

Geometry

1.

Which sector does NOT have an area of 3π ?

A central angle 135° ; radius $2\sqrt{2}$

B central angle 80° ; radius 3

C central angle 67.5° ; radius 4

D central angle 270° ; diameter 4

$$\begin{aligned} A. \pi r^2 \left(\frac{\theta}{360^\circ} \right) &= \pi (2\sqrt{2})^2 \left(\frac{135}{360} \right) \\ &= \pi (\cancel{8}) \left(\frac{3}{\cancel{8}} \right) \\ &= 3\pi \end{aligned}$$

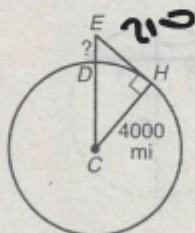
$$B. \pi (3)^2 \left(\frac{80}{360} \right) = 9\pi \left(\frac{2}{9} \right) = 2\pi$$

$$C. \pi (4)^2 \left(\frac{67.5}{360} \right) = 3\pi$$

$$D. \pi (2)^2 \left(\frac{270}{360} \right) = 3\pi$$

2.

A mountain climber is standing at the top of Mount Everest. The distance from the summit to the horizon is about 210 miles. About how high is Mount Everest?



F 5.5 mi

H 210 mi

G 11 mi

J 8000 mi

Using Pythagorean Theorem:

$$x^2 = 210^2 + 4000^2$$

$$x = \sqrt{210^2 + 4000^2}$$

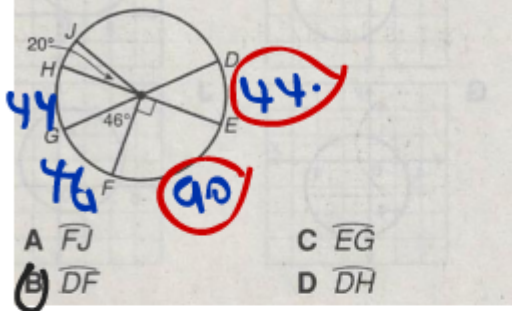
$$\approx 4005.5$$

Therefore, the height of Mount Everest is

$$4005.5 - 4000 = 5.5$$

3.

Which of these arcs has a measure of 134° ?



$$m \widehat{GF} = 46^\circ$$

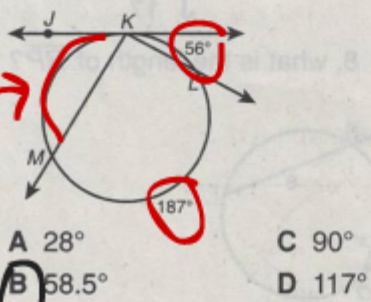
$$m \widehat{FE} = 90^\circ$$

$$m \widehat{HG} = 180^\circ - (46^\circ + 90^\circ) = 44^\circ$$

$$m \widehat{DE} = 44^\circ$$

4. *Note: 56° is the measure of the arc, not the angle.

What is $m\angle JKM$?

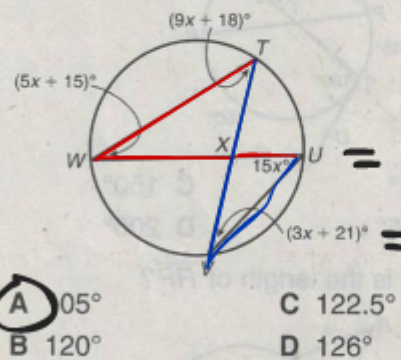


$$360^\circ - (187^\circ + 56^\circ) = 117^\circ$$

$$m\angle JKM = \frac{117^\circ}{2} = 58.5^\circ \quad (\text{inscribed angle})$$

5.

Which is $m\angle VXU$?



$\angle TWU$

$\angle TVU$



is intercepted by both inscribed angles

$$5x + 15 = 3x + 21$$

$$2x + 15 = 21$$

$$m\angle V \times U$$

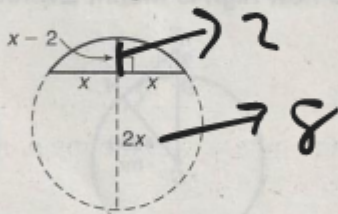
$$= 180^\circ - (45^\circ + 30^\circ)$$

$$2x = 6$$

$$x = 3$$

6.

