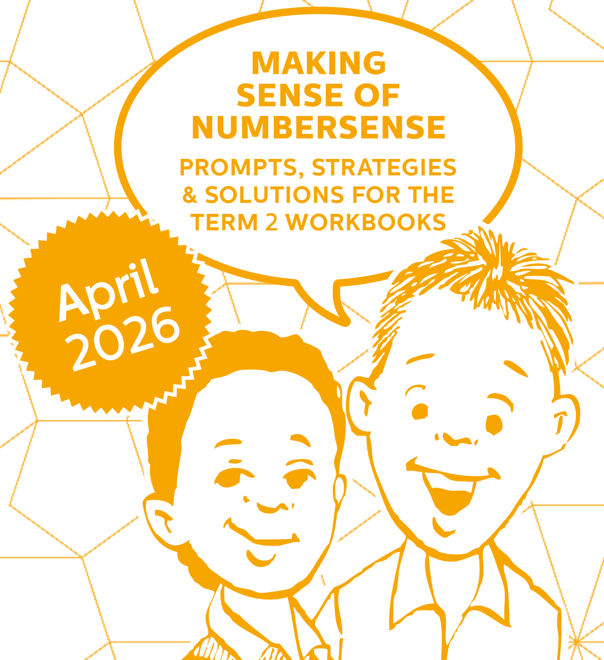
22 NumberSense

PROMPTS, STRATEGIES & SOLUTIONS

English

Teacher's Guide



1. A truck used to transport bags of wheat weighs 4 500 kg. A bag of wheat weighs 50 kg.

a. Complete the tables to help you calculate how much the different loads of wheat weigh.

No. of bags of wheat	1	2	3	4	5	6	7	8	9
Weight (kg)	50	100	150	200	250	300	350	400	450

No. of bags of wheat	10	20	30	40	50	60	70	80	90
Weight (kg)	500	1 000	1 500	2 000	2 500	3 000	3 500	4 000	4 500

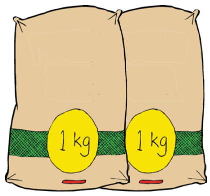
b. How much will the truck weigh if it is loaded with 48 bags?

4 500 + 2 400 = 6 900 kg

40 + 8 ⟶ 48 bags

2 000 + 400 ⟶ 2 400 kg

48 × 50
= 2 000 + 400
= 2 400 kg



? How did you complete this table?

I used the tables above to help me know how much the bags will weigh. Then I added 4 500 kg (the weight of the truck).

c. Complete the table.

No. of bags of wheat	20	35	42	54	65	72	82	90	100
Truck + bags (kg)	5 500	6 250	6 600	7 200	7 750	8 100	8 600	9 000	9 500

A flow diagram can be used to calculate how much the truck and load will weigh.

a. Complete the flow diagram.

No. of bags of wheat ⟶ × 50 ⟶ + 4 500 ⟶ Truck and load (kg)

b. Complete to calculate how much the truck and load will weigh.

10 ⟶ × 50 ⟶ + 4500 ⟶ 5 000
15 ⟶ × 50 ⟶ + 4500 ⟶ 5 150
25 ⟶ × 50 ⟶ + 4500 ⟶ 5 550
30 ⟶ × 50 ⟶ + 4500 ⟶ 6 000
51 ⟶ × 50 ⟶ + 4500 ⟶ 6 750

? Explain how you determined these.

c. How many bags of wheat are there on the truck if the truck and load weigh:

- 5 000 kg? − 4 500 ⟶ 500 ⟶ 10 bags
- 4 750 kg? − 4 500 ⟶ 250 ⟶ 5 bags
- 5 300 kg? − 4 500 ⟶ 800 ⟶ 16 bags

d. Describe how you calculated the answers to c.

(− 4 500 ÷ 50)

1. Write as hundredths.

a. $\frac{1}{2} = \frac{50}{100}$

b. $\frac{1}{10} = \frac{10}{100}$

c. $\frac{2}{10} = \frac{20}{100}$

d. $\frac{9}{10} = \frac{90}{100}$

e. $\frac{1}{4} = \frac{}{100}$

f. $\frac{1}{20} = \frac{}{100}$

g. $0,5 = \frac{}{100}$

h. $0,3 = \frac{}{100}$

i. $0,03 = \frac{3}{100}$

j. $0,45 = \frac{45}{100}$

k. $0,06 = \frac{6}{100}$

l. $\frac{1}{25} = \frac{4}{100}$

So far we have worked with two kinds of fractions.

