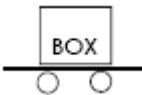
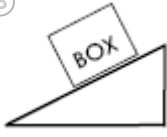
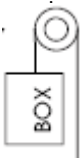





4. Which simple machine would NOT decrease the force needed to move the same box?

|  |  |
|--|--|
| <p>(A)</p>  <p>wheel and axle</p> | <p>(B)</p>  <p>inclined plane</p> |
| <p>(C)</p>  <p>single pulley</p>  | <p>(D)</p>  <p>double pulley</p>  |

5. The picture below shows a pair of scissors. Scissors are an example of a complex machine. Which of the following simple machines are combined to make scissors?



- (A) lever and gear
- (B) gear and pulley
- (C) lever and wedge
- (D) wedge and pulley

6. An industrial engineer is MOST likely to work on:

- (A) building a new bridge to replace an old one.
- (B) cleaning up oil that was spilled by a factory.
- (C) designing a new bridge to replace an old one.
- (D) helping a toy factory to make more toys each day.

Look at each picture. Mark the simple machine shown in each picture.

7. Tricycle



- (A) pulley
- (B) screw
- (C) wedge
- (D) wheel & axle

8. Top of Flagpole



- (A) lever
- (B) pulley
- (C) wedge
- (D) inclined plane

9. Ladder



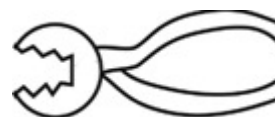
- (A) lever
- (B) pulley
- (C) wedge
- (D) inclined plane

10. Thumbtack



- (A) lever
- (B) pulley
- (C) wedge
- (D) wheel & axle

11. Pliers



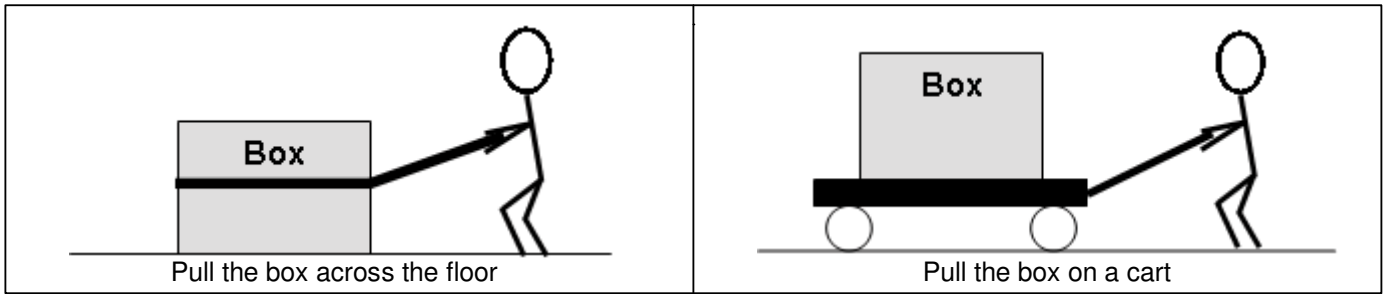
- (A) lever
- (B) pulley
- (C) wheel & axle
- (D) inclined plane

12. Jelly Jar with Lid



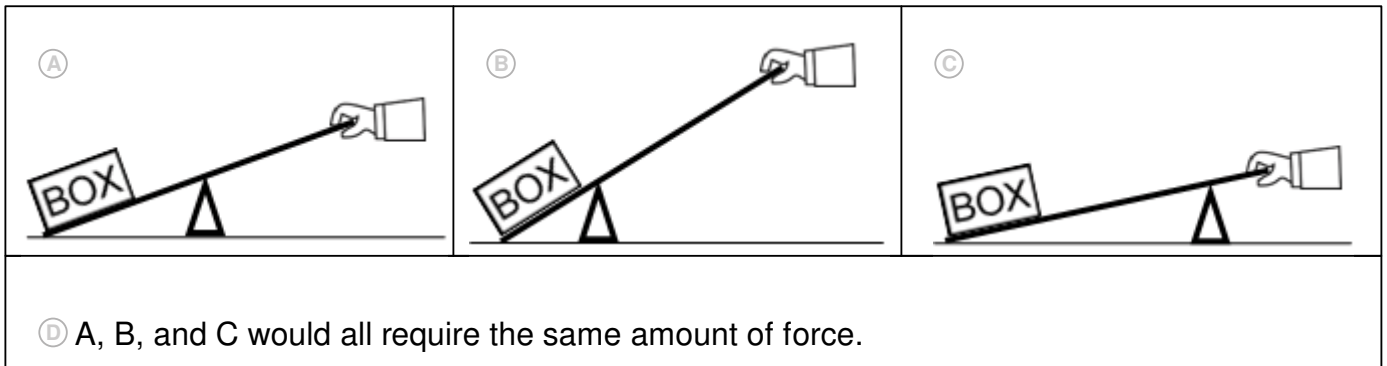
- (A) lever
- (B) screw
- (C) wedge
- (D) wheel and axle

13. Here are two ways to move a heavy box across a room. Which would require LESS force to move the same box?



- A pulling the box across the floor
- B pulling the box on a cart
- C both would require the same force
- D no force is required to move the box

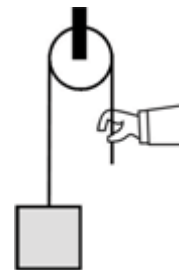
14. How should you set up a lever so that you use the least amount of force to lift the same box?



