Results of Primary 6 Mathematics in TSA 2011

The territory-wide percentage of P.6 students achieving Mathematics Basic Competency in TSA 2011 was 84.1% which was almost the same as the performance levels in 2008 and 2010.

Primary 6 Assessment Design

The assessment tasks for P.6 were based on the *Basic Competency at the end of KS2 for the Mathematics Curriculum (Trial Version)* and the *Mathematics Curriculum Guide (P1 – P6), 2000*. The tasks covered the five Dimensions of the Mathematics curriculum, i.e. Number, Measures, Shape & Space, Data Handling and Algebra.

The Assessment assumed students had already mastered the Basic Competencies covered in Key Stage 1 (Primary 1 to 3) and therefore focused primarily on the basic and important areas of the Key Stage 2 (Primary 4 to 6) curriculum, testing the concepts, knowledge, skills and applications relevant to these areas. However, a small number of test items were specifically set to test some of the Basic Competencies covered in Key Stage 1 to determine whether or not P.6 students still retained some essential concepts and skills learnt in Primary 1 to 3. Furthermore, since some of the Basic Competencies in the Number, Measures and Shape & Space Dimensions are common for both Key Stages 1 and 2, five items (eight score points) testing these common Basic Competencies were purposefully set to be the same in the P.3 and P.6 Assessments. In this way, there was a basis for comparing the performance of P.3 and P.6 students in the same Basic Competencies which they had learnt during Key Stage 1. This comparison could indicate whether P.6 students still retained the Basic Competencies they had learnt during Key Stage 1. As expected, the P.6 students performed better than the P.3 students.

The Assessment included a number of item types including multiple choice, fill in the blanks, solutions with working steps (or equations) required, as well as open-ended questions in which students were required to justify their answers, with item types varying according to the context. Some of the 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 the necessary statements, mathematical expressions, equations and explanations.

The Assessment consisted of 120 test items (195 score points) covering the five Dimensions.

These items were grouped into four sub-papers, each of 50-minutes in duration and covering all five Dimensions. Some items appeared in more than one sub-paper to provide 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 8.3 Composition of the Sub-papers

Sub-paper	Number of Test Items (Score Points)					
	Number Dimension	Measures Dimension	Shape & Space Dimension	Data Handling Dimension	Algebra Dimension	Total
M1	21 (29)	8 (14)	5 (11)	3 (9)	4 (6)	41 (69)
M2	23 (31)	8 (15)	5 (11)	3 (7)	4 (6)	43 (70)
M3	20 (28)	8 (15)	7 (14)	3 (7)	4 (6)	42 (70)
M4	21 (28)	8 (16)	5 (12)	3 (7)	5 (7)	42 (70)
Total *	62 (83)	26 (46)	13 (29)	8 (22)	11 (15)	120 (195)

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

Performance of P.6 Students with Minimally Acceptable Levels of Basic Competence in TSA 2011

P.6 Number Dimension

P.6 students performed satisfactorily in the Number Dimension. The majority of students understood the basic concepts of whole numbers, fractions, decimals and percentages as well as the skills of arithmetic operations. They understood the concept of place values and method of estimation. However, some students were weak in solving application problems with contexts related to fractions. Further comments on their performance are provided below with examples from different sub-papers quoted in brackets as follows.

Understanding basic concepts

- Most P.6 students understood the concept of place values of 5-digit numbers (e.g. Q1/M1; Q1/M3).
- Most students were able to correctly write a 5-digit number in words (e.g. Q1/M4).

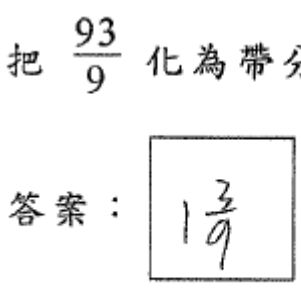
Multiples and factors

- While the majority of students understood the concept of factors and multiples (e.g. Q2/M1 and Q2/M3), some students confused the multiples with factors. Many students were able to use the listing method to find all the factors of a number (e.g. Q3/M1).
- The majority of students could find the common multiples of two numbers (e.g. Q2/M4) but some students had difficulty in grasping the concept of common factors (e.g. Q3/M3).
- The majority of students could use the listing method to find the common factors and common multiples of two numbers (e.g. Q4(a)/M3; Q5(a)/M1) as well as their highest common factor (H.C.F) (e.g. Q4(b)/M3) and least common multiple (L.C.M.) (e.g. Q4(b)/M3; Q5(b)/M1).

