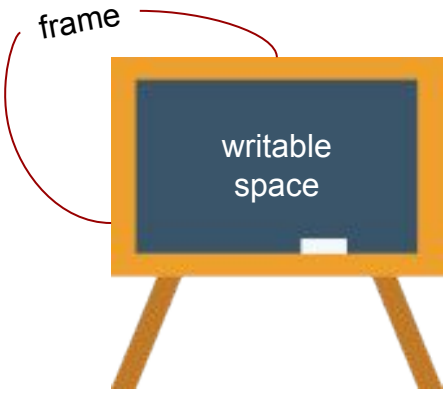
Helping With Math

Solving for Perimeter and Area of Polygons

GRADE 3

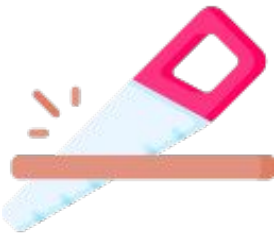
Being knowledgeable about perimeter and area helps in describing a physical space in terms of size. Moreover, it provides foundation on more advanced mathematics such as algebra, trigonometry, etc.



In making a chalkboard, the length of the wood needed for the frame is defined by the **perimeter**. Meanwhile, the green paint needed for the writable space might be known by the board's **area**.

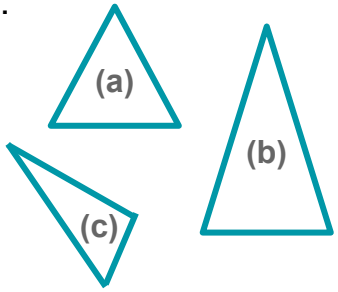
- In a two-dimensional figure, both perimeter and area can be calculated.
- **Perimeter** is the total length of the sides of a polygon while **area** is the measure of how many square units a polygon has.
- Both have played an important role in many fields, especially in engineering and construction.

RECALL: POLYGONS



Polygons are two-dimensional figures formed by connecting at least three straight lines with no open part. Polygons are named based on the number of sides (line segments) composing it.

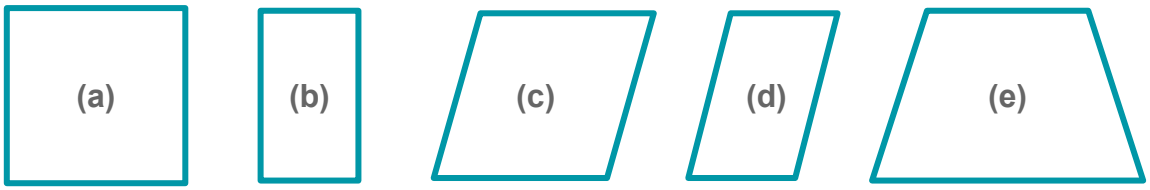
1. **TRIANGLE** - A polygon with three sides. There are three types of triangles namely equilateral, isosceles and scalene.



   a. **Equilateral triangle** - all sides are equal.
   b. **Isosceles** - two sides are equal.
   c. **Scalene** - no side is equal to any side.

2. **QUADRILATERAL** - polygon consisting of four sides.

   a. **Square** - all sides and angles are equal (to 90°).
   b. **Rectangle** - two parallel sides are longer than the other two but all angles are equal (to 90°).
   c. **Rhombus** - all sides are equal but only opposite angles are equal.
   d. **Parallelogram** - two parallel sides are longer than the other two and only opposite angles are equal.
   e. **Trapezoid** - has at least two opposite sides parallel.

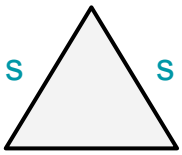


- Polygon with more than 4 sides are named by attaching the suffixes to "-gon". Example, polygons with 5, 6, 7, 8 9 and 10 sides are named **penta**gon, **hexa**gon, **hepta**gon, **octa**gon, **nona**gon and **deca**gon, respectively.
- Polygons can also be described as regular or not. **Regular polygons** are those polygons with all of the sides equal to each other.

PERIMETER

The total length or distance that covers or outlines a shape is what we call the **perimeter**, denoted by "P". There are formula specifically made for each shape so that you can find a shape's perimeter easily.

