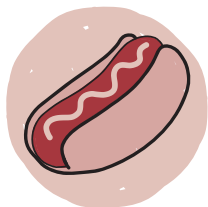


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Mathematics Tasks for the Thinking Classroom, Grades
6-12.

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TASK 30: GRAPHING LINEAR RELATIONS

TASK

This task has students create a table of values and graph their profits for a hotdog cart in a wide range of contexts.

Content: graphing linear relations

Competencies: organization, communication

Seen Before: table of values, plotting on a coordinate plane

Before You Launch: This task is a great way for students to get introduced to linear relations. It also works well to pull together a whole bunch of concepts regarding linear relations. This task is perfect for a horizontal banner. It helps if you can provide the students with erasable grids at their vertical workstations.

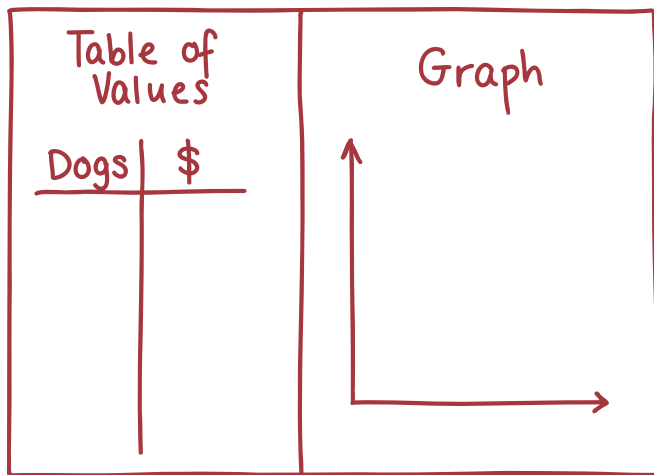
LAUNCH SCRIPT

Teacher: Hello, mathematicians. Today I want to tell you about a side hustle that I have been running for the last few years. I bet you didn't know this, but I have a hotdog cart. I only do one kind of hotdog. Then it is all about the toppings. I have ketchup, three types of mustard, raw and grilled onions. I also have chili, cheese, jalapenos, sweet peppers. And all the toppings are free. You buy the dog, you get the toppings. You can get whatever you want for the same price.

On weekends, I either set up somewhere in the city or I work a special event like a birthday party, a company picnic, a block party, and even sometimes a wedding.

Teacher: This past weekend, I was just set up on a street corner downtown and I made \$2.00 for every hotdog I sold. What I need from you is a sense of what that looks like. So, at your boards I need you to split the board in two. On the left [teacher points to the left], I need you to make a table of values with the number of hotdogs sold on the left and the profit on the right.

On the right side of the board [teacher points to the right], I need you to plot a graph of the data.



TASK SEQUENCE

Type 1: Profit Only

1. Last weekend, I sold hotdogs on a street corner. I made \$2.00 per hotdog.
2. Last weekend, I sold hotdogs in a park. I made \$3.00 per hotdog.
3. Last weekend, I sold hotdogs in the parking lot outside the football stadium. I made \$6.00 per hotdog.
4. Last weekend, I sold hotdogs outside the skating rink. I made \$2.50 per hotdog.
5. Last weekend, I sold hotdogs outside the movie theatre. I made \$3.50 per hotdog.
6. Last night, I sold hotdogs on the sidewalk outside the school after parent teacher night. I made \$0.50 per hotdog.
7. Last weekend, I sold hotdogs at the beach. I made \$0.25 per hotdog. It turns out that the beach is not a great place to sell hotdogs.

Type 2: Start-Up Cost Plus Profit

8. Last weekend, I sold hotdogs at the farmer's market. I had to pay \$20.00 to the organizers to be allowed to be there. But, I made \$2.00 per hotdog.
9. Last weekend, I sold hotdogs at the Christmas tree market. I had to pay \$40.00 to the organizers to be allowed to be there. But, I made \$5.00 per hotdog.
10. Last weekend, I sold hotdogs at the track meet. I had to pay \$50.00 to the organizers to be allowed to be there. But, I made \$4.00 per hotdog.
11. Last weekend, I sold hotdogs at the night market. I had to pay \$100.00 to the organizers to be allowed to be there. But, I made \$2.50 per hotdog.
12. Last weekend, I sold hotdogs at the principal's backyard BBQ. I had to pay \$27.50 to the principal to be allowed to be there. But, I made \$3.50 per hotdog.

