

Summary of students' performance by the end of Grade 5

Reasoning and problem solving

Students represent and interpret routine and non-routine mathematical problems using calculations, mathematical symbols, diagrams, graphs, charts and tables. They describe and explain their problem solving strategies and reasoning, orally and in writing. They find examples that match a general statement and present their results and conclusions systematically. They use ICT to support their work, including deciding when it is appropriate to use a calculator to solve a number problem and how to interpret the display in the context of the problem.

Number and algebra

Students recognise properties of numbers up to 100 such as factor, multiple or prime. They add mentally several one-digit numbers and use factors to multiply and divide two-digit numbers mentally. They use their understanding of place value to multiply and divide whole numbers and decimals with up to three places by 10, 100 or 1000, and to order decimals to three places. They divide whole numbers with up to three digits by a two-digit number, giving the answer as a fraction or a decimal. They solve routine and non-routine problems, with and without a calculator, using addition, subtraction, multiplication or division of whole numbers or decimals, including inverse operations. In solving problems, students check the reasonableness of results by estimating answers and by referring to the context. They round answers to a suitable degree of accuracy. They order related and unrelated fractions with denominators up to 12, identify simple equivalent fractions and compare simple fraction, decimal and percentage equivalents. They recognise proportions of a whole and use simple fractions and percentages to describe these and to solve problems. They begin to use simple formulae expressed in words. They find pairs of numbers related by a given rule, extend and find missing terms in number sequences, and describe in words the relationship between one term and the next.

Geometry and measures

Students recognise a quarter turn as 90° or a right angle, and estimate, measure and draw acute angles in degrees. They identify equilateral, isosceles and right-angled triangles. They know the sum of angles at a point, on a straight line and in a triangle, and use these properties to find unknown angles. They identify the nets of a cube and cuboid. They use coordinates in the first quadrant. They convert one metric unit of measurement to another using decimal notation and interpret with appropriate accuracy readings on a range of measuring instruments. They use the 24-hour clock. They solve simple problems involving finding the areas and perimeters of shapes related to rectangles and squares, and the volumes of cuboids.

Data handling

Students collect discrete data, grouping them where appropriate, and represent and interpret data in frequency diagrams. They construct and

interpret simple line graphs and Venn diagrams. They solve problems by asking and answering their own questions related to data, and drawing and analysing graphs, charts and tables, including those generated by ICT.

Content and assessment weightings for Grade 5

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 5, about 50% 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 5 teachers should review and consolidate Grade 4 standards where necessary.

Reasoning and problem solving

By the end of Grade 5, students represent and interpret routine and non-routine mathematical problems using calculations, mathematical symbols, diagrams, graphs, charts and tables. They describe and explain their problem solving strategies and reasoning, orally and in writing. They find examples that match a general statement and present their results and conclusions systematically. They use ICT to support their work, including deciding when it is appropriate to use a calculator to solve a number problem and how to interpret the display in the context of the problem.

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.

*This four-digit number is a square number.
Write in the missing digits.*

9□□9

What size is the angle between the hands of a clock at 5 o'clock?

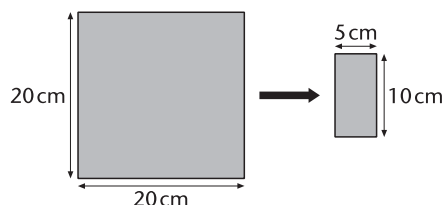
- 1.2** Describe and explain their problem solving strategies and reasoning, orally and in writing.

*Here is a number sequence.
Write the missing number.*

1 3 6 10 □

Explain how you worked it out.

*I have a square made out of paper. The square measures 20 cm by 20 cm.
I keep folding it in half until I have a rectangle that is 5 cm by 10 cm.*



How many times did I fold it?

*Sabbah needs half a litre of lemon juice to make a fruit drink.
She squeezes 14 lemons.
Each lemon gives her 35 ml of juice.
Does Sabbah have enough lemon juice for her recipe?*

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 2.3.

