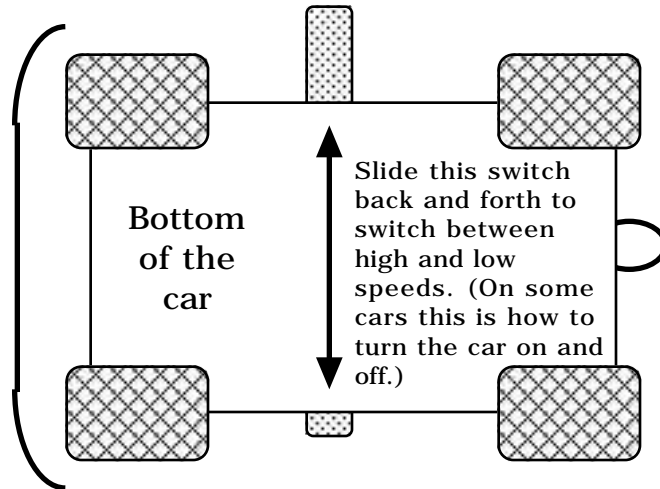


You will be divided up into groups. Each person in the group will keep individual records. All the information collected and calculated will be reviewed next class. Your group will rotate among the stations. If you cannot get to a station then work together on the problems on the boards. Your priority is to get through the stations in the room before doing the word problems. **Do all calculations with standard S.I. units.**

**STATION 1: "STOMPER" Toy car**

The car is tethered to a weighted can. The car is battery powered and has a two speeds. It is turned on and off via a switch under the car.

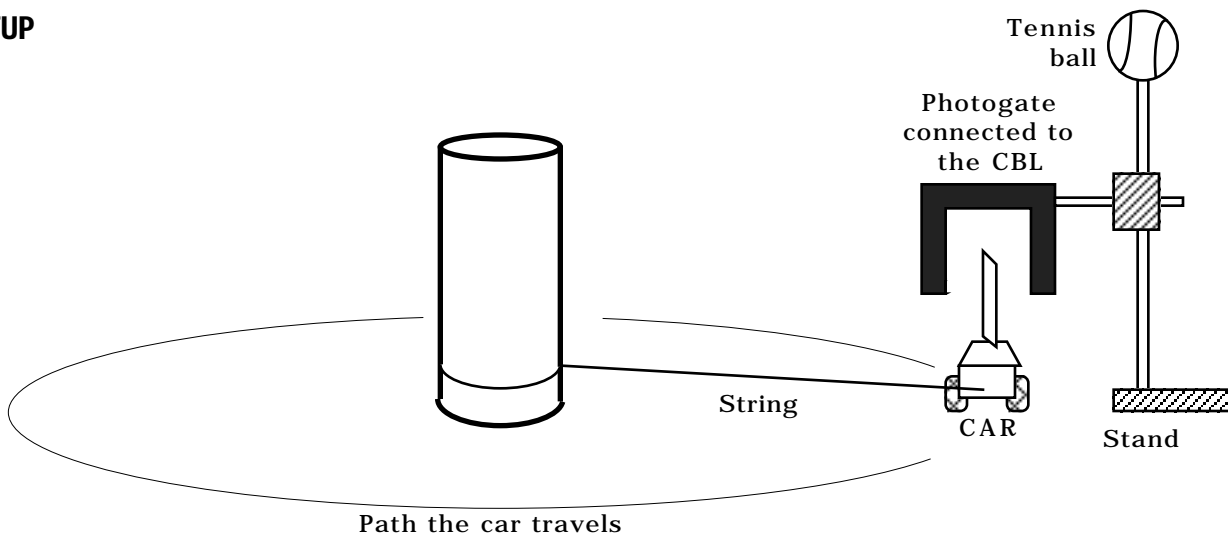


Your car has an index card taped to the top of the vehicle. This card is used in conjunction with the CBL to calculate the vehicle's velocity. Position the gate such that the the card on top of the car travels through the gate. when setting up the CBL use the GATE mode. This will tell you how long it takes for the card to break the photogate's beam. Run the car through the gate until you have ONE good time measurement.

