

Provide the **best answer** to the following questions and problems. Watch your sig figs.

1) The number of **meaningful digits** in a number is called the number of _____. When numbers are multiplied or divided, the number of these digits in the result is no _____ than the in the factor with the _____ of these. When you _____, the answer can have no more decimal places than the term with the _____ decimal places. (4 pts)

- a) significant digits, greater, most, add or subtract, fewest
- b) significant digits, least, fewest, multiply or divide, least
- c) precision figures, greater, most, multiply or divide, least
- d) significant digits, greater, fewest, add or subtract, fewest

2) In everyday usage, we often use the word model. . in physics, a **model** is a _____ version of a physical system that would be too _____ to analyze in full without the _____. (4 pts)

- a) small, messy, smallness
- b) representative, large, complications
- c) complicated, simplistic, complications
- d) simplified, complicated, simplifications

3) Complete the calculations by using the **prefixes** of the units. (6 pts)

- 1) femto x Tera = _____
- 2) milli / nano = _____
- 3) Giga x micro = _____
- 4) Mega / micro = _____
- 5) $10^9 \times 10^7 =$ _____
- 6) $10^3 / 10^{-6} =$ _____

4) How tall is a flagpole, if I am standing 30 meters from the base of the pole and sighting the top with a protractor at an angle of 43°? (4 pts)

5) How many **sig figs** does each number contain? (4 pts)

- 1) 0.002
 - 2) 2000
 - 3) 2.02×10^{-6}
 - 4) 1.025600
 - 5) 21500
 - 6) 7000 billion
 - 7) 700×10^9
 - 8) 0.0000500
- _____

6) **Trigonometry** is the mathematics that deals with the _____ of the _____ of the sides of a right triangle. The sides have names: the _____ which is opposite / the hypotenuse, the cosine which is the _____ / by the hypotenuse and the tangent which is the _____ / the adjacent. (4 pts)

- a) lengths, ratios, sine, opposite, adjacent
- b) lengths, ratios, sine, adjacent, opposite
- c) ratios, lengths, sine, hypotenuse, adjacent
- d) ratios, lengths, sine, adjacent, opposite

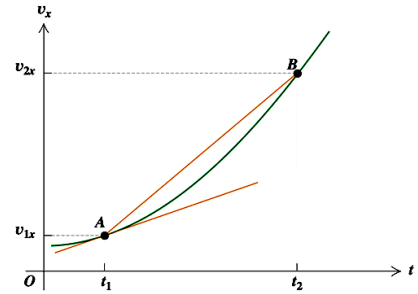
7) Do the calculations (watch your sig figs) (3 pts)

- 1) $\sin 66.3^\circ =$ _____
- 2) $\tan^{-1} (43/34) =$ _____
- 3) $1750 \sin 40^\circ =$ _____

8) What do the two slopes represent on the graph? (4pts)

a) _____

b) _____



9) If vector **B** has components B_x and B_y and makes an angle θ with the x-axis, then (4 pts)

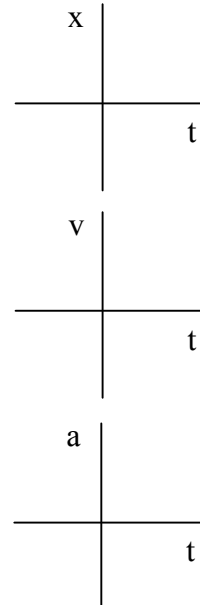
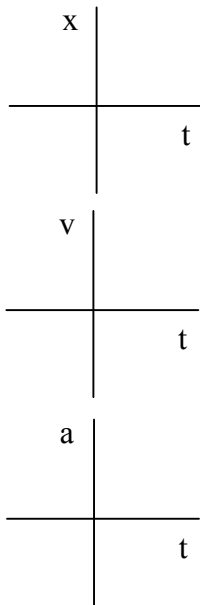
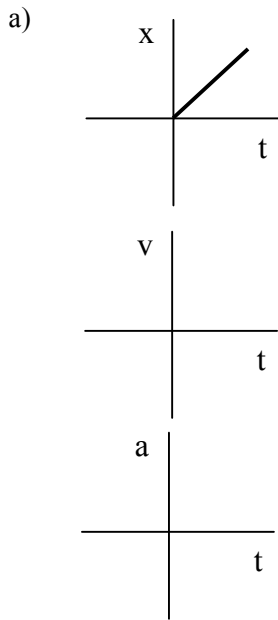
a) $\theta = B_y/B_x$

