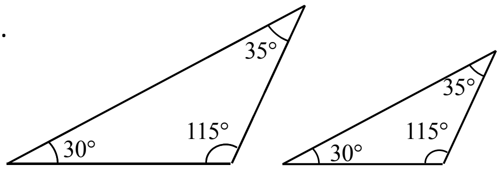
B.



C.



D.



Coordinate Geometry of Straight Lines

- Demonstrate recognition of the conditions for parallel lines and perpendicular lines (e.g. Q17/M2): Students were weak in the recognition of the conditions for perpendicular lines. Only half of the students chose the correct answer, option D. Each of the remaining options was chosen by over 10% of students.

Q17/M2

It is given that the slope of a straight line ℓ is $-\frac{3}{2}$. Which of the following straight lines is perpendicular to ℓ ?

Straight line	L_1	L_2	L_3	L_4
Slope	$-\frac{3}{2}$	$-\frac{2}{3}$	$\frac{3}{2}$	$\frac{2}{3}$

A. L_1
B. L_2
C. L_3
D. L_4

Introduction to Various Stages of Statistics

- Distinguish discrete and continuous data (e.g. Q19/M1): Some students confused continuous data with discrete data. Only half of the students chose the correct answer, option B. Over 20% of the students chose option C.

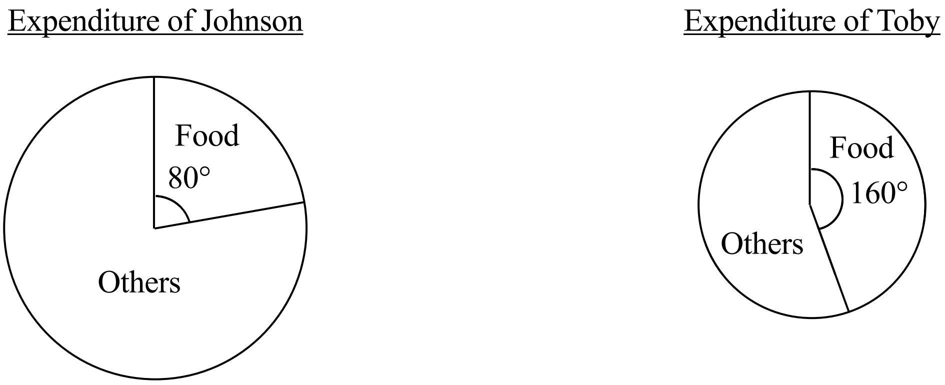
Q19/M1
Which of the following data is continuous? A. The number of votes received by the candidates in the Legislative Council Election. B. The waiting time of patients in a hospital. C. The number of goals scored by football players. D. The number of students admitted by universities last year.

Construction and Interpretation of Simple Diagrams and Graphs

- Interpret simple statistical charts (e.g. Q19/M2): Some students chose option C. They were not aware that the expenditures of Johnson and Toby in May may not be the same.

Q19/M2

The following two pie charts show the expenditures of Johnson and Toby in May.



Which of the following descriptions **MUST** be correct?

A. The total expenditure of Johnson in May is more than that of Toby.

B. The expenditure of Johnson spent on food in May is more than that of Toby.

C. The expenditure of Toby spent on food in May is two times as much as that of Johnson.

D. The percentage of Toby’s total expenditure spent on food in May is more than that of Johnson.

Best Performance of S.3 Students in TSA 2014

Students sitting for each sub-paper were ranked according to their scores and the performances of approximately the top 10% were singled out for further analysis. The performances of these students are described below.

Among these students, the majority of them achieved a full score or lost at most five score points in the whole assessment. They demonstrated almost complete mastery of the concepts and skills assessed by the sub-papers they attempted.

