For Grade 6

Some things change, some remain the same

This material is provided to schools and learners as part of Community Development Programmes.
Alwyn Olivier and Piet Human are the principal authors of the text in this booklet.
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1 NUMBER SENTENCES

1.1 Equivalence

Farmer Nyathi buys three goats for R423 each. Here is a plan to calculate the total cost: 423 + 423 + 423
Here is another plan to calculate the total cost: 3 × 400 + 3 × 20 + 3 × 3

We can write a **number sentence** to state our belief that these two calculation plans will give the same result:

423 + 423 + 423 = 3 × 400 + 3 × 20 + 3 × 3

Two different calculation plans that produce the same result are called **equivalent** calculation plans.

1. Complete the calculations below to check whether the plans 423 + 423 + 423 and 3 × 400 + 3 × 20 + 3 × 3 are really equivalent.

\[
\begin{array}{c}
423 \\
+ 423 \\
6 \\
40 \\
800 \\
846 \\
+ 423 \\
3 \times 400 = 1200 \\
3 \times 20 = \ldots. \\
3 \times 3 = \ldots. \\
\ldots. \\
\end{array}
\]

The calculation plans 423 + 423 + 423 and 3 × 400 + 3 × 20 + 3 × 3 produce the same result.

So, the two plans are equivalent.

Another way to state this is to write the number sentence 423 + 423 + 423 = 3 × 400 + 3 × 20 + 3 × 3.

This is a **true** number sentence.

The number sentence 25 + 25 + 25 + 25 + 25 = 4 × 20 + 4 × 5 is clearly not true. We say it is **false**.
2. Which of the number sentences below are false?
   Replace each false sentence by a true sentence, by writing a different plan on the right-hand side.
   (a) $7 \times 37 + 3 \times 37 = 10 \times 37$  
       (b) $14 \times 53 + 6 \times 53 = 24 \times 53$
   (c) $47 + 28 = 50 + 25$  
       (d) $96 + 36 = 100 + 31$
   (e) $14 \times 76 - 4 \times 76 = 10 \times 76$
   (f) $683 + 683 + 683 + 683 + 683 = 5 \times 600 + 5 \times 80 + 5 \times 3$

3. For each of the true sentences in question 2, decide which of the two plans are the easiest. Then use the plan to find the answer.

4. Write an easier equivalent calculation plan for each of the following, and use your plan to find the answer.
   (a) $4 \times 158 + 6 \times 158$  
       (b) $13 \times 47 - 3 \times 47$  
       (c) $134 \times 47 - 34 \times$

5. Calculate $7 \times 20 - 6 + 4 \times 2$.

Here are three different learners’ answers for question 5:

**Tom:** $140 - 10 \times 2 = 130 \times 2 = 260$
He added the 6 and 4 to get 10, subtracted 10 from 140 and then multiplied by 2.

**Zolani:** $70 \times 2 = 140$
She also added 6 and 4 to get 10. Then she subtracted the 10 from 20. Then she calculated $7 \times 10 \times 2$.

**Tshepo:** $140 - 6 + 8 = 134 + 8 = 142$
He first calculated $7 \times 20$ and $4 \times 2$, before he added and subtracted.

To avoid confusion like this when reading instructions to do calculations, people all over the world use the rules given on the next page.
When a calculation plan includes addition and subtraction only, the calculations are done from left to right.

**Example:** $30 - 6 + 8 - 5 + 7$ is written to indicate that you have to do the following:

$30 - 6 = 24$
$24 + 8 = 32$
$32 - 5 = 27$
$27 + 7 = 34$

If you don't do the calculations from left to right, you will get a different answer. For example, if you first calculate

$6 + 8 = 14$ and $5 + 7 = 12$ and then

$30 - 14 = 16$ and then $16 - 12$, the answer is 4.

That is why you should always follow the above rule, unless you replace the plan with an equivalent plan.

Suppose you want to state that 8 should be added to 6, and 7 to 5, and the two answers subtracted from 30. The use of brackets makes it possible to write such instructions.

Brackets are used to indicate that certain calculations should be done before others.

**Example:** $30 - (6 + 8) - (5 + 7)$ is written to indicate that the following should be done:

$6 + 8 = 14$ \hspace{1cm} $5 + 7 = 12$ \hspace{1cm} $30 - 14 = 16$ \hspace{1cm} $16 - 12 = 4$

When a calculation plan includes multiplication, the multiplication is done first and the remaining calculations are done from left to right.

**Example:** $7 	imes 20 - 6 + 4 	imes 2$ is written to indicate that the following should be done:

$7 	imes 20 = 140$ \hspace{1cm} $4 	imes 2 = 8$ \hspace{1cm} $140 - 6 = 134$ \hspace{1cm} $134 + 8 = 142$
6. Write each of the sets of instructions below in symbols, for example 
\((20 + 5) \times 10 - 5 + 15\) for the instructions in (a).

(a) Add 5 to 20, multiply by 10, subtract 5 and add 15.
(b) Multiply 20 by 10, add this to 5, subtract 5 and add 15.
(c) Subtract 5 from 10, multiply this by 5, add the answer to 20, then add 15 to this answer.
(d) Add 5 to 20, multiply the answer by 10 and write it down. Add 5 and 15 and subtract this from the previous answer that you have written down.

