

Math-in-CTE Lesson Plan Template

Lesson Title: Estimating the Subfloor		Lesson # 8
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Occupational Area: Carpentry I		
CTE Concept(s): Estimating the subfloor		
Math Concepts: Area, multiplication and division		
Lesson Objective:	To obtain an accurate material takeoff for the number of sheets of subfloor (AdvanTech) needed for a 24' x 40' ranch home	
Supplies Needed:	Scrap paper, calculator, textbook, whiteboard and marker (chalkboard) Optional: computer for power point presentation, possibly to display pictures	

THE "7 ELEMENTS"	TEACHER NOTES (and answer key)
<p>1. Introduce the CTE lesson.</p> <p>What is the purpose of a subfloor? →It's the material used as the first layer on top of the floor joists. It is the floor sheathing that the finished floor will go on. It provides a working platform.</p> <p>What type of floor sheathing we will use? → AdvanTech. The material we will use for this example will be sheets of $1\frac{1}{8}$" x 4' x 8'. Some of the advantages of AdvanTech are that it can take a lot of weather and it can withstand water without swelling and warping. The manufacturer suggests that it does not deteriorate quickly and will make a quieter floor with more strength.</p>	<p>Teacher question/hook for students</p> <p>Show picture of AdvanTech (attached at end of document)</p> <p>Show chart with advantages of strength and stiffness</p> <p>If possible show students a previous project in the shop with a subfloor that is finished, an unfinished deck that needs a subfloor or, if necessary, a picture of a deck (the floor of house not outside where the grill is!) Pictures located at the end of document.</p>

<p>It holds nails in better so it can minimize floor squeaks. Advantech floor sheathing comes with tongue and groove. AdvanTech is made of compressed wood from young trees so it can be considered more “green” than some materials.</p> <p>Discuss safety: When we get out to the shop (job site) be careful of where you are stepping. Discuss how students need to be aware of body position and where they are placing their feet when working on elevated platforms. Discuss body mechanics concerning material handling and proper techniques for cutting sheet goods.</p>	
<p>2. Assess students’ math awareness as it relates to the CTE lesson.</p> <p>Who knows how we can find how many sheets of subfloor we need? All right, let’s start back at the beginning...</p> <p>What type of shape is the house? Rectangle!</p> <p>How do find the AREA of rectangle? Area = Length x Width</p> <p>Can you find the area of the house drawn on the board? This house will have an area of 10’ x 30’ = 300 sq. ft.</p>	<p>Front-Load for student knowledge about shapes and area.</p> <p>Student knowledge and responses may vary here. Some students may remember the formula for the area of rectangle. They may say Area = base x height (said this way in math class)</p> <p>Draw a house with simple dimensions on the board. Perhaps draw a 10’ x 30’ house. Area = 300 sq. ft</p> <p>Emphasis on “sq. ft.” is important here. Units are always important in traditional math. If students struggle with the concept, consider using the example of a 1’ x 1’ square and explaining that is one square foot.</p>
<p>3. Work through the math example <i>embedded</i> in the CTE lesson.</p> <p>What is the area of the subfloor that we need to cover on our project? What type of shape is this? We have discussed this shape before... Rectangle</p> <p>Have you learned how to find the area of this shape? A = L x W</p>	<p>This can be adapted to a specific project. The house that our program builds is a simple ranch house with dimensions of 24’ x 40’. Feel free to use the dimensions of your school’s project.</p> <p>Shape: Rectangle</p> <p>Area of a rectangle: Length x Width = Area (the traditional math formula is Area = Base X Height)</p> <p>Area of house = 24’ x 40 ‘ = 960 sq. ft</p>