What is the length of the diameter?



F 5
G 8

H 10
J Not here

$$(x-2)(2x) = (x)(x)$$

$$2x^2 - 4x = x^2$$

$$x^2 - 4x = 0$$

$$x(x-4) = 0$$

$$x = 4$$

7.

Quadrilateral $PQRS$ is inscribed in a circle. The ratio of $m\angle P$ to $m\angle R$ is 2 : 4. What is $m\angle R$?

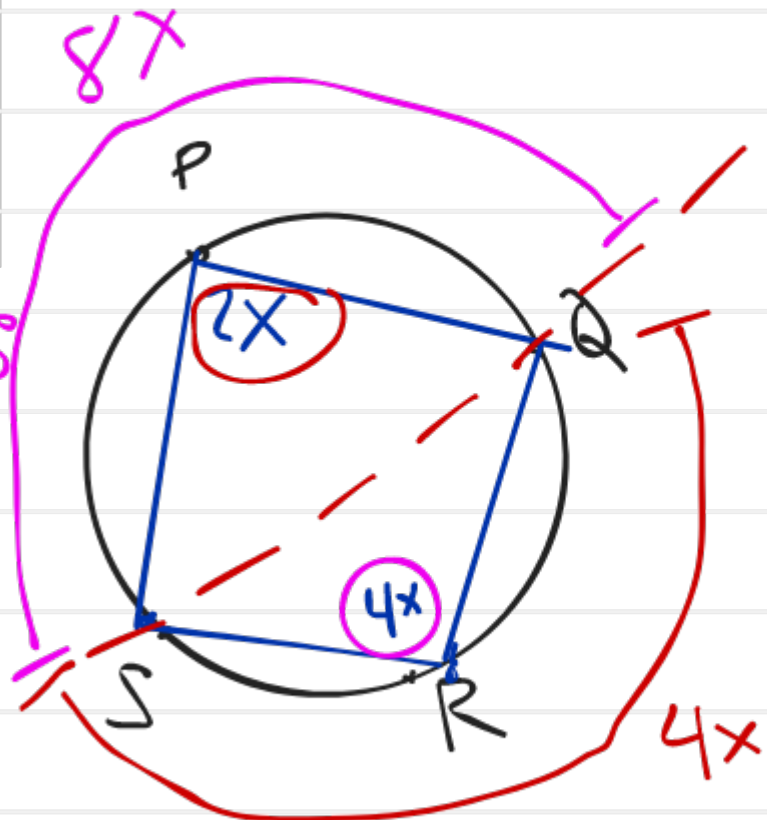
F 30°
G 60°

H 120°
J Not here

$$4x + 8x = 12x = 360^\circ$$

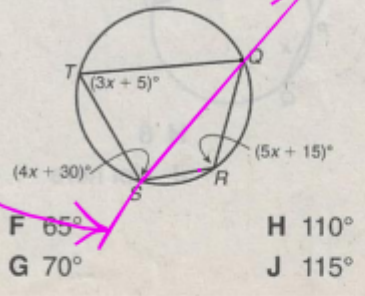
$$x = 30^\circ$$

$$4x = 120^\circ$$



8.

What is $m\angle TQR$?



$10x + 36$

add

$6x + 10$

same

$16x + 40 = 360$

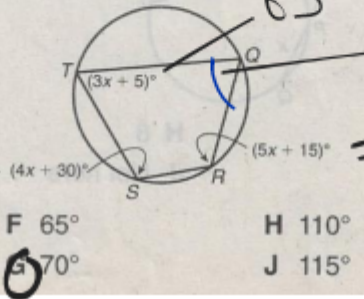
$16x = 320$

$x = 20$

$360 - (110 + 65 + 115) = 70^\circ$

8.

What is $m\angle TQR$?



110°

65°

$= 115^\circ$

F 65°

H 110°

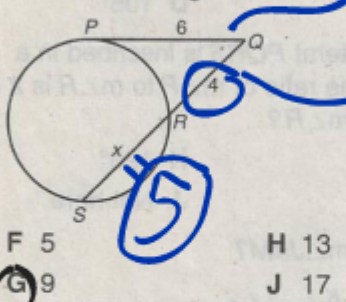
G 70°

J 115°

#9

9.

