Results of Primary 6 Mathematics in TSA 2013

The territory-wide percentage of P.6 students achieving Mathematics Basic Competency in TSA 2013 was 84.2% which was similar to that of the performance levels in 2010 and 2011.

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. Items were specifically set on the Basic Competencies covered in Key Stage 1 in order to test whether P.6 students still retained the essential knowledge and skills learnt in Primary 1 to 3.

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 114 test items (173 score points) covering the five Dimensions. These items were grouped into four sub-papers, each 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	20½ (28)	7½ (13)	5 (11)	3 (6)	3 (5)	39 (63)
M2	23 (30)	7 (11)	5 (8)	3 (6)	4 (6)	42 (61)
M3	22 (25)	7½ (15)	4½ (8)	3 (10)	5 (7)	42 (65)
M4	21 (25)	6½ (15)	5½ (11)	3 (8)	5 (7)	41 (66)
Total *	61½ (77)	21 (37)	12½ (23)	9 (21)	10 (15)	114 (173)

* 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 2013

P.6 Number Dimension

P.6 students performed satisfactorily in the Number Dimension. The majority of students understood the concepts of place values in whole numbers and decimals, common factors and multiples, conversion between fractions, decimals and percentages as well as the basic skills of arithmetic operations and methods of estimation. However, some students were weak in solving application problems involving fractions and decimals. Further comments on their performance are provided below with examples from different sub-papers quoted in brackets.

Understanding basic concepts learnt in KS1

- Most P.6 students mastered the concept of place values of whole numbers including the value represented by '0' (e.g. Q1/M1; Q1/M4).
- Most students were able to correctly arrange numbers in descending order (e.g. Q1/M3).

Multiples and factors

- The majority of P.6 students understood the concept of multiples (e.g. Q2/M1), though some students confused the multiples with the factors of a number (e.g. Q2/M3).
- Many students were able to use the listing method to find all the factors of a number (e.g. Q3/M1).
- The majority of P.6 students understood the concepts of common factors and common multiples (e.g. Q3/M3; Q2/M4)
- The majority of students could find the common multiples of two numbers (e.g. Q6/M1) though some students were not able to find all the common factors of two numbers (e.g. Q4/M3).
- The majority of students could find the highest common factor (H.C.F) (e.g. Q4/M1) and least common multiple (L.C.M.) (e.g. Q5/M3).

Fractions

- Most P.6 students understood fractions as parts of one whole (e.g. Q6/M3) but were relatively weaker on the concept of equal parts (e.g. Q7/M1).
- The majority of P.6 students could grasp the relationship between a fraction and the whole (e.g. Q8/M3) and they did well in expressing 1 as a fraction with equal numerator and denominator (e.g.Q5/M1; Q15/M4).
- The majority of P.6 students performed satisfactorily when converting mixed numbers into improper fractions and vice versa (e.g. Q8/M1).
- The majority of students could understand the concept of equivalent fractions (e.g. Q7/M3; Q3/M4).
- The majority of students were capable of comparing fractions (e.g. Q9/M1; Q9/M3).

Decimals

- The majority of P.6 students were able to record numbers with decimals, for instance, they could use decimal numbers to represent the readings of a scale (e.g. Q4/M4).
- Most P.6 students could recognize the place value of digits in decimals (e.g. Q11/M1; Q10/M3) but some of them easily confused the ‘tenths place’ with the ‘hundredths

place' or wrongly wrote '十分位' as '十份位' (e.g. Q6/M4) (see the following examples of students' work on Q6/M4).

Q6/M4

In the number 0.628, the digit '6' is in the hundredths place.

在 0.628 這個數中，數字「6」是在 十份 位。

- The majority of students were capable of converting decimals into fractions and vice versa (e.g. Q10/M1) but some students did not give the fraction in the simplest form (e.g. Q5/M4).

Percentages

- The majority of P.6 students understood the basic concept of percentages (e.g. Q22/M2; Q16/M4).
- The majority of students were capable of converting percentages into fractions reduced to the simplest form and vice versa (e.g. Q19/M2).
- Most students were capable of converting percentages into decimals and vice versa (e.g. Q20/M1).

