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| **Title:** | **Working as a Zoologist** |
| **Grade:** | **6** |
| **Claim(s):** | **Claim 4: Modeling and Data Analysis**<br>Students can analyze complex, real-world scenarios and can construct and use mathematical models to interpret and solve problems.<br>**Claim 3: Communicating Reasoning**<br>Students clearly and precisely construct viable arguments to support their own reasoning and to critique the reasoning of others.<br>**Claim 2: Problem Solving**<br>Students can solve a range of well-posed problems in pure and applied mathematics, making productive use of knowledge and problem-solving strategies. |
| **Assessment Target(s):** | **Claim 4**<br>**B.** Construct, autonomously, chains of reasoning to justify mathematical models used, interpretations made, and solutions proposed for a complex problem.<br>**D.** Interpret results in the context of the situation.<br>**Claim 3**<br>**D:** Use the technique of breaking an argument into cases.<br>**E:** Distinguish correct logic or reasoning from that which is flawed and—if there is a flaw in the argument—explain what it is.<br>**Claim 2**<br>**A.** Apply mathematics to solve well-posed problems in pure mathematics and arising in everyday life, society, and the workplace.<br>**C.** Interpret results in the context of the situation. |
| **Standard(s):** | 6.NS.1, 6.RP.3b, 6.RP.3c, 6.G.1, 6.G.2, 6.SP.5c, 6.SP.5d |
| **Mathematical Practice(s):** | 1, 2, 3, 4, 6 |
| **Bloom's Taxonomy Level:** | Analyzing - 4 |
| **DOK Level:** | Strategic Thinking/Reasoning - 3 |
| **Score Points:** | 13 points possible |
| **Difficulty:** | Hard |
| **Resources:** | Calculators are needed throughout this performance task. |
| **Notes:** | N/A |
| **Task Overview:** | The student will solve problems involving area, volume, percent, fractions, and data analysis. |
| **Teacher Preparation/Resource Requirements:** | None required |
| **Time Requirements:** | Approximately 60-80 minutes |

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| **Prework:** | None |

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| **Sample Top-Score Response** | You have been hired as the new zoologist at a zoo. You have many jobs to complete during a normal workday, and you will need to use your math knowledge in order to complete the jobs successfully.<br><br>**Part A**<br><br>1. One part of your job as a zoologist is to administer vitamins to many animals in the zoo. Currently, there is a giraffe who needs one dose of vitamins every morning. You have three bottles of the vitamins, each with a capacity of 26.25 mL. Two of the three bottles are full, and the third bottle contains 20% less than capacity. If each dose is 24% of a full bottle, how many complete doses of vitamins do you have?<br><br>**11 doses**<br><br>2. The next job of your day is to buy new food troughs for the zebra enclosure.<br><br>You have narrowed your decision down to two rectangular prism-shaped food troughs with different dimensions. One choice has dimensions of $6\frac{2}{3}$ feet long, $4\frac{2}{5}$ feet wide, and $2\frac{4}{7}$ feet high. The other choice has dimensions of $5\frac{9}{10}$ feet long, $5\frac{1}{2}$ feet wide, and $2\frac{6}{7}$ feet high.<br><br>You have decided to choose the food trough that holds a greater volume. Enter the volume, written as a *reduced* mixed number, of the food trough you should choose.<br><br>**$92\frac{5}{7}$ feet$^3$** |

**Part B**

3. A project you are working on as a zoologist is the planning of the new aquarium exhibit in the zoo. Today, you need to calculate the number of small aquariums you will be able to have in the exhibit, $x$. You have been told that you may use only one large barrel of water in order to fill all the small aquariums. You know that one barrel holds a total of $231\frac{5}{8}$ gallons of water, and each small aquarium can hold $27\frac{1}{4}$ gallons of water. In order to solve for the number of small aquariums you will be able to have, you complete the following steps:

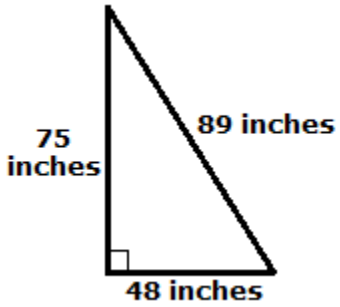
   Step 1 - Write the equation: $x = 231\frac{5}{8} \div 27\frac{1}{4}$
   Step 2 - Convert mixed numbers to irregular fractions: $x = \frac{1853}{8} \div \frac{109}{4}$
   Step 3 - Change division to multiplication: $x = \frac{1853}{8} \times \frac{109}{4}$
   Step 4 - Solve: $x = \frac{201977}{32}$; $x = 6311.78$; I can fit 6311 small aquariums in the new exhibit.