Most of these students were able to

- Add, subtract, multiply and divide directed numbers (e.g. Q21/M3).
- Demonstrate, without using calculators, recognition of the integral part of $\sqrt{a}$, where a is a positive integer not greater than 200 (e.g. Q2/M3).
- Solve simple selling problems (e.g. Q42/M1).
- Solve simple problems on compound interest, compounded yearly (e.g. Q41/M3).
- Use rate and ratio to solve simple real-life problems (e.g. Q24/M4).
- Distinguish the difference between $2x$ and $2 + x$; $(-2)^n$ and -2^n; x^2 and $2x$, etc. (e.g. Q3/M2).
- Substitute values into some common and simple formulas and find the value of a specified variable (e.g. Q24/M1).
- Multiply a binomial by a monomial (e.g. Q26/M1).
- Formulate simple equations/inequalities from simple contexts (e.g. Q3/M4).
- Find the value of a^n, where a and n are integers (e.g. Q5/M2).
- Use the laws of integral indices to simplify simple algebraic expressions (e.g. Q45/M1).
- Demonstrate recognition of factorization as a reverse process of expansion (e.g. Q5/M4).
- Solve simple equations (e.g. Q6/M3).
- Plot graphs of linear equations in 2 unknowns (e.g. Q46/M1).
- Solve a system of simple linear simultaneous equations by algebraic methods (e.g. Q44/M3).

- Substitute values of formulas (in which all exponents are positive integers) and find the value of a specified variable (e.g. Q31/M2).
- Demonstrate recognition of and apply the properties of inequalities (e.g. Q8/M4).
- Find the range of measures from a measurement of a given degree of accuracy (e.g. Q9/M1).
- Reduce errors in measurements (e.g. Q10/M4).
- Use the formulas for circumferences and areas of circles (e.g. Q44/M1).
- Use the relationships between sides and surface areas/volumes of similar figures to solve related problems (e.g. Q11/M1).
- Make 3-D solids from given nets (e.g. Q12/M2).
- Determine the number of axes of symmetry from a figure and draw the axes of symmetry (e.g. Q33/M3).
- Determine the order of rotational symmetry from a figure and locate the centre of rotation (e.g. Q12/M1).
- Demonstrate recognition of the effect on the size and shape of a figure under a single transformation (e.g. Q13/M1).
- Demonstrate recognition of the properties of congruent and similar triangles (e.g. Q34/M3).
- Demonstrate recognition of the terminologies on angles with respect to their positions relative to lines and polygons (e.g. Q14/M1).
- Use the angle properties associated with intersecting lines/parallel lines to solve simple geometric problems (e.g. Q34/M2).
- Use the relations between sides and angles associated with isosceles/equilateral triangles to solve simple geometric problems (e.g. Q48/M4).
- Name axes of rotational symmetries of cubes (e.g. Q15/M4).
- Use the properties of rectangles and parallelograms in numerical calculations (e.g. Q37/M2).
- 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. Q16/M3 and Q38/M4).

- Find the sine, cosine and tangent ratios for angles between 0° to 90° and vice versa (e.g. Q17/M3).
- Use simple methods to collect data (e.g. Q19/M4).
- Calculate the theoretical probability by listing (e.g. Q50/M1).

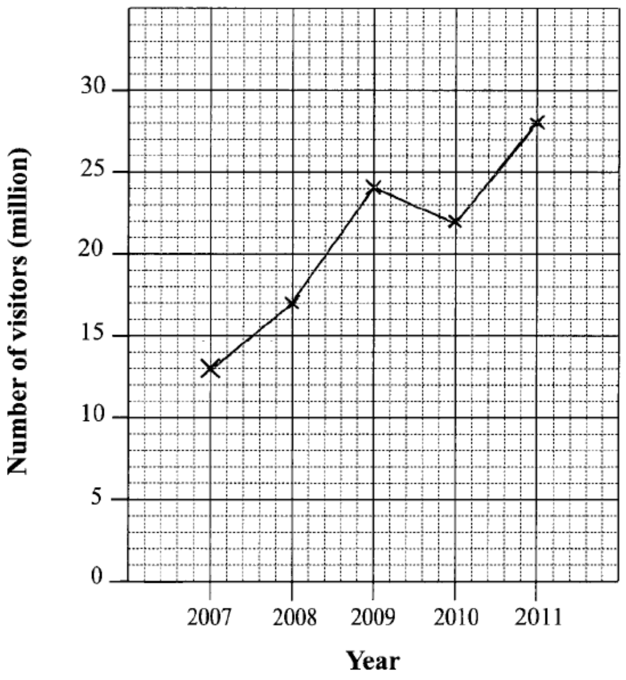
The examples of work by these students are illustrated:

