Angle Definitions

- **Angle** – how we measure the amount of the opening between the two lines
  - The basic unit we attach to an angle is degrees (°)
  - We also use minutes (') and seconds (") to break down degrees more accurately in Trigonometry
  - Vertex – where two lines meet and form an angle

- **Basic Angles**
  - A full circle is ______°.
  - A straight line is ____°.
  - A perfect vertical line and horizontal line makes a ___° angle.

- **Types of Angles**
  - Acute – the angle is between 0° and 90°
  - Right – the angle is exactly 90°
  - Obtuse – the angle is between 90° and 180°
  - Angles of a triangle – add up to ____°

- **Example**: Find the missing angle:

- **Example**: A bolt hole circle has eight circles. How far apart are the holes, in degrees?

Angle Relationships

- **Vertical angles** – the opposite angles of two intersecting lines
  - The two vertical angles formed are always equal
  - Example: Find angles m, n, and p

- **Parallel Lines** – two lines that never cross

- **Transversal** – a line that crosses two parallel lines
  - The corresponding angles formed are equal
  - Example: Fill in all missing angles
Try Yourself

- Find the missing angles
- The vertical and horizontal lines are perpendicular

Polygons

- Polygon – a shape with at least three straight sides
- The different things that we calculate for two-dimensional polygons are:
  - Perimeter
  - Area

  What does it mean to calculate each of these? Give examples of when you would do each.

  See the formula sheet to look at the different shapes we will calculate Perimeter, Area, Surface Area, and Volume for.

Rectangles

- Example: Find the perimeter and area

Try Yourself

- Example: Find the perimeter (in ft and in) and area (in square feet).

Try Yourself

- Example: You want to pave your driveway that is currently gravel. One company tells you that they charge $45/square yard. Your driveway is sixty feet long and fifteen feet wide. What would the cost be?
Trapezoid

- Example: Find the perimeter and area

\[ \text{Perimeter} = 3 + 2.75 + 3 + 4.25 = 12.25 \text{ ft} \]
\[ \text{Area} = \frac{(3 + 2.75) \times 3}{2} = 8.0625 \text{ ft}^2 \]

Try Yourself - Parallelogram

- See Formula Sheet
- Example: Find the perimeter and area

\[ \text{Perimeter} = 12 + 25 + 30 = 67 \text{ in} \]
\[ \text{Area} = 12 \times 25 = 300 \text{ in}^2 \]

Pythagorean Theorem

- Used to find the third side of a right triangle if we know two of the sides.
- Notice that \( c \) must be the hypotenuse.
- Pythagorean Theorem: \( a^2 + b^2 = c^2 \)
- Example: Find the missing side

\[ 4^2 + 12^2 = c^2 \]
\[ c = \sqrt{16 + 144} = \sqrt{160} = 12.65 \]

Try Yourself

- Example: Find the missing dimension to the nearest 16\( ^{th} \) of an inch

\[ 4 \frac{2}{3} + \frac{1}{4} = 4 \frac{11}{12} \]

Try Yourself

- The following cross brace needs to be made. Find the total length of bar needed to make this piece.

\[ 14.875 \text{ in} \]
Example: Find the perimeter and area

7 in
13 in
9 in

Isosceles Triangle
- two sides are equal

Example: Find the perimeter and area

6 ft
2 ft
6 ft

Equilateral Triangle
- all three sides are equal

Example: Find the perimeter and area

3 \text{ in}
1 1/4 \text{ in}
3 \text{ in}
1 1/4 \text{ in}
3 \text{ in}
1 1/4 \text{ in}

Find the total length of weld needed to go around the sheet of metal. Also calculate the area

65 mm
65 mm
20 mm

The supports under a bridge are shown below. If the sheets weigh 14.8 lb/sq ft, how much does each piece weigh?

5' 3"
1' 6"

Regular Hexagons
- a polygon with six equal sides
  - a is the length of a side
  - d is the distance from opposite corners
  - f is the shortest distance across opposite sides
Regular Hexagons

- Example: Find the side of the hexagon and find the area.

Try Yourself

- Example: You are asked to make a road sign in the shape of a regular hexagon. They should have a maximum width of 2 ft 3 in. Find the length of each side and find the area of the sign.

Irregular Polygons

- Find the area of the sheet of metal.

Irregular Polygons

- Find the area of the shaded part:

Application Problem

- The following figure needs to be cut from an originally rectangular sheet of metal that is $16 \frac{5}{16}$ by $8 \frac{5}{16}$. Determine the original area and the area once the triangular parts have been cut and removed.
Try Yourself

› Determine the perimeter and area of the following sheet of metal in order to determine costs of materials related to the job.

Try Yourself

› Find the perimeter and area of the figure below.

Circles

› Find the π button on your calculator. What is π?

› Examples: Convert to the decimal form to the nearest thousandth:
  - \( \pi = \)
  - \( 2\pi = \)
  - \( 0.57\pi = \)

› Circles: \( r \) is the radius, \( d \) is the diameter
  - Area: \( A = \pi r^2 \)
  - Circumference (Perimeter): \( C = \pi d = 2\pi r \)

Try Yourself

› Find the area and circumference of the circle:

Irregular Shapes with Circles

› Find the area and perimeter of the figure with the semicircles removed from a rectangular sheet of metal.
Try Yourself

Find the area of the shaded figure: (Ø is diameter)

Length of Stock

Measure from the middle of the piece. This gives the mean (average) diameter or mean radius.

Example: Find the original length of stock needed to have bend a ½” diameter round stock to have an inner diameter of 6” and bent 180°.

Try Yourself

Find the length of stock in the figure below, including the vertical and horizontal parts at the ends: