

Half Math

In carpentry it is often necessary to divide certain measurements in half in order to find their center. Whether it is finding the center of a room, a window opening or an archway... etc. Here are some simple ways of accomplishing this task.

If we are dealing with whole feet we can simply divide the number by 2. For example: the center of a 6 foot opening would be 3 feet.

6 divided by 2 = 3

Another example using whole feet is any odd number of whole feet. For example: the center of a 5 foot opening would be 2 feet 6 inches.

5 feet divided by 2 = 2.5 feet or 2 feet 6 inches

When we are dealing with feet and inches we can break it down to two operations. For example: the center of a room that measures 60 feet 4 inches would be 30 feet 2 inches.

60 feet divided by 2 = 30 feet

4 inches divided by 2 = 2 inches

Odd numbers make it a little more difficult. Take the example: 27 feet 6 inches. To find center we still divide by 2, but we must now add the inches together.

27 feet divided by 2 = 13.5 or 13 feet 6 inches

6 inches divided by 2 = 3 inches

Add the 3 inches to the 13 feet 6 inches and we get 13 feet 9 inches

When there are an odd number of inches, we will end up with a fraction of an inch. For example: half of 15 inches would be 7 ½ inches.

15 inches divided by 2 = 7.5 or 7 ½ inches

So far we have been figuring whole feet and whole inches and finding their centers using half math. To be completely accurate we need to be able to split fractions of an inch in half. There is a very simple way to do this. Any fraction consists of a numerator and a denominator. The numerator being the top number and the denominator being the bottom number. If we take any fraction and multiply the denominator by 2 and leave the numerator alone we have split that fraction in half. For example: half of $\frac{3}{4}$ is $\frac{3}{8}$ ths. Half of $\frac{3}{8}$ ths is $\frac{3}{16}$ ths.

$$\underline{4 \text{ times } 2 = 8}$$

$$\underline{8 \text{ times } 2 = 16}$$

When calculating feet, inches and fractions of an inch using half math, special consideration must be given to odd numbers of inches with fractions included. For example: 9 $\frac{1}{4}$ inches. If we address the fraction first we will know how to address the inches. Half of $\frac{1}{4}$ is $\frac{1}{8}$ th.

If we split the inches and convert the fraction to eighths, we can add this to what we have when we split the fraction.

$$\underline{9 \text{ divided by } 2 = 4.5 \text{ or } 4 \text{ and } \frac{4}{8} \text{ths.}}$$

$$\underline{\frac{4}{8} \text{ths} + \frac{1}{8} = \frac{5}{8} \text{ths}}$$

$$\underline{\text{Half of } 9 \frac{1}{4} \text{ inches is } 4 \frac{5}{8} \text{th inches}}$$

Another way to do this that is much quicker, is to look first at the inches. If we have an even number of inches, we would use the method described at the top of the page. If there are an odd number of inches, then we can **add the numerator to the denominator and then double the denominator.**

In the example above we would add the 1 to the 4 and that becomes the numerator. Then we would double the denominator and that becomes the new denominator. Then we take the whole number of inches that we get when we split the 9 inches in half and our answer would be 4 $\frac{5}{8}$ inches.

$$\underline{1 + 4 = 5 \text{ and that is the numerator}}$$

$$\underline{4 \times 2 = 8 \text{ and that is the denominator}}$$

$$\underline{\frac{5}{8} \text{ is the new fraction}}$$

$$\underline{9 \text{ divided by } 2 = 4.5 \text{ the whole number of inches is } 4.}$$

$$\underline{\text{Half of } 9 \frac{1}{4} \text{ inches is } 4 \frac{5}{8} \text{ inches}}$$

Split these dimensions in half using half math

- | | |
|-------------------|-------|
| 1) 30' | _____ |
| 2) 75' | _____ |
| 3) 96' | _____ |
| 4) 90' | _____ |
| 5) 32' 10" | _____ |
| 6) 100' 8" | _____ |
| 7) 50' 6" | _____ |
| 8) 22' 2" | _____ |
| 9) 27' 4" | _____ |
| 10) 25' 2" | _____ |
| 11) 39' 7" | _____ |
| 12) 45' 5" | _____ |
| 13) 50' 6 1/2" | _____ |
| 14) 52' 4 3/8" | _____ |
| 15) 73' 5 5/16" | _____ |
| 16) 107' 9 11/16" | _____ |
| 17) 24' 7 3/4" | _____ |
| 18) 92' 3 1/4" | _____ |
| 19) 35' 2 1/2" | _____ |
| 20) 67' 1 1/8" | _____ |

Name: _____ Date: _____

Basic Math

Homework Packet #1

Due 2nd Session

Homework Rules
(unless stated otherwise)

Homework is done in pencil and is legible.

