

Summary of students' performance by the end of Grade 3

Reasoning and problem solving

Students model or represent mathematical problems using calculations, mathematical symbols, diagrams, graphs, charts and tables. They explain orally in their own words, or in writing or by using diagrams, the method used to solve a problem, or why an answer is correct. They justify their reasoning in simple cases.

Number and algebra

Students use their knowledge of place value in numbers up to 10 000 to multiply and divide whole numbers by 10 or 100. They compare numbers using the symbols $<$, $=$ and $>$. They identify odd and even numbers. They know by heart multiplication facts to 10×10 and use the inverse relationship between multiplication and division to derive corresponding division facts. They choose, use and explain mental methods to add three one-digit numbers, to add and subtract numbers with two digits and to multiply and divide a two-digit number by a one-digit number in simple cases. They use written column methods to add and subtract numbers with three or four digits. They solve two-step problems involving addition and subtraction and one-step problems involving multiplication or division of whole numbers, including simple division problems that give rise to remainders. Their problem solving extends to both non-routine and routine problems, including real-life problems involving money or measures. They recognise and compare simple fractions represented by diagrams and find simple unit fractions of small whole numbers.

Geometry and measures

Students understand angle as a measure of turn and recognise right angles. They identify equilateral, isosceles and right-angled triangles and regular and irregular polygons, and complete simple symmetrical patterns. They use and know the relationships between standard units of length (kilometre, metre, centimetre), weight (kilogram, gram) and capacity (litre, millilitre), and standard units of time (hour, minute, second). They record estimates and measurements of length, weight and capacity, including readings from scales, in mixed units. They read the time to the nearest minute, use the 12-hour clock and the notation 6:45, and use simple timetables. They find the perimeters of simple shapes, compare areas by counting squares and calculate the areas of squares and rectangles.

Data handling

Students collect data systematically. They record and read data in simple tally charts. They represent and interpret data in bar charts, reading simple scales on the axes. They solve problems by asking and answering questions related to the data.

Content and assessment weightings for Grade 3

The mathematics standards for Grades K to 9 are grouped into four strands: reasoning and problem solving; number and algebra; geometry and measures; and data handling.

The reasoning and problem solving strand cuts across the other three strands and should be integrated with them in teaching and assessments. For Grade 3, about 40% of the teaching and assessment of each of the other three strands should be devoted to reasoning and problem solving.

For Grades 1 to 6, the weightings of the three content strands relative to each other are as follows:

Number and algebra	Geometry and measures	Data handling
60%	30%	10%

The standards are numbered for easy reference. Those in shaded rectangles, e.g. 1.2, are the performance standards for all students. The national tests for mathematics will be based on these standards.

Grade 3 teachers should review and consolidate Grade 2 standards where necessary.

Reasoning and problem solving

By the end of Grade 3, students model or represent mathematical problems using calculations, mathematical symbols, diagrams, graphs, charts and tables. They explain orally in their own words, or in writing or by using diagrams, the method used to solve a problem, or why an answer is correct. They justify their reasoning in simple cases.

Students should:

1 Use mathematical reasoning to solve simple problems

- 1.1** Model or represent a problem using calculations, mathematical symbols, diagrams, graphs, charts and tables.

Sharifa has read the first 78 pages of a book that is 130 pages long.

Which of these number sentences could Sharifa use to find the number of pages she must read to finish the book?

- A. $130 + 78 = \square$ B. $\square - 78 = 130$ C. $130 \div 78 = \square$ D. $130 - 78 = \square$

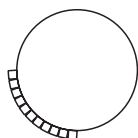
TIMSS Grades 3 and 4

- 1.2** Explain orally in own words, or in writing or by using diagrams, the method used to solve a problem, or why an answer is correct.

Use a number line to show why $382 - 179 = 203$.

- 1.3** Justify reasoning in simple cases.

The outside of this circle has 11 squares fitted around part of it.



About how many squares could be fitted around the whole circle?

Tick (✓) the answer.

- 80 40 25 100 65

Explain how you worked out your answer.

When you subtract one of the numbers below from 900, the answer is greater than 300. Which number is it?

- A. 823 B. 712 C. 667 D. 579

Explain how you know.

TIMSS Grades 3 and 4

Key standards

Key performance standards are shown in shaded rectangles, e.g. **1.2**.

Cross-references

Standards are referred to using the notation RP for reasoning and problem solving, NA for number and algebra, GM for geometry and measures and DH for data handling, e.g. standard NA 2.4.

