Solving Two-Step Equations

Name: _____	Date: _____	Score: _____ / 17

Two-step equations are just one-step equations with one extra move—you can totally handle this! The trick is to undo the operations in the right order: peel away addition or subtraction first, *then* tackle the multiplication or division that is closest to the variable. Working step by step keeps the equation balanced and prevents the most common mistakes. Think of it as unwrapping a present: take off the outer layer first, then the inner one!

Key Concepts & Quick Review

Solve $ax + b = c$**:** Step 1 — subtract b from both sides: $ax = c - b$. Step 2 — divide both sides by a: $x = \dfrac{c-b}{a}$.

Solve $\dfrac{x}{a} + b = c$**:** Step 1 — subtract b: $\dfrac{x}{a} = c - b$. Step 2 — multiply by a: $x = a(c-b)$. Always check by substituting back.

Examples

① Solve: $3x - 7 = 14$.

Think It Through: Solve in reverse order of operations. First undo the subtraction by adding 7 to both sides, which gives $3x = 21$. Then undo the multiplication by dividing both sides by 3, so $x = 7$. A quick check in the original equation confirms the answer: $3(7) - 7 = 14$.

Answer: $x = 7$

② A rideshare app charges a $\$2.50$ booking fee plus $\$1.50$ per mile. Jada's total ride cost was $\$14.50$. Write and solve a two-step equation to find the number of miles she traveled.

Think It Through: Let m be the number of miles. The cost equation is $1.50m + 2.50 = 14.50$. First subtract the booking fee from both sides to get $1.50m = 12$. Then divide both sides by 1.50: $m = 12 \div 1.50 = 8\,mi$. Check: $1.50(8) + 2.50 = 12 + 2.50 = 14.50$ ✓.

Answer: $m = 8\,mi$

Practice Problems

Solve each two-step equation.

1. $2x + 3 = 11$ _____
2. $5n - 4 = 16$ _____
3. $3y + 9 = 0$ _____
4. $\dfrac{m}{2} + 6 = 10$ _____
5. $4a - 7 = -3$ _____
6. $-2k + 5 = 11$ _____
7. $6p + 1 = -17$ _____
8. $\dfrac{t}{3} - 4 = 2$ _____
9. $-3x + 8 = 20$ _____
10. $7n - 14 = 0$ _____

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11. $2 + 5y = 27$ _____

12. $\frac{x}{4} + 3 = -1$ _____

13. $9 - 2m = 1$ _____

14. $3t + \frac{1}{2} = \frac{7}{2}$ _____

15. $-6x - 3 = -33$ _____

Study Tips

- **Undo in reverse order of operations:** if the expression was "multiply then add," undo it by "subtract then divide."
- Write each step on a new line and show both sides — this makes checking much easier and prevents arithmetic slips.
- If the answer is a fraction or decimal, **check by substituting exactly**: fractions are less error-prone than rounded decimals.

Word Problems

16. A video game starts you with 50 bonus points. Each level you complete adds 15 points to your score. You finish the game with 320 points. Write and solve a two-step equation to find how many levels you completed. If each level takes about $12\ min$, how long did you play? _____

17. At a winter craft fair, Priya sells handmade candles for $\$8.50$ each. She spent $\$34$ on supplies before the fair. At the end of the day her profit (earnings minus costs) was $\$93.50$. Write and solve a two-step equation to find how many candles she sold. If she wants to reach a profit of $\$200$ at the next fair with the same supply cost, how many candles does she need to sell? _____

Answer Keys

1) 4
2) 4
3) -3
4) 8
5) 1
6) -3
7) -3
8) 18
9) -4
10) 2
11) 5
12) -16
13) 4
14) 1
15) 5
16) $n = 18$ levels; $216\ min$; $3.6\ hr$
17) 15 candles; 28 candles for $200 profit

Step-by-Step Explanations

Strategy: For Discounts, Markups, and Sales Tax, apply changes in the correct order: discount or markup first, then tax when the problem asks for a final price. The order of discount, markup, and tax matters because each step changes the next base amount.

Practice 1: An item costs $60 and is discounted 25%. Find the sale price. **Answer:** $45.00
In the opening example, subtract the discount from the original price rather than from the sale price.

Practice 15: An item costs $90, is discounted 20%, and then has 8% sales tax added. Find the final total. **Answer:** $77.76
For the end-of-set item, apply the discount first, then add tax to the discounted price.

Word-problem notes:

16. **Answer:** Retail: $\$88.80$; sale: $\$62.16$; total with tax: $\approx \$67.29$.
Start with the markup. An 85% markup means multiply the wholesale price by 1.85: $48 \times 1.85 = 88.80$, so the retail price is $88.80. Next apply the 30% discount by multiplying by 0.70: $88.80 \times 0.70 = 62.16$. Finally apply the sales tax by multiplying by 1.0825: $62.16 \times 1.0825 \approx 67.29$. The order matters because tax is charged on the sale price, not on the wholesale price.

17. **Answer:** Deal A: $\$561.60$; Deal B: $\$561.60$; yes, they are the same.
Deal A: $\$561.60$; Deal B: $\$561.60$; same final price.

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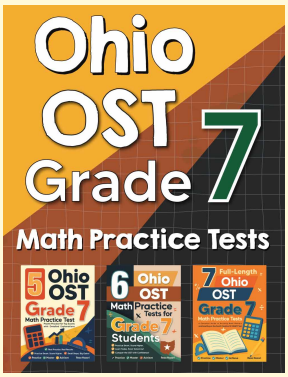

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