

Name: _____ Date: _____

Windy Tunnel Activity – Math Worksheet 2: What Does It Mean?

Below are four sentences that engineers use to help them design airplane wings. Your job is to turn these sentences into math equations that engineers can use.

1. The amount of air diverted by the wing is proportional to the speed of the wing and the air density.
2. The vertical velocity of the diverted air is proportional to the speed of the wing and the angle of attack.
3. The lift is proportional to the amount of air diverted times the vertical velocity of the air.
4. The power needed for lift is proportional to the lift times the vertical velocity of the air.

First: We need to define some variables. Remember a variable represents an amount of something that we do not know.

For example, we do not know what the amount of air is. Although we can actually choose any letter we would like for a variable, engineers try to use letters that relate to what they are describing. An applicable variable for this example would be the letter **A**. Therefore, we would say that the amount of air = **A**.

What would be some good variables for the other unknowns in the equations above?

Speed = _____
Vertical Velocity = _____
Lift = _____
Power = _____

What about air density and angle of attack? We have already used **A**. What would be some good variables for these?

Air Density = _____
Angle of Attach = _____

Why did you choose the variables that you did?

Remember that to say: is proportional to something mathematically speaking means: $\equiv K \text{ times something}$ where K is called the constant of proportionality.

Now that we have variables, let's make the equations.

Example

1. The amount of air diverted by the wing is proportional to the speed of the wing and the air density.

First find the key words:

The amount of air A
is proportional to = K x
the speed “desired variable”
and +
the air density “desired variable”

The equation would look something like:

$$A = K \times (\text{Speed} + \text{Air density})$$

Use your own variables for Speed and Air Density.

In the remaining three sentences underline the key words or phrases and write the math equations:

2. The vertical velocity of the diverted air is proportional to the speed of the wing and the angle of attack.
3. The lift is proportional to the amount of air diverted times the vertical velocity of the air.
4. The power needed for lift is proportional to the lift times the vertical velocity of the air.