Solutions for all Mathematics
Grade 6
Learner’s Book
Schools Development Unit

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In this unit you will:

- order, compare and represent numbers up to at least 9-digit numbers
- recognise the place value of digits in whole numbers to at least 9-digit numbers
- round off to the nearest 5, 10, 100 and 1 000
- write number sentences to describe problem situations
- solve and complete number sentences.

Getting started  Counting

1. Each bead on the string of beads represents the number 25.

   a) Count in 25s. Find the total value represented by the string of beads.
   b) Count the red beads. What is the total value of the red beads?
   c) What is the total value of the blue beads?
   d) How many more beads do you need to make 750?
   e) How many more beads do you need to make 2 000?

2. Each bead on this string of beads represents 150. What value does the string of beads represent?
Key ideas

Numbers in the millions follow the same place value pattern as numbers in the thousands.

<table>
<thead>
<tr>
<th>Place Value</th>
<th>Numerical Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>hundred millions</td>
<td>100,000,000</td>
</tr>
<tr>
<td>ten millions</td>
<td>10,000,000</td>
</tr>
<tr>
<td>millions</td>
<td>1,000,000</td>
</tr>
<tr>
<td>hundred thousands</td>
<td>100,000</td>
</tr>
<tr>
<td>ten thousands</td>
<td>10,000</td>
</tr>
<tr>
<td>thousands</td>
<td>1,000</td>
</tr>
<tr>
<td>hundreds</td>
<td>100</td>
</tr>
<tr>
<td>tens</td>
<td>10</td>
</tr>
<tr>
<td>ones</td>
<td>1</td>
</tr>
</tbody>
</table>

Activity 1  Think big

Use the table above to work with big numbers.

1. Say the numbers aloud:
   a) 4,510,698
   b) 75,355,260
   c) 756,223,456

2. Write the numbers in the place value columns. The first one is done for you.
   a) 5,094,320,611
   b) 4,510,698
   c) 75,344,260
   d) 756,223,476
   e) 9,098,085,000

<table>
<thead>
<tr>
<th>hundred millions</th>
<th>ten millions</th>
<th>millions</th>
<th>hundred thousands</th>
<th>ten thousands</th>
<th>thousands</th>
<th>hundreds</th>
<th>tens</th>
<th>ones</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>0</td>
<td>9</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>0</td>
<td>6</td>
<td>1</td>
</tr>
</tbody>
</table>

3. Look at the numbers in Question 2. What is the value of the digit 5 in each number?

4. Write the number symbols for these numbers:
   a) five hundred and twenty-one thousand four hundred and thirty-nine
   b) nine million four thousand and fifty-two
   c) one million one hundred and ten
Activity 2  Ordering, comparing and representing large numbers

1.  a) What is double 250 000?  
   b) What is half of 250 000?  
   c) What is double 500 000?  
   d) What is half of 500 000?  
   e) What is double 1 000 000?  
   f) What is half of 1 000 000?

2. Match the numbers in the columns.

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A.</td>
<td>250 000</td>
<td>a) 1 million</td>
</tr>
<tr>
<td>B.</td>
<td>500 000</td>
<td>b) 2,5 million</td>
</tr>
<tr>
<td>C.</td>
<td>750 000</td>
<td>c) 5 million</td>
</tr>
<tr>
<td>D.</td>
<td>1 000 000</td>
<td>d) (\frac{1}{4}) million</td>
</tr>
<tr>
<td>E.</td>
<td>2 500 000</td>
<td>e) (\frac{1}{2}) million</td>
</tr>
<tr>
<td>F.</td>
<td>5 000 000</td>
<td>f) (\frac{3}{4}) million</td>
</tr>
</tbody>
</table>

3. What is the value of the underlined digit in each of the following numbers?
   a) 835 092  
   b) 294 381  
   c) 9 349 290  
   d) 3 109 283

4. Arrange the following numbers from the smallest to the biggest:
   a) 397 564; 346 759; 397 546; 346 957; 357 649; 375 649  
   b) 131 469; 649 131; 491 136; 131 649; 649 311; 491 163

5. Arrange the following numbers from the biggest to the smallest:
   a) 1 248 367; 1 482 763; 2 163 782; 1 248 763; 1 482 376; 2 136 782  
   b) 34 681; 64 183; 18 463; 64 138; 34 861; 16 483

6. Round off the following numbers:
   a) to the nearest 10  
      i) 345 892  ii) 63 678  iii) 999 999  
   b) to the nearest 100  
      i) 76 456  ii) 354 674  iii) 108 060  
   c) to the nearest 1 000  
      i) 97 899  ii) 9 876  iii) 9 499
7. Complete the following number patterns. Fill in the missing numbers.

a) \[37 \rightarrow +50 \rightarrow \square \rightarrow +50 \rightarrow 137\]

b) \[3452 \rightarrow -25 \rightarrow \square \rightarrow -25 \rightarrow 3402\]

8. Fill in <, > or = between the following:

a) \[23\,053\,261 \square 23\,053\,260\]

b) \[4 \times 1\,000\,000 + 3 \times 100\,000 + 1\,000 + 6 \times 10 \square 4\,301\,600\]

c) \[6\,767\,676 \square 6\,766\,677\]

d) \[800\,001 \square 800\,100\]

Exercise 1 Working with large numbers

1. The place value cards make a number.

\[
\begin{align*}
5 & \square 2 \square 7 \square 1 \square 3 \square 2 \square 4 \square 8 \square 9
\end{align*}
\]

a) Write the number in words.

b) Copy and complete:

\[
527\,132\,489 = (5 \times \square) + (2 \times \square) + (7 \times \square) + (1 \times \square) + (3 \times \square) + (2 \times \square) + (4 \times \square) + (8 \times \square) + (9 \times 1)
\]

c) The digit 1 in this number represents 100 000.

i) What number does the 5 represent?

ii) What number does the 7 represent?

iii) What number does the 3 represent?
d) Round the number off to the nearest 10.

e) Round the number off to the nearest 100.

f) Round the number off to the nearest 1 000.

2. Complete the following:

a) \[9349295 = \square + 300000 + \square + 9000 + \square + 90 + \square\]

b) \[369456789 = \square + \square + \square + 400000 + \square + \square + 700 + \square + 9\]

3. Write down all the even numbers between 235 781 and 235 801.

4. Write down the largest odd number less than 1 234 896.

5. Arrange the following numbers from the biggest to the smallest.

675 480; 840 576; 485 067; 675 408; 804 765; 485 076

6. Arrange the following numbers from the smallest to the biggest.

765 439; 493 765; 934 567; 756 943; 493 756; 954 376

7. Fill in <, > or = between the following:

a) \[234876 \square 243675\]

b) \[30000 \square (30 \times 1000)\]

c) \[987231 \square (900000 + 8000 + 200 + 30 + 1)\]

d) \[(15 \times 100) \square 15000\]

e) \[10 \text{ eights} \square \text{ eighty}\]

**Activity 3  Operating with numbers**

Look at the two groups of counters.
1. What do you notice about the two groups of counters?
2. Write a multiplication number sentence for each group of counters.
3. Write a division number sentence for each group of counters.
4. We can write four number sentences for the numbers 3, 5 and 15.
   \[3 \times 5 = 15 \quad 5 \times 3 = 15 \quad 15 \div 3 = 5 \quad 15 \div 5 = 3\]
   Write four numbers sentences using
   a) 7, 8 and 56
   b) 9, 3 and 27.
5. We know that 6 \times 7 = 42.
   a) What can we do to 42 to get an answer of 6?
   b) Which two operations are inverse operations?
   c) Explain what inverse operations means.
6. a) Copy and complete the following flow diagram.

   \[
   \begin{array}{c}
   \text{input} \\
   \text{2} \\
   \text{3} \\
   \text{5} \\
   \text{10} \\
   \text{15} \\
   \end{array}
   \quad \begin{array}{c}
   \text{rule} \times5 \\
   \end{array}
   \quad \begin{array}{c}
   \text{output} \\
   \text{2} \\
   \text{3} \\
   \text{10} \\
   \text{15} \\
   \end{array}
   \]

   b) Explain how to use the flow diagram to find the output values.
   c) Complete the following number sentences:
      i) \[2 \times 5 = \square\]
      ii) \[10 \times 5 = \square = (5 \times 10) + (5 \times \square)\]
      iii) \[15 \times 5 = \square = (10 \times 5) + (\square \times 5) = \square + 25\]
   d) Copy and complete the following flow diagram.

   \[
   \begin{array}{c}
   \text{input} \\
   \text{2} \\
   \text{3} \\
   \text{5} \\
   \text{10} \\
   \text{15} \\
   \end{array}
   \quad \begin{array}{c}
   \text{rule} \times5 \\
   \end{array}
   \quad \begin{array}{c}
   \text{output} \\
   \text{2} \\
   \text{5} \\
   \text{15} \\
   \end{array}
   \]

   e) Explain how to use the flow diagram to find the output values.
f) Complete the following number sentences:
   i) \((2 \times 5) \div \square = 2\)
   ii) \((\square \times 5) \div 5 = 10\)
   iii) \((15 \times 5) \div 5 = (10 \times 5 \div 5) + (\square \times 5 \div 5) = 10 + \square = \square\)

**Check what you know**

1. Fill in the missing numbers.

<table>
<thead>
<tr>
<th>972 000</th>
<th>974 000</th>
<th>976 000</th>
<th>a) 980 000</th>
</tr>
</thead>
<tbody>
<tr>
<td>b) 984 000</td>
<td>986 000</td>
<td>988 000</td>
<td>c)</td>
</tr>
<tr>
<td>992 000</td>
<td>994 000</td>
<td>d) 998 000</td>
<td>e)</td>
</tr>
<tr>
<td>1 002 000</td>
<td>1 004 000</td>
<td>1 006 000</td>
<td>1 008 000</td>
</tr>
</tbody>
</table>

2. Write the number symbols for these numbers:
   a) Ten million, four hundred and twenty-seven thousand, six hundred and twelve
   b) Five hundred and fifty-five million, five hundred and fifty-five thousand, five hundred and fifty-five
   c) Seventeen million
   d) Nine hundred thousand and three
   e) Ten million and fourteen

3. Match the numbers in the columns.

| A. 1 250 000 | a) 600 000 + 50 000 |
| B. 650 000 | b) \(\frac{3}{4}\) of a million |
| C. 6 500 | c) \(1 \frac{1}{4}\) million |
| D. 750 000 | d) \(1 \frac{1}{2}\) million |
| E. 1 500 000 | e) \(6 \frac{1}{2}\) thousand |

4. Break the numbers up into their place value parts:
   a) \(1 350 798 = \square + 300 000 + \square + \square + 90 + \square\)
   b) 35 040 690
   c) 9 949 994
   d) 68 068 068
   e) 7 654 321
5. Look at the following numbers:
   785 375;  250 947;  999 327;  785 735;  250 497;  999 732
   a) Round off the each number to the nearest 1 000.
   b) Write the rounded off numbers from the smallest to the biggest.

