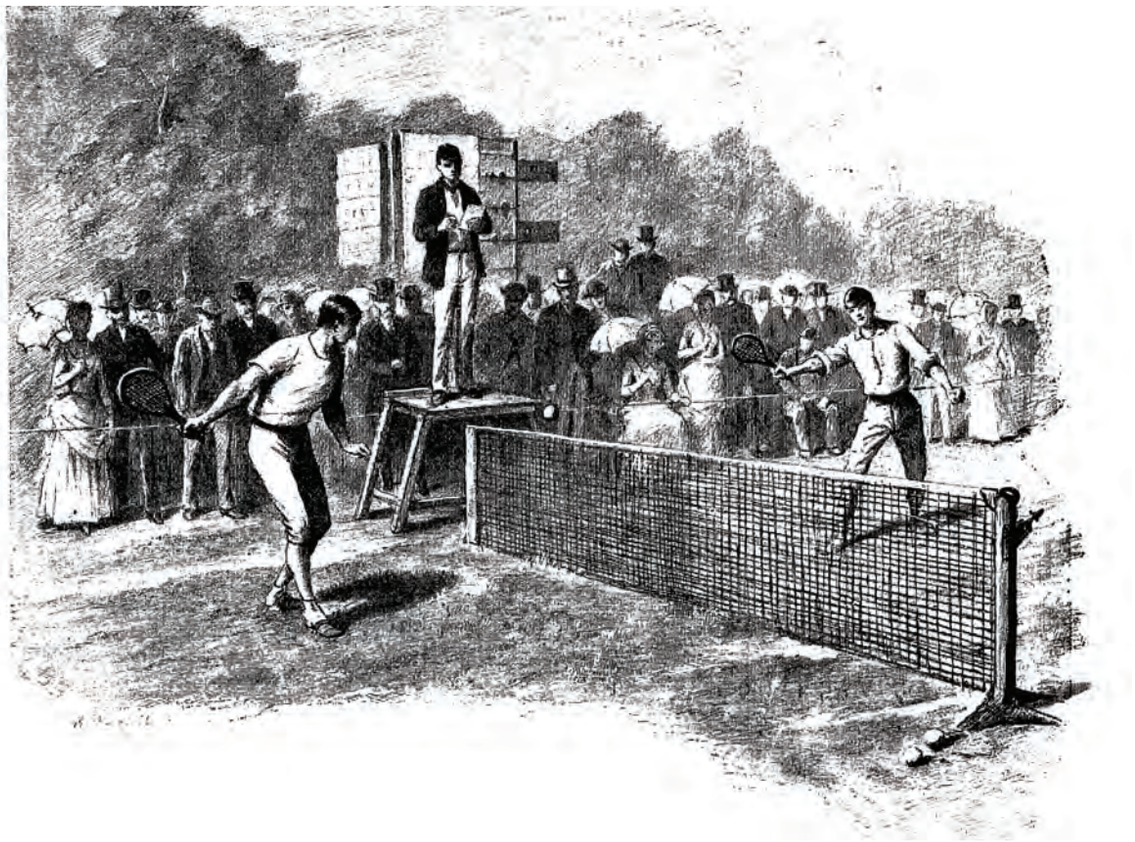
The Game Evolved



The game of tennis and its equipment has changed greatly since its introduction in France during the 12th century (1101 - 1200). In the early days of the game, players would play on a hard circular surface such as wood or stone, and would hit a wooden ball back and forth with their bare hand over a rope stretched from one side to the other; however, this style of game caused too many injuries. As a result, players began using leather gloves and leather balls toward the end of this century.

In the 13th century, the glove design evolved, players began using teardrop shaped wooden paddles with no webbing. These paddles were heavy, not flexible, and proved to be an insufficient design.

In the 14th century (1301 - 1400), the design of the paddle really changed to the racket we see today. The design was a long wooden handle with a raindrop wooden frame that was connected by strings. The addition of the strings increased the distance and bounce of the ball, which improved the overall game. In addition to the new and improved racket, a new type of cork ball was used; this ball was tightly wrapped with fabric and then covered in cloth.

The equipment in the game of tennis remained the same until 1850 when Charles Goodyear introduced a new process that made rubber stronger, allowing the ball to be bouncier and used on all types of playing surfaces. Twenty years later, Walter C. Wingfield took Goodyear's solid rubber ball design and found that if the rubber ball was hollow (empty on the inside), filled with air, and covered by a rubber cloth, the bounce and quality of the ball greatly improved.

