Questions

1. Solve for x when $\frac{1}{9}x = 4$.

2. Solve for x when $-35 = 21x$.

3. Solve for x when $-3.9x = -15.6$.

4. Find the value of the variable that satisfies $2x - 7x = 20$.

5. Find the value of the variable that satisfies $-6x - 3x = -7$.

6. Find the value of the variable that satisfies $\frac{3}{5}x = 39$.

7. We have said that if $a = b$ and $c \neq 0$, then $ac = bc$. Why is it important that $c \neq 0$? What would happen if we tried to solve an equation by multiplying both sides by zero?

8. We have said that if $a = b$ and $c \neq 0$, then $\frac{a}{c} = \frac{b}{c}$. Why is it important that $c \neq 0$? What would happen if we tried to solve an equation by dividing both sides by zero?

9. In an average year, worldwide, there are 20 earthquakes of magnitude 7 on the Richter scale. If next year is predicted to be an exceptional year, and the number of earthquakes of magnitude 7 is expected to increase by 35%, about how many earthquakes of magnitude 7 can be expected?

Solutions

1.

$$\begin{aligned} 9 \cdot \frac{1}{9}x &= 4 \cdot 9 \\ x &= 36 \end{aligned}$$

2.

$$\begin{aligned} -35 &= 21x \\ \frac{1}{21} \cdot (-35) &= \frac{1}{21} \cdot 21x \\ -\frac{\cancel{7} \cdot 5}{\cancel{7} \cdot 3} &= x \\ -\frac{5}{3} &= x \end{aligned}$$

3.

$$\begin{aligned} \frac{1}{-3.9} \cdot (-3.9x) &= \frac{1}{-3.9} \cdot (-15.6) \\ x &= \frac{15.6}{3.9} = 4 \end{aligned}$$

4.

$$\begin{aligned} 2x - 7x &= 20 \text{ simplify} \\ -5x &= 20 \\ \frac{1}{-5} \cdot (-5x) &= \frac{1}{-5} \cdot (20) \text{ multiplication principal} \\ x &= -4 \text{ simplify} \end{aligned}$$

5.

$$\begin{aligned} -6x - 3x &= -7 \\ -9x &= -7 \\ \frac{1}{-9} \cdot (-9x) &= \frac{1}{-9} \cdot (-7) \\ x &= \frac{7}{9} \end{aligned}$$

6.

$$\begin{aligned} \frac{3}{5}x &= 39 \\ \frac{5}{3} \cdot \left(\frac{3}{5}x\right) &= \frac{5}{3} \cdot 39 \\ x = \frac{39 \cdot 5}{3} &= \frac{\cancel{3} \cdot 13 \cdot 5}{\cancel{3}} = 65 \end{aligned}$$

7. When we solve an equation, we are performing algebraic steps to obtain equivalent equations until we arrive at $x =$ something. When we multiply an equation by zero, we do not have an equivalent equation, since the new equation is immediately satisfied.

Consider the following

$$\begin{aligned} 3 &= 4 \text{ is false} \\ 0 \cdot 3 &= 0 \cdot 4 \text{ multiply by zero} \\ 0 &= 0 \text{ simplify, and we get a true statement!} \end{aligned}$$

The first and last statements are not equivalent.

8. As soon as we divide something by zero, we get an undefined quantity and have to stop.

9. We need a number that is 35% larger than 20.

35% of 20 is $0.35 \cdot 20 = 7$.

Expect $20 + 7 = 27$ earthquakes of magnitude 7 of more next year.