Performing basic calculations

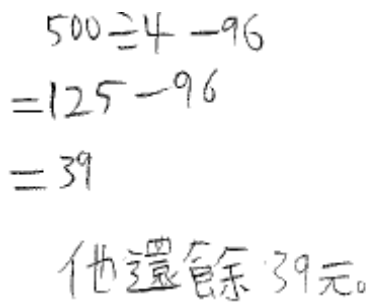
- Generally, P.6 students had no difficulty in carrying out the four arithmetic operations on whole numbers including division with a remainder (e.g. Q7/M4) and calculations involving small brackets (e.g. Q12/M2). Some students could not manipulate mixed operations involving multiplication and division (e.g. Q12/M1) or neglected the computation rule of 'doing multiplication/division before addition/subtraction'. For instance, in Q9/M4 some students wrongly chose the option D as the answer because they did the arithmetic operations from the left to the right.
- The majority of P.6 students were capable of carrying out the four arithmetic operations involving fractions (e.g. Q13/M1; Q14/M1; Q12/M3; Q13/M3; Q10/M4;

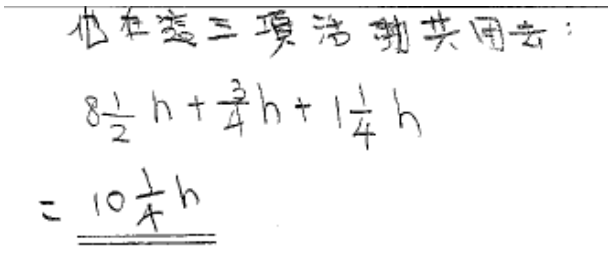
Q13/M4).

- The majority of students performed well in carrying out the four arithmetic operations involving decimals, including mixed operations (e.g. Q15/M1; Q16/M1; Q14/M3; Q12/M4). However, some students could not calculate division of decimals to specified accuracy (e.g. Q11/M4).

Solving application problems

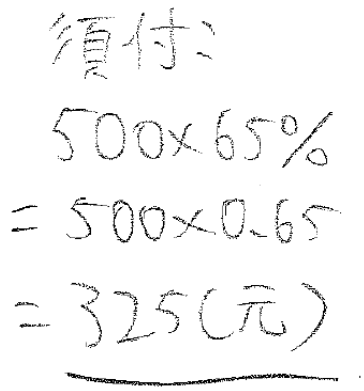
- Generally, students could solve application problems involving whole numbers and fractions (e.g. Q17/M1; Q17/M2; Q18/M2; Q15/M3; Q14/M4). Some students could write correct mathematical expressions but failed in subtractions with borrowing or addition of fractions (see the following examples of students' work on Q18/M2 and Q17/M1).

Q18/M2


Q17/M1


- The majority of students were capable of solving application problems involving decimals (e.g. Q18(a)/M1; Q19/M1; Q17/M3).
- Students performed well in solving application problems involving the calculation of money in daily life (e.g. Q20/M2, Q20/M3).

- The majority of students could solve application problems on percentages (e.g. Q21/M1; Q23(a)/M2) and discounts (e.g. Q23(b)/M2; Q22/M3).

Q23(b)/M2


- Students in general could choose a suitable estimation method for daily calculations such as finding the amount of money (e.g. Q21/M2; Q16/M3).

P.6 Measures Dimension

The performance of students in the Measures Dimension was satisfactory. On the whole, students mastered the basic knowledge and skills learnt in Key Stage 1. The majority of students could answer problems related to familiar contexts. However, some students were not able to apply the knowledge and formulae in finding the area or perimeter of 2-D shapes and the volume of 3-D shapes. Further comments on their performance are provided below with examples from different sub-papers quoted in brackets.

Measurement of time, length, distance, weight and capacity

- The majority of students could read the days of week and the dates from a calendar (e.g. Q24(a)&(b)/M2) but only about half of the students could give the correct dates in accordance with given conditions (e.g. Q24(c)/M2).
- Most students were able to tell time from a clock face (e.g. Q22(a)/M1) but some of them were not capable of applying the '24-hour time' appropriately (e.g. Q22(b)/M1).

Q22(b)/M1
嘉賓在 40 分鐘後演講完畢，以 24 小時報時制表示， 當時是 15 : 5 。

- About half of the students confused 'millimetres' with 'centimetres' when measuring the length of an object (e.g. Q24(b)/M3).
- Students did well in recording the length of objects (e.g. Q23(b)/M1) and the distance of a race (e.g. Q25(a)/M3) with appropriate units; comparing the weight of objects using improvised units (e.g. Q24/M1) and recording the weight of objects with an appropriate unit (e.g. Q23(c)/M1; Q25(b)/M3).
- Students could measure the weight of objects with suitable tools and appropriate scales but a few students imprudently mistook a beaker for measuring weight (e.g. they chose option B in Q26/M2).
- P.6 students performed well in 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).

