Project: Breakeven Analysis & Record Deals - A Captivating Math Lesson (For Instructors)

HIP HOP HAT GAME (CREATIVE CRITICAL THINKING)

**Think (5-10 minutes):**

- **Introduce the hat game:** There are players wearing either black or red hats. Each player can see the hats of others but not their own. The objective is to correctly guess the color of one's own hat based on the hats of the other players and the given information about the number of each color hat present. I like to use Celtics Fitted Hats against Lakers Hats, RedSox/Yankees or just markers or playing cards that are different. Sometimes I use the A/B side of my album or book covers as well.

- **Explain the rules:** Players sit down when they believe they know the color of their own hat. If a player sits down and guesses correctly, they win; if they guess incorrectly, they lose. The game ends when all players have sat down and guessed their hat colors. - Really this is done as a team, they should “all” be able to figure it out with practice and familiarity - and some creativity and critical thinking.

**Pair (10-15 minutes):**

- Have students gather in groups of four.
- Ask them to discuss and figure out different versions of the hat game:
    1. Three-person game with two of one color and one of the other.
    2. Four-person game with three of one color and one of the other.
    3. Four-person game with two of each color.
    4. Five-person game with four of one color and one of the other.
    5. Five-person game with three of one color and two of the other.

- **Encourage students to discuss what would happen in each scenario if the players understand the rules and have become experienced in playing.**

**Share (15-20 minutes):**

- Have each group share their findings and hypotheses for each version of the hat game.

- Discuss the optimal strategies for each scenario:
    1. In the three-person game with 2-1 distribution, the person who sees two hats of the same color will know that their hat is the opposite color to make the 2-1 distribution hold true. They should sit down immediately to convey this information to the others.

2. In the four-person game with 3-1 distribution, the person who sees three hats of the same color will know that their hat is the opposite color to make the 3-1 distribution hold true. They should sit down immediately to convey this information to the others.

3. In the four-person game with 2-2 distribution, if no one sits down immediately, it means that no one sees three hats of the same color. After a short delay, everyone will realize that the distribution must be 2-2, and they will know their own hat color based on the hats they see.

4. In the five-person game with 4-1 distribution, the person who sees four hats of the same color will know that their hat is the opposite color to make the 4-1 distribution hold true. They should sit down immediately to convey this information to the others.

5. In the five-person game with 3-2 distribution, if no one sits down immediately, it means that no one sees four hats of the same color. After a short delay, everyone will realize that the distribution must be 3-2, and they will know their own hat color based on the hats they see.

- **Emphasize that in each scenario, experienced players who understand the rules can use the information available to them (the colors of the other players' hats and the guaranteed presence of at least one hat of each color) to make informed decisions. Sitting down quickly or not sitting down at all can convey critical information to the other players, allowing them to deduce their own hat colors. THIS IS GREAT BECAUSE YOU DON'T HAVE TO BE "GOOD" AT MATH YET TO PARTICIPATE AND DO WELL. This is how we bring folks in from the margin.**

This think-pair-share activity allows students to explore different variations of the hat game, discuss strategies, and understand how players can use the available information to make optimal decisions based on the actions and inactions of other players.

- Discuss the optimal strategies for each scenario, using my quick little rhyme scheme - or your own one.
    1. "In the three-person game, with two of a kind/The odd color sits real quick to shine."
    2. "If you got more like four that's cool/Kinda the same thought of the three-game rule."
    3. "But four in a game might be two & two/People standing round like 'what do we do?'
    4. "Five in the mix, four hats the same/Rules don't change like the three hat

game"
5. "Five players might be a three-two split/No rapid moves, no one quick to sit."

- Emphasize the importance of using the available information to make informed decisions, comparing it to how rappers use their surroundings and context to create meaningful lyrics or freestyles. Make it fun, and get creative with your own rizz.