Fractions

- The majority of students understood the basic concept of fractions as parts of one whole (e.g. Q6/M1; Q3/M4).
- Most students could recognise the relationship between a fraction and the whole (e.g. Q4/M1; Q5/M3; Q15(b)/M4).
- P.6 students performed well when converting mixed numbers into improper fractions (e.g. Q7(a)/M1). Their results declined when converting improper fractions into mixed numbers and some students could not give the fraction in its simplest form (e.g. Q7(b)/M1).

Q7(b)/M1



- The majority of students could find a fraction of equivalent value to a given fraction (e.g. Q6/M3).
- The majority of students were capable of comparing fractions (e.g. Q8/M1; Q8/M3, Q15(a)/M4).

Decimals

- The majority of students were able to record numbers with decimals (e.g. Q4/M4).
- Most students could recognise the place value of digits in decimals (e.g. Q11/M1) except a small number of them confused the tenths and hundredths places (e.g. Q9/M1; Q9/M3).
- The majority of students were capable of converting decimals into fractions and vice versa (e.g. Q7/M3, Q5/M4).

Percentages

- Most students understood the basic concept of percentages (e.g. Q22/M2; Q20/M4).
- The majority of students were capable of converting percentages into fractions reduced to the simplest form and vice versa (e.g. Q18/M1).
- Most students were capable of converting percentages into decimals and vice versa (e.g. Q19/M3).

Performing basic calculations

- P.6 students were competent in carrying out the four arithmetic operations on whole numbers and fractions, including mixed operations involving brackets and division with a remainder (e.g. Q10/M1; Q13/M1; Q10/M3; Q11/M3; Q12/M3; Q6/M4, Q7/M4; Q8/M4).
- The majority of students performed well in carrying out the four arithmetic operations involving whole numbers and decimals (e.g. Q15/M1; Q16/M1; Q13/M3; Q10/M4; Q11/M4).

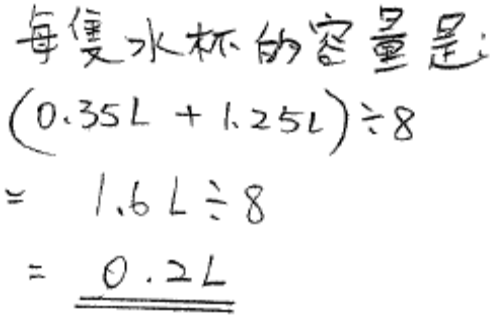
Solving application problems

- The majority of students could solve simple application problems involving whole numbers and fractions (e.g. Q17/M1; Q17/M2; Q18/M2; Q14/M3; Q12/M4) but the

performance of some students was unsatisfactory in finding a fraction of the total (e.g. Q13/M4).

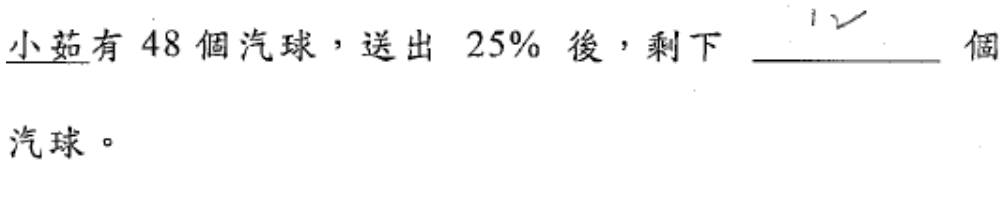
- The majority of students were capable of solving application problems involving whole numbers and decimals (e.g. Q19/M1; Q20/M1; Q14/M4).

