UNIT 3
ALGEBRA

Structures in this unit:
Pronouncing alphabet
Understanding Passive sentences
Speaking and listening to equations
... it follows that...
n number of...
Let m represent...

Vocabulary in this unit:
(an) unknown
(a) variable
(to) solve for
bracket(s)
operator
(to) simplify
(to) expand an expression
(to) multiply out
like / unlike terms
(to) factorise
(to) work out
(to) substitute
(to) evaluate

PREPARATION

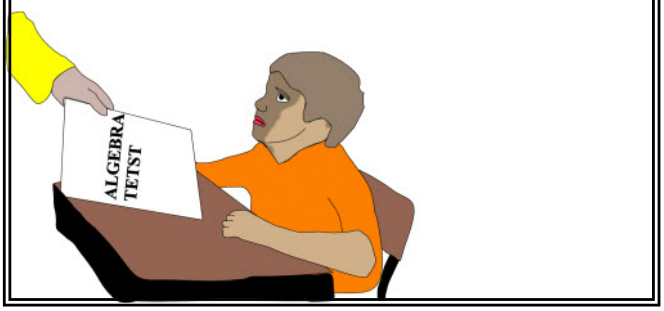
ALGEBRA: DO YOU LOVE IT OR HATE IT?

What do *you* think?

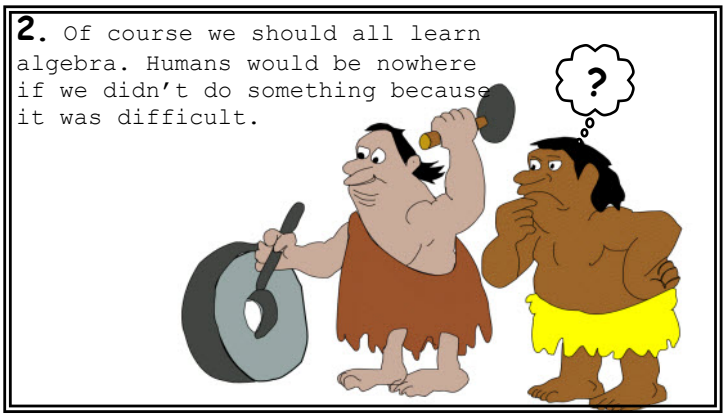
How much do you agree or disagree with these statements? Use a scale from 1 (completely disagree) to 10 'completely agree'.

Discuss your opinions with other students.

1. Algebra is cruel. If children can't do it they become school failures. We should only teach it to those who want to do it.



2. Of course we should all learn algebra. Humans would be nowhere if we didn't do something because it was difficult.



Speaking algebra

Smart Alex says:

Algebra variables and how to say them

a pronounced: a(ā) examples: f**a**ce / **a**pe
b pronounced: (bē) examples: **bee**n / **bee**r
c pronounced: (sē) example: re**c**eive
m pronounced: (ĕm) example: **em**pty
n pronounced: (ĕn) example: **en**try
o pronounced: (ō) example: h**o**pe
p pronounced: (pē) example: **pe**ter
q pronounced (kyōō) example: **queue**
r pronounced (är) example: f**ar**
x pronounced (ĕks) example: **ex**citing
y pronounced (wī) example: **wi**pe
z pronounced (zed)

Exercise 3.1 🎧 Listen to the alphabet and repeat.

(entire alphabet spoken slowly - each letter spoken twice by three or four different voices)

Exercise 3.2 🎧 Listen and write what you hear in numbers and letters. The first is done for you.

1. the sum of three times x and eight
3x + 8

2. y added to nine

3. Three times p divided by q.

4. Four r squared minus two.

5. Minus seven times six b.

Exercise 3.3 Work with a partner speak these algebraic expressions. The first is done for you.