   Explain what mistake you made in your steps. Correct your mistake, and calculate the accurate number of small aquariums you will be able to have in the new exhibit.

**Sample Top-Score Response**

**The mistake I made was not finding the reciprocal of the second fraction before multiplying. The equation in Step 3 should be $x = \frac{1853}{8} \times \frac{4}{109}$, which equals $8\frac{1}{2}$. I can have 8 small aquariums.**

4. You are working with advertisers to design a billboard that will advertise the new aquarium exhibit. The rectangular billboard will measure 14.5 feet high by 48.2 feet wide. The advertisers have suggested dividing the billboard into right triangle-shaped sections for showcasing pictures of some of the new fish that will soon be in the exhibit. Each section on the billboard will be the same size with the following dimensions:




If none of the triangles overlap, what is the largest number of complete right triangle-shaped sections that will be able to fit on the billboard? How much extra space will be left on the billboard after that number of triangle sections is used? Explain the steps you took to calculate your answers.

**To find the number of triangles: There is space on the billboard for 48 complete triangles. The converted dimensions of the billboard are 174 inches high by 578.4 inches wide. When this is divided by the height and width of the triangle, there is space for two rows of 24 triangles on the billboard, which equals a total of 48 triangles.**

**To find the extra space: The area of the billboard is 100,641.6 inches$^2$. The area of each triangle is 1800 inches$^2$; 1800 inches$^2$ × 48 triangles = 86,400 inches$^2$ taken up by triangles; 100,641.6 inches$^2$ – 86,400 inches$^2$ = 14,241.6 inches$^2$ of extra space left on the billboard.**

5. As the last task of your job today, you are creating a report based on the weights of the lions in the lion enclosure. You discover the following information while gathering your data.

   - Lion A weighs 420 pounds.
   - Lion B weighs 67% of Lion A.
   - Lion C weighs 25% more than Lion B.
   - Lion D, a newborn cub, weighs 5.7% of Lion A.

   Calculate the median and mean for your report, rounded to the nearest thousandth. Explain which measure of center is more accurate when describing your data.

   **The mean of this data is 269.273 pounds, and the median is 316.575 pounds. The median is more accurate because of the outlier of the newborn's weight. This outlier has a larger influence when calculating the mean, which makes the median a better choice.**

6. You also need to include the relationship between lion weight and food consumption in your lion report. You have calculated the amount of food eaten per day, per lion, and it is displayed in the following table.

| Lion | Amount of Food Eaten in One Day |
|---|---|
| A | 252 pounds |
| B | 174.468 pounds |
| C | 218.085 pounds |
| D | 14.364 pounds |

   One of the other zoologists argues that all lions eat at the same rate.

   0.62 pounds of food eaten/1 pound of weight

   Using the lion weights you found in Question 5, explain which lions support this argument and which lions do not support this argument.

   **Lions B and C both support the argument. When I calculate their rate of food consumption, they both have a rate of 0.62 pounds eaten/1 pound of weight. Lions A and D do not support the argument. Lion A's rate and Lion D's rate are both 0.60 pounds eaten/1 pound of weight.**

**End of Performance Task**

**Scoring Rubrics for Part A:**

| **Scoring Rubric Question 1:** | |
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| **1 Point:** | The student demonstrates good understanding of calculating with percents. The student correctly finds the number of doses of vitamins left. |
| **0 Points:** | The student demonstrates no understanding of calculating with percents. The student does not correctly find the number of doses of vitamins left. |

| **Scoring Rubric Question 2:** | |
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| **1 Point:** | The student demonstrates good understanding of calculating the volume of right rectangular prisms. The student correctly finds the volume of the larger container. |
| **0 Points:** | The student demonstrates no understanding of calculating the volume of right rectangular prisms. The student does not correctly find the volume of the larger container. |

