Mathematics In Sports

BY: REBECCA BLITZER AND BARBARA BARONE

MATH IN BASEBALL:
Ratio and proportion and rounding

The pitcher's "earned run average," number of runs in a specified number of innings, or more commonly known as his ERA.

Win-loss percentages

Ratio and proportion

Rounding to two decimal places

MATH IN HOCKEY:

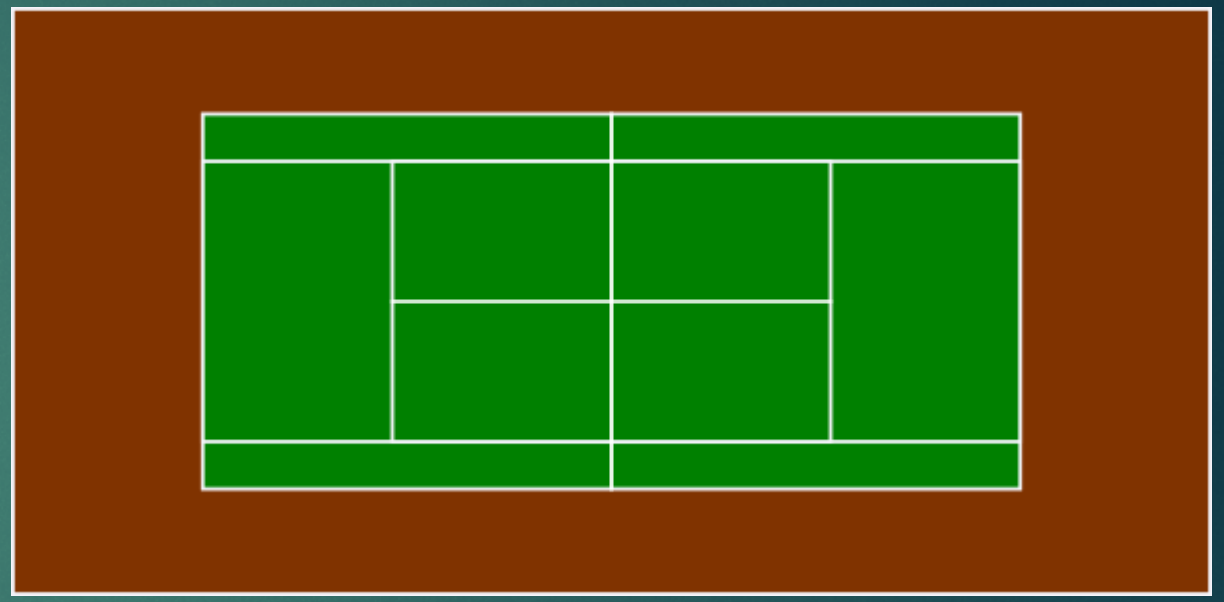
- Translating to algebra
- Solving equations and inequalities
- The hockey team needs 60 points to make the playoffs
- Wins, w, is worth 2 points
- Ties, t, worth 1 point
- $\boldsymbol{2w + t \geq 60}$

MATH IN TRACK AND FIELD

- Inner runners distances = outer runners distances
- Meter marks are staggered to make the running distances equal, although the finish line is one line for all of the runners.
- Calculating allowances for the weather conditions on the track for that day, i.e. energy cost of air resistance.
- Runners must pace themselves if they are in a race or they could easily become winded and not perform as well as they should.
- Runners with a best 5,000 meter/3-mile time of 15 minutes would have problems if they completed the first two laps in less than two minutes

MATH IN TENNIS (adapted from Math Anyone by Reyes and Reyes)

- In tennis, math is EVERYWHERE.
- We use geometry (congruence and similarity), measurement (perimeter and area), Pythagorean Theorem, ratio and proportion, algebra and probability.
- In doing so, we use whole numbers, fractions, decimals, and percents.

