Mathematics lessons for Grade 4

Lessons in this section

Using these lesson plans

These sample lessons for Grade 4 are suitable for use with a whole class. The lessons are single examples to illustrate different teaching and learning activities. They are not intended to be taught as a sequence. They are drawn from different topics and points in the teaching year to show spread rather than sequence.

The objectives for the lessons are drawn from the standards for Grade 4. Occasionally, a standard from an earlier grade is revised. The relevant standards are shown in the lesson plans.

The lessons are organised in three parts: a starter to introduce the lesson, a main activity, and a final phase to help students to reflect on the lesson and consolidate their learning. Before the starter, you should outline the purpose of the lesson, drawing out for students what they will learn and how this builds on previous work. In the final part of the lesson, you will need to establish the key learning points, what students need to remember and what they will go on to learn next. There is no expectation that students should copy out the key learning points in their exercise books.

The lesson plans do not include homework tasks because the lessons are single examples taken out of sequence. You will need to provide this, since homework is an important part of a lesson.

Each lesson plan has enough material to support about 45 minutes of teaching. You may need to supplement the activities with simpler or more challenging tasks if the students in your class have a range of attainment. You could choose from activities in textbooks or from your own resources. If you wish, different tasks can be given to different groups of students, according to their needs.

There may be too much material in the lesson plan for 45 minutes, since this will depend on the class. In this case, you could designate one of the activities in the lesson as homework, or carry it forward to the next lesson. Be selective about which activity to cut – it does not have to be the last one merely because it comes at the end.

Answers to questions are provided to help you to correct students' responses and give feedback. Sometimes, alternative answers are possible that are equally correct.

4.1 Addition and subtraction problems

Objectives

- Solve non-routine problems, including those involving more than one step.
- Identify the place value for each digit in whole numbers.
- Add and subtract two or more whole numbers, choosing and using mental or written methods as appropriate.

Starter

Vocabulary

total
digit
two-way table
symmetrical
diagonal
maximum
minimum

Resources

none

Write on the board the four digits 6, 7, 8 and 9.

Ask the class to work in pairs and to investigate how many different totals they can make choosing two of the numbers.

Allow the pairs some time to tackle the problem in whatever way that they decide. After a few minutes, gather the class together and discuss the different ways that they are keeping track of the possible combinations of numbers.

Show students that one way to organise their work is in a two-way table.

+	6	7	8	9
6				
7				
8				
9				

Ask the pairs to complete the table as quickly as possible.

Q What do you notice about the table? (it is symmetrical about the diagonal)

Q What is the minimum total? (12) **What is the maximum total?** (18)

Q How many different totals are there in the table? (7)

Main activity

Vocabulary

problem
solution
possibilities
digit
systematically

Resources

OHTs 4.1a, 4.1b

Show the first problem on **OHT 4.1a**. Explain that each box represents a digit. Ask:

Q How would you explain what the question is asking you to do?

Confirm that students are to look for a two-digit number and a single-digit number with a difference of 25. The digits must be chosen from 1, 3 and 6, and each digit must be used.

Q How many times can we use each digit? (once)

Q How could we begin to solve this problem?

Discuss students' responses.

Q What could the first digit of the two-digit number be? Explain why the digit 1 would be impossible.

Q Could 61 be the first number? If not, why not? What about 63?

Q Could 36 be the first number? Why not?

Q What is the solution to the problem? How did you get it?

Q Are there any other solutions? (no)

Say that this time they can use any digits but each digit must be different.

Q How many different solutions can you find?

Ask students to work in pairs for two or three minutes on the problem, then ask the pairs to pause. Ask:

Q What could the second number be?

Establish that it could be any of the digits from 0 to 9 (we know the solution for 6 from earlier work in the lesson).

Q If the second number is 9, what is the first number? Explain why.

Q If the second number is 8, what is the first number? (33) **Is this possible, given the rules of the problem?** (no)

Ask them now to complete the problem by working systematically through the digits 0 to 7. Emphasise that instead of just trying numbers in any order we are using a system and our knowledge of numbers. Explain that this is what being systematic means.

When students have completed the task, establish that there are eight solutions altogether (the second number cannot be 2 or 8).

