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Assessment Questions

Module 1.1: Arm Strength: Youth vs Foam Football

1. According to the equation below, how does the mass of an object affect kinetic energy?

$$E_k = \frac{1}{2}mv^2$$

$E_k = kinetic\ energy\ of\ object$
$m = mass\ of\ object$
$v = speed\ of\ object$

   a. A football that is ½ mass will have more kinetic energy.
   b. A football with larger mass (at a constant velocity) will increase kinetic energy.
   c. A football that is twice the mass will have more kinetic energy.
   d. A football with smaller mass (at a constant velocity) will increase kinetic energy.

2. Based on the following data, which football has the greatest kinetic energy?

	Youth Football	Foam Football	NFL Regulation Football
Mass	0.3 kg	0.2 kg	0.4 kg
Distance	35 meters	15 meters	65 meters
Time	4 seconds	5 seconds	8 seconds

   a. Youth football
   b. Foam football
   c. NFL Regulation Football
   d. A Different Football

Module 2.1: Technological Advancements and Improved QB Play

1. A football player has a 0.78 probability of pass completion. If they attempted 23 passes in the season, how many completions do you predict they would make?
   a. 10
   b. 14
   c. 18
   d. 22

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2. Which of the following is the strongest evidence and reasoning to support the claim that glove technology has increased the pace of the game?
   a. When gloves were introduced in 1981, pass completion rate increased by 8%, the increased pass completion rate increases the time the clock is running during the average game.
   b. For the past 40 years, players have gradually become better, faster and stronger. The fastest NFL player runs 22 mph and the average player can squat 500 lbs.
   c. Gloves help players grip the ball, and according to a survey of all NFL players, 98% wear gloves and 95% prefer gloves. Gloves increase the pace of the game because the players hold onto the ball more often/fumble less.
   d. Glove technology helps players hold onto the ball during the game. Therefore, players can complete quicker plays and the pace increases.

Module 3.1: Engineering Better Gameplay Communication

1. In analyzing technology, which of the following is the best way to collect information?
   a. Take measurements and test the equipment
   b. Record the color and style
   c. Note how the cost has changed over time
   d. Look it up online

2. Criteria or Constraint: Each offensive and defensive team is permitted no more than one player on the field with a speaker in his helmet.

3. Criteria or Constraint: The radio must be wireless.

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4. Why is it important to establish clear criteria and constraints for an Engineering Design?
   a. Clear criteria makes it easier to come up with ideas to solve the problem.
   b. Criteria and constraints help narrow the design to fix the problem.
   c. Constraints help the engineer make more of a profit.
   d. Criteria and constraints ensure a working prototype.

Module 4.1: The Evolution of a Football Helmet

1. In football and other sports, players wear helmets and other protective equipment. Which helmet would provide the best protection?

A. 

B. 

C. 

D. 

2. Justify your selection from question one.

3. True or False: Risk of concussion can be lowered by new helmet technology.

4. True or False: Concussions or blows to the brain cannot kill neurons; they will heal over time.

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Module 5.1: Intricacies of a Football Field

1. Which of the following would have the most reasonable scaled size for a whiteboard (4 feet wide and 10 feet long) in the locker room?

   a. $\frac{0.25 \text{ inch } (\frac{1}{4})}{1 \text{ yard}} = \frac{x \text{ inches}}{57.3 \text{ yards}}$

   b. $\frac{0.5 \text{ inch } (\frac{1}{2})}{1 \text{ yard}} = \frac{x \text{ inches}}{57.3 \text{ yards}}$

   c. $\frac{0.125 \text{ inch } (\frac{1}{8})}{1 \text{ yard}} = \frac{x \text{ inches}}{57.3 \text{ yards}}$

   d. $\frac{0.75 \text{ inch } (\frac{3}{4})}{1 \text{ yard}} = \frac{x \text{ inches}}{57.3 \text{ yards}}$

2. Which of the following would have the most reasonable scaled size for a whiteboard (4 feet wide and 10 feet long) in the locker room?

