Thanks

Thank you for downloading my product. I truly appreciate your support and look forward to hearing your feedback.

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I look forward helping you focus your instruction and save time prepping.

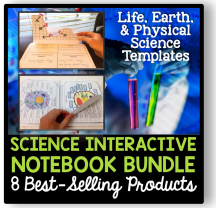
Connect

Kesler Science Facebook Group – Break down the walls of your school and **connect with nearly 10k other science teachers** for collaboration, support, and an often hilariously good time.

Kesler Science MasterClass – Join my FREE MasterClass to watch **over 3 hours of on-demand training** about interactive notebooks, station labs, and the 5E method of instruction. I share all my tips and strategies from my own classes.

You Might Also Like

Kesler Science Complete 5E Lessons
40%+ Savings!



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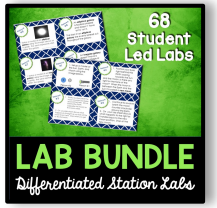

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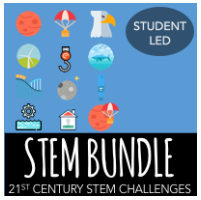

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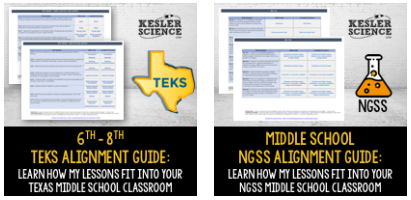


Alignment Guides **FREE**

Kesler Science Teacher Resource

Differentiated Learning:

Listed below are the three different modification levels used for this lab. Each lab is differentiated using the icons below. They are also included in labeled sections on the preview to the left.

Independent Inquiry: This level is the most student-centered experience. Suggestions are made for the students to get started, but most of the decisions will be student-centered. The students will be responsible for most aspects of the lab and will have the least guidance. Suggested for advanced learners.

Dependent Inquiry: This level is written with a combination of procedural instructions and inquiry questions. They are moderately student-centered with guided inquiry questions throughout the lab. Suggested for on-level learners.

Modified Inquiry: This level provides the most structured lab experience. The lessons may eliminate parts of the lab and change the questioning to include sentence stems or multiple choice questions. Suggested for learners with modifications.

CER:

Students will be using the CER model at the conclusion of the lab. The CER model includes 3 parts.

1. Claim – A statement that answers the original question. Usually one sentence in length. Must be specific and answer the question.
2. Evidence – Scientific data that supports the claim. It may include numbers but can also state observations.
3. Reasoning – Explanation that connects evidence to the claim. Answers "why" the evidence supports the claim. Includes science concepts by name (ex. thermal energy, chemical reaction).

YouTube Video on the CER Model
(CER - Claim Evidence Reasoning – Bozeman Science)

Calculate Unbalanced Force Teacher Directions

General:

- partners or small groups
- one, 45-minute class period

Standards:
TEKS: 8.6 A- Demonstrate and calculate how unbalanced forces change the speed or direction of an object's motion.

Teacher Notes:
In this lab, students will play a board game to demonstrate and calculate how unbalanced forces change the direction of an object.

Newton cards (laminated), a Push Force arrow (laminated) and a Newton Football Field should be provided for each group. You may choose to laminate the field but it is not necessary.

Materials per Group:
1 or 2 decks of Newton cards, printed, cut apart, laminated.
*__The Independent level is the only one that needs the blank cards__
1 Newton Football Field (possibly laminated)
1 Push Force arrow (laminated)
1 die
! Dry erase marker (Independent only)

