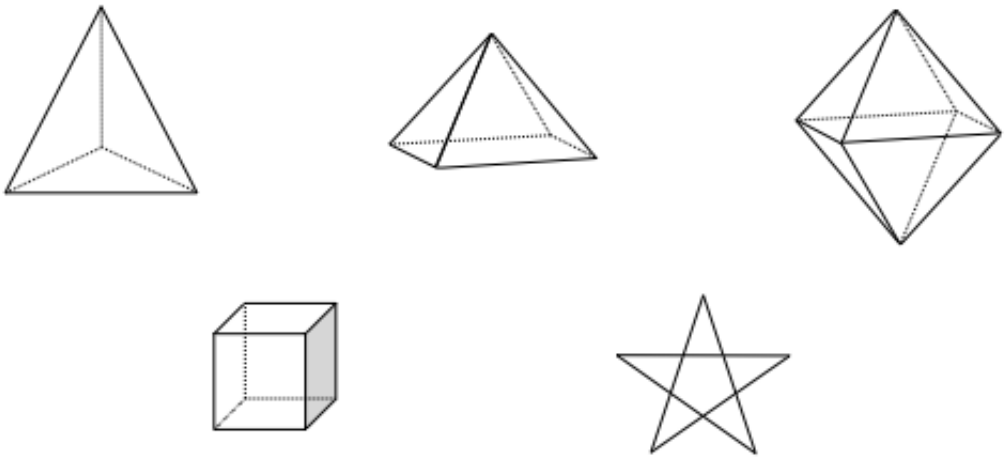
1.1.1 How can I work with my team to figure it out?

Solving Puzzles in Teams

Welcome to Algebra 2! This first chapter will challenge you to use different problem-solving strategies. You will also be introduced to different tools and resources that you can use throughout the course as you investigate new ideas, solve problems, and share mathematical ideas.

1-1. BUILDING WITH YARN

Work with your team to make each of the shapes you see below out of a single loop of yarn. You may make the shapes in any order. Before you start, review the Team Roles that are described on the next page. Use these roles to help your study team work together today. When you make one of the shapes successfully, call your teacher over to show off your accomplishment.



Team Roles

Resource Manager - If your name comes first alphabetically:

- Make sure your team has all of the necessary materials, such as yarn for problem 1-1 or the resource pages for problem 1-2.
- Ask your teacher a question when the*entire* team is stuck. Before raising your hand, you might ask your team, *"Does anyone have an idea? Should I ask the teacher?"*
- Make sure your team cleans up materials by delegating tasks. You could say, *"I will put away*

the ____ while you ____."

Facilitator - If your name comes second alphabetically:

- Start your team's discussion by reading the question aloud and then asking,*"Which shape should we start with?"* or*"How can we work together to make this shape?"*
- Make sure that all of the team members get any necessary help. You do not need to answer all of the questions yourself. A good Facilitator regularly asks, *"Do we understand what we are supposed to do?"* and *"Who can answer ____'s question?"*

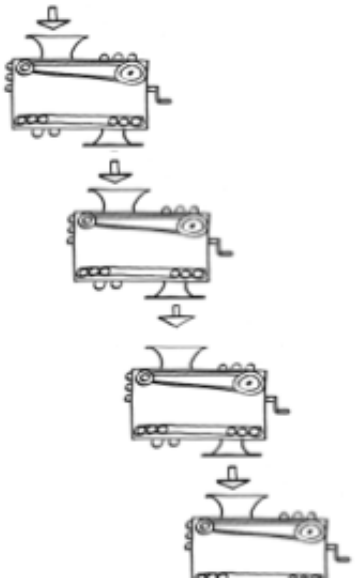
Recorder/Reporter - If your name comes third alphabetically:

- Be sure all team members are able to reach the yarn and have access to the resource pages. Make sure resource pages and work that is being discussed are placed in the center of the table or group of desks in a spot where everyone can see them.
- Be prepared to share your team's strategies and results with the class. You might report, *"We tried ____, but it didn't work, so we decided to try ____."*

Task Manager - If your name comes fourth alphabetically:

- Remind the team to stay on task and not to talk to students in other teams. You can suggest, *"Let's try working on a different shape,"* or *"Are we ready to try the function machines in a different order?"*
- Keep track of time. Give your team reminders, such as, "*I think we need to decide now so that we will have enough time to ...*"

1-2. FUNCTION MACHINES



Your teacher will give you a set of four function machines. Your team's job is to get a specific output by putting those machines in a particular order so that one machine's output becomes the next machine's input. As you work, discuss what you know about the kind of output each function produces to help you arrange the machines in an appropriate order. The four functions are reprinted below.

$f(x) = \sqrt{x}$ $\quad$ $g(x) = -(x - 2)^2$

$h(x) = 2^x - 7$ $\quad$ $k(x) = -\frac{x}{2} - 1$

a. In what order should you stack the machines so that when 6 is dropped into the first machine, and all four machines have had their effect, the last machine's output is 11?

b. What order will result in a final output of 131,065 when the first input is 64?