b) $\tan \theta = B_x/B_y$

c) $B = B_x + B_y$ (where B is the magnitude of B)

d) $\cos \theta = \frac{B_x}{\sqrt{B_x^2 + B_y^2}}$

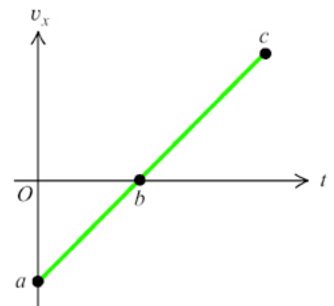
10) Draw the velocity and acceleration graphs associated with the displacement graphs. (6 pts)



11) A wildebeest is running in a straight line, which we shall call the x-axis, with the positive direction to the right. The figure below shows this animal's velocity as a function of time. (4 pts)

Which of the following statements about the animal's motion must be true?

- A. It is moving to the left between a and b and to the right between b and c.
- B. It is moving to the right between a and c.
- C. Its speed is decreasing from a to b and increasing from b to c.
- D. Its acceleration is increasing

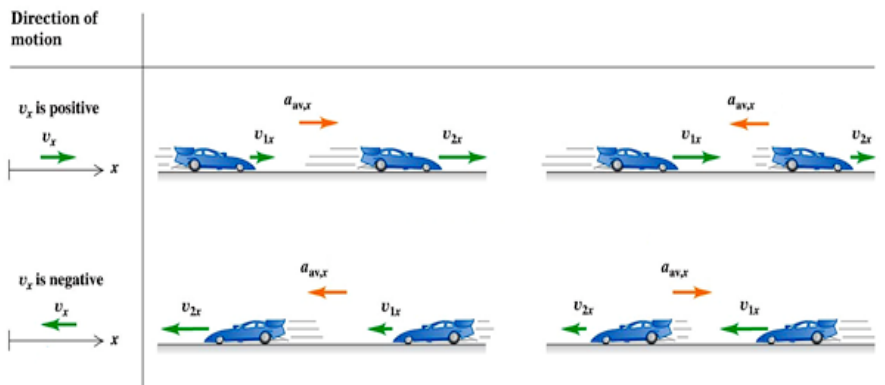


12) Fill in the diagram. (6 pts)

a) Which cars are speeding up or slowing down?

b) What are the signs of the acceleration in each situation?

c) What is the overall equation that determines the sign of the acceleration?



13) The key to analyzing _____ is the fact that we can treat the x and y coordinates _____. So we can think of this motion as a combination of _____ motion with constant velocity and vertical motion with _____. (4 pts)

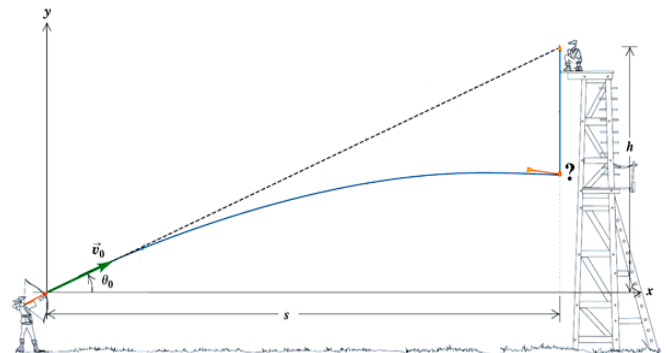
- a) projectile motion, separately, horizontal, constant velocity
- b) projectile motion, separately, horizontal, constant acceleration
- c) freefall motion, together, vertical, constant acceleration
- d) projectile motion, together, horizontal, constant acceleration

14) Write the two motion equations that describe the two paths in the diagram. (4 pts)

- a) _____
- b) _____

15) Why does the arrow hit the apple? (3 pts)

- a) The archer aimed the arrow at the point at which they will collide.
- b) the apple is falling faster in the y-direction but the arrow is traveling in the x-direction faster.
- c) both the arrow and the apple are falling at the same rate.
- d) both the arrow and the apple have the same horizontal velocity.



