

5.5 General Solutions of Triangles

4. To find the area of the rhombus, use the formula $K = \frac{1}{2} bc \sin A$ and then multiply that by 2. We first need to find one of the angles that are opposite the given diagonal (they are both the same measurement). We will call it angle A . $21.5^2 = 12^2 + 12^2 - 2(12)(12) \sin A$, $A = 127.2^\circ$, which means the other two angles are both 52.8° ($360^\circ - 127.2^\circ - 127.2^\circ$ and then divide by 2).

$$K = 2 \left(\frac{1}{2} (12)(12) \sin 127.2^\circ \right) = 114.7$$

5. Divide the pentagon into three triangles, drawing segments from $\angle 2$ to $\angle 5$, called x below, and $\angle 2$ to $\angle 4$, called y below. With these three triangles, only the middle triangle needs us to find two sides and the angle between them (called $\angle Z$ below) to use $K = \frac{1}{2} bc \sin A$ (the outer two triangles already have two sides and an angle that fit this criteria).

$$x^2 = 192^2 + 190.5^2 - 2(192)(190.5) \cos 81^\circ \rightarrow x = 248.4$$

$$y^2 = 146^2 + 173.8^2 - 2(146)(173.8) \cos 73^\circ \rightarrow y = 191.5$$

$$118^2 = 248.4^2 + 191.5^2 - 2(248.4)(191.5) \cos Z \rightarrow \angle Z = 27.4^\circ$$

$$\text{Areas: } K = \frac{1}{2} (190.5)(192) \sin 81^\circ = 18062.8$$

$$k = \frac{1}{2} (248.4)(191.5) \sin 27.4^\circ = 10945.5$$

$$K = \frac{1}{2} (173.8)(146) \sin 73^\circ = 12133.0$$

$$\text{Total Area: } 41141.3$$

6. altitude, x : $\sin 56.8^\circ = \frac{x}{38} \rightarrow x = 31.8$

$$GT = \sqrt{38^2 - 31.8^2} = 20.8$$

$$GI = 88 - 20.8 = 67.2$$

$$A_{\text{small}} = \frac{1}{2} (20.8)(31.8) = 330.8$$

$$A_{\text{big}} = \frac{1}{2} (67.2)(31.8) = 1068.5$$

$$RI = \sqrt{67.2^2 + 31.8^2} = 74.3$$

$$\angle I \rightarrow \sin I = \frac{31.8}{74.3} \rightarrow 25.3^\circ$$

7. The headings would be as follows:

- $W28.2^\circ N$
- $S28.8^\circ W$
- $N90^\circ E$

8. Answers:

- $a^2 = 187^2 + 218^2 - 2(187)(218) \cos 115^\circ$, he would need to hit the ball 342.0 yards.
- $\frac{\sin 115^\circ}{342} = \frac{\sin B}{187}$, he would have to hit the ball at a 29.7° angle.

9. Answers:

- $180^\circ - 14.2^\circ - 162.2^\circ = 3.6^\circ$
- $\frac{\sin 14.2^\circ}{b} = \frac{\sin 162.2^\circ}{320}$, 256.8 yards
- $\frac{\sin 162.2^\circ}{320} = \frac{\sin 3.6^\circ}{c}$, 65.7 yards