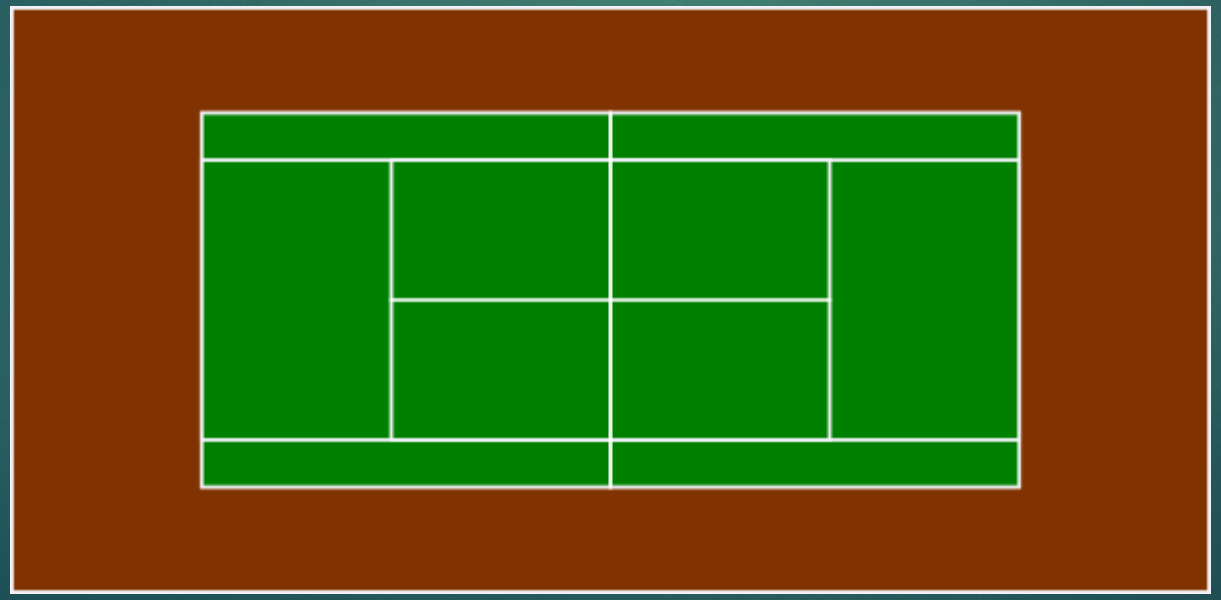


MATH IN TENNIS: Geometry

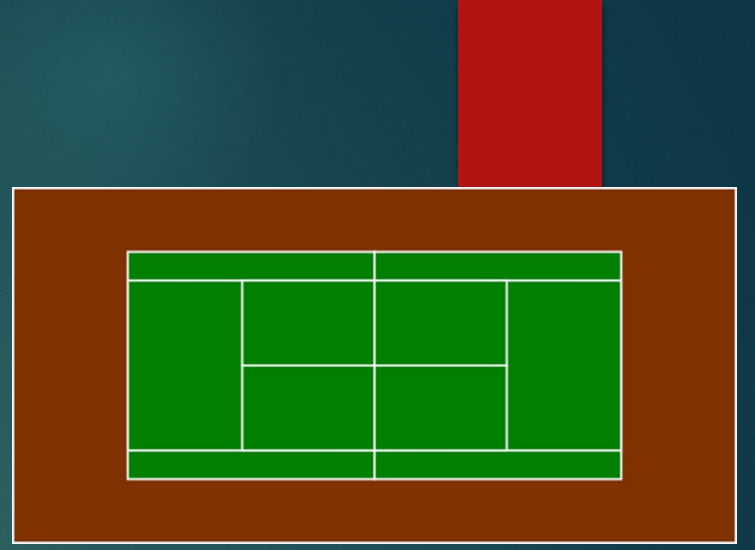
- The tennis courts, themselves, are rectangles.
  - On a tennis court there are "obvious and embedded rectangles."

    How many rectangles can you find in this green tennis court?

    There are 31!



