8. MATHEMATICS

Results of Primary 3 Mathematics in TSA 2013

The Territory-wide percentage of P.3 students achieving Mathematics Basic Competency in TSA 2013 was 87.5%. The proportion achieving basic competency in 2013 was almost the same as that in 2011 and 2012.

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, i.e. Number, Measures, Shape & Space and Data Handling, and tested the concepts, knowledge, skills and applications relevant to these areas.

The Assessment included a number of formats according to the context of the question, including fill in the blanks, answers only and answers involving working steps as well as multiple choice. Some of the test items consisted of 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 119 test items (193 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	19(24)	8(17)	8(11)	2(6)	37(58)
M2	19(25)	10(17)	8(10)	2(6)	39(58)
M3	19(26)	9½(15)	8½(17)	2(5)	39(63)
M4	16(23)	9(16)	8(14)	2(5)	35(58)
Total *	53(75)	28½ (51)	30½ (47)	7(20)	119(193)

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

Performance of P.3 Students with Minimally Acceptable Levels of Basic Competence in TSA 2013

P.3 Number Dimension

Students did well 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. In general, students were able to solve application problems. They could demonstrate working steps clearly in presenting their solutions. They also showed a satisfactory performance in solving division problems involving remainders. Further comments on students' performance are provided below with examples from different sub-papers quoted in brackets.

Understanding basic concepts of numbers and fractions

- Students did well in recognizing the place values of digits in a whole number and the values represented by the 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/M1; Q2/M3; Q3/M3).

- A minority of students were not capable of expressing Arabic numbers in correct Chinese characters or English words (see examples of students' work on Q3/M1 below).

Q3/M1
答案：四萬六千零三十五
答案：4萬六千零三十五
Answer: Forty-six and thirty-five

- The majority of students were capable of using fractions to represent parts of a whole (e.g. Q16/M1; Q17/M1; Q17/M2; Q18/M2; Q14/M4).
- Most students could recognize the relationship between fractions and 1 as the whole (e.g. Q19(a)/M2; Q15(a)/M4).
- Many students were able to compare fractions with the same numerators or with the same denominators (e.g. Q18/M1; Q19/M1; Q19(b)/M2; Q15(b)/M4; Q16/M4).

Performing basic calculations with whole numbers

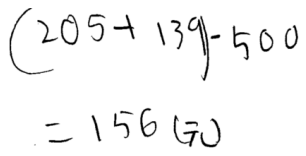
- Addition – The majority of students were good at adding whole numbers (e.g. Q4/M1). They were capable of answering questions involving repeated addition of 3-digit numbers including carrying (e.g. Q4/M3; Q3/M4).
- Subtraction – The majority of students were able to perform subtraction of 3-digit numbers, involving decomposition and repeated subtraction (e.g. Q5/M1; Q6/M1; Q5/M3; Q4/M4).
- Multiplication – The majority of students could perform multiplication of whole numbers up to 1 digit by 3 digits involving carrying (e.g. Q7/M1; Q7/M3; Q5/M4) and repeated multiplication (e.g. Q6/M3).
- Division – Students were capable in division with a divisor of 1 digit and a dividend

of 3 digits (e.g. Q8/M1; Q8/M3; Q7/M4）). In Q9/M1, a minority of students failed to put a zero in the quotient and chose option B. A small proportion of students ignored the remainder and chose option C.

- Mixed operations – The majority of students could perform mixed operations of addition and subtraction including small brackets (e.g. Q8/M4). They could also handle mixed operations of multiplication and subtraction (e.g. Q9/M4). But in Q10/M1 and Q9/M3, a minority of students were not aware of the computational rule of doing 'multiplication/division before addition/subtraction' and chose option D.

Solving application problems

- Students were capable of solving simple problems involving addition and subtraction (e.g. Q13/M1; Q14/M1; Q11/M3; Q13/M3). In Q12/M2, some students were careless in doing subtraction or confused the subtrahend with the minuend in writing a subtraction expression (see an example of a student's work below).

