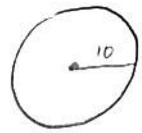
Topic 5: Circles

1. A designer needs to create perfectly circular necklaces. The necklaces each need to have a radius of 10 cm. What is the largest number of necklaces that can be made from 1000 cm of wire?
   1 15
   2 16
   3 31
   4 32



circumference

$C = 2\pi r$

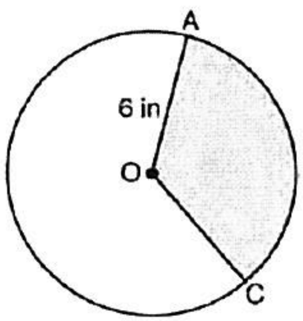
$C = 2\pi(10)$

$C = 62.83185307$

$\frac{1000}{62.8} = 15.9$

only 15 necklaces, not enough for 16

2. In the diagram below of circle O, the area of the shaded sector AOC is 12π in^2 and the length of $\overline{OA}$ is 6 inches. Determine and state $m\angle AOC$.



$A_{sector} = \frac{n}{360} \cdot \pi r^2$

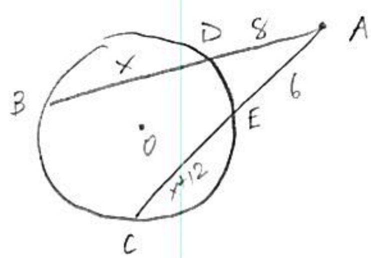
$12\pi = \frac{n}{360} \cdot \pi (6)^2$

$12\cancel{\pi} = \frac{n}{360} \cdot 36\cancel{\pi}$

$\frac{1}{3} = \frac{n}{360}$

$n = 120^\circ$

3. In circle O, secants $\overline{ADB}$ and $\overline{AEC}$ are drawn from external point A such that points D, B, E, and C are on circle O. If $AD = 8$, $AE = 6$, and EC is 12 more than BD, the length of $\overline{BD}$ is
   1 6
   2 22
   3 36
   4 48



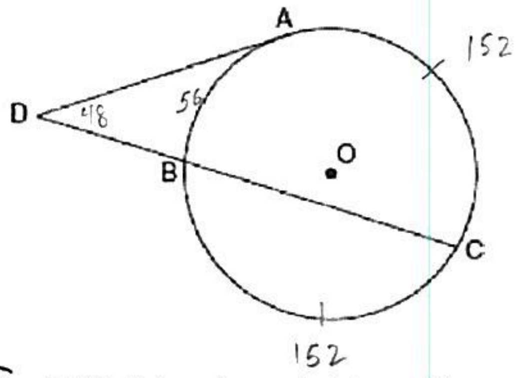
$8(x+8) = 6(x+18)$

$8x + 64 = 6x + 108$

$\frac{2x}{2} = \frac{44}{2}$

$x = 22$

4. In the diagram below, tangent $\overline{DA}$ and secant $\overline{DBC}$ are drawn to circle O from external point D, such that $\overparen{AC} \cong \overparen{BC}$.



If $m\overparen{BC} = 152°$, determine and state $m\angle D$.

$\frac{152-56}{2} = 48$

$\angle D = 48°$

5. The equation of a circle is $x^2 + y^2 - 6y + 1 = 0$. What are the coordinates of the center and the length of the radius of this circle?

1. center $(0,3)$ and radius $= 2\sqrt{2}$
2. center $(0,-3)$ and radius $= 2\sqrt{2}$
3. center $(0,6)$ and radius $= \sqrt{35}$
4. center $(0,-6)$ and radius $= \sqrt{35}$

$x^2 + y^2 - 6y = -1$

$x^2 + y^2 - 6y + 9 = -1 + 9$

$x^2 + (y-3)^2 = 8$

center $(0,3)$

radius $= \sqrt{8}$

$= 2\sqrt{2}$

6. A circle has a center at $(1,-2)$ and radius of 4. Does the point $(3.4, 1.2)$ lie on the circle? Justify your answer.

$(x-1)^2 + (y+2)^2 = 16$

$(3.4-1)^2 + (1.2+2)^2 = 16$

$5.76 + 10.24 = 16$

$16 = 16$

Yes, $(3.4, 1.2)$ lies on the circle because it satisfies the equation of the circle.

Topic 6: 2D & 3D Figures

1. A farmer has 64 feet of fence to enclose a rectangular vegetable garden. Which dimensions would result in the biggest area for this garden?
   1. the length and the width are equal
   2. the length is 2 more than the width
   3. the length is 4 more than the width
   4. the length is 6 more than the width

1. $\frac{64}{4} = 16$

$(16)(16)$

$\boxed{256}$

2. $2w + 2(w+2) = 64$

$2w + 2w + 4 = 64$

$4w = 60$

$w = 15$

$(15)(17)$

255

3. $2w + 2(w+4) = 64$

$2w + 2w + 8 = 64$

$4w = 56$

$w = 14$

$(14)(18)$

252

4. $2w + 2(w+6) = 64$

$2w + 2w + 12 = 64$

$4w = 52$

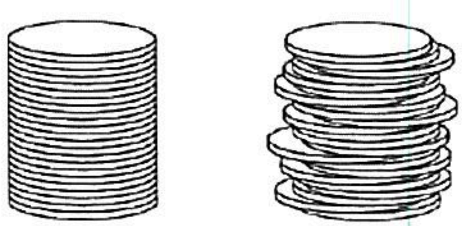
$w = 13$

$(13)(19) = 247$

2. If an equilateral triangle is continuously rotated around one of its medians, which 3-dimensional object is generated?
   1. cone
   2. pyramid
   3. prism
   4. sphere

3. The cross section of a regular pyramid contains the altitude of the pyramid. The shape of this cross section is a
   1. circle
   2. square
   3. triangle
   4. rectangle

4. Two stacks of 23 quarters each are shown below. One stack forms a cylinder but the other stack does not form a cylinder.

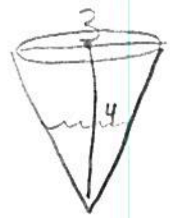


Use Cavelieri's principle to explain why the volumes of these two stacks of quarters are equal.

Since the two stacks of quarters have the same height of 23 quarters and the base areas are the same, the two volumes must be the same.

5. A water cup in the shape of a cone has a height of 4 inches and a maximum diameter of 3 inches. What is the volume of the water in the cup, to the *nearest tenth of a cubic inch*, when the cup is filled to half its height?

1 1.2
2 3.5
3 4.7
4 14.1



$V = \frac{1}{3}\pi r^2 h$

$V = \frac{1}{3}\pi \left(\frac{1.5}{2}\right)^2 \left(\frac{4}{2}\right)$

$V \approx 1.2 \text{ in}^3$

HALF FULL

6. A contractor needs to purchase 500 bricks. The dimensions of each brick are 5.1 cm by 10.2 cm by 20.3 cm, and the density of each brick is 1920 kg/m^3. The maximum capacity of the contractor's trailer is 900 kg. Can the trailer hold the weight of 500 bricks? Justify your answer.

$V = l \cdot w \cdot h$

$V = 5.1 \cdot 10.2 \cdot 20.3$

$V = 1056.006 \text{ cm}^3$

$\times 500 = 528003 \text{ cm}^3$ → $.528003 \text{ m}^3$

$D = \frac{M}{V}$

$1920 \text{ kg/m}^3 = \frac{M}{.528003}$

$M = 1013.76576 \text{ kg}$

No, the weight of the bricks is greater than 900 kg.