GROWING MATHLETES

Math, Growth Mindset, and Sports

MEAD
January 21, 2023

Introductions

Erin Turner, Professor of Teaching, Learning and Sociocultural Studies

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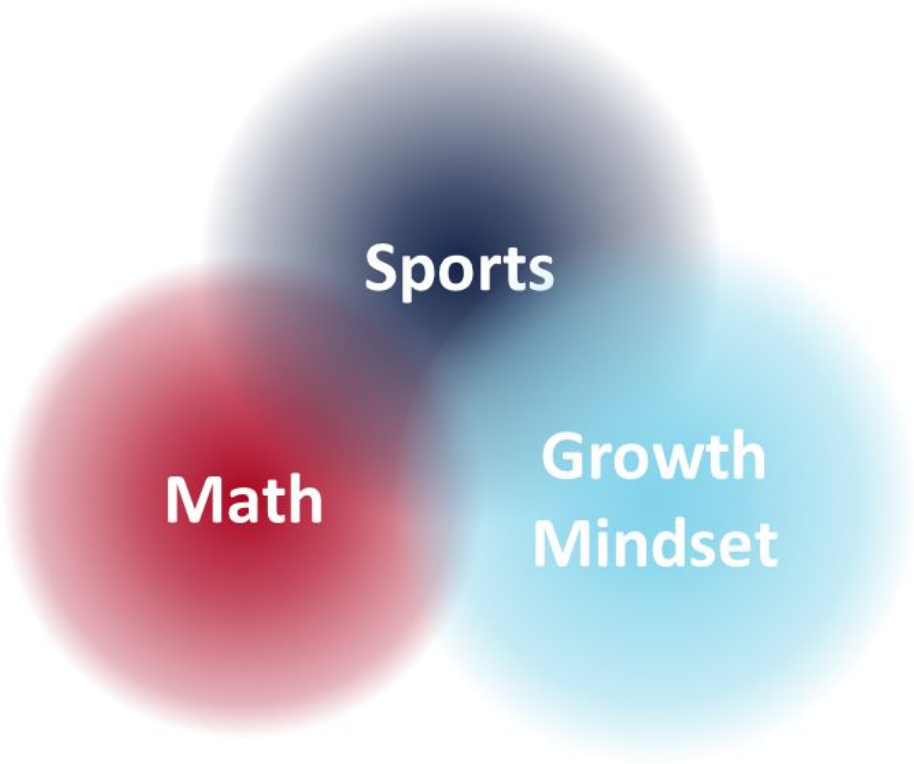
Christina Baze, Assistant Research Professor, Systems & Industrial Engineering

Ricardo Valerdi, Professor of Systems & Industrial Engineering

Briefly introduce yourselves!

Name, role, grade level/specialty, what you hope to get from this presentation

The Curriculum



Three content areas integrated in all lessons

Overview of Sample Lessons

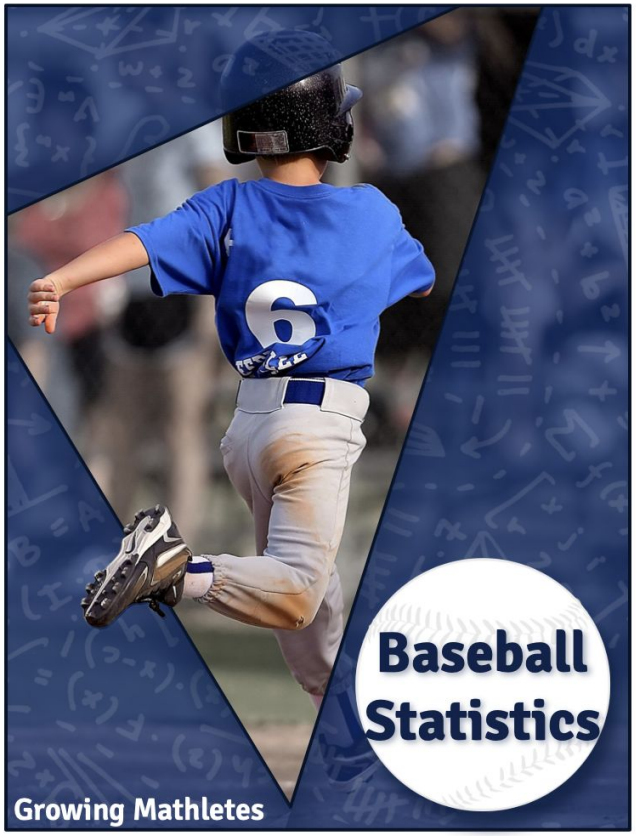
Baseball Statistics	Wingspan and Height	Base Running
Baseball Concept: ● Hits (H), at bats (AB), and batting average (BA)	Baseball Concept: ● Wingspan is the length of both of your arms from fingertips to fingertips	Baseball Concept: ● Straight and banana running paths
Math Concepts: ● Averages ● Fractions, decimals, and percents	Math Concepts: ● Measurement of length ● Scatterplots	Math Concepts: ● Measuring time ● Line plots
Growth Mindset Concepts: ● The value of mistakes in supporting learning ● Malleability of the brain and the role of struggle in learning	Growth Mindset Concept: ● The power of effort and persistence	Growth Mindset Concept: ● Malleability of the brain and the role of struggle in learning