Examples of problems

The examples of problems in italics are intended to clarify the standards, not to represent the full range of possible problems.

Number and algebra

By the end of Grade 3, students use their knowledge of place value in numbers up to 10 000 to multiply and divide whole numbers by 10 or 100. They compare numbers using the symbols $<$, $=$ and $>$. They identify odd and even numbers. They know by heart multiplication facts to 10×10 and use the inverse relationship between multiplication and division to derive corresponding division facts. They choose, use and explain mental methods to add three one-digit numbers, to add and subtract numbers with two digits and to multiply and divide a two-digit number by a one-digit number in simple cases. They use written column methods to add and subtract numbers with three or four digits. They solve two-step problems involving addition and subtraction and one-step problems involving multiplication or division of whole numbers, including simple division problems that give rise to remainders. Their problem solving extends to both non-routine and routine problems, including real-life problems involving money or measures. They recognise and compare simple fractions represented by diagrams and find simple unit fractions of small whole numbers.

Students should:

2 Understand and use place value in whole numbers to 10 000

2.1 Read and write whole numbers up to 10 000 in numerals and words.

Use each of the digits 7, 9, 0 and 5 exactly once.

What is the smallest number you can make?

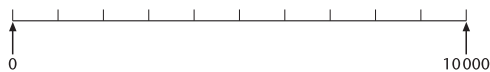
Write your number in words.

2.2 Represent the place value for whole numbers with up to four digits (thousands, hundreds, tens, ones) using models and expanded notation.

What number goes where the box is to make this number sentence true?

$$2000 + \square + 30 + 8 = 2538$$

Draw an arrow (\uparrow) to show the position for 7500 on this number line.



2.3 Compare and order numbers using the symbols $<$, $=$ and $>$.

Use these signs: $=$ $<$ $>$. Write the correct sign in each box.

$$8 \times 7 \square 9 \times 6 \quad 5 \times 7 \square 5 \times 5 \quad 10 \times 6 \square 6 \times 10$$

2.4 Round two-digit whole numbers to the nearest 10.

3 Recognise properties of numbers and number sequences

3.1 Count on or back from a given four-digit number in 1s, 10s, 100s, 1000s.

3.2 Count on from and back to zero in steps of 6, 7, 8, 9.

3.3 Identify odd and even numbers.

Choose three of these number cards.



Make an even number that is greater than 400.

Representing numbers

Use models such as a number line, an abacus, or place value cards.

Ordering

Include ordering on the number line.

Counting on

Include completing number sequences.

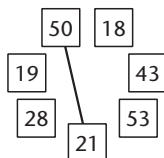
4 Add, subtract, multiply and divide whole numbers and apply these skills to solving routine and non-routine problems

Addition and subtraction

- 4.1 Add three one-digit numbers mentally.
- 4.2 Use and explain mental methods to add and subtract any pair of two-digit whole numbers.

*In a group of sixty-four children, twenty-nine wear glasses.
How many do not wear glasses?*

Join two more pairs of numbers that total 71.



- 4.3 Use and explain written column methods to add and subtract whole numbers with up to four digits.

Multiplication and division

- 4.4 Derive and learn by heart multiplication facts to 10×10 .
- 4.5 Understand the special properties of 0 and 1 in multiplication and division.
- 4.6 Use the commutative, associative and distributive laws of multiplication, and the distributive law of division, to multiply and divide.

Example of the distributive law of multiplication over addition
 $(4 + 3) \times 5 = (4 \times 5) + (3 \times 5) = 20 + 15 = 35$

Example of the distributive law of division over addition
 $(20 + 8) \div 4 = (20 \div 4) + (8 \div 4) = 5 + 2 = 7$

- 4.7 Use and explain mental methods to multiply and divide a two-digit number by a one-digit number in simple cases, supported where necessary by models (no remainder for division), e.g. 24×3 , $52 \div 4$.
- 4.8 Find remainders after division.
- 4.9 Round the quotient up or down after division, depending on the context.

*One box holds 8 cakes.
There are 62 cakes.
How many boxes can be filled with cakes?*

*70 boys go camping. They sleep in tents.
Each tent takes up to 6 boys.
What is the least number of tents the boys will need?*

- 4.10 Use and explain written methods to multiply and divide two-digit numbers by a one-digit number (including a remainder for division).

