Gravity and Staying in Orbit
The Rope and Ball Activity

Isaac Newton's 1st Law of Motion: An object at rest tends to stay at rest. An object in motion tends to stay in motion in a straight line. While an object is in motion, it will change direction or speed only if acted upon by an outside force.

Isaac Newton's 2nd Law of Motion: the acceleration of an object is dependent upon the force acting upon the object and the mass of the object.

Centripetal Force: moving or tending to move toward a center.

Velocity: The speed of something in a given direction

Directions:

1. Everyone on the team:
    a. Orbit the rope above your head.
        i. With the ball only a foot out, try to keep the ball the same distance, for a few seconds, without it moving farther out.
        ii. While the ball is orbiting, try to move the ball out about a foot keeping it the same distance for a few seconds.
        iii. While the ball is orbiting, try to move the ball out about another foot then keeping it the same distance for a few seconds.
        iv. Keep doing this until the ball can't go out any further.

2. Take turns swinging the rope at different lengths for one minute. Count the number of orbits it makes at that length. Mark the table below.

	Length of the Rope in inches	Number of Orbits Per Minute	The Speed of the Orbiting Ball compared to the last	Amount of Force to Orbit the Ball from the last level
1.	6			
2.	12			
3.	18			
4.	24			
5.	30			
6.	36			

3. Answer the questions on the next page.

Questions about the Rope and Ball Activity

Answers for question one.

1. What did you find out about force with the orbit of the ball when it stayed the same length while orbiting?

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2. What did you find out about force with the orbit of the ball to take it farther out into orbit?

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3. What did you find out about force with the orbit of the ball when the ball was farther out while the ball was orbiting at the next length?

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Answers for question two.

4. What does the length of the rope have to do with the number of orbits?

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5. Why do you think length of the rope has something to do with the number of orbits?

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6. What does the length of the rope have to do with the velocity of the ball?

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7. Why do you think length of the rope has something to do with the velocity of the ball?

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8. What does the length of the rope have to do with the force for the ball to orbit?

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9. Why do you think length of the rope has something to do with the force for the ball to orbit?

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10. Looking at real world ideas, what makes moons and planets stay in orbit.

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11. Draw a model of what is happening in space that keeps planets and moon in orbit on the backside of the first paper.