Stopping Superbugs!

Name: _____

Date: _____

Student worksheet

Directions: Prepare for the experiment.

1. Before the Experiment

a. What do the dice represent in your antibiotic treatment model?

b. What do the different die colors mean?

Purple: _____

Green: _____

Red: _____

c. Write down your predictions about how many dice of each color you will have left at the end (after rolling them 12 times).

Purple dice: _____

Green dice: _____

Red dice: _____

Name: _____

Directions: Follow the directions below to do the experiment.

d. What do you think will happen if you cut an antibiotic treatment short?

2. Experiment

Follow these steps to do your experiments:

1. You will roll the dice 12 times in total to simulate a full course of antibiotic treatment. Each time you roll the dice represents one dose of antibiotics. Bacteria will survive a dose of antibiotics according to the rules given in the table.

Dice description	Number of starting dice	Roll outcome	
		Bacteria survive if roll	Bacteria die if roll
Purple dice	70	6	1, 2, 3, 4, or 5
Green dice	25	4, 5, or 6	1, 2, or 3
Red dice	5	2, 3, 4, 5, or 6	1

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Directions: Record your data.

2. During your experiment, you will need to fill out the data table. Make sure you enter your results in the data table every time you roll the dice.

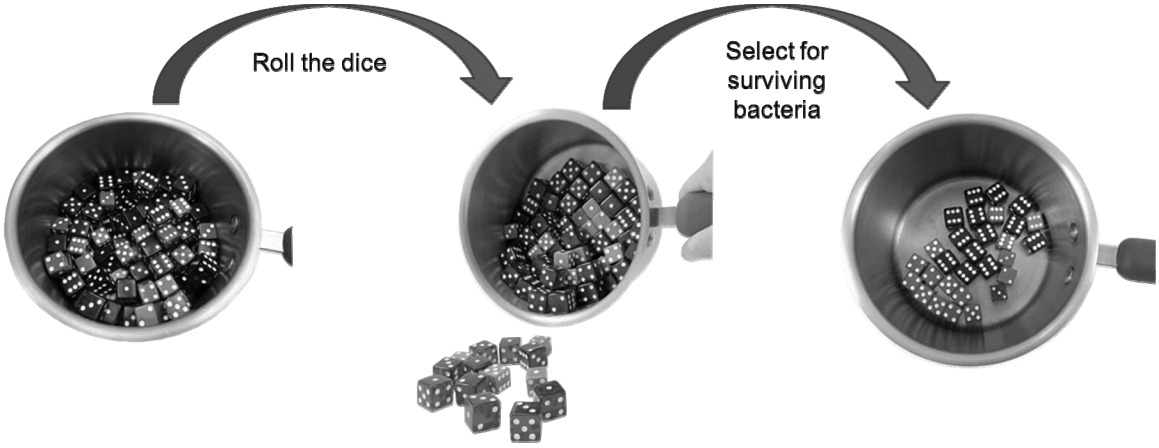
	Number of Antibiotic Doses												
Type of Bacteria	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Normal													
Moderately resistant													
Super-resistant													
Total number of bacteria													

3. To fill out the data table, follow these steps (as shown in the figure on the next page):
   a. Fill in the number of normal, moderately resistant, and super-resistant bacteria in the "0" antibiotic doses column. (This should be 70, 25, and 5 dice, respectively.)
   b. Roll the 100 dice and carefully pour them out onto a large, flat surface.
   c. Separate the rolled dice into a "surviving" pile and a "died" pile based on the rules from your table above.
   d. Set all the dice in the "died" pile aside. They will not be used anymore.
   e. Count how many dice of each color are in the "surviving" pile and record your results in your data table.
   f. Place all dice from the "surviving" pile back in the pot.

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Name: _____

Directions: Continue the experiment and plot your results.



g. Fill in the data table (in the "1" antibiotic doses column) with the results, including the total number of surviving bacteria.

h. Repeat this process (Step 3) 11 more times (or until *no* dice are left in the pot, if that happens sooner) so that 12 antibiotic doses have been modeled. Be sure you fill out the data table after each dose is modeled.