All fraction answers are to be in "lowest terms".

When converting, you are expected to use 16ths.

Show all work for the Homework.

All answers will include the labels or units of measurement required in the question.

Name: _____ Date: _____

Subtracting Whole Numbers

Put the answer to each problem in the answer slot to the left.

1. _____ A contractor buys 325 sheets of $\frac{5}{8}$ plywood sheeting. The roof required 112 sheets, the first floor needed 37 sheets, and the second floor used 31. How many sheets were left?
2. _____ The outside diameter of a gear is 16" while the pitch diameter of the same gear is 15". What is the difference between the two diameters?
3. _____ A carpenter builds a deck for \$2,850.00. She spent \$1,435.00 on joints and decking, \$128.00 on hardware and fasteners. She also paid \$84.00 for posts. How much profit did she make?
4. _____ Journeyman carpenter scale is \$34.00 plus \$11.00 for benefits. How much less does the apprentice carpenter make if he receives the same benefit package but his taxable hourly rate is \$16.00?
5. _____ A gym floor contains 1800 square feet. After the first week, the crew installed 1175 square feet. The crew size was reduced during the second week but they were able to install another 541 square feet. How much remained?
6. _____ Three pieces of rail were cut from a 21 foot piece. One was cut at 13'-0", another at 5'-0". The last needed to be 2'-0". What length remained?
7. _____ A window was to be installed in a basement where a ductwork ran parallel with the outside wall. The window measured 32" x 20" (L x H) and was to rest 24" from the top of the wall. How much of the window would be covered by ductwork if the duct measured 8" high and 16" wide? (Assume that the top of the duct was at the same elevation as the top of the wall.)
8. _____ A house is set back 35'-0" from the right of way at the street. The front edge of the sidewalk is 7'-0" from the right of way. How far is it from the front edge of the sidewalk to the house?
9. _____ A 90 tooth saw blade has seven damaged carbide tips. How many good teeth remained?
10. _____ Twenty-seven stories of a 43-story building were completed. How many remain to be finished?

Name: _____ Date: _____

Multiplying Whole Numbers

Put the answer to each problem in the answer slot to the left.

1. _____ Determine the total length of a piece of material that has been cut into 22 pieces with each piece 21" long.
2. _____ An octagonal building is constructed of 8 walls each having an area of 357 square feet. What is the total area of the structure?
3. _____ A carpenter installs 27 sheets of drywall in an 8 hour day. How many sheets are installed in the 5 day week?
4. _____ A roofer can install 45 square feet of shingles per hour. How many square feet can be installed at the end of an 8 hour day? How many square feet can be installed by the end of the week?
5. _____ How many sheets of 4'-0" x 9'-0" drywall are required to cover a wall 29'-0" long and 9'-0" high?
6. _____ A bundle of red cedar shingles contains 250 pieces. How many are in 196 bundles?
7. _____ A double shelf unit requires 32" of oak. How much oak needs to be ordered for 25 units?
8. _____ How many hours did it take for a crew of carpenters to rough in a house if 5 of them worked 11 eight hour days?
9. _____ One floor of multi-story apartment building requires 37 sheets of plywood for subfloor or 1200 square feet. How many sheets are required for 11 floors? How many square feet are contained in the 11 story building?
10. _____ A box of 16d nails costs \$26.00. The house requires 5 boxes. How much will the nails cost for the house?
11. _____ Standard furring strips come in bundles of 12 per bundle. How many pieces are contained in 23 bundles?
12. _____ A concrete foundation requires 58 two foot panels, 6 12" fillers, and 2 bulkhead panels for each section. The total wall is to be built in eight sections. How many panels are required?

Name: _____ Date: _____

Fractions

Put the answer to each problem in the answer slot to the left.

