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Triangle Review

I. shape with 180° angle = triangle

2. no angle bigger than 90° = not obtuse

3. one angle is exactly 90° = right triangle

4. two sides have the same length = isosceles, but not equilateral

① **Identify the true statements about triangles.**

② Classify the different triangles.

③ Decide if the suspect is the thief.

④ State what kind of triangle appears in each flag.

⑤ Identify the bank robber's safe house.

⑥ Determine which portions of the statements are incorrect.

+ with lots of tips, answer keys, and detailed answer explanations for all of the problems.
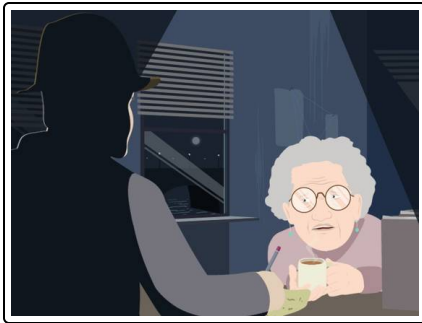
⚠ The complete package, **including all problems, hints, answers, and detailed answer explanations** is available for all sofatutor.com subscribers.

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Identify the true statements about triangles.

Choose the correct statements.

Old Lady Miller needs help solving a crime, and a friend of hers recommends Sherlock Bones. She enthusiastically goes to meet him at his office. She doesn't recognize the sleuth, and realizes that she misheard Sherlock's last name when her friend recommended him. She is unsure about his reputation, and decides to put him to the test before asking him for help. The case involves the properties of triangles, so she asks Sherlock to tell her if several statements about triangles are true or false.

Help Sherlock impress Old Lady Miller and get the case.

A
☐ The bigger the value of an angle within a triangle, the longer the corresponding side length will be.

B
☐ Each internal angle in an acute triangle must be less than $90°$.

C
☐ The sum of the angles in a triangle will always be less than $180°$.

D
☐ An obtuse triangle has two acute angles.

E
☐ All isosceles triangles are also equilateral triangles, but not all equilateral triangles are isosceles.

F
☐ Two of the angles in an isosceles triangle are equal.

Hints for solving these problems

Identify the true statements about triangles.

Hint #1

Acute angles are less than $90°$. Obtuse angles are greater than $90°$.

Hint #2

The sum of all angles in a triangle must be equal to $180°$.

Hint #3

An obtuse triangles has one angle greater than $90°$. Since the sum of all the angles must be equal to $180°$, the sum of the other two angles must be less than $90°$.

Hint #4

Equilateral triangles are a special case of isosceles triangles.

Answers and detailed answer explanations for these problems

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Identify the true statements about triangles.

Answer key: A, B, D, F

The bigger the value of an angle within a triangle, the longer the corresponding side length will be. ✓

The side opposite an angle in a triangle is known as the corresponding side. In general, when an angle in a triangle is larger, the corresponding side will be longer. The angle 'points' to the two ends of its corresponding side. If the angle is larger, the two ends of the corresponding side will be farther apart. This means that the side will be longer.

Each angle in an acute triangle must be less than $90°$**.** ✓

An acute triangle can only contain acute angles. So all angles in an acute triangle must be less than $90°$.

The sum of the angles in a triangle will always be less than $180°$**.** ✗

The sum of the angles in a triangle must always be equal to $180°$. Therefore this sum can never be less than $180°$.

An obtuse triangle has two acute angles. ✓

The sum of the angles in a triangle must always be equal to $180°$. An obtuse triangle has one obtuse angle. We can show these two properties mathematically:

1. $\angle A + \angle B + \angle C = 180°$
2. $\angle A > 90°$

Starting with equation (1):

$$\begin{aligned} \angle A + \angle B + \angle C &= 180° \\ -\angle B - \angle C \qquad & -\angle B - \angle C \\ \angle A &= 180° - \angle B - \angle C \end{aligned}$$

We can substitute this new expression for $\angle A$ into equation (2) to get:

$$\begin{aligned} 180° - \angle B - \angle C &> 90° \\ +\angle B + \angle C - 90° \qquad & +\angle B + \angle C - 90° \\ 180° - 90° &> \angle B + \angle C \\ 90° &> \angle B + \angle C \end{aligned}$$

So the sum of angle B and angle C is less than $90°$. Therefore they are both acute angles.

All isosceles triangles are also equilateral triangles, but not all equilateral triangles are isosceles. ✗

Two sides of an isosceles triangle are equal in length. All three sides of an equilateral triangle are equal in length. Therefore an equilateral triangle will also have two sides that are equal in length. This means that

equilateral triangles are also isosceles triangles. However, an isosceles triangle can have two sides that are equal, and a third side that is of a different length. This shows that a triangle can be isosceles without being equilateral.

Two of the angles in an isosceles triangle are equal. ✓

Isosceles triangles have two sides that are equal, and two angles that are equal.

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