

Physics 1205 – Fall 2008
Exam #1

Name (Print): Key

My signature below is a statement that all work contained in this exam is my own work. I have not copied work from any other source, or used any material other than one 3 by 5 card and my calculator.

Name (Signature): _____

DO NOT TURN THIS PAGE OVER UNTIL YOU ARE INSTRUCTED TO DO SO.

STOP WORKING ON THIS EXAM AS SOON AS YOU ARE INSTRUCTED TO DO SO.

You will have approximately 1 hour to do this exam

- The following exam consists of 7 multiple-choice questions and 2 worked problems.
 - Point values are assigned to each problem in the exam.
- It is a good idea to first skim through the entire test and begin with the problems that seem most familiar. If you get stuck on a problem, skip to another.
- For the computational problems, please show all problem solving steps and all your work.
 - All work must be done on the pages provided.
 - Please write neatly and put a **BOX** around your final answer.
 - Use significant figures in your answers.
- Calculators may be used only to do arithmetic. You cannot use your calculator for solving algebraic equations, for graphing, for vectors, etc.

Problem #	Max Points	Score
1	5	
2	5	
3	5	
4	5	
5	5	
6	5	
7	5	
8	35	
9	30	
Total	100	

1. Consider the equation $v = At + Bt^3$ where v is a velocity, t is a time, and A and B are constants. What are the dimensions of A and B ?

	<u>A</u>	<u>B</u>
<input type="checkbox"/>	[L]/[T]	[L]/[T]
<input type="checkbox"/>	[L]/[T]	[L]/[T] ³
<input type="checkbox"/>	[L]	[L][T] ²
<input checked="" type="checkbox"/>	[L]/[T] ²	[L]/[T] ⁴
<input type="checkbox"/>	[L]/[T] ²	[L]/[T] ³
<input type="checkbox"/>	[L][T]	[L][T] ³

$$\frac{[L]}{[T]} = A[T] + B[T]^3$$

$$\Rightarrow A = \frac{[L]}{[T]^2} \quad B = \frac{[L]}{[T]^4}$$

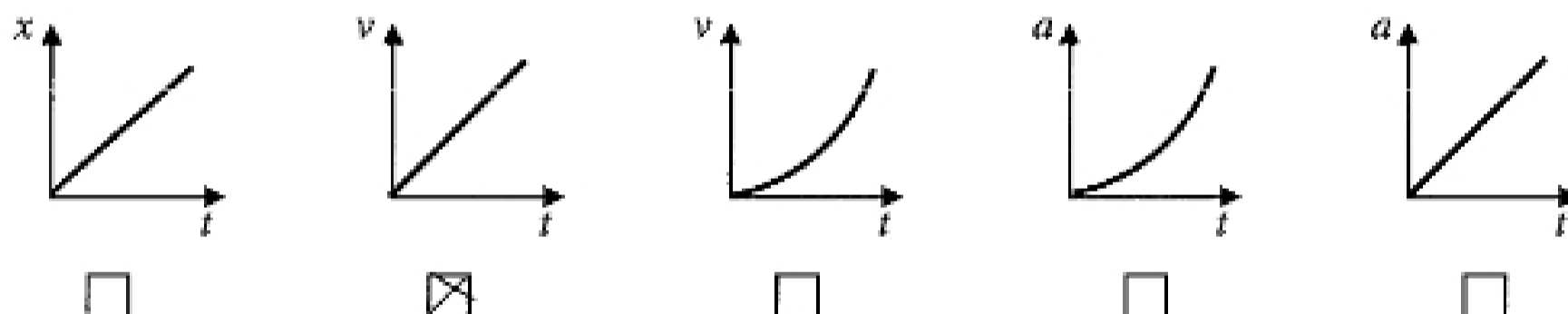
2. An object is dropped from a certain height on the earth and takes a time Δt to hit the ground. (Air resistance can be neglected.) If the same object were dropped from the same height on the moon, where the acceleration due to gravity is $1/6$ that of earth, how long would it take the object to hit the moon's surface?

- | | |
|--|--|
| <input checked="" type="checkbox"/> $\sqrt{6}\Delta t$ | <input type="checkbox"/> $\Delta t/\sqrt{6}$ |
| <input type="checkbox"/> $6\Delta t$ | <input type="checkbox"/> $\Delta t/6$ |
| <input type="checkbox"/> $36\Delta t$ | <input type="checkbox"/> $\Delta t/36$ |

Want: Δt
 Same: $v_i = 0, \Delta x$
 Know: $a_e = 6a_m$
 $\Delta x = v_i \Delta t + \frac{1}{2} a t^2$
 $\Delta x = \frac{1}{2} a t^2$
 $t = \sqrt{\frac{2\Delta x}{a}}$ $\frac{t_m}{t_e} = \sqrt{\frac{a_e}{a_m}} = \sqrt{6}$

3. A stone is dropped from a cliff. If the positive x direction is defined as pointing toward the center of the earth, which graph below best represents the motion of the stone as it falls? Note that the vertical axis is different for the different graphs.