16) A brick is released with no initial speed from the roof of a building and strikes the ground in 3.30 s, encountering no appreciable air drag. How tall, in meters, is the building? How fast is the brick moving just before it reaches the ground? (6 pts)

tall

fast

17) A tennis ball rolls off the edge of a tabletop 0.850 m above the floor and strikes the floor at a point 1.90 m horizontally from the edge of the table. Find the time of flight of the ball. Find the magnitude of the initial velocity of the ball. Find the magnitude of the velocity of the ball just before it strikes the floor. (9 pts)

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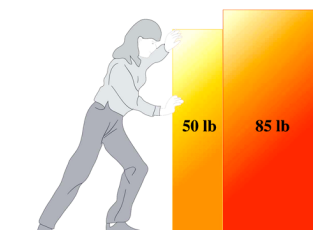
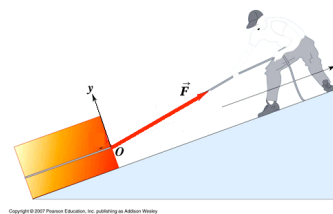
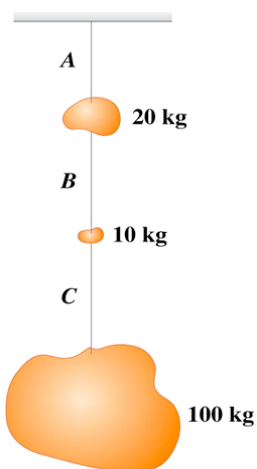
v_0

V_f

18) A golf ball is hit into the air, but not straight up, and encounters no significant air resistance. Which statements accurately describe its motion while it is in the air? (4 pts)

- a) Its horizontal velocity does not change once it is in the air, but its vertical velocity does change.
- b) Its vertical acceleration is zero at the highest point.
- c) On the way up it is accelerating upward, and on the way down it is accelerating downward.
- d) On the way up, both its horizontal and vertical velocity components are decreasing; on the way down, they are both increasing.

19) Draw the freebody diagram for each object in each figure next to the figure in the situations below. (6 pts)



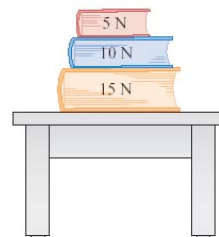
20) A person pushes two boxes with a horizontal 100 N force on a frictionless floor, as shown in the figure. Box A is heavier than box B. Which of the following statements about these boxes is correct? (4 pts)



- a) Boxes *A* and *B* push on each other with equal forces of less than 100 N.
- b) Box *A* pushes on box *B* with a force of 100 N, and box *B* pushes on box *A* with a force of 100 N.
- c) Box *A* pushes on box *B* harder than box *B* pushes on box *A*.
- d) The boxes will not begin to move unless the total weight of the two boxes is less than 100 N.

21) Three books are at rest on a horizontal table, as shown in the figure. The *net* force on the middle book is (4 pts)

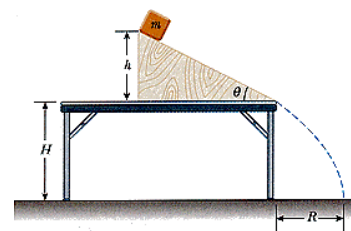
- a) 5 N downward
- b) 0 N
- c) 15 N upward
- d) 15 N downward



22)

23) A block of mass $m = 3.00$ kg is released from rest $h = 0.600$ m from the surface of a table, at the top of a $\theta = 40.0^\circ$ incline. The frictionless incline is fixed on a table of height $H = 4.00$ m. (4 pts)

- (a) Determine the acceleration of the block as it slides down the incline.
- (b) What is the velocity of the block as it leaves the incline?
- (c) How far from the table will the block hit the floor?
- (d) How much time has elapsed between when the block is released and when it hits the floor?



24) **DRS Problem.** Draw a Diagram (5pts), Reason your steps (5pts) and Solve the problem (5pts).