Math Trades 1

Whole Numbers Video

Name \_INSTRUCTOR ANSWER KEY\_\_\_\_



**Video Link**: <https://www.youtube.com/watch?v=6P69vLOe_vA>

**Summary**: In this video, you will need to determine the total amount of tubing (assume the top of the riser will be added later) needed to produce a riser that will be used in a robotic welding enclosure at KI in Green Bay. You will be challenged to understand a two-dimensional figure (blueprint) that represents a three-dimensional object. You will also look at the loss of material from cutting.

**Company Information:** KI is an international manufacturer of office and institutional furniture. KI has ten different manufacturing plants, with its headquarters located in Green Bay, Wisconsin. Each plant focuses on a different aspect of business. At the Green Bay plant the focus is on chairs, desks and tables. The largest part of what KI-Green Bay produces is for educational markets, in both K-12 and post-secondary settings. In 2012, KI shipped about 876,000 combined units total.

**Part 1** (0:00-0:36)

* Play video (0:00-0:16), pause at (0:17) to answer the discussion questions.
* What exactly might the pedestal be used for? What type of item could be made by this welding robot?
	+ These pedestals will be used to place an item on that will be welded by a robotic arm. Alex’s boss said that it is a “dolly robot”. This robot will be welding together dollies – a structure that holds chairs or tables that are regularly taken down and set up. See the link for possible types of dollies this robot will be welding parts of: <http://www.amazon.com/s?rh=n%3A256347011%2Cp_4%3AKI>
* What knowledge and skills should Alex have to be able to accomplish the task given to him by his boss? His boss said that he will need to “fabricate and weld”. What does it mean to fabricate something?
	+ He will need to understand how to read a blueprint, calculate the total amount of rectangular tubing needed, be able to weld the parts. Fabricate means that Alex will need to order the proper length of material, saw the parts to the proper length, construct the pedestal, weld the pedestal, and paint them to have the final product.The total number of lengths of each part will need to be figured to determine the total material needed. (A student may mention factoring in the material loss, kerf, due to the width of the cut but if not, this will come up later.)
* Based on the blueprint Alex is given shown below, what type of material is being used?
	+ Rectangular Tubing is being used. Tubing means that the middle is hollow. This rectangular tubing is 2” by 1½“ based on the dimensions of the blueprint. You can discuss that there is circular, square, or rectangular tubing that is used.



* Play video (0:18-0:31), pause at prompt (0:32-0:36) at “Break 1” to answer the questions below.
* Determine the total length needed for each pedestal
	+ 4-18”, 4-14”, 4-13” = 180”
* Earlier in the video, Alex’s boss said that four pedestals will be needed for the dolly robot. What is the total number of inches of tubing that will be needed for all four pedestals?
	+ 4\*180 = 720” total

**Part 2** (0:37- 1:16)

* Play video (0:37-1:11), pause at (1:12-1:16) at “Break 2” to verify that you had the correct number of lengths needed, total number of inches of rectangular tubing for each riser, and for all four risers. Then answer the questions below.
* Steel tubing often comes in 20 foot lengths when ordered or pulled from the stock room at a company. Explain in your own words how and why Alex determined that 20 feet is equal to 240 inches.
	+ 12\*20 = 240 in
* How many of these 20 foot lengths will be needed?
* Hopefully at this point some students will determine that Alex will need more than 3 20 foot lengths since there will be some loss due to cutting (the width of the blade).

**Part 3** (1:17-1:44)

* Play video (1:17-1:38), Pause at prompt (1:39-1:44) at “Break 3” to discuss as a class who thought you needed three lengths versus four. Then answer the discussion questions below.
* Why do you think the width of saw blades typically are?
	+ $\frac{1}{16}"$ would be most common for working on a project like this. They can be as small as 0.025” for working with thin sheet metal or as large as $\frac{1}{8}"$ if working with large structural shapes.
* In Alex’s example he said, “I wouldn’t be able to take two 12 inch pieces out of one 24 inch length of tube because I would come up a little bit short. I would need just over 24 inches to produce the two 12 inch pieces of material.” Using his example, if the saw blade cut were to be $\frac{1}{16}"$, exactly how much material would Alex need to start out with to get two 12 inch pieces?
	+ He would need 24 $\frac{1}{16}"$ – the 12 inch piece, one cut inbetween, and another 12 inch piece. (For students who have not dealt with fractions yet, you may want to pick something easier for this example like ¼ inch saw blade or ½ inch saw blade as an easier example.)

**Part 4** (1:45-2:05)

* Play video (1:45-2:00), pause at prompt (2:01-2:05) at “Break 4” to verify that you have determined that they would need 3 20-foot lengths exactly but realistically need four 20-foot lengths based on earlier discussion.
* Besides factoring in the loss of material due to each cut, for what other reason would it probably not work out to be able to use exactly three 20-foot lengths?
	+ If this has not come up yet, most likely, the dimensions will not fit perfectly on the 20 foot lengths. For example, towards the end of one of the full lengths, you may end up with six inches leftover, which could not be used to get another 14”, 13”, or 18” length.
* What implications will there be if not enough material is ordered?
	+ Not ordering enough material could cause a delay in production due to waiting for material to be delivered.

**Part 5** (2:06-2:33)

* Play video (2:06-2:33) and then answer the discussion question below
* What additional things were needed to be done to the riser to produce the finished product?
	+ The rough edges where the cuts were made need to be deburred (smoothed).
	+ Four pieces of angle iron with holes drilled were attached in order to fasten the riser down, the tubing was painted, and the top piece of 17” by 17” sheet metal was needed.