Setting up for Trigonometry

So far, you know two ways to determine the sides of a **right triangle**:

1. The Pythagorean Theorem, $a^{2}+b^{2}=c^{2}$ (used when you have *two sides*)
2. Special triangles (used when you have *one* *side* and *know it’s 30-60-90* or *45-45-90*)

The third method for determining sides on a **right triangle** is called **Trigonometry** (used when you have *one side* and *one angle* ***that’s not*** *the right angle*). If you want to use trigonometry, the first thing that you must do, is pick the angle you want to use. It will be the angle marked with a degree measure in the problem, the angle given to you, or the angle that the problem asks you to use.

YOU CANNOT USE THE RIGHT ANGLE FOR LABELING OR SOLVING ANY TRIGONOMETRY PROBLEM!!

Your next task is to name the three sides *in terms of their relationship to the marked, given, or asked for angle*. Since there are three sides, there are three relationships. These relationship names are:

1. The **hypotenuse**. It is the only side that does not depend on the angle you are using.

It is **always across from 90˚**.

1. The **opposite side**. It is the side across from the angle you are focusing on.
2. The **adjacent side**. It is the side that is **not the hypotenuse**, but is next to the angle you are using.

This side is whichever side is left once you’ve labeled the hypotenuse and the opposite.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **EXAMPLE**Label the sides of the triangle for trigonometry using $∠A$.*First, organize the sides according to which angle they are across from:*

|  |  |  |
| --- | --- | --- |
| $$∠A$$ | $$∠C$$ | $$∠B$$*(right to the right)* |
| $$\overbar{BC}$$ | $$\overbar{AB}$$ | $$\overbar{AC}$$ |

*Next, choose your focus angle (this problem states “using* $$*,” so it’s our focus).**Then, label the focus angle’s side “opp,” the 90˚ side “hyp,” and the leftover “adj.”*

|  |  |  |
| --- | --- | --- |
| $$$$ | $$∠C$$ | $$∠B$$ |
| $$\overbar{BC}$$ | $$\overbar{AB}$$ | $$\overbar{AC}$$ |
| $$$$ | Adj. | Hyp. |

 | **EXAMPLE** Label the sides of the triangle for trigonometry using $∠B$.*First, organize the sides according to which angle they are across from:*

|  |  |  |
| --- | --- | --- |
| $$∠A$$ | $$∠C$$ | $$∠B$$*(right to the right)* |
| $$\overbar{BC}$$ | $$\overbar{AB}$$ | $$\overbar{AC}$$ |

*Next, choose your focus angle (this problem states “using* $$*,” so it’s our focus).***B is the right angle, so** ***I CANNOT USE IT! STOP!*** | **EXAMPLE**Label the sides of the triangle for trigonometry using $∠C$.*First, organize the sides according to which angle they are across from:*

|  |  |  |
| --- | --- | --- |
| $$∠A$$ | $$∠C$$ | $$∠B$$*(right to the right)* |
| $$\overbar{BC}$$ | $$\overbar{AB}$$ | $$\overbar{AC}$$ |

*Next, choose your focus angle (this problem states “using* $$*,” so it’s our focus).**Then, label the focus angle’s side “opp,” the 90˚ side “hyp,” and the leftover “adj.”*

|  |  |  |
| --- | --- | --- |
| $$∠A$$ | $$$$ | $$∠B$$ |
| $$\overbar{BC}$$ | $$\overbar{AB}$$ | $$\overbar{AC}$$ |
| Adj. | $$$$ | Hyp. |

 |
| 1. Label the sides of the triangle for trigonometry using $∠D$.

|  |  |  |
| --- | --- | --- |
| $$∠E$$ | $$∠F$$ | $$∠D$$ |
|  |  |  |
|  |  |  |

 | 2. Label the sides of the triangle for trigonometry using $∠E$.

