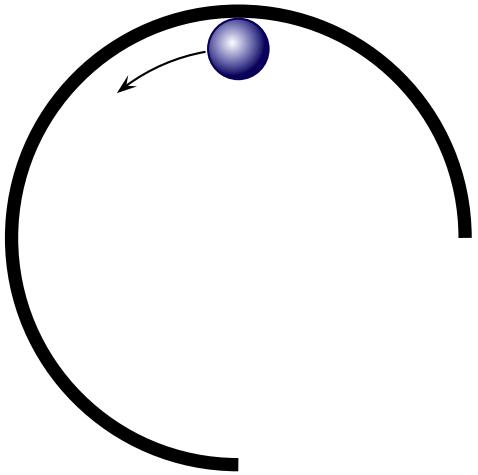
Question 1

A nearly complete hoop is placed on a perfectly frictionless horizontal table. A marble is placed inside the hoop and given an initial push so that it rolls touching the inside of the hoop. Viewed *from above:*

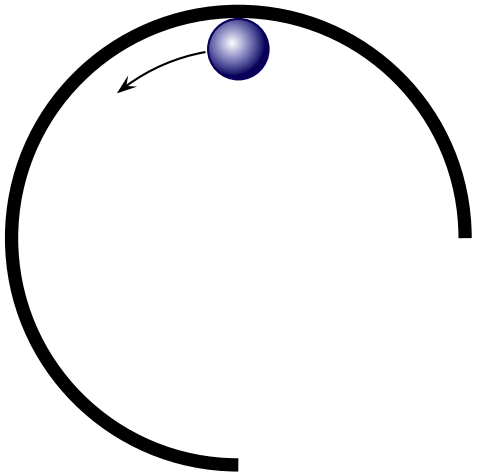


The ball slides at a constant speed while in contact with the hoop. Which of the following is true while the ball slides along the hoop?

1. The net force on the ball is zero.
2. The net force on the ball is not zero.
3. There is not enough information to decide whether the net force on the ball is zero or not.

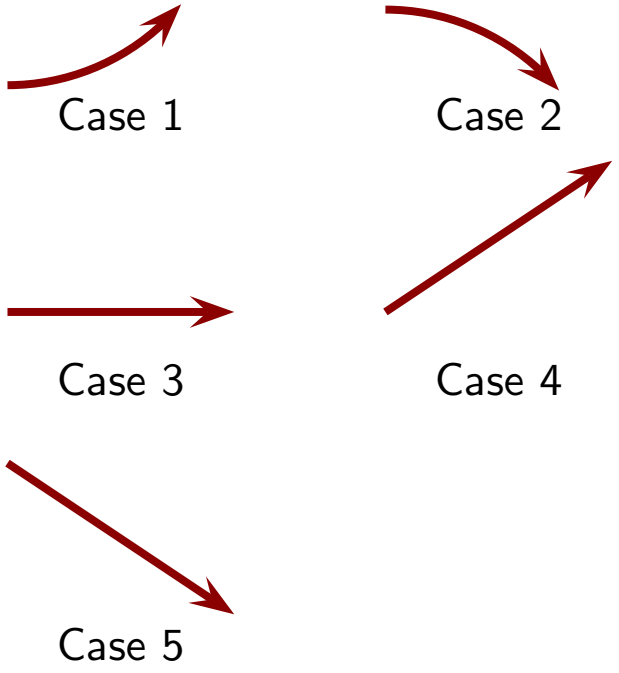
Question 2

A nearly complete hoop is placed on a perfectly frictionless horizontal table. A marble is placed inside the hoop and given an initial push so that it rolls touching the inside of the hoop. Viewed *from above:*



The effects of the earth's gravity and the table cancel each other.

Which of the following best describes the trajectory of the marble after it leaves the hoop?

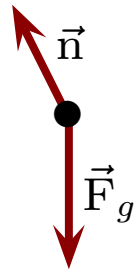


Question 3

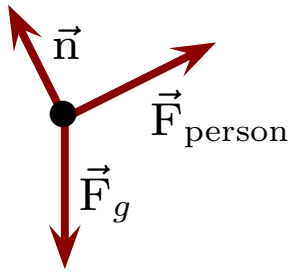
A sled can move along the illustrated frictionless surface. A person pushes it along the horizontal section and loses contact with the sled before the bottom of the ramp. It slides up the ramp.

Which of the following represents the FBD for the sled as it moves up the ramp?