7. For each false sentence below, make a true sentence by writing a different plan on the right-hand side.

(a) \((40 - 5) \times 6 = 40 \times 6 - 5 \times 6\)
(b) \(37 \times (40 + 3) = 37 \times 40 + 3\)
(c) \(24 \times (30 + 6) = 24 \times 30 + 24 \times 6\)
(d) \((400 + 60 + 3) + (300 + 20 + 5) = (300 + 60 + 5) + (400 + 20 + 5)\)
(e) \((400 + 60 + 3) - (300 + 20 + 5) = (300 + 60 + 5) - (400 + 20 + 5)\)
(f) \(300 + 80 + 7 - (200 + 30 + 5) = 300 + 80 + 7 - 200 + 30 + 5\)
(g) \(300 + 80 + 7 - (200 + 30 + 5) = 300 + 80 + 7 - 200 - 30 - 5\)
(h) \((300 + 80 + 7) - (200 + 30 + 5) = (300 + 200) - (80 + 30) - (7 + 5)\)
(i) \((500 + 70 + 6) - (200 + 40 + 2) = (500 - 200) + (70 - 40) + (6 - 2)\)

8. Write an easier equivalent plan for each of the following sets of calculations.

(a) \((46 + 73) + (56 + 27)\) \(\quad\) (b) \((96 - 38) + (88 - 46)\)
(c) \(46 \times 238 + 56 \times 238\) \(\quad\) (d) \(46 \times 238 - 36 \times 238\)
(e) \((18 \times 23 + 17 \times 33) + (12 \times 23 - 7 \times 33)\)
9. The number sentences below are about three numbers. One number is hidden behind the red stickers. It is the same number behind each of the red stickers. Likewise, another number is hidden behind each blue sticker, and another number behind each green sticker.

(a) \[ \square \times (\square + \square) = \square \times \square + \square \]
(b) \[ \square \times (\square + \square) = \square \times \square + \square \times \square \]
(c) \[ (\square + \square) \times (\square + \square) = \square \times \square + \square \times \square \]

Which of the above number sentences are false? Give examples to show that your answer is right.

10. Which of these sentences are true, and which are false?

(a) \[ 6 \times 37 = 6 \times 30 + 7 \]
(b) \[ 6 \times 37 = 6 \times 30 + 6 \times 7 \]
(c) \[ 26 \times 37 = 20 \times 30 + 6 \times 7 \]
(d) \[ 26 \times 37 = 20 \times 30 + 20 \times 7 + 6 \times 30 + 6 \times 7 \]

If some numbers are missing, a number sentence is called open, for example: \( 64 + \ldots = 100 \)
To complete this open number sentence you have to find out what you need to add to 64 to reach 100.
If all the numbers are given, a number sentence is called closed. For example \( 64 + 36 = 100 \) is called a closed number sentence.

Open number sentences can be written in different ways:

\[
\begin{align*}
700 + \ldots &= 1000 \\
700 + ? &= 1000 \\
700 + \square &= 1000 \\
700 + \text{ a number } &= 1000 \\
700 + x &= 1000
\end{align*}
\]

11. In each case find the missing number that will make the number sentence true.

(a) \[ 100 + 1100 = \text{ a number } + 800 \]  
(b) \[ \text{ a number } + 300 = 40 \times 40 \]
(c) \[ 300 + 500 = 100 + \text{ a number } \]
(d) \[ \square \times 300 = 600 \times 100 \]  
(e) \[ 700 + \square = 2000 - 600 \]
(f) \[ 1000 - 300 = 400 + \square \]  
(g) \[ 500 + 900 = \square + 700 \]
You already know that in a **number sequence** like 6, 12, 18, 24, … , although the numbers change (are *not the same*),

- there is some **horizontal pattern** that does not change (is always the same for all numbers) and
- there is a **vertical calculation plan (rule)** that does not change and is *the same* for all the input and output numbers.

Here are the horizontal and vertical patterns for 6, 12, 18, 24, …:

<table>
<thead>
<tr>
<th>Input numbers</th>
<th>Output numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>2</td>
<td>12</td>
</tr>
<tr>
<td>3</td>
<td>18</td>
</tr>
<tr>
<td>4</td>
<td>24</td>
</tr>
<tr>
<td>5</td>
<td>30</td>
</tr>
</tbody>
</table>

We can describe and write the patterns in such sequences in different ways: in **words**, in a **table**, in a **flow diagram** or as a **calculation plan** (also called a **rule**).

These descriptions help us to solve problems like these:

1. To continue the sequence, in other words to find the next numbers in the sequence.
2. To calculate numbers further on in the sequence, for example the 100th number in the sequence. This is the same as calculating the output number if the input number is 100.
3. To find out the position of a number in the sequence, for example: is 436 the 1st, 50th, … 87th number in the sequence? This is the same as finding the input number if the output number is 436.
4. To decide if a number, for example 438, is in the sequence or not.
2.1 Revising sequences of multiples

1. Below are five sequences of multiples. For each sequence:
   (a) Continue the sequence for the next five numbers.
   (b) Calculate the 100th number in the sequence. Explain your method.
   (c) 360 is a number in the sequence. Do you agree?
   (d) What is the position of 360 in the sequence (for example, is it the 10th or 23rd)?
   (e) Is 465 a number in the sequence? How do you know?

   Sequence A: 3, 6, 9, 12, 15, 18, ...
   Sequence B: 4, 8, 12, 16, 20, 24, ...
   Sequence C: 5, 10, 15, 20, 25, 30, ...
   Sequence D: 9, 18, 27, 36, 45, 54, ...
   Sequence E: 10, 20, 30, 40, 50, 60, ...

