Drawing Free Body Diagrams

Review all of **Lessons 2 and 3** of the **Newton's Laws** chapter at **The Physics Classroom**:

http://www.physicsclassroom.com/Class/newtlaws/newtltoc.html

MOP Connection: Newton's Laws: sublevels 5, 8 and 9

For the following situations, draw a free-body diagram in which you represent the various forces that are acting upon the object(s) using vector arrows. Label each arrow to indicate the type of force. Determine the magnitude of all forces and fill in the blanks.

1. A 1.0 kg book is at rest on a tabletop. Diagram the forces acting on the book.

FBD:

$\sum F_x =$ _____ $\sum F_y =$ _____

$a_x =$ _____ $a_y =$ _____

2. A 5.0 kg flying squirrel is flying from a tree to the ground at constant velocity. Consider air resistance. Diagram the forces acting on the squirrel.

FBD:

$\sum F_x =$ _____ $\sum F_y =$ _____

$a_x =$ _____ $a_y =$ _____

3. An egg with a weight of 0.10 N is free-falling from a nest in a tree. Neglect air resistance. Diagram the forces acting on the egg as it is falling.

FBD:

$\sum F_x =$ _____ $\sum F_y =$ _____

$a_x =$ _____ $a_y =$ _____

4. A 2.0-kg bucket is tied to a rope and accelerated upward out of a well at a rate of 1.5 m/s/s. Neglect air resistance. Diagram the forces acting on the bucket.

FBD:

$\sum F_x =$ _____ $\sum F_y =$ _____

$a_x =$ _____ $a_y =$ _____

5. A 2.0-N force is applied to a 1.0 kg book in order to move it across a desk with an acceleration of 0.5 m/sec^2. Consider frictional forces. Neglect air resistance. Diagram the forces acting on the book.

FBD:

$\sum F_x =$ _____ $\sum F_y =$ _____

$a_x =$ _____ $a_y =$ _____

6. A 1.5-N force is applied to a 1.0 kg book in order to move it across a desk at constant velocity. Consider frictional forces. Neglect air resistance. Diagram the forces acting on the book.

FBD:

$\sum F_x =$ _____ $\sum F_y =$ _____

$a_x =$ _____ $a_y =$ _____

7. A 70.0-kg skydiver is descending with a constant velocity. Consider air resistance. Diagram the forces acting upon the skydiver.

FBD:

$\sum F_x =$ _____ $\sum F_y =$ _____

$a_x =$ _____ $a_y =$ _____

8. A 30-N force is applied to drag a 20-kg sled across loosely packed snow with an acceleration of 1.0 m/s^2. Diagram the forces acting upon the sled.

FBD:

$\sum F_x =$ _____ $\sum F_y =$ _____

$a_x =$ _____ $a_y =$ _____

9. An 800-kg car is coasting to the right with a leftward acceleration of 1 m/s^2. Diagram the forces acting upon the car.

FBD:

$\sum F_x =$ _____ $\sum F_y =$ _____

$a_x =$ _____ $a_y =$ _____

