CALIFORNIA STEAM SYMPOSIUM

DECEMBER 10–11 2017

CORE®

Guided Investigations Where Discovery is Productive

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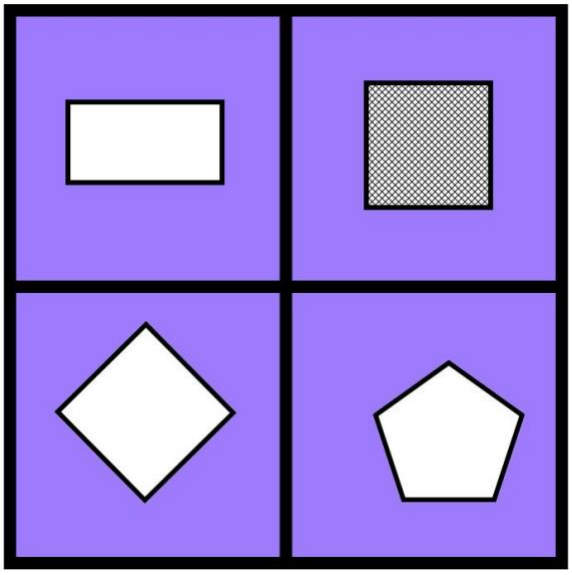
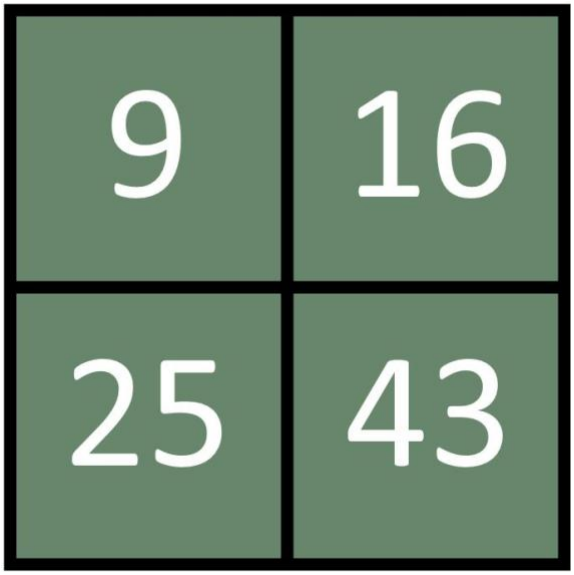
Three Types of Purposes for Activities

- Apply knowledge
- Learn about problem solving
- Gain and/or extend knowledge

Activity	Apply Knowledge	Learn about Problem Solving	Gain or Extend Knowledge	Other
Which One Doesn't Belong				
KenKen Puzzle				
Flipping Out				
Untying Knots in a Rope				
Super Bear				
Sides of Triangles				

Which One Doesn't Belong (wodb.ca)





Ken Ken Puzzles (kenkenpuzzle.com)

4+	7+		2
	3+		7+
6+	5+		
	2	4+	

1	6+		4+
5+	7+		
	3+		7+
7+			

FLIPPING OUT!

Materials: One coin and one cup (like a Dixie cup) per two people.

A. Work with a partner to answer the following questions (3 min):

1. What do you think is the probability of getting heads? Out of 40 coin flips what is your estimate for the number of times a coin will land on heads?

2. What do you think is the probability of the cup landing on either end? Out of 40 cup flips, what is your estimate for the number of times a cup will land on the end?

B. In pairs, EACH person will flip the coin 20 times and flip the cup 20 times.

1. Count number of heads for coins: _____ heads out of 20 coin flips.
2. Count number of times landing on either end for the cup: _____ ends out of 20 cup flips.
3. Partners **total** their coin flip data together and **total** their cup flip data together.

4. **TOTALS with your partner:**

   _____ heads out of coin 40 flips; _____ ends out of 40 cup flips.

C. Answer the following questions:

1. How are the two flipping activities the same and how are they different?

2. Combine your coin and cup data with two other partner pairs (so you'll each have a total number of heads out of 120 coin flips; and a total number of ends out of cup 120 flips). Examine the combined data.

   TOTALS:

   _____ heads out of coin 120 flips; _____ ends out of 120 cup flips.

3. Does this data change your mind about the probability of getting heads? Why or why not?

4. Predict out of 600 coin flips how many times you think we, as a whole group, will have heads.

5. Does this data change your mind about the probability of getting ends? Why or why not?

6. Predict out of 600 cup flips how many times you think we, as a whole group, will have ends.

D. Discussion/Notes on theoretical and experimental probabilities.

Name: _____

Untying Knots in a Rope

Collect data and analyze the relationships between knots and the length of ropes.