## FUN TRIVIA “ICE” Breaker - Have students guest the top ten wealthiest! **Wealthy Rappers Top 50: Source** [https://wealthygorilla.com/top-20-richest-rappers-world/](https://wealthygorilla.com/top-20-richest-rappers-world/)

- **1. Engage students (Fun Trivia "ICE" Breaker).**
- **2. Analyze wealth distribution (list analysis)/**
- **Compare with Top CEO pay (AFL CIO list) -top performers eclipse rappers.**
- **3. Recognize diverse roles (industry contributions).**
- **4. Explore beyond music (income diversification).**
- **5. Spark discussion (critical thinking & communication).**

Fun facts bottom 20 are less than $100 million each top 30 are over. Jay-Z is listed as 2.5 Billion, but the next closest, P Diddy is more than 1.5 Billion away listed as around 900 Million. Drake listed at number 6 is one of the only ones primarily making his money off of music, most others have become moguls, and sell other goods or services to become wealthy. This leads in nicely to the second part of the lesson/lessons.

Find their MEAN/MEDIAN and discuss what happens when we drop off the huge #1 net worth of Jay-Z out of the top ten - does the mean move (how so) , or does the median move. What does this mean, which is more sticky. Compare how consistent the numbers are in relation to the mean - this is the concept of standard deviation and can build some intuition.

## Top 50 Wealthiest Rappers as of 2/2024:

1. **Jay-Z**
2. **P Diddy**
3. **Dr. Dre**
4. **Kanye West**
5. **Russell Simmons (Music Executive/Entrepreneur)****
6. **Drake**
7. **Pharrell Williams (Producer/Songwriter)****
8. **Eminem**
9. **Master P (Entrepreneur/CEO)****
10. **Usher (Singer/Songwriter)****
11. **Lil Wayne**
12. **Ice Cube**

13. **Birdman**
14. **Ronald Slim Williams (Music Executive)****
15. **Snoop Dogg**
16. **Swizz Beatz (Producer)****
17. **LL Cool J**
18. **Nicki Minaj**
19. **Pitbull**
20. **Adam Horovitz AKA Ad-Rock**
21. **Michael Diamond AKA Mike D**
22. **Timbaland (Producer)****
23. **DJ Khaled (Record Executive/DJ)****
24. **Kendrick Lamar**
25. **Nas**
26. **Will.I.Am**
27. **Wiz Khalifa**
28. **Ice T**
29. **Akon**
30. **J. Cole**
31. **Joseph Simmons AKA Rev Run**
32. **Travis Scott**
33. **PSY (Singer/Rapper)****
34. **Chad Hugo (Producer)****
35. **Chamillionaire (Rapper/Entrepreneur)****
36. **Common (Rapper/Activist)****
37. **Post Malone**
38. **Rick Ross**
39. **50 Cent**
40. **Cardi B**
41. **Daddy Yankee**
42. **Darryl McDaniels (Rapper/DJ)****
43. **Future**
44. **Andre 3000**
45. **Big Boi**
46. **G-Dragon (Singer/Rapper)****
47. **Lil Jon**
48. **Soulja Boy**
49. **Offset**
50. **Quavo**

Please note: Individuals with asterisks (*) are not primarily known as rappers but hold significant roles within the hip hop industry. This list aims to recognize both rappers and key figures who contribute in other ways.

For the more adventurous and for balance this could be contrasted with the other side https://www.grunge.com/151067/rappers-who-lost-all-their-money/ or https://www.ranker.com/list/rappers-who-went-broke/ranker-hip-hop or the similar https://www.ranker.com/list/rappers-who-went-broke/ranker-hip-hop
(it is worth noting some on these list like Nas, Common, etc. have rebounded significantly, and that poor record deals and tax liability has been a large problem as well).

