

DEDUCTIVE REASONING In Example 2, you simplified the expression at each step. Had you not done this, you would have obtained the expression $\frac{3(2x + 8)}{6} - 4$. You can still show that $\frac{3(2x + 8)}{6} - 4 = x$ by applying *deductive reasoning*. When you make a conclusion based on statements that are assumed or shown to be true, you are using **deductive reasoning**.

EXAMPLE 3 Use deductive reasoning

Show that $\frac{3(2x + 8)}{6} - 4 = x$. Justify each step.

Solution

| Step | Justification |
|---|----------------------------------|
| $\frac{3(2x + 8)}{6} - 4 = \frac{6x + 24}{6} - 4$ | Distributive property |
| $= (x + 4) - 4$ | Divide $(6x + 24)$ by 6. |
| $= (x + 4) + (-4)$ | Subtraction rule |
| $= x + [4 + (-4)]$ | Associative property of addition |
| $= x + 0$ | Inverse property of addition |
| $= x$ | Identity property of addition |

PRACTICE

EXAMPLES 1, 2, and 3

on pp. 117–118
for Exs. 1–3

In Exercises 1 and 2, perform the given number trick for three numbers. Make a conjecture based on the results. Then show that your conjecture is true for all numbers.

- Choose any number. Then subtract 5. Then multiply by 6. Then divide by 3. Then add 10.
- Choose any number. Then double it. Then add 12. Then multiply by 4. Then divide by 8. Then subtract the number you chose.
- The steps below show that $\frac{4(3x + 5) - 20}{12} = x$. Justify each step.

$$\begin{aligned}
 \frac{4(3x + 5) - 20}{12} &= \frac{(12x + 20) - 20}{12} && \underline{\quad ? \quad} \\
 &= \frac{(12x + 20) + (-20)}{12} && \underline{\quad ? \quad} \\
 &= \frac{12x + [20 + (-20)]}{12} && \underline{\quad ? \quad} \\
 &= \frac{12x + 0}{12} && \underline{\quad ? \quad} \\
 &= \frac{12x}{12} && \underline{\quad ? \quad} \\
 &= x && \underline{\quad ? \quad}
 \end{aligned}$$