Q12/M2


- The majority of students in general were capable of solving simple problems involving multiplication (e.g. Q11/M1; Q15/M1; Q10(a)/M3) and mixed operations (e.g. Q13/M2; Q12/M3; Q11/M4). In Q14/M2, a considerable proportion of students were either careless or did not understand the question, neglected the term 'one week' and chose option A.

- The majority of students could solve problems involving division (e.g. Q10(b)/M3; Q13/M4). A minority of students confused the dividend with the divisor or did calculations carelessly (see examples of students' work below).

Q13/M4	
最多可裝成多少筒 9÷447 =16(個)	還餘： 447÷9 =16(筒)…2(個) 即最多可裝成17筒

- Many students were able to solve application problems involving the calculation of money (e.g. Q12/M1; Q16/M2; Q12/M4). However, more than half of the students were not able to perform division involving conversion of dollars to cents (e.g. Q15/M2).
- Many students could present their solutions with working steps in solving application problems. However, some students were not able to deduce or explain their answers logically (see examples of students' work below).

(a) Some students were messy in their working steps and made computational errors.

Q12/M2	Q11/M3
應找回： 205+139 (500-344) =500-344 =156(元)	737-185+737 =552+737 =1239 the toal length of nature trail is 1239m.

(b) Some students presented illogical steps.

Q13/M2
原有: 26÷6+17 =156+17 =174(粒) ∴原有174粒。

(c) Some students showed incomplete working steps.

Q13/M1
參加旅行的老師有: 267-(132+114) =267- =21(人)

P.3 Measures Dimension

The performance of students at basic competency was good in this dimension. Most students could identify and use Hong Kong money and read price tags. The majority of students were capable of comparing the length and weight of objects as well as the capacity of containers. They could choose appropriate units of measurements to record the length and the weight of objects, and also appropriate tools to measure the length and the weight as well as the capacity of containers. However, students were weaker in comparing the weights of different objects.

Most students were able to tell the time on a clock face or a digital clock. They could recognize the dates and days of a week on a calendar. However, there was room for improvement in applying the '24-hour time' and deducing the number of days needed for activities. Further comments on students' performance are provided with examples from different sub-papers quoted in brackets.

Hong Kong money

- Most P.3 students could identify Hong Kong money (e.g. Q20(a)/M1) and read the price tags of goods (e.g. Q20(a)/M2).
- P.3 students could use Hong Kong money (e.g. Q20(b)/M1; Q20(b)/M2)
- The majority of students were able to carry out simple money exchanges (e.g. Q21/M1).

Date and time

- The majority of students could write down the correct dates and days of a week shown on a calendar (e.g. Q23(a) and (c)/M1; Q23(a) and (c)/M2). However, some students did not give the correct number of days according to given conditions (e.g. Q23(b)/M1; Q23(b)/M2).
- Most students were capable of telling the time on a clock face (e.g. Q24(a)/M1) and a digital clock (e.g. Q24(a)/M2).
- The majority of P.3 students were capable of measuring time duration in 'minutes' and 'seconds' (e.g. Q24(c)/M1; Q28(a)/M3). However, some students showed obvious weakness in understanding the problem and deducing the time interval correctly (see an example of a student's work on Q24(c)/M1 below).

Q24(c)/M1

離家時間

到校時間

(c) 學校在上午八時開始上課。森美到達學校的時間比開始上課的時間早了 30 分鐘。

- The majority of students understood the '24-hour time' (e.g. Q24(b)/M1; Q25/M2; Q28(b)/M3) though some were not able to show the '24-hour time' correctly (see an example of a student's work on the next page).