**This leads in with the next part about how poorly record contracts are made from an artist perspective.**

**Main Lesson Learning Objectives (So you want a record deal?:**

- Integrate captivating scenarios into math lessons that students will appreciate.
- Apply break-even analysis to real-world situations in the music industry.
- Develop an understanding of record contract complexities, including advances and royalty structures.
- Analyze the impact of pricing & sales volume on artist and label profits (and see exploitation!)
- Formulate and solve systems of equations to model and analyze business scenarios.

**Part 1: Introduction (1 Class Period)**

This project introduces your students to **break-even analysis** through engaging scenarios in the music industry. Students will explore how costs, pricing strategies, and sales volume impact profit.

**Part 2: Breakeven Analysis & Record Deals (2 Class Periods)**

**Scenario:**

A rapper signs a record deal with a significant **$1,000,000 advance**, but with a unique structure:

- The actual **wholesale price** of the album is **$10**, though the contract stipulates the rapper only receives **$1 per album sold** until the advance is recouped.
- After recouping the advance, the rapper earns a **10% royalty** on an undisclosed price point (which students are unaware of being the $10 wholesale price).

**Teacher Note:** The retail price is not revealed to students in this exercise. They will solve for the break-even point and calculate royalties based on the $1 per album and the undisclosed wholesale price.

**Step 1: Break-Even Point Calculation**

1. **Problem:** How many albums must the rapper sell to break even (recoup the advance)?
2. **Solution:** Divide the advance ($1,000,000) by the earnings per album ($1): **1,000,000 / 1 = 1,000,000 albums**
3. **Reflection:** Discuss the significance of the break-even point for the artist. Emphasize that they haven't earned any profit at this stage; they've simply recovered the label's investment.

**Step 2: Artist Earnings**

1. **Scenario:** The album achieves "double platinum" status, selling **2 million copies**.
2. **Calculating Royalties:**
    - **Teacher Note:** While students won't explicitly calculate with the $10 wholesale price, guide them to understand that reaching the previously calculated break-even point of 1,000,000

albums sold also signifies the point where they begin earning royalties.
    - **(For Teacher Reference Only):** Calculate the actual royalty per album: $10 (wholesale price) * 10% (royalty rate) = $1.
    - **For Student Calculation:** Explain that the royalty is based on the undisclosed wholesale price, but for simplicity, they can assume a $1 royalty per album for the remaining copies sold.
    - Calculate total royalties earned: $1/album * 1,000,000 copies = $1,000,000
3. **Reflection:** Compare the rapper's earnings to the advance. Encourage discussion on the potential financial risks associated with record deals, especially those involving significant advances.

**Step 3: Label Profit**

1. **Label's Earnings:**
    - The label earns the wholesale price ($10) minus the $1 paid to the rapper after the break-even point.
    - Calculate the label's profit per album: $10 (wholesale price) - $1 (payment to rapper) = $9
    - Calculate the label's total profit: $9/album * 2,000,000 copies = $18,000,000
2. **Reflection:** Compare the label's profit to their initial investment (advance). This scenario highlights the potential financial gain for the label, even if the artist doesn't see significant profit until later.

**Newer "sales" model (STREAMING)**

## Lesson: The $tream Game: Demystifying Music Revenue in the Digital Age with some Math

Source: https://www.musicbusinessworldwide.com/over-75-of-artists-on-spotify-have-fewer-than-50-monthly-listeners/

### Learning Objectives:

1. **Analyze the math and finance of the revenue model of music streaming platforms.**
2. **Critically evaluate the challenges and limitations of relying solely on streaming income for musicians.**
3. **Explore alternative income streams for artists in the digital age.**
4. **Identify ethical concerns surrounding artificial manipulation of streaming data.**

### Introduction:

The music industry has undergone a significant transformation in recent years, with streaming platforms like Spotify and YouTube becoming the primary source of music consumption for many listeners. While this offers convenient access to a vast library of music, it also raises questions about how much artists actually earn from these platforms.