1. $a^2 + b^2$
a squared plus b squared

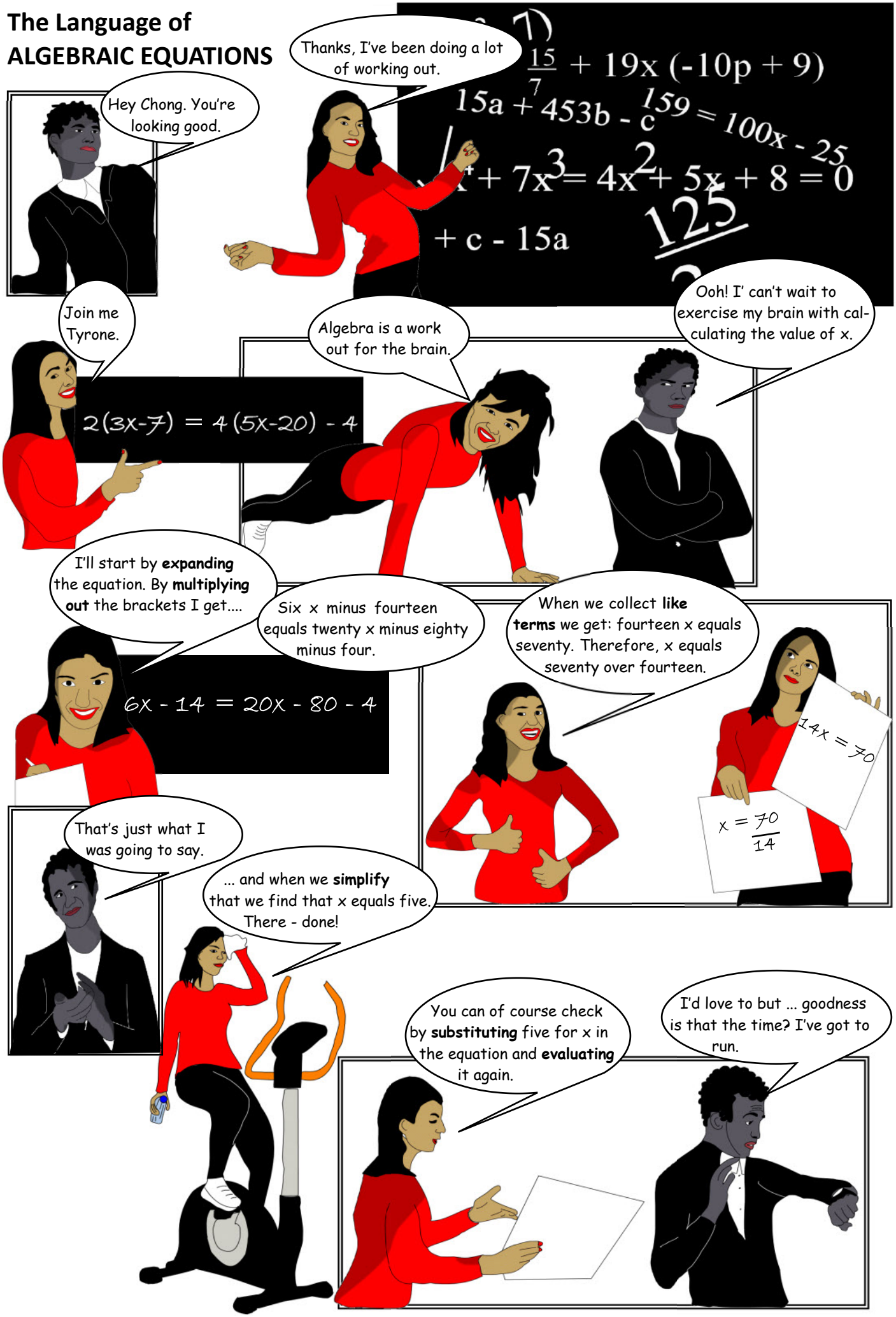
2. $\frac{3q}{6}$

3. 9r - 5

4. 15p x 9q

5. 23x -7 + 15m

The Language of ALGEBRAIC EQUATIONS



Exercise 3.4 🎧 Here are some harder questions. Listen and write what you hear in numbers and letters. The first is done for you.

1. the product of an unknown number and the same number less 3
x(x – 3)

2. a number divided by the same number less five

3. Four, open brackets, r squared minus two q, close brackets.

4. m equals minus n plus or minus the square root of b.