What is the length of SQ ?



tangent

secant

$6^2 = 4(4 + x)$

$36 = 16 + 4x$

$20 = 4x$

$x = 5$

$SQ = 9$

10.

Which is the equation of a circle that passes through (2, 2) and is centered at (5, 6)?

- A $(x - 6)^2 + (y - 5)^2 = 25$
- B $(x - 5)^2 + (y - 6)^2 = 5$
- C $(x + 5)^2 + (y + 6)^2 = 25$
- D** $(x - 5)^2 + (y - 6)^2 = 25$

(h, k) center
r radius

$$(x-h)^2 + (y-k)^2 = r^2$$

$$(x-5)^2 + (y-6)^2 = 25$$

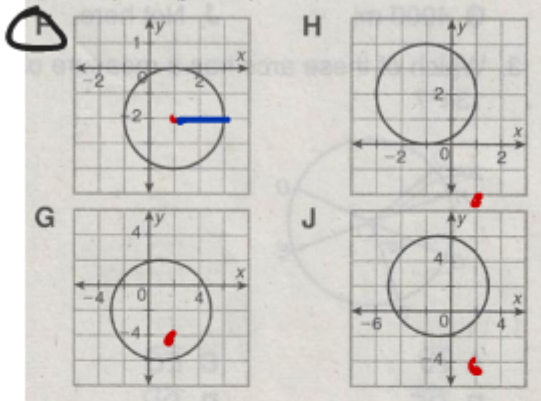
distance between (2,2) and (5,6)

$$\sqrt{(6-2)^2 + (5-2)^2} = \sqrt{16+9} = 5 \text{ (radius)}$$

↑ square it

11.

Which is the graph of $(x - 1)^2 + (y + 2)^2 = 4$?



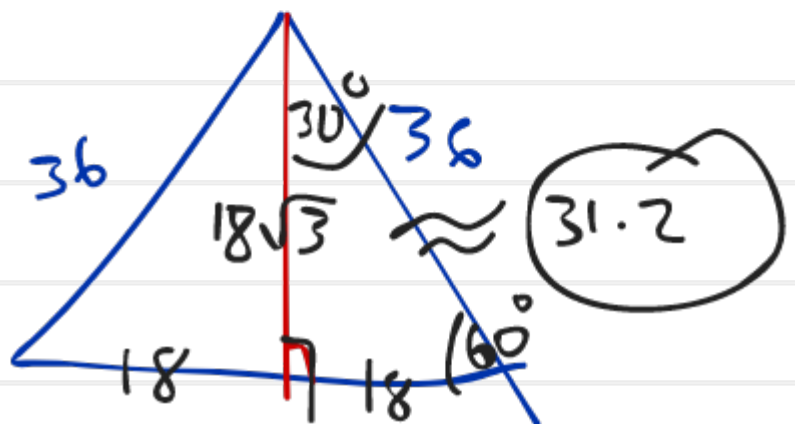
$h = 1, k = -2$
 $(1, -2)$ center

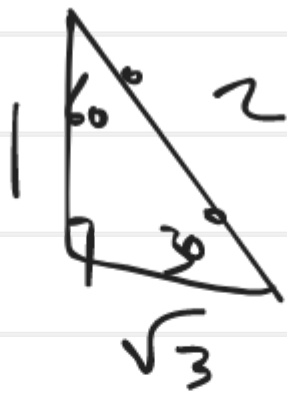
$$r = \sqrt{4} = 2$$

12.

A traffic yield sign is in the shape of an equilateral triangle. If each side is 36 inches, what is the height of the sign to the nearest tenth of an inch?

- F 18.0 in.
- G 20.8 in.
- H 25.5 in.
- J** 31.2 in.





13.

What is the measure of one exterior angle of a regular octagon?

- A 8° C 37.5°
 B 22.5° D 45°

$$\frac{360^\circ}{8} = 45^\circ$$

14.

The vertices of a quadrilateral are $(4, 6)$, $(7, -2)$, $(-1, -5)$, and $(-4, 3)$. Which is the best classification for the quadrilateral?

