


Math-in-CTE Lesson Plan Estimating material cost

Lesson Title: Determining Material Cost		Lesson # 14
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Occupational Area: Metal Fabrication/Welding		
CTE Concept(s): Material cost (sheet stock)		
Math Concepts: Measurement, Area, Percent, Conversion		
Lesson Objective:	To determine cost of material	
Supplies Needed:	Calculators, Material size and weights reference book. www.engineeringtoolbox.com/gauge-sheet-d_915.html	

THE "7 ELEMENTS"	TEACHER NOTES (and answer key)
<p>1. Introduce the CTE lesson.</p> <p>What we need to learn today is how to determine the cost of any given size and or type of sheet stock material.</p> <p>Last class, we learned how to find the weight per square foot of the given material by using the material size and weights reference book.</p> <p>Also we learned that different materials come stock in different size sheets.</p> <p>In math class, this is called two dimensional measurement used to describe area.</p>	<p>Area is calculated by multiplying length x width.</p> 

2. Assess students' math awareness as it relates to the CTE lesson.

Who remembers how to calculate square footage ?

Your math instructor will probably use the term “**Area**”

On your worksheet are a few examples to be completed.

Formula: Length in feet x Width in feet = Square Feet

Hand out worksheet 1.

$$5' \times 6' = \text{Feet}$$

$$6' \times 4' - 6'' = \text{Feet and Inches}$$

$$24'' \times 36'' = \text{Inches}$$

$$16'' \times 30'' = \text{Inches}$$

Let's calculate the area in these examples on worksheet 1.

Worksheet 1

1. $3' \times 4' = 12$ Square feet
2. $4' \times 5' - 6''' = 22$ Square feet
3. $12'' \times 36'' = 3$ Square feet
4. $18'' \times 42'' = 5.25$ Square feet

3. Work through the math example *embedded* in the CTE lesson.

Now we need to determine the cost of materials to be used on a job.

NOTE: Cost is based on material type and weight. Weight is determined by square footage and thickness. Weight per square foot of materials can be located in the Material size and weights reference book or on a variety of web-sites.

Inaccurate calculation of actual material cost could raise or lower the price determining profit or potentially losing the job.

Hand-out A: Calculate material cost example.

Formula:

1. Length in inches x width in inches = Total Sq inches.
2. Total Sq inches / by 144 = Total Sq feet.
3. Total Sq feet x weight of material per sq foot (see Material size and weights reference book) = Total LBS.
4. Total LBS x cost of material type = Total cost.

Hand out work sheet 2.

Hand out A:

1 pc 32" x 54" x 16 ga BI

1. $32 \times 54 = 1728$ Sq inches.
2. $1728 / 144 = 12$ Sq feet
3. $12 \times 2.5 = 30$ LBS
4. $30 \times .82 \text{ cents} = \$ 24.60$

Worksheet 2

1. 1 pc 56" x 92" x 3/16" BI
2. 1 pc 22" x 44" x 1/16" BI
3. 1 pc 48" x 72" x 1/4" Aluminum

NOTE: Aluminum = \$2.96 per lb.
BI = \$0.82 per lb

4. Work through *related, contextual* math-in-CTE examples

Up to this point we've been dealing with mostly with even ended numbered dimensions in terms of feet and inches along with single quantity terms. Now the following examples will deal with multiple

Worksheet 3

From the list determine the total weight in LBS and material

<p>quantities and mixed dimensions.</p> <p>Hand out worksheet 3</p>	<p>cost of each item.</p> <ol style="list-style-type: none"> 3 pcs 18" x 70" x 1/8" Aluminum 4 pcs 28-1/2" x 33-3/4" x 1/8" Aluminum 2 pcs 6'-8" x 14" x 3/16" Aluminum 22 pcs 8" x 2'- 6" x 16 ga Stainless Steel 12 pcs 14" x 26-1/2" x 1/4" BI 8 pcs 33.25" x 57.5" x 1/8" Aluminum. <p>Answers:</p> <ol style="list-style-type: none"> 123.87 LBS @ \$2.96 per LB = \$366.66 7.68 LBS Stainless Steel @ \$3.21= \$24.57 315.66 LBS BI @ \$.82 = \$258.84 192 LBS Aluminum @ \$2.96 =\$ 568.32 Total; \$ 851.73
<p>5. Work through <i>traditional math</i> examples.</p> <p>In math class, area calculations are used for figuring the area of various geometric shapes. In the case of staining or painting a deck or wall we first need to know the square footage of the area along with the manufacturers suggested area coverage of their product.</p> <p>Hand out worksheet 4.</p>	<p>Example: 20' x 20' = 400square feet / by 200 = 2 gallons</p> <p>Worksheet 4</p> <p>With a manufacturers suggested coverage of 200 sq ft per gallon determine how many gallons needed for the following problems.</p> <ol style="list-style-type: none"> Deck 18' x 28' Wall - 36' x 18' with six windows at 30" x 54" and one door at 3' - 0" x 6' - 8" NOTE: 2 coats required. <p>Answers</p> <ol style="list-style-type: none"> 504 sq ft / 200 = 2.52 gallons or 3 gallons

	<p>2. $1296 \text{ sq ft} - 135 \text{ sq ft} - 40 \text{ sq ft} = 1121 / 200 = 5.6$ or 6 gallons.</p>
<p>6. Students demonstrate their understanding.</p> <p>From the following material list determine the weight and cost of each item.</p> <p>Hand out Worksheet 5.</p>	<p>Worksheet 5</p> <p>Note: BI = \$.82 lb Alu = \$3.10 lb SS = \$4.22 lb</p> <p>1. 1 pc 14" x 28" x 20 ga BI 1 pc 2'-6" x 4'-8" x 1/8" BI 1 pc 3'-4" x 62" x 1/4" BI</p> <p>2. 10 pcs 16.5" x 47.25" x 1/8" SS 8 pcs 2'-3" x 41" x 16 ga SS 4 pcs 8" x 14" x 3/16" SS</p> <p>3. 16 pcs 26-1/2" x 14.25" x 1/8" aluminum 4 pcs 8" x 8" x 16 ga SS 10 pcs 8'-4" x 22" x 3/16" BI</p> <p>Answers:</p> <p>1. 4.08 lbs @ .82 = \$3.35 58.33 lbs @ .82= \$47.83 175.84 lbs @ .82 =\$144.19 Total: = \$195.37</p>

	<p>2. 270.70 lbs @\$4.22 = \$1142.37 307.5 lbs @ \$4.22 = \$1297.65 24.27 lbs @ \$4.22 = \$102.41 Total: = \$2542.43</p> <p>3. 75.53 lbs @ \$2.96 = \$223.55 4.44 lbs @ \$4.22 = \$18.76 1145.82 lbs @ \$.82 = \$939.58 Total = \$ 1181.89</p>
<p>7. Formal assessment. Assessment is determined by grade of worksheet 5</p>	

NOTES: Weights and material data can be found online or by contacting your steel supplier.