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

Q49/M1

Example of Student Work (Construct simple statistical charts)

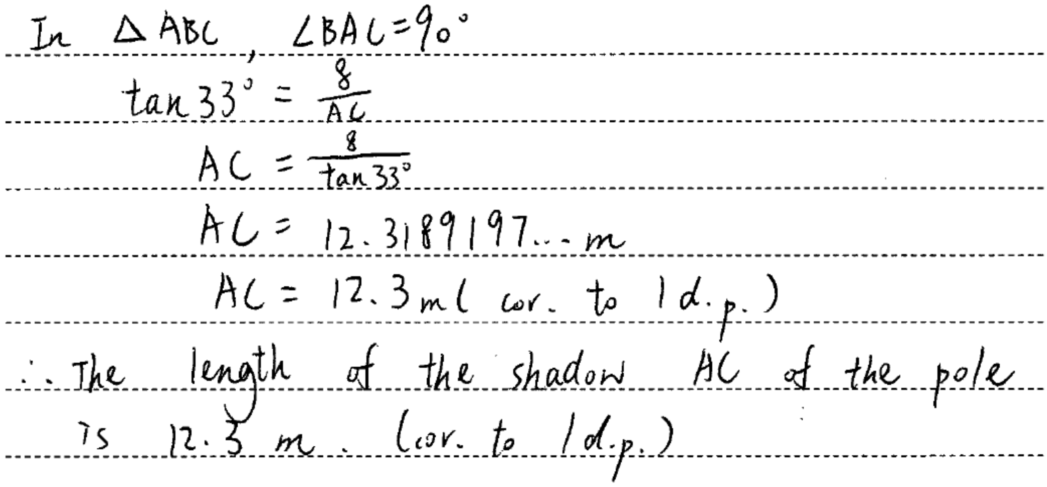
The number of visitors of a country from 2007 to 2011



Students with the best performance could solve the problem correctly with a complete and clear presentation.

Q49/M2

Example of Student Work (Use trigonometry to find the length of the shadow)



In $\triangle ABC$, $\angle BAC = 90^\circ$

$\tan 33^\circ = \frac{8}{AC}$

$AC = \frac{8}{\tan 33^\circ}$

$AC = 12.3189197\ldots$ m

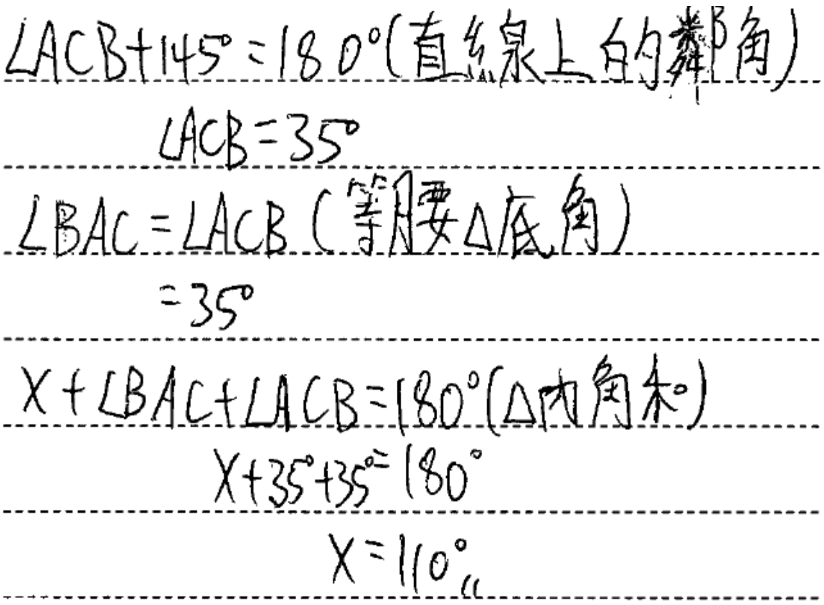
$AC = 12.3$ m (cor. to 1 d.p.)

