

Name \_\_\_\_\_

Date \_\_\_\_\_

## 2.3 Collecting like terms — worked answers

Collect like terms to simplify an algebraic expression. · 56 questions

### A · Fluency — Simplify by collecting like terms.

- 1 Simplify:  $3x + 2x$   
**Answer:  $5x$**   
Collect the like terms:  $3x + 2x = 5x$ .
- 2 Simplify:  $5a - 2a$   
**Answer:  $3a$**   
Collect the like terms:  $5a - 2a = 3a$ .
- 3 Simplify:  $7b + b$   
**Answer:  $8b$**   
Collect the like terms:  $7b + b = 8b$ .
- 4 Simplify:  $9m - 4m$   
**Answer:  $5m$**   
Collect the like terms:  $9m - 4m = 5m$ .
- 5 Simplify:  $4x + 3y + 2x - y$   
**Answer:  $6x + 2y$**   
Collect the like terms:  $4x + 3y + 2x - y = 6x + 2y$ .
- 6 Simplify:  $6p + 2q - p + 5q$   
**Answer:  $5p + 7q$**   
Collect the like terms:  $6p + 2q - p + 5q = 5p + 7q$ .
- 7 Simplify:  $2a + 3b + 4a$   
**Answer:  $6a + 3b$**   
Collect the like terms:  $2a + 3b + 4a = 6a + 3b$ .
- 8 Simplify:  $8c - 3c + 2d$   
**Answer:  $5c + 2d$**   
Collect the like terms:  $8c - 3c + 2d = 5c + 2d$ .
- 9 Simplify:  $5x + 7 - 2x - 3$   
**Answer:  $3x + 4$**   
Collect the like terms:  $5x + 7 - 2x - 3 = 3x + 4$ .
- 10 Simplify:  $10 - 3n + 4n$   
**Answer:  $n + 10$**   
Collect the like terms:  $10 - 3n + 4n = n + 10$ .

**11** Simplify:  $3s + 4t - 3s$

**Answer:  $4t$**

Collect the like terms:  $3s + 4t - 3s = 4t$ .

**12** Simplify:  $2u + 5v - 2v$

**Answer:  $2u + 3v$**

Collect the like terms:  $2u + 5v - 2v = 2u + 3v$ .

**13** Simplify:  $a + a + a + a$

**Answer:  $4a$**

Collect the like terms:  $a + a + a + a = 4a$ .

**14** Simplify:  $6y - y - 2y$

**Answer:  $3y$**

Collect the like terms:  $6y - y - 2y = 3y$ .

**15** Simplify:  $4e + 3f - 2e - 3f$

**Answer:  $2e$**

Collect the like terms:  $4e + 3f - 2e - 3f = 2e$ .

**16** Simplify:  $12k - 5k + 2$

**Answer:  $7k + 2$**

Collect the like terms:  $12k - 5k + 2 = 7k + 2$ .

**17** Simplify:  $3a/4 + 5a/12$

**Answer:  $7a/6$**

Collect the like terms:  $3a/4 + 5a/12 = 7a/6$ .

**18** Simplify:  $a/2 + 5a/8$

**Answer:  $9a/8$**

Collect the like terms:  $a/2 + 5a/8 = 9a/8$ .

**19** Simplify:  $y/2 - y/6$

**Answer:  $y/3$**

Collect the like terms:  $y/2 - y/6 = y/3$ .

**20** Simplify:  $2x/3 - 5x/12$

**Answer:  $x/4$**

Collect the like terms:  $2x/3 - 5x/12 = x/4$ .

**21** Simplify:  $3a/4 + a/2$

**Answer:  $5a/4$**

Collect the like terms:  $3a/4 + a/2 = 5a/4$ .

**22** Simplify:  $3b/5 + 7b/15$

**Answer:  $16b/15$**

Collect the like terms:  $3b/5 + 7b/15 = 16b/15$ .