1 EQUILATERAL TRIANGLE

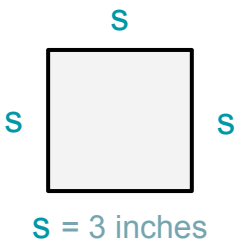


P = 3s

P = 3 x 3 in
P = 9 inches

Multiply the length, s, of the side by 3 which is the number of sides of a triangle.

2 SQUARE

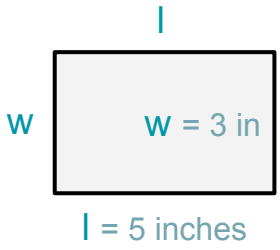


P = 4s

P = 4 x 3 in
P = 12 inches

Multiply the length, s, of the side by 4 which is the number of sides of a square.

3 RECTANGLE



P = 2l + 2w

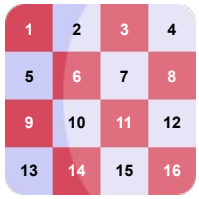
P = (2 x 5in) + (2 x 3in)
P = 16 inches

Multiply the length, l, by 2, as well as the width, w, then add it together.

- There's no one formula in computing the perimeter of all trapezoids, rhombuses and parallelograms. But the key is just adding the length of all the sides to get the perimeter. The same applies to the two other types of triangle: scalene and isosceles.
- For the regular polygons having numerous sides, do as what is done with triangle and square. Multiply the length of side, s, with the number of sides to get the perimeter.

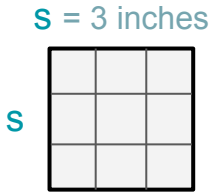
AREA

The concept of **area** is determining how many square units a figure contains. Unlike in computing for the perimeter, there's no general formula for all polygons.



16 square units

1 SQUARE

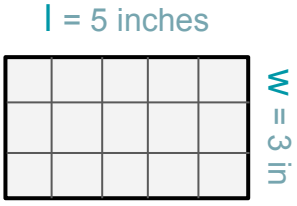


$$A = s^2$$

A = 3in x 3in
A = 9 square inches

Multiply the length, s, of the side by itself.

2 RECTANGLE

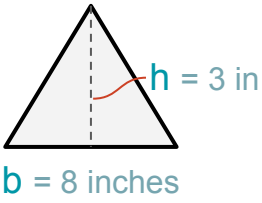


$$A = l \times w$$

A = 5in x 3in
A = 15 square inches

Multiply the length, l, to the width, w.

3 TRIANGLE

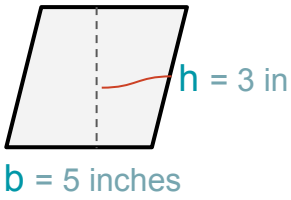


$$A = \tfrac{1}{2}\, bh$$

A = ½ (8in x 3in)
A = 12 square inches

Multiply the product of the base, b, and height, h, with ½.

4 RHOMBUS and PARALLELOGRAM



$$A = bh$$

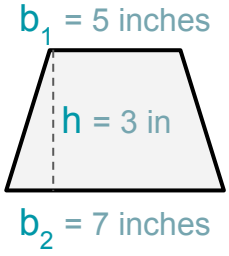
A = 5in x 3in
A = 15 square inches

Multiply the base, b, with the height, h.

AREA

Note that the **height** or **altitude**, **h** is perpendicular to the base. Aside from writing your answer as "5 square inches", it may be "**5 in²**".

5 ISOSCELES TRAPEZOID



$$A = \frac{1}{2} (b_1 + b_2) \times h$$

$A = \frac{1}{2} (5in + 7in) \times 3in$

$A = 18$ square inches

Multiply the sum of the bases, b_1 and b_1, with the height, h.

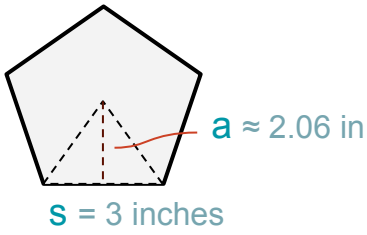
6 REGULAR POLYGONS WITH MORE THAN FOUR SIDES

$$A = \frac{1}{2} (n \times s \times a)$$

Where...

