8. MATHEMATICS

Results of Primary 3 Mathematics in TSA 2011

The Territory-wide percentage of P.3 students achieving Mathematics Basic Competency in TSA 2011 was 87%. The proportion achieving basic competency in 2011 was almost the same as that in 2008 and 2010.

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 (200 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.

Since some Basic Competencies in the Number, Measures, and Shape & Space Dimensions are common to both Key Stages 1 and 2, five items (eight score points) testing these common Basic Competencies were purposefully set to be the same in both the P.3 and the P.6 Assessments. These measures provided a common basis to compare the performance of P.3 and P.6 students on the same Basic Competencies.

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)	9(18)	7(14)	2(5)	37(61)
M2	19(25)	11(18)	7(13)	2(6)	39(62)
M3	18(27)	10(17)	8(14)	2(5)	38(63)
M4	18(23)	9(16)	8(16)	2(6)	37(61)
Total *	55(76)	33(56)	27(49)	7(19)	122(200)

* 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 2011

P.3 Number Dimension

Students performed satisfactorily in this dimension. They could understand the basic concepts of whole numbers and simple fractions. Students were good at performing addition, subtraction, multiplication and division of whole numbers as well as their mixed operations. In general, students had adequate skills in solving application problems and were able to demonstrate clear working steps in presenting their solutions. They have shown a slight improvement 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

- Most students were capable of recognising the place values of digits in a whole number and the value of the digit (e.g. Q1/M1; Q1/M3). They performed quite well in ordering whole numbers in descending order (e.g. Q2/M1; Q1/M4) and forming three whole numbers with given digits according to specific conditions (e.g. Q2/M4).
- The majority of students were capable of reading numbers expressed in words (e.g. Q2/M3) but did not perform as well in writing Arabic numerals in words (e.g. Q3/M1) (see examples of students' work below).

Q3/M1
答案：七萬一二十
答案：七十萬一千零二
Answer: 71 thousands 2 tens

- Most students understood the basic concept of fractions (e.g. Q17/M1; Q18/M1; Q17/M2). They knew that, when a fraction is used to represent part of a whole, the whole must be divided into a number of equal parts (e.g. Q18/M2; Q16/M4). They could recognise the general relationship between fractions and the whole (e.g. Q18(a)/M4) but in Q19(b)/M3, half of them were unable to compare $\frac{6}{6}$ and 6. In Q17/M4, some students were either careless or did not understand the question and gave the number of paper birds that Elaine had made as an answer.
- Many students were able to compare fractions with the same numerators as well as those with the same denominators (e.g. Q19/M1; Q19/M2; Q19(a)/M3; Q18(b)/M4).

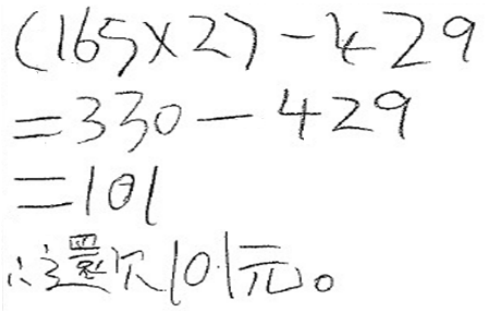
Performing basic calculations on whole numbers

- Addition – The majority of students performed well in the addition of whole numbers up to 3 digits including carrying once in repeated addition (e.g. Q3/M3; Q3/M4) and addition involving the process of two successive carrying (e.g. Q4/M1).
- Subtraction – The majority of students did well in the subtraction of whole numbers up to 3 digits involving decomposition and repeated subtraction (e.g. Q5/M1; Q6/M1; Q4/M3; Q4/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/M3) and repeated multiplication (e.g. Q5/M4).
- Division – Students showed satisfactory performance in both division with divisor 1 digit and dividend 3 digits (e.g. Q9/M1; Q7/M3) and division with remainders (e.g. Q8/M1; Q7/M4).
- Mixed operations – The majority of students could perform mixed operations of addition and subtraction involving small brackets (e.g. Q8/M4), though careless

