Inclement Weather Packet
Trigonometry/Precalculus
1st Semester 2018

Attached you will find the material for inclement weather days that will help you to continue learning and to gain knowledge rather than forgetting information we have covered. All material covered by the Trig Inclement Weather Day Packet has been taught and practiced in class and is review work. The lessons are labelled as **Day # 1 – Day # 5**. You are to **complete one day's assignment for each inclement weather day or "Snow and Go Day" school is closed** (up to 5 days). **All work is to be returned upon returning to school.**

Your teacher will be available to provide assistance via **LiveGrades and/or email.** You can contact me for help at the following:

Mrs. Bledsoe – mbledsoe@k12.wv.us

Additional help may be obtained through online searches, Kahn Academy, You Tube, etc...

These assignments will be recorded grades.

Mrs. Bledsoe - Trig 2018 Emergency School Cancellation Packet

Worksheet 2.8 Introduction to Trigonometry

Day 1

Section 1 Introduction to Plane Geometry

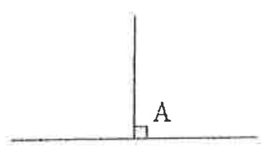
Examples

When two lines cross each other to make four angles all exactly the same, we call these two lines perpendicular. The angle between each of the lines is 90 deg or $\frac{\pi}{2}$ radians. We also can call an angle of $\frac{\pi}{2}$ radians a right angle, and it would be indicated on a picture by a small square in the angle.

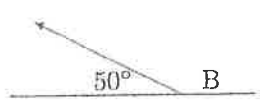
Two lines are parallel if it is possible to draw a line which is perpendicular to both lines. An arrow sitting on both lines in a diagram indicates that they are parallel.

A line forms what is called a straight angle. It is the same as if we were facing one direction, and then did an about face. We have moved through 180 deg, or π radians. To change directions on a line we must do the same thing: move through 180 deg. When we do a full turn or revolution on the plane, we move through 360 deg or 2π radians. So a straight angle is π radians and a full turn is 2π radians.

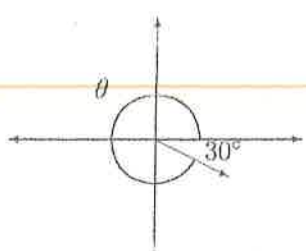
Example 1 : Angle A is a right angle.



Example 2 : Angle B is given by $B = 180° - 50° = 130°$.

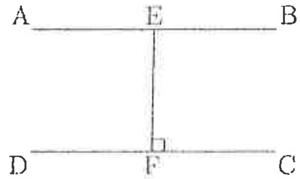


Example 3 : What is θ?



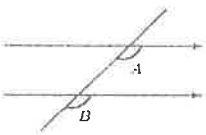
$\theta = 360° - 30°$

Example 4 : If CD and AB are parallel, and EFC is a right angle, what is FEB?

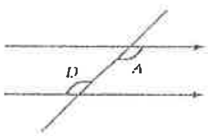


EFC is a right angle also.

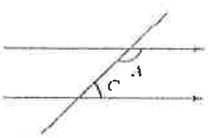
When pairs of parallel lines are both cut by another straight line, the various angles formed have some properties.



Angles A and B are called corresponding angles and are equal.



A and D are called alternate angles and are also equal.

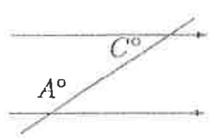


A and C are called co-interior angles and are supplementary, which means that $A + C = 180°$.

Example 5 : What is angle C?

C is 100°.