Q19/M1



- The majority of students were capable of solving application problems involving the calculation of money in daily life (e.g. Q19(a)/M2, Q20/M2, Q17/M3). The explanations of scenarios were relatively weak (e.g. Q19(b)/M2).
- Students performed well in solving application problems involving percentages and discounts (e.g. Q21/M1; Q23/M2). However, some students overlooked key words in reading the questions (e.g. the meaning of 'remaining' in Q20/M3 was ignored).

Q20/M3



- The majority of students could choose the best expression in order to estimate values in different situations (e.g. Q21/M2; Q17/M4).

P.6 Measures Dimension

The performance of students in the Measures Dimension was satisfactory. On the whole, students had mastered the basic knowledge and skills learnt in Key Stage 1. They could apply basic concepts and formulae to solve problems of familiar contexts. Further comments on their performance are provided with examples from different sub-papers

quoted in brackets.

Measurement of time, length, distance, weight and capacity

- Many students could give the correct dates according to given conditions (e.g. Q25(a)&(c)/M2) but more than half of the students could not identify the last day of November or give the day of a week correctly (e.g. Q25(b)/M2).
- Most students were able to tell time from a clock face (e.g. Q22(a)/M1) but some of them were not able to use the '24-hour time' appropriately (e.g. Q22(b)/M1).
- The majority of students could find the time lapsed in minutes between two events (e.g. Q21(a)/M3).
- Students were capable of measuring length with a ruler calibrated in millimetres (e.g. Q23(b)/M3).
- Students were capable of comparing the weight of objects using improvised units (e.g. Q24/M1). They could choose an appropriate scale to measure the weight of an object (e.g. Q27/M2) and record the weight of objects with an appropriate unit (e.g. Q23(b)/M1; Q26(c)/M2).
- P.6 students performed satisfactorily when comparing the capacity of containers (e.g. Q25(c)/M1) though some students made careless mistakes in reading the scales of beakers (e.g. Q25(a)&(b)/M1).
- P.6 students did well in using millilitres (mL) for recording capacity (e.g. Q23(c)/M1) but they were less familiar with litres (L) (e.g. Q26(b)/M2).

Finding perimeters

- The majority of students could compare the perimeters of 2-D shapes directly (e.g. Q25/M4).
- Most students could calculate the perimeters of a square and a rectangle (e.g. Q28(a)/M2; Q26(a)&(b)/M4) though some students were weak in finding the perimeters of composite figures correctly (e.g. Q26(c)/M4).
- A considerable number of students could recognise the relationship between the circumference and the diameter of a circle (e.g. Q26/M1; Q24/M3).
- The majority of students could apply the circumference formula in finding the unknown circumference with given diameter (e.g. Q28(b)/M2; Q27/M4).

Finding areas

- The majority of students could estimate the area of an irregular 2-D shape on square grids of 1 cm^2 (e.g. Q29/M2) but a few students used ineffective counting methods.
- In general, P.6 students were able to find the area of squares and trapeziums (e.g. Q25/M3). However, some students were not able to correctly calculate the area of parallelograms and triangles (e.g. Q27/M1 and Q30/M2).
- The majority of students could find the areas of irregular figures but some gave the wrong unit of area in cm^3 (e.g. Q28/M4).

Finding volumes

- The majority of students could measure the volume of 3-D solids by effectively counting the number of cubes, though some students confused the unit of volume with that of area (e.g. Q26/M3).
- The majority of students could calculate the volume of cubes correctly (e.g. Q28(a)/M1).
- About half of the students were not capable of recognising the relationship between capacity and volume (e.g. Q27/M3).
- Many students were capable of finding the volume of irregular solids by displacement of water (e.g. Q28/M3) but the performance of students dropped in applying the volume formula of cuboids (e.g. Q28(b)/M1).

Speed

- The majority of students could record the speed of cars with a suitable unit (e.g. Q29/M1).
- The majority of students could correctly calculate speed in m/s or km/h (e.g. Q31/M2; Q29/M3). However, some students could not convert minutes to hours when applying the speed formula (e.g. Q21(b)/M3).