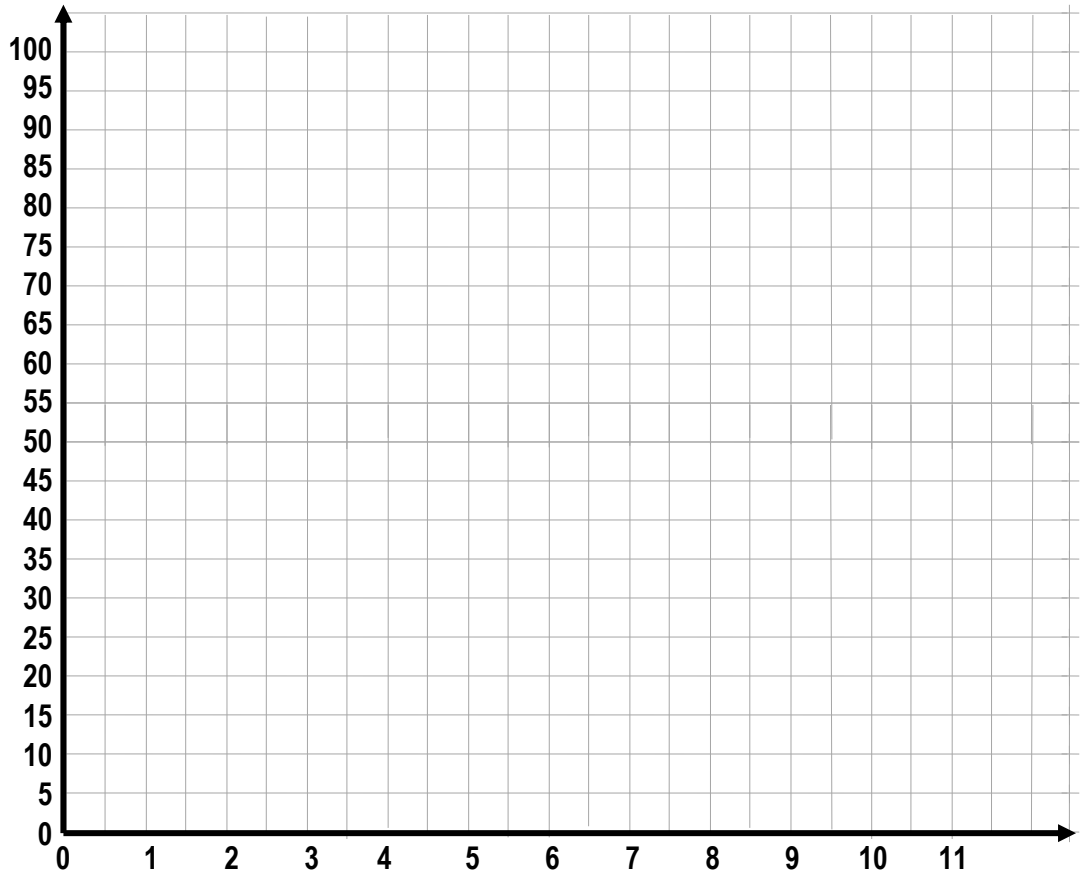
1. After each knot is untied, enter the data into the table below.

Your Rope	
# of Knots Untied	Length of Rope
0	

Partner's Rope	
# of Knots Untied	Length of Rope

2. a) Label the axis the on coordinate plane below.

   b) Graph your data for the ropes on the coordinated axes below.



3. Write a rule for the length (L) of your rope based on (as a function of) the number of knots that have been untied.

4. Graph your rule or function on the same graph you used for the rope data.

5. Describe how the graph of your function compares to the graph of the data from the rope.

6. Predict the length your rope will be when all knots have been untied. Show or explain how you determined your prediction.

7. What is the rate at which your rope is changing?

8. How does the graph of the function you created (from problem #3) show the rate?

9. How does the table of the data show the rate?

10. a) What does the *y*-intercept (on the graph) represent about your function?

    b) How does the *y*-intercept relate to the rope and knots?

    c) How does the *y*-intercept relate to the table of data?

Name: _____

Super Bear

Estimate: _____

Central Questions:

Information I need:

Information I am given:

My work answering the Super Bear central questions:

EXTENSION:

1. If you want to eat gummy bears, what's the cheapest way to get your fix? Use the following information about bears and prices.
    - 352 Mini bears for $6.99
    - 587 Regular bears for $8.99
    - One 5-pound Super Bear for $29.95

Triangle Sides

Materials: One bag with various lengths of straws and one measuring tape.

A. Work with a partner to answer the following questions

1. Pick three straws and see if they can connect ends to ends to make a triangle.
2. Enter the three lengths on either the Makes Triangle" or "Does Not Make Triangle" column of the data chart below.
3. Continue to pick different sets of three straws, check if a triangle can be made and record the set of three straws on the chart.
    - Experiment with at least **8** different sets of sides.
    - Find at least four sets that make a triangle and at least three sets that do not make a triangle.
    - (Note: 3, 5, 7 & 3, 5, 9 count as two different sets of straws since they are not exactly the same.)

Makes a Triangle	Does Not Make a Triangle

4. Write a conjecture about how what is required for a set of three lengths of straw to be able to make a triangle.

5. Explain why you think your conjecture is true and makes sense.