

BLC150—Algebra Workshop

Worksheet 2

Name: Daniel - Me

1. Solve these.

a. $1.3x = 4 - 0.7x$

$$2x = 4$$

$$x = 2$$

If in doubt, plug your answer into the original problem.

$$1.3(2) = 4 - (0.7)(2)$$

$$2.6 = 4 - 1.4 = 2.6 \text{ Ta Da!}$$

b. $\frac{x}{4} - 2 = -1$

$$\frac{x}{4} = 1$$

$$x = 4$$

c. $3(x + 4) - 5(x + 1) = -5$

$$3x + 12 - 5x - 5 = -5$$

$$-2x = -12$$

$$x = 6$$

d. $\frac{x+16}{2} - 4 = x$

$$\frac{x+16-2x}{2} = 4$$

$$\frac{-x+16}{2} = 4$$

$$-x+16 = 8$$

$$-x = -8$$

$$x = 8$$

2. Compute the following without using a calculator:

a. $4^2 =$	16
b. $(-3)^2 =$	9

c. $(3)^2 =$	9
d. $\sqrt{9} =$	± 3

e. $2\sqrt{36} =$	± 12
f. $-\sqrt{81} =$	± 9 or -9

3. Solve the following equations for x. Round to 2 decimal places if and when necessary.

a. $2x^2 - 3 = 15$

$$2x^2 = 18$$

$$x^2 = 9$$

$$x = \pm 3$$

b. $x^2 + 5 = 21$

$$x^2 = 16$$

$$x = \pm 4$$

c. $\frac{\sqrt{2x-1}}{3} + 4 = 5$

$$\sqrt{2x-1} = 3$$

$$2x-1 = 9$$

$$2x = 10$$

$$x = 5$$

d. $2\sqrt{3x-1} = 2\sqrt{17}$

$$3x-1 = 17$$

$$3x = 18$$

$$x = 6$$

$$e. \sqrt{x+18} = 5$$

$$x+18 = 25$$

$$x = 7$$

$$f. 2\sqrt{x} = 4\sqrt{2}$$

$$\sqrt{x} = 2\sqrt{2}$$

$$x = 4 \cdot 2 = 8$$

4. Find all solutions to the following system of equations:

$$a. \begin{cases} x + y = 2 \\ 2x - 3y = 39 \end{cases} \rightarrow y = 2 - x$$

$$2x - 3y = 39$$

||

$$2x - 3(2 - x) = 39$$

$$x = 9$$

$$y = -7$$

$$2x - 6 + 3x = 39$$

$$5x = 45$$

$$x = 9 \Rightarrow y = -7$$

$$b. \begin{cases} 3x + 2y = 5 \\ 2x + y = 4 \end{cases}$$

$$2x + y = 4 \rightarrow y = 4 - 2x$$

$$x = 3$$

$$y = -2$$

$$\rightarrow 3x + 2(4 - 2x) = 5$$

$$3x + 8 - 4x = 5$$

$$-x = -3$$

$$x = 3$$

Then plug in $x = 3$ into one of the equations and you'll get

$$y = -2.$$

5. Jack has 96 marbles, which are colored red, yellow, and green. He has 4 fewer red than green, and 3 times as many yellow as green. How many marbles of each color does he have?

$$r = g - 4$$

$$y = 3g$$

$$r + y + g = 96$$

plug in all versions with g.

$$(g - 4) + (3g) + g = 96$$

$$g = 20$$

$$r = 16$$

$$y = 60$$

6. Lucy can feel that she has 7 coins in her pocket. She knows that they add up to \$0.95 because she recalls buying a Tootsie Roll™ that cost \$0.05 with a dollar bill. She cannot distinguish the quarters from the nickels. Can she deduce how many nickels and quarters she has? What is the distribution?