2. Complete all missing parts in this flow diagram and table for multiples of 6. What patterns do you notice?

   | Input numbers |
   |---|---|---|---|---|---|---|---|
   | Position no. | 1 | 2 | 3 | 10 | 15 | 20 | 40 |
   | Output numbers |
   |---|---|---|---|---|---|---|---|

   Calculation plan

<table>
<thead>
<tr>
<th>Position no.</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>10</th>
<th>15</th>
<th>20</th>
<th>40</th>
<th>50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Position no. × 6</td>
<td>6</td>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>726</td>
<td></td>
</tr>
</tbody>
</table>
2.2 Non-multiple sequences

We have studied sequences of multiples. For example, what is the 100th multiple of 5 in 5, 10, 15, 20, 25, 30, ...? Do you agree that it is easy: the 100th number is 100 × 5 = 500?

But what about sequences that are not multiples? For example, what is the 100th number in 6, 11, 16, 21, 26, 31, ...? Let us now investigate this.

1. Study the three sequences in this table.

<table>
<thead>
<tr>
<th>Position no.</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>20</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sequence 1</td>
<td>4</td>
<td>9</td>
<td>14</td>
<td>19</td>
<td>24</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sequence 2</td>
<td>5</td>
<td>10</td>
<td>15</td>
<td>20</td>
<td>25</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sequence 3</td>
<td>6</td>
<td>11</td>
<td>16</td>
<td>21</td>
<td>26</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(a) Describe horizontal patterns for each of the sequences. How are they the same and how are they different?

(b) Describe vertical patterns for each of the sequences. How are they the same and how are they different?

(c) Complete the table. Describe and discuss your methods.

2. Below are three flow diagrams for the three sequences in question 1. How are the flow diagrams the same and how are they different? Complete all missing parts in the flow diagrams.

Sequence 1

```
1
2
3
20
100
?

Rule

4
9
14
?
?
```
3. Calculate the 100th number in 7, 12, 17, 22, 27, ...
4. Calculate the 100th number in 8, 13, 18, 23, 28, ...
5. (a) What is the same in Sequences A to D below?
   (b) Calculate the 100th number in each sequence.

   Sequence A: 6, 12, 18, 24, 30, 36, 42, ...
   Sequence B: 7, 13, 19, 25, 31, 37, 43, ...
   Sequence C: 9, 15, 21, 27, 33, 39, 45, ...
   Sequence D: 4, 10, 16, 22, 28, 34, 40, ...

Every sequence of multiples has a family of sequences that are not multiples, but have \textbf{the same constant difference}. For example:

4, 8, 12, 16, 20, 24, 28, ... \quad \leftarrow \text{these numbers are multiples of 4}
5, 9, 13, 17, 21, 25, 29, ... \quad \leftarrow \text{these are 1 more than a multiple of 4}
6, 10, 14, 18, 22, 26, 30, ... \quad \leftarrow \text{these are 2 more than a multiple of 4}
3, 7, 11, 15, 19, 23, 27, ... \quad \leftarrow \text{these are 1 less than a multiple of 4}
**Problem:** Find the 100th number in the sequence
10, 14, 18, 22, 26, 30, ...

Zukele does it like this:
*My clue is that there is a constant difference of 4.*
*So then I know that it is family of the multiples of 4: 4, 8, 12, 16, ...
So I can see each number in 10, 14, 18, 22, ... is 6 more than 4, 8, 12, 16, ...
But I know that the 100th number in 4, 8, 12, 16, ... is $100 \times 4 = 400$
So I know that the 100th number in 10, 14, 18, 22, ... is $100 \times 4 + 6 = 406$*

6. Calculate the 87th number in each of these sequences.

   Also answer the other questions.
   
   (a) 2, 5, 8, 11, 14, ... Is 623 a number in this sequence?
   
   (b) 4, 7, 10, 13, 16, ... Is 334 a number in this sequence?
   
   (c) 3, 6, 9, 12, 15, ... Is 334 a number in this sequence?
   
   (d) 5, 8, 11, 14, 17, ... Is 623 a number in this sequence?

7. Find the missing input numbers:

   ![](flow_diagram.png)

8. It will be easier to find missing input numbers if we rewrite the flow diagram in question 7 so that the known numbers become the input numbers. Complete all the missing parts in the flow diagram.
2.3 Flow diagrams and rules

1. Write the rule (calculation plan) for each of these sequences as a flow diagram. How are the flow diagrams different, and how are they the same? Also calculate all missing input and output numbers.

(a) 4, 8, 12, 16, 20, 24, 28, ...

(b) 5, 9, 13, 17, 21, 25, 29, ...

(c) 6, 10, 14, 18, 22, 26, 30, ...
2. Complete this table.

<table>
<thead>
<tr>
<th>Position</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>30</th>
</tr>
</thead>
<tbody>
<tr>
<td>Position $\times 4$</td>
<td>4</td>
<td>8</td>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Position $\times 4 + 1$</td>
<td>5</td>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Position $\times 4 + 2$</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Position $\times 4 + 3$</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Position $\times 4 + 4$</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Position $\times 4 + 5$</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(a) Describe and discuss your methods.

(b) Describe horizontal and vertical patterns in the table.