Examples of problems

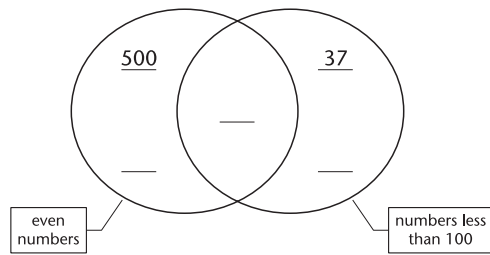
The examples of problems in italics are intended to clarify the standards, not to represent the full range of possible problems.

1.3 Find examples that match a general statement.

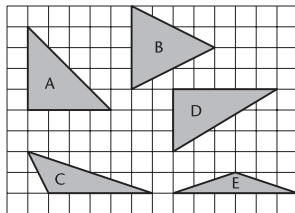
Circle the numbers in this list that are 1 more than a multiple of 6.

13 16 23 31 46 55 63

Fill in three missing numbers.



Which of these triangles has an obtuse angle and is not isosceles?



1.4 Present results and conclusions in an organised way.

Adel, Essa, Haya and Mai played some games at home.

They played two different games.

Each child played each of the others in each game.

Mai recorded how many games each person won.

Adel	///
Mai	///
Haya	////
Essa	//

Adel recorded who won each game.

Game 1	Game 2
Adel	Mai
Haya	Essa
Essa	
Adel	Mai
Adel	Haya
Haya	Mai

Adel forgot to put one of the names on his table.

Use Mai's table to work out what the missing name is.

Give one reason why Mai's table is a good way of recording the results.

Give one reason why Adel's table is a good way of recording the results.

1.5 Decide when it is appropriate to use a basic calculator to solve a numerical problem; know how to interpret the display in the context of the problem.

There is 60 g of rice in one portion.

How many portions are there in a 3 kg bag of rice?

1.6 Use ICT to support their mathematics.

Number and algebra

By the end of Grade 5, students recognise properties of numbers up to 100 such as factor, multiple or prime. They add mentally several one-digit numbers and use factors to multiply and divide two-digit numbers mentally. They use their understanding of place value to multiply and divide whole numbers and decimals with up to three places by 10, 100 or 1000, and to order decimals to three places. They divide whole numbers with up to three digits by a two-digit number, giving the answer as a fraction or a decimal. They solve routine and non-routine problems, with and without a calculator, using addition, subtraction, multiplication or division of whole numbers or decimals, including inverse operations. In solving problems, students check the reasonableness of results by estimating answers and by referring to the context. They round answers to a suitable degree of accuracy. They order related and unrelated fractions with denominators up to 12, identify simple equivalent fractions and compare simple fraction, decimal and percentage equivalents. They recognise proportions of a whole and use simple fractions and percentages to describe these and to solve problems. They begin to use simple formulae expressed in words. They find pairs of numbers related by a given rule, extend and find missing terms in number sequences, and describe in words the relationship between one term and the next.

Students should:

2 Use their knowledge of place value in the decimal system to round numbers and estimate answers to calculations

- 2.1** Read and write decimals with up to three places; represent place value in decimals with up to three places (tenths, hundredths, thousandths) in words, models or expanded form.

e.g. $34.627 = 30 + 4 + 0.6 + 0.02 + 0.007$

$$34.627 = 30 + 4 + \frac{6}{10} + \frac{2}{100} + \frac{7}{1000}$$

- 2.2** Compare and order decimals with one, two or three places.

Write these numbers in order of size, starting with the smallest.

1.01 1.001 1.101 0.11

<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
----------------------	----------------------	----------------------	----------------------

smallest

- 2.3** Multiply or divide whole numbers and decimals by 10, 100 or 1000.

- 2.4** Round:

- whole numbers to the nearest 10, 100 or 1000;
- decimals to the nearest whole number, or to one or two decimal places.

- 2.5** Use approximations to estimate answers to addition, subtraction, multiplication and division calculations involving whole numbers or decimals, with and without a calculator.

- 2.6** Round answers to calculations, including those done on a calculator, to a given degree of accuracy.

Decimal place value

Include identifying values of digits as fractions or decimals.

Dividing by 10, 100, 1000

Limit decimal quotients to up to three places.

Rounding decimals

Include measures and money.