Overview of Sample Lessons

Strike Zone	Baseball Field Geometry	Fielding Percentage
Baseball Concept: ● The strike zone is where the pitcher aims Math Concept: ● Calculating area Growth Mindset Concept: ● The value of mistakes in supporting learning	Baseball Concept: ● Each baseball outfield has unique dimensions Math Concept: ● Measuring distances and angles Growth Mindset Concept: ● Malleability of the brain and the role of struggle in learning	Baseball Concept: ● Fielding percentages Math Concept: ● Fractions, decimals, and percents Growth Mindset Concepts: ● The value of mistakes in supporting learning ● The power of effort and persistence

Baseball Statistics and Modeling Batting Average

Activity	Description
Activity 1 Baseball Cards and Batting Average Line Up	Youth explore baseball cards and learn about batting average. Youth compare batting averages of different players and order the batting averages from least to greatest.
Activity 2 Learning from Mistakes and Growing our Brains	Youth will reflect on mistakes they have made recently, and learn about how mistakes make their brains grow!
Activity 3 Modeling Batting Average	Youth complete different probability activities such as flipping a coin, rolling two dice, and selecting a colored counter. Youth record specific outcomes for each activity using fractions, decimals and percents and reason about which activity best represents a typical batting average in MLB, college, and youth baseball.

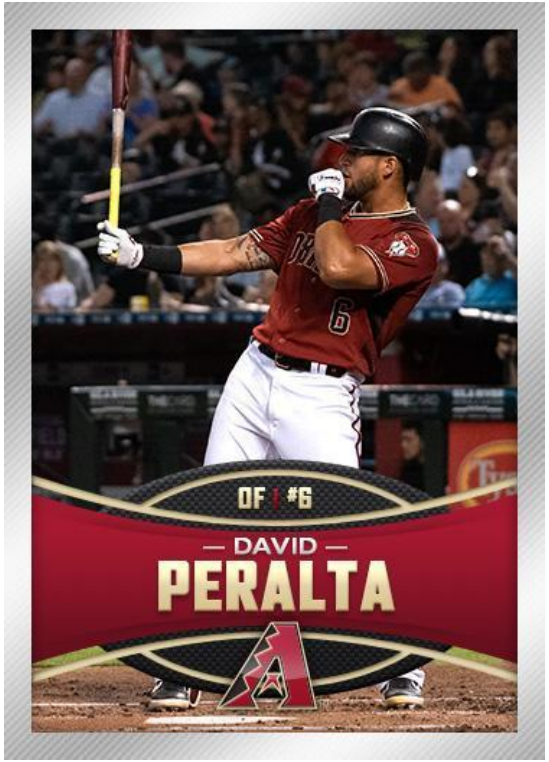


Baseball Statistics

What does this quote mean to you? What message is Michael Jordan trying to send?

I've missed more than 9,000 shots in my career. I've lost almost 300 games. 26 times, I've been trusted to take the game-winning shot and missed. I've failed over and over and over again in my life. And that is why I succeed.
-Michael Jordan

https://www.britannica.com/biography/Michael-Jordan



DAVID PERALTA | OF **#6**

Ht: 6'3 Wt: 245 Bats: Right Throws: Right
Born: 8-14-87, Valencia, Venezuela

Signed by D-backs as a Minor League free agent (July 3, 2013). He and his wife, Jordan, welcomed their first child, Sofia, on Aug. 14, 2017, also David's 30th birthday. Has a cat named Maximus. Named after a character from his favorite movie, "Gladiator."

YR	TEAM	G	AB	R	H	2B	3B	HR	RBI	SB	BB	SO	SLG	AVG
15	D-BACKS	109	462	61	144	26	9	8	78	6	44	107	.450	.312
16	D-BACKS	159	567	103	182	38	2	33	110	21	118	151	.570	.321
17	D-BACKS	158	579	106	172	33	3	24	95	32	110	150	.489	.297
18	D-BACKS	155	558	117	166	34	3	36	120	18	94	147	.563	.297
MLB TOTALS	2013-2018	578	2080	288	614	110	32	74	277	29	159	433	.486	.293

dbacks.com

Look at your baseball card for a FIELD PLAYER.

- Can you find the player's team?
- Can you find the player's position?
- What other important information do you see on the card?
- What information is given with whole numbers? With decimals?

Share what you notice with a partner.

