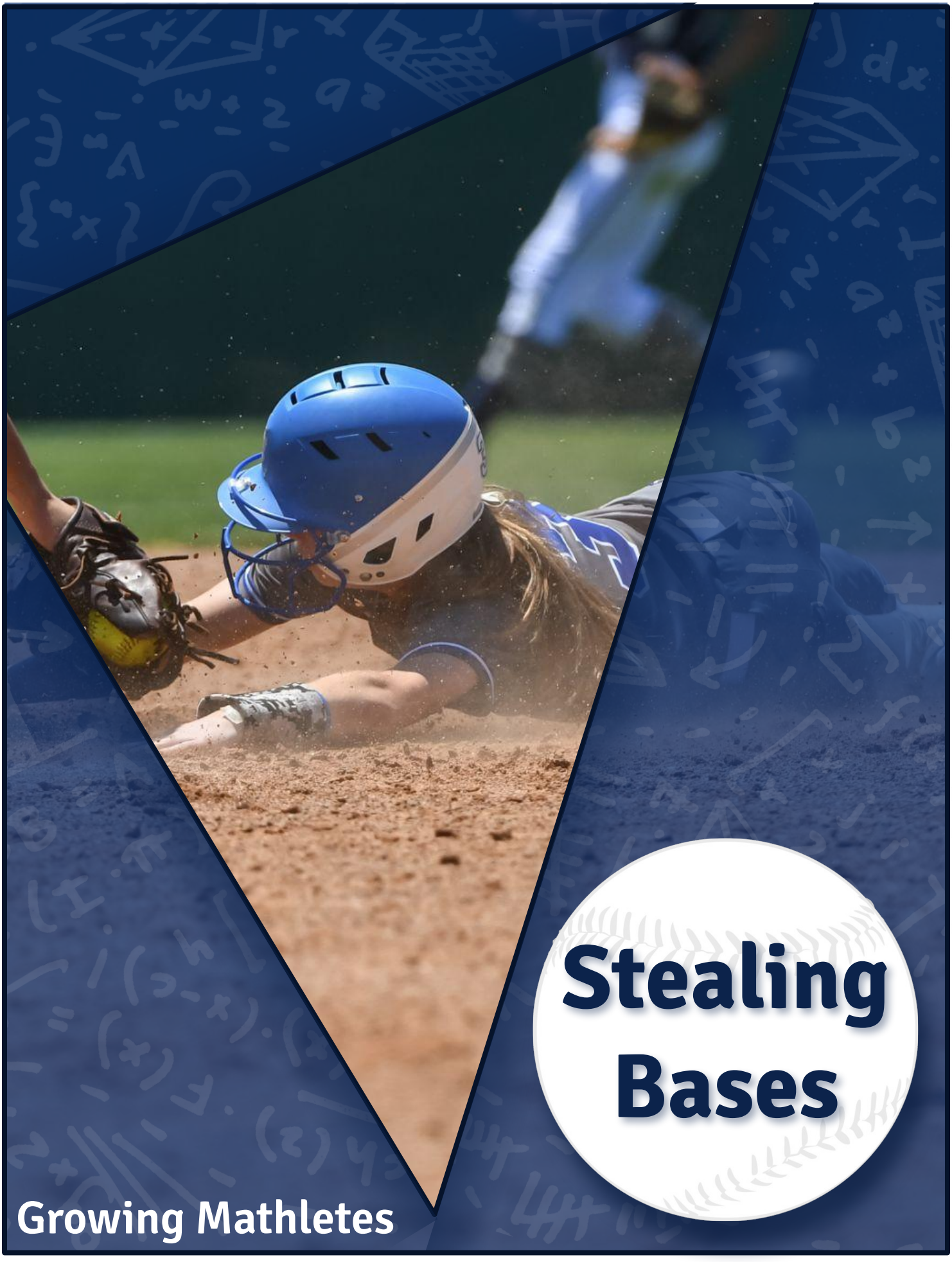


Stealing Bases

Growing Mathletes

Stealing Bases Lesson Overview

Key Ideas in This Session:

Youth explore the mathematical basis for deciding whether or not to steal a base and connect these experiences to other experiences learning a new skill for the first time.

Driving Questions:

1. How do baseball players use math to decide when to steal a base?
2. How do our brains develop connections to make decisions faster through experience?

Math Standards:

4.NF.C.7 Compare two decimals to hundredths by reasoning about their size. Recognize that comparisons are valid only when the two decimals refer to the same whole. Record the results of comparisons with the symbols >, =, or <, and justify the conclusions, e.g., by using a visual model.

4.MD.A.2 Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale.

6.EE.5 Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true? Use substitution to determine whether a given number in a specified set makes an equation or inequality true.

6.EE.8 Write an inequality of the form x > c or x < c to represent a constraint or condition in a real-world or mathematical problem. Recognize that inequalities of the form x > c or x < c have infinitely many solutions; represent solutions of such inequalities on number line diagrams.

Activity	Time	Description
Activity 1	45 minutes	Youth will run the distance from first base to second base three times to find their running time. Then youth will compare their running time to the time to plate and pop time for different baseball teams to decide if they should try to steal a base against those teams.
Activity 2	15 minutes	Youth will learn about how the brain changes when you are posed with a new challenge.

Materials

- Pencils and Markers
- Stopwatch (one per youth pair)
- Baseball bases/cones/place markers (2-4 pairs per whole group)
- Tape measure (to set out bases, 1 per whole group)
- Copy of **Worksheet 1** (1 per youth)

Set-Up

For Activity 1, set up multiple sets of two bases approximately 30-50 feet apart (see Set Up pages for guidance). Make copies of Worksheet 1, and distribute 1 stopwatch to each youth pair.

Growth Mindset Connection
The malleability of the brain.

