

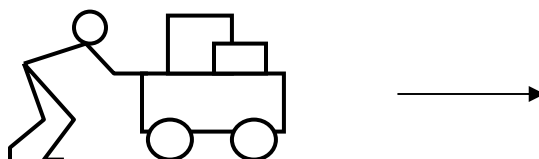
**CODE:**

Summer Science 2008—"Way to Go"  
**Student Assessment**  
IT'S DYNAMIC!

*Please read each item carefully. Then circle the correct answer to the question (A, B, C, or D).*

*For each answer, also circle whether you are (A. Very sure, B. Somewhat sure, or C. My best guess).*

**1a.** Amy pushes a wagon containing some packages along a level floor. The wagon has such good wheels that friction is very small.

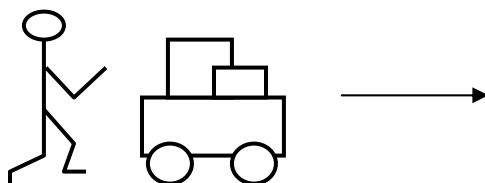


If Amy continuously pushes with a **constant pushing force**, and friction is ignored, then the wagon will . . .

- A. not move.
- B. move with a constant speed.
- C. speed up steadily.
- D. slow down.

**1b.** How sure are you of your answer? A. Very sure B. Somewhat sure C. My best guess

**2a.** Amy suddenly **stops pushing** when the wagon is moving quite fast.

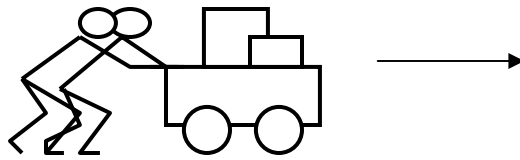


What will happen next? (Remember that friction can be ignored.) The wagon will . . .

- A. stop immediately.
- B. continue moving at the speed it was going.
- C. speed up.
- D. slow down quickly, and then stop.

**2b.** How sure are you of your answer? A. Very sure B. Somewhat sure C. My best guess

**3a.** Amy's sister joins her and **both push together** in the same direction on the loaded wagon, **each** exerting the same force as Amy used before.

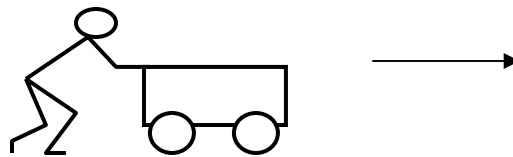


Compared to when Amy was pushing alone, the wagon will now.....

- A. travel at the same steady speed.
- B. travel at a faster steady speed.
- C. speed up just as before.
- D. speed up quicker than before.

**3b.** How sure are you of your answer? A. Very sure B. Somewhat sure C. My best guess

**4a.** Amy now **unloads** the packages from the wagon and then pushes it with the **same constant force** as before.

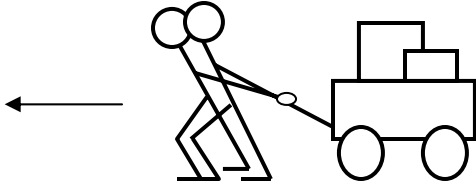


The empty wagon will now . . .

- A. move just the same as when it was loaded.
- B. move at a steady speed, but faster than before.
- C. move at a steady speed, but slower than before.
- D. speed up, more rapidly than before.

**4b.** How sure are you of your answer? A. Very sure B. Somewhat sure C. My best guess

5a. Jill and Lucy are pulling on a cart. Jill is exerting a force of 40 newtons and Lucy is exerting a force of 50 newtons. Friction may be ignored for this cart.

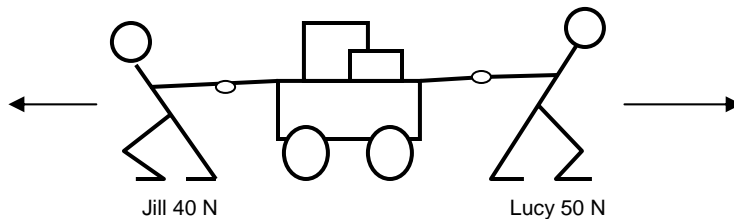


If they **both** pull the cart in the **same** direction, then the net force (combined effect of both forces) on the cart will be....

- A. 10 newtons.
- B. 45 newtons.
- C. 50 newtons.
- D. 90 newtons.

5b. How sure are you of your answer? A. Very sure B. Somewhat sure C. My best guess

6a. Jill and Lucy now pull in **opposite** directions on the cart with forces of 40 newtons and 50 newtons as shown.



