Youtube : Exterior Angle Theorem
by Doodle Math

Name Key
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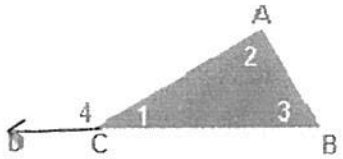
Date_____
8R period_____

Exterior Angles of a Triangle

An exterior angle of a triangle is equal in measure to the sum of the two non-adjacent interior angles of the triangle

In the triangle to the right, <4 is an exterior angle, because it is formed by a side of the triangle and an extension of another side.

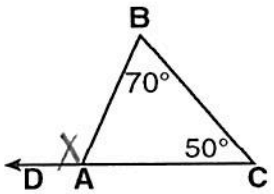


The theorem above states that because <4 is an exterior angle, its measure is equal to the sum of the measures of the 2 interior angles to which it is not adjacent, namely, <2 and <3.

$m\angle 4 = m\angle 2 + m\angle 3$

I Examples

① In the accompanying diagram of $\triangle ABC$, $\overline{CA}$ is extended to D, $m\angle ABC = 70°$, and $m\angle BCA = 50°$. Find $m\angle DAB$.

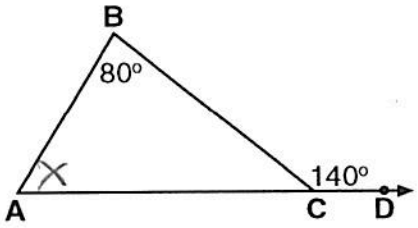


$70 + 50 = x$

$120 = x$

$m\angle DAB = 120°$

② In the accompanying diagram, $\overline{AC}$ is extended from C through D, $m\angle BCD = 140°$, and $m\angle B = 80°$. Find $m\angle BAC$.



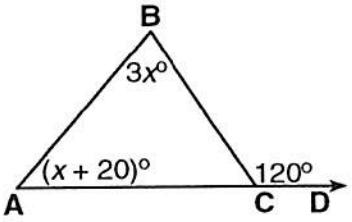
$80 + x = 140$

$-80 \quad -80$

$x = 60$

$m\angle BAC = 60°$

③ In the accompanying diagram, $m\angle A = (x + 20)°$, $m\angle B = 3x°$, $\angle BCD$ is an exterior angle formed by extending $\overline{AC}$ to point D, and $m\angle BCD = 120°$. Find the value of x.



$3x + x + 20 = 120$

$4x + 20 = 120$

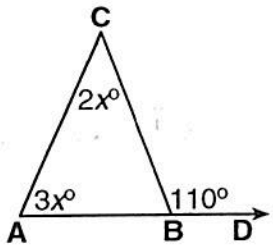
$-20 \quad -20$

$4x = 100$

$\frac{4x}{4} = \frac{100}{4}$

$x = 25$

④ In the accompanying diagram, the measure of exterior angle CBD is 110°. If the measures of the two nonadjacent interior angles are represented by $3x°$ and $2x°$, find the value of x.



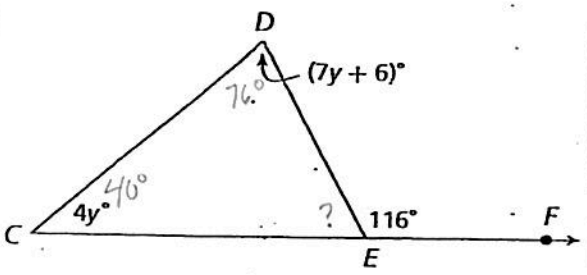
$2x + 3x = 110$

$\frac{5x}{5} = \frac{110}{5}$

$x = 22$

Use the Exterior Angles Theorem to find the measure of each angle in degrees.

(5)



$m\angle C =$ 40°

$m\angle D =$ 76°

$m\angle DEC =$ 64°

$4y + 7y + 6 = 116$

$11y + 6 = 116$

$-6 \quad -6$

$\frac{11y}{11} = \frac{110}{11}$

$y = 10$

$m\angle C = 4y$

$m\angle C = 4(10)$

$m\angle C = 40°$

$m\angle D = 7y + 6$

$m\angle D = 7(10) + 6$

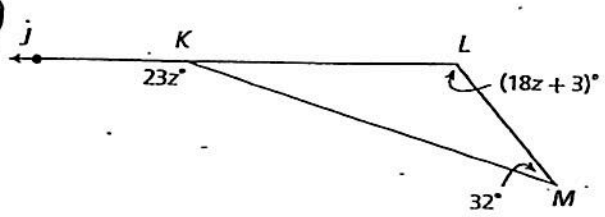
$m\angle D = 70 + 6$

$m\angle D = 76°$

$180 - 116 = 64°$

$m\angle DEC = 64°$

(6)



$m\angle L =$ 129°

$m\angle MKL =$ 19°

$m\angle MKJ =$ 161°

$32 + 18z + 3 = 23z$

$32 + 3 + 18z = 23z$

$35 + 18z = 23z$

$-18z \quad -18z$

$\frac{35}{5} = \frac{5z}{5}$

$z = 7$

$m\angle L = 18z + 3$

$m\angle L = 18(7) + 3$

$m\angle L = 126 + 3$

$m\angle L = 129°$

$32 + 129 = 161$

$180 - 161 = 19$

$m\angle MKL = 19°$

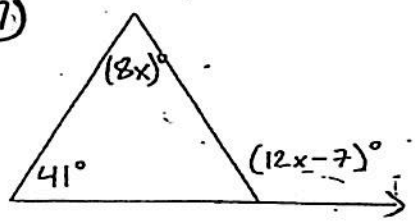
$m\angle MKJ = 23z$

$m\angle MKJ = 23(7)$

$m\angle MKJ = 161$

More Practice: In each triangle below, solve for x

(7)



$41 + 8x = 12x - 7$

$-8x \quad -8x$

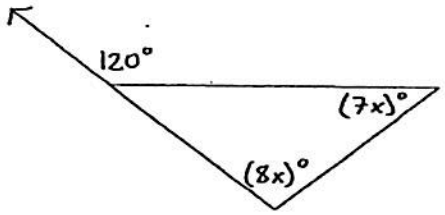
$41 = 4x - 7$

$+7 \quad +7$

$\frac{48}{4} = \frac{4x}{4}$

$x = 12$

(8)



$8x + 7x = 120$

$\frac{15x}{15} = \frac{120}{15}$

$x = 8$