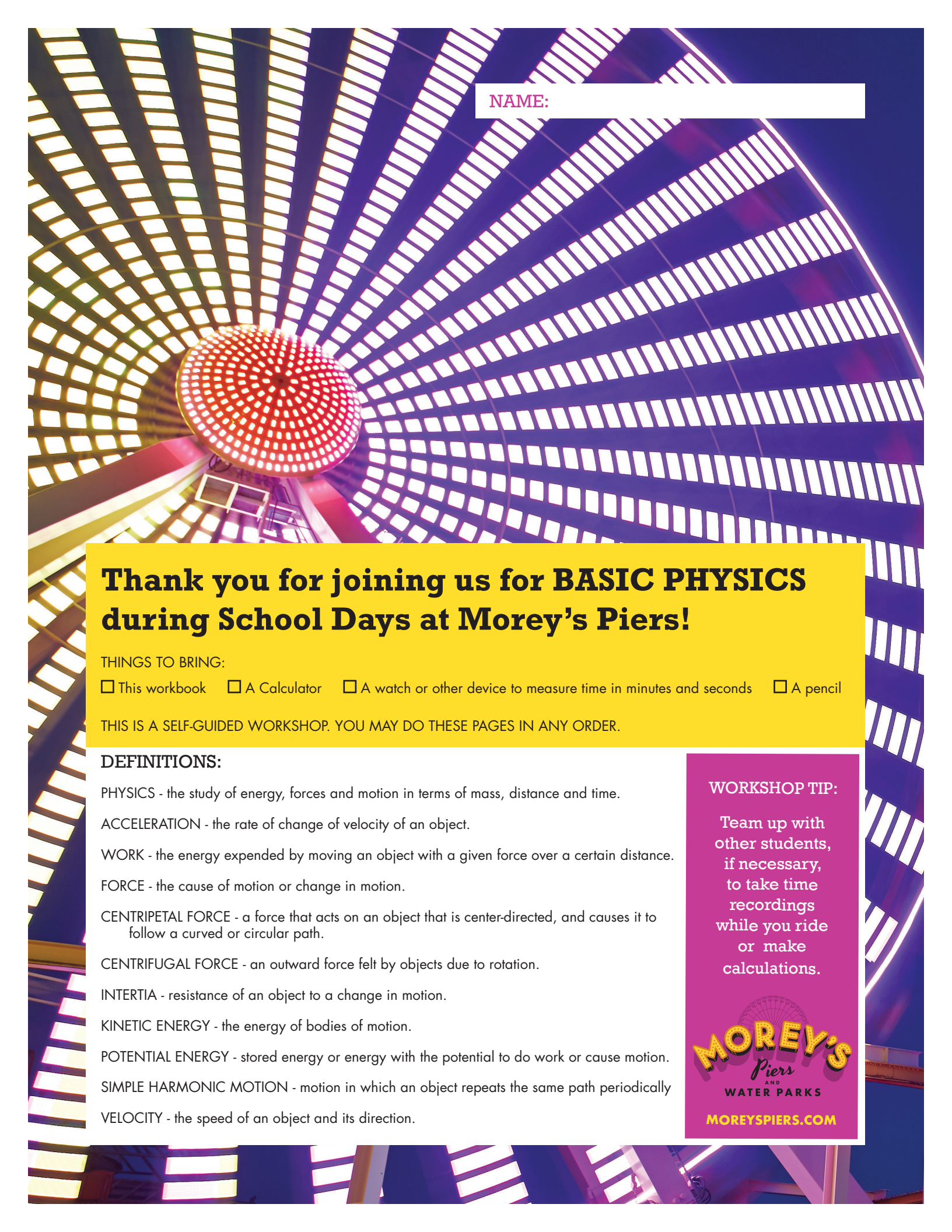




NAME: _____

Thank you for joining us for **BASIC PHYSICS** during School Days at Morey's Piers!

THINGS TO BRING:

☐ This workbook ☐ A Calculator ☐ A watch or other device to measure time in minutes and seconds ☐ A pencil

THIS IS A SELF-GUIDED WORKSHOP. YOU MAY DO THESE PAGES IN ANY ORDER.

DEFINITIONS:

PHYSICS - the study of energy, forces and motion in terms of mass, distance and time.

ACCELERATION - the rate of change of velocity of an object.

WORK - the energy expended by moving an object with a given force over a certain distance.

FORCE - the cause of motion or change in motion.

CENTRIPETAL FORCE - a force that acts on an object that is center-directed, and causes it to follow a curved or circular path.