Popular tennis companies, like Penn, took these ideas and continued to improve the performance of tennis balls over the next few decades. In 1970, Penn released their "play-rated" balls. These are unique tennis balls designed to maximize the play on different court surfaces and high altitude areas.

In 2001, they released a tennis ball with SMART OPTIK felt that increases visibility. In 2010, Penn introduced multiple 10 and under tennis balls specifically designed to encourage more kids to play tennis; these balls were lower pressurized balls that allowed for longer rallies, making tennis more fun. In a joint venture with the USTA, smaller rackets were also introduced for this age group. By 2011, Penn introduced their longest lasting tennis ball featuring Encore Technology, creating a ball lasting 22% longer than the previous one.

With several changes in ball design, Wingfield now decided it was time to focus on the racket. This original paddle design from earlier centuries inspired his very first tennis racket made in 1874; this racket was a large oval, made of solid wood and connected together by strings, a design used often over the next hundred years. By 1947, new technology allowed very thin layers of wood to be stuck together, which increased the overall performance of this racket design.

It is no surprise Wingfield is considered one of the "Founding Fathers" of tennis with all of his contributions to the equipment in the game; however, he is also responsible for coming up with the idea for the game of tennis. He provided many of the concepts, rules, and designs of the game. The most significant change in the engineering design of the racket occurred in 1967, when Wilson released the very first steel racket, T2000. The head of the Head Classic Racket was double the size of the models that came before it. Although much bigger, it was still much lighter and easier to swing than wooden rackets of the past.

Wilson's design inspired other engineers to try and improve the metals used in the racket. After years of testing and redesign, a breakthrough happened in 1976. Graphite was found to be the best metal for the racket: it is light and strong. Since this breakthrough to graphite, rackets haven't changed too much. Rackets today are simply a combination of different alloys, ceramics, and fiberglass to meet the needs of the individual player

The equipment and game of tennis has been the same now for many years. However, current-day technology used throughout the world is changing faster than ever before. What will be the next big change to the game of tennis? And will these changes improve the game as players, officials, and spectators see it?

Sources: https://medium.com/lantern-theater-company-searchlight/the-evolution-of-tennis-2b1b4b99e93f

https://www.thoughtco.com/who-invented-tennis-1991673

Name: _____

The Game Evolved

GRADES 3-5

Elaborate

1. The paddle design in the 14th century is similar to the racket we use today. What were the strengths of this design? What were the weaknesses of this design?

2. What changes were made to the tennis ball over time?

3. What do you believe was Wingfield's most important contribution to the game of tennis?

4. Why is the introduction of graphite considered one of the biggest breakthroughs in the equipment of tennis?

5. What do you think will be the next big change to the game of tennis?

Module 1.0

Name: _____

The Game Evolved

GRADES 3-5

Elaborate

Describe how each ball would behave using some or all of the options provided. Think about the distances and bounce-ability of each racket and ball type.

Options	Tennis Ball	Golf Ball	Softball	Baseball
Tennis Racket				
Badminton Racket				

Name: _____

Options	Tennis Ball	Golf Ball	Softball	Baseball
Ping Pong Paddle				
Baseball / Softball Bat				
Bottom of Your shoe				
Other				

