Wind Turbine Challenge

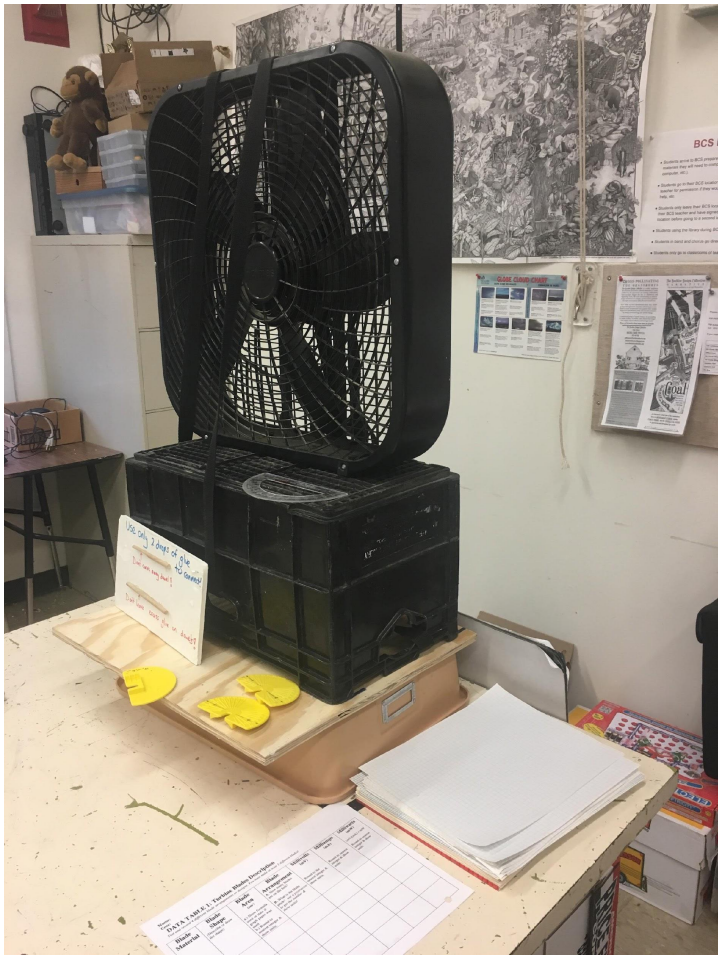
1.) Determine dimensions.

2.)Draw preliminary tower views & 1st blade.

3.)Complete tower. Test & record blade on data table.

4.) Do 4 different blade arrangements; test & record.

5.) Best mV is recorded and RPM calculated.



***Save each blade created!**

***Save all drawn plans!**

KidWind Challenge, Portland, March 23rd

Wind Turbine Process

1st Engineering Journal: Tower & 1st Blade

2nd Build tower

3rd Construct 1st blade and test on tower

4th Record data of blade

5th Make 3 more blades, test & record data

6th Use the best mV blade and find the RPM

7th Complete the Wind Assessment

Tower & Blade Design

Tower:

1)height

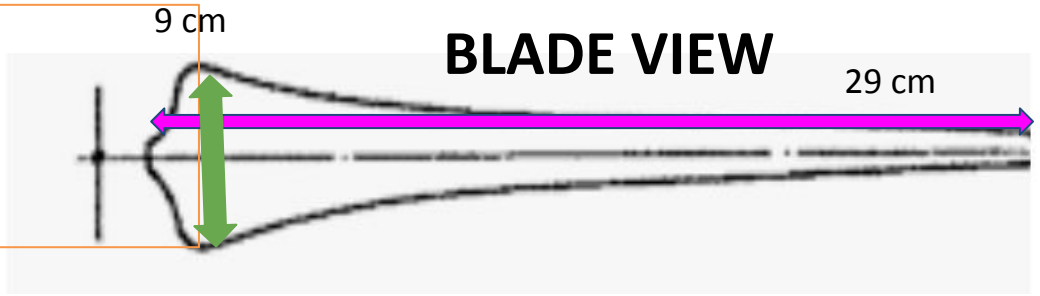
2)base dimensions

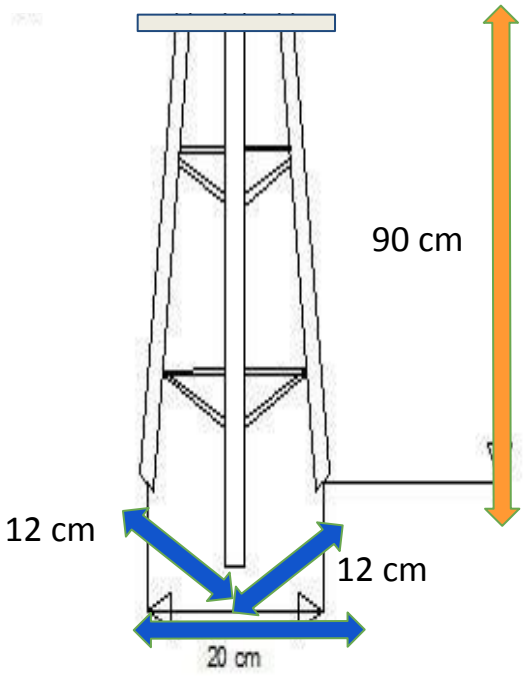
3)features

Blade:

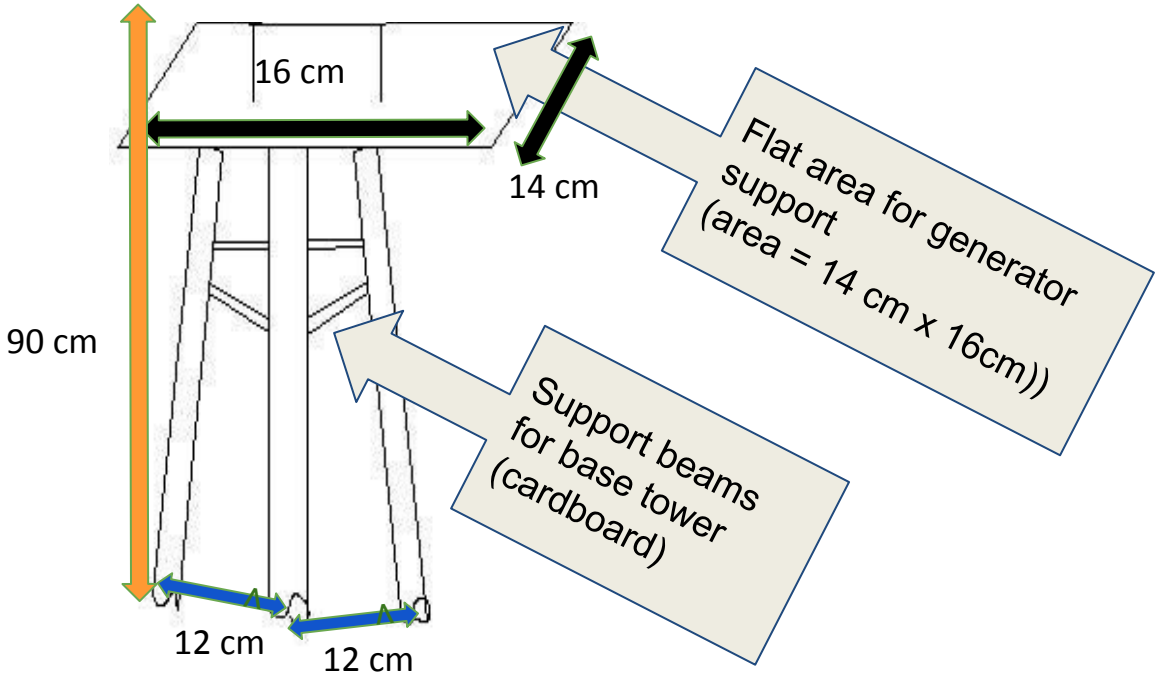
4)length

5)width





FRONT VIEW



SIDE VIEW

What are the variables for blade design?

different prototypes.