Finding perimeters

- The majority of students could compare the perimeters of 2-D shapes directly (e.g. Q25/M4).
- The majority of students could calculate the perimeters of a rectangle or a square (e.g. Q18(b)/M1; Q26(b)/M3) though some students were weak in finding the perimeter of a rectangle in real problems (e.g. Q26(a)/M3).
- Students in general could recognize the relationship between the circumference and the diameter of a circle (e.g. Q27/M2).
- The majority of students could apply the circumference formula in solving real problems (e.g. Q26/M1).

Finding areas

- The majority of P.6 students could estimate with effective counting methods, the area

of an irregular 2-D shape on square grids of 1 cm^2 (e.g. Q28/M2).

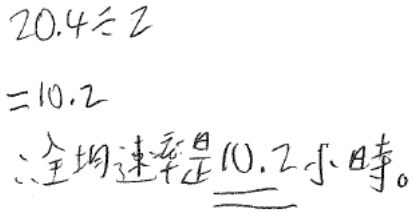
- Students generally were able to find the areas of triangles and trapeziums (e.g. Q28/M4) as well as the area of parallelograms (e.g. Q27/M1).

Finding volumes

- Most students could give the volume of 3-D solids in correct units by counting the number of unit cubes (e.g. Q27/M3).
- Many students could calculate the volume of cuboids (e.g. Q29/M2). However, the performance of students dropped when they were required to find the volume of 3-D shapes using the volume formula of cubes (e.g. Q28/M3).
- The majority of students were capable of finding the volume of irregular solids by displacement of water (e.g. Q29/M3).

Speed

- The majority of students could record the speed of bicycles with a suitable unit (e.g. Q28/M1).
- The majority of students could calculate speed in kilometres per hour (km/h) (e.g. Q30/M3) but some students mistook 'hour' for the unit of speed.

Q30/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 curves, parallel lines and perpendicular lines as well as the eight compass points**.** There was room for improvement in the recognition of direction with reference to specified positions or orientations. Further comments on their performance are provided below with examples from different sub-papers quoted in brackets.

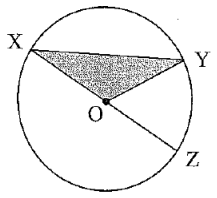
Lines and curves

- The majority of students were able to recognize straight lines and curves (e.g. Q33/M3). However, some students could not identify parallel lines and perpendicular lines in 2-D figures (e.g. Q32/M1).

3-D and 2-D Shapes

- Most students could recognize cones (e.g. Q31/M3).
- Most students could distinguish between pyramids and prisms and correctly give the numbers of vertices, edges and faces (e.g. Q29/M1; Q31/M2).
- Most students could recognize the centre of a circle (e.g. Q31(a)/M1) but a small proportion of them mistook the radius for the centre of a circle (e.g. Q33(a)/M2).