∴ The length of the shadow AC of the pole is 12.3 m. (cor. to 1 d.p.)

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

Q48/M4

Example of Student Work (Use the relations between sides and angles associated with isosceles triangles to solve simple geometric problems)



$\angle ACB + 145^\circ = 180^\circ$ (直線上的鄰角)

$\angle ACB = 35^\circ$

$\angle BAC = \angle ACB$ (等腰Δ底角)

$= 35^\circ$

$X + \angle BAC + \angle ACB = 180^\circ$ (Δ內角和)

$X + 35^\circ + 35^\circ = 180^\circ$

$X = 110^\circ$

Students with the best performance were able to show steps clearly and used correct reasoning to draw their conclusions.

Q47/M1
Example of Student Work (Estimate the total amount that Miss Lee paid and explain whether she can join the lucky draw)

理由：

以下捨入法至十位數估算李小姐是否能夠參加抽獎，

價錢分別下捨至$310、$600、$120。

∵ 310 + 600 + 120 = $1030

∴ 估算金額 $1030 > $1000

∴李小姐 *[✓ 能夠] ／ 不能夠 參加抽獎。 (*圈出正確答案)

Q46/M3
Example of Student Work (Geometric Proof)

∵ $\angle FDC + \angle FDG + \angle GDA = 180^\circ$ (直線上的鄰角)

$65^\circ + \angle FDG + 35^\circ = 180^\circ$

$\angle FDG = 80^\circ$

$\angle FDA = 80^\circ + 35^\circ = 115^\circ$

$35^\circ + 80^\circ + \angle GAD = 180^\circ$ (△內角和)

$\angle GAD = 65^\circ$

$\angle GAD + \angle FDA = 65^\circ + 115^\circ = 180^\circ$

∴ $AB // DF$ (同旁內角互補)

Some common weaknesses of high-achieving students are as follows:

- Some students could not name planes of reflectional symmetries of cubes.
- Some students could not choose appropriate diagrams/graphs to present a set of data.
- Some students could not distinguish polynomials from algebraic expressions.

Overview of Student Performances in Mathematics at Secondary 3 TSA 2012-2014

This was the ninth year that Secondary 3 students participated in the Territory-wide System Assessment. The percentage of students achieving Basic Competency this year was 79.9% which was about the same as last year.

The percentages of students achieving Basic Competency from 2012 to 2014 are listed below:

Table 8.6 Percentages of S.3 Students Achieving Mathematics Basic Competency from 2012 to 2014

Year	% of Students Achieving Mathematics Basic Competency
2012	79.8
2013	79.7
2014	79.9

The performances of S.3 students over the past three years in each Dimension of Mathematics are summarized as follows:

Table 8.7 Overview of Student Performances in Mathematics at S.3 TSA 2012-2014

Year / Number and Algebra	2012	2013	2014	Remarks
Strengths	• Students could understand the concept of directed numbers and perform the operations. They demonstrated recognition of the number line. • Students could determine whether to estimate or to compute the exact value in a simple context. • Students could round off a number to a certain number of significant figures. They demonstrated recognition of scientific notation. • The majority of students could represent fractions on a number line. • Students could solve simple problems by using rate. • Students could translate word phrases/contexts into algebraic languages. • Students could substitute values into formulas to find the unknown value.	• Students did well in the operations of directed numbers. They could also use directed numbers to describe real life situations. • Students could determine whether to estimate or to compute the exact value in a simple context. • Students could convert numbers in scientific notation to integers. • Students could solve simple problems by using rate. • Students could formulate equations from simple contexts. • Students could observe the pattern of the number sequences and wrote down the next few terms.	• Students did well in the operations of directed numbers. They demonstrated recognition of the number line. • Students could determine whether to estimate or to compute the exact value in a simple context. • Students could convert numbers in scientific notation to decimals. • Students could solve simple problems by using rate. • Students could translate word phrases/contexts into algebraic languages. • Most students were capable of solving simple equations. They could also substitute values into formulas to find the unknown value. • Students could formulate equations from simple contexts. • Students could observe the pattern of the number sequences and wrote down the next few terms. • Students demonstrated recognition of the properties of inequalities.	• Many students were not familiar with the formulas. • The presentation of some students' answers remained incomplete and careless mistakes occurred frequently in solving problems. • Many students did not use a ruler to draw straight lines. • Answers were often not corrected to the required degree of accuracy. • Units were often omitted in the answer. • Students could not master abstract concepts (such as the n^{th} term of a sequence).