Show the second problem on **OHT 4.1a**. Remind them that the < sign means 'is less than'. Explain that we are looking for a three-digit number that, when subtracted from 550, leaves a positive number less than 200. The digits must be chosen from 1, 3, 5, 7 and 9, without repeats.

Q Could the first digit of the three-digit number be 7 or 9? Why not? (the answer would be negative)

Q Could it be 1? Why not? (the answer would be too big)

Q Imagine that the first digit is 5. What could the second digit be?

Draw out that the second digit could be 1 or 3, but that 5 would be a repeat and 7 or 9 would result in a negative answer. Ask students in pairs to work out all the solutions if the first digit is 5 (513, 517, 519, 531, 537, 539).

Q What if the first digit is 3? What could the second digit be?

Establish that the second digit could be 5 or 7 or 9, but that 1 or 3 would make the answer too big (and 3 would be repeated). Ask the pairs to work out all the solutions if the first digit is 3 and the second digit is 5 or 7 or 9. Remind them to work systematically. (Solutions are 351, 357, 359, 371, 375, 379, 391, 395, 397.)

Q How many solutions are there altogether? (15)

Q How can we be certain we have found them all? (we have worked systematically through all the possibilities)

Display the problem on **OHT 4.1b**.

Q Explain in your own words what the question is asking you to do.

Q How many times can we use each digit? (once)

Q How could we begin to solve this problem?

Q Can we put any digits in place immediately? Explain why. (the three-digit number must have a hundreds digit of 4)

Q What other information can we use? (the two units digits must have a total of 10)

Ask students to find at least one solution to the problem.

Q Are there any other solutions? How many solutions are there altogether?

The four solutions are 442 + 58, 448 + 52, 452 + 48, 458 + 42.

Other tasks

If necessary, choose further related activities, selecting from available textbooks or your own materials.

Consolidation

Invite pairs of students to the board to demonstrate their solutions to the problems they have done independently.

Q Did anyone have a different way of tackling this problem?

Q Would your approach be different if you had a calculator?

Q Are there any other solutions?

Q How can you be sure that you have found all the solutions?

Summary for students

- Look at the last digits to see if you can use your knowledge of number facts to find possible values and eliminate others.
- Try out values that you can work out quickly in your head.
- Work systematically.

4.2 Equivalence of tenths and hundredths

Objectives

- Read and write decimals with one or two places; represent place value in decimals with one or two places in words, models or expanded form.
- Understand that fractions and decimals are two different representations of the same concept; recognise the fraction and decimal equivalents for one half, one tenth and one hundredth.

Starter

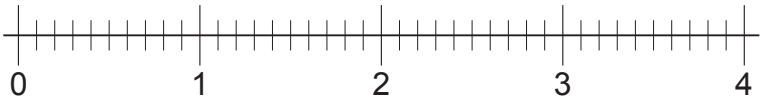
Vocabulary

fraction
decimal
tenth
whole

Resources

OHT 4.2a
Interlocking cubes

Draw on the board a number line from 0 to 4, marked in tenths, or use **OHT 4.2a**.



Hold up a stick of ten interlocking cubes.

Q How many cubes in this stick? Count them with me: one, two, three, …, nine, ten.

Hold up one cube.

Q What fraction – what part – of the whole stick is this? (one tenth)

Write $\frac{1}{10}$ on the board. Tell the class that the fraction can also be written as a decimal number, and write 0.1 on the board.

Hold up seven cubes.

Q What fraction – what part – of the whole stick is this? (seven tenths)

Write $\frac{7}{10}$ on the board. Explain that this fraction can also be written as a decimal number. Write 0.7 on the board.

Write 0.5 on the board.

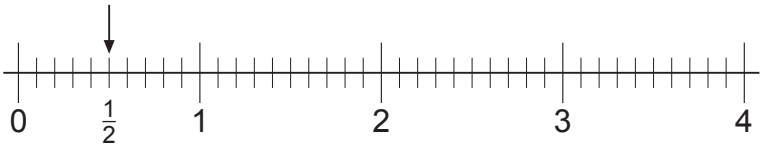
Q What is this decimal as a fraction? ($\frac{5}{10}$)

Q How else can we write $\frac{5}{10}$? ($\frac{1}{2}$)

Write on the board: $0.5 = \frac{5}{10} = \frac{1}{2}$.

