

Definitions

Pythagorean triple: a set of three positive integers that satisfy $a^2 + b^2 = c^2$.

Geometric mean: the value x that satisfies $\frac{a}{x} = \frac{x}{b}$ of two numbers a and b . So, $x^2 = ab$ and $x = \sqrt{ab}$.

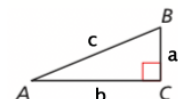
Angle of elevation: the angle that an upward line of sight makes with a horizontal line (horizon).

Angle of depression: the angle that a downward line of sight makes with a horizontal line (horizon).

Only RIGHT TRIANGLES

Trigonometric ratios (SOHCAHTOA): $\sin A = \frac{\text{opposite}}{\text{hypotenuse}} = \frac{a}{c}$ $\cos A = \frac{\text{adjacent}}{\text{hypotenuse}} = \frac{b}{c}$ $\tan A = \frac{\text{opposite}}{\text{adjacent}} = \frac{a}{b}$

Inverse Trigonometric ratios: $A = \tan^{-1}\left(\frac{a}{b}\right)$ $A = \sin^{-1}\left(\frac{a}{c}\right)$ $A = \cos^{-1}\left(\frac{b}{c}\right)$



ANY Triangles

Area of a Triangle: $A = \frac{1}{2}bc \sin A$

Trigonometric identities: Let A and B be complementary angles (e.g. acute angles in right triangle).

$\sin A = \cos(90^\circ - A) = \cos B$ $\cos A = \sin(90^\circ - A) = \sin B$

Law of Sines: $\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$ for AAS, ASA, SSA

Law of Cosines: $c^2 = a^2 + b^2 - 2ab \cos C$ for SAS, SSS

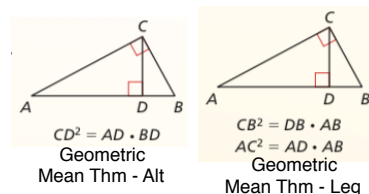


Theorems and Postulates

- **Pythagorean Theorem:** In a right triangle, the square of the length of the hypotenuse is equal to the sum of the squares of the lengths of the legs.
- **Converse of the Pythagorean Theorem:** If the square of the length of the longest side of a triangle is equal to the sum of the squares of the lengths of the other two sides, then the triangle is a right triangle.
- **Pythagorean Inequalities Theorem:** For any $\triangle ABC$, where c is the length of the longest side, the following statements are true.
 - If $c^2 < a^2 + b^2$, then $\triangle ABC$ is acute.
 - If $c^2 > a^2 + b^2$, then $\triangle ABC$ is obtuse.

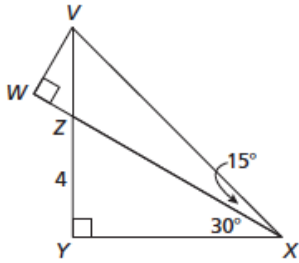
Special Triangles Theorems

- **40°-40°-90° Triangle Theorem:** In a 45°- 45°- 90° triangle, the hypotenuse is $\sqrt{2}$ times as long as each leg.
- **30°-60°-90° Triangle Theorem:** In a 30°- 60°- 90° triangle, the hypotenuse is twice as long as the shortest leg, and the longer leg is $\sqrt{3}$ times as long as the shortest leg.
- **Right Triangle Similarity Theorem:** If the altitude is drawn to the hypotenuse of a right triangle, then the two triangles formed are similar to the original triangle and to each other.
- **Geometric Mean Theorem (Altitude):** In a right triangle, the altitude from the right angle to the hypotenuse divides the hypotenuse into two segments. The length of the altitude is the geometric mean of the lengths of the two segments of the hypotenuse.
- **Geometric Mean Theorem (Leg):** In a right triangle, the altitude from the right angle to the hypotenuse divides the hypotenuse into two segments. The length of each leg of the right triangle is the geometric mean of the lengths of the hypotenuse and the segment of the hypotenuse that is adjacent to the leg.

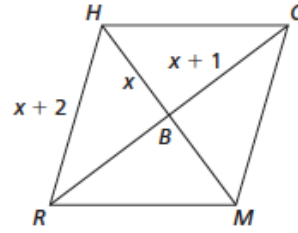


Show all work!!!

1) In the diagram, $YZ = 4$. Find the side lengths of $\triangle VWX$, a 15° - 75° - 90° triangle. Round answers to nearest hundredth.



2) RHOM is a rhombus. Find the value of x .

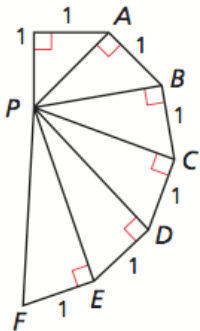


Find the measures of the two acute angles, to the nearest degree, in triangles with sides of these lengths.
Draw a figure and solve.

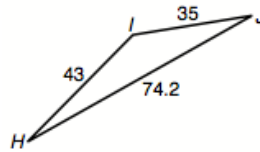
3) 8, 15, 17

4) 7, 24, 25

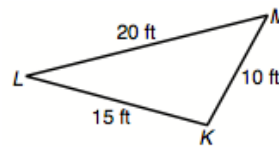
5) Find PA, PB, PC, PD, PE, and PF in simplest radical form.



6) Use the Law of Cosines to find the angle measures.



$m\angle I =$ _____



$m\angle M =$ _____

7) A surveyor sights the top of a building with a handheld range finder. The top of the building is 148 feet 2 inches away. The angle of elevation is 56° .

a) distance from surveyor to the building = _____

b) The angle of depression to the bottom of the building is 4° .
Find the height of the surveyor and building.

height of surveyor = _____

height of building = _____

8) A rhombus has diagonals of length 4 and 10. Find the angles of the rhombus to the nearest degree.