Results of Secondary 3 Mathematics in Territory-wide System Assessment 2023

The percentage of Secondary 3 students achieving Mathematics Basic Competency in 2023 is 76.6%.

Secondary 3 Assessment Design

- The design of assessment tasks for S.3 was based on the documents *Basic Competency Descriptors for Key Stage 3 Mathematics Curriculum* and *Mathematics Education Key Learning Area Curriculum Guide (Primary 1 – Secondary 6)* (2017). The tasks covered the three strands of the mathematics curriculum, namely **Number and Algebra**, **Measures**, **Shape and Space**, and **Data Handling**. They focused on the Foundation Part of the S.1 – 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 141 test items (195 score points), covering all of the 118 Basic Competency Descriptors. These items were organised into four sub-papers, each 65 minutes in duration and covering all three strands. Each student was required to attempt one sub-paper only. Some items appeared in more than one sub-paper to act as inter-paper links and to enable the equating of test scores. The number of items on the various sub-papers is summarised 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	24 (32)	24 (30)	23 (30)	23 (27)	69 (89)
Measures, Shape and Space	17 (23)	17 (25)	18 (24)	17 (24)	55 (75)
Data Handling	6 (10)	6 (10)	6 (11)	7 (14)	17 (31)
Total	47 (65)	47 (65)	47 (65)	47 (65)	141 (195)

***** 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
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 Competency in 2023

Secondary 3 Number and Algebra Strand

S.3 students performed steadily in this strand. In the learning units of this strand, the majority of students could demonstrate recognition of directed numbers, rates, ratios and proportions, algebraic expressions and laws of integral indices. However, students' performance was not satisfactory in items related to approximate values and numerical estimation. 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***.

- Basic Computation: Students did well in performing mixed arithmetic operations of positive numbers, using powers to express the repeated multiplication of a number and using repeated multiplication to express the power of a number. Half of them could find the greatest common divisor of two numbers expressed as products of prime factors. However, their performance in handling prime factorisation of a positive integer was not satisfactory.

Q21/M1		
Exemplar Item (Perform prime factorisation of a positive integer) Express 45 as a product of prime factors.		
Example of Student Work		
(1)	3×5^2	(Not able to perform prime factorisation of a positive integer correctly)
(2)	5×9	(Not able to demonstrate recognition of prime factorisation)
(3)	$1 \times 3^2 \times 5$	(Mistakenly took "1" as a prime number)

- Directed Numbers: Students did well in demonstrating recognition of the ordering of integers on the number line. Many of them were capable of using directed numbers to describe the time differences between Hong Kong and other regions and performing mixed arithmetic operations of directed numbers.

- Approximate Values and Numerical Estimation: Many students were capable of rounding off a number to 3 significant figures. Half of them could round off a number

to 3 decimal places. However, they were weak in using suitable estimation strategies to solve simple real-life problems. They need an ongoing improvement in using rounding down as the means of getting approximation value.

Q40/M2
Exemplar Item (Estimate total calorie intake and judge whether Mr Chan's intake is over the standard) It is recommended that the standard daily calorie intake of a male adult should not exceed 2 500 calories. Mr Chan ate instant noodles, pizza and roast goose today. The calories are 381, 532 and 1 706 respectively. Based on the description above, give an appropriate approximation for each **UNDERLINED VALUE**. Hence, estimate the total calorie intake of Mr Chan today. Briefly explain whether his calorie intake today is over the standard.
Example of Student Work (Did not give approximations for the calorie of each of the items) 381+532+1706 =2619 (卡) ∴ 陳先生今天攝取的熱量 *(有)／ 沒有 超標。 (*圈出正確答案)
Example of Student Work (Wrongly used rounding up to find the approximation) By rounding up to nearest hundred. value of calories that Mr Chan intake today = 381+532+1706 ≈ 400+600+1800 = 2800 calories ∴ Mr Chan's calorie intake today is * **over** / **not over** the standard. (*Circle the correct answer)
Example of Student Work (Wrongly used rounding off to find the approximation) 熱量總數: 381+532+1706 ≈400+500+1700 =2600 ∵ 2600 > 2500 ∴ 陳先生今天攝取的熱量 *(有)／ 沒有 超標。 (*圈出正確答案)

Example of Student Work (Good performance)

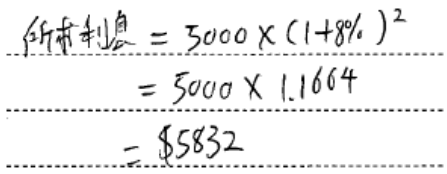
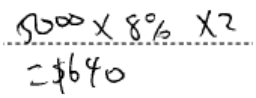
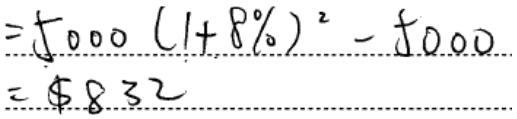
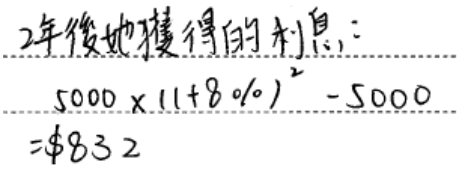
Round down the value, they will be 380, 530, 1700.
The total calorie intake of Mr Chan today
= 380+530+1700
= 2610
∵ 2610 > 2500

∴ Mr Chan's calorie intake today is *(**over**) / **not over** the standard.
(*Circle the correct answer)

- Rational and Irrational Numbers: Many students could represent a decimal number which is an irrational number on the number line. Quite a number of them were able to calculate the value of x in the expression $\sqrt[3]{a} = x$, where a is a positive integer. Half of them could not recognise that π is an irrational number.

- Using Percentages: The majority of students were able to solve problems on percentage decrease and percentage change in mathematical contexts. Their performance in solving problems on simple interest and depreciations was acceptable. Nevertheless, there was room for improvement in solving problems on discounts and compound interests compounded yearly.

Q24/M3	
Exemplar Item (Find the discount) The marked price of a cake is \$320 . If it is sold at 30% off, find the discount.	
Example of Student Work	
(1) 該蛋糕的折扣是 \$224 。	(Confused selling prices with discounts)
(2) The discount of the cake is 30%.	(Confused discount percentages with discounts)
(3) 該蛋糕的折扣是 70% 。	(Not able to understand the context)

Q40/M3
Exemplar Item (Find the compound interest) Winnie deposits $5 000 in a bank and the interest rate is 8% p.a. **compounded** yearly. Find the interest she will receive after 2 years.
Example of Student Work (Confused amounts with interests)  所求利息 = 5000 × (1+8%)² = 5000 × 1.1664 = $5832
Example of Student Work (Confused simple interests with compound interests)  5000 × 8% × 2 = $640
Example of Student Work (Incomplete presentation)  = $000 (1+8%)² − $000 = $832
Example of Student Work (Correct solution)  2年後她獲得的利息： 5000 × (1+8%)² − 5000 = $832

- Rates, Ratios and Proportions: Many students were able to use a : b to represent a ratio and use rates, ratios and inverse proportions to solve simple real-life problems. Quite a number of students were capable of distinguishing direct and inverse proportions.
- Algebraic Expressions: The majority of students were able to formulate algebraic expressions from word phrases and write down the next term of a sequence of triangular numbers with several consecutive terms given. Quite a number of them could demonstrate recognition of notations of algebraic expressions such as x^2 and find a particular term from the general term of a sequence.
- Linear Equations in One Unknown: Many students were able to solve simple linear equations in one unknown and demonstrate understanding of the meaning of solutions of equations. Half of them could formulate a linear equation in one unknown from a simple problem situation.

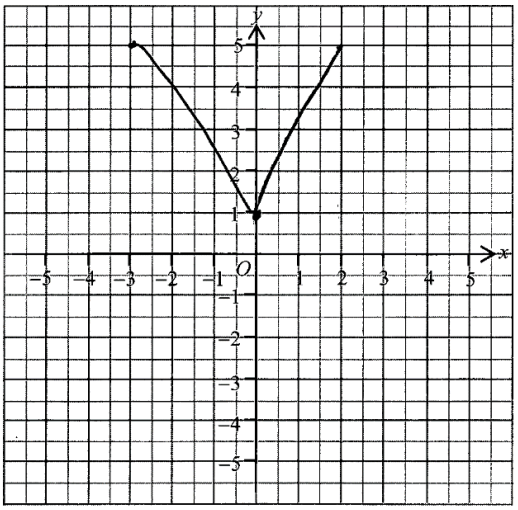
- Linear Equations in Two Unknowns: The majority of students were able to formulate simultaneous linear equations in two unknowns from simple problem situations. Many of them could solve simple simultaneous linear equations by graphical methods. Quite a number of them were capable of solving simple simultaneous linear equations by algebraic methods and demonstrating recognition that graphs of equations of the form $ax + by + c = 0$ are straight lines. Their performance was acceptable in plotting graphs of linear equations in two unknowns and determining whether a point lies on a straight line given its linear equation.