6. Fill in <, > or =
   a) 80 000 + 3 476 □ 80 000 + 3 000 + 400 + 80 + 6
   b) 321 954 □ (3 × 100 000) + (22 × 1 000) + (95 × 10) + (4 × 1)
   c) 1 000 000 + 359 000 + 754 □ 1 000 000 + 368 000 + 927
   d) (3 × 5 × 10) □ (15 × 2 × 5)
   e) Seventeen million □ One hundred and seventy thousand

7. Copy and complete the following:
   a) 4 × 7 = 7 × □ = 28 and □ = 28 ÷ 4 or 4 = 28 ÷ □
   b) 42 ÷ 6 = □ or 6 = □ ÷ 7 and 6 × 7 = 7 × □ = □
   c) (2 × 3 × 8) = (6 × 2 × □) = □ and 6 = □ ÷ 8 or □ ÷ 8 = 6

8. a) Copy and complete the following flow diagram. Find the output values. Complete the rule.
   b) Write a number sentence for the input value of 70.
   c) Write a number sentence for an input value of 700.
   d) Is the following statement true? Explain.
      (5 × 7) = (7 × 5) = 35 = (35 × 7 ÷ 7)
In this unit you will:

- add and subtract numbers up to at least 9 digits
- check solutions to addition and subtraction problems
- estimate answers by rounding off to the nearest 1 000 and 10 000
- use doubling and halving as a strategy to calculate problems
- calculate addition and subtraction problems using column methods.

Getting started

Andile and Gilbert both support soccer teams. They want to know which soccer team has more supporters. Andile’s team has an average of 75 478 supporters at each soccer game. Gilbert’s team has an average of 59 995 supporters at each soccer game.

How many more supporters does Andile’s team have?

75 478 – 59 995 = □

Andile estimates the answer by rounding off the numbers.

I rounded off to the nearest 10 000. I can see on the number lines that 75 478 is closer to 80 000. I can see that 59 995 is closer to 60 000.
So $75\,478 - 59\,995 \approx 80\,000 - 60\,000 = 20\,000$

My soccer team has about 20,000 more supporters at the matches than Gilbert’s team.

Gilbert is not happy with this estimation. He says that it is more accurate to round off to the nearest 1,000.

On the number lines, I can see that $75\,478$ is closer to $75\,000$.

$59\,995$ is closer to $60\,000$.

So $75\,478 - 59\,995 = 75\,000 - 60\,000 = 15\,000$

So Andile’s soccer team only has 15,000 more supporters at matches than my team!

1. Estimate the answers to the following problems by rounding off to the nearest 10,000:
   a) $15\,600 + 18\,357 = \square$
   b) $37\,463 - 19\,867 = \square$
   c) $13\,960 + 65\,501 = \square$
   d) $20\,786 - 18\,569 = \square$

2. Get a more accurate estimation by rounding off the problems in Question 1 to the nearest 1,000.

3. Which estimate is easier to work out?

4. Compare the estimates. What do you notice about the number of zeros in the answers?

5. Write a sentence to explain why rounding to 1,000 is more accurate than rounding to 10,000.
Activity 1 More estimation

At a local soccer tournament, there were 24 980 supporters on the first day. There were 25 030 supporters on the second day. How many people supported the soccer tournament altogether?

Tami works it out like this.

![Diagram showing 24 980 and 25 030 with arrows pointing to 25 000]

Both numbers are quite close to 25 000.

So the answer is close to 25 000 + 25 000 or double 25 000.

I can write:

\[24 \, 980 + 25 \, 030 \approx \text{double } 25 \, 000 = 50 \, 000\]

So approximately 50 000 people supported the soccer tournament.

Estimate the answers to the following problems using doubling:

1. \[39 \, 867 + 40 \, 495 = \square\]
2. \[90 \, 489 + 88 \, 989 = \square\]
3. \[63 \, 985 + 64 \, 132 = \square\]
4. \[21 \, 003 + 19 \, 897 = \square\]

Exercise 1 Estimating before calculating

1. Plot the following numbers on the number lines. Then round off to the nearest 1 000:
   a) \(36 \, 485 \approx \square\)
   b) \(108 \, 701 \approx \square\)
2. Plot the same numbers from Question 1 on the following number lines. Then round off to the nearest 10 000:
   a) 36 485
   b) 108 701
   c) 325 095
   d) 3 482 581

3. Estimate the answers to the following problems by rounding off the numbers to the nearest 10 000:
   a) 48 671 + 18 957 =
   b) 82 345 − 29 302 =
   c) 45 376 + 52 974 =
   d) 54 875 − 14 762 =
   e) 7 040 + 36 488 + 47 659 =

4. How can you estimate the answers in Question 3 more accurately?

5. Vusi plays a new video game. He scores 59 570 points on his first try. He scores 61 020 points on his second try. How many points does Vusi score altogether playing the video game? Use doubling to estimate your answer.
Activity 2  Different ways to add

Three towns in a part of South Africa had the following population count in the 2011 Census:

Town A: 80 553
Town B: 640
Town C: 3 084

Calculate the total population count in the three towns.

Kabelo

I used a method I learnt last year to add big numbers:

\[
\begin{align*}
80 553 &= 80 000 + 500 + 50 + 3 \\
+ 640 &= 600 + 40 \\
+ 3 084 &= 3 000 + 80 + 4 \\
\end{align*}
\]

\[
\begin{align*}
80 000 + 3 000 + 1 100 + 170 + 7 \\
\end{align*}
\]

I can write this as:

\[
\begin{align*}
80 000 + 4 000 + 200 + 70 + 7 \\
= 84 277 \\
\end{align*}
\]

1. Use Kabelo’s method to add the following:

a) 4 270 + 475 = □

b) 7 760 + 1 836 = □

c) 36 540 + 3 261 + 468 = □

d) 4 763 + 1 374 + 71 256 = □

Lumka remembered a different way of adding.

Lumka

I used the column method I learnt to add big numbers:

<table>
<thead>
<tr>
<th>TTh</th>
<th>Th</th>
<th>H</th>
<th>T</th>
<th>O</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>10</td>
<td>15</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>0</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>+</td>
<td>6</td>
<td>4</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>=</td>
<td>8</td>
<td>4</td>
<td>2</td>
<td>7</td>
</tr>
</tbody>
</table>

Term 1 • Unit 2
2. What do you think Lumka meant when she wrote TTh, Th, H, T and O?

3. Calculate each of the problems in Question 1. Use Lumka’s method.

4. Which method was quicker to use? Explain.

Key ideas

- When you add in columns, first add the 1s, then the 10s, then the 100s, and so on.
- Write the numbers in the correct columns. If you don’t, your answer will be wrong.
- Write the parts of the answer in the correct columns too. Tens go into the tens column and 10 tens are 100. So, you can put 1 in the hundreds column. Also, 10 hundreds are 1 000. So, you can put 1 in the thousands column.

Activity 3 Different ways to subtract

A survey on energy use found that 8 769 out of 74 525 households use gas for heating.

How many households do not use gas for heating? Compare your answer with Kabelo’s answer.

\[
\begin{align*}
74 525 & = 70 000 + 4 000 + 500 + 20 + 5 \\
- 8 769 & = 8 000 + 700 + 60 + 9 \\
\hline
60 000 + 5 000 + 700 + 30 + 6 & = 65 756 \\
\hline
\end{align*}
\]

So: 60 000 + 5 000 + 700 + 50 + 6 = 65 756

1. Why has Kabelo written 60 000 + 13 000 + 1 400 + 110 + 15 above the numbers for 74 525?

2. Use Kabelo’s method. Subtract the following:
   a) \( 37 674 - 26 585 = \) 
   b) \( 98 629 - 67 518 = \)
   c) \( 80 675 - 63 468 = \) 
   d) \( 78 121 - 48 324 = \)
Lumka calculated the same problem using a different method.

\[
\begin{array}{c|c|c|c|c}
\text{TTh} & \text{Th} & \text{H} & \text{T} & \text{O} \\
\hline
7 & 4 & 5 & 12 & 15 \\
\hline
- & 8 & 7 & 6 & 9 \\
\hline
= & 6
\end{array}
\]

I cannot do this. I'll take ten from the tens column and take it to the ones column. So 9 ones from 15 ones is 6 ones.

\[
\begin{array}{c|c|c|c|c}
\text{TTh} & \text{Th} & \text{H} & \text{T} & \text{O} \\
\hline
7 & 4 & 5 & 12 & 15 \\
\hline
- & 8 & 7 & 6 & 9 \\
\hline
= & 7 & 5 & 6
\end{array}
\]

I cannot take away 6 tens from 1 ten. So I take 1 hundred from the hundreds column to the tens column. There are 11 tens in the tens column. 11 tens – 6 tens is 5 tens. Then in the 100s column,

4 hundreds – 7 hundreds I can’t do. I take 1 thousand from the thousands column to make 14 hundreds in the hundreds column. 14 hundreds – 7 hundreds = 7 hundreds.

\[
\begin{array}{c|c|c|c|c|c}
\text{TTh} & \text{Th} & \text{H} & \text{T} & \text{O} \\
\hline
6 & 4 & 5 & 12 & 15 \\
\hline
- & 8 & 7 & 6 & 9 \\
\hline
= & 6 & 5 & 7 & 5 & 6
\end{array}
\]

I can’t subtract 8 thousands from 3 thousands. I take 1 ten thousand and add it to the thousand. That makes 13 thousands. That makes 13

\[
\begin{array}{c|c|c|c|c|c|c|c}
\text{TTh} & \text{Th} & \text{H} & \text{T} & \text{O} \\
\hline
6 & 4 & 5 & 12 & 15 \\
\hline
- & 8 & 7 & 6 & 9 \\
\hline
= & 6 & 5 & 7 & 5 & 6
\end{array}
\]

There are 6 ten thousands left.
3. Calculate the problems in Question 2. Use Lumka’s method.


Key ideas

• When you subtract in columns, you first subtract the ones, then the tens, then the hundreds, then the thousands, and so on.
• If the tens and the ones you need to subtract are more than the tens and ones you are subtracting from, then you can take 1 ten (or 10 ones) from the tens column, and so on.
• If the hundreds you are subtracting are more than the hundreds you are subtracting from, you can take 1 000 or 10 hundreds from the thousands column, and so on.