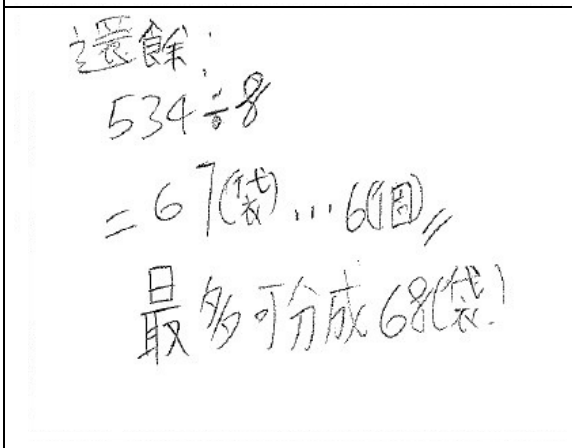
computational mistakes were evident. Many students could carry out the required calculations for mixed operations of multiplication and addition/subtraction (e.g. Q10/M1; Q8/M3; Q9/M4).

Solving application problems

- P.3 students in general were capable of understanding and solving simple problems involving addition and subtraction (e.g. Q13/M2; Q11/M4; Q16(b)/M1). In some cases, students were careless in reading the questions, for example, in Q16(a)/M1, a few students gave the amount left as an answer instead of finding the total amount spent on the toys. The majority of students could solve straightforward problems involving multiplication (e.g. Q11/M1; Q10/M4) and mixed operations (e.g. Q15/M2; Q10/M3; Q11/M3; Q15/M4). In Q14/M1, some students were careless in doing subtraction or confused the subtrahend with the minuend in writing a subtraction expression (see an example of students' work below).

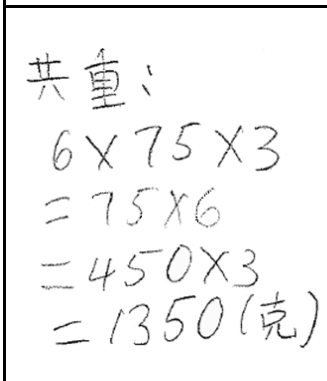
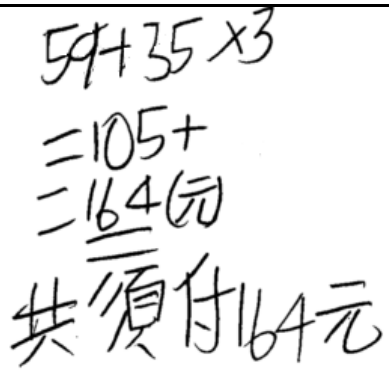
Q14/M1


- For problems with more complicated contexts, more than half of the students were either careless in reading the question or weak in comprehending the situation (e.g. Q13/M1; Q12/M4). A significant proportion of students had difficulty in division problems involving a remainder (e.g. Q12/M1; Q9/M3). Some of them mistook the quotient as the answer and ignored the remainder. However, the majority of students performed quite well in Q14/M2 and Q13/M4, although few students made errors in the computation and were careless in reading the question (see an example of students' work on the next page).

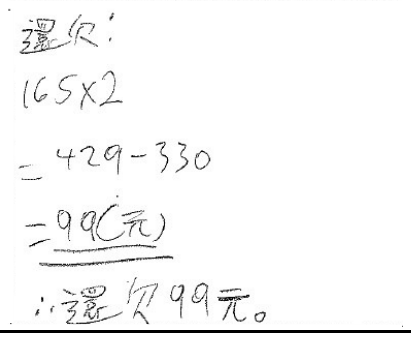
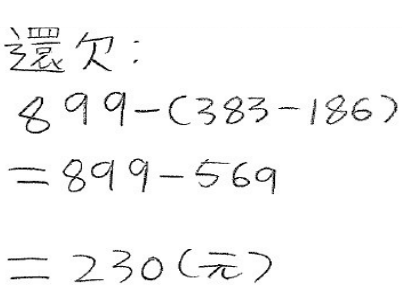
Q14/M2


- Many students could present their solutions with working steps in solving application problems. However, some students were not able to write an appropriate description to illustrate or explain their solutions (see examples of students' work below).

