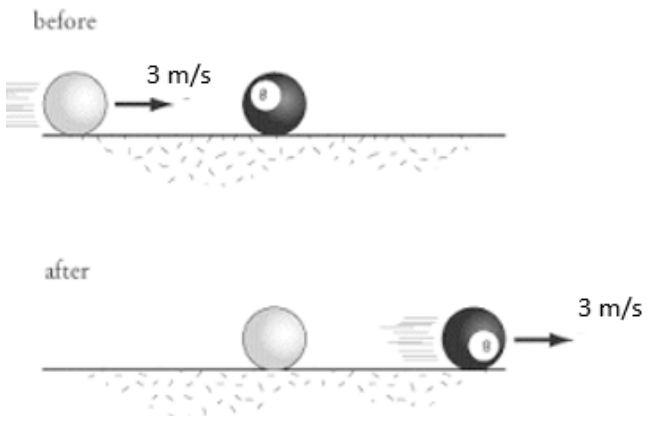
Form	BA - 1, Science, Grade 7, SY 24-25
Identifier	F-BO07WQ_C69216

Item	Newton’s 3rd Law Applied in a Collision #1
Identifier	I-SCI-F-S000024
Standards	SCI.6-8.MS-PS2-1

Newton’s 3rd Law Applied in a Collision

In an experiment conducted by a group of students, two billiard balls of equal mass were observed colliding on a frictionless surface. The white billiard ball was initially traveling with a velocity of 3 m/s to the right, while the black number 8 billiard ball was at rest. Upon collision, white billiard ball came to a complete stop, and the black number 8 billiard ball moved to the right with a velocity of 3 m/s.



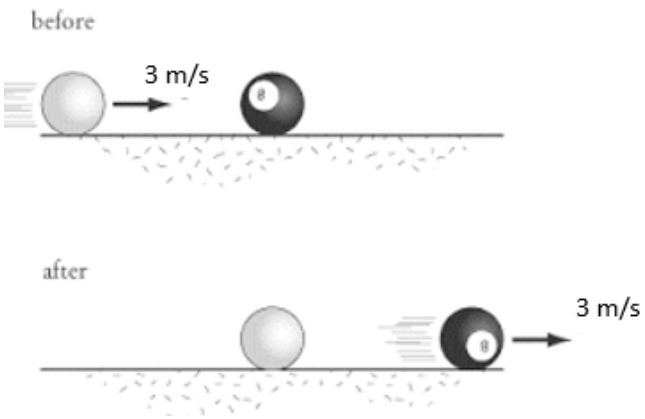
According to Newton's third law of motion, what can be inferred about the forces experienced by the billiard balls during the collision?

- A — The white billiard ball experienced a greater force than the black number 8 billiard ball.
- B — The black number 8 billiard ball experienced a greater force than the white billiard ball. T
- C — Both the white billiard ball and the black number 8 billiard ball experienced equal and opposite forces.
- D — Neither the white billiard ball nor the black number 8 billiard ball experienced any force during the collision.

Item	Newton’s 3rd Law Applied in a Collision #2
Identifier	I-SCI-F-S000033
Standards	SCI.6-8.MS-PS2-1

Newton’s 3rd Law Applied in a Collision

In an experiment conducted by a group of students, two billiard balls of equal mass were observed colliding on a frictionless surface. The white billiard ball was initially traveling with a velocity of 3 m/s to the right, while the black number 8 billiard ball was at rest. Upon collision, the white billiard ball came to a complete stop, and the black number 8 billiard ball moved to the right with a velocity of 3 m/s.



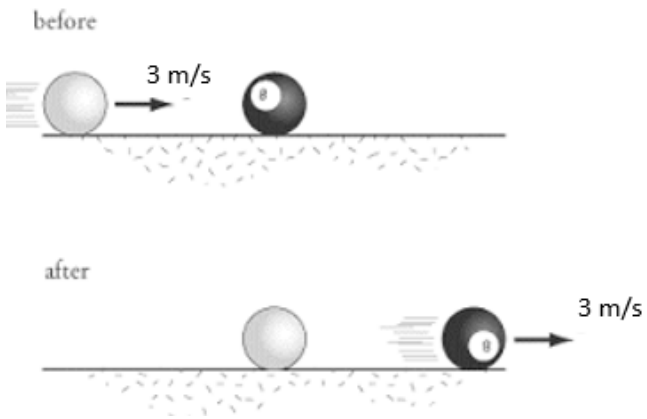
Describe how momentum was conserved in the collision between the white billiard ball and the black number 8 billiard ball based on the initial and final velocities of the objects.