Module 1.0

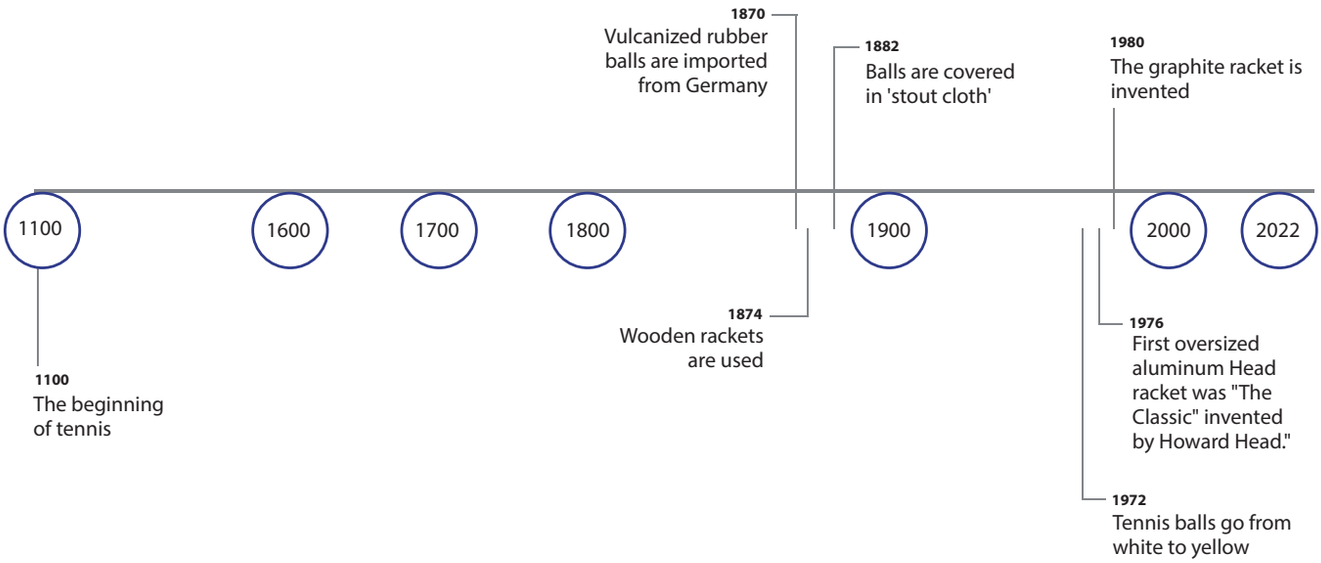
Name: _____

The Game Evolved

GRADES 3-5

Evaluate

Review the timeline below of the evolution of the tennis racket and ball.



Pros for using different rackets/balls as a tennis racket	Cons for using different rackets/balls as a tennis racket

Name: _____

Dimensions of the Court

GRADES 3-5

Elaborate

Part 1: Using a protractor with a scale factor 1 m = 2/3 mm, draw a scale model of a tennis court.

1. At the top of your paper, draw a horizontal line that is 5.5 mm long. Label this your baseline.

2. At the right end of the baseline, create a 90 degree angle towards the bottom of your paper with the protractor, drawing a line that is 15.9 mm long. Label this your doubles sideline.

3. At the end of the doubles sideline, create a 90 degree angle towards the left side of your paper with the protractor, drawing a line that is 5.5 mm long. Label this your baseline.

4. At the end of the baseline, create a 90 degree angle towards the top of your paper with the protractor, drawing a line that is 15.9 mm long. Label this your doubles sideline.

5. Find the halfway or midpoint of your doubles sideline. From this point, draw a line that connects one side of the sideline to the other.

6. At the end of the baseline, measure 0.9 mm into the court and draw a line that connects one side of the baseline to the other. Label this your singles sideline.

7. Follow the same directions from Step 6, but on the other side of the baseline to draw the other singles sideline.

8. Starting at the intersection of the singles sideline and the net, measure 4.3 mm above the net. From this point, draw a line connecting one side of the singles sideline to the other. Label this the service line.

9. Follow the same directions from Step 8, but measure below the net. Label this the service line.

10. Find the halfway or midpoint of your service line, draw a line connecting the service line to the net; do this on both sides of the net. Label this your center service line.

Module 2.0

Name: _____

Dimensions of the Court

GRADES 3-5

Evaluate

Part 2: Parallel, Perpendicular, and Lines of Symmetry

1. Using the scale model of your tennis court, use two different colored utensils to identify two sets of lines parallel to each other.

2. Using the scale model of your tennis court, use two different colored utensils to identify two sets of lines perpendicular to each other.

3. Using the scale model of your tennis court, use two different colored utensils to identify two lines of symmetry.

Module 3.0

Name: _____

The Playing Surface

GRADES 3-5

Explore

Surface	Rolling the Tennis Ball	Bouncing the Tennis Ball
Grass	**Benefits:** **Challenges:**	**Benefits:** **Challenges:**
Concrete (also known as a "hard surface")	**Benefits:** **Challenges:**	**Benefits:** **Challenges:**
Dirt	**Benefits:** **Challenges:**	**Benefits:** **Challenges:**

Name: _____

The Playing Surface

GRADES 3-5

Evaluate

Surface	Adapt Play	Adapt Surface
Grass		
Clay		
Concrete/Hard Surface		

I'd Love to Keep Score!