1. _____ If $6\frac{1}{2}$ boxes of tile are used to cover the floor of one 10'-6" $\times$ 13'-0" office, how many boxes will be needed to cover 8 similar sized offices?
2. _____ In the scenario in question 1, how many boxes of tile are needed to cover another floor that measures 955.5 sq. ft.?
3. _____ A pole standing 4'-6" out of the ground casts a shadow that is 3'-0" long. At the same time, a partly driven pile casts a shadow 15'-6" long. How much of the pile is out of the ground?
4. _____ If a 15 HP motor cuts 8000 lineal feet of lumber in 9 hours, how much time is required to cut the same amount of lumber with a 25 HP motor?
5. _____ A millwright takes $24\frac{3}{4}$ hours to align 11 pump shafts and motors. How much time will it take to align 6 more?
6. _____ When rigging a load for an overhead lift, the safety factor used is 5:1. If a load weighs $3\frac{3}{5}$ tons, what is the minimum allowable capacity of the wire rope being used?
7. _____ If 5 quarts of machine oil can be purchased for \$16.75, how many quarts can be purchased for \$43.55?
8. _____ If 50 pounds of nails cost \$26.25, how much will 130 pounds cost?
9. _____ If 48 welding rods were used to weld 9 exterior panels for a building, how many rods would be used to assemble and weld 78 panels?
10. _____ $9\frac{1}{4}$ cu. yds. of a 5 bag mix of concrete is ordered for a 136'-0" long footing. How many cu. yds. of concrete will be required to pour 1156'-0" of similar sized footings?

Name: _____ Date: _____

Basic Math

Homework Packet #2

Due 3rd Session

Homework Rules
(unless stated otherwise)

Homework is done in pencil and is legible.

All fraction answers are to be in "lowest terms".

When converting, you are expected to use **16ths**.

Show all work for the Homework.

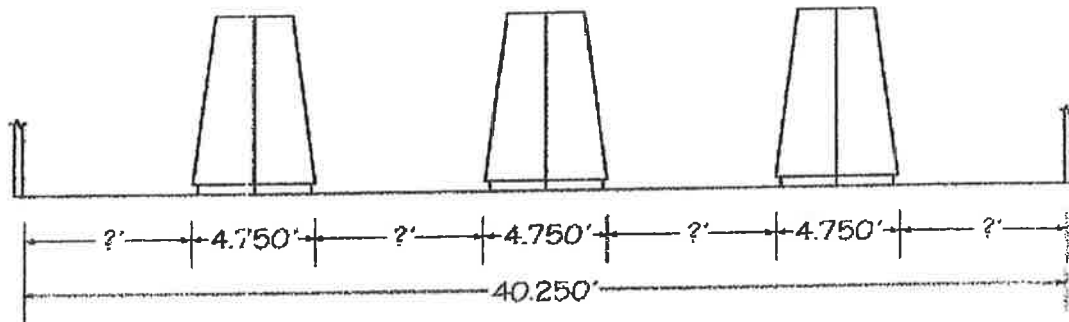
All answers will include the labels or units of measurement required in the question.

Name: _____ Date: _____

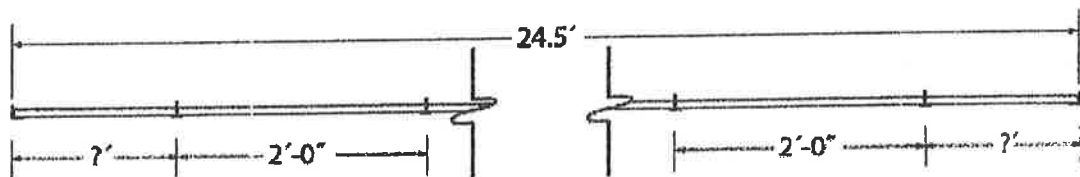
Decimals

Place the answer to each problem in the answer slot to the left.

1. _____ In one section of store, back-to-back shelving units are 4.75' wide. If 3 shelving units are centered and equally spaced in an area that is 40.25' wide, what is the width of each aisle?