Do not hold the wheels of the car while the motor is turned on.

$$V_T = \frac{\text{Card width}}{\text{CBL time}}$$

**SETUP**



**Questions**

1.1) What is the width of the index card that passes through the photogate? \_\_\_\_\_

1.2) How much time does it take for the card to pass through the gate when the car is traveling SLOW?

\_\_\_\_\_

1.3) How much time does it take for the car to pass through the gate when the car is traveling FAST? (If your car does not have a "FAST" speed then skip this questions.)

\_\_\_\_\_

1.4) Measure the radius of the circle from the center of the can to the card. What is this radius's measurement?

\_\_\_\_\_

1.5) What is the tangential velocity of the car? (Give two answer if your car has two speeds.)

\_\_\_\_\_

1.6) Calculate the car's period of motion using the tangential velocity and radius. Show all of your work.

Period of the slow car: \_\_\_\_\_

Period of the fast car: \_\_\_\_\_

1.7) Calculate the car's centripetal acceleration. (Give two answer if your car has two speeds.)

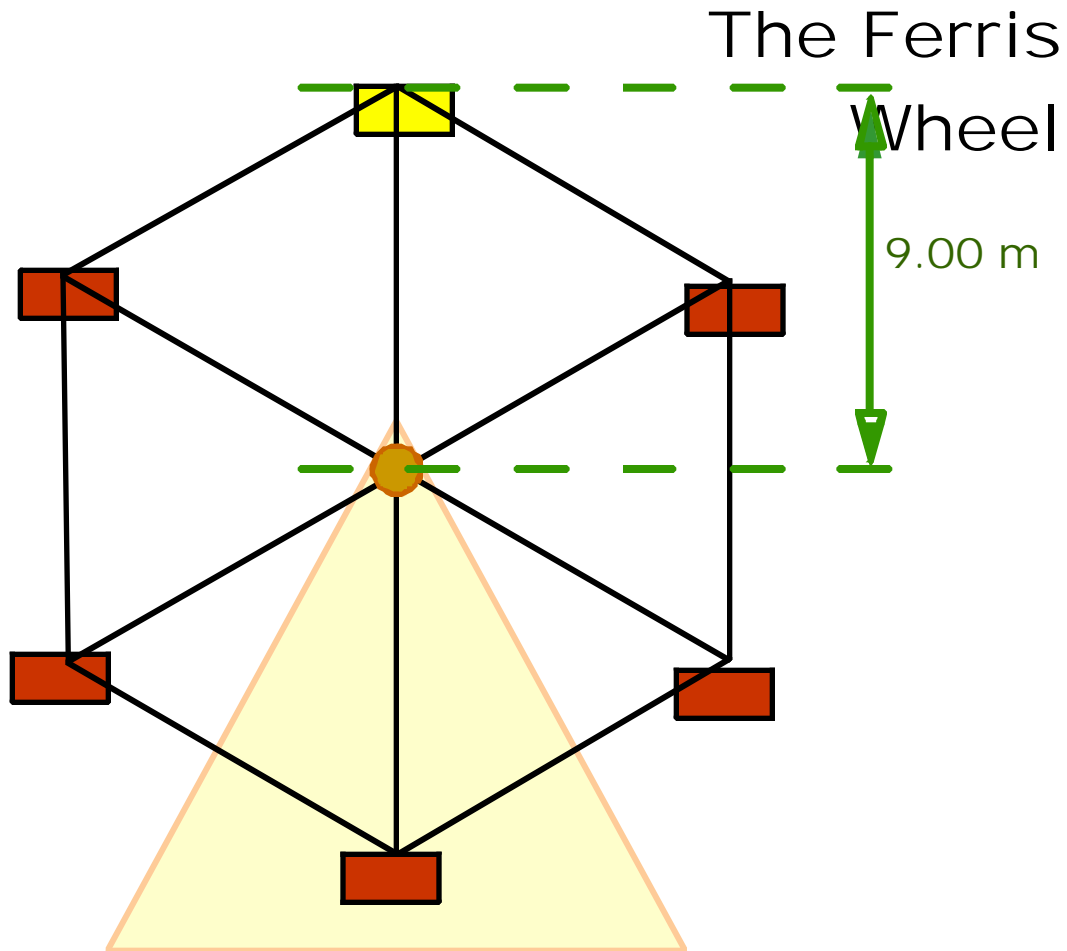
ANSWER \_\_\_\_\_

1.8) The term centripetal force is a generic term. If you were to talk about gravity, you would know that only mass exerts a gravitational force. But a "centripetal force" can be exerted by many different things. What is supplying the centripetal force to keep this car traveling in a circle?