<p>How much does each piece of subfloor (Advantech) cover? What type of shape is each sheet? Rectangle Area for a sheet of Advantech - $A = 4' \times 8' = 32 \text{ sq. ft}$</p> <p>How many pieces of subfloor we will need? Does any one remember this process? (Discuss different answers and whether or not they are appropriate) Area of house \div Area of each subfloor piece = Number of pieces $960 \text{ sq. ft} \div 32 \text{ sq. ft} = 30 \text{ sheets}$</p> <p>One certainly might work through several examples of finding area and the number of pieces to cover said area.</p>	<p>Area of each piece of subfloor = $4' \times 8' = 32 \text{ sq. ft}$</p> <p>Some students may know how to do this, but others may need an explanation.</p>
<p>4. Work through <i>related, contextual math-in-CTE examples.</i></p> <p>How many sheets of $1\frac{1}{8}" \times 4' \times 8'$ Advantech would be needed to install subflooring on a Ranch style house that is 32'x60'?</p> <p>Find the area of the 32'x60' house. $32 \times 60 = 1920 \text{ sq.ft.}$</p> <p>Take the total area and divide by 32 sq. ft. (area of each sheet of AdvanTech) $1920 \div 32 = 60 \text{ sheets}$</p> <p>Next example: How many sheets of $1\frac{1}{8}" \times 4' \times 8'$ of Advantech would be needed to install subflooring on a ranch style house that is 26' x 42' with a 16'x20' L (see Handout 1)</p>	<p>Some students may need an explanation of why the first dimension, the thickness of the sheet, is not a necessary number.</p> <p>Draw a picture of a house with these dimensions on the board.</p> <p>You may need to remind students why to divide by 32 here.</p> <p>This example has an added component of needing to break the diagram of the house into two rectangles. There are two ways to divide the shape to find the area, but</p>

<p>We will need to split this house into two rectangles to find the area.</p> <p>Find the total area by finding the area of both rectangles and then adding them:</p> <p>26' x42'=1092 sq.ft.</p> <p>16'x20'=320 sq.ft.</p> <p>Total area is 1412 sq.ft</p> <p>1412÷32=44.125</p> <p>Round up to 45 sheets.</p>	<p>practicality will rule. One method will have to consider and explain that due to framing of any given building and using material to avoid waste there may be only one way that is feasible. In the following pages both ways are shown. (Teacher answer key for house with an L and alternate answer)</p> <p>See attached drawing for drawing of ranch house with L. (Handout 1)</p> <p>Teacher Answer Key 1 + 2 will have the teacher notes and answer keys.</p> <p>Discuss why we need to round up to 45 sheets</p>
<p>5. Work through <i>traditional math</i> examples.</p> <p>What if you have a more complex shape? Here is an example of another shape. Can you find the area? (See Handout 2)</p> <p>This building needs to be divided into more rectangles to find the area.</p> <p>What if we had a house (or a room) that was in the shape of a triangle? Who remembers how to find the area of a triangle?</p> <p>Can you find the area of this triangle?</p> <p>Area of a triangle $A = \frac{1}{2} b h$ (Area = $\frac{1}{2}$ base X height)</p> <p>How do you talk about the units in your math class?</p> <p>Instead of seeing sq. ft. you might see something like ft² or ft².</p> <p>(optional math extra, maximizing the math)</p> <p>What if you had a measurement that wasn't in feet or inches? What if it was in meters?</p>	<p>Handout 2 – This shape is comprised of more rectangles. Some buildings may have irregular shapes such as this.</p> <p>Divide the shape into separate rectangles and find the area of each rectangle. Then add together all the areas to find the total area of the irregular shape. There is an answer key sheet attached.</p> <p>After finding the total area divide by 32 sq.ft. as we did before to find the number of AdvanTech sheets.</p> <p>We include the triangle here as a pure math type example.</p> <p>Area of a triangle $A = \frac{1}{2} b h$</p> <p>Draw a triangle on the board (a right triangle, so the height is built in). Handout 3</p> <p>Show how to find the area – we have used meters as the units. If you are uncomfortable with meters, feel free to change the units to feet.</p> <p>$A = \frac{1}{2} \times 16 \times 32 = 256 \text{ meters}^2 \text{ or } 256 \text{ m}^2$ (both answers</p>

