



Innovation today, healthier tomorrows

PRESENTS

WALLY & TESSIE'S STEM WORKSHEET



VIRTUAL
STEM EDUCATION
SERIES

PRESENTED BY  moderna

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What's momentum? It's the amount of moving stuff.

Momentum can move from one object to another. Baseball pitchers transfer momentum starting from their feet and legs all the way up to their arms and fingertips, and finally to the ball. Conservation of momentum says if momentum is going from a heavier to lighter object, the velocity increases. For example, if your arm is 10 times heavier than your fingers or the ball, the ball speeds up 10 times.

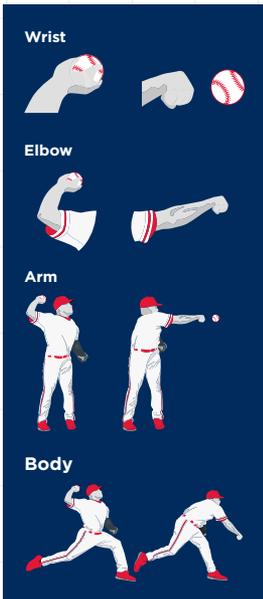
Momentum (P) = Mass (M) x Velocity (V)

TRY THIS

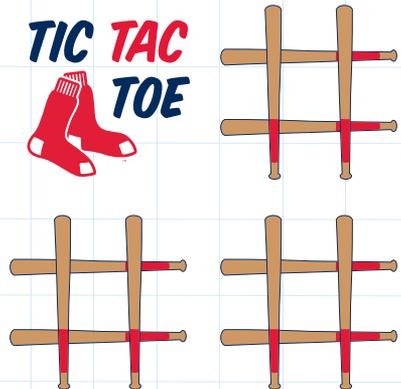
1. Standing at a mark on the ground, throw a ball moving only your wrist and keeping the rest of your arm still. Measure where the ball lands.
2. Now throw the ball with your elbow and wrist, keeping your shoulder and upper arm still.
3. Throw with your entire arm.
4. Stepping back 2-3 feet, pick up the leg opposite to your throwing arm, push off your other leg, and throw using your entire body.
5. How did the distance or speed of your throw change?



THROW THE BALL USING YOUR:



HOW FAR DOES THE BALL GO?



BASEBALL BAG MIX UP

Can you find 2 identical baseballs from Wally's equipment bag?



What makes someone a fast runner?

Height is only a small factor in running speed. A taller person does have longer steps length but might not be able to move their legs as fast. How fast a person can move their legs is more important than their height.

Speed is an important part of baseball. A hitter at bat or a runner on base wants to advance and score runs. There are 90 feet between each base, how fast they run can make a difference between a hit and an out. An outfielder also has to cover a lot of distance quickly to catch a fly ball.

TRY THIS

1. Mark 10 feet on the ground. Count how many steps it takes to walk from one end to the other.
2. Repeat with different speeds.
3. Record your number of steps.
4. Compare with a partner (try to find someone who's a different height than you).

NAME _____ HEIGHT _____	NUMBER OF STEPS	TIME (SEC.)
<i>WALK</i>		
<i>JOG</i>		
<i>SPRINT</i>		

NAME _____ HEIGHT _____	NUMBER OF STEPS	TIME (SEC.)
<i>WALK</i>		
<i>JOG</i>		
<i>SPRINT</i>		

You have 5 senses: **Taste, Touch, Sight, Hearing, and Smell.** Tessie does too!



TRY THIS

The players in the field or at the plate have to tune out much of the information from their senses to focus on playing. **What senses are they using while...**

Catching a fly ball?

Tagging up at third?

Running to first?

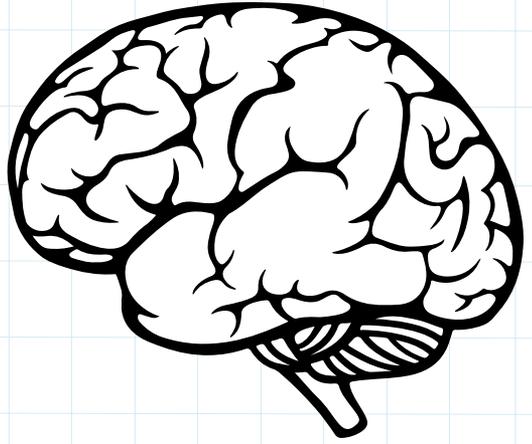
Hitting a home run?

TRY THIS

Color Wally!



The Brain in Baseball Stats



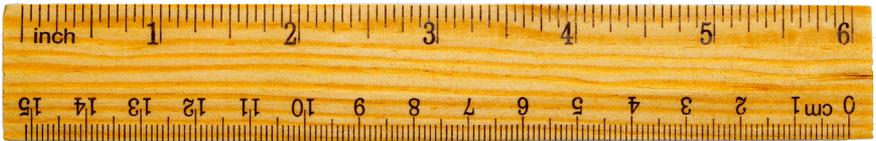
Brain Weight

3 lbs or about 9 baseballs



Average Brain Length

6 inches



Your brain can process an image that your eyes have seen for as little as

13 milliseconds

less time than it takes for you to blink.

Brain Statistics and Other Fun Facts

100 BILLION

Neurons present in the brain



2.6 MILLION TIMES

How many times Fenway Park would need to be filled to equal the number of neurons on the brain

250 MPH

How fast neurons can send signals from the brain to the body



2.5 TIMES

How much faster the brain is than a 100 mph pitch

100,000 MILES

Length of the blood vessels in the brain



1.5 MILLION

The number of home runs needed to match the length of blood vessels in the brain

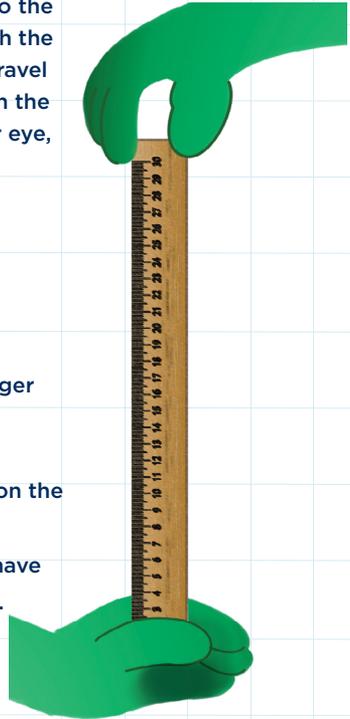
Ruler Reaction Test

HOW DOES THIS WORK?

Our eyes see that the ruler has been dropped and send a signal to the brain, which sends a signal to the muscles in the arm and hand to tell them to catch the ruler. Our body is very clever and these signals travel very, very quickly. Your reaction time depends on the time taken for the signals to travel between your eye, brain and hand.

HOW TO TEST REACTION TIME

1. Hold the top of the ruler with your arm stretched out. Your fingers should be on the highest measurement.
2. Ask a friend to put their thumb and index finger slightly open at the bottom of the ruler, with the ruler between their fingers.
3. Drop the ruler and record the measurement on the ruler where the other persons fingers are.
4. Repeat for all participants. Let each person have three attempts and record the average value.



PERSON 1

DISTANCE ON RULER (CM)	REACTION TIME (SEC.)

PERSON 2

DISTANCE ON RULER (CM)	REACTION TIME (SEC.)