

Triangles ABC and ADC are isosceles with $AB = BC$ and $AD = DC$. Point D is inside $\triangle ABC$, $\angle ABC = 40^\circ$, and $\angle ADC = 140^\circ$. What is the degree measure of $\angle BAD$?

- (A) 20 (B) 30 (C) 40 (D) 50 (E) 60

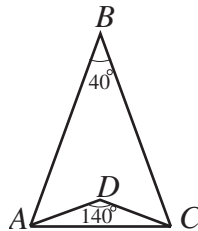
2007 AMC 10 A, Problem #8—

2007 AMC 12 A, Problem #6—

“ $\angle BAD = \angle BAC - \angle DAC$.”

Solution

Answer (D): Because $\triangle ABC$ is isosceles, $\angle BAC = \frac{1}{2}(180^\circ - \angle ABC) = 70^\circ$.



Similarly,

$$\angle DAC = \frac{1}{2}(180^\circ - \angle ADC) = 20^\circ.$$

Thus $\angle BAD = \angle BAC - \angle DAC = 50^\circ$.

OR

Because $\triangle ABC$ and $\triangle ADC$ are isosceles triangles and \overline{BD} bisects $\angle ABC$ and $\angle ADC$, applying the Exterior Angle Theorem to $\triangle ABD$ gives $\angle BAD = 70^\circ - 20^\circ = 50^\circ$.

Difficulty: Medium

NCTM Standard: Geometry Standard: analyze characteristics and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships.

Mathworld.com Classification: Geometry > Plane Geometry > Triangles > Special Triangles > Other Triangles > Isosceles Triangles