- ➔ **n** - number of sides
- ➔ **s** - length of one side
- ➔ **a** - apothem, perpendicular distance from the center to one side

REGULAR PENTAGON:

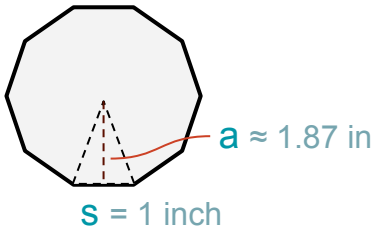


$$A = \frac{1}{2} (n \times s \times a)$$

$A = \frac{1}{2} (5 \times 3in \times 2in)$

$A = 15.48$ square inches

REGULAR DODECAGON:



$$A = \frac{1}{2} (n \times s \times a)$$

$A = \frac{1}{2} (12 \times 1in \times 1.87in)$

$A = 11.22$ square inches

APPLICATION

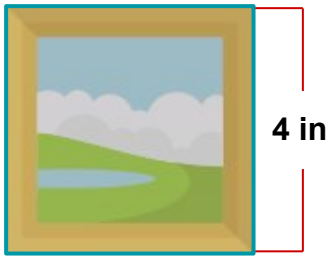
A picture frame in the shape of a square was made. If the outer part of the border measures 4 inches, solve for the following:

a. outside perimeter of the frame

P = 4s, where s = 4in.

P = _____

Illustration for a:

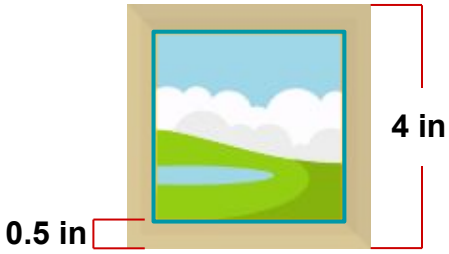


b. perimeter of the displaying space if the border is 0.5 inch thick

P = 4s, where s = 4in - 0.5in

P = _____

Illustration for b & d:



c. area of the border that is 0.5 inch thick

A = l x w, where l = 4in and w = 0.5in

A = _____

d. area of the space where the picture is displayed if the border is 0.5 inch thick

A = s^2, where s = 4in - 0.5 in

A = _____

Illustration for c:

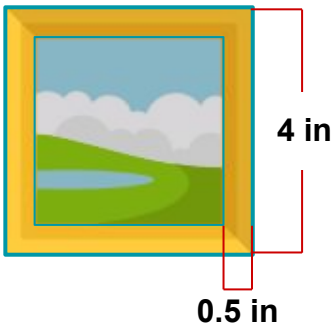


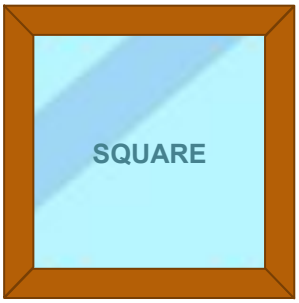
TABLE OF ACTIVITIES

REFLECTED PERIMETER

Mirror, mirror on the wall, the timber for your frame, just how tall? Compute for the perimeter to know the total length used.

Manny received a sketch of the mirrors to be produced by a mirror maker. The mirror maker ordered the frames from him. Before proceeding to wood carving, Manny needs to cut the appropriate size for the frame. Help him know the length of wood timber to be used for each mirror.