Instructions for Setting Up Baseball Field (1 of 2)

MLB Infield Dimensions

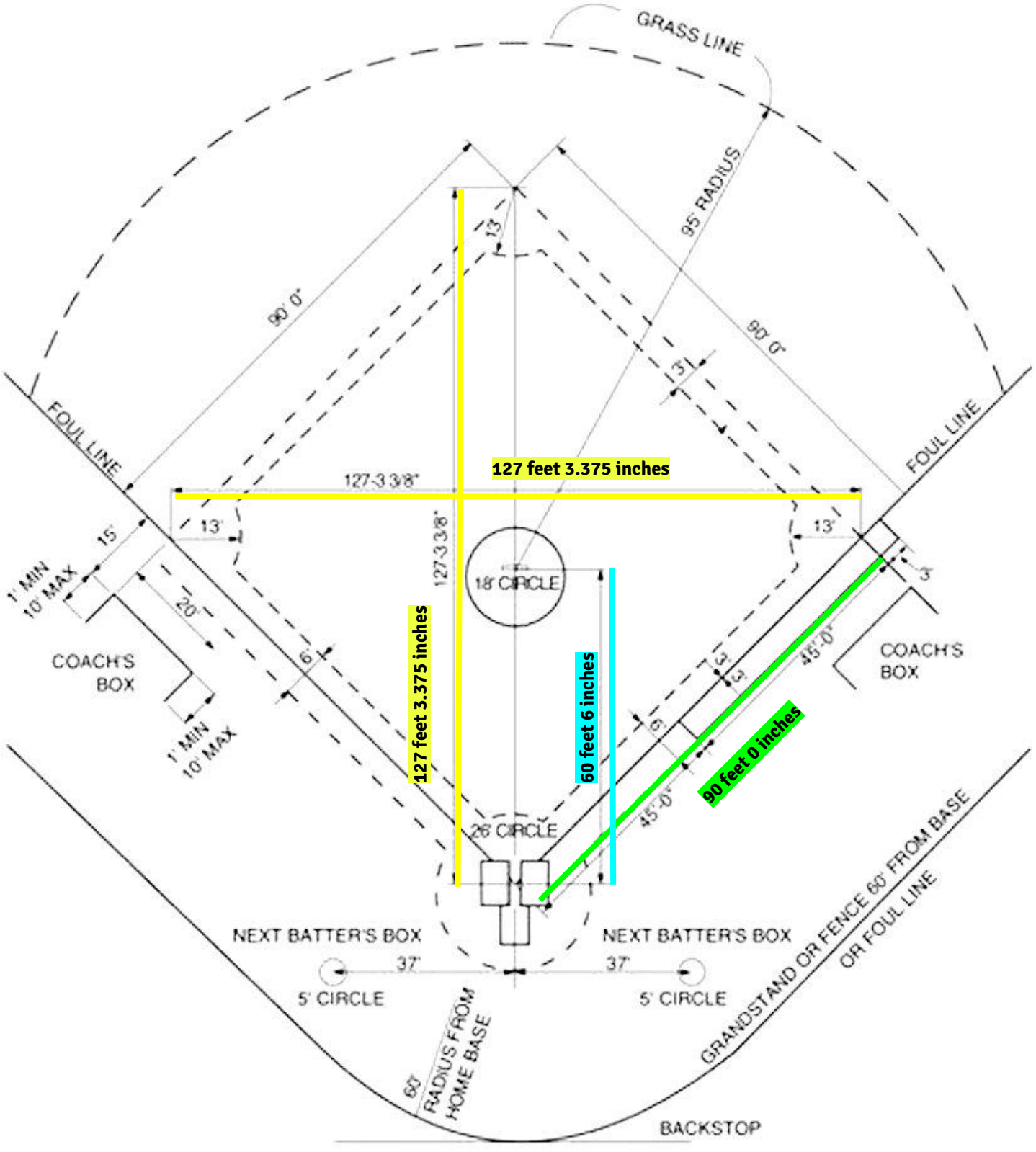


Image Source: https://img.mlbstatic.com/mlb-images/image/upload/mlb/atcjzj9j7wrgvsm8wnjq.pdf

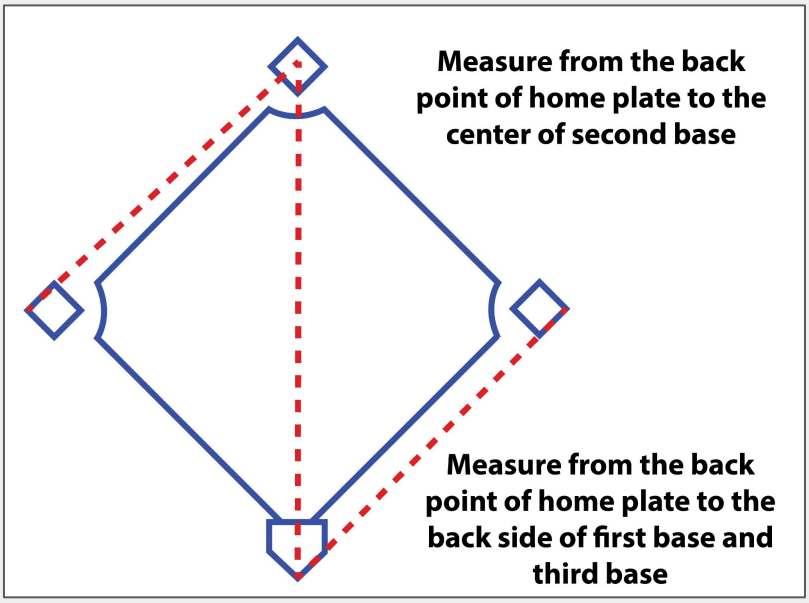
Instructions for Setting Up Baseball Field (2 of 2)

MLB, Little League, and Indoor/Small Space Infield Dimensions Chart

	Distance between Bases	Distance between home plate and pitcher's mound	Distance between home plate and second base
MLB	90 feet	60 feet 6 inches	127 feet 3.375 inches
Little League	60 feet	46 feet	~ 85 feet
Indoor and Small Space Set Up	30 feet	20 feet 2 inches	~ 42 feet

MLB dimensions source: https://www.mlb.com/glossary/rules/field-dimensions

How to Measure Between Bases



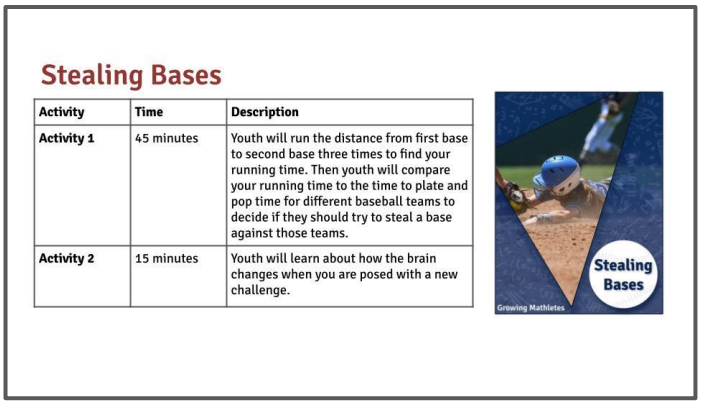
To measure from each base:

Measure from the back point of home plate along the outer edge of first base (1B) and third base (3B) to the far edge.