Example 6 : What is angle A, if $C° = 45°$?



$$\begin{aligned} A &= 180° - 45° \\ &= 135° \end{aligned}$$

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| Day 1 |

Exercises:

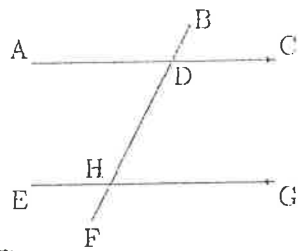
1. Name the following pairs of angles:

    (a) $\angle ADF$ and $\angle DHG$

    (b) $\angle BDC$ and $\angle DHG$

    (c) $\angle ADH$ and $\angle DHE$

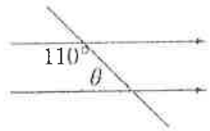
    (d) $\angle BDA$ and $\angle DHE$



2. Find the value of θ in each of the following:

(a)

(c)



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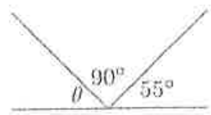
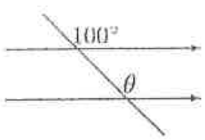


(b)



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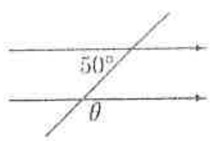

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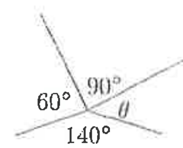

Write Answers :

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Therefore $1^\circ = \frac{\pi}{180}$ radians. So

$$60^\circ = 60 \times \frac{\pi}{180} = \frac{\pi}{3} \text{ radians}$$

A similar argument is used to convert radians to degrees.

$$\begin{aligned} \pi \text{ radians} &= 180^\circ \\ 1 \text{ radian} &= \frac{180^\circ}{\pi} \end{aligned}$$

Therefore, if we want to find out how many degrees there are in $\frac{\pi}{4}$ radians, we calculate as follows:

$$\frac{\pi}{4} \text{ radians} = \frac{\pi}{4} \times \frac{180^\circ}{\pi} = 45^\circ$$

Exercises:

1. Convert the following angles in degrees to radians; write the answers in terms of π.

   (a) 60° (b) 90° (c) 120° (d) 45° (e) 100° (f) 360° (g) 240° (h) 80° (i) 300°

2. Convert the following angles in degrees to radians; write the answers to 2 decimal places.

   (a) 30° (b) 40° (c) 90° (d) 100° (e) 45° (f) 160° (g) 240° (h) 600° (i) 300°

3. Convert the following angles in radians to angles in degrees:

   (a) $\frac{\pi}{2}$ (b) $\frac{\pi}{6}$ (c) $\frac{\pi}{8}$ (d) 2.5 (e) $\frac{\pi}{7}$ (f) $\frac{\pi}{12}$ (g) $\frac{2\pi}{3}$ (h) $\frac{3\pi}{2}$ (i) $\frac{5\pi}{6}$

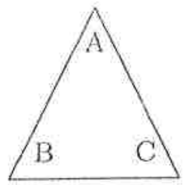
 Day 2

Day 2

Section 2 TRIANGLES

A triangle has three sides, which are normally denoted with lower-case letters and the opposite angle denoted by the corresponding capital letter. A triangle is often described by its three vertices. The interior angles of a triangle add up to 180 deg = π radians. Thus, given two angles in a triangle, we can work out the third angle. If one of the angles in a triangle is a right angle, it is a right-angled triangle.

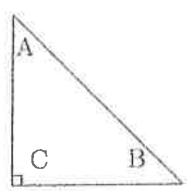
Example 1 : If angle A is 60°, and angle B is also 60°, what is angle C?



$$C = 180° - 60° - 60° = 120° - 60° = 60°$$

The triangle ABC in the above example is a special triangle called an equilateral triangle. Any triangle with three equal angles is an equilateral triangle. All the angles must be 60°. The sides, also, have an equal length.

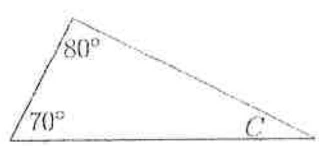
Example 2 : If angle A is 45°, what is angle B?



Since C is a right angle, we know that $C = 90°$. Therefore $B = 180° - 90° - 45° = 45°$.

There is another special triangle called the isosceles triangle; it has two angles the same. The lengths of the sides opposite the equal angles are the same. Isosceles triangles can come in various shapes as the third angle can vary. The third angle doesn't have to be a right angle.

Example 3 : What is the angle C?



$$C = 180° - 80° - 70° = 30°$$

You will have noticed that, when referring to angles, we have often given two units of measure: degrees and radians - the most important unit being the radian. If the unit of measure is not specified on a given angle, the angle is assumed to be in radians. To convert degrees to radians, we use the following:

$$\pi \text{ radians} = 180°$$

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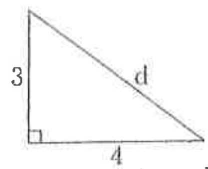
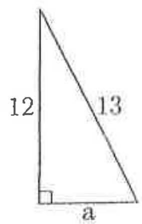
Example 4 : What is d?



$$\begin{aligned} d^2 &= 3^2 + 4^2 \\ d^2 &= 25 \\ d &= 5 \end{aligned}$$

Note that, since d is a length, we take the positive solution of the quadratic equation $d^2 = 25$.

Example 5 : What is a?

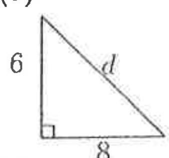


$$\begin{aligned} 13^2 &= a^2 + 12^2 \\ 169 &= a^2 + 144 \\ 169 - 144 &= a^2 \\ 25 &= a^2 \\ 5 &= a \end{aligned}$$

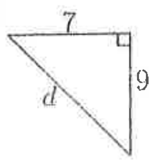
Exercises:

1. Use Pythagoras' theorem to find the length of the unknown side:

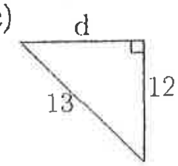
(a)



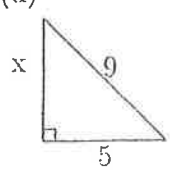
(b)



(c)



(d)



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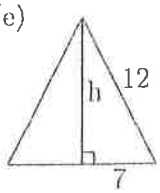
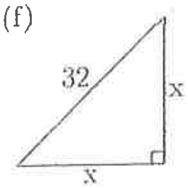


(f)



2. (a) A 4m long ladder is leaning against a wall. The foot of the ladder is 1.2 meters out from the wall. How far up the wall does the ladder reach? Draw a diagram!

   (b) In a triangle ABC, $\angle ABC = 90°$, $AC = 20$cm, and $AB = 9$ cm. Find the length of BC.

 Day 3 WS

Trig.

Day 3 - Examples

Section 3 PYTHAGORAS' THEOREM

All right-angled triangles obey the theorem of Pythagoras, which states:

> The square of the length of the hypotenuse is equal to the sum of the squares of the other two sides.

Construct two identical squares, and divide the sides into lengths a and b as shown.

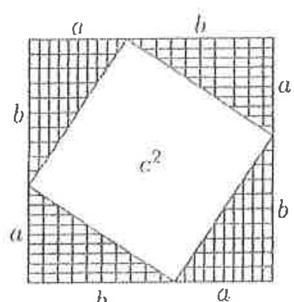


Fig. 1

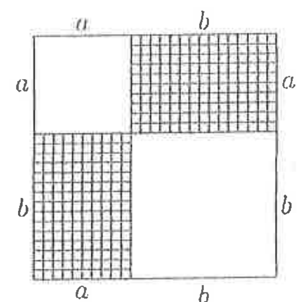
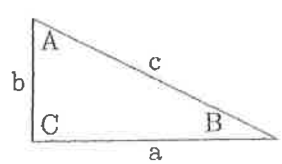


Fig. 2

$$
\begin{aligned}
\text{Shaded area in Fig. 1} &= 4 \times \frac{1}{2}ab = 2ab \\
\text{Shaded area in Fig. 2} &= 2 \times ab = 2ab \\
c^2 + 2ab &= (a+b)^2 \\
&= a^2 + 2ab + b^2 \\
\text{therefore } a^2 + b^2 &= c^2
\end{aligned}
$$

The hypotenuse is the side opposite the right angle. We now put this information onto a diagram and into a formula.