Q33(a)/M2



OY 是圓的 圓心 。

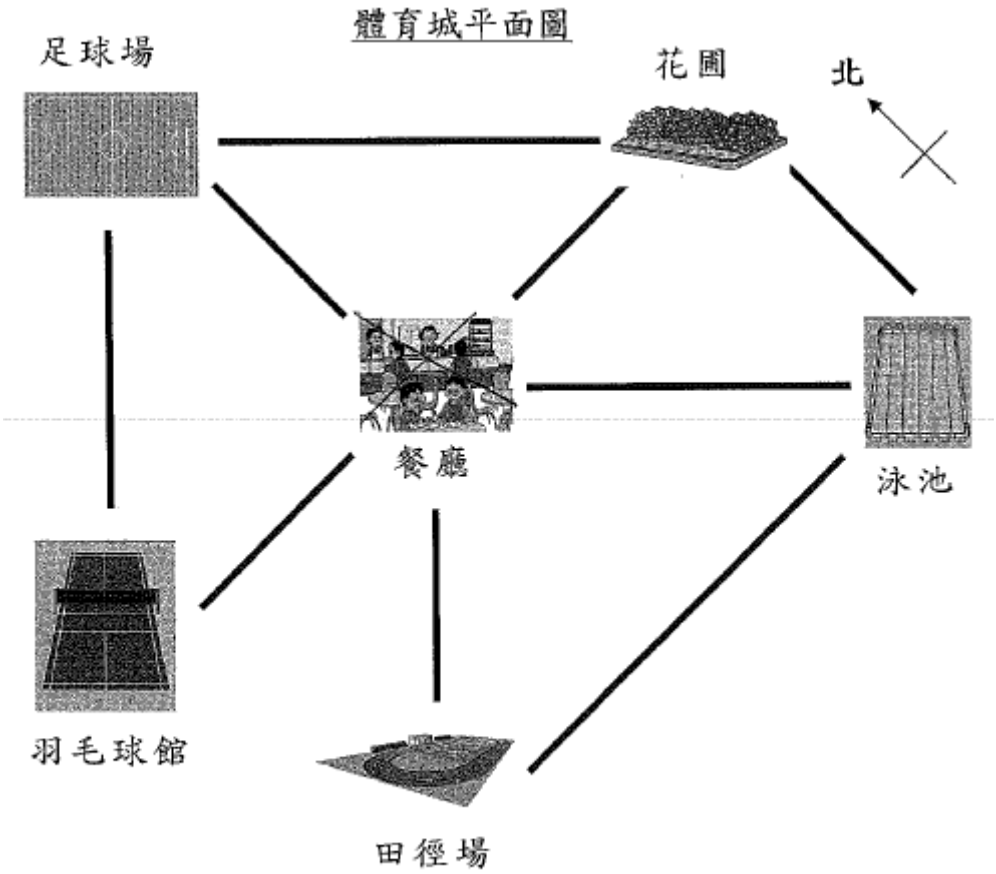
- The majority of P.6 students could identify 2-D shapes and know their properties (e.g. the rhombus in Q30(a)/M1; trapeziums in Q32(a)/M2).
- The majority of students could recognize isosceles triangles (e.g. Q30(b)/M1; Q33(b)/M2) and right-angled triangles (e.g. Q31(b)/M1; Q24(a)/M3). However, some students were not able to recognize equilateral triangles (e.g. Q32(b)/M2).

- Some students were not able to classify 2-D figures according to their number of sides (e.g. Q34/M2).

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 oriented in other directions (e.g. Q35/M2). There were some students who wrote the incorrect Chinese characters for 'south' (e.g. Q35(a)/M2).

Q35(a)/M2: Two examples of writing incorrect Chinese characters for 'south'



田徑場在餐廳的 西南 方。

P.6 Data Handling Dimension

Students performed well in the Data Handling Dimension. Most students were capable of drawing correct pictograms and bar charts as well as reading and interpreting the data given in statistical graphs. They could also 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.

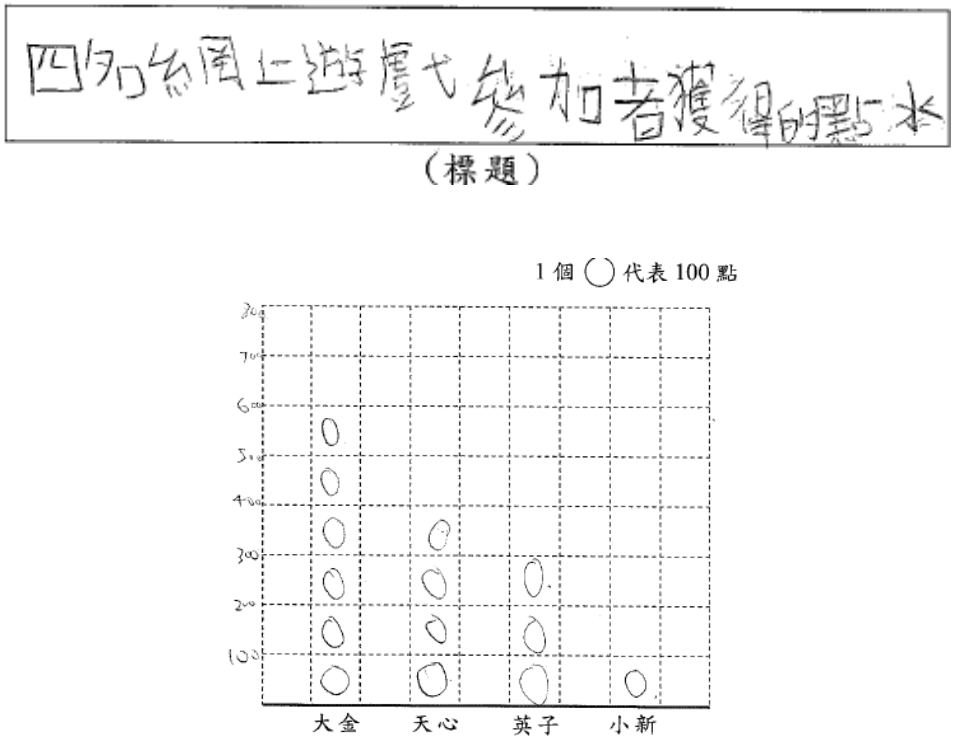
Reading and interpreting pictograms and bar charts

