8. MATHEMATICS

Results of Primary 3 Mathematics in TSA 2012

The Territory-wide percentage of P.3 students achieving Mathematics Basic Competency in TSA 2012 was 87.3%, which was almost the same as the performance levels in 2010 and 2011.

Primary 3 Assessment Design

The assessment tasks for P.3 were based on the *Basic Competency at the end of KS1 for the Mathematics Curriculum (Trial Version)* and the *Mathematics Curriculum Guide (P1 – P6), 2000.* The tasks covered the four Dimensions of the Mathematics Primary 1 to 3 curriculum, namely, Number, Measures, Shape & Space and Data Handling, testing the concepts, knowledge, skills and applications relevant to these areas.

The Assessment consisted of test items in a number of formats according to the contexts of the questions, including fill in the blanks, answers only and answers involving working steps as well as multiple choice. Some of the test items had sub-items. Besides finding the correct answers, students were also tested on the ability to present their solutions to problems, including writing out necessary statements, mathematical expressions and explanations.

The Assessment consisted of 122 test items (197 score points) covering the four Dimensions. These items were grouped into four sub-papers, each 40 minutes in duration and covered all four Dimensions. Some items appeared in more than one sub-paper to act as inter-paper links. Each student was required to attempt only one of the four sub-papers.

The composition of the four sub-papers is illustrated as follows:

Table 8.1 Composition of the Sub-papers

Sub-paper	No. of Items (Score Points)				
	Number Dimension	Measures Dimension	Shape & Space Dimension	Data Handling Dimension	Total
M1	17½ (24)	8½ (15)	8 (15)	2 (5)	36 (59)
M2	17½ (24)	11½ (18)	7 (13)	2 (6)	38 (61)
M3	16 (21)	10½ (19)	9½ (14)	2 (6)	38 (60)
M4	18 (23)	10½ (15)	9½ (16)	2 (5)	40 (59)
Total *	54½ (75)	31½ (54)	30 (51)	6 (17)	122 (197)

* Items that appear in more than one sub-paper are counted once only.

Performance of P.3 Students with Minimally Acceptable Levels of Basic Competence in TSA 2012

P.3 Number Dimension

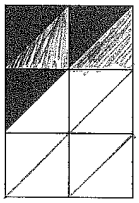
Students performed satisfactorily in this dimension. They could understand the basic concepts of fractions and compare fractions. Students were good at performing addition, subtraction, multiplication and division of whole numbers as well as their mixed operations. Some students had difficulty in finding the remainder of division problems. In general, students were able to solve application problems. They could demonstrate clear working steps in presenting their solutions. Further comments on students' performance are provided below with examples from different sub-papers quoted in brackets.

Understanding basic concepts of numbers and fractions

- Most students were capable of recognizing the place values of digits in a whole number and the values represented by its digits (e.g. Q1/M1; Q1/M3; Q1/M4). The majority of students could read, write and order numbers up to 5 digits (e.g. Q2/M3; Q2/M1; Q2/M4), although some weaknesses were observed when they were asked to form whole numbers satisfying specific conditions (e.g. Q2/M2).
- However, some students were not capable of expressing Arabic numbers in correct Chinese characters or English words (see examples of students' work on Q3/M1 on the next page).

Q3/M1	
用中國數字寫出「52008」這個數。 答案：五萬二千零8 答案：五萬二千零零八	Write the number '52008' in words. Answer: fifth-two thousand and eight Answer: Fifty-two thousands and eight

- The majority of students were capable of using fractions to represent parts of a whole (e.g. Q17/M1; Q15/M2; Q16/M3: Q17/M4).

Q17/M4	
Use a pencil to shade the remaining part so that $\frac{5}{12}$ of the whole diagram is shaded.	

