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| --- |
| **Teacher Notes:**  This exploration guides students to an understanding of the difference between multiplicative and additive relationships which leads to an understanding of slope and y-intercept (SOL 7.10).  Students should have some prior knowledge of proportional reasoning/relationships and graphing in a coordinate plane before this activity. It might also be smart to review how to create a table and graph from a table prior to this activity but you should let them complete the first part of the activity itself without teacher guidance.  **Delivering the lesson:**   1. Start with a warm-up activity that reviews creating a table and graphing the points. 2. Pair or group students and give each student a copy of “Carnival Games”. Have students work together to make sense of the games and develop tables and graphs for each. Students should then reflect on the similarities and differences on the back of the sheet. Guide students by asking questions about what they notice and wonder but don’t lead them to any specific answers. *\*They might need help determining how to label their x and y axis – this would be an okay thing to just tell them at this point.* 3. After students have completed “Carnival Games”, have them share with a partner from a different group. They should have similar tables and graphs and should talk through the questions on the back. 4. Next, put students into different groups and have them complete the front of “Carnival Sort”. Students should complete 6 different tables and think about whether each scenario and table is more similar to Ring Toss or Balloon Pop from the first part of the lesson. At this point, you should not have given the students any information about what they are specifically looking for but should be asking guiding questions to get students to think about the scenarios and tables and how they are different or similar. *\*You could also print the “Carnival Sort” scenarios onto cards and have students complete the tables and sort the cards into two piles based on which game they are more like.* 5. After students are done, have a class discussion about how students sorted each scenario and why. Try to press students for specific details about how they made their decisions. At this point you may want to list the two groups on the board and the characteristics that each group has. This will make it very easy to return to the list and help the students make connections to the notes that will come next. 6. Once you have finished this discussion, have the students flip their “Carnival Sort” sheet over to find the notes on Multiplicative and Additive Relationships. Guide students through completing the notes. As you are completing the notes, refer to the lists on the board and the scenarios that students completed but don’t TELL which scenarios align with which relationship – allow students to identify those connections. 7. After you have completed the notes, students should return to their scenarios and identify whether each is multiplicative or additive and then try to write an equation for each.*\*They will likely struggle to write the equations at this point and that is OKAY. We just want them to start to see the connections. After this lesson students will need LOTS of practice doing these things!* 8. As an exit ticket, have students tell you about ONE of the games from the lesson. Students should share their table, which kind of relationship, and an attempt at an equation. |

Sarah Leahey, 2019

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**Carnival Games**

Kari and her friends are building carnival games for a school project. Kari and John are making a ring toss game and Joaquin and Ann are making a balloon pop game. Each game has a different scoring system.

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| --- | --- |
| **Ring Toss** | **Balloon Pop** |
| In ring toss, you get 3 points for each ring you land on a peg.  Create a table to show how many points you earn each time you get another ring on a peg.    Next, create a graph to show the change in points as you get more pegs.  https://lh5.googleusercontent.com/1m1sICS3c_ZrdNw18SZS1TA3IuurDshpQ_h4PwQ0WDddzvcz3viT3c1T9rVbxj7ImmqclPsc-AtmxOKx6NG5q-s2AEuCWjnjYbOQurfjGdrTXdtv13Q_J08RzTDzlR_5gWzSXqE1 | In balloon pop, you start with 10 points and then earn one point for each balloon you pop.  Create a table to show how many points to get for each balloon you pop.    Next, create a graph to show the change in points as you pop each balloon.  https://lh5.googleusercontent.com/1m1sICS3c_ZrdNw18SZS1TA3IuurDshpQ_h4PwQ0WDddzvcz3viT3c1T9rVbxj7ImmqclPsc-AtmxOKx6NG5q-s2AEuCWjnjYbOQurfjGdrTXdtv13Q_J08RzTDzlR_5gWzSXqE1 |

What are some differences you notice between the two games/tables/graphs?

What are some similarities you notice between each game/table/graph?

One of the games shows an additive relationship and one shows a proportional relationship, can you figure out which is which? How do you know?

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**Carnival Sort**

Complete each of the tables below based on the given scenario. THEN, determine whether the situation is more similar to Ring Toss or to Balloon Pop.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Scenario 1  **Tickets for the carnival are $7 per person. How much does it cost for x people?**   |  |  | | --- | --- | | # of people | Cost | | 1 |  | | 2 |  | | 3 |  |   *Ring Toss or Balloon Pop?* | Scenario 2  **Jillian’s friend gets to the carnival 30 minutes after her. How long has Jillian been there when her friend has been there x minutes?**   |  |  | | --- | --- | | Friend’s Time (mins) | Jillian’s time (mins) | | 10 |  | | 20 |  | | 50 |  |   *Ring Toss or Balloon Pop?* | Scenario 3  **The total number of people at the carnival includes the patrons and the employees. There are 16 employees working at the carnival at all times. How many total people are there when x patrons are there?**   |  |  | | --- | --- | | Patrons | Total People | | 0 |  | | 40 |  | | 80 |  |     *Ring Toss or Balloon Pop?* |
| Scenario 4  **Each car on the roller coaster can hold 2 people. How many people fit in x cars?**   |  |  | | --- | --- | | # of cars | # of people | | 1 |  | | 5 |  | | 10 |  |   *Ring Toss or Balloon Pop?* | Scenario 5  **You need four tickets to ride each ride. How much does it cost for x number of riders?**   |  |  | | --- | --- | | # of rides | # of tickets | | 0 |  | | 2 |  | | 4 |  |   *Ring Toss or Balloon Pop?* | Scenario 6  **Steve has already eaten 3 bags of popcorn. If his friend dares him to eat another bag of popcorn every hour, how many bags of popcorn will Steve have eaten after x hours?**   |  |  | | --- | --- | | Hours | # of bags | | 0 |  | | 1 |  | | 2 |  |   *Ring Toss or Balloon Pop?* |

**Writing Equations** - Notes

|  |  |
| --- | --- |
| **Proportional (Multiplicative) Relationship** | **Additive Relationship** |
| Relationship (table):      Equation:  **y = \_\_\_\_\_\_\_\_\_\_**    Graph looks like:    https://lh5.googleusercontent.com/1m1sICS3c_ZrdNw18SZS1TA3IuurDshpQ_h4PwQ0WDddzvcz3viT3c1T9rVbxj7ImmqclPsc-AtmxOKx6NG5q-s2AEuCWjnjYbOQurfjGdrTXdtv13Q_J08RzTDzlR_5gWzSXqE1 | Relationship (table):      Equation:  **y = \_\_\_\_\_\_\_\_\_\_**  Graph looks like:    https://lh5.googleusercontent.com/1m1sICS3c_ZrdNw18SZS1TA3IuurDshpQ_h4PwQ0WDddzvcz3viT3c1T9rVbxj7ImmqclPsc-AtmxOKx6NG5q-s2AEuCWjnjYbOQurfjGdrTXdtv13Q_J08RzTDzlR_5gWzSXqE1 |

**Exit Ticket**

**Select ONE scenario from the lesson today. Complete the following using that ONE scenario.**

1. Which scenario did you choose? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Table:

|  |  |
| --- | --- |
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1. Does the scenario show an additive or multiplicative relationship? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Explain how you know?

1. What equation did you write to show the relationship? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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