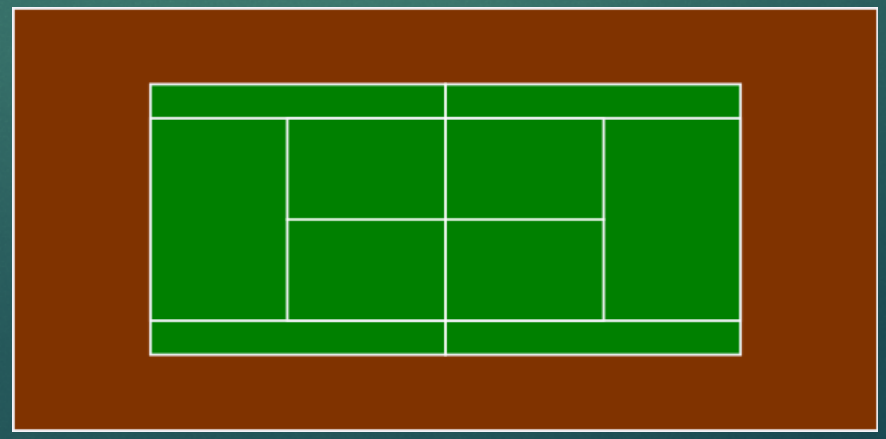
MATH IN TENNIS: Congruence and Symmetry



- One side of the court is the mirror image of the other.
- The net serves as one line of symmetry
- The centerline provides a second line of symmetry for both sides of the court.
- Each rectangle on one side of the net has a congruent rectangle on the other.
- Every shape on one side of the court has a congruent shape on the other side of the court.

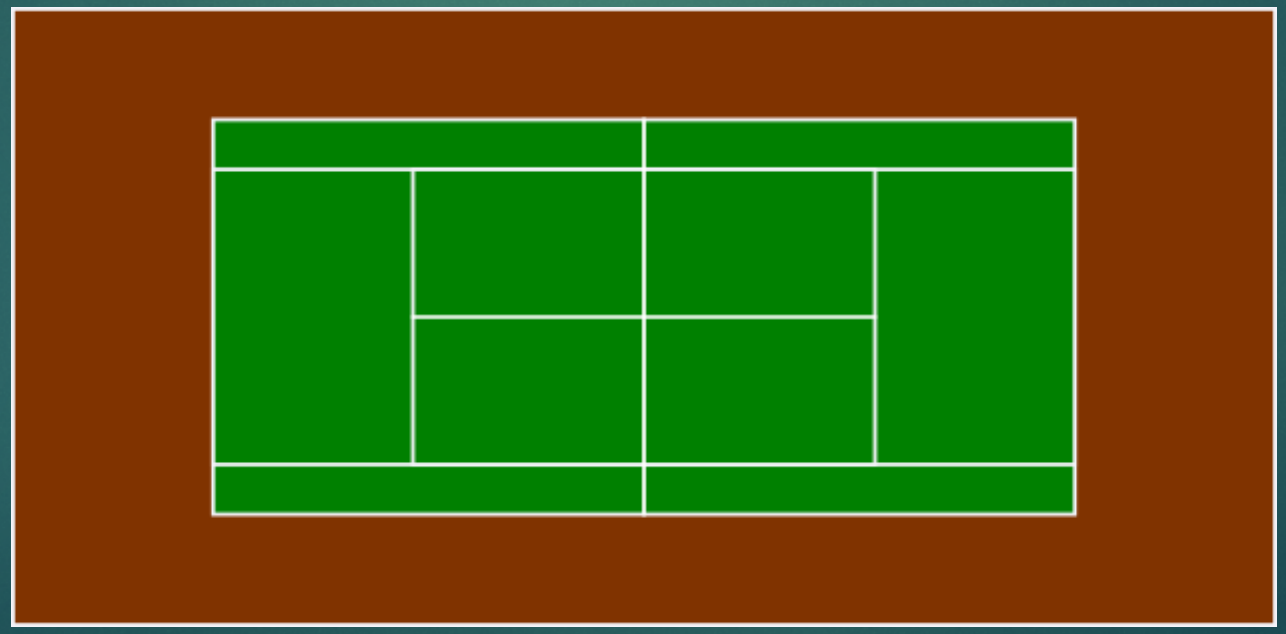
MATH IN TENNIS: Perimeter and Area

- All tennis courts have the same dimensions (whether it be clay, grass, hard, or carpet).
- If a player has to run the long lines from baseline to baseline or one side to the other, they need to take into consider the perimeter of half of the court.
- Ever wonder how much of the court is covered by each player? We need to find the area in order to compute this.



MATH IN TENNIS: Probability

- How one can determine whether they will be able to hit the ball in a certain area is a probability question and is based on the area of the different parts of the court.