Fractions of the form $\frac{1}{2}$; $\frac{4}{10}$ and $\frac{2}{5}$ are called *common fractions*.

Fractions of the form 0,2 and 0,25 and 0,70 are called *decimal fractions*.

Decimal fractions are very useful when working with money, for example R7,25 and measurement, for example 12,50 km.

Percentages are another form of fraction. They represent a part of a whole written in hundreds. For example:

$\frac{2}{5} = \frac{4}{10} = \frac{40}{100} = 40\%$

$\frac{3}{20} = \frac{15}{100} = 15\%$

2. Write as a percentage. ? *How do you write common fractions as percentages?*

I change them to hundredths because percentages are a part of a whole written in hundredths.

a. $\frac{56}{100} = 56\%$

b. $\frac{5}{100} = 5\%$

c. $\frac{5}{10} = \frac{50}{100} = 50\%$

d. $\frac{1}{4} = \frac{25}{100} = 25\%$

e. $\frac{1}{20} =$

f. $\frac{60}{100} =$

g. $\frac{6}{100} =$

h. $\frac{6}{10} =$

i. $\frac{3}{5} = \frac{60}{100} = 60\%$

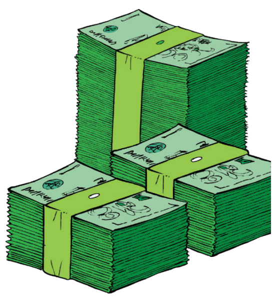
j. $\frac{1}{25} = \frac{4}{100} = 4\%$

k. $\frac{3}{4} = \frac{75}{100} = 75\%$

l. $\frac{35}{50} = \frac{70}{100} = 70\%$

3. On a certain day the exchange rates are:

US$1	R18
€1	R20
£1	R24
NZ$1	R11



What are the following amounts in Rand?

a. US$80 000 = R ____________

b. €100 000 = R ____________

c. £100 000 = R ____________

d. NZ$250 000 = R ____________

Things to think about

This is the first introduction to percentages. Children will have the opportunity to practise what they learn on this page in upcoming pages. Take the time to read through and discuss the information in the box.

<u>What we want children to notice:</u>

- That percenatges are another form of fraction
- That percentage represents a part of a whole written in hundredths.

<u>Reflection questions:</u>

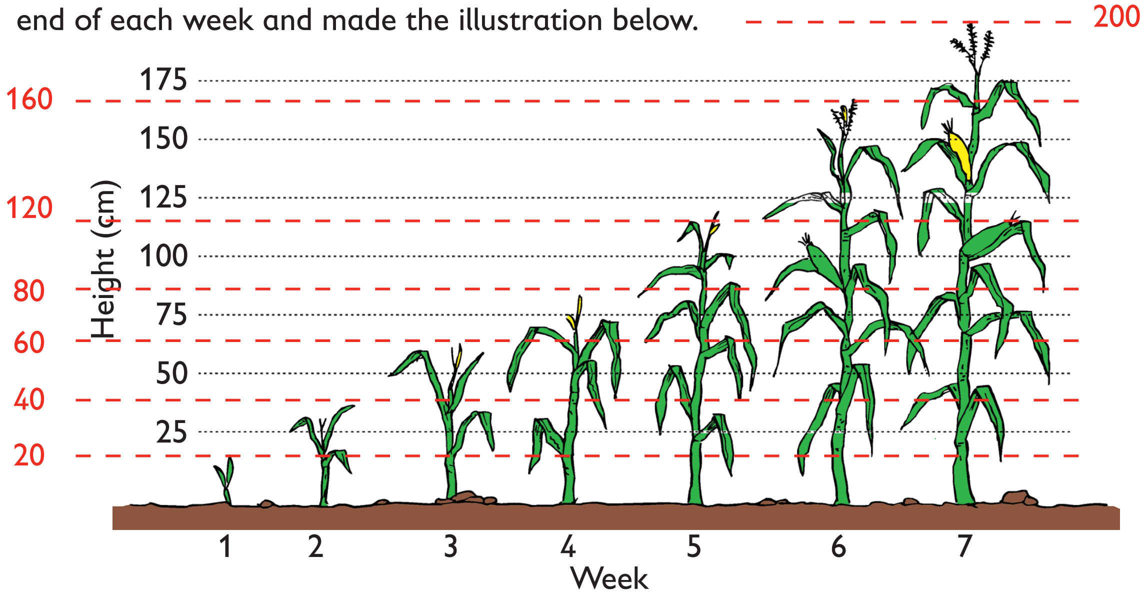
? What does it mean to get 100% for a test?

