Your name sticker with exam code. SIGN HERE:

1. The exam will last from 10:00 - 11:20 p.m. Use a #2 pencil to make entries on the answer sheet. Enter the following ID information now, before the exam starts..
2. In the section labeled NAME (Last, First, M.I.) enter your last name, then fill in the empty circle for a blank, then enter your first name, another blank, and finally your middle initial.
3. Under STUDENT # enter your 9-digit RUID Number.
4. Enter 123 under COURSE, and your section number (see label above) under SEC.
5. Under CODE enter the exam code given above.
6. During the exam, you may use pencils, a calculator, and one 8.5 x 11 inch sheet (both sides) with formulas and notes.
7. There are 15 multiple-choice questions on the exam. For each question, mark only one answer on the answer sheet. There is no deduction of points for an incorrect answer, so even if you cannot work out the answer to a question, you should make an educated guess. At the end of the exam, hand in the answer sheet and the cover page. Retain this question paper for future reference and study.
8. When you are asked to open the exam, make sure that your copy contains all 15 questions. Raise your hand if this is not the case, and a proctor will help you. Also raise your hand during the exam if you have a question.
9. Please SIGN the cover sheet under your name sticker and have your student ID ready to show to the proctor during the exam.
10. If needed, the acceleration due to gravity on earth may be taken as g = 9.8 m/s².
1. A football is thrown upward at an angle of 30° with respect to the horizontal. In order to throw a 40 m pass what must be the initial speed of the ball?
   a) 28 m/s  
   b) 10 m/s  
   c) 18 m/s  
   d) 21 m/s  
   e) 450 m/s

2. A train moves at a constant speed of 40 km/h. Outside, rain falls straight down with speed 80 km/h relative to an observer on the ground. To a rider in the train, the rain appears to fall at what angle from the vertical?
   a) 30°  
   b) 27°  
   c) 60°  
   d) 63°  
   e) 45°

3. The rower club president Rick rows on the Raritan River for 1.00 mi straight upstream and returns to the original point in 1.50 h. Rick’s speed with respect to the flowing water is 2.00 mi/h. What is the flow speed (in mi/h) of the river?
   a) 1.15  
   b) 0.67  
   c) 1.33  
   d) 1.00  
   e) 0.50

4. A boy on a skate board skates off a horizontal bench at a velocity of 10 m/s. One tenth of a second after he leaves the bench, to two significant figures, the magnitudes of his velocity and acceleration are:
   a) 10 m/s; 9.8 m/s^2  
   b) 9.0 m/s; 9.8 m/s^2  
   c) 9.0 m/s; 9.0 m/s^2  
   d) 1.0 m/s; 9.0 m/s^2  
   e) 1.0 m/s; 9.8 m/s^2
5. An 8.0-kg object rests on the floor of an elevator which is accelerating downward at a rate of 1.3 m/s\(^2\). What is the magnitude of the force the elevator floor exerts on the object?
   a) 59 N  
   b) 10 N  
   c) 89 N  
   d) 68 N  
   e) 78 N

6. A 3.0-kg block moves up a 40° incline with constant speed under the action of a 26-N force acting upwards, parallel to the incline. Suppose now, instead, that the block moves down the incline at constant speed. What is the magnitude of the force acting up and parallel to the incline required?
   a) 14 N  
   b) 12 N  
   c) 16 N  
   d) 18 N  
   e) 25 N

7. You hold a tennis racket vertically in your hand. On the top edge of the racket you have balanced a ball. Which statement is true?
   a) The force of your hand on the racket and the force of the ball on the racket are equal in magnitude and opposite in direction.
   b) The force of the racket on your hand and the force of the ball on the racket are equal in magnitude and opposite in direction.
   c) The force of your hand on the racket and the force of the racket on the ball are equal in magnitude and opposite in direction.
   d) The force of the racket on your hand and the force of the racket on the ball are equal in magnitude and opposite in direction.
   e) The force of your hand on the racket and the force of the racket on your hand are equal in magnitude and opposite in direction.

8. The horizontal surface on which the objects in the picture slide is frictionless. If F = 6.0 N and M = 1.0 kg, what is the magnitude of the force exerted on the large block by the small block?
   a) 7.7 N  
   b) 9.8 N  
   c) 9.1 N  
   d) 8.4 N  
   e) 6.5 N
9. You are in a car going around a circular exit ramp at a speed of 36 km/h. If the radius of the car’s path is 20 m, the acceleration of the car is
   a) 1.8 m/s^2
   b) 5.0 m/s^2
   c) 65 m/s^2
   d) 10 m/s^2
   e) 0.5 m/s^2

10. The earth orbits the sun at an average distance of 150 million km. Assuming earth’s orbit is circular and the distance from the sun is constant, and ignoring the effects of the moon and the other planets, the acceleration of the earth is
   a) 60 m/s^2
   b) 6 mm/s^2
   c) 6 m/s^2
   d) 6 km/s^2
   e) 0.006 mm/s^2

11. Why do raindrops fall with constant speed during the later stages of their descent?
   a) The gravitational force is the same for all drops.
   b) Air resistance just balances the force of gravity.
   c) The drops all fall from the same height.
   d) The force of gravity is negligible for objects as small as raindrops.
   e) Gravity can not increase the speed of a falling object to more than 9.8 m/s.

12. Three 1-kg blocks are stacked vertically. The force of the bottom block on the middle block is
   a) 9.8 N, upward
   b) 9.8 N, downward
   c) 20 N, upwards
   d) 20 N, downward
   e) zero
13. A 2.0-kg block slides down a frictionless incline from point A to point B as shown. A force (magnitude $P=3.0$ N) acts on the block between A and B, as shown. Points A and B are 2.0 m apart. If the kinetic energy of the block at A is 10 J, what is the kinetic energy of the block at B?

a) 27 J  
b) 20 J  
c) 24 J  
d) 17 J  
e) 37 J

14. The same constant force is used to accelerate two carts of the same mass, initially at rest, on horizontal, frictionless tracks. The force is applied to cart A for twice as long a time as it is applied to cart B. The work the force does on cart A is $W_A$. The work the force does on cart B is $W_B$. Which statement is correct?

a) $W_A = W_B$  
b) $W_A = \sqrt{2}W_B$  
c) $W_A = 2W_B$  
d) $W_A = 4W_B$  
e) $W_B = 2W_A$

15. A 4 kg crate is initially moving with a velocity that has magnitude 5.2 m/s in a direction 40° west of north. How much work must be done to the crate to change its velocity to 6 m/s in a direction 20° east?

a) 15.6 J  
b) 9 J  
c) 12 J  
d) 18 J  
e) Not enough information