Exercise 2  Combining methods to add and subtract

1. Use Lumka’s method. Complete the calculations. Also complete the names of the place value columns.

   a)  
      \[
      \begin{array}{c}
      _ \text{Th} _ _ _ \\
      1 7 3 6 5 \\
      + 1 0 2 1 6 \\
      \hline
      \end{array}
      \]

   b)  
      \[
      \begin{array}{c}
      _ _ \text{H} _ _ \\
      2 9 3 2 4 \\
      + 7 1 2 4 0 \\
      + 1 1 3 9 \\
      \hline
      \end{array}
      \]

   c)  
      \[
      \begin{array}{c}
      \text{H} _ _ \\
      8 9 2 \\
      - 6 7 \\
      \hline
      \end{array}
      \]

   d)  
      \[
      \begin{array}{c}
      _ _ \text{T} \text{O} \\
      2 2 3 4 \\
      - 7 6 3 \\
      \hline
      \end{array}
      \]

   e)  
      \[
      \begin{array}{c}
      \text{TTh} \text{Th} _ _ _ \text{O} \\
      4 1 5 9 0 \\
      - 9 1 8 5 \\
      \hline
      \end{array}
      \]
2. Use any method. Add or subtract the following:
   
a) $636 + 425 + 729 = \square$
   b) $2 945 + 4 123 = \square$
   c) $34 521 + 12 402 = \square$
   d) $879 – 327 = \square$
   e) $1 116 – 672 = \square$
   f) $76 251 – 46 745 = \square$

3. What is the same about all these groups of numbers? Answer these questions in your head and write down the answer.
   a) $325 + 1 175 = \square$  $325 + \square = 1 500$  $\square + 1 175 = 1 500$
   b) $630 + 1 370 = \square$  $630 + \square = 2 000$  $\square + 1 370 = 2 000$
   c) $2 500 – 850 = \square$  $2 500 – \square = 1 650$  $\square – 850 = 1 650$

**Activity 4  Checking your solutions**

Lumka calculates this problem: $36 142 + 69 575 = \square$
She gets 95 617 as an answer.

1. a) Estimate the solution to the problem by rounding off to the nearest 10 000.
   b) Could Lumka’s answer be correct? Explain.

2. a) Calculate $95 617 – 69 575 = \square$ to check Lumka’s solution.
   b) Is Lumka’s answer correct? Explain.
   c) Find the mistake in Lumka’s calculation:

   ![Carry error]

   d) Calculate the sum to check her answer.
Check what you know

1. Estimate the answers by rounding the numbers off to the nearest 10 000.
   a) $38 675 + 17 487 = \Box$
   b) $62 403 − 24 812 = \Box$
   c) $22 849 + 39 016 = \Box$

2. Calculate the solutions to Question 1. Use any method.

3. Check the solutions to Question 2 by using the inverse operation. Use the column method to add or subtract.

4. Calculate the following. Use rounding off and doubling.
   $8 996 + 9 014 + 8 940 = \Box$

5. The space shuttle travelled at 27 358 km per hour. The Concorde travelled at 2 333 km per hour.

   How much faster did the space shuttle travel than the Concorde?
   a) Choose the correct number sentence to work this out.
      A. $27 358 − 2 333 = \Box$
      B. $2 333 + 27 358 = \Box$
      C. $2 333 − 27 358 = \Box$

   b) Calculate the answer.

6. Fill in the missing digits:
   a) $\boxed{8} \boxed{2} \boxed{4} \Box$
      + $\boxed{3} \boxed{0} \boxed{0} \boxed{4}$
      $\underline{8 8 2 2 8 8}$
   b) $\boxed{9} \boxed{3} 2 5 1$
      $− \boxed{4} \boxed{6} \Box$
      $\underline{\boxed{4} \boxed{1}}$
In this unit you will:

- solve problems involving fractions
- find equivalent fractions
- add and subtract fractions with the same denominators.

Getting started  Fractions

1. What fraction of each of these shapes is shaded?

   a)  
   b)  
   c)  
   d)  

2. a) Show the following numbers on the number line:
   
   \[
   0 \quad \frac{1}{2} \quad 1 \quad \frac{1}{4} \quad \frac{3}{4} \quad 1 \quad \frac{1}{2} \quad 0
   \]

   b) Write the missing fractions at A, B and C on the number line.

   c) Write the missing fractions at A, B and C on the number line.
3. You can see $\frac{1}{3}$ of this train.

How many carriages are there still in the tunnel?
Check your answer with Mpho’s answer.

Mpho
I know that 3 thirds make up a whole thing. So I said 3 carriages is $\frac{1}{3}$ of the train. I drew the whole train with 3 carriages for each $\frac{1}{3}$.

There are 9 carriages in the whole train. If I can see 3, then there are still 6 carriages in the tunnel.
Exercise 1  Practice with fractions

1. Calculate the following:
   a) Seven grapefruit are cut into halves. How many halves are there?
   b) Five round cheeses are cut into quarters. How many quarters are there?
   c) Three sweet melons are cut into sixths. How many sixths are there?

2. Copy and complete the fractions:
   a) \(1 = \frac{2}{2} = \frac{3}{3} = \square = \square = \square\)
   b) \(4 = \frac{8}{2} = \frac{20}{5} = \frac{10}{10} = \frac{20}{100}\)

3. Write the following as a whole and a fraction:
   a) \(\frac{11}{9}\)
   b) \(\frac{29}{3}\)
   c) \(\frac{41}{5}\)
   d) \(\frac{60}{8}\)
   e) \(\frac{33}{6}\)
   f) \(\frac{72}{12}\)

4. Find the value of \(\square\):
   a) \(3 + \square = 3\frac{1}{3}\)
   b) \(\frac{2}{9} + \frac{1}{9} + \frac{4}{9} = \square\)
   c) \(3\frac{1}{6} + 2\frac{2}{6} = \square\)
   d) \(4\frac{4}{5} - \square = 4\frac{2}{5}\)
   e) \(\square - 2\frac{1}{7} = 3\frac{4}{7}\)
   f) \(7\frac{10}{12} - \frac{7}{12} = \square\)
Key ideas

- You name fractions according to the number of equal parts there are and the number of parts you are counting.

\[
\begin{array}{c|c}
\text{3} & \text{4} \\
\hline
\text{Number of parts shaded.} & \text{This is called the numerator.} \\
\text{Number of equal parts altogether.} & \text{This is called the denominator.}
\end{array}
\]

- When we add or subtract fractions with the same denominator, the denominator does not change.

**Example:** \(\frac{6}{7} - \frac{2}{7} = \frac{4}{7}\)

- When we add or subtract wholes and fractions, we can first add or subtract the whole numbers, then the fractions.

**Example:** \(7 \frac{10}{11} - 6 \frac{7}{12} = 1 + (\frac{10}{12} - \frac{7}{12}) = 1 \frac{3}{12}\)

Activity 1

**Equivalent fractions**

1. Use the fraction wall to complete each list of equivalent fractions.
   
a) \(1 = \frac{2}{2} = \frac{3}{3} = \frac{4}{4} = \frac{\square}{\square} = \frac{\square}{\square} = \frac{\square}{\square} = \frac{\square}{\square} = \frac{\square}{\square} = \frac{\square}{\square} = \frac{\square}{\square} = \frac{\square}{\square}\)
   
b) \(\frac{1}{2} = \frac{2}{4} = \frac{3}{6} = \frac{\square}{\square} = \frac{\square}{\square} = \frac{\square}{\square}\)
   
c) \(\frac{1}{3} = \frac{\square}{6} = \frac{\square}{\square} = \frac{\square}{\square}\)
   
d) \(\frac{2}{3} = \frac{4}{6} = \frac{\square}{9} = \frac{\square}{\square}\)
23

Term 1  
Unit 3

2.  a) Arrange the fractions from the smallest to the biggest:
\[
\frac{1}{2} \quad \frac{1}{5} \quad \frac{1}{10} \quad \frac{1}{3} \quad \frac{1}{7}
\]

b) What do you notice about the fractions as the denominator gets bigger?

3. Some of the following fractions are not part of the fraction wall. Find a way to complete the equivalent fractions.

a) \(\frac{1}{2} = \frac{\Box}{8}\)

b) \(\frac{2}{3} = \frac{\Box}{9}\)

c) \(\frac{1}{4} = \frac{5}{\Box}\)

d) \(\frac{\Box}{5} = \frac{6}{10}\)

e) \(\frac{1}{4} = \frac{\Box}{100}\)

Key ideas

- As the denominator of a fraction gets bigger, the fraction piece gets smaller.

- Fractions with different names can have the same value.

  Example: \(\frac{1}{3} = \frac{2}{6} = \frac{3}{9} = \frac{4}{12}\)

- We call fractions with the same value equivalent fractions.

Activity 2  Tenths and hundredths

1. What fraction of each of the following grids has been shaded?

2. Which fraction is the smallest?

\[
\frac{3}{10} \quad \frac{5}{10} \quad \frac{1}{10} \quad \frac{6}{10} \quad \frac{2}{10} \quad \frac{8}{10}
\]
3. Write the following fractions from the biggest to the smallest:

\[
\begin{array}{ccccc}
\frac{9}{100} & \frac{4}{100} & \frac{46}{100} & \frac{16}{100} & \frac{45}{100}
\end{array}
\]

4. Write the following as fractions:

a) 3 tenths  
b) 3 hundredths  
c) 5 tenths  
d) 50 hundredths  
e) 5 hundredths  
f) 55 hundredths

5. Complete the equivalent fractions:

a) \( \frac{5}{10} = \frac{1}{2} = \frac{\square}{100} \)  
b) \( \frac{6}{10} = \frac{\square}{5} = \frac{\square}{100} \)  
c) \( \frac{\square}{100} = \frac{3}{4} \)

**Activity 3 Adding fractions**

Use your list of equivalent fractions or your fraction wall. Answer the following questions:

1. Thobile, Carol and Naomi ordered a pizza to share. By the time that Thobile came to the table, Carol had eaten \( \frac{1}{3} \) of the pizza and Naomi had eaten \( \frac{1}{6} \). How much of the pizza did they eat?

Compare your answer to Anastasia’s and Lundi’s answers.

Anastasia

I used the fraction wall to answer the question because my denominators were not the same.

<table>
<thead>
<tr>
<th>1 Whole</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \frac{1}{3} )</td>
</tr>
<tr>
<td>( \frac{1}{6} )</td>
</tr>
</tbody>
</table>

I looked at \( \frac{1}{3} \) and saw that it was the same as \( \frac{2}{6} \).

So I changed my thirds into sixths because they are the same: \( \frac{2}{6} + \frac{1}{6} = \frac{3}{6} \).

Carol and Naomi ate \( \frac{3}{6} \) of the pizza.
Lundi

I used my list and saw that \( \frac{1}{3} = \frac{2}{6} \).