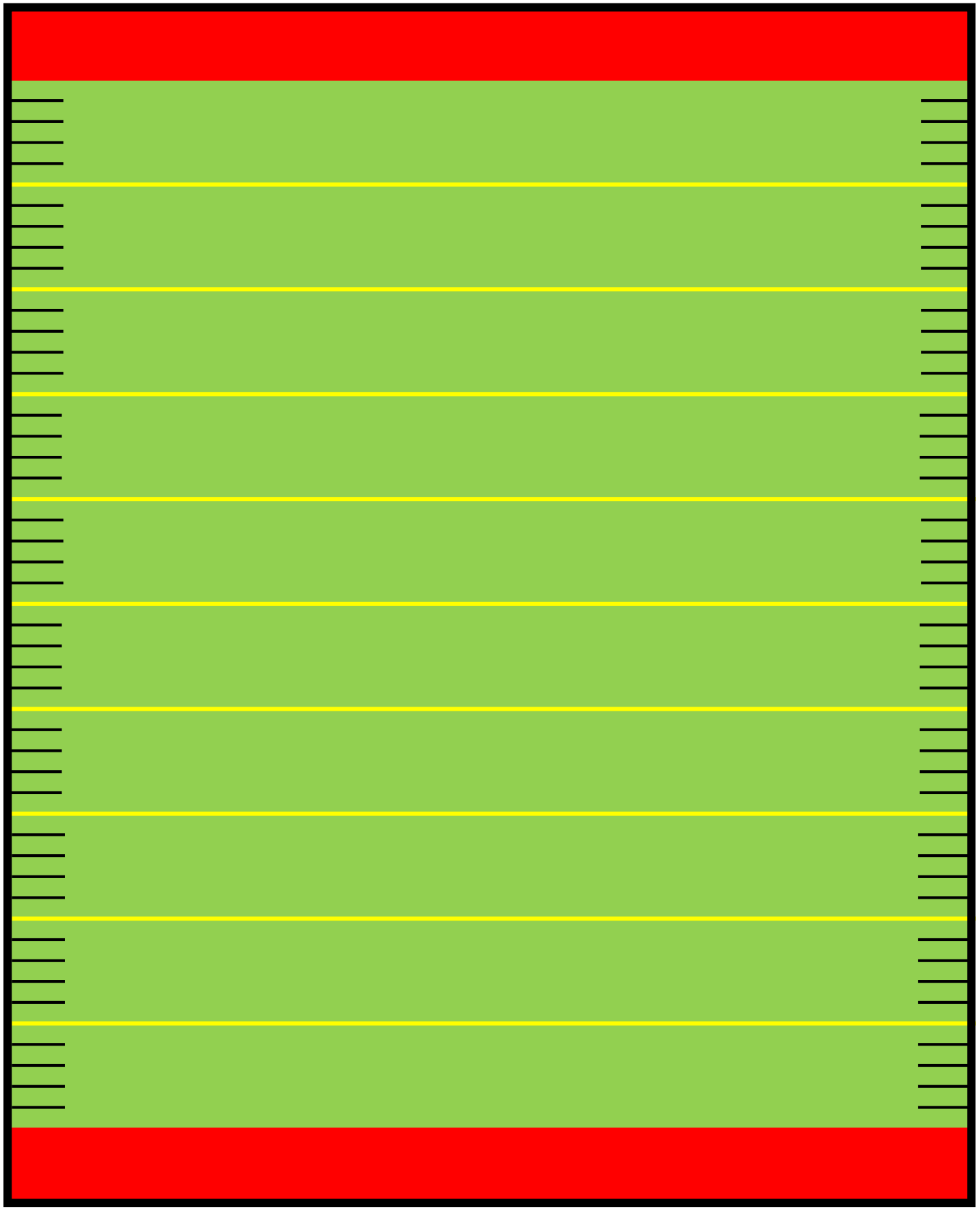
Additional Resources For This Topic:

Unbalanced Forces Complete 5E Lesson – Includes engagement activity, word wall cards, objective cards, student-led station lab, interactive notebook templates, PowerPoint, modified notes, student-choice project, homework, and assessment (including modified).

Unbalanced Forces Station Lab – Includes 8 stations where students will receive new information at the input stations (Read, Watch, Explore, Research) and demonstrate understanding at the output stations (Write, Organize, Asses, Illustrate).

Calculate Unbalanced Force Teacher Directions

Newton's Football Field



Calculate Unbalanced Force Teacher Directions

Push Force
10N

Pull Force
10N

Push Force
20N

Pull Force
20N

Push Force
50N

Pull Force
50N

Push Force
60N

Pull Force
60N

Calculate Unbalanced Force Teacher Directions

The ball is thrown with a push force of 70N with a tail-wind of 20N.

Net Force?