Q28(b)/M3

名次	運動員	所需時間
1	張小金	7 分鐘 17 秒
2	黃國強	7 分鐘 36 秒
3	李子傑	8 分鐘 37 秒
4	何卓仁	9 分鐘 0 秒

跑步比賽在下午二時開始，用「24 小時報時制」表示，何卓仁在 14 : 9 完成比賽。

Length, distance, weight and capacity

- Most students could directly compare the distance of objects (e.g. Q22/M3) and use improvised units to compare the length of different objects (e.g. Q17/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 km or 'kilometres' (e.g. Q23/M3).
- The majority of students could use improvised units to compare the weight of different objects (e.g. Q25/M1). However, when the situation allowed direct comparison (e.g. Q26/M2), many students had difficulties; a considerable proportion of students might have thought that an object of smaller size in appearance would be lighter and chose option B.
- The majority of students could measure the weight of objects (e.g. Q27(a)/M2; Q27/M3) but were weaker in comapring the weights of objects using 'gram' (g) and 'kilogram' (kg) (e.g. Q27(b)/M2).
- Most students were also capable of using the finger width as an 'ever-ready ruler' for measuring the breath of small objects (e.g. Q21/M2).
- Students performed quite well in choosing the appropriate measuring tools for measuring the heights and weights of objects as well as the capacity of containers (e.g. Q24/M3; Q26/M3; Q29/M2).

- Students in general could choose suitable measurement units for recording length (e.g. Q22(a) and (c)/M1; Q22(a)/M2; Q25(b)/M3; Q18(a) and (c)/M4) and weight (e.g. Q22(b)/M1; Q22(b)/M2; Q25(a)/M3). However, few students did not have clear concepts of 'gram' (g) and 'kilogram' (kg) (e.g. Q18(b)/M4).
- Some students confused the unit of length with the unit of weight (see an example of a student's work on Q18(b)/M4 below).

Q18(b)/M4
一輛私家車重約 1 000 米。

- A considerable number of students could directly compare the capacity of containers (e.g. Q26/M1) and use improvised units to measure and compare the capacity of containers (e.g. Q27/M1).
- The majority of students could measure and compare the capacity of containers using 'litre' (L) or 'millilitre' (mL) (Q28/M2; Q29/M3).

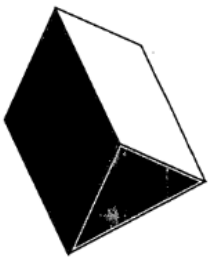
P.3 Shape & Space Dimension

P.3 students performed well in the Shape & Space Dimension. The majority of students were capable of identifying familiar 2-D and 3-D shapes; grasping the basic concept of straight lines, curves, parallel lines and perpendicular lines; identifying right angles and comparing the size of angles. However, some students were weak in identifying prisms/cylinders 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. Q28/M1; Q30/M2; Q31/M2; Q30/M3) as well as writing the correct names of certain 3-D shapes (e.g. Q29/M1; Q26/M4). However, some students confused a triangular prism with a triangle (see an example of students' work on the next page).

Q31/M2

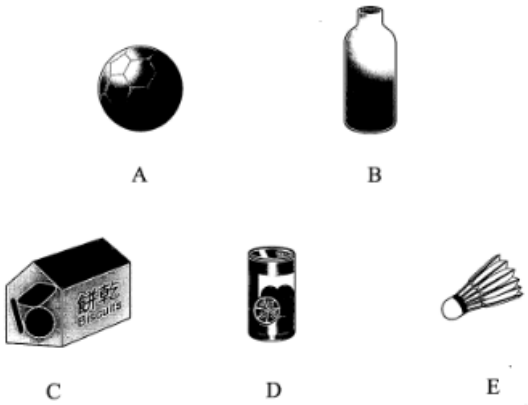


以上的立體圖形是一個

◉ A. 三角形。
○ B. 長方形。
○ C. 角柱。
○ D. 角錐。

- Generally, P.3 students were able to differentiate 3-D shapes according to whether they were prisms/cylinders, pyramids/cones and spheres as well as classify familiar 3-D objects in daily life (e.g. Q33(a)/M2; Q32/M3; Q27(a)/M4).
- However, the performance of many students was weaker in identifying prisms (e.g. they chose options B and E in Q33(b)/M2) (see an example of a student's work below).

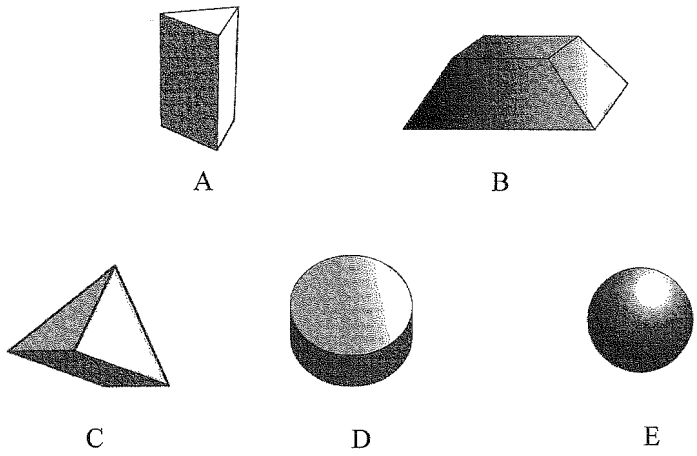
Q33(b)/M2



柱體：D,E,B

- Some students mistook Figure B in Q27(b)/M4 as a prism (see an example of a student's work on the next page).

Q27(b)/M4



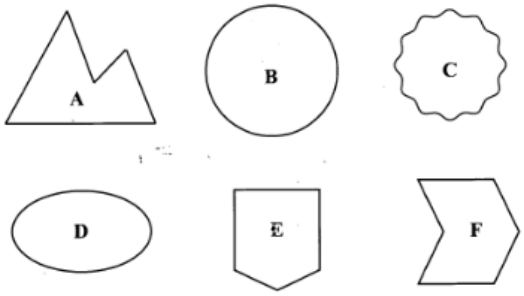
(b) 角柱：A, B

- The majority of students were able to compare the thickness of objects (e.g. Q29/M4).

2-D Shapes

- Generally speaking, the majority of students could identify 2-D shapes including triangles, squares, quadrilaterals, pentagons, trapeziums, rhombuses and circles (e.g. Q30/M1; Q32/M2; Q34/M3; Q28/M4; Q30/M4).
- A considerable proportion of students could not identify pentagons when they were not shown in their typical forms (e.g. Q35/M3) (see an example of a student's work below).

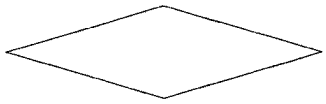
Q35/M3



五邊形：E

- Some students could not give the specific name of a rhombus (only naming a parallelogram) while some others could not write the name correctly (see an example of a student's work on Q32(a)/M2 below).

Q32(a)/M2



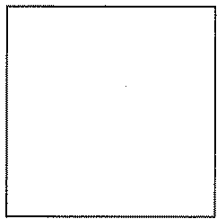
(a) 答案：菱 形

答案：笑 形

答案：箋 形

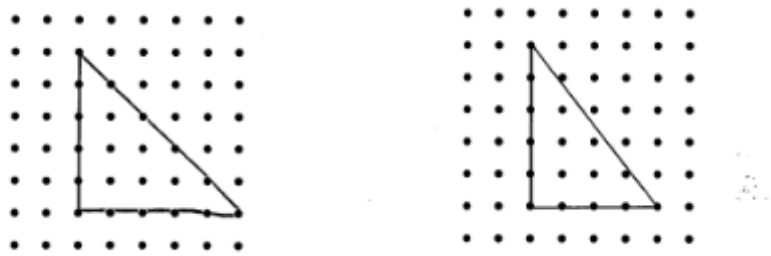
- A small proportion of students confused a square with a rectangle (see an example of a student's work on Q32(b)/M2 below).

Q32(b)/M2



答案：長方 形

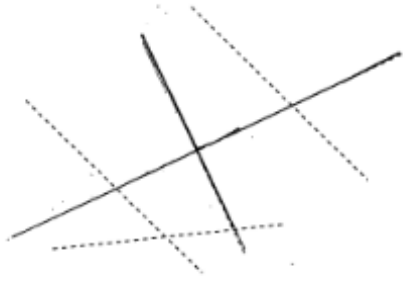
- P.3 students were capable of recognizing right-angled triangles, equilateral triangles and isosceles triangles (e.g. Q31/M1; Q34/M2; Q33/M3; Q31/M4) (see an example of student's work on Q33/M3 on the next page).

