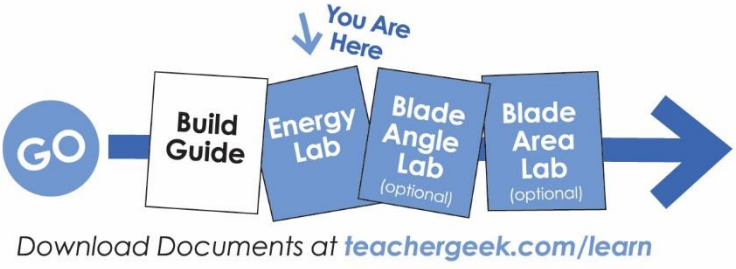
Wind Lift Lab Activities



For use with TeacherGeek Wind Lift Activity Pack, or Maker Cart. Find documents and activity materials at **teachergeek.com**.

Wind Lift Energy Lab

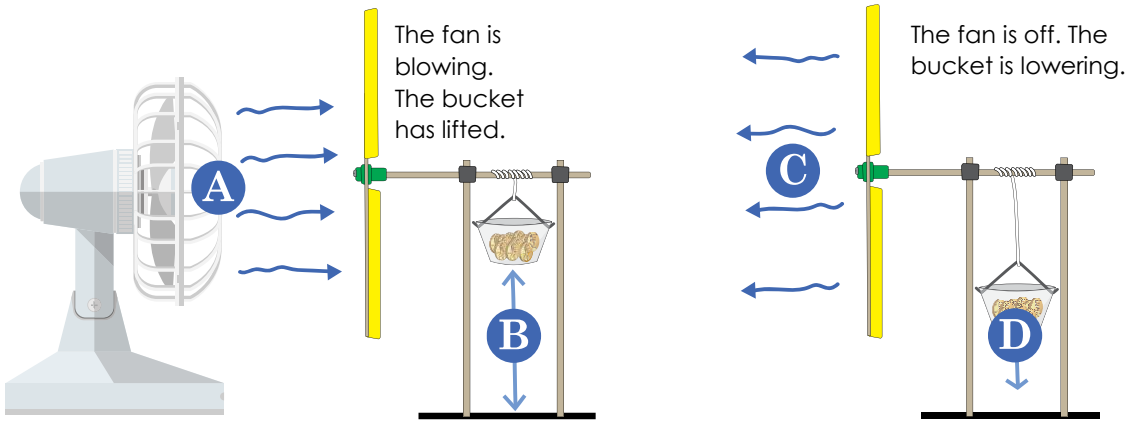
Name(s): _____

Make sure you have built a TeacherGeek Wind Lift, before starting this lab.

Energy is the ability to **do work**

Potential energy is **stored energy**. It is as the result of its **position**.

Kinetic Energy is the **energy of motion**. If an object is **moving**, it has kinetic energy.



Write the letters to match the type of energy shown above. Use letters only once.

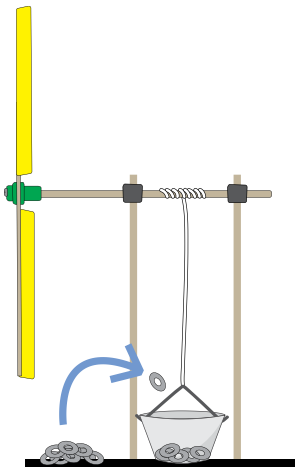
1. ____ shows potential energy turning into kinetic energy

2. ____ shows potential energy as a result of height

3. ____ shows kinetic energy that came from electricity

4. ____ shows the kinetic energy of blowing air; from the potential energy of the bucket

5. Put something heavy in the bucket. Wind up the bucket by hand (without the fan) and let it drop. Notice how fast the blades spin and how much air is pushed. Now put something light in the bucket. Wind it up and let the bucket drop. *What's different?* Figure it out. Explain it to your teacher using these, and other words:



☐ Potential Energy ☐ Kinetic Energy ☐ More Energy ☐ Less Energy

Teacher Signature _____

Wind Lift Blade Angle Lab

Name(s): _____

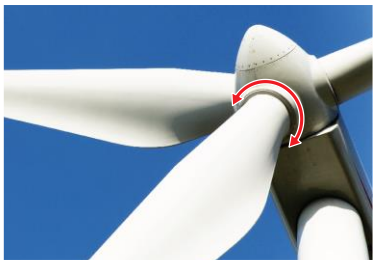
Make sure you have built a TeacherGeek Wind Lift, before starting this lab.