2. _____ How many courses of siding are needed to cover a wall 11.75' tall if each course of siding covers 5.5"?
3. _____ A ceiling of 2' x 2' tiles are to be installed in a room that measures 19' x 24.5'. What will be the measure of the border tile spacing on the 24.5' side if the suspended ceiling is centered in the room so that no less than one half of a full tile is along the wall?



4. _____ The 4th floor of an office building has a finished elevation of 147.29'. The 7th floor of the same building has a finished floor elevation of 181.415'. If the floors are all equally spaced what is the floor-to-floor distance between each floor?
5. _____ 14.375' of edge banding is needed for a table. If the edge banding comes in 50m (164') rolls, how many rolls are needed to complete an order for 125 tables?

Name: _____ Date: _____

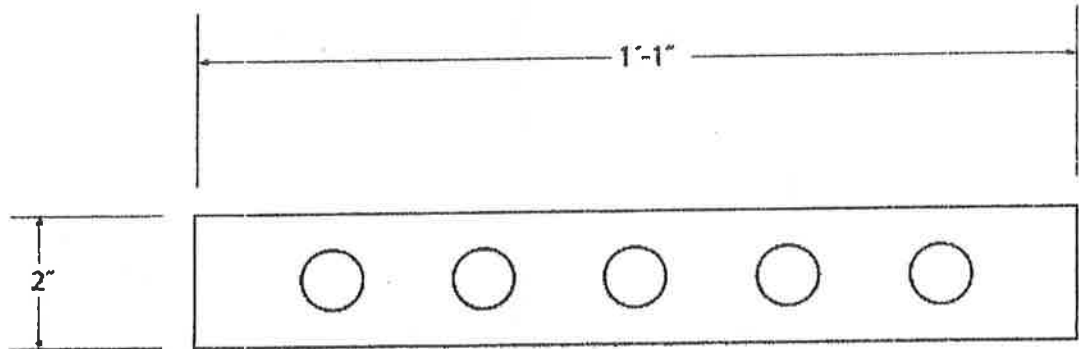
Converting Decimal Parts of a Foot

Problem

1. _____ Convert 7 feet 3 inches to feet and decimal parts of a foot
2. _____ Convert 7 feet 4 inches to feet and decimal parts of a foot
3. _____ Convert 12 feet 9 inches to feet and decimal parts of a foot
4. _____ Convert 21 feet $7 \frac{1}{4}$ inches to feet and decimal parts of a foot
5. _____ Convert 63 feet $11 \frac{5}{16}$ inches to feet and decimal parts of a foot
6. _____ Convert 12.544 feet to feet, inches and fractions of an inch
7. _____ Convert 14.802 feet to feet, inches and fractions of an inch
8. _____ Convert 102.347 feet to feet, inches and fractions of an inch
9. _____ Convert 47.417 feet to feet and inches
10. _____ Convert 81.083 feet to feet and inches