- A considerable number of students were not fully aware of the concept about fractions that the whole must be divided into a number of equal parts (about one-third of the students chose the option B in Q16/M1).
- Most students could recognize the relationship between fractions and 1 as the whole (e.g. Q16(a)/M2; Q18(a)/M4).
- The majority of students were able to compare fractions (e.g. Q19/M1; Q16(b)/M2; Q18(b)/M4) but few were quite weak in comparing fractions with the same numerators (e.g. Q17/M2).
- In Q16/M4, many students seemed to have carelessly missed the words 'more than' in the stem and chose the option D.

Performing basic calculations with whole numbers

- Addition – The majority of students were able to add whole numbers including carrying (e.g. Q3/M3). They could answer questions involving repeated addition of 3-digit numbers (e.g. Q4/M4) and the commutative properties of addition (e.g. Q4/M1).
- Subtraction – The majority of students did well in the subtraction of whole numbers involving decomposition and repeated subtraction (e.g. Q5/M1; Q6/M1; Q4/M3; Q5/M4).

- Multiplication – Students did well in the multiplication of whole numbers up to 1 digit by 3 digits involving carrying (e.g. Q7/M1; Q5/M3; Q6/M4). In Q6/M3, students were relatively weak in repeated multiplication.
- Division – Students performed satisfactorily in division with divisor of 1 digit and dividend of 3 digits (e.g. Q8/M1; Q7/M4), although they were apparently weaker in cases with remainder (e.g. Q7/M3). In Q8/M4, individual students chose the option B because of neglecting the remainder. A minority of students failed to put a zero in the quotient and chose the option C.

Q8/M4

$628 \div 3 =$

○ A. 29
○ B. 209
● C. 29…1
○ D. 209…1

- Mixed operations – The majority of students could perform mixed operations of addition and subtraction including small brackets (e.g. Q9/M4). Many students could handle mixed operations of multiplication and addition/subtraction (e.g. Q9/M1; Q8/M3; Q10/M4).

Solving application problems

- P.3 students in general were capable of solving simple problems involving addition, subtraction, multiplication, division and mixed operations (e.g. Q10/M1; Q11(a)/M1; Q12/M1; Q14/M1; Q12/M2; Q9/M3; Q10/M3; Q11/M3; Q12/M3; Q11/M4; Q12/M4; Q14/M4). However, some students misunderstood the meaning of more complicated contexts due to carelessness in reading the questions (e.g. Q11(b)/M1).
- The performance of students was not steady in solving problems involving division. Some students confused the dividend with the divisor or did calculations carelessly (see examples of student's work on Q13/M1 on the next page).

Q13/M1	
共賣出衣架： 6×864 =143(包)	6÷864 =144 144 bags of hangers are sold altogether.

- The majority of students were capable of solving problems involving addition, subtraction, multiplication and division in the calculation of money (e.g. Q15(b)/M1; Q13/M3; Q15/M4; Q14/M2).
- Generally, students managed to solve familiar types of problems by showing their methods with correct working steps. In some cases, students were careless in reading the questions. For example, in Q13/M2, a number of students failed to recognize the fact that 'each of us' paying $12 was not simply $12 in total.
- Some students made computational errors and were messy in their working steps (see examples of students' work below).

Q13/M2	Q11/M4
筆盒價： 12+12−5 =17(元)	(409×2)+158=818+158=976 The total number of swimmers in these two days.

- Some students presented illogical steps or wrong units (see examples of students' work below).

Q10/M3	Q11/M3
155+18+25 =155+198 =353 How mahk $353 points does John get.	祖父共寫字： 127張×4 =508個

P.3 Measures Dimension

The performance of students was good in this dimension. The majority of students could identify and use Hong Kong money and read price tags. They were also capable of comparing the length and weight of objects as well as the capacity of containers. Students could choose appropriate units of measurements for recording the length and the weight of objects, and also appropriate tools for measuring the length and the weight of objects as well as the capacity of containers. However, students were weak in reading different scales on measuring cups.

Most students were able to tell the time on a clock face and a digital clock. They could recognize the dates in a calendar and apply the '24-hour time'. There was still room for improvement in inferring the dates and the duration of activities. Further comments on students' performance are provided below with examples from different sub-papers quoted in brackets.

