# MATH 170 – CHAPTER 1 Name: _______

## 1.1 Angles, Degrees & Triangles

Need To Know

- Vocabulary
- Formulas
- Special Triangles

## Vocabulary

**Angle**

**Degree**

## Vocabulary

**Types of Angles**

- Right Angle
- Straight Angle
- Acute Angle
- Obtuse Angle

**Angle Relationships**

- Complementary Angles
- Supplementary Angles

# Formulas

1. Area of a Triangle
2. Angle sum of a triangle
3. Pythagorean Theorem

# Special Triangles

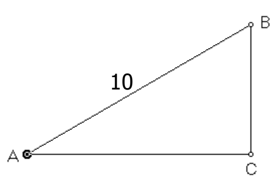
Two special triangles will make the basis of much of what you have to memorize.

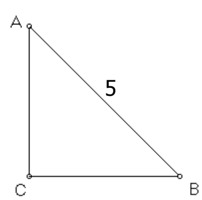
Study hard on this topic.

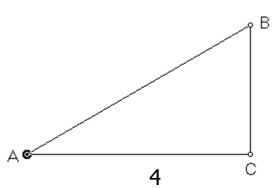
1. 30 – 60 – 90 Triangle
2. 45 – 45 – 90 Triangle

# Practice

Solve the triangles

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## 1.2 Rectangular Coordinates Sys.

Need To Know

- Vocabulary
- Formula
- Angles in the rectangular coordinate system

**Set**

- Descartes, Cartesian Plane, Calculus and the development of science.

## Vocabulary

Coordinate System

Origin, x-axis, y-axis

Quadrants I, II, III, IV

Plotting points

Graphs of lines

$y = 2x + 3$

$3x - 2y = 6$

## Formula

Circle formula

Examples:

$x^2 + y^2 = 36$

$x^2 + y^2 = 5$

## Formula

Distance formula for 2 points $(x_1, y_1)$ & $(x_2, y_2)$

Example:
Find the distance between (-8, 9) and (-3, -2)

## Vocabulary

**Angle in standard position** –

___________________________________________

___________________________________________

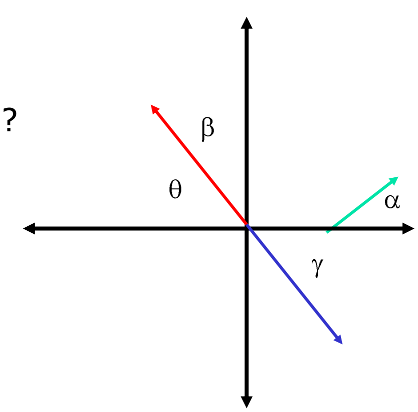
$\theta \in$ QI

Quadrantal Angle –

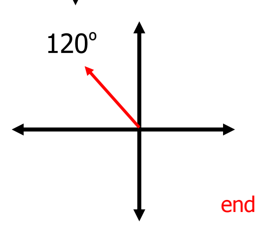
Coterminal Angles –

## Practice

Is $\alpha$ in standard position?
Are the others in standard position?
Are $\beta$ & $\gamma$ coterminal?
Which angles are coterminal?
True/False: $\theta \in$ QII
True/False: $\beta \in$ QII
Fill in: $\gamma \in$ ______




Find all angles that are coterminal to $120^o$



## 1.3 Definitions of Trig Function

<u>Need To Know</u>

- Definitions of 6 Trigonometric Functions
- Sign patterns of each function
- How to solve with them

## Definitions of Trig Functions

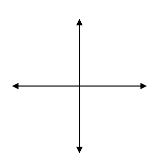
For θ in standard position with its <u>terminal</u> side going through the point (x, y) and $r = \sqrt{x^2 + y^2}$ :

| Function Name | Abbreviation | Definition |
|---|---|---|
| The sine of θ | sin θ | |
| The cosine of θ | cos θ | |
| The tangent of θ | tan θ | |
| The cotangent of θ | cot θ | |
| The secant of θ | sec θ | |
| The cosecant of θ | csc θ | |