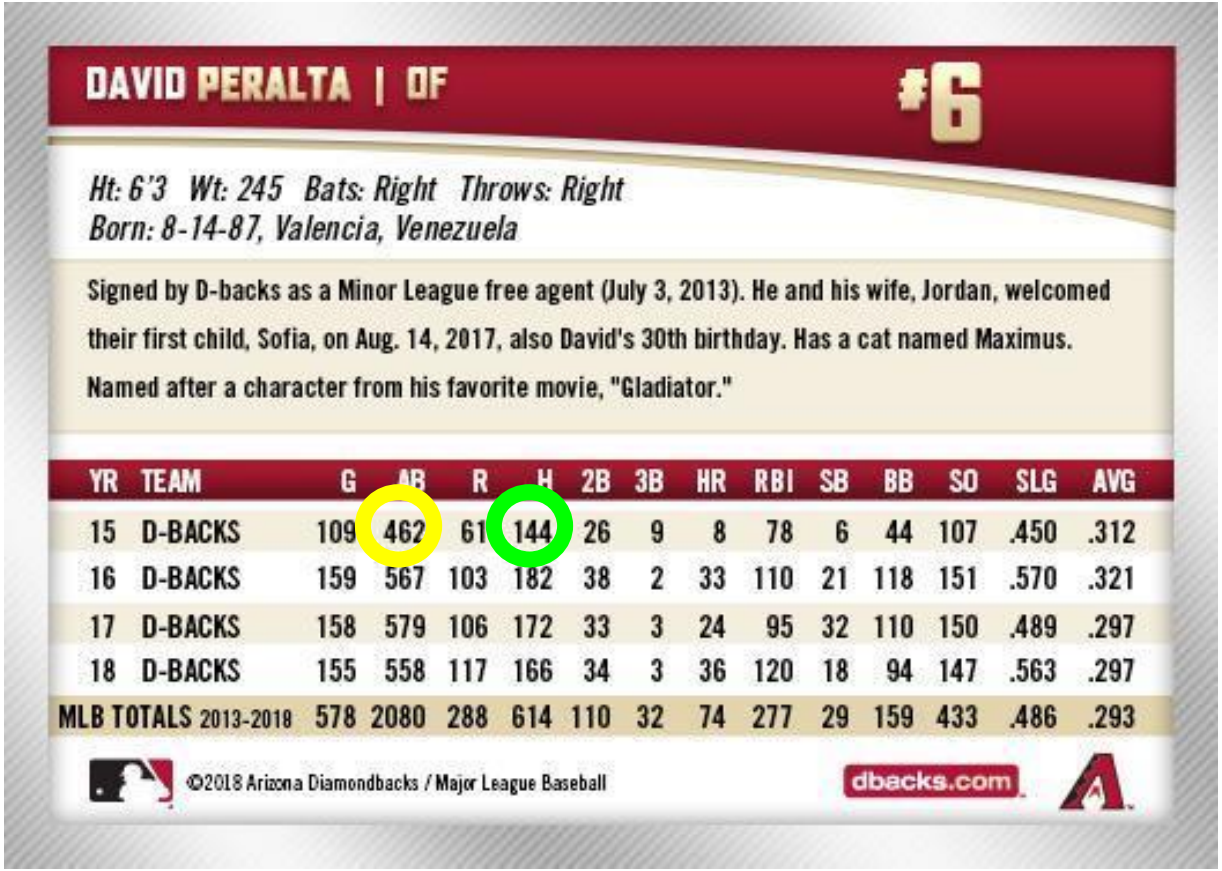
Activity 1

Reading the Back of a Baseball Card

AB means "AT BATS"
This is the number of times the player comes to the plate and this results in a hit, or an error, or a non-sacrifice out.

H means "HITS"
This is the number of times the player hit the ball and did not get out.

What do you notice about your player's **AB** and **H**?



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dbacks.com

Comparing Baseball Statistics

Find a partner.

Compare the **AT BATS (AB)** and the **HITS (H)** on your cards.

Which player has more at bats?

Which player has more hits?

Which player has the **most Hits (H)** of all the players in the room?

Which player has the **most At Bats (AB)** of all the players in the room?