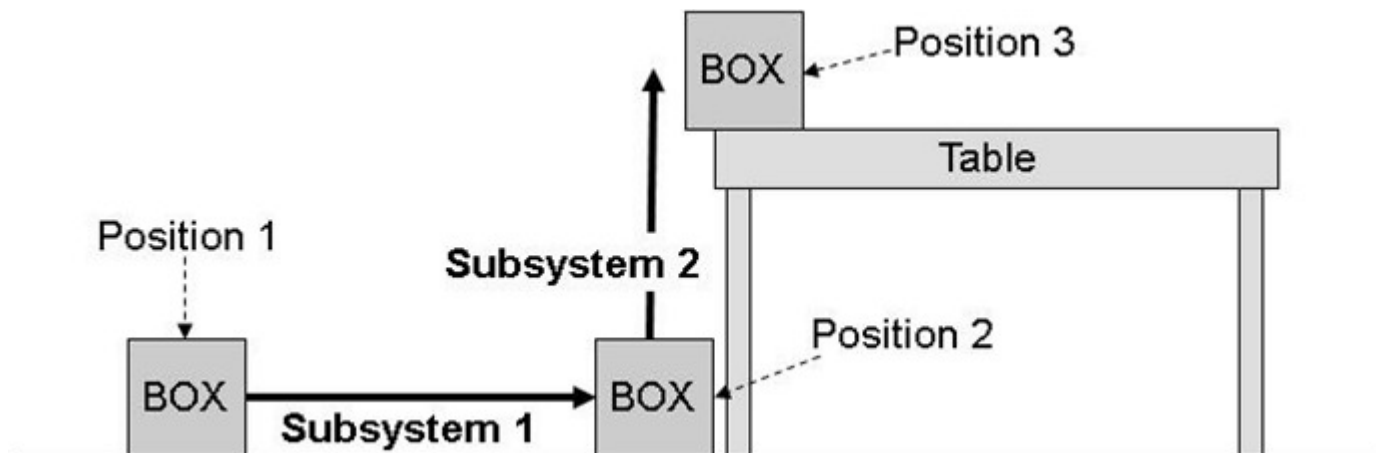
- D A, B, and C would all require the same amount of force.

15. Why does it feel easier to lift a box with a single pulley than without one?

- A You don't have to do as much work.
- B You don't have to apply as much force.
- C You can apply force in a different direction.
- D It does not feel easier to lift a box with a single pulley.



- A group of students is designing two subsystems to move heavy boxes up onto a table. The two subsystems are shown in the image below. Subsystem 1 needs to move the box from Position 1 to Position 2, next to the table. Subsystem 2 needs to lift the box up to Position 3, on the table.



16. Which simple machine could be used for Subsystem 1 to make the work easier?

- (A) lever
- (B) double pulley
- (C) wheel and axle
- (D) any of these could be used

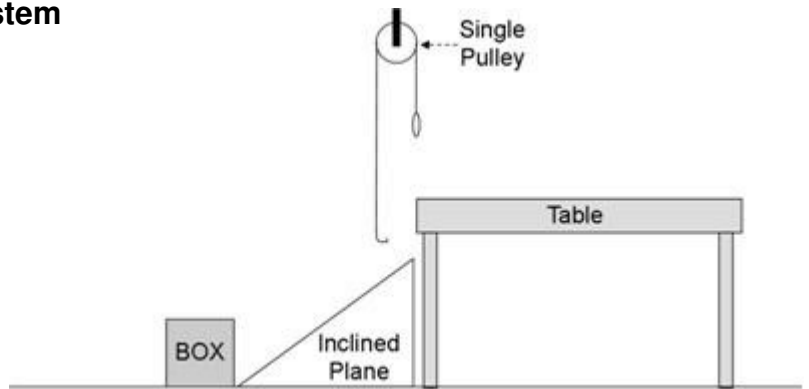
17. One student would like to use a single pulley in the design for Subsystem 2. Will this make the work feel easier to do?