Now I can add because the denominators are the same: \( \frac{2}{6} + \frac{1}{6} = \frac{3}{6} \).

Together they ate \( \frac{3}{6} \) of the pizza.

2. How much of the pizza is left for Thobile?

Key ideas

When we add fractions with different denominators, we can rewrite the one fraction using equivalent fractions. This so to that the one fraction has the same denominator as the other fraction.

Example: We can write \( \frac{1}{3} + \frac{1}{6} \) as \( \frac{2}{6} + \frac{1}{6} = \frac{3}{6} \).

So finding equivalent fractions can help us with addition of fractions.

Exercise 2 Adding fractions

1. Add the following fractions.

   a) \( \frac{1}{3} + \frac{1}{9} \)

   \[
   \begin{align*}
   &= \frac{1}{9} + \frac{1}{9} \\
   &= \frac{2}{9}
   \end{align*}
   \]

   b) \( \frac{1}{10} + \frac{2}{5} \)

   \[
   \begin{align*}
   &= \frac{1}{10} + \frac{4}{10} \\
   &= \frac{5}{10}
   \end{align*}
   \]

   c) \( \frac{2}{3} + \frac{4}{12} \)

   \[
   \begin{align*}
   &= \frac{8}{12} + \frac{4}{12} \\
   &= \frac{12}{12}
   \end{align*}
   \]

2. Copy and complete the following problems. Add the whole numbers. Then add the fractions.

<table>
<thead>
<tr>
<th>Wholes</th>
<th>Fractions</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) ( 2 \frac{1}{4} + 1 \frac{1}{2} )</td>
<td>( 2 + 1 )</td>
<td>( \frac{1}{4} + \frac{1}{2} )</td>
</tr>
<tr>
<td>b) ( 3 \frac{1}{3} + 4 \frac{3}{15} )</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wholes</td>
<td>Fractions</td>
<td>Answer</td>
</tr>
<tr>
<td>--------</td>
<td>-----------</td>
<td>--------</td>
</tr>
<tr>
<td>c) 1 1/2 + 2 3/6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d) 5 7/10 + 1 3/20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>e) 3 2/5 + 1 4/15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>f) 2 2/4 + 4 3/8</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3. Mrs Arendse made a pepper steak pie. She cut it into eight pieces.
   Her son Eugene ate 3/8 of the pie. His friend Rowan ate 1/4 of the pie.
   a) How much pie did they eat altogether?
   b) How much of the pie was left?

Activity 4  Subtracting fractions

Do the following subtraction problem. Use your fraction wall or your list of equivalent fractions: 7/9 – 2/3

Compare your answers to Lundi’s and Anastasia’s answers.

Lundi

I still find it easier to use my list. From the list I can see that 2/3 = 6/9.

\[
\frac{2}{3} = \frac{4}{6} = \frac{6}{9} \quad \text{so} \quad \frac{7}{9} - \frac{6}{9} = \frac{1}{9}.
\]

Anastasia

I used my fraction wall again.

\[
\begin{array}{ccccccc}
\text{I Whole} \\
\frac{1}{9} & \frac{2}{9} & \frac{1}{3} & \frac{3}{9} & \frac{1}{3} & \frac{1}{3} & \frac{1}{9} \\
\frac{1}{3} & \frac{2}{3} & \frac{3}{9} & \frac{1}{9} & \frac{1}{9} & \frac{1}{9} & \frac{1}{9} \\
\end{array}
\]

I saw that 2/3 is equal to 6/9. Now that my denominators are the same I can subtract.

\[
\frac{7}{9} - \frac{6}{9} = \frac{1}{9}.
\]
Key ideas

When we subtract fractions with different denominators we can rewrite the one fraction using equivalent fractions. This is so that the one fraction has the same denominator as the other fraction.

Example: \( \frac{5}{8} - \frac{1}{4} \)

We can write \( \frac{1}{4} \) as \( \frac{2}{8} \).

Now we can subtract: \( \frac{5}{8} - \frac{2}{8} = \frac{3}{8} \)

Making equivalent fractions can help us when we subtract fractions.

Activity 5   Finding fractions of whole numbers

Find the following:
1. \( \frac{1}{2} \) of 120 
2. \( \frac{1}{3} \) of 96 
3. \( \frac{1}{5} \) of 130 
4. \( \frac{1}{8} \) of 176 
5. \( \frac{1}{10} \) of 190 
6. \( \frac{1}{12} \) of 180

Now have a look at how Vicky worked them out.

Vicky

When you find \( \frac{1}{2} \) of 120 then you can also say 120 divided by 2.

It means the same. I know that \( 120 \div 2 = 60 \).

I also know that \( \frac{1}{2} \) of 120 = 60.

I know that \( \frac{1}{3} \) of 96 is the same as \( 96 \div 3 = 32 \).

I wanted to see if I could find \( \frac{2}{3} \) of 96.

If \( \frac{1}{3} \) of 96 = 32 then \( \frac{2}{3} \) of 96 = \( 32 \times 2 = \frac{64}{3} \).

Key ideas

Finding \( \frac{1}{6} \) of a whole number is the same as dividing the whole number by 6.
**Exercise 3**  \hspace{1cm} \textbf{Subtracting fractions}

1. Complete:
   
   a) \[
   \frac{8}{10} - \frac{1}{5} = \frac{8}{10} \quad \boxed{\quad} \quad \frac{8}{10} - \boxed{\quad} = \boxed{\quad} \]
   
   b) \[
   \frac{3}{4} - \frac{1}{2} = \boxed{\quad} \quad \frac{3}{4} - \boxed{\quad} = \boxed{\quad} \]
   
   c) \[
   \frac{7}{8} - \frac{1}{4} = \boxed{\quad} \quad \frac{7}{8} - \boxed{\quad} = \boxed{\quad} \]
   
   d) \[
   \frac{6}{6} - \frac{2}{3} = \boxed{\quad} \quad \frac{6}{6} - \boxed{\quad} = \boxed{\quad} \]
   
   e) \[
   5 \frac{1}{2} + 3 \frac{2}{8} = \boxed{\quad} \]
   
   f) \[
   6 \frac{10}{12} - 5 \frac{2}{3} = \boxed{\quad} \]

2. Jessica and Melissa shared 12 pieces of dried pears. Jessica ate \(\frac{1}{3}\) of the dried pears. Melissa ate \(\frac{1}{6}\). How many pieces did they eat in all? What fraction of the dried pears did they eat altogether?

3. Find:
   
   a) \[
   \frac{1}{6} \text{ of } 138 = \boxed{\quad} \]
   
   b) \[
   \frac{1}{4} \text{ of } 208 = \boxed{\quad} \]
   
   c) \[
   \frac{1}{9} \text{ of } 306 = \boxed{\quad} \]
   
   d) \[
   \frac{1}{4} \text{ of } 136 = \boxed{\quad} \]
   
   e) \[
   \frac{2}{4} \text{ of } 208 = \boxed{\quad} \]
   
   f) \[
   \frac{3}{9} \text{ of } 306 = \boxed{\quad} \]

---

**Check what you know**

1. What fraction of the following shapes is shaded?

   a) 
   
   b) 
   
   c) 

2. There were 15 children playing in the park. One third of the children went home. How many children stayed in the park?

3. Write the missing fractions on the number line:

   \[
   \begin{array}{cccc}
   0 & & & 1 \\
   \boxed{A} & \boxed{B} & \boxed{C} & \\
   \end{array}
   \]
4. Fill in $>$, $<$, or $=$.
   a) $\frac{3}{4} \square \frac{2}{8}$  
   b) $\frac{2}{4} \square \frac{3}{12}$  
   c) $\frac{2}{3} \square \frac{12}{18}$  
   d) $\frac{1}{5} \square \frac{3}{15}$  
   e) $\frac{4}{7} \square \frac{5}{14}$  
   f) $\frac{1}{2} \square \frac{3}{6}$

5. a) You cut 8 lemons into quarters. How many quarters are there?
   b) You cut 6 yellow cling peaches into halves. How many halves are there?
   c) You cut 9 avocado pears into sixths. How many sixths are there?

6. a) You are offered money. Which amount will you choose?
   Give a reason for your answer.
   
   A. $\frac{1}{2}$ of R1 000  
   B. $\frac{1}{4}$ of R1 000  
   C. $\frac{1}{5}$ of R1 000  
   D. $\frac{1}{10}$ of R1 000  
   E. $\frac{1}{20}$ of R1 000  
   F. $\frac{1}{100}$ of R1 000
   
   b) What happens to the amount of money as the denominator gets bigger?

7. Lindikhaya gave Phetiwe 12 pencil crayons. Phetiwe lost 5 of the pencil crayons. What fraction of pencil crayons were left?

8. Which is more:
   a) $\frac{1}{4}$ of 24 or $\frac{2}{6}$ of 24?
   b) $\frac{2}{10}$ of 200 or $\frac{2}{5}$ of 200?
   c) $\frac{1}{9}$ of 135 or $\frac{1}{3}$ of 135?
   d) $\frac{1}{2}$ of 400 or $\frac{4}{100}$ of 400?

9. Calculate the answers to the following:
   a) $\frac{2}{4} + \frac{1}{8} = \square$
   b) $\frac{3}{6} + \frac{1}{12} = \square$
   c) $\frac{12}{6} + \frac{4}{3} = \square$
   d) $\frac{3}{5} + \frac{2}{10} = \square$
   e) $\frac{10}{12} - \frac{1}{4}$
   f) $\frac{7}{8} - \frac{1}{2}$
   g) $\frac{5}{10} - \frac{1}{2}$
   h) $\frac{6}{5} - \frac{1}{10}$
In this unit you will:

• read, tell and write time in 12-hour and 24-hour formats
• read calendars
• calculate and solve problems with time
• read time zone maps and do calculations
• learn about the history of time.

Getting started

1. Which of the following statements about time are true?
   a) There are hands on a digital clock.
   b) The a.m. time is from noon until midnight.
   c) We write 3 p.m. as 13h00 in 24-hour time.
   d) 45 minutes after 1:30 p.m. is 1:45 p.m.
   e) There are always 365 days in a year.

