

Name _____

Date _____

2.5 Constructing and solving equations — worked answers

Write and use equations, and solve them to find an unknown value. · 56 questions

A · Fluency — Solve one-step and two-step equations.

- 1 Solve: $x - 3 = 12$. Give the value of x .

Answer: 15

Do the same thing to both sides until x is on its own. The solution is $x = 15$. Check by substituting it back into the equation.

- 2 Solve: $2y + 4 = 16$. Give the value of y .

Answer: 6

Do the same thing to both sides until y is on its own. The solution is $y = 6$. Check by substituting it back into the equation.

- 3 Solve: $x + 5 = 12$. Give the value of x .

Answer: 7

Do the same thing to both sides until x is on its own. The solution is $x = 7$. Check by substituting it back into the equation.

- 4 Solve: $a - 7 = 2$. Give the value of a .

Answer: 9

Do the same thing to both sides until a is on its own. The solution is $a = 9$. Check by substituting it back into the equation.

- 5 Solve: $3n = 18$. Give the value of n .

Answer: 6

Do the same thing to both sides until n is on its own. The solution is $n = 6$. Check by substituting it back into the equation.

- 6 Solve: $m/4 = 5$. Give the value of m .

Answer: 20

Do the same thing to both sides until m is on its own. The solution is $m = 20$. Check by substituting it back into the equation.

- 7 Solve: $2x + 1 = 9$. Give the value of x .

Answer: 4

Do the same thing to both sides until x is on its own. The solution is $x = 4$. Check by substituting it back into the equation.

- 8 Solve: $5p - 3 = 12$. Give the value of p .

Answer: 3

Do the same thing to both sides until p is on its own. The solution is $p = 3$. Check by substituting it back into the equation.

- 9 Solve: $4k + 7 = 31$. Give the value of k .

Answer: 6

Do the same thing to both sides until k is on its own. The solution is $k = 6$. Check by substituting it back into the equation.

- 10 Solve: $6w - 5 = 13$. Give the value of w .

Answer: 3

Do the same thing to both sides until w is on its own. The solution is $w = 3$. Check by substituting it back into the equation.

- 11 Solve: $x/2 + 3 = 8$. Give the value of x .

Answer: 10

Do the same thing to both sides until x is on its own. The solution is $x = 10$. Check by substituting it back into the equation.

- 12 Solve: $3y - 2 = 10$. Give the value of y .

Answer: 4

Do the same thing to both sides until y is on its own. The solution is $y = 4$. Check by substituting it back into the equation.

- 13 Solve: $7 + 2c = 19$. Give the value of c .

Answer: 6

Do the same thing to both sides until c is on its own. The solution is $c = 6$. Check by substituting it back into the equation.

- 14 Solve: $20 - 3d = 5$. Give the value of d .

Answer: 5

Do the same thing to both sides until d is on its own. The solution is $d = 5$. Check by substituting it back into the equation.

- 15 Solve: $8 - x = 3$. Give the value of x .

Answer: 5

Do the same thing to both sides until x is on its own. The solution is $x = 5$. Check by substituting it back into the equation.

- 16 Solve: $2(t + 3) = 14$. Give the value of t .

Answer: 4

Do the same thing to both sides until t is on its own. The solution is $t = 4$. Check by substituting it back into the equation.

- 17 Solve: $3(u - 1) = 12$. Give the value of u .

Answer: 5

Do the same thing to both sides until u is on its own. The solution is $u = 5$. Check by substituting it back into the equation.

- 18 Solve: $5(v + 2) = 35$. Give the value of v .

Answer: 5

Do the same thing to both sides until v is on its own. The solution is $v = 5$. Check by substituting it back into the equation.

- 19 Solve: $4x = 10$. Give the value of x .

Answer: 5/2

Do the same thing to both sides until x is on its own. The solution is $x = 5/2$. Check by substituting it back into the equation.

- 20** Solve: $2n + 7 = 2$. Give the value of n .

Answer: $-5/2$

Do the same thing to both sides until n is on its own. The solution is $n = -5/2$. Check by substituting it back into the equation.

- 21** Solve: $3z + 11 = 5$. Give the value of z .