   a. $\frac{0.25 \text{ inch } (\frac{1}{4})}{1 \text{ yard}} = \frac{x \text{ inches}}{120 \text{ yards}}$

   b. $\frac{0.5 \text{ inch } (\frac{1}{2})}{1 \text{ yard}} = \frac{x \text{ inches}}{120 \text{ yards}}$

   c. $\frac{0.125 \text{ inch } (\frac{1}{8})}{1 \text{ yard}} = \frac{x \text{ inches}}{120 \text{ yards}}$

   d. $\frac{0.75 \text{ inch } (\frac{3}{4})}{1 \text{ yard}} = \frac{x \text{ inches}}{120 \text{ yards}}$

Module 6.1: Extra Point vs Two-Point Conversion

1. Prior to 2015 PAT, kicks had a probability of 0.996. If a team attempted 3 PAT a game for the season (16 games), how many times can you predict they will score the extra point?

   a. 15
   b. 16
   c. 45
   d. 48

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2. After the 2015 rule change, PAT kicks had a probability of 0.942. If the team attempted 3 PATs a game for the season (16 games), how many times can you predict they will score the extra point?
   a. 14
   b. 16
   c. 45
   d. 48

3. In 2018, the chances of success for a two-point conversion was 0.6. If the team attempted 3 two-point conversions a game for the season (16 games), what is the predicted point difference if they would have attempted all PAT's instead (based on probability)?
   a. +11 (eleven more points)
   b. +13 (thirteen more points)
   c. -2 (two less points)
   d. -5 (five less points)

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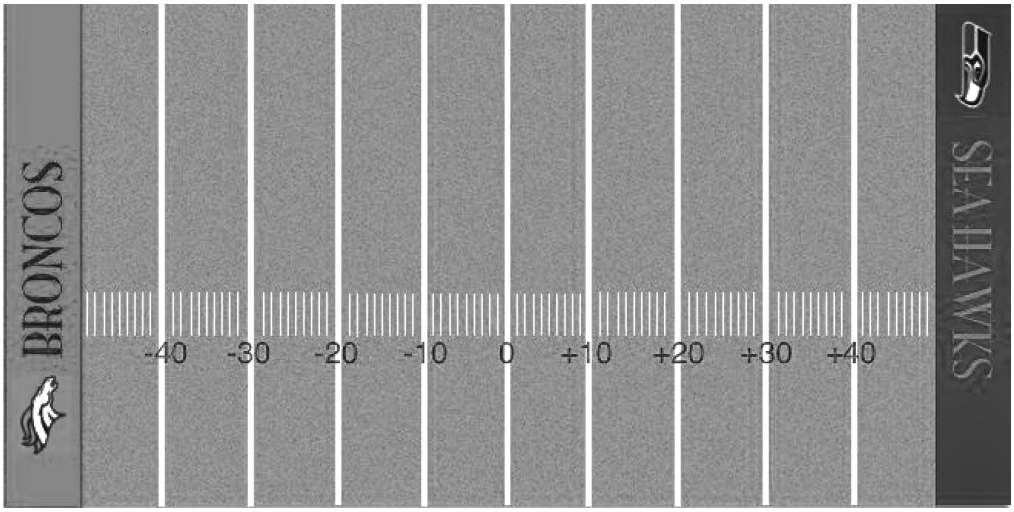
Assessment Questions

Module 7.1: Integers of Play



1. Based on the football number line above, the Broncos are on the +12 yard line, the ball is intercepted at the +20 yard line, and the Seahawks player runs the ball to the -16 yard line. How many yards did he run the ball?
   a. 26 yards
   b. 28 yards
   c. 32 yards
   d. 36 yards

2. If a player is on the -42 yard line and runs 34 yards, what yard line are they on?
   a. 8
   b. -8
   c. 76
   d. -76

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Module 8.1: Properties and Behavior of Footballs

1. What is the equation for density?
   a. Mass divided by Volume
   b. Perimeter divided by Mass
   c. Mass times Volume
   d. Volume times Perimeter

2. Which of the following equations in relation to volume would be the most useful to calculate the volume of a football (multiple answers)?
   a. Cube = (Length of a side)^3
   b. Prism = length x width x height
   c. Cylinder = π x radius^2 x height
   d. Cone = ⅓ x π x radius^2 x height
   e. Sphere = ⅘ x π x radius^3