

4.2 Solving Complex Equations

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pg 200 # 2, 3, 4, 5, 9, 10

$$\begin{aligned} 2a) \quad 5x + 9 &= 3x + 7 \\ 5x + 9 - 9 &= 3x + 7 - 9 \\ 5x &= 3x - 2 \\ 5x - 3x &= 3x - 3x - 2 \\ \frac{2x}{2} &= \frac{-2}{2} \\ x &= -1 \end{aligned}$$

This is the "step-by-step" way.

Here is the simpler method:

$$\begin{aligned} 5x + 9 &= 3x + 7 \\ 5x - 3x &= 7 - 9 \\ \frac{2x}{2} &= \frac{-2}{2} \\ x &= -1 \end{aligned}$$

$$\begin{aligned} b) \quad -2u - 8 &= 5u - 1 \\ -2u - 5u &= -1 + 8 \\ \frac{-7u}{-7} &= \frac{7}{-7} \\ u &= -1 \end{aligned}$$

$$\begin{aligned} c) \quad 4y - 13 &= -6y + 7 \\ 4y + 6y &= 7 + 13 \\ \frac{10y}{10} &= \frac{20}{10} \\ y &= 2 \end{aligned}$$

$$\begin{aligned} d) \quad 7 - 5m &= -2 - 2m \\ -5m + 2m &= -2 - 7 \\ \frac{-3m}{-3} &= \frac{-9}{-3} \\ m &= 3 \end{aligned}$$

$$\begin{aligned} 3.a) \quad 0 &= 14 - x + 6x - 9 \\ 0 &= 14 - 9 - x + 6x \\ 0 &= 5 + 5x \\ 0 - 5 &= 5 - 5 + 5x \\ \frac{-5}{5} &= \frac{5x}{5} \\ -1 &= x \end{aligned}$$

$$\begin{aligned} b) \quad 11 - n + 3 &= 3n + 3n \\ 14 - n &= 6n \\ 14 - n + n &= 6n + n \\ \frac{14}{7} &= \frac{7n}{7} \\ 2 &= n \end{aligned}$$

$$\begin{aligned} c) \quad 4t - 5 &= 2t + 5 \\ 4t - 2t &= 5 + 5 \\ \frac{2t}{2} &= \frac{10}{2} \\ t &= 5 \end{aligned}$$

$$\begin{aligned} d) \quad 6k - 3 - 2k &= k - 3 \\ 6k - 2k - 3 &= k - 3 \\ 4k - 3 &= k - 3 \\ 4k - k &= -3 + 3 \\ \frac{3k}{3} &= \frac{0}{3} \\ k &= 0 \end{aligned}$$

$$\begin{aligned} 4.a) \quad 2(x - 2) &= 4x - 2 \\ 2x - 4 &= 4x - 2 \\ 2x - 4x &= -2 + 4 \\ \frac{-2x}{-2} &= \frac{2}{-2} \\ x &= -1 \end{aligned}$$

$$\begin{aligned} b) \quad 4c + 3 &= 3(c - 4) \\ 4c + 3 &= 3c - 12 \\ 4c - 3c &= -12 - 3 \\ c &= -15 \end{aligned}$$

$$\begin{aligned} c) \quad 6p + 4(8 - p) &= 22 \\ 6p + 32 - 4p &= 22 \end{aligned}$$

$$\begin{aligned} d) \quad k &= 2(11 - k) + 14 \\ k &= 22 - 2k + 14 \end{aligned}$$

$$\begin{aligned}
 c) \quad 6p + 4(8-p) &= 22 \\
 6p + 32 - 4p &= 22 \\
 6p - 4p &= 22 - 32 \\
 \frac{2p}{2} &= \frac{-10}{2} \\
 p &= -5
 \end{aligned}$$

$$\begin{aligned}
 d) \quad k &= 2(11-k) + 14 \\
 k &= 22 - 2k + 14 \\
 k &= 22 + 14 - 2k \\
 k + 2k &= 22 + 14 \\
 \frac{3k}{3} &= \frac{36}{3} \\
 k &= 12
 \end{aligned}$$