Like other sports, the game of tennis has its own special way of scoring the game. Before a winner can be determined, three phases of the game must be played: a game, a set, and a match.

A **game** is played until a player can win by reaching 4 points. A point can be earned one of five ways:

- A player can not hit a ball, and the ball bounces twice.
- A **double fault** occurs where the server misses two back to back serves.
  An **Ace** occurs where the player's serve is unable to be returned.
- A ball is hit out of bounds.
- A ball is hit into the net.

Scoring in tennis is unlike any other sport. The first points are actually 15, 30, 40, and then the game winning point.

You might think the game of tennis would be scored as 0 points, 1 point, 2 points, 3 points, and 4 points. However, scoring in tennis is unlike any other sport. The first points are actually 15, 30, 40, and then the game winning point. There are many thoughts as to why tennis is scored this way, but one of the most popular ones is that the game of tennis, which dates back to 12th century France, 12th century France, was originally kept on the face of a clock. The hands of the clock would be moved from 0 minutes to 15 minutes, 30 minutes, 45 minutes, and 60 minutes to keep score.

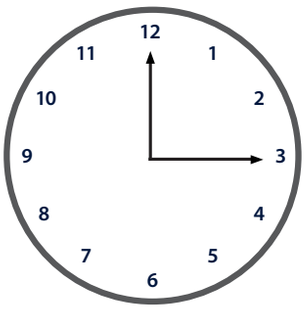
When announcing the score in tennis point zero is called **love**. There are also many thoughts of why the score of zero is referred to as "love", the most popular one is that it comes from the French word "l'oeuf" which means "egg". A "l'oeuf" resembles the number zero, which is why "love" is used in the game today. Point one is then called 15, point two is called 30, point three is called 40, and point four is called the game-winning point.

You might be wondering why point 3 is called 40 and not 45… Because if both

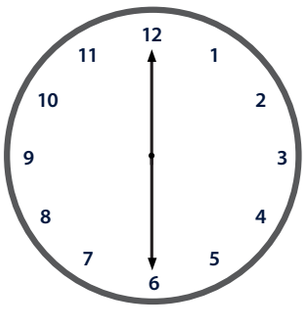
players make it to point 3 or 40, the score is called "deuce". In order to win, the player must win the next two points in a row. If a player can do this, the next two points would be called "advantage", then the game-winning point. If a player wins the first point, but loses the second point, the points would be called "advantage", then back to deuce. The 40-minute mark is used to represent point 3 in the event of a deuce, letting the 45-minute mark be used to represent the player who has the advantage in the match.

When a player reaches the **fourth** point, the game is over. The player must win **6** games in order to win the set. Likewise, the player must win by two points to win the set and they must win by two games to win the match. So if a game is at 6-5, a seventh game would have to be played to determine the set winner.

When a player reaches 2 sets won, the match is over!

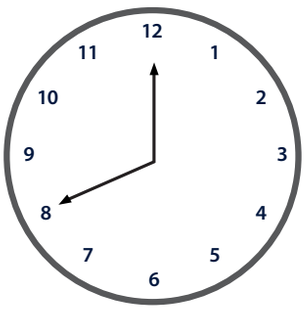


Player A

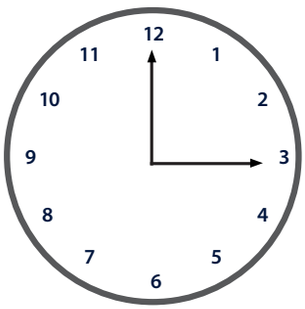


Player B

This model shows an example of Player A having 15/1 points and Player B having 30/2 points



Player A



Player B

This model shows an example of a deuce, where Player A has the advantage

	Set 1	Set 2	Set 3	Match Winner
Player A	6	5	6	Player A
Player B	4	7	3	

Sources: https://www.sportingnews.com/us/tennis/news/tennis-scoring-explained-rules-system-points-terms/7uzp2evdhbd11obdd59p3p1cx

Module 4.0

Name: _____

I'd Love To Keep Score

GRADES 3-5

Explain

Answer the following in the form of a fraction.

