

Literal Equations

Name: _____ Date: _____ Score: _____ / 24

Q Quick Review

A **literal equation** is an equation with several letters, like a formula. “Solving” one means **isolating one variable** — getting it alone on one side — while the other letters just come along for the ride. You use the *same moves* as with number equations: add, subtract, multiply, and divide both sides, and undo operations in reverse order. The answer will be an expression in the *other* letters. This is exactly how you rearrange formulas like $A = lw$ or $d = rt$.

◇ **Example:** Solve $d = rt$ for t .

⇒ We want t all by itself, but right now it’s stuck being multiplied by r . To undo a multiplication, we divide — and we do it to *both* sides to keep the equation balanced. Dividing both sides by r gives $\frac{d}{r} = \frac{rt}{r}$, and on the right the r ’s cancel, leaving just t . So $t = \frac{d}{r}$. The letters d and r stay put — only t had to move. This is the distance formula rearranged to find time.

Answer: $t = \frac{d}{r}$

PRACTICE

Solve each literal equation for the indicated variable.

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|----------------------------|-------|-----------------------------------|-------|
| 1. $A = lw$, for w | _____ | 11. $ax = b$, for x | _____ |
| 2. $A = lw$, for l | _____ | 12. $x + y = c$, for x | _____ |
| 3. $d = rt$, for r | _____ | 13. $\frac{x}{a} = b$, for x | _____ |
| 4. $P = 4s$, for s | _____ | 14. $2x + k = m$, for x | _____ |
| 5. $C = 2\pi r$, for r | _____ | 15. $A = \frac{1}{2}bh$, for h | _____ |
| 6. $y = mx + b$, for b | _____ | 16. $F = ma$, for a | _____ |
| 7. $y = mx + b$, for m | _____ | 17. $y - k = m(x - h)$, for y | _____ |
| 8. $P = 2l + 2w$, for l | _____ | 18. $ax + by = c$, for y | _____ |
| 9. $V = lwh$, for h | _____ | 19. $p = \frac{q}{r}$, for q | _____ |
| 10. $I = prt$, for p | _____ | 20. $3a - b = 2c$, for a | _____ |

◆ Word Problems

21. The area of a triangle is $A = \frac{1}{2}bh$. Solve for the base b , then find b when $A = 24$ and $h = 6$. _____
22. The distance formula is $d = rt$. Solve for the rate r , then find r when $d = 240$ miles and $t = 4$ hours. _____
23. The perimeter of a rectangle is $P = 2l + 2w$. Solve for the width w , then find w when $P = 30$ and $l = 9$. _____
24. Simple interest is $I = prt$. Solve for the time t , then find t when $I = 90$, $p = 600$, and $r = 0.05$. _____



Answer Keys

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| <ol style="list-style-type: none"> 1. $w = \frac{A}{l}$ 2. $l = \frac{A}{w}$ 3. $r = \frac{d}{t}$ 4. $s = \frac{P}{4}$ 5. $r = \frac{C}{2\pi}$ 6. $b = y - mx$ 7. $m = \frac{y-b}{x}$ 8. $l = \frac{P-2w}{2}$ 9. $h = \frac{V}{lw}$ 10. $p = \frac{I}{rt}$ 11. $x = \frac{b}{a}$ 12. $x = c - y$ 13. $x = ab$ | <ol style="list-style-type: none"> 14. $x = \frac{m-k}{2}$ 15. $h = \frac{2A}{b}$ 16. $a = \frac{F}{m}$ 17. $y = m(x - h) + k$ 18. $y = \frac{c-ax}{b}$ 19. $q = pr$ 20. $a = \frac{2c+b}{3}$ 21. $b = \frac{2A}{h}; b = 8$ 22. $r = \frac{d}{t}; r = 60 \text{ mph}$ 23. $w = \frac{P-2l}{2}; w = 6$ 24. $t = \frac{I}{pr}; t = 3 \text{ years}$ |
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Step-by-Step Explanations

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| <ol style="list-style-type: none"> 1. Divide both sides by l: $w = \frac{A}{l}$. 2. Divide both sides by w: $l = \frac{A}{w}$. 3. Divide both sides by t: $r = \frac{d}{t}$. 4. Divide both sides by 4: $s = \frac{P}{4}$. 5. Divide both sides by 2π: $r = \frac{C}{2\pi}$. 6. Subtract mx from both sides: $b = y - mx$. 7. Subtract b: $y - b = mx$, then divide by x: $m = \frac{y-b}{x}$. 8. Subtract $2w$: $P - 2w = 2l$, then divide by 2. 9. Divide both sides by lw: $h = \frac{V}{lw}$. 10. Divide both sides by rt: $p = \frac{I}{rt}$. 11. Divide both sides by a: $x = \frac{b}{a}$. 12. Subtract y from both sides: $x = c - y$. 13. Multiply both sides by a: $x = ab$. 14. Subtract k: $2x = m - k$, then divide by 2. | <ol style="list-style-type: none"> 15. Multiply by 2: $2A = bh$, then divide by b: $h = \frac{2A}{b}$. 16. Divide both sides by m: $a = \frac{F}{m}$. 17. Add k to both sides: $y = m(x - h) + k$. 18. Subtract ax: $by = c - ax$, then divide by b. 19. Multiply both sides by r: $q = pr$. 20. Add b: $3a = 2c + b$, then divide by 3. 21. Multiply by 2: $2A = bh$, then divide by h: $b = \frac{2A}{h}$. With $A = 24$, $h = 6$: $b = \frac{48}{6} = 8$. 22. Divide both sides by t: $r = \frac{d}{t}$. With $d = 240$ and $t = 4$: $r = \frac{240}{4} = 60$ mph. 23. Subtract $2l$: $P - 2l = 2w$, then divide by 2: $w = \frac{P-2l}{2}$. With $P = 30$, $l = 9$: $w = \frac{30-18}{2} = 6$. 24. Divide both sides by pr: $t = \frac{I}{pr}$. With the numbers: $t = \frac{90}{600 \times 0.05} = \frac{90}{30} = 3$ years. |
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