Answer: -2

Do the same thing to both sides until z is on its own. The solution is $z = -2$. Check by substituting it back into the equation.

- 22** Solve: $x/3 = 4$. Give the value of x .

Answer: 12

Do the same thing to both sides until x is on its own. The solution is $x = 12$. Check by substituting it back into the equation.

- 23** Solve: $10 - 2g = 16$. Give the value of g .

Answer: -3

Do the same thing to both sides until g is on its own. The solution is $g = -3$. Check by substituting it back into the equation.

- 24** Solve: $6h + 1 = 1$. Give the value of h .

Answer: 0

Do the same thing to both sides until h is on its own. The solution is $h = 0$. Check by substituting it back into the equation.

B · Reasoning — Choose the right step; build equations from words.

- 25** Solve $x + 5 = 12$ and check your answer. What is x ?

Answer: 7

Subtract 5 from both sides: $x = 7$. Check: $7 + 5 = 12$ ✓

- 26** I think of a number and add 6. The answer is 15. What was my number?

Answer: 9

$n + 6 = 15$, so $n = 15 - 6 = 9$.

- 27** I think of a number and multiply it by 4. The answer is 28. What was my number?

Answer: 7

$4n = 28$, so $n = 28 \div 4 = 7$.

- 28** I think of a number, double it and add 3. The answer is 17. What was my number?

Answer: 7

$2n + 3 = 17 \rightarrow 2n = 14 \rightarrow n = 7$.

- 29** I think of a number, subtract 4 and then multiply by 3. The answer is 21. What was my number?

Answer: 11

$3(n - 4) = 21 \rightarrow n - 4 = 7 \rightarrow n = 11$.

- 30** Write an equation for: "a number n multiplied by 5 gives 40". Write the left-hand side only.

Answer: $5n$

The equation is $5n = 40$, so the left-hand side is $5n$.

- 31 To solve $2y + 4 = 16$, what is the first step?

- ☐ Divide both sides by 2
- ☐ Subtract 4 from both sides
- ☐ Add 4 to both sides
- ☐ Multiply both sides by 2

Answer: Subtract 4 from both sides

Undo the operations in reverse order: take away the 4 first, giving $2y = 12$, then divide by 2.

- 32 Arun solves $3x = 12$ by subtracting 3 from both sides. Is he right?

- ☐ Yes
- ☐ No

Answer: No

$3x$ means $3 \times x$, so you undo it by **dividing** by 3, giving $x = 4$.

- 33 The perimeter of a square is 36 cm. Write and solve an equation to find the side length, in cm.

Answer: 9

$4s = 36$, so $s = 9$ cm.

- 34 A rectangle has perimeter 30 cm and width 5 cm. Find its length, in cm.

Answer: 10

$2(l + 5) = 30 \rightarrow l + 5 = 15 \rightarrow l = 10$ cm.

- 35 Three consecutive integers add up to 42. What is the smallest one?

Answer: 13

$n + (n + 1) + (n + 2) = 42 \rightarrow 3n + 3 = 42 \rightarrow 3n = 39 \rightarrow n = 13$. The numbers are 13, 14 and 15.

- 36 Two numbers add up to 20 and one is 4 more than the other. What is the smaller number?

Answer: 8

$n + (n + 4) = 20 \rightarrow 2n + 4 = 20 \rightarrow 2n = 16 \rightarrow n = 8$.

C · Challenge — Brackets, unknowns on both sides, geometry.

- 37 Solve $4(x - 2) = 20$. What is x ?

Answer: 7

Divide both sides by 4: $x - 2 = 5$, so $x = 7$. (Or expand first: $4x - 8 = 20$.)

- 38 Solve $2(3x + 1) = 26$. What is x ?

Answer: 4

$6x + 2 = 26 \rightarrow 6x = 24 \rightarrow x = 4$.

- 39 Solve $5x + 3 = 3x + 11$. What is x ?

Answer: 4

Take $3x$ from both sides: $2x + 3 = 11$, then $2x = 8$ and $x = 4$.

- 40 Solve $7x - 2 = 4x + 13$. What is x ?