Estimating and rounding

Include checking whether answers are reasonable.

3 Calculate with whole numbers and apply these skills to solving routine and non-routine problems

3.1 Add mentally several one-digit numbers.

3.2 Know the squares of whole numbers 1 to 12 and the corresponding square roots; use the notation 5^2 for 5×5 .

Square roots

Exclude the $\sqrt{\quad}$ symbol.

3.3 Use factors to multiply and divide two-digit numbers mentally.

e.g. $12 \times 15 = (12 \times 5) \times 3 = 180$
 $72 \div 18 = (72 \div 2) \div 9 = 36 \div 9 = 4$

3.4 Identify properties of numbers less than 100 such as multiple, factor or prime; use factors to multiply and divide whole numbers by multiples of 10, 100 or 1000.

Dividing by multiple of 10, 100, 1000

Limit decimal quotients to decimals with up to three places.

e.g. $45 \times 6000 = (45 \times 6) \times 1000 = 270 \times 1000 = 270\,000$
 $720 \div 800 = (720 \div 8) \div 100 = 90 \div 100 = 0.9$

3.5 Express the result of division by a whole number as a fraction or decimal.

e.g. $48 \div 5 = 9\frac{3}{5}$ or 9.6

3.6 Use and explain written column methods to multiply and divide three-digit numbers by a two-digit number.

e.g. $683 \times 37, 437 \div 28$

Problem solving with whole numbers

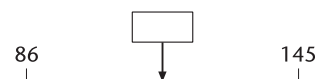
3.7 With and without a calculator, solve word problems with up to three steps using addition, subtraction, multiplication or division of whole numbers, including real-life problems involving money or measures.

Word problems

Include related but different units in problems involving money, cm and mm, cm and m, days and weeks.

Include problems involving proportional reasoning.

Work out the number halfway between 86 and 145. Write it in the box.



12 adults and 20 children visited a zoo.
It cost QR 8.50 for an adult and QR 4.50 for a child.
How much did they pay altogether?

3.8 With and without a calculator, solve missing-number problems involving inverse operations.

Write in the missing digit.

$$\square 92 \div 14 = 28$$

3.9 Model with an equation a problem situation involving an unknown number.

Mohammed thought of a number.
He doubled it, then added 4. The answer was 88.
Write an equation to show this.

3.10 With and without a calculator, solve non-routine problems involving large or small numbers, or decimals.

Use two + signs and two - signs. Put them in the boxes to make this equation correct.

$$5 \square 4 \square 3 \square 2 \square 1 = 5$$

A large cake costs QR 9 and a small cake costs QR 7.50.
Noura bought some cakes.
Altogether, she spent QR 42.
How many cakes did Noura buy?

4 Understand the equivalence of fractions and use fractions to solve problems

- 4.1 Compare and order related and unrelated fractions with denominators up to 12 by using diagrams.

Here are some number cards.



Use two of the cards to make a fraction which is less than $\frac{1}{2}$.

- 4.2 Add and subtract two proper fractions where one denominator is a multiple of the other.

- 4.3 Relate fractions to division (see standard NA 3.5); find fractions of quantities.

- 4.4 Know that the value of a fraction does not change if the numerator and denominator are multiplied or divided by the same number. Use this to identify equivalent fractions by:

- reducing a fraction to its simplest form by cancelling a common factor;
- listing the first eight equivalent fractions, given a unit fraction with a denominator not greater than 10.

- 4.5 Solve up to two-step problems involving fractions, including finding the whole given a fractional part.

Three fifths of a number is 12. What is the number?

5 Calculate with and solve problems involving decimals

- 5.1 Know equivalent fractions and decimals in simple cases, such as $0.25 = \frac{1}{4}$, $0.75 = \frac{3}{4}$, $0.125 = \frac{1}{8}$, $0.333 \approx \frac{1}{3}$, $0.667 \approx \frac{2}{3}$.

- 5.2 Convert fractions expressed as tenths, hundredths or thousandths to decimals, and vice versa.