## Definitions of Trig Functions

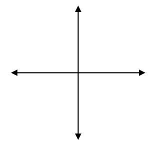
Example:

Find all 6 trig functions of θ at the vertex with the terminal side through the point (-4, -2)



## Practice

Find sine, cosine and tangent of $\theta = 135°$



## Sign Patterns of Trig Functions

What are the signs of each function in any particular quadrant?

| For $\theta$ in quad. | I | II | III | IV |
|---|---|---|---|---|
| $\sin \theta$ | | | | |
| $\cos \theta$ | | | | |
| $\tan \theta$ | | | | |

## Practice

In which quadrant does the terminal side lie?

$\sin \theta = +$

$\cos \theta = -$

$\tan \theta = -$

$\sin \theta = -$ and $\tan \theta = +$

## Practice

Find all 6 trig functions of $\theta$ when $\csc\theta = 13/5$ and $\cos\theta < 0$.

end

## 1.4 Introductions to Identities

Need To Know

- Reciprocal Identities
- Ratio Identities
- Pythagorean Identities

## Reciprocal Identities

Prove:

Practice:

If $\cos\theta = \sqrt{3}/2$ , $\sec\theta =$

If $\csc\theta = -13/12$ , $\sin\theta =$

## Ratio Identities

Prove:

Practice:

If sin $\theta$ = $^{2}/_{\sqrt{13}}$ , cos $\theta$ = $^{3}/_{\sqrt{13}}$ ,

find cot $\theta$.

## Pythagorean Identity

Given: $x^2 + y^2 = r^2$

## Practice

If $\cos\theta = \dfrac{-1}{\sqrt{10}}$, and $\theta \in$ QIII,

find all other trig functions of $\theta$.

## Practice

If csc θ = 2 and cos θ = negative, then find the other trig functions.

end

## 1.5 More About Identities

Need To Know

- Recall Basic Identities
- Transformations
  - by simple equivalency
  - by algebraic manipulation
- Transformation Tips

## MEMORIZE - Basic Identities

| Reciprocal | Ratio | Pythagorean |
|---|---|---|
| $\sec\theta = \dfrac{1}{\cos\theta}$ | $\tan\theta = \dfrac{\sin\theta}{\cos\theta}$ | $\cos^2\theta + \sin^2\theta = 1$ |
| $\csc\theta = \dfrac{1}{\sin\theta}$ | $\cot\theta = \dfrac{\cos\theta}{\sin\theta}$ | $1 + \tan^2\theta = \sec^2\theta$ |
| $\cot\theta = \dfrac{1}{\tan\theta}$ | | $\cot^2\theta + 1 = \csc^2\theta$ |

## Transformations

Write each in terms of cosine only.

$\sec\theta$ $\cot\theta$

## Transformations

Algebra is another way to transform an expression

$$\frac{\cos\theta}{\sin\theta}+\frac{\sin\theta}{\cos\theta}$$

## Transformations

Try your own algebraic transformation

$$\frac{1}{\sin\theta}-\frac{1}{\cos\theta}$$

## Transformations

In addition to adding and subtraction you can multiply an expression to get rid of parentheses.

$$(\cos\theta + 2)(\cos\theta - 5)$$

$$(\sin\theta - 3)^2$$

$$(1 - \cot\theta)(1 + \cot\theta)$$

## Transformations Practice

Simplify the expression as much as possible by substituting 8sec(θ) for x in: $\sqrt{x^2 - 64}$

## Transformations Tips

1. Start with the side that appears the most complex
2. Substitute sine and cosine identities and simplify
3. Add, subtract or multiply and simplify
4. Work on the left side and then work on the right side until both expressions change into a common result

Show: $\dfrac{\csc\theta}{\cot\theta} = \sec\theta$

## Transformations Practice

Show: $\sec\theta\cot\theta - \sin\theta = \dfrac{\cos^2\theta}{\sin\theta}$

end