2. Change the false statements in Question 1 to make true statements.

3. The year 1996 was a leap year. Write down the next four leap years after 1996.

Key ideas

• We write 12-hour time using a.m. If the time is between midnight and midday (noon). So 5 o’clock in the morning is 5 a.m.
• We write 12-hour time using p.m. if the time is between midday (noon) and midnight. So 5 o’clock in the afternoon is 5 p.m.
• A digital clock does not have hands showing the hours and minutes. Digital time is measured over 24 hours. So 3 p.m. is 15h00 (12 hours + 3 hours).
• The Earth takes 365 days to move around the Sun. This is how we measure a year.
• Every fourth year is a leap year. A leap year has an extra day in February. There are 366 days in a leap year.
Activity 1  Read, tell and write time

1. Write the time shown on each of these clocks. Use 12-hour time.
   a) afternoon
   b) morning
   c) afternoon
   d) morning
   e) afternoon
   f) morning
   g) evening
   h) morning
   i) night

   One o’clock can be 01:00 or 13:00 in 24-hour time, depending on whether it is morning or afternoon. Write the times for each clock in Question 1 using 24-hour time.

2. Write the time in words for each of these 24-hour times.
   a) 19:53
   b) 13:41
   c) 04:12
   d) 08:35:57
   e) 16:13:28
### Activity 2 Reading calendars

1. Use Mpumalelo’s calendar to answer the questions.

<table>
<thead>
<tr>
<th>S</th>
<th>M</th>
<th>T</th>
<th>W</th>
<th>T</th>
<th>F</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 Sleepover party!</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6 Band practice</td>
<td>7</td>
<td>8 Civvies Day</td>
<td>9 Swimming with Sam</td>
</tr>
<tr>
<td>10</td>
<td>11 Buy dog food</td>
<td>12</td>
<td>13 Band practice</td>
<td>14</td>
<td>15</td>
<td>16 Plant a tree</td>
</tr>
<tr>
<td>17 St. Patrick’s Day</td>
<td>18</td>
<td>19 Call Granny</td>
<td>20 Band practice</td>
<td>21 Sally’s birthday</td>
<td>22</td>
<td>23</td>
</tr>
<tr>
<td>24 Go on holiday</td>
<td>25</td>
<td>26</td>
<td>27</td>
<td>28</td>
<td>29</td>
<td>30 Get back</td>
</tr>
<tr>
<td>31</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- a) What is the month and the year on the calendar?
- b) On what date must Mpumalelo buy dog food?
- c) For how many days will Mpumalelo be on holiday?
- d) On what day of the week is Sally’s birthday?
- e) How many days are there in March?
- f) What does Mpumalelo have planned for the 9th of March?
- g) What must Mpumalelo do 10 days after he goes swimming?
- h) What is the date 6 days after the second Wednesday?
- i) What is the date 2 weeks and 6 days before 23rd of March?

2. Read about Galileo and answer the questions.
Galileo Galilei was an inventor born in 1564. He watched a lamp swinging from the ceiling of the Pisa cathedral. He timed the lamp using his pulse. He realised that the lamp always took the same time to complete a swing from one side to the other. He later used a pendulum to measure time.

a) Describe how a pendulum clock measures time.

b) Galileo was 78 years old when he died. In what year did he die?

c) For how many decades did Galileo live?

d) How many years have passed since Galileo died?

e) About how many centuries have passed since Galileo died?

Key ideas

- There are 7 days in a week.
- There are approximately 52 weeks in a year.
- There are 12 months in a year.
- There are 10 years in a decade.
- There are 100 years in a century.

Activity 3  Conversions with time

1. Do the following conversions:
   a) How many minutes are there in 3 hours 45 minutes?
   b) How many seconds are there in 2 minutes 35 seconds?
   c) How many days are there in 2 weeks 5 days?
   d) 48 hours = \square days
   e) 2 days 16 hours = \square hours
   f) 23 days = \square weeks \square days

2. The time is shown on a digital clock.
   a) \[03:55\] What will the time be 120 minutes later?
   b) \[15:15\] What will the time be 100 minutes later?
   c) \[17:45\] What will the time be 45 minutes later?
3. Match the times in the two columns.

| A. 12 days + 9 days          | a) 2 years       |
| B. 35 seconds + 25 seconds  | b) 6 weeks       |
| C. 11 months + 1 year and 1 month | c) 5 weeks 2 days 16 hours |
| D. 8 weeks – 14 days        | d) 3 weeks       |
| E. 6 weeks – 4 days 8 hours | e) 6 weeks 1 day 4 hours |
| F. 4 weeks + 15 days + 4 hours | f) 1 year 7 months |
| G. 11 months + 8 months     | g) 1 minute      |

**Key ideas**

• There are 60 seconds in a minute.
• There are 60 minutes in an hour.
• There are 24 hours in a day.

**Activity 4 Calculate with time**

1. Faisal's class had an outing to the science museum. They left school at 10:00 a.m. It takes 30 minutes to drive to the museum. They stay there for 1\(\frac{1}{2}\) hours and drive back. What time do they get back to school?

2. Azibo goes camping with his family. They leave their house at 3:30 p.m. It takes 1\(\frac{1}{4}\) hours to drive to the campground. They spend 1\(\frac{1}{2}\) hours setting up the campsite and \(\frac{3}{4}\) of an hour cooking dinner. What time does the family eat dinner?

3. Edith went for a hike. The hike took 4 hours. Then she played volleyball for 30 minutes. It was 10:15 a.m. when Edith finished playing volleyball. What time did she start her hike?
Activity 5  Time zones

We measure the time of day by looking at the position of the Sun. For example, we say that the Sun is at its highest point at 12 o’clock midday. When we have the Sun’s light in South Africa, countries on the opposite side of the globe from us will have darkness. Every 24 hours, the earth completes a rotation on its own axis as it travels around the Sun.

Scientists came up with the idea of dividing the Earth into time zones. There are 24 hours in a day, so there are 24 time zones. At a specific moment in time, different parts of the world have different times on their clocks.

1. When it is 12 noon in London, it is 2 p.m. in Johannesburg. Find the time zones for these places on the map.

2. The time in Kuala Lumpur in Malaysia is 8 hours ahead of London.
   a) Find Malaysia on the map.
   b) If it is 10 a.m. in South Africa, what is the time in Kuala Lumpur? And in London?
3. When it is 2 p.m. in South Africa, it is 5:30 p.m. in New Delhi, the capital of India. How many hours is New Delhi ahead of South Africa?

4. The table shows the times in four cities. Use the map to complete the table.

<table>
<thead>
<tr>
<th>Kuala Lumpur</th>
<th>Johannesburg</th>
<th>London</th>
<th>New Delhi</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wednesday</td>
<td>Tuesday 6:00 p.m.</td>
<td>Tuesday</td>
<td>Tuesday</td>
</tr>
</tbody>
</table>

5. a) How many hours behind Cape Town is Rio de Janeiro?
   b) Which city is 1 hour behind Cape Town?
   c) How many hours ahead of Cape Town is Sydney?
   d) How many hours is Rome behind Singapore?
   e) It is 8:15 p.m. on a Wednesday in Cape Town. What is the time and the day in each of the following cities?
      i) Sydney, Australia
      ii) Rome, Italy
      iii) Durban
      iv) Rio de Janeiro, Brazil
      v) New York, USA

6. Use the time zone map on page 35 to answer the following questions.
   a) Rani in India is in the lunch line at her school at 12:00 p.m. Simone in Ireland is just getting on the morning bus. What time is it in Ireland?
   b) Bongani in Durban looks at his clock. It is 4:00 a.m. He calls his cousin Jabulani in Wellington, New Zealand. Jabulani says he is having lunch. What time is it in Wellington?

Key ideas

- The world map is divided into 24 time zones. At a particular moment, the clock time is different in different time zones.
- In South Africa there is only one time zone. So the time is the same in all parts of South Africa.
Check what you know

1. Write down the time shown in 12-hour time. Then calculate the difference between the two times:
   
   a)  
   ![Clock Image]
   
   b)  
   ![Clock Image]
   
   c)  
   ![Clock Image]

2. Show the following times on a 12-hour clock face.
   
   a) 03:47
   b) 05:27
   c) 17:27
   d) 20:00
   e) 00:00
   f) 12:00

3. Suresh is a Fiji rugby supporter. His team is playing against South Africa in the semi-finals of the Rugby World Cup. The game starts at 7:30 p.m. in Wellington, New Zealand. Use the table to answer the following questions.

<table>
<thead>
<tr>
<th>Time Zone</th>
<th>Countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>−12:00</td>
<td>Egypt, Turkey, South Africa</td>
</tr>
<tr>
<td>−08:00</td>
<td>Mauritius, Oman, Seychelles</td>
</tr>
<tr>
<td>−06:30</td>
<td>India, Sri Lanka</td>
</tr>
<tr>
<td>+00:00</td>
<td>Fiji, New Zealand</td>
</tr>
</tbody>
</table>

   a) At what time must Suresh switch on his TV to see the start of the match?
   b) Fatima is watching in South Africa. At what time must she switch on the TV to watch the match?

4. Four children start and finish their homework at different times.
   
   • Billy starts his homework at 3:45 p.m. and finishes at 4:05 p.m.
   • Jamie starts at 4:30 p.m. and finishes at 5:37 p.m.
   • Tapelo starts at 6:05 p.m. and finishes at 6:57 p.m.
   • Eric starts at 5:45 and takes 1 hour and 3 minutes.

   a) Work out how long they each take to do their homework.
   b) Who takes the longest?

5. Paul walks to the cinema at 7:15 p.m. to watch a movie. He arrives 15 minutes later and the movie starts. The movie is 2 hours 5 minutes long. He walks back home. What time does Paul arrive home?
In this unit you will:

- recognise and name the angles in 2-D shapes
- sort and compare shapes according to whether they have curved or straight sides
- know and name different closed, straight-sided shapes (polygons) according to the number of sides and type of angles
- sort and compare straight-sided shapes according to the number of sides and angles they have
- draw different 2-D shapes on grid paper
- know different types of angles.

Getting started

Looking back on 2-D shapes

Use the letters of the shapes to answer the following questions:

1. Name the shapes that are closed with only curved sides.
2. Name the shapes that are closed with curved sides and straight sides.
3. Name the shapes that are polygons.
4. Name the quadrilaterals.
Key ideas

- Flat shapes that are closed, with only straight sides and no crossing lines are called **polygons**.
- We call polygons with four sides **quadrilaterals**.

**Activity 1**  
**Same or different?**

1. **a)** Which of Marie’s rectangles are exactly the same?

   ![Rectangle Diagram]

   b) Trace the rectangles. Write their letters on them. Cut the rectangles out. The rectangles that you can fit exactly on top of each other are the same.

2. **a)** Which of Nomvu’s triangles are exactly the same?

   ![Triangle Diagram]

   b) Trace the triangles. Label them. Cut them out. Fit them on top of each other to check your answers.
Key ideas

- In mathematics we say that shapes are the same if the number and size of their sides and corners (angles) are the same. It does not matter how the shape is turned.

For example, all the following triangles are the same:

- We call shapes that are the same identical.
- To check whether shapes are identical you can trace them, cut them out and try to place one exactly on top of the other.