- 5.3 Use written column methods to:

- add and subtract decimals with up to three places;
e.g. $6.475 + 5.625$, $4.375 - 3.125$, $4.06 - 1.275$
- multiply and divide decimals with up to two places by a one-digit whole number.
e.g. 5.83×9 , $3.47 \div 4$

- 5.4 With and without a calculator, solve problems with up to two steps using addition, subtraction, multiplication or division of decimals, including rounding the answer to a specified degree of accuracy (see standard NA 2.6).

- 5.5 Use a calculator to solve problems involving inverse operations.

What is the missing number?

$$6669 \div \square = 38$$

Ordering fractions

The number of fractions to order should not be greater than three.

Include both increasing and decreasing order.

Use diagrams to support ordering of fractions.

Converting decimals

Include reducing the fraction to its simplest form.

Decimals

Include adding and subtracting decimals with different numbers of places.

Solving problems

Include measurements and money.

Include checking whether answers are reasonable.

6 Use a basic calculator effectively

- 6.1** Use a calculator for calculations involving several digits, including decimals, interpreting the display. Know how to:
- clear the display before starting a calculation;
 - use the [+], [-], [×] and [÷] keys, the [=] key and decimal point;
 - change an accidental wrong entry by using the [clear entry] key;
 - key in and interpret calculations involving money or measures, e.g.
 - interpret 0.75 as 75 dirhams in the context of money;
 - key in 4.65 m + 3.85 m as 4.65 [+] 3.85 [=], and interpret the outcome of 8.5 as 8.5 m, or 8 metres 50 centimetres;
 - interpret a rounding error such as 6.999999 as 7.

Using a calculator

Include:

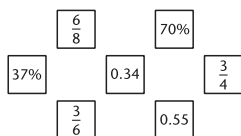
- estimating answers to check reasonableness;
- giving a result to a given degree of accuracy, e.g. the nearest metre;
- discussing when and when not to use a calculator.

7 Understand the meaning of percentage and the relationship between fractions, decimals and percentages

- 7.1** Understand that percentage means the number of parts per 100 and that it is used for comparisons.

- 7.2** Find and compare fraction, decimal and percentage equivalents for halves, quarters, tenths and hundredths.

Tick each card that shows more than a half.

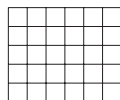


Percentages

Include the use of the percentage symbol (%).

- 7.3** Calculate a given percentage of a whole, e.g. 25% of 30 kg.

Shade 10% of this grid.



- 7.4** Without a calculator, solve up to two-step word problems involving percentages.

Ten students chose which subject they liked best.

	Number of students
Arabic	4
Mathematics	2
Science	3
English	0
Geography	1
Total 10	

Which subject did 20% of the students choose?

What percentage of the students chose mathematics or science?

Solving problems

Exclude percentage increase/decrease and percentage profit and loss.

8 Write and evaluate simple formulae in words

- 8.1** Express simple unit conversions in words and numbers.

e.g. number of days = number of weeks × 7
 number of weeks = number of days ÷ 7

Conversions

Relate to standards GM 11.1 and GM 11.2.

8.2 Evaluate simple formulae by substituting numbers for words.

The total cost in riyals of a number of pens is given by the formula:

$$\text{cost of pens} = 5 \times \text{number of pens}$$

What is the cost of 11 pens?

9 Use rules to generate ordered pairs and simple sequences

9.1 Find pairs of numbers related by a given rule.

9.2 Given a rule, generate a simple sequence.

The rule for a number sequence is:

'The next number is the sum of the two previous numbers.'

Use the rule to write in the three missing numbers.

□, □, □, 5, 8, 13, 21, ...

9.3 Describe in words the relationship between one term of a sequence and the next.

Rules

Include showing why a number pair satisfies a given rule.

Use coordinates in the first quadrant to plot pairs that satisfy a given rule (see also standard GM 10.11).

ICT opportunity

Use a spreadsheet to generate simple sequences.

Geometry and measures

By the end of Grade 5, students recognise a quarter turn as 90° or a right angle, and estimate, measure and draw acute angles in degrees. They identify equilateral, isosceles and right-angled triangles. They know the sum of angles at a point, on a straight line and in a triangle, and use these properties to find unknown angles. They identify the nets of a cube and cuboid. They use coordinates in the first quadrant. They convert one metric unit of measurement to another using decimal notation and interpret with appropriate accuracy readings on a range of measuring instruments. They use the 24-hour clock. They solve simple problems involving finding the areas and perimeters of shapes related to rectangles and squares, and the volumes of cuboids.