**23** Simplify:  $2c + c/3$

**Answer:  $7c/3$**

Collect the like terms:  $2c + c/3 = 7c/3$ .

**24** Simplify:  $x/3 + x/4$

**Answer:  $7x/12$**

Collect the like terms:  $x/3 + x/4 = 7x/12$ .

### B · Reasoning — Which terms are like, and correct notation.

**25** Which pair are **like terms**?

- ☐  $3x$  and  $3y$
- ☐  $5a$  and  $2a$
- ☐  $4p$  and  $4$
- ☐  $2m$  and  $m^2$

**Answer:  $5a$  and  $2a$**

Like terms contain exactly the same letter to the same power, so  $5a$  and  $2a$  are like terms and can be combined into  $7a$ .

**26** Zara writes  $3x + 4y = 7xy$ . Is she correct?

- ☐ Yes
- ☐ No

**Answer: No**

$3x$  and  $4y$  are not like terms — they contain different letters — so the expression cannot be simplified at all. It stays  $3x + 4y$ .

**27** Write  $1 \times a$  in its simplest form.

**Answer:  $a$**

You never write the coefficient 1, so the answer is just  $a$ .

**28** Write  $a \times b$  in its simplest form.

**Answer:  $ab$**

Write the letters next to each other in alphabetical order:  $ab$ .

**29** Write  $b \times a$  in its simplest form.

**Answer:  $ab$**

Multiplication can be done in either order, so  $b \times a$  is written  $ab$ .

**30** Write  $a \times a \times a$  in index form.

**Answer:  $a^3$**

Three lots of  $a$  multiplied together is  $a^3$ .

**31** Simplify  $a + a$  and then compare with  $a \times a$ . Give the answer to  $a + a$ .

**Answer:  $2a$**

$a + a = 2a$  (adding), whereas  $a \times a = a^2$  (multiplying). These are completely different.

**32** An algebraic pyramid has bottom row  $c + d$ , then the two bricks above it. If the bottom-left brick is  $c + d$  and the next is  $6c + 2d$ , what is the brick above them?

**Answer:  $7c + 3d$**

Add the two bricks below:  $(c + d) + (6c + 2d) = 7c + 3d$ .

**33** In an algebraic pyramid the top brick is  $12c + 11d$  and one of the two bricks below it is  $7c + 3d$ . What is the other one?

**Answer:  $5c + 8d$**

Subtract:  $(12c + 11d) - (7c + 3d) = 5c + 8d$ .

- 34 Simplify  $5x + 3 - 2x + 7$ .

**Answer:  $3x + 10$**

Collect the  $x$  terms and the numbers separately:  $3x + 10$ .

- 35 Simplify  $4a - 7a$ .

**Answer:  $-3a$**

$4 - 7 = -3$ , so the answer is  $-3a$ . A negative coefficient is perfectly acceptable.

- 36 How many terms are there in the simplified form of  $2x + 3y + 5x - y$ ?

**Answer: 2**

It simplifies to  $7x + 2y$ , which has 2 terms.

### C · Challenge — Brackets, powers and perimeters.

- 37 Simplify  $3(a + 2) + 2a$ . (Expand first, then collect like terms.)

**Answer:  $5a + 6$**

$3(a + 2) = 3a + 6$ , then  $3a + 6 + 2a = 5a + 6$ .

- 38 Simplify  $4x + 2y - 3x + 5y - 7$ .

**Answer:  $x + 7y - 7$**

$x$  terms:  $4x - 3x = x$ .  $y$  terms:  $2y + 5y = 7y$ . So the answer is  $x + 7y - 7$ .

- 39 Simplify  $2ab + 3ab - ab$ .

**Answer:  $4ab$**

All three are like terms because each contains  $ab$ :  $2 + 3 - 1 = 4$ , giving  $4ab$ .

- 40 Simplify  $a^2 + 3a^2 - 2a^2$ .

**Answer:  $2a^2$**

All three terms contain  $a^2$ , so  $1 + 3 - 2 = 2$ , giving  $2a^2$ .