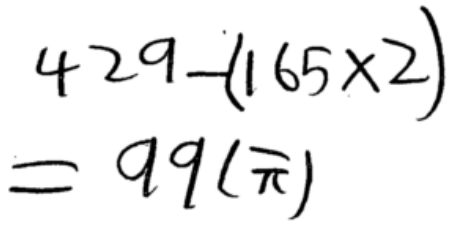
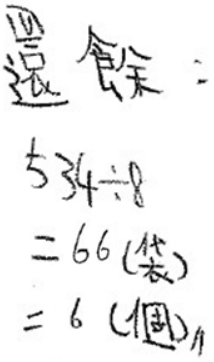
(a) Incomplete working steps:

Q13/M1	Q15/M4
	

(b) Incorrect working steps:

Q14/M1	Q13/M2
	

(c) Inadequate explanatory statements: no descriptions or conclusions were provided and the explanations were not clear enough.

Q14/M1	Q14/M2
	

- Students were capable of solving problems involving addition in the calculation of money (e.g. Q14/M4) and many of them were able to perform division of money not involving conversion of money (e.g. Q16/M2). However, some students were unable to perform multiplication of money (e.g. Q15/M1).

P.3 Measures Dimension

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

Students in general were able to tell the time on a clock face and a digital clock. They could tell the dates and days of the week and apply the '24-hour time', but there was room for improvement in students' performance in both identifying correctly the dates of an activity with a given duration and recording the duration of activities with given dates or times. Further comments on students' performance are provided below with examples from different sub-papers quoted in brackets.

Knowledge of Hong Kong money

- Students in general could identify and use Hong Kong money (e.g. Q20/M1;

Q20(b)/M4). Most students could read price tags (e.g. Q16(a)/M4).

- Many students could exchange money directly (e.g. Q21(a)&(c)/M1), but some students were still weak in finding the change required when the amount was large (e.g. Q21(b)/M1) or when simple calculations were involved (e.g. Q20(b)/M2) (see example of students' work below).

Q21(b)/M1

(b) 2 張 

可換得

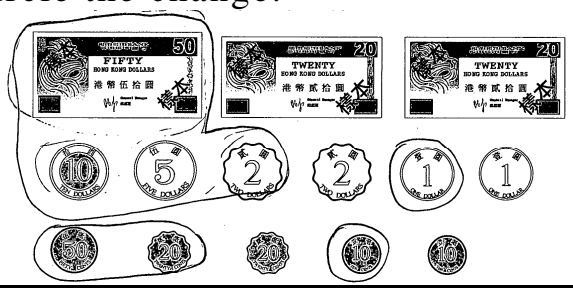
(00 張 

。

Q20(b)/M2

Mother buys a mixer and pays with two 

How much change should she get?
Circle the change.

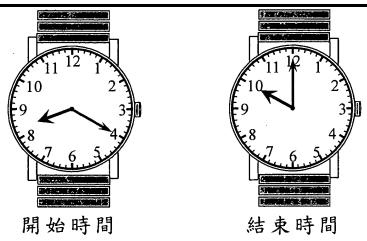


Knowledge of time

- With a monthly calendar given, many students could deduce the date of an activity in the following month (e.g. Q23(b)/M2). About half of the students could not identify the start date/end date of an activity with a given duration of the activity. For example, in Q22(b)/M4, a few students counted the 1st of April as the start date and gave Wednesday as the last day of the holiday. In Q23(a)/M1, a few students did not read the question carefully and gave the 16th of March as the answer. Furthermore, a small number of students did not know the number of days in a common year (e.g. Q22(c)/M4).
- The majority of students were good at telling the time on a clock face/digital clock

including the '24-hour time' (e.g. Q24&25(a)/M1; Q24(a)&Q25(a)/M2). Students' performance in working out the duration of an activity was satisfactory when the time shown was in the format of a digital clock or in '12-hour time' system (e.g. Q25(b)/M1; Q23/M4). However, students had difficulties in working out the duration of an activity when it involved reading the time on a clock face, activity timetable or including '24-hour time' (e.g. Q25(c)/M1; Q24(b)&25(b)/M2; Q26(b)/M3) (see an example of students' work below).

