

2.5 SOLVING EQUATIONS WITH VARIABLES ON BOTH SIDES

✿ Undo addition or subtraction to get variable on one side.

EXAMPLES:

1. $7x + 19 = -2x + 55$

$$\begin{array}{r} +2x \\ 9x + 19 = 55 \\ -19 \quad -19 \\ \hline 9x = 36 \\ \frac{9x}{9} = \frac{36}{9} \\ \hline x = 4 \end{array}$$

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2. $6x + 22 = -3x + 31$

$$\begin{array}{r} +3x \\ 9x + 22 = 31 \\ -22 \quad -22 \\ \hline 9x = 9 \\ \frac{9x}{9} = \frac{9}{9} \\ \hline x = 1 \end{array}$$

3. $80 - 9y = 6y$

$$\begin{array}{r} +9y \\ 80 = 15y \\ \frac{80}{15} = \frac{15y}{15} \\ \hline \frac{16}{3} = y \end{array}$$

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4. $34 - 3k = 14k$

$$\begin{array}{r} +3k \\ 34 = 17k \\ \frac{34}{17} = \frac{17k}{17} \\ \hline 2 = k \end{array}$$

5. $-6g + 4 = -8g$

$$\begin{array}{r} +6g \\ 4 = -2g \\ \frac{4}{-2} = \frac{-2g}{-2} \\ \hline -2 = g \end{array}$$

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6. $3p - 10 + 4p = 5p - 7$

$$\begin{array}{r} 7p - 10 = 5p - 7 \\ -5p \\ 2p - 10 = -7 \\ +10 \quad +10 \\ 2p = 3 \\ \frac{2p}{2} = \frac{3}{2} \\ \hline p = \frac{3}{2} \end{array}$$

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7. $5t - 16 + 2t = 9t - 15$

$$\begin{array}{r} 7t - 16 = 9t - 15 \\ -9t \\ -2t - 16 = -15 \\ +16 \quad +16 \\ -2t = 1 \\ \frac{-2t}{-2} = \frac{1}{-2} \\ \hline t = -\frac{1}{2} \end{array}$$

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Special Cases

8. $2(x + 4) - 8 = 2x$

$$\begin{array}{r} 2x + 8 - 8 = 2x \\ \frac{2x}{2} = \frac{2x}{2} \\ \hline x = x \\ \hline \text{Infinte} \end{array}$$

9. $5(x + 3) = 5x + 10$

$$\begin{array}{r} 5x + 15 = 5x + 10 \\ \frac{5x}{5x} \\ 15 = 10 \\ \hline \text{no solution} \end{array}$$

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Expert Equations

10. $-2(4x + 2) = -2(x + 3) + 9$

$$-8x - 4 = -2x - 6 + 9$$

$$-8x - 4 = -2x + 3$$

$$\begin{array}{r} -8x - 4 \\ +2x \end{array} = \begin{array}{r} -2x + 3 \\ +2x \end{array}$$

$$-6x - 4 = 3$$

$$\begin{array}{r} -6x - 4 \\ +4 \end{array} = \begin{array}{r} 3 \\ +4 \end{array}$$

$$-6x = 7$$

$$\frac{-6x}{-6} = \frac{7}{-6}$$

$$x = \frac{-7}{6}$$

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11. $6 - 2(y - 1) = \frac{1}{3}(3y - 12)$

$$6 - 2y + 2 = 1y - 4$$

$$8 - 2y = 1y - 4$$

$$\begin{array}{r} 8 - 2y \\ -1y \end{array} = \begin{array}{r} 1y - 4 \\ -1y \end{array}$$

$$8 - 3y = -4$$

$$\begin{array}{r} 8 - 3y \\ -8 \end{array} = \begin{array}{r} -4 \\ -8 \end{array}$$

$$-3y = -12$$

$$\frac{-3y}{-3} = \frac{-12}{-3}$$

$$y = 4$$

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12. $\frac{1}{2}(8n - 2) = -(-8 + 9n) - 5n$

$$4n - 1 = 8 - 9n - 5n$$

$$4n - 1 = 8 - 14n$$

$$\begin{array}{r} 4n - 1 \\ +14n \end{array} = \begin{array}{r} 8 - 14n \\ +14n \end{array}$$

$$18n - 1 = 8$$

$$\begin{array}{r} 18n - 1 \\ +1 \end{array} = \begin{array}{r} 8 \\ +1 \end{array}$$

$$18n = 9$$

$$\frac{18n}{18} = \frac{9}{18}$$

$$n = \frac{1}{2}$$

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13.

The diagram gives information about the populations of two towns. After how many years will the populations be equal? How do you know?

TOWN A
POPULATION: 3225
Yearly growth: 100 people each year

TOWN B
POPULATION: 3300
Yearly growth: 75 people each year

$$3225 + 100y = 3300 + 75y$$

$$\begin{array}{r} 3225 + 100y \\ -75y \end{array} = \begin{array}{r} 3300 + 75y \\ -75y \end{array}$$

$$3225 + 25y = 3300$$

$$\begin{array}{r} 3225 + 25y \\ -3225 \end{array} = \begin{array}{r} 3300 \\ -3225 \end{array}$$

$$25y = 75$$

$$\frac{25y}{25} = \frac{75}{25}$$

$$y = 3 \text{ years}$$

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14.

An office manager spent \$650 on a new energy-saving copier that will reduce the monthly electric bill for the office from \$112 to \$88. In how many months will the copier pay for itself?

old = new

$$112m = 88m + 650$$

$$\begin{array}{r} 112m \\ -88m \end{array} = \begin{array}{r} 88m + 650 \\ -88m \end{array}$$

$$24m = 650$$

$$\frac{24m}{24} = \frac{650}{24}$$

$$m = 27 \text{ months}$$

Sep 11-3:03 PM

Classwork: p.107 #4-26 even
30-36 even, 50
Copy problem. Show work.

Final Five

Two times a number plus three equals one half of the number plus 12. What is the number?

a) 3.6 b) 6 c) 8 d) 10

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