



Algebra

Main Instructional Section(s)	Learning Objective(s)
Algebraic Expressions involving Addition and Subtraction	Use letters to represent an unknown number in expressions involving addition and subtraction.
Algebraic Expressions involving Multiplication and Division	Use letters to represent an unknown number in expressions involving multiplication and division.
Simplifying Algebraic Expressions	Simplify linear expressions excluding brackets.
Evaluating Algebraic Expressions	Evaluate simple linear expressions by substitution.
Solving Algebraic Equations	Solve simple linear equations involving whole number coefficient.

Maths Vocabulary

Algebraic expressions, simplify, evaluate, solve



My Lesson Notes

- What I noticed in this lesson.
- What prior knowledge my students already have.
- What I can include in this lesson.
- What preparations I need to do.



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1

Algebra

There are some cupcakes in the box.
Three cupcakes are on the plate.
How many cupcakes are there altogether?

Since I don't know the number of
cupcakes in the box,
I'll use the letter n to represent the
number of cupcakes in the box.

$$n + 3$$

This bag contains some buns.
I take out two buns.

If there were g buns in the
bag and 2 buns were taken
out, how many buns are left?

Chapter Opener

- Refer students to the picture carefully and describe what is happening at the table (cupcakes, buns, and children discussing).
- Ask students what they notice about the cupcakes on the plate and guide them to state that there are 3 cupcakes and possibly more in the box.
- For the expression $n + 3$, ask students what the letter n might represent in this situation.
- Affirm correct responses by noting that n stands for an unknown number of cupcakes and that the total is made by combining the unknown with 3 more.
- Shift focus to the buns scenario and ask what happens when 2 buns are taken away from a bag with an unknown number of buns.
- Encourage students to describe this situation using words first (some buns, take away 2, how many left).
- Ask how students might represent the situation using a letter and guide them towards expressions like $x - 2$.
- Prompt students to compare both situations and discuss how numbers can be added to or taken away from an unknown quantity.
- Conclude that letters can be used to represent unknown numbers, and we can form expressions to describe real-life situations involving addition and subtraction.



1 (a)

- Go through the context that asks students to add to find the total number of cupcakes. Students should be able to understand and do this as they have learned it in the lower primary levels.
- Help students recall $5 + 3 = 8$ is called an equation because it has an equal sign and shows a complete calculation.

(b)

- Go through the context with the students.
- Now, using the same context, introduce the letter n and explain that it is used to represent an unknown number of cupcakes.
- Ask students how many cupcakes there are altogether, and guide them to describe the total number of cupcakes using $n + 3$, reinforcing that this represents a quantity but does not yet give a final value.
- Highlight that $n + 3$ is an algebraic expression and distinguish it from an equation by noting the absence of an equal sign.
- Draw attention to the use of brackets in $(n + 3)$ and explain that it represents the entire quantity as one unit.
- Reinforce the key idea that letters or symbols can be used to represent unknown numbers in mathematics.

Algebraic Expressions Involving Addition and Subtraction

Let's Learn

- 1 (a) There are 5 cupcakes in the box and 3 cupcakes on the plate.



5



3

$5 + 3 = 8$ is an **equation**.
It has an equal sign.



$$5 + 3 = 8$$

There are 8 cupcakes altogether.

- (b) Suppose there are n cupcakes in the box and 3 cupcakes on the plate.
The letter n represents an unknown number of cupcakes.



n



3

$n + 3$ is an **algebraic expression**.
It does not have an equal sign.



There are $(n + 3)$ cupcakes altogether.

We can use a letter or a symbol to represent an unknown number.

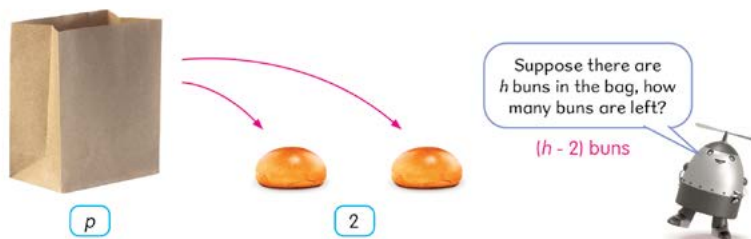


Using brackets helps us see the entire expression " $n + 3$ " as one unit, to avoid confusion.



2

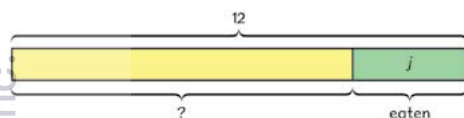
- 2 There are p buns in a bag. Cheryl takes out 2 buns.
How many buns are left in the bag?



There are $(p - 2)$ buns left in the bag.

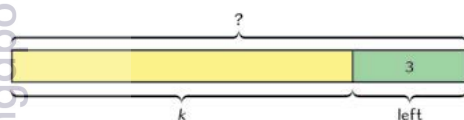
- 3 We can draw bar models to help us understand algebraic expressions.

- (a) There are 12 apples.
 j apples are eaten.
How many apples are there left?



There are $(12 - j)$ apples left.

- (b) After eating k oranges, Alan has 3 oranges left.
How many oranges did he have at first?



He had $(k + 3)$ oranges at first.

- 2
- Go through the context with the students.
 - Ask students what the letter p represents and guide them to state that it is the unknown number of buns in the bag.
 - Lead students to describe the action mathematically (taking away 2 buns) and represent it as $p - 2$, reinforcing that subtraction shows removal.
 - Emphasise that $(p - 2)$ represents the number of buns left after removing 2 buns.

3 (a)

- Go through the context with the students.
- Explain the bar model and guide them to interpret the diagram (total of 12 apples, with j apples eaten).
- Ask how we can find the number of apples left.
- Help students identify the known and unknown parts, and lead them to express the remaining apples as $12 - j$.
- Highlight how the bar model visually represents subtraction by showing the whole and the part removed.

(b)

- Go through the context with the students.
- Invite students to interpret the new bar model (unknown total, k oranges eaten, 3 oranges left).
- Ask how we can find the total number of oranges.
- Guide students to reason that the total is made up of what was eaten and what is left, leading to $k + 3$.
- Reinforce that bar models can help represent both subtraction and addition situations involving unknown quantities.

