

Two-Step Equations

KEY IDEAS

Goal: get the variable alone. Whatever you do to one side, do to the other, so the equation stays balanced.

Step 1: undo the **adding or subtracting**. **Step 2:** undo the **multiplying or dividing**. **Step 3:** **check** by substituting.

Example: $3x + 4 = 19 \rightarrow$ subtract 4: $3x = 15 \rightarrow$ divide by 3: $x = 5 \rightarrow$ check: $3(5) + 4 = 19 \checkmark$

A Warm-up: one-step equations

2 marks (½ each)

1. $x + 7 = 15 \rightarrow$ _____

2. $y - 4 = 11 \rightarrow$ _____

3. $6m = 42 \rightarrow$ _____

4. $\frac{n}{5} = 9 \rightarrow$ _____

B Solve two-step equations

6 marks

5. $2x + 5 = 17$

Step 1 _____

Step 2 _____

Check _____

6. $3y - 4 = 20$

Step 1 _____

Step 2 _____

Check _____

7. $5n + 12 = 2$

Step 1 _____

Step 2 _____

Check _____

8. $\frac{x}{4} + 3 = 10$

Step 1 _____

Step 2 _____

Check _____

9. $7 - 2k = -5$

Step 1 _____

Step 2 _____

Check _____

10. $-3a + 8 = 29$

Step 1 _____

Step 2 _____

Check _____

C Brackets, fractions and decimals

4 marks

11. $2(x + 3) = 18$

Work _____

12. $\frac{n-5}{3} = 4$

Work _____

13. $0.5x + 1.5 = 4$

Work _____

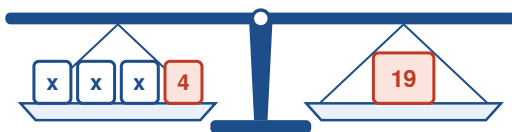
14. $4(y - 2) = -12$

Work _____

D Balance scales

4 marks

15. Write the equation, then solve.



Equation: _____ $x =$ _____

16. Write the equation, then solve.



Equation: _____ $x =$ _____

E Write an equation, then solve (let n be the number)**4 marks ($\frac{1}{2} + \frac{1}{2}$ each)****17.** Five more than twice a number is 21.Equation: _____ $n =$ _____**18.** A number divided by 3, minus 4, is 2.Equation: _____ $n =$ _____**19.** Triple a number, decreased by 7, is 20.Equation: _____ $n =$ _____**20.** The sum of a number and 6, multiplied by 2, is 30.Equation: _____ $n =$ _____**F Check the solution****2 marks ($\frac{1}{2}$ each)**

	Question	Substitute and work it out	Yes / No
21.	Is $x = 4$ a solution of $3x - 5 = 7$?		
22.	Is $y = 2$ a solution of $4y + 9 = 15$?		
23.	Is $m = -3$ a solution of $2m + 10 = 4$?		
24.	Is $p = 12$ a solution of $\frac{p}{4} - 1 = 3$?		

G Real-world problems**6 marks***Write an equation, solve it and give units. 2 marks each.***25.** A taxi charges a \$3.50 flat fee plus \$2.25 per kilometre. A ride costs \$21.50. Write an equation and solve it to find how many kilometres the ride was.

_____**26.** A gym charges a \$25 sign-up fee plus \$15 per month. Maya has paid \$130 in total. Write and solve an equation to find how many months she has been a member.

_____**27.** Jordan has \$40 saved and adds \$12 every week. How many weeks will it take him to reach \$172 for a new bike?

_____**H Spot the mistake****2 marks****28.** To solve $2x + 6 = 20$, a student writes: $x + 6 = 10$, so $x = 4$. Explain the error and solve it correctly.

_____**29.** To solve $3x - 4 = 11$, a student writes: $3x = 7$, so $x = 7/3$. Explain the error and solve it correctly.

Two-Step Equations

ANSWER KEY**KEY IDEAS****Goal:** get the variable alone. Whatever you do to one side, do to the other, so the equation stays balanced.**Step 1:** undo the **adding or subtracting**. **Step 2:** undo the **multiplying or dividing**. **Step 3:** **check** by substituting.**Example:** $3x + 4 = 19 \rightarrow$ subtract 4: $3x = 15 \rightarrow$ divide by 3: $x = 5 \rightarrow$ check: $3(5) + 4 = 19 \checkmark$ **A Warm-up: one-step equations****2 marks (½ each)**

1. $x + 7 = 15 \rightarrow x = 8$

2. $y - 4 = 11 \rightarrow y = 15$

3. $6m = 42 \rightarrow m = 7$

4. $\frac{n}{5} = 9 \rightarrow n = 45$

B Solve two-step equations**6 marks**

5. $2x + 5 = 17$

Step 1 **subtract 5:** $2x = 12$ Step 2 **divide by 2:** $x = 6$ Check $2(6) + 5 = 17 \checkmark$