s = 5 inches



P =

LENGTH OF TIMBER

s = 2.05 cm

P =

LENGTH OF TIMBER

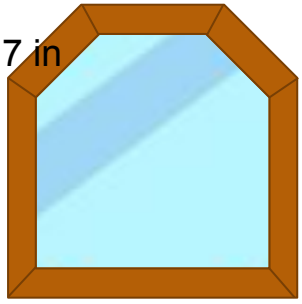
s = 3.72 cm

P =

LENGTH OF TIMBER

a = 2 in

b = 1.7 in



c = 3.5 in

d = 5 inches

P =

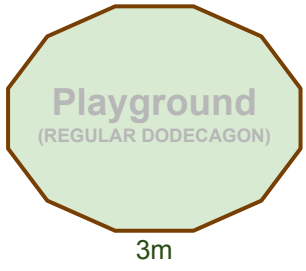
LENGTH OF TIMBER

FENCE THE PERIMETER

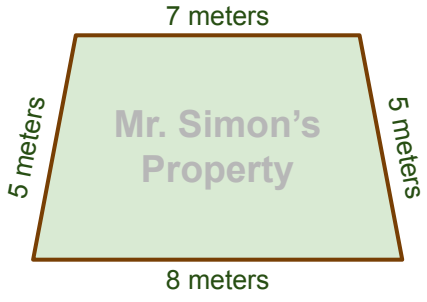
Put fences to avoid unwanted visitors. Compute for the lots' perimeter to help the carpenter know the size he is about to fence.

Sammy, the carpenter, is known for making sturdy and beautiful fences. With his reputation, many customers asked for his service. But he needs to know the **perimeter of the lot** he will be fencing to prepare the right amount of fence. Lend him a hand and use what you learned about the perimeter of polygons!

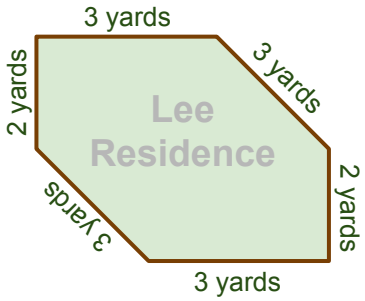
LIST OF SAMMY'S CLIENTS:



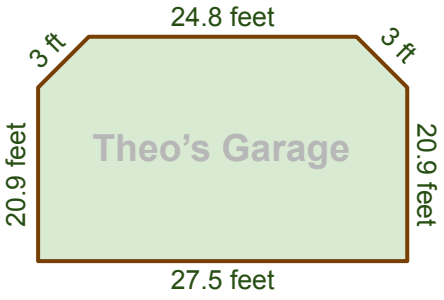
P = _____ meters



P = _____ meters



P = _____ yards



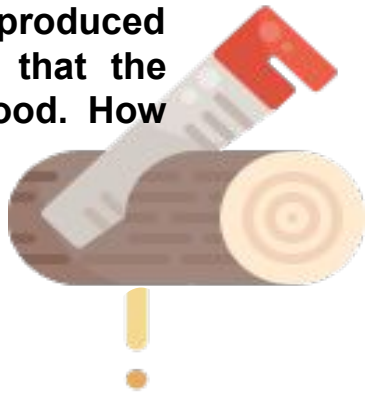
P = _____ feet

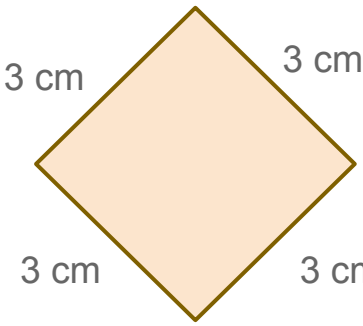
Use this portion for the solution.

WHEN YOU SAW THE DUST

Sawdust is usually ignored but it actually has numbers of uses. With the given rate of production, compute the amount of sawdust produced for cutting the thick hardwood.

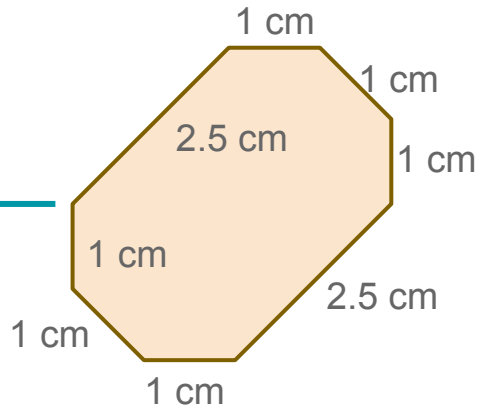
When cutting a 5-inch thick wood, 1mL of saw dust is produced for every 1 centimeter cut in the wood. Suppose that the following shapes were cut from the 5-inch thick wood. How much sawdust (in mL) is produced per shape?





