1.0 The Puck & Stick

GRADES 3rd-5th

Explore

Describe how each ball would function as a hockey puck, including shape and bounce-ability, hypothesizing how each sport ball would function if they were to play hockey with it.
Answers will vary based on student observation.

Baseball: **It bounces unlike a hockey puck that slides; they differ in weight and size.**

Golf ball: **Way too small and lighter than a hockey puck; it bounces unlike a hockey puck that slides.**

Ping Pong ball: **Way too small and light; it bounces unlike a hockey puck that slides.**

Softball: **Too large; won't go as far or fast; it bounces unlike a hockey puck that slides.**

Tennis ball: **Too light; won't go as far; it bounces unlike a hockey puck that slides.**

Using the data collected, identify properties and materials that support a hockey puck's function.

	Size/Shape	Materials	Weight	Texture	Other Features
Baseball	9 in	Leather Cork Rubber	5 oz	Smooth	Two circulating seams with stitching
Golf ball	5 in	Rubber Plastic	1.6 oz	Smooth	Dimples
Ping Pong Ball	5 in	Plastic Air	.095 oz	Smooth	None
Softball	11 in	Leather Cork Rubber	6 oz	Smooth	Two circulating seams with stitching
Tennis ball	8 in	Rubber Air Felt	2.0 oz	Rough	Two circulating seams in rubber

Describe how each stick would function as a hockey stick, including shape, hardness, and distance, hypothesizing how each sport stick/club would function if they were to play hockey with it.
Answers will vary based on student observation.

Baseball Bat: **It's similar in shape, but thicker than a hockey stick yet not as long.**

Golf Club: **Definitely similar in shape; not as long or thick as a hockey stick.**

Ping Pong Paddle: **It is very different in shape, size, and weight than a hockey stick.**

Softball Bat: **It's similar in shape, but thicker than a hockey stick yet not quite as long.**

Tennis Racket: **It is very different in shape and size, yet the weight is similar to a hockey stick.**

Using the data collected, identify properties and materials that support a hockey stick's function.