**Soring Rubric for Part B:**

| **Scoring Rubric Question 3:** | |
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| **2 Points:** | The student demonstrates good understanding of interpreting and computing the division of fractions. The student correctly identifies the mistake and correctly calculates the number of small aquariums. |
| **1 Point:** | The student demonstrates limited understanding of interpreting and computing the division of fractions. The student correctly identifies the mistake but does not correctly calculate the number of small aquariums. |
| **0 Points:** | The student demonstrates no understanding of interpreting and computing the division of fractions. The student does not correctly identify the mistake and does not correctly calculate the number of small aquariums. |

| **Scoring Rubric Question 4:** | |
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| **3 Points:** | The student demonstrates thorough understanding of calculating the area of right triangles and rectangles. The student thoroughly explains the steps, taken, correctly calculates the number of right triangles that will fit, and correctly calculates the amount of extra space left over. |
| **2 Points:** | The student demonstrates good understanding of calculating the area of right triangles and rectangles. The student correctly explains the steps taken, correctly calculates the number of right triangles that will fit, but does not correctly calculate the amount of extra space left over. OR The student correctly calculates the number of right triangles that will fit, correctly calculates the amount of space left over, but does not thoroughly explain the steps taken. |
| **1 Point:** | The student demonstrates limited understanding of calculating the area of right triangles and rectangles. The student correctly calculates the number of right triangles that will fit but does not correctly calculate the amount of space left over and does not thoroughly explain the steps taken. OR The student correctly calculates the amount of space left over but does not correctly calculate the number of right triangles that will fit and does not thoroughly explain the steps taken. |
| **0 Points:** | The student demonstrates no understanding of calculating the area of right triangles and rectangles. The student does not thoroughly explain the steps taken, does not correctly calculate the number of right triangles that will fit, and does not correctly calculate the amount of extra space left over. |

| **Scoring Rubric Question 5:** | |
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| **3 Points:** | The student demonstrates thorough understanding of calculating and interpreting the measures of center of a set of data. The student correctly calculates the mean, correctly calculates the median, and correctly explains why the median is a more accurate choice. |
| **2 Points:** | The student demonstrates good understanding of calculating and interpreting the measures of center of a set of data. The student correctly calculates the mean but does not correctly calculate the median and uses the information found to correctly explain which measure of center is a more accurate choice. OR The student correctly calculates the median but does not correctly calculate the mean and uses the information found to correctly explain which measure of center is a more accurate choice. OR The student correctly calculates the mean and correctly calculates the median but does not correctly explain why the median is a more accurate choice. |
| **1 Point:** | The student demonstrates limited understanding of calculating and interpreting the measures of center of a set of data. The student correctly calculates the mean but does not correctly calculate the median and does not use the information found correctly to explain which measure of center is a more accurate choice. OR The student correctly calculates the median but does not correctly calculate the mean and does not use the information found correctly to explain which measure of center is a more accurate choice. OR The student does not correctly calculate the mean, does not correctly calculate the median, but does use the information found to correctly explain which measure of center is a more accurate choice. |
| **0 Points:** | The student demonstrates no understanding of calculating and interpreting the measures of center of a set of data. The student does not correctly calculate the mean, does not correctly calculate the median, and does not use the information found to correctly explain which measure of center is a more accurate choice. |

| **Scoring Rubric Question 6:** | |
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| **3 Points:** | The student demonstrates thorough understanding of solving rate problems. The student correctly identifies Lion B and Lion C as supporting the argument and correctly identifies Lion A and Lion D as not supporting the argument. |
| **2 Points:** | The student demonstrates good understanding of solving rate problems. The student correctly identifies only Lion B OR only Lion C as supporting the argument and correctly identifies both Lion A and Lion D as not supporting the argument. OR The student correctly identifies both Lion B and Lion C as supporting the argument but only correctly identifies Lion A OR only Lion D as not supporting the argument. |
| **1 Point:** | The student demonstrates limited understanding of solving rate problems. The student correctly identifies only Lion B OR only Lion C as supporting the argument and correctly identifies only Lion A OR only Lion D as not supporting the argument. OR The student does not correctly identify either Lion B nor Lion C as supporting the argument but does correctly identify both Lion A and Lion D as not supporting the argument. OR The student correctly identifies both Lion B and Lion C as supporting the argument but does not correctly identify neither Lion A nor Lion D as not supporting the argument. |
| **0 Points:** | The student demonstrates no understanding of solving rate problems. The student does not correctly identify either Lion B or Lion C as supporting the argument and does not correctly identify either Lion A or Lion D as not supporting the argument. |

**A student should receive full credit for this question if they correctly calculate with the incorrect numbers from the previous question(s).*