|  |  |  |
| --- | --- | --- |
| $$∠E$$ | $$∠F$$ | $$∠D$$ |
|  |  |  |
|  |  |  |

 | 3. Label the sides of the triangle for trigonometry using $∠F$.

|  |  |  |
| --- | --- | --- |
| $$∠E$$ | $$∠F$$ | $$∠D$$ |
|  |  |  |
|  |  |  |

 |
| 4. Label the sides of the triangle for trigonometry using $∠G$.

|  |  |  |
| --- | --- | --- |
| $$∠$$ | $$∠$$ | $$∠I$$ |
|  |  |  |
|  |  |  |

 | 5. Label the sides of the triangle for trigonometry using $∠H$.

|  |  |  |
| --- | --- | --- |
| $$∠$$ | $$∠$$ | $$∠I$$ |
|  |  |  |
|  |  |  |

 | 6. Label the sides of the triangle for trigonometry using $∠I$.

|  |  |  |
| --- | --- | --- |
| $$∠$$ | $$∠$$ | $$∠I$$ |
|  |  |  |
|  |  |  |

 |
| 7. Label the sides of the triangle for trigonometry using $∠J$.

|  |  |  |
| --- | --- | --- |
|  |  |  |
|  |  |  |
|  |  |  |

 | 8. Label the sides of the triangle for trigonometry using $∠K$.

|  |  |  |
| --- | --- | --- |
|  |  |  |
|  |  |  |
|  |  |  |

 | 9. Label the sides of the triangle for trigonometry using $∠L$.

|  |  |  |
| --- | --- | --- |
|  |  |  |
|  |  |  |
|  |  |  |

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Once you have labeled the three side relationships, you have to be able to create the following fractions:

$$\frac{opp}{hyp} \& \frac{adj}{hyp} \& \frac{opp}{adj}$$

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **EXAMPLE**Create a sine fraction $\frac{opp}{hyp}$ using $∠M$.*Identify hyp, opp, and adj for*$ ∠M$.

|  |  |  |
| --- | --- | --- |
| $$$$ | $∠$N | $∠$O |
| *x* | 3 | *y* |
| Opp | Adj | Hyp |

$$Now, plug it in: \sin(\left(∠M\right))=\frac{opp}{hyp}$$$$$$ | **EXAMPLE**Create a cosine fraction $\frac{adj}{hyp}$ using $∠M$.*Identify hyp, opp, and adj for*$ ∠M$.

|  |  |  |
| --- | --- | --- |
| $$$$ | $∠$N | $∠$O |
| *x* | 3 | *y* |
| Opp | Adj | Hyp |

$$Now, plug it in: \cos(\left(∠M\right))=\frac{adj}{hyp}$$$$$$ | **EXAMPLE**Create tangent fraction $\frac{opp}{adj}$ using $∠M$.*Identify hyp, opp, and adj for*$ ∠M$.

|  |  |  |
| --- | --- | --- |
| $$$$ | $∠$N | $∠$O |
| *x* | 3 | *y* |
| Opp | Adj | Hyp |

$$Now, plug it in: \tan(\left(∠M\right))=\frac{opp}{adj}$$$$$$ |
| 10. Create the sine fraction $\frac{opp}{hyp}$ using $∠N$. | 11. Create the cosine fraction $\frac{adj}{hyp}$ using $∠N$. | 12. Create the tangent fraction $\frac{opp}{adj}$ using $∠N$. |
| 13. Create the sine fraction $\frac{opp}{hyp}$ using $∠T$. | 14. Create the cosine fraction $\frac{adj}{hyp}$ using $∠T$. | 15. Create the tangent fraction $\frac{opp}{adj}$ using $∠T$. |
| 16. Create the sine fraction $\frac{opp}{hyp}$ using $∠V$. | 17. Create the cosine fraction $\frac{adj}{hyp}$ using $∠V$. | 18. Create the tangent fraction $\frac{opp}{adj}$ using $∠V$. |