Name: **Key** Class:________________

Module 1.1: CALCULATING THROW-INS

Ensure all your data is in the same unit (feet or meters)

	Partner 1	Partner 2	Partner 3
Throw-in Prediction	Results may vary based on the student.		

Example data below.

Distance of Throw	Height ball was released *(a)*	Throw 1	Throw 2	Throw 3	Throw 4	Throw 5	Average *(b)*
Stand Still	Height of student's arms						(T1+ T2 + T3 + T4+T5)/5
Kneeling							
Step Into							

Calculate the approximate distance the ball travelled: $a^2 + b^2 = c^2$

- Stand-Still: Ex: $\sqrt{(6\text{ ft})^2 + (14\text{ ft})^2}$
- Kneeling: Ex: $\sqrt{(4\text{ ft})^2 + (13\text{ ft})^2}$
- Step Into: Ex: $\sqrt{(5\text{ ft})^2 + (17\text{ ft})^2}$

1. Which of the three types of throwing techniques produced the greatest results?
   Results will vary based on student data.

2. Would you select a taller or shorter player to get the ball the farthest? Justify your answer using the equation. Results will vary based on student data.
   Students should use their data to justify their answer and make a connection between a standing player versus a kneeling player.

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Module 2.1: HEART RATE AND CALORIES

	Partner 1	Partner 2
Resting heart rate (measured)	Results will vary based on student data.	
Heart rate after 2.5 minutes of play		
Heart rate after 5 minutes of play		
Maximum heart rate (calculated)		

Using the equation C = (MET*weight)*t, calculate C (calories burned) for the following MET

Results will vary based on student data.

Example below is based on a *95 pound player.*

Time of Activity (hours) *t*	@ Resting Heart Rate (MET 1.5)	@ Heart Rate for Playing Soccer (MET 8.5)
0	0	0
1	64.5	365.5
2	129	731
3	193.5	1096.5
4	258	1462
5	322.5	1827.5
6	387	2193

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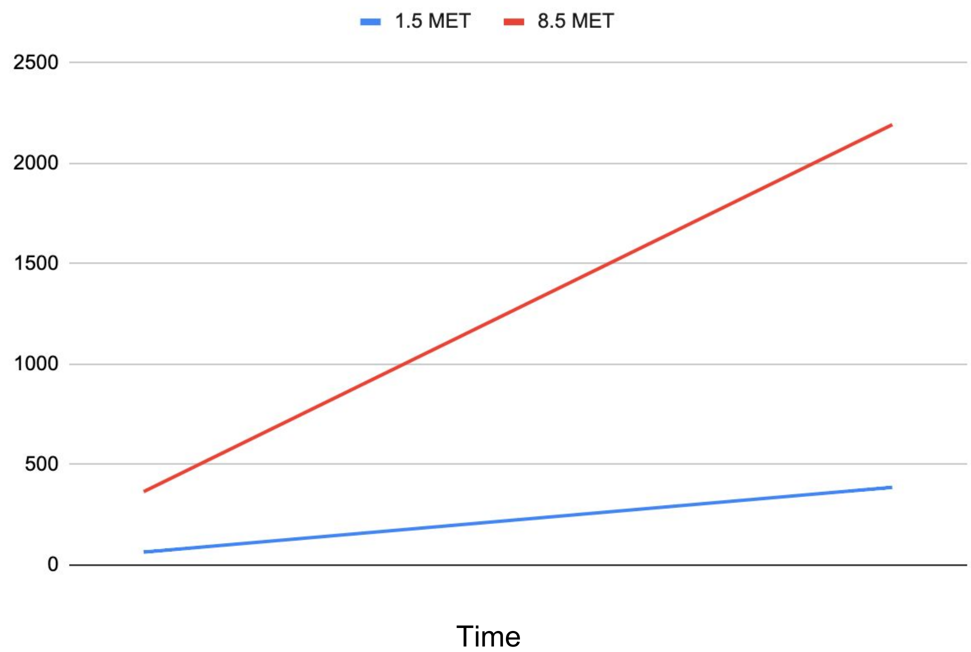

Using the graph or by calculations:

1. How many calories did you burn when you played soccer for 5 minutes?
   C = (MET*weight)*t,
   C = (8.5*43)*(5/60)
   30 Calories

2. If you played soccer for 45 minutes, how many calories would you burn?
   C = (MET*weight)*t,
   C = (8.5*43)*(45/60)
   274 Calories

3. If you played soccer for 90 minutes, how many calories would you burn?
   C = (MET*weight)*t,
   C = (8.5*43)*(90/60)
   548 Calories

4. How did your calculations compare to those provided by the heart rate monitor?
   Answers will vary based on student data.

