

MTH 60 Group Work – Linear Equations – Key for Problem Set 4

Problem Set 4

Solve each equation showing all of the steps illustrated in class and in your textbook. (questions a – h)

a.  $5x - 7 + 3(x + 8) = 9 + 10x$

$$5x - 7 + 3(x + 8) = 9 + 10x$$

$$5x - 7 + 3x + 24 = 9 + 10x$$

$$8x + 17 = 9 + 10x$$

$$8x + 17 - 8x = 9 + 10x - 8x$$

$$17 = 9 + 2x$$

$$17 - 9 = 9 + 2x - 9$$

$$8 = 2x$$

$$\frac{8}{2} = \frac{2x}{2}$$

$$4 = x$$

Check 4 in the original equation

$$5x - 7 + 3(x + 8) = 9 + 10x ?$$

$$5(4) - 7 + 3(4 + 8) = 9 + 10(4) ?$$

$$20 - 7 + 3(12) = 9 + 40 ?$$

$$13 + 36 = 49 \checkmark$$

The solution to the equation is 4.

b.  $14(t - 6) = 14t - 6(t - 14)$

$$14(t - 6) = 14t - 6(t - 14)$$

$$14t - 84 = 14t - 6t + 84$$

$$14t - 84 = 8t + 84$$

$$14t - 84 - 8t = 8t + 84 - 8t$$

$$6t - 84 = 84$$

$$6t - 84 + 84 = 84 + 84$$

$$6t = 168$$

$$\frac{6t}{6} = \frac{168}{6}$$

$$t = 28$$

CHECK 28 in the original equation

$$14(t - 6) = 14t - 6(t - 14)?$$

$$14(28 - 6) = 14(28) - 6(28 - 14)?$$

$$14(22) = 392 - 6(14)?$$

$$308 = 392 - 84?$$

$$308 = 308 \checkmark$$

The solution to the equation is 28.

$$c, \quad 18 + \left(-4 - \frac{3}{2}w\right) = 6 - \left(\frac{1}{2}w - 8\right)$$

$$18 + (-4 - \frac{3}{2}w) = 6 - (\frac{1}{2}w - 8)$$

$$18 - 4 - \frac{3}{2}w = 6 - \frac{1}{2}w + 8$$

$$14 - \frac{3}{2}w = 14 - \frac{1}{2}w$$

$$14 - \frac{3}{2}w + \frac{3}{2}w = 14 - \frac{1}{2}w + \frac{3}{2}w$$

$$14 = 14 + w$$

$$14 - 14 = 14 + w - 14$$

$$0 = w$$

Check  $0$  in the original equation

$$18 + (-4 - \frac{3}{2}w) = 6 - (\frac{1}{2}w - 8)?$$

$$18 + -4 - \frac{3}{2}(0) = 6 - (\frac{1}{2}(0) - 8)?$$

$$18 - 4 = 6 - (-8)?$$

$$14 = 14 \checkmark$$

The solution to the equation is  $0$ .

d.  $4 + 4\left(x + \frac{3}{2}\right) = 30x - 3$

$$4 + 4\left(x + \frac{3}{2}\right) = 30x - 3$$

$$4 + 4x + \frac{4}{1} \cdot \frac{3}{2} = 30x - 3$$

$$4 + 4x + 6 = 30x - 3$$

$$4x + 10 = 30x - 3$$

$$4x + 10 - 4x = 30x - 3 - 4x$$

$$10 = 26x - 3$$

$$10 + 3 = 26x - 3 + 3$$

$$13 = 26x$$

$$\frac{13}{26} = \frac{26x}{26}$$

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

Check  $\frac{1}{2}$  in the original equation

$$4 + 4\left(x + \frac{3}{2}\right) = 30x - 3?$$

$$4 + 4\left(\frac{1}{2} + \frac{3}{2}\right) = 30\left(\frac{1}{2}\right) - 3?$$

$$4 + 4(2) = 15 - 3?$$

$$4 + 8 = 12 \checkmark$$

The solution to the equation is  $\frac{1}{2}$ .

e.  $0.1x + 1.5(4 + x) = 43 - (2x + 1)$

$$0.1x + 1.5(4 + x) = 43 - (2x + 1)$$

$$0.1x + 6 + 1.5x = 43 - 2x - 1$$

$$6 + 1.6x = 42 - 2x$$

$$6 + 1.6x + 2x = 42 - 2x + 2x$$

$$6 + 3.6x = 42$$

$$6 + 3.6x - 6 = 42 - 6$$

$$3.6x = 36$$

$$\frac{3.6x}{3.6} = \frac{36}{3.6}$$

$$x = 10$$

Check 10 in the original equation

$$0.1x + 1.5(4 + x) = 43 - (2x + 1) \quad ?$$

$$0.1(10) + 1.5(4 + 10) = 43 - (2(10) + 1) \quad ?$$

$$1 + 1.5(14) = 43 - 21 \quad ?$$

$$1 + 21 = 22 \quad \checkmark$$

The solution to the equation is 10.