Measure from the far corner of first or third base (3B) along the outer edge to the center of second base (2B), and from the back point of home plate (HP) to the center of second base (2B).

Stealing Bases Introduction

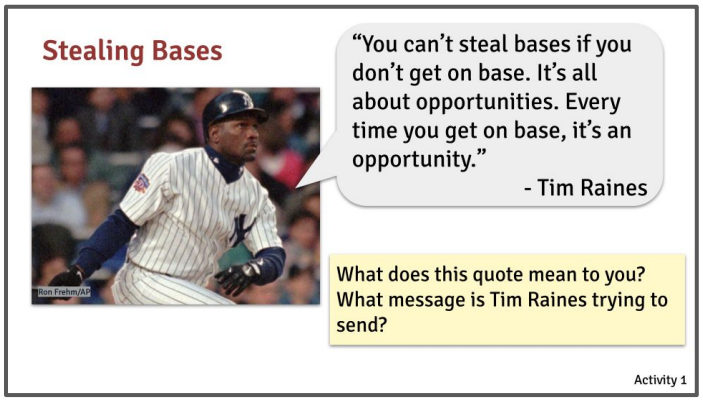
Start the session by providing youth with an overview of the key activities.



Stealing Bases Youth Slides, Slide 1

Next, share and discuss this quote.

"You can't steal bases if you don't get on base. It's all about opportunities.
Every time you get on base, it's an opportunity."
– Tim Raines



Stealing Bases Youth Slides, Slide 2

Activity 1 - Use Running Time to Make Decisions (1 of 7)

Description: Youth work in pairs or groups of three to measure and record their running time between bases and to compare their running times to the time to plate and pop time for different baseball teams to decide if they should try to steal a base against those teams.

Baseball Ideas: The time it takes a runner to get from one base to the next, measured in seconds, is called **running time**. The time it takes for the pitcher to throw to home plate is called **time to plate** and the time it takes the catcher to throw the ball to the second base player is called **pop time**.

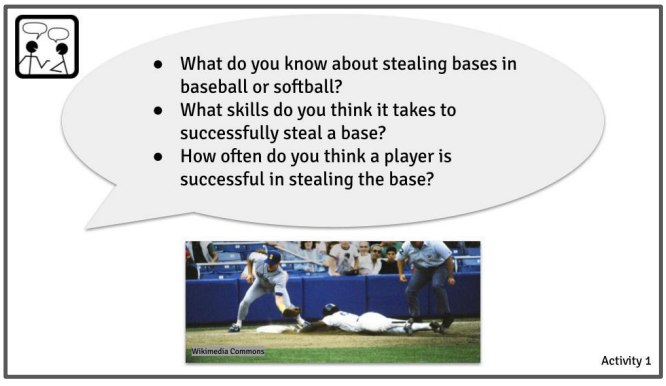
Math Ideas: Rounding and Interpreting Decimals In this lesson, youth may see times recorded in tenths or hundredths of a second. **Discuss how to interpret** each time. For example, 6.21 seconds is 6 seconds and 21 hundredths of a second. 6.21 seconds is more than 6 seconds, but less than 6 and a half seconds. 6.21 **rounded to the nearest tenth of a second** is 6.2 seconds. Another example, 3.6 seconds is 3 and 6 tenths of a second, which is more than 3 seconds, and also more than 3 and a half seconds, but still less than 4 seconds.

Math Ideas: Inequalities An **inequality** compares two values, showing if one value is less than, or greater than, or equal to another value. In this lesson, youth use inequalities to **compare expressions**: they will add time to plate and pop time and then determine if this value is less than or greater than their base running time. Youth will use these inequalities to make a mathematical decision about whether to steal a base:

If your running time < (is less than) time to plate + pop time, go for the steal!

LAUNCH: Connecting to Prior Knowledge Ask youth to share their experience or knowledge about base stealing.

- What do you know about stealing bases in baseball or softball?
- What skills do you think it takes to successfully steal a base?
- How often do you think a player is successful in stealing the base?



Stealing Bases Youth Slides 3

Activity 1 - Use Running Time to Make Decisions (2 of 7)

Background Information:

Show video of base stealing.

Option 1: Fast pitch softball base stealing examples: https://www.youtube.com/watch?v=DSsL1Zk9NF0

Have youth discuss with a partner:

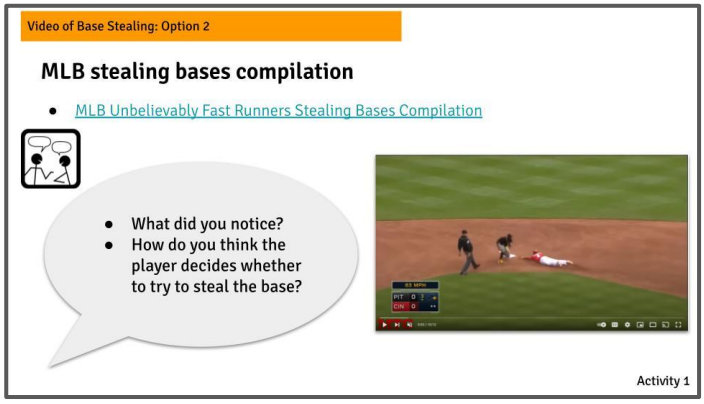
- What did you notice?
- How do you think the player decides whether to try to steal the base?

Option 2: MLB stealing bases compilation: https://www.youtube.com/watch?v=wMzvqYBEcDw

Have youth discuss with a partner:

- What did you notice?
- How do you think the player decides whether to try to steal the base?