\_\_\_\_\_

## STATION 2: COMPUTER FERRIS WHEEL

Find a computer displaying the circular motion page. Select Ferris Wheel. Press the PLAY button to see the animation.



**QUESTIONS AND PROCEDURE:**

2.1) Use the stopwatch to measure the period of motion for the ferris wheel. What is it's period? \_\_\_\_\_

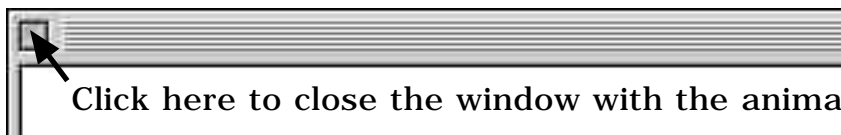
2.2) Calculate it's tangential velocity: \_\_\_\_\_

2.3) Calculate its centripetal acceleration: \_\_\_\_\_

2.4) Calculate It he mass of a rider is 65 kg, the what is the centripetal force exerted by the ferris wheel? \_\_\_\_\_

2.5) The term centripetal force is a generic term. If you were to talk about gravity, you would know that only mass exerts a gravitational force. But a "centripetal force" can be exerted by many different things. What is supplying the centripetal force to keep the seat the rider is in going in a circle at the bottom of the motion?  
\_\_\_\_\_

**Go back to the main menu**



Click here to close the window with the animation.

**STATION 3: RADIO CONTROLLED TRUCK**

The remote is not needed. When turned on, the car will run backwards while turning. **DO NOT TAMPER WITH THIS.** The car will not travel in a precise circle. In other words it will not travel the exact same circle twice in a row.

**QUESTIONS AND PROCEDURE:**

Devise a way to measure/calculate the car's radius.

3.1) What is the truck's radius as it travels around once? \_\_\_\_\_

3.2) Use a stop watch and measure the truck's period of motion. \_\_\_\_\_

3.3) What is the truck's tangential velocity? \_\_\_\_\_

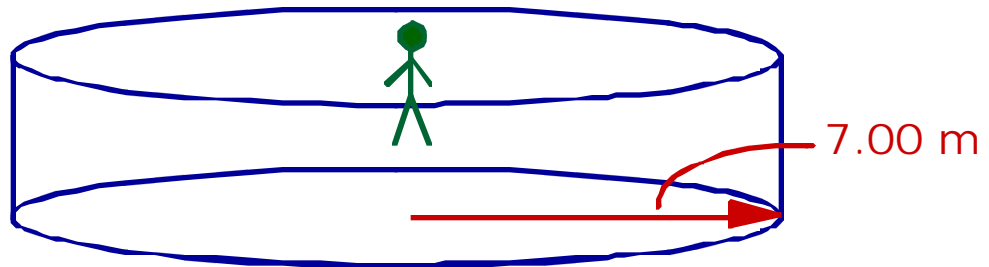
3.4) What is the truck's centripetal force if it's mass is 755 grams?

3.5) The term centripetal force is a generic term. If you were to talk about gravity, you would know that only mass exerts a gravitational force. But a "centripetal force" can be exerted by many different things. What is supplying the centripetal force to keep the truck going in a circle?

---

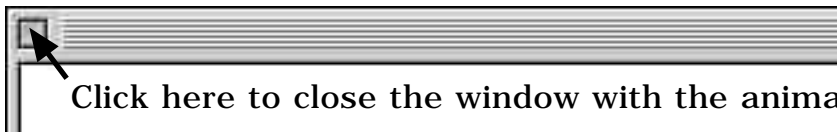
**STATION 4: THE ANTIGRAVITY RIDE**

Find a computer displaying the circular motion page. Select the Anti-Gravity Ride. Press the PLAY button to see the animation.



