Pre-Calc Area of a Triangle

Area of a Triangle

You already know this formula for the area, K of a triangle: $K= \frac{1}{2}bh$, where b is the base and h is the height.

**Consider** $∆ABC $ **in Figure 1**.

1. AB = 31 cm, AC = 42 cm, BC = a, $m∠A=57°$ and the height

Figure 1

of the triangle from vertex B to the side AC.

Find the height, h.

2. Find the area of the triangle to the nearest $cm^{2}$.

3. a. Fill in the value you used for the base, b**. b =\_\_\_\_\_\_\_\_\_\_\_\_\_**

b. Show how you calculated the height**. h = \_\_\_\_\_\_\_\_\_\_\_\_**

Put your answers from a. & b. into a single equation which shows how you calculated the area, **K** using the side(s) and the angle(s) of the triangle.

**K =**

Figure 2

**Consider the** $∆ ABC$ **in Figure 2**

In the triangle $m∠A=61°$ and $m∠C=78°$, AC = 37 in., BC=a

AB = c and the height is from vertex B to side AC.

4. Find the area of the triangle to the nearest $in^{2}$.

5. Did you need to find any of the unknown dimensions of this triangle in order to calculate the area (i.e. side c, side a, or angle B)? If yes, which dimension(s) and why?

6. Think about side(s) and angle(s) which were required to calculate the area of Figures 1 and 2. Within each triangle, what is the relationship of the side(s) to the angle(s)?

**Consider** $∆ABC$**in Figure 3**

Figure 3

AB = 19.2 cm, BC = 11.3 cm, AC = b, $m∠B=87.3°$.

7. If you drew the height from A to $\overbar{BC}$

 What is the value you would use for the base?

 b = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 Show how you would calculate the height.

 h = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

8. If you drew the height form C to $\overbar{AB}$

 What is the value you would use for the base?

 b = \_\_\_\_\_\_\_\_\_\_\_\_\_\_

 Show how you would calculate the height.

 h = \_\_\_\_\_\_\_\_\_\_\_\_\_\_

9. Using your answers from #7 and #8 above, write the two equations that you could use to calculate the area, **K**  using the side(s) and angle(s) of the triangle.

From #7 : **K =**

From #8: **K =**

10. What do you notice about the two equations?

 Was is important where you drew the height?

**Consider the** $∆ABC$ **in Figure 4**

Figure 4

11. Write 3 equations that could be used to calculate the area of this triangle.

 One equation should use angle A, anouther should use angle B, and the

 third should use angle C.

Using angle A: **K =**

Using angle B: **K =**

Using angle C: **K =**

Can you put into words the strategy that you would use to find the area of a triangle with an unknow height? (Discuss this with your partner)

 Here is another formula you can use to find the area, K of a triangle. This formula is names for Heron who lived in Egypt from about 10-70 AD and whose proof of this oldesr in record.

 **Heron’s Formula:** $\sqrt{s(s-a)(s-b)(s-c)}$

 where a,b & c are lengths of the sides and s is the semiperimeter = $\frac{(a+b+c)}{2}$

12. Find the area of $∆ABC$ where AB = 5 in, BC = 7in and AC = 9 in.

13. Without using Heron’s formula, how else could you find the area of the triangle in #12? Do not do it, just describe how it can be done.

14. On Sunday afternoon in Charlotte, NC, the Pittburgh Steelers were playing the Carolina Panthers. At the start of the game, the Panthers kicked off from their own 35 yard line. The ball flew 73 yards and was caught by Ryan Switzer. Switzer started running at some angle from the line of the kick and ran for 12.5 yards before being tackled. The perimiter of the triangle formed by the point of the kick off, the catch and the tackle. Is 150.5 yards. What angle was formed between the line of the kick and the path of Ryan Switzer?