Activity 2 Comparing shapes

1. What do you call flat shapes with four sides?

2. a) What makes these two rectangles the same?

   b) What makes these two squares the same?

3. a) What is the same about these two shapes?
   b) What makes these two shapes different?
   c) Name both the shapes.

4. a) What is the same about these two shapes?
   b) What makes these two shapes different?
   c) Name both the shapes.
Key ideas

- We can sort quadrilaterals by the length of their sides and by how big the angles are.
- A rectangle and a parallelogram are both kinds of quadrilaterals.

![Rectangle and Parallelogram]

- A rectangle and a parallelogram both have two pairs of equal and parallel sides.
- The angles of a rectangle are all right angles.

Activity 3  Sorting triangles

Sort the following triangles into three groups by comparing the lengths of the sides:

Group 1: All three of their sides have the same length.

Group 2: Only two sides are the same length.

Group 3: All three of their sides have different lengths.
Key ideas

- Flat, closed shapes with three sides are called triangles.
- We can group triangles in different groups by comparing the lengths of their sides.

Exercise 1  Comparing shapes

1. Name each of the following shapes.

   ![Shapes](image)

2. a) Make four different parallelograms on your geoboard or on dotted square paper.
   b) Compare your shapes with a friend’s shapes.
   c) Write a sentence to describe your parallelograms.

3. a) Make four different rectangles on your geoboard or on dotted square paper.
   b) Thabelo made this shape. Is it a rectangle? Why do you say so?
   c) Write a sentence to describe your four rectangles.
Activity 4  Shapes with many sides

1. Name the following shapes:

2. Copy and complete the table. Write the number and name of each shape in the correct column.

<table>
<thead>
<tr>
<th>Three-sided shapes</th>
<th>Four-sided shapes</th>
<th>Five-sided shapes</th>
<th>Six-sided shapes</th>
<th>Eight-sided shapes</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 – isosceles triangle</td>
<td>1 – rectangle</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 – parallelogram</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Key ideas

- A **pentagon** is a flat shape with five straight sides. The sides don’t have to be the same length.
- A **hexagon** is a flat shape with six straight sides. The sides don’t have to be the same length.
- An **octagon** is a flat shape with eight straight sides. The sides don’t have to be the same length.
1. Copy and complete the sentences.
   
   a) The clocks show the time has moved from 2 o’clock to quarter past 2. So the minute hand has moved by a ____ turn.
   
   b) The clocks show the time has moved from 3 o’clock to ____ past 3. So the minute hand has moved by a ____ turn.
   
   c) The clocks show the time has moved from 5 o’clock to ____ o’clock. So the minute hand has moved by a ____ turn.
2. Make a right angle by folding a piece of paper like this:

   ![diagram](image)

You can use your paper to measure angles to see if they are right angles. Use your paper to find:

a) four things in the classroom that have a right angle.

b) two things or shapes that have angles less than a right angle.

c) two things or shapes that have angles greater than a right angle.

---

**Key ideas**

- When you turn around a complete circle, we call it a full turn. We call the angle a **revolution**.
- When you turn halfway around a circle, we call it a half turn. We call the angle a **straight angle**.
- When you turn a quarter of the way around a circle, we call it a quarter turn. We call the angle a **right angle**.
Some angles are smaller than a right angle. We call them **acute angles**.
Some angles are bigger than a right angle, but smaller than a straight angle. We call them **obtuse angles**.
Some angles are bigger than a straight angle, but smaller than a revolution. We call them **reflex angles**.
We call the sides of an angle the arms of the angle.

**Activity 6  Quarter turns and three quarter turns**

1. Look at the following turns:
   a) Which show $\frac{1}{4}$ turns? Which show $\frac{3}{4}$ turns? 
   b) What shows the difference between the $\frac{1}{4}$ turns and the $\frac{3}{4}$ turns?

2. Match the following angles with the turners in Question 1.
Exercise 2  Matching angles

1. Match each of the following angles with their names.

   a)  
   b)  
   c)  
   d)  
   e)  

   A. acute: less than a right angle
   B. a right angle
   C. obtuse: more than a right angle, but less than a straight angle
   D. a straight angle
   E. reflex: more than a straight angle, but less than a revolution

2. Order the angles in Question 1 from the smallest to the biggest.

3. Draw each of the following angles and name them. Show the size of the angle with the curved line:
   a) less than a straight angle, but more than a right angle
   b) more than a straight angle, but less than $\frac{3}{4}$ turn angle
   c) less than a right angle
   d) more than a $\frac{3}{4}$ turn angle, but less than a revolution
1. See how Tebogo checks if angles are the same size. First he traces over one angle on tracing paper. Then he sees if the traced angle fits exactly on top of the other angle.

2. Look at the following sets of angles. Say if the angles in each set are the same size. If they are not the same size, order them from the biggest angle to the smallest angle.

   a)  
   i)  
   ii)  

   b)  
   i)  
   ii)  
   iii)  

   c)  
   i)  
   ii)  
   iii)  

   d)  
   i)  
   ii)  

3. Answer the following questions:
   a) Does the direction that an angle faces affect its size?
   b) Does the length of the arms of an angle affect its size?
   c) Does the size of the curve showing the angle affect the size of the angle?

Word bank

- **polygon**: a closed shape made of only straight lines that do not cross each other
- **triangle**: a polygon with 3 sides and 3 angles
- **quadrilateral**: a polygon with 4 sides and 4 angles
- **square**: a quadrilateral with 4 equal sides and 4 right angles
- **rectangle**: a quadrilateral with 4 right angles and opposite sides equal
- **parallelogram**: a quadrilateral with opposite sides equal
- **pentagon**: a 5-sided polygon
- **hexagon**: a 6-sided polygon
- **heptagon**: a 7-sided polygon
- **octagon**: an 8-sided polygon
- **acute angle**: an angle smaller than a right angle
- **obtuse angle**: an angle bigger than a right angle, but smaller than a straight angle
- **straight angle**: an angle that makes a half turn between the arms of the angle
- **reflex angle**: an angle bigger than a straight angle, but smaller than a revolution
- **revolution**: an angle that is a full turn around a point
In this unit you will:

- read information from a map, tables, lists and bar graphs
- represent data on a pictograph with a many-to-one representation
- analyse and interpret data from words, tables, pictographs and bar graphs.

Getting started Different ways to show information

1. Look at this map. It shows how many people are in each province in South Africa.

a) Which province has the fewest people?

b) About how many people live in your province?

c) How many people does ⬇️ stand for?

d) How many people does ⬇️⬇️ stand for?

e) In which province do people have the most space per person?

f) Which province looks the most crowded?
2. Copy and complete the table.

<table>
<thead>
<tr>
<th>Province</th>
<th>Population</th>
<th>Population to the nearest half million</th>
</tr>
</thead>
<tbody>
<tr>
<td>KwaZulu-Natal</td>
<td>9 450 000</td>
<td>9 ( \frac{1}{2} )</td>
</tr>
<tr>
<td>Gauteng</td>
<td>8 100 000</td>
<td>( \underline{8} )</td>
</tr>
<tr>
<td>Eastern Cape</td>
<td>7 200 000</td>
<td></td>
</tr>
<tr>
<td>Limpopo</td>
<td>5 400 000</td>
<td></td>
</tr>
<tr>
<td>Western Cape</td>
<td>4 500 000</td>
<td></td>
</tr>
<tr>
<td>North West</td>
<td>3 600 000</td>
<td>( 3 \frac{1}{2} )</td>
</tr>
<tr>
<td>Mpumalanga</td>
<td>3 150 000</td>
<td></td>
</tr>
<tr>
<td>Free State</td>
<td>2 700 000</td>
<td></td>
</tr>
<tr>
<td>Northern Cape</td>
<td>900 000</td>
<td></td>
</tr>
</tbody>
</table>

a) Choose the best answer. About how many people live in South Africa?
   i) 30 million  ii) 40 million  iii) 50 million

b) Which province has less than 1 million people?

c) How many more people does this province need to make a population of 1 million?

d) Which province has more people than Limpopo but fewer people than Gauteng?

e) How many fewer people does this province have than Gauteng?
   Compare your answer with Nadia’s and Serebola’s answers.

<table>
<thead>
<tr>
<th>Nadia</th>
<th>Serebola</th>
</tr>
</thead>
<tbody>
<tr>
<td>900 000 people</td>
<td>1 million people</td>
</tr>
</tbody>
</table>

   Why did Serebola and Nadia get different answers?

3. Draw a pictograph to show the number of people in each province.
   a) How many people will you let each \( \bigtriangleup \) stand for?
   b) Remember to write the following on your graph:
      - Write the name of your graph.
      - Label what you show down the side of your graph.
      - Label what you show along the bottom of your graph.
      - Write what each symbol \( \bigtriangleup \) stands for.
4. Read the following information off your pictograph:
   a) Which province has the most people?
   b) Which province has the fewest people?
   c) Which province has about double the population of North West?
   d) The population of Gauteng is about how many times more than the population of the Northern Cape?
5. a) What do you like best about the map?
   b) What do you like best about the pictograph?

Key ideas

- We can represent information in a paragraph, a table, a picture, a map or a graph.
- We call bits of information data.
- Sometimes you have too much data to show the exact numbers. Rounding off the numbers can make them easier to read.
- Sometimes you have too much data to let one picture or space stand for one piece of data. It helps to use one picture to represent many.
- On the map each person stands for about 1 million people. This makes it easy to compare the information, but it hides the exact numbers.
- When you read a map or a graph, you need to know what the symbols stand for. For example 🌴 stands for 1 million people and 🌴 stands for $\frac{1}{2}$ million people.

Exercise 1  Picturing growing numbers of people

By the year 2000, there were 6 000 million people in the world. If all the people in the world stood 30 cm apart in a straight line, this line could make a loop to the moon and back three times.

1. The following table shows the estimated population from the year 1000 to the year 2000. Copy and complete the table. Let each stand 🌴 for 30 million people.
### World population growth

<table>
<thead>
<tr>
<th>Year</th>
<th>Estimated number of people in millions</th>
<th>How many 👤 to draw if 👤 = 30 million people</th>
</tr>
</thead>
<tbody>
<tr>
<td>1000</td>
<td>30</td>
<td>1</td>
</tr>
<tr>
<td>1100</td>
<td>60</td>
<td>2</td>
</tr>
<tr>
<td>1200</td>
<td>90</td>
<td>3</td>
</tr>
<tr>
<td>1300</td>
<td>120</td>
<td></td>
</tr>
<tr>
<td>1400</td>
<td>150</td>
<td></td>
</tr>
<tr>
<td>1500</td>
<td>180</td>
<td></td>
</tr>
<tr>
<td>1600</td>
<td>360</td>
<td></td>
</tr>
<tr>
<td>1700</td>
<td>750</td>
<td></td>
</tr>
<tr>
<td>1800</td>
<td>1 000</td>
<td>33</td>
</tr>
<tr>
<td>1900</td>
<td>2 000</td>
<td>67</td>
</tr>
<tr>
<td>2000</td>
<td>6 000</td>
<td>200</td>
</tr>
</tbody>
</table>

2. Write down some questions to ask your class about the information shown in the table.

3. Write a story about the increasing world population. Use the information shown in the table.

4. a) Let each 👤 stand for 60 million people. Now make a new column for your table to show how many to draw for each year.
   b) Let each 👤 stand for 15 million people. Now make a new column for your table to show how many to draw for each year.