Stealing Bases Youth Slides, Slide 4

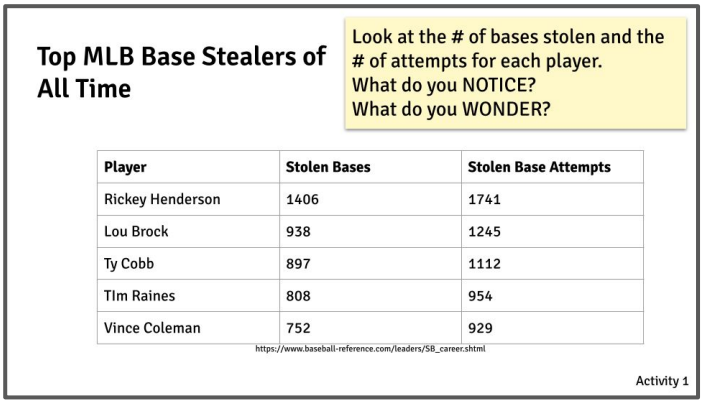


Stealing Bases Youth Slides, Slide 5

Share the list of top base stealers of all time in the MLB (Youth Slide 6). Ask youth what they NOTICE, and what they WONDER about the relationship between the # of bases stolen and the # of attempts. Some potential youth noticings may include:

- *Players make most of the base steals that they attempt.*
- *Players make more than half of the base steals that they attempt.*
- *Only one player has stolen a base over 1000 times .*
- *Some players try to steal bases a lot!*

NOTE: The success rate is approximately 67%.



Stealing Bases Youth Slides, Slide 6

Activity 1 - Use Running Time to Make Decisions (3 of 7)

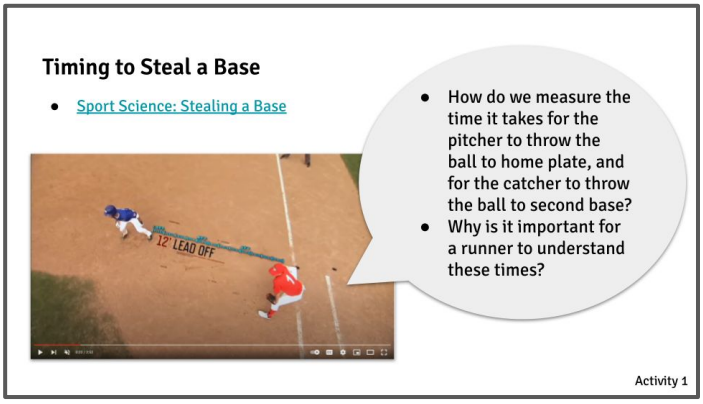
Background Information: (Cont.)

Show video explaining base stealing -

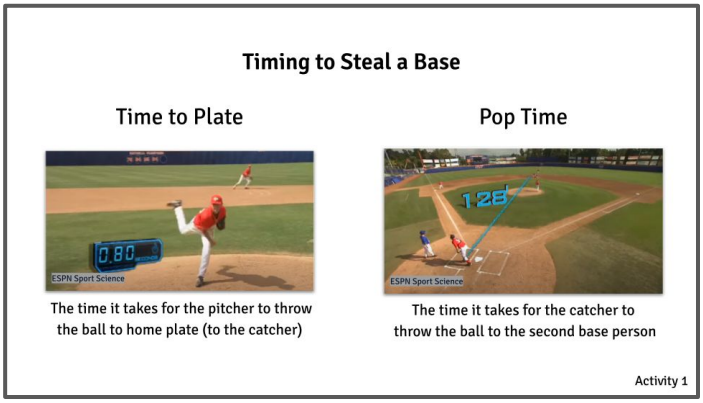
Sport Science: Stealing a Base: https://www.youtube.com/watch?v=xgz5-XToJIw

Ask youth to discuss:

- How do we measure the time it takes for the pitcher to throw the ball to home plate, and for the catcher to throw the ball to second base? (*Time to plate and pop time, respectively.*)
- Why is it important for a runner to understand these times? (*If a runner's running time is less than the time to plate plus the pop time, they are likely to be able to steal second base. If their running time is greater, then they will probably not be successful.*)



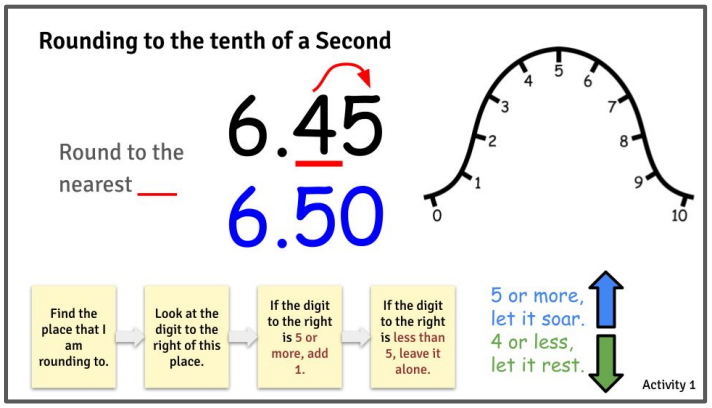
Stealing Bases Youth Slides, Slide 7



Stealing Bases Youth Slides, Slide 8

Measuring Time to the Nearest Tenth of a Second

To help youth record their running times, encourage them to round their running time to the nearest tenth of a second (Youth Slide 9). Use "5 or more, let it soar; 4 or less, let it rest" to help them understand when to round up or down.



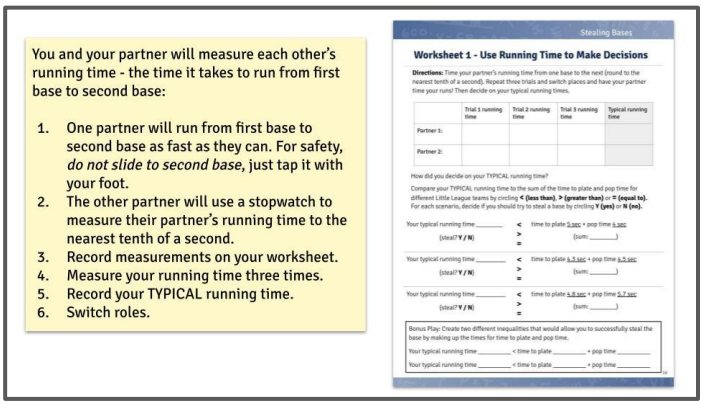
Stealing Bases Youth Slides, Slide 9

Activity 1 - Use Running Time to Make Decisions (4 of 7)

Partner Activity: Timing Your Run

Ask youth to work with a partner to measure their ***running time*** – the time it takes to run from first base to second base. Model strategies to reduce running time such as pushing off from the base, pumping your arms, etc. For safety, tell youth they will *not* be sliding but should tap the second base with their foot. Youth will record their running times *to the nearest tenth of a second* over three trials on **Worksheet 1**.

