MathLinks

GRADE 7 TASKS
Proportional Reasoning, Probability, and Statistics

A SPECIAL DIET

Fractions, ratios, modeling real life situations

Charles is an elite athlete with an intense training regimen, and his trainer suggests a special diet for him:

- $\frac{2}{5}$ of his calories should come from protein;
- $\frac{3}{10}$ of his calories should come from fruits and vegetables;
- $\frac{1}{5}$ should come from carbohydrates;
- The rest should come from fat.

1. Write the following ratios. Simplify all ratios so that only whole numbers are used.
   - Calories from protein to calories from fruits and vegetables.
   - Calories from carbohydrates to calories from fat.
   - Calories from fat and carbohydrates to calories from fruits and vegetables and protein.

2. The ratio for the calories from carbohydrates and fat to the calories from fruits and vegetables is 1:1. Explain what the ratio 1:1 means in the context of the problem.

3. On Monday, Charlie calculated his calories for the day. He ate 960 calories from protein, 480 calories from carbohydrates, 720 calories from fruits and vegetables, and 240 calories from fat. Did Charlie follow his trainer's orders? Explain.

4. If Charlie wanted to limit his total daily calories to 2600, how many calories should he eat from each group?

5. If Charlie consumes 500 calories of protein on Wednesday, how many calories should he consume of the other food groups?

USING COUPONS

Percent

1. Bridget has four coupons for the same department store.

   - Coupon A offers 25% off any item.
   - Coupon B offers $20 off any item.
   - Coupon C offers 10% off any item
   - Coupon D offers $10 off any item.

   She needs to buy the following items.

   - One set of sheets for $45.
   - One mattress for $400
   - One set of 4 pillows for $60.
   - One bed frame for $120.

   If she is allowed to use only one coupon per item, how should she use her coupons to save the most money? Thoroughly explain your thinking.

2. Howard has the same coupons as Bridget, but for a department store that allows him to use all four coupons on the same item. He wants to buy a $1200 TV.

   Consider if the order that Howard uses his coupons matters or not to find the cheapest TV price that Howard can get using all 4 coupons. Thoroughly explain your thinking.

MINIMUM WAGES

Percent; modeling real life situations

The federal government and many states require that employers pay their employees an hourly "minimum wage." The minimum wage helps to make sure that workers are fairly compensated for the work they do.

Over the years, the minimum wage has increased because the cost of most of the things we buy has also increased. This increase in prices is called inflation.

This task analyzes the increases in minimum wages.

Here is some data about federal minimum wages over the years. (Many states impose higher minimum wage rates than this)

Year	1960	1970	1980	1990	2000	2010
Hourly Minimum Wage	$1.00	$1.60	$3.10	$3.80	$5.15	$7.25

1. Make a graph of the data. Describe any patterns you notice.

2. Find the percent increases from each decade to the next decade.

3. Which decade saw the largest increase?

4. In 2014, President Barack Obama called on Congress to raise the minimum wage to $10.10. Find the percent increase from 2010 and compare it the percent increases you found in problem 2. Do some research to determine if this minimum raise increase took place.

5. In the 1960s, a leading fast food restaurant sold hamburgers for about $0.15. Currently, that same restaurant sells hamburgers for about $0.90. What is the percent increase in the cost of the hamburger? How does this compare to the increase in the minimum wage from 1960 to 2010? Have increases in minimum wage kept up with increases in the cost of hamburgers?

6. In 1960, a full year tuition at a large public university cost about $280. In 2010, the cost at the same university was about $8,800. What is the percent increase? How does this compare to the percent increase in minimum wage during the same time? Have increases in minimum wage kept up with increases in the cost of tuition?

7. Do some more research on cost increases from 1960 to 2010 and reflect on whether it is important or not to raise the minimum wage now. Raising the minimum wage could potentially help workers with these jobs that pay minimum wage. Is there anyone it might hurt?

STUDENT LOAN

Percent

A more common practice for paying off a loan includes paying compound interest. That is, you pay interest on the principal *and* the interest over several payment periods. Below is a comparison of simple and compound interest for a given situation.