Q33/M3


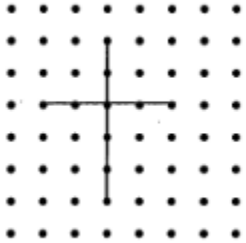
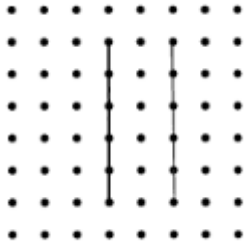
- Some students confused 'long and thin' right-angled triangles with isosceles triangles (e.g. Q21(a)/M3).
- The majority of students could describe the relative positions of two 2-D shapes (e.g. Q32/M4).

Straight Lines and Curves

- The majority of students were capable of identifying straight lines and curves (e.g. Q33/M1; Q36/M3) and identifying perpendicular lines in given figures (e.g. Q36/M2) (see an example of a student's work below).

Q36/M2


- The majority of students could draw a pair of parallel lines or perpendicular lines (e.g. Q32/M1; Q35/M2) (see an example of a student's work on the next page).

Q32/M1	Q35/M2
	

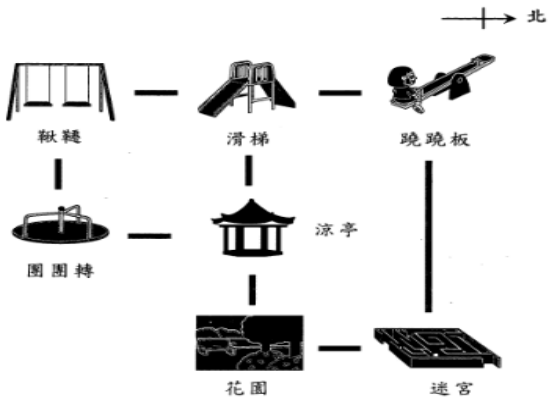
Angles

- Most students were capable of identifying a right angle (e.g. Q37/M2).
- Most students were capable of comparing the size of angles (e.g. Q34/M1).

Directions

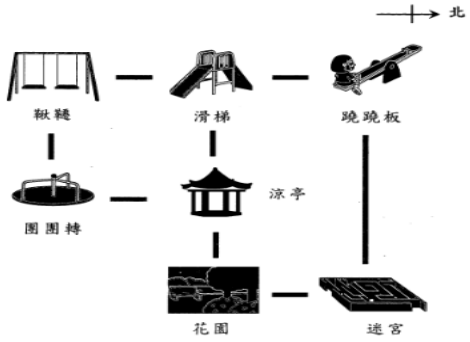
- The majority of students were capable of recognizing the four directions: north, east, south and west (e.g. Q35(a)/M1). However, some students were unable to give the correct direction relative to a reference point, particularly when the 'north' direction was not pointing upward (e.g. Q35(a)/M1) (see an example of students' work below).

Q35(a)/M1



鞦韆在跷跷板的 北 方。

- In Q35(b)/M1, some students missed the arrow pointing to the right which represented the 'north' direction in the map (see an example of students' work on the next page).

Q35(b)/M1	
	凉亭在 跷跷板和迷宫的西方。

- A considerable proportion of students were weak in identifying the reference point when the direction of an object was given (Q35(b)/M1; Q37(a)/M3).

P.3 Data Handling Dimension

Students performed well in this Dimension. They could read information from the data given in pictograms. They could interpret data and make use of them to answer straightforward questions. They were also capable of constructing pictograms from tabulated data. Further comments on students' performance are provided below with examples from different sub-papers quoted in brackets.