Q42/M1

Example of Student Work (Did not recognise that the graph of $ax + by + c = 0$ must be a straight line)

$y = 2x + 1$

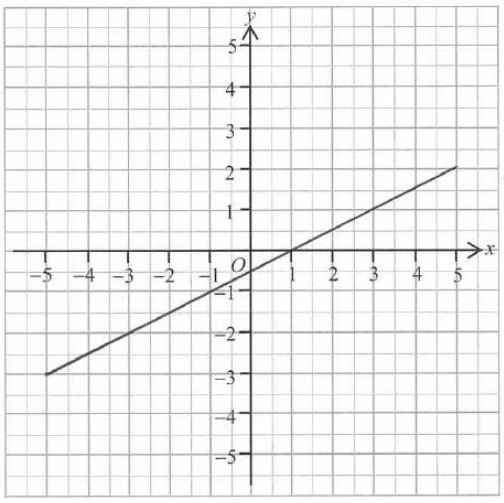
x	-3	0	2
y	-5	1	5

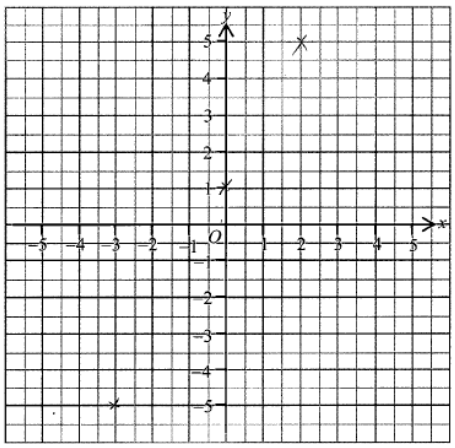
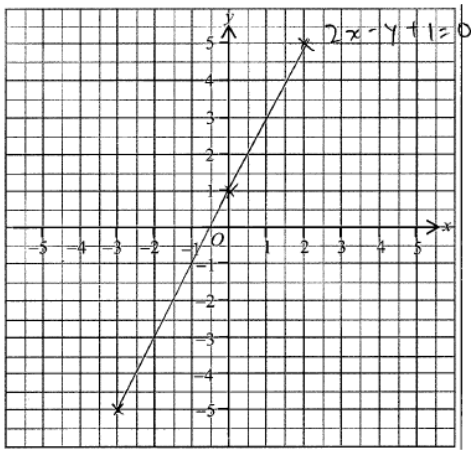


Example of Student Work (Mixed up x-coordinate and y-coordinate)

$y = 2x + 1$

x	-3	0	2
y	-5	1	5



Q41/M3
Example of Student Work (Did not draw a straight line to pass through the three points) $2x - y + 1 = 0$ x | -3 | 0 | 2 y | -5 | 1 | 5 
Example of Student Work (Did not extend two ends of the line) $2x - y + 1 = 0$ x | -3 | 0 | 2 y | -5 | 1 | 5 

- Laws of Integral Indices: The performance of students in converting a positive number in scientific notations to an integer was well. Many of them were capable of finding the value of a^n (where a and n are negative integers), using the laws of integral indices to simplify simple algebraic expressions and representing a positive number in scientific notations.

- Polynomials: Many students were able to distinguish factorisation and expansion of polynomials. Quite a number of students could factorise simple polynomials by taking out common factors and expressions of the form $ax^2 + bx + c$. The performance of students was acceptable in performing addition/subtraction of two polynomials, arranging the terms of a polynomial in descending order, and performing multiplication of a monomial by a binomial or multiplication of two binomials. Only some students could demonstrate recognition of coefficients. However, many students could not distinguish polynomials from algebraic expressions.

Q27/M2	
Exemplar Item (Demonstrate recognition of coefficients) Find the coefficient of x^2 in the polynomial of $5x^3 - 7x^2 + 6x - 9$.	
Example of Student Work	
(1) The coefficient of x^2 is 2	(Confused powers with coefficients)
(2) x^2 的係數是 7 。	(Did not consider the sign of coefficients)
(3) x^2 的係數是 3 。	(Confused orders with coefficients)
(4) The coefficient of x^2 is -9 .	(Confused constants with coefficients)
(5) x^2 的係數是 $-7x^2$ 。	(Did not recognise that coefficients should not include the variables)

- Identities: Many students could use the identity of perfect square to factorise simple polynomials. Quite a number of them were able to indicate whether an equation is an identity. Half of them could use the identity of difference of two squares to factorise simple polynomials. However, there was room for improvement in using the identity of perfect square to expand simple algebraic expressions.

Q29/M2
Exemplar Item (Use the identity of perfect square to expand an algebraic expression) Expand $(y - 4)^2$.
Example of Student Work (Wrong computation)
(1) $y^2 + 8y - 16$
(2) $y^2 - 16$
(3) $y^2 + 4^2$
(4) $(y - 4)(y + 4)$
(5) $y^2 - 32y + 16$

- Formulae: Students were good at substituting values into formulae in which all exponents are positive integers and finding the value of a specified variable. Their performance was fair in adding two algebraic fractions (both the numerators and denominators being monomials). However, there was room for improvement in multiplication. Only some students were capable of performing change of subject in simple formulae not involving radical sign.

Q31/M2
Exemplar Item (Perform change of subject in simple formulae) Make y the subject of the formula $w = k + \frac{y}{5}$.
Example of Student Work (Wrong computation) (1) $y = -(k - 5w)$ (2) $y = 5w - k$ (3) $y = \frac{w-k}{5}$ (4) $y = 5(k+w)$ (5) $5(w-k)$

- Linear Inequalities in One Unknown: The performance of students was good in determining whether a number satisfies a given inequality. Many of them could demonstrate recognition of the properties of inequalities. Quite a number of them were able to represent inequalities on the number line in mathematical expressions. Half of them were capable of solving simple linear inequalities in one unknown with integral coefficients and constants and formulating a linear inequality in one unknown from a simple problem situation.

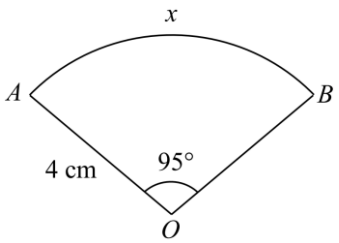
Secondary 3 Measures, Shape and Space Strand

S.3 students performed steadily in this strand. In the learning units of this strand, they were able to perform calculations regarding 3-D figures, quadrilaterals, centres of triangles and Pythagoras' Theorem. However, more improvement could be shown in items related to errors in measurement, arc lengths and areas of sectors, mensuration and similar triangles. 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***.

- Errors in Measurement: The majority of students could find the range of measures in measurements of given degrees of accuracy. Quite a number of them were capable of finding maximum absolute errors when using protractors. However, the minority of students could calculate percentage errors from given measurements.

Q32/M4		
Exemplar Item (Calculate percentage error) Alice runs around the park. She takes 80 seconds (correct to the nearest second) to finish a lap. Find the percentage error of the measured value. Example of Student Work		
(1)	所得的量度值的百分誤差是 0.5秒 。	(Confused maximum absolute errors with percentage errors)
(2)	所得的量度值的百分誤差是 0.625 。	(Not able to recognise percentage)

- Arc Lengths and Areas of Sectors: Many students were able to calculate areas of sectors. There was room for improvement in finding arc lengths.

Q43/M2
Exemplar Item (Calculate arc length) In the figure, the radius of sector OAB is 4 cm and $\angle AOB = 95°$. Let x be the arc length of the sector, find x. Give the answer correct to 3 significant figures.   

Example of Student Work (Incomplete presentation)

$2 \times 4\pi \times \frac{95}{360}$

$= 6.63\ cm$

Example of Student Work (Confused areas of sectors with arc lengths)

$x = \frac{95^\circ}{360^\circ} \times 4^2 \times \pi$

$x = \frac{19}{72} \times 16 \times \pi$

$x = 13.3$ (準確至三位有效數字)

Example of Student Work (Confused diameters with radiuses)

$\pi 4 \cdot \frac{95^\circ}{360} = x$

$x = 3.32\ cm$

Example of Student Work (Correct solution)

$2\pi(4) \times \frac{95^\circ}{360^\circ} = x$

$8\pi \times \frac{95^\circ}{360^\circ} = x$

$x = 6.63\ cm$ (corr to 3 sig.fig.)

- 3-D Figures: Students performed well in demonstrating recognition of the sections of pyramids and the concepts of right pyramids. The majority of them could sketch the 2-D representations of right prisms.

