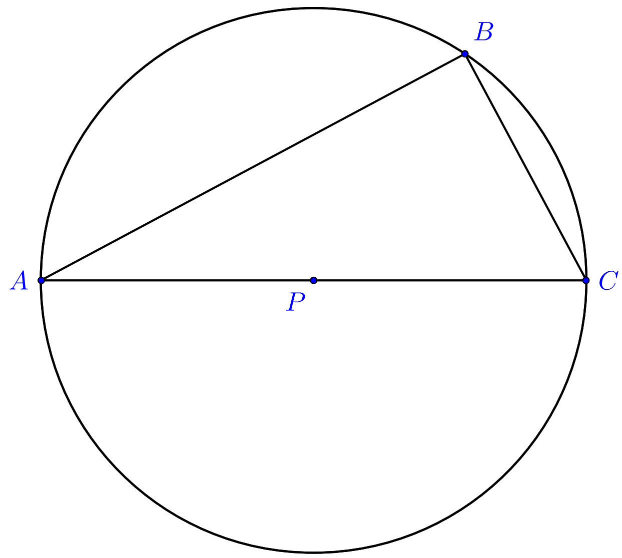
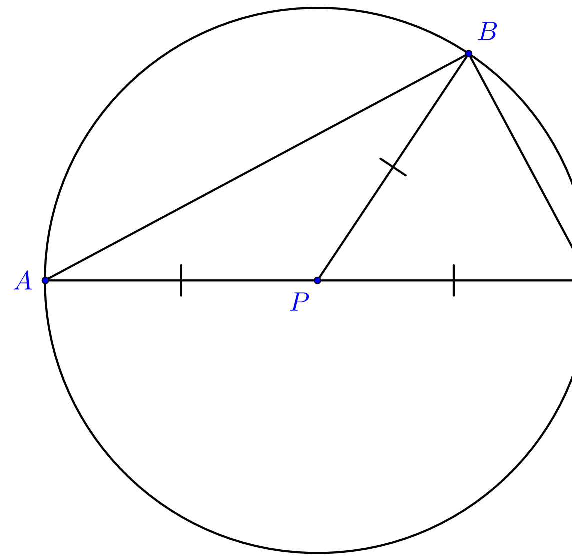
Inscribed Angles

Proofs updated.

Problem 1 *In the figure below, $\overline{AC}$ is a diameter of a circle with center P. Prove that $\angle ABC$ is a right angle.*





(a) *Beginning with the diagram on the left, Natalia draws $\overline{PB}$ and marks the diagram to show segments that she knows to be congruent because each one is a* $\boxed{?}$ *of the circle.*

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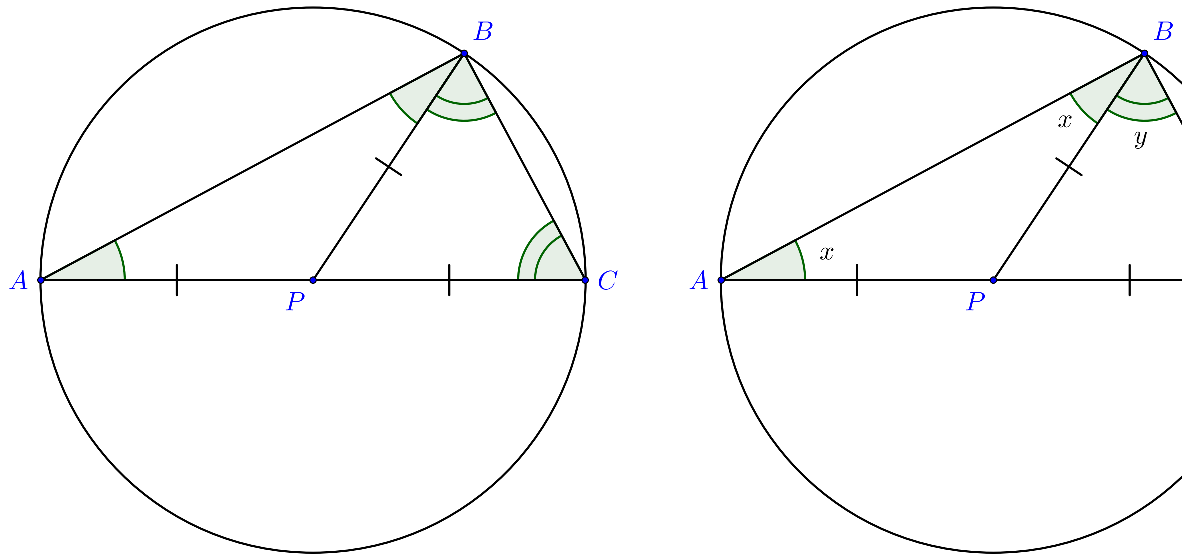


(b) *Natalia sees that* $\triangle APB$ *and* $\triangle BPC$ *are* $\boxed{?}$ *triangles, so she marks the figure to show angles that must be congruent.*

(c) *In order to do some algebra with these congruent angles, Natalia labels their measures* x *and* y*, as shown in the picture on the right.*

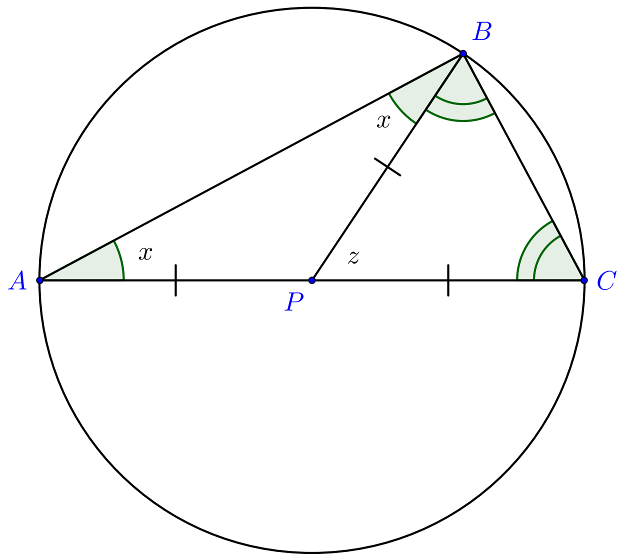
(d) *She writes an equation for the sum of the angles of* $\triangle ABC$*:*

$$\boxed{?} = 180^\circ$$

(e) *She divides that equation by* $\boxed{?}$ *to conclude that* $m\angle ABC = x + y = \boxed{?}$ *degrees.*

Problem 2 *A special case of the relationship between an inscribed angle and the corresponding central angle.*

In the figure below, $\overline{AC}$ *is a diameter of a circle with center* P*. Prove that* $z = 2x$*.*



Because z is the measure of an angle exterior to $\triangle\boxed{?}$, it is equal to the sum of the measures of the (opposite/ adjacent/ remote interior/ alternate interior) angles. In other words $z = 2x$.

Alternatively, without using the exterior angle theorem, one might proceed as follows:

(a) $\angle APB + x + x = 180^\circ$ *because of the angle sum in* $\triangle\boxed{?}$.

(b) $\angle APB + z = 180^\circ$ *because they form a linear pair.*

(c) *Then $z = 2x$ by comparing the two equations.*

Note: *This handles the special case in which the center of the circle lies on one side of the inscribed angle. For the general result, consider two cases: (1) When the center of the circle is in the interior of the inscribed angle; and (2) When the center of the circle is not in the interior of the inscribed angle.*