Q24(b)/M2



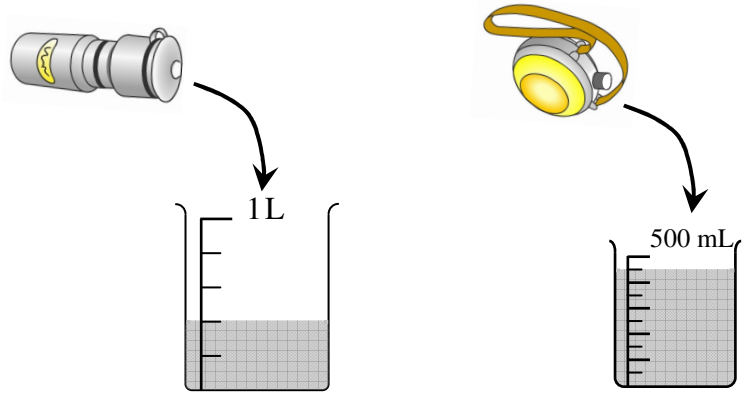
他共用了 2 小時 40 分鐘練習跑步。

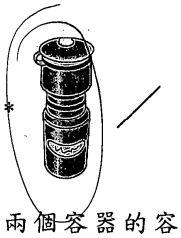
Measurement of length/distance, weight and capacity

- Most students could directly compare the length/distance of different objects (e.g. Q20/M3) and the weight of three objects by simple deduction (e.g. Q24/M4). The majority of students were capable of directly comparing the capacity of three containers (e.g. Q27/M1) and comparing the weight of different objects using improvised units (e.g. Q26/M1). However, they did not perform as well in using improvised units to measure and compare the capacity of different containers (e.g. Q28/M1).

- Many students were capable of using a ruler to measure and record the length of an object (e.g. Q21/M2; Q22/M3; Q19/M4) and were able to compare the distance in kilometers between objects (e.g. Q21/M3). Moreover, they could measure and compare the weight of objects using 'gram'(g) or 'kilogram' (kg) (e.g. Q25/M4; Q27/M3). Students did well in measuring and comparing the capacity of containers using different measurement units (e.g. Q28/M3) but their performance declined when it involved reading scales on measuring cups (e.g.Q28/M2) (see an example of students' work on the next page).

Q28/M2






* 的容量較大。(*圈出答案)

兩個容器的容量相差 250 mL。

- Students did well in choosing the appropriate measuring tools for measuring length/distance and the weight of objects and the capacity of containers (e.g. Q29/M2; Q23&Q24/M3). Many students were also capable of using finger width, arm length, foot span etc., as 'ever-ready rulers' for measuring the lengths of objects and the distance between objects (e.g. Q31/M2).
- Students in general did well in choosing suitable measurement units for recording length (e.g. Q22(b)/M1; Q22(a)&(b)/M2; Q25(a)&(b)/M3) and weight (e.g. Q22(c)&(d)/M1; Q22(c)/M2; Q25(c)&(d)/M3). Nevertheless, almost half of the students were unable to record the length of an airport runway with an appropriate unit. Some students confused the unit of recording the length with the unit of recording the weight (see examples of students' work below).

Q22(a)/M1

(a) 香港國際機場的跑道長約 3800 公里。

(a) 香港國際機場的跑道長約 3800 cm。

Q25/M3
(a) 一個三歲的小朋友身高約 1 kg 。 (d) 一個足球重約 430 厘米 。

P.3 Shape & Space Dimension

The performance of P.3 students was good in the Shape & Space Dimension. They were capable of identifying familiar 2-D and 3-D shapes though they sometimes gave incorrect names of the 2-D and 3-D shapes. P.3 students mastered the basic concepts of straight lines, curves, angles and the four directions. Some students were weak in identifying a pair of parallel lines or perpendicular lines in given figures. 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 cylinders, cones and prisms (e.g. Q29/M1; Q29/M3; Q30/M3). They could name 3-D shapes correctly, including cones and spheres (e.g. Q30/M1;Q30/M2) as well as classify familiar 3-D objects in real life (e.g. a football as an example of a sphere in Q30(a)/M4).
- Most P.3 students could group 3-D shapes into cones/pyramids and cylinders/prisms (e.g. Q33(a)&(b)/M2). However, some students confused objects belonging to cones/pyramids with cylinders/prisms (e.g. Q30(b)&(c)/M4) and mistook some other shapes for spheres (e.g. Q33(c)/M2).