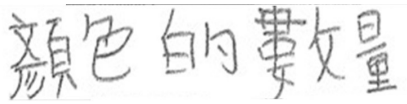
Reading and interpreting pictograms

- The majority of students were capable of reading the data given in the pictograms. They could compare the data given in pictograms in order to answer questions (e.g. Q36(a)&(b)/M1; Q38(a)&(b)/M2; Q39(a)&(b)/M3; Q35(a)&(b)/M4) or carry out simple calculations (e.g. Q36(c)/M1; Q38(c)/M2; Q35(c)/M4).
- In answering open-ended questions, half of the students were not able to apply the actual data given in pictograms and give the correct explanation and make the correct inference (e.g. Q39(c)/M3) (see an example of a student's work on the next page).

Q39(c)/M3
老師應多買 花生和腰果， 因為 他們一樣有9公
老師應多買 花生和腰果， 因為 學生愛吃的果仁

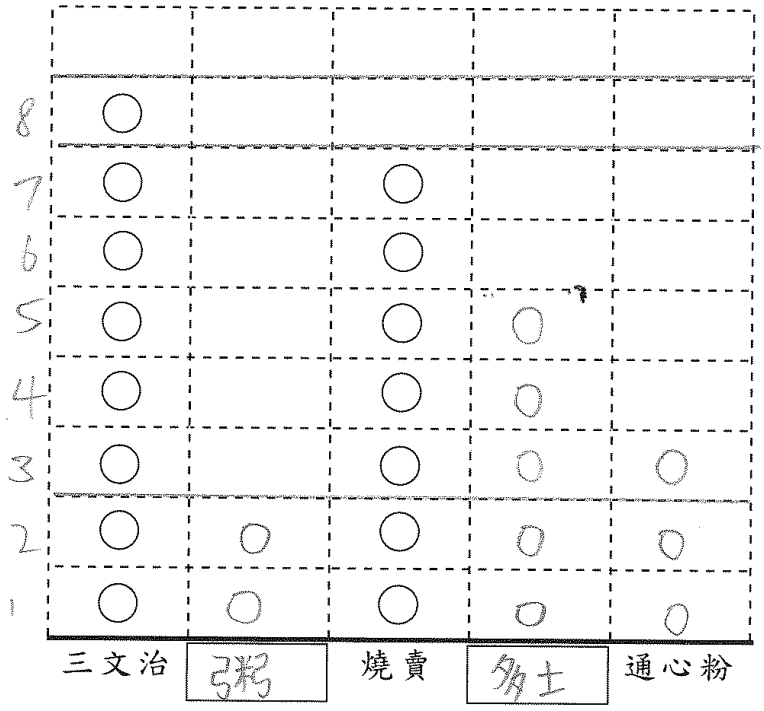
Constructing pictograms

- The majority of students were capable of constructing pictograms from tabular data and providing a proper title for a pictogram (e.g. Q37/M1; Q39/M2; Q38/M3). However, a minority of students could not use the appropriate keywords for their titles (see an example of a student's work below).

Q37/M1


- A small proportion of students unnecessarily added a 'frequency axis' to represent the data given by a pictogram whereas few of them confused pictograms with bar charts (see an example of a student's work on the next page).

Q39/M2



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 present proper working steps for their solutions. They performed steadily in division problems involving remainders.

In the Measures Dimension, the majority of students were able to use and exchange Hong Kong money, tell time on a clock face or digital clock, measure and compare the length and weight of objects as well as the capacity of containers. However, their performance was relatively weak in calculating the number of days needed or the duration of an activity, correctly expressing '24-hour time' and the unit of weight, comparing the weights of objects and capacities of containers.

In the Shape & Space Dimension, the majority of students were capable of recognizing 2-D shapes, 3-D shapes, curves, parallel lines, perpendicular lines, right angles and the four directions. Some students could not identify prisms / cylinders or finding the direction of an object relative to a reference position.

Students' performance in the Data Handling Dimension was good. They could read data from given pictograms with a one-to-one representation and construct pictograms from tabular data. However, about half of the students could not correctly interpret the data given in pictograms and give reasonable explanations. In general, P.3 students were able to solve familiar problems but sometimes misinterpreted questions due to carelessness. They did not perform as well in answering questions involving specific data and conditions because their reasoning was based on intuition or common sense.

