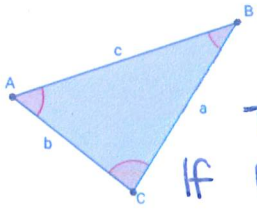


Law of sines

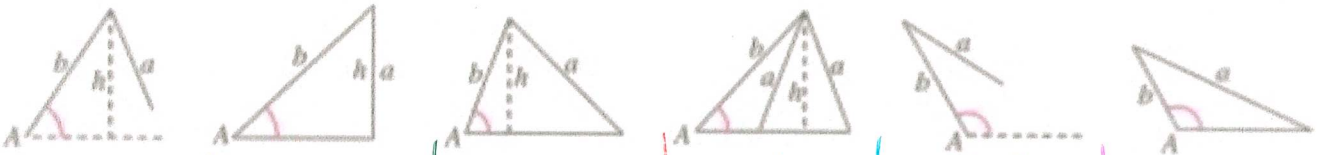
$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$

Triangle Inequality Thm:
If $b<a<c$ THEN $B<A<C$

**MATH 1113 Precalculus**
**InClassDrill: OBJ#1113-21**
**Law of Sines**

**Name:** key

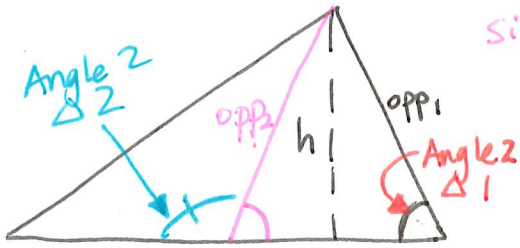
Decide how many triangles are possible in each situation



| | | | | | |
|---|---|---|---|---|---|
| Angle A: | acute | acute | acute | acute | obtuse | obtuse |
| Opp & adj | opp < adj | opp < adj | opp > adj | opp < adj | opp < adj | opp > adj |
| Opp & ht | opp < ht | opp = ht | opp > ht | opp > ht | n/a | n/a |
| # triangles | None | 1 right △ | 1 oblique △ | 2 oblique △'s | None | 1 oblique △ |

How to find the height in an oblique triangle: adjacent side · sine(given angle)

How to find the second angle in a second triangle:

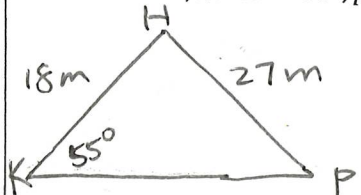



since $opp_1 \cong opp_2$ they form an isosceles △ with congruent base angles

$\text{Angle 2}_{\triangle 2} + \text{Angle 2}_{\triangle 1} = 180°$

(F) (B&P)

1. In△ $KHP, m\angle K = 55°, p = 18\,m, k = 27\,m$. Find $m\angle P$




$\frac{\sin 55°}{27} = \frac{\sin P}{18} = \frac{\sin H}{h}$

$P = \sin^{-1}\left(\frac{18 \cdot \sin 55°}{27}\right) = 33.1°$

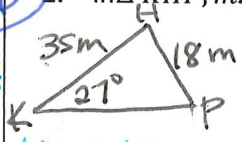
K acute
opp > adj
opp > ht
(1) oblique △

to finish solving △
K = 27m, K = 55°
h = 32.9m, H = 91.9°
p = 18m, p = ~~33.1°~~

$H: 180° - (55° + 33.1°) = 91.9°$

$h = \frac{27 \cdot \sin 91.9°}{\sin 55°} = 32.9$

2. In△ $KHP, m\angle K = 27°, p = 35\,m, k = 18\,m$. Find $m\angle P$




$\frac{\sin 27°}{18} = \frac{\sin P}{35} = \frac{\sin H}{h}$

$P_1 = \sin^{-1}\left(\frac{35 \cdot \sin 27°}{18}\right) = 62°$

$P_2 = 180° - 62° = 118°$

K acute
opp < adj
ht: $35(\sin 27°) = 15.9$
opp > ht
(2) oblique △'s

to finish solving △'s

△1
K = 18m, K = 27°
h = 39.6m, H = 91°
p = 35m, P = 62°

$H = 180° - (62° + 27°) = 91°$

$\frac{18 \sin 91°}{\sin 27°} = h = 39.6\,m$

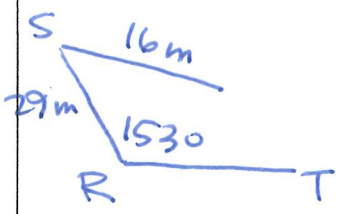
△2
K = 18m, K = 27°
h = 22.7m, H = 35°
p = 35m, P = 118°

