Spark 101 Math Snack Pack



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Spark 101 Math Snack Pack Navigating the Future of Autonomous Vehicles

Experimenting with LIDAR (Light Detection and Ranging)

INGREDIENTS

- Spark 101's "Navigating the Future of Autonomous Vehicles" <u>video</u>
- Working flashlight or phone with a flashlight
- String or tape
- Ruler or measuring tape
- <u>Videos</u> on perimeter and area (if needed)

FOOD FOR THOUGHT

- Does the placement of the flashlight make a difference in how much of your area is illuminated?
- How does changing the angle at which the flashlight is shining down on the area change the amount of light and area of coverage?

EXTRA HELPINGS

- Try the experiment multiple times by changing the shape of your area and adding additional flashlights to cover the area.
- Using an outdoor sensor on your house and chalk/string, try to trace/draw the area where light picks up movement.

DIRECTIONS

 Watch the first 4:45 minutes of Spark
 101's "Navigating the Future of Autonomous Vehicles" <u>video</u> to learn about sensors used on unmanned vehicles.



2. Find a location in your house (or outside in the evening) that would allow for you to see a flashlight's light over a flat surface.

3. Measure off a section with a perimeter of 100 inches (263 centimeters) in the shape of a square or rectangle. Mark the area using either string or tape. (**Size may need to be adjusted depending on the size and brightness of flashlight)

4. Use your flashlight like a sensor to try and cover the entire space you created with light. (Hint: You may need to adjust the location of your flashlight as well as the level at which it is being held.)

5. Try again by increasing the size of your shape. (Perimeter of 200 inches/500 centimeters, 300 inches/760 centimeters, etc.)

6. Watch the third segment of the <u>video</u> (starts at 8:32) on career pathways and see what specific classes can be taken in high school to help enhance your learning.

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EXTRA HELPINGS CONT.

- Using a nightlight with a sensor, explore the distance you can be away from the light before it turns on. Try using different objects around the home (glass, paper, plate, etc.) to see how close you need to be for the light to turn on. Explore if the opaqueness of an object makes a difference.
- For a more in-depth look at autonomous vehicles and multiple sensor types, watch the rest of Spark 101's "Navigating the Future of Autonomous Vehicles" video.

DID YOU KNOW?

- Lasers must have unobstructed views free from atmospheric contamination to be used to determine distance to objects effectively.
- Radar can move through atmospheric contamination to determine distance, however, they cannot see size or shape of objects.
- Albert Einstein's Quantum Theory of Light was proved to be true by scientists. While his theory is over 115 years old, the technology was put on hold until the lasers and advanced technology use was more logical.

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What's for Lunch?

INGREDIENTS

- Spark 101's <u>"What's for Lunch?"</u> video
- Paper
- Writing utensil
- Websites, newspaper inserts, previous receipts, a store, or another resource of your choosing for noting grocery store item prices
- (Optional, to taste) USDA's <u>MyPlate</u>
 <u>template</u>

FOOD FOR THOUGHT

Think about how some grocery items can be used more than once. For example, a carton of a dozen eggs can be used in multiple meals. For an extension, see if your child can use the quantity, volume, and/or serving sizes to figure out how many meals a packaged grocery item could provide. This may affect the cost per week or month.

EXTRA HELPINGS

- For a more in-depth look at meal planning and cost challenges to solve in larger organizations, watch the rest of Spark 101's <u>"What's for Lunch?"</u> <u>video.</u>
- Also, check out additional <u>MyPlate at</u> <u>Home</u> resources from the USDA.

DIRECTIONS

1. Watch the first 2 minutes of Spark 101's <u>"What's for Lunch?" video</u>.



2. Create one or more meals with nutritious foods your family enjoys. Try to include vegetables, fruits, protein, grains, and dairy in each meal. You may wish to look at the <u>MyPlate template</u> with recommendations provided by the USDA.

3. Write a grocery list of items to buy to create one or more of these meals.

4. Use your chosen resource for food item prices and have your child add up the cost of the grocery list items.

5. Ask your child how much it will cost to create the meal or meals on your meal plan. Based on this figure, ask your child to try to figure out approximately how much one person would need to spend on groceries for a week, a month, etc.? How much would your family need to spend on groceries for a week, a month, etc.?

6. Be sure to check out and explore the career pathways section of Spark 101's <u>"What's for Lunch?"</u> video at the end.

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Positioning Tower Cranes During Construction on the National Mall

INGREDIENTS

- Spark 101's "Positioning Tower Cranes During Construction on the National Mall" <u>video</u>
- A 8.5" x 11" (21.59 cm x 27.94 cm) piece of paper
- Pencil
- 4 Burrito-size tortillas (10" or 25.40 cm) or cut out 4 10" (25.40 cm) circles from paper

FOOD FOR THOUGHT

- For a more in-depth look at how they position the cranes, watch the rest of Spark 101's "Positioning Tower Cranes During Construction on the National Mall" video.
- Can you find the circumference and area of a donut?
- Can you create or construct a tower crane using legos or other materials in your house? Think about how the height of the tower might impact the work of the cranes.

EXTRA HELPINGS

Want more practice on understanding the parts of a circle and finding the circumference and area? Watch:

- <u>PBS</u>
- <u>Math Antics</u>

DIRECTIONS

1. Watch the first 4 minutes of Spark 101's "Positioning Tower Cranes" <u>video</u>.



2. Use the 8.5" x 11" (21.59 cm x 27.94 cm) piece of paper as the base of your building.

3. Calculate the circumference of the 10" (25.40 cm) tortilla or circle. Determine the placement of the 4 10" (25.40 cm) tortillas or circles (represents the area the cranes can reach) so that each part of the paper (base of the building) can be reached by the cranes.

4. What is the total area that the cranes cover? How much area is overlapping?

5. Could you cover the paper (base of the building) only using 3 10" (25.40 cm) circles? Why or why not?

6. (Optional) If you used 8" (20.32 cm) soft taco-size tortillas or circles, how many would you need to cover the base of the building? If you used 6" (15.24 cm) fajita-size tortillas or circles, how many would you need to cover the base of the building? Could you use a combination of all three sizes to minimize overlapping areas?

7. Check out the end of the Spark 101's "Positioning Tower Cranes" <u>video</u> to explore the career pathways.