2-D Shapes

- The majority of students could identify 2-D shapes including triangles, parallelograms, squares and pentagons (e.g. 31/M4; Q31(a)/M3; Q31(b)&(c)/M1). They could name trapeziums, rectangles and parallelograms correctly (e.g. Q32/M2; Q31(a)/M3). However, a small number of students were unable to distinguish between a circle and an ellipse (e.g. Q31(a)/M1).

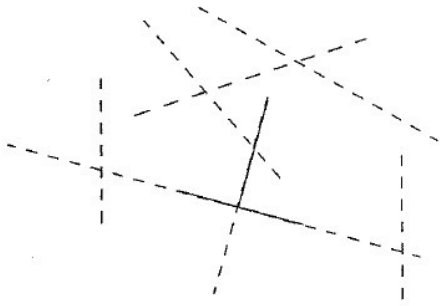
- The majority of students could group 2-D shapes according to the number of sides (e.g. Q33(a)/M3) but they were weak in recognising the parallel opposite sides of a trapezium (e.g. Q33(b)/M3)
- Some students had difficulty in recognising or naming rhombuses correctly (e.g. Q29(a)/M4; Q31(b)/M3) (see examples of students' work below).

Q31(b)/M3	
	

- P.3 students were good at recognising isosceles triangles, right-angled triangles and equilateral triangles (e.g. Q32(a)/M1; Q32/M3; Q34/M2; Q32/M4). Some students were weak in observing right-angled triangles in different orientations (e.g. Q32(b)/M1).

Straight Lines and Curves

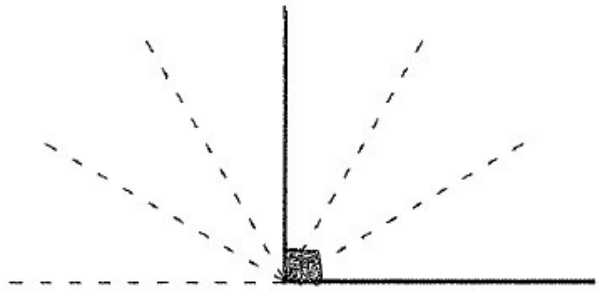
- Most students did well in identifying straight lines and curves (e.g. Q34/M1; Q35(a)/M2). They could also trace parallel lines and perpendicular lines along dotted lines (e.g. Q33/M4; Q36/M2) (see an example of students' work below).

Q36/M2


- Some students were not able to identify parallel lines and perpendicular lines in given figures (e.g. Q34/M3; Q35(b)/M2).

Angles

- Most students were capable of recognising right angles (e.g. Q33/M1; Q35(a)/M3). (see an example of students' work below).

Q33/M1


- The majority of students were able to compare the size of angles (e.g. Q37/M2) and did well in comparing the size of an angle with respect to a right angle (e.g. Q35(b)/M3).

Directions

- Students in general did well in recognising the four directions: east, south, west and north (e.g. Q35/M1; Q36/M3), yet some were unable to write the direction correctly in Chinese characters (e.g. Q36(c)/M3) (see examples of students' work below).

Q36(c)/M3

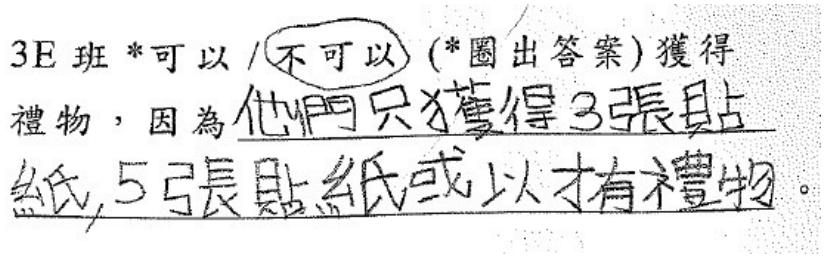

P.3 Data Handling Dimension

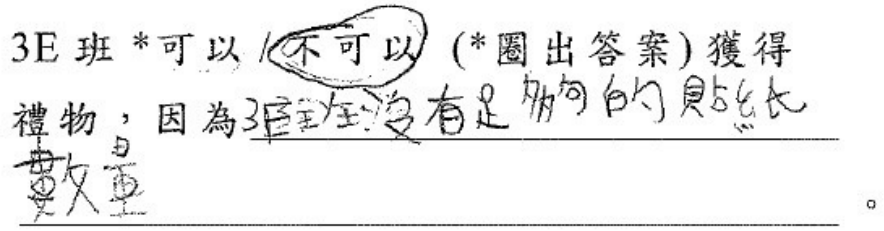
Students performed well in this dimension. They could read and interpret data or information from given pictograms and made use of them to answer straightforward questions. They were also capable of constructing pictograms from given data. Further comments on students' performance are provided below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