- P.6 students were good at reading data directly from pictograms. They were capable of interpreting the data given by pictograms with a one-to-ten representation or greater frequency counts (e.g. Q40/M2 and Q39/M4).
- The majority of students were good at reading data directly from bar charts with a one-to-two representation or greater frequency counts (e.g. Q38/M1; Q42(a)&(b)/M3). Students performed quite well in making inferences using information extracted from a bar chart but some of them could not give sound reasons with reference to given data (e.g. Q42(c)/M3).

Constructing pictograms and bar charts

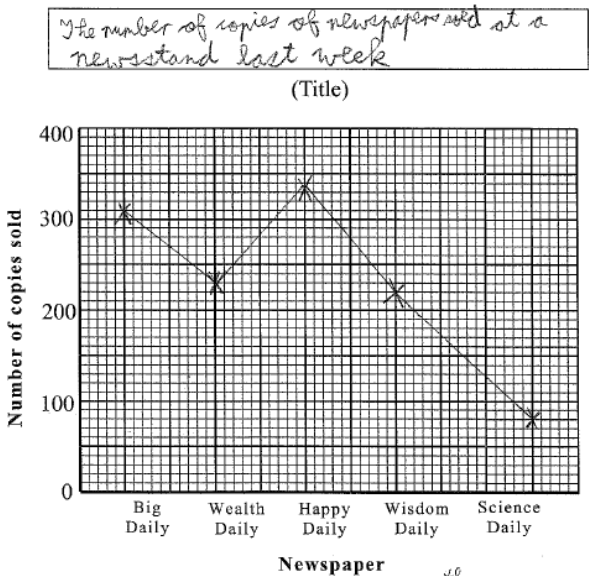
- The majority of students could construct correct pictograms. Some students gave inappropriate titles or unnecessarily added a frequency axis (see the example of a student's work on Q37/M1 on the following page).

Q37/M1



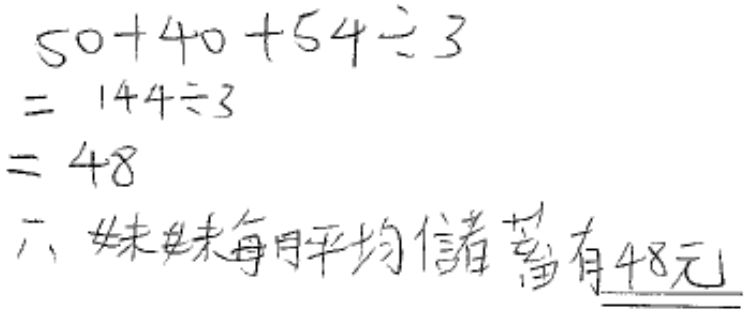
- The majority of students were capable of constructing bar charts but a few students drew wrong statistical graphs (see the example of Q41/M2 below).

Q41/M2



Concept of averages and its applications

- The majority of P.6 students were able to calculate the average of a group of data (e.g. Q42/M2).
- In solving applications, the majority of students could correctly show working steps and find the average (e.g. Q40/M3) but some of them missed the brackets in calculating the total amount of money (see the following example of a student's work on Q40/M3).

Q40/M3


P.6 Algebra Dimension

The performance of P.6 students was stable 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 below with examples from different sub-papers quoted in brackets.

Using symbols to represent numbers

- The majority of students could use algebraic expressions to represent situations in daily life (e.g. Q33/M1; Q37/M2) but a few students confused the dividend with the divisor.

Solving simple equations

- In general, students understood the concept of an equation. Only a small number of students could not distinguish equations from algebraic expressions (e.g. Q36/M3 and

Q35/M4).