---

**Activity 1  Recycling glass**

In 2000, you could get paid the following amounts of money for reusable bottles:
- cooldrink bottles up to 500 ml: 50c
- 1 litre and 1,5 litre cooldrink bottles: R1,50
- 750 ml wine bottles: 17c
- 750 ml beer bottles: 50c

You could get about R50 for every 1 000 kg of glass you collected for recycling.

Winterveld S.P. School collected the following bottles and glass:
- 200 ml and 500 ml bottles: 1 230
- 1 litre and 1,5 litre cooldrink bottles: 988
750 ml beer bottles: 1,546
750 ml wine bottles: 384.
The school also collected 2,500 kg of glass for recycling.

1. Why do you get more for returning reusable bottles than for recyclable glass?
2. Make a table. Show the numbers of bottles the learners collected.
3. Draw a pictograph to show the numbers of bottles the learners collected. Let 1 picture of a bottle represent 100 bottles. Label your columns. Give the graph a heading. Show the number of bottles on the left of the graph. You will need to round off some numbers.
4. Write a story about the numbers of bottles the learners collected.
5. Work out how much money the learners got from the bottles and the other glass.

**Activity 2  Reading bar graphs**

Work with a friend. Read the graphs. Then answer the questions that follow.

Fastest times in Cape Argus Pick n Pay Cycle Tour

1. How many years of the race are shown?
2. In which year was the fastest race cycled?
3. In which years did the winners take between 2\(\frac{1}{2}\) and 3 hours?
4. What was the difference between the winners’ times in 1978 and 1988?
5. a) Did the winner take less time in 1998 or in 2000?
   b) What was the difference in time?
c) What pattern would you expect with the winning times over the years?

6. a) Did the winner take less time in 1993 or in 2000?
   b) What was the difference in time?

7. a) What does the following graph show?

   ![Graph of Cape Argus Pick n Pay Cycle Tour 2012](chart.png)

   b) How is it different from the graph on page 54?

8. What was the most common time taken to complete the Cape Argus Pick n Pay Cycle Tour 2012?

9. About how many people completed the race in less than $2 \frac{3}{4}$ hours? Choose from the following answers:
   a) More than 500  
   b) About 250  
   c) Fewer than 100

10. About how many people took longer than $2 \frac{3}{4}$ hours but less than 3 hours?
    a) More than 500  
    b) About 400  
    c) About 100

11. About how many people in total completed the race in less than 3 hours?
    a) About 500  
    b) About 1 000  
    c) More than 1 000

12. About how many people completed the race in more than 7 hours but less than $7 \frac{1}{2}$ hours?
    a) About 250  
    b) About 500  
    c) About 1 000
Check what you know

Read the table and the graph. Then answer the following questions.

<table>
<thead>
<tr>
<th>Year</th>
<th>Cyclists entering</th>
<th>Fastest time</th>
</tr>
</thead>
<tbody>
<tr>
<td>1978</td>
<td>525</td>
<td>3:02:26</td>
</tr>
<tr>
<td>1979</td>
<td>999</td>
<td>2:55:46</td>
</tr>
<tr>
<td>1980</td>
<td>1 398</td>
<td>3:02:19</td>
</tr>
<tr>
<td>1981</td>
<td>1 669</td>
<td>2:50:47</td>
</tr>
<tr>
<td>1982</td>
<td>1 698</td>
<td>3:01:28</td>
</tr>
<tr>
<td>1983</td>
<td>2 302</td>
<td>2:49:55</td>
</tr>
<tr>
<td>1984</td>
<td>2 373</td>
<td>2:55:07</td>
</tr>
<tr>
<td>1985</td>
<td>3 008</td>
<td>2:44:38</td>
</tr>
<tr>
<td>1986</td>
<td>3 494</td>
<td>2:42:40</td>
</tr>
<tr>
<td>1987</td>
<td>5 934</td>
<td>2:47:45</td>
</tr>
<tr>
<td>1988</td>
<td>10 850</td>
<td>2:33:03</td>
</tr>
<tr>
<td>1989</td>
<td>12 802</td>
<td>2:37:35</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Cyclists entering</th>
<th>Fastest time</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
<td>14 427</td>
<td>2:40:29</td>
</tr>
<tr>
<td>1991</td>
<td>15 593</td>
<td>2:28:46</td>
</tr>
<tr>
<td>1992</td>
<td>17 274</td>
<td>2:49:42</td>
</tr>
<tr>
<td>1993</td>
<td>18 659</td>
<td>2:16:40</td>
</tr>
<tr>
<td>1994</td>
<td>20 964</td>
<td>2:23:22</td>
</tr>
<tr>
<td>1995</td>
<td>25 313</td>
<td>2:22:56</td>
</tr>
<tr>
<td>1996</td>
<td>28 711</td>
<td>2:41:47</td>
</tr>
<tr>
<td>1997</td>
<td>28 875</td>
<td>2:38:27</td>
</tr>
<tr>
<td>1998</td>
<td>34 162</td>
<td>2:39:25</td>
</tr>
<tr>
<td>1999</td>
<td>36 153</td>
<td>2:31:26</td>
</tr>
<tr>
<td>2000</td>
<td>39 864</td>
<td>2:39:35</td>
</tr>
</tbody>
</table>

Cape Argus Pick n Pay Cycle Tour 2000

Number of people entering the race

Number of people entering the race: 2000, 2200, 2400, 2600, 2800, 3000, 3200, 3400, 3600, 3800, 4000, 4200
1. The Cape Argus Pick n Pay Cycle Tour is said to be South Africa’s biggest sports event. Which of the following statements do you think is true?
   A. It makes more money than any other sports event.
   B. More people watch it on TV than any other sports event.
   C. It has more live spectators than any other sports event.
   D. More people take part in it than any other sports event.

2. In which years were there:
   a) over 20 000 cyclists?
   b) fewer than 10 000 cyclists?
   c) over 30 000 cyclists?

3. About how many cyclists entered in the first race in 1978? Choose one of the following answers:
   A. About 2 000   B. About 1 000   C. About 500

4. About how many cyclists entered the race in 2000? Choose one of the following answers:
   A. About 20 000   B. About 30 000   C. About 40 000

5. a) About how many more people entered in 1989 than in 1988?
   b) About how many times more people entered in 1990 than in 1987?
      i) 1 \frac{1}{2}   ii) 2   iii) 3

6. In which three years did the number of cyclists increase by more than 4 000?

7. In which years were there fewer than \frac{1}{10} of the number of cyclists in 2000?

8. a) Exactly how many people entered the race in 2000?
   b) Must you get this data from the graph or from the table?
   c) What does this tell you about the way you are given the data in the graph and the way you are given the data in the table?
9. a) What does the following graph show?

Fastest time for each decade of the Two Oceans Marathon in the last century

<table>
<thead>
<tr>
<th>Times</th>
</tr>
</thead>
<tbody>
<tr>
<td>3:10</td>
</tr>
<tr>
<td>3:09</td>
</tr>
<tr>
<td>3:08</td>
</tr>
<tr>
<td>3:07</td>
</tr>
<tr>
<td>3:06</td>
</tr>
<tr>
<td>3:05</td>
</tr>
<tr>
<td>3:04</td>
</tr>
<tr>
<td>3:03</td>
</tr>
<tr>
<td>3:02</td>
</tr>
<tr>
<td>3:01</td>
</tr>
<tr>
<td>3:00</td>
</tr>
</tbody>
</table>

1970s 1980s 1990s

Decades

b) What is the fastest time taken to run the Two Oceans Marathon?
c) In which decade was that?

Word bank

pictograph: graph that uses pictures to represent one or many of the data collected

bar graph: graph that uses the height of bars to represent the data
In this unit you will:

- collect data using a questionnaire
- organise data in tally tables
- represent data in pictographs, bar graphs and double bar graphs
- analyse and interpret data in graphs
- analyse and interpret data using the mode and the median
- complete a data cycle and report on data.

Getting started  Asking questions

Work in groups of four.

1. Ask each member of the group the following questions. Write down their answers in a table. Include your own answers.
   a) How old are you in years and months?
   b) What sport do you play after school?
   c) How long do you take to get to school in the mornings?
   d) How do you get to school?

<table>
<thead>
<tr>
<th>Name:</th>
<th>Name:</th>
<th>Name:</th>
<th>Name:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Your age in years and months</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The sport you play after school</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>How long you take to get to school</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>How you get to school</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. In your groups, write down four more questions to ask your friends. Ask the questions. Record the answers.

3. Record tallies or make graphs from the data you have collected.

4. Change the questions so that you can represent your data on a graph.
Key ideas

- We can collect data by asking questions and recording the answers.
- We need to have a question with a few set answers. This makes it easier to group the answers and show them on a graph.

Activity 1  Organising data

1. Taliep asked his class what they like to do on the weekend. They had to choose from five activities on his list. Copy and complete his tally table.

<table>
<thead>
<tr>
<th>What do you like to do on the weekend?</th>
<th>Tally</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Read</td>
<td>///////////</td>
<td>15</td>
</tr>
<tr>
<td>2. Watch TV</td>
<td>///////////</td>
<td></td>
</tr>
<tr>
<td>3. Listen to music</td>
<td>///////////</td>
<td></td>
</tr>
<tr>
<td>4. Play games</td>
<td>///////////</td>
<td></td>
</tr>
<tr>
<td>5. Exercise</td>
<td>///////////</td>
<td></td>
</tr>
</tbody>
</table>

a) How many answers did Taliep record?
b) How many more learners like watching TV than reading?
c) How many learners do not like to watch TV?
d) What fraction of the learners like to read?
e) How many learners like to play games?
f) Do you think the tallies will be different for a Grade 3 class? Which activities would be more popular? Which activities would be less popular?

2. Baruti and his class collect litter at their school. They collected the following during one break:

15 pieces of paper; 4 pencils; 7 boxes; 3 books; 12 sandwiches; 22 sweet wrappers; 17 apple cores; 6 banana peels.