6. $3y - 4 = 20$

Step 1 **add 4:** $3y = 24$ Step 2 **divide by 3:** $y = 8$ Check $3(8) - 4 = 20 \checkmark$

7. $5n + 12 = 2$

Step 1 **subtract 12:** $5n = -10$ Step 2 **divide by 5:** $n = -2$ Check $5(-2) + 12 = 2 \checkmark$

8. $\frac{x}{4} + 3 = 10$

Step 1 **subtract 3:** $x/4 = 7$ Step 2 **multiply by 4:** $x = 28$ Check $28/4 + 3 = 10 \checkmark$

9. $7 - 2k = -5$

Step 1 **subtract 7:** $-2k = -12$ Step 2 **divide by -2:** $k = 6$ Check $7 - 2(6) = -5 \checkmark$

10. $-3a + 8 = 29$

Step 1 **subtract 8:** $-3a = 21$ Step 2 **divide by -3:** $a = -7$ Check $-3(-7) + 8 = 29 \checkmark$ **C Brackets, fractions and decimals****4 marks**

11. $2(x + 3) = 18$

Work **divide by 2:** $x + 3 = 9$, so $x = 6$

12. $\frac{n-5}{3} = 4$

Work **multiply by 3:** $n - 5 = 12$, so $n = 17$

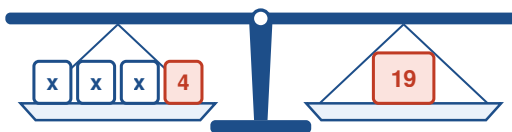
13. $0.5x + 1.5 = 4$

Work **subtract 1.5:** $0.5x = 2.5$, so $x = 5$

14. $4(y - 2) = -12$

Work **divide by 4:** $y - 2 = -3$, so $y = -1$ **D Balance scales****4 marks**

15. Write the equation, then solve.

Equation: $3x + 4 = 19$ $x = 5$

16. Write the equation, then solve.

Equation: $2x + 7 = 15$ $x = 4$

E Write an equation, then solve (let n be the number)**4 marks ($\frac{1}{2} + \frac{1}{2}$ each)**

17. Five more than twice a number is 21.

Equation: $2n + 5 = 21$

$n = 8$

18. A number divided by 3, minus 4, is 2.

Equation: $n/3 - 4 = 2$

$n = 18$

19. Triple a number, decreased by 7, is 20.

Equation: $3n - 7 = 20$

$n = 9$

20. The sum of a number and 6, multiplied by 2, is 30.

Equation: $2(n + 6) = 30$

$n = 9$

F Check the solution**2 marks ($\frac{1}{2}$ each)**

	Question	Substitute and work it out	Yes / No
21.	Is $x = 4$ a solution of $3x - 5 = 7$?	$3(4) - 5 = 7 \checkmark$	Yes
22.	Is $y = 2$ a solution of $4y + 9 = 15$?	$4(2) + 9 = 17$, not 15	No
23.	Is $m = -3$ a solution of $2m + 10 = 4$?	$2(-3) + 10 = 4 \checkmark$	Yes
24.	Is $p = 12$ a solution of $\frac{p}{4} - 1 = 3$?	$\frac{12}{4} - 1 = 2$, not 3	No

G Real-world problems**6 marks***Write an equation, solve it and give units. 2 marks each.*

25. A taxi charges a \$3.50 flat fee plus \$2.25 per kilometre. A ride costs \$21.50. Write an equation and solve it to find how many kilometres the ride was.

$3.50 + 2.25k = 21.50 \rightarrow 2.25k = 18 \rightarrow k = 8 \text{ km}$

26. A gym charges a \$25 sign-up fee plus \$15 per month. Maya has paid \$130 in total. Write and solve an equation to find how many months she has been a member.

$25 + 15m = 130 \rightarrow 15m = 105 \rightarrow m = 7 \text{ months}$

27. Jordan has \$40 saved and adds \$12 every week. How many weeks will it take him to reach \$172 for a new bike?

$40 + 12w = 172 \rightarrow 12w = 132 \rightarrow w = 11 \text{ weeks}$

H Spot the mistake**2 marks**28. To solve $2x + 6 = 20$, a student writes: $x + 6 = 10$, so $x = 4$. Explain the error and solve it correctly.Dividing by 2 must divide **every** term, so 6 becomes 3. Easier: subtract 6 first. $2x = 14$, so $x = 7$. Check: $2(7) + 6 = 20 \checkmark$ 29. To solve $3x - 4 = 11$, a student writes: $3x = 7$, so $x = 7/3$. Explain the error and solve it correctly.To undo -4 you **add** 4, not subtract it: $3x = 15$, so $x = 5$. Check: $3(5) - 4 = 11 \checkmark$