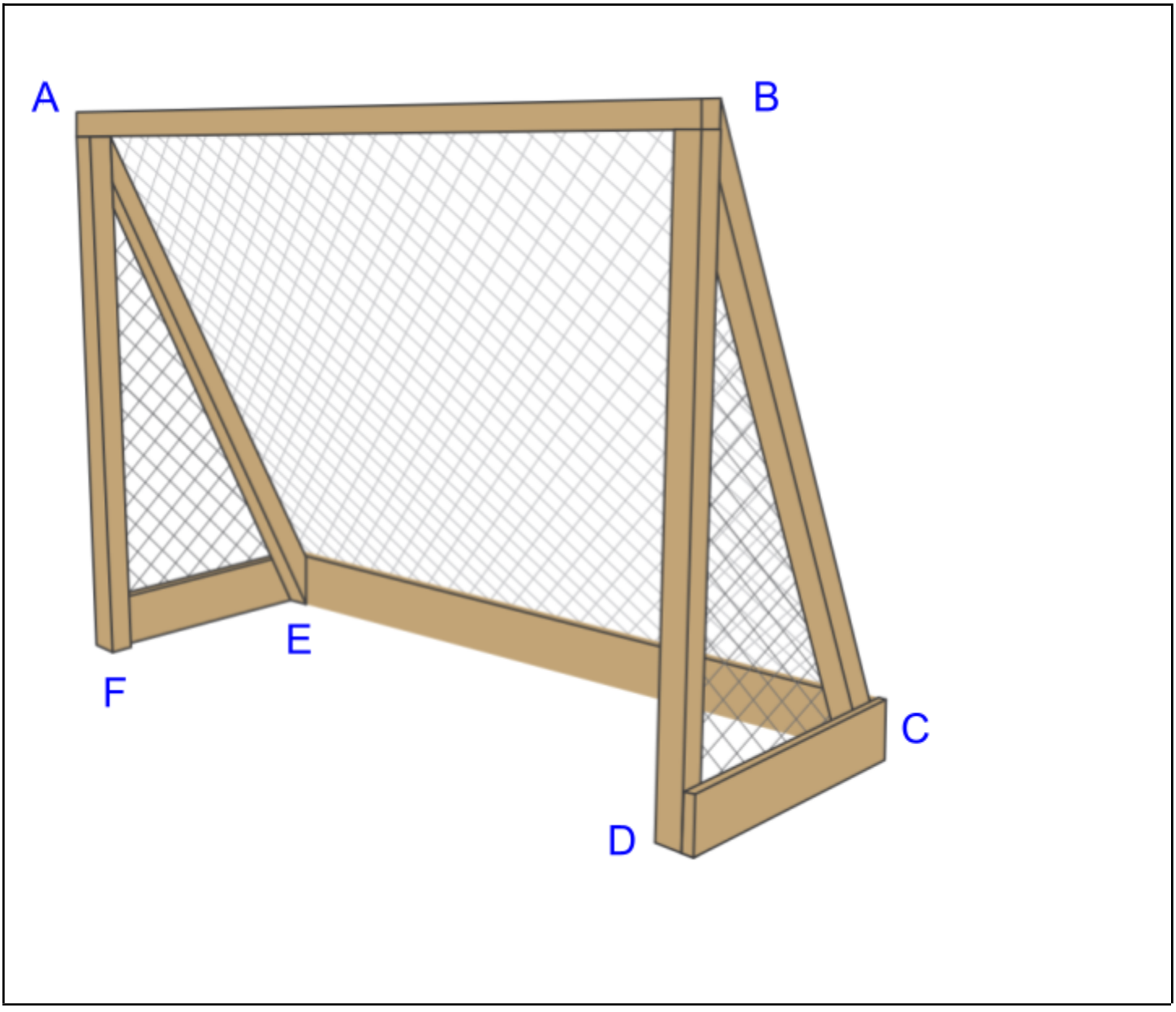
	Size/Shape	Materials	Weight	Texture	Other Features
Baseball Bat	**35 in**	**Metal Wood**	**34 oz**	**Smooth**	**Handles were a little different**
Golf Club	**48 in**	**Metal**	**15 oz**	**Club head - ridged Shaft - smooth Handle: pretty smooth**	**Varying clubs differ slightly in shape and texture**
Ping Pong Paddle	**11 in**	**Wood & rubber**	**4.8 oz**	**Paddle-head - ridged Handle: pretty smooth**	**None**
Softball Bat	**37 in**	**Metal**	**22 oz**	**Smooth**	**None**
Tennis Racket	**27 in**	**Graphic & wood Plastic string**	**12 oz**	**Handle and shaft were smooth**	**Varying handle materials**

2.0 The Net

GRADES 3rd-5th

Elaborate

Sketch a detailed diagram of your hockey net model. Each vertex (point where two lines meet) should be labeled with a different letter.



Evaluate

Please answer the questions below using your sketched model.

1. What are the parallel lines in your hockey net?
   AB and EC
   FE and DC
   AF and BD

2. What are the perpendicular lines in your hockey net?
   AF and FE
   BD and DC
   FE and EC
   DC and EC

3. What acute angles are in your hockey net?
   <AEF , < FEA , <BCD , <DCB

4. What obtuse angles are in your hockey net?
   None

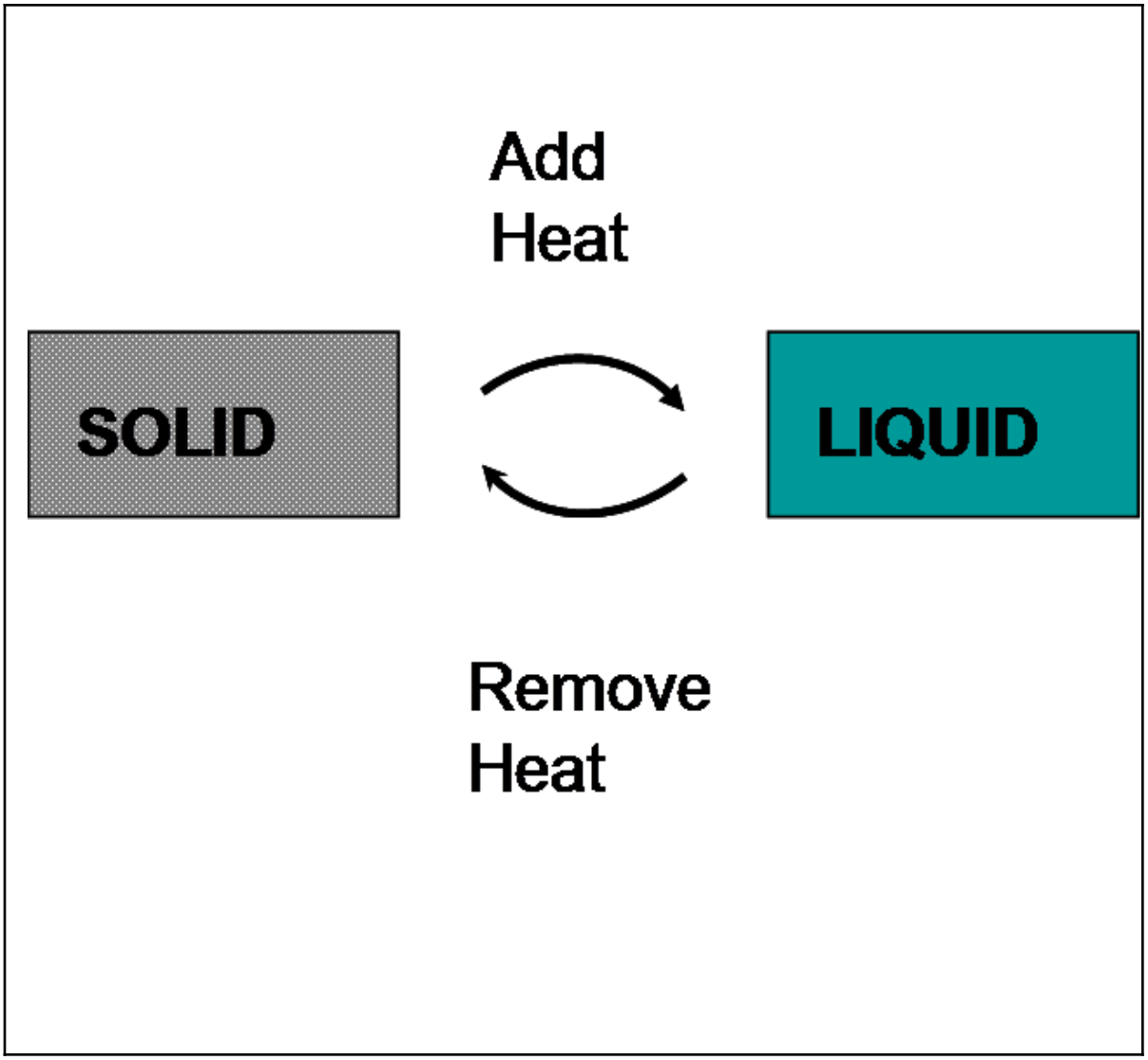
5. What right angles are in your hockey net?
   <AFE, <BDC, <FEC, DCE, <FAB, <DBA

3.0 Playing on Ice

GRADES 3rd-5th

Elaborate

Create a diagram that demonstrates the change from a liquid to a solid. Use lines, arrows, boxes, and circles to clearly describe this change.



Evaluate

Fill in the blanks to determine the best playing surface for ice hockey.

1) When water reaches its freezing point, molecules form a definitive structure known as ____Molecular_____ structure. (Molecular or Proton)

2) The temperature to play ice hockey must be at least: ___0____℃ / ____32____℉

3) Before changing to ice, it is this state of matter: _____Liquid_____. (Solid or Liquid)

4) To play on the ice, it must be in this state of matter: ____Solid_____. (Liquid or Solid)

5) Based on the images from the *Explore* section, as well as your diagram that demonstrates the change from a liquid to a solid, why do you think this reaction occurs on ice? Please explain your answer.

The ice will slowly change/breakdown from its original solid state due to the heat generated by friction from the hockey player's skates. The ice will also change overtime when several players are moving up and down the ice generating heat from their bodies during play.

4.0 Ice Time

GRADES 3rd-5th

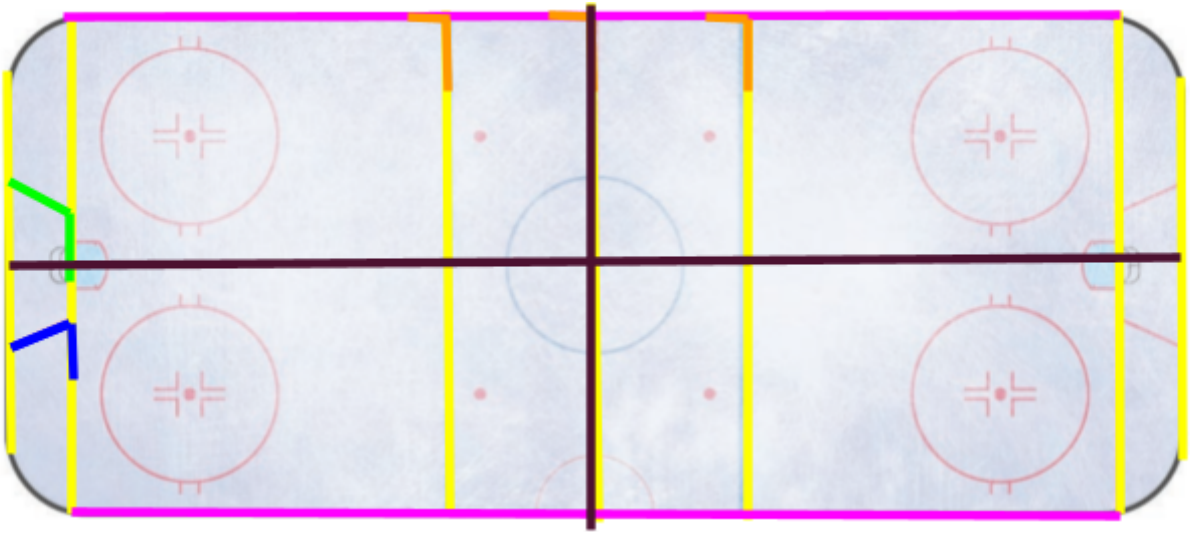
Explore

Draw a line connecting the ice marking to its corresponding rule.

Center Line		Used to separate the ice into three zones: offensive, defensive, and neutral.
Dots		Used for face-offs: marks where the players can position themselves.
Blue Lines		Used to judge icing.
Circles		Used to judge goals.
Goal Line		Used to mark the goalies area.
Semi Circle		Used for face-offs.

Explain

Label the five ice markings mentioned above on the rink below.



Label the six different math relationships on the rink above.

Using the color _yellow____, outline the hockey markings that result in parallel lines.

Using the color __pink_____, outline the hockey markings that result in perpendicular lines.

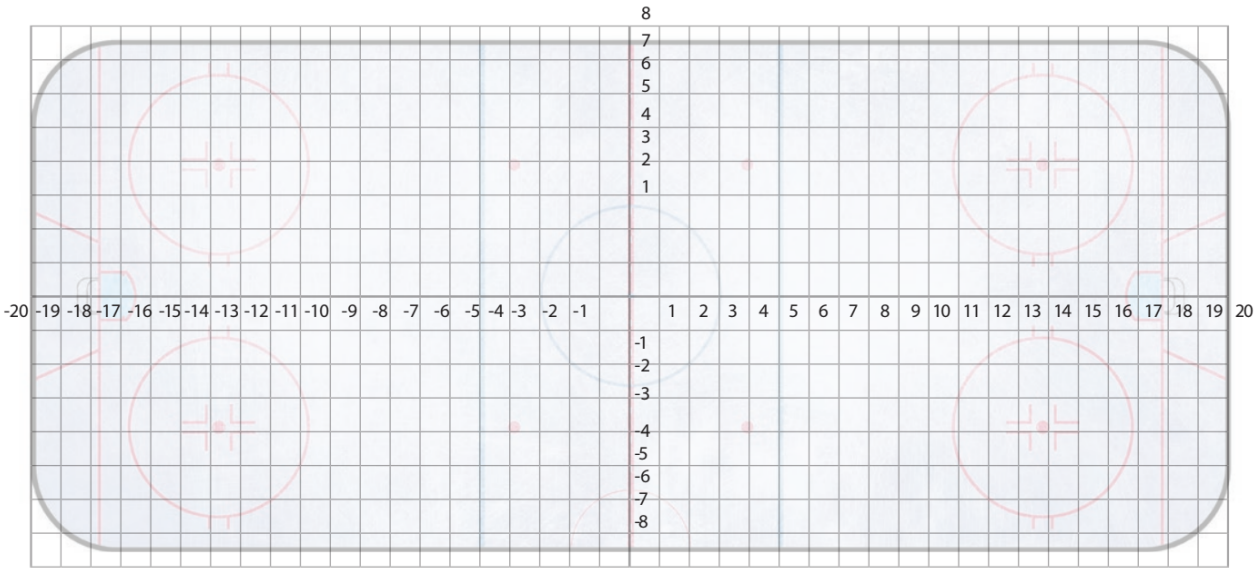
Using the color ___orange___, outline the hockey markings that result in right angles.

Using the color __blue____, outline the hockey markings that result in acute angles.

Using the color __green__, outline the hockey markings that result in obtuse angles.

Using the color ____black_____, draw the two lines of symmetry in the hockey rink.

Elaborate



Evaluate

Graph the point (5, 2). What is the name of this hockey marking?

Blue Line

Graph the point (18, 6). What is the name of this hockey marking?

Goal Line

Graph the point (0, 5). What is the name of this hockey marking?

Center Line

Graph the point (11, 3). What is the name of this hockey marking?

Face off circle

Name two coordinate points where you can find a face-off dot.

(-4,4) , (-4,-4), (4,4), (4,-4)

5.0 Puck Precision

GRADES 3rd-5th

Elaborate

Take five forehand shots from each of the 3 shooting spots. Record your makes and misses below.

Distance of Shot = 10 ft	Shot 1	Shot 2	Shot 3	Shot 4	Shot 5
Left Side	Make	Miss	Make	Make	Miss
Center	Miss	Make	Make	Make	Make
Right Side	Miss	Make	Miss	Miss	Make

Calculate your probability of scoring a goal, write this as a fraction and decimal.

1. What is your probability of scoring a goal from the left side?

   Fraction : Total Made/Total Shots Taken Decimal : Numerator/Denominator

   3/5 0.6

2. What is your probability of scoring a goal from the center?

   4/5 0.8

3. What is your probability of scoring a goal from the right side?

   2/5 0.4

4. What is your probability of scoring a goal from any spot?

   10/15 0.67

Evaluate

Take five forehand shots from each of the 3 shooting spots. Record your makes and misses below.

Distance of Shot = 15 ft	Shot 1	Shot 2	Shot 3	Shot 4	Shot 5
Left Side	Miss	Miss	Make	Miss	Miss
Center	Make	Make	Make	Make	Make
Right Side	Miss	Miss	Miss	Miss	Miss

Calculate your probability of scoring a goal, write this as a fraction and decimal.

1. What is your probability of scoring a goal from the left side?

   Fraction : Total Made/Total Shots Taken Decimal : Numerator/Denominator

   1/5 0.20

2. What is your probability of scoring a goal from the center?

   5/5 1.00

3. What is your probability of scoring a goal from the right side?

   0/5 0.00

4. What is your probability of scoring a goal from any spot?

   6/15 0.40

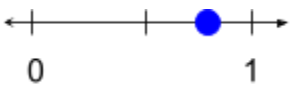
5. How did your probability of scoring a goal change from 10 feet away to 15 feet away?

   10 feet → 10/15 0.67 Probability of scoring from 10 feet is

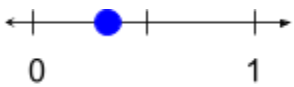
   15 feet → 6/15 0.40 greater than scoring at 15 feet

6. Represent your probability of scoring a goal from 10 feet and 15 feet away on a number line.

   10 feet → 0.67

   15 feet → 6/15 0.40

6.0 Shooting Forces in Hockey

GRADES 3rd-5th

Elaborate

Examples below

Pass and Shot Type	**Fastest (1) to Slowest (4)**	**Observations**
Forehand Pass	4	**By using less motion with my body or more arms/wrist, the overall speed was not that fast.**
Forehand Shot	3	**By using a little more motion with my body to shoot the puck, the overall speed was a little faster than the forehand pass.**
Slap Shot/One-timer	1	**By using considerably more motion with my body, I generated much greater speed with the slap shot/one-timer.**
Student idea: _____		

	Trial 1		Trial 2		Trial 3	
Pass and Shot Type	Speed	Distance	Speed	Distance	Speed	Distance
Forehand Pass	**28 mph**	**60 feet**	**33 mph**	**72 feet**	**31 mph**	**67 feet**
Forehand Shot	**41 mph**	**81 feet**	**40 mph**	**80 feet**	**42 mph**	**84 feet**
Slap Shot/ One-timer	**58 mph**	**126 feet**	**61 mph**	**135 feet**	**64 mph**	**145 feet**
Student idea: _____						

Evaluate

Use the below space to create your Force Diagrams.

Performance and results will vary among students.

How does a larger unbalanced force change motion? Answer using evidence from your experiment.

The more unbalanced force created less speed from the forehand pass and shot. Whereas the slap shot/one-timer motion created more speed.

7.0 Skating in the Zone

GRADES 3rd-5th

Explore

Measure the Neutral Zone and Defensive/Offensive zone; do not include the area behind the goal line.

Zones	Length (feet)	Width (feet)
Defensive/Offensive Zone	**89**	**85**
Neutral Zone	**50**	**85**

Elaborate

Record the time it took to skate around each zone. Then use your dimensions from *Explore* to calculate the total time, distance, and area skated.

Neutral Zone	Time	How far did you skate? (perimeter)	How much area of the ice did you cover? (area)
Attempt 1	**62 seconds**	**Add the four sides individually 50 + 85 + 50 + 85 = 270 feet**	**A = l x w 50 x 85 = 6,800 feet^2**
Attempt 2	**58 seconds**	**Or P = 2L + 2W 2(50) + 2(85) = 270 feet**	**50 x 85 = 6,800 feet^2**
Attempt 3	**74 seconds**	**270**	**50 x 85 = 6,800 feet^2**
Total	**194 seconds**	**270 + 270 + 270 or 3(270) = 810 feet**	**6,800 + 6,800 + 6,800 or 3(6,800) = 20,400 feet^2**

Evaluate

Record the time it took to skate around each zone. Then use your dimensions from *Explore* to calculate the total time, distance, and area skated.

Defensive/ Offensive Zone	Time	How far did you skate? (perimeter)	How much area of the ice did you cover? (area)
Attempt 1	**85 seconds**	**Add the four sides individually 89 + 85 + 89 + 85 = 348 feet**	**A = l x w 89 x 85 = 7,565 feet^2**
Attempt 2	**79 seconds**	**Or P = 2L + 2W 2(89) + 2(85) = 348 feet**	**89 x 85 = 7,565 feet^2**
Attempt 3	**92 seconds**	**348 feet**	**89 x 85 = 7,565 feet^2**
Total	**256 seconds**	**348 + 348 + 348 or 3(348) = 1,044 feet**	**7,565 + 7,565 + 7,565 or 3(7,565) = 22,695 feet^2**

Use your totals from both zones to calculate the total time, distance, and area skated.

Zones	Time	How far did you skate? (perimeter)	How much area of the ice did you cover? (area)
Neutral Zone Total	**194 seconds**	**810 feet**	**20,400 feet^2**
Defensive/ Offensive Zone Total	**256 seconds**	**1,044 feet**	**22,695 feet^2**
Total	**450 seconds**	**810 + 1,044 = 1854 feet**	**20,400 + 22,695 = 43,095 feet^2**

Extend

As a group, calculate your total time, distance, and area skated.

Both Zones	Time	How far did you skate? (perimeter)	How much area of the ice did you cover? (area)
Student 1 Total	**450 seconds**	**1854 feet**	**43,095 feet^2**
Student 2 Total	**502 seconds**	**1854 feet**	**43,095 feet^2**
Student 3 Total	**461 seconds**	**1854 feet**	**43,095 feet^2**
Student 4 Total	**487 seconds**	**1854 feet**	**43,095 feet^2**
Team Total	**1,900 seconds**	**1854 + 1854 + 1854 + 1854 or 4(1854) = 7,416 feet**	**43,095 + 43,905 + 43,905 + 43,905 or 4(43,905) = 172,380 feet^2**

8.0 Advancements in Hockey

GRADES 3rd-5th

Circle your stance regarding instant replay: For or Against

Brainstorm: What problems do instant replay solve?

OR

What problems does instant replay cause?

Criteria for Improvements/Changes of Instant Replay	Constraints for Improvements/Changes of Instant Replay
Examples: • **Ensure play does not slow down.** • **Designate officials to view and operate instant replay.**	**Examples:** • **Play is slowed down even more.** • **Technological support is the same or ineffective as before.**

Write a letter to the Commissioner's Office of the National Hockey League (NHL). This letter should provide justification for supporting or opposing the use of instant replay, including specific changes/improvements for the benefit of fans, referees/game officials, players and coaches.

Stances and responses will vary among students.