

**CP PHYSICS  
MIDTERM REVIEW Fall 2013**

Name: KEY \_\_\_\_\_ period

1. What are scalar quantities? Give three examples.

magnitude speed, distance, temperature

2. What are vector quantities? Give three examples.

magnitude & direction velocity, displacement, Force, momentum

3. What is the difference between speed and velocity?

magnitude magnitude & direction

4. One car travels east for 250 m over a period of 50 seconds. A second car travels west for 125 m over a period of 25 seconds. What is true about their speeds? their velocities?

$$250/50 = 5 \text{ m/s E}$$

Same Speeds

opposite directions

$$125/25 = 5 \text{ m/s W}$$

5. A car travels down the road 853 m in a time of 42.8 s before beginning to stop at a red light. What was the car's average velocity during this trip?

$$853/42.8 = 20.2 \text{ m/s} \quad * \text{ no direction is given}$$

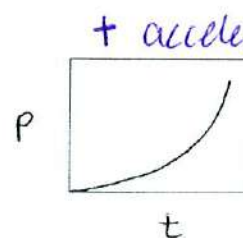
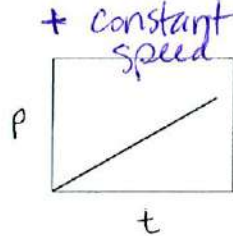
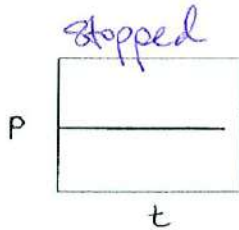
6. The speed of sound through air is 343 m/s. If a person hears a clap of thunder 11.7 s after seeing a bolt of lightning, how far away is the lightning strike?

$$343 = d/11.7 \quad d = 4013.1 \text{ m}$$

7. What does the slope of a position time graph represent?

speed

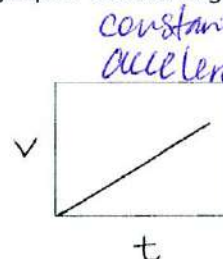
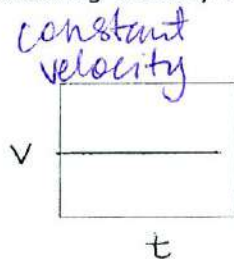
8. Explain what each of the following position time graphs shows regarding an object's motion.



9. What does the slope of a velocity time graph represent?

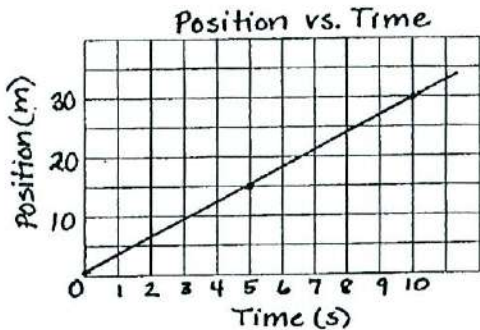
acceleration

10. Explain what each of the following velocity time graphs shows regarding an object's motion.



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11. Use the position time graph below to answer the following questions.



a. What type of motion does the object have?

constant speed

b. What is the instantaneous velocity at  $t = 5.0$  s?

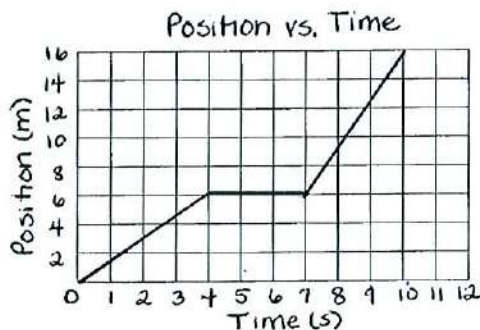
$$15/5 = 3 \text{ m/s}$$

c. What is the average velocity between  $t = 5.0$  s and  $t = 10.0$  s?

$$\frac{30 - 15}{10 - 5} = \frac{15}{5} = 3 \text{ m/s}$$

\* No math is required due to the slope being constant

12. Use the position time graph below to answer the following questions.



a. What is the average velocity of the object at  $t = 2.0$  s?

