04-10-26 MTH 111

I will provide supplementary material about computing values in direct, indirect, and inverse variation.

Elementary College Geometry - 2021 ed. Henry Africk
Chapter 1 - Lines, Angles, and Triangles
1.6 Triangle Classifications, p. 62: 1, 3, 9

Chapter 6 - Area and Perimeter
6.1 The Area of a Rectangle and Square, p.213: 1, 4, 7, 15, 21

6.3 The Area of a Triangle, p. 225: 1, 7, 21

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Chapter 7 - Regular Polygons and Circles
7.1 Regular Polygons, p. 245: 1, 7, 9

7.2: Circles, p. 255: 1, 3
7.4 Degrees in an Arc, p. 277: 1. 5

7.5: Circumference of a Circle, p. 289: 1, 5, 7, 9, 10

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7.1
memorize

A **regular polygon** is a polygon in which all sides are equal and all angles are equal. Examples of a regular polygon are the equilateral triangle (3 sides), the square (4 sides), the regular pentagon (5 sides) and the regular hexagon (6 sides). The angles of a regular polygon can easily be found using the methods of section 1.5.

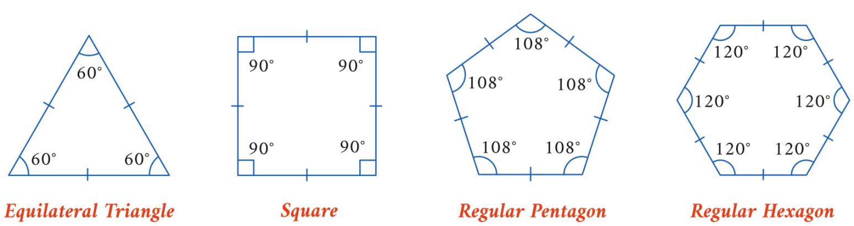



*Figure 1*. Examples of regular polygons.

supplied

**THEOREM 2**

The radii of a regular polygon divide the polygon into congruent isosceles triangles. All the radii are equal.

A line segment drawn from the center perpendicular to the sides of a regular polygon is called an **apothem**. (see Figure 6).

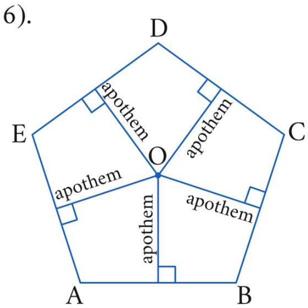



*Figure 6*. The apothems of a regular pentagon.

supplied

## THEOREM 3

The apothems of a regular polygon are all equal. They bisect the sides of the regular polygon.

Supplied

## THEOREM 4

The area of a regular polygon is one-half the product of the apothem and the perimeter.

$$\boxed{A = \frac{1}{2}aP}$$

Supplied

## THEOREM 5

The perimeter of a regular polygon of $n$ sides with radius $r$ is given by the formula

$$\boxed{P = 2rn \sin \frac{180^\circ}{n}}.$$

7.2

Memorize

A **circle** is a figure consisting of all points in the plane which are a given distance from a fixed point called the **center**. For example the circle in Figure 2 consists of all points which are a distance of 3 from the center O. The **radius** is the distance of any point on the circle from the center.

Memorize

A circle is usually named for its center. The circle in Figure 2 is called **circle O**.
A **chord** is a line segment joining two points on a circle. In Figure 2, DE is a chord. A **diameter** is a chord which passes through the center. BC is a diameter. A diameter is always twice the length of a radius since it consists of two radii. Any diameter of circle O is equal to 6. All diameters of a circle are equal.

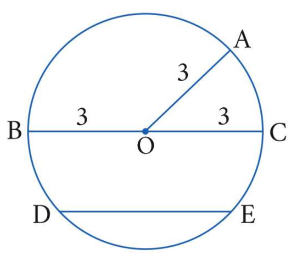
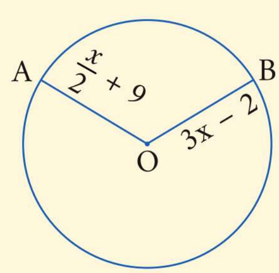
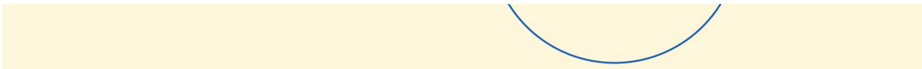



*Figure 2*. A circle with radius 3.

