Happy International Artist Day!

- Park your phones
- Grab your calculators
- Start the warm up
Area of a \( \triangle \)

1. **Heron's Formula**
   \[
   A = \sqrt{s(s-a)(s-b)(s-c)}
   \]
   \( s \) = semiperimeter
   \( a, b, c \) are sides

2. \( A = \frac{1}{2} b \cdot h \) or \( A = \frac{b \cdot h}{2} \)
   base = \( b \)
   height = \( h \) \( \geq \) make 90° angle

3. \( A = \frac{1}{2} a b \sin C \)
   \( a, b \) are sides and \( C \) angle
   "SAS" \( \text{in between } a \text{ and } b \)
Area of Triangle Warmup

Find the area of the triangle

1) **Heron's Formula**
   \[ A = \sqrt{s(s-a)(s-b)(s-c)} \]
   \[ s = \frac{a+b+c}{2} = 14.5 \]
   \[ A = 36 \text{ km}^2 \]

2) **Trigonometric Area Formula**
   \[ \text{Area} = \frac{1}{2}ab \sin(C) \]
   \[ A = 45.77 \text{ m}^2 \]

3) \[ A = \frac{1}{2}bh \]
   \[ A = \frac{1}{2} \cdot 7 \cdot 16 \]
   \[ A = 56 \text{ m}^2 \]
Right Triangle Trigonometry Warm-up

1) \[ \sin 40^\circ = \frac{R}{25} \]
   \[ 25 \cdot \sin 40^\circ = R \]
   \[ 16.07 = R \]
   \[ \cos 40^\circ = \frac{S}{25} \]
   \[ 25 \cdot \cos 40^\circ = S \]
   \[ 19.15 = S \]

2) \[ \sin 36.2^\circ = \frac{88}{T} \]
   \[ T \cdot \sin 36.2^\circ = 88 \]
   \[ T = \frac{88}{\sin 36.2^\circ} \]
   \[ T = 149 \]
   \[ \cos 36.2^\circ = \frac{U}{88} \]
   \[ U = \frac{88}{\cos 36.2^\circ} \]
   \[ U = 120.24 \]

3) \[ \alpha = 53.8^\circ \]

4) \[ 25^2 - 7^2 = x^2 \]
   \[ x = 24 \]

\[ \alpha = 38.1^\circ \]
\[ V = 190.61 \]
\[ W = 117.62 \]
\[ \tan 51.9^\circ = \frac{180}{W} \]

\[ \theta = \cos^{-1} \left( \frac{2}{3} \right) \]
\[ \theta = 73.74^\circ \]
\[ \sin \theta = \frac{2}{3} \]
\[ \theta = \sin^{-1} \left( \frac{2}{3} \right) \]
\[ \theta = 41.81^\circ \]
Right Triangle Trigonometry Warm-up

Solving Right Triangles Practice

Use a trigonometric function to find the value of $x$. Round to the nearest tenth.

6. \[ \text{\text{Diagram with angle 30\degree and side 8}} \]
7. \[ \text{\text{Diagram with angle 80\degree}} \]
8. \[ \text{\text{Diagram with angle 22\degree and side 10}} \]

9. \[ \text{\text{Diagram with angle 60\degree and side 5}} \]
10. \[ \text{\text{Diagram with angle 51\degree and side 8}} \]
11. \[ \text{\text{Diagram with angle 63\degree and side x}} \]

Find the value of $x$. Round to the nearest tenth.

12. \[ \text{\text{Diagram with side 5 and 4}} \]
13. \[ \text{\text{Diagram with side 7 and 13}} \]
14. \[ \text{\text{Diagram with side 15 and 2}} \]

Use a trigonometric function to find each value of $x$. Round to the nearest tenth if necessary.

7. \[ \text{\text{Diagram with angle 30\degree and side 7}} \]
8. \[ \text{\text{Diagram with angle 20\degree and side 32}} \]
9. \[ \text{\text{Diagram with angle 40\degree and side 17}} \]

Use trigonometric functions to find the values of $x$ and $y$. Round to the nearest tenth if necessary.

10. \[ \text{\text{Diagram with angle 41\degree and sides 28 and y}}} \]
11. \[ \text{\text{Diagram with angle 19.2 and sides 17 and x}}} \]
12. \[ \text{\text{Diagram with sides 7, 15.3, and y}}} \]
The Law of Sines

An oblique triangle is a triangle that does not contain a right angle.

\[ \frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c} \]

Law of Sines: In any triangle ABC: \( \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C} \)

Ratio \Rightarrow \text{proportions}

Law of Sines can be used when given AAS, ASA, or SSA

Right \( \Delta \)’s vs. Oblique \( \Delta \)’s

- Sides: Pythagorean Thm
- SohCahToa
- Angles: Triangle Sum
- Inverse SohCahToa

- Sides: Law of Sines
- Angles: Triangle Sum
- Inverse Law of Sines

\*If it’s a right \( \Delta \) use SohCahToa
**Example 1:** If $B = 20^\circ$, $C = 31^\circ$, and $b = 210$, solve the triangle.

\[
\frac{a}{\sin 20^\circ} = \frac{b}{\sin 129^\circ} = \frac{c}{\sin 31^\circ}
\]

\[
A = 180^\circ - 20^\circ - 31^\circ = 129^\circ
\]

\[
a = \frac{210 \cdot \sin 31^\circ}{\sin 20^\circ} = 316.23
\]

\[
c = \frac{210 \cdot \sin 129^\circ}{\sin 20^\circ}
\]

**Example 2:** Solve triangle ABC, if $A = 63^\circ$, $B = 49^\circ$, and $c = 78$

\[
\frac{78}{\sin 68^\circ} = \frac{a}{\sin 63^\circ} = \frac{b}{\sin 49^\circ}
\]

\[
a = \frac{78 \cdot \sin 63^\circ}{\sin 68^\circ} = 74.96
\]

\[
b = \frac{78 \cdot \sin 49^\circ}{\sin 68^\circ}
\]

**Example 3:** Solve the triangle. $A = 10^\circ$, $C = 60^\circ$, and $b = 14$

\[
\frac{14}{\sin 110^\circ} = \frac{a}{\sin 10^\circ} = \frac{c}{\sin 60^\circ}
\]

\[
B = 110^\circ
\]

\[
c = 12.9
\]

\[
a = 2.59
\]
Find each measurement indicated. Round your answers to the nearest tenth.

1) Find BC

2) Find AB

3) Find \( m \angle K \)

4) Find \( m \angle R \)

5) Find AB

6) Find \( m \angle B \)
Solve each triangle. Round your answers to the nearest tenth.

7) In \( \triangle RST \), \( m \angle S = 44^\circ \), \( m \angle T = 97^\circ \), \( s = 21 \)

8) In \( \triangle QRP \), \( m \angle Q = 118^\circ \), \( p = 18 \), \( q = 30 \)

9) In \( \triangle EFD \), \( m \angle D = 75^\circ \), \( d = 30 \), \( f = 7 \)

10) In \( \triangle YZX \), \( m \angle Z = 24^\circ \), \( m \angle X = 97^\circ \), \( y = 19 \)