$$\begin{aligned}
 5. a) \quad 2(x-3) + 3(x-2) &= 18 \\
 2x - 6 + 3x - 6 &= 18 \\
 5x - 12 &= 18 \\
 5x &= 18 + 12 \\
 5x &= 30 \\
 x &= \frac{30}{5} \\
 x &= 6
 \end{aligned}$$

$$\begin{aligned}
 b) \quad 4(y-1) - (y-5) &= 10 \\
 4y - 4 - y + 5 &= 10 \\
 4y - y - 4 + 5 &= 10 \\
 3y + 1 &= 10 \\
 3y &= 10 - 1 \\
 3y &= 9 \\
 y &= \frac{9}{3} \\
 y &= 3
 \end{aligned}$$

$$\begin{aligned}
 c) \quad 2(c+2) &= 5(c+1) - 7 \\
 2c + 4 &= 5c + 5 - 7 \\
 2c + 4 &= 5c - 2 \\
 2c - 5c &= -2 - 4 \\
 -3c &= -6 \\
 c &= \frac{-6}{-3} \\
 c &= 2
 \end{aligned}$$

$$\begin{aligned}
 d) \quad 3(t-4) &= -2(t+3) + 14 \\
 3t - 12 &= -2t - 6 + 14 \\
 3t - 12 &= -2t + 8 \\
 3t + 2t &= 8 + 12 \\
 5t &= 20 \\
 t &= \frac{20}{5} \\
 t &= 4
 \end{aligned}$$

$$\begin{aligned}
 9 a) \quad 3x - 8 &= 7x + 10 \\
 3x - 7x &= 10 + 8 \\
 -4x &= 18 \\
 x &= \frac{18}{-4} \\
 x &= -\frac{9}{2}
 \end{aligned}$$

$$\begin{aligned}
 b) \quad 3 + 10i &= 4i - 18 \\
 10i - 4i &= -18 - 3 \\
 6i &= -21 \\
 i &= \frac{-21}{6} \\
 i &= -\frac{7}{2}
 \end{aligned}$$

$$\begin{aligned}
 c) \quad -4(u+6) &= 2(3u-4) \\
 -4u - 24 &= 6u - 8 \\
 -4u - 6u &= -8 + 24 \\
 -10u &= 16 \\
 u &= \frac{16}{-10} \\
 u &= -\frac{8}{5}
 \end{aligned}$$

$$\begin{aligned}
 d) \quad 4(k-3) &= 2 - (2k-6) \\
 4k - 12 &= 2 - 2k + 6 \\
 4k + 2k &= 2 + 6 + 12 \\
 6k &= 20 \\
 k &= \frac{20}{6} \\
 k &= \frac{10}{3}
 \end{aligned}$$

$$\begin{aligned}
 e) \quad 3(p+7) - (4p-1) &= -5(2p-3) + 1 \\
 3p + 21 - 4p + 1 &= -10p + 15 + 1 \\
 3p - 4p + 21 + 1 &= -10p + 16 \\
 -p + 22 &= -10p + 16 \\
 -p + 10p &= 16 - 22 \\
 9p &= -6 \\
 p &= \frac{-6}{9} = -\frac{2}{3}
 \end{aligned}$$

$$-p + 10p - 16 = 2d$$

$$9p = -6$$

$$p = \frac{-6}{9} = -\frac{2}{3}$$

f)

$$8 - (3w - 2) = -5(w - 3) - (4w - 3)$$

$$8 - 3w + 2 = -5w + 15 - 4w + 3$$

$$8 + 2 - 3w = -5w - 4w + 15 + 3$$

$$10 - 3w = -9w + 18$$

$$-3w + 9w = 18 - 10$$

$$6w = 8$$

$$w = \frac{8}{6}$$

$$w = \frac{4}{3}$$

10a)

$$3.2x - 7.4 = 2.1x + 1.5$$

$$3.2x - 2.1x = 1.5 + 7.4$$

$$1.1x = 8.9$$

$$x = \frac{8.9}{1.1}$$

$$x = 8.1$$

b)

$$3(2.5d - 1.1) = 2(5.2 - 3.3d)$$

$$7.5d - 3.3 = 10.4 - 6.6d$$

$$7.5d + 6.6d = 10.4 + 3.3$$

$$14.1d = 13.7$$

$$d = \frac{13.7}{14.1}$$

$$d = 0.97$$

$$d = 1.0 \text{ (1 decimal place)}$$