(c) What is the same in each sequence, and what is the same in each calculation plan (rule)?
2.4 Tables and rules

A computer uses a secret rule so that for every input number that you type in, it produces an output number using the same rule every time. Here are some examples of the computer’s answers:

<table>
<thead>
<tr>
<th>Input number</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>5</th>
<th>20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output number</td>
<td>2</td>
<td>7</td>
<td>12</td>
<td>17</td>
<td>27</td>
<td>102</td>
</tr>
</tbody>
</table>

1. (a) Which one of these is the computer’s rule (calculation plan)? Explain how you know, and how you can be sure.

Rule 1: \( \text{Output number} = \text{Input number} + 6 \)
Rule 2: \( \text{Output number} = \text{Input number} \times 6 \)
Rule 3: \( \text{Output number} = \text{Input number} \times 5 + 2 \)
Rule 4: \( \text{Output number} = (\text{Input number} + 2) \times 5 \)
None of these

(b) What will the computer’s output number be for each of these input numbers: 4, 6, 21, 25, 50, 100?

2. The computer also made tables using the other calculation plans (rules) in question 1. Which rule did the computer use for which table? Explain how you know, and how you can be sure.

<table>
<thead>
<tr>
<th>Table 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input number</td>
</tr>
<tr>
<td>Output number</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input number</td>
</tr>
<tr>
<td>Output number</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input number</td>
</tr>
<tr>
<td>Output number</td>
</tr>
</tbody>
</table>
3. On two other occasions, the computer produced these tables:

**Table 4**

<table>
<thead>
<tr>
<th>Input number</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>17</th>
<th>60</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output number</td>
<td>12</td>
<td>24</td>
<td>36</td>
<td>48</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Table 5**

<table>
<thead>
<tr>
<th>Input number</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>17</th>
<th>60</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output number</td>
<td>14</td>
<td>26</td>
<td>38</td>
<td>50</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(a) Complete the tables.

(b) Explain how you calculated Output number 17 and Output number 60 in each table.

(c) How are Table 4 and Table 5 the same and how are they different? Is there a connection (a link) between the two tables?

4. For each of Sequences A to F below:

(a) Describe the pattern in the sequence.

(b) Continue the sequence for another five numbers.

(c) Calculate the 100th number.

Sequence A: 7, 12, 17, 22, 27, 32, ...
Sequence B: 8, 13, 18, 23, 28, 33, ...
Sequence C: 9, 14, 19, 24, 29, 34, ...
Sequence D: 7, 13, 19, 25, 31, 37, ...
Sequence E: 8, 14, 20, 26, 32, 38, ...
Sequence F: 1, 7, 13, 19, 25, 31, ...

5. Write down your own numerical sequence, ask your own questions, and then answer your questions.
3.1 Making beautiful patterns

Busi makes beautiful bead bracelets of different designs and sizes. Size 1 and Size 2 for each design are shown below, but Busi can make bracelets of any size.

![Design 1](image1)

![Design 2](image2)

![Design 3](image3)
1. For Design 1:
   (a) Describe in words how the design works.
   (b) Complete this table. Do not count the beads in Size 1 and Size 2 one by one, but try to see bigger units and use calculation plans.

<table>
<thead>
<tr>
<th>Size</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>30</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of white beads</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. of black beads</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. of yellow beads</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. of green beads</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total no. of beads</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

   (c) Describe and discuss the methods you used to complete the table. Also describe and discuss patterns you see in the table.
   (d) Write down a calculation plan for the number of beads of each colour, and for the total number of beads.
   (e) Use your calculation plans to calculate the number of beads of each colour for Size 10, Size 20 and Size 100.

2. For Design 2, answer the same questions as for Design 1.
3. For Design 3, answer the same questions as for Design 1.
3.2 Writing calculation plans

1. Thabo uses beads to make a pattern of Xs like this:

If Thabo continues the pattern, how many beads will there be in X5, how many in X6, how many in X50 and how many in X60?

2. Mary uses clever counting to answer question 1! Try to follow her reasoning. Explain her plan to a classmate.

Mary writes a calculation plan (rule):
\[ X_{\text{number}} = 4 \times \text{number} + 1 \]
Now she can calculate \( X_{\text{number}} \) for any number.
3. Suzi uses beads to make this growing V-pattern:

![V-pattern diagram]

(a) Describe V6, V60 and V87 in words.

(b) Write your plan as a flow diagram and then calculate the number of beads in V6, V60 and V87.

(c) Write down your calculation plan, and then use it to calculate the total number of beads in V6, V60 and V87.

(d) What is the biggest V-number that can be made with 100 green beads and one yellow bead? How many beads are left over?

4. Sam uses beads to make these alphabet patterns.

Answer the same questions as in question 3 for these T, C and L patterns.

![Alphabet patterns diagram]
3.3 Describing patterns

Purple tiles and white tiles are arranged to make this growing pattern:

<table>
<thead>
<tr>
<th>Size</th>
<th>No. of purple tiles</th>
<th>No. of white tiles</th>
<th>Total no. of tiles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size 1</td>
<td>2</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Size 2</td>
<td>4</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Size 3</td>
<td>6</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>Size 4</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Complete the table. Describe your methods.

2. Describe horizontal numeric patterns for the purple tiles, for the white tiles and for the total number of tiles in the table.

   How can you use these horizontal patterns to calculate the number of purple tiles, the number of white tiles and the total number of tiles?

3. Describe vertical numeric patterns for the purple tiles, for the white tiles and for the total number of tiles in the table.

   How can you use these patterns to calculate the number of purple tiles, the number of white tiles and the total number of tiles?