f.  $5 + 9t - 11 = -27(3 + 8t)$

$$5 + 9t - 11 = -27(3 + 8t)$$

$$9t - 6 = -81 - 216t$$

$$9t - 6 + 216t = -81 - 216t + 216t$$

$$225t - 6 = -81$$

$$225t - 6 + 6 = -81 + 6$$

$$225t = -75$$

$$\frac{225t}{225} = \frac{-75}{225}$$

$$t = -\frac{1}{3}$$

Check  $-\frac{1}{3}$  in the original equation

$$5 + 9t - 11 = -27(3 + 8t) ?$$

$$5 + \frac{9}{1}\left(-\frac{1}{3}\right) - 11 = -27\left(3 + \frac{8}{1}\left(-\frac{1}{3}\right)\right) ?$$

$$5 - 3 - 11 = -27\left(\frac{9}{3} - \frac{8}{3}\right) ?$$

$$-9 = -\frac{27}{1}\left(\frac{1}{3}\right) ?$$

$$-9 = -9 \checkmark$$

The solution to the equation is  $-\frac{1}{3}$ .

g.  $y + y + y = 18(2 - 5y + 29)$

$$y + y + y = 18(2 - 5y + 29)$$

$$y + y + y = 18(2 - 5y + 29)$$

$$3y = 558 - 90y$$

$$3y + 90y = 558 - 90y + 90y$$

$$93y = 558$$

$$\frac{93y}{93} = \frac{558}{93}$$

$$y = 6$$

Check 6 in the original equation.

$$3y = 18(2 - 5y) ?$$

$$3(6) = 18(2 - 5(6)) ?$$

$$18 = 18(2 - 30) ?$$

$$18 = 18(1) \checkmark$$

The solution to the equation is 6.

h.  $0.05N + 0.1(N + 17) = 0.25(N - 32)$

$$0.05N + 0.1(N + 17) = 0.25(N - 32)$$

$$0.05N + 0.1N + 1.7 = 0.25N - 8$$

$$0.15N + 1.7 = 0.25N - 8$$

$$0.15N + 1.7 - 0.15N = 0.25N - 8 - 0.15N$$

$$1.7 = 0.1N - 8$$

$$1.7 + 8 = 0.1N - 8 + 8$$

$$9.7 = 0.1N$$

$$\frac{9.7}{0.1} = \frac{0.1N}{0.1}$$

$$97 = N$$

Check 97 in the original equation.

$$0.05N + 0.1(N + 17) = 0.25(N - 32) ?$$

$$0.05(97) + 0.1(97 + 17) = 0.25(97 - 32) ?$$

$$4.85 + 0.1(114) = 0.25(65) ?$$

$$4.85 + 11.4 = 16.25 ?$$

$$16.25 = 16.25 ?$$

The solution to the equation is 97.

- i. Pick **any three numbers** and show that they are **each one** is a solution to the equation:

$$-14 - 3(3x - 14) = 3 + x + 5(5 - 2x)$$

Check 0 in the equation.

$$-14 - 3(3(0) - 14) = 3 + 0 + 5(5 - 2(0))?$$

$$-14 - 3(0 - 14) = 3 + 0 + 5(5 - 0)?$$

$$-14 - 3(-14) = 3 + 5(5)?$$

$$-14 + 42 = 3 + 25?$$

$$28 = 28 \checkmark$$

So 0 is a solution to the equation.

Check 1 in the equation.

$$-14 - 3(3(1) - 14) = 3 + 1 + 5(5 - 2(1))?$$

$$-14 - 3(3 - 14) = 3 + 1 + 5(5 - 2)?$$

$$-14 - 3(-11) = 4 + 5(3)?$$

$$-14 + 33 = 4 + 15?$$

$$19 = 19 \checkmark$$

So 1 is a solution to the equation.

Check 16 in the equation ('cuz I'm weird)

$$-14 - 3(3(16) - 14) = 3 + 16 + 5(5 - 2(16))?$$

$$-14 - 3(48 - 14) = 3 + 16 + 5(5 - 32)?$$

$$-14 - 3(34) = 19 + 5(-27)?$$

$$-14 - 102 = 19 - 135?$$

$$-116 = -116 \checkmark$$

Yes, even 16 is a solution to the equation!

- j. What really, **really** frustrating thing happens when you try to solve the equation:

$$2t + 6(8 - 4t) = 17 - (22t - 8)$$

$$2t + 6(8 - 4t) = 17 - (22t - 8)$$

$$2t + 48 - 24t = 17 - 22t + 8$$

$$48 - 22t = 25 - 22t$$

$$48 - 22t + 22t = 25 - 22t + 22t$$

$$48 = 25$$

Well, dagnabbit, that's pretty darn frustrating!