4

- Refer students to the table on Daniel's age and describe what changes and what stays the same, focusing on how his current age remains 12 while time shifts.
- Guide students to interpret each row by linking time phrases to operations, for example "in 3 years' time" means adding 3, and "5 years ago" means subtracting 5.
- Emphasise how unknown time is represented using letters such as x , y , z , and model how to write expressions like $12 + x$ and $12 - z$.
- Reinforce that these are algebraic expressions because they represent values that depend on unknown quantities.
- Highlight the consistency of starting from the present age (12) and adjusting based on time, helping them see structure and pattern.

5

- Have students read each statement carefully, such as "Add 10 to a " and "12 more than b ".
- Guide students to interpret key language such as "add", "more than", "subtract", and "less than", linking each phrase to the correct operation.
- Use the bar models to help them visualise how quantities are combined or separated, reinforcing meaning before symbolic representation.
- Draw attention to equivalent expressions such as $a + 10$ and $10 + a$, and explain that order does not change the sum in addition.
- Emphasise correct structure for subtraction expressions such as $20 - c$ and $d - 15$ to avoid reversal errors.

- 4 Daniel is 12 years old now. What are his ages at different periods of time?

Time	Daniel's age (years)
now	12
in 3 years' time	$12 + 3 = 15$
in x years' time	$12 + x$
in y more years	$12 + y$
5 years ago	$12 - 5 = 7$
z years ago	$12 - z$

$12 + x$, $12 + y$ and $12 - z$ are examples of algebraic expressions.



- 5 Here are some ways to write algebraic expressions.

Statement	Model	Algebraic Expression
Add 10 to a		$a + 10$ or $10 + a$
12 more than b		$b + 12$ or $12 + b$
Subtract c from 20		$20 - c$
15 less than d		$d - 15$

Let's Practise

- Write the algebraic expressions for each of the following.
 - Add 7 to q . $7 + q$
 - 10 less than r . $r - 10$
- Express each answer as an algebraic expression.
 - A pizza costs \$20. A cake costs $\$x$ more than a pizza. How much does the cake cost? $\$(20 + x)$
 - Hazel had $\$p$. She bought a pencil case and received \$2 change. How much did the pencil case cost? $\$(p - 2)$

Go to PB 6A Practice 1

Let's Practise

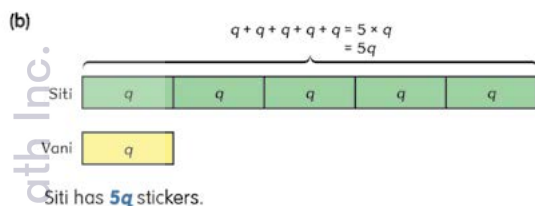
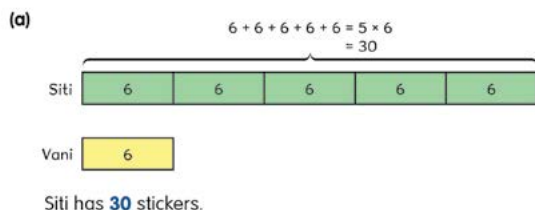
- Invite students to complete the exercises independently.
- Provide guidance when needed.
- Discuss the answers with them.

Algebraic Expressions Involving Multiplication and Division

Let's Learn

- 1 Siti has 5 times as many stickers as Vani.
How many stickers does Siti have if Vani has

- (a) 6 stickers?
(b) q stickers?



$5 \times q = q \times 5$.
We write $5 \times q = 5q$.



- 2 Each shirt has 8 buttons. How many buttons are there on the given number of shirts?

Number of shirts	Number of buttons
1	$1 \times 8 = 8$
2	$2 \times 8 = 16$
5	$5 \times 8 = 40$
k	$k \times 8 = 8k$

$5q$ and $8k$ are also examples of algebraic expressions.



Let's Learn



- 1
- Go through the context with the students.
- (a)
- Ask students to describe what “5 times as many” means and relate it using the bar model.
 - Guide students to interpret that Siti has 5 groups of 6 compared to Vani, leading them to represent this as repeated addition and then as multiplication.
 - Help students connect repeated addition to multiplication, showing that $6 + 6 + 6 + 6 + 6$ can be written as 5×6 .
- (b)
- Follow up using the same idea alongside the presentation of the bar model. Highlight that the number of stickers is now unknown, represented by q .
 - Guide students to express 5 groups of q as $5 \times q$ and introduce the simplified form $5q$.
 - Emphasise that $5q$ is an algebraic expression representing an unknown quantity multiplied by 5.
 - Draw attention to the structure of multiplication expressions and how the number and the letter are written together without a multiplication sign.
- 2
- Go through the context with the students.
 - Guide students to identify the pattern that each shirt has 8 buttons and that the total number of buttons increases in equal groups.
 - Help students express the relationship using multiplication, leading to expressions such as $k \times 8$ and $8k$.
 - Reinforce that expressions like $5q$ and $8k$ represent quantities that depend on unknown numbers.

3 (a)

- Go through the context with the students.
- Ask students to describe what is happening, focusing on the idea of sharing \$120 equally among 3 children.
- Guide students to interpret the bar model by identifying that the total is divided into 3 equal parts.
- Lead students to express the situation as a division statement, showing that $120 \div 3$ gives the amount each child receives.
- Reinforce that equal sharing is represented by division and connect this to the value of 40 for each child.

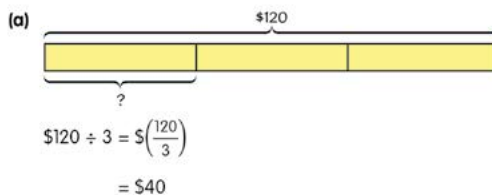
(b)

- Follow up using the same idea alongside the presentation of the bar model.
- Ask students what p represents, and guide them to see that the total amount is now unknown, represented by p .
- Ask students how we can show sharing p equally with 3 children. Affirm correct responses and guide them to express the equal sharing using $p \div 3$ and introduce the fractional form $\frac{p}{3}$ over 3.
- Emphasise that $p \div 3$ and $\frac{p}{3}$ both represent the amount each child receives.
- Reinforce that this is an algebraic expression representing division of an unknown quantity.