- A — Momentum was not conserved as the white billiard ball came to a complete stop after the collision.
- B — Momentum was conserved as the initial momentum of the white billiard ball was completely transferred to the black number 8 billiard ball, resulting in their final velocities.
- C — Momentum was conserved only for the black number 8 billiard ball as it continued to move after the collision.
- D — Momentum was conserved only for the white billiard ball as it came to a complete stop, preserving its initial momentum.

Item	Newton’s 3rd Law Applied in a Collision #3_C93945
Identifier	I-SCI-F-S000033_C93945
Standards	SCI.6-8.MS-PS2-1

Newton’s 3rd Law Applied in a Collision

In an experiment conducted by a group of students, two billiard balls of equal mass were observed colliding on a frictionless surface. The white billiard ball was initially traveling with a velocity of 3 m/s to the right, while the black number 8 billiard ball was at rest. Upon collision, the white billiard ball came to a complete stop, and the black number 8 billiard ball moved to the right with a velocity of 3 m/s.



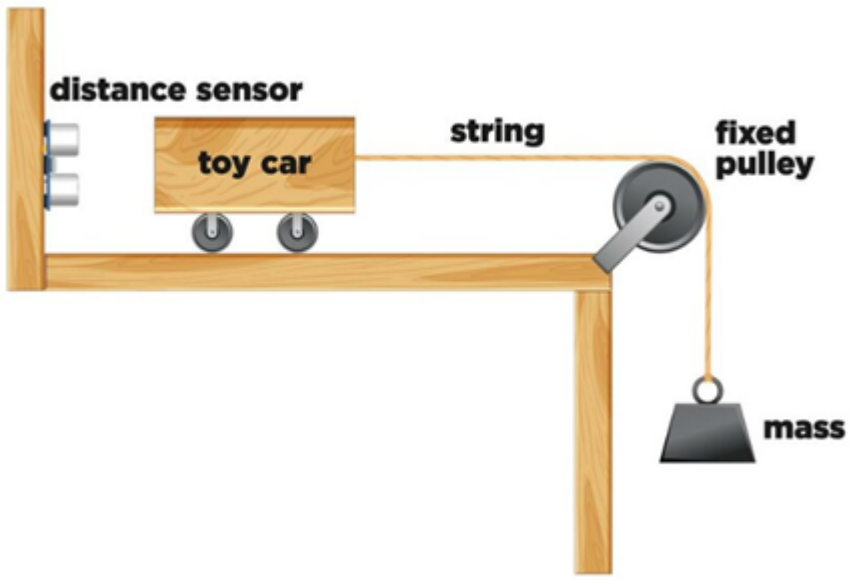
If the white billiard ball had a mass of 2 kg, what would be the mass of the black number 8 billiard ball based on the given scenario?

- A 2kg
- B 3 kg
- C 4 kg
- D 6 kg

Item	Investigating the Relationship Between Force, Mass, and the Change in an Object's Motion - 4
Identifier	I-SCI-F-S000033_C25514
Standards	SCI.6-8.MS-PS2-2

Investigating the Relationship Between Force, Mass, and the Change in an Object's Motion

Students conducted an experiment to see how the movement of an object changes based on the total forces acting on it and the object's mass. They used toy cars of different weights and a flat, smooth surface. Each toy car was attached to a string that went over a pulley, with weights added to the end of the string. By changing the weights and releasing the cars from the same spot each time, the students watched how quickly the cars moved across the table. They recorded how long it took for each car to reach a certain distance and figured out how fast each car was accelerating.



How did the students in the experiment manipulate the variables to investigate the relationship between force, mass, and change in the object's motion?

A By changing the height from which the toy cars were released.

B By changing the surface texture of the table.