- 4.1) Use the stopwatch to measure the period of motion for the ride wheel. What is its period? \_\_\_\_\_
- 4.2) Calculate its tangential velocity: \_\_\_\_\_
- 4.3) Calculate its centripetal acceleration: \_\_\_\_\_
- 4.4) If the mass of a rider is 55 kg, what is the centripetal force exerted by the ride wheel? \_\_\_\_\_
- 4.5) The term centripetal force is a generic term. If you were to talk about gravity, you would know that only mass exerts a gravitational force. But a “centripetal force” can be exerted by many different things. What is supplying the centripetal force to keep the seat the rider is in going in a circle at the bottom of the motion? \_\_\_\_\_

**Go back to the main menu**

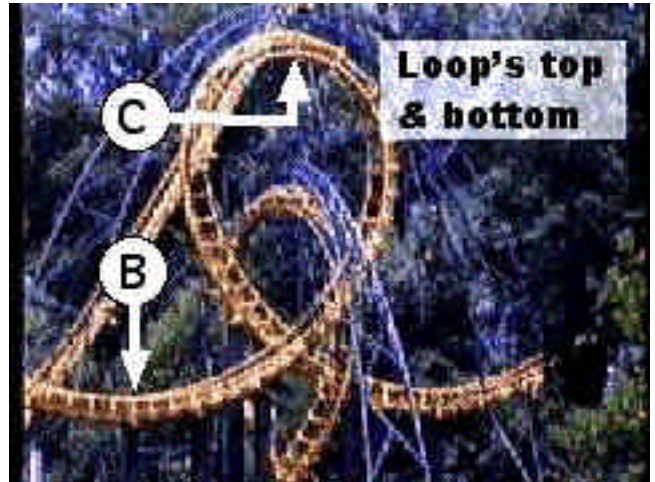


Click here to close the window with the animation.

**STATION 5: THE ROLLER COASTER LOOP**

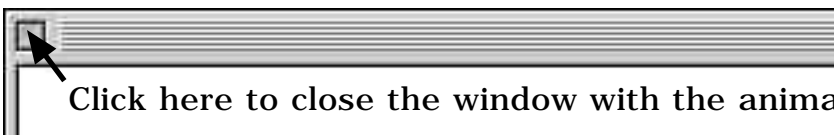
Find a computer displaying the circular motion page. Select the roller coaster. Read through the measurement animation. Understand the method being described. You will use this method.

Click to the movie and run it. Use the stopwatch as needed.



- 5.1) What is the length of the roller coaster train? \_\_\_\_\_
- 5.2) What is the velocity of the train at the highest point on the loop? \_\_\_\_\_
- 5.3) Using the tangential velocity, find the centripetal acceleration at the highest point on the loop? ( $R = 7.00$  m at the loop's top.) \_\_\_\_\_
- 5.4) If train's car with rider has a mass of 455 kg, then what centripetal force is exerted on the car? \_\_\_\_\_
- 5.5) The term centripetal force is a generic term. If you were to talk about gravity, you would know that only mass exerts a gravitational force. But a "centripetal force" can be exerted by many different things. What is supplying the centripetal force to keep the coaster car traveling in a circle? \_\_\_\_\_

**Go back to the main menu**

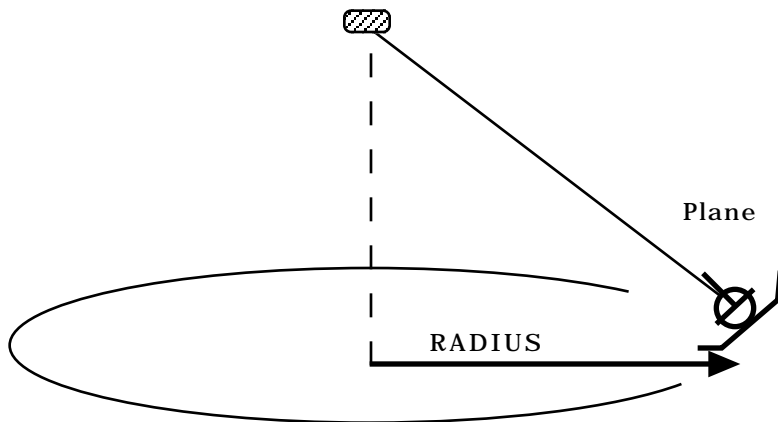


Click here to close the window with the animation.