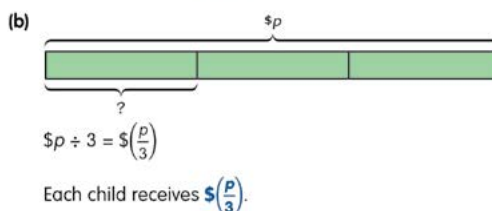
4

- Have students study the table showing different sums and numbers of children.
- Guide students to identify the pattern that the total amount is divided equally by the number of children in each case.
- Help students express each situation using division, such as $120 \div 4$ and $y \div 2$ or $y \div 4$.
- Emphasise that division can be written as a fraction and represents equal sharing.

- 3 (a) A sum of \$120 is shared equally among 3 children. Find the amount of money each child receives.
- (b) A sum of \$ p is shared equally among 3 children. Write an algebraic expression to represent the amount of money each child receives.



Each child receives **\$40**.



- 4 Each sum of money is shared equally among a number of children. How much money does each child receive?

Sum of money	Number of children	Amount each child receives
\$120	4	$120 \div 4 = \$\left(\frac{120}{4}\right)$ $= \$30$
\$ y	2	$y \div 2 = \$\left(\frac{y}{2}\right)$
\$ y	4	$y \div 4 = \$\left(\frac{y}{4}\right)$

- 5 Here are some ways to write algebraic expressions.

Statement	Model	Algebraic Expression
3 groups of x		$3x$
Divide y by 6		$\frac{y}{6}$

Maths Talk

Four students express $d + d + d + d$ as shown below.



Who is correct? Hairul, Daniel and Vani are correct.

Let's Practise

- Write the algebraic expression representing each of the following.
 - The product of 12 and h . $12h$
 - Divide k by 9. $\frac{k}{9}$
- Express each answer as an algebraic expression.
 - There are 6 cans of drinks in a carton. Mr Raj bought y cartons of drinks. How many cans of drinks did he buy? $6y$
 - j stickers were shared equally among 4 girls. How many stickers did each girl receive? $\frac{j}{4}$

Go to PB 6A Practice 2

5

- Refer students to the first statement “3 groups of x ” and describe what the model shows, focusing on equal groups.
- Guide students to interpret that there are 3 equal parts, each with value x , and connect this to repeated addition ($x + x + x$).
- Lead students to represent this using multiplication as $3 \times x$ and introduce the simplified form $3x$.
- Emphasise that $3x$ represents three equal groups of an unknown quantity.
- Refer students to the second statement “Divide y by 6” and ask them to interpret the model, focusing on splitting into equal parts.
- Guide students to see that y is divided into 6 equal groups and that each part represents one share.
- Lead students to express this as $y \div 6$ and introduce the fractional form $\frac{y}{6}$.
- Reinforce that division represents equal sharing and that $\frac{y}{6}$ is an algebraic expression.

Maths Talk

- Refers students to observe the four representations of $d + d + d + d$ and describe what each student has written.
- Invite students to interpret each expression and relate it back to the repeated addition of d four times.
- Invite students to justify their reasoning and respond to peers' ideas.
- Conclude that repeated addition of the same quantity can be written as multiplication, and correct notation is important for clarity.

AfL Are students able to:

- Recognise that $d + d + d + d$ represents repeated addition of the same quantity?
- Identify which expressions are equivalent to $d + d + d + d$?
- Explain why $4 + d$ is not correct in this context?
- Understand that $4 \times d$ and $d \times 4$ represent the same quantity?

Suggested Action(s)

For students who need additional support:

- Use concrete objects such as counters to model $d + d + d + d$ as four equal groups and physically group them.
- Guide students to verbalise expressions, such as saying “4 groups of d ” instead of “4 plus d ”.
- Provide sentence frames such as “_____ means _____ groups of _____” to support explanation.

(Continued on Pg 8.)

(Continued from Pg 9.)

- Revisit the meaning of multiplication as repeated addition using simpler numbers before returning to algebraic form.

Let's Practise

- Invite students to complete the exercises independently.
- Provide guidance when needed.
- Discuss the answers with them.

Let's Learn

- Go through the context with the students.

(a)

- Ask students what y represents. Affirm correct responses before guiding them to express the number of blue clips as repeated addition of y six times and simplify this to $6y$.
- Similarly, lead students to express the number of red clips as $y + y$ and simplify this to $2y$.
- Ask how we can find the total number of clips. Show students the combining of both quantities to form $6y + 2y$ and guide them to simplify this by combining like terms to get $8y$.
- Emphasise that like terms (terms with the same variable) can be combined by adding their coefficients.

(b)

- Refer students to the comparison model and compare the number of blue clips and red clips using the expressions $6y$ and $2y$.
- Guide students to interpret "how many more" as subtraction and represent this as $6y - 2y$.
- Ask students how we can simplify $6y - 2y$. Lead them to simplify the expression to $4y$, reinforcing the idea of combining like terms through subtraction.

Simplifying Algebraic Expressions

Let's Learn

Mr Tan had 6 boxes of blue clips and 2 boxes of red clips. There were y clips in each box.

- How many clips did he have altogether?
- How many more blue clips than red clips did he have?
- He found 2 blue clips and 5 red clips. How many clips did he have in the end?
Express each answer in terms of y .