The quarterback fumbled the ball while running toward the end zone. Calculate the difference between the a 20N push force and 50N pull.

Net Force?

The ball is thrown with a push force of 50N into a head-wind of 20N.

Net Force?

While running the play, two opponents hit the player. One has a push force of 90N and the other a pull force of 70N.

Net Force?

The receiver is hit by two opposing players. One has a push force of 50N and the other a pull force 30N.

Net Force?

At the hike, the quarterback is moving backward with a 10N pull and is tackled head-on by an opponent with 50N push force.

Net Force?

Push Force

Calculate Unbalanced Force Teacher Directions

Net Force?

Net Force?

Net Force?

Net Force?

Net Force?

Net Force?

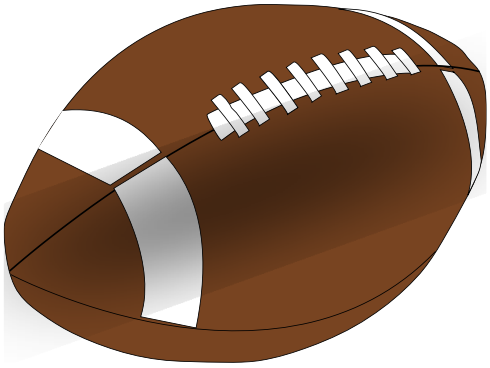
These blank cards are for Independent only.

Name(s):_____
Date:_____

Calculate Unbalanced Force Student Lab Sheet

Essential Question: What kind of forces cause an object to change speed or direction?

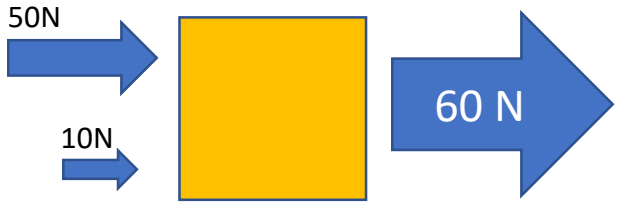
Background or Phenomena:



When two football players collide, what determines where they will land? Is it how fast they are moving? How heavy they are? Or something that combines all of these factors?

Force is a push or a pull, and is measured in units called **Newtons**. An object in motion only changes direction (or speed) when an an **unbalanced** force – one that isn't matched by an opposite force – acts on it. The object will move in the direction of the greatest force.

We calculate this by finding the sum or difference of the combined forces to get the **net force**. If an object is moving with 10N of force and is pushed by 50N in the **opposite** direction, the object will change direction and move in the direction of the bigger push with a 40N net force.



If the object is moving with 10N of force and a 50N force pushes in the **same** direction, the object will move in the direction of the two pushes with 60N of net force. This doesn't change the object's direction, but it would move faster.

So where do two colliding football players end up? They land in the direction that the player with the most force was pushing!

In this lab, you will play a board game to demonstrate and calculate how unbalanced forces change the speed or direction of an object.

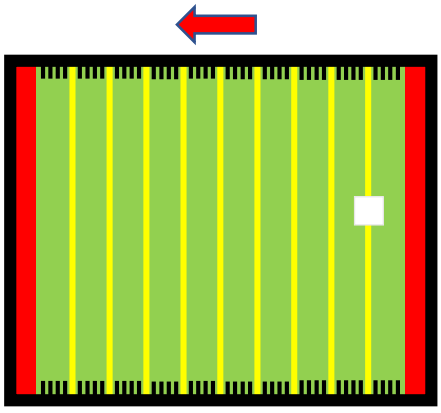
Materials per Group:

- 1 or 2 decks of Newton cards
- 1 Newton Football field
- 1 Push Force arrow
- 1 die

Calculate Unbalanced Force
Student Lab sheet

Newton Football Game Rules

1. Divide the group into two teams.
2. Shuffle the Newton Cards and set them in a draw pile.
3. Flip a coin to decide which team will be offense and which will be defense. The offense picks an end zone.
4. Place the Push Force arrow in the direction pointing towards the offense's end zone.
5. Each stripe in the field represents 10 Newtons. Place the die on the 50 Newton line to represent the football.
6. The starting team draws a card. Some cards give a push or pull force; others must be calculated before using them.
    - Cards with a "PUSH" force are moving in the direction of the Push Force arrow.
    - Cards with a "PULL" force are moving in the opposite direction.
    - The current location of the ball is always a "PUSH" force.
7. Use the **Calculate Unbalanced Forces** page to calculate which direction the ball will travel. Don't forget use to arrows to show the direction traveled and label your answer correctly.
8. Move the die forward or back the calculated number of Newtons.