$$\frac{6 - 0}{4 - 0} = \frac{6}{4} = 1.5 \text{ m/s}$$

\* Find the slope of the line that point is on  $\rightarrow \frac{\text{rise}}{\text{run}} = \frac{y_2 - y_1}{x_2 - x_1}$

b. What is the velocity of the object at  $t = 5.0$  s?

$$0 \text{ m/s}$$

\* Not moving

c. What is the instantaneous velocity of the object at  $t = 9.0$  s?

$$\frac{16 - 6}{10 - 7} = \frac{10}{3} = 3.3 \text{ m/s}$$

\* Find the slope  $\frac{\text{rise}}{\text{run}} = \frac{y_2 - y_1}{x_2 - x_1}$

13. A motorcyclist traveling at  $12 \text{ m/s}$  accelerates at a constant rate of  $2.5 \text{ m/s}^2$  for  $4.0 \text{ s}$ . What distance did the motorcyclist travel while he was accelerating?

$$x_f = 0 + (12 \cdot 4) + \frac{1}{2}(2.5)(4^2)$$

$$x_f = 48 + 20$$

$$x_f = 68 \text{ m}$$

14. A driver is stopped at a red light. When the light turns green, she accelerates at a rate of  $1.8 \text{ m/s}^2$  for  $8.5 \text{ s}$ . How fast is she driving at the end of the acceleration period?

$$1.8 = \frac{v_f - 0}{8.5}$$

$$v_f = 15.3 \text{ m/s}$$

15. A semi truck accelerates at  $0.64 \text{ m/s}^2$  over a distance of  $125 \text{ m}$  and reaches a velocity of  $17 \text{ m/s}$ . What was the truck's initial velocity?

$$17^2 = v_i^2 + 2(0.64)(125)$$

$$289 = v_i^2 + 160$$

$$\sqrt{129} = \sqrt{v_i^2}$$

$$v_i = 11.4 \text{ m/s}$$

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16. An airplane taxis down a runway with an acceleration of  $4.1 \text{ m/s}^2$ . It finally lifts off the ground after 27.0 s. How far down the runway did it travel before lifting off the ground?

$$x_f = 0 + (0 \cdot 27) + \frac{1}{2}(4.1)(27^2)$$

$$x_f = 1494.5 \text{ m}$$

17. An object is dropped from the top of a tall building. If it takes 4.2 seconds for the object to hit the ground below, how tall is the building?

$$x_f = 0 + (0 \cdot 4.2) + \frac{1}{2}(9.8)(4.2^2)$$

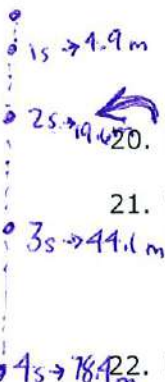
$$x_f = 86.4 \text{ m}$$

18. What is the acceleration due to gravity on Earth? ~~What sign does it always have? Why?~~

$$9.8 \text{ m/s}^2$$

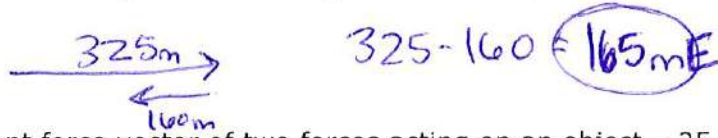
19. Ignoring air resistance, does a heavier object fall faster than a lighter object? Explain.

They will both fall at the same rate due to the same amt of gravity acting on both objects.