$H = 180° - (118° + 27°) = 35°$

$h = \frac{18 \sin 35°}{\sin 27°} = 22.7$

(H)

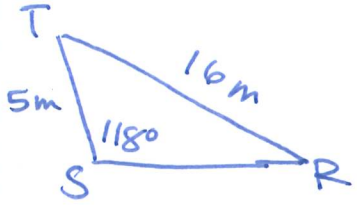
3. In $\triangle RST, m\angle R = 153°, t = 29\ m, r = 16\ m.$
*Find* $m\angle S$




R Obtuse
opp < adj ⟶ no triangle

(A)

4. In $\triangle RST, m\angle S = 118°, s = 16\ m, r = 5\ m.$
*Find* $m\angle R$




$\frac{\sin 118°}{16} = \frac{\sin R}{5} = \frac{\sin T}{t}$

$R = \sin^{-1}\left(\frac{5 \cdot \sin 118°}{16}\right)$

$= 16°$

S obtuse
opp > adj
↓
1 oblique △

finish solving △:

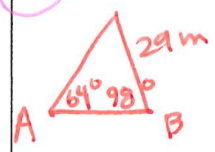
r: 5m R: 16°
s: 16m S: 118°
t: 13m T: 46°

$T = 180° - (118+16)° = 46°$

$t = \frac{16 \cdot \sin 46°}{\sin 118°} = 13$

(G)

5. In $\triangle ABC, m\angle A = 64°, m\angle B = 98°, a = 29\ m.$
*Find* $b$




2 angles + 1 side = no worries!

$\frac{\sin 64°}{29} = \frac{\sin 98°}{b} = \frac{\sin C}{c}$

$b = \frac{29 \cdot \sin 98°}{\sin 64°} = 32m$

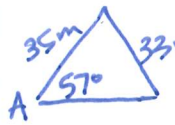
$C = 180° - (64° + 98°) = 18°$

$c = \frac{29 \sin 18°}{\sin 64°} =$

finish solving △

a: 29m A: 64°
b: 32m B: 98°
c: 10m C: 18°

6. In $\triangle ABC, m\angle A = 57°, c = 35\ m, a = 33\ m.$
*Find* $b$




A acute
opp < adj
ht: $35(\sin 57°) = 29.4$ m
opp > ht
② OBLIQUE △s

△1

a = 33m A = 57°
b = 34.1m B = 60°
c = 35m C = 63°

$\frac{\sin 57°}{33} = \frac{\sin C}{35}$

$C = \sin^{-1}\left(\frac{35 \sin 57°}{33}\right) = 63°$

$B = 180° - 57° + 63°$

$b = \frac{33 \sin 60°}{\sin 57°} = 34.1$

△2

a = 33m A = 57°
b = 4.1m B = 6°
c = 35m C = 117°

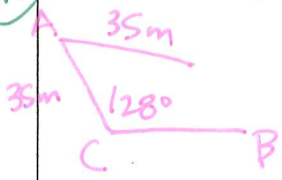
$C = 180° - 63°$

$B = 180° - (117° + 57°)$

$b = \frac{33 \sin 6°}{\sin 57°} = 4.1$

(H)

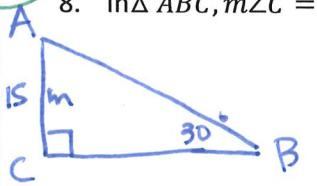
7. In $\triangle ABC, m\angle C = 128°,\ b = 35\ m, c = 35\ m.$
*Find* $a$




C: obtuse
opp = adj ⟶ no triangle
(in an obtuse △, opp must exceed other sides)

(E)

8. In $\triangle ABC, m\angle C = 90°, m\angle B = 30, b = 15\ m.$
*Find* $c$




2 angles + 1 side = no worries!

$A = 180° - (90° + 30°) = 60°$

since rt triangle: use SOHCAHTOA

$\sin 30° = \frac{15}{c}$

$c = \frac{15}{\sin 30°} = \frac{15}{\frac{1}{2}} = 30m$

## Answer bank:

A) 16° B) 62° C) 4 m D) 118° E) 30 m F) 33.1° G) 32 m H) Not a triangle J) 34.1 m