4. How many purple tiles are there in a Size 50 pattern?

5. How many white tiles are there in a Size 50 pattern?

6. How many tiles are there in total in a Size 50 pattern?
7. Here are three other growing geometric patterns made with purple and white tiles.

Answer the same questions as in questions 1 to 6 for each tile pattern.

Pattern X

Pattern Y

Pattern Z
3.4 From pictures to tables

In this tile pattern, a Size 1 tile is made of 4 green tiles and 5 smaller purple tiles. The pattern is then continued as shown.

Size 1

Size 2

Size 3

1. Complete this table and describe your methods.

<table>
<thead>
<tr>
<th>Size</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>30</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of green tiles</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. of purple tiles</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. Describe horizontal numeric patterns for the green and for the purple tiles in the table. How can you use these patterns to calculate the number of green tiles and the number of purple tiles?

3. Describe vertical numeric patterns for the green and for the purple tiles in the table. How can you use these patterns to calculate the number of green tiles and the number of purple tiles?

4. Write down a calculation plan (rule) to calculate the number of green tiles instead of counting them. How many green tiles are there in a Size 50 pattern?

5. Write down a calculation plan (rule) to calculate the number of purple tiles. How many purple tiles are there in a Size 50 pattern?
3.5 More pictures and tables

In this tile pattern, a Size 1 tile is made of 8 green tiles and 9 smaller purple tiles. The pattern is then continued as shown.

![Tile pattern sizes](image)

1. Complete this table and describe your methods.

<table>
<thead>
<tr>
<th>Size</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>30</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of green tiles</td>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. of purple tiles</td>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. Describe *horizontal* numeric patterns for the green and for the purple tiles in the table. How can you use these patterns to calculate the number of green tiles and the number of purple tiles?

3. Describe *vertical* numeric patterns for the green tiles and for the purple tiles in the table. How can you use these patterns to calculate the number of green tiles and the number of purple tiles?

4. Write down a calculation plan (rule) to calculate the number of green tiles instead of counting them. How many green tiles are there in a Size 50 pattern?

5. Write down a calculation plan (rule) to calculate the number of purple tiles. How many purple tiles are there in a Size 50 pattern?
6. This growing pattern of light blue, dark blue and white tiles is used for a large supermarket floor.

![Patterns of tiles](image)

Size 1    Size 2    Size 3    Size 4

Complete the table.

Describe your method, and describe the patterns that you see in the table.

<table>
<thead>
<tr>
<th>Size</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>10</th>
<th>30</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of light blue tiles</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. of dark blue tiles</td>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

7. Make your own growing geometric pattern with squares, ask your own questions, and then answer your questions.
### Numeric Patterns

#### 4.1 Finding input and output numbers

A candle manufacturer claims that their new candles burn for at least 16 hours.

To test the claim, a Grade 6 Natural Sciences class did an experiment: they lit four different candles and measured their lengths every hour for four hours and then stopped. Here are their results:

**Candle A**

<table>
<thead>
<tr>
<th>Time (hours)</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length (cm)</td>
<td>36</td>
<td>34</td>
<td>32</td>
<td>30</td>
<td>28</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Candle B**

<table>
<thead>
<tr>
<th>Time (hours)</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length (cm)</td>
<td>16</td>
<td>15</td>
<td>14</td>
<td>13</td>
<td>12</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Candle C**

<table>
<thead>
<tr>
<th>Time (hours)</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length (cm)</td>
<td>12</td>
<td>11.5</td>
<td>11</td>
<td>10.5</td>
<td>10</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Candle D**

<table>
<thead>
<tr>
<th>Time (hours)</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length (cm)</td>
<td>44</td>
<td>42</td>
<td>40</td>
<td>38</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
1. The class did not continue after 4 hours. But if they did, can you say how long each candle was after 5 hours and after 10 hours? (Complete the tables.)
   Explain and discuss your methods.

2. The class forgot to fill in the length of Candle D before they lit it. How long was it?

3. Which calculation plan (rule or formula) belongs with which table? How do you know?
   Rule 1: \( \text{Length} = 46 - 2 \times \text{Time} \)
   Rule 2: \( \text{Length} = 16 - \text{Time} \)
   Rule 3: \( \text{Length} = 12 - 0,5 \times \text{Time} \)
   Rule 4: \( \text{Length} = 36 - 2 \times \text{Time} \)

4. Use the rules in question 3 to calculate how long each of the candles will be after 12 hours and after 15 hours.

5. (a) After how many hours will Candle A be 10 cm long? Explain your method.
   (b) After how many hours will each of the other candles be 10 cm long?

6. (a) Is the manufacturer's claim that all the candles will burn for more than 16 hours true? How do you know?
   (b) How many hours will Candle A burn before it is burnt out?
   (c) How many hours will each of the other candles last?
   (d) Which candle will burn the longest? How long? Explain!

7. The manufacturer's newest “monster candle” is 48 cm long and burns at 3 cm per hour. Complete this table of the candle’s length over time. How many hours will it burn before it is burnt out?

<table>
<thead>
<tr>
<th>Time (hours)</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>10</th>
<th>15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length (cm)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

26
4.2 Using patterns to solve problems

1. Mario sells small doughnuts at a stall in a shopping mall. He does not want to do calculations every time he sells some doughnuts. So he started to prepare the following table:

<table>
<thead>
<tr>
<th>Number of doughnuts</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total cost (in cents)</td>
<td>25</td>
<td>50</td>
<td>75</td>
<td>100</td>
<td>125</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(a) Complete Mario’s table.
(b) How much will 25 doughnuts cost?
(c) Describe your rule for calculating the cost of any number of doughnuts.
(d) How do you know that your rule is correct?
(e) A customer pays Mario R5,50. How many doughnuts does she buy?

