Solving Equations with the Distributive Property

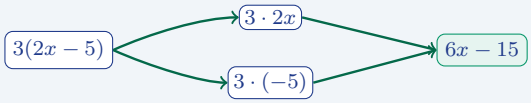
Name: _____	Date: _____	Score: _____ / 17

When parentheses pop up in an equation, the first move is to **distribute**—multiply the outside term by everything inside to clear those brackets away. Once the parentheses are gone, you will see a familiar one- or two-step equation waiting for you. The biggest thing to watch for is a negative sign outside the parentheses—distribute it carefully and the rest falls into place. This skill turns scary-looking equations into problems you already know how to solve!

Key Concepts & Quick Review

Strategy: (1) Distribute. (2) Combine like terms. (3) Add/subtract. (4) Multiply/divide.

Example: $3(2x - 5) = 21$
Step 1: $6x - 15 = 21$. Step 2: $6x = 36$. Step 3: $x = 6$.
Check: $3(12 - 5) = 3(7) = 21$ ✓.



Send the outside factor to every term inside the parentheses.

Examples

① Solve: $-2(3x + 4) = 16$.

Think It Through: Start by distributing the -2 to both terms inside the parentheses. That gives $-6x - 8 = 16$. Now solve the two-step equation: add 8 to both sides to get $-6x = 24$, then divide by -6 to find $x = -4$. Distributing correctly is the key first step in this kind of problem.

Answer: $x = -4$

② Five friends split the total cost of a birthday party evenly. Each person's share covers a $\$6$ decoration fee plus their portion of the food cost f. The total bill was $\$90$. Write and solve an equation to find each person's food share.

Think It Through: Each friend pays a decoration fee plus a food share, and there are 5 friends, so the total bill is $5(f + 6) = 90$. Distribute the 5 to get $5f + 30 = 90$. Subtract 30 from both sides: $5f = 60$. Divide by 5: $f = 12$. So each person's food share is $12.

Answer: $f = 12$; *each person's food share is* $\$12$

Practice Problems

Distribute, simplify, and solve each equation.

1. $2(x+3)=14$ _____
2. $4(n-1)=20$ _____
3. $3(2y+5)=21$ _____
4. $-2(m+4)=10$ _____
5. $5(k-3)=0$ _____
6. $-3(2x-1)=15$ _____
7. $6(a+2)=36$ _____
8. $2(3n+7)=-4$ _____
9. $-(x-8)=12$ _____
10. $4(2t-3)=20$ _____
11. $-5(y+2)=-30$ _____
12. $3(4-x)=6$ _____
13. $7(2p+1)=35$ _____
14. $-4(3-2k)=20$ _____
15. $2(5m-4)+6=20$ _____

Study Tips

- **Distribute before anything else** — never try to divide both sides by the factor while there are still parentheses with two terms inside.
- A negative factor flips **every** sign inside: $-3(x-4)=-3x+12$. Write each term explicitly.
- When variables appear on **both sides**, collect them on one side by adding or subtracting the variable term first.

Word Problems

16. A roller-skating rink charges $\$5$ for skate rental and then a flat hourly rate h for rink time. Four friends each paid for their own rentals and the same rink time, and together they spent $\$76$. Write and solve an equation of the form $4(h+5)=76$ to find the hourly rate. How much would it cost for *six* friends to skate for the same amount of time? _____

17. Two garden plots are being fenced. Plot A is a square with side length $(2x+3)$ feet, and Plot B is a rectangle with dimensions $(x+5)$ feet by 4 feet. If both plots require the same total length of fencing (same perimeter), write and solve an equation to find x. Then find the actual perimeter of each plot. _____

Answer Keys

1) 4
2) 6
3) 1
4) -9
5) 3
6) -2
7) 4
8) -3
9) -4
10) 4
11) 4
12) 2
13) 2
14) 4
15) 2
16) 14 per hour; \$114 for 6 friends
17) $x = 1$; perimeter $20\,ft$ each

Step-by-Step Explanations

Strategy: For Simple Interest, use $I = Prt$ and make sure the rate is a decimal and the time is measured in years. Once P, r, and t are labeled, the interest calculation is direct.

Practice 1: Use $I = Prt$ to find the interest for principal \$500, rate 3%, and time 2 years. **Answer:** \$30.00
At the beginning of the practice, plug the principal, rate, and time directly into $I = Prt$.

Practice 15: A loan has principal \$3,000, rate 7%, and time 3 years. Find the total amount after simple interest.
Answer: \$3,630.00
For the second model problem, add the interest back to the principal only after the interest is found.

Word-problem notes:

16. **Answer:** $I = \$336$; $A = \$2{,}736$; to reach $\$3{,}000$: $t \approx 7.14$ years.
Use the simple interest formula $I = Prt$. Here, $P = 2400$, $r = 0.035$, and $t = 4$, so $I = 2400 \times 0.035 \times 4 = 336$ dollars. Add the interest to the principal to get the total balance: $2400 + 336 = 2736$ dollars. For a balance of 3000, Maya needs $3000 - 2400 = 600$ dollars of interest. Set $600 = 2400 \times 0.035 \times t$, which gives $t = \frac{600}{84} \approx 7.14$ years (about 7 years and 2 months). Since 7 full years only yields $\$588$ in interest (total $\$2{,}988$), she must wait past the 7-year mark.

17. **Answer:** $t = 1.5$ yr; $I = \$432$; total $= \$4{,}032$; months to repay: $\lceil 4032/150 \rceil = 27$ months.
First convert 18 months into years because the interest rate is yearly: 18 months $= 1.5$ years. Now use $I = Prt$: $I = 3600 \times 0.08 \times 1.5 = 432$ dollars. The total amount owed is $3600 + 432 = 4032$ dollars. If Jordan pays \$150 each month, divide the total by the monthly payment: $4032 \div 150 = 26.88$. Since he cannot make only part of a final payment month, round up to 27 months.

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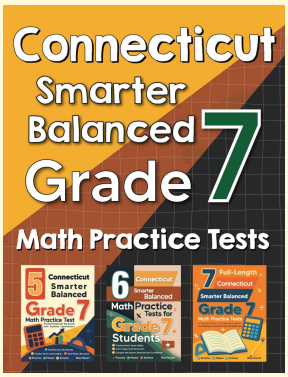

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