Reading and interpreting pictograms

- Most students were capable of reading the data given in pictograms to answer straightforward questions, comparing the data and carrying out simple calculations (e.g. Q36/M1; Q38/M2; Q38(a)/M3; Q37/M4). Regarding open-ended questions, the majority of students were able to explain their reasoning using the data given from the pictogram (e.g. Q38(b)/M3) (see examples of students' work below).

Q38(b)/M3

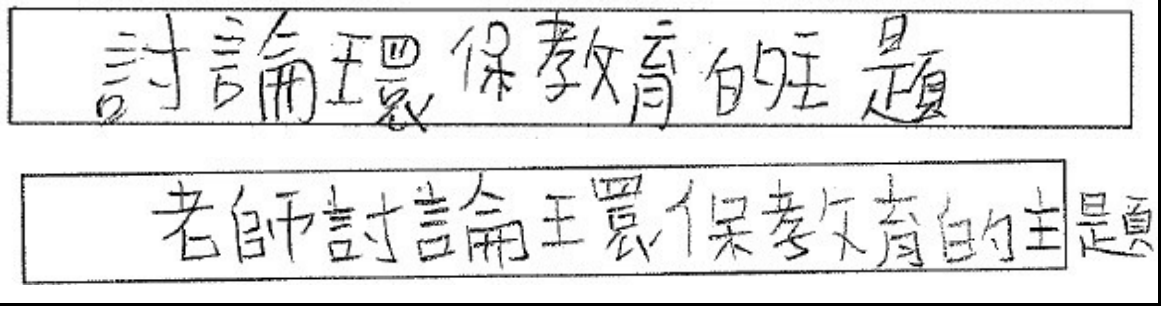




Constructing pictograms

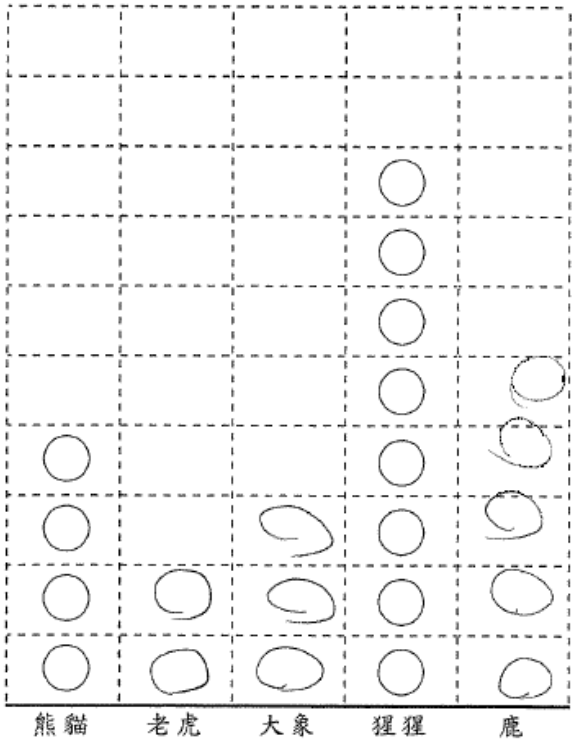
- Most students were capable of constructing pictograms from a table of raw data and providing a proper title for a pictogram (e.g. Q37(1)/M1; Q39(b)(1)/M2; Q37(1)/M3). A few students were careless in reading the questions and they missed the keywords or used the wrong keywords for the titles (see examples of students' work below).