- Mensuration: The majority of students could recognise the formula for the volumes of spheres. Quite a number of them were able to calculate the volume of prisms, the total surface areas of right circular cones and use the formula for the volumes of prisms to find unknowns. However, only half of them were capable of using the formula for the surface areas of right circular cylinders to find unknowns. They were weak in applying the relationships between sides and volumes of similar 3-D figures to solve problems.

Q44/M2

Exemplar Item (Use the relationships of similar 3-D figures to solve problems)

In the figure, Ball A and Ball B are similar solids. The diameter of Ball A is 3 times that of Ball B. The volume of Ball A is $2\,700\ cm^3$. Find the volume of Ball B.

Ball A

Ball B

Example of Student Work (Mistakenly took the ratio of the volumes of similar figures as the ratio of their corresponding sides)

∵ The diameter of Ball A is 3 times that of Ball B
The volume of Ball A is $2700\ cm^3$

∴ The volume of Ball B $= \frac{2700}{3}$
$= 900\ cm^3$

Example of Student Work (Confused the relationships between sides and surface areas with sides and volumes of similar 3-D figures)

∵ The ratio of A's and B's diameter $= \frac{3}{1}$
∴ The ratio of A's and B's volume $= \frac{9}{1}$
∴ The volume of B's $= 2700 \div 9$
$= 300$

Example of Student Work (Wrong computation)

Let $x\ cm^3$ be the volume of Ball B.

$\frac{x}{2700} = (\frac{1}{3})^3$

$\frac{x}{2700} = \frac{1}{9}$

$x = 300$

∴ The volume of Ball B $= 300\ cm^3$

Example of Student Work (Correct solution)

Let the volume of Ball B is $x\ cm^3$

$(\frac{1}{3})^3 = \frac{x}{2700}$

$\frac{1}{27} = \frac{x}{2700}$

$x = 100$

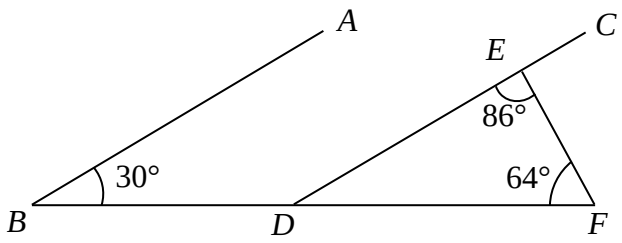
the volume of Ball B is $100\ cm^3$

- Angles and Parallel Lines: Students did well in using the angle properties associated with parallel lines and vertically opposite angles to find unknowns. Many of them could identify corresponding angles and alternate interior angles. A considerable number of students were able to use the properties of angles of triangles to find unknowns. Their performance was acceptable in using the conditions of alternate interior angles which are equal, corresponding angles which are equal, or interior angles which are supplementary to perform simple proof of two straight lines being parallel.

Q44/M1

Exemplar Item (Geometric proof)

In the figure, BDF and CED are straight lines. It is given that $\angle ABD = 30°$, $\angle DEF = 86°$ and $\angle EFD = 64°$. Prove that $AB \parallel CD$.



Example of Student Work (Incorrect logical reasoning in the proof – used the conclusion $AB \parallel CD$ as a reasoning)

AB // CD

$\angle ABD = 30°$

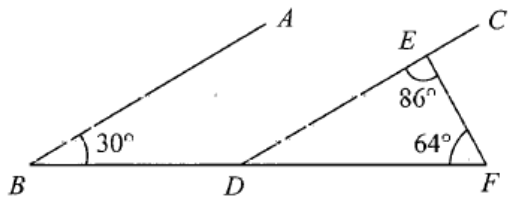
$\angle ABD = \angle CDF$

$\angle CDF + 86° + 64 = 180°$

$\angle CDF = 30$

$\therefore \angle ABD // \angle CDF$

$\therefore$ AB // CD



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

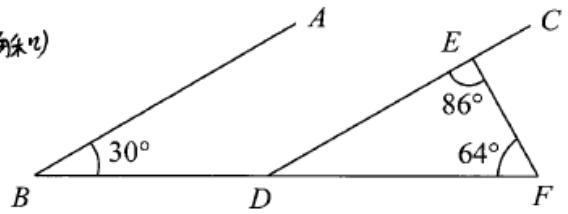
在△EDF中

86°+64°+∠EDF=180°(△內角和)

∠EDF=30°

∵ ∠ABD=∠EDF=30°

∴ AB // CD



Example of Student Work (Good performance)

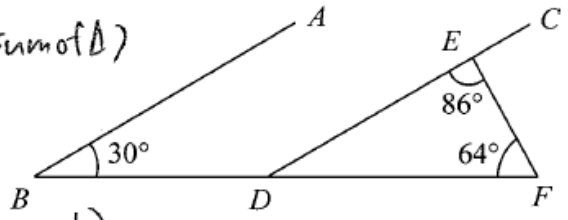
In △EDF,

∠EDF = 180°-86°-64° (∠sum of △)

∠EDF = 30°

∵ ∠EDF = ∠ABD = 30°

∴ AB // CD (corr. ∠s, equal)



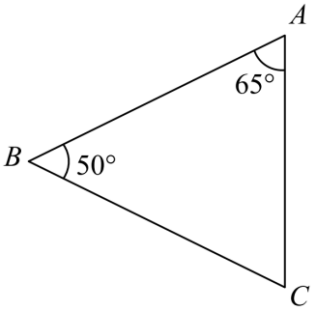
- Polygons: Most students could use common notations to represent rhombuses. Many of them were capable of using the formula for the sum of the interior angles and exterior angles of a convex polygon to find unknowns. However, they were weak in recognising that an equiangular triangle is a regular polygon.

- Congruent Triangles: The majority of students could demonstrate recognition of the properties of congruent triangles, but half of them were not able to determine whether a pair of triangles were congruent triangles. Their performance in using the conditions for congruent triangles to perform simple proofs was acceptable. Many students could use the relations between sides and angles associated with isosceles triangles to find unknowns, but they could not use the condition for isosceles triangles to perform simple proofs.

Q45/M2

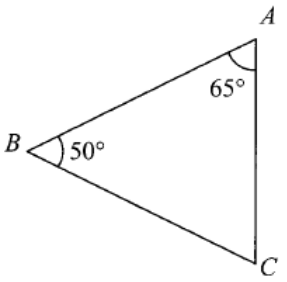
Exemplar Item (Geometric proof)

In the figure, $\angle ABC = 50°$ and $\angle CAB = 65°$. Prove that $\triangle BCA$ is an isosceles triangle.



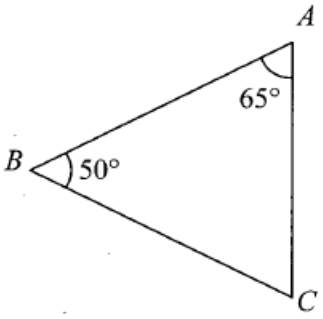
Example of Student Work (Not able to provide correct reasons)

$\angle ACB = 180° - 65° - 50°$
$= 65°$
$\because \angle ACB = \angle BAC$
$\therefore BA = BC$ (opp $\angle$s eq. $\triangle$)
$\because BA = BC$
$\therefore \triangle ABC$ is a isosceles triangle



Example of Student Work (Good performance)

$\angle ACB = 180° - 50° - 65°$ ($\angle$ sum of $\triangle$)
$= 65°$
$\because \angle ACB = \angle BAC = 65°$
$\therefore BA = BC$ (sides opp. equal $\angle$s)
$\therefore \triangle BCA$ is an isos. $\triangle$

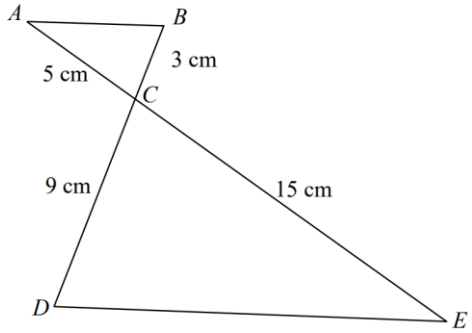


- Similar Triangles: Many students could demonstrate recognition of the conditions and properties of similar triangles. However, they were weak in using the conditions for similar triangles to perform simple proofs. The majority of them could not provide sufficient reasons or complete the proof.