- The performance of students was good in solving equations of up to two steps (e.g. Q36/M2; Q38/M2; Q38/M3; Q36/M4). Besides careless mistakes in computations, students had less difficulty in solving one-step equations involving addition/subtraction. However, their performance dropped significantly when the manipulations of coefficients were required or the answer was a fraction (see examples of Q36/M2 and Q35/M1 below).

Q36/M2	Q35/M1
$55 = x - 20$ $x =$ 70	$21y = 7$ $y =$ 3

- Students could solve application problems by setting up an equation with a well-defined symbol (e.g. Q36/M1 and Q39/M2). Some students forgot the bracket in algebraic expressions. Hence, their working steps and answers were presented incorrectly (see students' answers for Q39/M2 below).

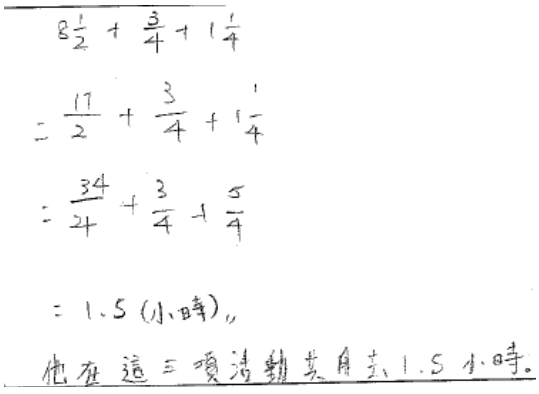
Q39/M2	
$y+12\times5=160$ $y+60=160$ $y+60-60=160-60$ $y=100$	設某婁女是y, $y+12\times5=160$ $y+12=\frac{160}{5}32$ $y=32-12$ $y=20$ ∴某數是20

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 and performed satisfactorily in the Number and Measures Dimensions. Their performance was stable in the Algebra Dimension. 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 needed to enforce their basic concepts such as factors and common factors, the perimeters and areas of 2-D figures as well as the volume of cuboids. They needed improvement in calculations involving fractions and percentages, reading calendars, measuring length in the unit of 'millimetres' (mm), the use of symbols to represent numbers and the skills of solving equations.

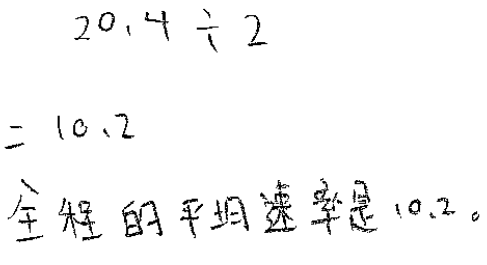
Some students were weak in solving application problems involving fractions. For example, in Q17/M1, many students did not add fractions correctly.

Q17/M1



In Q30/M3, the students could use the speed formula to solve problems but forgot to give the unit.

Q30/M3

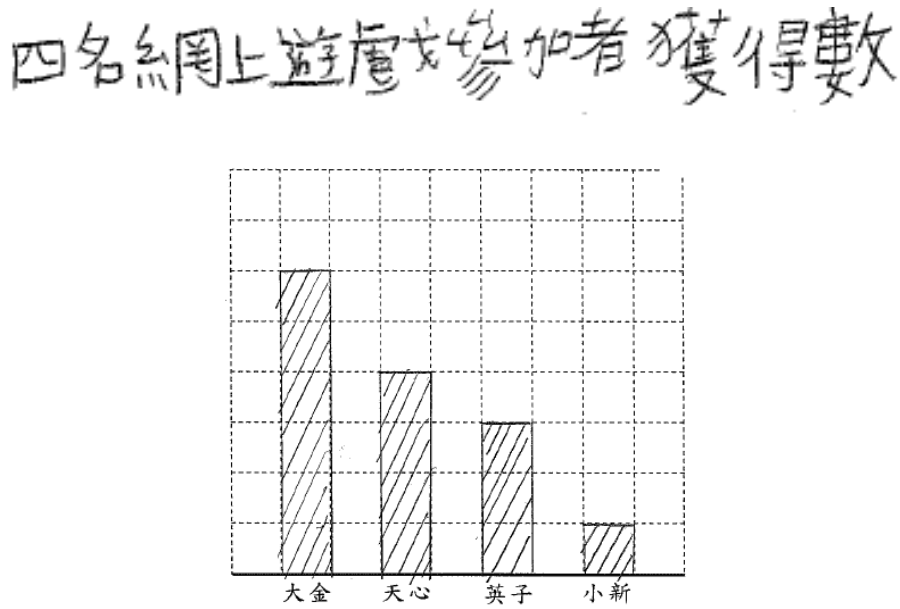


Some students solved the equations incorrectly, as shown in the following examples for Q36/M1 below.