Q Where is one half on the line?

Invite a student to mark it with an arrow.



Hold up two whole sticks of ten cubes, and four single cubes.

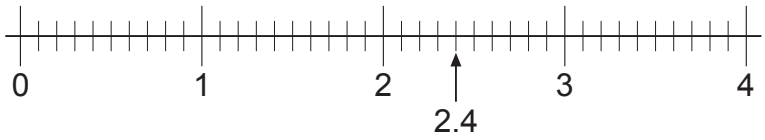
Q How many whole sticks? (two)

Q How many parts of a whole stick? (four tenths)

Write $2\frac{4}{10}$ on the board.

Q Where is two and four tenths on the line?

Point to 2, saying: 'two whole ones'. Count on four tenths from 2: one tenth, two tenths, three tenths, four tenths. Mark it with an arrow.



Repeat by holding up whole sticks of cubes and single cubes for 1.7, 3.6 and 0.9.

Main activity

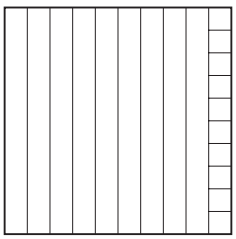
Vocabulary

hundredth
equivalent

Resources

Prepared paper squares

Prepare several large paper squares, all the same size. Mark one in ten equal strips, with one strip marked in ten equal small squares, and keep it whole. Make another copy of this square, and cut it into nine strips and ten small squares.



Hold up the whole square marked in strips. Tell the class that this is one whole square, which you have cut into ten equal strips. Hold up one of the prepared strips, matching it to a strip on the whole square.

Q What fraction – or part – of the whole square is this? (one tenth)

Write $\frac{1}{10}$ on the board.

Q How do you write one tenth as a decimal number? (0.1)

Write 0.1 next to $\frac{1}{10}$ on the board. Point to each in turn, saying: 'one tenth, zero point one'.

Choose seven students to help you. Give four of them a large paper square, and three of them a paper strip.

Q How many whole squares? (four) **How many tenths?** (three)
How many tenths altogether? (forty-three)

Write $\frac{43}{10}$, $4\frac{3}{10}$ and 4.3 on the board. Point to each in turn, saying: 'forty-three tenths, four and three tenths, four point three'. Now write on the board:

$4.3 = 4 + 0.3$

$4\frac{3}{10} = 4 + \frac{3}{10}$

Repeat with 6.2.

Hold up the strip marked in ten small squares. Tell the class that you have cut this strip into ten small squares. Hold up one of the small squares, matching it to a small square on the strip.

Q How many of these small squares are in a whole square? How did you work that out?

Establish that there are 100 small squares in the large square, because there are 10 small squares in a strip, and 10 strips in the whole square. Ten lots of ten make one hundred.

Point again to the small square.

Q What fraction – or part – of the whole square is this? (one hundredth)

Write $\frac{1}{100}$ on the board. Tell the class that the fraction $\frac{1}{100}$ can also be written as a decimal number. Write 0.01 next to $\frac{1}{100}$. Point to each in turn, saying: 'one hundredth, zero point zero one'.

Choose six students to help you: two to hold up two large squares each, one to hold up two strips, and three to hold up two small squares each.

Q How many squares can you see?

Establish that this is four and two tenths and six hundredths. Write 4.26 on the board. Point to each digit in turn, saying: 'four, the whole number; two tenths, the number of tenths; six hundredths, the number of hundredths'. Write:

$4.26 = 4 + 0.2 + 0.06$

$4.26 = 4 + \frac{2}{10} + \frac{6}{100}$

Ask the class to think about two tenths and six hundredths. Write 0.26 on the board. Refer again to the student holding the two strips and say 'two tenths', and to the students holding the six small squares, saying: 'six hundredths'.

Q How many hundredths are equivalent to or the same as two tenths and six hundredths?

Establish that there are ten hundredths in every tenth, so there are twenty hundredths in two tenths. Altogether, there are twenty-six hundredths. Write on the board: $0.26 = \frac{26}{100}$.

Repeat with other decimals.

Other tasks

If necessary, choose further related activities, selecting from available textbooks or your own materials.

