

1.0 Energy in Baseball

GRADES 3rd-5th

Trial 1 - Sitting/Kneeling Position

Results may vary among students. Example data below.

Distance: _____ **15 feet** _____

	Throw 1	Throw 2	Throw 3	Throw 4	Throw 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	3.5s

Trial 1: Speed Calculations (Distance/Time)

	Throw 1 Speed	Throw 2 Speed	Throw 3 Speed	Throw 4 Speed	Throw 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 throw.

	Throw 1	Throw 2	Throw 3	Throw 4	Throw 5
Partner 1	1.7 s	1.1 s	1.3 s	0.8 s	2.2 s

Partner 2	2.1 s	2.1 s	2.4 s	1.3 s	2.8s
--------------	-------	-------	-------	-------	------

Trial 2: Speed Calculations (Distance/Time)

	Throw 1 Speed	Throw 2 Speed	Throw 3 Speed	Throw 4 Speed	Throw 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 may 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 throw/pitch.

2.0 Composition of a Baseball

GRADES 3rd-5th

Describe how each ball will function as a baseball. Think about the distance and bounce-ability of each ball type.

Answers may vary among students. Example data below.

Tennis ball: Too light; won't go as far; bounces more than a golf ball.

Softball: Too large and heavy; lack of stitching for control.

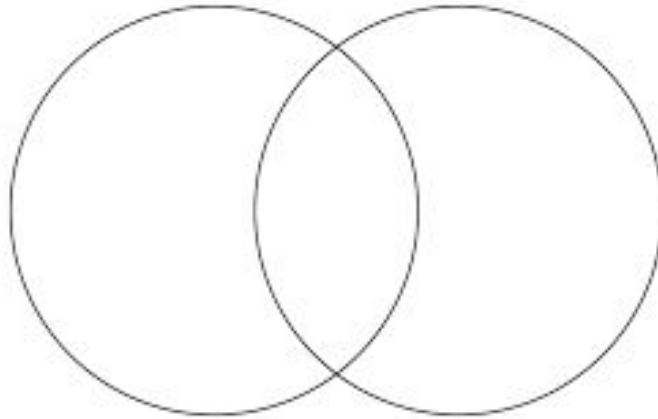
Ping Pong ball: Too small and light; bounces much more than a baseball.

Golf ball: Much harder and smaller than all sport balls but the ping pong ball; plastic and dense inside and outside; will go very far when hit.

	Shape/Size	Materials	Weight	Texture	Internal Structure
Tennis ball	Round; similar size as baseball	Felt Air Rubber	2.0 oz	Rough	Air and rubber
Golf ball	Round; smaller than a baseball	Rubber and Plastic	1.6 oz	Dimples, smooth	Hard, dense
Baseball	Round; similar size as tennis	Leather and stitches	5 oz	Smooth	Cork/Rubber
Softball	Round and larger than a tennis and baseball	Leather	6 oz	Smooth	Cork/Rubber

Ping Pong ball	Round and much smaller than a baseball	Plastic	.095 oz	Smooth	Air/Hallow
----------------	--	---------	---------	--------	------------

Using the data collected, pick one other ball and fill in the Venn diagram comparing and contrasting the ball's properties? **Results will vary based on ball choice and depiction.**



Using the data collected, what properties (traits) and materials support a baseball's function (job)? **Answers will vary based on student trial results.**

Extend only:

Hit each ball five (5) times: tennis, golf, baseball, softball, and ping pong. How does each ball function differently when hit? Use descriptive words and details to compare and contrast.

Answers will vary based on student data.

Example response: The mass and volume relationship (density) differs for each ball and the baseball weighs more than most of the other balls (except the softball). The baseball is not hollow like the ping pong ball and tennis ball and it has a unique covering by way of the stitching compared to all the other balls, except the softball. The stitching is very pronounced, even versus the softball, making it unique compared to the other sports balls.

3.0 The Field of Play

GRADES 3rd-5th

General Similarities and Differences

Answers will vary among students. Example data below.

Field 1	Field 2	Field 3	Scale Field 1 inch = 30 feet
Very simple; just grass and no dirt; baselines next to home plate.	Plenty of dirt and grass on the infield; a pitcher's mound; no baselines, but dirt in place of the baselines.	Very clean; lines for the bases and batter's boxes; grass and dirt on the infield.	<p>Distance from home plate down the foul line: - Measured ____ *30= Actual ____</p> <p>Distance from home plate to the pitcher's mound - Measured ____ *30= Actual ____</p> <p>Distance from home plate to first base - Measured ____ *30= Actual ____</p>

- 1) What are similarities and differences between baseball fields of the past and today's baseball field?