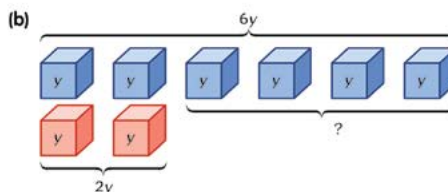


$$\begin{aligned}\text{Number of blue clips} &= y + y + y + y + y + y \\ &= 6 \times y \\ &= 6y\end{aligned}$$

$$\begin{aligned}\text{Number of red clips} &= y + y \\ &= 2 \times y \\ &= 2y\end{aligned}$$

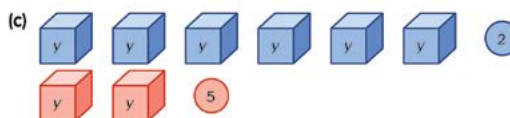
$$\begin{aligned}\text{Total number of clips} &= 6y + 2y \\ &= 8y\end{aligned}$$

He had **$8y$** clips altogether.



$$\begin{aligned}\text{Number of blue clips more than red clips} &= 6y - 2y \\ &= 4y\end{aligned}$$

He had **$4y$** more blue clips than red clips.



$$\begin{aligned}\text{Number of clips in the end} &= 6y + 2 + 2y + 5 \\ &= 8y + 7\end{aligned}$$

He had **$(8y + 7)$** clips in the end.

$$\begin{aligned}6y + 2y &= 8y \\ 2 + 5 &= 7\end{aligned}$$



(c)

- Have students note the additional clips added (2 blue clips and 5 red clips).
- Ask students how they can combine the clips and write the expression for the total number of clips.
- Guide students to represent the total as $6y + 2 + 2y + 5$, linking each part of the expression to the visual.
- Help students group like terms ($6y + 2y$ and $2 + 5$) and simplify step by step to $8y + 7$ emphasising that they can combine like terms.
- Reinforce that simplifying expressions makes them easier to understand and work with.

2 Simplify each algebraic expression.

(a) $2q + 2q = 4q$	
(b) $6q - 4q = 2q$	
(c) $5q - q + 3q = 4q + 3q = 7q$	
(d) $q + 3q + 1 = 4q + 1$	
(e) $5q + 3 - 2q + 3 = 5q - 2q + 3 + 3 = 3q + 6$	

Let's Practise

1 Fill in the boxes.

(a) $9p = 4p + 5p$

(c) $7h = 7 \times h$

(b) $5q = 8q - 3q$

(d) $15r = 15 \times r$

2 Simplify each of the following.

(a) $2k + 5k = 7k$

(c) $9d - 5d + 10 = 4d + 10$

(e) $30 + h - 1 + 6h = 7h + 29$

(b) $15q - 6q = 9q$

(d) $c + 9 + 12c = 13c + 9$

(f) $20a + 8 - 14a - 3 + a = 7a + 5$

Go to PB 6A Practice 3

Let's Practise

- Invite students to complete the exercises independently.
- Provide guidance when needed.
- Discuss the answers with them.

2

- Explain to students that to simplify expressions, they can only combine like terms.

(a)

- Ask students if they can combine $2q$ and $2q$. Affirm correct responses by recognising them as like terms and relating this to combining equal groups in the model to form $4q$.

(b)

- Direct students to interpret subtraction visually by crossing out $4q$ from $6q$ from the bar model, helping them see that $2q$ remains.
- Emphasise that subtraction of like terms means removing equal groups.

(c)

- Ask students if all the givens are like terms. Affirm correct responses and guide them to work out the simplification.
- Encourage students to use the model to visualise cancellation and remaining quantities.

(d)

- Ask students to identify the like terms.
- Emphasise the importance of not combining unlike terms.
- Guide students to combine only q and $3q$ to form $4q + 1$.
- Encourage students to use the model to visualise combining of quantities.

(e)

- Ask students to group like terms and unlike terms separately before simplifying.
- Encourage students to use the model to visualise cancellation and combining remaining quantities.



1

- Go through the context with the students.
- Ask students what y represents, and what $y + 8$ means, linking the expression directly to the visual of adding more buttons.
- Affirm correct responses and then introduce the idea of assigning a value to y , for example $y = 6$.
- Guide students to substitute 6 into the expression $y + 8$ and rewrite it as $6 + 8$.
- Lead students to evaluate the expression by calculating $6 + 8$ and obtaining 14.
- Reinforce that evaluating an algebraic expression means replacing the variable with a given value and then computing the result.

2

- In this context, ask students what $n - 4$ represents.
- Affirm correct responses and guide them to substitute given values such as $n = 6$ and $n = 15$ into the expression.
- Lead students to evaluate each case step by step, showing $6 - 4 = 2$ and $15 - 4 = 11$.
- Emphasise that the same expression can have different values depending on the value of the variable.
- Reinforce the importance of substituting correctly before performing the operation.

Evaluating Algebraic Expressions

Let's Learn

- 1 Anna has y buttons in a container at first. She puts 8 more buttons into the container. How many buttons does she have in all?



y buttons

Add 8 more buttons



Anna has $(y + 8)$ buttons in all.

If there are 6 buttons in the container at first, then $y = 6$.



Add 8 more buttons



$$y + 8 = 6 + 8 \\ = 14$$

Anna has **14** buttons in all.

How many buttons does Anna have in all if $y = 10$?

18 buttons



- 2 There are $(n - 4)$ strawberries in a basket. How many strawberries are there if

(a) $n = 6$?

$$n - 4 = 6 - 4 \\ = 2$$

There are **2** strawberries.

(b) $n = 15$?

$$n - 4 = 15 - 4 \\ = 11$$

There are **11** strawberries.

10

- 3 (a) There are k oranges in each bag.
How many oranges are there altogether if $k = 5$?

Number of bags	Total number of oranges in terms of k	Total number of oranges if $k = 5$
2	$2k$	$2 \times 5 = 10$
5	$5k$	$5 \times 5 = 25$
10	$10k$	$10 \times 5 = 50$

$$\begin{aligned} k &= 5 \\ 2k &= 2 \times k \\ &= 2 \times 5 \\ &= 10 \end{aligned}$$



- (b) There are w stickers that are shared equally among some children.
How many stickers does each child get if $w = 20$?

Number of children	Number of stickers each child gets in terms of w	Number of stickers each child gets if $w = 20$
2	$\frac{w}{2}$	$\frac{20}{2} = 10$
5	$\frac{w}{5}$	$\frac{20}{5} = 4$
10	$\frac{w}{10}$	$\frac{20}{10} = 2$

$$\begin{aligned} w &= 20 \\ \frac{w}{2} &= \frac{20}{2} \\ &= 10 \end{aligned}$$



- 4 Find the value of each algebraic expression if $z = 8$.

(a) $z + 2z = 3z$
 $= 3 \times 8$
 $= 24$

(b) $5z + 2 - 3z = 5z - 3z + 2$
 $= 2z + 2$
 $= 2 \times 8 + 2$
 $= 16 + 2$
 $= 18$

(c) $\frac{z-2}{3} = \frac{8-2}{3}$
 $= \frac{6}{3}$
 $= 2$

(d) $\frac{4+3z}{4} = \frac{4+3 \times 8}{4}$
 $= \frac{4+24}{4}$
 $= \frac{28}{4}$
 $= 7$

3 (a)

- Describe what the table shows, focusing on the relationship between number of bags and total number of oranges.
- Guide students to interpret expressions such as $2k$, $5k$ and $10k$ as representing equal groups of k oranges.
- Introduce the given value $k = 5$ and ask students to substitute into each expression, showing how $2k$ becomes 2×5 , and so on.
- Lead students to evaluate each expression step by step and relate the numerical answers back to the context.

(b)

- Carry out the teaching in a similar manner as (a).

4

- Invite selected students to evaluate each expression on the board and then have the class constructively comment on the solutions.
- In the discussion, highlight the need to follow the correct order of operations, especially when dealing with fractions.
- Reinforce careful working and clear organisation to avoid errors.
- Refer students to the solutions in the textbook page and briefly go through them as reinforcement.

5 (a)

- Go through the context with the students.
- Describe the relationship between the shorter and longer ribbon using the bar model by having students interpret that the longer ribbon consists of the shorter ribbon (20 cm) plus an additional length of y .
- Lead students to express the total length as $20 + y$ (the total length of the longer ribbon in terms of y).

(b)

- Introduce the given value $y = 9$.
- Ask students to substitute 9 into the expression $20 + y$ and evaluate.

6

- Go through the context with the students.

(a)

- Guide students to represent the problem situation using bar models, expressing the number of cherries in Box A as x , Box B as $3x$, and Box C as 9.
- Ask students what operation is involved. Affirm correct responses and guide them to form the total expression $x + 3x + 9$.
- Emphasise that like terms (x and $3x$) can be combined, and simplify to get $4x + 9$.

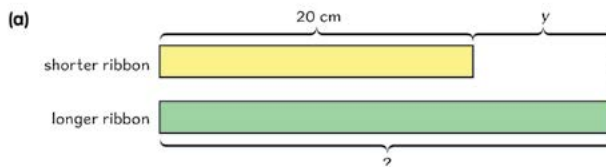
(b)

- Introduce the value $x = 15$.
- Guide students to substitute 15 into $4x + 9$ and evaluate step by step to obtain 69.

5 The difference in length between 2 ribbons is y cm. The shorter ribbon is 20 cm.

(a) Express the length of the longer ribbon in terms of y .

(b) If $y = 9$, what is the length of the longer ribbon?



The length of the longer ribbon is $(20 + y)$ cm.

(b) If $y = 9$,

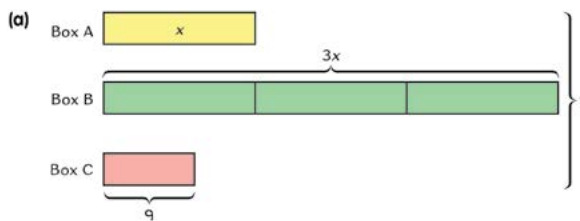
$$20 + y = 20 + 9 \\ = 29 \text{ cm}$$

The length of the longer ribbon is **29 cm**.

6 Box A has x cherries. Box B has 3 times as many cherries as Box A. Box C has 9 cherries.

(a) Express the total number of cherries in the 3 boxes in terms of x .

(b) If Box A has 15 cherries, how many cherries are there in the 3 boxes altogether?



$$x + 3x + 9 = 4x + 9$$

The total number of cherries in the 3 boxes is $4x + 9$.

(b) If $x = 15$,

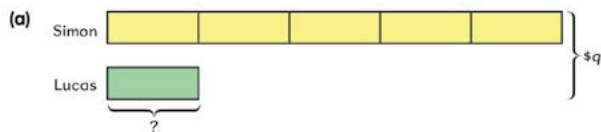
$$4x + 9 = 4 \times 15 + 9 \\ = 60 + 9 \\ = 69$$

There are **69** cherries in the 3 boxes altogether.

- 7 Simon has 5 times as much money as Lucas. They have a total of \$ q .

(a) Express the amount of money Lucas has in terms of q .

(b) If $q = \$84$, how much money does Lucas have?



$$6 \text{ units} = \$q$$

$$1 \text{ unit} = \$\left(\frac{q}{6}\right)$$

$$\text{Lucas has } \$\left(\frac{q}{6}\right).$$

(b) If $q = \$84$,

$$\begin{aligned} \$\left(\frac{q}{6}\right) &= \$\left(\frac{84}{6}\right) \\ &= 14 \end{aligned}$$

Lucas has **\$14**.

- 8 Mr Low rented a bus to take p students for an educational tour. He paid \$30 for rental of the bus and \$6 for each student ticket. As a teacher facilitating the trip, he was offered a free ticket.

(a) Find the total amount Mr Low had to pay in terms of p .

(b) If $p = 20$, how much did Mr Low pay in all?

(a) Amount Mr Low had to pay in terms of p = $\$30 + \$6 \times p$

$$\begin{aligned} &= \$30 + \$6p \\ &= \$ (30 + 6p) \end{aligned}$$

The total amount Mr Low paid in terms of p is **$\$(30 + 6p)$** .

(b) If $p = 20$,

$$\begin{aligned} \text{Amount Mr Low paid} &= \$ (30 + 6 \times 20) \\ &= \$ (30 + 120) \\ &= \$150 \end{aligned}$$

Mr Low paid **\$150** in all.

7 (a) and (b)

- Carry out the teaching in a similar manner as 6.

8

- Go through the context with the students.