Q39/M2

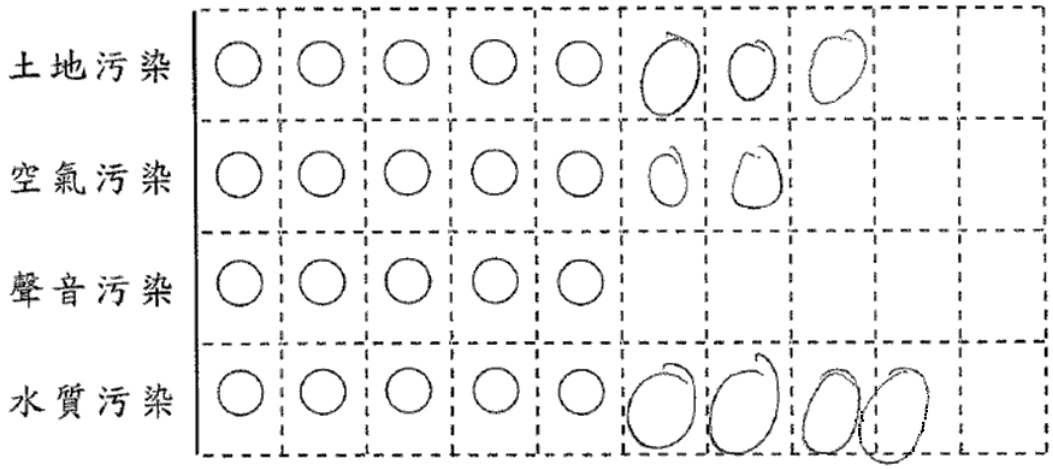


- Some students did not draw the pictures correctly or neatly to represent their respective frequencies across the rows or columns (e.g. Q37(2)/M1; Q39(b)(2)/M2; Q37(3)/M3) (see examples of students' work below).

Q37/M1



Q39/M2



General Comments on P.3 Student Performances

The overall performance of P.3 students was good. Students demonstrated mastery of basic concepts and computational skills of foundational mathematics in Key Stage 1.

The performance of P.3 students was consistently good across the Number and Data Handling Dimensions. They were capable of solving simple application problems and presenting proper working steps for their solutions, but there were still a minority of students who could not write their mathematical expressions correctly or give clear explanations or concluding statements. A slight improvement was shown in handling the remainder involved in divisions. The majority of students could read and interpret simple pictograms and performed well in constructing pictograms from tabulated data.

In the Measures Dimension and Shape & Space Dimension, students generally performed steadily in areas such as identifying Hong Kong money, comparing the length and weight of objects, the capacity of containers and telling the time on a clock face/digital clock.

They performed well in recognising 2-D shapes, 3-D shapes, lines, curves, angles and the four directions. However, their performance was relatively weak in the following areas: exchange of money, giving correct units, measuring and comparing the capacity of containers using improvised units, identifying the start/end date of an activity with a given duration, and recording the duration of the activities. Also, their performance declined in identifying trapeziums, parallel lines and perpendicular lines. Some students could not name a rhombus and a cuboid correctly.

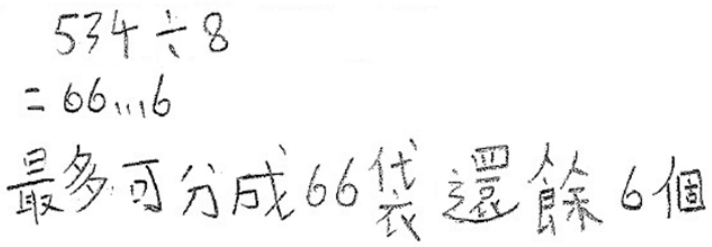
In general, P.3 students had little difficulty solving familiar problems. However, sometimes they did not complete the task as required because they might have misread instructions or drawn conclusions based on their intuition or usual practices without mathematically sound reasoning. As a result, their performance tended to decline slightly for test items that were less familiar or required higher order thinking.

Best performance of P.3 Students in TSA 2011

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 continued to excel in all dimensions. These students were very good at arithmetic computations and could solve application problems in various contexts. Almost all students were capable of presenting their solutions with working steps and explanatory statements (see an example of students' work below).