Activity 1

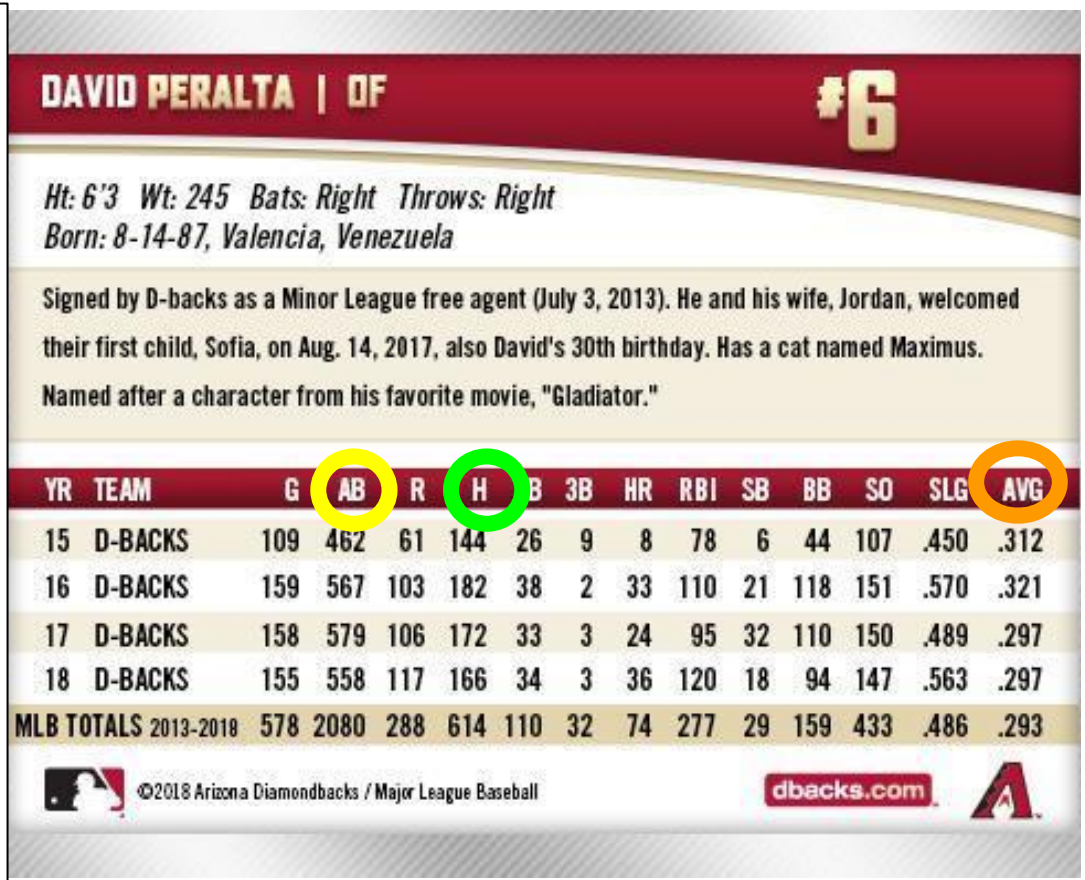
AVG or BA means "Batting Average"

You find the batting average by dividing the number of "Hits" by the number of "At Bats"

$$\text{Batting Average} = \frac{\text{Hits}}{\text{Atbats}}$$

What is your player's **AVG or BA?**

- What year did Peralta have the highest batting average?
- Is your player's batting average higher or lower than Peralta's?



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dbacks.com

Batting Average = $\frac{\text{Hits}}{\text{Atbats}}$

Suzie got 4 hits, out of 10 at bats.
What is her batting average?

$\frac{4}{10}$ = 0.4 or 0.400

4 tenths 400 thousandths

Andre got 3 hits, out of 10 at bats.
What is his batting average?

$\frac{3}{10}$ = 0.3 or 0.300

3 tenths 300 thousandths

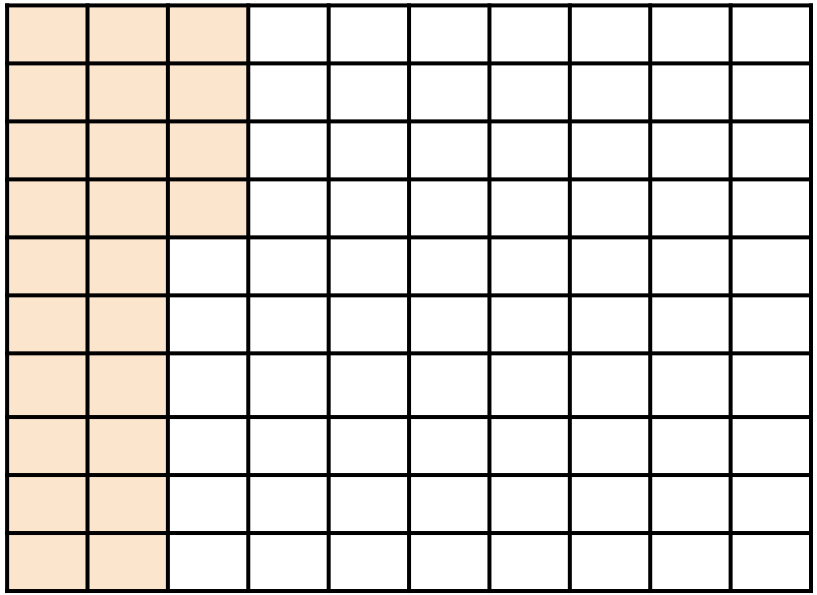
Emmet has 24 hits of 100 at bats.
What is his batting average?

Selena has 31 hits of 100 at bats.
What is her batting average?