1. Hypothesis: How do you think changing the angle of the *Wind Lift Blades* will affect the number of pennies it can lift?

_____

_____

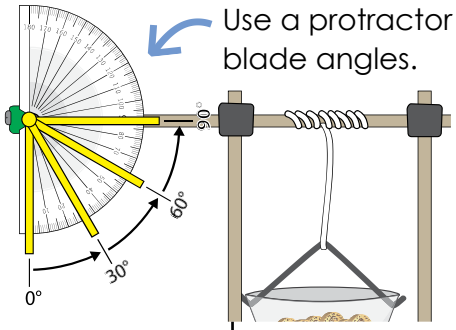
_____



Many wind turbines change the angle of their blades to adjust to wind conditions.

Test your Hypothesis

Test how many pennies your wind turbine can pick up, at different blade angles.



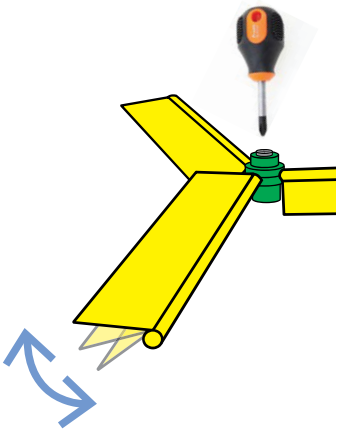
Use a protractor to set blade angles.

Change the Blade Angle

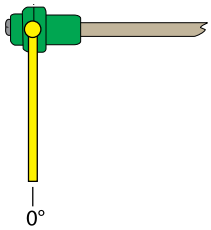
A. Loosen the **hub screw** a little bit, so the **blades** can **turn**, but do not fall.

B. Change the **blade angle** using a **protractor**.

C. Tighten the **screw.**



0° Blade Angle



2. What happens when the blade is at 0°?

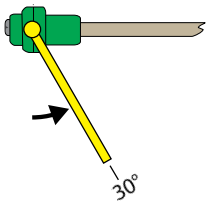
_____

_____

_____

_____

30° Blade Angle



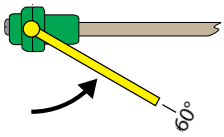
3. How many pennies can it lift at 30°?

_____

4. How long does it take to lift the bucket?

_____

60° Blade Angle



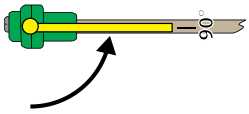
5. How many pennies can it lift at 60°?

_____

6. How long does it take to lift the bucket?

_____

90° Blade Angle



7. What happens when the blade is at 90°?

_____

_____

_____

_____

Wind Lift Blade Angle Lab

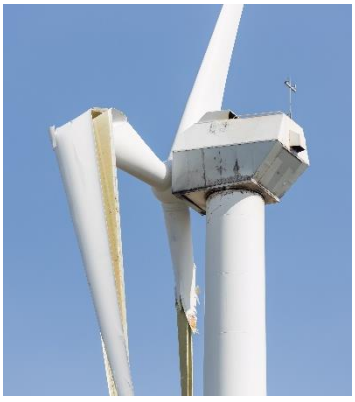
8. Was your hypothesis correct? Please explain why, or why not *(don't just write "yes" or "no").*

_____

_____

_____

9. The wind turbine shown on the right was damaged from high winds. What did you learn from your blade angle tests that could have helped this wind turbine? What would you have it do in high winds to protect the blades?