Hong Kong money

- Most students could identify Hong Kong money (e.g. Q19/M2) and read price tags (e.g. Q15(a)/M1; Q14(a)/M3).
- Students in general could use Hong Kong money (e.g. Q18/M1; Q14(b)/M3) and carry out simple money exchanges (e.g. Q20/M1).

Date and time

- The majority of students could deduce the dates and days of a week under given conditions (e.g. Q22(a) and (b)/M1; Q20(a) and (b)/M2). However, a small number of students did not know the number of days in a leap year (e.g. Q22(c)/M1).
- Most students were good at telling the time on a digital clock (e.g. Q23(a)/M1) and a clock face (e.g. Q26(a)/M3; Q24(a)/M4).
- P.3 students were capable of measuring the duration of an activity using 'hours' and 'minutes' (e.g. Q23(b)/M1; Q20(c)/M2; Q25(b)/M4). However, some students were not able to deduce the end time of an activity or its duration (e.g. Q26(b)/M3; Q24(b)/M4) (see an example of students' work on the next page).

Q26/M3

常識科評估在早上  開始。

(a) 評估的開始時間是 上 午 9 時 33 分。

(b) 評估限時 40 分鐘，結束時間是 上 午 9 時 13 分。

- Most students understood and applied the '24-hour time' appropriately (e.g. Q21(a)/M2; Q21(b)/M2; Q25(a)/M4).

Length, distance, weight and capacity

- Most students could directly compare the length of objects (e.g. Q20(b)/M4) and use improvised units to compare the length of different objects (e.g. Q22/M4).
- Most students could directly compare the weight of objects (e.g. Q24/M1; Q25/M2) and use improvised units to compare the weight of different objects (e.g. Q27/M4).
- The majority of students were capable of using a ruler to measure the length of an object (e.g. Q21(b)/M3) and comparing distances given in kilometres (e.g. Q18/M3). However, only about half of the students could measure and compare the weight of objects using 'gram' when the scales were given in 'kg' (e.g. Q26/M4).
- Students did well in choosing the appropriate measuring tools for measuring lengths and weights as well as the capacity of containers (e.g. Q23/M4; Q24/M3; Q29/M2).
- Most students were also capable of using stride length as an 'ever-ready ruler' for measuring the distance (e.g. Q23/M2).
- Students in general could choose suitable measurement units for recording length (e.g. Q21(a) and (b)/M1; Q26(a) and (c)/M2; Q25(a) and (b)/M3) and weight (e.g.

Q26(b) and (d)/M2; Q25(c)/M3; Q21/M4). However, a few students did not have a clear concept of 'millimetre' (mm) and 'kilometre' (km) (see examples of students' work below).

Q21(a)/M1
屯門公路全長約 20 公厘 。 屯門公路全長約 20 厘米 。
Q26(a)/M2
一本學生手冊厚約 5 厘米 。

- Some students confused the units of length with the units of weight (see an example of students' work below).

Q26(a)/M2
一本學生手冊厚約 5 g 。

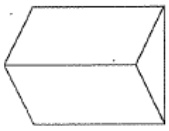
- The majority of students could directly compare the capacity of containers (e.g. Q25/M1) and use improvised units to measure and compare the capacity of containers (e.g. Q26/M1).
- The majority of students could measure and compare the capacity of containers (e.g. Q27/M2) but their performance declined when it involved reading scales on measuring cups (e.g. Q27/M3).

P.3 Shape & Space Dimension

The performance of P.3 students was good in the Shape & Space Dimension. The majority of students were capable of identifying familiar 2-D and 3-D shapes, though they sometimes wrote incorrect Chinese characters or made spelling mistakes in naming 2-D and 3-D shapes. P.3 students mastered the basic concepts of straight lines, curves, parallel lines and perpendicular lines. The majority of students could compare the size of angles, but some were weak in identifying right angles and the four directions. Further comments on students' performance are provided below with examples from different sub-papers quoted in brackets.