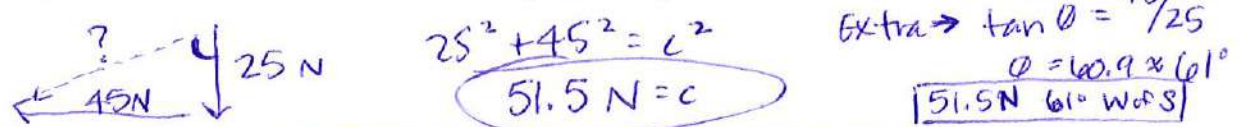


20. Draw a diagram in the margin showing how far an object has fallen after 1 s, 2 s, 3 s, and 4 s.

21. What is the resultant displacement of a person who first walks 325 m east and then walks 160 m west?

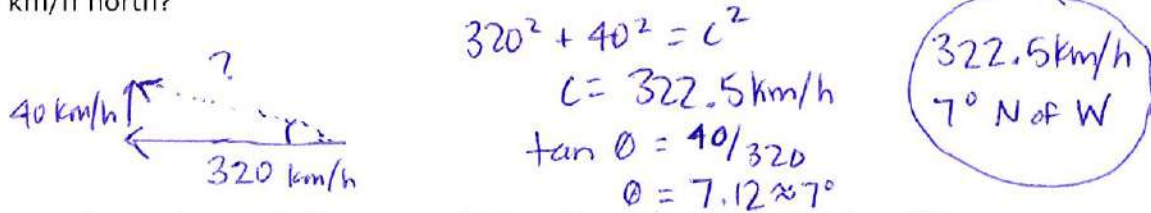


22. Find the resultant force vector of two forces acting on an object - 25 N, south and 45 N, west.

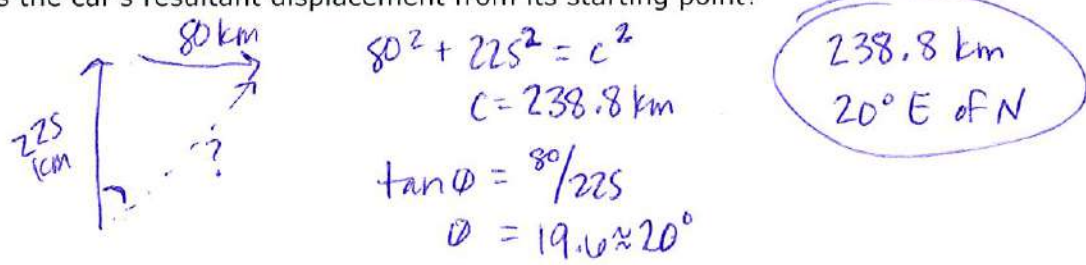


- ~~23. When perpendicular vectors are added, what is true about the resultant vector?~~

24. What is the resultant velocity of a plane which travels 320 km/h west if it experiences a cross wind that blows 40 km/h north?

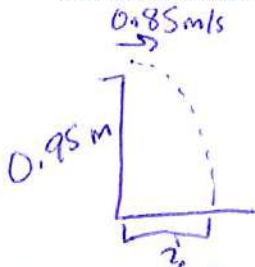


25. A car travels 225 km north to Atlanta. It then turns right and heads east for 80.0 km. What is the car's resultant displacement from its starting point?



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26. A ping pong ball moving at a speed of 0.85 m/s rolls off a 0.95 m table. How far away from the table does the ball land?



x	y
$v = 0.85$	$d_y = 0.95$
$d = ?$	$a = 9.8$
	$v_{iy} = 0$

$$0.95 = 0 + 0 + \frac{1}{2}(9.8)t^2$$

$$0.95 = 4.9t^2$$

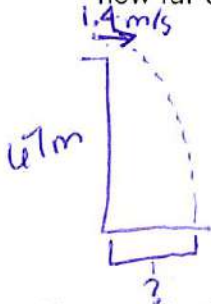
$$\sqrt{0.193} = \sqrt{t^2}$$

$$0.44 \text{ s} = t$$

$$0.85 = \frac{d_x}{0.44}$$

$$d_x = 0.37 \text{ m}$$

27. A soccer ball rolls over the edge of a cliff with a velocity of 1.4 m/s. If the cliff is 67 m high, how far away does land from the base of the cliff below.