- A parallelogram C rectangle
 B rhombus D square

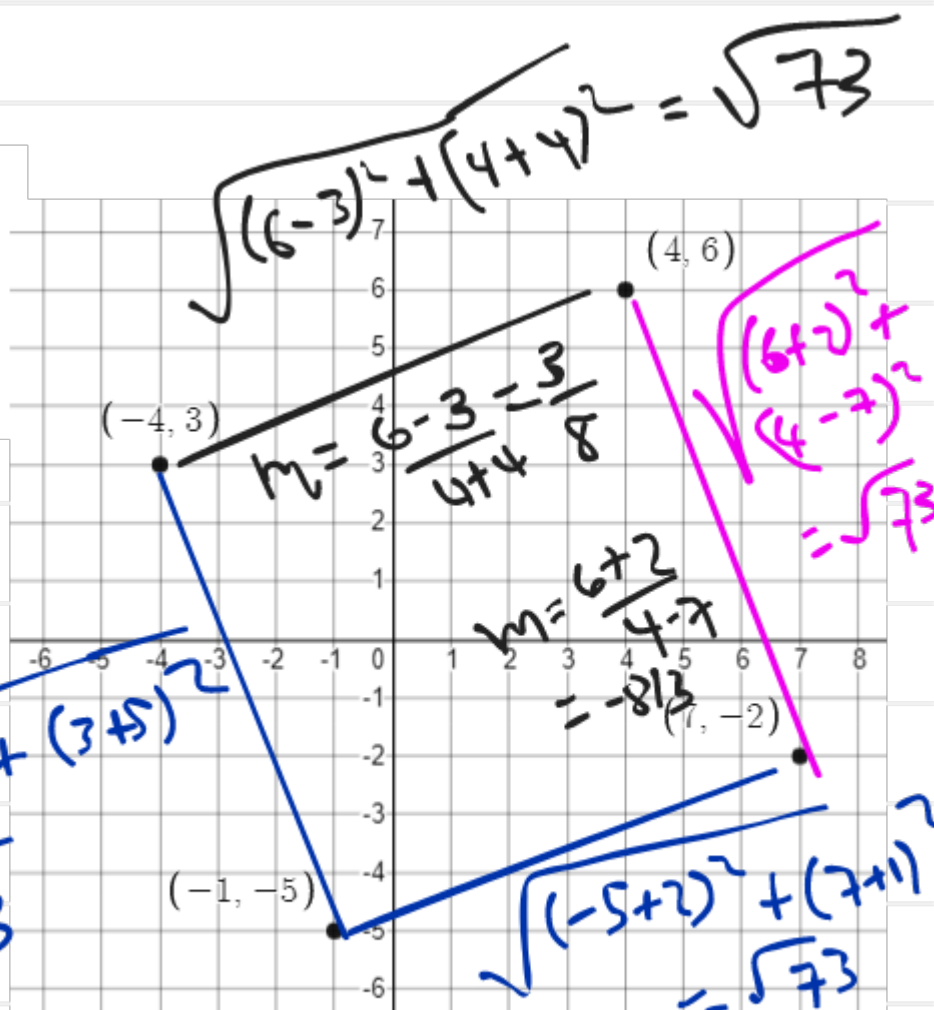
Explanation:

The sides are all equal to $\sqrt{73}$

The angles formed are right angles because two adjacent sides have slopes that are negative reciprocal of each other.

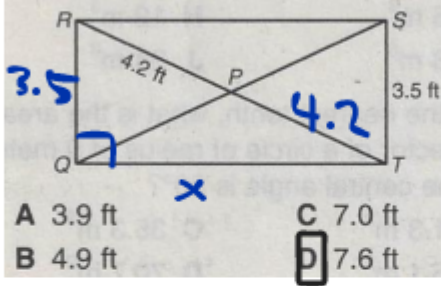
$$\sqrt{(-4+1)^2 + (3+5)^2} = \sqrt{73}$$

$$\sqrt{73}$$



15.

The figure represents a rectangular gate with diagonal braces. To the nearest tenth, what is the width, QT , of the gate?