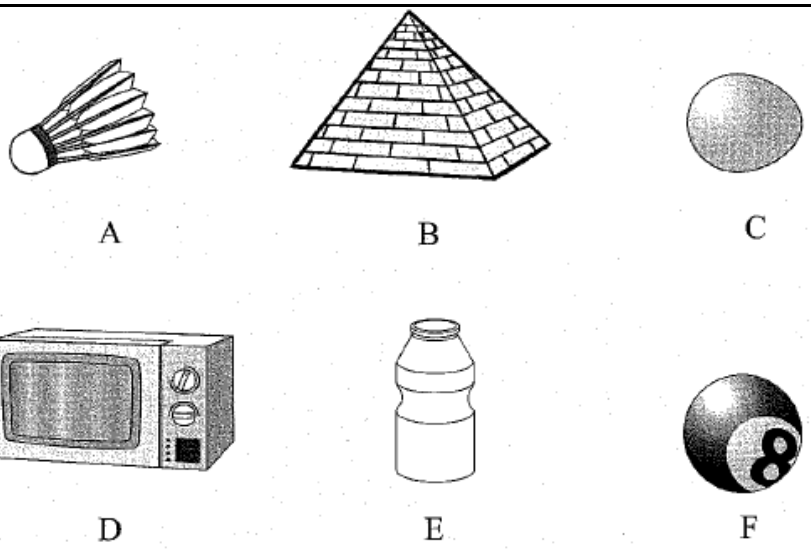
3-D Shapes

- The majority of students were capable of identifying 3-D shapes including prisms and pyramids (e.g. Q27/M1; Q29/M3; Q30/M4). They could name 3-D shapes correctly (e.g. Q28(a)/M1; Q30/M2) but some students confused prisms with pyramids, especially when the solid appeared to have triangular faces (e.g. Q28(b)/M1).

Q28(b)/M1
 答案：角錐體

- Generally, P.3 students were able to differentiate 3-D shapes according to prisms/cylinders, pyramids/cones and spheres as well as to classify familiar 3-D objects in real life (e.g. Q31(a)/M2; Q31(b)/M3). However, they seemed to have difficulties with objects that appeared to be too flat to be a prism (e.g. Q31(b)/M2) or looked like a sphere (e.g. Q31(a)/M3) (see an example of students' work on the next page).

Q31(a)/M3



- The majority of students were able to compare the width of objects (e.g. Q20(a)/M4).

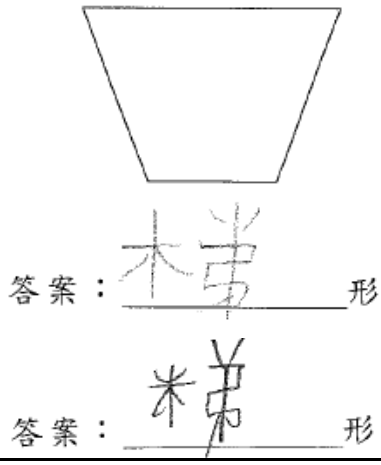
2-D Shapes

- The majority of students could identify 2-D shapes including squares, rhombuses, quadrilaterals, pentagons and hexagons (e.g. Q29(a)/M1; Q21(a)/M3; Q33/M3; Q32/M4). However, a small number of students confused a circle with an ellipse (e.g. Q29(b)/M1).

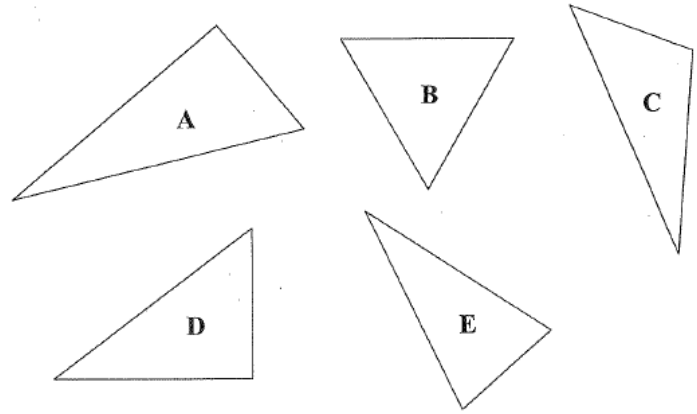
- P.3 students could group 2-D shapes according to the number of sides (e.g. Q35/M2).