Q36/M1
設每名小童的收費是 y 元。 $260-2y=40$ $260-2y+2y=40+2y$ $2y=300$ $\frac{2y}{2}=\frac{300}{2}$ $y=150$ 每名小童的收費是150元
Let the fee of a child be y $\frac{y}{2}+40=260$ $\frac{y}{2}+40-40=260-40$ $\frac{y}{2}=\frac{220}{2}$ $y=110$ The fee of a child is $110

Some students confused pictograms with bar charts and ‘bars’ were drawn instead of pictures, as shown in an example of Q37/M1 below.

Q37/M1



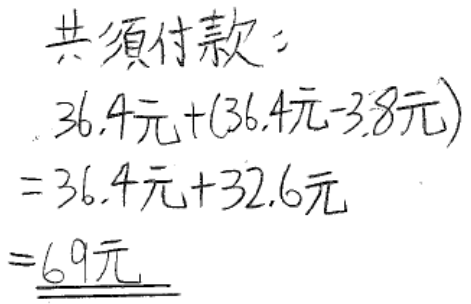
Best Performance of P.6 Students in TSA 2013

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.

The top performing students understood most basic important concepts and computational methods, including the common factors and common multiples of two numbers; finding the least common multiple and the highest common factor of two numbers; calculations involving whole numbers, fractions, decimals and percentages and solving related application problems. Furthermore, they understood the concept of equations and how to solve equations in logical steps.

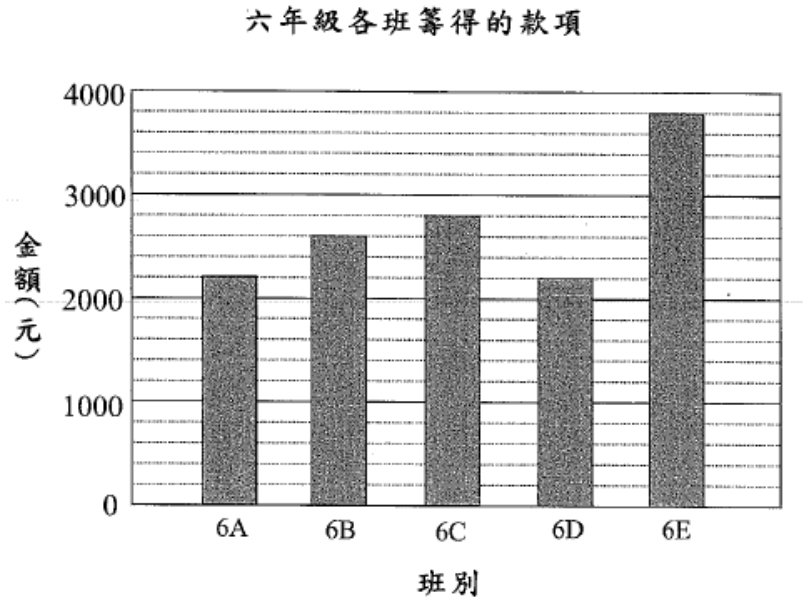
The top performing students could find the perimeters and areas of common 2-D shapes as well as the volume of cubes and cuboids. They understood the characteristics of various 2-D shapes and 3-D shapes. They could recognize curves, parallel lines and perpendicular lines, and the eight compass points.

The top performing students were capable of solving problems with mathematical knowledge learnt in primary schools, for instance, calculating the amount of money with decimals and small brackets and solving simple problems of averages (see the following example of a student's answer for Q18/M4).

Q18/M4


The top performing students were able to extract relevant data from pictograms and bar charts. They could make inferences from extracted data and give reasonable explanations (see students' answers of Q42/M3 below).