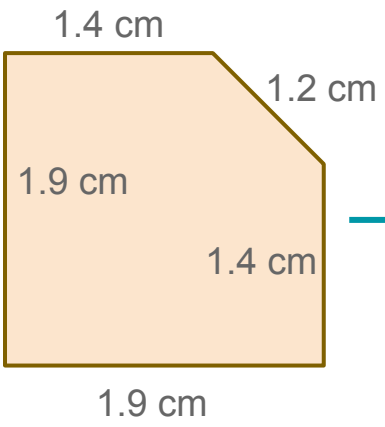
1

AMOUNT OF SAWDUST
(in mL)



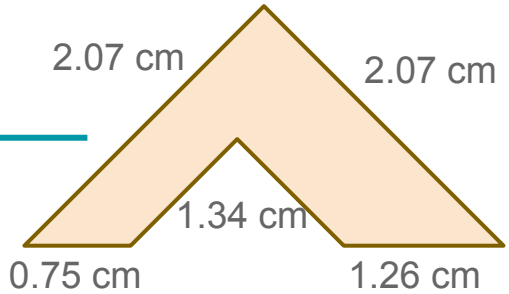
2

AMOUNT OF SAWDUST
(in mL)



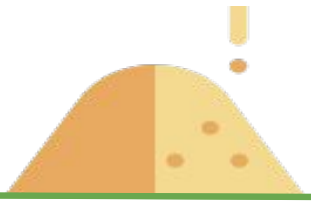
3

AMOUNT OF SAWDUST
(in mL)



4

AMOUNT OF SAWDUST
(in mL)



JIG-SAW PUZZLE

A barn's rear side was destroyed by a fire. Help repair it by picking the right shape and size of planks to cover it.

Hi, I'm Jig. I am the carpenter tasked to repair the damaged rear side of a barn. The owner told me to cover it with different shapes so it would look creative. Help me put the right pieces by giving the area.