Multiply: 43×6

Divide: $84 \div 7$

Write in the missing digit: $2\Box \times 8 = 184$

\times	40	3
6	240	18

$$240 + 18 = 258$$

- 4.11 Multiply or divide whole numbers by 10 or 100.
- 4.12 Multiply or divide whole numbers by 1000.
- 4.13 Use the inverse relationship between multiplication and division (e.g. since $8 \times 9 = 72$, $72 \div 9 = 8$) to calculate and check results.

Addition and subtraction
Include the use of the terms *sum* and *difference*.

Multiplication/division
Include the terms *product*, *quotient*, *remainder*.

Laws of arithmetic
Exclude names of the laws.

Mental methods
Include doubling two-digit numbers.
Use informal recording to support or explain mental calculations, e.g.

$$\begin{array}{r} 24 \\ 20 + 4 \\ \downarrow \quad \downarrow \times 3 \\ 60 + 12 = 72 \end{array}$$

Exclude crossing 100.

Division
Limit division by 10, 100 or 1000 to whole-number answers.

Problem solving with whole numbers

- 4.14** Solve word problems involving whole numbers, measurements or money using addition and subtraction (up to two steps) or multiplication and division (one step).

Noura is 109 cm tall.

Muna is 137 cm tall.

Huda is 53 cm taller than Noura.

How much taller is Huda than Muna?

Apples are sold in packs of 5.

How many apples are there in 72 packs?

There are 440 drinking straws in a box.

The straws are red, yellow, blue and green.

There is the same number of each colour.

How many red straws are in the box?

- 4.15** Solve problems in which a symbol represents an unknown number, including problems involving inverse operations.

Write the missing numbers in the boxes.

$$\square + 28 = 113$$

$$\square \times 3 = 45$$

$$65 + \square = 402$$

$$30 \times \square = 90$$

$$\square - 42 = 650$$

$$\square \div 2 = 18$$

$$91 - \square = 37$$

$$48 \div \square = 3$$

- 4.16** Model a problem ‘story’ or ‘situation’ by writing an equation.

- 4.17** Solve non-routine problems involving whole numbers less than 100.

Here is a row of numbers.

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18

Find three numbers next to each other that add up to 39.

Draw a ring round them.

5 Solve problems involving money

- 5.1** Find a total (up to QR 10 000) and calculate change.

It costs QR 3540 for an adult to fly from Doha to New York.

It costs QR 1855 for a child under 12 to fly from Doha to New York.

What does it cost for two adults and one child to fly from Doha to New York?

- 5.2** Solve money problems involving simple proportional reasoning:

- determine the total cost of a number of items, given the unit cost (up to QR 100) and number of units (up to 9 units);
- determine the unit cost when given the total cost (up to QR 100) and number of units (up to 9).

A box of six tennis balls costs QR 84.

What does one tennis ball cost?

6 Recognise simple fractions of shapes and numbers

- 6.1** Use diagrams, including number lines, to recognise and name:

- unit fractions to $\frac{1}{12}$;
- simple fractions that are several parts of a whole, e.g. $\frac{3}{5}$.

Word problems

Include money and units of measurement.

Measurements in a problem should be expressed in the same unit.

Finding totals and change

Include two-step problems.

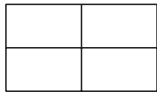
Finding the unit cost

Limit to whole numbers, riyals only.

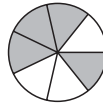
Fractions

Include the terms *numerator, denominator*.

Shade three quarters of the rectangle.

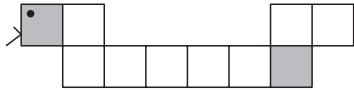


What fraction of the circle is shaded?



Two squares on the snake are filled in.

Fill in more squares to cover half of the snake.



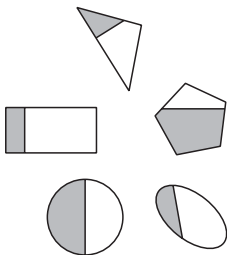
6.2 Use fraction notation.

6.3 Know that when all fractional parts are included, the result equals one whole, so that $\frac{5}{5} = 1$.

6.4 Use diagrams, including number lines, to:

- identify the equivalence of simple fractions, e.g. show that half a circle is equivalent to two quarters of a circle of the same size;
- compare two unit fractions, or two simple fractions with the same denominator, e.g. show that $\frac{7}{8} > \frac{5}{8}$.

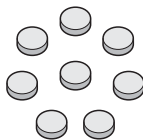
Tick (✓) the shape that is more than half shaded.



6.5 Find a unit fraction of a whole number up to 30.

Hana ate $\frac{1}{4}$ of these sweets.

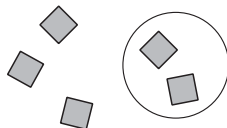
How many sweets did she eat?