Students should:

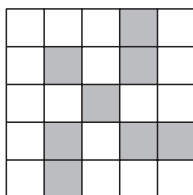
10 Identify properties of and relationships in geometric shapes

Angles and geometrical reasoning

10.1 Associate 360° with one whole turn, 270° with a three quarters turn, 180° with a half turn or a straight line, and 90° with a quarter turn or right angle.

10.2 Identify rotation symmetry in 2-D shapes.

Shade in one more square so that this design has rotation symmetry of order 4.



Rotation symmetry

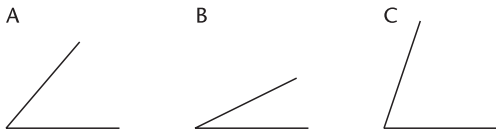
Include the term *order of rotation symmetry*.

Use ICT to show examples of rotation symmetry.



10.3 Estimate and compare the size of acute angles.

Which of these angles is closest to 45°?



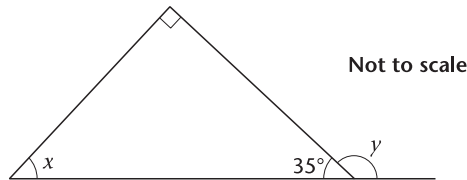
Angles

Include the terms *acute* and *obtuse* and the notation $\angle ABC$ or $\angle x$ to name angles.

10.4 Use the labelling conventions for angles, e.g. $\angle ABC$.

10.5 Find unknown angles in a straight line or around a point.

*Look at this diagram.
Calculate the size of angle y .*



Labelling angles

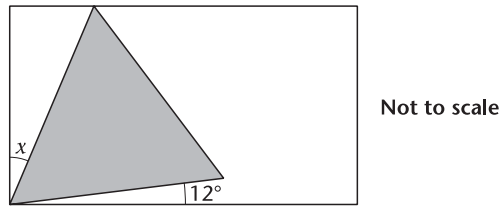
Include identifying given angles on a labelled diagram.

10.6 Recognise and use the property that the angle sum of a triangle is 180°.

10.7 Know the angle and side properties of isosceles, equilateral and right-angled triangles; classify triangles according to these properties.

10.8 Find unknown angles involving the angle properties of an isosceles, equilateral or right-angled triangle, and rectangles and squares.

*Here is an equilateral triangle inside a rectangle.
Calculate the value of angle x .*

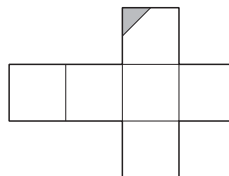


10.9 Identify nets of open and closed boxes in the shape of a cube or cuboid.

A cube has shaded triangles on three of its faces.



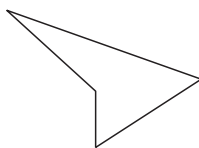
*Here is the net of the cube.
Draw in the two missing shaded triangles.*



Constructions

10.10 Use a protractor to measure acute angles in degrees and to draw a given acute angle.

*Measure accurately the smallest angle in this shape.
Use a protractor.*

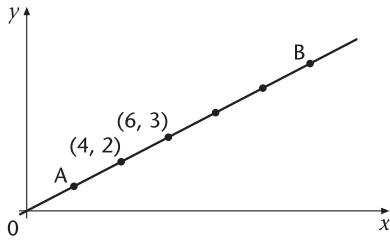


10.11

Use coordinates in the first quadrant to represent points; understand that the length of a horizontal line segment equals the difference of the x -coordinates and the length of a vertical line segment equals the difference of the y -coordinates.

Coordinates and ordered pairs
Link to work on NA 9.1, 9.2.

Here is a graph.



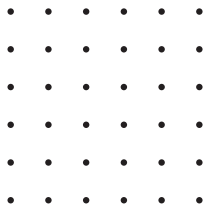
Six points on the line are marked with dots (•). They are equally spaced. What are the coordinates of the point A?