**STATION 6: THE AIRPLANE**

**WARNING WARNING WARNING**

**Only one person at a time is allowed under the plane. Everyone else is to stay away.**



6.1) What is the radius of the plane's circle? \_\_\_\_\_

6.2) What is the plane's period of motion? \_\_\_\_\_

6.3) What is the plane's tangential velocity? \_\_\_\_\_

6.4) What is the plane's centripetal acceleration? \_\_\_\_\_

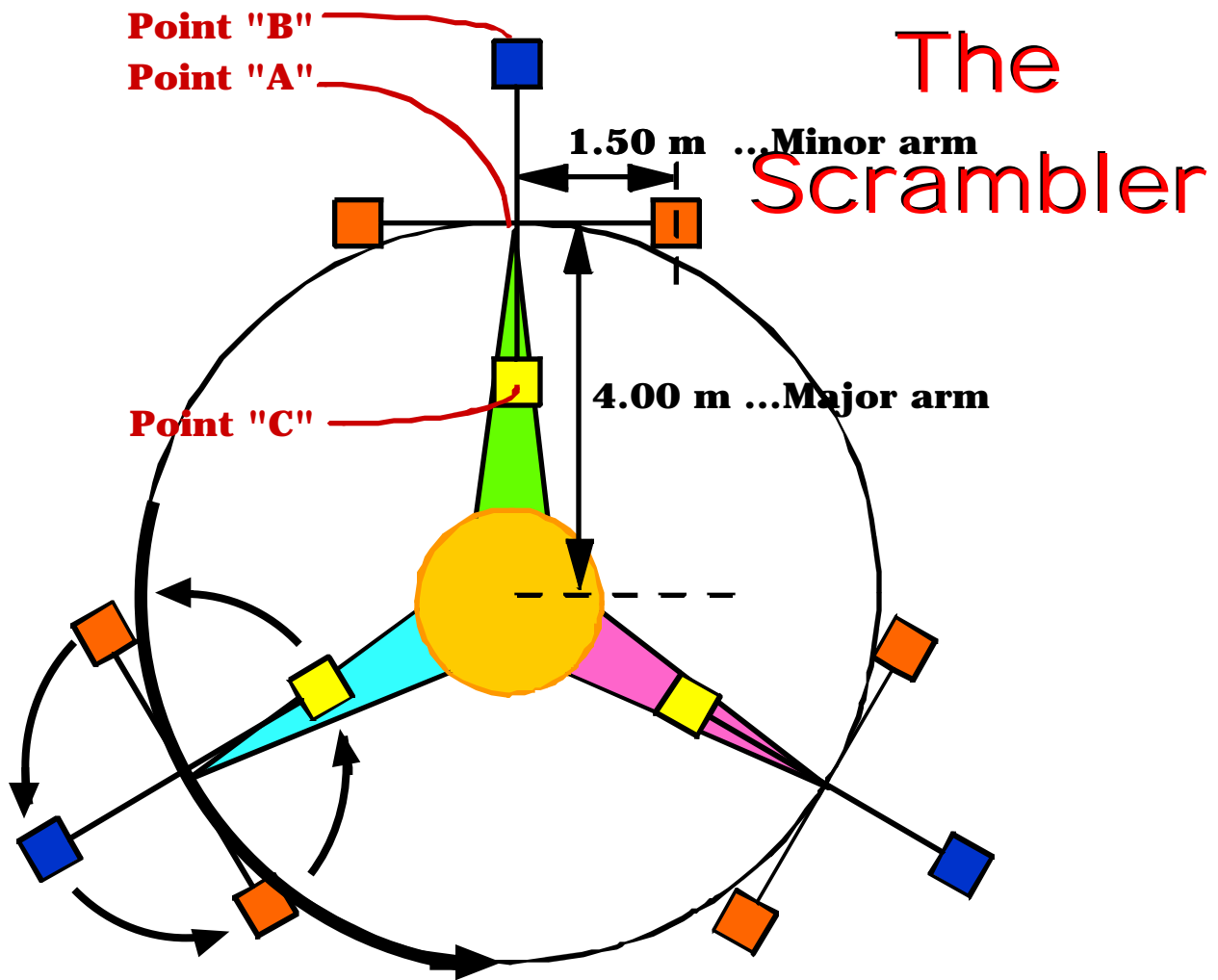
6.5) If the mass of the plane is 247 grams, then what centripetal force is exerted on it? \_\_\_\_\_

6.6) The term centripetal force is a generic term. If you were to talk about gravity, you would know that only mass exerts a gravitational force. But a "centripetal force" can be exerted by many different things. What is supplying the centripetal force to keep the coaster car traveling in a circle?