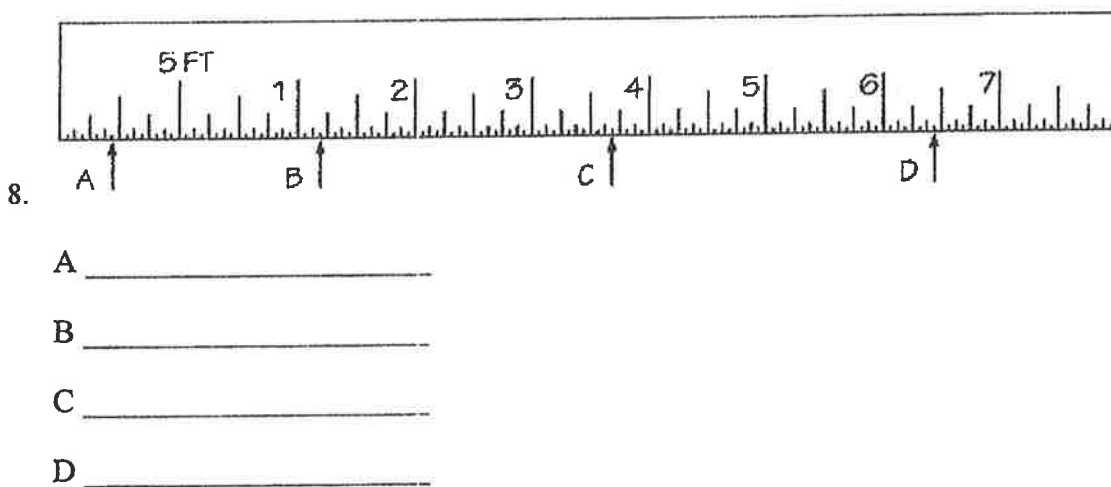
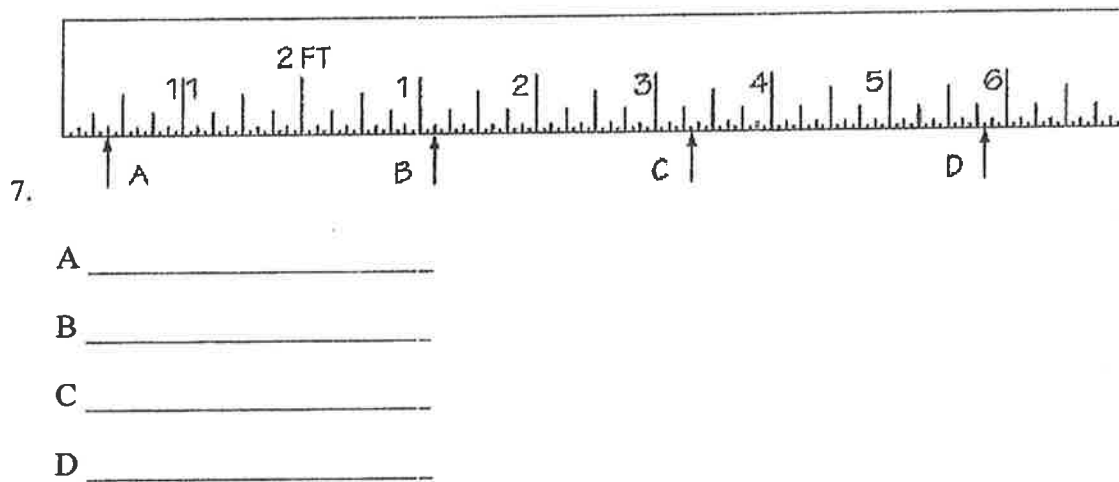
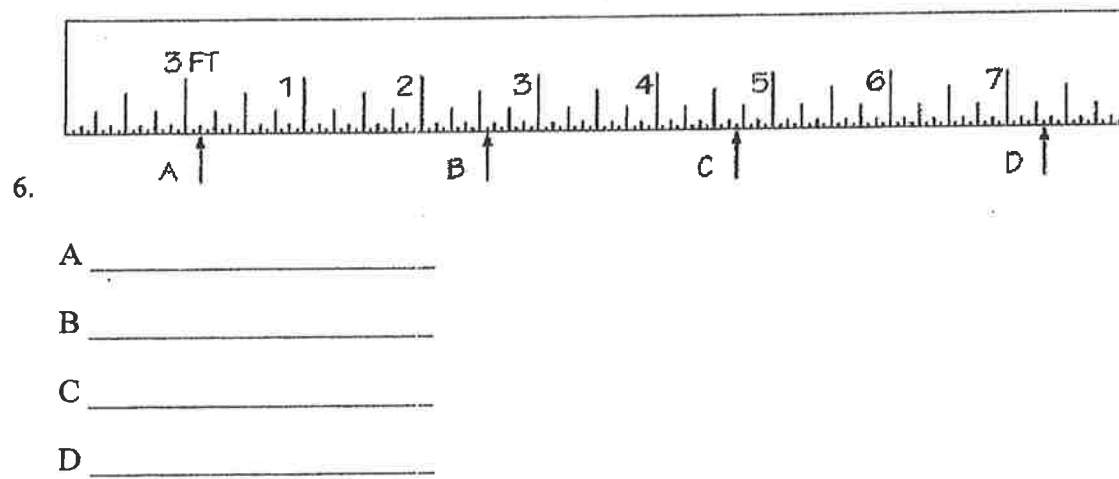
5. _____ How much roofing felt should be ordered if the roof area to be covered is 3,150 sq. ft. and 15% is figured for waste?

6. _____ What percentage of the total area of the stock shown in the figure is removed by the holes drilled in the stock? The total area removed by holes is 3 sq. in. Express your answer to the nearest tenth of a percent.