Safety Tips:
If outside, think about weather, shade, and access to water.
Time Tip: students can run at the same time side by side, rather than one pair at a time!

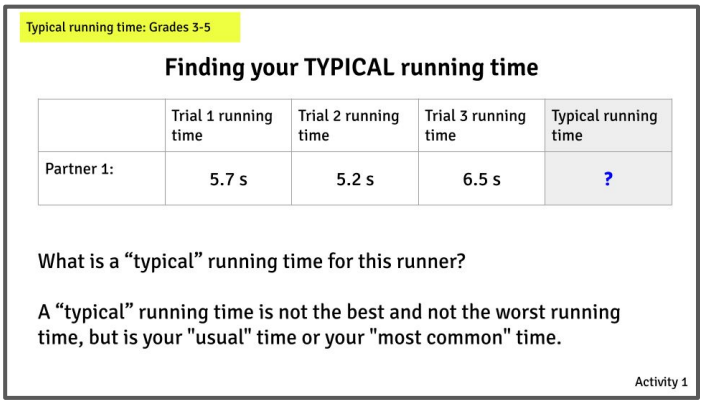


Stealing Bases Youth Slides, Slide 10

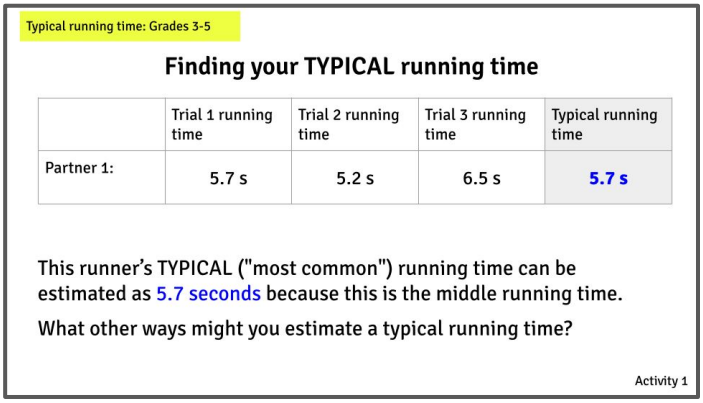
Demonstrate: Finding Typical Running Time

Youth will record a time that best reflects their **typical** running time. Your typical running time is the time that best shows how long it usually takes you to run from home to first base. Your typical time is not your "best ever" time or "worst ever" time. Your typical time is your "most common" time. It is most likely between your "best" and your "worst" times. Youth in grades 3-5 might select their typical running time by using the middle recorded time, or selecting a time midway between the fastest and longest running time. Allow youth to apply their own reasoning by **asking:**

- What other ways might you estimate a typical running time?



Stealing Bases Youth Slides, Slide 11

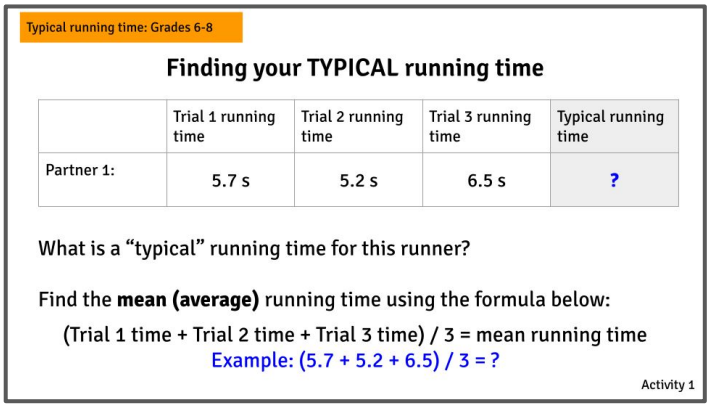


Stealing Bases Youth Slides, Slide 12

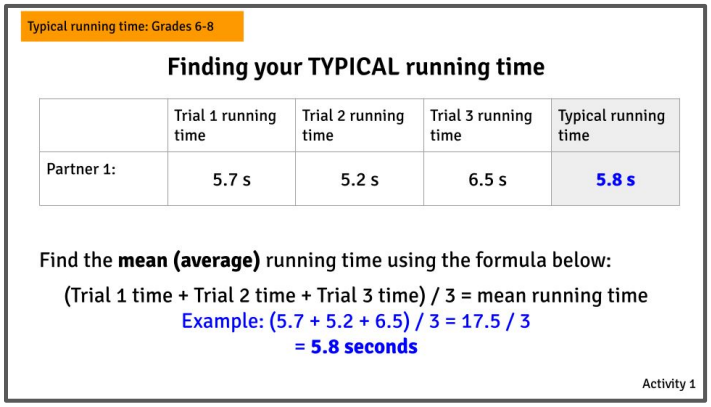
Activity 1 - Use Running Time to Make Decisions (5 of 7)

Demonstrate: Finding Typical Running Time (Cont.)

For youth in grades 6-8, ask youth to calculate their **mean** (average) running time. To do this, youth will add up all of their running times then divide the total by three (the number of recorded running times) Use Slides 13-14 to support youth understanding.