Blade Material (What's it made from?)	**Blade Shape** (Draw the shape)	**Blade Number** How many blades are on the hub?	**Blade Pitch** *Use a protractor* (Find the average and round to the nearest integer.)	**Blade Area** **(cm^2)** a.) Show your formula used or state if graph paper was used. b.) Round to the nearest integer.	**Total Blade Area** **(cm^2)** (Multiply the blade area by the total blade number.)

DATA TABLE 1: Turbine Blades Description

***EACH** group member must have their own data tables. Test and record 4 different blade arrangements or designs. You must make at least 4 different prototypes!*

Blade Material (What's it made from?)	**Blade Shape** (Draw the shape)	**Blade Number** How many blades are on the hub?	**Blade Pitch** *Use a protractor* (Find the average and round to the nearest integer.)	**Blade Area** (cm^2) a.) Show your formula used or state if graph paper was used. b.) Round to the nearest integer.	**Total Blade Area** (cm^2) (Multiply the blade area by the total blade number.)	**Millivolts (mV)** *-use multimeter* Round to the nearest integer.	**Milliamps (mA)** *-use multimeter* Round to the nearest integer.	**Milliwatts (mW)** *Calculate using the formula:* (mV)(mA) = mW Round to the nearest integer.
1								
2								
3								
4								

Enter data ONLY when your tower is built and blades are on the tower!

Reading a Multimeter

Electrical Force

(voltage)

mV (millivolts

Which place value is milli?

Electrical Flow

(current)

mA (milliamps)

Round to nearest integer…

Name: **Partner:**
Section:

DATA TABLE 1: Turbine Blades Description

EACH *group member must have their own data tables. Test and record 4 different blade arrangements or designs. You must make at least 4 different prototypes!*

Blade Material	**Blade Shape** (Describe or draw the shape)	**Blade Area** (cm^2) a.) Show formula used or state if graph paper was used. b.) Round to the nearest integer.	**Blade Arrangement** **A**. How many blades are on the hub? **B.** What is the blade pitch*?- use a protractor* Find the average and round to the nearest integer.	**Millivolts (mV)** *-use multimeter* Round to the nearest integer.	**Milliamps (mA)** *-use multimeter* Round to the nearest integer.	**Milliwatts (mW)** *Calculate using the formula:* (mV)(mA) = mW Round to the nearest integer.
1						
2						
3						
4						

Calculating RPM
(Rotations per Minute)

Tracker Online

Tracker

File Edit Video Track Coordinate System View Help

protractor A | Ruler | step 15: 88.5° | 196.4 m | 316.1 m

Plots | protractor A

protractor A (t, θ)

θ: 95, 90, 85, 80

t (s): 0, 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0, 5.5

Columns | protractor A

t (s)	θ
0.333	88.5°
0.367	88.5°
0.400	88.5°
0.433	88.5°
0.467	88.5°

x=277.9 y=-368.9

Movie on 3-24-22 at 12.34 PM.mov

DATA TABLE 2: Turbine Blade RPM Analysis

Choose your best blade design and arrangement and analyze the rotations per minute. ***EACH*** *partner must do their own set of data recordings.*
**Go to Mr. Nicholson's subpage "Wind Power" for the tutorial on how to analyze the RPM.*

1st Frame Time (seconds) **Show 3 decimal places**	**2nd Frame Time** (seconds) **Show 3 decimal places**	**Time Difference** (seconds) *(2nd Frame Time- 1st Frame Time)* **Round to 3 decimal places**	**Angle** (degrees) **Round to the nearest integer**	**Rotation** $\frac{Angle}{360^0}$ **Round to 2 decimal places**	**Rotations per Second** (RPS) $\frac{Rotation}{Time\ difference}$ **Round to 2 decimal places**	**Rotations per Minute** (RPM) *(RPS) (60 s/min)* **Round to the nearest integer**

Average Rotations per Minute (RPM) = _____