Title: Let's Go to the Carnival

Brief Overview:

Students will use concepts of linear and area measurement to formulate a scale model of a carnival setting. Students will determine the cost and profit margin of a refreshment stand. Students will determine the probability of winning a carnival game.

Links to Standards:

- **Mathematics as Problem Solving**
  Students will demonstrate their ability to solve mathematical problems relating to their particular group's situation.

- **Mathematics as Communication**
  Students will demonstrate their ability to communicate mathematically by writing a persuasive letter to their principal.

- **Mathematics as Reasoning**
  Students will demonstrate their ability to reason mathematically by making predictions based upon their group's discussions, observations, and calculations.

- **Mathematical Connections**
  Students will demonstrate their ability to connect their mathematical calculations through written justifications and real-life problems solving applications.

- **Number and Number Relationships**
  Students will demonstrate mathematical strategies to solve various problems and determine appropriateness of solutions such as: proportions, unit price, and scale models.

- **Statistics**
  Students will demonstrate their ability to collect, organize, and display data relating to their group's real-life situation.

- **Probability**
  Students will demonstrate their understanding of probability based upon their simulations and predictions of independent events occurring within their carnival game.

- **Measurement**
  Students will demonstrate their ability to calculate are of various geometric figures and convert standard units of measure. Students will demonstrate their ability to apply measurement to their real-world group activity.

- **Geometry**
  Students will demonstrate their understanding of geometric relationships by manipulating two dimensional figures within their group's design.

Grade/Level:

Grades 6-8

Duration/Length:

This learning unit is arranged so that each activity stands on its own and has its own time frame for completion. The tasks may be performed by separate groups that will share their findings with the class in order to complete the culminating activity; or the class as a whole may perform each of the tasks. Each of the three activities (bean bag toss, scale model, and food stand) requires two to three days to accomplish. The writing activity is a one or two day assignment for each child to complete individually.

Prerequisite Knowledge:

Students should have working knowledge of the following skills:

- Unit pricing and profit margin calculations
- Conducting a survey
- Basic properties of probability
- Standard measurement conversions
- Area formulas for square, rectangle, triangle, and circle

Objectives:

Students will:

- work in cooperative groups.
- create a survey and line plot/histogram.
- find probability of given events.
- make accurate calculations using appropriate units of measure.
- make a scale model.
- submit a persuasive letter with proper support.

Materials/Resources/Printed Materials:

- Calculator
- Paper and pencil
- Worksheets

Development/Procedures:

Introduce the unit and explain that students will begin with the food section.

<u>Food Activity</u>

DAY 1: Students will review concepts of surveys and line plot/ histograms. Students, as a group, will then create their own survey. Each student will then take a survey with them to lunch or homeroom in order to question five other students before the next class meeting.

DAY 2: Students will bring their completed surveys to class in order to compile their data so that each student is making only one line graph/histogram. Students will also research information on prices as a homework assignment.

DAY 3: Students will then bring in their research and complete the remaining tasks of lists, menus, and justifications.

Scale Model Activity

DAY 1: Discuss and review measurement conversions and area. Pass out worksheet . Students calculate the area of the various figures then determine if all of the figures will fit onto the provided grid.

DAY 2: Students will cut out and arrange figures on their grids, following all given directions. Students will then write a justified explanation as to their arrangement.

Bean Toss Activity

DAY 1: Pass out worksheet . Discuss the game idea. Students will complete question one through four.

DAY 2: Students will complete questions five through seven, involving creating their own targets.

Writing Prompt

DAY 1: Students will prewrite and draft their letter to the principal.

DAY 2: Students will complete a final copy.

Performance Assessment:

The evaluation of this learning unit is based on four separate activities. Each of the activities has its own scoring tool following the last worksheet.

Authors:

Lora L. Bennett
Benjamin Stoddert Middle School
Charles County, MD

Bonnie Lacey
Father Andrew White
St. Mary's County, MD

Lisa Neradka Daly
Greenbelt Middle School
Prince George's County, MD

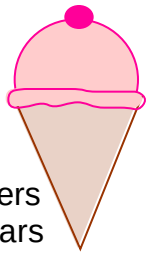
Trisha Bushway
National Cathedral School
Washington, DC

Rena Stevens
Benjamin Stoddert Middle School
Prince George's County, MD

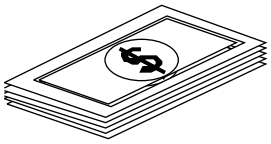
Food Task

In preparation for the upcoming carnival, your job is to come up with a survey of possible food and drink items to sell to 6th, 7th, and 8th graders. Here is a sample survey that you might use or you are welcome to make up your own.

Check one item from each column:



Drink	Snack	Food	Candy
❏ Sprite	❏ Nachos	❏ Pizza	❏ Skittles
❏ Pepsi	❏ Chips	❏ Hamburger	❏ Now & Laters
❏ Coke	❏ Pretzels	❏ Hot Dogs	❏ Hershey Bars
❏ Sam's Orange	❏ Popcorn	❏ Tacos	❏ Snickers
❏ Dr. Pepper			
❏ 7-Up			



Making A Line Plot or Histogram:

Now that you have collected your data make a separate line plot/ histogram for each food/ drink item that shows the consensus of all the students. Also include an interpretation of the data. After deciding the kind of soda, food, candy, and snack that you will sell, do price comparisons among your local grocery stores or newspaper ads. Remember to check stores that sell bulk items, like Price & Sam's Club.

Completing the Task:

As a group:

- you will make a separate line plot/ histogram for each food, drink, snack, and candy items
- you will have to decide your profit margin
- you will create a food and drink menu
- you will create a price list
- you will need to write out a detailed justification explaining why you chose the particular food / drink / price. Explain your choices through unit pricing and student survey.

Scoring Rubric for Line Plot

3 Student labeled axis correctly, included title, neatly completed, correctly interpreted data.

2 Student labeled axis correctly, omitted title, neatly completed, correctly interpreted data.

1 Student omitted axis labels, omitted title, neatly completed, correctly interpreted data.

0 Student omitted axis labels, omitted title, incomplete, no data interpreted.

Scoring Rubric for Justification

3 Student has justification based on collected data, reasoning is clearly based on research, has included profit margin, and has neat. presentation

2 Student has justification based on collected data, reasoning is clearly based on research, has omitted profit margin and neatness.