Ex. 1: The die is on the 10N line. The card is a 30 N push. A 10 N push + a 30 N push = 40 N (push). Move the die 40 N towards the offense's endzone. Land on the 50 N line.

Ex. 2: The die is on the 10N line. The card is a 25 N pull. A 10 N push + a 25 N pull = 15 N (pull). Move the die 15 N away from the offense's endzone. Land in the defense's endzone and score a point!

9. The second team repeats steps 6 and 7.
10. When the die crosses an end zone, that team scores 1 point.
11. After each score, place the die back on the 50N yard line. Turn the Push Force arrow to aim the other way. Have the non-scoring team draw first.
12. Reshuffle the deck when you reach the bottom.
13. The first team to score 5 points wins the game.

Calculate Unbalanced Force
Student Lab sheet

Same Direction : Add → →	Different Direction : Subtract ← →

Ex.

50 ↑ Push
- 30 ↓ Pull

20N ↑ Push

Check for Understanding: What causes an object to change speed or direction?

Calculate Unbalanced Force
Student Lab sheet

Conclusion: What kind of forces cause an object to change speed or direction?

Claim:

Evidence:

Reasoning:

Reflections:

1. What is the unit of measurement when calculating force?

2. What is required in a force for an object's speed or direction to change?

3. What would happen to an object if the two forces acting on it equal and in opposite directions?

Calculate Unbalanced Force
Teacher Answer Key

Same Direction	Add → →		Different Direction	Subtract ← →
	Add ← ←			

Ex.

Students' answers will depend on their individual game results. Their answers should show an understanding of calculating the sum or difference of the forces. The example on the page shows them how to show their work.

Check for Understanding: What causes an object to change speed or direction?

When unbalanced forces acts upon it.

Calculate Unbalanced Force
Teacher Answer Key

Conclusion: What kind of forces cause an object to change speed or direction?

Claim:
Unbalanced forces are what change the speed or direction of an object.

Evidence:
In the game, the direction that the ball moved was changed when the push and pull forces were not the same. When they were equal, the ball did not move.

Reasoning:
An object changes speed or direction whenever the force that is acting on it is unbalanced: not matched by an equal and opposite force. When the two forces move in the opposite direction, we find the net force by finding the difference between the two. When two forces are moving in the same direction, we find the sum of both.

Reflections:

1. What is the unit of measurement when calculating force? The unit of measurement for force is Newtons.

2. What is required in a force for an object's speed or direction to change? The net force must be greater than the force already being used.

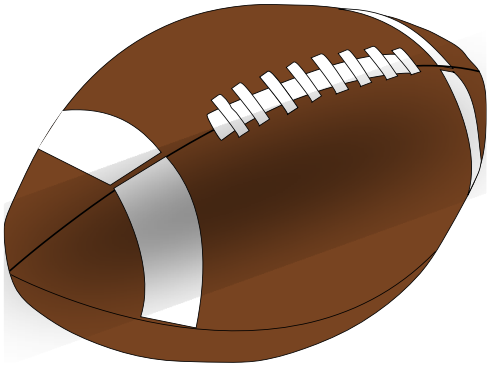
3. What would happen to an object if the two forces acting on it equal and in opposite directions? Its speed or direction wouldn't change or it stays motionless.

Name(s):_____
Date:_____

Calculate Unbalanced Force Student Lab Sheet

Essential Question: What kind of forces cause an object to change speed or direction?

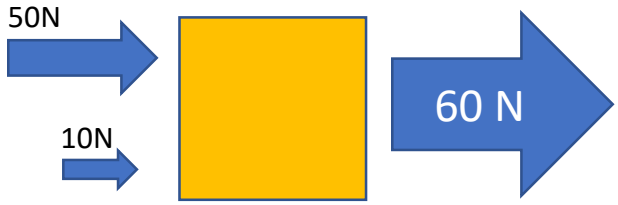
Background or Phenomena:



When two football players collide, what determines where they will land? Is it how fast they are moving? How heavy they are? Or something that combines all of these factors?