$$x + y = 7$$

$$25x + 5y = 95$$

$$x = 3$$

$$y = 4$$

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Homework 2

Name: *Me*

1. Solve these. Hint: Leonardo of Pisa.

<p>a. $2x^2 - 15 = -13$ $+15 = +15$ $\frac{2x^2}{2} = \frac{2}{2} \Rightarrow x^2 = 1 \Rightarrow \sqrt{x^2} = \sqrt{1}$ $x = 1 \text{ or } -1$</p>	<p>b. $x^2 + 4 = 8$ $x^2 = 4$ $x = 2 \text{ or } -2$</p>
<p>c. $\frac{6x^2}{6} = \frac{54}{6}$ $x^2 = 9$ $\sqrt{x^2} = \sqrt{9}$ $x = \pm 3$</p>	<p>d. $\frac{x^2-1}{2} = 12$ $\left(\frac{x^2-1}{2}\right) \frac{2}{1} = 12 \left(\frac{2}{1}\right)$ $x^2-1 = 24$ $x^2 = 25$ $x = \pm 5$</p>
<p>e. $\sqrt{3x+1} = 5$ $(\sqrt{3x+1})^2 = (5)^2$ $3x+1 = 25$ $3x = 24$ $x = 8$ <i>Not also -8. See... $\sqrt{3(-8)+1} = \sqrt{-23} \neq 5$</i></p>	<p>f. $\frac{\sqrt{x+23}}{3} + 1 = 3$ $\frac{\sqrt{x+23}}{3} = 2$ $\sqrt{x+23} = 6$ $x+23 = 36$ $x = 13$</p>
<p>g. $\frac{\sqrt{x+4}}{5} + 12 = 13$ $\frac{\sqrt{x+4}}{5} = 1$ $x+4 = 25$ $x = 21$ <i>If in doubt, plug in and check. The square root of 25 divided by 5 is 1... then plus 12 equals 13. Bingo!</i></p>	<p>h. $5(8 - \sqrt{x-18}) = 20$ $5(8 - \sqrt{x-18}) \frac{1}{5} = 20 \left(\frac{1}{5}\right)$ $8 - \sqrt{x-18} = 4$ $-\sqrt{x-18} = -4$ <i>(The negatives cancel out)</i> $x-18 = 16$ $x = 34$</p>

2. Compute the x-value from 1h (above) divided by the x-value of 1g (above).

I.e. $\frac{\text{answer to 1h}}{\text{answer to 1g}} = \frac{34}{21} \approx 1.619 \approx \phi$ This is approximately the Golden Ratio, ϕ .

$$\frac{10x^2y}{2x} = \frac{\cancel{2}(5)x \cdot \cancel{x} \cdot y}{\cancel{2} \cdot \cancel{x}} = 5xy$$

3. Simplify the following expressions:

a. $4xy + 3y^2 + 4y - y^2 + 6xy - 2y(5x + 2y + 2)$

$$10xy + 2y^2 + 4y - (10xy + 4y^2 + 4y)$$

$$10xy + 2y^2 + 4y - 10xy - 4y^2 - 4y$$

$$-2y^2$$

b. $2x + 3y^2 - 5y(x + 2y) + 7y^2 + \frac{10x^2y}{2x} - 2x$

$$2x + 3y^2 - 5xy - 10y^2 + 7y^2 + 5xy - 2x$$

$$0$$

4. Find all solutions to the following system of equations:

a. $x + y = 5$
 $3x - 2y = 5$

① $y = 5 - x$

② plug $y = 5 - x$ into the other equation

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

③ Solve for x

$$3x - 10 + 2x = 5$$

$$5x = 15$$

$$x = 3$$

④ plug $x = 3$ into either original equation

$$y + y = 5$$

$$3 + y = 5 \Rightarrow y = 2$$

or... $3x - 2y = 5$

$$9 - 2y = 5$$

$$-2y = -4$$

$$y = 2$$

b. $4x - y = 7$
 $5x - 2y = 5$

① $-y = 7 - 4x$ Think about it.
 $y = 4x - 7$

② $5x - 2(4x - 7) = 5$

③ $5x - 8x + 14 = 5$
 $-3x = -9$
 $x = 3$

④ $4x - y = 7$
 $4(3) - y = 7$
 $-y = -5$
 $y = 5$

check it out: $4x - y = 7$ } $5x - 2y = 5$
 $12 - 5 = 7$ } $15 - 10 = 5$ ✓ Bingo

5. What three consecutive even numbers add up to 636.

One way...

$$x + (x+2) + (x+4) = 636 = 210 + 212 + 214$$

$$3x + 6 = 636$$

$$3x = 630$$

$$x = 210$$

Or another way...

$$(x-2) + x + (x+2) = 636 = 210 + 212 + 214$$

$$3x = 636$$

$$x = 212$$

6. Using a 5-dollar bill you buy a Snickers™ bar from a vending machine for \$0.77. Your change comes back in equal numbers of dollar bills, quarters, dimes, nickels, and pennies. How many nickels did you receive?

\$4.23 in change. Or 423 cents.

dollar bill = 100
 quarter = 25
 dime = 10
 nickel = 5
 penny = 1

Equal number of each denomination.

$$x(100) + x(25) + x(10) + x(5) + x(1) = 423$$

$$141x = 423$$

$$x = 3$$

You have in your pocket 3 of each denomination.