Consolidation

Write on the board 8.1 and 8.01. Ask the class:

Q How would you explain to a friend what is different about these two numbers?

Q Which of the two numbers do you think is the larger? Why?

Q What number is one tenth more than 8.1? One tenth more than 8.01?

Repeat with one tenth less, one hundredth more, and one hundredth less.

Summary for students

- Fractions can be seen as parts of a whole or as points on a line.
- Equivalent fractions have the same value but are written in different ways.
- One whole is equivalent to ten tenths, or one hundred hundredths.
- One tenth is equivalent to ten hundredths.

4.3 Drawing and measuring lines

Objectives

- Use a ruler to measure and draw lines to the nearest centimetre or millimetre.
- Identify parallel and perpendicular lines.
- Know simple side and angle properties of:
  - squares: four equal sides, four right angles, opposite sides parallel;
  - rectangles: opposite sides equal, four right angles, opposite sides parallel;
- Solve simple problems involving properties of lines, squares and rectangles.

Starter

Vocabulary

length
height
width
estimate
metre (m)
centimetre (cm)

Resources

Metre stick, marked in cm
Mini-whiteboards
Six paper strips, varying in length from 5 cm to 30 cm, marked faintly with the length

Ask students to stand up and to estimate the length of 1 metre by holding one hand 1 metre from the floor. Choose a student to take the metre stick and to compare it with some of the students' estimates. Ask the class to sit down again.

Hold up the metre stick so that everyone can see it. Say that you want students to estimate some lengths in metres, and to write their estimates on their mini-whiteboards. Remind them to include the abbreviation *m* for metres when they write their estimates.

Q What is your estimate in metres of the height of this room? Of the height of the classroom door? Of the top of the display board? Of your table?

Q What is your estimate in metres of the length of this room? The width?

Show the metre stick again and point to the divisions for centimetres.

Q How long is the space between each small division? (1 cm)

Q How many centimetres are in one metre? (100 cm)

Write on the board: 1 m = 100 cm.

One by one, hold up the paper strips. Ask students to estimate the length, and to write their estimates on their whiteboards. Remind them to include the abbreviation *cm* for centimetres when they write their estimates. Tell students the measured length in centimetres after they have made each estimate.

Main activity

Vocabulary

millimetre (mm)
parallel
perpendicular
right angle
acute angle
obtuse angle
horizon, horizontal
vertical

Resources

Transparent ruler, marked in cm and mm
30 cm ruler and pencil for each student
Mini-whiteboards

Place on the overhead projector a transparent ruler, making sure that the zero mark and the 15 cm mark are visible. Point out the centimetre markings, and the half-centimetre markings. Place a pen or pencil against the ruler to measure the length, demonstrating how to line up one end with the zero mark on the ruler. Show how to measure to the nearest centimetre by rounding up or down as appropriate.

Refer students to their own rulers. Ask them to measure the length of their pencil to the nearest centimetre. Stress that the zero mark on the ruler must match the end of the pencil. Discuss the lengths and record one or two of them on the board, including the abbreviation *cm* for centimetres.

Repeat the process, asking students to measure one or two more lengths to the nearest centimetre, such as the height and width of their exercise books.

Refer again to the transparent ruler on the projector.

Resources (continued)

Metre stick, marked in cm

OHTs 4.3a, 4.3c and blank OHT

Copies of Resource 4.3b

Q What are the divisions between 7 cm and 8 cm? (millimetres) **How many of the divisions are there?** (10)

Write on the board: 1 cm = 10 mm. Explain that *mm* is a short way of writing millimetres, and that each millimetre is one tenth of a centimetre. Say that using millimetres can help to measure lengths more accurately.

Show **OHT 4.3a**. Demonstrate how to measure the length of line A to the nearest millimetre, positioning the transparent ruler's zero mark against one end.

Q How many whole centimetres long is this line? (e.g. 8 cm) **How many extra millimetres is it?** (e.g. 4 mm) **What is its length?** (e.g. 8 cm 4 mm)

Q How many millimetres long is the line? (e.g. 84 mm)

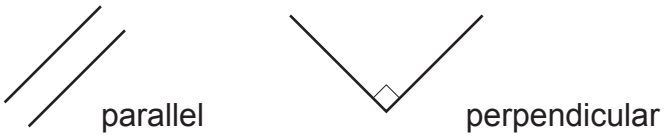
Write on the board: 8 cm 4 mm = 84 mm. Invite students to the projector to measure lines B, C and D.