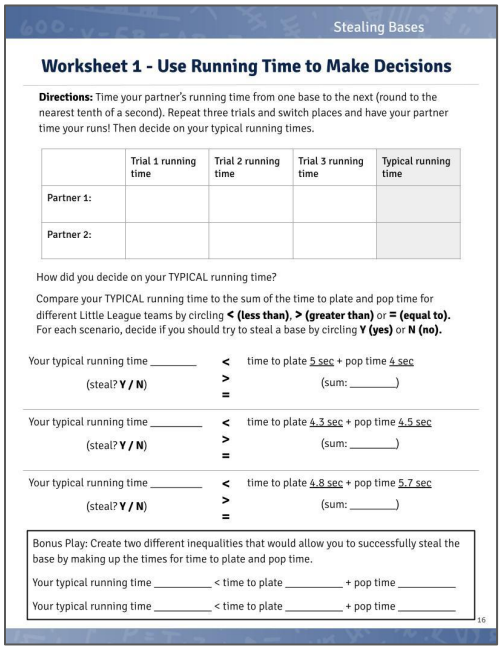
Stealing Bases Youth Slides, Slide 13



Stealing Bases Youth Slides, Slide 14

Partner Activity: Comparing Running Time to Time to Plate + Pop Time

Youth will decide whether or not they would try to steal a base against different teams based on their own running time on **Worksheet 1**.



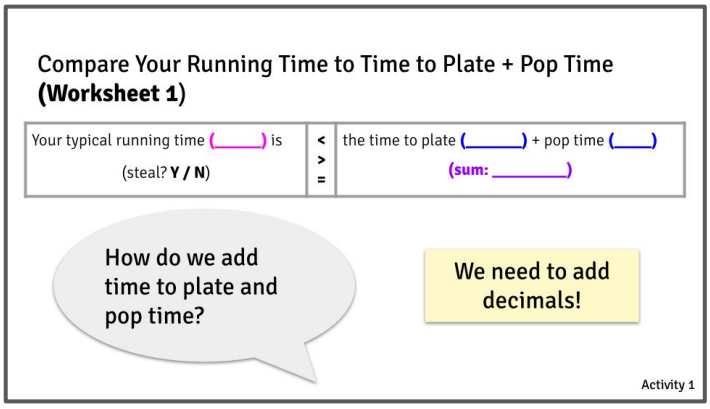
Worksheet 1

Activity 1 - Use Running Time to Make Decisions (6 of 7)

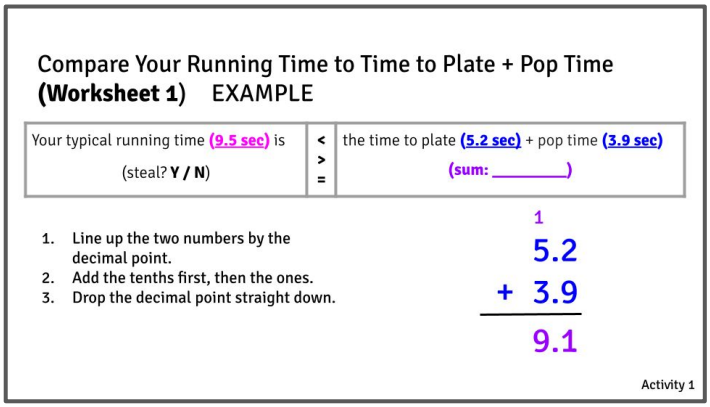
Partner Activity: Comparing Running Time to Time to Plate + Pop Time (Cont.)

Use the example provided to support youth understanding of adding decimals (Youth Slides 15-16) and to explain the comparison between a player's running time to the sum of the time to plate plus pop time (Youth Slide 17). If the running time is less than the sum of the time to plate plus the pop time, the runner has a good chance of stealing the base and should go for it! In the example given on Youth Slides 16-17, there is a typically running time of 9.5 seconds. If a pitcher's time to plate is 5.2 seconds, and a catcher's pop time if 3.9 seconds, the sum of the time to plate and pop time is 9.1 seconds.

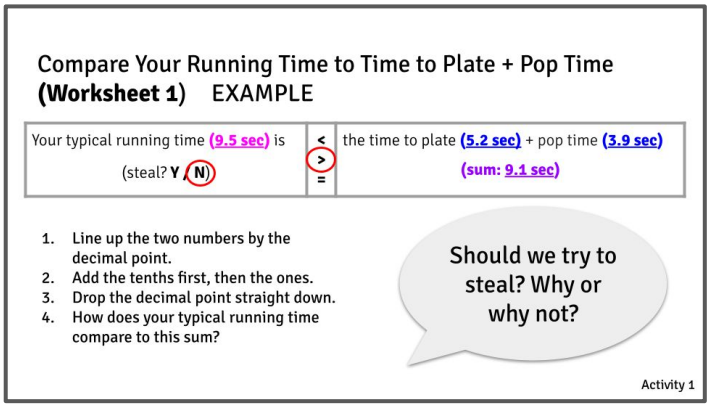
- Should we try to steal? Why or why not? (*No, because the ball will reach the second baseperson in 9.1 seconds. The running time is greater than this time, so the runner will not reach second base before the ball.*)



Stealing Bases Youth Slides, Slide 15



Stealing Bases Youth Slides, Slide 16

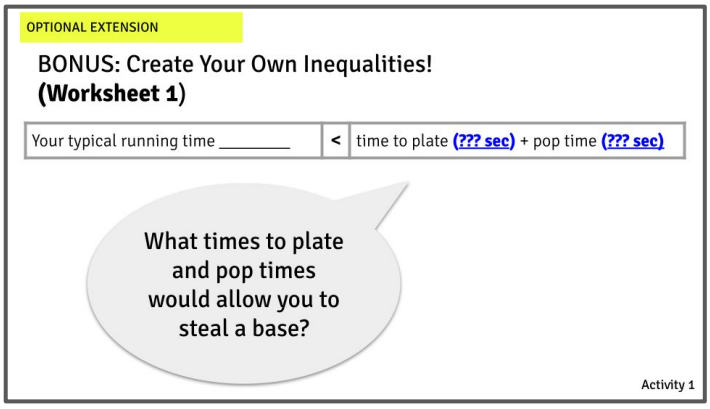


Stealing Bases Youth Slides, Slide 17

Activity 1 - Use Running Time to Make Decisions (7 of 7)

Extension (Optional): Bonus Play

Older youth may create two different inequalities that would allow them to successfully steal the base by making up the times for the pitcher's time to plate and catcher's pop time (**Worksheet 1**).