ABC is a right angled triangle, and c is the hypotenuse. Then a, b, and c satisfy the relationship:

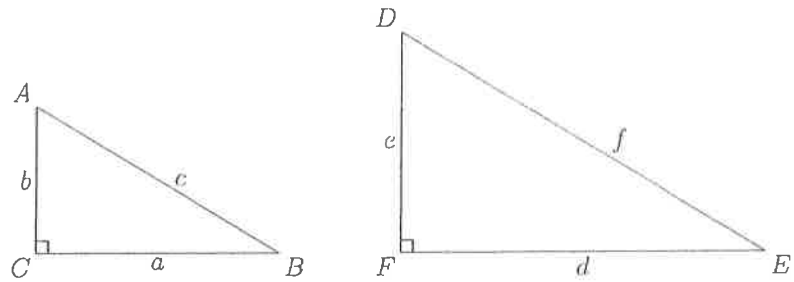
$$a^2 + b^2 = c^2$$

Trig.

Day 4 Examples

Section 4 INTRODUCTORY TRIGONOMETRY

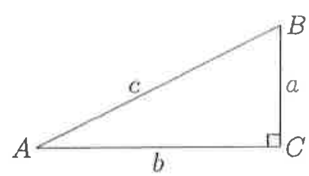
Similar triangles are ones which have the same shape. All the internal angles are the same. Similar triangles may be different sizes. The triangles ABC and DEF drawn below are similar but not the same.



The length of the sides of these triangles are proportional. That is, we can find one number p that gives

$$\begin{aligned} e &= pb \\ f &= pc \\ d &= pa \end{aligned}$$

In addition, corresponding angles are the *same*. Since the triangles formed by certain angles are proportional, we can describe angles by looking at the ratios of the sides around them. For the moment, we will restrict our discussion to that of right-angled triangles. Consider



Recall that the side opposite the right angle is called the hypotenuse. In this case it is c. The side opposite the angle in question (in this case A) is called the opposite side. The remaining side is called the adjacent side, in this case b.

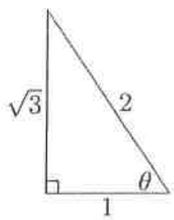
The trigonometric ratios are the ratios of various pairs of sides. They are sine (usually written sin), cosine (usually written cos), and tangent (usually written tan). The definitions of these

Day 4 Examples - Trig.

ratios, in terms of right angled triangles are:

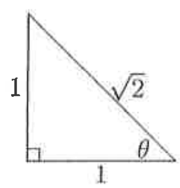
$$\begin{aligned}
\sin A &= \frac{\text{opposite side}}{\text{hypotenuse}} \\
&= \frac{a}{c} \\
\cos A &= \frac{\text{adjacent side}}{\text{hypotenuse}} \\
&= \frac{b}{c} \\
\tan A &= \frac{\text{opposite side}}{\text{adjacent side}} \\
&= \frac{a}{b}
\end{aligned}$$

Example 1 :



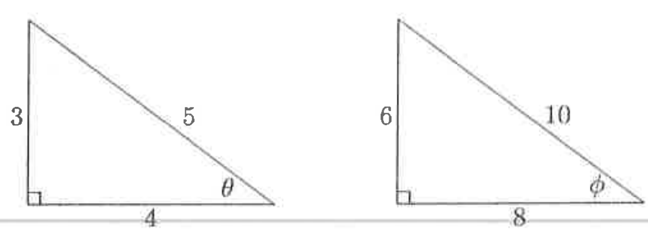
$$\begin{aligned}
\sin\theta &= \frac{\text{OPP}}{\text{HYP}} &= \frac{\sqrt{3}}{2} \\
\cos\theta &= \frac{\text{ADJ}}{\text{HYP}} &= \frac{1}{2} \\
\tan\theta &= \frac{\text{OPP}}{\text{ADJ}} &= \frac{\sqrt{3}}{1}
\end{aligned}$$

Example 2 :



$$\begin{aligned}
\sin\theta &= \frac{1}{\sqrt{2}} \\
\cos\theta &= \frac{1}{\sqrt{2}} \\
\tan\theta &= 1
\end{aligned}$$

Example 3 : How are θ and ϕ related?