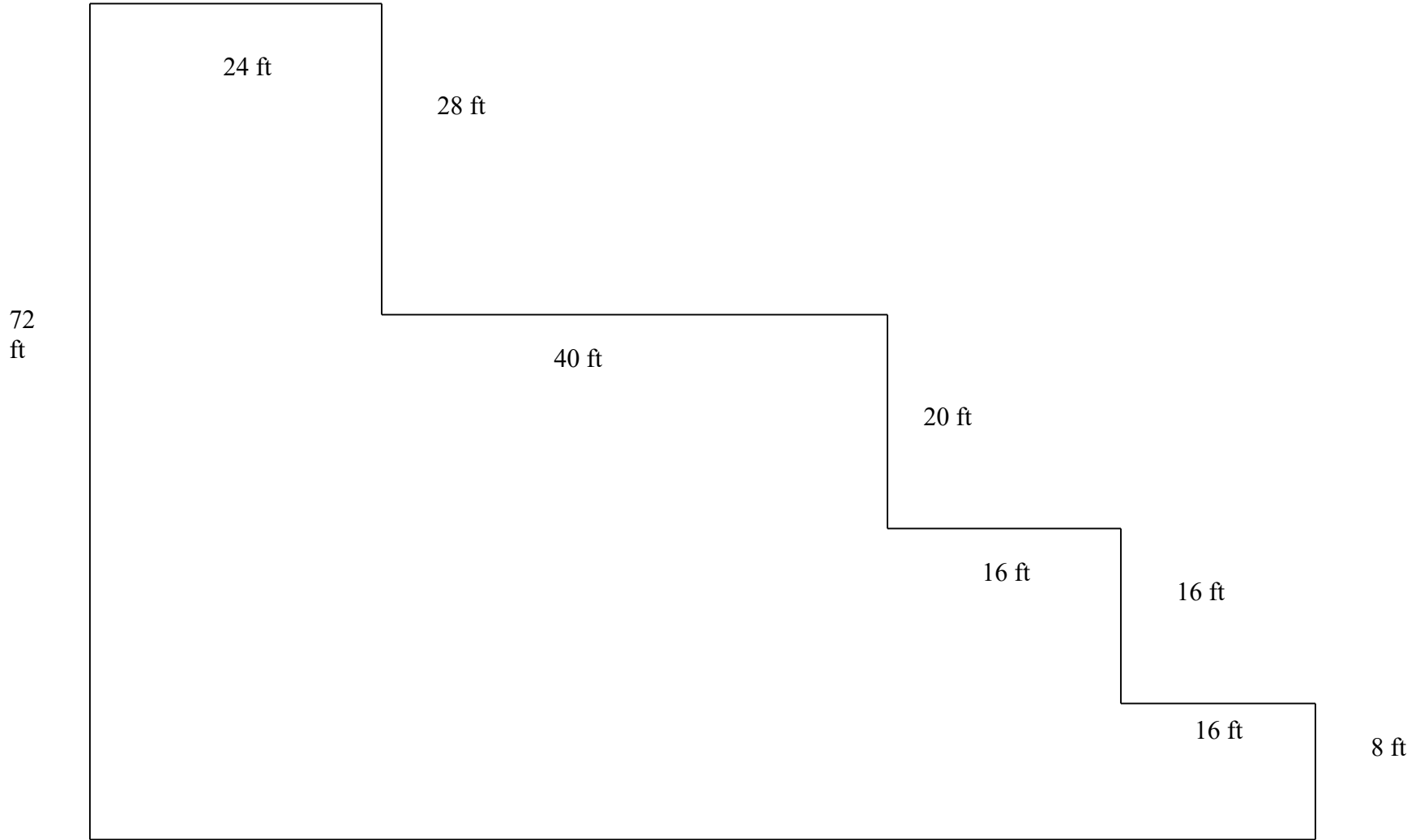
<p>It might be written as meters squared or m².</p>	<p>are the same, just the notation is different)</p> <p>If there is time and it is appropriate pass out a worksheet with a few basic examples from a traditional math text.</p>
<p>6. Students demonstrate their understanding.</p> <p>Students are to find the area of a ranch style house that is 32' x 60'</p> <p>32' x60' ÷32=60 pieces of Advantech</p>	<p>Perhaps draw this on board to get students ready to take a quick formal assessment.</p> <p>Students can work on this in pairs or in groups.</p>
<p>7. Formal assessment.</p> <p>Find out how many sheets of Advantech is required to install the subflooring on a ranch house that is 36' x 46'</p> <p>Go to the shop or job site and start installing flooring on your project!</p>	<p>Have students work out this example independently.</p> <p>36' x 46' ÷ 32=51.75</p> <p>52 sheets</p>

NOTES:

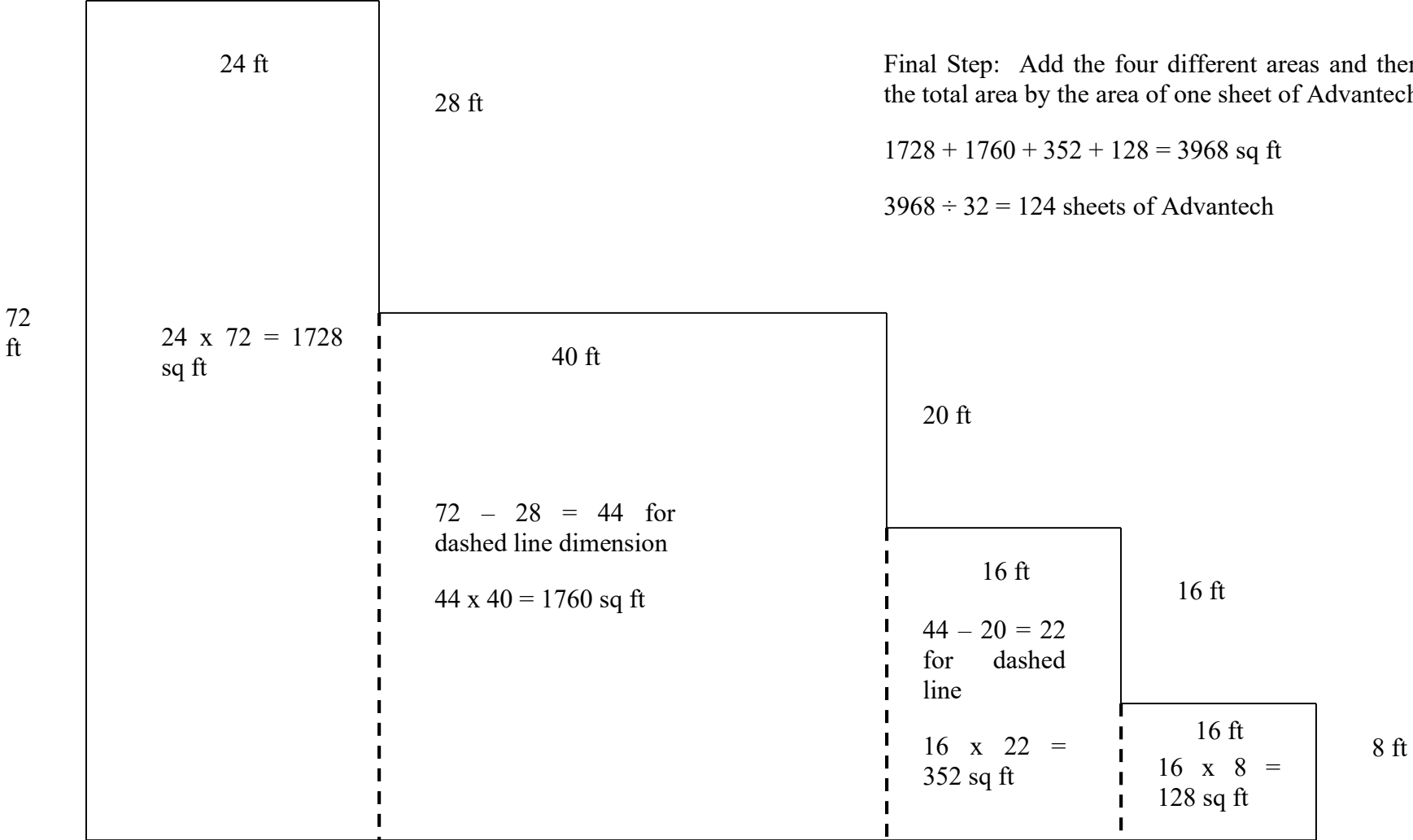


Pictures from (<http://www.advantechperforms.com/>)

Handout 2 – An Irregular Building – How many sheets of flooring do we need?