P.6 Shape & Space Dimension

Students performed well in the Shape & Space Dimension. They were good at recognising the characteristics of 2-D and 3-D shapes. They mastered straight lines, curves, angles and the eight compass points**.** There was room for improvement in the recognition of parallel lines and perpendicular lines. Further comments on their performance are provided below with examples from different sub-papers quoted in brackets.

Lines and curves

- The majority of students were able to identify straight lines and curves correctly but some of them could not recognise parallel lines and perpendicular lines given in a figure (e.g. Q33/M1; Q34/M3).
- The majority of students were able to compare the size of angles (e.g. Q33/M3).

3-D and 2-D Shapes

- Most students could recognise pentagonal pyramids (e.g. Q30/M1).
- Most students could distinguish between pyramids and prisms and give the correct numbers of faces and edges (e.g. Q32/M2).
- Most students could recognise the centre of a circle (e.g. Q31(a)/M1; Q23(a)/M3).
- P.6 students were good at recognising the diameter of a circle and its properties (e.g. Q31(b)/M1; Q23(c)/M3).
- Generally, P.6 students could identify 2-D shapes according to their configurations and properties (e.g. hexagons and quadrilaterals in Q33/M2; trapeziums in Q34/M2). However, some students confused a circle with an ellipse (e.g. Q32(a)/M3).
- The majority of students could recognise right-angled triangles (e.g. Q35(b)/M2) and isosceles triangles (e.g. Q31(c)/M1). Some students confused equilateral triangles with isosceles triangles (e.g. Q35(c)/M2; Q32(b)/M3).

The eight compass points

- Most students were good at recognising the eight compass points whether the north direction was pointing upward on the map (e.g. Q34/M1) or in other directions (e.g. Q36/M2).

P.6 Data Handling Dimension

Students performed well in the Data Handling Dimension. The majority of students were capable of reading and interpreting the data given in statistical graphs. They could also construct a correct graph from tabulated data. The majority of students could calculate the average of a group of data and solve simple problems of averages. Further comments on their performance are provided below with examples from different sub-papers quoted in brackets.

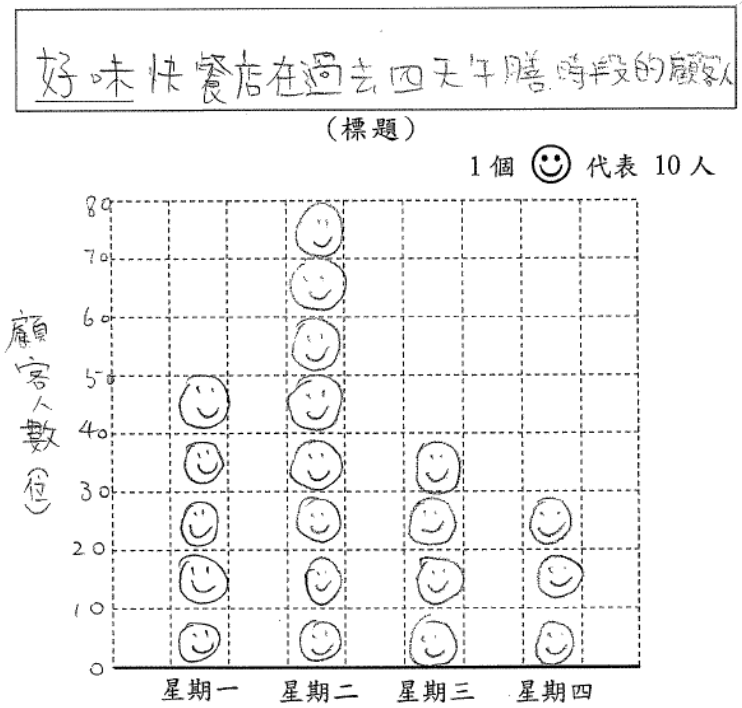
Reading and interpreting pictograms and bar charts

- P.6 students were good at reading data directly from pictograms with a one-to-ten representation or greater frequency counts (e.g. Q41/M3; Q41/M2 respectively). Students were capable of interpreting the data given by pictograms while a few of them could not find the correct percentage (e.g. Q41(c)/M2).
- P.6 students were good at reading data directly from bar charts with a one-to-ten representation or greater frequency counts (e.g. Q42/M3; Q40/M1 respectively). Students performed well in extracting information from a bar chart but a small number of them could not find the correct total (e.g. Q42(c)/M3).