- Some students confused parallelograms with rhombuses or named a trapezium wrongly (e.g. Q32/M2) (see examples of students' work on Q32(b)/M2 below).

Q32(b)/M2



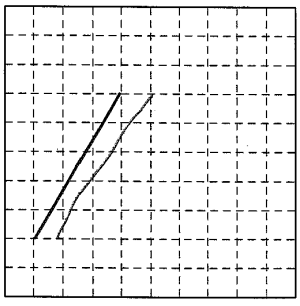
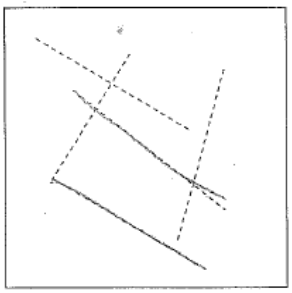
- P.3 students were quite good at recognizing right-angled triangles, equilateral triangles and isosceles triangles (e.g. Q31/M1; Q33/M2; Q28/M3; Q30/M3; Q34/M4).
- Some students were weak in identifying right-angled triangles placed in different orientations (see an example of students' work on Q31(a)/M1 below).

Q31(a)/M1
 列出： (a) 直角三角形：D

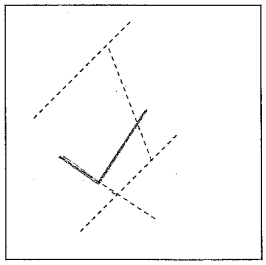
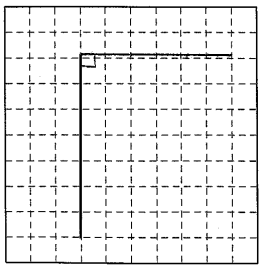
- Most students could describe the relative positions of two 2-D shapes (e.g. Q35/M3).

Straight Lines and Curves

- The majority of students were capable of identifying straight lines and curves (e.g. Q33/M1) and identifying the parallel lines and perpendicular lines in given figures (e.g. Q36/M4).
- A few students were not able to draw a pair of parallel lines (e.g. Q32/M1; Q34/M2).

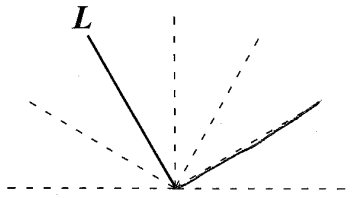
Q32/M1	Q34/M2
	

- The majority of students were capable of tracing perpendicular lines (e.g. Q34/M3; Q37/M4).

Q34/M3	Q37/M4
	

Angles

- Most students were capable of drawing a right angle along given lines (e.g. Q30/M1).

Q30/M1


- Despite a good knowledge of what a right angle was, the performance of P.3 students was comparatively weak in identifying *all* right angles in a figure (e.g. Q36(a)/M2).
- The majority of students could compare the size of angles (e.g. Q36(b)/M2).

Directions

- Most students were capable of recognizing the four directions: east, south, west and north (e.g. Q34(b)/M1; Q36(b)/M3), yet few students were unable to judge the correct position of the reference point (e.g. Q34(a)/M1; Q36(a)/M3).

- A small bunch of students were not able to write the direction correctly (see examples of students' work on Q36(a)/M3 below).