Type 3: Start-Up Money Plus Profit

13. Last weekend, I sold hotdogs at my dentist's backyard BBQ. I really didn't want to do it. But she paid me \$50.00 to be there. And, I made \$5.00 per hotdog.
14. Last weekend, I sold hotdogs at a wedding. They paid me \$200.00 to be there. And, I made \$2.50 per hotdog.
15. Last weekend, I sold hotdogs at a company picnic. They paid me \$200.00 to be there. But, I was only allowed to make \$0.50 per hotdog.
16. Last weekend, I sold hotdogs at a private concert. They paid me \$300.00 to be there. But, I was not allowed to make and profit on hotdog sales.
17. Last weekend, I sold hotdogs at the art gallery. They paid me \$100.00 to be there. But, hotdogs were free to the guests. I lost \$5.00 per hot dog. They had an art exhibit showing photographs of dirty socks. It was super popular and there were so many people.
18. Last weekend, I sold hotdogs at a famous musician's album release party. It was massive. There were at least a 200 people there. She paid me \$500.00 to be there. But, hotdogs were free to the guests. It cost me \$4.00 for every hotdog I prepared.
19. Last weekend, I sold hotdogs at a charity event. I paid \$10 to be there. And, I sold hotdogs at a loss of \$0.25 per hotdog.
20. Last weekend, I set up my hotdog stand in my math class. I paid the school \$20.00 to be allowed to do this and I gave every student a free hotdog. I lost \$2.25 for every hotdog I gave away.

CONSOLIDATION TASKS

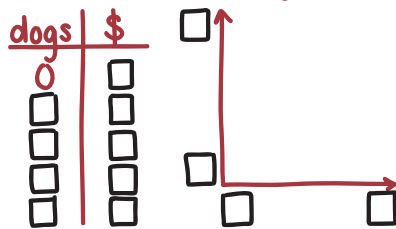
Teacher: I have written on the board three questions like the ones you just did in your groups. But I may have put them in the wrong order. Turn to your neighbor and discuss what the order should be and why.

- A. Last weekend, I sold hotdogs outside of the grocery store. I paid \$50.00 to be allowed to be there. I made \$5.00 per hotdog. (Type 2)
- B. Last weekend, I sold hotdogs at the splash park. I made \$5.00 per hotdog. (Type 1)
- C. Last weekend, I sold hotdogs at a ski hill. They paid me \$50.00 to be there. I lost \$2.00 per hotdog. (Type 3)

STUDENT NOTES TO THEIR FUTURE FORGETFUL SELVES

Example 1 :

Tomorrow, I am earning \$4 for each hotdog I sell.



Example 2 :

This weekend I am earning \$6 for every hotdog I sell, but I need to pay \$30 to be there.

Things to Remember:

Example 3 :

(HECK-YOUR-UNDERSTANDING QUESTIONS

MILD

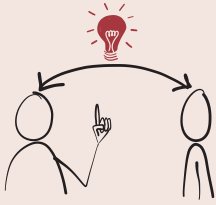
- A. Next week, I will be selling hotdogs at the community garage sale. I'll make \$7 per hotdog.
- B. Next week, I will be selling hotdogs at the dog park. I'll make \$10 per hotdog.
- C. Next week, I will be selling hotdogs outside of the library. I'll make \$1.50 per hotdog.

MEDIUM

- A. Next week, I will be selling hotdogs in the middle of the comic con expo. I need to pay \$30.00 to set up a booth there. But, I'll make \$4.00 per hotdog.
- B. Next week, I will be selling hotdogs at the craft fair. I need to pay \$25 to be there. But, I'll make \$6.00 per hotdog.
- C. Next week, I will be selling hotdogs for lunch at a summer camp. I need to pay \$80.00 to be there. But, I'll make \$8.00 per hotdog.

SPICY

- A. Next week, I will be selling hotdogs on the set of the new action film. They are paying me \$100 to be there, and I'll make \$5.00 per hotdog.
- B. Next week, I will be selling hotdogs at a construction site. They are paying me \$250 to be there, but I will lose \$2.50 per hotdog.
- C. Next week, I will be selling hotdogs at the track and field meet. They are paying me \$50.00 to give a free hotdog to each athlete. I'll lose \$3.75 for each hotdog I give away.



Author Notes

You'll notice that the general context for every question within this task remains the same. This is on purpose. Word problems are challenging for students. By keeping the context the same we're allowing students the space to deeply understand the context and how each variation within the thin-slicing sequences slightly changes the context. This proves to be a very effective way for students to not become burdened by the decoding of words and to focus more on what is changing within the context.

In your consolidation, you should make a point to address the concepts of discrete and continuous data. In this task, we are only selling whole hotdogs, so we should not see continuous graphs.

Make sure to really dig into the various components of the graphs and how they connect to each situation. Discuss how the slope of each graph represents the rate of profit increase/decrease per hotdog. Be sure to also draw attention to the y-intercept representing the up-front cost/payment in each context and how the x-intercept can tell us our break-even point. A potential question to students when consolidating the Type 3 example could be "If I don't want to lose money, when should I pack up the cart and go home?"



Notes to My Future Forgetful Self

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