1 Student has justification based on collected data, reasoning is not based on research, has omitted profit margin and neatness.

0 Student has omitted justification, reasoning, profit margin, and neatness.

Worksheet

You have a total of seven tables or games to place in the gym for the carnival.

Your objective is to place all the games and tables in the gym with <u>at least</u> a three foot border around each game and table.

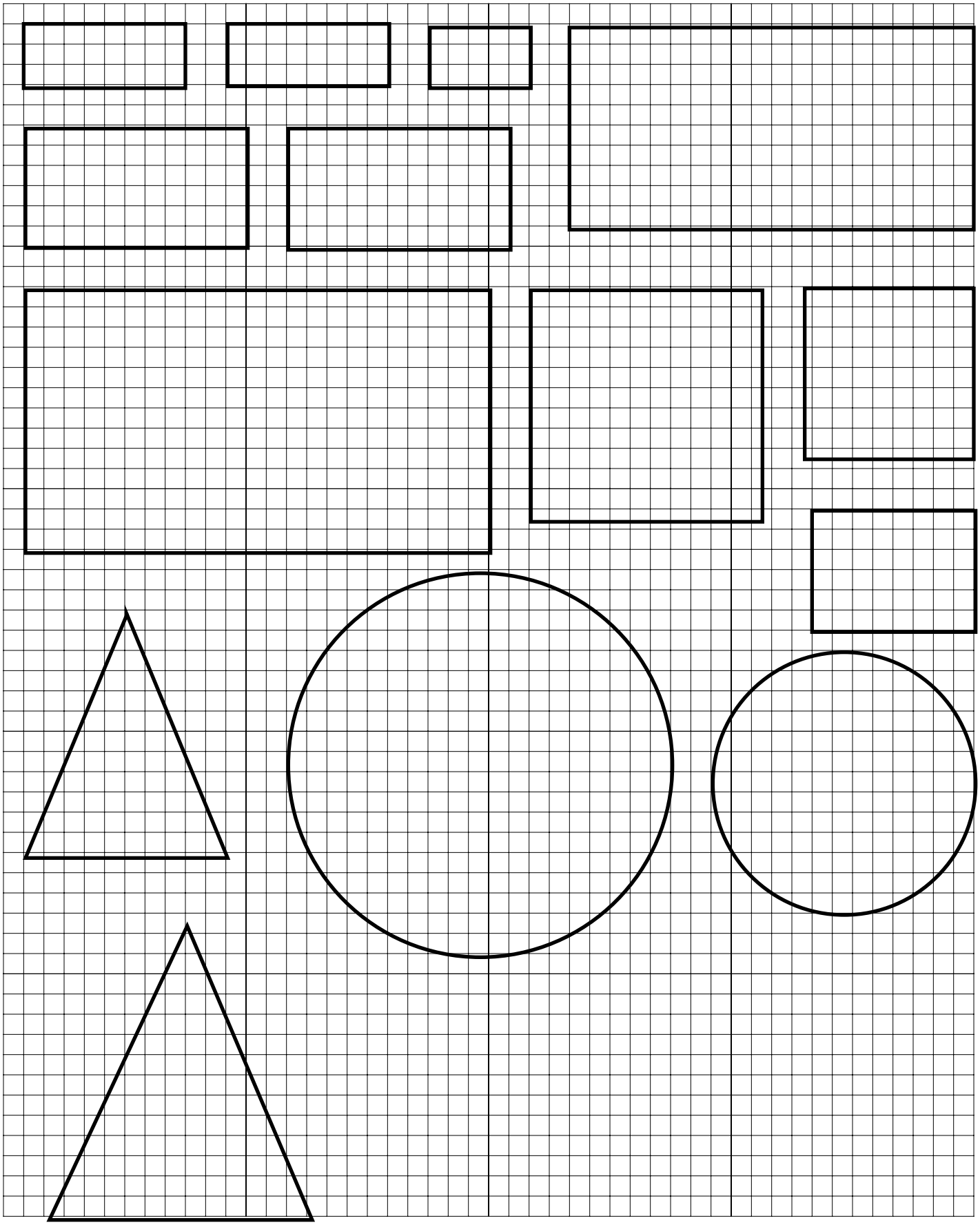
The tables/games dimensions:

2 Food tables - each rectangle 3 feet by 8 feet
Game 1 - isosceles triangle with base of 10 feet, 2 sides of 13 feet and height of 12 feet
Game 2 - rectangle 10 feet by 20 feet
Game 3 - circle with radius of 6 feet 6 inches
Game 4 - square with sides of 8 feet 3 inches
Entrance table - rectangle 3 feet by 5 feet

1) Find the area in feet of each table/ game.
   a) Food table =
   b) Game 1 =
   c) Game 2 =
   d) Game 3 =
   e) Game 4 =
   f) Entrance table =

2) Will all the tables fit into a room that is 60 feet by 50 feet? Explain.

3) On the grid provided, arrange the tables leaving a 3 foot border around each table/game. Justify your setup for the carnival, making sure to explain the reasoning of the placement for each table/ game.



1 square = 1 square foot

1 square = 1 square foot

Scoring Key - Worksheet

Points:

1) 1 = for each correct answer
0 = for each incorrect answer

2) 2 = answer with explanation
1 = answer with out explanation
0 = answer and explanation missing

3) 5 =
i) All 7 tables/games are in the floor plan
ii) There is at least a three foot border around each table/game (Whether using the smaller model pieces with a three foot border or using the larger models with the three feet already included)
iii) The explanation given contains clear statements justifying the placement of each table/ game with relationship to each other and the room.

4 =
i) All 7 tables/games are in the floor plan
ii) There is not a three foot border around each table/game (Whether using the smaller model pieces with a three foot border or using the larger models with the three feet already included)
iii) The explanation given contains clear statements justifying the placement of each table/ game with relationship to each other and the room.

3 =
i) All 7 tables/games are not in the floor plan
ii) There is at least a three foot border around each table/game (Whether using the smaller model pieces with a three foot border or using the larger models with the three feet already included)
iii) The explanation given contains clear statements justifying the placement of each table/ game with relationship to each other and the room.