Use Pythagorean Theorem:

$$3.5^2 + x^2 = 4.2^2$$

$$x = \sqrt{4.2^2 - 3.5^2}$$

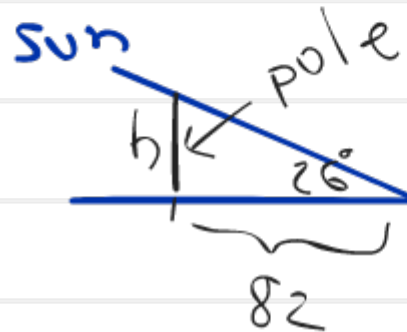
$$\approx 2.6$$

Explanation: Diagonals of a rectangle bisect each other and the diagonal divides the rectangle into two congruent right triangles.

16.

When the angle of elevation to the sun is 26° , a flagpole casts a shadow that is 82 feet long. What is the height of the flagpole to the nearest foot?

- F 36 ft H 74 ft
 G 40 ft J 166 ft



$$\tan 26^\circ = \frac{h}{82}$$

$$h = 82(\tan 26^\circ)$$

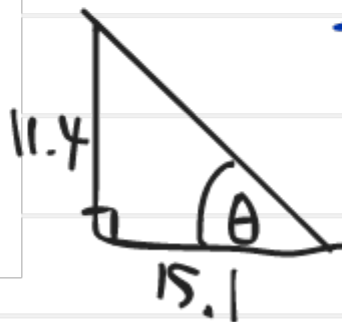
$$= 82(0.4877)$$

$$\approx 40$$

17.

The legs of a right triangle measure 11.4 meters and 15.1 meters. To the nearest tenth, which could be the measure of the smallest angle?

- A 31.1° C 38.6°
 B 37.1° D 52.9°



$$\tan \theta = \frac{11.4}{15.1}$$

$$\tan \theta = 0.755$$

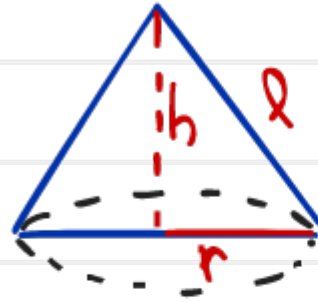
$$\theta = \arctan(0.755)$$

$$\theta = 37.1^\circ$$

18.

To the nearest tenth, what is the surface area of a right cone with a height of 10.1 centimeters and a diameter of 8.8 centimeters?

- A 213.1 cm² C 266.6 cm²
 B 246.0 cm² D 613.6 cm²



slant height,

$$l = \sqrt{h^2 + r^2}$$

$$= \sqrt{10.1^2 + 4.4^2}$$

$$= 11.01681$$

Surface Area, A =

$$\pi r^2 + \pi r l$$

$$= \pi r (r + l)$$

$$= \pi (4.4)(4.4 + 11.01681)$$

$$\approx 213.1$$

19.

A hollow globe of the world is in the shape of a sphere. The diameter of the sphere is 22 inches. To the nearest cubic inch, how much air does the globe hold?

- F 380 in³ H 4181 in³
 G 507 in³ J 5575 in³

$$V = \frac{4}{3} \pi r^3$$

$$= \frac{4}{3} \pi (11^3)$$

$$\approx 5575$$

20.

To the nearest tenth, what is the area of a regular octagon with a perimeter of 32 meters?

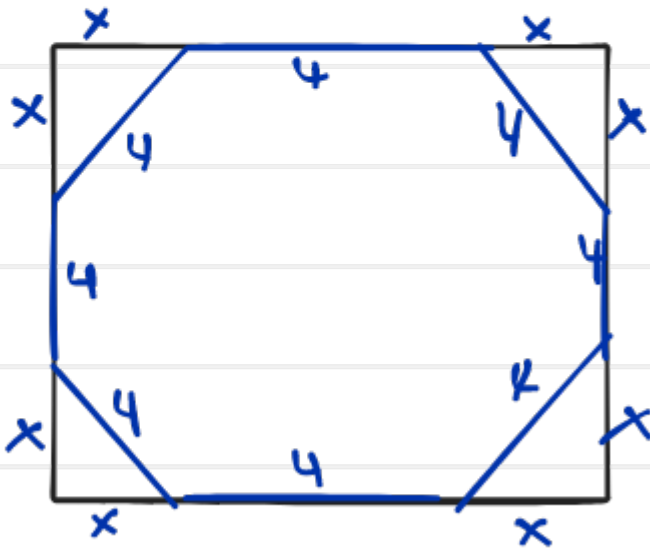
F 77.3 m²

H 180.0 m²

G 154.5 m²

J 1024 m²

Each side of the regular octagon is $32/8 = 4$ m



Note: The entire figure is a square where each side measures $(4 + 2x)$

By Pythagorean Theorem:

$$x^2 + x^2 = 4^2$$

$$2x^2 = 16$$

$$x^2 = 8$$

$$x = 2\sqrt{2}$$

$$\begin{aligned} \text{Area of each small right triangle} &= \frac{1}{2} (\text{base}) (\text{altitude}) \\ &= \frac{1}{2} (2\sqrt{2}) (2\sqrt{2}) \\ &= 4 \end{aligned}$$

Area of regular octagon = (Area of Entire Square) - 4 (Area of each small right triangle)

$$= (4 + 2\sqrt{2})^2 - 4(4)$$

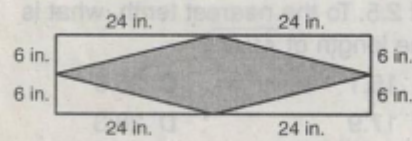
$$= 16 + 32\sqrt{2} + 32 - 16$$

$$= 32\sqrt{2} + 32$$

$$\approx 77.3$$

21.

A rectangular scarf with the design shown is set out to dry. A fly lands on the scarf. What is the probability that it lands in the shaded region?



- F 0.25 H 0.75
 G 0.50 J 0.80

4 small right triangles are formed and the area of each is

$$\begin{aligned}
 A_{\Delta} &= \frac{1}{2} (\text{base}) (\text{altitude}) \\
 &= \frac{1}{2} (24) (6) \\
 &= 72
 \end{aligned}$$

The area of the entire rectangle is

$$\begin{aligned}
 A_{\square} &= (\text{length}) (\text{width}) \\
 &= (24 + 24) (6 + 6) \\
 &= 576
 \end{aligned}$$

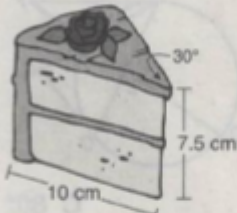
The area of shaded region is

$$\begin{aligned}
 A_{\text{shaded}} &= A_{\square} - 4A_{\Delta} \\
 &= 576 - 4(72) \\
 &= 288
 \end{aligned}$$

$$\text{Probability} = \frac{A_{\text{shaded}}}{A_{\square}} = \frac{288}{576} = 0.5$$

22.

A slice of cake is a sector of a cylinder. To the nearest hundredth, what is the volume of the piece of cake? Use 3.14 for π .



- A 26.17 cm³ C 196.25 cm³
 B 39.25 cm³ D Not here

$$V = \pi r^2 h \left(\frac{\theta}{360^\circ} \right)$$

$$= 3.14 (10^2) (7.5) \left(\frac{30}{360} \right)$$

$$= 196.25$$

23.

The ratio of the angle measures in a triangle is 2 : 5 : 11. What is the measure of the largest angle?

- A 10° C 18°
 B 11° D 110°

$$2x + 5x + 11x = 180$$

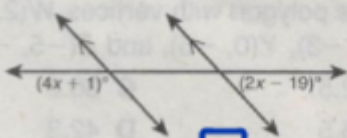
$$18x = 180$$

$$x = 10$$

The largest angle is $11x = 110^\circ$

24.

What is the value of x ?



- F 9.5 H 33
 G 18 J 81

$$(4x + 1) + (2x - 19) = 180$$

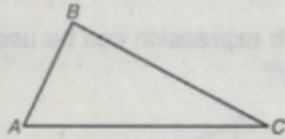
$$6x - 18 = 180$$

$$6x = 198$$

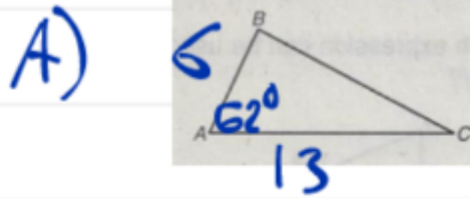
$$x = 33$$

25.