The net (unbalanced) force on the cart will now be . . .

- A. 0 newtons.
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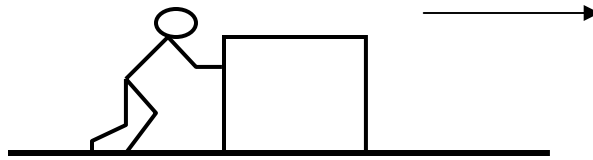
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7a. The **direction** of this net (unbalanced) force will be . . .

- A. to the right.
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- C. neither direction.
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**8a.** Tom is pushing on a crate with a constant force of **90 newtons**, across a level floor. The floor creates a **friction force** on the box of **40 newtons**.



What is the size of the net (unbalanced) force on the box causing it to speed up?

- A. 50 newtons.
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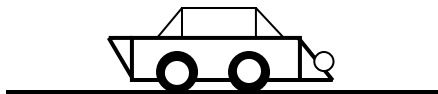
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**9a.** After the box has gained some speed, Tom reduces his applied force to 40 newtons (which is the same as the friction force). What will be the motion of the box when he is pushing with 40 newtons?

- A. It will stop immediately.
- B. It will still speed up, but not as quickly as before.
- C. It will move at a steady speed.
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**10a.** A car is traveling at a **constant** 70 mph along a straight level highway.

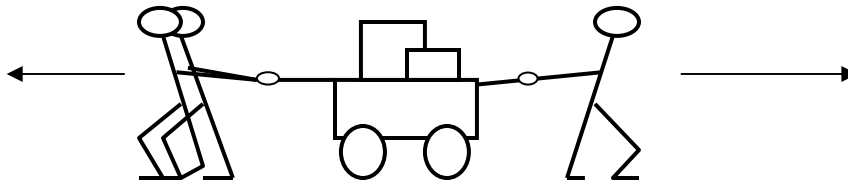


What is true of the forward and backward force(s) acting on the car in this situation?

- A. There are no forces acting on the car.
- B. There is a forward force and a backward force, which are equal and opposite (balanced).
- C. There is a forward force and a backward force, but the forward force is bigger.
- D. There is only a forward force on the car.

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11a. Three people are pulling on a cart as shown in the picture below.



Jill and Sue pull to the left with forces of 30 newtons and 40 newtons, while Jack pulls to the right with a force of 50 newtons. What is the net (unbalanced) force on the cart?

- A. 0 newtons.
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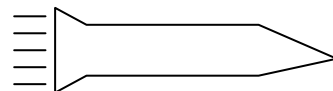
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- A. to the left.
- B. to the right.
- C. upward.
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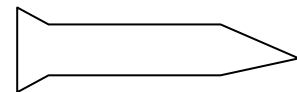
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13a. A rocket is out in space where there is no friction at all to affect its motion. You can ignore any effect of gravity.

At first the rocket engine is operating continuously and the rocket is speeding up.



Then the engine suddenly shuts off.

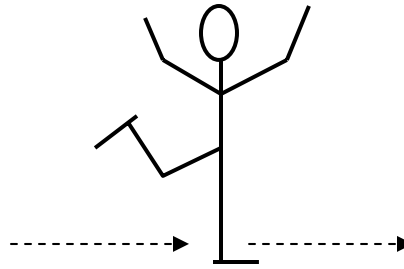


**After the engine shuts off**, what is true of the forces acting on the rocket and how it moves?

- A. The force remains as it was before, and the rocket keeps speeding up.
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**14a.** An ice skater is skating on a flat indoor ice rink. She first gets up to a fast speed, then stands on one skate and keeps going steadily across the ice without any apparent effort.

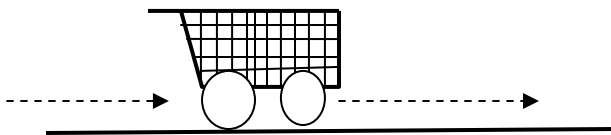


The reason for her keeping moving like this without effort is that . . .

- E. the ice must be sloping slightly downwards.
- F. the air is pushing her forward.
- G. this is the natural behavior of objects with no net force on them.
- H. the force that got her moving is still acting on her.

**14b.** How sure are you of your answer? A. Very sure B. Somewhat sure C. My best guess

**15a.** A shopping cart is given an initial push to get it moving on a carpeted floor. The cart then travels along the carpet on its own for a while, gradually slowing down.



Dotted line indicates the direction the cart is moving.