2 =
i) All 7 tables/games are not in their floor plan
ii) There is not at least a three foot border around each table/game (Whether using the smaller model pieces with a three foot border or using the larger models with the three feet already included)
iii) The explanation given contains clear statements justifying the placement of each table/ game with relationship to each other and the room.

1 = All criteria are complete, but incorrect or any two criteria are missing.

0 = There is no attempt made to complete any activity.

Bean Bag Toss Worksheets

In this section, there are two versions of the bean bag activity and a key. Version A asks the students to calculate the probability of a bean bag landing on a target in one of three different point regions. The students then can make conjectures about the games properties. Version B contains all of the activities of version A but also includes some more skill oriented procedures involving probability . The students will complete a provability chart that will enable them to calculate the provability of earning points needed to win a prize in three tosses. Chose the version of the activity that best suits your students needs.

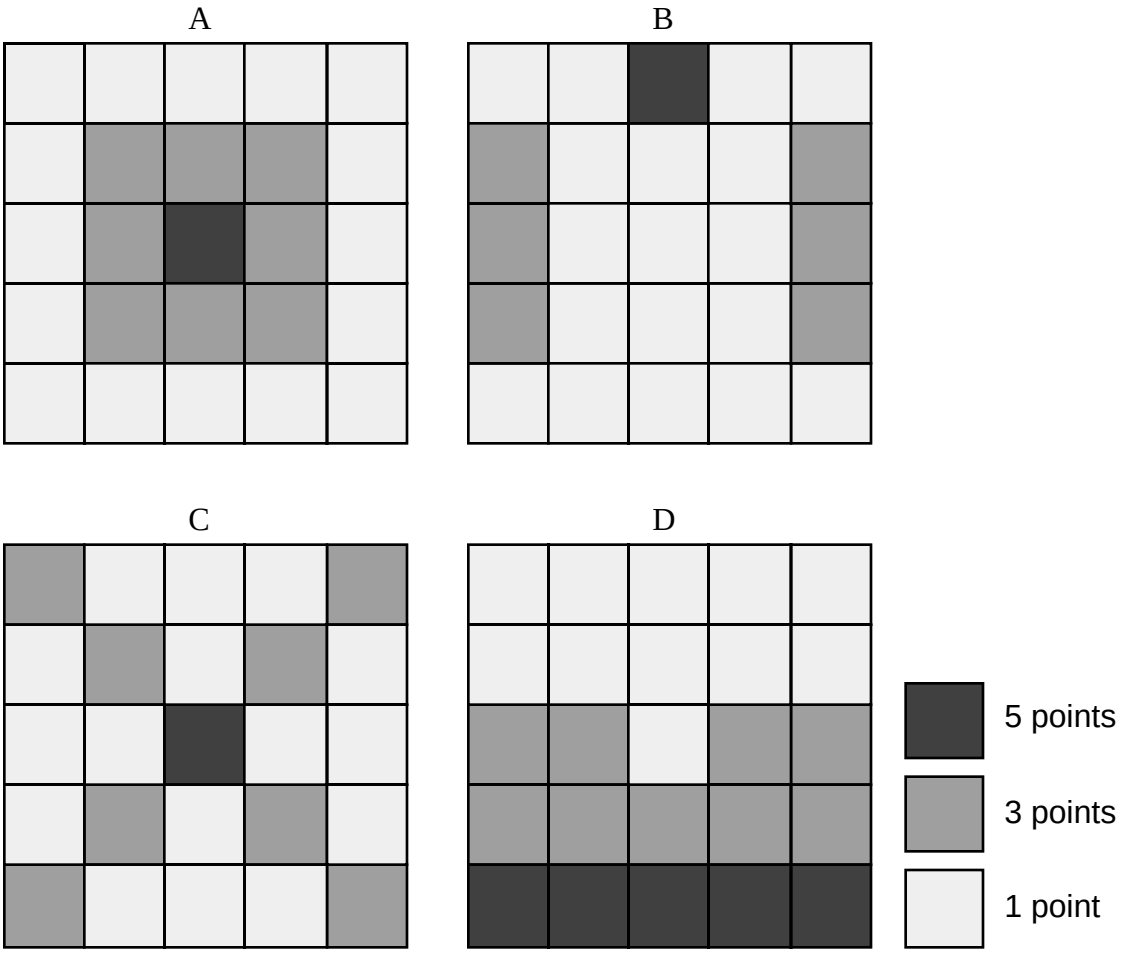
Bean Bag Toss - Version A

Your help is needed to design a bean bag toss game that people will be willing to play and that will most likely maximize profits for the school. The rules of the game are as follows:

- A person can play one round of the game for 50 cents.
- Each round consists of three tosses.
- A player's total score is the sum of the scores of each toss.
- A toss is valid if the bean bag lands completely within the lines of the grid, any toss that does not lie within the lines of the grid may be taken over.
- A player wins a prize if their total score is 11 points or greater.
- The prize is a small bean bag animal, worth about $2.00.
- The player tosses the bean bag standing 6 feet in front of the target. (The front being the bottom of the paper as you look at the target.)

ACME carnival company has sent the following ideas for targets for this game.

Possible Game Targets



Examine the four given targets.

1) Given that a toss lands on the target and in the lines, what is the probability that the toss will land in the...

five point region of target A?_____
three point region of target A?_____
one point region of target A?_____

Describe the results:

five point region of target B?_____
three point region of target B?_____
one point region of target B?_____

five point region of target C?_____
three point region of target C?_____
one point region of target C?_____

five point region of target D?_____
three point region of target D?_____
one point region of target D?_____