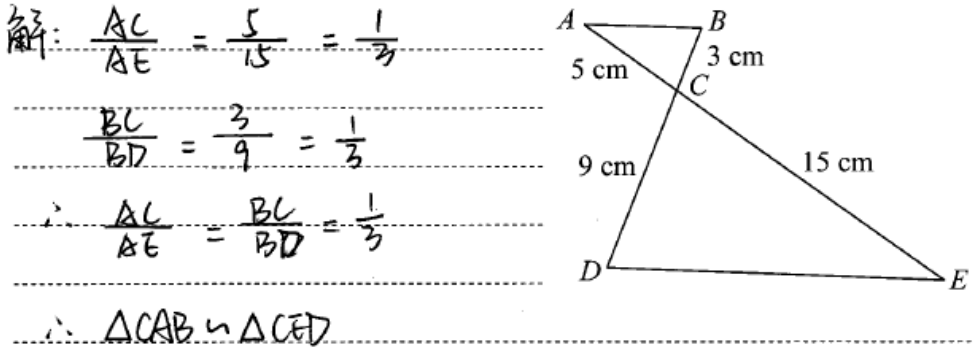
Q46/M3

Exemplar Item (Geometric proof)

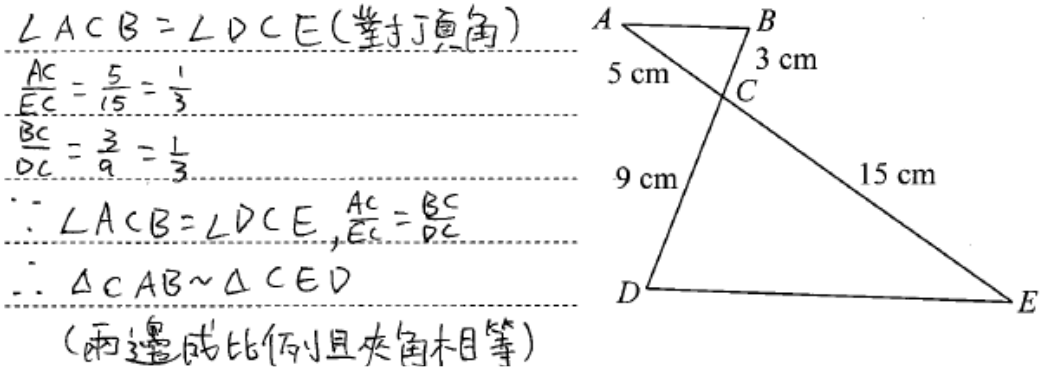
In the figure, ACE and BCD are straight lines. $CB = 3\text{cm}$, $CA = 5\text{ cm}$, $CD = 9\text{ cm}$ and $CE = 15\text{ cm}$. Prove that $\triangle CAB \sim \triangle CED$.



Example of Student Work (Not able to provide a complete proof)

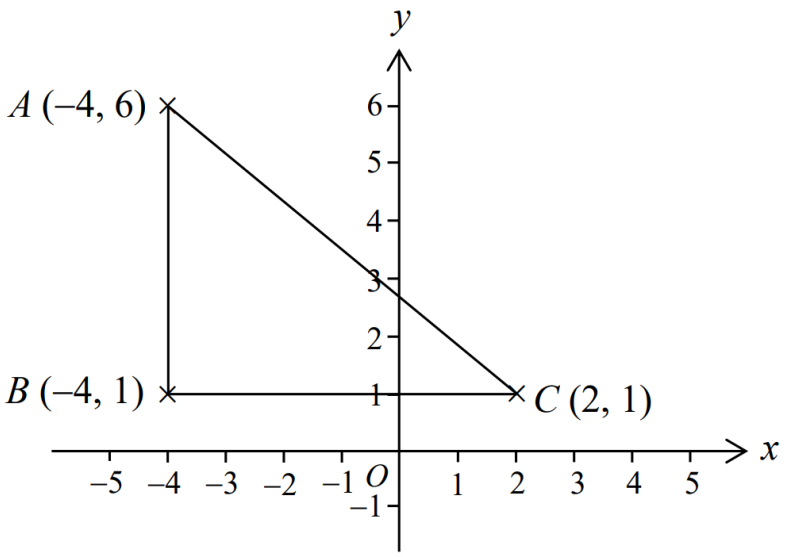


Example of Student Work (Good performance)

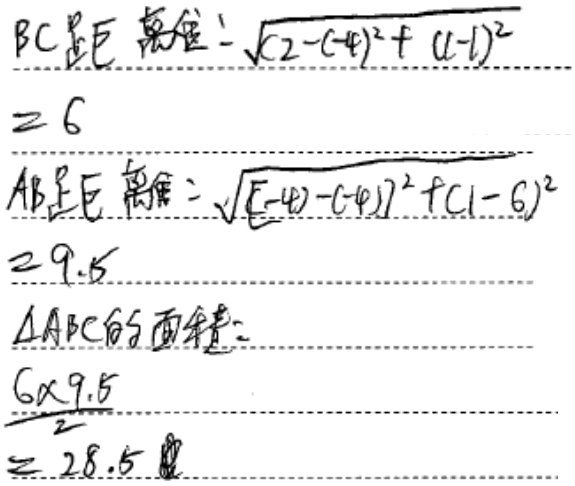


- Quadrilaterals: Students performed well in using the properties of parallelograms and rectangles to find unknowns.

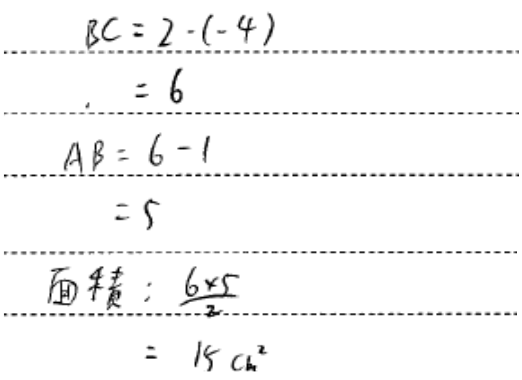
- Centres of Triangles: Students' performance in identifying angle bisectors of a triangle was satisfactory.
- Pythagoras' Theorem: Students' performance in using Pythagoras' theorem to find unknowns and applying the converse of Pythagoras' theorem to identify right-angled triangles was satisfactory.
- Rectangular Coordinate System: In a rectangular coordinate plane, the majority of students could mark the point with given coordinates and find the image of a given point under a single translation. Quite a number of them were able to find the image of a given point rotating about the origin through 90° in a clockwise direction. Many of them could use the slope formula to find the slope of the straight line which passes through two given points. They could use the mid-point formula to find the mid-point between two points. Their performance in demonstrating recognition of the relationship between the slopes of parallel lines and using the distance formula to find the distance between two points was fair. Their performance in calculating areas of triangles in a rectangular coordinate plane was acceptable.

Q46/M1
Exemplar Item (Calculate areas of triangles) Find the area of $\triangle ABC$ in the figure.   

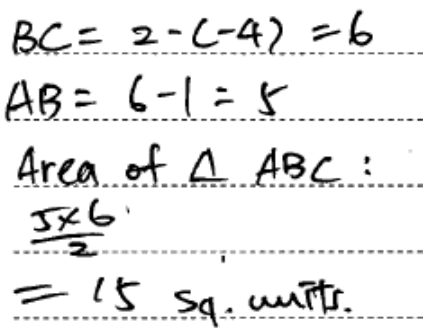
Example of Student Work (Wrong computation)



Example of Student Work (Wrong unit)



Example of Student Work (Correct solution)

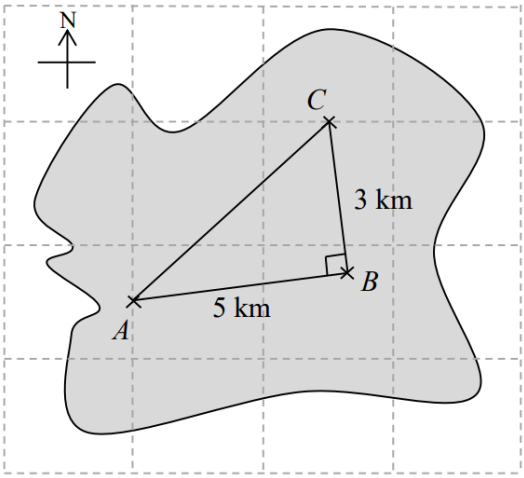


- Trigonometry: The majority of students could find tangents of angles and angles from sine. Many of them could solve right-angled triangles involving sine and demonstrate recognition of the concepts of angles of elevation. Quite a number of them were able to solve right-angled triangles involving cosine. Their performance in solving simple problems involving one right-angled triangle was acceptable.

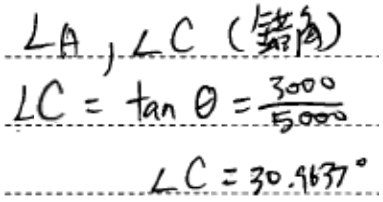
Q46/M2

Exemplar Item (Find the size of an angle)

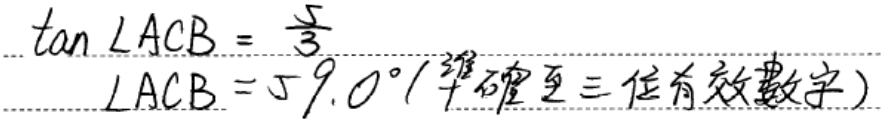
The figure shows a map of an orienteering competition. It is given that the distance of AB is 5 km and the distance of BC is 3 km. Find $\angle ACB$. Give the answer correct to 3 significant figures.