Year / Number and Algebra	2012	2013	2014	Remarks
Weaknesses	• Students were quite weak in recognizing the concept of percentage (e.g. mixed up the mathematical concepts of y and y %). • For the percentage problem which express in the form of $a \times b\% = c$, students could not solve a if only b and c were given. • Many students could not intuitively find the n^{th} term of a number sequence. • Students were weak in recognizing the terminologies of polynomials. • Students' performance was only fair in factorization of simple polynomials. • Students were quite weak in recognizing the meaning of roots of equations. • Their performance was fair only in solving equation when the bracket is involved and the coefficient of a term is a negative number. • Most students were unable to draw the graph of $y = c$.	• When students were asked to round off a number to a certain number of decimal places, they mistakenly rounded off the number to a certain number of significant figures. • Many students could not represent a number in scientific notation. • Many students could not represent irrational numbers on a number line. • Students' performance was weak in using percentages to find the cost price of an object or find the original value in a situation regarding repeated growths and depreciations. • Students mixed up the formulas for finding simple interest and compound interest. • Many students could not intuitively find the n^{th} term of a number sequence. • Performance was weak when students were asked to simplify algebraic expressions with negative indices. • Students' performance was only fair in factorization of simple polynomials.	• When students were asked to round off a number to a certain number of decimal places, they mistakenly rounded off the number to a certain number of significant figures. • Many students could not represent a number in scientific notation. • Students were quite weak in recognizing the concepts of percentage change, percentage decrease and loss percentage. They mistakenly substituted the cost price and selling price in the formulas. • Students mixed up the formulas for finding simple interest and compound interest. • Students could not distinguish polynomials from algebraic expressions. • Students were weak in recognizing the terminologies of polynomials. • Students' performance was only fair in factorization of simple polynomials.	

Year / Number and Algebra	2012	2013	2014	Remarks
	• Students were unable to solve simple linear inequalities in one unknown when the coefficients or constants are negative.	• Students were quite weak in recognizing the meaning of roots of equations. • Students could not distinguish whether an equality is an equation or an identity. • Students were quite weak in recognizing the properties of inequalities.	• Students could not distinguish whether an equality is an equation or an identity.	

Year / Measures, Shape and Space	2012	2013	2014	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 could choose the method that gave a more accurate reading. • Students could identify types of angles with respect to their sizes.	• Students were able to find the areas of sectors. • Students could identify the relationship between simple 3-D solids and their corresponding 2-D figures. They could also recognize the cross-sections of simple solids. • Students could draw the axes of symmetry. • When the object and its image were given, students could identify the single transformation involved.	• 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 could choose the method from the given options that gave a more accurate reading. • Students were able to find the areas of sectors. • Quite a number of students could calculate the surface areas of spheres.	• Students did well in straightforward questions (such as choosing methods to reduce errors in measurements, numerical calculation in simple geometric problems). However, their performance was only fair in items involving more judgments. • Students could not master abstract concepts (such as projection of an edge on a plane, using the relationship of similar figures to find measures).

