Physics For Everyone

http://www.coloradocollege.edu/Dept/PC/RepresentativePhy/home.htm

Momentum Answers

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Answer 2.1: Chelsea's center of mass is her body's most natural axis for rotation if she is to be lying with her back to the floor. If her center of mass was located around her shoulder region she wouldn't have as great a difficulty with this particular move, but as it is her center of mass is lower on her torso. She spins like a hardboiled egg.

Answer 2.2: The artist must not have dropped the ball onto the center of the spinning wheel.

Answer 2.3: Approximately 2.5 inches from the mother's shoulders and 43 inches from the floor. (Assume the woman's height to be 65 in, with a center of mass 42 in from the floor. She is holding the child 20 in from her body and 49 in from the floor).

Answer 2.4: We estimated the aunt at height 1.52 m (5 ft). with center of mass 98 cm from the ground, and a weight of 73 kg (160 lbs). We estimated the baby at 10 kg with a center of mass displaced 12 cm from the aunt's along the horizontal axis, and 116 cm from the ground. The center of mass of the aunt-niece system is 1.4 cm behind Qinaluqana's back, and 1 m from the ground.

Answer 2.5: For a woman of average height and weight (5'5" and 140 lbs), she will hold a heavy object about 20″ from her vertical axis. Yes she will balance just fine in this position, it is close enough to the base of her stance especially since she has her knees bent - her base stance is widened. In a squatting position, her center of mass will be closer.

Answer 2.6: The first dowel has a center of mass 8.75 cm from the end with the bear. The second dowel's center of mass is 8.22 cm from the seal. The third dowel's center of mass is 7 cm from the end from which the bear and puppy are suspended.

Answer 2.7: A person's center of mass is approximately located in the lower part of their torso, in the region between the belly button and the hips. The center of mass of a person who is squatting will be closer to the longboard than the center of mass of a person who is standing. Turning will be easier when the center of mass is closer to the turning object.

Answer 4.1: Assume the passengers have an average mass of 150 lbs=68 kg. Then the total mass of the loaded boat is 568 kg. The initial momentum is 398 kg m/s; the final momentum is 1477 kg, so 1079 kg m/s is transformed from the river to the raft.

Answer 4.2: Her momentum on a still day is 986 kg m/s; she transfers 238 kg m/s on the next day to the wind, and on the day after that the wind transfers 75 kg m/s to her.

Answer 4.3: Mae will travel toward the shuttle at a speed of 1.7 cm/s, so she will reach the shuttle 2 minutes and 26 seconds after she releases the camera.

Answer 5.1: After the collision, the dog chow launches forward with a speed of 3m/s.

Answer 5.2: The magnitude of the displacement of Felicia's new position from her old is 0.97 ft (0.5 ft north, 0.83ft east).

Answer 5.3: Your two kayaks move together at 58 degrees west of north at a velocity of 11.4 m/s

Answer 5.4: 2.5 m/s

Answer 5.5: Its velocity after the collision is 0.67 m/s, and so it will travel 1.02 m, well outside the circle.

Answer 5.6: Both puppies have the same mass, so their velocity will be halved after the collision.

Answer 5.7: Lightning’s momentum is 4484kg m/s. Sonora’s momentum changes from 0 to 431kg m/s.

Answer 5.8: 8.2 m/s

Answer 5.9: The mass of the woman's handbag is approximately 1.4kg. If the skater just drops the handbag in the woman's arms, her speed will remain unaltered, because the handbag will keep its momentum.

Answer 5.10: The smaller print is half the size of the larger, assuming the paper is the same for both.

Answer 5.11: Use your own mass for this problem. Roughly 5 kg m/s.

Answer 5.12: They will stick together and stop.

Answer 5.13: 2.8 m/s

Answer 5.14: 3rd piece travels 135 degrees from either of the other two pieces at a speed larger by a factor of 1.4 (square root of 2).

Answer 5.15: Their combined velocity will be 29.5 m/s vertically, and 0.16 m/s horizontally.