Example of Student Work (Confused adjacent sides with opposite sides)



Example of Student Work (Correct solution)



Secondary 3 Data Handling Strand

The performances of S.3 students were quite good in this strand. In the learning units of this strand, they were good at both organising and presenting of 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***.

- Organisation of Data: Students were good at organising the same set of data by different grouping methods.

- Presentation of Data: The majority of students were able to interpret histograms and read off data from statistical charts representing two different sets of data. Many of them could construct frequency polygons and interpret cumulative frequency curves. Quite a number of them were able to identify the abuses from examples of abuses of statistical charts. Half of them could choose appropriate statistical charts to present data and construct stem-and-leaf diagrams.

Q47/M2

Exemplar Item (Construct stem-and-leaf diagram)

The following data shows the number of absentees of a secondary school in the last 15 school days.

9	12	17	18	20
15	8	25	14	30
42	36	7	22	15

Complete the stem-and-leaf diagram in the **ANSWER BOOKLET** to represent the above data.

Example of Student Work (Spaces between data of 'leaf' were handled improperly)

幹 (10)	葉 (1)
0	7 8 9
1	2 4 5 5 7 8
2	0 2
3	0 6
4	2

Example of Student Work (Data were unnecessarily separated by symbols)

Stem (10)	Leaf (1)
0	7, 8, 9
1	2, 4, 5, 5, 7, 8
2	0, 5
3	0, 6
4	2

Example of Student Work (Data of 'stem' was included in the data of 'leaf')

幹（10）	葉（1）
0	7 8 9
1	12 14 15 15 17 18
2	20 22 25
3	30 36
4	42

Example of Student Work (The order of data of 'leaf' was handled improperly)

幹（10）	葉（1）
0	9 8 7
1	2 7 8 5 4 5
2	0 5 2
3	0 6
4	2

Example of Student Work (Good performance)

幹（10）	葉（1）
0	7 8 9
1	2 4 5 5 7 8
2	0 2 5
3	0 6
4	2

- Measures of Central Tendency: The majority of students could find mean and median from a set of ungrouped data. Many of them were able to calculate the weighted mean of a set of data. Quite a number of them were capable of finding mean and modal class from a set of grouped data. However, their performance in indicating the abuses from examples of abuses of mean was not satisfactory.

Q47/M1

Exemplar Item (Indicate the abuses)

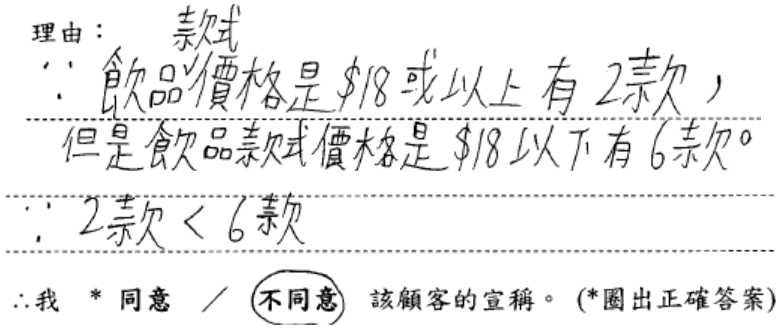
The prices of drinks at a restaurant are shown as follows:

Drink	Price
Green Tea	$14
Red Tea	$14
Lemon Water	$16
Lemon Tea	$16
Coffee	$17
Milk Tea	$17
Chocolate Milk	$24
Fresh Milk	$26

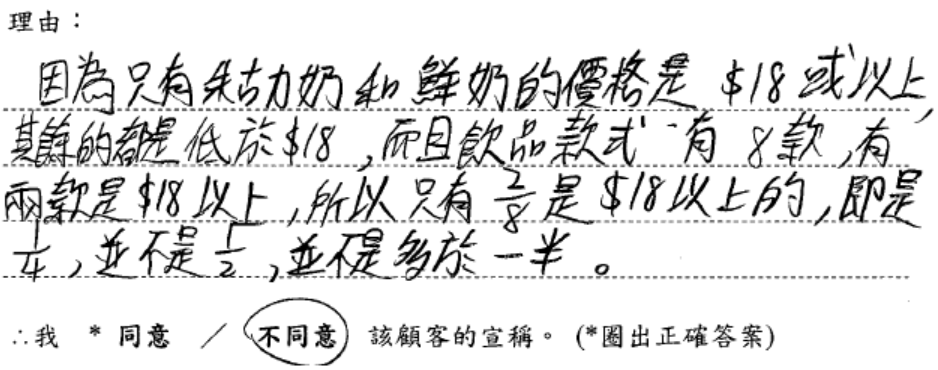
A customer said, 'Since the mean price of all types of drinks is $18 , over half of the types of drinks are $18 or more.'

Do you agree with the customer's claim? Explain your answer.

Example of Student Work (Wrong comparison)



Example of Student Work (Good performance)



- Probability: Students were good at calculating the probability by listing. However, their performance in calculating the relative frequency was acceptable.

General Comments on Secondary 3 Student Performances

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

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

Basic Computation

- Use powers to express the repeated multiplication of a number and use repeated multiplication to express the power of a number (e.g. Q1/M3)
- Perform mixed arithmetic operation of positive integers involving two levels and at most three pairs of brackets (e.g. Q21/M2)

Directed Numbers

- Demonstrate recognition of the ordering of integers on the number line (e.g. Q22/M4)

Using Percentages

- Solve problems on percentage increase, percentage decrease and percentage change in mathematical context (e.g. Q2/M1)

Algebraic Expressions

- Formulate algebraic expressions from word phrases (e.g. Q4/M1)
- Write down the next term of a sequence of odd numbers, even numbers, square numbers and triangular numbers with several consecutive terms given (e.g. Q25/M2)

Linear Equations in Two Unknowns

- Formulate simultaneous linear equations in two unknowns from a simple problem situation (e.g. Q7/M1)

Laws of Integral Indices

- Convert a positive number in scientific notations to an integer or a decimal (e.g. Q6/M2)

Polynomials

- Perform multiplication of a monomial by a binomial or a trinomial, in which the terms involved contain at most two variables (e.g. Q9/M1)

Formulae

- Substitute values into formulae (in which all exponents are positive integers) and find the value of a specified variable (e.g. Q29/M3)

Linear Inequalities in One Unknown

- Determine whether a number satisfies a given inequality of $x > a$, $x \geq a$, $x < a$ and $x \leq a$ (e.g. Q9/M2)

Errors in Measurement

- Find the range of measures in measurements of given degrees of accuracy (e.g. Q11/M2)

3-D Figures

- Demonstrate recognition of the concepts of right prisms, right circular cylinders, right pyramids and right circular cones (e.g. Q32/M2)
- Demonstrate recognition of the sections of prisms, circular cylinders, pyramids and circular cones (e.g. Q12/M1)
- Sketch the 2-D representations of right prisms, right circular cylinders, right pyramids and right circular cones (e.g. Q31/M1)

Angles and Parallel Lines

- Use the properties of adjacent angles on a straight line, vertically opposite angles, and angles at a point to find unknowns (e.g. Q31/M3)
- Use the angle properties associated with parallel lines to find unknowns (e.g. Q32/M1)

Polygons

- Use common notations to represent polygons (e.g. Q14/M3)

Congruent Triangles

- Demonstrate recognition of the properties of congruent triangles (e.g. Q34/M1)
- Use the relations between sides and angles associated with isosceles triangles to find unknowns (e.g. Q34/M2)

Quadrilaterals

- Use the properties of parallelograms to find unknowns (e.g. Q35/M4)
- Use the properties of rectangles, rhombuses and squares to find unknowns (e.g. Q35/M2)

Pythagoras' Theorem

- Use Pythagoras' theorem to find unknowns (e.g. Q16/M3)

Rectangular Coordinate System

- Use coordinates to represent the position of a point and mark the point with given coordinates (e.g. Q15/M4)
- Find the image of a given point under a single transformation (the transformation includes only translation, reflection in a line parallel to the x-axis, or y- axis and rotation about the origin through 90°, 180° and 270°) in the rectangular coordinate plane (e.g. Q36/M4)

Trigonometry

- Find the sine, cosine and tangent of angles between 0° to 90° and vice versa (e.g. Q18/M4)

Organisation of Data

- Organise the same set of data by different grouping methods (e.g. Q37/M3)

Presentation of Data

- Interpret stem-and-leaf diagrams and histograms (e.g. Q37/M1)
- Read off data from statistical charts representing two different sets of data (e.g. (Q38/M2)

Probability

- Calculate the probability by listing (e.g. Q47/M4)

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

Basic Computation

- Find the greatest common divisor of two numbers which are expressed as products of prime factors (e.g. Q1/M1): Half of the students chose the correct answer, option A. Nearly 20% of them chose option C. They confused least common multiples with greatest common divisors.

