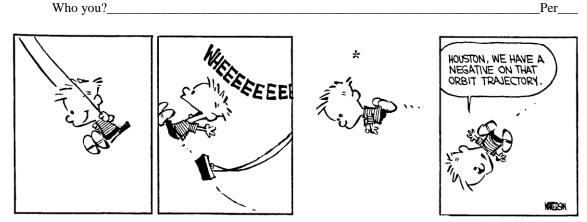
## AP Physics – Gravity – 28



Far away there in the sunshine are my highest aspirations. I may not reach them, but I can look up and see their beauty, believe in them, and try to follow where they lead. - Louisa May Alcott

1. A girl on a skateboard at rest, throws a bag of sand away from herself, giving it a speed of 12.0 m/s. The girl/skateboard's mass is 37.2 kg and the mass of the sandbag is 22.9 kg. What is the final velocity of the lass?

2. A 5.25 kg ball traveling rightward at 4.25m/s collides head on with a 2.00 kg ball traveling in the opposite direction at 3.55 m/s. If the final velocity of the second ball is 5.15 m/s rightward, (a) what is the final velocity of the first ball? (b) What is the change in kinetic energy?

3. A 65.0 kg astronaut at rest in space catches a 23.0 kg oxygen tank travelling at a speed of 6.25 m/s. With what velocity does the astronaut start to move through space?

4.	You playfully toss a 1725 g tomato at your sibling. The tomato, traveling at 25.0 m/s, smashes into the young juvenile. (a) If the time of the interaction is 0.350 sec, what is the average force on the child? (b) What is the impulse? (c) If the tomato bounced off with no loss in kinetic energy (and the sibling remained motionless) what would be the force on the child?
5.	Jupiter has a mass about 300 times bigger than the earth's mass. So you should weigh 300 times more on Jupiter, right? Wrong. You would actually only weigh about three times as much on Jupiter as you do on earth. How come?
6.	What is the force pulling you towards the center of the earth if you are on its surface and weigh $500\ N$ ?
7.	An asteroid revolves around the sun at a distance of $5.35 \times 10^{11}$ m. The Sun's mass is $1.99 \times 10^{30}$ kg (a) What is its orbital velocity? (b) What is the period of its orbit (in years)?
8.	A satellite is in orbit - like 595 km above the earth's surface. (a) What is its orbital velocity? Earth's radius is $6.37 \times 10^6$ m, earth's mass is $5.98 \times 10^{24}$ kg. (b) What is the centripetal acceleration acting on the satellite?

9. A 2.35 kg ball is traveling at 5.30 m/s to the north. It glances off of a 2.75 kg ball that is at rest. The first ball ends up traveling to the west at 3.16 m/s. What is the final speed of the 2.75 kg ball?

10. A 1.50 kg block is pushed into a spring (k = 345 N/m) a distance of 25.0 cm. When the block is released it slides along a smooth surface and then up a ramp (elevation angle is 32.0°). (a) What is the velocity of the block when it is released from the spring? If the length of the ramp is 1.20 m, (b) does the block slide off the end of the ramp? If it does not, how far up the ramp does it go?



11. A 2.50 kg stone ball hangs from two pieces of line as shown. The long line has a length of 76.0 cm. Find: (a) the tension in each of the cords. The short string breaks and the rock swings to the right. (b) find the speed of the ball at the lowest point in its travel.

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