5. Two w squared subtract four w is equal to zero.

6. **x** equals minus six plus or minus the square root of b squared minus four ac all divided by two a.

Exercise 3.5 work with a partner and speak aloud these equations.

1. (a-1) (a+3) = 1

2. $p^2 - 7p + 12 = 0$

3. $r^2 + 9r + 20 = 0$

4. 4s - 23 = 3 (4s + 3)

5. -7(y+6) = -3(y+10)

6. $x = -b \pm \sqrt{(b^2 - 4ac)}\ 2a$

Exercise 3.6 Match the following with definitions.

1. (to) work out _____
2. (to) factorise _____
3. (to) expand _____
4. (to) multiply out _____
5. (to) collect _____
6. (to) simplify _____
7. (to) evaluate _____
8. (to) substitute _____

replace a letter with a number

add all the same variables together

find the answer

turn an equation into a simpler form

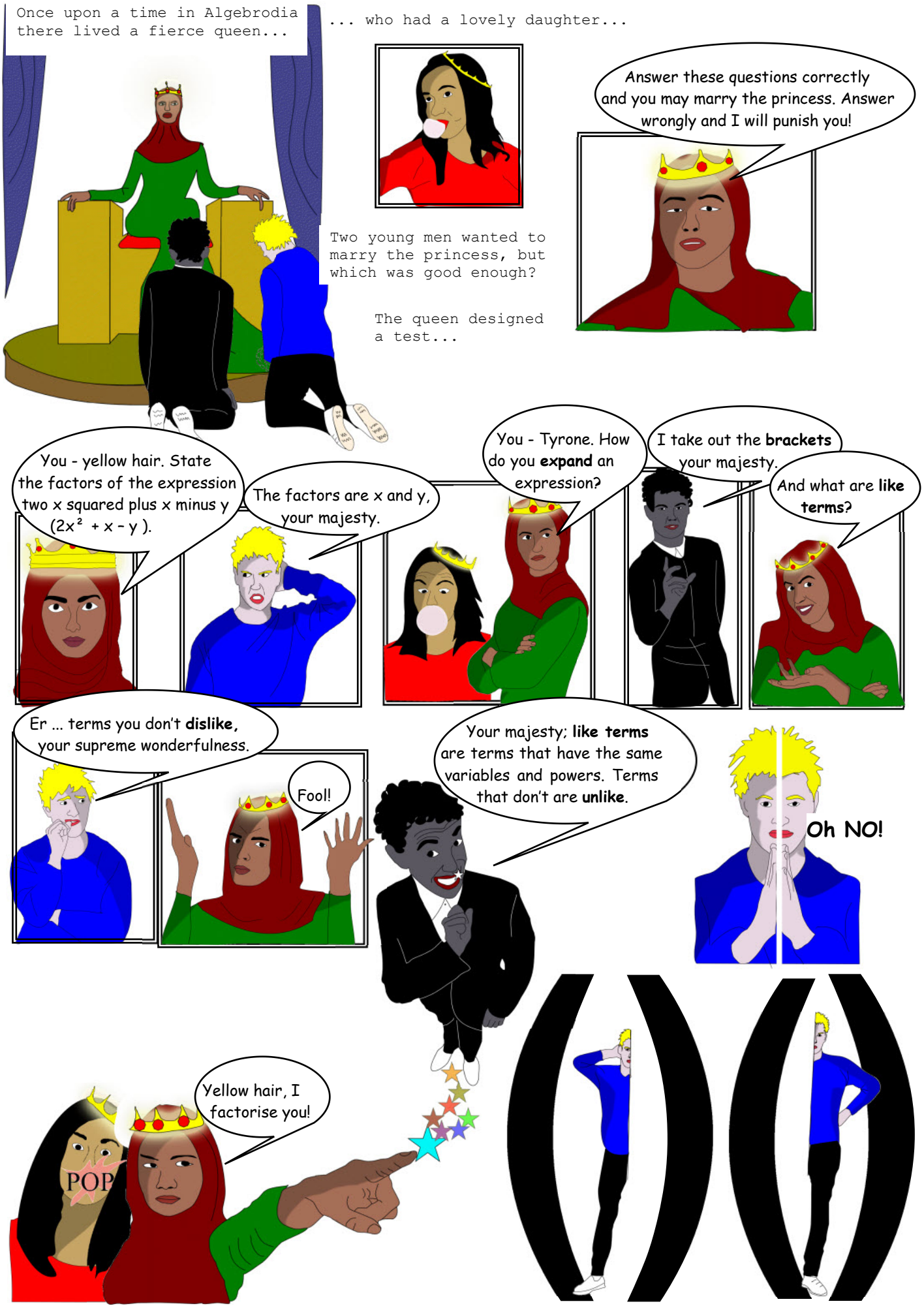
use brackets to write an expression

take out brackets from an equation

calculate an equation

take out brackets by multiplying

ALGEBRAIC TERMS

