PART A: MULTIPLE CHOICE (10 MARKS)

Choose the best response in each case and place your answer in the appropriate space on your answer sheet.

1. A net force of 16 N accelerates a 4.0 kg body from 21 m/s to 29 m/s. The net force is applied for:
   (a) 0.5 s (b) 1.0 s
   (c) 2.0 s (d) 4.0 s

2. A 60 kg skydiver is falling through the air (parachute opened). The force of wind resistance on the skydiver is 400 N[up]. If g = 10 m/s^2[down] on Earth, the net vertical force on the skydiver is:
   (a) 200 N[down] (b) 400 N[down]
   (c) 600 N[down] (d) 800 N[down]

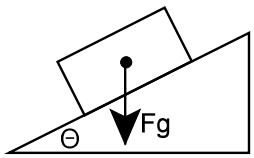
3. An experimenter uses a bathroom scale to measure his weight while riding in an elevator. How will the reading on the bathroom scale compare to the normal reading for the following sequence of motion:

   ① elevator starts to ascend (ie go up)
   ② elevator ascends at a constant velocity
   ③ elevator stops

   (a) lighter, lighter, heavier
   (b) heavier, heavier, lighter
   (c) heavier, normal, lighter
   (d) lighter, normal, heavier

4. The mass of an object:
   (a) is numerically equal to its weight.
   (b) has the same units as weight.
   (c) depends on its location.
   (d) is a measure of its inertia.

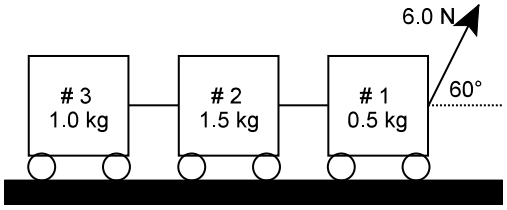
5. An object is placed on an inclined plane. There is a component of the force of gravity acting on the object in a direction <u>perpendicular</u> to the plane. If the inclined plane is made steeper, that component:



   (a) always increases
   (b) always decreases
   (c) may either increase or decrease depending on the initial angle of inclination
   (d) may either increase or decrease depending on the roughness of the surface.

6. A 3.0 kg sphere is released on a smooth frictionless plane which is inclined 30° to the horizontal (use g = 10 m/s^2.) The force exerted by the plane on the sphere is closest to:
   (a) 10 N (b) 15 N
   (c) 26 N (d) 30 N

7. A pull toy consists of three carts joined together by two short strings and with a longer string, for pulling, attached to the front cart. A child pulls the toy with a force of 6.0 N [60° above the horizontal].



   What is the magnitude of the force pulling the toy in the horizontal direction?
   (a) 5.2 N (b) 4.8 N
   (c) 3.6 N (d) 3.0 N

The following table lists the gravitational force fields of several planets. Use the table to answer questions 8 & 9.

Planet	g(N/kg)
Earth	9.81
Mercury	3.60
Jupiter	26.40
Venus	8.60

8. An astronaut leaves Earth and lands on Jupiter. The astronaut has a mass of 50.0 kg on Earth. What is the mass of the astronaut on Jupiter?
   (a) 50.0 kg (b) 76.4 kg
   (c) 1.32×10^3 N (d) 2.02×10^3 N

9. If you stand on the same spring scale on all of the planets, on which planet will your weight be the <u>smallest</u>?
   (a) Earth (b) Mercury
   (c) Jupiter (d) Venus

10. Christine exerts a constant force of 1.5 N to pull a 2.0 kg object at constant velocity along a level surface on the moon (g = 1.6 N/kg [down]). The coefficient of kinetic friction for this situation is:
    (a) 0.12 (b) 0.47
    (c) 0.75 (d) 1.3

PART A: MULTIPLE CHOICE (10 MARKS)

1	2	3	4	5	6	7	8	9	10

PART B: MATCH (0 MARKS)

1	2	3	4	5

PART C: PROBLEMS (40 MARKS)

Answer the following questions on a separate sheet of paper. You may use the back of this sheet if you wish.

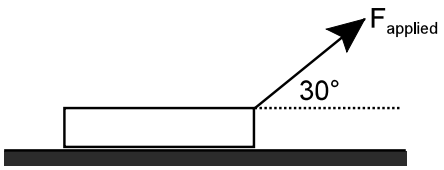
Use g = 9.81 m/s^2[down] where necessary.

1. An astronaut on the surface of Mars finds that a rock accelerates at 3.6 m/s^2 when it is dropped. The astronaut also finds that a force scale reads 260 N when the astronaut steps on it.

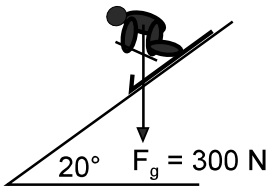
{3} (a) What is the astronaut's mass as determined on the surface of Mars?

{2} (b) What would the force scale read if the astronaut stepped on it on Earth?

{7} 2. A sled, 14.0 kg in mass, is being towed over ice by a rope that makes an angle of 30.0° with the horizontal. A force of 236 N acts along the rope. The frictional force is 100 N. Draw a FBD of the situation. Be sure to label your forces appropriately and to include their values. (NOTE: don't forget to resolve $F_{applied}$ into its components in order to analyze this problem!)



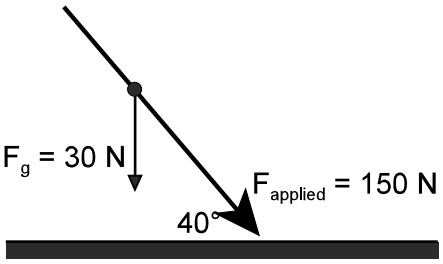
{6} 3. A skier weighing 300 N (ie F_g = 300 N) has just begun descending a 20° slope. The coefficient of kinetic friction is 0.20. Draw a FBD of the situation. Be sure to label your forces appropriately and to include their values. (NOTE: don't forget to resolve F_g into its components in order to analyze this problem!)



4. A girl pushes a snow shovel weighing 30 N at a uniform velocity across a sidewalk. The handle of the shovel is inclined at 40° to the horizontal and she pushes along the handle with a force of 150 N.

{6} (a) Draw a FBD of the situation. Be sure to label your forces appropriately and to include values. (Hint: You may find it easier to resolve $F_{applied}$ into horizontal and vertical components in order to analyze the problem.)

{4} (b) What is the coefficient of kinetic friction?



5. A 8.0 kg mass on a frictionless table is accelerated by a 2.0 kg mass hanging from the table as shown.

{5} (a) Draw a FBD for each mass. Be sure to label your forces appropriately and to include values (if possible).

{4} (b) Calculate the acceleration of the blocks. (Watch your form ie FBD, positive directions, ...)

{3} (c) Calculate the tension in the rope. (ditto ...)