1. Cary needs money for her final year of college at a public university. Grandma Bobbie will loan $10,000 at 4% if she pays it back with interest at the end of 2 years.

Simple Interest Example		
P = R = T =	$I = PRT$ I =	$A = P + I$ A =
Using simple interest, the total amount that Cary has to pay Grandma Bobbie back after 2 years is $_____		

Compound Interest Example		
Compound interest works in stages. Here we will examine interest compounded annually, which means that interest is calculated each year.		
Year 1	P = R = T = 1 year (for year 1 only)	$I = PRT$ I =
Year 2	$P_{new} = P_{previous} + I$ = R = T =1 year (for year 2 only)	$I = PRT$ I =

Total I = _____ (year 1) + _____ (year 2) = _____	$A = P + I$ A =
Using compound interest, the total amount that Cary has to pay Grandma Bobbie back after 2 years is $_____	

2. Brian needs money for his final year of college at a private university. Uncle Harry will loan Brian $40,000 at 5%, to be paid back with interest at the end of 3 years.

   a. Find the simple interest and the total amount to repay Uncle Harry after 3 years.
   b. Find the total amount to repay Uncle Harry if interest is compounded annually.

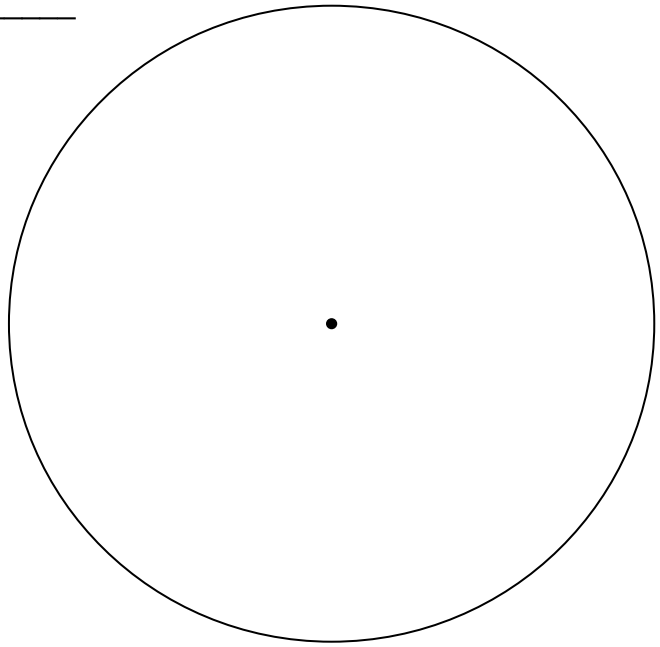
CREATE A SPINNER PUZZLE

probability

This problem allows you to be creative in showing your understanding of probability concepts, including fractions, decimals, and percents.

Draw a spinner with three to five parts. Label the spinner parts with a theme of your choice. Accurately identify each section of the spinner with its appropriate fraction, decimal, and percent. Write four to six clues to create a spinner puzzle.

Theme: _____



Clues:

1. _____

2. _____

3. _____

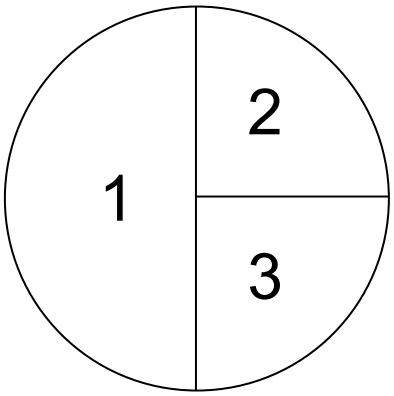
4. _____

5. _____

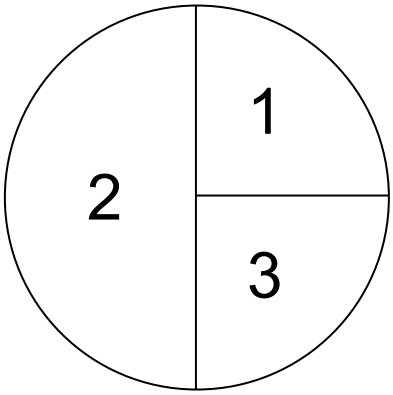
6. _____

SPINNER SUMS

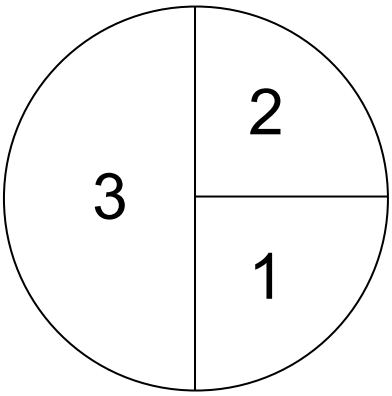
probability



Spinner A



Spinner B



Spinner C

1. Make predictions.

   If you spin Spinner A twice and find the sum, what do you think is the mostly likely outcome? What about for Spinner B? Spinner C? Explain by using your "gut feeling" when casually observing each of these spinners. Analysis will come later.

2. Collect data.

   Use a paper clip and a pencil to make several pairs of spins to find sums. Record your data in an organized way. Do the data support your predictions? Explain.

3. Theoretical analysis.

   Use outcome grids or tree diagrams to calculate the theoretical probabilities for each sum on Spinners A, B, and C. Clearly indicate the most likely sum for each spinner.

4. Concluding paragraph.

   Write a paragraph that includes your thinking throughout the entire process. Discuss whether your predictions, your empirical data, and your theoretical analyses were in agreement or not. Was there anything that you got stuck on along the way? Was there anything surprising, or anything that did not make sense? Make final assertions and statements about this experiment.

PASCAL'S TRIANGLE

probability

1. The triangle below is called Pascal's Triangle. The first 6 rows are shown. Find a pattern that will allow you to produce the next four rows.

Row 0	1
Row 1	1 1
Row 2	1 2 1
Row 3	1 3 3 1
Row 4	1 4 6 4 1
Row 5	1 5 10 10 5 1

2. List other patterns you can find in Pascal's Triangle.

3. If a coin is flipped, there are two possible outcomes: heads (H) or tails (T).

   How many possible outcomes are there if two coins are flipped simultaneously? Organize your work using a tool you learned in this packet.

   How many possible outcomes are there if three coins are flipped simultaneously? Organize your work using a tool you learned in this packet.

   Ponder, but don't answer this question: How many possible outcomes are there if 10 coins are flipped? You probably realize that listing all the possible outcomes for 10 coins and counting them would be a very long and tedious process. In fact, there are 1,024 possible outcomes if 10 coins are flipped. That's a really long list and a really big tree diagram!

   Pascal's Triangle can be helpful in finding solutions to probability problems like these.

   Examine the 2^{nd}, 3^{rd}, and 4^{th} rows of Pascal's Triangle. How do the rows show the number of possible outcomes for 1, 2, and 3 coins?

   What might the 5^{th} row of Pascal's Triangle represent? Explain your reasoning.

   Use Pascal's Triangle to find out how many possible outcomes there are if 9 coins are flipped.

4. Go online and read more about Pascal's Triangle. Write down three things you learn.

THE CEREAL BOX PROBLEM

Statistics / sampling

There are six different animal prizes in Krispi Krunchy Cereal, and you want to collect all six. How many boxes do you think you need to buy to get all six?

1. Make a prediction.

   What is your "gut feeling?" Analysis will come later.

2. Design an experiment.

   Describe your experiment. What tools will you need? How many times will you perform the experiment?

3. Collect data.

   Perform your experiment and organize your data.

4. Analyze the data

   Use statistical tools to analyze the data

5. Concluding paragraph.

   Write a paragraph that includes your thinking throughout the entire process. Discuss whether your predictions, your empirical data, and your theoretical analyses were in agreement or not. Was there anything that you got stuck on along the way? Was there anything surprising, or anything that did not make sense? Make final assertions and statements about this experiment.