Now use a blank transparency to show the class how to draw a line XY of length 7 cm. Position the transparent ruler and draw along it from the zero mark on the left to the 7 cm mark on the right. Label the line X at one end and Y at the other, and write 7 cm about halfway along it. Repeat by drawing a line 97 mm long.

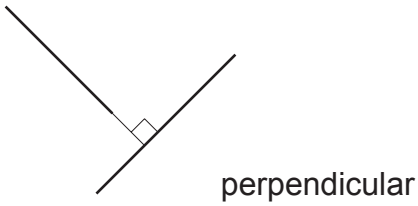
Give out copies of **Resource 4.3b** and ask students to measure and draw the lines indicated.

Draw a pair of sloping parallel lines on the board. Tell the class that these lines are called *parallel lines*. Write *parallel* on the board. Explain that the lines never cross or meet, even if they are extended.

Draw a pair of perpendicular lines on the board. Tell the class that these lines meet at a right angle, and that they are called *perpendicular lines*. Write *perpendicular*.



Explain that these lines are also perpendicular.

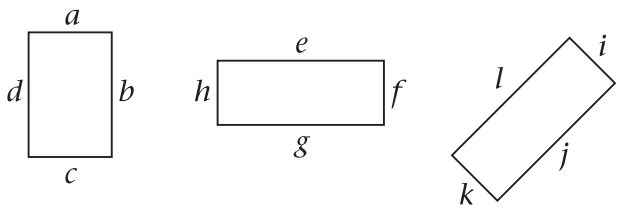


Q What parallel and perpendicular lines can you see in the classroom? (e.g. the edges of a sheet of paper)

Show **OHT 4.3c** and work through the questions with the class.

Tell the class that the line where the sea and the sky meet is called the *horizon*, and that lines which are parallel to the horizon are called *horizontal*. Draw some horizontal lines on the board and write *horizontal*. Explain that vertical lines are at right angles to horizontal lines. Draw some on the board and write *vertical*.

Draw three rectangles on the board and label the sides *a* to *l*.



Q Which sides are horizontal? (*a*, *c*, *e*, *g*)
Which are vertical? (*b*, *d*, *f*, *h*)

Q Which pairs of sides are parallel? (*a*, *c*; *b*, *d*; *e*, *g*; *h*, *f*; *i*, *k*; *j*, *l*)

Q Which sides are perpendicular to side *a*? (e.g. *b* and *d*)
To side *d*? (e.g. *a* and *c*)
To side *f*? (e.g. *e* and *g*)
To side *k*? (e.g. *j* and *l*)

Other tasks

If necessary, choose further related activities, selecting from available textbooks or your own materials.

Consolidation

Resources

Mini-whiteboards

Tell the class to close their eyes. Say:

Q I want you to imagine a square. How many pairs of parallel lines can you see?

Q Imagine a rectangle. How many pairs of parallel lines can you see?

Q Imagine a parallelogram. How many pairs of parallel lines can you see?

Q Imagine a regular hexagon. How many pairs of parallel lines can you see?

Draw a square and a rectangle on the board. Ask:

Q What statements can you make about the sides or angles that apply to both the square and the rectangle?

Draw out that in both the square and the rectangle:

- there are four sides;
- opposite sides are equal and parallel;
- all four angles are equal;
- each angle is a right angle, so that adjacent sides are perpendicular.

Say that a square is a special case of a rectangle, and that in the square only:

- all four sides are equal.

Summary for students

- When you are using a ruler to measure or draw lines, make sure that you position the zero mark on the ruler at the end of the line.
- Parallel lines never meet. They are always the same distance apart.
- Perpendicular lines are at right angles to each other.
- 1 metre is the same as 100 centimetres.
  1 centimetre is the same as 10 millimetres.

4.4 Interpreting data in two-way tables

Objectives

- Recognise that a proportion of a number of objects can be described by a fraction.
- Complete a table from given information.
- Answer questions by:
  - recording and interpreting information in lists and two-way tables;
  - representing and interpreting data in one- or two-variable bar charts.