One third of a number is 4.

What is the number?

What fraction of these squares is circled?



6.6 Solve simple word problems involving fractions.

Geometry and measures

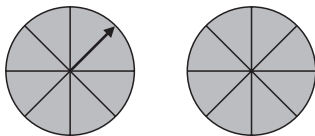
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Students should:

7 Identify simple properties of shapes, understand angle as a measure of turn and recognise right angles

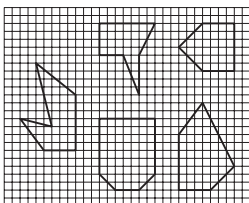
- 7.1** Know that angle measures the amount of turn and recognise whole, half and quarter turns; know that an angle that measures a quarter turn is called a right angle.

Draw the arrow after a quarter turn clockwise.



- 7.2** Identify right angles in the environment and contained in 2-D shapes.

*Two of the shapes are hexagons and have two right angles.
Put a tick (✓) on each of the two shapes.*

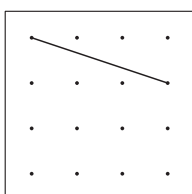


- 7.3** Use the eight points of the compass.

- 7.4** Describe and visualise 2-D and 3-D shapes.

- 7.5** Identify simple properties of triangles, such as two equal sides for an isosceles triangle, three equal sides for an equilateral triangle, a right angle for a right-angled triangle.

Use a ruler to draw two more lines to make an isosceles triangle.



- 7.6** Identify regular and irregular polygons.

Angles

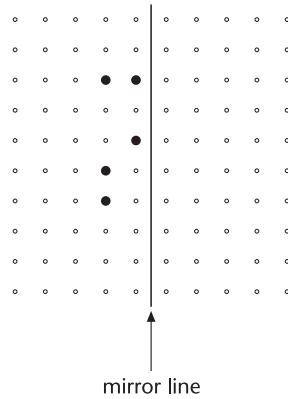
Include clockwise and anticlockwise turns.

Exclude use of the terms *acute*, *obtuse*, *reflex*.

Include the shapes identified in earlier grades and the tetrahedron and heptagon.

7.7 Draw a line of symmetry and complete simple symmetrical patterns.

Complete this pattern so that it is symmetrical about the mirror line.



8 Choose and use appropriate units and measurement tools to estimate and measure length, weight, capacity, time

8.1 Estimate measurements using a single unit.

Estimate the capacity of a kitchen bucket, an egg cup, ... the weight of a shoe, of a pencil, ... the height of a classroom, the length of a pencil, ...

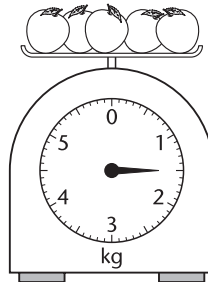
8.2 Know the relationships between:

- kilometres, metres and centimetres;
- kilograms and grams;
- litres and millilitres.

8.3 Choose suitable measuring equipment to measure the length, weight and capacity of given objects.

8.4 Record estimates and measurement, including readings from scales, using mixed units where appropriate.

*What is the total weight of these apples?
(1 kg 500 g)*



8.5 Convert metres to centimetres and centimetres to metres, expressing the result in mixed units where appropriate.

8.6 Measure minutes or seconds using a stopwatch or clock.

8.7 Read the time to the minute from digital and analogue clocks and watches; use the 12-hour clock notation 6:45, specifying morning or afternoon.

*One of these watches is 3 minutes fast.
The other watch is 4 minutes slow.
What is the correct time?*



Weight

Strictly speaking, mass, not weight, is compared. But in the lower grades, mass and weight are treated as the same, so 'weight' is used.

Units of measurement

Include abbreviations (km, m, cm; kg, g; l, ml).

Exclude conversions between units, with the exception of the units in standard GM 8.5.

Time

Include abbreviations (h, min, s).

Include the use of *past* and *to*, as in *23 minutes past 6*, *14 minutes to 9*.

8.8 Read and make simple calculations from timetables.

These are the opening times at a museum.

	Opening times		
	morning	to	afternoon
Sunday	8:00	to	6:00
Monday	10:30	to	5:30
Tuesday	10:30	to	8:30
Wednesday	10:30	to	9:00
Thursday	Museum closed		
Friday	Museum closed		
Saturday	11:00	to	4:00

How many hours is the museum open on a Monday?

Which day has the latest closing time?

Abdulla arrives at the museum at 3:15 on Saturday afternoon.