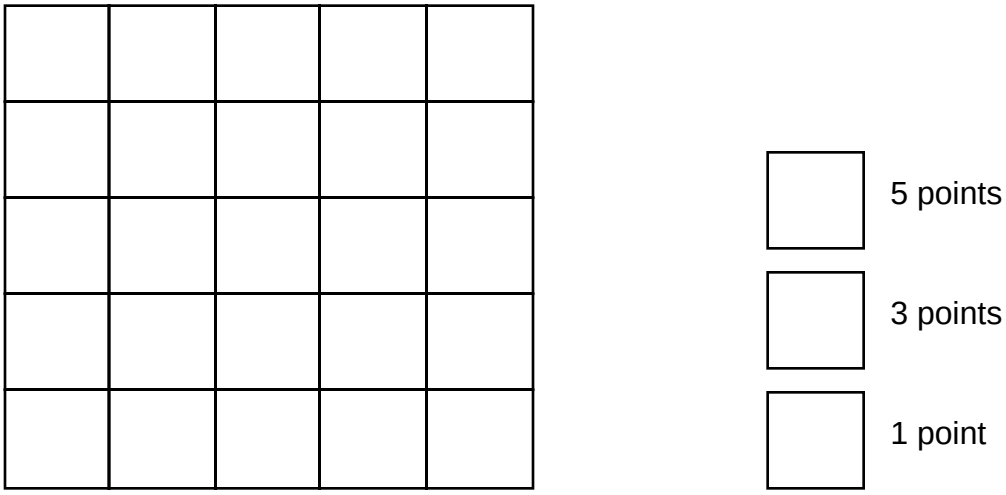
2) Which target would likely allow the school to earn the most money? Why?

3) Which target would likely allow the player the best chance to win a prize? Why?

4) Which target would the participant want to play and still allow the school to earn money? Why?

5) Create a new target that you think could be more profitable for the school and a game which the carnival participants would still like to play.

Your Target



6) Examine your target and find the probability for the following:

five point region of your target ?_____
three point region of your target ?_____
one point region of your target ?_____

7) Why is this target better than any of the others?

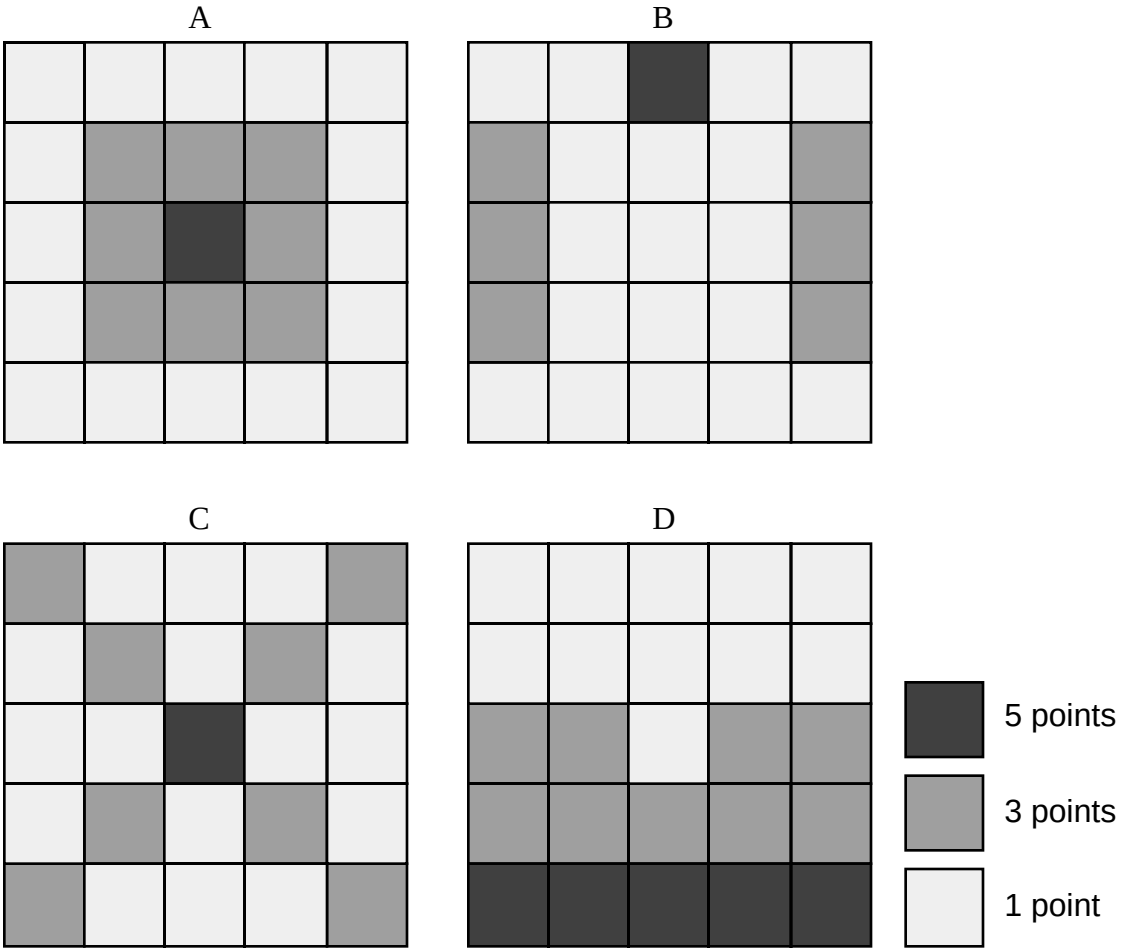
Bean Bag Toss - Version B

Your help is needed to design a bean bag toss game that people will be willing to play and that will most likely maximize profits for the school. The rules of the game are as follows:

- A person can play one round of the game for 50 cents.
- Each round consists of three tosses.
- A player's total score is the sum of the scores of each toss.
- A toss is valid if the bean bag lands completely within the lines of the grid, any toss that does not lie within the lines of the grid may be taken over.
- A player wins a prize if their total score is 11 points or greater.
- The prize is a small bean bag animal, worth about $2.00.
- The player tosses the bean bag standing 6 feet in front of the target. (The front being the bottom of the paper as you look at the target.)

ACME carnival company has sent the following ideas for targets for this game.

Possible Game Targets



Examine the four given targets.