$$\frac{24}{100} = 0.24 = 0.240$$

24 hundredths

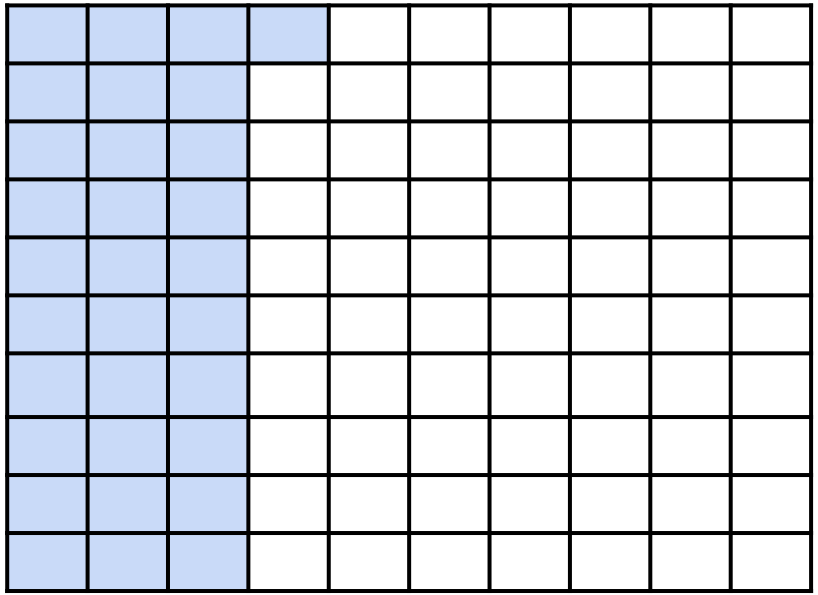
240 thousandths



$$\frac{31}{100} = 0.31 = 0.310$$

31 hundredths

310 thousandths

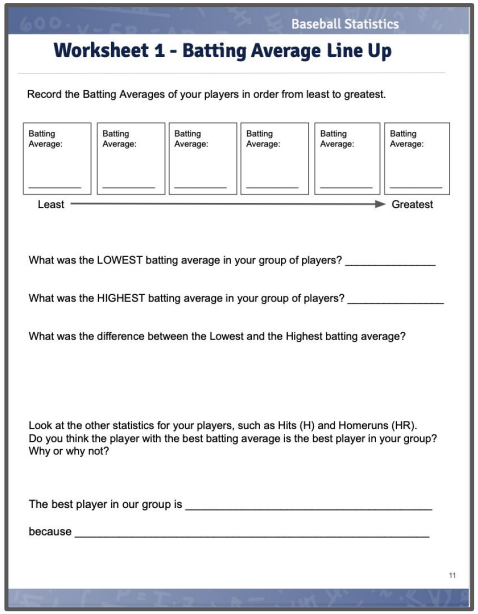


Activity 1

Small Group Activity: Batting Average Line Up

Each person needs 1 baseball card.
Find each player's Batting Average.
Place your baseball player cards in order from the **Least/Lowest Batting Average** to the **Greatest/Highest Batting Average.**

Record your Line Up on Worksheet 1.



Baseball Statistics

Worksheet 1 - Batting Average Line Up

Record the Batting Averages of your players in order from least to greatest.

Batting Average:	Batting Average:	Batting Average:	Batting Average:	Batting Average:	Batting Average:
_____	_____	_____	_____	_____	_____

Least → Greatest

What was the LOWEST batting average in your group of players? _____

What was the HIGHEST batting average in your group of players? _____

What was the difference between the Lowest and the Highest batting average?

Look at the other statistics for your players, such as Hits (H) and Homeruns (HR). Do you think the player with the best batting average is the best player in your group? Why or why not?

The best player in our group is _____

because _____

11

Worksheet 1

Player 1	Player 2	Player 3	Player 4	Player 5	Player 6
BA: _____	BA: _____	BA: _____	BA: _____	BA: _____	BA: _____

Lowest Batting Average

Highest Batting Average

Activity 1

Whole Group Activity: Batting Average Line Up

Who has a player with a batting average between 0.200 and 0.250?

Who has a player with a batting average between 0.250 and 0.300?

Who has a player with a batting average above 0.275 but less than the highest batting average?

Who has a player with a batting average greater than the lowest batting average, but still less than .0225?

Who has the player with the lowest batting average?

Who has the player with the highest batting average?

Activity 1

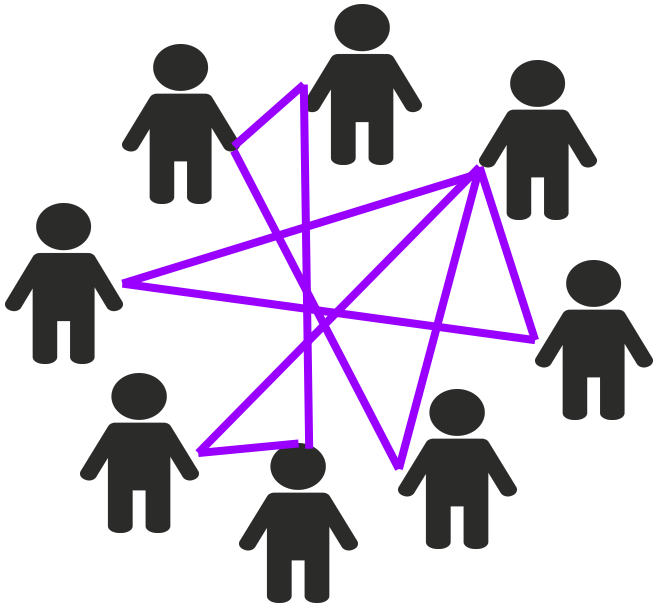
https://www.baseballamerica.com/stories/home-runs-strikeouts-and-low-averages-are-trending-throughout-baseball/

Mistakes are expected in baseball.

