Precalculus

Lesson 8.4: Area of a Triangle

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If we know two sides of a triangle and the included triangle we may apply the general formula for the area of a triangle (SAS).

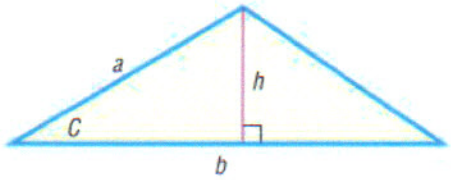
$$\sin C = \frac{h}{a}$$

solving for h:

$$h = a \sin C$$

so area is:

$$K = \frac{1}{2}bh = \frac{1}{2}ab \sin C$$



To find area of a triangle knowing SAS

$$K = \frac{1}{2}ab \sin C$$
$$K = \frac{1}{2}ac \sin B$$
$$K = \frac{1}{2}bc \sin A$$

From the law of cosines comes **Heron's Formula** that may be used to find the area of a triangle if only given the lengths of the three sides (SSS):

For a triangle with sides of lengths $a, b, and\ c$, it will have a **semiperimeter** of:

$$\boldsymbol{s = \frac{1}{2}(a + b + c)}$$

the area of the triangle is:

$$\boldsymbol{K = \sqrt{s(s-a)(s-b)(s-c)}}$$

Find the area of a triangle whose sides are
$a = 4, b = 5, c = 7$

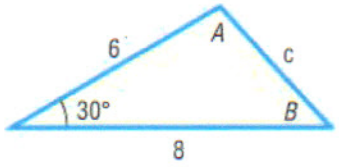
Semiperimeter $= s = \frac{1}{2}(4+5+7) = \frac{1}{2}(16) = 8$

$K = \sqrt{8(8-4)(8-5)(8-7)}$

$= \sqrt{96} = \sqrt{16 \cdot 6}$

$K = 4\sqrt{6}$ or ~ 9.8 units^2

Find the area of the triangle:



$A = \frac{1}{2}(6)(8)\sin 30$

$= 12 \text{ units}^2$