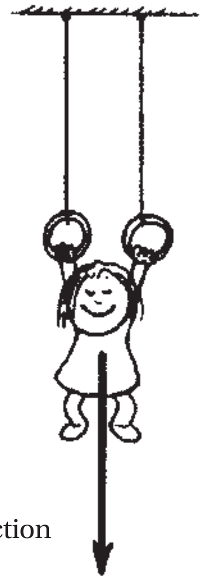
Name ______________________ Class ______________ Date ______________

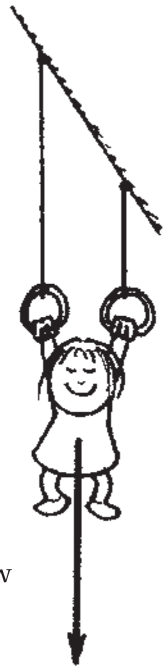
Concept-Development Practice Page **2-2**

Vectors and Equilibrium

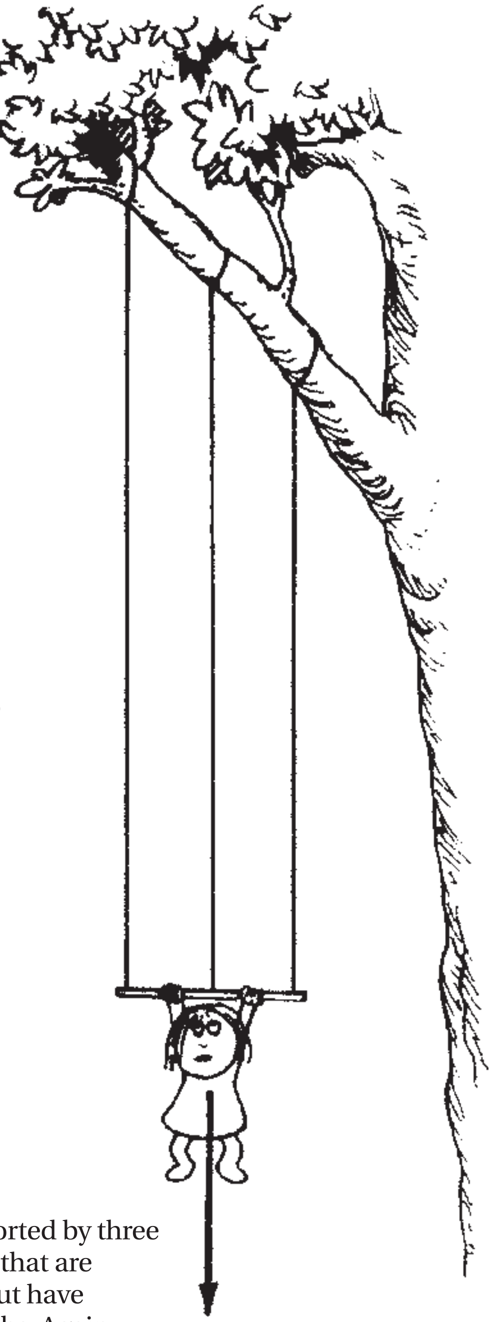
1. Nellie Newton dangles from a vertical rope in equilibrium: $\sum F = 0$. The tension in the rope (upward vector) has the same magnitude as the downward pull of gravity (downward vector).



2. Nellie is supported by two vertical ropes. Draw tension vectors to scale along the direction of each rope.



3. This time the vertical ropes have different lengths. Draw tension vectors to scale for each of the two ropes.



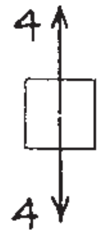
4. Nellie is supported by three vertical ropes that are equally taut but have different lengths. Again, draw tension vectors to scale for each of the three ropes.

Circle the correct answers.

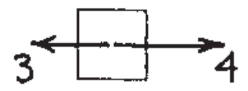
5. We see that tension in a rope is (dependent on) (independent of) the length of the rope. So the length of a vector representing rope tension is (dependent on) (independent of) the length of the rope.

Net Force

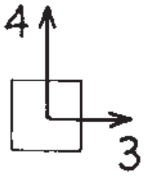
Fill in the magnitudes of net force for each case.