Haya says: 'The point B has coordinates (11, 5).' Use the graph to explain why she cannot be correct.

10.12

Construct 2-D shapes on grids.

Use the dots to draw a quadrilateral with no right angles. Use a ruler.



Constructing shapes on grids
Include triangles (isosceles, equilateral, right-angled, scalene), squares, rectangles and other quadrilaterals.

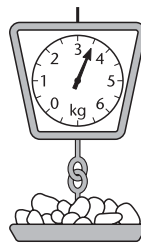
11 Measure and compare length, mass, capacity and time

11.1

Convert between km, m, cm and mm, kg and g, and l and ml, using decimal notation.

This table shows the mass of some fruits and vegetables. Complete the table.

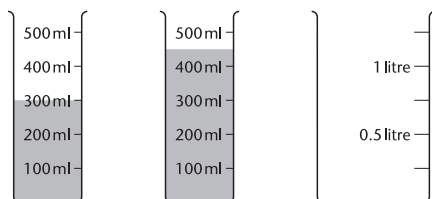
	grams	kilograms
potatoes	3500	3.5
apples		1.2
grapes	250	
ginger		0.03



Mass/weight
In earlier grades, weight and mass are treated as the same. From Grade 5 mass (measured in kg) is used to distinguish from weight, which is a force.

Units of measurement
Include abbreviations (km, m, cm, mm, kg, g, l, ml).

All the water in the first two containers is poured into the third empty container. Draw where the water level is in the third container.



11.2

Convert standard units of time, including years to months or weeks, weeks to days, days to hours, hours to minutes, minutes to seconds, and vice versa (see also standard NA 8.1).

Units of time
Include the abbreviations h, min, s.

- 11.3** Use 24-hour clock times; use timetables and calculate a time interval in hours and minutes.

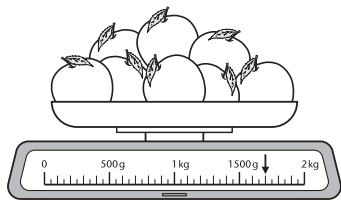
A flight from London arrived in Doha at 20:47.

It departed again for London at 23:25.

For how many hours and minutes was the aeroplane on the ground at Doha?

- 11.4** Use rulers, measuring cylinders, weighing scales and stopwatches to make measurements; read measurements from scales with appropriate accuracy.

What is the total mass of this fruit? (1.7 kg)



24-hour clock

Include conversions from the 12-hour clock.

Reading measurements from scales

Include circular dials.

12 Understand and calculate perimeter, area and volume

- 12.1** Know the formula for the area of a rectangle and use it to find:

- the area of squares and rectangles;
- the side of a square, given its area or perimeter;
The area of a square is 64 cm^2 . What is the length of its perimeter?
- the side of a rectangle, given its length or width and its area or perimeter.

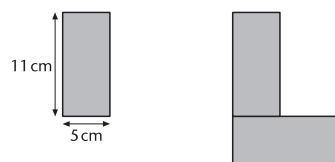
Areas of squares

Exclude use of $\sqrt{\quad}$ sign.

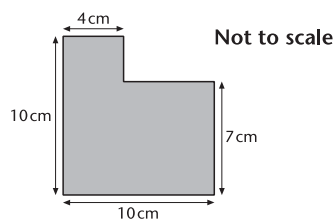
- 12.2** Find the perimeter or area of shapes formed from two or more squares or rectangles.

Two rectangular tiles are used to make an L-shape.

What is the perimeter of the L-shape?



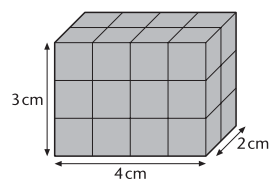
What is the area of this shape?



- 12.3** Build solids with unit cubes and compare their volumes by counting cubes.

- 12.4** Derive and use the formula for calculating the volume of a cuboid.

This cuboid is made from centimetre cubes. What is its volume?



Another cuboid is made from centimetre cubes.

It has a volume of 30 cubic centimetres.

What could its length, height and width be?

Volume

Include abbreviations (m^3 , cm^3).