1| Regular Heptagon

s = 5 inches

a = 1 inch

A =

2| Triangle

b = 4cm | h = 2cm

A =

6| Trapezoid

b_1 = 2 in

b_2 = 4 in

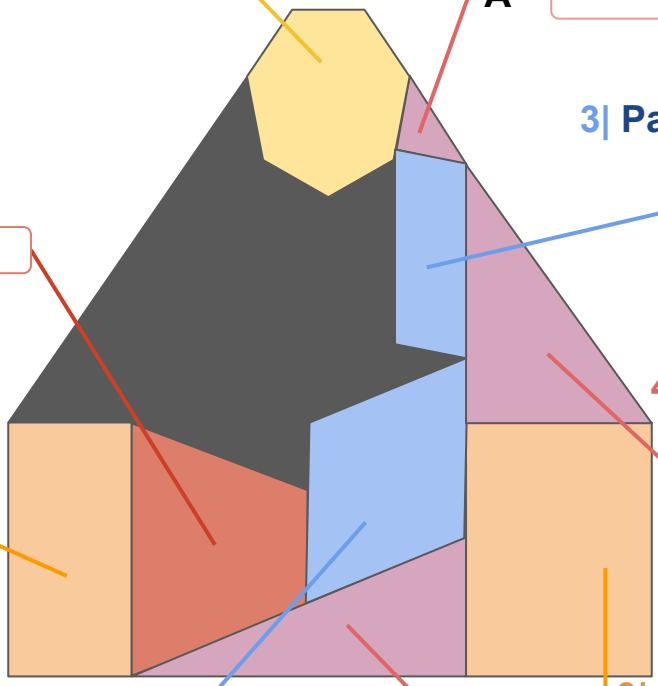
h = 3.5 in

A =

3| Parallelogram

b = 10 in | h = 2 in

A =



5| Rectangle

l = 0.01 yard

w = 1.4 yard

A =

4| Triangle

b = 0.7 ft

h = 1 ft

A =

7| Parallelogram

b = 7 dm

h = 3.7 dm

A =

8| Triangle

b = 8.5 in

h = 3.54 in

A =

9| Rectangle

l = 0.25 m

w = 0.30 m

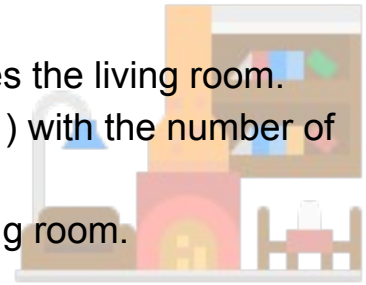
A =

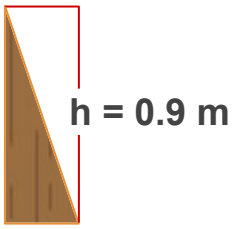
WOODY SLAB

Put some touch of antiquity. Compute the floor area of the living room with the given wooden slabs.

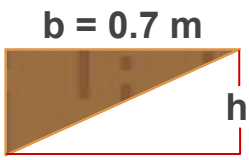
Compute the floor area of the living room installed with wooden slabs. Follow the steps given.

STEP 1 | Solve for the area of each wooden slab.
STEP 2 | Count how many of each wooden slab composes the living room.
STEP 3 | Multiply the area of each wooden slab (in Step 1) with the number of its pieces (in Step 2).
STEP 4 | Add it all so you'll know the floor area of the living room.

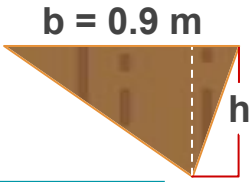




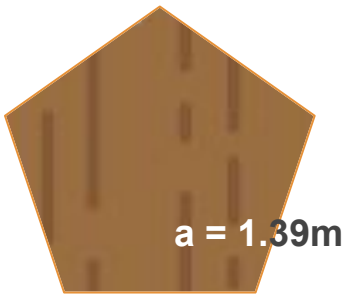
A_4 = _____



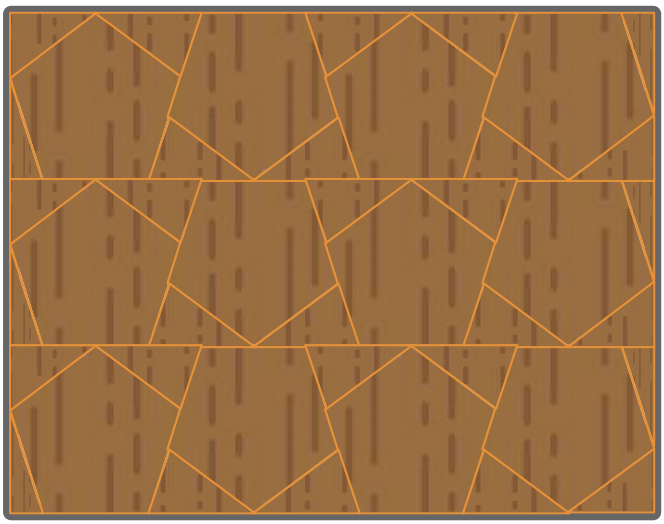
A_1 = _____



A_2 = _____



A_3 = _____



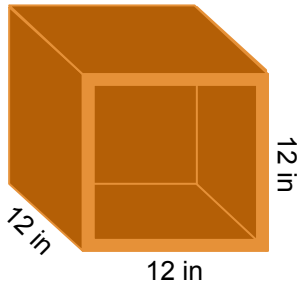
FLOOR AREA = _____

WOODEN SHELVES

It's pleasing in the eyes if everything is organized. Help Bob compute for the area of the plywood used for every cabinet.

I'm Bob, a cabinet maker. I want to know the area of the plywood that I used for each cabinet so that I can estimate the cost and sell it for the right price. If you would lend me a hand, please be aware that you are looking for the area of a three-dimensional object, so imagine it properly. You may use the space provided for your solution.