Starter

Vocabulary

two-way table

Resources

OHTs 4.4a, 4.4b

Show **OHT 4.4a**, a table showing some children's favourite fruits.

	Anan	Nara	Loula	Eiman	Aziza
apples	✓	✓		✓	
figs			✓		
dates	✓				✓
bananas			✓	✓	✓
oranges	✓	✓	✓		

Say that this is a two-way table – it goes across the page as well as down the page. Show students how to scan down each column, looking at the information in each row to find the information that they need.

Show **OHT 4.4b**, a table showing the opening times of Doha ice rink.

	Opening time morning	Closing time afternoon
Sunday	10:30	5:30
Monday	10:30	8:30
Tuesday	10:30	9:00
Wednesday	8:00	6:00
Thursday	7:00	4:00

Ask the class to discuss each question in pairs. Invite students to the projector to identify which rows and columns they used to find the information and to explain to the class how they worked out the answer.

Main activity

Vocabulary

bar chart
line graph

Resources

OHTs 4.4c, 4.4d
Mini-whiteboards

Show **OHT 4.4c**, another two-way table, but this time a frequency table. Say that a group of children have answered the question: 'Do you own a bicycle?' Their replies are shown in the table.

	Have a bicycle	No bicycle	Totals
age 9	3	5	
age 10	4	3	
Totals			

Ask students to use their whiteboards to answer some questions about the information in the table. After the first two questions, invite students to explain how they worked out the answer, and fill in the relevant blanks on the table.

Q How many children aged 10 own a bicycle? (4)

Q How many children aged 9 don't own a bicycle? (5)

Q How many bicycles does the whole group own? (7)

Q How many children aged 9 are in the group? (8)

Q How many children are there altogether in the group? (15)

Q What fraction of the children aged 10 own bicycles? (4/7)

Q What fraction of the children aged 9 own bicycles? (3/8)

Point out that the sum of the totals of the rows equals the sum of the totals of the columns, because each represents the total number of students in the group.

Q What fraction of the whole group are aged 9? (8/15)

Q What fraction of those who don't own bicycles are aged 9? (5/8)

Now complete the table in the lower part of the grid by collecting data from your own class, writing in two different ages and a suitable object (e.g. a bicycle, a computer). For example, ask all the children aged 9 who own a computer to put their hands up, and so on. Show again that the sum of the totals of the rows equals the sum of the totals of the columns.

Tell the class that the information in two-way frequency tables can be represented in bar charts. Show the top half of **OHT 4.4d**. Explain that the two graphs show the same information as in the table on 9- and 10-year-olds owning bicycles. The bar chart on the left shows the data in the first row of the table and the bar chart on the right shows the data in the second row of the table.

Show the lower half of **OHT 4.4d**. Explain that this combines the data from the two graphs above, with the bars presented side by side. Point out how the title of the graph has changed. Explain that this time there needs to be a key for the graph to explain what each pair of bars represents.

Other tasks

If necessary, choose further related activities, selecting from available textbooks or your own materials.

Consolidation

Resources

OHT 4.4e
Mini-whiteboards

Show **OHT 4.4e**. Say that this table, which is slightly different, shows the distances between five towns.

Q Why are some of the squares blanked out? (each blanked-out square is the distance between a town and itself – it has no meaning)

Explain that the table can be read either from the top to the point of intersection with the relevant row, or from the left-hand side to the point of intersection with the relevant column. Point out that the distance between Doha and Umm Said is the same as the distance between Umm Said and Doha.

Ask the class some questions about the distance between one town and another to answer using their whiteboards, for example:

Q What is the distance between Al Khor and Umm Said?

Stress that students should name the units in their answers.

Refer to the question on the OHT. Ask the class to discuss it in pairs and to use one of their whiteboards for any working out that they need to do. Then ask for answers to the question on the other whiteboards. Invite a pair to the projector to identify which rows and columns they used to find the information and to explain to the class how they worked out the answer.

Show the class how to fill in the space marked ‘Show your method’.

Summary for students

- Two-way tables are read both across and down the page.
- In a two-way frequency table the sum of the totals of the rows equals the sum of the totals of the columns.
- Information in two-way frequency tables can be represented in bar charts.