(a)

- Ask students to interpret the situation involving a fixed cost and a cost per student.
- Ask students what the fixed cost is and how they can find the total amount the students have to pay (that is, $6p$).
- Affirm correct responses and guide them to form the expression $30 + 6p$ and explain that it represents the total cost.

(b)

- Introduce the value $p = 20$.
- Guide students to substitute 20 into the expression and evaluate step by step to obtain 150.

Let's Practise

- Invite students to complete the exercises independently.
- Provide guidance when needed.
- Discuss the answers with them.

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Let's Practise

- What is the value of each algebraic expression if $m = 3$?
 - $7m$ 21
 - $40 - 3m$ 31
 - $8 + 4m$ 20
 - $6 \times 2m$ 36
 - $\frac{2m}{3}$ 2
 - $\frac{8m - 6}{2}$ 9
- Amy has a sticker album with x pages.
She pastes 5 stickers on each page and has 3 stickers left.
 - Express the total number of stickers Amy has in terms of x . $5x + 3$
 - If $x = 7$, how many stickers does Amy have? 38
- John has 4 times as many coins as Chandra.
They have $6w$ coins altogether.
 - Express the number of coins Chandra has in terms of w . $\frac{6w}{5}$
 - If $w = 20$, how many coins does John have? 96
- Minah is t years old. She is 4 years younger than her sister.
 - Express her sister's age in terms of t . $t + 4$
 - If $t = 8$, how old will her sister be in 7 years' time? 19
- Jessie bought a plate for $\$w$.
A cup cost \$2 less than the plate.
 - Find the cost of 4 plates and 2 cups in terms of w . $\$(6w - 4)$
 - If $w = \$10$, find the total cost of a plate and a cup. \$18

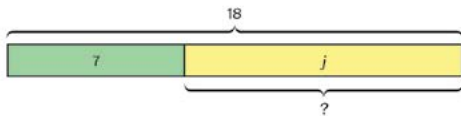
14

Go to PB 6A Practice 4

Solving Algebraic Equations

Let's Learn

- 1 Siti had 7 crayons. She bought j more crayons.
How many crayons did Siti buy if she had 18 crayons in the end?



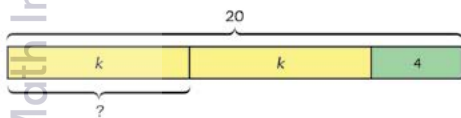
$$\begin{aligned} 7 + j &= 18 \\ j &= 18 - 7 \\ &= 11 \end{aligned}$$

Siti bought **11** crayons.

$7 + j = 18$ is an algebraic equation.



- 2 A container had k yellow buttons at first. After Mrs Tan added the same number of yellow buttons and 4 green buttons into the container, there were 20 buttons in total. How many buttons were there in the container at first?



$$\begin{aligned} 4 + 2k &= 20 \\ 2k &= 20 - 4 \\ &= 16 \\ k &= \frac{16}{2} \\ &= 8 \end{aligned}$$

There were **8** buttons in the container at first.

1

- Go through the context with the students.
- Ask students to represent the word problem using a bar model. Have them interpret the unknown part, j , as the number of crayons added.
- Based on the context, ask students what the equation is to solve the problem. Affirm correct responses by linking $7 + j = 18$ to the bar model.
- Emphasise that an equation shows two equal quantities and includes an equal sign.
- Guide students to solve the equation by taking the whole to subtract one part to find the other part, j (part-whole concept).

2

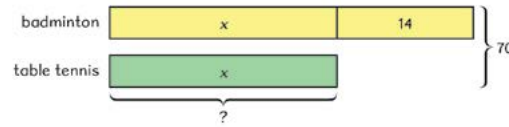
- Go through the context with the students.
- Carry out the teaching in a similar manner as 6.
- Note that for this word problem, emphasise that like terms (k and k) can be combined to form $2k$.
- Guide students to solve the equation using the part-whole concept.

3

- Go through the context with the students.
- Ask students to represent the word problem using a bar model by focusing on two groups of children and the total of 70.
- Guide students to interpret that table tennis is represented by x and badminton is $x + 14$, linking this clearly to the bar model.
- Ask students how to form the equation to represent the total, 70. Affirm correct responses, $2x + 14 = 70$, by combining both groups.
- Guide students to solve the equation step by step by first subtracting 14 from both sides to get $2x = 56$ before dividing both sides by 2 to find $x = 28$.
- Highlight the alternative unit method shown, where $2 \text{ units} + 14 = 70$, helping them visualise solving through equal units.
- Emphasise that solving equations is about finding the value of one unit.

- 3 There are 70 children playing badminton or table tennis in total. There are 14 more children playing badminton than table tennis. How many children are playing table tennis?

Let the number of children playing table tennis be x .



$$\begin{aligned} 2x + 14 &= 70 \\ 2x &= 70 - 14 \\ &= 56 \\ x &= 56 \div 2 \\ &= 28 \end{aligned}$$

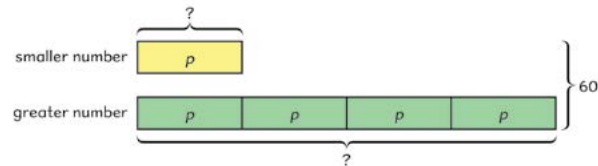
28 children are playing table tennis.

Solving algebraic equations is similar to finding the value of 1 unit.

$$\begin{aligned} 2 \text{ units} + 14 &= 70 \\ 2 \text{ units} &= 70 - 14 \\ &= 56 \\ 1 \text{ unit} &= 56 \div 2 \\ &= 28 \end{aligned}$$


- 4 The sum of two numbers is 60. The greater number is 4 times the smaller number. What are the two numbers?

Let the smaller number be p .



$$\begin{aligned} p + 4p &= 60 \\ 5p &= 60 \\ p &= 60 \div 5 \\ &= 12 \end{aligned}$$

The smaller number is **12**.

$$\begin{aligned} 4p &= 4 \times 12 & \text{or} & & 60 - 12 &= 48 \\ &= 48 \end{aligned}$$

The greater number is **48**.

