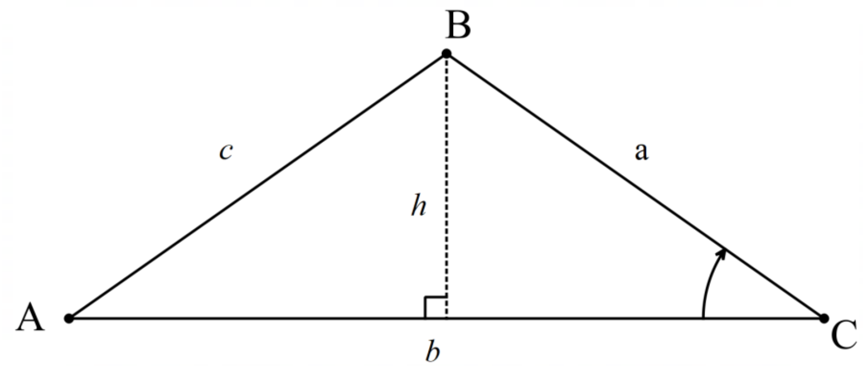
<u>Area of Triangles</u>

Given ANY triangle:



We know that $\sin C = \frac{h}{a}$, cross-multiplying we get that the height, h, is h = a sin C

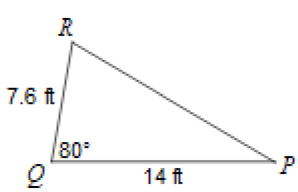
Since the area of a triangle is height times based divided by two,

We get: Area = $\frac{(a\sin C)(b)}{2}$

Or Area = $\frac{ab\sin C}{2}$

Looking at the original diagram we see that this involves multiplying two sides (a and b) times the sine of the CONTAINED angle (the angle between the two sides) and dividing by two. Generalizing, this means to find the area of any triangle (if we're not directly given the height and the base) we **NEED SAS** (side-angle-side).

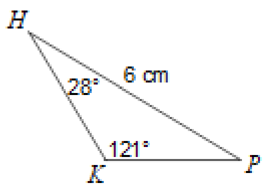
Case 1: SAS



$$Area = \frac{7.6(14)(\sin 80^{\circ})}{2}$$
$$= 52.4\, yd^2$$

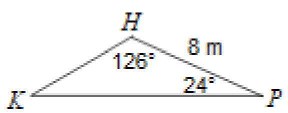
Case 2: AAS

Use law of sines to get side KP, subtract to get angle P, then you have SAS (see Case 1) (Answer: 5.1 cm^2)



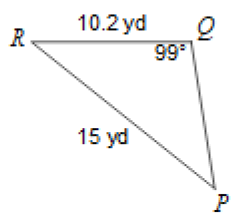
Case 3: ASA

Subtract to get angle K, use sine law to get side KH or side KP, then you have SAS (see Case 1) (Answer: 21.0 m^2)



Case 4: SSA

Use sine law to get angle P, then subtract to get angle R, then you have SAS (see Case 1) (Answer: 47.9 yd^2)

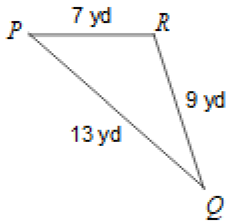


Heron's Formula

Case 5: SSS

When given all 3 sides we use Heron's formula

- Find the semi-perimeter, s (half of the perimeter)
- Calculate: $Area = \sqrt{s(s-a)(s-b)(s-c)}$



In this case:

$$s = \frac{7+9+13}{2}$$

$$s = \frac{29}{2}$$

$$s = 14.5\ yd$$

$$Area = \sqrt{14.5(14.5-7)(14.5-9)(14.5-13)}$$

$$Area = \sqrt{14.5(7.5)(5.5)(1.5)}$$

$$Area = \sqrt{897.1875}$$

$$Area = 29.953\ yd^2$$

Rounded to one decimal place, this is 30.0 yd^2