Math Trades 1 Activity Description

Competency	Activity	Hands-on Aspect	Supplies Needed
1. Perform operations involving whole numbers	Students need to cut various lengths of round stock and then flat bar out of 20' bars. They need to determine the combination of how to cut the pieces to minimize the waste.	Students can use cut out pieces of laminated paper measured to scale and can move the smaller pieces around to match the original 20' bar to see how the waster would be minimized. ***Not in kit, instructor would need to print, laminate, and cut the document in Blackboard.	
2. Perform operations involving fractions and mixed numbers	Students are giving various lengths of pieces of angle iron, rectangular tubing, and flat bar. They measure the dimensions of the pieces to the nearest 16ths of an inch and label the dimensions on three dimensional images. They then use the dimensions to calculate things like total lengths of putting pieces together (adding), how much material is left from cutting a piece off of a specified length to start with (subtracting), total amount needed for multiple pieces (multiplication), finding the middle of a piece (division), how many pieces you can get out of a longer piece (division), etc. For some problems they verify their calculations using the specified combination of the pieces.	Students are measuring pieces and putting them into various configurations. They are getting familiar with dimensions of standard pieces of material and types of material commonly used.	~ combination square ~aluminum structural shapes - angle iron, rectangular tubing, and flat bar
3. Perform operations involving decimals	Student first convert their fraction dimensions measured in the fraction activity to decimals and fill them in on a new reference sheet. Students then use a Ryerson stock list (printed pages/website/or app) to look up the appropriate weight per ft. They determine the weight of each piece and then verify using a scale.	Students are weighing the pieces to verify their calculations and learning how to look up weights of material.	~ Fraction activity previously done ~ aluminum structural shapes - angle iron, rectangular tubing, and flat bar ~ Ryerson stock list ~ scale ~ caliper and micrometer
4. Perform operations involving measurement (converting units)	Students are given a blueprint of a motor stand which is in metric (mm). They first convert the dimensions to inches, to the nearest 16th of an inch. They verify the dimensions in metric and US customary with an actual motor stand made from the blueprint. They also calculate the total length of angle iron needed, how much supplies to order, and weight of a motor stand.	Students are verifying their calculations by measuring an actual motor stand and weighing it.	~ motor stand ~ combination square ~ Ryerson stock list

5. Perform operations involving integers	Students look at a budgetting problem. They look at a job where the cost was underestimated and determine the loss on the job due to underestimating the material and labor costs.	none	
6. Solve equations	Students are given four pieces of material (round stock and/or flat bar). They are to weigh each piece and are given the density of the material. They then use the formula for volume of a cylinder/rectangular solid to calculate the length of the part to the nearest 16th of an inch. They then can verify with a ruler.	Students are weighing and measuring the pieces. They are getting familiar with dimensions of standard pieces of material and types of material commonly used.	~ scale ~ aluminum pieces of round stock, square stock, and rectangular bar ~ combination square
7. Perform operations involving practical plane geometry	Students are given specifications to make a small scale "fuel tank" in the shape of a rectangular solid with circular ends. They determine the volume and verify the calculations using water and a measuring cup. They calculate the total and lateral surface area to determine the amount of product needed to cover the tank (paint, etc). They verify this by using paper to wrap around the "tank" to better understand the formulas for surface area. They then determine the weight of the tank and verify with a scale.	Students see and measure the actual small scale tank and compare to the blueprint. They use real volumes and surface areas to verify.	~ tank replica ~ pee wee tape ~ water ~ measuring cup ~ scale ~ Ryerson stock list
8. Perform operations involving trigonometry - Arc Length	Students replicate creating the reducing part of the top of a tank. They utilize the pythagorean theorem to determine the hypotenuse of a cone to sketch out the arc to create on paper. They then go a step further and utilize cosine and tangent to determine the hypotenuse of the reducing part of the tank. Students sketch out the two arcs and cut out their shape on paper. They then verify with a metal "answer key" they can drop their paper model into to see if it fits.	Students are using paper to replicate making the reducer part of the tank and sketch out the arc just as they would on metal and tape together the two pieces just as they would weld together the two pieces.	~ tank reducer ~ combination square ~ pee wee tape ~ angle finder ~ compass ~ paper or cardstock ~ scissors ~ tape
8. Perform operations involving trigonometry - Right Triangle Trigonometry	Students replicate laying out a bolt hole circle. The use trigonometry ratios to determine the distance between two consecutive holes around the bolt hole circle. The lay out the design on paper by measuring a straight distance between the holes and also by making arcs with a compass. Students verify their paper version by lining it up with a metal one to see if it fits.	Students are using paper to replicate laying out where the holes are located just as they would on metal.	~ bolt hole circle ~ combination square ~ compass ~ paper or cardstock ~ scissors

This material is based on work supported by the National Science Foundation under Grant No. DUE-1406857. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.