1.0 The Lacrosse Ball

GRADES 3rd-5th

Describe how each ball would function as a lacrosse ball. Think about the distance and bounce-ability of each ball type.
Answers will vary based on student observation.

Baseball: It won't bounce as well as a Lacrosse ball, yet closely similar in weight and size.

Golf ball: Way too small and lighter than a lacrosse ball; bounce-ability is close to the same.

Ping Pong ball: Way too little and light, yet does bounce more than a lacrosse ball.

Softball: Too large; won't go as far or fast; the bounce of the lacrosse ball is better.

Tennis ball: Too light; won't go as far; it will bounce better than a lacrosse ball.

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

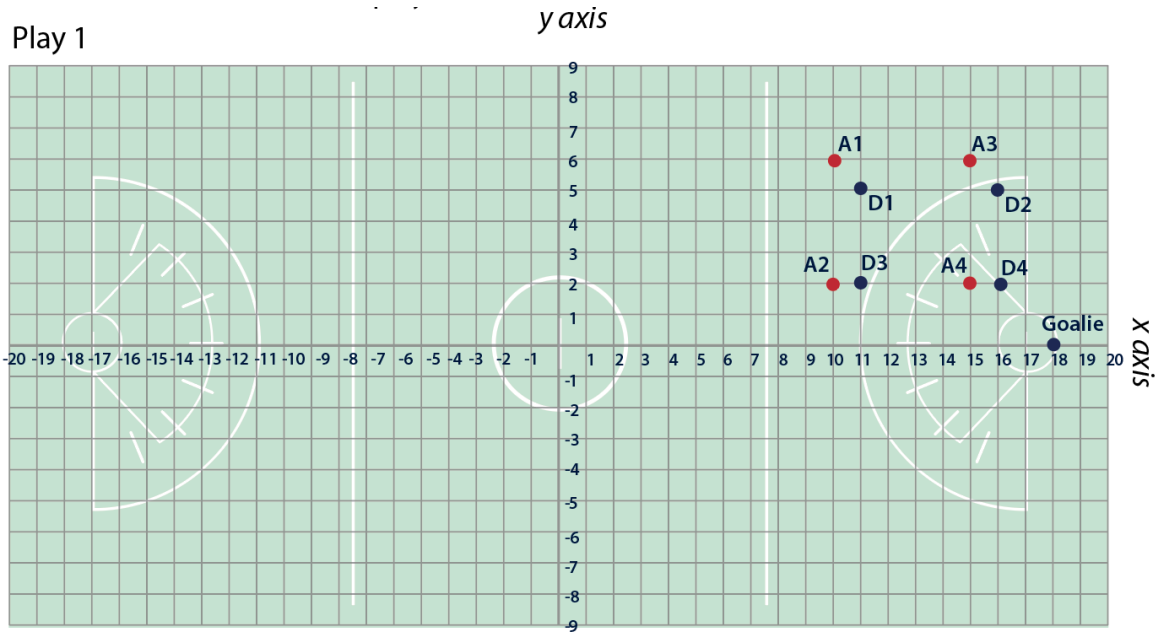
	Size/Shape	Materials	Weight	Texture	Other Features
Baseball	9 in	Leather Cork Rubber	5 oz	Smooth	Two circulating seams with stitching
Golf ball	5 in	Rubber Plastic	1.6 oz	Smooth	Dimples
Ping Pong Ball	5 in	Plastic Air	.095 oz	Smooth	None
Softball	11 in	Leather Cork Rubber	6 oz	Smooth	Two circulating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

2.0 The Playing Field

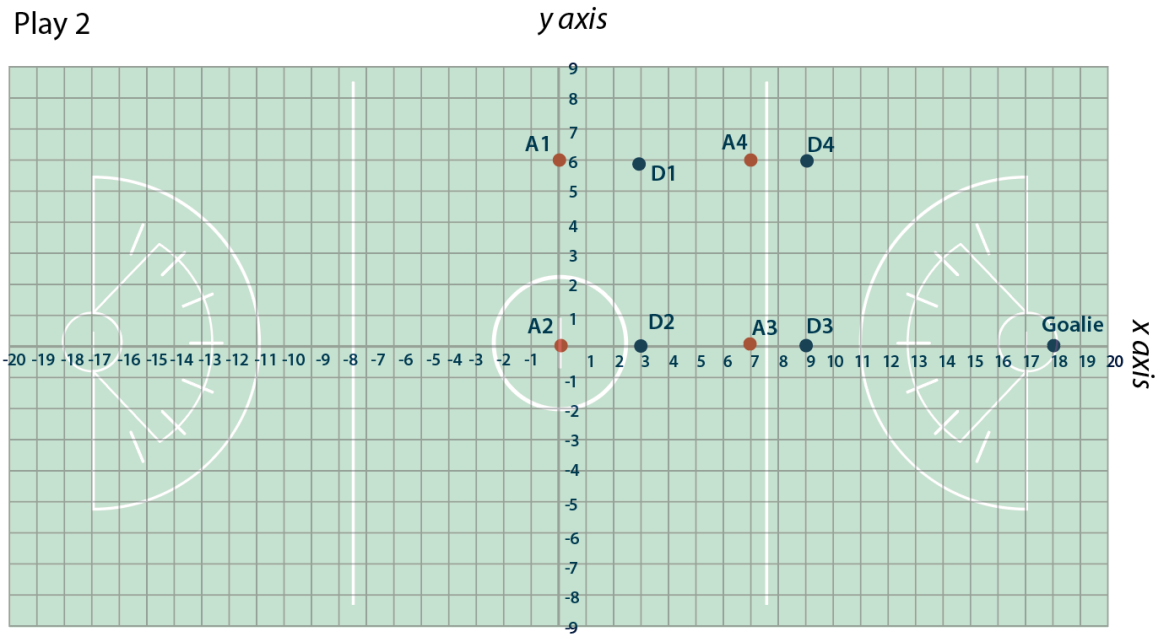
GRADES 3rd-5th

Find the area for the below plays:

Play 1



Play 2



Play 1: **A1**: 10, 6; **A2**: 10, 2; **A3**: 15, 6; **A4**: 15, 2; **D1**: 11, 5; **D2:** 16, 5; **D3**: 11, 2; **D4**: 16, 2

Play 2: **A1**: 6, 6; **A2**: 0, 0; **A3**: 7, 0; **A4**: 7, 6; **D1**: 3, 6; **D2:** 3, 1; **D3**: 9, 0; **D4**: 9, 6

3.0 Energy in Lacrosse

GRADES 3rd-5th

Trial 1: Kneeling Position

Results will vary among students. Example data below.

Distance: ___15 feet_____

	Pass 1	Pass 2	Pass 3	Pass 4	Pass 5
Partner 1	1.5 s	2 s	2.3 s	1.1 s	4 s
Partner 2	1.2 s	3.1 s	1.4 s	2.3 s	3.5 s

Trial 1: Speed Calculations (Distance/Time)

	Pass 1 Speed	Pass 2 Speed	Pass 3 Speed	Pass 4 Speed	Pass 5 Speed
Partner 1	10 feet per sec	7.5 feet per sec	6.5 feet per sec	13.6 feet per sec	3.75 feet per sec
Partner 2	12.5 feet per sec	4.8 feet per sec	10.7 feet per sec	6.5 feet per sec	4.2 feet per sec

Trial 2: Standing Position: Focusing on using your lower and upper body to pass and release.

	Pass 1	Pass 2	Pass 3	Pass 4	Pass 5
Partner 1	1.7 s	1.1 s	1.3 s	.8	2.2 s
Partner 2	2.1 s	2.1 s	2.4 s	1.3 s	2.8 s

Trial 2: Speed Calculations (Distance/Time)

	Pass 1 Speed	Pass 2 Speed	Pass 3 Speed	Pass 4 Speed	Pass 5 Speed
Partner 1	8.8 feet per sec	13.6 feet per sec	11.5 feet per sec	18.8 feet per sec	6.8 feet per sec
Partner 2	7.1 feet per sec	7.1 feet per sec	6.3 feet per sec	11.5 feet per sec	5.3 feet per sec

Which trial generated the most energy? Please explain using scientific reasoning from each trial.

Results will vary among students.

Trial 2 generated the most energy. By using my upper and lower body, I was able to create more energy and force on each pass.

5.0 Force of a Lacrosse Ball

GRADES 3rd-5th

Questions

1. How does a lacrosse ball move?

To move a ball, it must be acted on by an outside force, such as passing the ball with the stick. This, in addition to gravity pulling the ball down.

2. How does a lacrosse ball stop moving?

Gravity and friction slow down and stop the ball from moving.

3. Hypothesis: What do you think will make a lacrosse ball move and why?

In addition to passing the ball to a teammate, another outside force of either striking the ball with an object, such as a baseball bat, or rolling the lacrosse ball by hand, are both forces that generate force and subsequent energy for the lacrosse ball to move.

4. Based on evidence from your experiment, how does force create motion?

Motion was created when throwing and/or using a pushing force by the lacrosse stick to generate motion.

6.0 How Far Can You Pass It?

GRADES 3rd-5th

Results will vary among students. Example data below.

Measure Length of Passes (in feet)

	Pass 1	Pass 2	Pass 3	Pass 4	Range
Partner 1	15 ft	12 ft	11 ft	18 ft	7 ft
Partner 2	11 ft	9 ft	12 ft	8 ft	3 ft

Measure Length of Passes (Circle one: meters, centimeters, inches, millimeters or yards)

	Pass 1	Pass 2	Pass 3	Pass 4	Range
Partner 1	530 cm	410 cm	390 cm	670 cm	280 cm
Partner 2	420 cm	250 cm	470 cm	290 cm	220 cm

What is the best way to measure distance of a pass? Please explain.

Answers may vary based on student results.
Based on sample data, feet are a better way to measure distance than centimeters. Because centimeters are small and should be used to measure smaller distances. Meters or yards might be even better than feet to measure distance on a lacrosse field.

7.0 Headgear

GRADES 3rd-5th

Brainstorm Multiple Designs

Results will vary among students.

Select a Single Design: Draw in detail, label materials, and provide measurements

Results will vary among students.

8.0 Wearable Technology

GRADES 3rd-5th

Elaborate

Answers will vary based on student response and class discussion.

Criteria	Constraints
- User friendly - Easy to get control/manipulate - Easy to set-up	- Must be made of recycled materials - Must conform and be worn on helmet for optimum perspective - Cannot impede play of user and/or be a distraction to user and others during play

Answers may vary among students.

Evaluate

Visual	Use of Energy/Resources	Meets Criteria	Avoids Constraint
Video Camera	Potential energy to electrical energy	No	No
Clip Board	No energy transfer	Yes	No
Helmet Camera	Potential energy to electrical energy	Yes	Yes
Speaker	Potential energy to sound energy	Yes	No
GPS Tracker	Potential energy to electrical energy	Yes	No
Smartwatch	Potential energy to light energy	Yes	No