What kind of mistakes do you think batters make?

How do you think baseball players learn from their mistakes at bat?

- Stand in a circle with 5-6 peers. One person in your group will start with the ball of yarn.
- Next, you will listen to a scenario about a situation at school or in sports.
- As you listen, think about the mistake in the scenario and what the person could do or say or think to themselves to learn from the mistake.



Activity 2

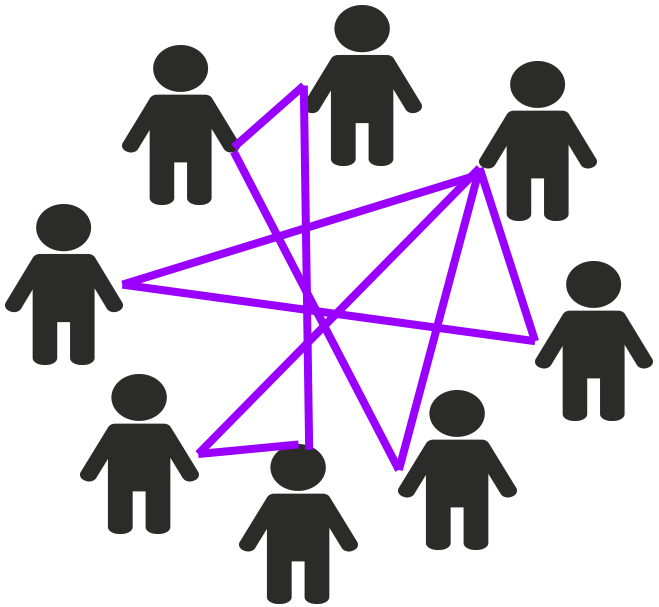
Scenario #1

Keith had a hard night at baseball practice. He was working on his throw, and trying to throw faster to his teammate.
But his aim was off!
He threw the ball too wide, and then too short. He ended the practice and thought, “I keep messing up. I just can’t throw the ball.”
What should Keith do?

- The person holding the yarn will share one idea about what Keith could do or say or think to learn from the mistake.
- Next, the person with the ball of yarn will hold the end of the string, and pass the ball of yarn to another person in the group.
- Then that person shares a different idea about what Keith could do, or say, or think to learn from the mistake, and then holds the string and balls the yarn to a new group member.
- Continue until 3 or 4 group members have shared ideas about Keith's scenario.

Then get ready for a new scenario!

- After each scenario, 3 or 4 group members will pass the yarn and then share ideas about what the person in the scenario could do or say to learn from the mistake.
- Remember to keep holding the yarn and to pass it carefully and slowly so that it does not fall.



Activity 2

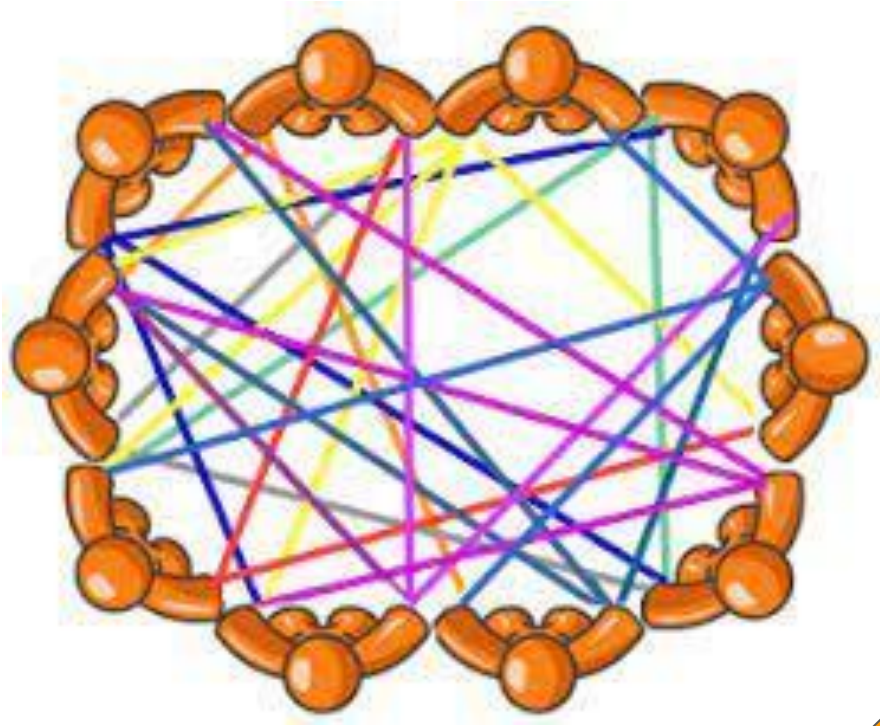
Scenario #4

Julio was checking his math homework with his friend Henry. On the fraction addition problem, Henry had a different answer. Julio was trying hard to figure out how to add the fractions, but this was a new concept and he still had a lot of questions. Henry told him, “just erase your answer and copy mine, then you’ll get it right!” What should Julio do?

