

1. Consider the following set of numbers:

$$\{-4.71, -\pi, 0, 0.\bar{2}, 2\frac{5}{8}, \sqrt{16}, \sqrt{22}, 7\}$$

List the numbers in the set that are:

a. natural numbers :  $\sqrt{16}, 7$

e. irrational numbers

b. whole numbers :  $0, \sqrt{16}, 7$

$-\pi, \sqrt{22}$

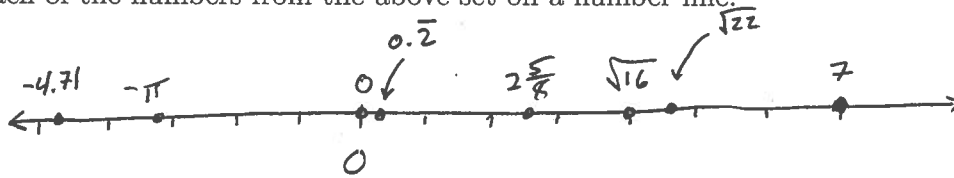
c. integers :  $0, \sqrt{16}, 7$

f. real numbers

d. rational numbers :  $-4.71, 0, 0.\bar{2}, 2\frac{5}{8}, \sqrt{16}, 7$

*All of em*

2. Graph each of the numbers from the above set on a number line.



3. Insert either  $>$ ,  $<$  or  $=$  between the two numbers to make a true statement.

a.  $2.7 > -3.4$

b.  $|-15| = \frac{60}{4}$

c.  $-\sqrt{16} > -5$

4. What is  $|- \sqrt{5}|$ ?

$$|-\sqrt{5}| = \sqrt{5}$$

5. What is  $\frac{3}{0}$ ?

*It is undefined*

6. Convert  $3\frac{7}{9}$  to an improper fraction.

$$3\frac{7}{9} = \frac{34}{9}$$

7. Convert  $\frac{5}{3}$  to a mixed number.

$$\frac{5}{3} = 1\frac{2}{3}$$

8. Convert each fraction to a decimal.

a.  $\frac{3}{8} = 0.375$

$$\begin{array}{r} 0.375 \\ 8 \overline{) 3.000} \\ \underline{-24} \phantom{00} \\ 60 \phantom{0} \\ \underline{-56} \phantom{0} \\ 40 \\ \underline{-40} \\ 0 \end{array}$$

b.  $\frac{5}{11} = 0.\overline{45}$

$$\begin{array}{r} 0.4545\dots \\ 11 \overline{) 5.0000} \\ \underline{-44} \phantom{000} \\ 60 \phantom{00} \\ \underline{-55} \phantom{00} \\ 50 \phantom{0} \\ \underline{-44} \phantom{0} \\ 60 \end{array}$$

9. Perform the indicated operation

a.  $(-4)^3 = -64$

d.  $15 - (-32) = 47$

g.  $\frac{7}{12} + \frac{2}{15} = \frac{35}{60} + \frac{8}{60}$   
 $= \frac{43}{60}$

b.  $(-1)^4 = 1$

e.  $-44 - (-21) = -23$

h.  $\frac{6}{2} \cdot \left(-\frac{4}{25}\right) = -\frac{1}{10}$

c.  $-1^4 = -1$

f.  $\frac{1}{4} - \frac{3}{5} = \frac{5}{20} - \frac{12}{20}$   
 $= -\frac{7}{20}$

i.  $\frac{14}{15} \div \frac{8}{20} = \frac{14}{15} \cdot \frac{20}{8} = \frac{7}{3}$