2. The Natural Sciences class measured the growth of a seedling over a two-week period. They recorded the following information:

<table>
<thead>
<tr>
<th>Day number</th>
<th>0</th>
<th>2</th>
<th>4</th>
<th>6</th>
<th>8</th>
<th>10</th>
<th>12</th>
<th>14</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height (mm)</td>
<td>0</td>
<td>3</td>
<td>6</td>
<td>9</td>
<td>12</td>
<td>15</td>
<td>18</td>
<td>21</td>
</tr>
</tbody>
</table>

(a) What was the daily growth of the seedling?
(b) When was the seedling 10,5 mm high?
(c) What was the height of the seedling after 11 days?
(d) Explain how the age and the height of the seedling are related.
(e) If the seedling continues to grow at the same rate, when will it be 60 mm high?
(f) Do you think the seedling will continue to grow at this rate? Explain your answer.
4.3 From tables to rules

The whole numbers are arranged in columns like this.

<table>
<thead>
<tr>
<th>Column 1</th>
<th>Column 2</th>
<th>Column 3</th>
<th>Column 4</th>
<th>Column 5</th>
<th>Column 6</th>
<th>Column 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>↓</td>
<td>↓</td>
<td>↓</td>
<td>↓</td>
<td>↓</td>
<td>↓</td>
<td>↓</td>
</tr>
<tr>
<td>Row 1</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Row 2</td>
<td>8</td>
<td>9</td>
<td>10</td>
<td>11</td>
<td>12</td>
<td>13</td>
</tr>
<tr>
<td>Row 3</td>
<td>15</td>
<td>16</td>
<td>17</td>
<td>18</td>
<td>19</td>
<td>20</td>
</tr>
<tr>
<td>Row 4</td>
<td>22</td>
<td>23</td>
<td>24</td>
<td>25</td>
<td>26</td>
<td>27</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Discuss what patterns you see in the grid.

2. If the grid is continued downwards, what will Row 100 look like? Write it down.

3. In which Row and which Column is 256?

4. What are the calculation plans (rules) for Column 7 and Column 6? In other words, what rule will give these input and output values in these flow diagrams?

<table>
<thead>
<tr>
<th>Row no.</th>
<th>Sequence no.</th>
<th>Row no.</th>
<th>Sequence no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>7</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>2</td>
<td>14</td>
<td>2</td>
<td>13</td>
</tr>
<tr>
<td>3</td>
<td>21</td>
<td>3</td>
<td>20</td>
</tr>
<tr>
<td>4</td>
<td>28</td>
<td>4</td>
<td>27</td>
</tr>
<tr>
<td>100</td>
<td>?</td>
<td>100</td>
<td>?</td>
</tr>
</tbody>
</table>

5. Write down rules for each of Columns 1 to 7.
6. Now study this arrangement of numbers.

<table>
<thead>
<tr>
<th>Row</th>
<th>Column 1</th>
<th>Column 2</th>
<th>Column 3</th>
<th>Column 4</th>
<th>Column 5</th>
<th>Column 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>2</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>10</td>
<td>11</td>
<td>12</td>
</tr>
<tr>
<td>3</td>
<td>13</td>
<td>14</td>
<td>15</td>
<td>16</td>
<td>17</td>
<td>18</td>
</tr>
<tr>
<td>4</td>
<td>19</td>
<td>20</td>
<td>21</td>
<td>22</td>
<td>23</td>
<td>24</td>
</tr>
</tbody>
</table>

(a) Discuss what patterns you see in the grid.

(b) If the grid is continued downwards, what will Row 100 look like? Write it down.

(c) In which Row and which Column is 256?

(d) What are the calculation plans (rules) for Column 1 and Column 3? In other words, what rule will give these input and output values in these flow diagrams?

7. Write down rules for each of Columns 1 to 6.
4.4 Adding sequences

What happens if we add the numbers in two sequences?

We will start by adding the 1st numbers in each of the two sequences, then the 2nd numbers, then the 3rd numbers and so on. The answers will give us a new sequence, with a new pattern. Here is an example:

Sequence 1: 2, 4, 6, 8, 10, ...
Sequence 2: 3, 6, 9, 12, 15, ...
Sequence 1 + Sequence 2: 5, 10, 15, 20, 25, ...

1. It seems from the example above that if we add multiples of 2 and multiples of 3, the result is multiples of 5. Do you agree?

2. Investigate what happens if you add these sequences. In each case, continue the new sequence for another five numbers, and then calculate the 20th and 100th number in the new sequence.

   (a) Sequence 1: 2, 4, 6, 8, 10, ...
       Sequence 2: 4, 8, 12, 16, 20, ...

   (b) Sequence 1: 3, 6, 9, 12, 15, ...
       Sequence 2: 4, 8, 12, 16, 20, ...

   (c) Sequence 1: 2, 4, 6, 8, 10, ...
       Sequence 2: 5, 10, 15, 20, 25, ...

   (d) Sequence 1: 4, 7, 10, 13, 16, ...
       Sequence 2: 6, 11, 16, 21, 26, ...