How many minutes is this before the museum closes?

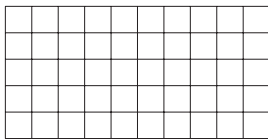
9 Find the perimeter of a regular polygon and the perimeter and area of a square and rectangle

9.1 Know that perimeter is the distance measured around the boundary of a figure.

9.2 Measure and calculate the perimeter of squares, rectangles and regular polygons with whole-number sides.

Here is a centimetre square grid.

On the grid, draw a rectangle with a perimeter of 10 cm.



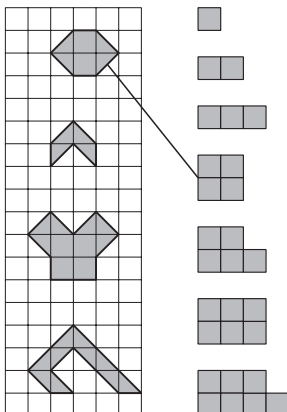
Each side of a pentagon is 12 cm.

What is the perimeter of the pentagon?

9.3 Know that area is the size of a surface, or of the space enclosed by the boundary of a plane figure; find and compare the areas of irregular plane shapes by estimating/counting the number of unit squares that cover them.

Match each shape on the left to one with equal area on the right.

One has been done for you.



Timetables

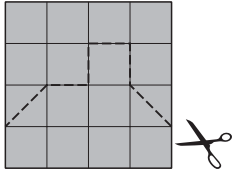
Limit calculations of time intervals from timetables to intervals of:

- less than 1 hour (multiples of 5 minutes, including crossing the hour);
- more than 1 hour (whole numbers of hours).

Perimeters

Include estimating and measuring perimeters.

Newsha has a square piece of card.

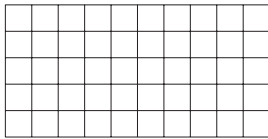


She cuts along the dashed line to make two pieces of card.
Do the two pieces of card have the same area?
Explain your answer.

- 9.4** Derive and use the formula $area = length \times width$ for calculating the area of a square or rectangle.

Here is a centimetre square grid.

On the grid, draw two different rectangles, each with an area of 12 cm^2 .



Area

Include square centimetres (cm^2) and square metres (m^2).

Data handling

By the end of Grade 3, students collect data systematically. They record and read data in simple tally charts. They represent and interpret data in bar charts, reading simple scales on the axes. They solve problems by asking and answering questions related to the data.

Students should:

10 Make and interpret tables and bar charts of sets of data and solve problems using the information

- 10.1** Collect and record data systematically, keeping track of what has been counted (e.g. in a tally chart).

This table shows how many people went into shops in one hour.

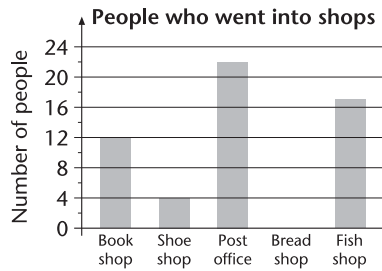
Number of people who went into a shop	
+++ stands for 5 people	
Book shop	+++ +++
Shoe shop	
Post office	+++ +++ +++ +++
Bread shop	+++ +++
Fish shop	+++ +++ +++

How many people went into the fish shop in the hour?
How many more people went into the post office than the book shop?

- 10.2** Record and interpret information in simple Carroll diagrams.

10.3 Represent and interpret data in a bar chart with a scale numbered in intervals of 2, 4, 5 or 10; label the axes and give the graph a title.

Here is a bar chart of the information shown in the tally chart in standard 10.1. Draw in the missing bar.

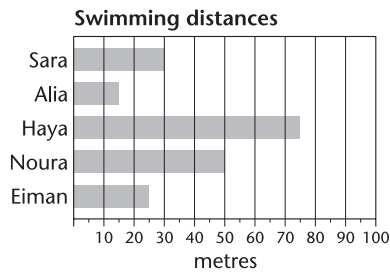


Bar charts

Include both horizontal and vertical formats.

10.4 Ask and answer questions related to data in tables and bar charts.

Some girls made a bar chart showing how far they could swim.



How far can Haya swim?

Sara can swim further than Alia. How much further?

What other questions could you ask about the data?

The table shows the times when some boys start their swimming lessons.

Name	Time
Fahad	9:15
Tamin	9:45
Jassim	8:45
Saad	7:15
Suood	8:15
Mishal	7:45

Which two boys have a swimming lesson after Saad and before Jassim?