1) Given that a toss lands on the target and in the lines, what is the probability that the toss will land in the...

five point region of target A?_____
three point region of target A?_____
one point region of target A?_____
P(scoring 11 points in three tosses) = _____
P(scoring 12 points in three tosses) = _____
P(scoring 13 points in three tosses) = _____
P(scoring 14 points in three tosses) = _____
P(scoring 15 points in three tosses) = _____
P(scoring 11 or more points in three tosses) = _____

Describe the results:

five point region of target B?_____
three point region of target B?_____
one point region of target B?_____
P(scoring 11 points in three tosses) = _____
P(scoring 12 points in three tosses) = _____
P(scoring 13 points in three tosses) = _____
P(scoring 14 points in three tosses) = _____
P(scoring 15 points in three tosses) = _____
P(scoring 11 or more points in three tosses) = _____

five point region of target C?_____
three point region of target C?_____
one point region of target C?_____
P(scoring 11 points in three tosses) = _____
P(scoring 12 points in three tosses) = _____
P(scoring 13 points in three tosses) = _____
P(scoring 14 points in three tosses) = _____
P(scoring 15 points in three tosses) = _____
P(scoring 11 or more points in three tosses) = _____
five point region of target D?_____
three point region of target D?_____
one point region of target D?_____
P(scoring 11 points in three tosses) = _____
P(scoring 12 points in three tosses) = _____
P(scoring 13 points in three tosses) = _____
P(scoring 14 points in three tosses) = _____
P(scoring 15 points in three tosses) = _____
P(scoring 11 or more points in three tosses) = _____

2) Which target would likely allow the school to earn the most money? Why?

3) Which target would likely allow the player the best chance to win a prize? Why?

4) Which target would the participant want to play and still allow the school to earn money? Why?

5) Create a new target that you think could be more profitable for the school and a game which the carnival participants would still like to play.

Your Target

5 points

3 points

1 point

6) Examine your target and find the probability for the following:

five point region of your target ?_____
three point region of your target ?_____
one point region of your target ?_____
P(scoring 11 points in three tosses) = _____
P(scoring 12 points in three tosses) = _____
P(scoring 13 points in three tosses) = _____
P(scoring 14 points in three tosses) = _____
P(scoring 15 points in three tosses) = _____
P(scoring 11 or more points in three tosses) = _____

7) Why is this target better than any of the others?

PROBABILITY WORKSHEET

TARGET _____ (BREAKDOWN OF PROBABILITIES)

First Toss	Second Toss	Third Toss	Total score	P(Total score| configuration)
1	1	1		(/25)(/25)(/25) = /15625
1	1	3		(/25)(/25)(/25) = /15625
1	1	5		(/25)(/25)(/25) = /15625
1	3	1		(/25)(/25)(/25) = /15625
1	3	3		(/25)(/25)(/25) = /15625
1	3	5		(/25)(/25)(/25) = /15625
1	5	1		(/25)(/25)(/25) = /15625
1	5	3		(/25)(/25)(/25) = /15625
1	5	5		(/25)(/25)(/25) = /15625
3	1	1		(/25)(/25)(/25) = /15625
3	1	3		(/25)(/25)(/25) = /15625
3	1	5		(/25)(/25)(/25) = /15625
3	3	1		(/25)(/25)(/25) = /15625
3	3	3		(/25)(/25)(/25) = /15625
3	3	5		(/25)(/25)(/25) = /15625
3	5	1		(/25)(/25)(/25) = /15625
3	5	3		(/25)(/25)(/25) = /15625
3	5	5		(/25)(/25)(/25) = /15625
5	1	1		(/25)(/25)(/25) = /15625
5	1	3		(/25)(/25)(/25) = /15625
5	1	5		(/25)(/25)(/25) = /15625
5	3	1		(/25)(/25)(/25) = /15625
5	3	3		(/25)(/25)(/25) = /15625
5	3	5		(/25)(/25)(/25) = /15625
5	5	1		(/25)(/25)(/25) = /15625
5	5	3		(/25)(/25)(/25) = /15625
5	5	5		(/25)(/25)(/25) = /15625

TOTAL SUM 15625/15625

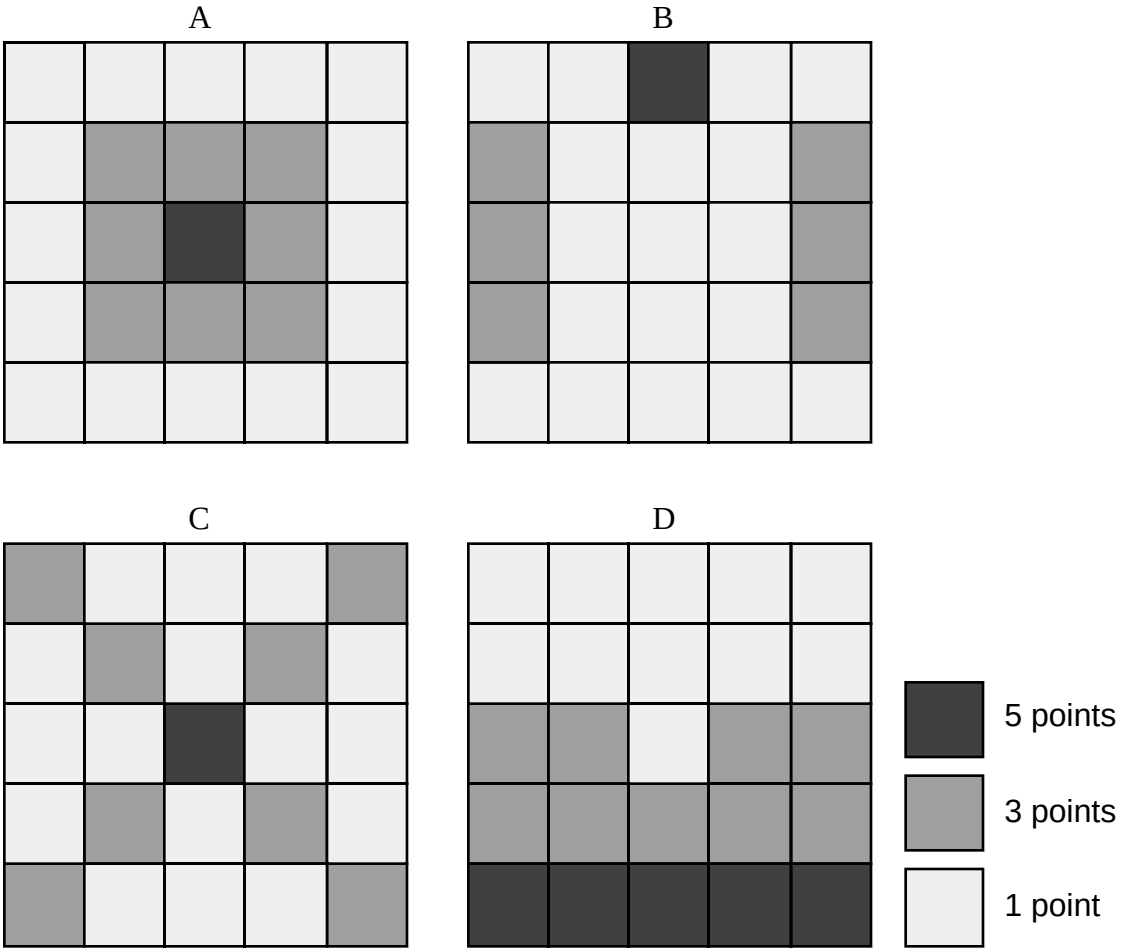
KEY - Bean Bag Toss - Both Version A and Version B