Year / Measures, Shape and Space	2012	2013	2014	Remarks
	• When the object and its image were given, students could identify the single transformation involved.	• Students could use the angle properties associated with intersecting lines/parallel lines and the properties of triangles to solve simple geometric problems. • Students could use the properties of angles of triangles and the relations between sides and angles associated with isosceles triangles to solve simple geometric problems. • Students could use the formulas for the sums of the interior angles of convex polygons. • Students were able to use the properties of quadrilaterals in numerical calculations. • Students had good knowledge of the rectangular coordinate system.	• Students could demonstrate recognition of common terms in geometry. • Students could identify types of angles with respect to their sizes. • Students could identify the relationship between simple 3-D solids and their corresponding 2-D figures. • Students could determine the number of axes of symmetry from a figure. • Students could locate the centre of rotation from a figure. • When the object and its image were given, students could identify the single transformation involved. • Students could use the angle properties associated with intersecting lines/parallel lines and the properties of triangles to solve simple geometric problems. • Students could use the relationship between sides and angles associated with isosceles triangles to solve simple geometric problems. • Students could use the formulas for the sums of the exterior angles of convex polygons. • Students had good knowledge of the rectangular coordinate system.	• Inappropriate or incorrect presentation frequently occurred (such as confused $\angle ABC$ with $\triangle ABC$, $AB = BC$ with $AB \,//\, BC$). • Answers were often not corrected to the required degree of accuracy. • Units were often omitted in the answer. • Many students were not familiar with the formulas.

Year / Measures, Shape and Space	2012	2013	2014	Remarks
Weaknesses	● Many students could not find the arc length when the angle at the centre is a reflex angle. ● Students were weak in more abstract concepts (such as using relationship of similar figures to find measures, and the meaning of dimensions). ● Students could not determine whether a polygon is equilateral. ● Quite a number of students could not identify the image of a figure after rotation. ● Students could not demonstrate recognition of the conditions for congruent and similar triangles. ● Students were weak in identifying the planes of reflectional symmetries of cubes. ● Quite a number of students could not identify the projection of an edge on a plane.	● Quite a number of students could not choose appropriate measuring techniques for real-life measurements. ● Students' performance was weak in finding the area of a semi-circle. ● Students were weak in more abstract concepts (such as using the relationship of similar figures to find measures). ● Students could not demonstrate recognition of common terms in geometry. ● Students could not determine whether a polygon is convex. ● Many students were unable to sketch simple solids. ● Students could not demonstrate recognition of the conditions for congruent and similar triangles. ● Students were weak in identifying the planes of reflectional symmetries and axes of rotational symmetries of cubes.	● Students were unable to distinguish among formulas for volumes by considering dimensions. ● Students could not determine whether a polygon is regular. ● Quite a number of students could not identify the image of a figure after reflection. ● Students could not demonstrate recognition of the conditions for congruent and similar triangles. ● Students were weak in identifying the planes of reflectional symmetries of cubes. ● Many students could not identify the projection of an edge on a plane. ● Students' performance was only fair in applying the conditions for perpendicular lines.	

Year Data Handling	2012	2013	2014	Remarks
Strengths	• Students could organize the same set of data by different grouping methods. • Students could read information from diagrams and interpret the information.	• Students could organize the same set of data by different grouping methods. • Students' performance was quite good in calculating the empirical probability and the theoretical probability by listing.	• Students could use simple methods to collect data. • Students could interpret simple statistical charts. • Students' performance was quite good in calculating the empirical probability and the theoretical probability by listing.	• Many students did not use ruler to draw statistical charts. • Students were weak in recognizing the discrete and continuous data.
Weaknesses	• Many students could not distinguish between discrete and continuous data. • Students in general could not choose appropriate diagrams / graphs to present a set of data. • Quite a number of students were not able to find averages from a set of grouped data. • Quite a number of students were not able to calculate the weighted mean of a set of data. • Students' performance was only fair in calculating the theoretical probability by listing.	• Quite a number of students could not distinguish between discrete and continuous data. • Students in general could not choose appropriate diagrams / graphs to present a set of data and 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' performance was only fair in distinguishing discrete and continuous data. • Students in general could not choose appropriate diagrams / graphs to present a set of data. • Quite a number of students were not able to find averages from a set of grouped data.	