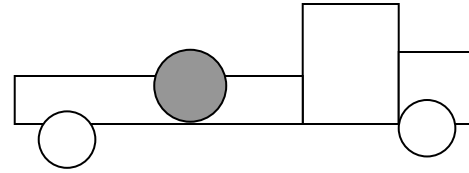
What horizontal force(s), if any, are acting on the shopping cart while it is still moving forward but slowing down?

- A. only a forward force, which diminishes with time.
- B. only a backward force.
- C. a forward force and a backward force, but the forward force is bigger.
- D. a forward force and a backward force, but the backward force is bigger.

**15b.** How sure are you of your answer? A. Very sure B. Somewhat sure C. My best guess

**16a.** A round boulder is placed loose in the back of a pickup truck. The driver starts the truck and begins speeding up.

As the pickup starts moving forward, the driver hears a noise, and looking back notices that the boulder has hit the back (tailgate) of the pickup. The driver wonders about the reason for this.



Sally and Sam give different explanations, as follows.

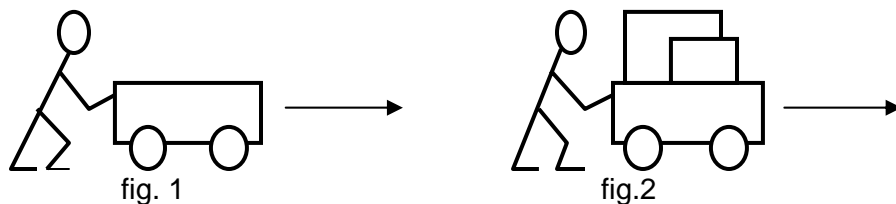
1. Sally says that the boulder tended to ‘stay put’ as the truck started moving, so it did not move forward with the truck. It only appeared to move backward in the truck because the truck moved forward.
2. Sam says that since the boulder hit the back of the truck, there must have been a backward force acting on it, causing it to do so.

What is the best comment about these two statements?

- A. Only Sally’s statement (#1) is correct.
- B. Only Sam’s statement (#2) is correct.
- C. Both Sally and Sam have made correct statements.
- D. Neither Sally’s nor Sam’s statements are correct.

**16b.** How sure are you of your answer? A. Very sure B. Somewhat sure C. My best guess

**17a.** While a force is being applied to a wagon, it speeds up (fig. 1). There is little or no friction.

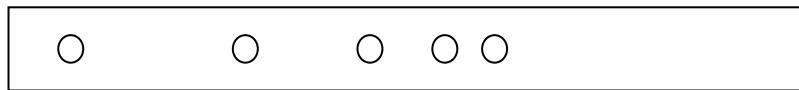


If we now load the wagon with packages and push again with the same force (fig.2), what will be true of the motion?

- A. It will speed up just the same as before.
- B. It will speed up slower than before.
- C. It will not speed up but move at a steady speed.
- D. It will not move.

**17b.** How sure are you of your answer? A. Very sure B. Somewhat sure C. My best guess

**18a.** A toy cart is moving along the floor. Every second, the position of the car is marked on the floor. This produces a row of marks, as shown.



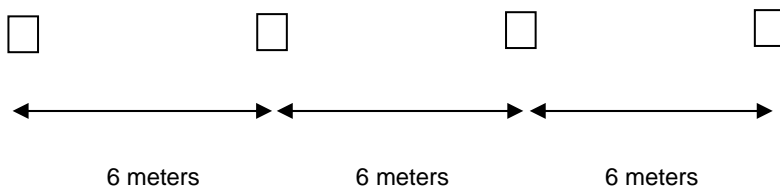
Motion direction →

From this pattern of marks, we can say that the toy car . . .

- A. was going faster and faster.
- B. was going slower and slower.
- C. was going at a constant speed.
- D. was moving in short jerks.

**18b.** How sure are you of your answer? A. Very sure B. Somewhat sure C. My best guess

**19a.** A person in a moving wagon drops a card on the ground every 2 seconds. The diagram shows the row of dropped cards on the ground afterwards. We find they are spaced 6 meters apart.



This diagram shows that the wagon was . . .

- A. staying in one place.
- B. speeding up.
- C. slowing down.
- D. traveling at constant speed.

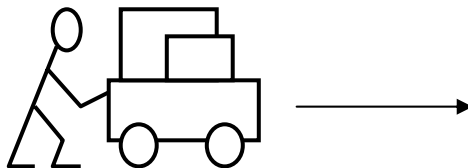
**19b.** How sure are you of your answer? A. Very sure B. Somewhat sure C. My best guess

**20a.** From the information given in the question above, the speed of the wagon was . . .

- A. zero.
- B. 3 meters per second.
- C. 6 meters per second.
- D. 12 meters per second.