Your help is needed to design a bean bag toss game that people will be willing to play and that will most likely maximize profits for the school. The rules of the game are as follows:

- A person can play one round of the game for 50 cents.
- Each round consists of three tosses.
- A player's total score is the sum of the scores of each toss.
- A toss is valid if the bean bag lands completely within the lines of the grid, any toss that does not lie within the lines of the grid may be taken over.
- A player wins a prize if their total score is 11 points or greater.
- The prize is a small bean bag animal, worth about $2.00.
- The player tosses the bean bag standing 6 feet in front of the target. (The front being the bottom of the paper as you look at the target.)

ACME carnival company has sent the following ideas for targets for this game.

Possible Game Targets



Examine the four given targets.

1) Given that a toss lands on the target and in the lines, what is the probability that the toss will land in the...

five point region of target A? 1/25
three point region of target A? 8/25
one point region of target A? 16/25
P(scoring 11 points in three tosses) = 240/15625
P(scoring 12 points in three tosses) = 0
P(scoring 13 points in three tosses) = 24/15625
P(scoring 14 points in three tosses) = 0
P(scoring 15 points in three tosses) = 1/15625
P(scoring 11 or more points in three tosses) = 265/15625 = .01696 = 1.696%

TARGET A (BREAKDOWN OF PROBABILITIES)

First Toss	Second Toss	Third Toss	Total score	P(Total score| configuration)
1	1	1	3	(16/25)(16/25)(16/25) = 4096/15625
1	1	3	5	(16/25)(16/25)(8/25) = 2048/15625
1	1	5	7	(16/25)(16/25)(1/25) = 256/15625
1	3	1	5	(16/25)(8/25)(16/25) = 2048/15625
1	3	3	7	(16/25)(8/25)(8/25) = 1024/15625
1	3	5	9	(16/25)(8/25)(1/25) = 128/15625
1	5	1	7	(16/25)(1/25)(16/25) = 256/15625
1	5	3	9	(16/25)(1/25)(8/25) = 128/15625
1	5	5	11	(16/25)(1/25)(1/25) = 16/15625
3	1	1	5	(8/25)(16/25)(16/25) = 2048/15625
3	1	3	7	(8/25)(16/25)(8/25) = 1024/15625
3	1	5	9	(8/25)(16/25)(1/25) = 128/15625
3	3	1	7	(8/25)(8/25)(16/25) = 1024/15625
3	3	3	9	(8/25)(8/25)(8/25) = 512/15625
3	3	5	11	(8/25)(8/25)(1/25) = 64/15625
3	5	1	9	(8/25)(1/25)(16/25) = 128/15625
3	5	3	11	(8/25)(1/25)(8/25) = 64/15625
3	5	5	13	(8/25)(1/25)(1/25) = 8/15625
5	1	1	7	(1/25)(16/25)(16/25) = 256/15625
5	1	3	9	(1/25)(16/25)(8/25) = 128/15625
5	1	5	11	(1/25)(16/25)(1/25) = 16/15625
5	3	1	9	(1/25)(8/25)(16/25) = 128/15625
5	3	3	11	(1/25)(8/25)(8/25) = 64/15625
5	3	5	13	(1/25)(8/25)(1/25) = 8/15625
5	5	1	11	(1/25)(1/25)(16/25) = 16/15625
5	5	3	13	(1/25)(1/25)(8/25) = 8/15625
5	5	5	15	(1/25)(1/25)(1/25) = 1/15625
				TOTAL SUM 15625/15625

five point region of target B? 1/25
three point region of target B? 6/25
one point region of target B? 18/25
P(scoring 11 points in three tosses) = 162/15625
P(scoring 12 points in three tosses) = 0
P(scoring 13 points in three tosses) = 18/15625
P(scoring 14 points in three tosses) = 0
P(scoring 15 points in three tosses) = 1/15625
P(scoring 11 or more points in three tosses) = 181/15625 = .011584 = 1.1584%

TARGET B (BREAKDOWN OF PROBABILITIES)

First Toss	Second Toss	Third Toss	Total score	P(Total score| configuration)
1	1	1	3	(18/25)(18/25)(18/25) = 5832/15625
1	1	3	5	(18/25)(18/25)(6/25) = 1944/15625
1	1	5	7	(18/25)(18/25)(1/25) = 324/15625
1	3	1	5	(18/25)(6/25)(18/25) = 1944/15625
1	3	3	7	(18/25)(6/25)(6/25) = 648/15625
1	3	5	9	(18/25)(6/25)(1/25) = 108/15625
1	5	1	7	(18/25)(1/25)(18/25) = 324/15625
1	5	3	9	(18/25)(1/25)(6/25) = 108/15625
1	5	5	11	(18/25)(1/25)(1/25) = 18/15625
3	1	1	5	(6/25)(18/25)(18/25) = 1944/15625
3	1	3	7	(6/25)(18/25)(6/25) = 648/15625
3	1	5	9	(6/25)(18/25)(1/25) = 108/15625
3	3	1	7	(6/25)(6/25)(18/25) = 648/15625
3	3	3	9	(6/25)(6/25)(6/25) = 216/15625
3	3	5	11	(6/25)(6/25)(1/25) = 36/15625
3	5	1	9	(6/25)(1/25)(18/25) = 108/15625
3	5	3	11	(6/25)(1/25)(6/25) = 36/15625
3	5	5	13	(6/25)(1/25)(1/25) = 6/15625
5	1	1	7	(1/25)(18/25)(18/25) = 324/15625
5	1	3	9	(1/25)(18/25)(6/25) = 108/15625
5	1	5	11	(1/25)(18/25)(1/25) = 18/15625
5	3	1	9	(1/25)(6/25)(18/25) = 108/15625
5	3	3	11	(1/25)(6/25)(6/25) = 36/15625
5	3	5	13	(1/25)(6/25)(1/25) = 6/15625
5	5	1	11	(1/25)(1/25)(18/25) = 18/15625
5	5	3	13	(1/25)(1/25)(6/25) = 6/15625
5	5	5	15	(1/25)(1/25)(1/25) = 1/15625
				TOTAL SUM 15625/15625

