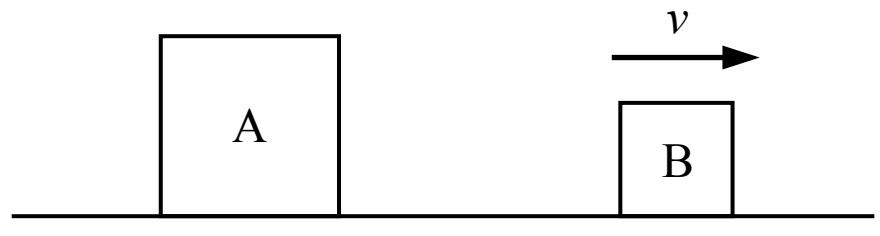
NEWTON'S 1ST LAW OF MOTION



1. Block A is sitting on the ground at rest and block B is moving with a constant velocity as shown in the figure above. The mass of block A is greater than the mass of block B. Which of the following is true of the net force acting on block A and the net force acting on block B?

   (A) The net force on block A is greater than the net force on block B

   (B) The net force on block B is greater than the net force on block A

   (C) The net force on block A is equal to the net force on block B

   (D) The relationship between the net force on block A and block B cannot be determined

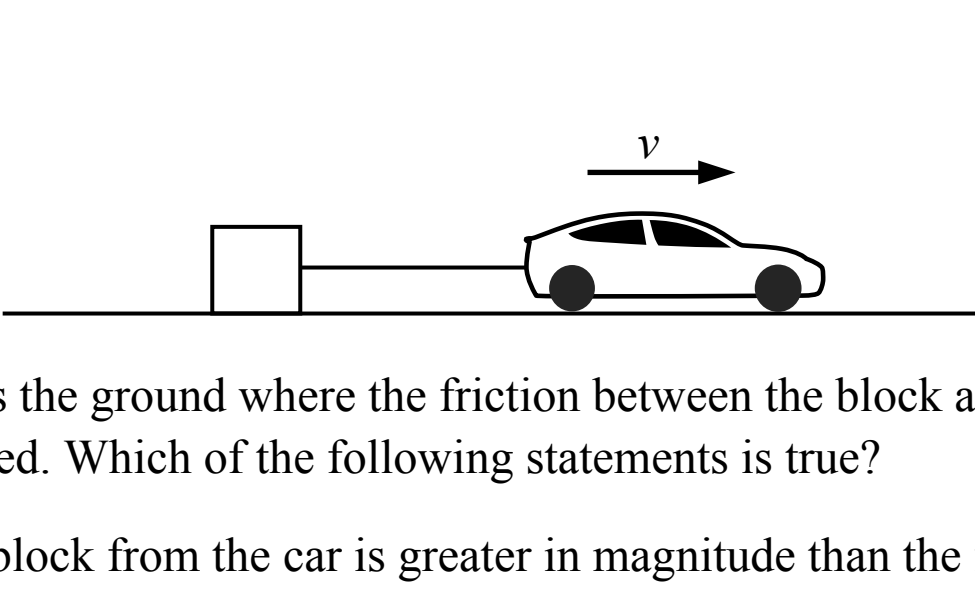
2. A car pulls a large block across the ground where the friction between the block and the ground is not negligble. The car is moving at a constant speed. Which of the following statements is true?

   (A) The force exerted on the block from the car is greater in magnitude than the friction force on the block

   (B) The force exerted on the block from the car is smaller in magnitude than the friction force on the block

   (C) The force exerted on the block from the car is equal in magnitude to the friction force on the block

   (D) The friction force on the block is zero



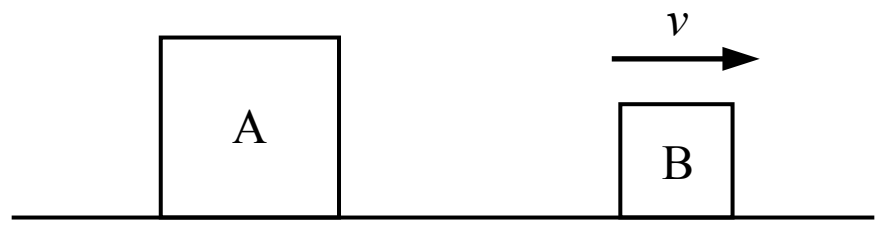
3. A cart moves on a horizontal surface and its motion is shown in the above graph. Which of the following statements about the motion of the cart is most accurate?