Past fields had no dirt; just grass. But did have a home plate and baselines. The fields of today versus the past field have dirt and grass that outline places on the infield, such as the baselines, pitcher's mound, and home plate area.

- 2) Based on your list of similarities and differences, what field would you prefer to play on and why?

I would prefer to play on today's fields. I think the dirt and grass provide an outline that determines placement of both offensive and defensive players, establishing more concise play. However, I think it would be neat to go back in time to play on a field the way they use too.

- 3) How has technology changed the field of play? Has it helped or hurt the game? Explain.

I believe it has made the game more succinct, making the game more enjoyable for players, coaches, umpires/officials, and fans.

- 4) How would a change in field size impact the game?

I actually think it would make it more enjoyable to watch, as it wouldn't be as easy to hit home runs yet more doubles and triples, demanding more movement/running from the defense (infielders/outfielders).

4.0 The Art of Pitching

GRADES 3rd-5th

Results will vary based on student trial results.

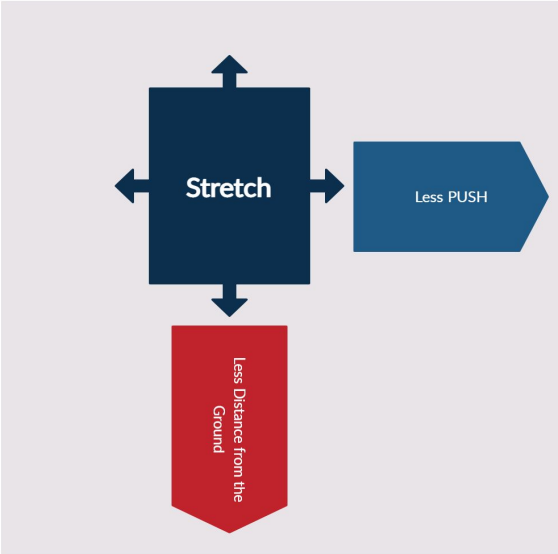
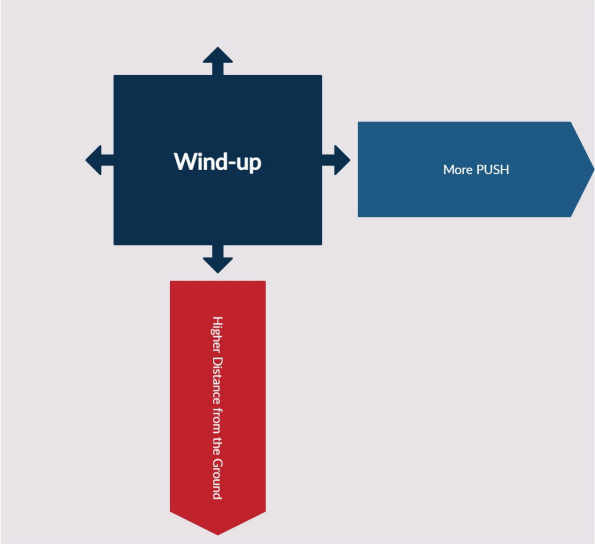
	Fastest (1) to slowest (4)	Observations
The wind-up	1	By using more motion with my body, I was able to generate more speed from the wind-up position.
The Stretch	3	By using considerably less motion with my body, I generated less speed from the stretch position.
Student idea: _____		
Student idea: _____		

Results will vary based on student trial results.

	Trial 1		Trial 2		Trial 3	
	Speed from radar gun	Distance to hit the ground	Speed from radar gun	Distance to hit the ground	Speed from radar gun	Distance to hit the ground
The wind-up	22 mph	4 feet	24 mph	4 feet	23 mph	5 feet
The Stretch	18 mph	3 feet	19 mph	3 feet	17 mph	4 feet
Student idea: _____						
Student						

idea: _____						
----------------	--	--	--	--	--	--

Force Diagrams:



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

The more unbalanced force created less speed and control from the “Stretch” motion. Whereas the “Wind-up” motion created more speed and control.