five point region of target C? 1/25
three point region of target C? 8/25
one point region of target C? 16/25
P(scoring 11 points in three tosses) = 240/15625
P(scoring 12 points in three tosses) = 0
P(scoring 13 points in three tosses) = 24/15625
P(scoring 14 points in three tosses) = 0
P(scoring 15 points in three tosses) = 1/15625 = .01696 = 1.696%

TARGET C (BREAKDOWN OF PROBABILITIES)

First Toss	Second Toss	Third Toss	Total score	P(Total score| configuration)
1	1	1	3	(16/25)(16/25)(16/25) = 4096/15625
1	1	3	5	(16/25)(16/25)(8/25) = 2048/15625
1	1	5	7	(16/25)(16/25)(1/25) = 256/15625
1	3	1	5	(16/25)(8/25)(16/25) = 2048/15625
1	3	3	7	(16/25)(8/25)(8/25) = 1024/15625
1	3	5	9	(16/25)(8/25)(1/25) = 128/15625
1	5	1	7	(16/25)(1/25)(16/25) = 256/15625
1	5	3	9	(16/25)(1/25)(8/25) = 128/15625
1	5	5	11	(16/25)(1/25)(1/25) = 16/15625
3	1	1	5	(8/25)(16/25)(16/25) = 2048/15625
3	1	3	7	(8/25)(16/25)(8/25) = 1024/15625
3	1	5	9	(8/25)(16/25)(1/25) = 128/15625
3	3	1	7	(8/25)(8/25)(16/25) = 1024/15625
3	3	3	9	(8/25)(8/25)(8/25) = 512/15625
3	3	5	11	(8/25)(8/25)(1/25) = 64/15625
3	5	1	9	(8/25)(1/25)(16/25) = 128/15625
3	5	3	11	(8/25)(1/25)(8/25) = 64/15625
3	5	5	13	(8/25)(1/25)(1/25) = 8/15625
5	1	1	7	(1/25)(16/25)(16/25) = 256/15625
5	1	3	9	(1/25)(16/25)(8/25) = 128/15625
5	1	5	11	(1/25)(16/25)(1/25) = 16/15625
5	3	1	9	(1/25)(8/25)(16/25) = 128/15625
5	3	3	11	(1/25)(8/25)(8/25) = 64/15625
5	3	5	13	(1/25)(8/25)(1/25) = 8/15625
5	5	1	11	(1/25)(1/25)(16/25) = 16/15625
5	5	3	13	(1/25)(1/25)(8/25) = 8/15625
5	5	5	15	(1/25)(1/25)(1/25) = 1/15625
				TOTAL SUM 15625/15625

NOTE : Mathematically, A and C are the same target!

five point region of target D? 5/25
three point region of target D? 9/25
one point region of target D? 11/25
P(scoring 11 points in three tosses) = 2040/15625
P(scoring 12 points in three tosses) = 0
P(scoring 13 points in three tosses) = 675/15625
P(scoring 14 points in three tosses) = 0
P(scoring 15 points in three tosses) = 125/15625
P(scoring 11 or more points in three tosses) = 2840/15625 = 0.18176 = 18.176%

TARGET D (BREAKDOWN OF PROBABILITIES)

First Toss	Second Toss	Third Toss	Total score	P(Total score| configuration)
1	1	1	3	(11/25)(11/25)(11/25) = 1331/15625
1	1	3	5	(11/25)(11/25)(9/25) = 1089/15625
1	1	5	7	(11/25)(11/25)(5/25) = 605/15625
1	3	1	5	(11/25)(9/25)(11/25) = 1089/15625
1	3	3	7	(11/25)(9/25)(9/25) = 891/15625
1	3	5	9	(11/25)(9/25)(5/25) = 495/15625
1	5	1	7	(11/25)(5/25)(11/25) = 605/15625
1	5	3	9	(11/25)(5/25)(9/25) = 495/15625
1	5	5	11	(11/25)(5/25)(5/25) = 275/15625
3	1	1	5	(9/25)(11/25)(11/25) = 1089/15625
3	1	3	7	(9/25)(11/25)(9/25) = 891/15625
3	1	5	9	(9/25)(11/25)(5/25) = 495/15625
3	3	1	7	(9/25)(9/25)(11/25) = 891/15625
3	3	3	9	(9/25)(9/25)(9/25) = 729/15625
3	3	5	11	(9/25)(9/25)(5/25) = 405/15625
3	5	1	9	(9/25)(5/25)(11/25) = 495/15625
3	5	3	11	(9/25)(5/25)(9/25) = 405/15625
3	5	5	13	(9/25)(5/25)(5/25) = 225/15625
5	1	1	7	(5/25)(11/25)(11/25) = 605/15625
5	1	3	9	(5/25)(11/25)(9/25) = 495/15625
5	1	5	11	(5/25)(11/25)(5/25) = 275/15625
5	3	1	9	(5/25)(9/25)(11/25) = 495/15625
5	3	3	11	(5/25)(9/25)(9/25) = 405/15625
5	3	5	13	(5/25)(9/25)(5/25) = 225/15625
5	5	1	11	(5/25)(5/25)(11/25) = 275/15625
5	5	3	13	(5/25)(5/25)(9/25) = 225/15625
5	5	5	15	(5/25)(5/25)(5/25) = 125/15625
				TOTAL SUM 15625/15625

2) Which target would likely allow the school to earn the most money? Why?