Q42/M3



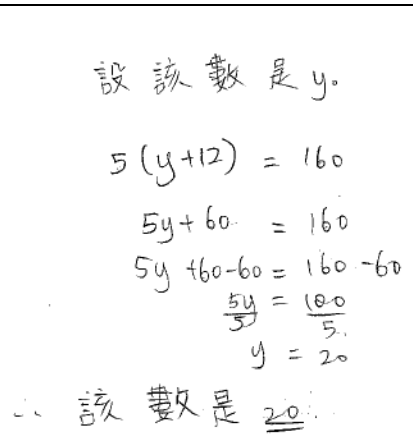
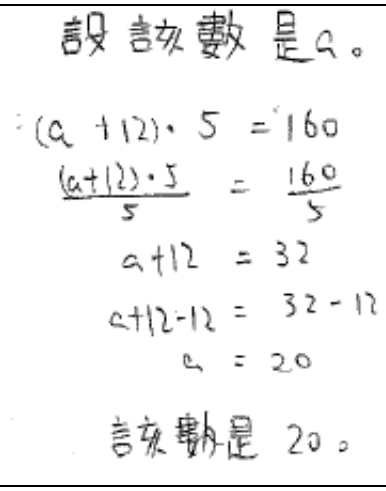
籌得 M 元或以上的班別可獲頒獎狀。如果只有 6C 班和 6E 班獲頒獎狀，M 可能是多少？為什麼？

答案：M 可能是 2800 ，因為 籌得2600元的6B沒有獲頒獎狀，而籌得2800元的6C則獲頒獎狀，那麼M應是大於2600及小於2800或剛好是2800 。

答案：M 可能是 2800元 ，因為 6C 和 6E 班都是籌得最多款項的兩班，而6C班是籌得第二多款項，又拿得獎狀 。

答案：M 可能是 $2720 ，因為六年級平均籌得的款項是$2720，而且只有6C($2800)和6E($3900)籌得的款項是勿過平均籌得的款項 。

In solving application problems by the method of solving an equation, the top performing students could set up equations and show the working steps correctly (see two students' answers of Q39/M2 below).

Q39/M2	
	

Comparison of Student Performances in Mathematics at Primary 6 TSA 2010, 2011 and 2013

The percentages of students achieving Basic Competency in 2010, 2011 and 2013 are provided below.

Table 8.4 Percentages of P.6 Students Achieving Mathematics Basic Competency in 2010, 2011 and 2013^

Year	% of Students Achieving Mathematics Basic Competency
2010	84.2
2011	84.1
2013	84.2

^ The 2012 P6 TSA was suspended. As participation in the 2012 P6 TSA was on a voluntary basis, not all P6 students were involved and hence no territory-wide data is provided in this report.

A comparison of the strengths and weaknesses of P.6 students in TSA 2010, 2011 and 2013 provides useful information for teachers to help students improve their effectiveness of learning. The percentage of students achieving mathematics basic competency in 2013 was similar to that of 2010 and 2011. The following provides a comparison of the student performances for these years in each of the five dimensions.

Number Dimension

- The overall performance P.6 students remained steady at the same level as that of previous years in the Number Dimension.
- Students had much room for improvement in finding the common factors and common multiples of two numbers as well as their highest common factor and the least common multiple.
- P.6 students in 2013 could present their solutions and working steps clearly in solving application problems involving whole numbers, fractions, decimals and percentages.
- P.6 students needed improvement in calculations of fractions and estimations involving decimals.

Measures Dimension

- In the Measures Dimension, the overall performance of P.6 students was better than in previous years.
- Students on the whole 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.).
- There was room for improvement in finding the perimeter and area of 2-D shapes.
- Students in 2013 were comparatively weak in finding the capacity of containers and the volume of solids.
- Students in 2013 improved a little bit on application problems of speed.

Shape & Space Dimension

- In the Shape and Space Dimension, students' performance in 2013 was better than in previous years.
- Students' performance remained at a high level in identifying curves, parallel lines and perpendicular lines.
- The majority of students were capable of identifying 2-D shapes and recognising the characteristics of 3-D shapes including the numbers of vertices, edges and faces.
- The majority of students could recognize the eight compass points. However, a small number of students neglected the implication when the 'north' direction is not

pointing upward on the map.

Data Handling Dimension

- Students in 2013 had good results in the Data Handling Dimension.
- The majority of students were capable of reading data presented in statistical graphs. Many students could use the extracted data in making inferences and interpretations.
- Students in 2013 performed well in drawing pictograms or bar charts. However, some students wrote unacceptable titles and unnecessarily added a 'frequency axis' to the pictogram.
- P.6 students were able to find the average of a group of data and solve daily problems involving averages.

Algebra Dimension

- Students' performance in 2013 was stable in the Algebra Dimension.
- P.6 students were able to use symbols to represent numbers and solving equations of up to two steps.
- Students had room for improvement in solving application problems by equations.