Force is a push or a pull, and is measured in units called **Newtons**. An object in motion only changes direction (or speed) when an an **unbalanced** force – one that isn't matched by an opposite force – acts on it. The object will move in the direction of the greatest force.

We calculate this by finding the sum or difference of the combined forces to get the **net force**. If an object is moving with 10N of force and is pushed by 50N in the **opposite** direction, the object will change direction and move in the direction of the bigger push with a 40N net force.



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So where do two colliding football players end up? They land in the direction that the player with the most force was pushing!

In this lab, you will play a board game to demonstrate and calculate how unbalanced forces change the speed or direction of an object.

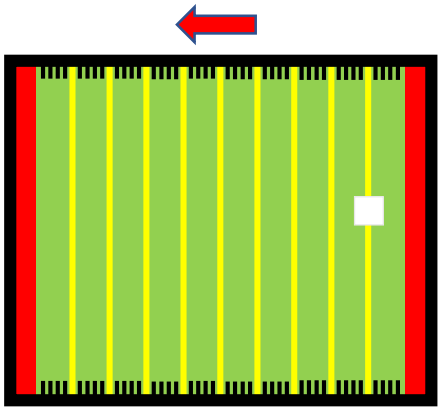
Materials per Group:

1 or 2 decks of Newton cards
1 Newton Football field
1 Push Force arrow
1 die

Calculate Unbalanced Force
Student Lab sheet

Newton Football Game Rules

1. Divide the group into two teams.
2. Shuffle the Newton Cards and set them in a draw pile.
3. Flip a coin to decide which team will be offense and which will be defense. The offense picks an end zone.
4. Place the Push Force arrow in the direction pointing towards the offense's end zone.
5. Each stripe in the field represents 10 Newtons. Place the die on the 50 Newton line to represent the football.
6. The starting team draws a card. Some cards give a push or pull force; others must be calculated before using them.
    - Cards with a "PUSH" force are moving in the direction of the Push Force arrow.
    - Cards with a "PULL" force are moving in the opposite direction.
    - The current location of the ball is always a "PUSH" force.
7. Use the **Calculate Unbalanced Forces** page to calculate which direction the ball will travel. Don't forget to use arrows to show the direction traveled and label your answer correctly.
8. Move the die forward or back the calculated number of Newtons.



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Ex. 2: The die is on the 10N line. The card is a 25 N pull. A 10 N push + a 25 N pull = 15 N (pull). Move the die 15 N away from the offense's endzone. Land in the defense's endzone and score a point!

9. The second team repeats steps 6 and 7.
10. When the die crosses an end zone, that team scores 1 point.
11. After each score, place the die back on the 50N yard line. Turn the Push Force arrow to aim the other way. Have the non-scoring team draw first.
12. Reshuffle the deck when you reach the bottom.
13. The first team to score 5 points wins the game.