It looks like target B would allow the school to earn the most money.

Justifications:

1) (objective reasoning) Both the five and three point regions are as small as or smaller than any of the other target regions.
2) (objective reasoning) The probability of scoring 11 or more points is less than scoring 11 or more points for any of the other targets.
3) (subjective reasoning) The five point region is in the row farthest away from the person tossing the bean bag, so it may be more difficult to get to.
4) (objective reasoning) Each prize costs $2.00 and each try is $0.50. Given the probabilities, it looks like about 90 students (100% / 1.1%) would have to play before someone won. So theoretically, the school would take in $45 before giving out a $2.00 prize!

3) Which target would likely allow the player the best chance to win a prize? Why?

It looks like target D would give the player the best chance to win a prize.

Justifications:

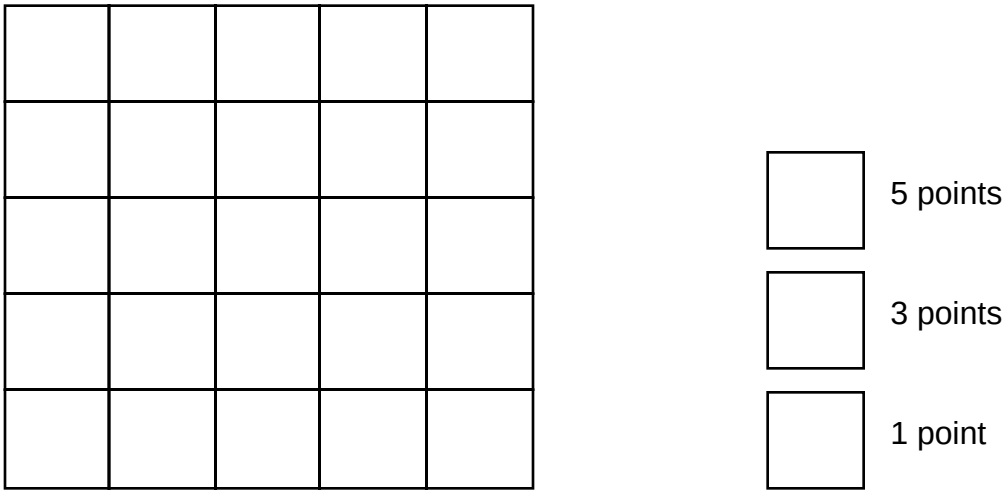
1) (objective reasoning) Both the five and three point regions are larger than the three and five point regions in the other targets.
2) (objective reasoning) The probability of scoring 11 or more points is more than scoring 11 or more points for any of the other targets.
3) (subjective reasoning) The five point region is in the row closest to the person tossing the bean bag, so it may be easier to get to.
4) (objective reasoning) Each prize costs $2.00 and each try is $0.50. Given the probabilities, it looks like between 5 and 6 students (100% / 18%) would have to play before someone won. So theoretically, the school would take in $2.50 - $3.00 before giving out a $2.00 prize!

4) Which target would the participant want to play and still allow the school to earn money? Why?

Answers vary. Subjective and objective reasoning acceptable.

5) Create a new target that you think could be more profitable for the school and a game which the carnival participants would still like to play.

Your Target



Answers vary.

6) Examine your target and find the probability for the following:

five point region of your target ?_____
three point region of your target ?_____
one point region of your target ?_____
P(scoring 11 points in three tosses) = _____
P(scoring 12 points in three tosses) = _____
P(scoring 13 points in three tosses) = _____
P(scoring 14 points in three tosses) = _____
P(scoring 15 points in three tosses) = _____
P(scoring 11 or more points in three tosses) = _____

Answers vary.

7) Why is this target better than any of the others?

Answers vary, objective and subjective responses are acceptable.

The rubric may need to be adjusted if the probability of calculating certain total scores is included.

Scoring Rubric for #1

Target A:	Target B:
3 Student correctly displayed all 3 ratios	3 Student correctly displayed all 3 ratios
2 Student correctly displayed 2 ratios	2 Student correctly displayed 2 ratios
1 Student correctly displayed 1 ratio	1 Student correctly displayed 1 ratio
0 Student incorrectly displayed all ratios	0 Student incorrectly displayed all ratios

Targets C and D follow the same rubric as Targets A and B

Scoring Rubric for #2

3 Student chose a target and included 2 reasons
2 Student chose a target and included 1 reason
1 Student chose a target and omitted reasons
0 Student did not choose a target, omitted reasons, and included opinions

Scoring Rubric for #3

3 Student chose a target and included 2 reasons
2 Student chose a target and included 1 reason
1 Student chose a target and omitted reasons
0 Student did not choose a target, omitted reasons, and included opinions

Scoring Rubric for #4

3 Student chose a target and included justification based upon the school earning money
2 Student chose a target and a poor justification
1 Student chose a target and omitted a justification
0 Student omitted choosing a target and a justification

Scoring Rubric for #5

3 Student clearly displayed target, included a key, had key symbols that matched the target
2 Student clearly displayed target, included a key, and had key symbols that did not match target
1 Student clearly displayed target, omitted a key, and had key symbols that did not match target
0 Student poorly displayed target, omitted a key, and had key symbols that did not match target

Scoring Rubric for #6

3 Student correctly calculated the three ratios for their own target
2 Student correctly calculated two ratios for their own target
1 Student correctly calculated one ratio for their own target
0 Student incorrectly calculated all ratios for their own target

Scoring Rubric for #7

3 Student included probability calculations, justified reasoning, and stated clearly
2 Student included probability calculations, justified reasoning, and stated unclearly
1 Student omitted calculations and stated unclearly, however included justified reasoning
0 Student omitted calculations and reasoning and stated unclearly

Culminating Activity

Writing Prompt

Now that you have planned a carnival, write a letter to your principal persuading him / her to allow you and your classmates to have a carnival as this year's fund raising activity. Be sure to include previous justifications to help in your argument.

Before you begin to write, think about:

- where the carnival will be held
- how tables and games will be arranged
- the games that will be available; include probability and profit
- refreshments available, with cost analysis
- benefits for school, community, and students

Now write a letter to your principal persuading him / her to allow you and your classmates to have a carnival as this year's fund raising activity.