Constructing pictograms and bar charts

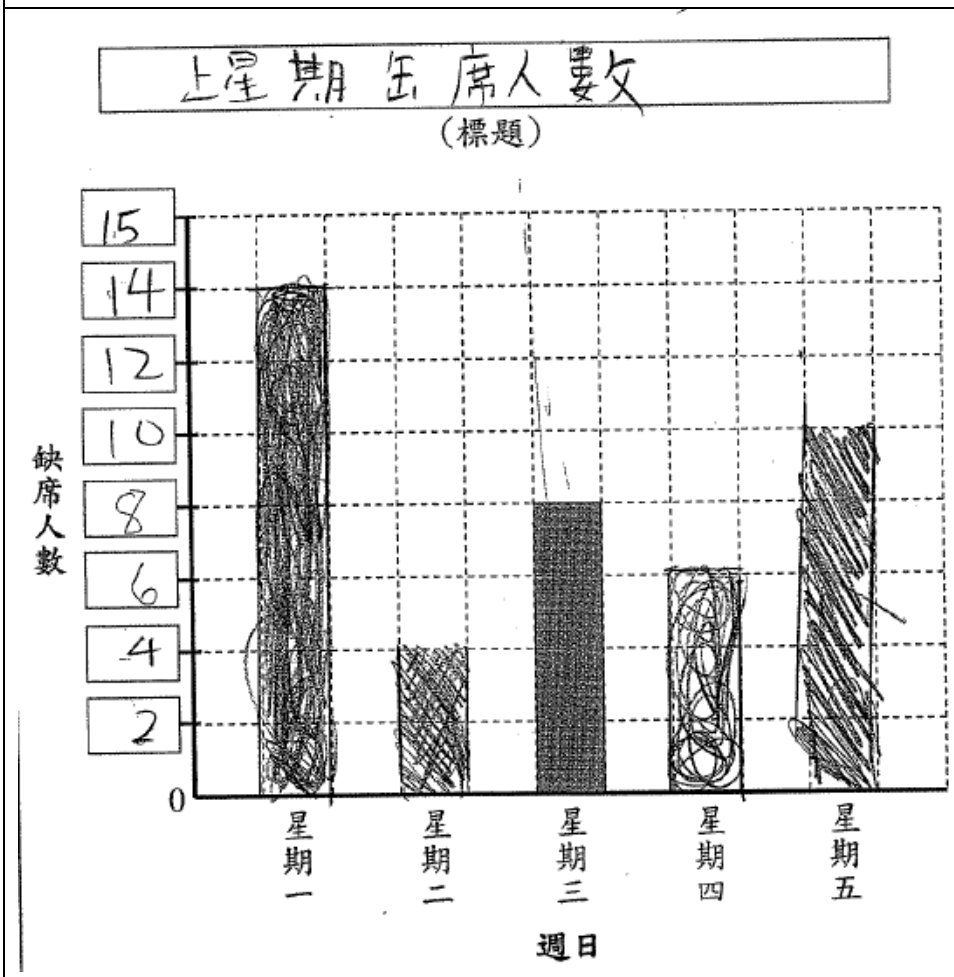
- The students' performance in constructing pictograms was satisfactory though some students added a frequency axis or scales to represent the number of customers (see the following example of students' work in Q39/M1).

Q39/M1



- Most students were capable of constructing bar charts but a few did not write down a proper title. Some students did not draw a bar chart tidily or give the scale correctly (see the following example of students' work in Q42/M2).

Q42/M2



Concept of averages and its applications

- P.6 students were able to calculate the average of a group of data (e.g.Q43/M2).
- The majority of students could find the average value in solving application problems (e.g. Q41/M1) but some missed the brackets in the arithmetic expression.