What information makes it possible to find the remaining measures in $\triangle ABC$ using the Law of Sines?



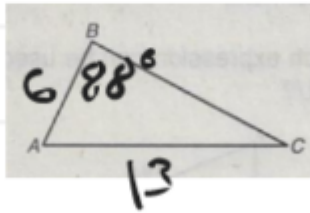
- A $AC = 13, m\angle A = 62^\circ, AB = 6$
- B $AC = 13, m\angle B = 88^\circ, AB = 6$
- C $AC = 13, AB = 6, BC = 11$
- D $m\angle A = 63^\circ, m\angle B = 88^\circ, m\angle C = 29^\circ$



$$\frac{a}{\sin 62^\circ} = \frac{6}{\sin C} = \frac{13}{\sin B}$$

It is not possible to solve for B and C

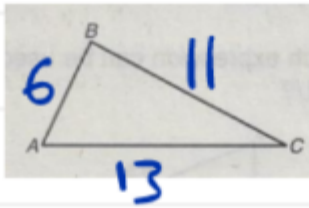
B)



$$\frac{13}{\sin 88^\circ} = \frac{6}{\sin C} = \frac{a}{\sin A}$$

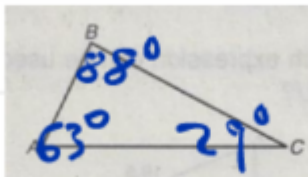
We cannot solve for the angles C and A and the side "a"

C)



We do not know any of the angles so Law of Sine cannot be used

D)

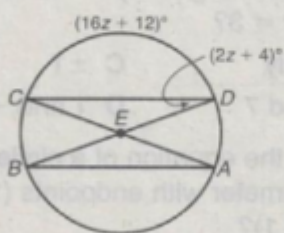


We do not any of the sides so Sine law cannot be used

EXTRA CREDIT:

1.

Which is $m\widehat{BA}$?



- A 80°
- B 120°
- C 128°
- D 140°

$$\begin{aligned} m\widehat{BC} &= 2(2z + 4) \\ &= 4z + 8 \end{aligned}$$

$$(4z + 8) + (16z + 12) = 180$$

$$20z + 20 = 180$$

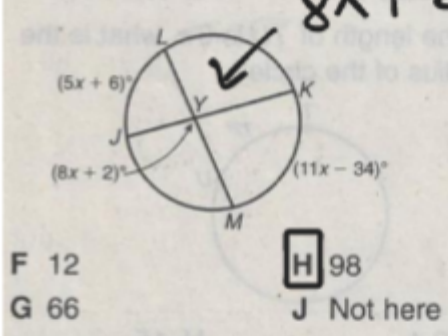
$$20z = 160$$

$$z = 8$$

$$m \widehat{BA} = m \widehat{CD} = 16z + 12 = 16(8) + 12 = 140^\circ$$

2.

What is $m\angle LYK$?



$$(5x+6) + 2(8x+2) + (11x-34) = 360$$

$$32x - 24 = 360$$

$$32x = 384$$

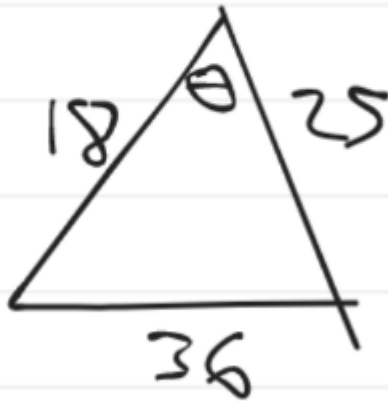
$$x = 12$$

$$m\angle LYK = 8x+2 = 8(12)+2 = 98^\circ$$

3. *Hint: Try the Law of Cosines!

The sides of a triangle measure 18 inches, 25 inches, and 36 inches. To the nearest degree, what is the measure of the largest angle?

- A 113° C 157°
 B 147° D 159°



$$36^2 = 18^2 + 25^2 - 2(18)(25)\cos\theta$$

$$900\cos\theta = -347$$

$$\cos\theta = -0.3856$$

$$\theta = \arccos(-0.3856)$$

$$\theta = 113^\circ$$