**20b.** How sure are you of your answer? A. Very sure B. Somewhat sure C. My best guess

**21a.** Students are investigating the motion of a loaded cart and find that it speeds up when they push it.



They suspect that how quickly the cart speeds up might depend on **two** things, namely: the **size of the force** they apply to the cart, and the **mass** of the cart. They decide to investigate this, but two groups use different methods, as follows.

<b>First Method (Group 1)</b>	<b>Second Method (Group 2)</b>
Group 1 first keeps the mass of the cart constant, and applies three different forces, to find the effect of the force size. Next they keep the force constant and apply it to the cart loaded with three different masses, to find the effect of the mass.	Group 2 varies both the force and the mass from one trial to the next to get six different combinations of force and mass. Then they look at their data for all six trials, looking for possible patterns that show the effect of the force size and of the mass.

Which of these two methods is better for finding out how speeding up depends on force size and on mass?

- A. The first method is better.
- B. The second method is better.
- C. Both methods are equally good.
- D. Neither method is good.

**21b.** How sure are you of your answer? A. Very sure B. somewhat sure C. My best guess

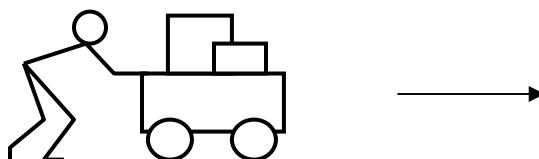
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**Student Pre-Assessment**  
IT'S DYNAMIC!

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**For each answer, also circle whether you are** (A. Very sure, B. Somewhat sure, or C. My best guess).

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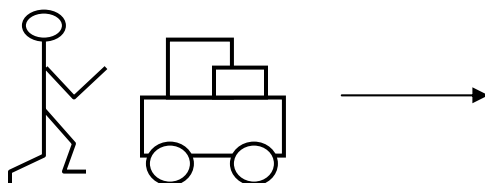


If Amy continuously pushes with a **constant pushing force**, and friction is ignored, then the wagon will . . .

- A. not move.
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- C. *speed up steadily.*
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**1b.** How sure are you of your answer? A. Very sure B. Somewhat sure C. My best guess

**2a.** Amy suddenly **stops pushing** when the wagon is moving quite fast.

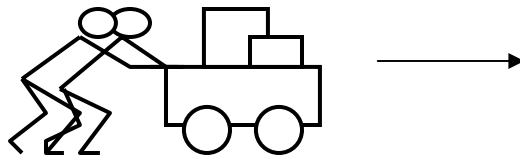


What will happen next? (Remember that friction can be ignored.) The wagon will . . .

- A. stop immediately.
- B. *continue moving at the speed it was going.*
- C. speed up.
- D. slow down quickly, and then stop.

**2b.** How sure are you of your answer? A. Very sure B. Somewhat sure C. My best guess

**3a.** Amy's sister joins her and **both push together** in the same direction on the loaded wagon, **each** exerting the same force as Amy used before.

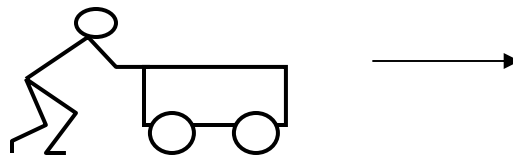


Compared to when Amy was pushing alone, the wagon will now.....

- A. travel at the same steady speed.
- B. travel at a faster steady speed.
- C. speed up just as before.
- D. *speed up quicker than before.*

**3b.** How sure are you of your answer? A. Very sure B. Somewhat sure C. My best guess

**4a.** Amy now **unloads** the packages from the wagon and then pushes it with the **same constant force** as before.

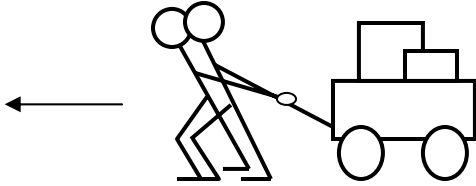


The empty wagon will now . . .

- A. move just the same as when it was loaded.
- B. move at a steady speed, but faster than before.
- C. move at a steady speed, but slower than before.
- D. *speed up, more rapidly than before.*

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**5a.** Jill and Lucy are pulling on a cart. Jill is exerting a force of 40 newtons and Lucy is exerting a force of 50 newtons. Friction may be ignored for this cart.