CENTRIFUGAL FORCE - an outward force felt by objects due to rotation.

INERTIA - resistance of an object to a change in motion.

KINETIC ENERGY - the energy of bodies of motion.

POTENTIAL ENERGY - stored energy or energy with the potential to do work or cause motion.

SIMPLE HARMONIC MOTION - motion in which an object repeats the same path periodically

VELOCITY - the speed of an object and its direction.

WORKSHOP TIP:

Team up with other students, if necessary, to take time recordings while you ride or make calculations.



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THE SEA SERPENT

Height = 33.5 meters

Radius = 9 meters

The height at the beginning of the backwards run is 33.5 meters. The radius of the loop is 9 meters.



1. After the roller coaster is towed by the chain, what is its energy source for the remainder of the ride?
2. Describe the difference among a passenger's experience in the front, middle and rear of the car.
3. Using the timer, record five readings of time from when the roller coaster is at the top of the first hill to the bottom before the curve. What is the average time?
1 _____ 2 _____ 3 _____ 4 _____ 5 _____
4. Find the average velocity of the Sea Serpent from the top of the first hill to the bottom before the curve into a loop. Use the information on the diagram above.
Hint: Use the formula, velocity = distance/time and use the average time found in the question above.
5. What holds your body in place inside and around the loop?
What type of force does the harness and seat have on you?
6. Using the formula, work = weight X distance lifted, find the work done by the motors to pull you up the first hill.
Hint: Multiply your weight in lbs. by 4.45 to convert your weight to Newtons, and use the diagram above for the distance.

THE WAVE SWINGER

1. Who appears to be going faster – the people on the inside seats or those on the outside seats?

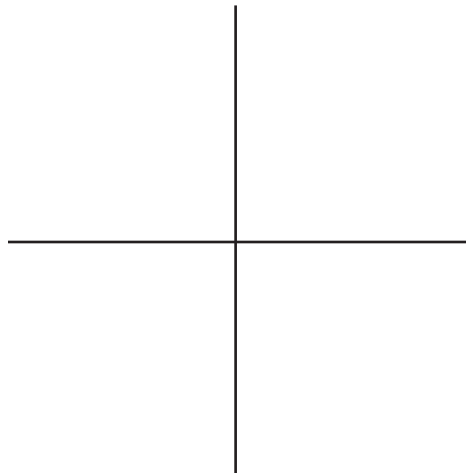
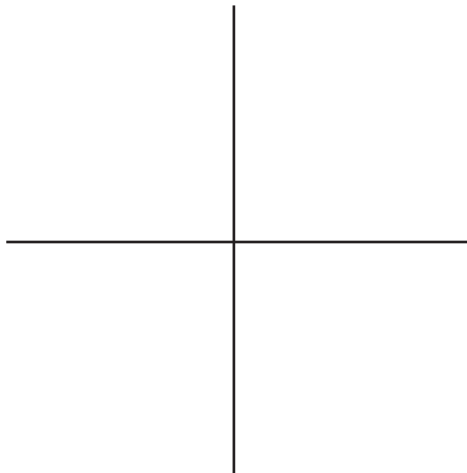
2. What makes the seats travel in a circular path?

3. What makes the seats tilt out while the ride is in motion?

4. Draw a diagram of the forces acting on a rider and seat combined when the swing is:

A. At Rest

B. Moving



SUPER SCOOTERS

1. What happens to each car in a collision when:
 - a. One car is not moving and is struck directly in the rear by one another?
 - b. Both cars are moving and there is a direct rear-end collision?
 - c. The car strikes a wall bumper?
2. In which cars, in the above situations, were you thrown forward? Explain.
3. In which cars, in the above situations, were you thrown backward? Explain.
4. What is the reason for having the rubber bumpers around the cars and the floor?
5. What is the role of friction between the cars and the floor?
6. Assume that you are traveling at 2m/s. Calculate the momentum of you and your car.
HINT: Momentum = mass times velocity, and mass = weight divided by gravitational acceleration.
7. During an elastic collision, is kinetic energy conserved? Explain.
Are the actual bumper car collisions elastic? If not, is energy still conserved?
What is the weight of the car?

THE GIANT WHEEL

Radius = 23 meters

1. Why don't the cars turn upside-down as the wheel goes around? Draw a picture to show why.



2. As you go up, explain the sensations you feel. How do the feelings change as you come down?
3. What is the force factor at the top of the wheel?
4. What is the force factor at the bottom of the wheel?
5. What is the circumference of the wheel?
6. Calculate your speed.