Lesson:

Using a tape measure to solve problems.

Goal: Use weld wire

Prerequisite Assumption:

Lesson Material: Welder, .045 Welding Wire 44# spool, Tape Measure, calculator

Notes to Self

- One thing I want to do during this lesson is to explain why wire speed with GMAW process is so important. Also what (IPM) inches per minute means?
- One thing I want to pay attention in my students' thinking is that a tape measure is just a collection of fractions, each set represents and inch, combined by a foot mark. They need to understand it's just a tool that represents math and help solves problems.
- One connection or idea I want to remember is that on a tape measure, each inch is likened to a football game with quarters and half time. I can make as many time periods in an inch like a sporting event. Also, students can just double the bottom denominator to split a measurement in half for quick work.

Time of Activity	Activity (Welders pay effect by welders wire)	Activity Group Size
10 Minutes	Activity Information and pose the problem, attendance/ Handouts/	Whole class- classroom
15 Minutes	Demonstration/ measuring wire IPM	Whole class- lab
5 Minutes	Group task/ data collection/ measuring wire IPM	Group of 2- lab
5 Minutes	Problem 1 Material thickness determines amperage/	Group of 2- classroom
5 Minutes	Problem 2/ Select proper wire size, according to amperage	Group of 2- classroom
5 Minutes	Problem 3/ Set the wire feed speed	Group of 2- classroom
5 Minutes	Problem 4, there are 2,210 inches in a pound. How many inches are in a spool (44 pounds)?	Group of 2- classroom
15 Minutes	Break	Whole class
5 Minutes	Problem 5/ How many inches does the average welder weld per day?	Group of 2- classroom
5 Minutes	Problem 6, how many pounds of wire is used each day?	Group of 2- classroom
5 Minutes	Problem 7, what is the cost of wire each does the average welder use a day?	Group of 2- classroom
15 Minutes	Group discussion/ Fun facts	Whole class- classroom

The chart and information below is a way for students to look at a chart a select information they may need. Also explain rule of thumb, it may be helpful as a way to remember helpful ideas.

For wire size	Multiply by	Ex. using 1/8 inch (125 amps)
.023 inch	3.5 inches per amp	3.5 x 125 = 437.5 ipm
.030 inch	2 inches per amp	2 x 125 = 250 ipm
.035 inch	1.6 inches per amp	1.6 x 125 = 200 ipm
.045 inch	1 inch per amp	1 x 125 = 125 ipm

https://www.millerwelds.com/resources/article-library/miggmaw-101-setting-the-correct-parameters

As a guideline, each .001 inch of material thickness requires 1 amp of output: .125 inch = 125 amps.

A rule of thumb is how ever thick the material is, we take that number without the decimal point and use it as the amps. An example is that's also how many amps it takes to make the weld, for instance .250 material takes 250 amps as a setting.

1. Problem 1, how many amps for 1/8” material thickness? 125 amps

   Material is 1/8 carbon steel, which actually is .125 as a decimal. Problem 2, Using .045 the wire, it comes on a 44# spool. .045 times 3.14= .1413
2. Problem 2, Wire of 0.035 inch diameter (D) has a cross-sectional area of = pi/4 x DxD = 3.14156/4 x 0.035 x 0.035 = 0.000962113 square inches. What is the square inches if the wire is .045? .00159041
3. Problem 3, .045 inch, 1 inch per amp, 1 x 125 = 125 ipm (Inches per Minute)
4. Problem 4, there are 2,210 inches in a pound. How many inches are in a spool (44 pounds)?

   .045 = 2,210 inches per lb (Pound)

   2,210 times 44= 97,240
5. Problem 5, how many inches does the average welder weld per day?

   Travel Speed = Length of Weld / Time to weld = 25 inches / 2 minutes = 12.5 inches per minute.

   Each welder works 8 hours in a day, they each get two 15 minute breaks and a half hour lunch.

   The average welder welds 35 minutes out of every hour? 12.5 times 35 = 437.5 inches an hour

   437.5 times 7= 3,062 inches per shift
6. Problem 6, how many pounds of wire is used each day?

   Deposition Rate Calculation

   Deposition rate (lb/hr) = 13.1 × (Wire diameter)Squared × (Wire-feed speed) ×

   (Efficiency)— Wire diameter in inches (in)

   — Wire-feed speed in inches per minute (ipm)

   — Efficiency (1.0 for solid wire, 0.85 for cored wire)

   — This calculation is for steel only

   — e.g.: Wire diameter = 0.045 in (1.2 mm) solid wire, WFS = 300 ipm

Deposition rate = 13.1 × (0.045)squared × (300) × (1.0) = 7.96 lb/hr

Deposition rate= 13.1 x (0.045)squared x (125) x (1.0) = 3.32 lb/hr x 4= 13.28 lb/hr

7. Problem 7, what is the cost of wire each does the average welder use a day?

   Each 44# spool cost 44 dollars, which is one dollar per pound

   3.32lb/hr times 7= 23.24 lb/day. $13 a day

8. Group discussion

Fun facts:

If there is 8289 feet in a 44# spool how many total in inches?

8289 times 12= 99,468 inches

0.045 welding wire 44# spool is 8289 feet long

5280 feet in a mile, 24,901.55 mile around the earth

131,480,184 feet divided by spools each 8289 feet long= 15,862.00796 or 15,863

Spools to go around the world.

Cut wires to express students height!

Students Objectives

At the completion of this lesson, the student should be able to use a tape measure to solve basic math

- In order to add/ subtract measurements the students need to use the same units
- In order to add/ subtract fractions we need to have the same denominators.
- A basic understanding of pi and how it can be used in a formula.

At the completion of this lesson, the student should be able to

- Add and subtract in different denominators
- Convert from mixed decimals to fractions and vice versa
- Add measurements given in feet and inches
- Perform basic geometry formulas

Problem 1:

The welding machines today use digital read outs on their display screens. The people using these welders would have to assume they are calibrated correctly, however they may be off. Students need to learn how another way to check this information. Considering the major cost and possible bad performance if the parameter is off.

Problem 2:

The welding students need to be able to figure out weld setting parameters without the manufactures books.

Problem 3:

The welders need to be able to figure the cost of electrode consumables by using basic math.