Q1/M1
Find the greatest common divisor (gcd) of $2^2 \times 3$ and $2 \times 3^2 \times 5$. A. 2×3 B. $2 \times 3 \times 5$ C. $2^2 \times 3^2 \times 5$ D. $2^3 \times 3^3 \times 5$

Approximate Values and Numerical Estimation

- Round off a number to a certain number of decimal places (e.g. Q1/M2): Half of the students chose the correct answer, option D. Around 15% of students chose option B. They confused 3 significant figures with 3 decimal places.

Q1/M2
Round off 0.069 87 to 3 decimal places. A. 0.069 B. 0.069 9 C. 0.07 D. 0.070

Rational and Irrational Numbers

- Demonstrate recognition of the concepts of rational and irrational numbers (e.g. Q2/M2): Almost half of the students chose the correct answer, option C, but around 30% of them chose option B. They mistakenly thought that the cube root is an irrational number. Around 10% of students chose the rest of each option. They mistakenly thought that decimals or fractions are irrational numbers.

Q2/M2
Which of the following is an irrational number? A. 0.14 B. $\sqrt[3]{27}$ C. 2π D. $\frac{1}{3}$

Polynomials

- Distinguish polynomials from algebraic expressions (e.g. Q9/M3): Less than 30% of students chose the correct answer, option A. 60% of students chose option C. They were not able to recognise that 3 and 2*y* can be the terms of polynomials.

Q9/M3
Which of the following is **NOT** a polynomial? A. $3+\frac{2}{y^2}$ B. $3+\frac{y^2}{2}$ C. $3+2y$ D. $3+2y^2$

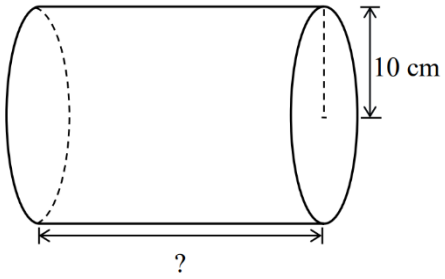
Linear Inequalities in One Unknown

- Formulate a linear inequality in one unknown from a simple problem situation (Q10/M2)：Half of the students chose the correct answer, option D, but nearly 30% of students chose option B. They mistakenly used '<' to represent 'not exceed'.

Q10/M2
A shop sells two kinds of candies including lollipops and chocolate. One pack of lollipops weighs x g. The weight of a pack of chocolate is half that of a pack of lollipops. Susan has 3 packs of lollipops and 4 packs of chocolate. The total weight of the candies does not exceed 750 g. Which of the following inequalities can be used to find the range of the values of x? A. $3x+4\times\left(\frac{x}{2}\right)>750$ B. $3x+4\times\left(\frac{x}{2}\right)<750$ C. $3x+4\times\left(\frac{x}{2}\right)\geq 750$ D. $3x+4\times\left(\frac{x}{2}\right)\leq 750$

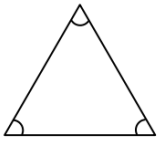
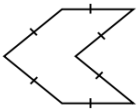
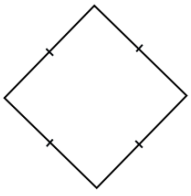
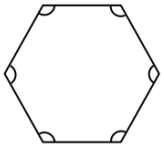
Mensuration

- Use the formula for the surface areas of right circular cylinders to find unknowns (e.g. Q13/M1)：Half of the students chose the correct answer, option C, but nearly 20 % of students chose option A and 20% also chose option D. They mistakenly used the formula for the volume of circular cylinders or mistakenly took the formula for the curved surface area of circular cylinders as πrh.

Q13/M1
The figure shows a solid right circular cylinder. Its curved surface area is $500\pi \text{ cm}^2$. Its base radius is 10 cm. Find the height of the cylinder.  A. 5 cm B. 15 cm C. 25 cm D. 50 cm

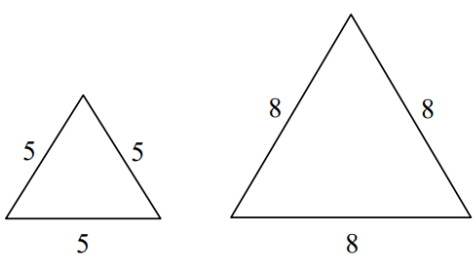
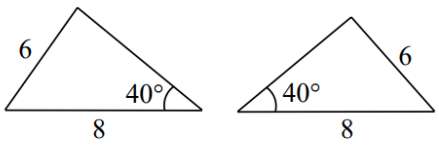
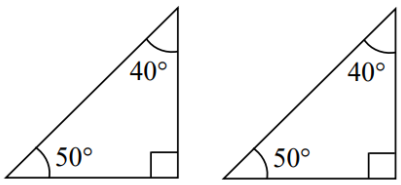
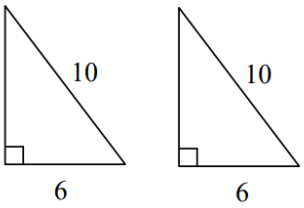
Polygons

- Demonstrate recognition of the concepts of regular polygons (e.g. Q14/M4): Around 20% of students chose the correct answer, option A. Around 40% of students chose option C. They mistakenly identified the rhombus as a regular polygon. More than 30% of students chose option D. They mistakenly identified the equiangular hexagon as a regular polygon.

Q14/M4
Which of the following figures **MUST** be a regular polygon? A.  B.  C.  D. 

Congruent Triangles

- Demonstrate recognition of the conditions for congruent triangles (e.g. Q15/M1): Almost half of students chose the correct answer, option D. There were around 20% of students who chose the other options. For students who chose option A, they mistakenly thought that 'three sides proportional' is the condition for congruent triangles. For students who chose option B or C, they mistakenly thought that 'SSA' or 'AAA' is the condition for congruent triangles respectively.

Q15/M1
Which of the following pairs of triangles **MUST** be congruent? A.    B.    C.    D. 

Good Performance of Secondary 3 Students in 2023

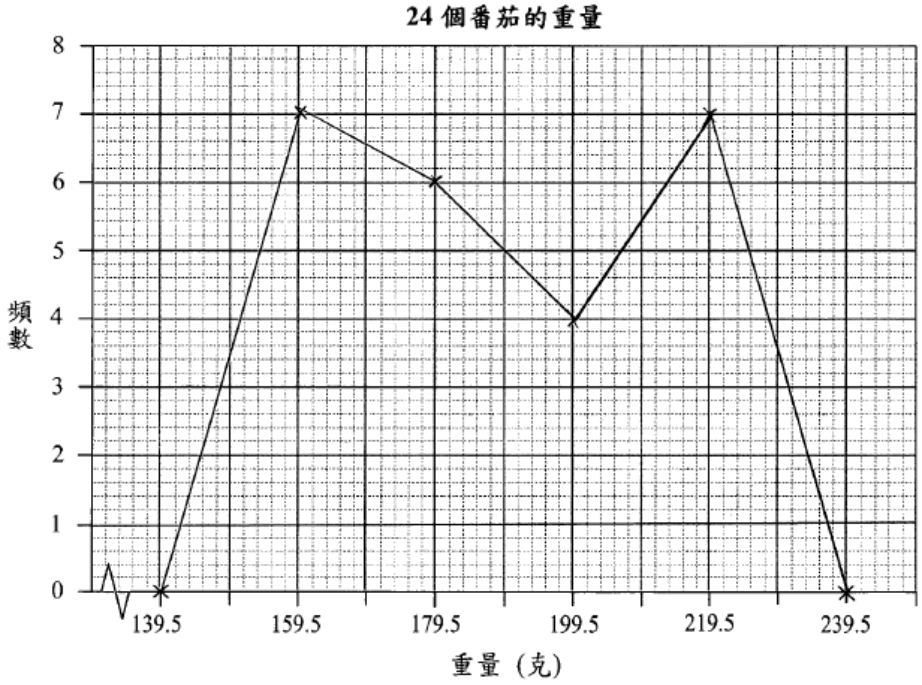
- Students with good performance demonstrated mastery of the concepts and skills assessed by the sub-papers. Their performance in numeracy skills and problem-solving skills was good. They were able to solve the problems relating to basic computation, approximate values and numerical estimation, rational and irrational numbers, using percentages, rates, ratios and proportions. Students had a thorough conceptual understanding of algebra and could demonstrate understanding of the meaning of solutions of equations. They were able to deal with the operations, factorisations and expansions of simple polynomials, and were familiar with laws of integral indices and linear inequalities in one unknown. They were capable of solving equations by using algebraic and graphical methods. They could also plot graphs of linear equations in two unknowns.