What do you notice about our web?

Many lines!

Lots of connections!



This is what happens in our BRAIN!

Mistakes help us make new connections and learn…

Watch How our Brains Grow When We Make Mistakes!

[Mindset Matters]

https://www.youtube.com/watch?v=9HEg-ftMEFA

Activity 2

Share with a partner:

What did you learn from this video?

Activity 2

What strategies can you use to learn and grow from mistakes in sports, or in school?

Activity 2

You will record the outcomes of different activities and then think about how the outcomes relate to batting average…

Modeling Batting Average……

Which activity is a model of a good batting average in youth baseball?

Which activity is a model of a good batting average in highschool or college baseball?

Which activity is a model of a good batting average in the MLB?

Station 1: Spin a Coin

- Take a quarter and spin it on an edge.
- When the quarter lands flat on the table, record if it lands with “heads” up or “tails” up.
- Repeat 10 times.

How many times did the coin land on heads?

Can you show the number of times out of 10 that the coin handed on “heads” as a:

- **FRACTION**
- **DECIMAL**
- **PERCENT**

Station 2: Rolling 2 Dice

- Roll 2 dice and notice what numbers you roll.
- Record whether you roll 2 even numbers.
- Repeat 10 times.

How many times did you roll **2 even numbers**?

Can you show the number of times out of 10 that you rolled "2 even numbers" as a:

- **FRACTION**
- **DECIMAL**
- **PERCENT**

Station 3: Colored Cubes

- Place 8 blue cubes and 4 yellow cubes in a bag.
- Without looking, pick 1 cube from the bag and record the color.
- Then place the cubes back in the bag.
- Repeat 10 times.

Can you show the number of times out of 10 that you picked "a BLUE cube" as a:

- **FRACTION**
- **DECIMAL**
- **PERCENT**

Station 4: Rolling 1 Dice

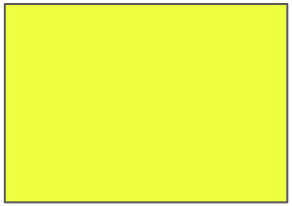
- Roll 1 dice and notice what number you roll.
- Record whether you roll **a 1 or 2.**
- Repeat 10 times.

How many times did you roll a **“1 or 2”**

Can you show the number of times out of 10 that you rolled “1 or 2” as a:

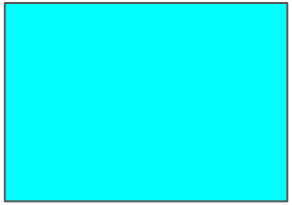
- **FRACTION**
- **DECIMAL**
- **PERCENT**

Record each outcome (as a fraction) on a post it note

Coins 

2 Dice 

Colored Cubes 

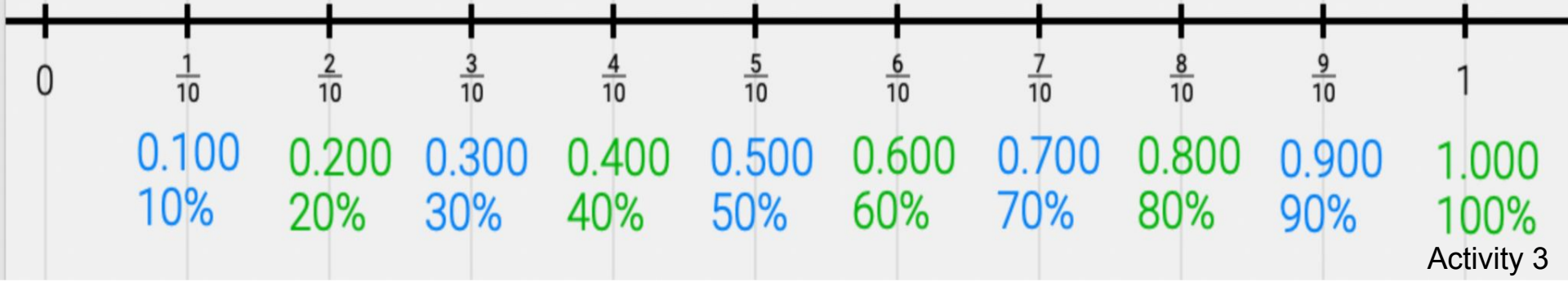
1 Dice 

Coins

2 Dice

Colored Cubes

1 Die



Activity 3

What is a “Good” Batting Average in…

Youth Baseball	Between 0.600 and 0.700
High School Baseball	Around 0.500
College Baseball	Around 0.400
MLB Baseball	Around 0.300