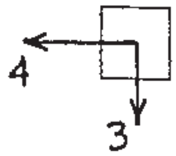
F_{net} = ________



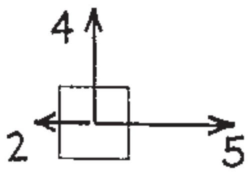
F_{net} = ________



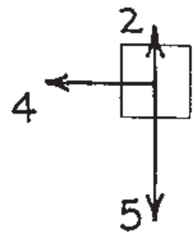
F_{net} = ________



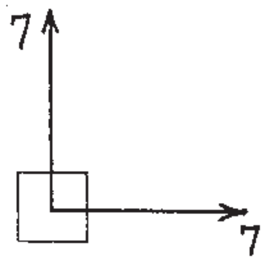
F_{net} = ________



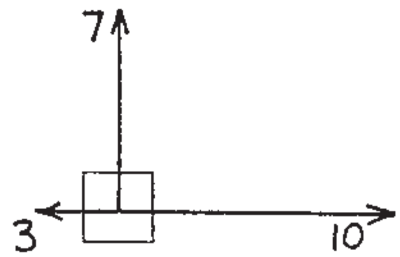
F_{net} = ________



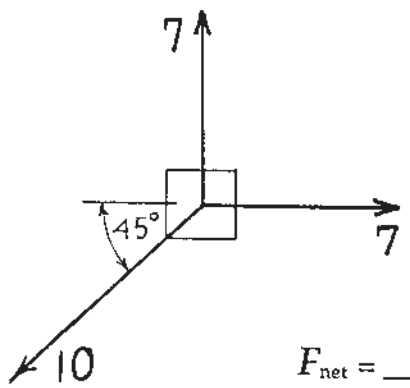
F_{net} = ________



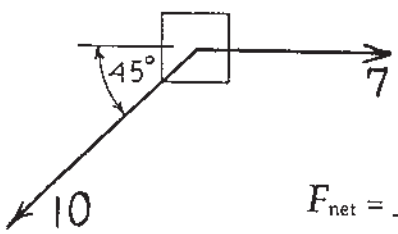
F_{net} = ________



F_{net} = ________

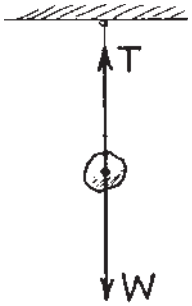


F_{net} = ________



F_{net} = ________

Vectors and Equilibrium



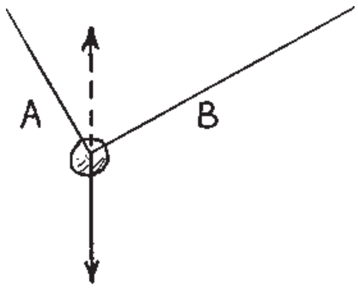
The rock hangs at rest from a single string. Only two forces act on it, the upward tension **T** of the string, and the downward pull of gravity **W**. The forces are equal in magnitude and opposite in direction.

Net force on the rock is (zero) (greater than zero).

Here the rock is suspended by 2 strings. Tension in each string acts in a direction along the string. We'll show tension of the left string by vector **A**, and tension of the right string by vector **B**. The resultant of **A** and **B** is found by the **parallelogram rule**, and is shown by the dashed vector. Note it has the same magnitude as **W**, so the net force on the rock is

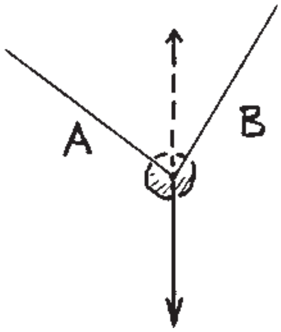
(zero) (greater than zero).

Consider strings at unequal angles. The resultant **A** + **B** is still equal and opposite to **W**, and is shown by the dashed vector. Construct the appropriate parallelogram to produce this resultant. Show the relative magnitudes of **A** and **B**.

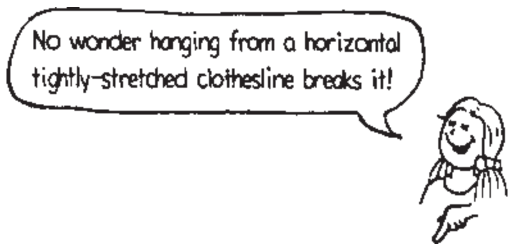


Tension in **A** is (less than) (equal to) (greater than) tension in **B**.

