

Solve the following triangles. Sketch and label triangles with your final answers.

SCORE: ____ / 12 PTS

If no such triangle exists, write "DNE". If more than one triangle is possible, solve for all possible triangles.

[a] $\triangle ABC$

if $a=5$, $b=9$ and $c=3$

$$9 > 5 + 3$$

DNE

[b] $\triangle RST$

if $r=7$, $s=8$ and $R=61^\circ$

$$\frac{\sin S}{8} = \frac{\sin 61^\circ}{7}$$

$$\sin S = \frac{8 \sin 61^\circ}{7} = 0.9996$$

$$S = 88.3^\circ$$

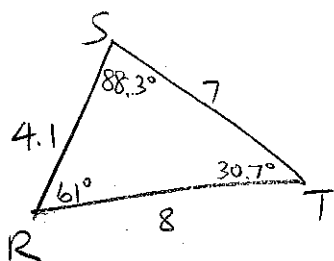
$$\text{or } 180^\circ - 88.3^\circ = 91.7^\circ$$

$$T = 180^\circ - 61^\circ - 88.3^\circ = 30.7^\circ$$

$$\frac{t}{\sin 30.7^\circ} = \frac{7}{\sin 61^\circ}$$

$$t = \frac{7 \sin 30.7^\circ}{\sin 61^\circ}$$

$$= 4.1$$

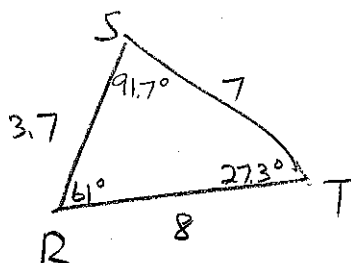


$$T = 180^\circ - 61^\circ - 91.7^\circ = 27.3^\circ$$

$$\frac{t}{\sin 27.3^\circ} = \frac{7}{\sin 61^\circ}$$

$$t = \frac{7 \sin 27.3^\circ}{\sin 61^\circ}$$

$$= 3.7$$



[c] $\triangle FGH$

if $f=5$, $g=8$ and $h=6$

$$8^2 = 5^2 + 6^2 - 2 \cdot 5 \cdot 6 \cos G$$

$$\cos G = -0.05$$

$$G = 92.9^\circ$$

$$\frac{\sin F}{5} = \frac{\sin 92.9^\circ}{8}$$

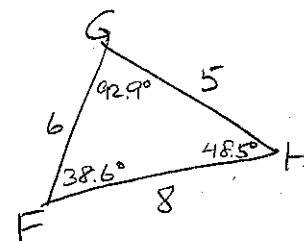
$$\sin F = \frac{5 \sin 92.9^\circ}{8}$$

$$= 0.6242$$

$$F = 38.6^\circ$$

$$H = 180^\circ - 92.9^\circ - 38.6^\circ$$

$$= 48.5^\circ$$



Suppose that $a = 12$ and $B = 26^\circ$.

SCORE: ____ / 6 PTS

- [a] Find all values of b for which there are two possible triangles. Do NOT solve the triangles.

$$a \sin B < b < a$$

$$12 \sin 26^\circ < b < 12$$

$$5.3 < b < 12$$

- [b] Find all values of b for which there are no possible triangles.

$$b < a \sin B$$

$$b < 5.3$$

- [c] Find all values of b for which there is exactly one possible triangle. Do NOT solve the triangle.

$$b = a \sin B \text{ or } b \geq a$$

$$b = 5.3 \text{ or } b \geq 12$$

Find the areas of the following triangles.

SCORE: ____ / 4 PTS

- [a] $\triangle MNP$ if $m = 5$, $n = 7$ and $p = 8$

$$s = \frac{1}{2}(5+7+8) = 10$$

$$\sqrt{10(10-5)(10-7)(10-8)} = 10\sqrt{3} = 17.3$$

- [b] $\triangle UVW$ if $u = 8.3$, $v = 13.2$, $V = 78^\circ$ and $W = 64^\circ$

$$\frac{1}{2}uv \sin W = \frac{1}{2}(8.3)(13.2) \sin 64^\circ = 49.2$$

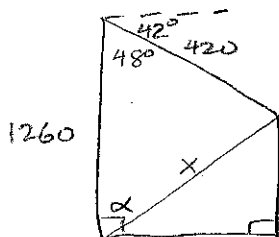
A 420 foot cable connects the roofs of two buildings.

SCORE: ____ / 8 PTS

From the roof of the 1260 foot tall west building, the angle of depression to the roof of the east building is 42° .

Find the angle of elevation from the base of the west building to the roof of the east building.

(You may need to calculate other information that is not explicitly requested.)



$$x^2 = 1260^2 + 420^2 - 2(1260)(420) \cos 48^\circ$$

$$= 1055792.166$$

$$x = 1027.517$$

$$\frac{\sin \alpha}{420} = \frac{\sin 48^\circ}{1027.517}$$

$$\sin \alpha = \frac{420 \sin 48^\circ}{1027.517}$$
$$= 0.3038$$

$$\alpha = 17.7^\circ$$

$$\text{ANGLE OF ELEVATION} = 90^\circ - 17.7^\circ$$
$$= 72.3^\circ$$