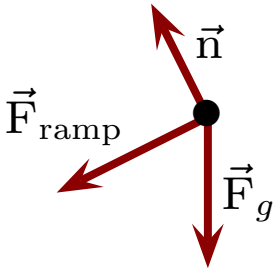
Case 1



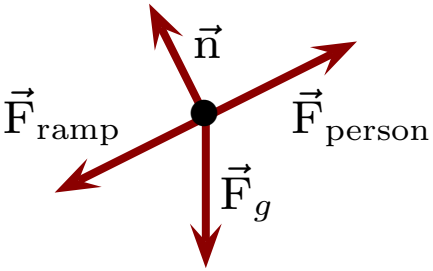
Case 2



Case 3



Case 4



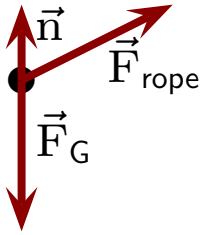
Question 4

A box is pulled across the floor with a rope as illustrated. The box slides with constant velocity.

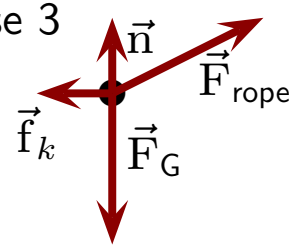
Which of the following ($\vec{f}_k$ represents friction) best represents the free body diagram for the box?

Case 1

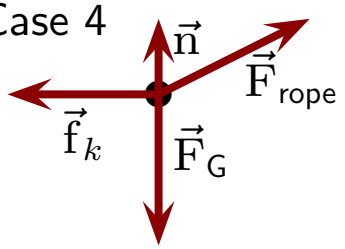
Case 2



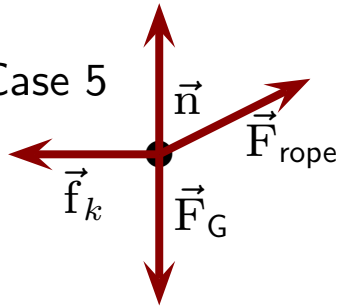
Case 3



Case 4



Case 5



Warm Up Question 1

King Zog observes a block on a horizontal frictionless surface. The block can be pulled by identical springs, each of which is stretched the same length. He believes that with a single spring the block will move with a constant velocity. He then considers the same block pulled by two such springs pulling in the same direction. He guesses that the block will move with a faster constant velocity than when just one spring is used. What advice would you offer to him regarding the velocity of the block when two springs are attached? Explain your answer.

1. Larger velocity. Larger force.
2. Double velocity. The force is double.
3. Same velocity. Springs exert same forces.
4. Both accelerate. Velocity is not constant.

Warm Up Question 2

A 5kg object slides along a frictionless horizontal surface. During a period of 10s a single force pulls to the right with magnitude 20N. During another period of 5s an additional force also pulls with magnitude 10N but perpendicular to the first force (and parallel to the surface). Compare the acceleration during the 5s period to the 10s period. During the 5s period, is it exactly double, exactly zero or somewhere between?

1. Between. Its $\sqrt{10^2 + 20^2} = 22\,\mathrm{N}$.
2. Less. The forces partly cancel.

Question 5

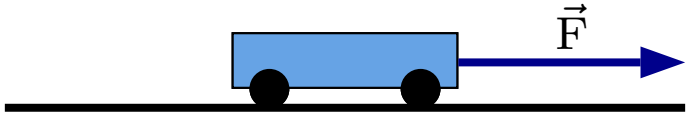
A cart moves along a horizontal surface to the right. During a particular period the cart slows down while moving to the right. The earth's gravitational force is irrelevant here and friction can be ignored.

Which of the following is true regarding the net force on the cart during this period?

1. $\vec{\mathrm{F}}_{\mathrm{net}} = 0.$
2. $\vec{\mathrm{F}}_{\mathrm{net}} \neq 0$ and points $\uparrow$
3. $\vec{\mathrm{F}}_{\mathrm{net}} \neq 0$ and points $\downarrow$
4. $\vec{\mathrm{F}}_{\mathrm{net}} \neq 0$ and points $\rightarrow$
5. $\vec{\mathrm{F}}_{\mathrm{net}} \neq 0$ and points $\leftarrow$

Question 6

A $1\,\mathrm{kg}$ cart moving along a horizontal surface is acted on by one force that constantly pulls from the right. The earth's gravitational force is irrelevant here and friction can be ignored.



The cart is initially at rest and after $2\,\mathrm{s}$ it reaches a velocity of $8\,\mathrm{m/s}$.

The same force is applied to a cart with the same mass, but initially moving with velocity $4\,\mathrm{m/s}$ right. The force is applied for $2\,\mathrm{s}$. The velocity of this cart after $2\,\mathrm{s}$ is (choose one):

1. $8\,\mathrm{m/s}$
2. $12\,\mathrm{m/s}$
3. $16\,\mathrm{m/s}$
4. $32\,\mathrm{m/s}$