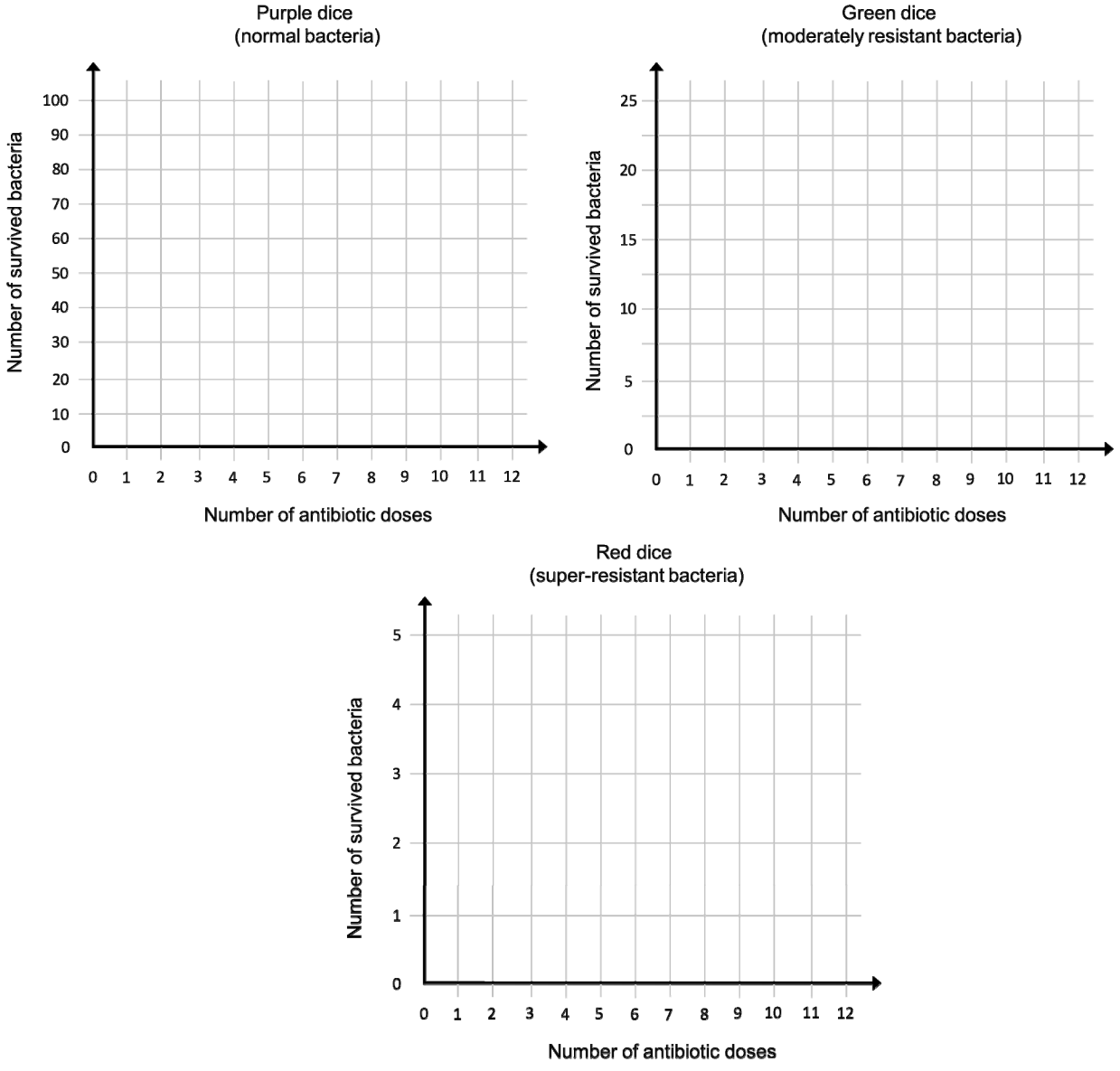
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Directions: Plot your results.

3. After the experiment

1. Plot your results on the graphs.
    - Make a dot (or cross) in the graph corresponding to the number of surviving bacteria after each dose of antibiotics for each bacteria type.



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Name: _____

Directions: Use your data to answer the questions.

a. How many bacteria were left after 12 doses of antibiotics? Are the numbers similar to your predictions?

Normal bacteria: _____

Moderately resistant bacteria: _____

Super-resistant bacteria: _____

b. How many days did it take to kill each type of bacteria? Explain your results below.

Normal bacteria: _____

Moderately resistant bacteria: _____

Super-resistant bacteria: _____

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Name: _____

Directions: Use your data to fill in the table and answer the questions.

2. Calculate what percentage of each bacteria type are present after each dose of antibiotics based on the total number of bacteria that survived each dose. For example, if 10 bacteria survived a dose of antibiotics, and 5 are super-resistant, 3 are moderately resistant and 2 are normal, then the percentage would be 50% for the super resistant, 30% for the moderately resistant and 20% for the normal bacteria. Record your results in the table on the next page.

	Calculated percentage of surviving bacteria for each bacteria type												
Type of Bacteria	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Normal													
Moderately resistant													
Super-resistant													

a. Based on your results in the data table above, how did the bacteria population change over the course of the treatment? Which bacteria are predominant in the beginning versus the end?

b. In your own words, explain what your overall results mean for a person who only takes one dose of antibiotics or cuts their antibiotic treatment short.