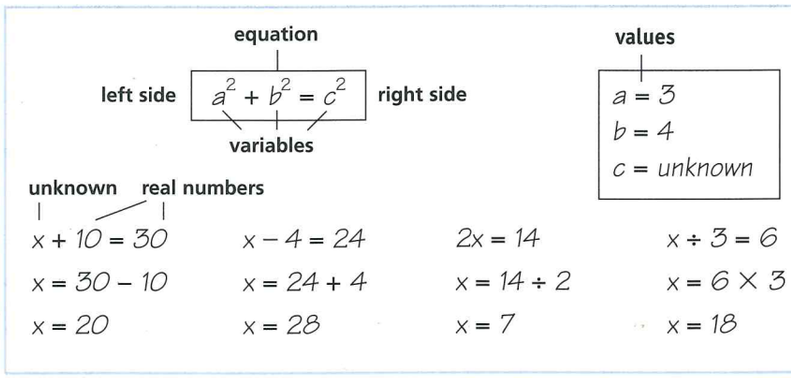
UNIT 7

Algebra and formulas

CD 1-32

Section 1 Vocabulary

A. Read the text and look at the diagram.



We learned Pythagoras's theorem in Unit 4. We can **express** the theorem as $a^2 + b^2 = c^2$. This is an **equation**. It has two **sides** with an equals sign in the middle.

In the equation above there are three **variables.** We use letters to **represent** the variables as *a*, *b* and *c*. When we use letters, like *a*, *b*, *c*, to represent variables, we are using **algebra**.

If we know the **value** of *a* and *b*, we can work out the value of *c*. In other words, we can **solve** the equation. We can find the value of the **unknown**, in this case *c*. For example:

if	$a = 3$ and $b = 4$
then	$a^2 = 9$, $b^2 = 16$
which means that	$a^2 + b^2 = 25$
so	c^2
must be	25
and	$c = \sqrt{25}$
therefore	$c = 5$

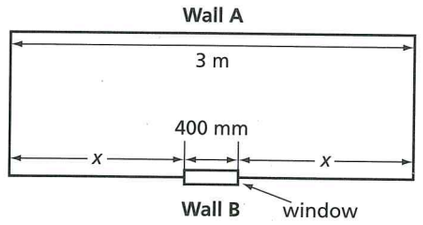
B. Look at the common formulas. Answer the questions.

1. What is on the right side of equation 2?
2. What does *r* represent in equation 3?
3. What letter is used to represent volume in equation 4?
4. In equation 5, if *a* is 4 and *b* is 10, what is *p*?
5. How can you write equation 3 in a different way?

Common formulas

1. *Pythagoras's theorem:* $a^2 + b^2 = c^2$
2. *Angles in a triangle:* $a + b + c = 180°$
3. *Radius of a circle:* $r = \frac{d}{2}$
4. *Volume of a sphere:* $v = 4 \pi r^3 \div 3$
5. *Calculating %:* $p = \frac{a}{b} \times 100$

Section 2 Reading



Imagine you are measuring a rectangular room. You know that the length of Wall A is 3 meters. You know that the window on Wall B is 400 millimeters. If the short walls next to the window are the same length, then you don't need to measure them. There is only one unknown so you can work out the length with algebra.

Call the length of one short wall *x*. If both short walls are equal, then the length of the two walls is $2x$. If Wall A is 3 meters long, then Wall B must be $2x + 400$ mm = 3 m.

However, there are different units of measurement on each side of the equation — millimeters on the left side and meters on the right. We must use a common unit on both sides. If we represent 3 m as 3,000 mm, then we can solve the equation. Take out the unit of measurement. We don't need it once we have reduced both sides to a common unit.

If $2x + 400 = 3{,}000$, then $2x = 3{,}000 - 400$. Therefore $2x = 2{,}600$, which means that $x = 2{,}600 \div 2$, so $x = 1{,}300$. If we add back the unit of measurement, then we can find the length of each short wall. It must be 1,300 millimeters or 1.3 meters.

A. Choose the best answer in each case.

1. Wall B is:
   a. 400 meters long
   b. 300 millimeters long
   c. 3,000 mm long
   d. 400 mm long
2. We don't need to measure the short walls because:
   a. the room is rectangular
   b. Wall B is the same length as Wall A
   c. the window is 400 mm
   d. there is only one unknown

3. $2x$ represents the length of:
   a. Wall A
   b. Wall B
   c. the window
   d. Wall B minus the window
4. We cannot solve $2x + 400$ mm = 3 m because:
   a. there are different units of measurement
   b. there are two unknowns
   c. there are millimeters on the left
   d. there are meters on the right
5. We can rewrite $2x + 400 = 3{,}000$ as:
   a. $2x + 3{,}000 = 400$
   b. $2x = 3{,}000 + 400$
   c. $2x = 3{,}000 - 400$
   d. $2x = 3{,}000 \times 400$

B. Study the following example sentences.

Making deductions

If both short walls are equal, **then** the length of the two walls is 2x.
If Wall A is 3 meters long, **then** Wall B must be 2x + 400 mm = 3 m.
If we represent 3 m as 3,000 mm, **then** we can solve the equation.
If 2x + 400 = 3,000, **then** 2x = 3,000 – 400. **Therefore** 2x = 2,600, which means that x = 2,600 ÷ 2, **so** x = 1,300.

C. Use the conjunctions or adverbs in parentheses to make logical sentences. Use appropriate punctuation. You may have to change the order of the original sentences.

1. nothing is done / global warming will surely progress (if)
2. the area must be 9 cm^2 / the square has a side of 3 cm (therefore)
3. we came home early / it started to rain (so)
4. the car wouldn't start / the battery was dead (because)
5. we were running short of gas / we looked for a gas station (since)
6. it is biodegradable / the package will soon break down (as)

CD 1-34

Section 3 *Listening*

A. Listen and complete the summary of the reading text in Section 2. Write one word or number in each space.

When there is only one _____ in an equation, you can work out its value with _____. We can represent the unknown with a _____, for example, x. If $2x + 400 = 3{,}000$, then $2x$ = _____ – 400. Therefore $2x = 2{,}600$, which _____ that $x = 1{,}300$.

CD 35,36

B. Listen to the conversation. Circle the formula they are talking about.

$$s = \frac{d}{t} \qquad d = st \qquad t = \frac{d}{s}$$

CD 37,36

C. Listen again and complete the summary. Write one word in each space.

How can you calculate the average _____ of a car? The formula is speed _____ distance divided by time. We can express this _____ s = d ÷ t. Therefore, if we _____ the distance and the time taken, we can _____ the speed. For example, if we drive 100 kilometers in 2 hours, the average speed is 100 divided _____ 2, which is 50 kilometers per _____.