

## PART A: MULTIPLE CHOICE (10 MARKS)

1	2	3	4	5	6	7	8	9	10
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## PART B: MATCH (0 MARKS)

1	2	3	4	5
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## 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.

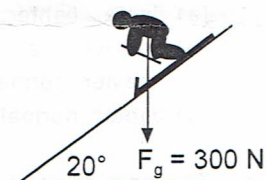
Use  $g = 9.81 \text{ m/s}^2$  [down] where necessary.

1. An astronaut on the surface of Mars finds that a rock accelerates at  $3.6 \text{ m/s}^2$  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?

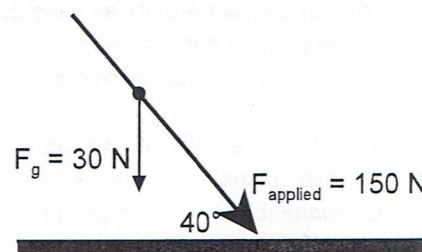
- {7} 2. A sled, 14.0 kg in mass, is being towed over ice by a rope that makes an angle of  $30.0^\circ$  with the horizontal. A force of 236 N acts along the rope. The frictional force is 100 N. Draw a FBD of the situation. Be sure to label your forces appropriately and to include their values. (NOTE: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



- {6} 3. A skier weighing 300 N (ie  $F_g = 300 \text{ N}$ ) has just begun descending a  $20^\circ$  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  $40^\circ$  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  $F_{\text{applied}}$  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 ...)