P.6 Algebra Dimension

The majority of P.6 students performed satisfactorily in the Algebra Dimension. They could use symbols to represent numbers, solve equations up to two steps and use equations to solve simple application problems. More detailed comments on their performance are provided with examples from different sub-papers quoted in brackets.

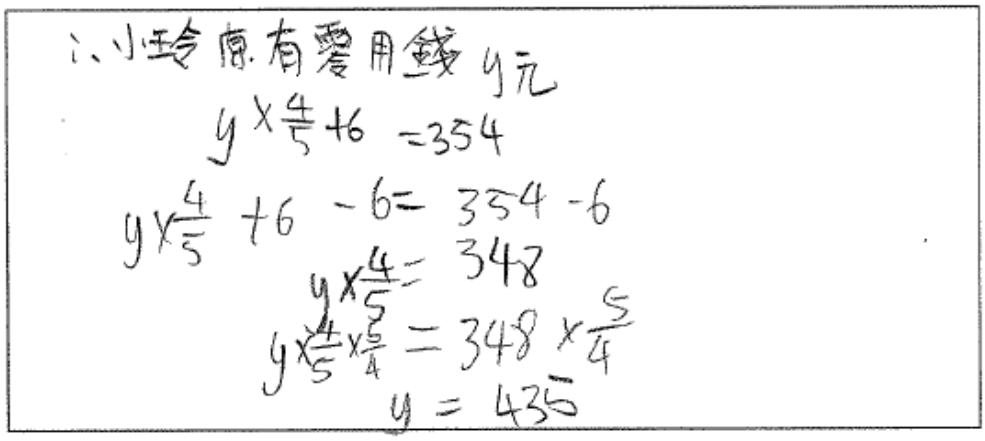
Using symbols to represent numbers

- The majority of students could use algebraic expressions to represent daily situations (e.g. Q35/M1), yet a few students confused the dividend with the divisor in Q36/M3.

Solving simple equations

- In general, students understood the concept of an equation but a small number could not distinguish equations from algebraic expressions (e.g. Q38/M2 and Q36/M4).
- Students performed well in solving equations of up to two steps and involving whole numbers, fractions or decimal numbers (e.g. Q36/M1; Q37/M1; Q37/M2 ; Q37/M3) but the correct responses dropped significantly when solving simple equations involving mixed numbers (e.g. Q39/M2).
- Students could solve application problems by setting up an equation with a well-defined symbol (e.g. Q38/M1 and Q40/M2). A few students did not present the steps logically and draw the conclusions appropriately (see a student's answer for Q38/M1 below).

Q38/M1



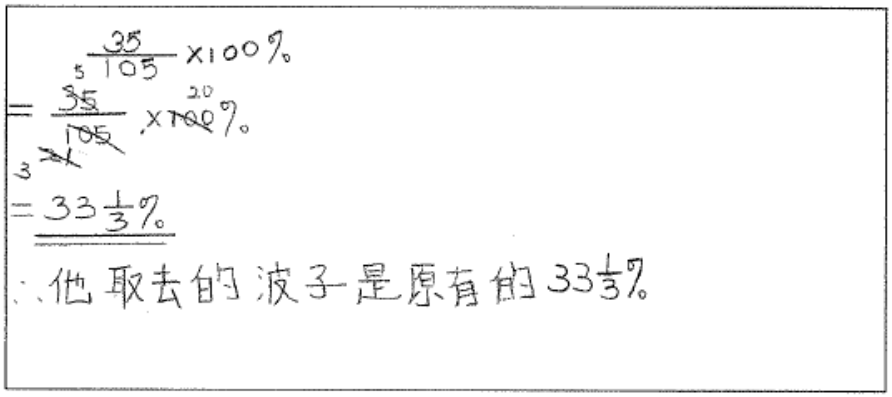
General Comments on P.6 Student Performances

The overall performance of P.6 students was good. P.6 students did well in the Data Handling and Shape & Space Dimensions while they demonstrated satisfactory performance in the Number, Algebra and Measures Dimensions. In general, P.6 students mastered the basic concepts and computational skills stipulated in the document *Basic Competency at the end of KS2 for the Mathematics Curriculum (Trial Version)*. Nonetheless, some students had learning difficulties in handling some basic concepts such as common multiples and common factors, characteristics of triangles and quadrilaterals, and the relationship between volume and capacity. They needed improvement in such fundamental skills as manipulating fractions and finding the perimeter and area of irregular figures.

