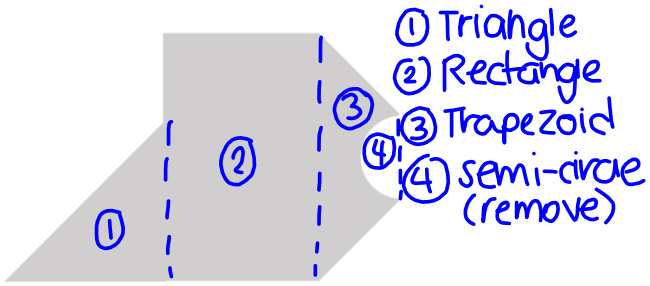
MAP4C1 Unit 2: Geometry

2.2 Area Applications

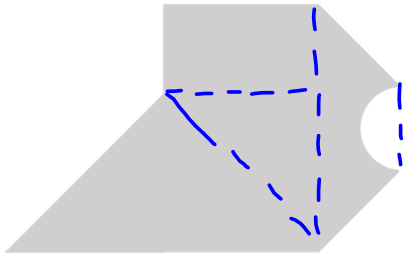
Learning Goals: I am learning to…
- ☐ Apply perimeter and area to composite figures by breaking the figure down into simpler shapes.

Sometimes figures are not always simple shapes where the area and perimeter can be determined using one formula. These type of figures can be broken down into smaller figures made up of a combination of small simple figures. These are known as **composite figures.**

Example: The composite figure below can be broken up into several simple figures. Is there more than one method of breaking this figure down?



① Triangle
② Rectangle
③ Trapezoid
④ semi-circle (remove)

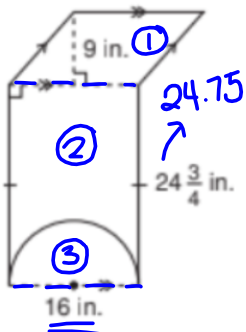


Steps to Finding the Area of a Composite figure:

1. Break the composite figure into **simpler figures** which you know how to calculate the area for.
   Note: There is often more than one way to break the figure down!
2. Determine the area of each simpler figure separately.
3. Combine all the areas of each simpler figure by adding.
4. Subtract any areas of any parts that have been removed in the figure.

Note: When working with pi (π), always use the pi button on your calculator! Never round to 3.14 in your solution!

Example 1: Determine the **area** of the following composite figure. *Round to one decimal place.*



24.75 in

① Parallelogram
$A = bh$
$= (16)(9)$
$= 144 \text{ in}^2$

② Rectangle
$A = lw$
$= (24.75)(16)$
$= 396 \text{ in}^2$

③ semi-circle
$A = \frac{\pi r^2}{2}$ $r = 8$
$= \frac{\pi (8)^2}{2}$
$= 100.5 \text{ in}^2$

④ Total area $= A_1 + A_2 - A_3$
$= 144 + 396 - 100.5$
$= 439.5 \text{ in}^2$

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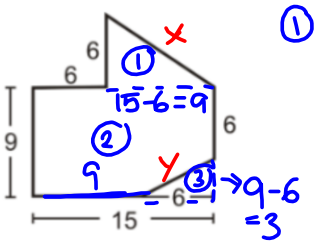
Example 2: Determine the **area** and **perimeter** for the following composite figure. *Round to one decimal place.*



① Triangle
$A = \frac{1}{2}bh$
$= \frac{1}{2}(9)(6)$
$= 27$

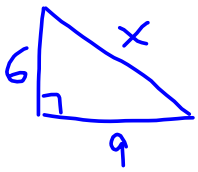
② Rectangle
$A = lw$
$= (15)(9)$
$= 135$

③ Triangle (remove)
$A = \frac{1}{2}bh$
$= \frac{1}{2}(6)(3)$
$= 9$

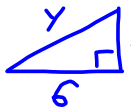
$9-6=3$

④ Total area $= A_1 + A_2 - A_3$
$= 27 + 135 - 9$
$= 153 \text{ units}^2$

Perimeter:



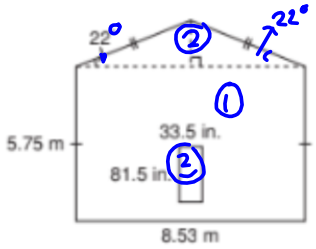
$x^2 = 6^2 + 9^2$
$x^2 = 36 + 81$
$x^2 = 117$
$x = 10.8$



$y^2 = 3^2 + 6^2$
$y^2 = 9 + 36$
$y^2 = 45$
$y = 6.7$

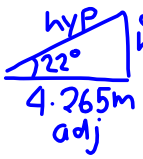
$P = 9 + 6 + 6 + 10.8 + 6 + 6.7 + 9$
$= 53.5 \text{ units}$

Example 3: Carpenters have constructed the frame for a house and will nail pressboard over the frame. Determine the area of the pressboard they need for the back wall of the house. *Round to* ***one decimal place.*** Hint: You may need to recall trigonometry!



① Rectangle
$A = lw$
$= 8.53(5.75)$
$= 49.05 \text{ m}^2$

② Triangle (Need SOH CAH TOA)



SOH CAH TOA

$\tan 22° = \frac{h}{4.265}$

$4.265(\tan 22°) = h$

$1.72 \text{ m} = h$

$A = \frac{1}{2}bh$
$= \frac{1}{2}(8.53)(1.72)$
$= 7.34 \text{ m}^2$

③ Door (Convert units!)

$81.5 \text{ in} \times \frac{2.54 \text{ cm}}{1 \text{ in}} \times \frac{1 \text{ m}}{100 \text{ cm}} = 2.0701 \text{ m}$

$33.5 \text{ in} \times \frac{2.54 \text{ cm}}{1 \text{ in}} \times \frac{1 \text{ m}}{100 \text{ cm}} = 0.8509 \text{ m}$

$A = lw$
$= (2.0701)(0.8509)$
$= 1.76 \text{ m}^2$

④ Total area $= A_1 + A_2 - A_3$
$= 49.05 + 7.34 - 1.76$
$= 54.64$

∴ They will need approx 54.6 m^2 of pressboard