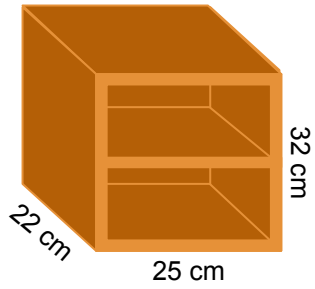
ON THE RUN CABINET



A small cabinet located near the door where wallet, keys, tumbler, and stuffs alike can be put. A cabinet with one opening.

AREA =

MINI SHOE RACK



A two-storey shoe rack where two pairs of footwear may be put. Ideally made to be put beside the door so it would only contain used footwear.

AREA =

ESTIMATE THE COST

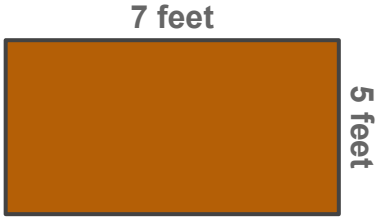
Knowing the cost of a construction project helps the client prepare the budget. Help the contractor solve for the perimeter or area of items.

Below are the items needed for constructing a wooden bed.

ITEM NO. 1 : Bed Frame (USD 23 per feet)

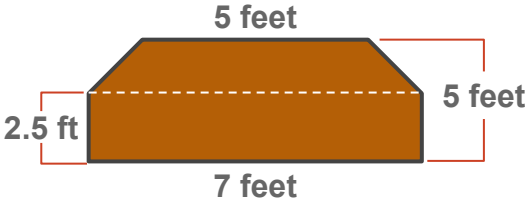
P = _____ → USD _____.00

ITEM NO. 2 : Bed Platform (USD 52.00 per square feet)



A = _____ → USD _____.00

ITEM NO. 3 : Headboard (USD 52.00 per square feet)



A = _____ → USD _____.00

Contractor's Note: The legs cost USD 92.00 and the foot board costs the same with the headboard.

A-DOOR-ABLE

One of the great ways to welcome visitors is an adorable door. Match the paint (area) and LED lights (perimeter) to the right door.

Louis Subdivision organized an anniversary celebration. The five pioneering home owners agreed to re-paint their doors and put led lights around it, so the visitors will easily notice. A carpenter was asked to do it. Help the carpenter match the right paint and light to the appropriate door.

PAINT

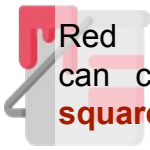
The amount of paint is based on the door's area.

DOOR

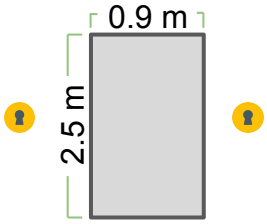
The doors are all rectangle but some parts are not to be painted.

LED LIGHTS

The length of the LED lights shall cover the door's perimeter.

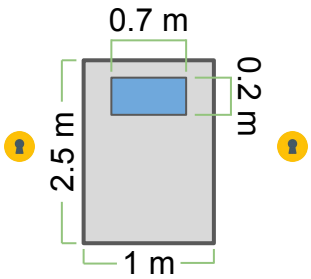


Red paint that can cover **2.36 square meters**.



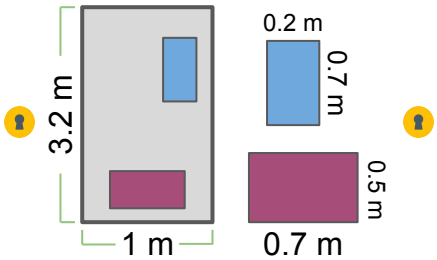
LED lights that can cover **8.4 m**.

Yellow paint that can cover **2.25 square meters**.



LED lights that can cover **7 m**.

Blue paint that can cover **2.71 square meters**.



LED lights that can cover **6.8 m**.

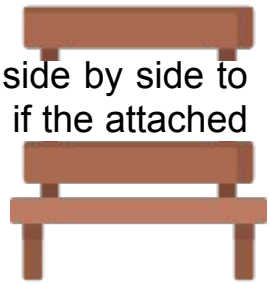
WOOD PROBLEMS

Woods require much of measurements. Solve the following word problems related to carpentry. Do not forget to put the right unit.