7. _____ A flooring contractor is installing 47,440 sq. ft. of carpet at an office building project. His weekly report from the field shows 62.5% of the carpet has been installed to date. How many square feet of carpet have been installed?
8. _____ An interior finish contractor estimated a project at \$108,530.86, adding 2% for incidentals and 8% as his profit. What is his final bid tally? (total bid)
9. _____ On a machinery repair project with a total cost to the owner of \$308,462.00, the contractor paid 58% for parts and incidental materials. What was his cost for parts and materials?
10. _____ A pile driving crew had 328 sheet pile to drive on a project. The first week they drove 89 pile. What percentage was completed the first week? Express your answer to the nearest tenth of a percent.

Give the ruler readings of each arrow position from the accompanying figures starting from the zero point on the ruler.



Basic Math

Homework Packet #3

Due 4th Session

Homework Rules

All homework should be done in pencil and be legible.

(Unless stated otherwise)

All decimal answers are to be rounded to **three decimal places**.

All fraction answers are to be in "**lowest terms**"

When converting, you are expected to use **16ths**.

Show all work for the Homework

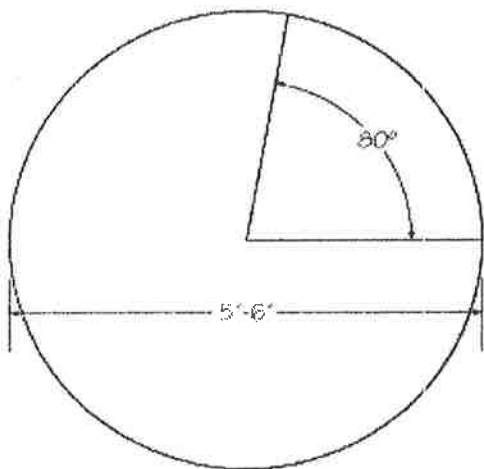
All answers will include labels or unit of measurement required in the question.

Name: _____ Date: _____

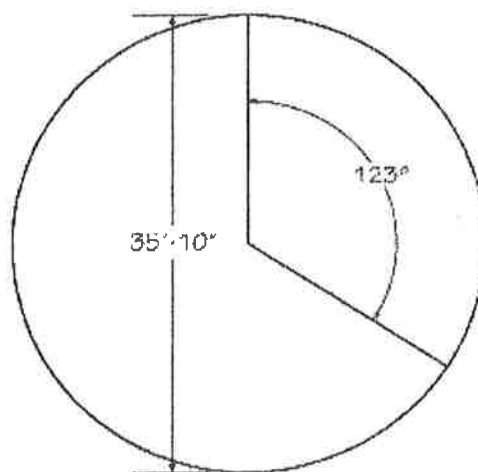
Length of an Arc

Calculate the length of the arcs. See the procedure "How to Find the Length of an Arc" in the participant manual.