### The Reality of Streaming Revenue:

Unlike traditional music sales, where artists receive a percentage of the sale price, streaming platforms pay out a fraction of a cent per stream. This payout varies depending

on several factors, including:

- **Subscription tier:** Streams from premium subscribers generally pay more than free tier listens.
- **Artist popularity:** More established artists may have negotiated higher payout rates.
- **Listener location:** Streaming income can differ based on the listener's geographic location.

**Let's do the math:**

- **Estimated payout per stream:**
  - Spotify: $0.003 - $0.005 (this is a third of a penny to a half of a penny per stream!)
  - YouTube: $0.0006 - $0.002 (60 cents to 2 dollars per 1000 plays, what is a million?)

**Question:** Assuming an artist earns $0.004 per stream, how many streams would they need to generate $1 million in revenue? **(Answer: 250,000,000 streams)**

**Challenges and Limitations:**

Reaching these astronomical numbers is incredibly difficult for most artists. While a viral hit can generate significant income, the vast majority of artists struggle to gain traction and build a sustainable income solely from streaming. Additionally, many artists on Spotify haven't even received a single stream.

**Advanced Question:** According to recent statistics, what percentage of music tracks on Spotify have been played **fewer than 1,000 times**? **(Answer: Nearly 80%)**

**Beyond the Music:**

To navigate this complex landscape, many artists diversify their income streams by exploring various avenues such as:

- **Live performances:** Touring and concerts offer a lucrative way to connect with fans and generate revenue.
- **Merchandise sales:** Selling branded clothing, accessories, and other merchandise can create an additional income stream.
- **Brand endorsements:** Partnering with brands for sponsored content or product placement can be financially rewarding.
- **Content creation:** Building a strong online presence through platforms like YouTube or Twitch can attract new fans and generate revenue through advertising or subscriptions.

RESEARCH YOUR FAVORITES and estimate how much they make per show- Read Donald Passman - All You Need To Know About the Music Business to find out more. It covers how much of the “gate” each artist makes, and how much they “pay” their team from these revenues. It is less glamorous then you’d think for nearly everyone - save perhaps some of these “top 50” or so. PUNCHLINE: Top ten ceo’s, make similar to the mean of what the top 20 rappers make in one year! They also have a way longer lifespan than the average artists who has to be on trend as the

rule and can be easily replaced in rap music due to fast changing tastes and trend changes.

**Ethical Concerns:**

Unfortunately, the quest for increased streaming numbers has led to the emergence of unethical practices like **pay-for-play schemes**, where artists or labels pay for fake streams to inflate their popularity and attract legitimate listeners. This not only undermines the integrity of the music industry but also disadvantages genuine artists who rely on organic growth and fan engagement.

**Conclusion:** While streaming offers a convenient and accessible way to listen to music, it's crucial to understand the limitations of its revenue model for artists. Building a diverse income stream, fostering genuine fan engagement (hard), and remaining aware of ethical considerations are big for navigating the complexities of the contemporary music industry.

**Brace yourselves for a mind-blowing statistic:** In 2022, **nearly a quarter (24%) of the 158 million audio tracks** on music streaming services monitored by Luminate received **0 plays**. That's a whopping **38 million tracks unheard** throughout the entire year.

Imagine the countless hours of creativity and dedication poured into these songs, only to be met with complete silence. While it's a sobering reality, this statistic underscores the highly competitive nature of the music industry and the immense challenge faced by aspiring artists in the digital age.

TRADITIONAL SOLVING SYSTEMS/BREAKEVEN

1. Take a bunch of items like albums & hoodies sold as merch at a Pro Lyrical show.
2. **Scenario:** Imagine that you know you put 40 items in a bag to sell and at the end of the show you had 900 in cash and wanted to know what mix actually sold. **How can you calculate this?**

   FACTS:

**Album cost:** $12 per copy
**Hoodie cost:** $18
**Album selling price:** $20 each
**Hoodie selling price:** $30 each

**Challenge:** You want to sell a combined total of **40 items** and generate **$900 in total revenue**. How many albums and hoodies should you sell to achieve this goal while maximizing profit?