- Students with good performance were good at calculating the surface areas and volumes of 3-D figures. They were able to demonstrate good recognition of angles and parallel lines, congruent and similar triangles, rectangular coordinate system, quadrilaterals, trigonometry and Pythagoras' Theorem. They were able to complete the geometric proofs with the correct steps and sufficient reasons provided.

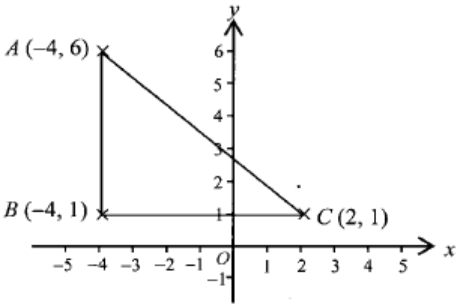
- Students with good performance had a good knowledge of organisation and presentation of data. They also grasped the basic concepts of probability. They were able to construct and interpret simple statistical charts, choose appropriate statistical charts to present data, and find the mean, median and mode/modal class from a set of data.

- 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/M3
Example of Student Work (Construct simple statistical charts) 

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

Q46/M1
Example of Student Work (Find the area of a triangle) AB = 6 - 1 = 5 units BC = 2 - (-4) = 6 units Area of $\triangle ABC = 6 \times 5 \times \frac{1}{2}$ = 15 sq. units 

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

Q46/M3
Example of Student Work (Geometric proof)

In △CAB and △CED,

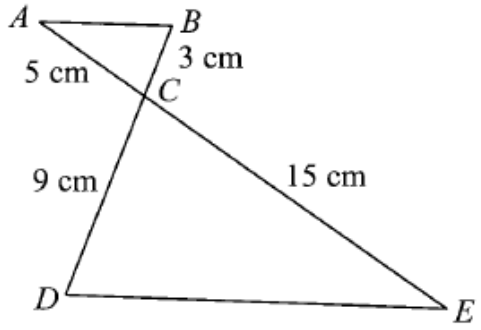
∠ACB = ∠ECD (vert. opp. ∠s)

$\frac{BC}{DC} = \frac{3\text{ cm}}{9\text{ cm}} = \frac{1}{3}$

$\frac{AC}{EC} = \frac{5\text{ cm}}{15\text{ cm}} = \frac{1}{3}$

$\because \angle ACB = \angle ECD$ and $\frac{BC}{DC} = \frac{AC}{EC} = \frac{1}{3}$

$\therefore$ △CAB ~ △CED (ratio of 2 sides, inc. ∠)



Some common weaknesses of high-achieving students were that:

- Some students tried to explain the sources of deception in cases of misuse of means, but they could not give sufficient explanations.
- Some students were not able to calculate the percentage errors from given measurements.
- Some students were not able to determine whether a polygon is regular.

Overview of Secondary 3 Student Performances in Mathematics in 2018, 2019 and 2023

The percentage of students achieving Basic Competency in the Territory-wide System Assessment this year was 76.6%.

The percentages of students achieving Basic Competency in 2018, 2019 and 2023 are listed below:

Table 8.9 Percentages of S.3 Students Achieving Mathematics Basic Competency in 2018, 2019 and 2023**

Year	% of Students Achieving Mathematics Basic Competency
2018	80.0
2019	79.6
2023	76.6

** Due to the volatility of the COVID-19 epidemic, the TSA 2020, 2021 and 2022 were suspended and no data was provided.

A comparison of the strengths and weaknesses of S.3 students in 2018, 2019 and 2023 provides useful information for teachers to help students improve their learning. The following tables provide an overview of student performances in each strand for these years.

Table 8.10 Overview of S.3 Student Performances in Mathematics in 2018, 2019 and 2023

Year / Number and Algebra	2018	2019	2023	Remarks
Strengths	• Students were good at using directed numbers to describe real life situations. They also recognised 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 did well in representing real numbers on the number line. • Students were able to solve simple problems by using ratio. • Students were able to substitute values into formulas to find the unknown values. • Students demonstrated good recognition of inequalities.	• Students did well in the operations of directed numbers. They demonstrated recognition of the ordering of integers on the number line. • Students were capable of converting numbers in scientific notation to integers. • Students were good at formulating simple inequalities from simple contexts. • Students are able to describe patterns by writing the next few terms in arithmetic sequences from several consecutive terms of integral values. • Students could solve simple equations. • Students demonstrated good recognition of using inequality signs to compare numbers.	• Students could use powers to express the repeated multiplication of a number and use repeated multiplication to express power of a number. • Students were good at performing mixed arithmetic operations of positive integers. • Students could demonstrate recognition of the ordering of integers on the number line. • Students could write down the next term of a sequence of triangular numbers with several consecutive terms given. • Students could convert a positive number in scientific notations to an integer. • Students could substitute values into formulae (in which all exponents are positive integers) and find the value of a specified variable.	

Year / Number and Algebra	2018	2019	2023	Remarks
Weaknesses	• Quite a number of students were not able to estimate values according to the given context with reasonable justifications. • Quite a number of students were not able to distinguish the difference between $(-2)^n$ and -2^n. • Students were weak in recognising the terminologies of polynomials such as number of terms. • Students were quite weak in recognising the meaning of roots of equations. • Students' performance was not satisfactory in manipulating algebraic fractions.	• Many students were not able to estimate values according to the given context with reasonable justifications. • Half of the students were not able to solve problems on simple interest to find the interest rate. • Students' performance was not satisfactory in expanding simple algebraic expressions by using the perfect square expressions. • Students were weak in performing change of subject in simple formulas. • Students' performance was only fair in using the laws of integral indices to simplify simple algebraic expressions. • Students' recognition of plotting graphs of linear equations in 2 unknowns was insufficient.	• Many students were not able to perform prime factorisation of a positive integer. • The minority of students were able to use suitable estimation strategies to solve simple real-life problems. • Students were weak in solving simple problems on discount. • Only some students could demonstrate recognition of coefficients. • There was room for improvement in expanding simple algebraic expressions by using the perfect square expressions. • Students' performance was not satisfactory in performing change of subject in simple formulae not involving radical sign.	• Students always use rounding off for estimation without considering the actual requirements of questions. • Units were often omitted in the answer. • Students were willing to show their working steps and strategies used in solving problems, but sometimes the solutions were incomplete.

Year / Measures, Shape and Space	2018	2019	2023	Remarks
Strengths	• Students were able to choose an appropriate unit and the degree of accuracy for real-life measurements. • Students were able to find the volumes of cylinders. • Students could use notations to represent angles. • Students demonstrated good recognition of the concepts of transformation. • Students were able to identify the nets of cubes. • Students were good at using the properties of squares in numerical calculations. • Students had good knowledge of the rectangular coordinate system. • Students understood the basic concepts of trigonometric ratios.	• 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 identify 3-D solids from given nets. • Students were capable of demonstrating recognition of interior angles of polygons. • Students were able to use the angle properties associated with intersecting lines/parallel lines to solve simple geometric problems. • Students were able to use the formula for the sums of the interior angles of convex polygons. • Students did well in using the relations between sides and angles associated with isosceles triangles. • Students were good at using the properties of rectangles in numerical calculations. • Students had good knowledge of the rectangular coordinate system.	• Students were able to find the range of measures in measurements of given degrees of accuracy. • Students were able to sketch the 2D-representation of a right prism. • Students could demonstrate recognition of the concepts of right pyramids. • Students were able to use the properties of vertical opposite angles to find unknowns. • Students were able to use the angle properties associated with parallel lines to find unknowns. • Students could demonstrate recognition of the conditions for congruent triangles. • Students did well in using the properties of rectangles and parallelograms to find unknowns. • Students were able to find the image of a given point under a translation in the rectangular coordinate plane.	

Year / Measures, Shape and Space	2018	2019	2023	Remarks
Weaknesses	• Students' performance in using the relationships between sides and surface areas of similar figures to solve related problems was fair. • Many students were not able to determine whether a polygon is convex. • Students were not able to use the conditions for similar triangles to perform simple proofs. • Students in general were not able to complete the proofs of simple geometric problems.	• Students' performance in using the relationships between sides and volumes of similar figures to solve related problems was fair. • Students were unable to distinguish among formulas for volumes by considering dimensions. • Students were weak in identifying regular polygons and concave polygons. • Students were not able to identify whether two triangles are congruent/similar with simple reasons. • Students in general were not able to complete the proofs of simple geometric problems.	• Students were weak in calculating percentage errors from given measurements. • Quite a number of students were not able to calculate arc lengths of sectors. • Students were weak in using the relationships between sides and volumes of 3-D figures to solve problems. • Students were weak in demonstrating recognition of the concepts of regular polygons. • Many students were not able to use the condition for isosceles triangles or the conditions for similar triangles to perform simple proofs.	• In doing geometric proofs, many students could not complete the proof such as using circular arguments, giving illogical reasoning and giving incorrect reasons. • Inappropriate or incorrect presentation frequently occurred (such as confused $\angle ABC$ with $\triangle ABC$, $AB = BC$ with $AB \parallel BC$). • Units were often omitted in the answer.