Answer Key for irregular shape (Handout 2)



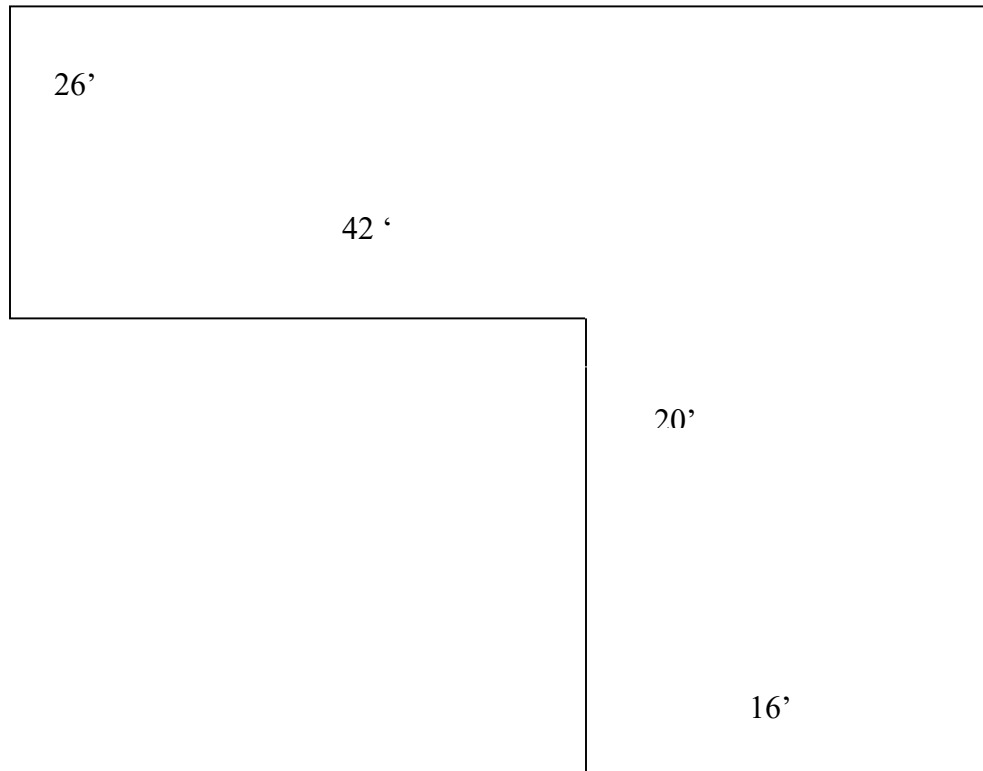
Final Step: Add the four different areas and then divide the total area by the area of one sheet of Advantech

$$1728 + 1760 + 352 + 128 = 3968 \text{ sq ft}$$

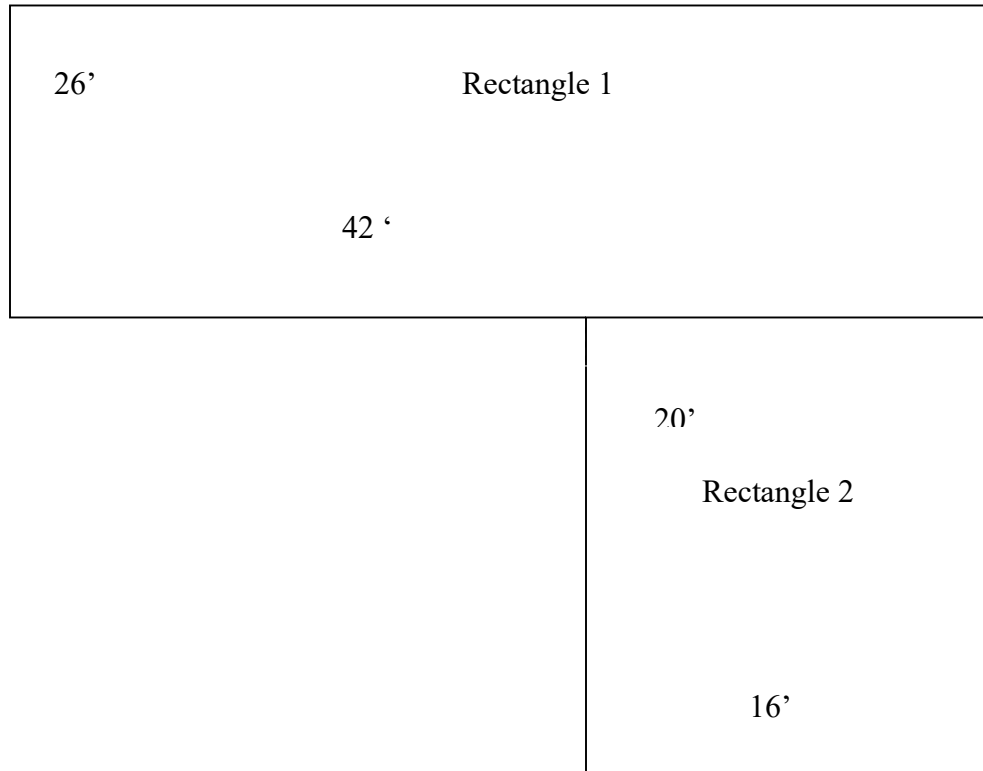
$$3968 \div 32 = 124 \text{ sheets of Advantech}$$

Handout 1 – A ranch house with an L. Find how many sheets of AdvanTech you will for the subflooring of this house.

Show your work here:



Teacher Answer Key for Ranch with an L



Show your work here:

$$\text{Rectangle 1} = 26 \times 42 = 1092 \text{ sq ft}$$

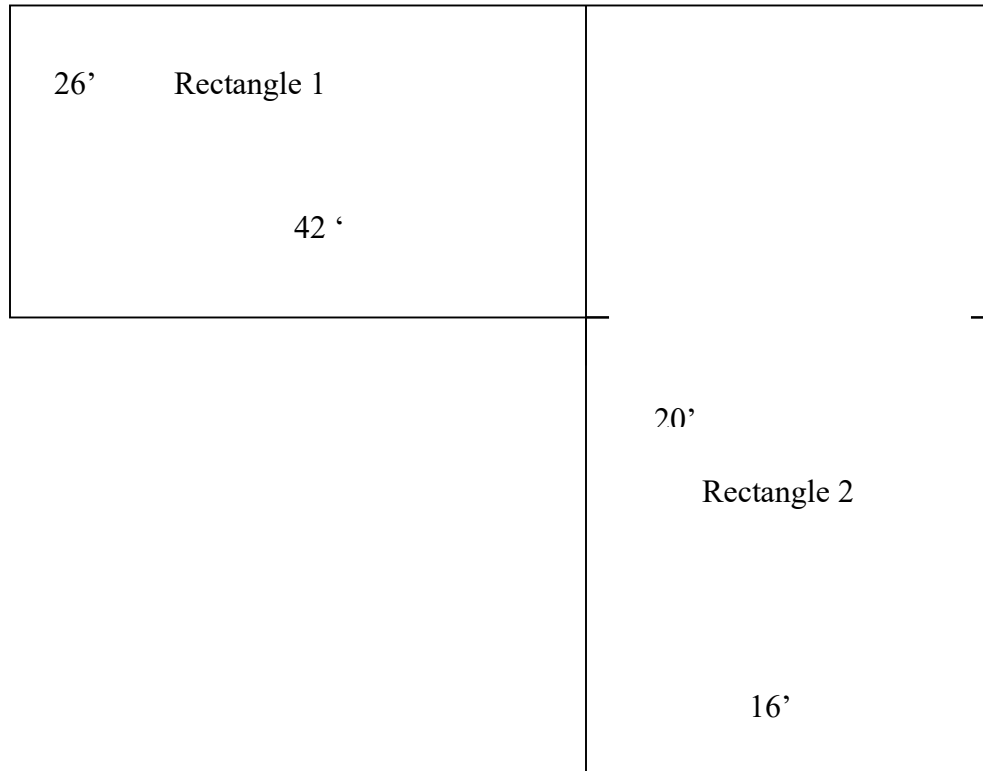
$$\text{Rectangle 2} = 20 \times 16 = 320$$

$$\text{Total area} = 1092 + 320 = 1412$$

$$1412 \div 32 = 44.125 \text{ sheets}$$

44.125 Sheets is unreasonable. We must round up to 45 sheets

Teacher Answer Key for Ranch with an L – Alternate



Show your work here: Shape of each rectangle has changed here

$$\text{Rectangle 1} = 26 \times (42 - 16) = 26 \times 26 = 676 \text{ sq ft}$$

$$\text{Rectangle 2} = 16 \times (20 + 26) = 16 \times 46 = 736$$

$$\text{Total area} = 676 + 736 = 1412$$

$$1412 \div 32 = 44.125 \text{ sheets}$$

44.125 Sheets is unreasonable. We must round up to 45 sheets

Handout 3 – A triangle!

How can we estimate the subflooring
for this shape?