Q36(a)/M3: South	
昆蟲館在售票處的 南 方。	昆蟲館在售票處的 南 方。

P.3 Data Handling Dimension

Students performed well in this dimension. They could read data from given pictograms with a one-to-one representation. They were also capable of constructing pictograms from tabular data. However, some students were not able to use the data in the pictograms to interpret facts. Further comments on students' performance are provided below with examples from different sub-papers quoted in brackets.

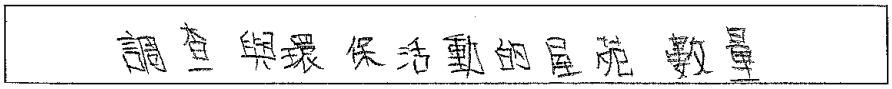
Reading and interpreting pictograms

- The majority of students were good at reading pictograms. They could compare the data given in pictograms in order to answer questions (e.g. Q35(a)&(b)/M1; Q37(a)&(b)/M2; Q37(a)&(b)/M3) or carry out simple calculations (e.g. Q35(c)/M1; Q37(c)/M3).
- In answering open-ended questions, some students were not able to apply the actual data given in pictograms and give the correct inference and explanation (see an example of students' work on Q37(c)/M2 below).

Q37(c)/M2
(c) 有六人或以上選擇的項目，學校才會開辦興趣班。根據象形圖的數據，學校會為3E班開辦電腦班嗎？為什麼？ 答案：* 會 / (不會)（*圈出答案），因為它不是最多學生。
答案：* 會 / (不會)（*圈出答案），因為沒有很多同學喜歡

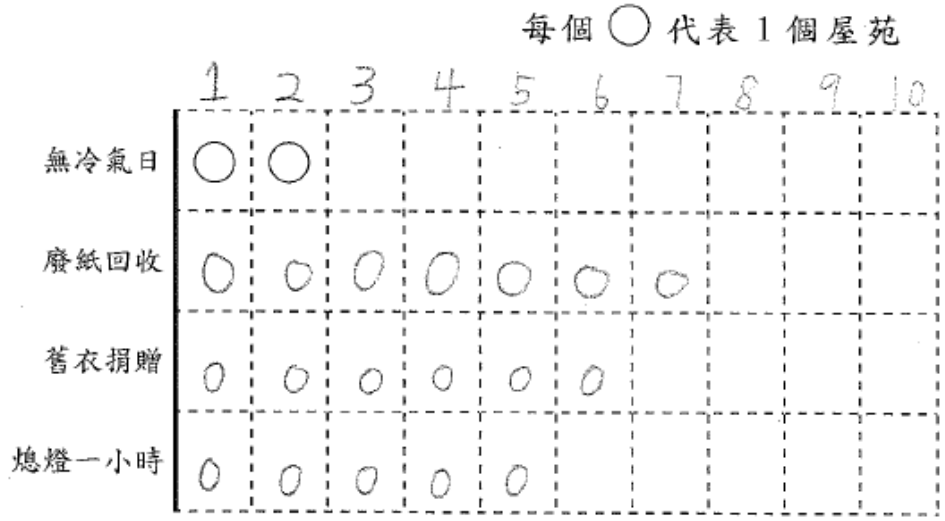
Constructing pictograms

- The majority of students were capable of constructing pictograms from tabular data and providing a proper title for a pictogram (e.g. Q36/M1; Q38/M2). However, some students used the wrong and ambiguous keywords for their titles (see examples of students' work below).

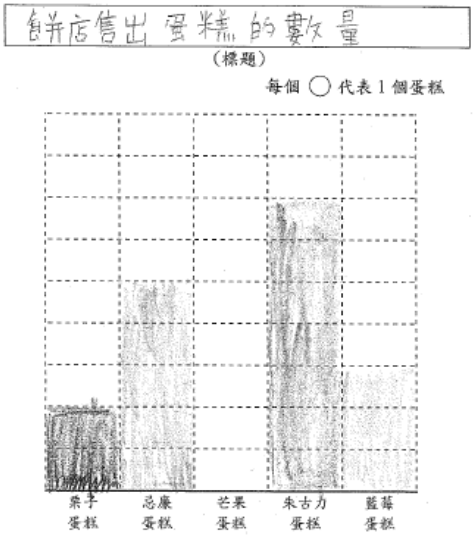
Q38/M3
 (標題)
 (標題)

- Some students unnecessarily added a 'frequency axis' to represent the data given by a pictogram whereas few of them might confuse pictograms with bar charts (see examples of students' work below).