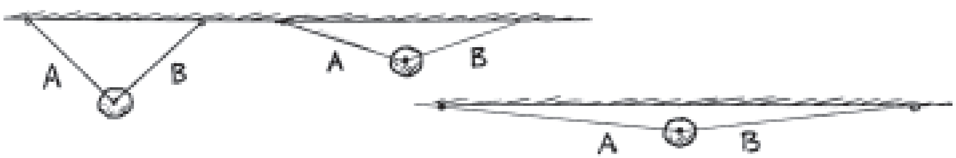
Repeat the procedure for the arrangement below.



Here tension is greater in ________.



Construct vectors **A** and **B** for the cases below. First draw a vector **W**, then the parallelogram that has equal and opposite vector **A** + **B** as the diagonal. Then find approximate magnitudes of **A** and **B**.



CONCEPTUAL PHYSICS

Name ______________________ Class ______________ Date ______________

Concept-Development Practice Page **3-2**

Inertia

Circle the correct answers.

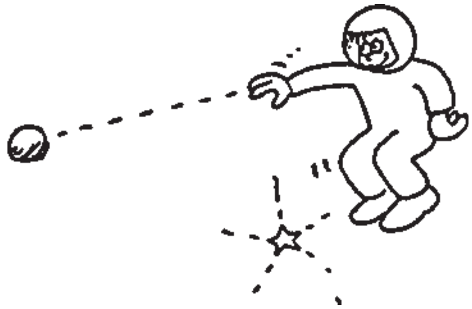
1. An astronaut in outer space away from gravitational or frictional forces throws a rock. The rock will

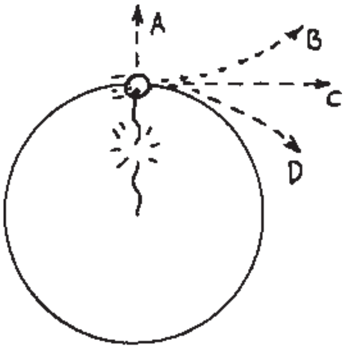
   (gradually slow to a stop)

   (continue moving in a straight line at constant speed).

   The rock's tendency to do this is called

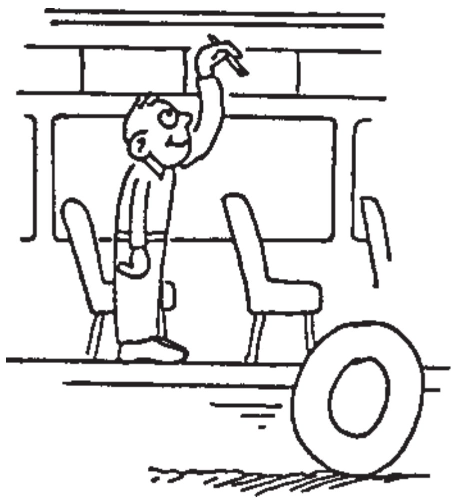
   (inertia) (weight) (acceleration).





2. The sketch shows a top view of a rock being whirled at the end of a string (clockwise). If the string breaks, the path of the rock is

   (A) (B) (C) (D).



3. Suppose you are standing in the aisle of a bus that travels along a straight road at 100 km/h, and you hold a pencil still above your head. Then relative to the bus, the velocity of the pencil is 0 km/h, and relative to the road, the pencil has a horizontal velocity of

   (less than 100 km/h) (100 km/h) (more than 100 km/h).

   Suppose you release the pencil. While it is dropping, and relative to the road, the pencil still has a horizontal velocity of

   (less than 100 km/h) (100 km/h) (more than 100 km/h).

   This means that the pencil will strike the floor at a place directly

   (behind you) (at your feet below your hand) (in front of you).

   Relative to you, the way the pencil drops

   (is the same as if the bus were at rest)

   (depends on the velocity of the bus).

   How does this example illustrate the law of inertia?

   ____

   ____

   ____

CONCEPTUAL PHYSICS