Some students were weak in solving application problems involving fractions. For example, in Q18/M2, many students applied percentages to find the fraction of marbles taken away.

Q18/M2

瓶子內原有波子 105 粒，小明取去 35 粒，他取去的波子是原有的幾分之幾？
（列式計算）



Some students missed the brackets if the addition operations were required before doing division or multiplication as shown in the examples below:

Q41/M1	Q23/M2
平均每天早餐的費用是： 7.5 +8.5+9+7 ÷4 = 8(元)	她必須付： 15 +45 ×85% = 14 × = 119(元)

Some students were not able to define the unknown properly when solving an equation as shown in the examples of Q39/M3 below.

Q39/M3	
x ×15 − 8 = 127 = 127+8÷15 = 135÷15 = 9 x= 9	9×15 −8=127 = 9×15 −8 = 135−8 = 127
15y −8=127 =15y−8+8=127+8 =15y/15 =135/15 =y=9	設該數是x 15y − 8 = 127 15y−8+8= 127+8 15y/15 = 135/15 y = 9 ∴該數是9

Some students were not able to round the data correctly or draw a pictogram accurately according to the rounded data.

Q39/M1

下表記錄了好味快餐店在過去四天午膳時段的顧客人數。

	星期一	星期二	星期三	星期四
顧客人數	50	75	42	34
取至十位	5	8	4	4

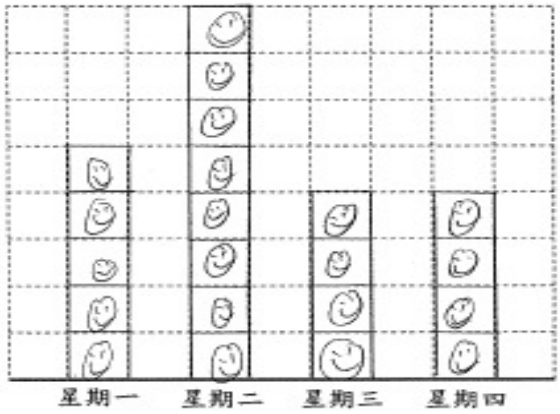
(a) 湊整顧客人數至十位，並完成上表。

(b) 根據湊整後的數據，以一個 ☺ 代表 10 位顧客，製作象形圖並加上標題。

好子味快餐店在過去四天午膳時段的顧客數

（標題）

1 個 ☺ 代表 10 人



Best performance of P.6 Students in TSA 2011

Students were ranked according to their scores and the performance of the top 10% was singled out for further analysis. Among the top performing P.6 students, about one third of them achieved a perfect 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.

Most of the top performing students understood the difficult concepts including the factors and multiples of a number as well as the common factors and common multiples of two numbers. They could solve application problems involving whole numbers, fractions and decimals. Furthermore, they understood the concept of equations and could solve problems by the 'method of solving an equation'.

The top performing students were capable of finding the volume of cubes and cuboids. They could recognise the characteristics of 2-D shapes and calculate their perimeters and areas. They could identify straight lines, curves, parallel lines, perpendicular lines and recognise the eight compass points. They did well in reading data from pictograms and bar charts as well as solving simple problems of averages.

The top performing students were able to apply mathematical knowledge to solve problems in alternative ways. For example, in Q16/M4, they chose to give answers in mL instead of L so as to avoid the manipulation of decimals.