? Does it mean that the test must count 100 marks? Explain.

? What if the test has a total of 20 marks? How many marks must you receive to get 50%? And 80%?

? Could you write a decimal, for example 0,3, as a percenatge? Explain.

Andy planted a mealie seed for a science project. He took a picture of the plant at the end of each week and made the illustration below.



1. Estimate, as carefully as you can, the height of the plant at the end of each week and complete the table. ? *How did you decide on which values to use from the graph?*

End of the week	1	2	3	4	5	6	7
Height (cm)	20	40	60	80	120	160	200

2. By how much did the plant grow during each week?

   a. Week 1: 20 cm
   b. Week 2: 20 cm
   c. Week 3: 20 cm
   d. Week 4: 20 cm
   e. Week 5: 40 cm
   f. Week 6: 40 cm
   g. Week 7: 40 cm

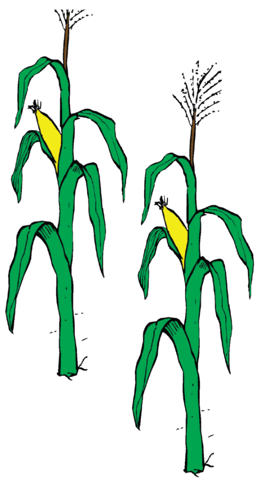
I noticed that the intervals for weeks 1 – 4 were similar in size so I made those 20 cm. I doubled that because the intervals of weeks 5, 6 and 7 were about double the size of weeks 1, 2, 3 and 4.

3. During which week did the plant grow the most?
   Weeks 5 – 7

4. During which week did the plant grow the least?
   Weeks 1 – 4

5. Estimate, as well as you can, when the plant was:

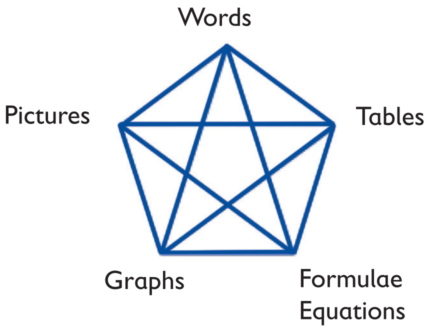
   a. 50 cm $2\frac{1}{2}$ weeks
   b. 100 cm $4\frac{1}{2}$ weeks
   c. 150 cm $5\frac{3}{4}$ weeks



Make it clear to the children that these are estimates. Although they are 'guessing', their guesses should be made with good reason.

Things to think about

Patterns can be represented in different ways. Up to now the children have experienced the same pattern being represented as pictures, tables, words and equations. This is the first time in the NumberSense Programme that children are introduced to a pattern also being represented as a graph.



Different possible representations of mathematical relationships

Exploring and describing the interrelationships between these representations is crucial to developing a deep understanding of patterns and relationships. The different representations complement each other, providing a more comprehensive understanding of the patterns and relationships being investigated.

Pictures show the situation that gives rise to the pattern, while words are needed to describe it. Tables record specific instances of the pattern/relationship that are not visible in the pictures or words. Formulae summarise the relationship in a way that enables the making of predictions of an outcome under certain conditions (using a formula) and the conditions that are needed for desired outcomes (solving equations). Graphs make the relationship(s) between the variables visible in ways that the pictures, words, tables, and formulae cannot.
By using these different representations in their study of patterns and relationships, children develop a more robust understanding of the relationship(s) between the variables in patterns and relationships.

