Geometry and Statistics Athletic Module

The purpose of this lesson is to introduce students to geometric shapes and statistics as related to athletics. It is hands-on, appropriate for MCAS preparation, and involves real world issues that should be relevant to most students. There is some preparation that needs to be completed by the teacher so that the lesson runs smoothly.

The first day involves explaining what the lesson is and why it is important. The teacher should review with the class as a whole how to find the areas of the following figures:

- Rectangle
- Circle
- Semicircle
- Quarter Sector of a Circle
- Square

This does not need to be a long review but the teacher should write the formulas down on the board and leave them there for students to use. They will use these formulas when calculating the areas of each piece of the field/court that they are creating.

Once the formulas are on the board, pair students up and have them choose one of the following athletes on which to focus their project:

- Basketball
  - Michael Jordan
  - Larry Bird
  - Wilt Chamberlain
  - Ervin “Magic” Johnson

- Hockey
  - Wayne Gretzky
  - Mario Lemieux
  - Ray Bourque
  - Brett Hull

- Baseball
  - Ted Williams
  - Babe Ruth
  - Joe DiMaggio
  - Tony Gwynn

Please keep in mind that constructing the baseball field takes the least amount of time and the basketball court and the hockey rink take a little while longer because of the number of geometric shapes.

The teacher should previously cut out the shapes necessary to create each field/court and provide the students with the dimensions in order to find the areas of each figure. The students should be able to look at a model of their respective field/court in order to accurately create their diagram. The following shapes are listed in the order in which they should be glued together.

**Basketball Court (inches)**
- 1 Large Rectangle (8.5 x 11)
- 2 Large Semicircles (Radius = 4)
- 2 Small Rectangles (2 x 2.5)
- 2 Small Semicircles (Radius = 1)
- 1 Large Circle (Radius = 1)
- 1 Small Circle (Radius = 0.5)
Hockey Rink (inches)
1 Large Rectangle (8.5 x 11)
2 Large Rectangles (8.5 x 1)
1 Large Rectangle (8.5 x 2)
4 Circles (Radius = 1)
1 Circle (Radius = 0.5)
2 Semicircles (Radius = 0.5)

Baseball Field (inches)
1 quarter circle sector (Radius = 8.5)
1 quarter circle sector (Radius = 6)
1 square (4 x 4)
1 circle (Radius = 0.5)

Once the fields/courts are created the students should begin working on the statistics component of the lesson. If students have internet access they can research the player that they chose to find the necessary stats, but the teacher can also provide the students with player stats so that they can do their computation.

<table>
<thead>
<tr>
<th>Basketball</th>
<th>Hockey</th>
<th>Baseball</th>
</tr>
</thead>
<tbody>
<tr>
<td>Field Goal Percentage</td>
<td>Shooting Percentage</td>
<td>Batting Average</td>
</tr>
<tr>
<td>Free Throw Percentage</td>
<td>Points Per Game</td>
<td>On-Base Percentage</td>
</tr>
<tr>
<td>Minutes Per Game</td>
<td>Face-off Percentage</td>
<td>Slugging Percentage</td>
</tr>
<tr>
<td>Points Per Game</td>
<td>Shifts Per Game</td>
<td>On-Base Plus Slugging</td>
</tr>
<tr>
<td>Turnover Ratio</td>
<td>Minutes Per Game</td>
<td>Isolated Power Index</td>
</tr>
</tbody>
</table>

These statistics can be found online as well as how to calculate them. The teacher should review a couple on the board before sending the students on their own.

This lesson focuses on identifying geometric figures, calculating area, researching statistics of historical sports figures, and calculating pertinent statistics related to sports. It is a hands-on lesson that allows students to work together and share their findings with their peers.
Standards:

10.M.1 – Calculate perimeter, circumference, and area of common geometric figures such as parallelograms, trapezoids, circles, and triangles.

10.D.1 – Select, create, and interpret an appropriate graphical representation for a set of data and use appropriate statistics to communicate information about the data. Use these notions to compare different sets of data.

10.N.2 – Simplify numerical expressions, including those involving positive integer exponents or the absolute value; apply such simplifications in the solution of problems.

10.G.1 – Identify figures using properties of sides, angles, and diagonals. Identify the figures’ type of symmetry.

Lesson 1 (45 min.)

Guiding Principals: By the end of this activity you will be able to:

- Identify geometric shapes
- Determine the area of each geometric shape
- Construct an athletic field/court using given shapes

Materials:

- Glue stick
- Pencil
- Calculator
- Geometric shapes previously cut out by teacher

Activity:

1. The teacher will discuss how to find the areas of different geometric shapes used to create athletic fields/courts with the class as a whole.
2. Students will pair up and choose 1 athlete and his corresponding sport that they wish to research.
3. Teachers will distribute groups of geometric shapes that fit together to create the athletic field/court that is used in the sport the students chose.
4. Students will first find the area of each shape and write it on the figure.
5. Once they have calculated each area, they will arrange the shapes to create the appropriate field/court.
Assessment:

1. What were the areas of the shapes that you calculated?
2. How did you find these areas?
3. Does your athletic field/court look accurate and to scale?

Lesson 2 (45 min.)

Guiding Principals: By the end of this activity you will be able to:

- Calculate statistics using given formulas
- Understand how statistics are used in sports

Materials:

- Calculator
- Pencil
- Computer with Internet (optional)
- Paper

Activity:

1. Provide students with necessary statistics to use for computation (see pre-lesson narrative).
2. Circle the room while students work in pairs to calculate relevant statistics for the athlete that they chose.
3. Allow students to address the class with their athletic field/court model and the statistics that they calculated.
4. Give students the correct statistics information to determine if their calculations were correct.

Assessment:

1. What are the five statistics that you calculated for your athlete?
2. How did you arrive at these numbers?

Next Steps:

Students should share their field/court constructions with each other and discuss how they calculated the appropriate statistics. A number of follow-up activities can be implemented to reinforce the geometric and statistical concepts focused on in these lessons.