- (A) No, because a single pulley cannot lift a box.
- (B) Yes, because it takes less force to lift a box with a single pulley.
- (C) No, because a single pulley doesn't help reduce the force needed to lift the box.
- (D) Yes, because a single pulley will change the direction of force needed to lift the box.

18. Which one simple machine would work BEST to accomplish the jobs of both Subsystem 1 and Subsystem 2 while making work easier?

- (A) a lever
- (B) a wheel and axle
- (C) a single pulley
- (D) an inclined plane

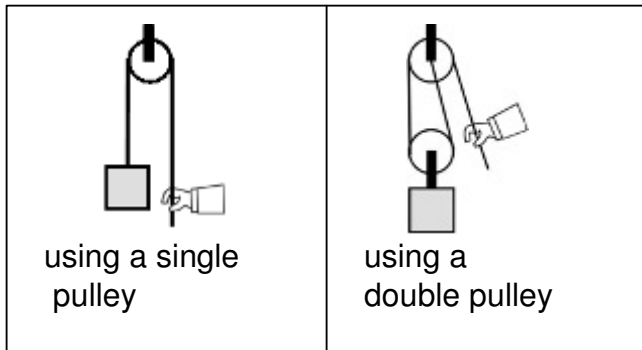
One group of students designed this system to move packages onto the table:



19. How could the students redesign their system so they use LESS force to move the packages?

|  |  |
|--|--|
| <p>Ⓐ Remove the inclined plane. Push the box to the single pulley.</p> |  |
| <p>Ⓑ Remove the single pulley and make the inclined plane steeper.</p> |  |
| <p>Ⓒ Replace the single pulley with a double pulley.</p>               |  |
| <p>Ⓓ You can't reduce the force.</p>                                   |  |

20. Here are two ways to lift the same object. Which would require LESS force to lift the object?

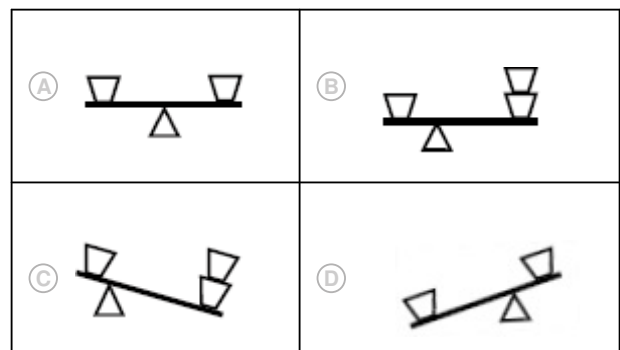


- A using a single pulley  
 B using a double pulley  
 C both would require the same force  
 D it is impossible to tell
21. Choose the BEST answer. An industrial engineer works on:
- A wires and electricity  
 B systems and processes  
 C engines in airplanes and cars  
 D factories and other large buildings
22. What simple machine would help a student to lift up a heavy object?
- A a wheel and axle  
 B an inclined plane  
 C a double pulley  
 D any of these

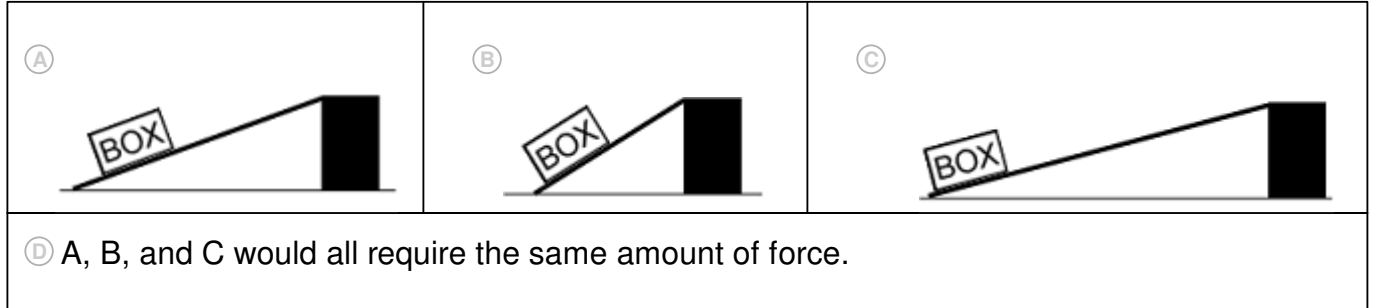
23. The picture below shows a seesaw. A seesaw on a playground is an example of what type of simple machine?



- A lever  
 B wedge  
 C screw  
 D wheel and axle
24. What would help decrease the force needed to push a box up an inclined plane?
- A Use a longer inclined plane.  
 B Put the box on a cart with wheels and pull it up the inclined plane.  
 C Attach the box to a double pulley and pull it up the inclined plane.  
 D Any of these would work.
25. The diagrams below show a balance with weights on it. All the weights are the same. Which diagram is NOT correct?