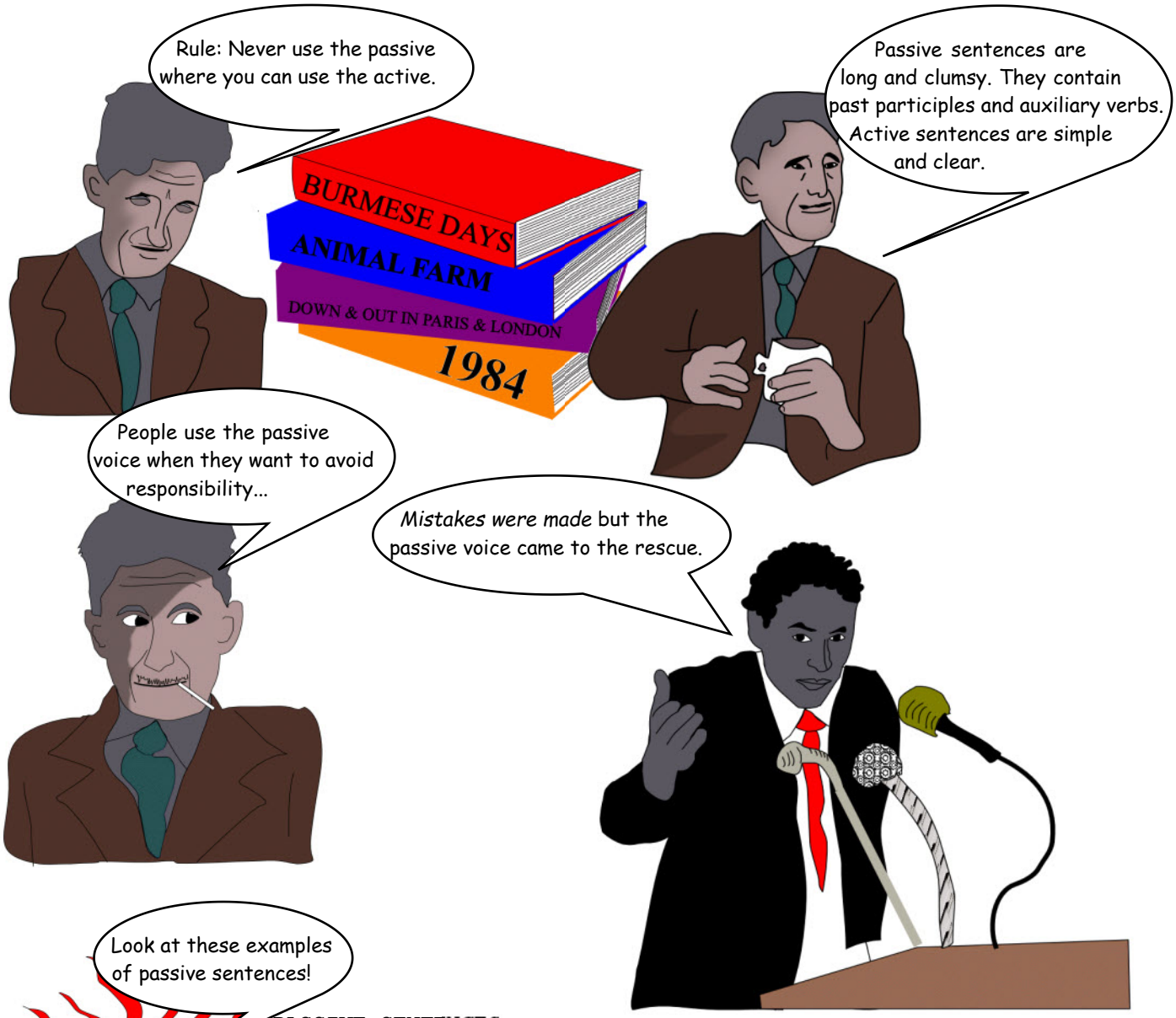


ACTIVE & PASSIVE SENTENCES

This is an active sentence: **multiply x by 2.**
In an active sentence, the subject performs the action.

This is a passive sentence: **Answers are expressed with a single exponent.**
In a passive sentence, the subject of the sentence has something *done to* it.

The English writer George Orwell had something to say about passive sentences:

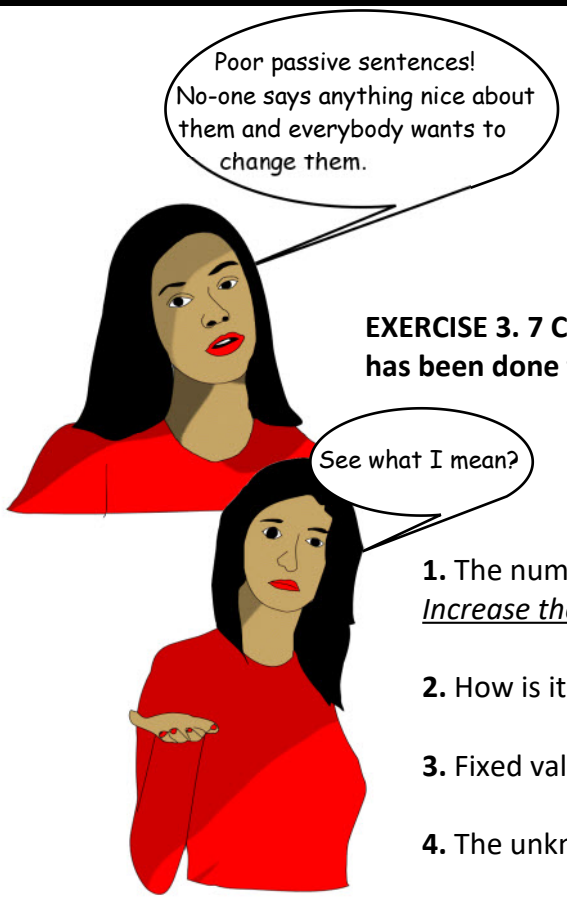


PASSIVE SENTENCES

1. The same operation is performed on both sides of the equation.
2. a is divided by b.
3. The equation can be solved by substituting 9 for x.
4. X is multiplied by itself to make x squared.

ACTIVE VERSIONS

1. Perform the same operation on both sides of the equation.
2. Divide a by b.
3. Solve the equation by substituting 9 for x.
4. Multiply x by itself to make x squared



EXERCISE 3. 7 Change these passive sentences into active ones. The first has been done for you (or; 'I have done the first one for you'):

1. The number is increased by 22.
Increase the number by 22 / add 22 to the number

2. How is it solved?

3. Fixed values are represented by letters.

4. The unknown number is represented by x.

5. How is 10 multiplied by itself ten times represented?

6. When the numbers are added together the result is 37.

7. The value of a variable is found when an equation is solved.

8. The variable is isolated on one side of the equation.

Understanding text books

Mathematics textbooks often use passive constructions. Look at this example:

To maintain an equality, the same operation, using equal numbers, may be performed on both sides of an equation.

To understand sentences like this:

1. Ask yourself; what is its purpose? For example, is it making a suggestion, warning about what *not* to do or setting an exercise? (This sentence is making a suggestion.)