x	y
$v_x = 1.4$	$d_y = 67$
$d_x = ?$	$a = 9.8$
	$v_{iy} = 0$

$$67 = 0 + 0 + \frac{1}{2}(9.8)t^2$$

$$67 = 4.9t^2$$

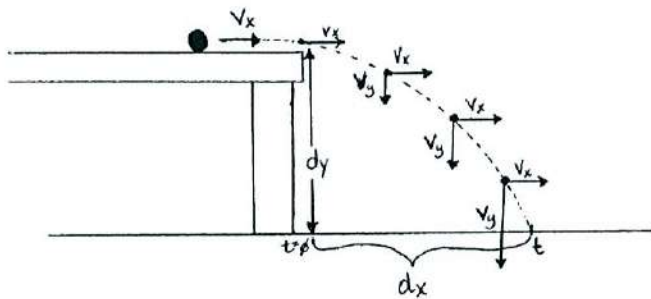
$$\sqrt{13.67} = \sqrt{t^2}$$

$$3.7 \text{ s} = t$$

$$1.4 = \frac{d_x}{3.7}$$

$$d_x = 5.18 \text{ m}$$

28. Use the following diagram of a horizontal projectile to answer the following questions:



a. What happens to the horizontal velocity ( $v_x$ ) as the object falls?

stays constant

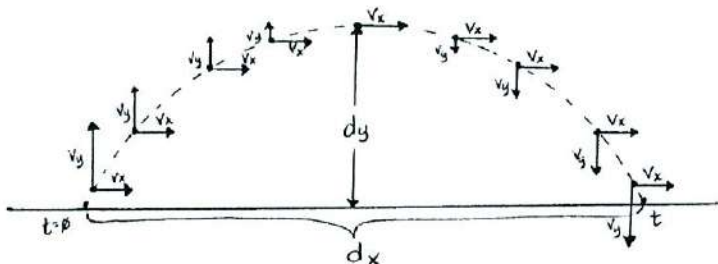
b. What happens to the vertical velocity ( $v_y$ ) as the object falls?

increases

c. What relationship do  $v_x$  and  $v_y$  have?

they are independent of one another

29. Use the following diagram of a projectile launched at an angle to answer the following questions:



a. What relationship do  $v_x$  and  $v_y$  have?

they are independent of one another

b. What value does the  $v_y$  have at the highest point in the trajectory?

0 m/s

c. What value does gravity throughout the trajectory?

9.8 m/s<sup>2</sup>

d. When is the vertical velocity at its maximum? when it is closest to the ground

e. When does the object reach the highest point during its trajectory? At the midpoint

answers will vary

30. What is Newton's First Law of Motion? Give two examples.

An object at rest will remain at rest  
 An object in motion will continue its motion } unless an outside force acts on it

31. What determines the amount of inertia in an object?

\* more mass = more inertia mass of the object

32. Does an object moving in a straight line at a constant speed have no forces acting on it?

Explain. It could have balanced forces acting on it (there is no net force although other forces may be present)

33. Explain why you keep moving forward if you crash your motorcycle into a guard rail.

Inertia - object will continue to move in its original direction until a force is strong enough to ~~at~~ change its motion

34. What is Newton's Second Law of Motion?

$$F = ma$$

35. What is the net force acting on a 120 kg mass that is accelerated at 1.3 m/s<sup>2</sup>?

$$120 \times 1.3 = 156 \text{ N}$$

~~36. In what direction must an object accelerate if it experiences a net force?~~

37. What is the relationship between mass and weight?

\* amount of matter in an object  
 \* does not change

\* force of gravity acting on a mass  
 \* will change depending on the amt of gravity present

38. What is the mass and weight of a 57 kg woman? What is her mass and weight on the moon whose acceleration due to gravity is 1.6 m/s<sup>2</sup>?

Earth

$$m = 57 \text{ kg}$$

$$F_g = 57 \times 9.8 = 558.6 \text{ N}$$

Moon

$$m = 57 \text{ kg}$$

$$F_g = 57 \times 1.6 = 91.2 \text{ N}$$

39. Two boxes are sitting on the floor—one is 10 kg and the other is 15 kg. Which has the greater weight? Which box experiences a greater force of gravity?

15 kg has the greater weight

40. What is Newton's Third Law of Motion? Give three examples.

answers will vary

For every action there is an equal & opposite reaction