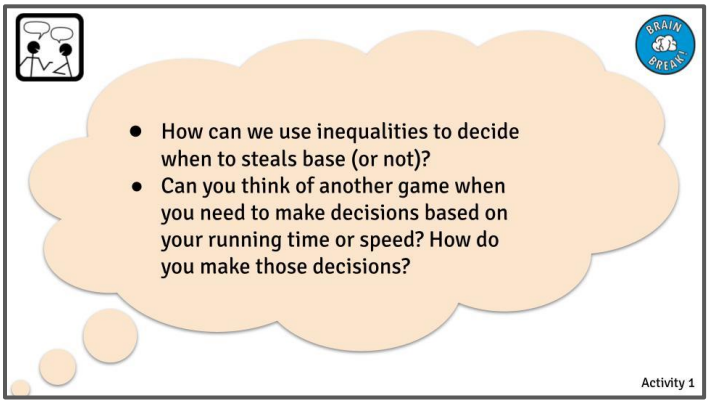


Stealing Bases Youth Slides, Slide 18

Reflection Questions:

Wrap up the activity with a reflective discussion about the concepts in the activity and the driving questions for the lesson.

- How can we use inequalities to decide when to steals base (or not)?
- Can you think of another game when you need to make decisions based on your running time or speed? (*E.g., flag football, capture the flag, riding a bike across the street*)
- How do you make those decisions?



Stealing Bases Youth Slides, Slide 19

Activity 2 - Growth Mindset Connection (1 of 3)

Description: In this activity, youth will learn about and discuss the malleability of the brain in relation to the skills and math knowledge needed to successfully steal bases.

Growth Mindset Connection: We can learn to make decisions "on the fly" based on experience and develop stronger neural pathways through repetition. Our brains learn to perform actions and make decisions faster through developing connections (synapses) in our brains. This is the scientific support of the phrase "practice makes progress."

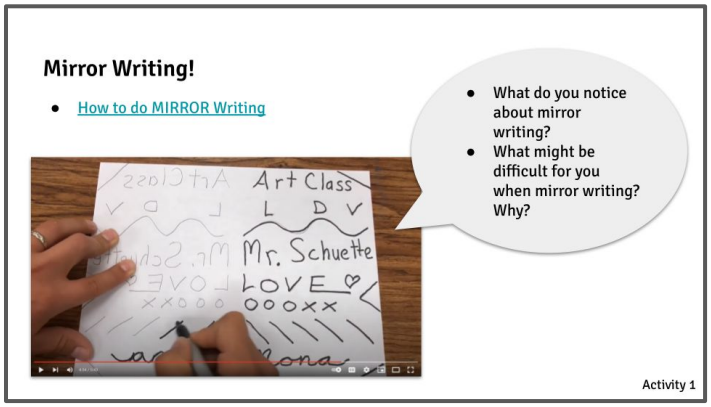
Demonstrate: Mirror Writing

Base stealing is one example of learning a new skill. There are many things to consider, and at first it may feel challenging to think about all the math components and to do the physical movements that it takes. But over time, with practice, it can get easier. Here is another activity that might be a new a new skill for most of the youth. Show the following video to introduce mirror writing:

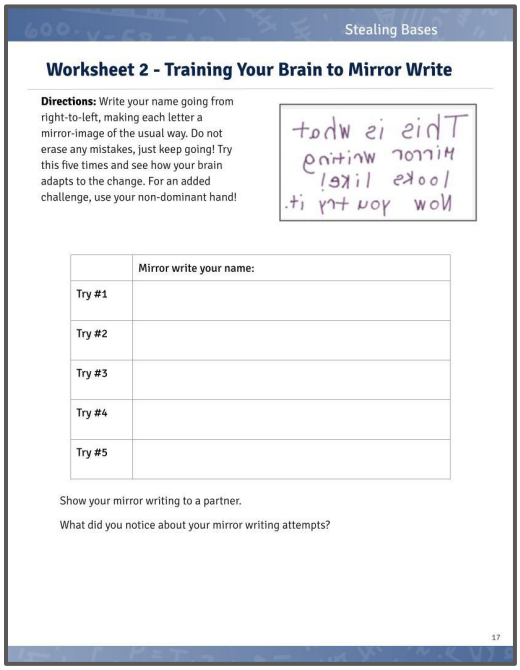
How to do MIRROR Writing EASY: https://www.youtube.com/watch?v=UGZjgmDpw-0 [0:00-4:55]

Discuss with youth:

- What do you notice about mirror writing?
- What might be difficult for you when mirror writing? Why?



Stealing Bases Youth Slides, Slide 20



Worksheet 2

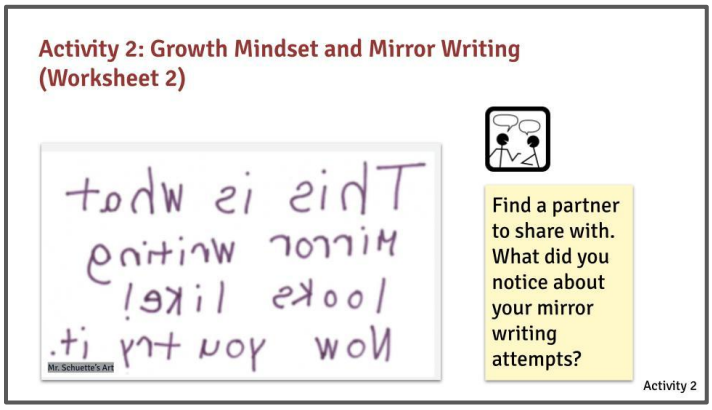
Activity 2 - Growth Mindset Connection (2 of 3)

Partner Activity: Mirror Writing

On **Worksheet 2**, youth will practice "mirror writing" their name. For youth who struggle with symbol inversion, they may also try to draw a simple object, such as a dog facing the right, then try to draw the same dog facing the left with their non-dominant hand. Demonstrate mirror writing your own name, then **ask youth to practice:**

1. Mirror write your name/drawing
2. Show your partner
3. Do it again 4 times.
4. Show your partner.

What do you notice about your mirror writing attempts?