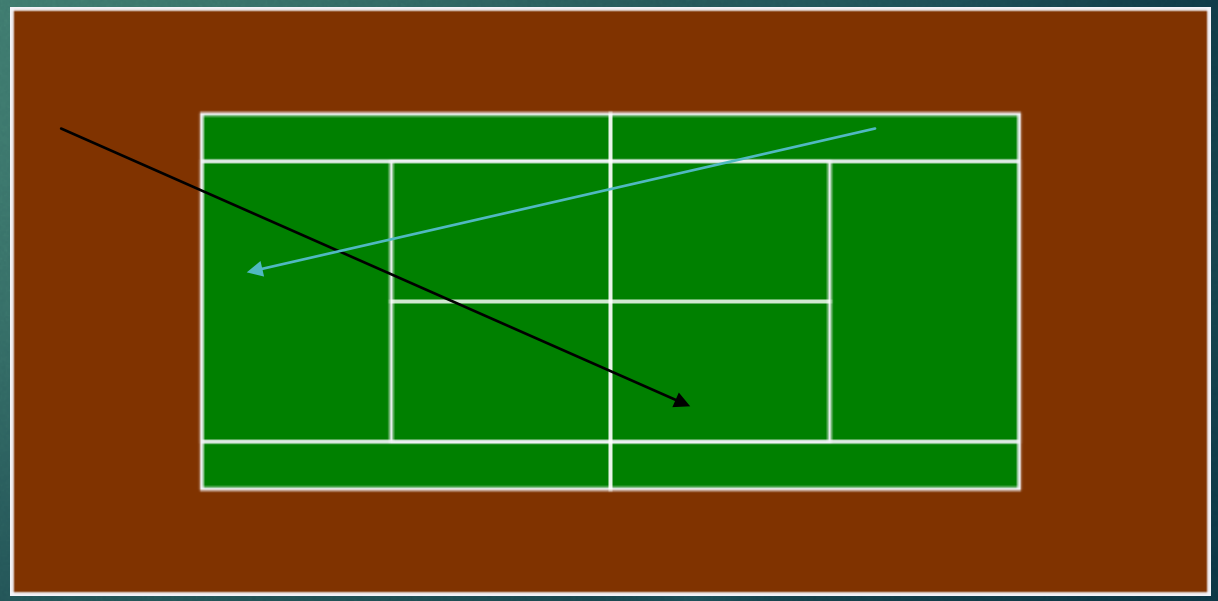
MATH IN TENNIS:
The Speed of the Serve vs Reaction Time

$$\text{At } 60\ mph = \frac{60\ mi.}{1\ hr.} * \frac{5280\ ft.}{1\ mi.} * \frac{1\ hr.}{60\ min.} * \frac{1\ min.}{60\ sec.} * \frac{88\ ft.}{1\ sec.} = 88\ ft.per\ sec.$$

So a 60 mph serve would travel from one baseline to the other in less than 1 second. Typical speed range from **100 to 130 miles per hour**, but some tennis players serves have surpassed this range!

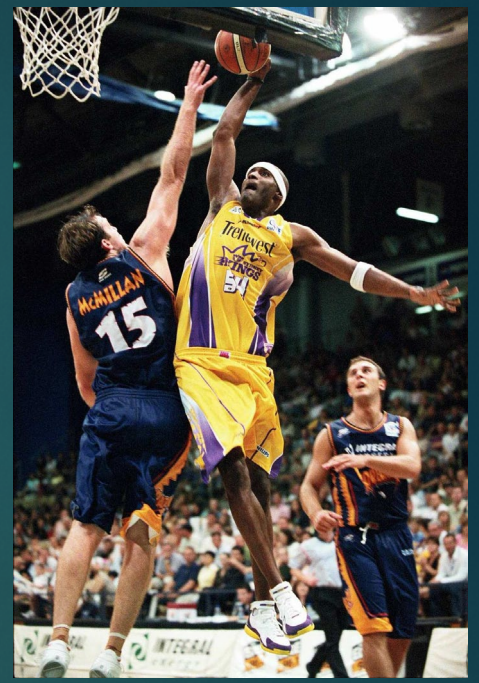
MATH IN TENNIS: The Pythagorean Theorem

- When a tennis player serves or hits the tennis ball cross- court, they are hitting the ball along the hypotenuse of a right triangle, which means that we can utilize the Pythagorean Theorem to help explain the hit.
- The maximum distance from one corner of the court to the other is the hypotenuse of the right triangle.