Exclude conversions between m^3 and cm^3 .

- 12.5** Solve simple problems involving the area and perimeter of squares and rectangles, or the volume of cuboids.

Data handling

By the end of Grade 5, students collect discrete data, grouping them where appropriate, and represent and interpret data in frequency diagrams. They construct and interpret simple line graphs and Venn diagrams. They solve problems by asking and answering their own questions related to data, and drawing and analysing graphs, charts and tables, including those generated by ICT.

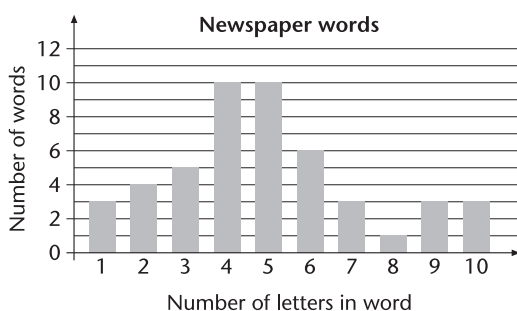
Students should:

13 Solve problems by collecting, organising, representing and interpreting data and drawing conclusions

- 13.1** Pose questions and answer them by collecting and analysing data.

- 13.2** Represent and interpret discrete data in a frequency diagram.

This graph shows the number of letters in each word in 50 words from the Gulf Times.

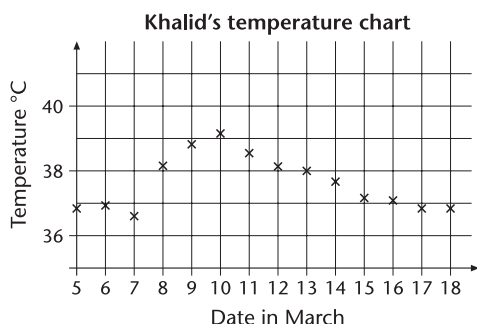


What fraction of the 50 words have more than 6 letters?

- 13.3** Represent a given set of data, or data from an experiment, in a line graph; interpret line graphs.

Khalid was ill in March.

This is his temperature chart.



For how many days was his temperature marked as more than 37°C?

Which date showed the largest change in temperature from the day before?

Estimate Khalid's highest temperature shown on the graph. Give your answer to 1 decimal place.

ICT opportunities

Include collecting data from the Internet.

Frequency diagrams

Include the use of ICT. For example, use a spreadsheet with graphs and charts to produce frequency diagrams/bar charts.

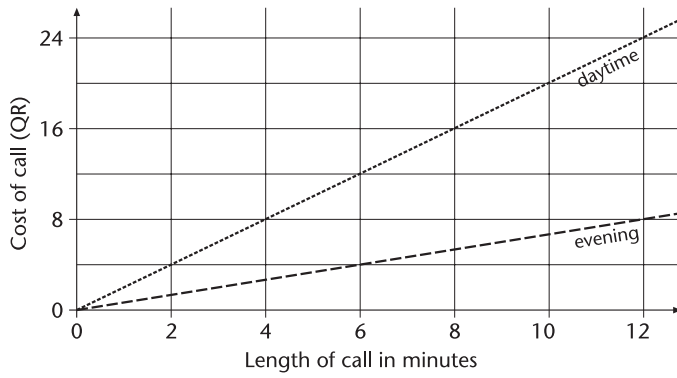
Line graphs

Exclude distance–time graphs.

Stress when it is appropriate and when it is not appropriate to join plotted points with a straight line; e.g. rise and fall in temperature from one reading to another is not necessarily represented by a straight line joining the two points.

Include the use of ICT. For example, use graph plotting software or a spreadsheet to generate line graphs.

This graph shows the cost of phone calls in the daytime and in the evening.



Estimate how much it costs to make a 9-minute call in the evening.

How much more does it cost to make a 6-minute call in the daytime than in the evening?

13.4 Use ICT to generate graphs, charts and tables, including frequency diagrams and line graphs.

13.5 Represent and interpret data in Venn diagrams.

Write these numbers in the correct places on the Venn diagram.
Some numbers are already placed.

99 170 221