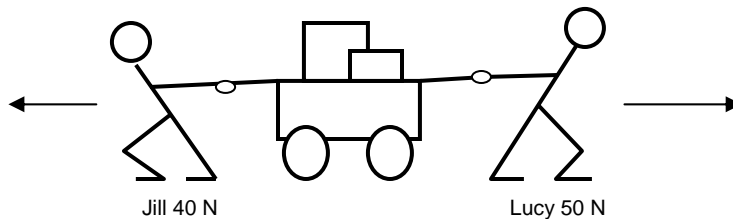


If they **both** pull the cart in the **same** direction, then the net force (combined effect of both forces) on the cart will be....

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**6a.** Jill and Lucy now pull in **opposite** directions on the cart with forces of 40 newtons and 50 newtons as shown.



The net (unbalanced) force on the cart will now be . . .

- A. 0 newtons.
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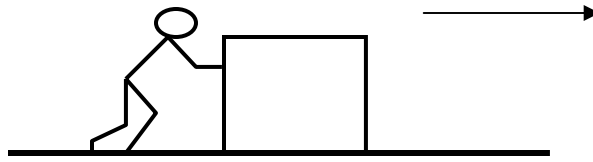
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**7a.** The **direction** of this net (unbalanced) force will be . . .

- A. to the right.
- B. to the left.
- C. neither direction.
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**8a.** Tom is pushing on a crate with a constant force of **90 newtons**, across a level floor. The floor creates a **friction force** on the box of **40 newtons**.



What is the size of the net (unbalanced) force on the box causing it to speed up?

- A. 50 newtons.
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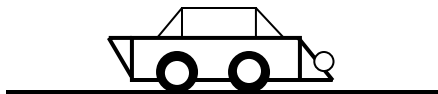
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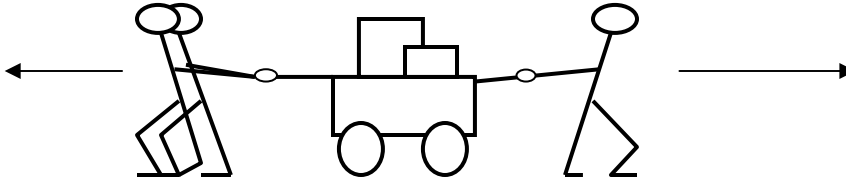


What is true of the forward and backward force(s) acting on the car in this situation?

- A. There are no forces acting on the car.
- B. *There is a forward force and a backward force, which are equal and opposite (balanced).*
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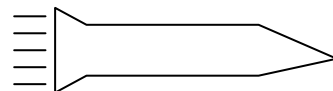
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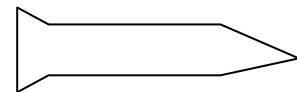
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Then the engine suddenly shuts off.

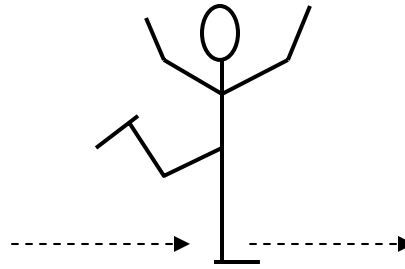


**After the engine shuts off**, what is true of the forces acting on the rocket and how it moves?

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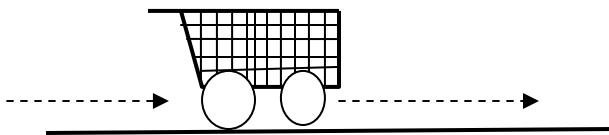


The reason for her keeping moving like this without effort is that . . .

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- G. (C) *this is the natural behavior of objects with no net force on them.*
- H. (D) the force that got her moving is still acting on her.

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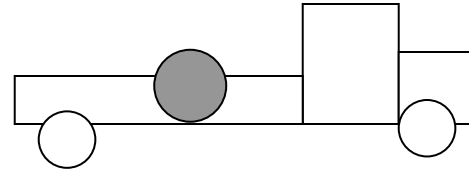
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Sally and Sam give different explanations, as follows.