Decide how to sort the data in a table. Draw a table of the data. Keep your table for the next activity.
Key ideas

• A tally is a way of counting and showing how many of something you have.
• We group tallies in fives. Draw every 5th tally across the last 4 tallies: \(/\)/
• You can use tally tables to record your data when you collect data.

Activity 2  Representing data in bar graphs and double bar graphs

1. Follow these steps. Draw a bar graph of the litter data from Activity 1.
   a) Work out how many bars you need. These must fit across your page.
   b) Work out what numbers you need on the left of the graph. What is the biggest number you need? Can you fit these on your page?
   c) Draw the bars with a ruler. The bars should all be the same width. The height shows how many pieces of litter are in that group.
   d) Give the graph a heading.

2. Bart asked his class which of the Big Five animals in South Africa are their favourites. He recorded the answers from girls in a separate column from the boys. Bart recorded their answers like this:

<table>
<thead>
<tr>
<th></th>
<th>Girls</th>
<th>Boys</th>
</tr>
</thead>
<tbody>
<tr>
<td>elephant</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>leopard</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>rhinoceros</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>buffalo</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>lion</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td><strong>23</strong></td>
<td><strong>19</strong></td>
</tr>
</tbody>
</table>
Bart starts making a double bar graph of his data.

- Copy and complete all the bars on his graph.
- Add a title or heading to your graph.
- Add a label under the bars and a label on the left side to show what the numbers represent.
- Make a key to show which bars are for girls and which bars are for boys.

**Key ideas**

- In a bar graph, each bar represents a group or category of the data.
- The height of each bar shows the number of things in each group.
- Make the bars the same width. Put in spaces between the bars.
- Label the bars. Number and label the left side.
- Give the graph a title.
- Double bar graphs divide the data into two bars for each category of data. For example, Bart separates the data about girls and boys for each category.
- Give a double bar graph a key. The key shows what the two bars in each group of data represent. Bart’s graph has the key:
  - Girls
  - Boys
Activity 3  Double bar graphs and pie charts

1. The following table shows the average temperatures for Johannesburg over a year. They are divided into the maximum and the minimum temperatures.

<table>
<thead>
<tr>
<th></th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max</td>
<td>26°C</td>
<td>26°C</td>
<td>25°C</td>
<td>23°C</td>
<td>20°C</td>
<td>18°C</td>
<td>18°C</td>
<td>21°C</td>
<td>25°C</td>
<td>26°C</td>
<td>26°C</td>
<td>26°C</td>
</tr>
<tr>
<td>Min</td>
<td>14°C</td>
<td>14°C</td>
<td>13°C</td>
<td>10°C</td>
<td>6°C</td>
<td>3°C</td>
<td>3°C</td>
<td>5°C</td>
<td>9°C</td>
<td>11°C</td>
<td>12°C</td>
<td>14°C</td>
</tr>
</tbody>
</table>

a) Copy and complete the double bar graph.

b) Give the graph a title. Label the bars. Label the numbers on the left. Give the graph a key.

c) Which months have the highest average maximum temperatures?

d) Which months have the lowest average minimum temperatures?

e) Use the temperatures. Say which four months are in summer. Say which four months are in winter.

f) What is the difference between the maximum and the minimum averages in September?
2. Look at the following pie graph. It shows the different official languages and the number of people who speak these languages. Each section of the pie graph shows a fraction of the total population.

a) Which language is spoken the most as the home language?

b) Which three languages are spoken the least as the home language?

c) Decide if the following statements are true or false:
   i) About a quarter of the population speak isiZulu.
   ii) There are more English home language speakers than Afrikaans home language speakers.
   iii) The total of the Setswana, Southern Sotho and Sepedi home language speakers together is about a quarter of the population.
   iv) The most common language used in books, on computers and in business is not the most common home language.

d) What languages might be included in ‘Other’?

e) This pie graph shows the home languages of people. But, many people communicate daily in another language. What language is used the most in your school?
Activity 4  The middle number and the most common number

1. Mr Bennett has marked the Grade 6 Maths tests. The learners got these marks out of 100:

69  29  85  98  94  47  78  94  47  47  15  67  55
54  63  19  44  48  47  87  92  74  73  31  66  92

a) How many tests did Mr Bennett mark?
b) Arrange the marks from highest to lowest.
c) What is the highest mark? What was the lowest mark?
d) What is the mode of this data?
e) What is the mark exactly in the middle of the list? We call this mark the median mark.
f) How many marks are lower than the median or middle number?
g) How many marks are higher than the median or middle number?
h) What does the median mark tell you about the class marks?
i) Explain why the mode and the median are different.

2. Ms Petersen also marked her Grade 6 Maths tests. The learners got these marks out of 100:

79  100  84  38  94  74  96  39  68  48  20
71  92  88  35  98  64  60  49  58  88  40  57

a) How many tests did Ms Petersen mark?
b) Arrange the tests from the highest to the lowest.
c) What is the median of Ms Petersen’s Maths test marks?
d) Which class has a higher median?

3. a) Look at your sorted list of Mr Bennett’s Maths test marks. What mark is the most common?
b) How many learners got this mark?
c) What is the mode for Ms Petersen’s Maths test marks?
Key ideas

- The middle number in a sorted list is the **median**.
- The median tells us that half of the list is lower than that number and the other half is higher than that number.
- The **mode** is the number that appears most often.

Check what you know

Project for Term 1

In February 2007, a Community Survey was conducted in all provinces. Data was recorded from 246 618 households.

In one of the survey questions, people were asked which household items they own. The following table shows the results.

<table>
<thead>
<tr>
<th>Household item</th>
<th>Number of households</th>
<th>Rounded off to nearest 10 000</th>
</tr>
</thead>
<tbody>
<tr>
<td>radio</td>
<td>188 909</td>
<td>190 000</td>
</tr>
<tr>
<td>television</td>
<td>161 781</td>
<td></td>
</tr>
<tr>
<td>computer</td>
<td>38 719</td>
<td></td>
</tr>
<tr>
<td>fridge</td>
<td>157 589</td>
<td></td>
</tr>
<tr>
<td>landline telephone</td>
<td>45 871</td>
<td></td>
</tr>
<tr>
<td>cellphone</td>
<td>179 785</td>
<td></td>
</tr>
</tbody>
</table>

[Source: Community Survey 2007 (www.statssa.gov.za)]
1. Decide how to show the data on a pictograph. The numbers are very large. It will be difficult to show them on a graph.
2. Round the numbers off to the nearest 10 000.
3. Decide what picture to use on your pictograph to represent households.
4. What number will each picture represent?
5. Work out how many pictures you need for each column of the graph.
6. Make the pictograph. Remember to label it.
7. Write four questions about your pictograph. Ask other learners to answer the questions.
8. Present your table, graph, questions and conclusions to the class.
In this unit you will:

- use number patterns for multiplication and division
- determine input values, output values and rules for patterns and relationships using flow diagrams.

Getting started  Finding patterns

At a school fundraising event, the local stationery shop promises to donate R4 for every R1 raised by the school.

<table>
<thead>
<tr>
<th>Money raised by the school in rands</th>
<th>1</th>
<th>2</th>
<th>5</th>
<th>10</th>
<th>15</th>
<th>20</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Money donated by the local stationary shop in rands</td>
<td>4</td>
<td>12</td>
<td>40</td>
<td>200</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Complete the table by filling in the missing values.
2. Explain how you calculated the missing values.
3. Write a rule for the pattern in the table.
4. Look at the following flow diagram. It shows the same relationship:

   Input: 1, 3, 12
   Rule: × 4
   Output: 4, 12, 32

   a) Is the money donated by the local stationery shop the input or the output?
   b) Copy and complete the flow diagram.
   c) What rule can you use to find the output values?
   d) What rule can you use to find the input values from the output values?
   e) Write a sentence to explain how multiplication and division can work together.
Activity 1 Patterns and rules

Copy and complete the following table:

<table>
<thead>
<tr>
<th>Input</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>5</th>
<th>10</th>
<th>15</th>
<th>20</th>
<th>25</th>
<th>50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Row 1</td>
<td>10</td>
<td>20</td>
<td>30</td>
<td>100</td>
<td>150</td>
<td>250</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Row 2</td>
<td>100</td>
<td>200</td>
<td>1</td>
<td>500</td>
<td>2000</td>
<td>2500</td>
<td>5000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Row 3</td>
<td>1000</td>
<td>3000</td>
<td>10000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Develop a rule for each row that gives you an output value for any input value.

2. a) Write a number sentence for the rule you used in Row 2 and an input value of 1.
   b) Copy and complete the flow diagram.
      
      ![Flow Diagram]
      
   c) Is the rule you wrote in Question 1 for Row 2 the same as the rule you used in the flow diagram? Explain.
   d) Use the flow diagram to complete the number sentences:
      
      \[1 \times 10 \times 10 = \square\]
      \[10 \times 10 \times 10 = \square\]

3. a) Draw a flow diagram to show the relationship between the input values and the output values in Row 3.
   You can only use (× 10) in your rule. You may need to use (× 10) more than once.
   b) Copy and complete the following:
      
      \[1000 = (100 \times \square) = (\square \times \square \times \square)\] or
      \[(1 \times 1000) = (1 \times \square \times 10) = (1 \times \square \times 10 \times \square)\]
Exercise 1  Tables and flow diagrams

1. Copy and complete the following table:

<table>
<thead>
<tr>
<th>Input</th>
<th>1</th>
<th>10</th>
<th>20</th>
<th>55</th>
</tr>
</thead>
<tbody>
<tr>
<td>Row 1</td>
<td>5</td>
<td>10</td>
<td>20</td>
<td>55</td>
</tr>
<tr>
<td>Row 2</td>
<td>10</td>
<td>20</td>
<td>40</td>
<td>110</td>
</tr>
<tr>
<td>Row 3</td>
<td>15</td>
<td>30</td>
<td>60</td>
<td>165</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>450</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 125</td>
</tr>
</tbody>
</table>

a) Calculate the missing input values.
b) Which output values did you use to find the input values?
c) What operation did you use to find the input values?
d) If the output value in Row 2 is 300, what is the input value?
e) If the output value in Row 3 is 1 125, what is the input value?
f) Write a rule for each row that will work for any input value.

2. Look at the following flow diagrams. Answer the questions.

i)

```
   1
  / \  \
/     \ \
input 5 10 2

   \   / \
   × 5 / 5
     \  /
   25

output

rule
```

ii)

```
   1
  / \  \
/     \ \
input 5 10 2

   \   / \
   × 5 / 5
     \  /
   50

output

rule
```

iii)

```
   1
  / \  \
/     \ \
input 5 10 2

   \   / \
   × 5 / 5
     \  /
   75

output

rule
```