_____

_____

_____

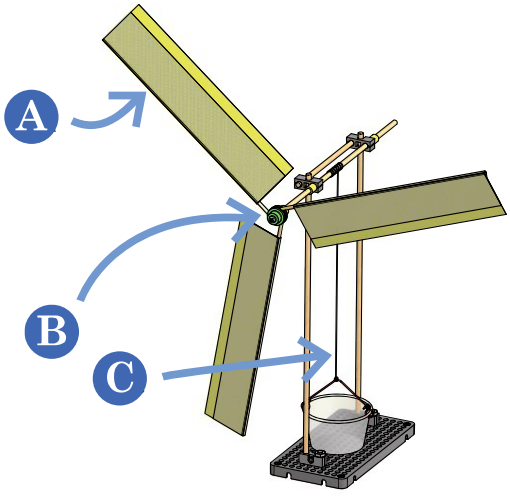
_____

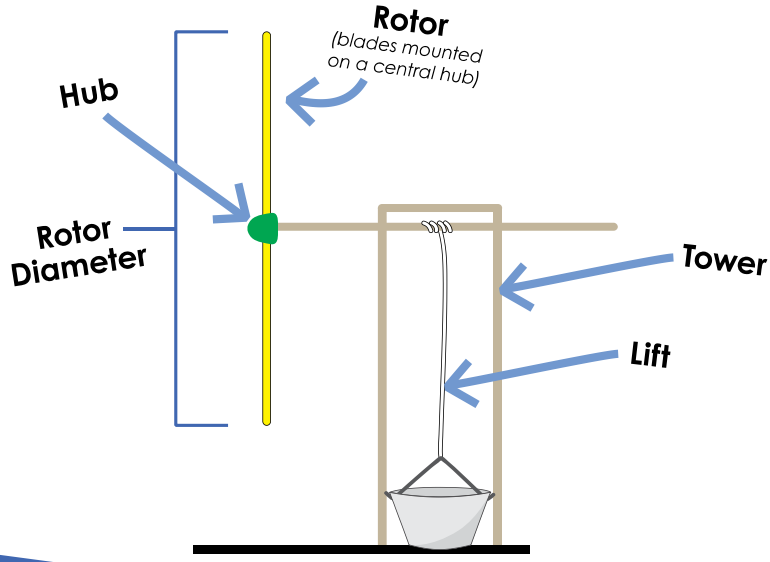
10. Write the names of the components shown below. *Note: Blade is not an answer.*