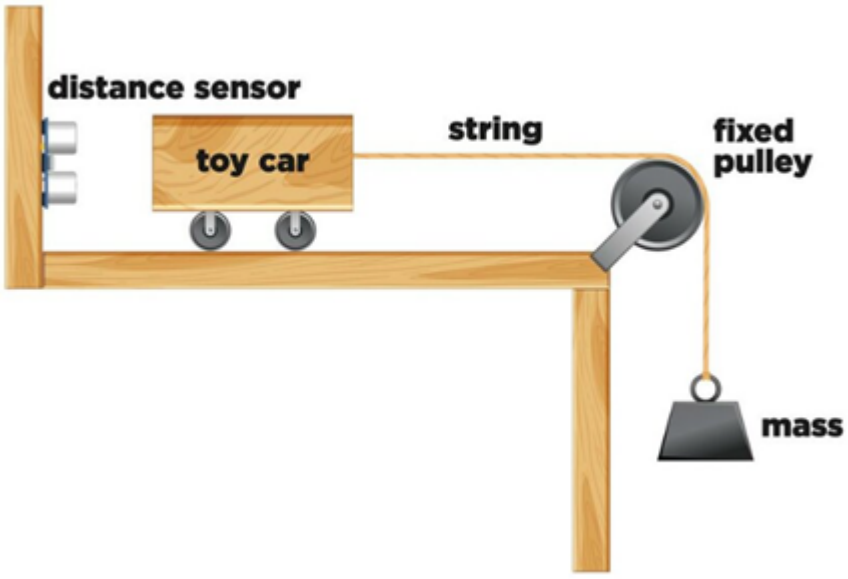
C By adjusting the mass of the weights attached to the end of the string.

D By changing the length of the string attached to the toy cars.

Item	Investigating the Relationship Between Force, Mass, and the Change in an Object's Motion - 5_C37990
Identifier	I-SCI-F-S000033_C37990
Standards	SCI.6-8.MS-PS2-2

Investigating the Relationship Between Force, Mass, and the Change in an Object's Motion

Students conducted an experiment to see how the movement of an object changes based on the total forces acting on it and the object's mass. They used toy cars of different weights and a flat, smooth surface. Each toy car was attached to a string that went over a pulley, with weights added to the end of the string. By changing the weights and releasing the cars from the same spot each time, the students watched how quickly the cars moved across the table. They recorded how long it took for each car to reach a certain distance and figured out how fast each car was accelerating.



Based on the experimental set up, what relationship would you predict to observe between the mass of the toy cars and the acceleration across the table?

A As the mass of the toy cars increased, the acceleration increased.

B There was no apparent relationship between the mass of the toy cars and the acceleration.

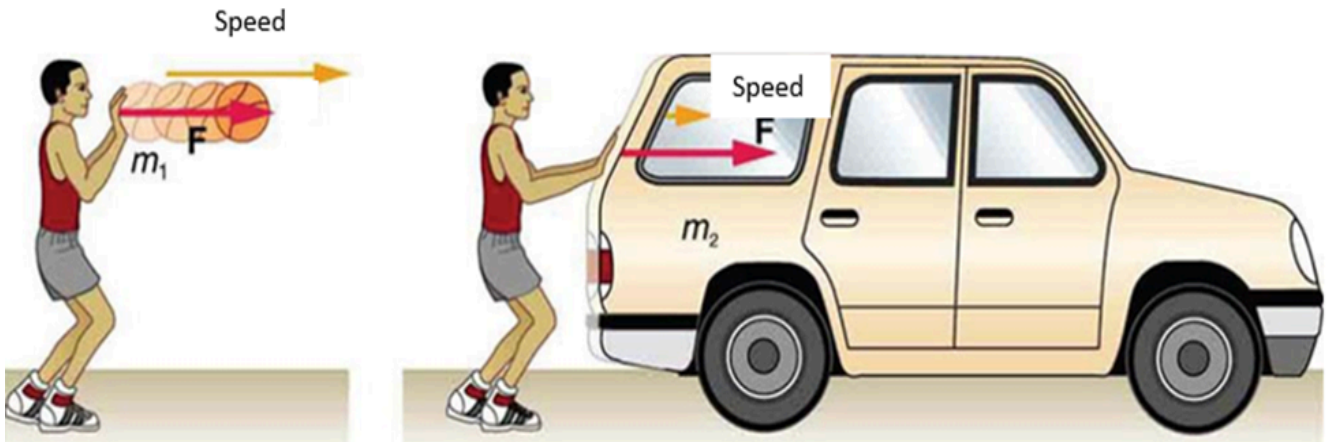
C The acceleration remained constant regardless of the mass of the toy cars.