3. Calculate the 20th and 100th number in the new sequence if you
   (a) add the sequences of multiples of 3 and multiples of 8.
   (b) add the sequences of multiples of 4 and multiples of 7.
4.5 Multiplying sequences

Investigate what happens if we multiply the numbers in two sequences. Here is an example:

Sequence 1:  2,  4,  6,  8, ...
Sequence 2:  3,  6,  9, 12, ...
Sequence 1 × Sequence 2:  6,  24,  54,  96, ...

1. In each case below, form a new sequence by multiplying the two sequences. Then continue the new sequence for another five numbers and calculate the 20th and 100th number in the new sequence.

(a) Sequence 1:  2,  4,  6,  8, 10, ...
   Sequence 2:  2,  4,  6,  8, 10, ...

(b) Sequence 1:  1,  2,  3,  4,  5, ...
   Sequence 2:  2,  4,  6,  8, 10, ...

(c) Sequence 1:  2,  4,  6,  8, 10, ...
   Sequence 2:  3,  6,  9, 12, 15, ...

(d) Sequence 1:  2,  4,  6,  8, 10, ...
   Sequence 2:  4,  8, 12, 16, 20, ...

(e) Sequence 1:  3,  6,  9, 12, 15, ...
   Sequence 2:  4,  8, 12, 16, 20, ...

2. Calculate the 20th and 100th number in the new sequence if you
   (a) multiply the sequences of multiples of 2 and multiples of 5.
   (b) multiply the sequences of multiples of 4 and multiples of 5.
5 **NUMBER SENTENCES**

### 5.1 Statements of equivalence

<table>
<thead>
<tr>
<th>10 × 10 − 5 × 5</th>
<th>(10 + 5) × (10 − 5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 100 − 25</td>
<td>= 15 × 5</td>
</tr>
<tr>
<td>= 75</td>
<td>= 75</td>
</tr>
</tbody>
</table>

Two different sets of calculations with 10 and 5 produce the same result. We can say:
The calculations 10 × 10 − 5 × 5 and (10 + 5) × (10 − 5) are **equivalent**.

1. (a) Calculate 20 × 20 − 10 × 10 and (20 + 10) × (20 − 10).
   (b) Calculate 8 × 8 − 3 × 3 and (8 + 3) × (8 − 3).
   (c) Calculate 5 × 5 − 2 × 2 and (5 + 2) × (5 − 2).

2. Suppose you have to find out how much 18 × 18 − 12 × 12 and 53 × 53 − 47 × 47 and 505 × 505 − 495 × 495 are.
   (a) Do you think 30 × 6 will produce the right answer for 18 × 18 − 12 × 12? Investigate.
   (b) Find out how much 53 × 53 − 47 × 47 and 505 × 505 − 495 × 495 are. Use a calculator and check your answers.
   (c) Do you think that 2 × 69 570 will give the answer for 34 786 × 34 786 − 34 784 × 34 784. Explain your thinking.

3. Which of these number sentences are true, and which are false?
   (a) 3 × 5 + 3 × 7 = 3 × 12
   (b) 3 × 5 + 3 × 7 = 6 × 12

4. Michael firmly believes the following:
   4 × 6 + 4 × 9 = 8 × 15
   3 × 5 + 3 × 7 = 6 × 12
   (a) What do you think Michael will believe about 6 × 4 + 6 × 8 and 10 × 5 + 10 × 7?
   (b) Write a letter to Michael. Explain to him why what he believes about addition and multiplication is wrong.
5.2 Substitution, trial and improvement

Suppose we want to find out what number will make this number sentence true: \(5 \times \text{the number} + 4 = 64 - 3 \times \text{the number}\)

The number in the left-hand part of the number sentence must be \(\text{the same}\) as the number in the right-hand part of the number sentence.

We can try the number \(10\):

\[
5 \times 10 + 4 = 50 + 4 = 54 \quad \text{and} \quad 64 - 3 \times 10 = 64 - 30 = 34,
\]

so the number is not 10.

If the number is \(10\),

\(5 \times \text{the number} + 4\) is \(20\) \(\text{bigger}\) than \(64 - 3 \times \text{the number}\).

We can try the number \(20\):

\[
5 \times 20 + 4 = 100 + 4 = 104 \quad \text{and} \quad 64 - 3 \times 20 = 64 - 60 = 4,
\]

so the number is not 20.

If the number is \(20\),

\(5 \times \text{the number} + 4\) is \(100\) \(\text{bigger}\) than \(64 - 3 \times \text{the number}\).

We can try a number smaller than 10. Let’s try the number \(5\):

\[
5 \times 5 + 4 = 25 + 4 = 29 \quad \text{and} \quad 64 - 3 \times 5 = 64 - 15 = 49,
\]

so the number is not 5.

Now \(5 \times \text{the number} + 4\) is \(\text{smaller}\) than \(64 - 3 \times \text{the number}\).