5. How does the MET value change the slope of the line?
   An increased MET value increases the slope.

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Module 3.1: EFFECTIVE BALL TRAVEL

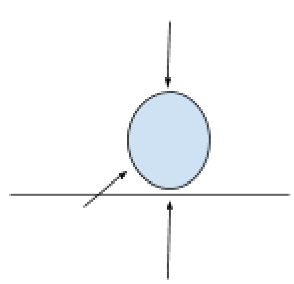
Data Collection

	Distance (meters)	Time (seconds)
Kick (in step)	Results will vary based on student data.	
Kick (laces)	Example: 25 m	Example: 2 s
Throw		

Calculations

	Initial Speed	Final Speed (distance divided by time)	Acceleration (initial- final divided by time)	Mass of ball	Force Acting on ball (Mass times Acceleration)
Kick (in step)	0 m/s	Example 12.5 m/s	Example: 6.25 m/s	0.43 kg	Example: 2.7 N
Kick (laces)	0 m/s			0.43 kg	
Throw	0 m/s			0.43 kg	

Diagrams: Draw a diagram that shows the amount of force acting on each ball and how it affects the motion.

Kick (in step)	**Kick (laces)**	**Throw**
Results will vary based on the student. 		

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Module 4.1: SYNTHETIC VS NATURAL MATERIALS

Observation

Soccer Ball	Futsal Ball
Results will vary based on the student.	Results will vary based on the student.

Reading Questions:

1. When and where did soccer orginate?
   China and Japan in the 7th century B.C.

2. How did soccer evolve over time?
   A more complex ball; elimination of tackling; arms/hand and upper body play is limited. Rugby was diverted due to injuries.

3. List the cultures that developed soccer? Why do you think the sport developed in multiple places with only slight differences?
   Chinese, Japanese, North Africian, British, Romans, and Greeks.
   Answers may vary.
   Example: It evolved few materials and kicking objects seemed natural.

4. What are the similarities and differences between soccer in the past and soccer today?
   Answers may vary.
   Similarities: Style - using your feet as a primary movement of the ball;
   Differences: Aggression - use of hands and change of the ball.

5. How has technology changed how the game is played?
   Balls are no longer made out of animal products but by chemical compounds.

6. Describe the materials used in a soccer ball. Compare the past and present balls.
   Rubber, leather, polyvinyl chloride. Past, more natural materials that are less durable; present synthetic or man-made material, lasts longer.

7. Summarize the steps of manufacturing a soccer ball.

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Answers will vary
Example: First, they reinforce the cover layer by adding multiple layers; the more expensive the ball, the more layers added. Once dry, they cut the unique soccer ball shaped panels. Next, they add color or logos to the panels. Then they make the inner bladder of the ball by melting and creating a balloon shape using a mold. Finally, 32 panels are sewn together to create the finished project. They check that the ball holds air and confirm the weight .

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Module 5.2: PRESSURE AND MOLECULAR MOTION

Collect data on the bounce back height when the ball is dropped from 2 meters.
[A properly inflated ball with bounce back is 115-165 centimeters.]

	Flat	3 PSI	6 PSI	9 PSI	12 PSI	15 PSI
Futsal Ball	Answers will vary. There should be a general increase in trend with increasing PSI.					
Soccer Ball						

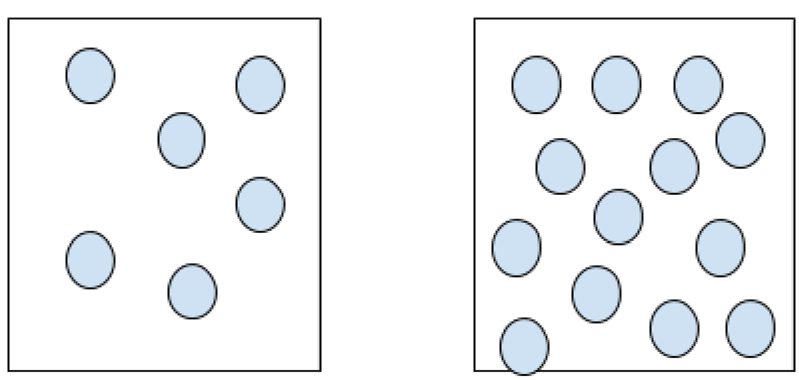
Based on the data above, answer the following questions:

1. What are some disadvantages of an under-inflated ball?
   Answers will vary based on the student.
   Example: Less bounce back

2. What are some disadvantages of an over-inflated ball?
   Answers will vary based on the student.
   Example: Risk of injury

3. Predict what will happen to the bounce of the ball if you continue to increase the pressure past 15 PSI. Use evidence to support your answer.
   Answers will vary based on student data.
   Students should see an increasing trend in bounce height; therefore, an accurate prediction would be a higher bounce with evidence from the increasing data.