A _____

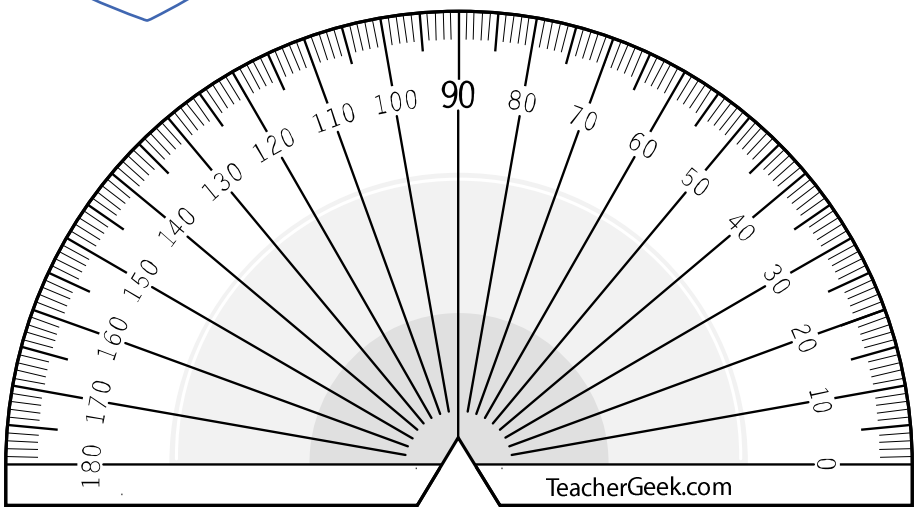
B _____

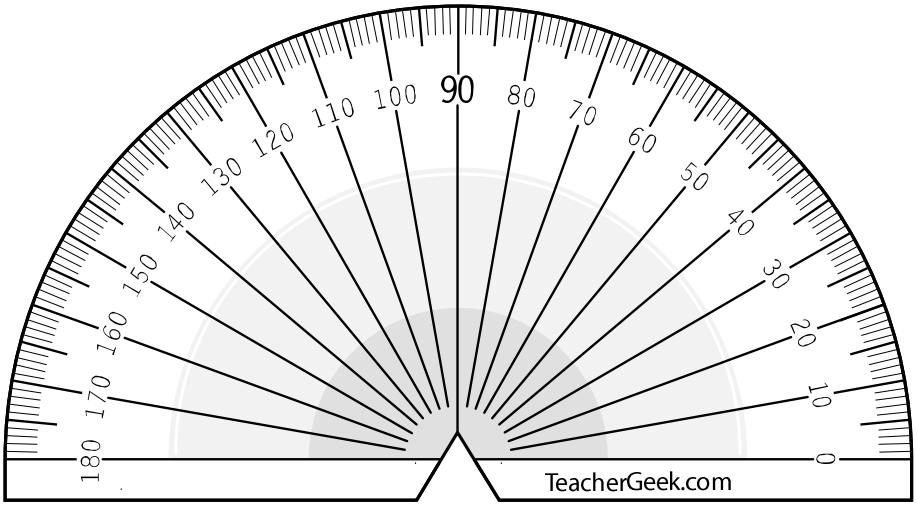
C _____

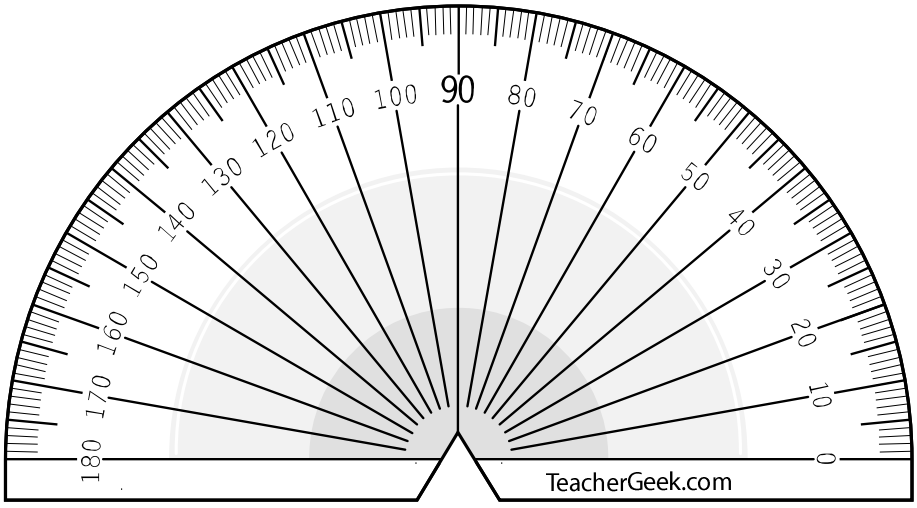




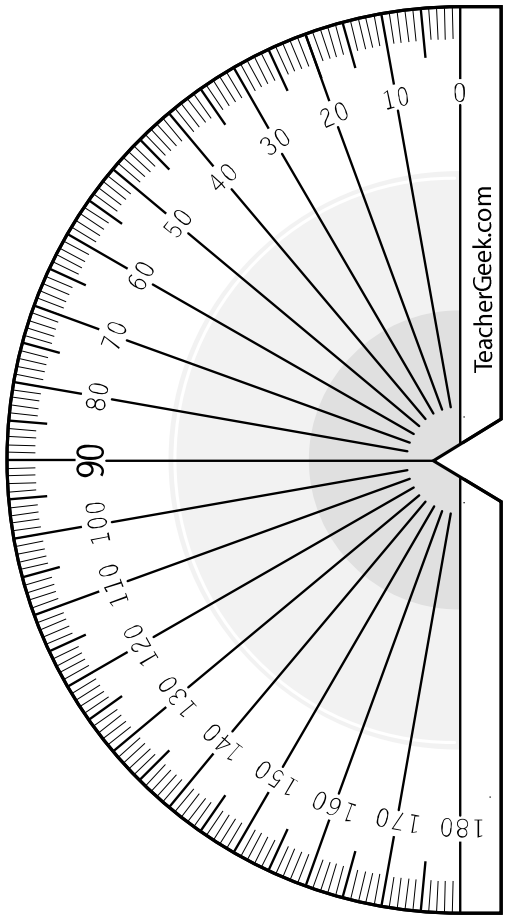
Wind Lift Blade Angle Lab







These protractors work well for the **Wind Lift Angle Lab**. Print them on heavy paper and cut them out. The notch allows them to position centrally on the blade shaft.



These protractors can be used with the optional *Design & Engineering Challenges* as well.

Documents at ***teachergeek.com/learn***

Wind Lift Blade Area Lab

Name(s):

_____

Make sure you have built a TeacherGeek Wind Lift, before starting this lab.

1. Hypothesis: How do you think the Wind Lift blade area affects the number of pennies that can be lifted?

_____

_____

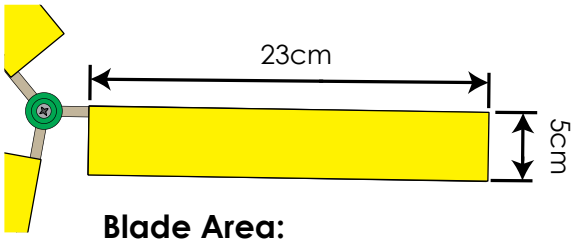
_____

_____

Some wind turbines/wind mills have blades with a lot of area. Other wind turbines have blades with very little area.