5.0 Engineering a Pitching Machine

GRADES 3rd-5th

Identify the problem: Create a device that will guarantee strikes/control of pitches during practice.

Answers will vary based on student response and class discussion.

Define Constraints and Criteria:

Criteria	Constraints
<p>Examples: Easy for coaches to use. Easy to move on and off the field. Easy to set-up.</p>	<p>Examples: Must be made of recycled materials. Must be high enough to ensure control. Cannot damage the field/pitcher's mound.</p>

Imagine:

Option 1: Potential Design

Drawings will vary based on student designs.

Option 2: Potential Design

Drawings will vary based on student designs.

Option 3: Potential Design

Drawings will vary based on student designs.

Based on the criteria and constraints, which design is best to solve the problem?
Answers will vary based on student design outcomes.

6.0 Success at the Plate

GRADES 3rd-5th

X = Hit

O = No Hit

Trial 1

Results will vary among students. Example data below.

<u>Hitter</u>	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	Fraction
Swings	O	O	X	X	O	X	X	O	O	X	5/10

Write a mathematical expression using the greater than or less than symbols comparing your prediction to your experimental results.

Prediction $3/10 < 5/10$ Results

X = Hit

O = No Hit

Trial 2

<u>Hitter</u>	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	Fraction
Swings	X	O	X	X	O	X	X	O	X	X	7/10

Based on your data from each trial, put the fractions in order from greatest to smallest using the greater than/less than symbols (< >).

Prediction $3/10 < 5/10$ Trial 1 Results $< 7/10$ Trial 2 Results

Based on this information, were you more or less successful before or after watching the video and changing your swing? Please explain.









































I was more successful after watching the video on hitting mechanics, as pre-video I hit only 5/10, whereas post video I hit 7/10.

7.0 Keeping Score

GRADES 3rd-5th

Option 1: Scoring the Game

Results will vary among students.

	1	2	3	4	5	6	7	8	9	10
3										
										
										
										

Option 2: Scoring the game

Add a tally mark, as needed.

Results will vary among students.

Inning	Runs	
	Team 1	Team 2
1		
2		
3		
4		
5		
6		
7		

8		
9		

Results will vary among students.

Inning	Strikes (3)				Balls (4)			
	Hitter 1	Hitter 2	Hitter 3	Hitter 4	Hitter 1	Hitter 2	Hitter 3	Hitter 4
1								
2								
3								
4								
5								
6								
7								
8								
9								

Graph your Score:

Results will vary among students.

Plot your Strikes:

Results will vary among students.

Inning 1:



Inning 6:



Inning 2:



Inning 7:



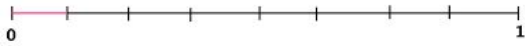
Inning 3



Inning 8:



Inning 4



Inning 9:



Inning 5



Plot your Balls:

Results will vary among students.

Inning 1:



Inning 6:



Inning 2:



Inning 7:



Inning 3



Inning 8:



Inning 4



Inning 9:



Inning 5



Use your graphs and number lines to answer the following questions:

Based on results, answers will vary among students.

1. Total your runs from all the innings you played. How many runs would you score if you play the same game 3 times?
2. Total your runs from all the innings you played. Divide your total by the total number of innings played. What is the average number of runs per inning?
3. Total your runs and your opponents runs. What is the difference between your totals?
Who won the game?

4. Review the graph. Which inning had the greatest difference in runs? Which inning had the least difference in runs?
5. Review your line graphs of Strikes: How many times during the game did you strike out the opponent (3/3)?
6. Review your line graphs of Strikes: How many times was your strike fraction greater than $\frac{1}{2}$?
7. Review your line graphs of Strikes: How many times was your strike fraction less than $\frac{1}{2}$?
8. Review your line graphs of Balls: How many times during the game did you walk the opponent (4/4)?
9. Review your line graphs of Balls: How many times was your ball fraction greater than $\frac{1}{2}$?
10. Review your line graphs of Balls: How many times was your ball fraction less than $\frac{1}{2}$?

8.0 Advancements in Baseball

GRADES 3rd-5th

Circle your Position: For or Against

Brainstorm: What problems does instant replay solve?

OR

What problems does instant replay cause?

Criteria for Improvements/Changes to Instant Replay	Constraints for Improvements/Changes to 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.

Letter to the Commissioner of Major League Baseball (MLB):
Stances and responses will vary among students