2. Find the verbs (*maintain* and *perform*) and make any passive constructions active.

The example sentence then becomes: *To maintain equality, you perform the same operation on both sides of an equation.*

To make a passive sentence into an active one:

a. Give the active sentence an *agent*. Often, mathematics the agent is 'you' or 'we': (you / we) perform).

b. Simplify the *past participle*, e.g. 'performed' becomes 'perform'.

c. Cut out *auxiliary verbs* (may and be).

Exercise 3.8. Study this sentence;

To factor an expression completely, factoring is continued until it cannot be factored further.

Which is the active version of it? (a, b or c)

a. To factor an expression correctly the factoring is continued until you cannot factor any more.

b. To factor an expression completely, continue factoring until you cannot factor any more.

c. An expression can be completely factored by factoring several times.

Exercise 3.9 Study this passage. Turn the two passive sentences in the passage into active ones.

In multiplying two numbers, the numbers (factors) may be interchanged. Thus, the product of n and 10 may be represented by n10 or 10n. The latter is preferred.

_____

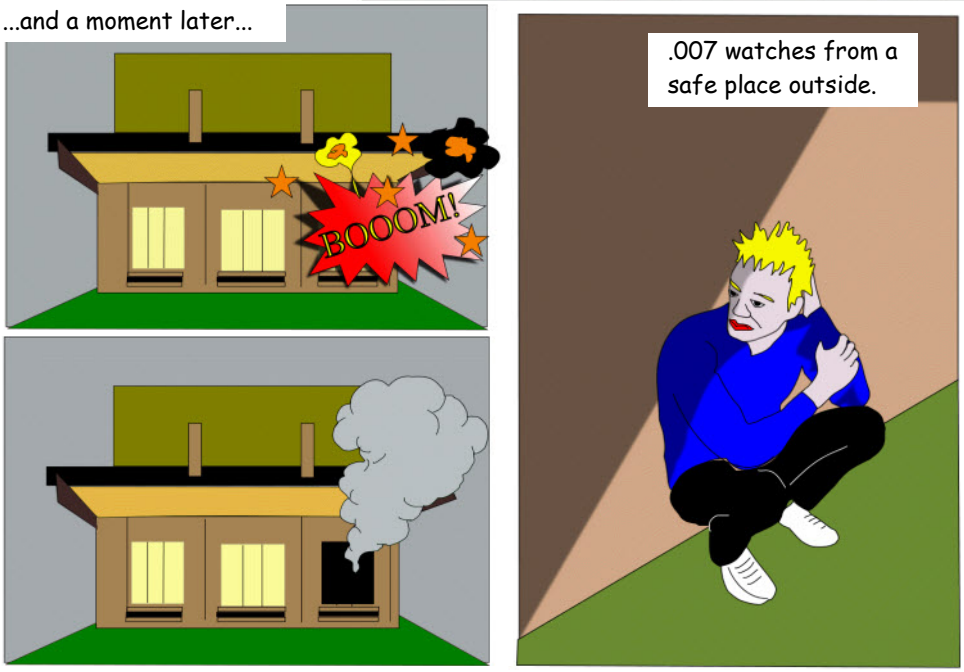
_____

_____

_____

FINDING X
Episode 3

The story so far:
New Agent Point-Double-Oh-Seven is on a mission to find the missing agent x. When .007 arrives at his Athens hotel, his telephone rings. A mystery voice warns him to get out immediately – he's in danger.



Continued in Unit 4

Exercise 3.10 What is the purpose of this sentence? (Choose from a, b and c)

Let E represent energy, m represent mass and c represent the speed of light. ($E = mc^2$)

a. To answer a question
b. To create an equation
c. To ask a question

Exercise 3.11 What do the words in *italics* mean in the following sentence? (Choose from a, b and c)

a + b = c so it *follows that* b = c - a

a. therefore
b. unless
c. however

Exercise 3.12 Put words from the box into the spaces in these sentences:

1. _____the following equation for x.
2. m and n are the unknown _____
3. Numbers in an equation are the _____
4. Taking out the brackets in an equation is known as _____
5. You _____ 3x(2x + 5) to take out the brackets.
6. The _____ terms in 2x + 6x + 3y are 2x and 6x
7. _____ $\frac{40}{10}$ to get 4.

expanding like constants unknown solve multiplying out substitute simplify