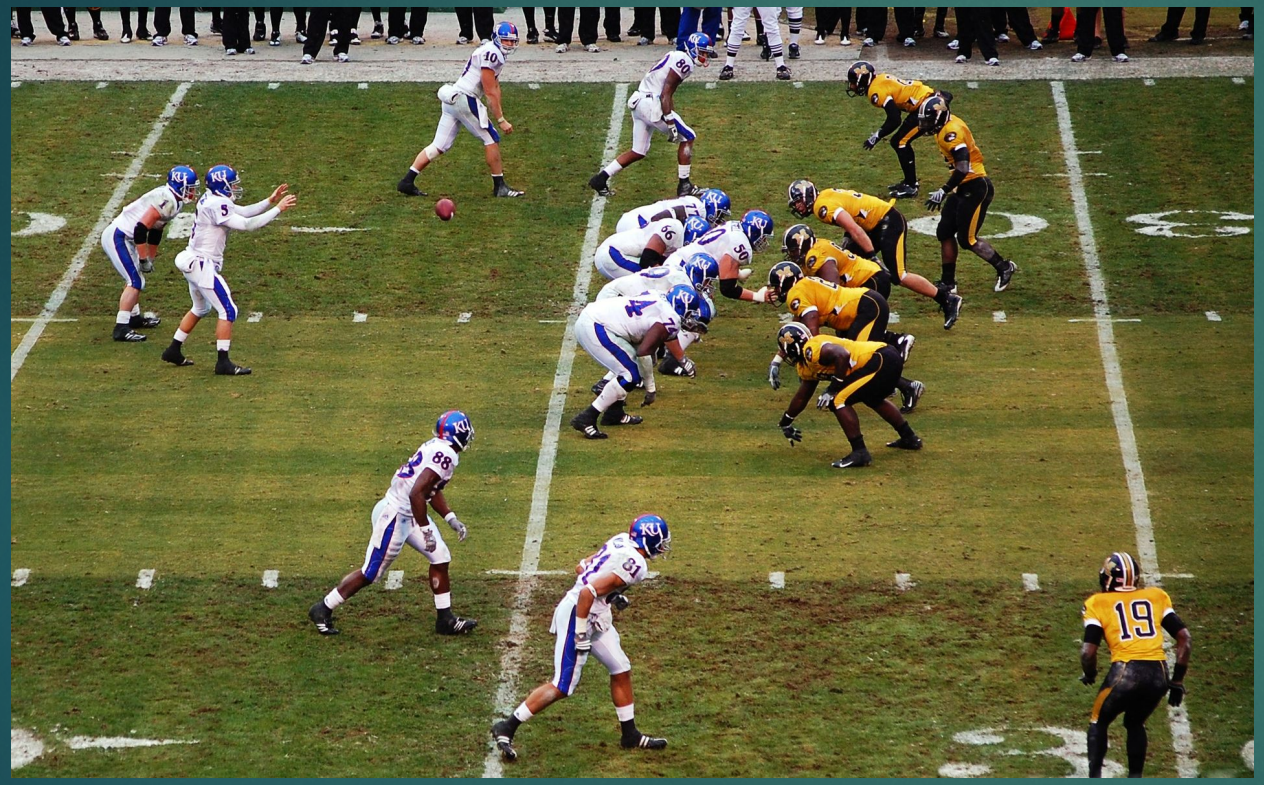


MATH IN BASKETBALL: Combinatorics, Probability

- NBA Draft uses Combinatorics and Probability to determine draft order
- Coaches formula for drafting players
- Velocity a basketball plater must throw the ball for it to land in the basket uses trigonometry and angle measures



MATH IN FOOTBALL



- Roman Numerals are used to denote the Super Bowl
- Angles are used in offense in the predetermined path in which the receiver runs and in defense when they are trying to determine the best angle of path to tackle

- https://prezi.com/4fec7sfqaix1/how-is-math-used-in-football/

MATH IN GOLF: Geometry and Integers

- shapes: the ball approximates a sphere.
- The "dimples" on the ball are circular.
- The shaft of the club is a cylinder.
- The face of the club is often trapezoidal.
- The fairways are roughly rectangular,
- The sand traps are sometimes circular.
- circumference of circles, radius and diameter
- parallel lines
- Triangles and angle measurement.

MATH IN BOWLING

- Arranged in a triangle
- Kinetic friction μk=Fk/mg. *μk* stands for the coefficient of kinetic friction and *Fk* stands for the Force due to kinetic friction, *m* is the mass of the ball and *g* stands for gravity.
- p (momentum) = mass (m) times velocity (v).

MATH IN SOCCER

- The goalkeeper needs to know where to stand and uses the angle bisector of the line from the player to the goal post
- The ball is the intersection of two Platonic solids
- The player needs to know how much exertion to get the ball away as well as speed and velocity