Q16/M4

將一罐 0.35 L 和一盒 1.25 L 的橙汁倒進大小相同的水杯，剛好盛滿 8 杯。每隻水杯的容量是多少？
（列式計算）

每隻水杯的容量是：
(350+1250)÷8
=1600÷8
=200（毫升）

In using the speed formula in Q21/M3, they were able to convert minutes to hours correctly as shown in example below:

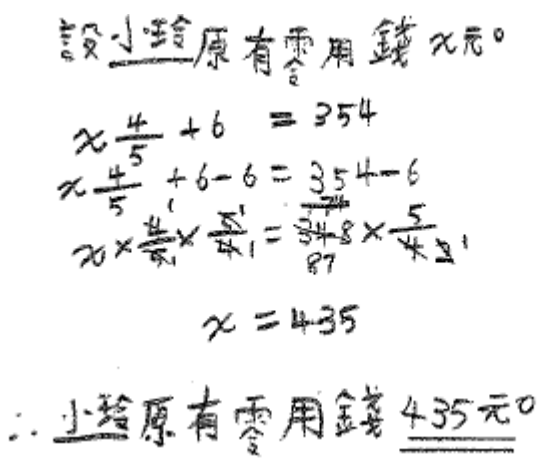
Q21/M3
航行3： 40 km/h × 45 min = 40 km/h × $\frac{45}{60}$ h = 30 km

They could use logical reasoning to explain problems encountered in daily life such as the disadvantages of paying with coins only (see the example of Q19/M2 below).

Q19/M2
答案：比較麻煩，而且收銀員數錢很不方便，浪費時間。

In solving application problems by the method of solving an equation, the top performing students could show their working steps logically but a few misplaced the symbol before its coefficient (see a student's answer for Q38/M1 below).

Q38/M1



Comparison of Student Performances in Mathematics at Primary 6 TSA 2008, 2010 and 2011

The percentages of students achieving Basic Competency in 2008, 2010 and 2011 are provided below.

Table 8.4 Percentages of P.6 Students Achieving Mathematics Basic Competency in 2008, 2010 and 2011#

Year	% of Students Achieving Mathematics Basic Competency
2008	84.1
2010	84.2
2011	84.1

Due to Human Swine Influenza causing the suspension of primary schools in June 2009, the TSA was cancelled and no data has been provided.

A comparison of the strengths and weaknesses of P.6 students in TSA 2008, 2010 and 2011 provides useful information to teachers who can help students improve their effectiveness of learning. The percentage of students achieving mathematics basic competency in 2011 was almost the same as that of 2008 and 2010. The following provides a comparison of the student performances for these years in each of the five dimensions.

Number Dimension

- In the Number Dimension, the overall performance P.6 students maintained the same level as in previous years
- P.6 students improved in using the listing method to find the common factors and common multiples of two numbers as well as their highest common factor and least common multiple.
- Students in 2011 could present their solutions and working steps clearly in solving application problems involving whole numbers, decimals and percentages. There was room for improvement in dealing with fractions.
- P.6 students improved in the estimation methods involving fractions and decimals.

Measures Dimension

- In the Measures Dimension, the overall performance of P.6 students remained at the same level as that of previous years.
- Students in 2011 could master the basic competencies learnt in Key Stage 1 (e.g. measuring length with a ruler; choosing the appropriate units of measurement for recording length, distance, weight and capacity; etc.).
- Students in 2011 had room for improvement in recognising the relationship between the circumference and diameter of a circle.
- P.6 students had room for improvement in recognising the relationship between the volume and the capacity.
- P.6 students needed improvement in solving speed problems.

Shape & Space Dimension

- Students' performance in 2011 improved in the Shape and Space Dimension.
- Students performed well in identifying lines and curves although some students could not recognise parallel lines and perpendicular lines.
- Students' performance improved slightly in identifying 2-D shapes and recognising the characteristics of 3-D shapes such as the numbers of vertices, edges and faces.
- Students this year had solid knowledge of the eight compass points.

Data Handling Dimension

- Students' performance in 2011 improved in the Data Handling Dimension.
- Students showed improvement in reading and interpreting data presented in statistical graphs.
- Students performed well in drawing pictograms or bar charts from tabulated data. However, a few students did not draw statistical graphs neatly and unnecessarily added a 'frequency axis' to a pictogram.
- Students could find the average of a group of data and solve simple problems of averages.

Algebra Dimension

- Students' performance in 2011 improved in the Algebra Dimension.
- Students performed well in using symbols to represent numbers and solving equations of up to two steps.
- Students' performance in 2011 improved in solving application problems by using simple equations.