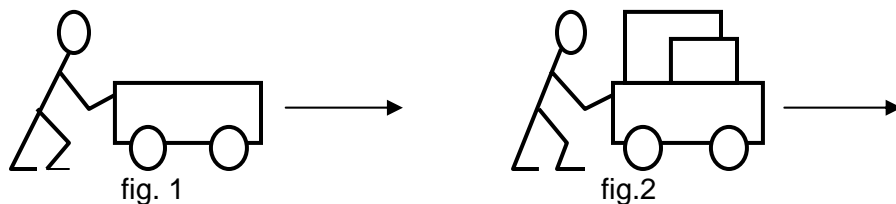
1. Sally says that the boulder tended to 'stay put' as the truck started moving, so it did not move forward with the truck. It only appeared to move backward in the truck because the truck moved forward.
2. Sam says that since the boulder hit the back of the truck, there must have been a backward force acting on it, causing it to do so.

What is the best comment about these two statements?

- A. Only Sally's statement (#1) is correct.
- B. Only Sam's statement (#2) is correct.
- C. Both Sally and Sam have made correct statements.
- D. Neither Sally's nor Sam's statements are correct.

**16b.** How sure are you of your answer? A. Very sure B. Somewhat sure C. My best guess

**17a.** While a force is being applied to a wagon, it speeds up (fig. 1). There is little or no friction.

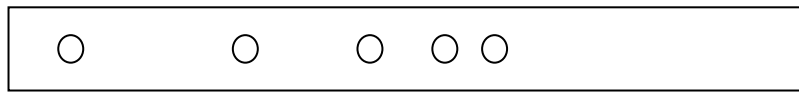


If we now load the wagon with packages and push again with the same force (fig.2), what will be true of the motion?

- A. It will speed up just the same as before.
- B. It will speed up slower than before.
- C. It will not speed up but move at a steady speed.
- D. It will not move.

**17b.** How sure are you of your answer? A. Very sure B. Somewhat sure C. My best guess

**18a.** A toy cart is moving along the floor. Every second, the position of the car is marked on the floor. This produces a row of marks, as shown.



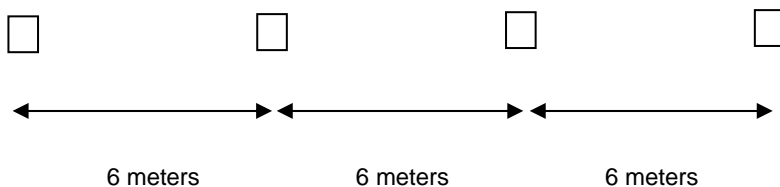
Motion direction →

From this pattern of marks, we can say that the toy car . . .

- A. was going faster and faster.
- B. was going slower and slower.*
- C. was going at a constant speed.
- D. was moving in short jerks.

**18b.** How sure are you of your answer? A. Very sure B. Somewhat sure C. My best guess

**19a.** A person in a moving wagon drops a card on the ground every 2 seconds. The diagram shows the row of dropped cards on the ground afterwards. We find they are spaced 6 meters apart.



This diagram shows that the wagon was . . .

- A. staying in one place.
- B. speeding up.
- C. slowing down.
- D. traveling at constant speed.*

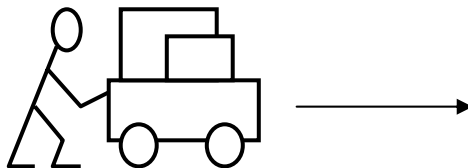
**19b.** How sure are you of your answer? A. Very sure B. Somewhat sure C. My best guess

**20a.** From the information given in the question above, the speed of the wagon was . . .

- A. zero.
- B. 3 meters per second.*
- C. 6 meters per second.
- D. 12 meters per second.

**20b.** How sure are you of your answer? A. Very sure B. Somewhat sure C. My best guess

**21a.** Students are investigating the motion of a loaded cart and find that it speeds up when they push it.



They suspect that how quickly the cart speeds up might depend on **two** things, namely: the **size of the force** they apply to the cart, and the **mass** of the cart. They decide to investigate this, but two groups use different methods, as follows.

<b>First Method (Group 1)</b>	<b>Second Method (Group 2)</b>
Group 1 first keeps the mass of the cart constant, and applies three different forces, to find the effect of the force size. Next they keep the force constant and apply it to the cart loaded with three different masses, to find the effect of the mass.	Group 2 varies both the force and the mass from one trial to the next to get six different combinations of force and mass. Then they look at their data for all six trials, looking for possible patterns that show the effect of the force size and of the mass.

Which of these two methods is better for finding out how speeding up depends on force size and on mass?

- A. *The first method is better.*
- B. The second method is better.
- C. Both methods are equally good.
- D. Neither method is good.

**21b.** How sure are you of your answer? A. Very sure B. somewhat sure C. My best guess