Get Ready

Make sure that your blades are 23cm x 5cm. If they are not, cut new blades and tape them on. They should be like this.



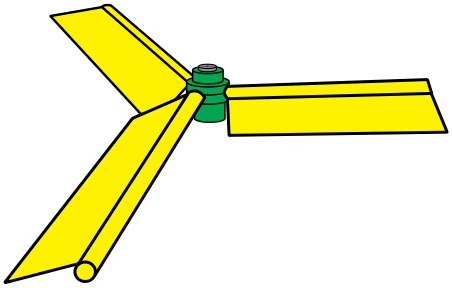
Blade Area:

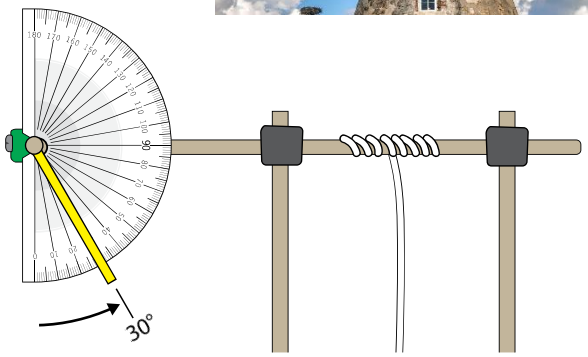
$23 \times 5 = 115cm^2$

$115cm^2 \times 3 = 345\ cm^2$

Blade Area x # *of blades* = total area

Set the angle of your blades to approximately 30°.



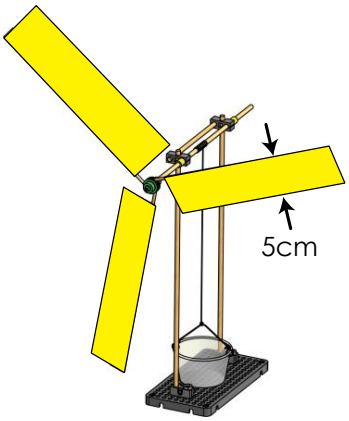


Change the blade angle:
A. **Loosen** the **hub screw** a little bit, so the **blades** can **turn**, but do not fall out. B. Change the **blade angle** using a **protractor**. C. **Tighten** the screw again.

Wind Lift Blade Area Lab

Test your Hypothesis: How does blade area affect the number of pennies that can be lifted?

Use your 5cm wide blades.



2. What is the combined area of all of the blades?

_____

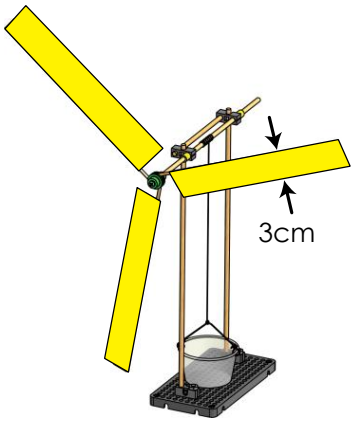
3. What is the maximum number of pennies that can be lifted?

_____

4. How long does it take to lift the bucket?

_____ seconds

Cut your blades to 3cm wide.



5. What is the combined area of all of the blades?

_____

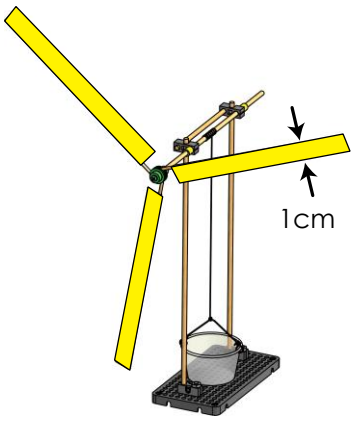
6. What is the maximum number of pennies that can be lifted?

_____

7. How long does it take to lift the bucket?

_____ seconds

Cut your blades to 1 cm wide.



8. What is the combined area of all of the blades?

_____

9. What is the maximum number of pennies that can be lifted?

_____

10. How long does it take to lift the bucket?

_____ seconds

11. Was your hypothesis correct? Please explain why, or why not *(don't just write "yes" or "no").*

_____

_____

_____

_____