D As the mass of the toy cars increased, the acceleration decreased.

Item	same force to a basketball and a car - 6
Identifier	I-SCI-F-S000033_C55965
Standards	SCI.6-8.MS-PS2-2

Investigating the Relationship Between Force, Mass, and the Change in an Object's Motion

In an experiment Similar to that shown below), a student applies the same force to a basketball and a car and observes their motions. The student finds that the object with less mass, the basketball, has a greater increase in speed.



Which of the following **BEST** explains this observation using Newton's Second Law (the mathematical model for Newton's 2nd Law is a=F/m)?

- A The basketball, having less mass, experiences less friction, allowing it to change speed more.
- B The force is distributed evenly between the basketball and the car, resulting in different changes in speed.
- C The basketball requires more force to achieve the same change in speed as car.
- D The change in speed of an object is directly proportional to the force applied and inversely proportional to the mass of the object.

Item	Relationship between Kinetic Energy, Mass, and Speed - 7
Identifier	I-SCI-F-S000033_C03415
Standards	SCI.6-8.MS-PS3-1

Relationship between Kinetic Energy, Mass, and Speed

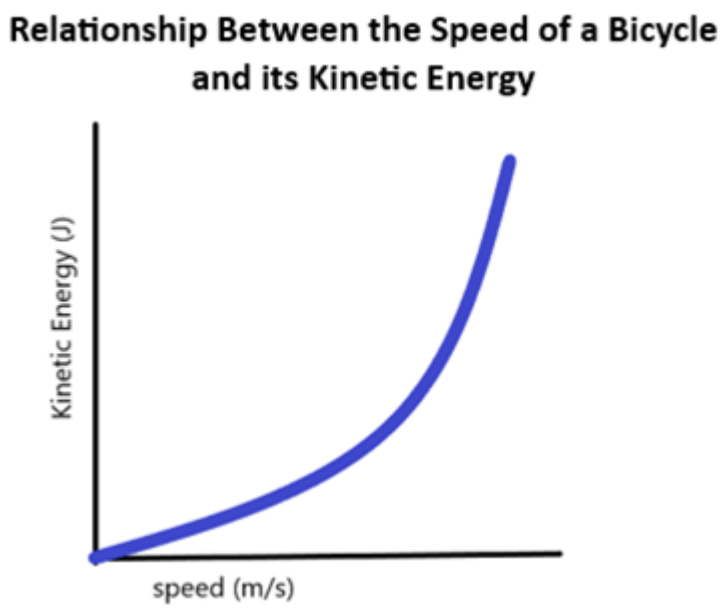
A graph is constructed to show the relationship between the mass of an object and its kinetic energy while maintaining a constant speed. What trend should appear in the graph?

- A Kinetic energy decreases as mass increases.
- B Kinetic energy remains constant regardless of mass.
- C Kinetic energy increases linearly with mass.
- D Kinetic energy decreases exponentially with mass.

Item	Relationship between Kinetic Energy, Mass, and Speed - 8_C65919
Identifier	I-SCI-F-S000033_C65919
Standards	SCI.6-8.MS-PS3-1

Relationship between Kinetic Energy, Mass, and Speed

A student is analyzing a graph that shows the relationship between the speed of a bicycle and its kinetic energy.



The graph shows that kinetic energy (KE = ½ mv^2) increases in a non-linear manner as speed increases, so which of the following **BEST** describes this relationship?

A Kinetic energy is directly proportional to speed.

B Kinetic energy is inversely proportional to speed.

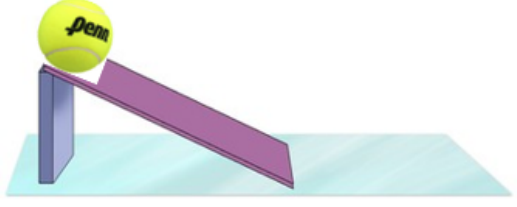
C Kinetic energy is proportional to the square of the speed.

