A4.1 Rules and formulae

objectives

- Add several small numbers.

- Use letter symbols to represent unknown numbers or variables.

- Substitute positive integers into simple linear expressions and formulae.

- Use simple formulae.

starter

Vocabulary
add
subtract
sum
difference

Resources
dice (three per group)

Ask a few questions such as:

Q   Subtract 8 from 12.

Q   What is the difference between 16 and 9?

Q   Add 6 to 8.

If necessary, remind pupils how they can bridge through 10.

Demonstrate how knowing that 8 + 6 = 14 leads to:

18 + 6 = 24
28 + 6 = 34
38 + 6 = 44, and so on.

Ask pupils to work in small groups. Give three dice to each group. They will also need pencil and paper to keep their scores. Tell pupils the rules of the game. In turn, each player rolls all three dice. Only fours, fives and sixes count. If you throw only ones, twos or threes, you miss that turn. The player finds the sum of the eligible numbers and adds this to their total score. The first player to reach a target number such as 50 or 100 wins the game.

Encourage pupils to add the numbers mentally. After the game, ask the whole class a few more questions, such as:

Q   Why is it impossible to score 11? (the minimum score is 12)

Q   How could you score 16? (4, 6, 6 or 5, 5, 6)

Q   What scores are possible after one throw? (any number from 12 to 18)

main activity

Vocabulary
rule
formula
substitute

Resources
OHTs A4.1a, A4.1b,
  A4.1c
computer with data
  projector
spreadsheet

Show **OHT A4.1a**. Explain that several families are going on a picnic together. The OHT shows some of the rules or formulae that they use when they are preparing for the picnic. Ask the class:

Q   How many bottles of water are needed for a picnic for 30 people? (30)

Q   20 bottles of water were packed for the picnic. How many people were going? (20)

Q   How many pizzas are needed for 12 people going on a picnic? (3)
For 20 people? (5)

Q   How many paper plates are needed for 9 people? (13) **For 30 people?** (34)

Q   How many cheese rolls are needed for 7 people? (19)

Q   35 cheese rolls were prepared for the picnic. How many people were expected to go? (15)

Continue asking similar questions based on the information on the OHT. Encourage pupils to suggest and apply one or two more rules for the picnic, for example, for the number of drinking straws and the number of cans of cola.

Explain that some rules can be written in a shorthand way. Demonstrate by writing on the board:

> Take two forks for every person.

> number of forks = number of people × 2

Ask:

Q   How many forks are needed for 7 people? (14)

Q   If 18 forks were taken to the picnic, how many people went along? (9)

Show **OHT A4.1b**. Ask:

Q   How many bananas are needed for 30 people going on a picnic? (26)

Q   All 16 bananas were eaten at a picnic. How many people went? (20)

Q   How many rugs are needed for 12 people on a picnic? (3)

Q   5 rugs were taken to a picnic. How many people went? (20)

Q   How many biscuits are needed for 8 people for a picnic? (48)

Q   60 biscuits were packed for a picnic. How many people went? (10)

Q   12 hard-boiled eggs were packed for a picnic. How many people went? (14)

Explain that rules can be written in an even shorter way. Write a rule on the board:

> number of apples = number of people + 4

Say that we can make this even shorter. We can write p to stand for the *number of people* and a to stand for the *number of apples*. So the formula for working out the number of apples becomes:

$a = p + 4$

Give another example.

> number of spoons = number of people × 2

We can write p to stand for the *number of people* and s to stand for the *number of spoons*. So the formula for working out the number of spoons becomes:

$s = p \times 2$ or even shorter $s = 2p$

Show **OHT A4.1c**, and work through the questions.

Write on the board a formula such as $n = m + 10$. Tell pupils that the value of m is 5, and show them how to work out the value of $m + 10$.

Q **What is the value of n if m equals 50? What if m equals 0?**

Repeat with a formula such as $a = 2b + 1$.

Tell pupils that the value of b is 8, and show them how to work out the value of $2b + 1$. Remind them that $2b = 2 \times b$.

Q **What is the value of a if b equals 10? What if b equals 0?**

Using a computer with a data projector, show a simple prepared spreadsheet with hidden formulae in cells B4 and B5, such as the one below. Set the size of the font to 28 pt or larger so that the whole class can see the text.

Ask pupils to suggest the number of people going on the picnic, and enter this into cell B2. Tell them to watch what happens to the numbers in cells B4 and B5. Each time that you enter a new number for the number of people, ask pupils:

Q **What do you think the formula is for the number of samosas? Why do you think so?**

Q **And the formula for the numbers of tomatoes?**

---

other tasks	There are no relevant exercises on using formulae and substitution in the *Springboard 7* folder. Choose suitable tasks or activities from textbooks or other resources, or devise your own. For practice in adding several small numbers use:

Springboard 7
Unit 10

Unit 10 section 1: Mental calculations

1	Adding numbers in your head	page 327
2	Adding multiples of 10 or 100	page 327

---

plenary	Show **OHTs A4.1d, A4.1e and A4.1f** and work through the questions with the class. Explain how pupils should 'show their working'.

Resources
OHTs A4.1d, A4.1e,
  A4.1f

> **Remember**
>
> - Algebra uses letters and numbers to replace words and numbers.
> - A rule written out in algebra is called a formula.
> - $5y$ means 5 times y. The number is always written first, so we never write $y5$.
> - Numbers can be substituted in a formula to work out the value of something that you want to know.