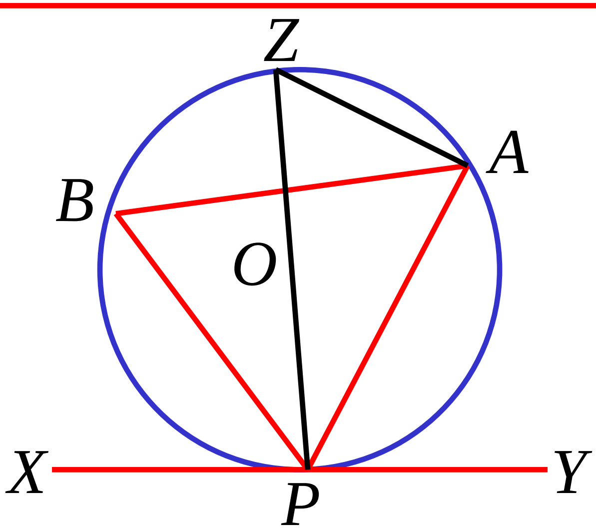
Alternate Segment Theorem

(9) An angle formed by a tangent to a circle with a chord drawn to the point of contact is equal to any angle in the alternate segment.

$\angle BPX = \angle PAB$ (alternate segment theorem)



Prove: $\angle APY = \angle ABP$

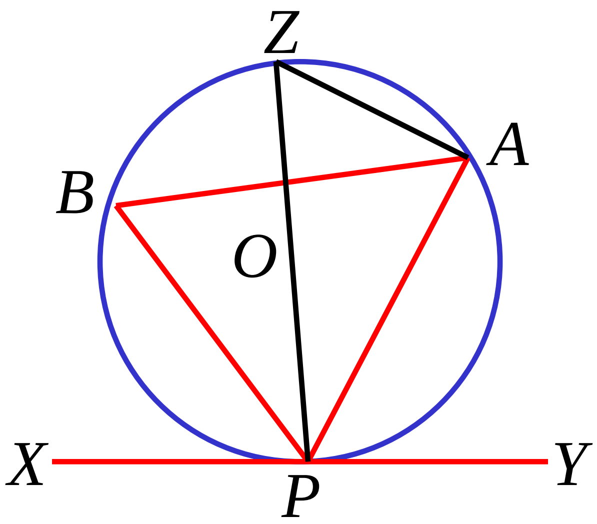
Proof: Join *PO* and produce to meet the circumference at *Z*

Join *AZ*

$\angle ZPY = 90^\circ$ (radius $\perp$ tangent)

$\angle APZ = 90^\circ - \angle APY$

$\angle PAZ = 90^\circ$ ($\angle$ in semicircle)



$$\angle PAZ + \angle AZP + \angle APZ = 180^\circ \qquad (\angle \text{ sum } \Delta APZ)$$

$$90^\circ + \angle AZP + 90^\circ - \angle APY = 180^\circ$$

$$\angle AZP = \angle APY$$

$$\angle AZP = \angle ABP \qquad (\angle\text{'s in same segment} =)$$

$$\therefore \angle APY = \angle ABP$$

Exercise 9F; 2ace etc, 3bd, 4bd, 5b, 7b, 9b, 10b, 12, 14, 15b