TRUE FALSE

The area of a triangle is given by one-half multiplied by base multiplied by height, where height is perpendicular to the base.

The area of a triangle is given by one-half multiplied by base multiplied by height, where height is perpendicular to the base.

True. This is the fundamental formula for triangle area, requiring the height to be perpendicular to the chosen base.

TRUE FALSE

If two triangles share the same base and have the same height, their areas are equal.

If two triangles share the same base and have the same height, their areas are equal.

True. Area depends solely on base and corresponding height. Identical base-height pairs yield equal areas, regardless of triangle shape.

TRUE FALSE

The area of a triangle with vertices at (0,0), (4,0), and (0,3) is 6 square units.

The area of a triangle with vertices at (0,0), (4,0), and (0,3) is 6 square units.

True. Using base=4 (x-axis) and height=3, area = $(1/2)*4*3 = 6$. Coordinate formula: $|(0(0-3)+4(3-0)+0(0-0))/2| = 6$.

TRUE FALSE

Doubling the height while keeping the base constant doubles the area of a triangle.

Doubling the height while keeping the base constant doubles the area of a triangle.

True. Area $\propto$ height for fixed base. Original area = $(1/2)*b*h$; new area = $(1/2)*b*(2h) = 2*(\text{original})$.

TRUE FALSE

The area of an equilateral triangle with side length a is $(\sqrt{3}/4)\ a^2$.

The area of an equilateral triangle with side length a is $(\sqrt{3}/4)\, a^2$.

True. Height $h = (\sqrt{3}/2)a$, so area $= (1/2)*a*(\sqrt{3}/2)a = (\sqrt{3}/4)a^2$. Verified standard formula.

TRUE FALSE

Tripling all sides of a triangle increases its area by a factor of 9.

Tripling all sides of a triangle increases its area by a factor of 9.

True. Area scales with square of linear dimensions.

Scaling factor $k=3$, area multiplier $= k^2 = 9$.

TRUE FALSE

A triangle with collinear vertices has zero area.

A triangle with collinear vertices has zero area.

True. Collinear points form a degenerate triangle with no height, resulting in zero area by coordinate or vector formulas.

TRUE FALSE

In a right-angled triangle, the area is half the product of the two legs.

In a right-angled triangle, the area is half the product of the two legs.

True. Legs are perpendicular, so one leg is base, the other is height. Area = $(1/2)*\text{leg}_1*\text{leg}_2$.

TRUE FALSE

Heron's formula computes area using all three sides without requiring height.

Heron's formula computes area using all three sides without requiring height.

True. Heron's formula: $\sqrt{[s(s-a)(s-b)(s-c)]}$, where s is semi-perimeter. Valid for any triangle with known sides.

TRUE FALSE

The area of a triangle is always positive unless vertices are collinear.

The area of a triangle is always positive unless vertices are collinear.

True. Non-collinear points form a bounded region with positive area. Collinear points yield zero area.

TRUE FALSE

The area of a triangle equals the product of its base and height.

The area of a triangle equals the product of its base and height.

False. Area is half the product of base and height.

Full product gives parallelogram area.

TRUE FALSE

Triangles with identical perimeters must have identical areas.

Triangles with identical perimeters must have identical areas.

False. Perimeter does not determine area. Example: Equilateral triangle (side=4, perimeter=12, area≈6.928) vs. isosceles triangle (sides 5,5,2, perimeter=12, area≈4.899).

TRUE FALSE

The height of a triangle is always one of its sides.

The height of a triangle is always one of its sides.

False. Height is perpendicular to the base and only coincides with a side in right triangles (for legs). In obtuse triangles, heights may lie outside.

TRUE FALSE

The area of a triangle with vertices (1,1), (2,2), and (3,3) is 1 square unit.

The area of a triangle with vertices (1,1), (2,2), and (3,3) is 1 square unit.

False. Points are collinear ($y=x$), so area$=0$.

Coordinate formula: $|(1(2-3)+2(3-1)+3(1-2))/2| = |0|/2 = 0$.

TRUE FALSE

Doubling both base and height doubles the area.

Doubling both base and height doubles the area.

False. Doubling both scales area by 4. Original area $= (1/2)bh$; new area $= (1/2)(2b)(2h) = 4*(\text{original})$.

TRUE FALSE

The area of a triangle is always greater than the product of any two sides.

The area of a triangle is always greater than the product of any two sides.

False. Area = $(1/2)ab \sin\theta \leq (1/2)ab < ab$.

Example: Right triangle (legs 1,1), area=0.5 < 1*1=1.

TRUE FALSE

A triangle with sides 3,4,5 has larger area than one with sides 4,5,6.

A triangle with sides 3,4,5 has larger area than one with sides 4,5,6.

False. 3-4-5 area: $(3*4)/2=6$. 4-5-6 area (Heron):

$s=7.5$, $\sqrt{[7.5(3.5)(2.5)(1.5)]} \approx 9.92 > 6$.

TRUE FALSE

Doubling the base while halving the height doubles the area.

Doubling the base while halving the height doubles the area.

False. Area remains unchanged: $(1/2)(2b)(h/2) = (1/2)bh$ = original area.

TRUE FALSE

Clockwise vertex order makes triangle area negative.

Clockwise vertex order makes triangle area negative.

False. Area is always non-negative. Coordinate formula uses absolute value; orientation affects sign in determinant but final area is |result|.

TRUE FALSE

The height always lies inside the triangle.

The height always lies inside the triangle.

False. In obtuse triangles, the height to the side opposite the obtuse angle falls outside the triangle.