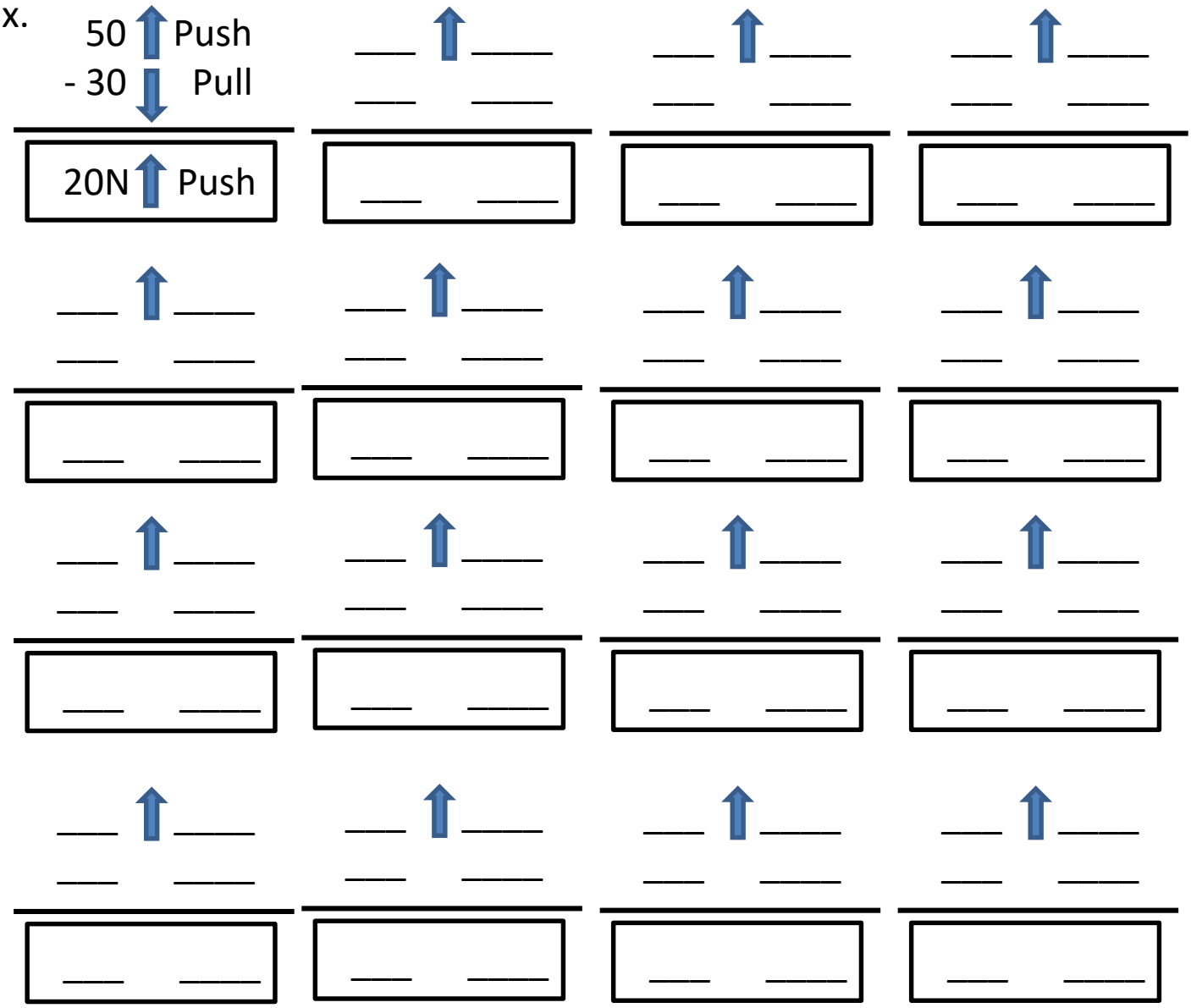
Calculate Unbalanced Force
Student Lab sheet

Same Direction : Add → →	Different Direction : Subtract ← →

Ex.

50 ↑ Push
- 30 ↓ Pull

20N ↑ Push



Check for Understanding: What causes an object to change speed or direction?

_____ causes an object to change speed or direction.

Calculate Unbalanced Force
Student Lab sheet

Conclusion: What kind of forces cause an object to change speed or direction?

Claim: _____ forces are what change the speed or direction of an object.

Evidence: What happened in the game?

Reasoning: Why did the "ball" move up and down the field instead of staying in place?

Reflections:

1. What is the unit of measurement when calculating force?

   The unit of measurement when calculating force is _____.

2. What is required in a force for an object's speed or direction to change?

   The _____ must be _____ than the force already being used.

3. What would happen to an object if the two forces acting on it equal and in opposite directions?

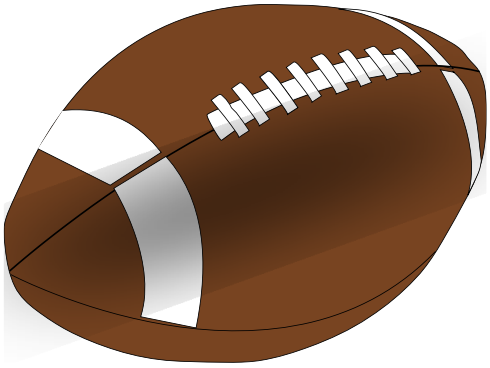
   The _____ wouldn't change or it _____.