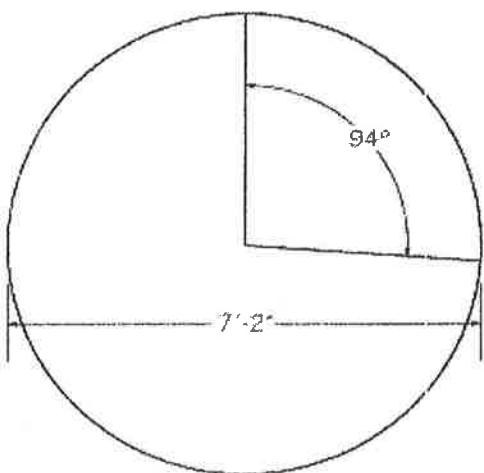
1. Arc length: _____



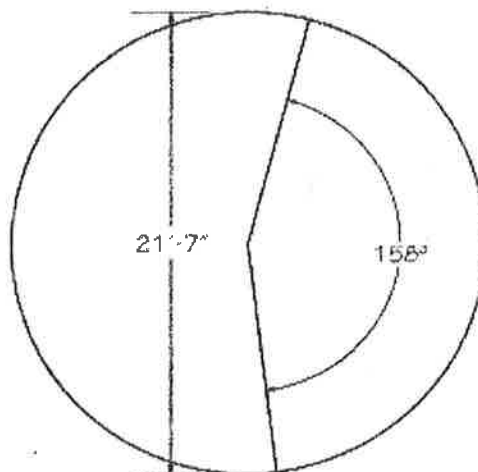
3. Arc length: _____



2. Arc length: _____

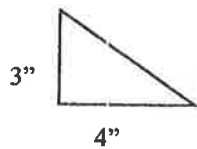


4. Arc length: _____

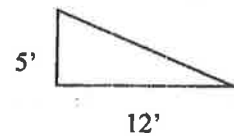


Use the pythagorean therum to find the hypotenuse
Of the following right angle triangles:

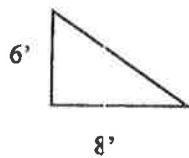
1) _____



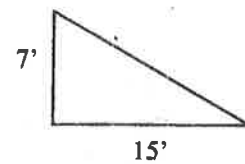
2) _____



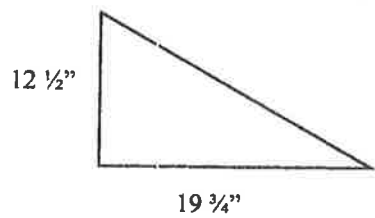
3) _____



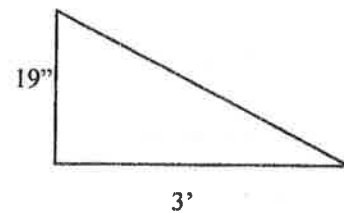
4) _____



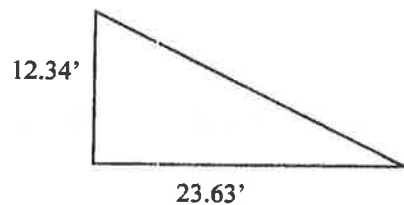
5) _____



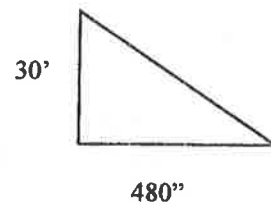
6) _____



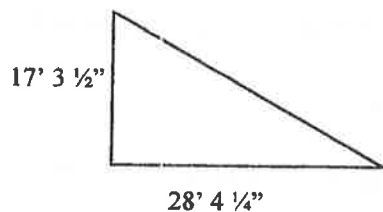
7) _____



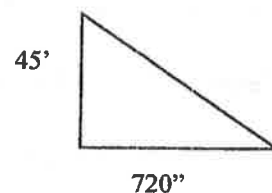
8) _____



9) _____

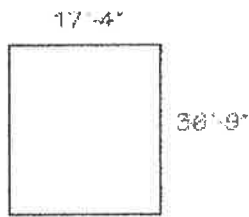


10) _____



60'-80'-100' is the largest multiple of 3'-4'-5' that will fit within the overall building size.

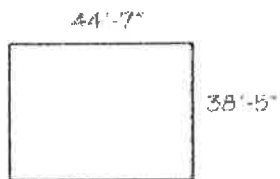
1.



Factor _____

Multiple _____

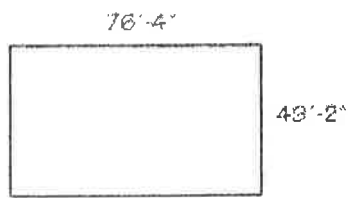
2.



Factor _____

Multiple _____

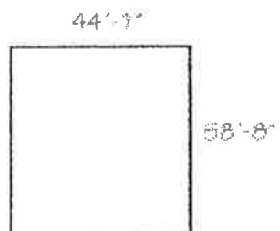
3.



Factor _____

Multiple _____

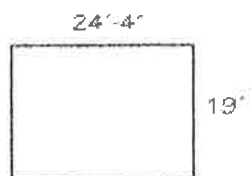
4.



Factor _____

Multiple _____

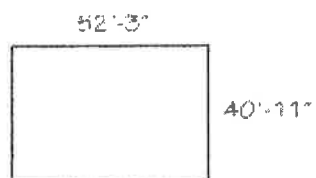
5.



Factor _____

Multiple _____

6.



Factor _____

Multiple _____