26. How should you set up an inclined plane so that you use the least amount of force to push the box to the top?



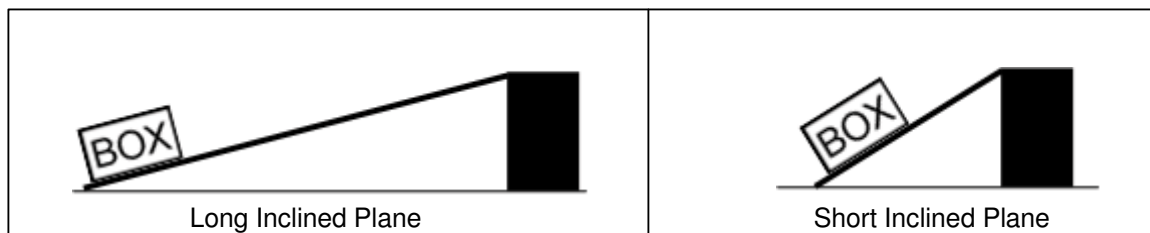
27. What is a reason to use a short inclined plane instead of a long inclined plane?

- (A) You don't have to push the box as far.
- (B) Short inclined planes apply more force.
- (C) You don't have to use as much force.
- (D) You can do less work.

28. Which of the following would an industrial engineer NOT do for her job?

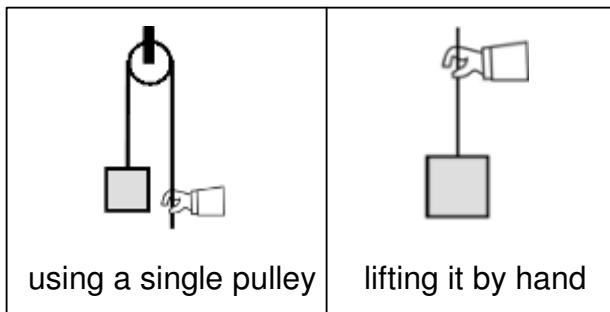
- (A) improve trains so they are easier to drive
- (B) improve train engines so trains can go faster
- (C) improve how people line up at an amusement park
- (D) improve stamp machines in a post office so they're easier to use

29. Which of the following statements is true?



- (A) More force is needed to move the box up the long inclined plane.
- (B) More force is needed to move the box up the short inclined plane.
- (C) The same amount of force is needed to move the box up both inclined planes.
- (D) A short inclined plane applies more force to the box than a long inclined plane.

30. Here are two ways to lift the same object. Which would require LESS force to lift the object?



- (A) using a single pulley
- (B) lifting it by hand
- (C) both would require the same force
- (D) it is impossible to tell

31. An industrial engineer is an expert in:

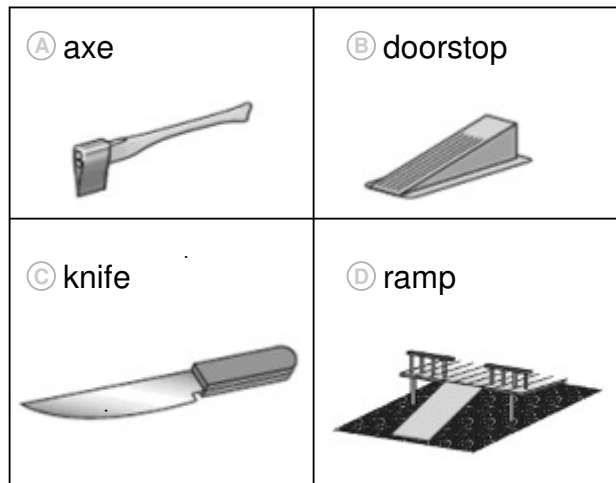
- (A) designing big buildings like factories
- (B) making potato chips taste really good
- (C) building new machines out of new metals
- (D) figuring out how to make a factory run better

32. The picture below shows a staircase. A staircase is MOST like what type of simple machine?

- (A) lever
- (B) wedge
- (C) inclined plane
- (D) wheel and axle



33. Which of the following objects does NOT have a wedge?



34. An industrial engineer working in a car factory is MOST LIKELY to:

- (A) fix machines that are broken in the factory.
- (B) design engines that are made by the factory.
- (C) put electrical wires into the machines in the factory.
- (D) figure out how people should do different jobs in the factory.

Question 3 from MCAS 2007 Science and Technology/Engineering Assessment- Grade 5.

Question 5 & Question 23 from MCAS 2006 Science and Technology/Engineering Assessment- Grade 5.

Question 32 from MCAS 2005 Science and Technology/Engineering Assessment- Grade 5.

Question 33 from MCAS 2008 Science and Technology/Engineering Assessment- Grade 5.

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