Unit 2 Problems – Kinematics

Name_____

Vocabulary:

Kinematics	Motion	Scalar	Magnitude
Distance	Displacement		Speed
Vector	Velocity	"g"	Acceleration

Questions:

1. If you shoot a basketball straight up in the air and it takes 3 seconds to reach its highest point, how long will it take to come back down?
2. How fast will it be traveling when it hits you?
3. Did the acceleration change?
4. Did the velocity?
5. What is the difference between distance and displacement?

Physics Problems: Work the following problems out to the correct number of sig. figs:

Probs A.

1. Trey travels 3000 km in 59 hours. What is his speed in m/s and km/hr?
2. If Alissa makes a round trip to and from San Antonio (483.9 km), in 6.53 hours, what is her average speed and velocity for the trip?
3. If Mars shot a standing rabbit with an arrow that was traveling at 38 m/s, and it took 5.8 s for the arrow to reach the bunny, how far was he from the rabbit?
4. Light travels at 299 792 458 m/s. If the sun is 1.5×10^8 km away from the earth, how long, in **minutes**, does the sunlight take to reach the earth? (Note conversions!)
5. The tortoise and the hare raced 30.8 km in their preliminary heat. The tortoise ran at 3.5 m/s and the hare ran at 4.8 m/s. How much time elapsed between the turtle's and rabbit's finish?

Probs B.

1. If a bullet achieves a velocity of 799.3 m/s from an acceleration of 3.26×10^5 m/s^2, how much time was the bullet inside the gun?
2. Aaron's car goes from 0 to 100 km/hr in 3.2 seconds. What is the rate of acceleration?
3. David ran a race. He accelerated at a rate of 0.862 m/s^2 for the entire 10.3s race. What was his finishing speed?
4. As you pass a car on the interstate, you accelerate from 15 to 35 m/s over a 5.97s period. What is your acceleration?
5. Yolanda's trike rolls down a hill, being pulled at 4.81 m/s^2 for 15 seconds by gravity. If it was not moving initially, how fast is it now going?
6. Ervey putts a golf ball uphill, where the slant slows it at a rate of .81 m/s^2 until it stops 7.54 s later. How fast did he putt the ball?
7. Cris slides into 3rd base head first. He hit the dirt at 13.7 m/s and slid to a stop in 3.14 s. What was his acceleration?

Probs C.

1. A bullet accelerates to 799.3 m/s in .00245 sec inside the rifle barrel. How long is that barrel?
2. David ran a race. He accelerated at a rate of 0.862 m/s^2 for the entire 10.3s race. How far was the race?
3. Cris slides into 3rd base head first. He hit the dirt at 13.7 m/s and slid to a stop in 3.14 s. How far did he slide?
4. Ervey putts a golf ball uphill at 6.1 m/s, where it slows at a rate of .81 m/s^2 until it stops 7.54 s later. How long was the putt?
5. If a jet taking off accelerates at 8.62 m/s^2 for 23.1 s before leaving the ground, how long must your runway be?
6. A UFO skids to a stop from its crash speed of 89.4 m/s in 11.9 s. What was its acceleration and how far did it slide?
7. You are traveling at 64.9 km/hr and your car brakes at -2.62 m/s^2. If a cat crosses the road in front of you, how far away must it be to avoid becoming a wet spot on the pavement?
8. Pauline is on a skateboard doing 3.42 m/s when she starts to accelerate (at 2.62m/s^2) down a hill for 5.94 s. How far down the hill is she?

Unit 2 Problems – Kinematics

Name_____

Probs D.

1. A bottle rocket achieves a velocity of 349 m/s after flying straight up at a rate of 12.62 m/s^2. How high is the rocket?
2. A jet fighter accelerates at 13.8 m/s^2 along the 100.0 m deck of the aircraft carrier. How fast is the jet going?
3. When Chris throws a football, he releases the ball at 16.9 m/s across a 2.03 m distance. What is the rate of acceleration on the ball?

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4. A bucket of water falls off a tall building. After 3.000 seconds, how fast is the bucket traveling? How far down has it fallen?
5. Julie hits a tennis ball straight up into the air at 22.8 m/s. How long before the ball hits the ground? How high does the ball go? What is its velocity as it hits the ground?
6. A penny is dropped off a tower 342 m tall. How fast is it going when it hits the ground?

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7. Cassie is traveling at a constant 3.02 m/s and is about to travel under the window of a mischievous ice cream eater. If the window is 4.6 m above Cassie's head, how many meters ahead should he aim to hit Cassie?
8. A rocket fired straight up loses its lower stage when it is traveling at a velocity of 132 m/s. If the lower stage free falls and the rocket continues upward at that constant speed, how far apart are they after 15 seconds? What is the velocity of the lower stage at that time?
9. A car has a maximum acceleration rate of 5.0 m/s^2, and a maximum braking acceleration of 8.0 m/s^2. If the speed limit on a road is 60.0 km/hr, what is the shortest legal time needed to go from one stop sign to another 300.0 m away?

Answers!

Pb A: 1. 10 m/s, 50 km/hr 2. 74.1 km/hr, zero 3. 220m 4. 8.3 min 5. 2400s or 40 min

Pb B: 1. .00245 sec 2. 9 m/s^2 3. 8.88 m/s 4. 3.4 m/s^2 5. 72 m/s

6. 6.1 m/s 7. -4.36 m/s^2

Pb C: 1. .979 m 2. 45.7 m 3. 21.5 m 4. 23 m 5. 2.30 x 10^3 m

6. -7.51 m/s^2, 532 m 7. 62.0 m 8. 66.5 m

Pb D: 1. 4830 m 2. 52.5 m/s 3. 70.3 m/s^2

4. -29.4 m/s, -44.1 m 5. 4.65 sec, 26.5 m, -22.8 m/s 6. -81.9 m/s

7. 2.9 m 8. 1100 m, -15 m/s 9. 21 sec