Since $\sin\theta = \frac{3}{5}$ and $\sin\phi = \frac{6}{10} = \frac{3}{5}$, θ and ϕ must be the same angle.

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$\boxed{\text{Day } 4}$

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Exercises: Emergency / Inclement Weather Packet

1. Find the following ratios:

   (a) $\sin\theta$

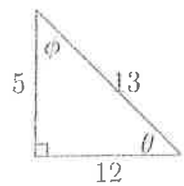
   (b) $\cos\theta$

   (c) $\tan\theta$

   (d) $\sin\phi$

   (e) $\cos\phi$

   (f) $\tan\phi$



2. Find the following ratios:

   (a) $\sin\theta$

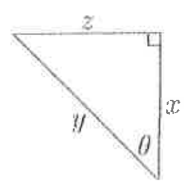
   (b) $\cos\theta$

   (c) $\tan\theta$

   (d) $\sin(90-\theta)$

   (e) $\cos(90-\theta)$

   (f) $\tan(90-\theta)$



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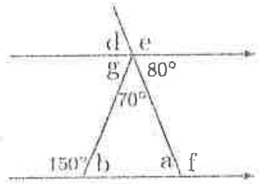
Emergency/Inclement Weather Packet

Introduction to Trigonometry

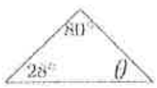
(Review)

1. Find the value of each of the pronumerals:

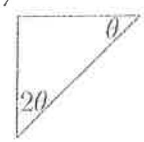


2. Find the value of θ in each of the following:

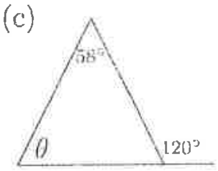
(a)



(b)



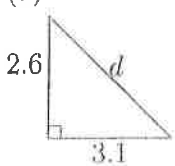
(c)



3. (a) Change the angle $\frac{7\pi}{3}$ to degrees.
   (b) Change the angle $\frac{6\pi}{5}$ to degrees.
   (c) Change 87° to radians. Write the answer to 2 decimal places.

4. Find the value of each pronumeral:

(a)



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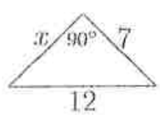

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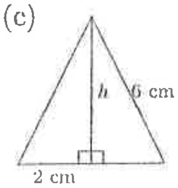
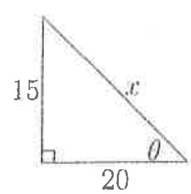


For part (c), assume the largest triangle is isosceles.

5. (a) Find the value of x
   (b) Find
      i. $\cos\theta$
      ii. $\sin\theta$
      iii. $\tan\theta$



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Study Guide and Intervention

(continued)

Day 6

Angles and Angle Measure

Convert Between Degrees and Radians Angles can be measured in **degrees** and **radians**, which are units based on arc length. One radian is the measure of an angle θ in standard position with a terminal side that intercepts an arc with the same length as the radius of the circle. Degree measure and radian measure are related by the equations 2π radians $= 360°$ and π radians $= 180°$.