4. Draw a molecular diagram of the ball at 3 PSI vs 15 PSI.



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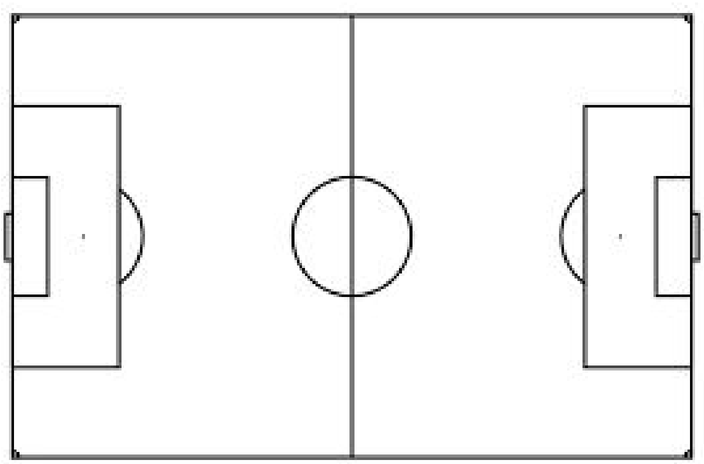
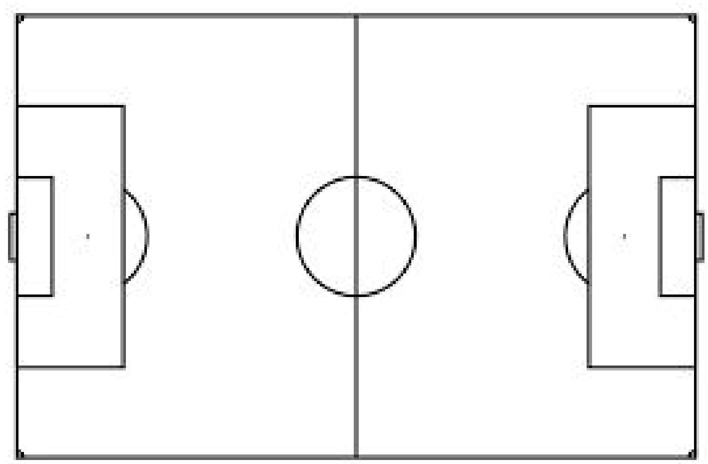
Module 6.1: AREA OF SHOOTING SPACES

Shooting Triangle	Person 1	Person 2	Person 3	Person 4
Height	Distance from the goal post and the player Example: 12 feet	Example: 17 feet	Example: 18 feet	Example: 23 feet
Base	Length of the goal Example 21 feet	Example: 21 feet	Example: 21 feet	Example: 21 feet
Area (calculated)	Example: ½(21*12)= 126 ft^2	Example: ½(21*17)= 178.5 ft^2	Example: ½(21*18)= 189 ft^2	Example: ½(21*23)= 241.5 ft^2
Number of goals made (out of 10)	7/10	6/10	6/10	4/10

Sketch each group member's shooting triangle. Label each side with the correct measurement and include the area in the center.



Person 1 Person 2



Person 3 Person 4

Claim (What is the relationship between shooting triangle area and number of goals made?):
Answers will vary.
Example: As the area increases, the number of goals made decreases.

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Evidence (Using your data, explain why your claim is supported):
Answers will vary based on data.
Example: During our experiment, we found that when the distance from the goal increased, so did the area of the goal triangle. The success of goals decreased. For example, at 23 feet from the goal line, person 5 only made 4 of 10 goals; whereas at 12 feet from the goal line, person 1 made almost double the number of goals (7/10).

Reasoning (justify your response):
Answers will vary based on data and students.
Example: When the area of the goal triangle increases, there is more distance for the shooter to cover in a single kick.

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Module 7.1: GOAL-LINE TECHNOLOGY

Problem: The Youth community league needs a low cost option to ensure the entire ball crosses the goal line.

Brainstorm Multiple Designs

Results will vary by student.		

Select a single design (draw in detail, label materials and provide measurements)

Results will vary by student.

Build, Design and Test It: Your test should be a controlled experiment; the table is provided to support your data collection.

	Test 1	Test 2	Test 3
	Results will vary by student.		

Communicate: Did it work? What evidence supports that it works? Would you make any changes?

Results will vary by student.

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Module 8.1: PROBABILITY AND PENALTY KICKS

Collect Data Results will vary. Example data below.

	Shots Made	Total Kicks	Probability (calculated)
Partner 1- Right foot	2	11	0.18
Partner 2- Right foot	4	13	0.31
Partner 1- Left foot	5	14	0.36
Partner 2- Left foot	3	9	0.33

Based on your dominant foot probability	Predicted outcome	Actual Outcome	Error (absolute value of actual subtracted from predicted)
12 kicks	Example: 0.36 *12 =4.3	6	1.7
15 kicks	Example: 0.36 *15 = 5.4	5	0.4
100 kicks	Example: 0.36 *100=36		
1,000 kicks	Example: 0.36 *1000 =360		
2,000 kicks	Example: 0.36* 2000=720		

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Explain how probability can be a helpful tool to make predictions.
Answers will vary.
Example: Probability can support a more accurate prediction based on data.

Explain how probability can have limitations in predictions.
Answers will vary.
Example: Probability does not equal the actual results, so there may be errors involved .