- 41 Simplify  $5x + 2x^2$ . (Careful — think about whether these are like terms.)

**Answer:  $2x^2 + 5x$**

$x$  and  $x^2$  are **not** like terms, so this cannot be simplified. The answer stays  $2x^2 + 5x$ .

- 42 A rectangle has length  $3x + 2$  and width  $x - 1$ . Write a simplified expression for its perimeter.

**Answer:  $8x + 2$**

Perimeter =  $2(\text{length} + \text{width}) = 2(4x + 1) = 8x + 2$ .

- 43 A triangle has sides  $2a + 1$ ,  $3a - 2$  and  $a + 4$ . Write a simplified expression for its perimeter.

**Answer:  $6a + 3$**

Add all three sides:  $6a + 3$ .

- 44 Simplify  $3a/4 + a/2$  and give your answer as a single fraction.

**Answer:  $5a/4$**

Use a common denominator of 4:  $3a/4 + 2a/4 = 5a/4$ .

### D · Word problems — Simplifying expressions from contexts.

- 45 A red brick is  $x$  cm long and a blue brick is  $y$  cm long. Write a simplified expression for the total length of three red bricks and two blue bricks, in cm.

**Answer:  $3x + 2y$**

Three red bricks give  $3x$  and two blue bricks give  $2y$ . They are not like terms, so the answer is  $3x + 2y$ .

- 46** A shop sells pens at \$p and rulers at \$r. Ravi buys 4 pens and 3 rulers; Mia buys 2 pens and 5 rulers. Write a simplified expression for the total spent.

**Answer:  $6p + 8r$**

Collect the p terms and the r terms:  $6p + 8r$ .

- 47** A square has side length s. A second square has side length 2s. Write a simplified expression for the total perimeter of both squares.

**Answer:  $12s$**

$4s + 8s = 12s$ .

- 48** A bus has b passengers. At the first stop 5 get on, at the second 3 get off, at the third 7 get on. Write a simplified expression for the number on board.

**Answer:  $b + 9$**

$b + 5 - 3 + 7 = b + 9$ .

- 49** A rectangle is 2x cm long and 3 cm wide. Another is x cm long and 3 cm wide. Write a simplified expression for the total of their perimeters, in cm.

**Answer:  $6x + 12$**

First:  $4x + 6$ . Second:  $2x + 6$ . Total:  $6x + 12$ .

- 50** Ali has n marbles. Ben has 3 times as many. Cara has 5 fewer than Ali. Write a simplified expression for the total number of marbles.

**Answer:  $5n - 5$**

$n + 3n + n - 5 = 5n - 5$ .

- 51** A trip costs \$c per student and \$a per adult. 30 students and 4 adults go in the morning, and 20 students and 3 adults in the afternoon. Write a simplified expression for the total cost.

**Answer:  $7a + 50c$**

$50c + 7a$ .

- 52** A garden path is made of p paving slabs each x cm long, plus a 40 cm step. Two such paths are laid end to end. Write a simplified expression for the total length, in cm.

**Answer:  $2px + 80$**

$2(px + 40) = 2px + 80$ .

- 53** A recipe uses f grams of flour and s grams of sugar. Write a simplified expression for the total mass, in grams, of a double batch and a single batch.

**Answer:  $3f + 3s$**

$2(f + s) + (f + s) = 3f + 3s$ .

- 54** A phone costs \$x and a case costs \$y. A shop sells 6 phones with cases and then 2 extra cases. Write a simplified expression for the total takings.

**Answer:  $6x + 8y$**

$6x + 6y + 2y = 6x + 8y$ .

- 55** A rectangle has length 5a and width 2a. Write a simplified expression for its perimeter.

**Answer:  $14a$**

$2(5a + 2a) = 2 \times 7a = 14a$ .

- 56** A number is n. Write a simplified expression for the total of the number, double the number and half the number.

**Answer:  $7n/2$**

$n + 2n + n/2 = 7n/2$ .