We can summarise the work that we did in a table:

<table>
<thead>
<tr>
<th>Trial number</th>
<th>10</th>
<th>20</th>
<th>5</th>
<th>\ldots</th>
<th>\ldots</th>
<th>\ldots</th>
<th>\ldots</th>
</tr>
</thead>
<tbody>
<tr>
<td>(5 \times \text{the number} + 4)</td>
<td>54</td>
<td>104</td>
<td>29</td>
<td>\ldots</td>
<td>\ldots</td>
<td>\ldots</td>
<td>\ldots</td>
</tr>
<tr>
<td>(64 - 3 \times \text{the number})</td>
<td>34</td>
<td>4</td>
<td>49</td>
<td>\ldots</td>
<td>\ldots</td>
<td>\ldots</td>
<td>\ldots</td>
</tr>
<tr>
<td>Difference</td>
<td>20</td>
<td>100</td>
<td>(-20)</td>
<td>\ldots</td>
<td>\ldots</td>
<td>\ldots</td>
<td>\ldots</td>
</tr>
</tbody>
</table>

1. Try the number 6 in \(5 \times \text{the number} + 4\) and in \(64 - 3 \times \text{the number}\). If the results still differ, try some other numbers until you know for which number the two calculation plans give the same result.
2. Find the numbers that make the number sentences true.
(a) \(15 \times \square - 11 = 11 \times \square + 1\)
(b) \(100 - 5 \times \square = 3 \times \square - 28\)
(c) \(10 \times \square + 1500 = 20 \times \square + 1250\)

3. (a) Write five numbers for which
\(10 \times \square + 1500\) is bigger than \(20 \times \square + 1250\).
(b) Write five numbers for which
\(10 \times \square + 1500\) is smaller than \(20 \times \square + 1250\).

4. Find the numbers that make the number sentences true.
(a) \(10 \times \square + 1500 = 20 \times \square - 2000\)
(b) \(20 \times (\square - 100) = 10 \times (\square + 150)\)

5. Explain why the number sentences \(10 \times \square + 1500 = 20 \times \square - 2000\)
and \(20 \times (\square - 100) = 10 \times (\square + 150)\) are true for the same number.

6. Find the numbers that make the sentences true.
(a) \(10 \times \square + 1500 = 20 \times \square + 1470\)
(b) \(10 \times \square + 1500 = 20 \times \square - 6500\)
(c) \(10 \times \square + 1500 = 20 \times \square + 300\)
(d) \(10 \times \square + 1500 = 20 \times (\square + 15)\)
(e) \(10 \times (\square + 150) = 20 \times \square + 300\)

7. (a) Try to find the number that makes this sentence true:
\(10 \times (\square + 150) = 10 \times \square + 1500\)
(b) Compare your experience with some classmates.
Try to find an explanation for what you experienced.

8. (a) Try to find the number that makes this sentence true:
\(10 \times (\square + 150) = 10 \times \square + 150\)
(b) Compare your experience with some classmates.
Try to find an explanation for what you experienced.
5.3 Use number sentences when needed

The production rate at a brick factory is 128 000 bricks per day. On September 1, there is a stock of 2,4 million bricks at the factory.

1. If no bricks are sold, how many bricks will be in stock on September 10?

2. How many bricks will be in stock on September 16?

3. On which day in September will the stock level reach 6,24 million?

4. Which of the following are correct plans to calculate the stock level at the factory, □ days after September 1?

   Plan A: 2,4 × □ + 128 000
   Plan B: 128 000 × □ + 2,4
   Plan C: 128 000 × □ + 2 400 000
   Plan D: 0,128 × □ + 2,4
   Plan E: 2,4 × □ + 6,24
   Plan F: 128 × □ + 2 400

5. Which of these number sentences show the situation in question 3?

   Number sentence A: 128 000 × □ + 2,4 = 6,24
   Number sentence B: 0,128 × □ + 2,4 = 6,24
   Number sentence C: 2,4 × □ + 128 000 = 6,24
   Number sentence D: 128 000 × □ + 2 400 000 = 6 240 000

6. (a) Copy and complete the table below to show the stock levels at the brick factory on different days in September.

<table>
<thead>
<tr>
<th>Day of September</th>
<th>1</th>
<th>7</th>
<th>14</th>
<th>21</th>
<th>28</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stock level</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(b) On what day in September will the stock level pass the 2 million mark? On what day will it pass the 4 million mark?

(c) On what day will the stock level be 5,344 million?
A large truck is used to deliver cement and roof sheets to building sites. The mass of the empty truck is 2 360 kg.

7. Pockets of cement with a mass of 90 kg each are loaded onto the truck.
   (a) What is the total mass of the truck with the load, if 144 pockets of cement are loaded?
   (b) How can the total mass of the truck with the load be calculated, for any number of pockets of cement?
   (c) If the total mass of the truck and the load is 12 710 kg, how many pockets of cement are loaded?
   (d) How many pockets of cement are loaded if the total mass of the truck and load is 8 480 kg?

8. The same truck is used to transport roof sheets that weigh 50 kg each.
   (a) What is the total mass of the truck with the load, if 76 roof sheets are loaded?
   (b) What is the total mass of the truck with the load, if 42 roof sheets and 65 pockets of cement are loaded?
   (c) The total mass of the truck with a load of 60 roof sheets and some pockets of cement is 9 680 kg. How many pockets of cement are loaded?
   (d) The total mass of the truck with a load of roof sheets and pockets of cement is 11 940 kg. How many pockets of cement and how many roof sheets are loaded? This is not meant to be an easy question. You will have to do some trial and improvement. If you feel like giving up, it may help to do the following questions first.
   (e) Calculate $9 580 - 90 \times \square$ for different values of $\square$ (in other words, different numbers in the place of the $\square$) until you find a value of $\square$ for which $9 580 - 90 \times \square$ is a multiple of 50.
   (f) The total mass of the truck with a load of roof sheets and pockets of cement is 12 940 kg. How many pockets of cement and how many roof sheets are loaded?