Name(s):_____
Date:_____

Calculate Unbalanced Force Student Lab Sheet

Essential Question: What kind of forces cause an object to change speed or direction?

Background or Phenomena:



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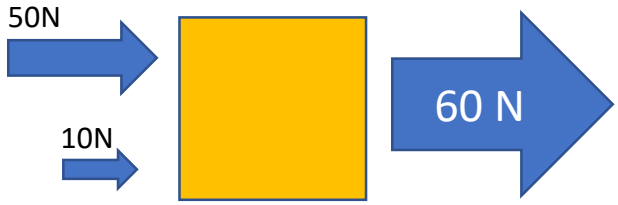

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So where do two colliding football players end up? They land in the direction that the player with the most force was pushing!

In this lab, you will play a board game to demonstrate and calculate how unbalanced forces change the speed or direction of an object.

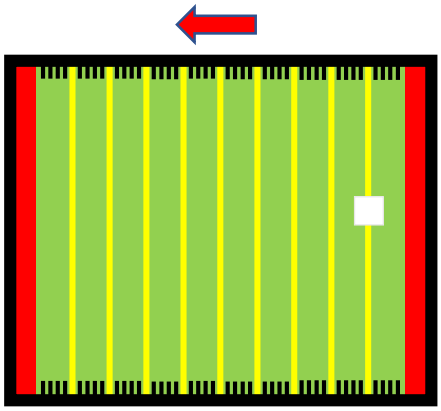
Materials per Group:

1 or 2 decks of Newton cards
6 blank Newton cards
1 Newton Football field
1 dry erase marker
1 Push Force arrow
1 die

Calculate Unbalanced Force
Student Lab sheet

Newton Football Game Rules

1. Divide the group into two teams. Look through the Newton cards and write 6 of your own unbalanced force scenarios with dry erase on blank cards. Shuffle the Newton Cards and set them in a draw pile.
2. Flip a coin to decide which team will be offense and which will be defense. The offense picks an end zone.
3. Place the Push Force arrow in the direction pointing towards the offense's end zone.
4. Each stripe in the field represents 10 Newtons. Place the die on the 50 Newton line to represent the football.
5. The starting team draws a card. Some cards give a push or pull force; others must be calculated before using them.
    - Cards with a "PUSH" force are moving in the direction of the Push Force arrow.
    - Cards with a "PULL" force are moving in the opposite direction.
    - The current location of the ball is always a "PUSH" force.
6. Use the **Calculate Unbalanced Forces** page to calculate which direction the ball will travel. Don't forget to use arrows to show the direction traveled and label your answer correctly.
7. Move the die forward or back the calculated number of Newtons.



Ex. 1: The die is on the 10N line. The card is a 30 N push. A 10 N push + a 30 N push = 40 N (push). Move the die 40 N towards the offense's endzone. Land on the 50 N line.

Ex. 2: The die is on the 10N line. The card is a 25 N pull. A 10 N push + a 25 N pull = 15 N (pull). Move the die 15 N away from the offense's endzone. Land in the defense's endzone and score a point!

8. The second team repeats steps 6 and 7.
9. When the die crosses an end zone, that team scores 1 point.
10. After each score, place the die back on the 50N yard line. Turn the Push Force arrow to aim the other way. Have the non-scoring team draw first.
11. Reshuffle the deck when you reach the bottom.
12. The first team to score 5 points wins the game.

Calculate Unbalanced Force
Student Lab sheet

Same Direction : Add → →

Different Direction : Subtract ← →

Ex.

50 ↑ Push

- 30 ↓ Pull

20N ↑ Push

Check for Understanding: What causes an object to change speed or direction?

Calculate Unbalanced Force
Student Lab sheet

Conclusion: What kind of forces cause an object to change speed or direction?

Claim:

Evidence:

Reasoning:

Reflections:

1. What is the unit of measurement when calculating force?

2. What is required in a force for an object's speed or direction to change?

3. What would happen to an object if the two forces acting on it equal and in opposite directions?