Answer: 5

Take $4x$ from both sides: $3x - 2 = 13$, then $3x = 15$ and $x = 5$.

- 41 The angles of a triangle are x , $2x$ and $3x$ degrees. What is the value of x ?

Answer: 30

Angles in a triangle add to 180° , so $6x = 180$ and $x = 30$.

- 42** Ali is x years old. His mother is 3 times as old. Together their ages total 48. How old is Ali?

Answer: 12

$$x + 3x = 48 \rightarrow 4x = 48 \rightarrow x = 12.$$

- 43** A rectangle has length $2x + 1$ and width x . Its perimeter is 26 cm. What is the value of x ?

Answer: 4

$$2((2x + 1) + x) = 26 \rightarrow 2(3x + 1) = 26 \rightarrow 6x + 2 = 26 \rightarrow 6x = 24 \rightarrow x = 4.$$

- 44** The formula $T = 25h + 40$ gives a plumber's charge in dollars. A job cost \$215. How many hours did it take?

Answer: 7

$$25h + 40 = 215 \rightarrow 25h = 175 \rightarrow h = 7 \text{ hours.}$$

D · Word problems — Set up and solve equations in context.

- 45** A taxi charges \$3 plus \$2 per kilometre. A journey cost \$23. How many kilometres was it?

Answer: 10

$$2k + 3 = 23 \rightarrow 2k = 20 \rightarrow k = 10 \text{ km.}$$

- 46** A cinema ticket costs \$9. Mia spent \$63 on tickets. How many did she buy?

Answer: 7

$$9n = 63, \text{ so } n = 7 \text{ tickets.}$$

- 47** A number of students share 84 pencils equally, getting 7 each. How many students are there?

Answer: 12

$$7s = 84, \text{ so } s = 12 \text{ students.}$$

- 48** A book costs \$12 more than a pen. Together they cost \$20. How much is the pen, in dollars?

Answer: 4

$$p + (p + 12) = 20 \rightarrow 2p + 12 = 20 \rightarrow 2p = 8 \rightarrow p = 4.$$

- 49** A gym charges \$50 to join plus \$30 a month. Ravi paid \$290 in total. For how many months?

Answer: 8

$$30m + 50 = 290 \rightarrow 30m = 240 \rightarrow m = 8 \text{ months.}$$

- 50** A phone plan costs \$15 plus \$0.20 per extra minute. A bill was \$23. How many extra minutes were used?

Answer: 40

$$0.2m + 15 = 23 \rightarrow 0.2m = 8 \rightarrow m = 40 \text{ minutes.}$$

- 51** Five identical boxes and a 3 kg bag weigh 43 kg altogether. What is the mass of one box, in kg?

Answer: 8

$$5b + 3 = 43 \rightarrow 5b = 40 \rightarrow b = 8 \text{ kg.}$$

- 52** A farmer has c cows. He buys 12 more and then has 3 times as many as he started with. How many did he start with?

Answer: 6

$$c + 12 = 3c \rightarrow 12 = 2c \rightarrow c = 6 \text{ cows.}$$

- 53** A rope 60 m long is cut into two pieces, one twice as long as the other. How long is the shorter piece, in metres?

Answer: 20

$$x + 2x = 60 \rightarrow 3x = 60 \rightarrow x = 20 \text{ m.}$$

- 54** The mass of a parcel is p kg. Four such parcels plus a 2 kg box weigh 22 kg. What is p ?

Answer: 5

$$4p + 2 = 22 \rightarrow 4p = 20 \rightarrow p = 5 \text{ kg.}$$

- 55** A cafe sells t teas at \$3 each and 5 coffees at \$4 each, taking \$47 altogether. How many teas were sold?

Answer: 9

$$3t + 20 = 47 \rightarrow 3t = 27 \rightarrow t = 9 \text{ teas.}$$

- 56** A rectangle is 3 cm longer than it is wide. Its perimeter is 34 cm. What is its width, in cm?

Answer: 7

$$2(w + w + 3) = 34 \rightarrow 2(2w + 3) = 34 \rightarrow 4w + 6 = 34 \rightarrow 4w = 28 \rightarrow w = 7 \text{ cm.}$$