Section 6.1a – Right Angle Triangle Trigonometry

This booklet belongs to:_____ Block: _____

- **Trigonometry** is the study of **angles and the ratios** that relate to them
- In the following sections will be only focus on **Right Angle Triangle** Trigonometry
- With the **Pythagorean Theorem** and **3 Trigonometric Functions** we can solve triangles
- They are:

Sine **Tangent** **Cosine**

Using your Calculator

- In my opinion, Trigonometry is the only topic that **requires a calculator** in this course
- This is because calculating the value of angles, given a specific Trig Function is very hard
- Also converting from the given ratios value back to the angle is just as tough
- In fact, I don't even know how to do it by hand!

First thing you want to check:

Make sure your Calculator is in **DEGREE MODE**, you should see a little **D or DEG** on the top

Second:

There are three buttons we will be using on our calculators they are:

Tan^{-1}	Sin^{-1}	Cos^{-1}
Tan	Sin	Cos

- We use $\boldsymbol{Tan}, \boldsymbol{Sin}, \boldsymbol{Cos}$ when we are **trying to get the decimal value** of a given angle
- Or their INVERSE buttons:
- We use $\boldsymbol{Tan^{-1}}, \boldsymbol{Sin^{-1}}, \boldsymbol{Cos^{-1}}$ when we are **trying to get the angle value** of a given decimal
  - You will need to hit the 2nd function button to access the INVERSE buttons

Third:

Depending on the calculator you have you will either be pressing:

- The **Trig button first** then the angle/ratio

or

- The **angle/ratio first** and then the Trig button

Solving for Values

- When **solving an angle** and getting its **decimal expansion**, round to **4 decimal places**

Example 1: Solve the following: $Tan\ 60°, Sin\ 60°, Cos\ 60°$

Solution 1: $Tan\ 60° = 1.732$ $Sin\ 60° = 0.8660$ $Cos\ 60° = 0.5$

Example 2: Solve the following: $Tan\ 30°, Sin\ 30°, Cos\ 30°$

Solution 2: $Tan\ 30° = 0.5774$ $Sin\ 30° = 0.5$ $Cos\ 30° = 0.8660$

Example 3: Solve the following: $Tan\ 0°, Sin\ 0°, Cos\ 0°$

Solution 3: $Tan\ 0° = 0$ $Sin\ 0° = 0$ $Cos\ 0° = 1$

Example 4: Solve the following: $Tan\ 34°, Sin\ 57°, Cos\ 102°$

Solution 4: $Tan\ 34° = 0.675$ $Sin\ 57° = 0.8387$ $Cos\ 102° = -0.208$

- When **converting a decimal** expansion **to an angle**, round to **1 decimal place**

Example 5: Convert 0.8660 to angles of all three trigonometric functions

Solution 5: $Tan^{-1}(0.8660) = 40.9°$ $Sin^{-1}(0.8660) = 60.0°$ $Cos^{-1}(0.8660) = 30.0°$

Example 6: Convert 1.0 to angles of all three trigonometric functions

Solution 6: $Tan^{-1}(1.0) = 45.0°$ $Sin^{-1}(1.0) = 90.0°$ $Cos^{-1}(1.0) = 0.0°$

Example 7: Convert 0.7002 to angles of all three trigonometric functions

Solution 7: $Tan^{-1}(0.7002) = 35.0°$ $Sin^{-1}(0.7002) \approx 44.4°$ $Cos^{-1}(0.7002) \approx 45.6°$

Next, we will see how we use these Trigonometric Functions to Solve for missing information

Solving Proportions

Solving trigonometry problems is just solving a proportion.

- A proportion is when we have two things equal to one another and one piece of information is unknown, ALGEBRA all over again

Example 8:

Solve the following proportions for a

1. $ab = c \quad \rightarrow \quad \frac{ab}{b} = \frac{c}{b} \quad \rightarrow \quad \boldsymbol{a = \frac{c}{b}}$ *Divide both sides by b*

2. $abc = d \quad \rightarrow \quad \frac{abc}{bc} = \frac{d}{bc} \quad \rightarrow \quad \boldsymbol{a = \frac{d}{bc}}$ *Divide both sides by bc*

3. $\frac{ab}{c} = d \quad \rightarrow \quad c \cdot \frac{ab}{c} = d \cdot c \quad \rightarrow \quad ab = dc \quad \rightarrow \quad \frac{ab}{b} = \frac{dc}{b} \quad \rightarrow \quad \boldsymbol{a = \frac{dc}{b}}$

   Multiply both sides by c *Divide both sides by b*

4. $\frac{a+b}{c} - d = e \quad \rightarrow \quad \frac{a+b}{c} - d + d = e + d \quad \rightarrow \quad \frac{a+b}{c} = e + d \quad \rightarrow \quad c \cdot \frac{a+b}{c} = (e+d)c \quad \rightarrow$

   Add d to both sides *Multiply both sides by c*

$a + b = (e + d)c \quad \rightarrow \quad a + b - b = (e + d)c - b \quad \rightarrow \quad \boldsymbol{a = c(e + d) - b}$

Subtract b from both sides

Section 6.1a – Practice Problems

EMERGING LEVEL QUESTIONS

Solve for the following Trigonometric Ratios. (Round to 4 decimals)

1. $Sin\ 12° =$	2. $Tan\ 57° =$	3. $Cos\ 123° =$
4. $Cos\ 34° =$	5. $Sin\ 360° =$	6. $Tan\ 270° =$
7. $Sin\ 234° =$	8. $Tan\ 2° =$	9. $Cos\ 180° =$
10. $Tan\ 45° =$	11. $Sin\ 45° =$	12. $Cos\ 45° =$

Solve for the following angles. (Round to 1 decimal)

13. $Sin^{-1}(0.8660) =$	14. $Tan^{-1}(0.2354)\ =$	15. $Cos^{-1}\ (0.6775) =$
16. $Cos^{-1}\ (0.1111) =$	17. $Sin^{-1}(0.9999) =$	18. $Tan^{-1}(1.234)\ =$
19. $Sin^{-1}(0.5628) =$	20. $Tan^{-1}\ (0.5555) =$	21. $Cos^{-1}\ (0.6258) =$
22. $Tan^{-1}(1.879)\ =$	23. $Sin^{-1}(0.1111) =$	24. $Cos^{-1}\ (0.0001) =$

PROFICIENT LEVEL QUESTIONS

Solve the following proportions for the variable a.

25. $b = \frac{a}{c}$	26. $b = \frac{c}{a}$
27. $c = \frac{b}{a+d}$	28. $d = ab - ac$
29. $ab = ac + d$	30. $b = \frac{ac}{d}$

Answer Key – Section 6.1a

1. 0.2079
2. 1.5399
3. -0.5446
4. 0.8290
5. 0
6. $No\ Solution$
7. -0.8090
8. 0.0349
9. -1
10. 1
11. 0.7071
12. 0.7071
13. $60°$
14. $13.2°$
15. $47.4°$
16. $83.6°$
17. $89.2°$
18. $51.0°$
19. $34.2°$
20. $29.1°$
21. $51.3°$
22. $62.0°$
23. $6.4°$
24. $90.0°$
25. $a = bc$
26. $a = \frac{c}{b}$
27. $a = \frac{b - cd}{c}$
28. $a = \frac{d}{(b - c)}$
29. $a = \frac{d}{(b - c)}$
30. $a = \frac{bd}{c}$

Extra Work Space