\_\_\_\_\_

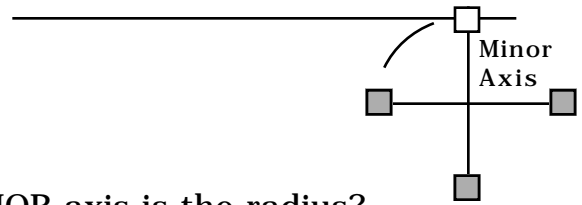
## STATION 7: THE SCRAMBLER RIDE

Find a computer displaying the circular motion page. Select The Scrambler Ride. Press the PLAY button to see the animation.



The "Scrambler's" motion is a complex circular motion. When rider is the farthest away from the center, point B, the rider is moving with a speed equal to the tangential velocities about the minor axis AND the major axis. The rider's radius is equal to the distance between him/her and the center. When the rider is closest to the center, point C, the rider experiences a velocity that is the difference between the major and minor axis. The rider's radius is equal to the radius associated with the greatest velocity.

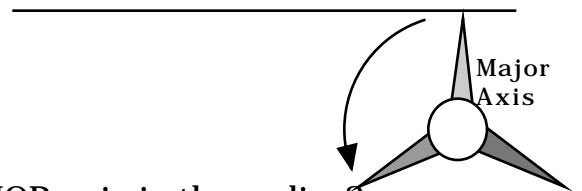
7.1) What is the period of motion when the MINOR axis is the radius?



7.2) What is the tangential velocity when the MINOR axis is the radius?

\_\_\_\_\_

7.3) What is the period of motion when the MAJOR axis is the radius?



7.4) What is the tangential velocity when the MAJOR axis is the radius?

\_\_\_\_\_

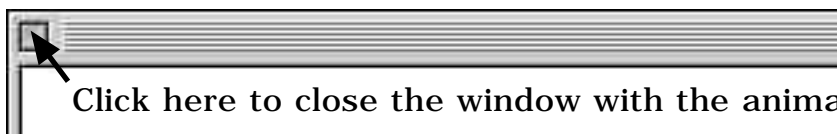
7.5) What is the centripetal acceleration in g's a point A? (Ignore the motions and look at the absolute radius the ride chair is spinning about.)

\_\_\_\_\_

7.6) What is the centripetal acceleration in g's a point C? (The radius to use will be the one associated with the fastest tangential velocity. The tangential velocity to use will be the net velocity of the two tangential velocities.)

\_\_\_\_\_

Go back to the main menu



Station 1

- is a “Stomper” car tethered to an upside down tennisball can. This card will need a 3” x 5” index card on its top.
- Set up a probe to calculate the time through it using the gate method



STATION 1

Station 2

- Set is up on a computer. It will run best if it is copied to the hard drive.
- stopwatch

Station 3

- This station needs a radio control car that runs backwards when turned on. This is a \$5.00 car from K-Mart. when turned on it runs. you do not need the controller to use it! It automatically runs in a circle backwards
- The actual remote is not used.
- stopwatch
- meter stick



STATION 3

Station 4

- Set is up on a computer. It will run best if it is copied to the hard drive.
- stopwatch

Station 5

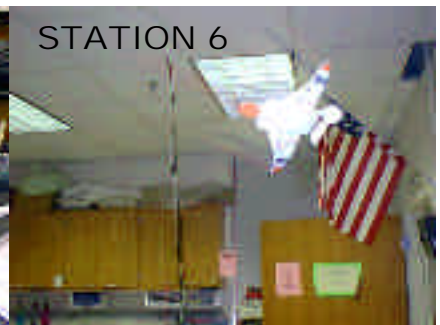
- Set is up on a computer. It will run best if it is copied to the hard drive.
- stopwatch

Station 6

- airplane: Think safety.
- (2) meter sticks
- stop watch
- The ariplane is tethered to the ceiling.



STATION 6

Station 7

- Set is up on a computer. It will run best if it is copied to the hard drive.
- stopwatch