Best Performance of P.3 Students in TSA 2013

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, about half of them achieved a full score or lost at most one score point 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 with more complicated contexts. Almost all students were capable of presenting their solutions with clear working steps and explanation. They also performed well in the division of money involving conversion of money. (see an example of a student's work below)

Q13/M4
最多可裝成： 947÷9 =105(筒)…2(個) 答：最多可裝成105筒，餘下2個

Most of these students demonstrated a good understanding of the concepts of fractions such as recognizing the relationship between fractions and the whole as well as comparing fractions.

The best performing P.3 students performed well in using and exchanging Hong Kong money, finding the duration of activities, choosing suitable measurement units and measuring with appropriate tools. They were capable of comparing the weights of objects and the capacities of containers, directly and indirectly.

The best performing students were capable of identifying 2-D shapes and 3-D shapes and naming the shapes correctly. They could identify curves, parallel lines, perpendicular lines and right angles. They also showed a good sense of the size of angles and 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 on the next page).

Q39(c)/M3
老師應多買 花生和腰果， 因為 花生和腰果都有是最多 同學喜歡吃的。
老師應多買 花生和腰果， 因為 那兩種是最多票數的，所以老師 應為買那兩食品 糧食品。
老師應多買 花生和腰果， 因為 3A班同學做統計時 最多人選。

Comparison of Student Performances in Mathematics at Primary 3 TSA 2011, 2012 and 2013

The percentages of students achieving Basic Competency in 2011, 2012 and 2013 are provided below.

Table 8.2 Percentages of P.3 Students Achieving Mathematics Basic Competency in 2011, 2012 and 2013

Year	% of Students Achieving Mathematics Basic Competency
2011	87.0
2012	87.3
2013	87.5

A comparison of the strengths and weaknesses of P.3 students in TSA 2011, 2012 and 2013 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 2013, the overall performance of P.3 students in the Number Dimension was about the same as in 2011 and 2012.
- Students performed well in questions involving concepts of place values and mixed operations of whole numbers.
- Students performed satisfactorily in solving simple application problems. Their performance in handling division problems involving remainders was steady.
- Students were relatively weak in solving problems involving calculations of money, and they were particular weak in solving problems involving division of money.
- Students performed well in understanding the basic concept of fractions and comparing fractions.

Measures Dimension

- In 2013, the overall performance of P.3 students in the Measures Dimension was about the same as in 2011 and 2012.
- Students performed well in the use and exchange of Hong Kong money.
- Students could write the dates and days of a week from a calendar correctly. In deducing the number of days of an activity, the performance declined a little bit.
- Students performed well in telling the time on a clock face or digital clock. The performance in recording the duration of activities declined a little bit.
- Students' performances were stable in measuring and comparing the distance between objects and comparing the length of objects using improvised units.
- Students' performance declined in comparing the weight of objects directly or indirectly.
- Students improved in measuring with appropriate tools and choosing suitable measuring units.
- Students' performance in 2013 declined slightly in comparing the capacity of containers directly. However, their performance was stable 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 2013 was about the same as that of 2011 and 2012.
- Students improved in identifying or grouping 2-D and 3-D shapes.
- Students' performance was stable in recognizing the simple characteristics of triangles, though some confused right-angled triangles with isosceles triangles.
- P.3 students' performance was good in identifying straight lines and curves as well as tracing a pair of parallel lines or perpendicular lines.
- The majority of P.3 students performed quite well in recognizing the four directions but there was room for improvement when the 'north' direction on a map was not pointing upward.

Data Handling Dimension

- In 2013, the overall performance of P.3 students in the Data Handling Dimension was steady.
- Students performed well in reading pictograms but they were rather weak at interpreting the data given in pictograms when answering open-ended questions.
- The majority of students could construct pictograms but regardless of the information conveyed by the pictogram, a minority of them just copied the wording in the questions to give a title or did not use the information to assist in their choice of keywords for the title.