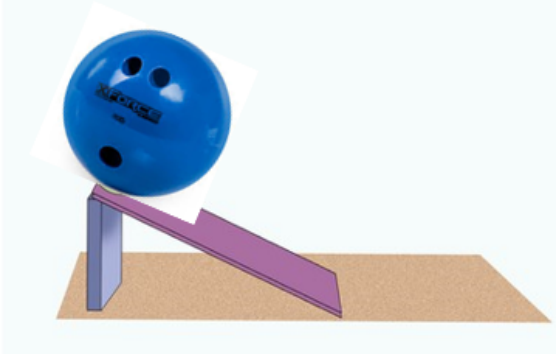
D Kinetic energy remains constant as speed increases.

Item	Relationship between Kinetic Energy, Mass, and Speed - 9_C84905
Identifier	I-SCI-F-S000033_C84905
Standards	SCI.6-8.MS-PS3-1

Relationship between Kinetic Energy, Mass, and Speed

Students conduct an experiment where they roll a tennis ball and a bowling ball down identical ramps at the same speed. The kinetic energy of each ball is recorded in a table.





Based on the results, which of the following conclusions can be drawn?

A The tennis ball has more kinetic energy because it is moving faster.

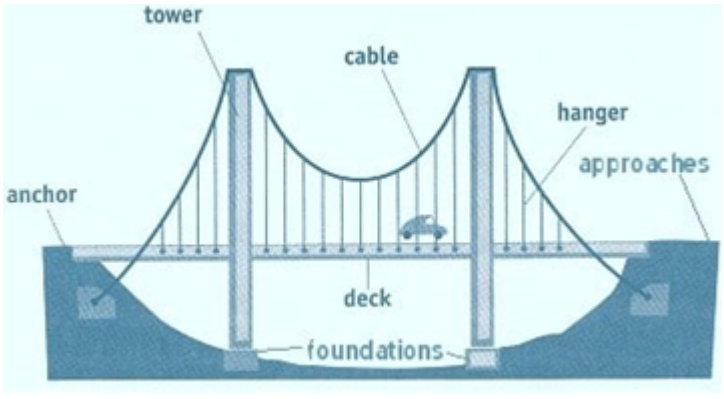
B The bowling ball has more kinetic energy because it has a greater mass.

C Both balls have the same kinetic energy because they are moving at the same speed.

D The kinetic energy is independent of mass and depends only on speed.

Item	MS-ETS1-1: Criteria and Constraints - 10
Identifier	I-SCI-F-S000033_C86197
Standards	SCI.6-8.MS-ETS1-1

Criteria and Constraints
A group of engineers is designing a bridge in a region prone to earthquakes with a magnitude of 6.5 on the Richter Scale and lower.



Which of the following **BEST** describes how they should define the criteria and constraints for their design?

A. The bridge should be constructed as quickly as possible, using the most cost-effective materials, without considering the potential impact of earthquakes.

B. The bridge should be built using only steel, regardless of its cost or availability, as steel is the strongest material.

C. The design should focus primarily on the bridge being nice to look at to attract tourists to the region, with minimal consideration of seismic activity.

D. The bridge must be able to withstand a minimum of a 7.0 magnitude earthquake, while also staying within the budget and minimizing environmental disruption during construction.

Item	MS-ETS1-2: Evaluating Design Solutions - 11_C41930
Identifier	I-SCI-F-S000033_C41930
Standards	SCI.6-8.MS-ETS1-2

Evaluating Design Solutions
Two designs for a new public park are under consideration:

Design A includes various recreational facilities and green spaces, while Design B focuses on extensive walking paths and minimal structures.

Which method should be used to evaluate which design better meets the criteria of providing recreational opportunities and maintaining green space?

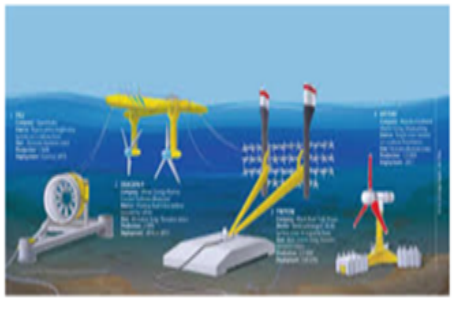
- A. Compare the usage statistics and community feedback on how well each design meets the needs for recreation and green space, including potential impacts on local wildlife and community satisfaction.
- B. Choose the design that has the most facilities, regardless of how well it integrates with the existing environment or community needs.
- C. Select the design with the lowest construction cost, without considering its suitability for recreational use or environmental impact.
- D. Evaluate how nice and modern each design looks and select the one that looks the most attractive.