METHODS AND MEANINGS

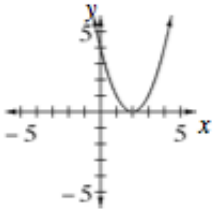
MATH NOTES

Functions

A relationship between inputs and outputs is a **function** if there is no more than one output for each input. Functions are often written as y = some expression involving x, where x is the input and y is the output. The following is an example of a function.

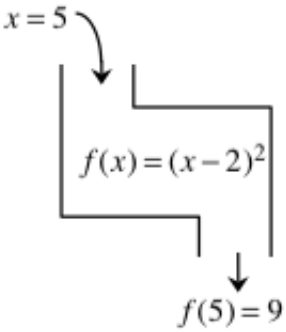
$$y = (x-2)^2$$

x	–2	–1	0	1	2	3	4	5
y	16	9	4	1	0	1	4	9



In the example above the value of y depends on x, so y is also called the **dependent variable** and x is called the **independent variable**.

Another way to write a function is with the notation "$f(x)$ =" instead of "y =". The function named "f" has output $f(x)$. The input is x.



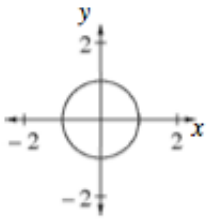
In the example at right, $f(5) = 9$. The input is 5 and the output is 9. You read this as, "f of 5 equals 9."

The set of all inputs for which there is an output is called the **domain**. The set of all possible outputs is called the **range**. In the example above, notice that you can input any x-value into the equation and get an output. The domain of this function is "all real numbers" because any number can be an input. The outputs are all greater than or equal to zero, so the range is $y \geq 0$.

$x^2 + y^2 = 1$ is not a function because there are two y-values (outputs) for some x-values, as shown below.

$$x^2 + y^2 = 1$$

x	–1	0	0	1
y	0	–1	1	0



1-3. KEEPING A NOTEBOOK Help (Html5)⇔Help (Java)

You will need to keep an organized notebook for this course. Below is one method of keeping a notebook. Ask your teacher if you should follow these guidelines or if there is another system you should follow.

- The notebook should be a sturdy, three-ring, loose-leaf binder with a hard cover.
- The binder should have dividers to separate it into five sections:

TEXT	TESTS AND QUIZZES
HOMEWORK	LINED AND GRAPH PAPER
CLASSWORK/NOTES	

You should put your name inside the front cover of your notebook so it will be returned to you if you lose it. Put your phone number and address (or the school's address, if you prefer) on the inside front cover. It will also help to put your name in large, clear letters on the outside so if someone sees it they can say, *"Hey, Julia, I saw your notebook in the cafeteria under the back table."*

Your notebook will be your biggest asset for this course and will be the primary resource you will use to study, so take good care of it!

1-4. "Find $f(3)$" means to find the output of function $f(x)$ for an input of $x = 3$. For the function $f(x) = \frac{1}{x-2}$, find each of the following values. Help (Html5)⇔Help (Java)

a. Find $f(4)$. (This means find the output of the function when $x = 4$.)

b. Find x when $f(x) = 1$. (This means find the input that gives an output of 1.)

1-5. Angelica is working with function machines. She has the two machines $g(x) = \sqrt{x-5}$ and $h(x) = x^2 - 6$. She wants to put them in order so that the output of the first machine becomes the input of the second. She wants to use a beginning input of 6. Help (Html5)⇔Help (Java)

a. In what order must she put the machines to get a final output of 5?

b. Is it possible for her to get a final output of −5? If so, show how she could do that. If not, explain why not.

1-6. An average school bus holds 45 people. Sketch a graph showing the relationship between the number of students who need bus transportation and the number of buses required. Be sure to label the axes. Help (Html5)⇔Help (Java)

1-7. In this course, you will learn shortcuts that allow you to sketch many different types of graphs quickly and accurately. However, when the directions ask you to graph an equation or to draw a graph, this means it is not just a sketch you should do quickly. You need to: Help (Html5)⇔Help (Java)

- Use graph paper.
- Scale your axes appropriately.
- Label key points.
- Plot points accurately.

On separate sets of axes, graph each of the following equations. If you do not remember any shortcuts for graphing, you can always make an $x \rightarrow y$ table.

a. $y = -2x + 7$

b. $y = \frac{3}{5}x + 1$

c. $3x + 2y = 6$

d. $y = x^2$

1-8. The graph for part (d) of problem 1-7 is different from the other three graphs. Help (Html5)⇔Help (Java)

a. Explain how the graph is different from the other three graphs.

b. What in the equation of part (d) makes its graph different?

c. What is the graph of part (d) called?

1-9. Write down everything you know about the equation $y = mx + b$. You should include what this general equation represents, as well as what each of the different letters represents. Be as thorough as possible. Help (Html5)⇔Help (Java)