$$v = at \quad a \text{ is constant (slope)}$$



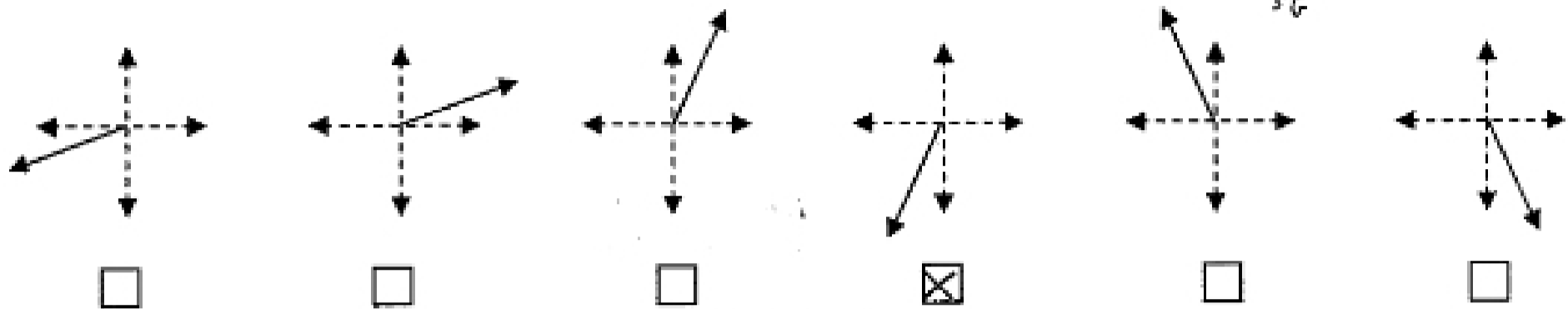
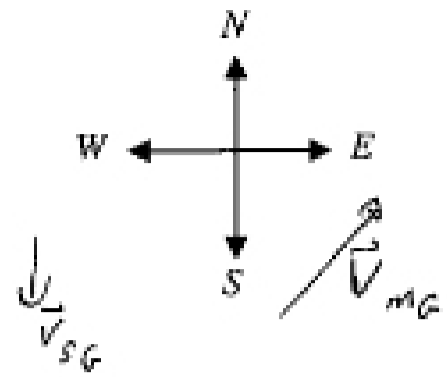
4. You tie a stone to a string and twirl it in a horizontal circle above your head at a constant speed. If you were to double the speed of the stone without changing the length of the string what would happen to the magnitude of the stone's centripetal acceleration?

- it would be one-fourth as much
- it would be half as much
- it would be the same
- it would be two times greater
- it would be four times greater

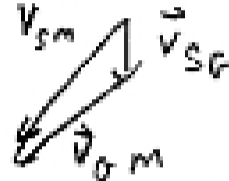
$$a_c = \frac{v^2}{r}$$

When $v \rightarrow 2v$
 $a_c \rightarrow 4a_c$

5. Consider the coordinate system shown in the figure to the right. If a sailboat is moving 5 m/s south and a motorboat is moving 10 m/s directly northeast, which vector below (shown as a solid-lined arrow) best represents the velocity of the sailboat relative to the motorboat?



$$\vec{v}_{SM} = \vec{v}_{SG} + \vec{v}_{GM}$$



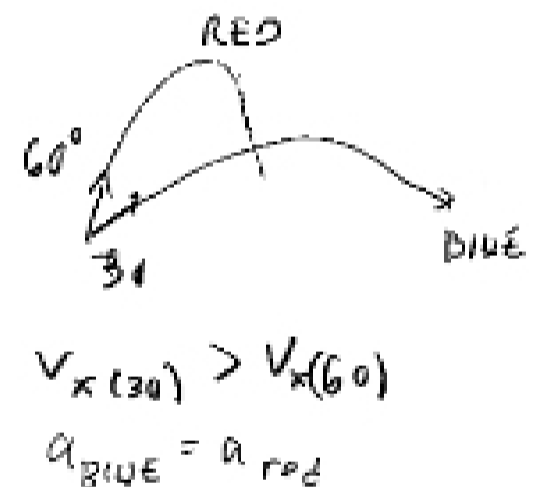
6. Two balls are thrown with exactly the same speed, but at different angles. A blue ball is thrown at an angle of 30° above the horizontal and a red ball is thrown at an angle of 60° above the horizontal. The blue ball is twice as heavy as the red ball. If you compare the highest point in the trajectory of the blue ball with the highest point in the trajectory of the red ball, which statement below is true about the velocities and accelerations of the balls?

Ball with **greatest velocity** at the apex of their respective flights

- blue
 red
 same
 blue
 red
 same

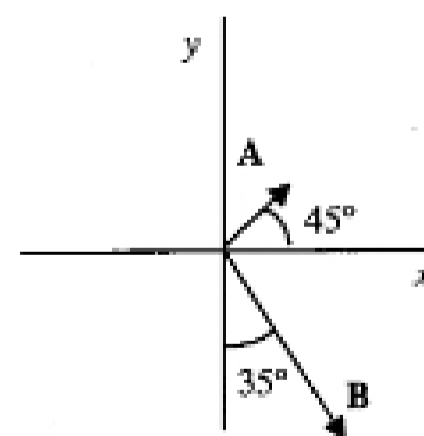
Ball with **greatest acceleration** at the apex of their respective flights

- blue
red
red
same
same
same



7. In the diagram to the right, the vector **A** has a magnitude of 6.0 and the vector **B** has a magnitude of 15. What is the magnitude of the sum **A + B**?

- 9.0
 15
 16
 17
 21



$$\begin{aligned} A_x &= A \cos 45 = 4.24 \\ A_y &= A \sin 45 = 4.24 \\ B_x &= B \sin 35 = 8.60 \\ B_y &= -B \cos 35 = -12.29 \end{aligned}$$

$$\begin{aligned} \vec{A} + \vec{B} &= (4.24 + 8.60)\hat{i} + (4.24 - 12.29)\hat{j} = 12.8\hat{i} - 8.05\hat{j} \\ &= \sqrt{(12.8)^2 + (8.05)^2} = 15 \end{aligned}$$