1. If a player scores 0 points, draw a fraction model to represent the number of points needed to win the set.

2. If a player scores 1 point, draw a fraction model to represent the number of points needed to win the set.

3. If a player scores 2 points, draw a fraction model to represent the number of points needed to win the set.

4. If a clock reads 12:45, draw a fraction model to represent the number of minutes needed to read 1:00.

5. If a player scores 4 points, draw a fraction model to represent the number of points needed to win the set.

Name: _____

I'd Love To Keep Score

GRADES 3-5

Explain

Answer the following in the form of a fraction.

1. If a clock reads 12:15, draw a fraction model to represent the number of minutes needed to read 1:00.

2. If a clock reads 12:30, draw a fraction model to represent the number of minutes needed to read 1:00.

3. If a clock reads 12:40, draw a fraction model to represent the number of minutes needed to read 1:00.

4. If a clock reads 12:45, draw a fraction model to represent the number of minutes needed to read 1:00.

Module 4.0

Name: _____

I'd Love To Keep Score

GRADES 3-5

Evaluate

Use greater than, less than, or equal to symbols (> < =) to answer the following.

1. Tennis Point 1 _____ Clock 12:15

2. Tennis Point 2 _____ Clock 12:30

3. Tennis Point 3 _____ Clock 12:45

4. Why do you think the third tennis point is said to be 40 instead of 45?

5. Based on this pattern, what do you think is the final point in a tennis set?

Name: _____

May the Force Be With You!

GRADES 3-5

	Fastest (1) to slowest (4)	Observations
Overhand Serve		
Forehand Hit		
Backhand Hit		
Student Idea: _____		

	Trial 1		Trial 2		Trial 3	
	Speed	Distance	Speed	Distance	Speed	Distance
Overhand Serve						
Forehand Hit						
Backhand Hit						
Student Idea: _____						

Module 5.0

Name: _____

May the Force Be With You!

GRADES 3-5

Evaluate

Use the below space to create your Force Diagrams.

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

_____

_____

_____

_____

_____

STEM sports science • technology engineering • math • sports

Name: _____

Stroke of Energy

GRADES 3-5

Explore

Record the times in the table below.

Underhand Hit Distance: _____

	Hit 1	Hit 2	Hit 3	Hit 4	Hit 5
Partner A					
Partner B					

Overhand Hit Distance: _____

	Hit 1	Hit 2	Hit 3	Hit 4	Hit 5
Partner A					
Partner B					

Module 6.0

Name: _____

Stroke of Energy

GRADES 3-5

Evaluate

Calculate Velocity

Underhand Hit

Distance: _____

	Hit 1	Hit 2	Hit 3	Hit 4	Hit 5
Partner A					
Partner B					

Overhand Hit

Distance: _____

	Hit 1	Hit 2	Hit 3	Hit 4	Hit 5
Partner A					
Partner B					

Which hit were you able to hit with more velocity and why?

_____

_____

STEM sports science • technology engineering • math • sports

Name: _____

Let's Serve

GRADES 3-5

First Serve			Second Serve (only needed if first serve is not inbounds)	
Serve Number	Speed	Result In - Out - Let	Speed	Result In - Out - Let
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

Module 7.0

Name: _____

Let's Serve

GRADES 3-5

Evaluate

1. Express the number of times you hit your first serve inbound as a fraction and decimal.

2. Based on the fraction above, write a fraction to represent 100 total serves.

3. Express the number of times you hit your second serve inbound as a fraction and decimal.

4. Based on the fraction above, write a fraction to represent 100 total serves.

5. How do your fractions from your first serve and second serve compare?

6. How does the speed from your first serve and second serve compare?

Name: _____

Let's Serve

GRADES 3-5

Extend

1. If a student was able to hit ¼ of their first serves inbound out of 20 serves, how many times would they serve it inbounds? How many times would they serve it out of bounds?

2. If a student was able to hit ⅔ of their first serves inbound out of 30 serves, how many times would they serve it inbounds? How many times would they serve it out of bounds?