Set up: Let x be one of the items such as albums, y the other (hoodies).

We want to linear equations taken together as a “system” **so  what do we know?**

X + y  = 40 items
20x + 30y = 900
Solve same way as normal or by graphing and finding intersection point see Desmos.com

Eliminate x or y, I choose x by multiplying top equation by -20(x + y =40)
So -20x -20y =-800  combine this now with second equation.
 The x values cancel and y becomes ten and the money becomes so 10y = 100
And y = 10. This means ten hoodies sold  so plug back into the what we know that X+Y = 40 so, 40-10 = 30 which is the amount sold of albums. MAGIC!

www.ProfessorLyrical.com

**Part 3: Breakeven Analysis & Systems of Equations (3 Class Periods)**

**Scenario:**

Imagine you are selling both physical albums and hoodies. Here's the information:

- **Album cost:** $12 per copy
- **Hoodie cost:** $18
- **Album selling price:** $20 each
- **Hoodie selling price:** $30 each

**Challenge:** You want to sell a combined total of **40 items** and generate **$900 in total revenue**. How many albums and hoodies should you sell to achieve this goal while maximizing profit? Scenario: Imagine that you know you through 40 items in a box to sell and at the end of the show you had 900 in cash and wanted to know what actually sold.

**Step 1: Define Variables**

Let: **x** be the number of albums sold. and **y** be the number of hoodies sold.

**Step 2: Formulate Equations**

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**The system of equations representing the scenario is as follows:**

1. **Total Revenue Equation:**
    - **20x (revenue per album) + 30y (revenue per hoodie) = 900 (total revenue)**
2. **Total Items Sold Equation:**
    - **x (number of albums) + y (number of hoodies) = 40 (total items)**

**Now, let's solve this system of equations using the elimination method.**

**Elimination Method: Multiply the second equation by 20 to make the coefficients of $x$ in both equations the same:**

$$20(x+y)=20\times40$$

$$20x+20y=800$$

**Subtract the second equation from the first equation to eliminate $y$:**

$$(20x+30y)-(20x+20y)=900-800$$

$$10y=100$$

$$y=10$$

**Substitute the value of $y$ back into the second equation to find $x$:**

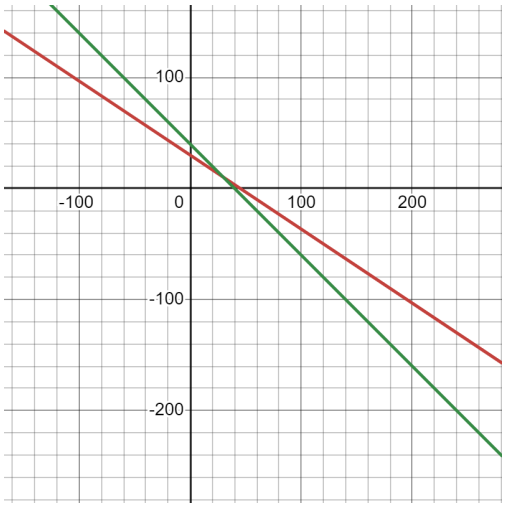
$$x+10=40$$

$$x=30$$

Solution: You sold 30 albums ($x$) **and 10 hoodies ($y$).**
**Graphical Representation:**

**Plug in original and solve by graphing (intersection in Desmos).**

https://www.desmos.com/calculator/86lccbzwqv




**Good resource with more graphs and numbers on platinum rap selling artists:**

https://djbooth.net/features/2015-10-14-rappers-platinum-albums-hip-hop-history **Dated and has one math error see if you or students can spot it!**

**Maybe use Polo G as an example of a double platinum artists more recently:**
https://www.hotnewhiphop.com/702326-polo-g-only-rapper-albums-double-platinum