Q38(b)/M3



Q40/M4



General Comments on P.3 Student Performances

P.3 students performed well in the Number, Measures and Shape & Space Dimensions. In the Number Dimension, the majority of students demonstrated mastery of basic concepts and computational skills taught in Key Stage 1. They were able to solve simple application problems and correctly showed the essential steps in arriving at their solutions. However, some students were rather weak in handling division problems involving the remainder. In the Measures Dimension, the majority of students were able to identify Hong Kong money, tell time on a clock face or digital clock, compare the length and weight of objects as well as measure and compare the capacity of containers. However, their performance was relatively weak in the exchange of money, identifying the dates of an activity, measuring the duration of an activity, giving correct units of measurement, comparing the distance between objects, etc. In the Shape & Space Dimension, the majority of students were capable of recognizing 2-D shapes, 3-D shapes, lines, curves, angles and the four directions. Some students could not draw a set of parallel lines and perpendicular lines or name a parallelogram and a trapezium correctly.

The performance of P.3 students in the Data Handling Dimension was quite good. They could read data from given pictograms with a one-to-one representation and construct pictograms from tabular data. However, there were still many students who could not correctly interpret the data given in pictograms and give reasonable explanations. P.3 students were able to solve familiar problems but sometimes misinterpreted questions due to carelessness. The performance of students declined in answering higher order questions because their reasoning was based on intuition or common sense without referring to the specific conditions given in the questions.

Best performance of P.3 Students in TSA 2012

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 two score points in the whole assessment. That is, they demonstrated an almost complete mastery of the concepts and skills being assessed by the sub-papers they attempted.

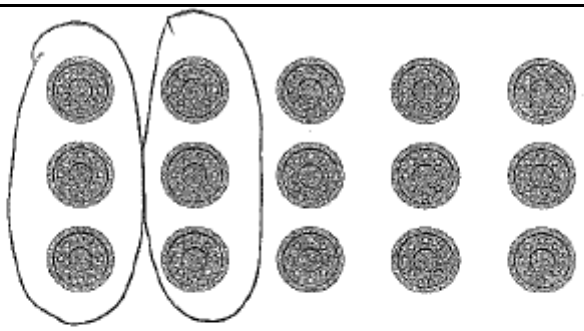
The best performing students were very good at arithmetic computations and could solve application problems in different contexts. Almost all students were capable of

presenting their solutions with clear working steps and explanation (see examples of students' work below).

Q13/M2	Q14/M4
筆盒售： 12元X2-5元 =24元-5元 =19元	三人共須付： 88元X2+68元 =176元+68元 =244元

Most of these students demonstrated a good understanding of the concepts of fractions (see an example of students' work below).

Q17/M1



媽媽有 15 個代幣，她把其中 6 個代幣給小偉。

(a) 小偉得到的代幣佔全部的 $\frac{2}{5}$。

(b) 小偉用了他得到的代幣的 $\frac{2}{3}$ 玩碰碰車，
他用了 4 個代幣。

The best performing students performed well in using and exchanging Hong Kong money, using suitable measurement units for recording length and distance, the weight of objects, the capacity of containers, and measuring with appropriate tools. They were very good at comparing directly or using improvised units, the length and weight of objects and the capacity of containers.