PROBLEM 1 :

A lumber 50 meters long is to provide the frame of a square table. How long will the remaining lumber be if the sides of the table measure 12 meters?

PROBLEM 2 :



If two benches, each having 6 square feet of area, are placed side by side to form a long bench, what is the perimeter of the new long bench if the attached side is 2 feet long?

PROBLEM 1 :

The rectangular wooden ceiling for a bedroom measures 112 square feet. What is the perimeter of the wooden ceiling if one side is 6 feet more than the shorter side?

NAIL THE FACTS

You nailed it! Confirm the accuracy of the following trivia by providing examples as proofs. Give at least three examples.

Use the spaces provided for providing examples.

TRIVIA 1

Prove that even rectangles have the same perimeter, areas are different.
Use **P = 50 inches**.

TRIVIA 2

Prove that a square has a larger area than any rectangle of equal length of perimeter.
Use **48in** for perimeter.

TRIVIA 3

Prove that the area of both squares and rectangles is always larger than their perimeter.
Use **20in**, **32in** and **50in** as perimeters.

ANSWER GUIDE

Activity 1

$P_{\square}$ = 20 inches

$P_{\hexagon}$ = 22.32 centimeters

$P_{\bigcirc}$ = 20.5 centimeters

$P_{\pentagon}$ = 17.4 inches

Activity 2

Playground = 30 meters

Mr. Simon's Property = 25 meters

Lee Residence = 16 yards

Theo's Garage = 100.1 feet

Activity 3

1) 12 millimeters
2) 11 millimeters
3) 7.8 millimeters
4) 8.83 millimeters

Activity 4

1) A = 17.5 square inches
2) A = 4 square centimeters
3) A = 20 square inches
4) A = 0.35 square foot
5) A = 0.014 square yard
6) A = 10.5 square inches
7) A = 25.9 square decimeters
8) A = 15.045 square inches
9) A = 0.075 square meter

ANSWER GUIDE

Activity 5

A_1 = **0.21 m^2** x 6 pcs = 2.1 m^2

A_2 = **0.225 m^2** x 18 pcs = 4.05 m^2

A_3 = **3.1275 m^2** x 12 pcs = 37.53 m^2

A_4 = **0.135 m^2** x 6 pcs = 0.81 m^2

FLOOR AREA = **44.49 square meters**

Activity 6

Area of on the run cabinet = 720 square inches
Area of mini shoe rack = 3,858 square centimeters

Activity 7

1) P = 24 feet x 23 USD/ft = USD 552.00
2) A = 35 ft^2 x 52 USD/ft^2 = USD 1, 820.00
3) A = 32.5 ft^2 x 52 USD/ft^2 = USD 1, 690.00

Activity 8

Door 1 : 2.25 square meters of paint and 6.8 m LED lights.
Door 2 : 2.36 square meters of paint and 7 m LED lights.
Door 3 : 2.71 square meters of paint and 8.4 m LED lights.

ANSWER GUIDE

Activity 9

1) 2 meters
2) 28 feet

3) 44 feet

Activity 10

TRIVIA 1

Example 1:	Example 2:	Example 3:
l = 15in ; w = 10in	l = 13in ; w = 12in	l = 20in ; w = 5in
P = 50 in	P = 50 in	P = 50 in
A = 150 in²	A = 156 in²	A = 100 in²

TRIVIA 2

Example 1:	Example 2:	Example 3:
s = 12 in	s = 12 in	s = 12 in
A_{square} = 144 in²	A_{square} = 144 in²	A_{square} = 144 in²
l = 15in ; w = 9in	l = 14in ; w = 10in	l = 13in ; w = 11in
$A_{rectangle}$ = 135 in²	$A_{rectangle}$ = 140 in²	$A_{rectangle}$ = 143 in²

TRIVIA 3

Example 1:	Example 2:	Example 3:
s = 5 in	l = 10in ; w = 6in	l = 15in ; w = 10in
P = 20 in	P = 32 in	P = 50 in
A = 25 in²	A = 60 in²	A = 150 in²

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