10. State the multiplicative inverse of each number.

a.  $7 \rightarrow \frac{1}{7}$

b.  $\frac{1}{8} \rightarrow 8$

c.  $-6 \rightarrow -\frac{1}{6}$

d.  $-\frac{7}{13} \rightarrow -\frac{13}{7}$

11. Use order of operations to simplify the following arithmetic expressions.

a.  $3 - 2(5 - 8)^3 = 3 - 2(-3)^3$   
 $= 3 - 2(-27)$   
 $= 3 + 54$   
 $= 57$

*scratch*  
 $\frac{1}{8} - \frac{3}{4}$   
 $= \frac{1}{8} - \frac{6}{8}$   
 $= -\frac{5}{8}$

c.  $\left(-\frac{1}{2}\right)^2 + \left(\frac{1}{8} - \frac{3}{4}\right)^2 (-16) = \frac{1}{4} + \left(-\frac{5}{8}\right)^2 (-16)$   
 $= \frac{1}{4} + \frac{25}{64} \left(-\frac{16}{1}\right)$   
 $= \frac{1}{4} - \frac{25}{4}$   
 $= -\frac{24}{4} = -6$

b.  $\frac{5(-2+1)^2-3}{2^3-4} = \frac{5(-1)^2-3}{8-4}$   
 $= \frac{5-3}{4}$   
 $= \frac{2}{4}$   
 $= \frac{1}{2}$

d.  $-|6 - (-10 + 15)| = -|6 - 5|$   
 $= -|1|$   
 $= -1$

$$\begin{aligned}
 \text{e. } 25 \div 5 + 3[4 + 2(7 - 9)^3] &= 5 + 3[4 + 2(-2)^3] \cdot \frac{5(4-9)+10 \cdot 3}{2^3-1} = \frac{5(-5) + 30}{8-1} \\
 &= 5 + 3[4 + 2(-8)] \\
 &= 5 + 3[-12] \\
 &= 5 - 36 \\
 &= -31
 \end{aligned}$$

12. Evaluate the following expressions for the given value of the variable.

a.  $\frac{x}{8} - \frac{5}{12}$  when  $x = 7$

$$\begin{aligned}
 \frac{7}{8} - \frac{5}{12} &= \frac{21}{24} - \frac{10}{24} \\
 &= \frac{11}{24}
 \end{aligned}$$

b.  $-x^2 - 4x$  for  $x = -5$

$$\begin{aligned}
 -(-5)^2 - 4(-5) &= -25 + 20 \\
 &= -5
 \end{aligned}$$

13. Simplify each algebraic expression.

a.  $7 - (x + 11) = 7 - x - 11$   
 $= -4 - x$

c.  $4(3y - 7) - (13y - 2) = 12y - 28 - 13y + 2$   
 $= -y - 26$

b.  $14 + \frac{1}{2}(6x - 8) = 14 + 3x - 4$   
 $= 10 + 3x$

d.  $14x^2 + 5 - [7(x^2 - 2) + 4] = 14x^2 + 5 - [7x^2 - 14 + 4]$   
 $= 14x^2 + 5 - [7x^2 - 10]$   
 $= 14x^2 + 5 - 7x^2 + 10$   
 $= 7x^2 + 15$

- 14. Determine whether or not  $\frac{2}{15}$  is a solution to  $\frac{1}{3} + 5x = 1$ .

$$\frac{1}{3} + \cancel{\frac{1}{1}} \left( \frac{2}{15} \right) \stackrel{?}{=} 1$$

$$\frac{1}{3} + \frac{2}{3} \stackrel{?}{=} 1$$

$$\frac{3}{3} \stackrel{?}{=} 1$$

$1=1$  is true so  $\frac{2}{15}$  is a solution.

- 15. Determine whether or not  $-2\frac{1}{2}$  is a solution to  $10 - 2x = 4x + 20$ .

$$10 - 2(-2\frac{1}{2}) \stackrel{?}{=} 4(-2\frac{1}{2}) + 20$$

$$10 - \cancel{2}(-\frac{5}{2}) \stackrel{?}{=} 4(-\frac{5}{2}) + 20$$

$$10 + 5 \stackrel{?}{=} -10 + 20$$

$$15 = 20 \text{ is false so } -2\frac{1}{2} \text{ isn't a solution.}$$

- 16. Answer the following questions regarding the polynomial

$$-4 - 11x + x - 5x.$$

a. How many terms does it have?