Module 8.0

Name: _____

Advancements in Tennis

GRADES 3-5

Explore

X = In O = Out

	Hit 1	Hit 2	Hit 3	Hit 4	Hit 5	Hit 6	Hit 7	Hit 8
Line Judge 1								
Line Judge 2								
Video Judge								

Explain/Elaborate

Criteria	Constraints
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

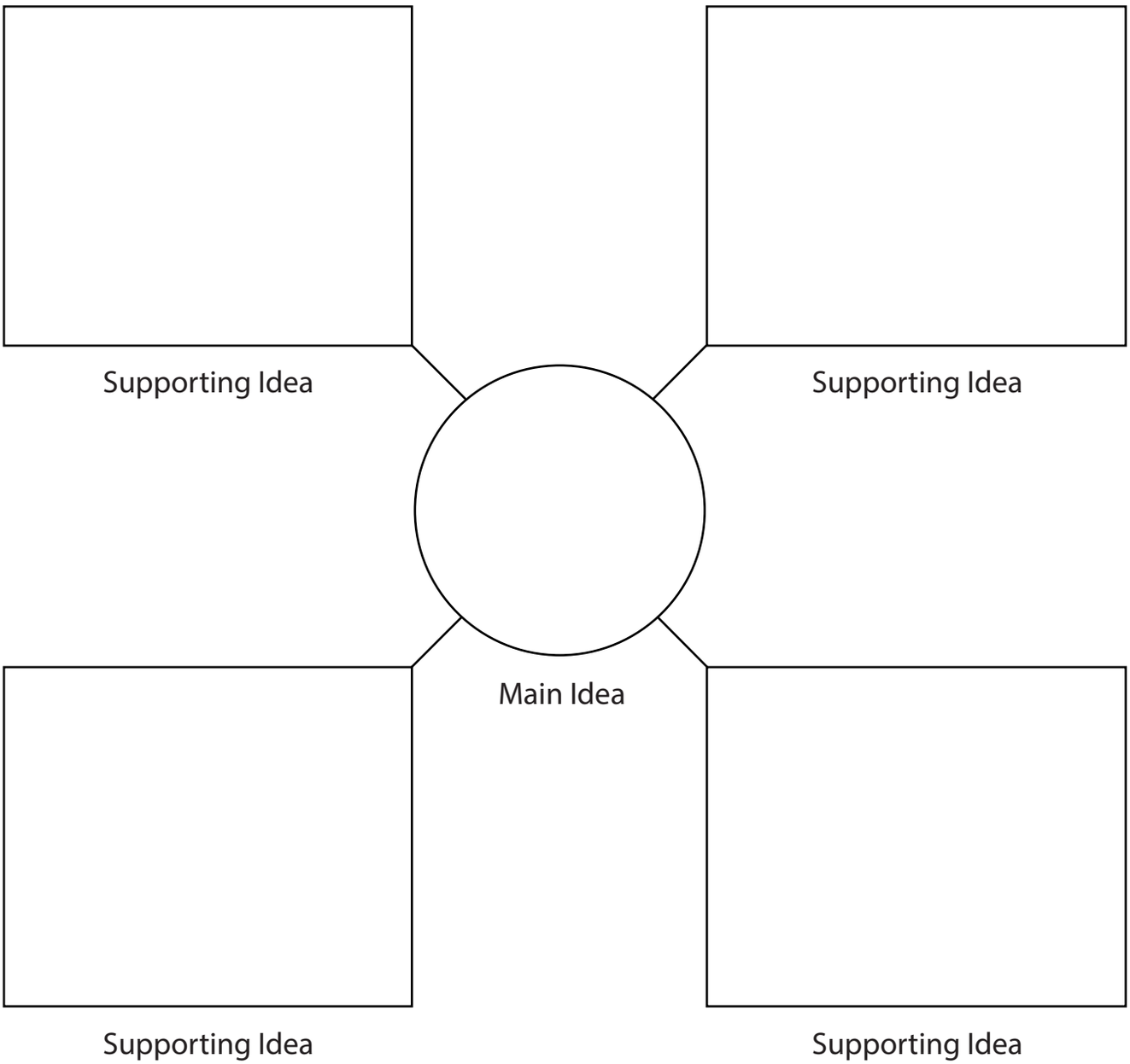
Name: _____

Advancements in Tennis

GRADES 3-5

Evaluate

Use the below graphic organizer to create an outline of your letter to the USTA (United States Tennis Association).



Module 8.0

Name: _____

Advancements in Tennis

GRADES 3-5

Evaluate

Have students write a letter to the USTA (United States Tennis Association). The letter should take a stance for supporting or opposing the use of instant replay in tennis. The letter should include specific changes and improvements to benefit all stakeholders involved: players, officials, and spectators.