Radian and Degree Measure	To rewrite the radian measure of an angle in degrees, multiply the number of radians by $\frac{180°}{\pi \text{ radians}}$. To rewrite the degree measure of an angle in radians, multiply the number of degrees by $\frac{\pi \text{ radians}}{180°}$.
Arc Length	For a circle with radius r and central angle θ (in radians), the arc length s equals the product of r and θ. $s = r\theta$

Example 1 **Rewrite each degree measure in radians and the radian measure in degrees.**

a. $45°$

$45° = 45°\left(\frac{\pi \text{ radians}}{180°}\right) = \frac{\pi}{4}$ radians

b. $\frac{5\pi}{3}$ **radians**

$\frac{5\pi}{3}$ radians $= \frac{5\pi}{3}\left(\frac{180°}{\pi}\right) = 300°$

Example 2 **A circle has a radius of 5 cm and central angle of 135°, what is the length of the circle's arc?**

Find the central angle in radians.

$135° = 135°\left(\frac{\pi \text{ radians}}{180°}\right) = \frac{3\pi}{4}$ radians

Use the radius and central angle to find the arc length.

$s = r\theta$	Write the formula for arc length.
$= 5 \cdot \frac{3\pi}{4}$	Replace r with 5 and θ with $\frac{3\pi}{4}$.
≈ 11.78	Use a calculator to simplify.

Exercises

Rewrite each degree measure in radians and each radian measure in degrees.

1. $140°$

2. $-260°$

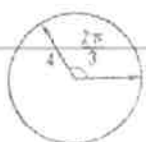
3. $-\frac{3\pi}{5}$

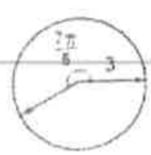
4. $-75°$

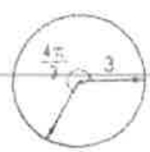
5. $\frac{7\pi}{6}$

6. $380°$

Find the length of each arc. Round to the nearest tenth.

7. 

8. 

9. 

Emergency/Inclement Weather Packet

NAME ______________________ DATE ____________ PERIOD ____________

Mrs. Bledsoe

Day 6

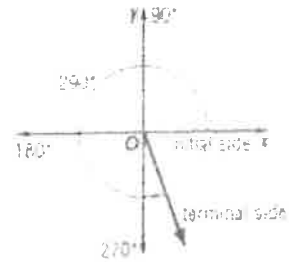
Study Guide and Intervention

Angles and Angle Measure

Angles in Standard Position An angle is determined by two rays. The degree measure of an angle in standard position is described by the amount and direction of rotation from the **initial side**, which lies along the positive x-axis, to the **terminal side**. A counterclockwise rotation is associated with positive angle measure and a clockwise rotation is associated with negative angle measure. Two or more angles in standard position with the same terminal side are called **coterminal angles**.

Example 1 **Draw an angle with measure 290° in standard position.**

The negative y-axis represents a positive rotation of 270°. To generate an angle of 290°, rotate the terminal side 20° more in the counterclockwise direction.



Example 2 **Find an angle with a positive measure and an angle with a negative measure that are coterminal with each angle.**

a. 250°

A positive angle is 250° + 360° or 610°. Add 360°

A negative angle is 250° − 360° or −110°. Subtract 360°

b. −140°

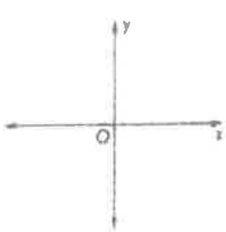
A positive angle is −140° + 360° or 220°. Add 360°

A negative angle is −140° − 360° or −500°. Subtract 360°

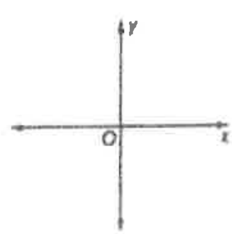
Exercises

Draw an angle with the given measure in standard position.

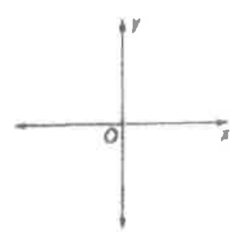
1. 160°



2. 280°



3. 400°



Find an angle with a positive measure and an angle with a negative measure that are coterminal with each angle.

4. 65° 5. −75° 6. 230° 7. 420°