## ? EXAMPLE A

Find the radius and diameter:





All radii of a given circle are equal

$$\Rightarrow \frac{x}{2} + 9 = 3x - 2$$

solve equation for $x$

$$\left(\frac{x}{2}\right)(2) + (9)(2) = (3x)(2) - 2(2)$$

$$x + 18 = 6x - 4$$

$$22 = 5x$$

$$\boxed{x = \frac{22}{5}}$$

$$\text{radius} = 3\left(\frac{22}{5}\right) - 2$$

$$= \frac{66}{5} - 2$$

$$= \frac{66}{5} - \frac{10}{5}$$

$$= \frac{56}{5}$$

$$5 \overline{)\,56.0\,} = 11.2$$

$$\boxed{\begin{array}{l} \text{radius} = 11.2 \\ \text{diameter} = 2(11.2) = 22.4 \end{array}}$$

Supplied

**THEOREM 1**

A diameter perpendicular to a chord bisects the chord.

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Your Name MTH 111 bonus quiz 2 write each problem

1. What is a solution of an equation? Answer in a sentence.

   A solution of an equation is the value, or values, of the variable(s) that make the equation true.

2. Write "the product of twice a number is the quotient of that number and 5." in mathematical symbols.

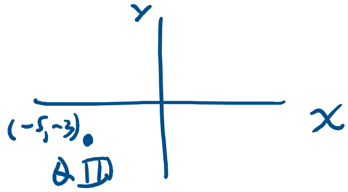
   Let $n$ = the number

   $$2n = \frac{n}{5}$$

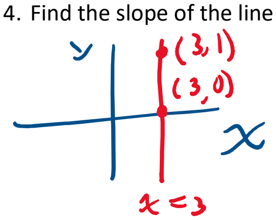
Let $n$ = the number

$$2n = \frac{n}{5}$$

3. Plot the point $(-5, -3)$ in the rectangular coordinate system and identify its quadrant.




4. Find the slope of the line $x = 3$ and graph the line.




slope $= \frac{1-0}{3-3} = \frac{1}{0}$ not defined

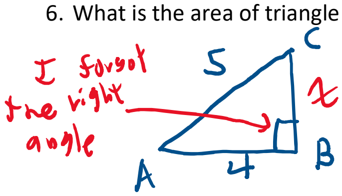
5. How many meters are in 1 centimeter?

$$100 \text{ cm} = 1 \text{ m}$$

$$\frac{100 \text{ cm}}{100} = \frac{1 \text{ m}}{100}$$

$$1 \text{ cm} = \left(\frac{1}{100}\right) \text{m} = 0.01 \text{ m}$$

6. What is the area of triangle ABC?




Let $x$ = 3rd side of $\triangle ABC$

$$x = \sqrt{5^2 - 4^2} = \sqrt{25-16} = \sqrt{9}$$

$$\boxed{x = 3}$$

area of $\triangle ABC = \left(\frac{1}{2}\right)(3)(4) = 6$

7.

> To convert from Fahrenheit temperature, F, to Celsius temperature, C, use the formula
> $C = \frac{5}{9}(F - 32)$.

Find a formula that converts C to F, that is, write F as an expression involving C.

$$9C = 5(F - 32)$$

$$\frac{9C}{5} = F - 32$$

$$\frac{9C}{5} + 32 = F$$

$$\boxed{F = \frac{9C}{5} + 32}$$

$$F(0) = \frac{9(0)}{5} + 32$$

$$= 0 + 32$$

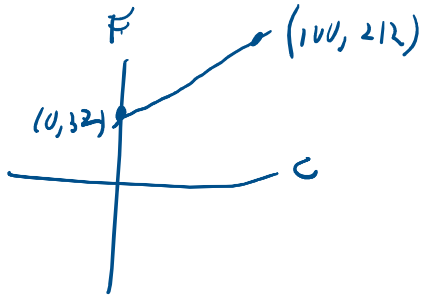
Assume linear relation

$F(0) = \frac{9(0)}{5} + 32$ Assume linear relation

$= 0 + 32$

$= 32$

| C | F |
|---|---|
| 0 | 32 |
| 100 | 212 |




$F = aC + b$

$a$ = slope

$b$ = F-intercept

$\boxed{b = 32}$

$a = \frac{212 - 32}{100 - 0}$

$a = \frac{180}{100} = \frac{90}{50} = \frac{9}{5}$

$$\boxed{F = \frac{9C}{5} + 32}$$

7.4

Memorize

An **arc** is a part of the circle included between two points. The symbol for the arc included between points A and B is $\overset{\frown}{AB}$. In Figure 1 there are two arcs determined by A and B. The shorter one is called the **minor arc** and the longer one is called the **major arc.** Unless otherwise indicated, $\overset{\frown}{AB}$ will always refer to the minor arc. In Figure 1 we might also write $\overset{\frown}{ACB}$ instead of $\overset{\frown}{AB}$ to indicate the major arc.

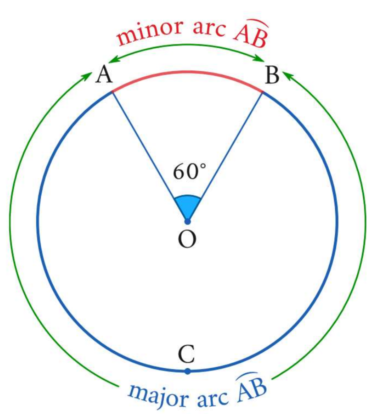



*Figure 1*. There are two arcs determined by A and B, the minor are and the major arc.

