LESSON MAKER PRO

Force Face-Off

Find the net force and predict what changes.

GRADE 6 · P.6.6

P.6.6 "Students will demonstrate an understanding of Newton's laws of motion using real world models and examples. Use an engineering design process to create or improve safety devices (e.g., seat belts, car seats..."

NAME _____ **DATE** _____

ADD FORCES BY DIRECTION

Net force is the sum of all the forces on an object. Forces in the same direction add. Forces in opposite directions subtract, and the net force points toward the stronger side. A net force changes an object's motion, while a net force of 0 N does not.

WORKED EXAMPLE

Find the net force on a cart.

FORCES ON THE CART

Force	Direction	Strength
Push	Right	31 N
Friction	Left	9 N

1. The forces point in opposite directions, so subtract.
2. 31 N - 9 N = 22 N.
3. The stronger force points right.

Answer: 22 N right

PRACTICE 6 problems

1 A box is pushed with 14 N right. Friction acts with 4 N left. What is the net force, including its direction?

ANSWER _____

2 A toy is pulled with 6 N up and 11 N down. What is the net force, including its direction?

ANSWER _____

3 Two students pull a wagon in the same direction. One pulls with 7 N right, and the other pulls with 3 N right. What is the net force?

ANSWER _____

4 Two teams pull on a rope. One pulls with 15 N right, and the other pulls with 15 N left. What is the net force?

ANSWER _____

5 A cart has one force of 20 N right and two forces of 6 N left and 2 N left. What is the net force, including its direction?

ANSWER _____

6 Use the table to find the net force on a fan-powered toy car, including its direction.

FORCES ON THE TOY CAR

Force	Direction	Strength
Fan thrust	Forward	18 N
Drag	Backward	26 N

ANSWER _____

APPLY IT Show your work

1 You push a scooter with the same force on two surfaces. Use the table to find the net force on each surface. On which surface is the forward net force greater?

SCOOTER FORCES

Surface	Push forward	Friction backward
Smooth path	24 N	10 N
Rough path	24 N	16 N

ANSWER _____

2 A robot-tag car is moving left. Two motors each push it right, one with 30 N and the other with 6 N. Friction pushes left with 28 N. Find the net force and explain what happens to the car's speed at first.

WORK SPACE

ANSWER _____

CHALLENGE One step up

A remote-control car is moving right. Use the table to find x, the force needed to make the net force 0 N. If these forces stay the same, what happens to the car's motion?

FORCES ON THE REMOTE-CONTROL CAR

Force	Direction	Strength
Motor A	Right	25 N
Motor B	Right	5 N
Friction	Left	12 N
Contact force	Left	x N

WORK SPACE AND ANSWER

Force Face-Off

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	A box is pushed with 14 N right. Friction acts with 4 N left. What is the net force, including its direction?	**10 N right**
2	A toy is pulled with 6 N up and 11 N down. What is the net force, including its direction?	**5 N down**
3	Two students pull a wagon in the same direction. One pulls with 7 N right, and the other pulls with 3 N right. What is the net force?	**10 N right**
4	Two teams pull on a rope. One pulls with 15 N right, and the other pulls with 15 N left. What is the net force?	**0 N**
5	A cart has one force of 20 N right and two forces of 6 N left and 2 N left. What is the net force, including its direction?	**12 N right**
6	Use the table to find the net force on a fan-powered toy car, including its direction.	**8 N backward**

PART 2 · APPLY IT

1. **Smooth path: 14 N forward. Rough path: 8 N forward. The forward net force is greater on the smooth path.** Subtract friction from the 24 N push for each surface. Compare the two results.
2. **The net force is 8 N right. The car slows down at first because it is moving left while the net force points right.** Add the rightward forces to get 36 N, then subtract the 28 N leftward force. A net force opposite the car's motion makes it slow down.

CHALLENGE

x = 18 N. With a net force of 0 N, the car continues moving right at a constant speed.

Accept equivalent wording for directions, such as forward in place of right when the context makes the direction clear. A net force of 0 N does not mean an object must be stopped.