4

c. What is the coefficient of the 4th term?

-5

b. What is the constant term?

-4

d. Are there any like terms? If so, list them using commas.

Yes:  $-11x, x, -5x$

- 17. Write each English phrase/sentence as an algebraic expression/sentence. Let the variable  $x$  represent the number.

a. the product of 6 and a number

$$6x$$

d. twice a number subtracted from 12

$$2(12 - x)$$

b. a number added to 4

$$4 + x$$

e. The quotient of a number and 6 is 5.

$$\frac{x}{6} = 5$$

c. three times a number, increased by 5

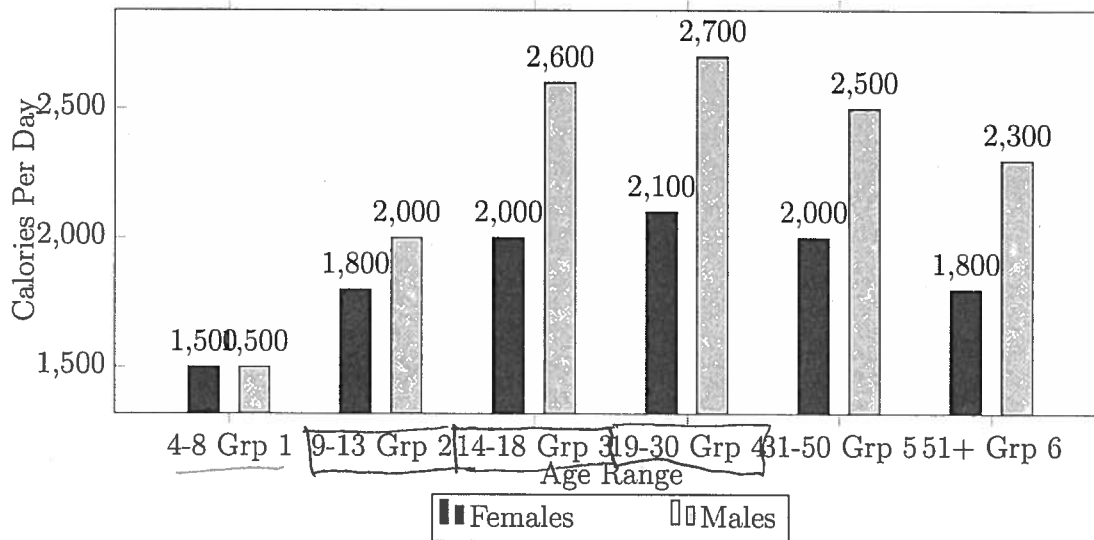
$$3x + 5$$

f. Seven decreased by twice a number yields 1.

$$7 - 2x = 1$$

18. The bar graph below depicts the estimated number of calories per day needed to maintain energy balance for various gender and age groups for moderately active lifestyles. (Moderately active means a lifestyle that includes physical activity equivalent to walking 1.5 to 3 miles per day at 3 to 4 miles per hour, in addition to the light physical activity associated with typical day-to-day life.)

Calories Needed to Maintain Energy Balance for Moderately Active Lifestyles



The mathematical model

$$F = -66x^2 + 526x + 1030$$

describes the number of calories needed per day,  $F$ , by females in age group  $x$  with moderately active lifestyles. According to the model, how many calories per day are needed by females between the ages of 19 and 30, inclusive, with this lifestyle? Does this underestimate or overestimate the number shown by the graph above? By how much?

19-30 is group 4. So  $x=4$

$$\begin{aligned} F &= -66(4)^2 + 526(4) + 1030 \\ &= -66 \cdot 16 + 2104 + 1030 \\ &= -1056 + 3134 \\ &= 2078 \end{aligned}$$

According to the model, females between the ages 19-30 inclusive should eat around 2078 calories per day.

This underestimates the data in the graph by 22 calories per day.