Memorize

A **central angle** is an angle whose vertex is the center of the circle and whose sides are radii. In Figure 1, ∠AOB is a central angle. ∠AOB is said to **intercept** arc $\overset{\frown}{AB}$.

7.5

Memorize

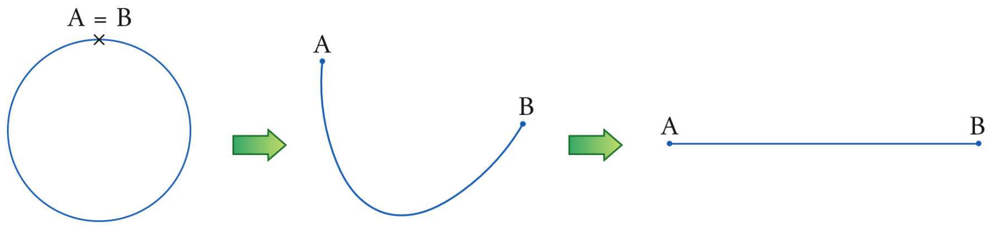



*Figure 1.* The circumference of a circle is the length of the line obtained by cutting the circle and straightening out the curves.

define $\pi = \dfrac{\text{circumference}}{\text{diameter}}$

$$\pi = \frac{\text{circumference}}{(2)\,\text{radius}} = \frac{C}{2r}$$

$$\Rightarrow \boxed{C = 2\pi r}$$ memorize

Memorize

$$L = \text{Arc length} = \frac{\overbrace{\text{Degrees in Arc}}^{D}}{360^\circ} \cdot \text{Circumference}$$

or simply

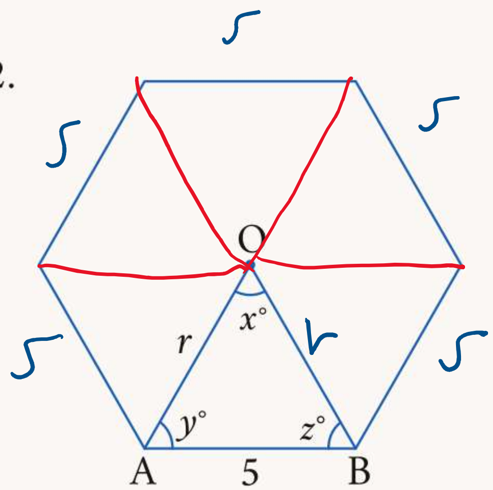
$$\boxed{L = \frac{D}{360^\circ} \cdot C}.$$

$$L = \frac{D}{360^\circ}(2\pi r)$$

$$\frac{\text{Arc length}}{\text{circumference}} = \frac{\text{central angle}}{360^\circ}$$

1 - 6. Find the angles x°, y°, z° and radius r of the regular polygons:

2.




$$x + y + z = 180^\circ$$

$$6x = 360^\circ$$

$$x = \frac{360^\circ}{6}$$

$$\boxed{x = 60^\circ}$$

$$y = z$$

$$x + y + y = 180^\circ$$

$$60^\circ + 2y = 180^\circ$$

$$2y = 120^\circ$$

$$\boxed{y = 60^\circ}$$

$$\boxed{z = 60^\circ}$$

equal angles $\Rightarrow$ equal sides

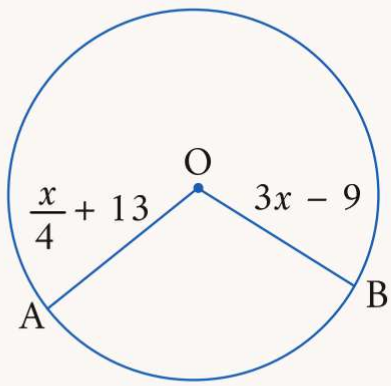
equal angles $\Rightarrow$ equal sides

$\therefore \boxed{r = 5}$

7.2

1 - 2. Find the radius and diameter:

2.




Let $r$ = radius

Let $D$ = diameter

radii are equal

$$\Rightarrow \frac{x}{4} + 13 = 3x - 9$$

$$3x - \frac{x}{4} = 13 + 9$$

$$\frac{(3x)(4)}{4} - \frac{x}{4} = 22$$

$$\frac{12x - x}{4} = 22$$

$$\frac{11x}{4} = 22$$

$$x = \left(\frac{4}{11}\right)(22)$$

$$x = (4)(2)$$

$$\boxed{x = 8}$$

$$\boxed{x = 8}$$

$$r = 3(8) - 9 = 24 - 9 = \boxed{15}$$

$$D = 2r = 2(15) = \boxed{30}$$

$\boxed{x = 8}$