

Exercise Set 2

Here is a set of problems to reawaken some of your math skills that may have gone dormant.

Manipulating equations

First up is manipulating equations to “solve” for a variable. We do this by applying operations to the equation to get the variable of interest alone on one side of the equals sign. So in the first problem below we are trying to work towards an equation that looks like: $x = \dots$. Remember the golden rule here is that we must always apply the same operation to *both* sides of the equation.

1. Solve for x : $x + 1 = 5$
2. Solve for t : $3t - 7 = 14$
3. Solve for p : $3p + 2 = 6p - 4$
4. Solve for t : $2(t + 3) = 5(t - 1) - 7(t - 3)$
5. Solve for x :

$$\frac{x-3}{2} = \frac{2x+4}{5}$$

Translating words into symbols

When we are applying mathematics to real-world problems we often need to translate information given to us in English sentences into equivalent mathematical statements. To do so we assign letters (variable names) to quantities, and translate verbs and descriptions into operations and relations.

6. One more than twice a certain number.
7. Three less than five times a certain number.
8. Two numbers whose difference is 10.

Solving simultaneous equations

Sometimes the values of the variables we seek are not specified explicitly by a single equation. Instead they may be specified by a pair of equations that must *both* be satisfied. Since they must

both be satisfied *at the same time* they are called *simultaneous* equations. Note that in these cases we are looking for values of not one, but two variables.

9. Solve:

$$2x - y = 4$$

$$x + 2y = -3$$

10. Solve:

$$2x - 3y = 7$$

$$3x + y = 5$$

11. Solve:

$$5x + 2y = 3$$

$$2x + 3y = -1$$

Artificial Problems

Here are some (artificial) problems that combine equation manipulations and English to math translation

12. The sum of two numbers is 21 and one number is twice the other. What are the numbers?

13. The sum of three consecutive whole numbers is 24. Find the numbers.

14. Betty has 50 coins, all in nickels and dimes, worth \$3.50. How many nickels does she have?

15. John made each side of his square garden plot 4 feet longer. This increased its area by 64 square feet. What were its original dimensions?

Graphing lines

So far we have been working with our equations algebraically, but equations can also be represented graphically, and this can make them easier to reason about and interpret. For now let's just recall *how* to graph them.

16. Graph the line $2x + 3y = 18$

17. Graph the line $12x + 4y = 36$

18. Graph the line $y = x + 4$.

19. Graph the line $y = 2x - 1$.

20. Graph the line $y = -2x + 6$.