Think of $5p$ as 5 units.
 $5 \text{ units} = 60$
 $1 \text{ unit} = 60 \div 5$
 $= 12$

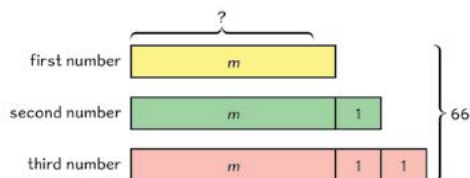


4

- Go through the context with the students.
- Ask students to represent the word problem using a bar model as they interpret the relationship between the two numbers.
- Guide students to let the smaller number be p and ask how the greater number is expressed.
- Ask students how to form the equation to represent the total, 60. Affirm correct responses, $p + 4p = 60$, by combining both groups.
- Ask students to solve $5p = 60$ by dividing both sides by 5 to get $p = 12$.
- Reinforce that the smaller number is 12 and guide them to find the greater number as $4 \times 12 = 48$.
- Highlight the unitary method again, showing 5 equal units make 60, so 1 unit is $60 \div 5$.

- 5 The sum of 3 numbers is 66.
The second number is 1 more than the first number.
The third number is 1 more than the second number.
What is the first number?

Let the smallest number be m .



$$\begin{aligned} 3m &= 66 - 3 \\ &= 63 \\ m &= 63 \div 3 \\ &= 21 \end{aligned}$$

The first number is **21**.

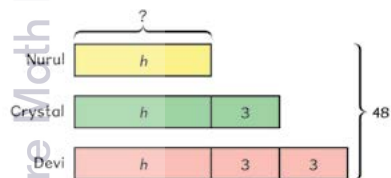
Think of $3m = 66 - 3$
as 3 units = $66 - 3$.

$$\begin{aligned} 3 \text{ units} &= 63 \\ 1 \text{ unit} &= 63 \div 3 \\ &= 21 \end{aligned}$$



- 6 Devi is 3 years older than Crystal. Nurul is 3 years younger than Crystal.
The sum of their ages is 48. How old is Nurul?

Let Nurul's age be h years.



$$\begin{aligned} 3h &= 48 - 3 - 3 - 3 \\ &= 39 \\ h &= 39 \div 3 \\ &= 13 \end{aligned}$$

Nurul is **13** years old.

5

- Go through the context with the students.
- Ask students to represent the word problem using a bar model as they interpret the relationship among the three numbers, focusing on how each number is built from the previous one.
- Guide students to interpret the first number as m , the second as $m + 1$, and the third as $m + 2$, linking this clearly to the bar model.
- Ask students how to form the equation to represent the total, 66. Affirm correct responses, $m + (m + 1) + (m + 2) = 66$, and guide them to simplify it to $3m + 3 = 66$.
- Emphasise that the three equal m units form $3m$, and the additional ones form 3.
- Guide students to solve the equation step by step by subtracting 3 to get 3 units of m , before dividing by 3 to find 1 unit of m .
- Reinforce that m represents the first (smallest) number.
- Highlight the unitary method shown, where 3 units and 3 extra make 66, helping them visualise how to isolate the equal units.

6

- Go through the context with the students.
- Carry out the teaching in a similar manner as 5.

7

- Go through the context with the students.

(a)

- Ask students to identify the key relationships, focusing on Raju's age as m and Rajeev being twice Raju's age.
- Guide them to express Rajeev's age as $2m$ and the current total age as $m + 2m$, leading to $3m$.
- Emphasise that combining like terms simplifies the expression to $3m$.
- Ask students what "in 4 years' time" means. Affirm correct responses and guide them to add 4 years to both Raju and Rajeev.
- Lead students to express the total age in 4 years as $3m + 8$, explaining that both individuals age by 4 years each.
- Help students form the equation $3m + 8 = 44$, linking it clearly to the context.
- Guide students to solve by subtracting 8 from 44 based on the part-whole concept.
- Reinforce that m represents Raju's current age.

(b)

- Guide students to find Rajeev's current age using $2m$.
- Ask students how they can find Rajeev's age in 3 years' time knowing that $m = 12$.
- Guide students to interpret "in 3 years' time" and add 3 to Rajeev's current age.
- Guide students to substitute $m = 12$ to find Rajeev's current age to obtain 24 and then add 3 to obtain 27.

7 Raju is m years old. Rajeev is twice as old as Raju. In 4 years' time, the total age of Raju and Rajeev will be 44 years.

(a) How old is Raju now?

(b) How old will Rajeev be in 3 years' time?

(a) Raju's age = m

Rajeev's age = $2m$

Total age of Raju and Rajeev in terms of $m = m + 2m$
 $= 3m$

Total age of Raju and Rajeev in 4 years in terms of $m = 3m + 4 + 4$
 $= 3m + 8$

$$3m + 8 = 44$$

$$3m = 44 - 8$$

$$= 36$$

$$m = 36 \div 3$$

$$= 12$$

Raju is **12** years old now.

(b) Rajeev's age in 3 years' time = $2m + 3$

$$= (2 \times 12) + 3$$

$$= 24 + 3$$

$$= 27$$

Rajeev will be **27** years old in 3 years' time.

Let's Practise

- 1 Find the number represented by each letter.

(a) $9g = 72$

$g = 8$

(b) $4 + 3h = 16$

$h = 4$

- 2 Lucy had 18 coins in her savings jar.
She put p more coins in the jar and there were 35 coins in all.
How many coins did she put in the jar? **17 coins**
- 3 Khadijah baked n chocolate cookies, 30 coconut cookies and $2n$ peanut cookies.
She baked 75 cookies altogether.
How many chocolate cookies did she bake? **15 chocolate cookies**
- 4 James has \$ x .
He has \$14 less than Alex.
They have \$50 in all.
How much money does James have? **\$18**

- 5 The sum of two numbers is 96.
The first number is 7 times the second number.
What is the first number? **84**



Here's a hint. Use a letter to represent the second number.