Q14/M2


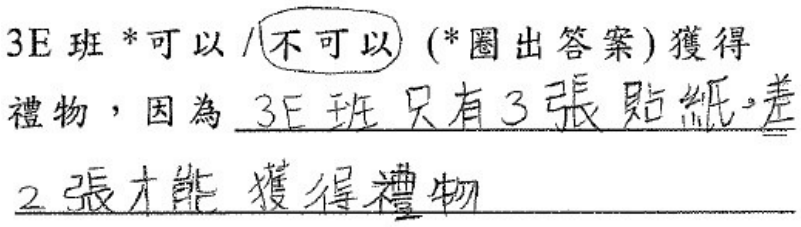
Most of these students demonstrated a good understanding of the concepts of fractions such as recognising the relationship between fractions and the whole as well as comparing fractions.

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 recording the duration of time for activities, directly and indirectly comparing the length/distance, the 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 as well as the four directions. They were able to compare the size of angles and recognise right angles.

The best performing students were capable of reading and interpreting the data given in pictograms as well as constructing pictograms according to the supplied data. They could

analyze data and extract information from a pictogram to explain their reasoning (see an example of students' work below).

Q38(b)/M3


In spite of the more than satisfactory performance of most students, some had common weaknesses as described below:

- In Q19(b)/M3, a few students did not understand the relationship between the fraction $\frac{6}{6}$ and the number 6.
- In Q17/M4, half of the students had difficulty understanding the question or they did not read it carefully.
- In Q22(a)/M1, some students were unable to choose a suitable measuring unit for the length of the airport runway.
- In Q23(b)/M1, some students were unable to correctly identify dates with a given duration of an activity.
- In Q31(b)/M3, a few students were unable to name the rhombus.
- In Q33(b)/M3, a few students were unable to recognise the trapeziums.

Comparison of Student Performances in Mathematics at Primary 3 TSA 2008, 2010 and 2011

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

Table 8.2 Percentages of P.3 Students Achieving Mathematics Basic Competency in 2008, 2010 and 2011[#]

Year	% of Students Achieving Mathematics Basic Competency
2008	86.9
2010	87.0
2011	87.0

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.3 students in TSA 2008, 2010 and 2011 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 2011, the overall performance of P.3 students in the Number Dimension was about the same as in 2008 and 2010.
- Students continued to perform well in questions involving concepts of place values and mixed operations of whole numbers.
- As in previous years, students exhibited stable performance in solving simple application problems. Besides, they showed a slight improvement in application problems involving division with a remainder.
- Compared to previous years, students did not perform as well in solving problems involving multiplication of money.
- Students showed a satisfactory performance in understanding the basic concept of fractions and comparing fractions.

Measures Dimension

- Compared to previous years, students made progress in identifying Hong Kong money. They performed steadily in exchanging and using money.
- This year, students showed a slight improvement in test items pertaining to telling the dates from a calendar and identifying the start date/end date of an activity.
- Students' performance in telling the time on a clock face/digital clock was steady. The performance in recording the duration of activities was similar to previous years.
- Students performed steadily in measuring and comparing the length/distance of objects, measuring with appropriate measuring tools and choosing suitable measuring units for recording the length of objects.
- Students' performance in comparing the weight of objects directly and measuring and comparing the weight of objects using improvised units remained good. They did better when they were asked to measure with appropriate tools.
- Students' performance remained steady in comparing the capacity of containers and measuring with appropriate tools. However, performance declined slightly in measuring the capacity of containers using improvised units.

Shapes & Space Dimension

- The overall performance of students in 2011 was better than that of students in 2008 and 2010.
- Students maintained the same level as in previous years when identifying 2-D shapes and 3-D shapes but there was still room for improvement in grouping 2-D shapes.
- Students in 2011 improved significantly in recognising the simple characteristics of triangles.
- Students performed at the same level as in previous years when identifying straight lines and curves but they were relatively weak in identifying parallel lines and perpendicular lines in 2-D shapes.
- Students in 2011 improved in the comparison of the size of angles and recognising right angles.

- The performance of P.3 students was stable in recognising the four directions.

Data Handling Dimension

- In 2011, the overall performance of P.3 students in the Data Handling Dimension was better than that of 2008 and 2010.
- Students performed well in reading and interpreting pictograms and they were capable of analyzing data in answering open-ended questions.
- Students could construct pictograms and a slight improvement was shown in the test items where they were asked to give a title to a pictogram.