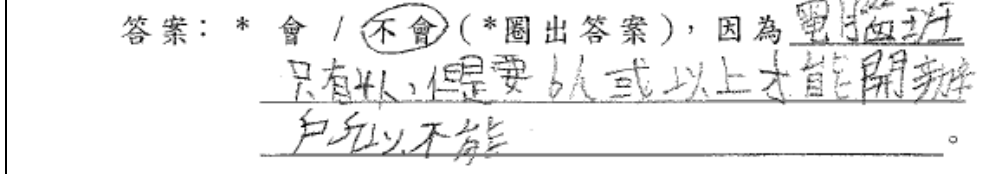
P.3 students were capable of identifying 2-D and 3-D shapes and gave their names accurately. They could identify figures composed of straight lines and curves. They were able to compare the size of angles and recognize right angles. They also showed a good comprehension of the four directions.

The best performing students were capable of constructing pictograms according to the supplied data. They could analyze data and extract relevant information from a pictogram to construct their reasoning (see examples of students' work below).

Q37(c)/M2

(c) 有六人或以上選擇的項目，學校才會開辦興趣班。根據象形圖的數據，學校會為3E班開辦電腦班嗎？為什麼？

答案：* 會 / 不會（*圈出答案），因為這班只有4人喜歡它，它不夠人數。



Comparison of Student Performances in Mathematics at Primary 3 TSA 2010, 2011 and 2012

The percentages of students achieving Basic Competency in 2010, 2011 and 2012 are provided below.

Table 8.2 Percentages of P.3 Students Achieving Mathematics Basic Competency in 2010, 2011 and 2012

Year	% of Students Achieving Mathematics Basic Competency
2010	87.0
2011	87.0
2012	87.3

A comparison of the strengths and weaknesses of P.3 students in TSA 2010, 2011 and 2012 provides useful information on how teachers can help students improve their learning. The following provides a comparison of the students' performances in each of the four Dimensions for the last three years.

Number Dimension

- In 2012, the overall performance of P.3 students in the Number Dimension was more or less the same as in 2010 and 2011.
- Students did better in mastering the concepts of place values and performing mixed operations of whole numbers but they were still weak in handling division problems involving the remainder.
- Students performed well in solving simple application problems. Some students read questions carelessly and could not give meaningful expressions. Their performance varied in application problems involving division with a remainder.
- Some students were relatively weak in solving problems involving calculations of money, probably due to lack of relevant experience in their daily lives.
- Students performed satisfactorily in understanding the basic concept of fractions and comparing fractions.

Measures Dimension

- In 2012, the overall performance of P.3 students in the Measures Dimension was about the same as in 2010 and 2011.
- Students performed steadily in identifying Hong Kong money as well as the exchange and use of money.
- Students in 2012 showed improvement in telling the dates and days of a week from a calendar except in recognizing the leap year.
- Students' performance in telling the time on a clock face or digital clock was good this year. The performance in recording the duration of activities declined a little bit.
- Students' performances were stable in measuring the length of objects, comparing the distance between objects and comparing the length of objects using improvised units, for instance, a paper clip.
- Students' performed well in comparing the weight of objects directly and measuring and comparing the weight of objects using improvised units.
- They did better than previous years in measuring with appropriate tools and choosing suitable measuring units.
- Students' performance was stable in comparing the capacity of containers directly. However, their performance declined slightly in measuring the capacity of containers using improvised units and using 'litre' (L) or 'millilitre' (mL).

Shapes & Space Dimension

- The overall performance of students in 2012 was about the same as that of 2010 and 2011.
- Students performed better than previous years when identifying 2-D shapes and 3-D shapes but there was still room for improvement in grouping 2-D shapes.
- Students this year improved in recognizing the simple characteristics of triangles.
- Students in 2012 did better than in previous years in identifying straight lines and curves as well as in recognizing a set of parallel lines or perpendicular lines.
- The performance of P.3 students was stable in recognizing the four directions.

Data Handling Dimension

- In 2012, the overall performance of P.3 students in the Data Handling Dimension was better than that of previous years.
- Students performed well in reading pictograms but they were not very capable at interpreting the data given in pictograms when answering open-ended questions.
- The majority of students could construct pictograms but some of them just copied words in the questions to give a title, regardless of the information conveyed by the pictogram.