Read through the given information with the class. It re-visits convention 1, introduced on p.7, but also introduces convention 2. These conventions work together to complete the order of operations for any expression.

On page 7 we introduced the order of operations convention for addition and multiplication. Of course we also subtract and divide and so we need to expand the convention to include these operations.

The order of operations convention can be summarised as:

- First perform the operation inside the brackets.
  Example: 12 ÷ (2 + 1) = 12 ÷ 3
- Then multiply and divide as the operations appear from left to right.
- Then add and subtract as the operations appear from left to right.

Examples:	(4 + 4) × 3 ÷ 2 − 5	14 − 4 × 5 ÷ 2 + 6
	= 8 × 3 ÷ 2 − 5	= 14 − 20 ÷ 2 + 6
	= 24 ÷ 2 − 5	= 14 − 10 + 6
	= 12 − 5	= 4 + 6
	= 7	= 10

1. Use the order of operations convention to calculate the value of each expression. The correct answers are at the bottom of the page.

   a. 8 ÷ 2 + 4 = _____
   b. 3 × 4 ÷ 2 = _____
   c. (6 + 3) ÷ 3 = _____
   d. 8 − 3 × 4 ÷ 2 = ____
   e. 24 ÷ (2 + 4) = _____
   f. 20 − 16 + 2 = _____
   g. 23 − (2 + 7) × 2 = _____
   h. 6 × 5 − 24 ÷ 3 = _____

2. Use the order of operations convention to calculate the value of each expression.

   a. 28 − 21 ÷ 3 = _____
   b. 60 ÷ 5 − 5 = _____
   c. (16 + 12) ÷ 2 = _____
   d. 4 + 6 × 3 ÷ 2 – 5 = _____
   e. 6 × 6 − 5 × 4 = _____
   f. 48 ÷ (4 + 2) = _____
   g. 5 + 5 × 6 ÷ 2 + 5 =____
   h. 18 ÷ 3 + 24 ÷ 2 = ____
   i. 9 ÷ 3 + 5 = ____
   j. (5 + 2) × 6 − 4 = _____
   k. 63 ÷ 9 × 4 = _____
   l. 28 ÷ (5 + 2) = _____
   m. 5 + 6 × 7 = _____
   n. 9 + 6 × (8 − 5) = _____
   o. 12 × 3 + 45 ÷ 9 = ____

Answers to question 1.

a. 8 b. 6 c. 3 d. 2 e. 4 f. 6 g. 5 h. 22

Parallel problem

Give the child a number of expressions without brackets. Task them with placing brackets in the correct places to make their calculating easier.

For example:

Expressions without brackets	Child's response
$4 + 2 \times 3$	$4 + (2 \times 3)$
$14 - 4 \times 3 \div 2 + 5$	$14 - (4 \times 3 \div 2) + 5$
$20 \div 4 + 12$	$(20 \div 4) + 12$

?What do you notice?

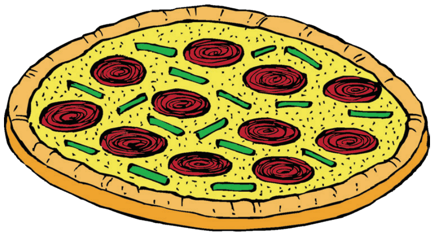
Multiplication must be done first. That means I will put the brackets around (2 × 3) to show that it must be done first.

Scaffolding Idea

Refer to Workbook 21 p.6; 29 to support children who are struggling with this.

Did you:
- ☐ draw a picture?
- ☐ make a list?
- ☐ use words?
- ☐ use an equation?

1. Large pizzas are cut into 24 slices and sold in three sizes:



- a Bite (a single slice)
- a Big Bite ($\frac{1}{6}$ of the whole pizza)
- a Super Bite ($\frac{1}{4}$ of the whole pizza).

a. What fraction of the whole pizza is a Bite?
$\frac{1}{24}$

b. Which size is the smallest? Which is the biggest? Explain.
Bite is the smallest (1 slice of 24) ; Super Bite is the biggest (6 slices)

c. Why do you think the pizzas are cut into 24 slices?
4 and 6 are factors of 24

d. Nadia buys two Big Bites. What fraction of the whole pizza does she buy? Explain.
$\frac{1}{6}$ of 24 = 4 slices $\quad \frac{2}{6}$ of 24 = 8 slices $\quad \frac{8}{24}$ of pizza

e. Jerome buys one Big Bite and one Super Bite. What fraction of the whole pizza does he buy? Explain. $\frac{1}{6} + \frac{1}{4} = \frac{4}{24} + \frac{6}{24} = \frac{10}{24}$

f. What combinations of the three sizes will give half of a whole pizza? Do you have them all?