Stealing Bases Youth Slides, Slide 21

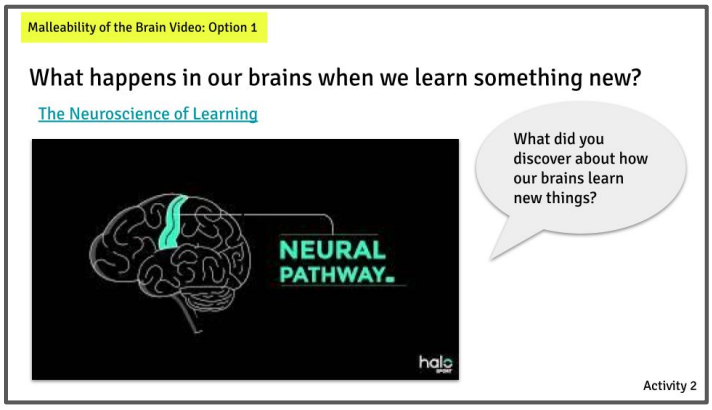
Growth Mindset Concepts

Show youth one of the two videos below and then discuss the connections between how our brains grow better pathways when developing skills.

Option 1: The Neuroscience of Learning *[NOTE: this is also used in the Base Running Lesson, so use option 2 if you are also facilitating that lesson.]*

Discuss with youth:

- What did you discover about how our brains learn new things?



Stealing Bases Youth Slides, Slide 22

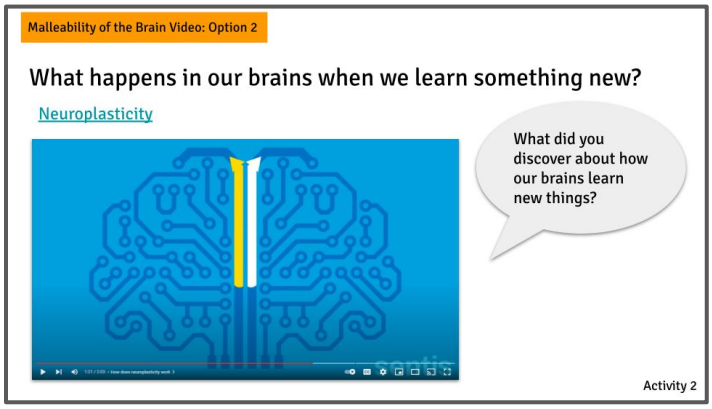
Activity 2 - Growth Mindset Connection (3 of 3)

Growth Mindset Concepts (Cont.)

Option 2: Neuroplasticity

Discuss with youth:

- What did you discover about how our brains learn new things?

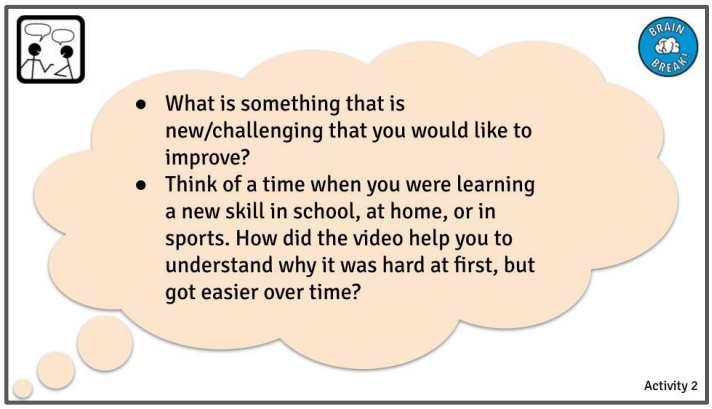


Stealing Bases Youth Slides, Slide 23

Closure Reflection Questions:

Wrap up the activity with a reflective discussion about the concepts in the activity and the driving questions for the lesson.

- **What is something that is new/challenging that you would like to improve?**
- Think of a time when you were learning a new skill in school, at home, or in sports.



Stealing Bases Youth Slides, Slide 24

How did the video help you to understand why it was hard at first, but got easier over time?

Worksheet 1 - Use Running Time to Make Decisions

Directions: Time your partner's running time from one base to the next (round to the nearest tenth of a second). Repeat three trials and switch places and have your partner time your runs! Then decide on your typical running times.

	Trial 1 running time	Trial 2 running time	Trial 3 running time	Typical running time
Partner 1:				
Partner 2:				

How did you decide on your TYPICAL running time?

Compare your TYPICAL running time to the sum of the time to plate and pop time for different Little League teams by circling **< (less than)**, **> (greater than)** or **= (equal to).** For each scenario, decide if you should try to steal a base by circling **Y (yes)** or **N (no).**

Your typical running time _____ (steal? **Y / N**) **< > =** time to plate 5 sec + pop time 4 sec (sum: _____)

Your typical running time _____ (steal? **Y / N**) **< > =** time to plate 4.3 sec + pop time 4.5 sec (sum: _____)

Your typical running time _____ (steal? **Y / N**) **< > =** time to plate 4.8 sec + pop time 5.7 sec (sum: _____)

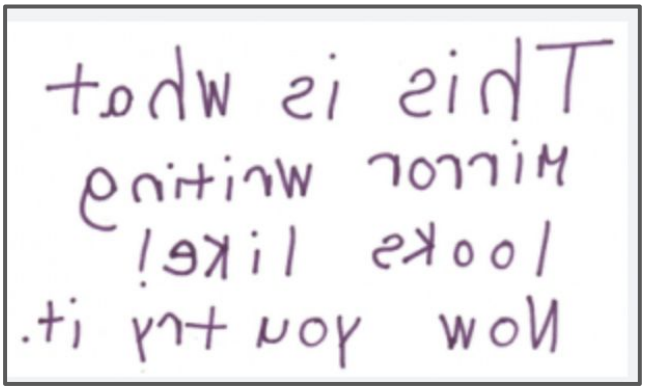
Bonus Play: Create two different inequalities that would allow you to successfully steal the base by making up the times for time to plate and pop time.

Your typical running time _____ < time to plate _____ + pop time _____

Your typical running time _____ < time to plate _____ + pop time _____

Worksheet 2 - Training Your Brain to Mirror Write

Directions: Write your name going from right-to-left, making each letter a mirror-image of the usual way. Do not erase any mistakes, just keep going! Try this five times and see how your brain adapts to the change. For an added challenge, use your non-dominant hand!



	Mirror write your name:
Try #1	
Try #2	
Try #3	
Try #4	
Try #5	

Show your mirror writing to a partner.

What did you notice about your mirror writing attempts?