Instructor(s): *J. Ipser*

PHYSICS DEPARTMENT

PHY 2004   3rd Exam   November 17, 2004

Name (print, last first): _____   Signature: _____

On my honor, I have neither given nor received unauthorized aid on this examination.

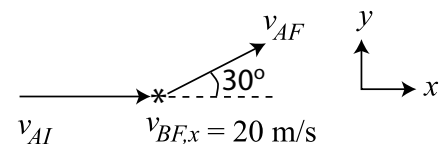### YOUR TEST NUMBER IS THE 5-DIGIT NUMBER AT THE TOP OF EACH PAGE.

(1) **Code your test number on your answer sheet (use 76–80 for the 5-digit number)**. Code your name on your answer sheet. **DARKEN CIRCLES COMPLETELY**. Code your UFID number on your answer sheet.
(2) Print your name on this sheet and sign it also.
(3) Do all scratch work anywhere on this exam that you like. **Circle your answers on the test form.** At the end of the test, this exam printout is to be turned in. No credit will be given without both answer sheet and printout with scratch work most questions demand.
(4) **Blacken the circle of your intended answer completely, using a #2 pencil or <u>blue</u> or <u>black</u> ink**. Do not make any stray marks or some answers may be counted as incorrect.
(5) The answers are rounded off. Choose the closest to exact. There is no penalty for guessing.
(6) **Hand in the answer sheet separately.**

Suggestion: Try ***** problems first.
$$g = 9.80 \text{ m/s}^2$$

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1. ***** A diver of weight 10^3N stands on the right end of a horizontal uniform diving board of weight 2×10^3N. The length of the diving board is 5 m. The diving board has 2 supports, A and B, A at the left end and B 2 m away from A. The magnitude of the forces exerted by A and B are F_A and F_B, respectively. Which of the following statements about F_A and F_B is true?
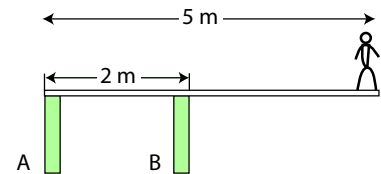
   (1) F_B exceeds F_A (2) $F_B = F_A$ (3) F_A exceeds F_B (4) not enough information   (5) not a well-posed problem

2. Ball A of mass $M_A = 0.5$ kg undergoes an elastic collision with ball B. Before the collision, A is moving in the negative x direction at 20 m/s, and B is at rest. After the collision, A is moving in the positive x direction at 10 m/s. What is the x-component of the final velocity of B?

   (1) -10 m/s   (2) $+10$ m/s   (3) -5 m/s   (4) -20 m/s   (5) -30 m/s

3. ***** A 5 kg rifle shoots a 0.01 kg bullet at 10^3m/s. The rifleman's shoulder brings the rifle to rest in 0.1 s. What is the force of the rifle on the rifleman's shoulder?

   (1) 100 N   (2) 200 N   (3) 400 N   (4) 600 N   (5) 800 N

4. Object A of mass $M_A = 2$kg undergoes a collision with object B of mass $M_B = 1$kg. Before the collision B is at rest and A is moving in the positive x direction at 30 m/s. After the collision, A is moving up at an angle of $30°$ with respect to the x axis, and the x-component of the final velocity of B is 20 m/s. What is the y-component of the final velocity of B?

   (1) -23.1 m/s   (2) -12.7 m/s   (3) -64.2 m/s   (4) 0   (5) $+12.6$ m/s

5. A uniform seesaw of length 5 m is in equilibrium. The seesaw is pivoted about its mid-point. A child of mass 50 kg sits at one end, and a child of mass 100 kg sits at the other end. A third child of mass 75 kg also sits on the seesaw. How far from the mid-point of the seesaw is the third child?

(1) 1.7 m   (2) 2.5 m   (3) 0   (4) 2.1 m   (5) 0.9 m

6. A uniform ladder of length 5 m and mass 50 kg leans against a wall at an angle of $60°$ with respect to the horizontal. The force W of the wall on the ladder is horizontal. If the ladder is in equilibrium, what is the minimum value of the coefficient of static friction of the floor?

(1) 0.3   (2) 0.1   (3) 0.5   (4) 0.7   (5) 0.9

7. * A wheel is spun up from rest with constant angular acceleration of 2 rad/s^2 for 10 s. How many revolutions does the wheel make during the process?

(1) 16   (2) 12   (3) 8   (4) 4   (5) 2

8. An auto accelerates from rest at a constant rate of 3 m/s^2. The radius of its wheels is 1/3 m. What is the angular velocity of the wheels, in rad/s, after 10 s?

(1) 90   (2) 60   (3) 30   (4) 120   (5) 150