2. Use the order of operations convention to calculate the value of each expression.

a. $4 \times (5 + 4) \div 3 =$ 12

b. $24 - 8 \div 4 =$ 22

c. $16 + 12 \div 2 =$ 22

d. $3 \times 13 - 4 \div 4 =$

e. $8 + 35 \div 7 \times 5 - 4 =$

f. $(6 + 24) \div 2 =$

Workbook 22 pp.7 and 25.

3. Add brackets to the equation to make it correct.

$4 \times (6 + 2) + (3 \times 6) = 50$

4. Bulelane makes bags of mixed raisins and peanuts. For every 300 g of raisins in the mixture he adds 700 g of peanuts. He wants to make a 5 kg bag of mixed peanuts and raisins. How many grams of raisins and how many grams of peanuts should he use?

What we want children to notice:

Be sensitive to the fact that children might have responded differently to these questions. Create space and opportunity to share their solutions with the group. Be clear in your mind-about which strategies will benefit/support your lesson.

(f.) Some combinations could include:

- 1 whole pizza = 24 slices
- Half a pizza = 12 slices

2 x Super Bite
= 2 x 6 slices
= 12 slices

2 x Big Bite + 2 x Bite
= 2 x 4 slices + 2 slices
= 8 slices + 2 slices
= 12 slices

12 x Bite
= 12 slices

4 x Bite + 2 x Big Bite
= 4 slices + 2 x 4 slices
= 12 slices

3 x Big Bite
= 3 x 4 slices
= 12 slice

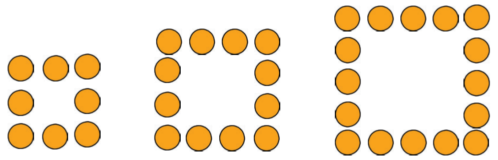
2 Bite + 1 Big Bite + 1 Super Bite
= 2 slices + 4 slices + 6 slices
= 12 slices

? Are there more ways to buy half a pizza?

The focus of this lesson should be on how the children make sense of Liam, Rebecca and Devon's approaches.

Thabo makes pictures with dots like this. The first 3 pictures make a pattern.

Workbook 23 p.29

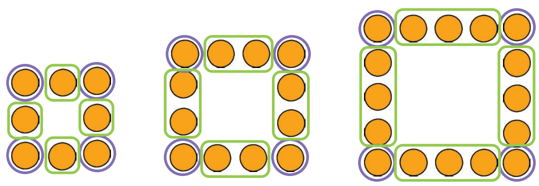


1. Draw the fourth and fifth picture in the pattern.

2. The class are working out how many dots are needed for picture 10. Each child's approach is shown next to the patterns of pictures. In each case:
   - Use the child's approach to calculate the number of dots needed for picture 10.
   - Use the pattern of pictures to explain how the child developed their approach.

a. Liam's approach corners

Pic. 1 : 4 × 1 + 4 = 8
Pic. 2 : 4 × 2 + 4 = 12
Pic. 3 : 4 × 3 + 4 = 16
Pic. 10 : 4 × 10 + 4 = 44



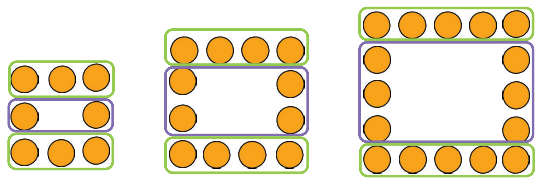
Explanation:

There are 4 sides. Each picture increases the 4 sides by 1. The 4 corners are then added.