Year / Data Handling	2018	2019	2023	Remarks
Strengths	• Students could organise the same set of data by different grouping methods. • Students could construct and interpret simple statistical charts. • Students were able to find mean and median from a set of ungrouped data. • Students could calculate the theoretical probability by listing.	• Students could organise the same set of data by different grouping methods. • Students could interpret simple statistical charts and compare the presentations of the same set of data by using statistical charts. • Students could calculate the theoretical probability by listing.	• Students were able to organise the same set of data by different grouping methods. • Students did well in reading off data from statistical charts representing two different sets of data. • Students were good at interpreting histograms. • Students were able to calculate the probability by listing.	
Weaknesses	• Students could not choose appropriate diagrams/graphs to present a set of data in general. • The performance of students in identifying sources of deception in cases of misuse of averages was not satisfactory.	• Students were weak in distinguishing discrete and continuous data. • The performance of students in identifying sources of deception in cases of misuse of means was not satisfactory.	• The performance of students was not satisfactory in indicating the abuses from examples of abuses of mean.	• Many students did not use rulers to draw statistical charts. • When answering questions about the abuses of mean, students often state the given information only. They could not indicate the abuses from examples and give sufficient explanations.

Comparison of Student Performances in Mathematics in Primary 3, Primary 6 and Secondary 3 in 2023

The percentages of P.3, P.6 and S.3 students achieving Basic Competency from 2004 to 2023 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**	**2018**	**2019**	**2023**
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$^{\nabla}$	88.0$^{\square}$	87.7$^{\square}$	86.5$^{\square}$
P.6	---	83.0	83.8	83.8	84.1	#	84.2	84.1	^	84.2	^	84.0	^	84.0	^	84.2	78.3
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	80.0	79.6	76.6

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

^ As participation in the P.6 TSA has been on a voluntary basis in even-numbered years since 2012, not all P.6 TSA 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.

$^{\square}$ Starting from 2018, the P.3 TSA is conducted on a sampling basis. The BC attainment rates are inferred from the sample of all students participating in the assessment.

** Due to the volatility of the COVID-19 epidemic, the TSA 2020, 2021 and 2022 were suspended and no data was provided.

The data shows the performance of Primary 3, Primary 6 and Secondary 3 students in different strands. Teachers could adapt their teaching strategies and curriculum design in accordance with the strengths and weaknesses of students. The strands of Mathematics Curriculum at each key stage belong to different strands as shown below:

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

	Primary 3	**Primary 6**	**Secondary 3**
Strand	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 2023:

Table 8.13 Comparison of Student Performances in Mathematics in Primary 3, Primary 6 and Secondary 3 in 2023

Level / Strand	P.3	P.6	S.3
Number	• Students could demonstrate the recognition of places and the values represented by the digits. • Students could perform addition, subtraction and multiplication of whole numbers. However, a small proportion of students neglected the computational rule of doing 'multiplication before addition'. • Students in general were able to solve simple application problems involving addition, subtraction, multiplication and mixed operations of multiplication and subtraction. A small proportion of students incorrectly used subtraction to solve application problems involving division or misunderstood the questions or used incorrect methods of calculation, leading to incorrect answers. • Students could demonstrate recognition of fractions as a part of one whole. They were able to compare fractions. • Students could solve problems involving addition or subtraction of fractions with the same denominator that are illustrated by diagrams.	• Students were able to recognise whole numbers, decimals and percentages but a small proportion of students confused the common factors with the common multiples. They were weak in identifying prime numbers and composite numbers. • Students were able to perform the interconversion between fractions, decimals and percentages. They could also compare the magnitude of fractions and decimals. • Students were capable of performing the four arithmetic operations of whole numbers, decimals and percentages. However, their performance in operations of fractions was only fair. • Students generally were able to solve application problems but there was room for improvement in solving problems involving fractions or percentages for some students. • Students were able to estimate the answer by choosing suitable approximate values.	• Students were able to use powers to express the repeated multiplication of a number and use repeated multiplication to express the power of a number. • Students were good at performing mixed arithmetic operations of positive integers. • Many students were not able to perform prime factorisation of a positive integer. • Students were weak in using suitable estimation strategies to solve simple real-life problems. • Students could solve simple problems on percentages, but there was room for improvement in solving problems on discount.
Algebra	N.A.	• Students were able to use algebraic expressions to represent the operations of and relations between quantities and unknown quantities. • Students were capable of solving equations not involving collecting like terms. • Students were able to solve application problems by using simple equations.	• Students were able to solve simple linear equations in one unknown. • Students were able to substitute values into formulae and find the value of a specific variable. • Students were able to demonstrate recognition of the properties of inequalities. • Students' performance was not satisfactory in performing change of subject in simple formulae.

Level / Strand	P.3	P.6	S.3
Measures	• Students were able to identify the money in circulation in Hong Kong and read price tags. There was room for improvement in demonstrating the understanding of the use of money in daily life. • Students could find the correct dates and days of a week from a calendar and tell time from an analog clock and a digital clock. • Students were able to measure and compare the length and weight of objects as well as 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 were able to select appropriate units to record the length and weight of objects.	• Students were able to find the perimeters of squares and rectangles, the areas of 2-D shapes, and apply the formula of circumference. • Students could find the volumes of cubes and cuboids. They were also able to find the volume of irregular solids by displacement of water. • A small proportion of students did not recognise the relationship between capacity and volume. • Students were able to solve simple problems of speed. • Students could compare the sizes of angles but they were relatively weak in measuring the sizes of reflex angles.	• Students were able to find the range of measures in measurements of given degrees of accuracy. • Many students were not able to calculate percentage errors from given measurements. • Students were able to calculate areas of sectors, surface areas of right circular cones. However, quite a number of students could not find the arc lengths of sectors. • Students were able to use the properties of rectangles and parallelograms to find unknowns.
Shape and Space	• Students were capable of identifying cylinders and spheres intuitively. Some of them could not identify prisms, pyramids and cones intuitively. • Almost half of students confused 3-D shapes with 2-D shapes. • Students were capable of identifying different 2-D shapes including triangles, quadrilaterals, squares, hexagons and circles intuitively. • Students could identify straight lines, curves and parallel lines. • Students were able to identify right angles and compare the size of angles. • Students were able to demonstrate recognition of the four directions: east, south, west and north.	• Students were able to recognise cones, pyramids, cylinders, prisms and spheres, involving vertices, edges and faces of 3-D shapes. • Students were able to recognise the properties of 2-D shapes. However, some students mixed up isosceles triangles and equilateral triangles, parallelograms and rhombuses. • Students were capable of recognising the eight compass points. • Students were able to find the axes of symmetry of symmetric 2-D shapes but some of them were not able to identify symmetric 2-D shapes.	• Students were able to sketch the 2-D representations of right prisms. • Students could demonstrate recognition of the concepts of right pyramids. • Students were able to use the angle properties associated with parallel lines to find unknowns. • Students could demonstrate recognition of the properties of congruent triangles. • Students were able to find the image of a given point under translation in a rectangular coordinate plane. • The majority of students were not able to demonstrate recognition of the concepts of regular polygons. • Many students were not able to use the condition for isosceles triangles or the conditions for congruent triangles to perform simple proofs. Many of them still could not provide sufficient reasons or complete the proof correctly.

Level / Strand	P.3	P.6	S.3
Data Handling	• Students were capable of reading pictograms and bar charts. They could interpret the information given in statistical graphs to answer straightforward questions. • Students were able to construct pictograms by referring to the given raw data. • There was room for improvement in the students' performance in constructing bar charts.	• Students were capable of reading the data presented in bar charts and broken line graphs as well as using the data from the statistical graphs to answer simple questions. • Students were good at constructing broken line graphs. • Many students could read data from pie charts to perform simple calculations. • Students' performance was fair in calculating the average of a group of data and solving simple problems of averages.	• Students were able to organise the same set of data by different grouping methods. • Students did well in reading off data from statistical charts representing two different sets of data. • Students were at good at interpreting histograms, but their performance was only acceptable in constructing stem-and-leaf diagrams. • Students' performance was not satisfactory in indicating the abuses from examples of abuses of mean. • Students did well in calculating the probability by listing.