Coins

2 Dice

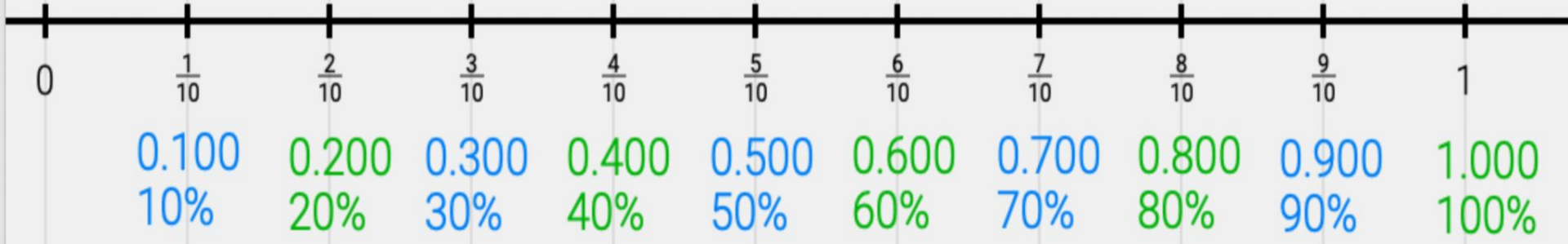
Colored Cubes

1 Die

Which activity is a model of a good batting average in youth baseball? Why? (0.600 to 0.700)

Which activity is a model of a good batting average in high school (0.500) or college (0.400) baseball?

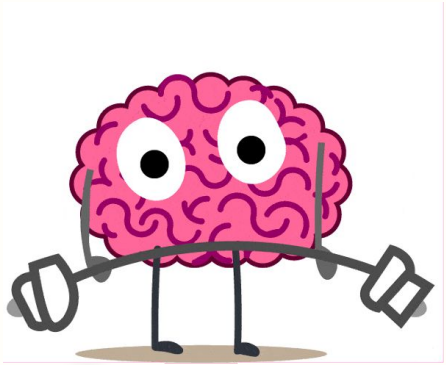
Which activity is a model of a good batting average in the MLB? (0.300) Why?

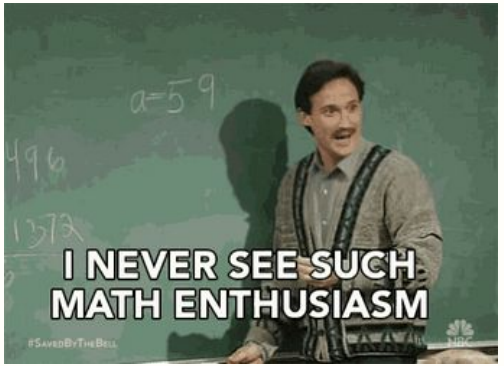


Let's Brainstorm!

What other connections between sports (any sport), math, and growth mindset can you think of?

Work in table groups and be prepared to share out!





Contact Information

Thank you!

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Website: https://mathletes.coe.arizona.edu/

STEM for ALL 2022 Video Showcase: https://stemforall2022.videohall.com/presentations/2605

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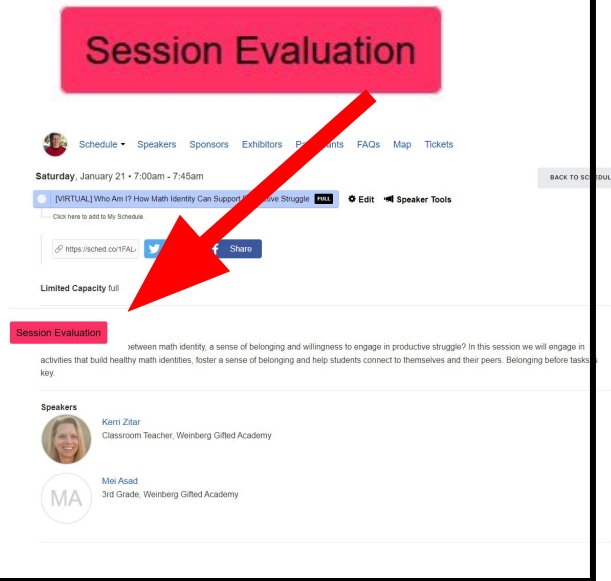
Session Evaluation

On your schedule in Sched, click on the session and the red **Session Evaluation** button for each session you attend.



Keynote: Be sure to find and attend the Keynote address at 12:15pm

12:15pm MST

Keynote Address by Peg Smith: The 5 Practices as a Tool for Supporting Equitable Mathematics Classrooms

Peg Smith

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SCHEDULE: Filter by Type, Grade-band, Content Area, Time, and Virtu[al] In-Person to help identify the sessions you want to attend. We highly recommend you start filtering by grade-band to help focus on your areas of i[n]terest. Once you have selected your sessions, see your schedule by hovering over your profile picture and selecting "**My Schedule**". For complete[te] details on setting up your account and personalized agenda, visit the **Sched Guide for Attendees**!

- ***NOTE** that session capacity is limit[ed] to 30 participants in-person and 60 participants online. However, everyone is invited to attend the live-streamed **keynote addr**ess wh[ich] is pinned to your schedule. Stay tuned after the keynote to meet the winners of the Excellence and Resiliency in Mathematics Teachi[ng] Awards!

EVALUATIONS: Pleas[e] complete an evaluation for each session you attend, including the keynote address. Also, complete an evaluation of your **General Conference experience** at the end of your day. Professional development hours will be provided for completed evaluations.

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