I noticed that the number of dots of the 4 sides (excluding the corners) is the same as the picture number.

b. Rebecca's approach

Pic. 1 : 2 × 3 + 2 × 1 = 8
Pic. 2 : 2 × 4 + 2 × 2 = 12
Pic. 3 : 2 × 5 + 2 × 3 = 16
Pic. 10 : 2 × 12 + 2 × 10 = 44

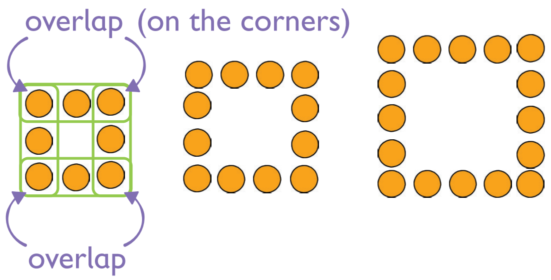


Explanation:

The top (and bottom) rows are always 2 more than the picture number. The dots in the middle are 2 groups of the picture number.

c. Devon's approach

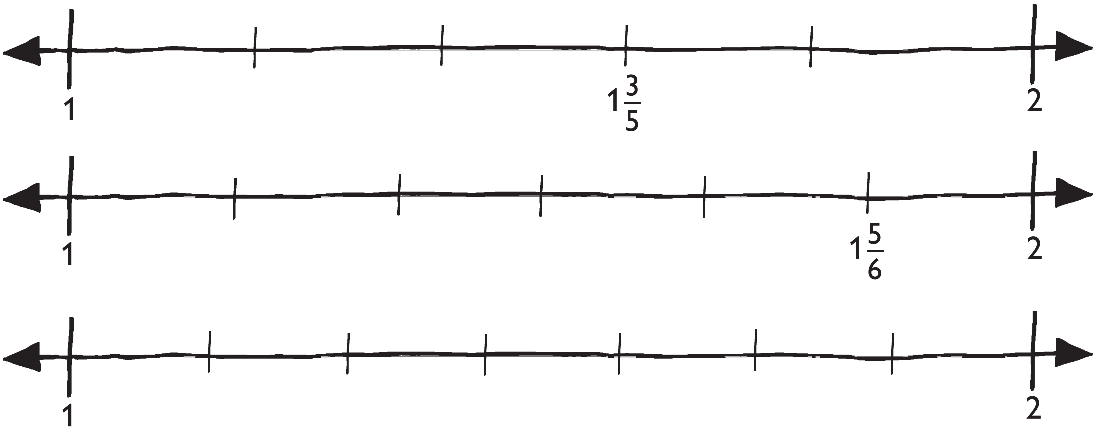
Pic. 1 : 4 × 3 – 4 = 8
Pic. 2 : 4 × 4 – 4 = 12
Pic. 3 : 4 × 5 – 4 = 16
Pic. 10 : 4 × 12 – 4 = 44



Explanation:

The sides of the square have two more than the number of dots as the picture number. The corners overlap and the extra dots must be subtracted.

1. Complete.



Use the number lines to help you decide which is bigger:

a. $1\frac{1}{5}$ or $1\frac{1}{7}$?

b. $1\frac{2}{6}$ or $1\frac{2}{5}$?

c. $1\frac{2}{5}$ or $1\frac{4}{7}$?

d. $1\frac{3}{5}$ or $1\frac{4}{6}$?

e. $1\frac{5}{7}$ or $1\frac{4}{6}$?

f. $1\frac{3}{5}$ or $1\frac{4}{7}$?

? *Why can we use the number lines to help us here?*

2. Mrs Black uses $\frac{5}{8}$ m of material to make one small table cloth. How many tablecloths can she make from 20 m of material?

Did you:
- ☐ draw a picture?
- ☐ count?
- ☐ guess and check?
- ☐ write an equation?