Item	MS-ETS1-3: Analyzing Data to Determine Similarities and Difference in Design Solutions - 12_C54728
Identifier	I-SCI-F-S000033_C54728
Standards	SCI.6-8.MS-ETS1-3

Analyzing Data to Determine Similarities and Difference in Design Solutions
Three different prototypes for a renewable energy device have been tested.

Prototype X is highly efficient but expensive, Prototype Y is affordable but less efficient, and Prototype Z has a moderate efficiency and high cost.





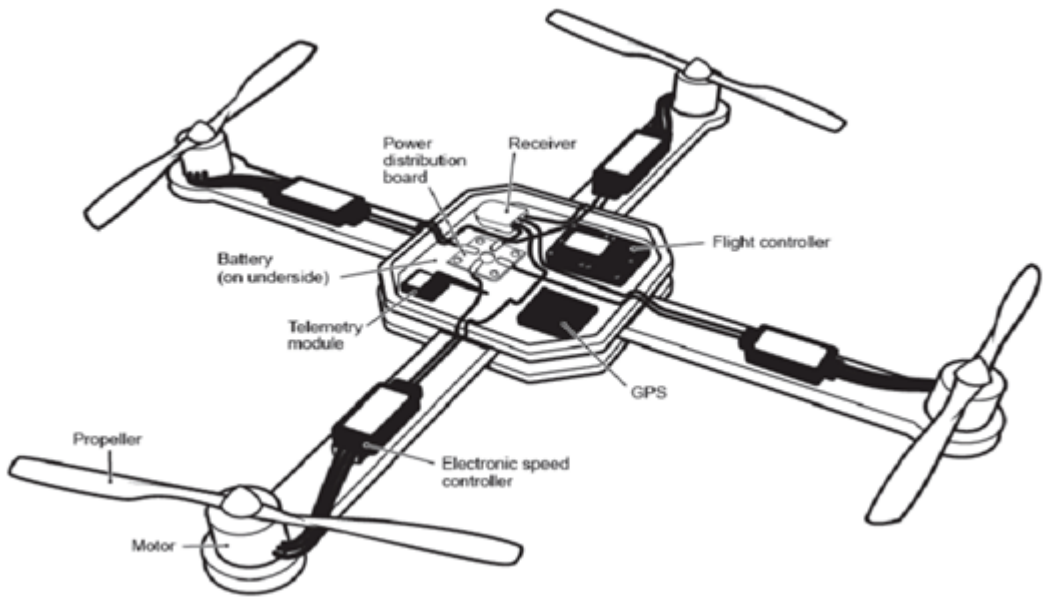
What systematic approach should be used to develop a new prototype that incorporates the **BEST** features of each?

- A. Combine all features from the prototypes without analyzing their impact on overall performance or cost.
- B. Select the least expensive prototype and modify it to include features from the more efficient prototypes, even if it results in increased complexity.
- C. Choose the prototype with the highest efficiency without considering its cost or other characteristics.
- D. Analyze the efficiency and cost data from each prototype and create a new prototype that integrates the most efficient and cost-effective features from the three designs.

Item	MS-ETS1-4:Developing a Model for Iterative Testing - 13_C20444
Identifier	I-SCI-F-S000033_C20444
Standards	SCI.6-8.MS-ETS1-4

Developing a Model for Iterative Testing
Three different prototypes for a renewable energy device have been tested.

A team is developing a new prototype for a drone and needs to create a model for iterative testing.



Which of the following approaches will **BEST** support generating data to optimize the drone's design?

A. Create a basic physical prototype without any simulations or models and make modifications based solely on trial-and-error testing.

B. Develop a simulation model that includes various factors such as aerodynamics, battery life, and payload capacity, and use this model to conduct iterative tests and refine the design based on performance data.

C. Focus only on developing sleek looks of the drone and test the prototype for visual appeal without considering performance metrics.

D. Use a pre-existing drone design as a reference and make minimal adjustments based on preliminary test results.