- 6 There are 3 numbers. The second number is 2 more than the first number.
The third number is 2 more than the second number.
The sum of the 3 numbers is 54. What is the greatest number? **20**
- 7 Mary is 45 years old. Susan is p years old. Mary is 3 times as old as Susan.
How old will Susan be in 6 years' time? **21 years old.**

Go to PB 6A Practice 5

19

Let's Practise

- Invite students to complete the exercises independently.
- Provide guidance when needed.
- Discuss the answers with them.



- Refer students to the scenario and describe what is happening at the cashier, focusing on buying pens and receiving change.
- Guide students to connect the situation to their own real-life experiences, such as buying items from a shop and receiving change.
- Help students identify the key quantities involved, including cost per item, number of items, total cost, and amount paid.
- Lead students to express the total cost of pens as $2 \times \text{number of pens}$, and then introduce the use of a letter p to represent the number of pens.
- Guide students to form the expression for change as $10 - 2p$ and explain how this models what happens during payment.
- Emphasise that algebra can be used to represent everyday transactions clearly and efficiently.
- Encourage students to evaluate the expression for different values of p and relate the answers to realistic outcomes.
- Prompt students to consider limitations in real life, such as not being able to buy more items than the money allows.
- Reinforce that mathematical expressions must make sense within the real-world context.

Mathematics AROUND US

A pen costs \$2 and Ben has a \$10 note.
How much change will he get if he wants to buy 3 pens?
How does the cash register calculate the change Ben should receive?



The cashier scans the barcode to get the price of the pen.

The cashier keys in the number of pens.

The cashier keys in the amount received.





\$2 2×3 $10 - (2 \times 3)$

We can use algebra to show the mathematical process.
Let p be the number of pens Ben buys.

\$2
Cost of each pen

$2p$
Cost of p pens

$10 - 2p$
Change received

What is the value of $10 - 2p$ if Ben buys
(a) 2 pens? \$4
(b) 4 pens? \$2

Can the value of p be greater than 5? Why?

No. The total price of the pens will exceed \$10.



20



Thinking Aloud

In the magic square below, the sum of the numbers in each row, column and diagonal is 15. What are the missing numbers in the magic square?

8	1	6
3	5	7
4	9	2

magic square

Check if you get 15 by adding the 3 numbers in each row, column and diagonal.



Now, make a similar magic square using algebra.
Let the number in the centre of the magic square be x .
The other numbers can be represented using expressions in x , such as $x + 1$.
If $x = 8$, what are the 9 numbers in the 3×3 box?

		$x + 1$
	x	
$x - 1$		$x - 3$

Did you get a magic square?
Check by adding each row, column and diagonal.



11	4	9
6	8	10
7	12	5

Do you get a magic square for any value represented by x ?



Yes. If x is any number, the magic square works based on the answers obtained after evaluating each expression. The sum of the numbers in each row, column or diagonal is the same.



Thinking Aloud



- Refer students to the first magic square and describe what is special about it, focusing on the fact that each row, column and diagonal has the same total.
- Guide students to identify the given numbers and reason step by step to find the missing numbers so that each line sums to 15.
- Encourage students to check their answers systematically by verifying all rows, columns and diagonals.
- Refer students to the second task and introduce the idea of representing the centre of the magic square with a variable x .
- Guide students to interpret the surrounding expressions such as $x + 1$, $x - 1$ and $x - 3$, linking the expressions to positions in the square. Ask them how these expressions relate to the earlier magic square.
- Encourage students to reason how the expressions are structured so that all rows, columns and diagonals will have equal sums.
- Lead students to substitute a value such as $x = 8$ and evaluate each expression to form a completed magic square.
- Have students verify that all rows, columns and diagonals have the same total after substitution.
- Encourage discussion on whether the structure of the expressions guarantees equal sums for any value of x .
- Conclude that algebra can be used to generalise patterns, and the structure of the expressions ensures the magic property holds for any value of x .

AfL Are students able to:

- Determine missing numbers logically to satisfy the magic sum?
- Understand the role of x in representing a variable number?
- Correctly substitute a value for x and evaluate expressions?
- Explain why the magic square still works after substitution?

Suggested Action(s)

For students who need additional support:

- Provide a partially completed magic square and guide them step by step to fill in one missing number at a time.
- Use the completed magic square from the first example to discuss how each expression from the second magic square relates to the values in the first magic square.

What Have I Learnt?



- Encourage students to read the summary section slowly and connect it to what they have learned earlier in the chapter, such as algebraic expressions involving addition, subtraction, multiplication and division, simplifying and evaluating algebraic expressions and solving algebraic equations.
- Invite students to reflect on whether the summary points helped them and if they are still uncertain about them and may need to revisit.
- Conclude by reinforcing that the summary serves as a tool students can revisit to check their understanding and support problem solving in future lessons.

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What Have I Learnt?



1 Algebraic expressions.

Each algebraic expression has a letter that represents a certain value.

(a) $6 + x$

(b) $9 - 7b$

(c) $15q$

(d) $\frac{h}{4}$

2 Simplifying algebraic expressions.

(a) $5m + 2m = 7m$

(b) $10p - 4p + 3 = 6p + 3$

(c) $2b + b + 9 = 3b + 9$

(d) $24w \div 5 = \frac{24w}{5}$

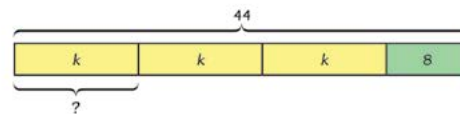
3 Evaluating algebraic expressions.

$$\begin{aligned} \text{If } a = 2, \text{ then } 4a + 9 &= 4 \times 2 + 9 \\ &= 8 + 9 \\ &= 17 \end{aligned}$$

4 Solving algebraic equations.

To solve an algebraic equation is to find the number represented by the letter or symbol. Find the value of k in the equation $3k + 8 = 44$.

We can draw a bar model to help us come up with the algebraic equation.



$$3k + 8 = 44$$

$$\begin{aligned} 3k &= 44 - 8 \\ &= 36 \end{aligned}$$

$$\begin{aligned} 3k &= 36 \\ k &= 36 \div 3 \\ &= 12 \end{aligned}$$