3. Complete.

$\frac{2}{5}$ → $+\frac{4}{5}$ → $1\frac{1}{5}$ → $+\frac{3}{5}$ → $1\frac{4}{5}$ → $+\frac{1}{5}$ → 2 → $-\frac{4}{7}$ → $1\frac{3}{7}$ → $-\frac{4}{7}$ → $\frac{6}{7}$

$\frac{6}{7}$ → $+\frac{2}{7}$ → $+1\frac{1}{7}$ → $+1\frac{1}{7}$ → $2\frac{2}{7}$ → $+\frac{3}{7}$ → $2\frac{5}{7}$ → $+\frac{2}{7}$ → 3 → $-1\frac{1}{8}$ → $1\frac{7}{8}$ → $+\frac{4}{8}$ → $2\frac{3}{8}$

? *Explain how you calculated this.*

$2\frac{3}{8}$ → $+\frac{5}{8}$ → 3

? *Explain how you calculated this.*

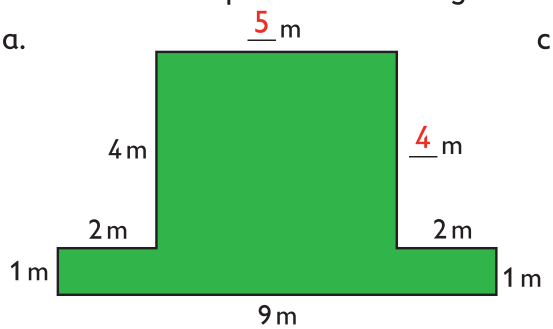
3 → $-\frac{7}{20}$ → $2\frac{13}{20}$ → $-\frac{7}{20}$ → $2\frac{6}{20}$ → $-\frac{7}{20}$ → $1\frac{1}{20}$ → $-\frac{14}{20}$ → $\frac{7}{20}$ → $+\frac{13}{20}$ → 1

? *Explain how you calculated this.*

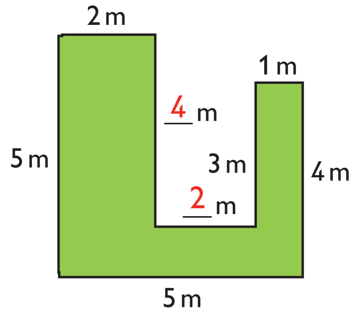
The perimeter of a shape is the distance around the outside of the shape.

1. The sketches show the dimensions of different flower beds. For each flower bed:
   - Determine the lengths of the sides that have not been given. Show your thinking.
   - Calculate the perimeter. Show your thinking.

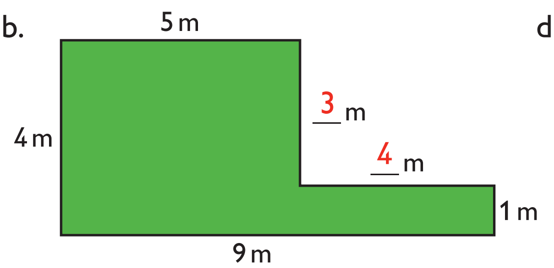
a.



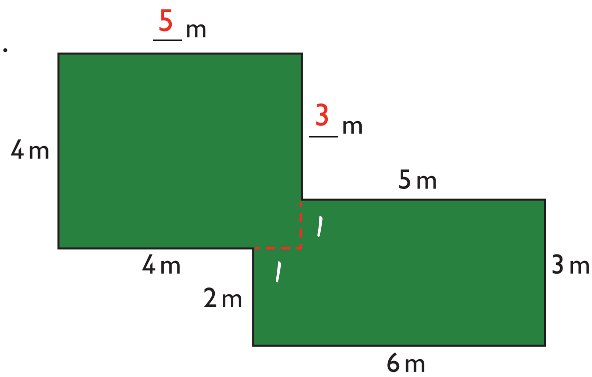
c.



b.



d.

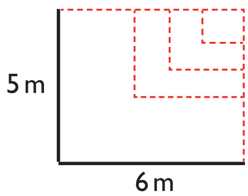


Workbook 18 p.58

Application of what was discussed previously.

2. The sketches show the two sides of a flower bed.

a.



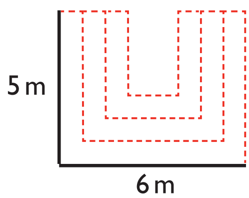
Investigate how to complete the flower bed so that it has a perimeter of 22 m but is not a rectangle.

Can you do so in more than one way? Discuss.

5 + 5 + 6 + 6 = 22 m

Yes, by removing varying sizes from corners.

b.



Investigate how to complete the flower bed so that it has a perimeter that is greater than 22 m.

Can you do so in more than one way? Discuss.

Yes, by removing varying sizes from the centre of edges/sides.