   (A) There must be no horizontal forces on the cart between 0 s and 2 s

   (B) There must be no horizontal forces on the cart between 2 s and 4 s

   (C) There may be horizontal forces on the cart between 2 s and 4 s

   (D) None of the above



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(B) The net force on block B is greater than the net force on block A

(C) The net force on block A is equal to the net force on block B

(D) The relationship between the net force on block A and block B cannot be determined

A Incorrect

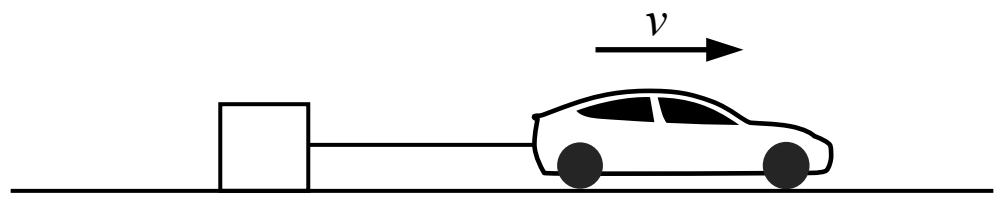
B Incorrect

This answer incorrectly assumes that a net force is required to move block B at a constant velocity.

C Correct

According to Newton's 1st law of motion an object at rest will remain at rest, or an object will continue moving at a constant velocity if there is no net force acting on the object. Block A is at rest so there is no net force acting on it (although there may be forces acting on it which are balanced in opposite directions). Block B is moving at a constant velocity so there is no net force acting on it. The net forces are both zero.

D Incorrect



2. A car pulls a large block across the ground where the friction between the block and the ground is not negligble. The car is moving at a constant speed. Which of the following statements is true?

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(C) The force exerted on the block from the car is equal in magnitude to the friction force on the block

(D) The friction force on the block is zero

A Incorrect

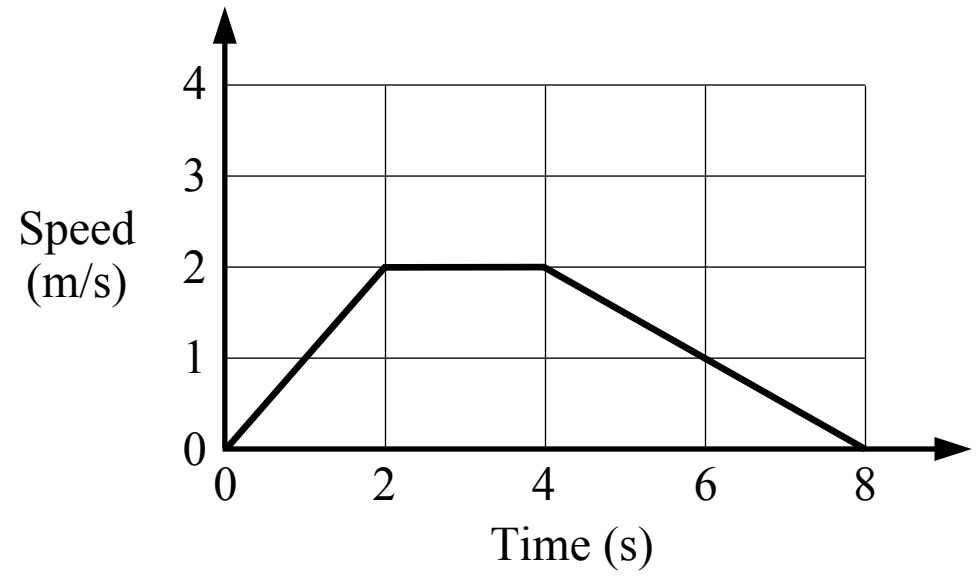
B Incorrect

C Correct

There is a force exerted on the block from the car which acts to the right and a friction force exerted on the block from the ground which acts to the left. The net horizontal force on the block is the force from the car minus the friction force. The block (and the car) are moving at a constant velocity (with zero acceleration) so the net horizontal force on the block is zero, and the force from the car is equal to the friction force.

Block: $\Sigma F_x = m a_x \qquad F_{car} - f = m(0) \qquad F_{car} = f$

D Incorrect



3. A cart moves on a horizontal surface and its motion is shown in the above graph. Which of the following statements about the motion of the cart is most accurate?

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(B) There must be no horizontal forces on the cart between 2 s and 4 s

(C) There may be horizontal forces on the cart between 2 s and 4 s

(D) None of the above

A Incorrect
The cart is accelerating between 0 s and 2 s so there must be a net force acting on the cart during that period.

B Incorrect
The cart is moving at a constant speed and not accelerating between 2 s and 4 s so there is no net force acting on the cart during that period. However, there may be multiple forces acting on the cart which are balanced in opposite directions.

C Correct
The cart is moving at a constant speed and not accelerating between 2 s and 4 s so there is no net force acting on the cart during that period. However, there may be multiple forces acting on the cart which are balanced in opposite directions.

D Incorrect