Easter Bunny Fractions

Exhausted and hungry from hours of delivering chocolate eggs and yellow marshmallow chicks to children around the world, the Easter Bunny came upon Elmer Fudd's most amazing vegetable garden.

1/6 of the garden was planted with chocolate broccoli. 1/6 was planted with marshmallow cauliflower and 1/8 of the garden was planted with peppermint peppers. 1/2 of the space was planted with the chocolate broccoli (already mentioned) and peanut brittle tomatoes.

What part of the garden was planted with his most favorite vegetable, Cherry Garcia carrots?

Grade Levels 6 - 8

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Context

The class is studying fractions. We have been renaming fractions and adding and subtracting fractions. We started studying fractions using a variety of manipulatives. Some students continue to rely on manipulatives whenever possible.

What This Task Accomplishes

This was an assessment to see how well students could manipulate fractions with unlike denominators in a non-routine problem. I knew most students could do the computation and the simple addition and subtraction problems in the textbook, but this problem would let me know how well they could plan a strategy that involved work with fractions. I was also curious as to what approach each student would take, as well as which students were more comfortable with a visual (area) approach and which students were more comfortable with a number approach. This knowledge will help me as I introduce new topics.

What the Student Will Do

Most students started using a combination of sketches and manipulation of numbers. Some students asked and were given the fraction pieces we had been using. Many students had to confirm that the chocolate broccoli mentioned twice were not two different plantings.

Time Required for Task

45 minutes

Some who wanted to do some representations took a little longer.

Interdisciplinary Links

This task could be linked to a unit on garden and landscape planning.

Teaching Tips

There could be some misunderstanding about the chocolate broccoli planting. Be sure students understand that there is only one section of chocolate broccoli.

Suggested Materials

- Fraction pieces available
- Graph paper

Possible Solutions

1/6 broccoli + 1/6 cauliflower + 1/8 peppers + (1/2 - 1/6) tomatoes = 19/24; leaving 5/24 for carrots.

Benchmark Descriptors

Novice
This student does not understand that they need to find the part of the garden that is Cherry Garcia carrots. S/he has what appears to be a completed garden plot that has broccoli, tomatoes, cauliflower, peppers and tomatoes. Although, the tomatoes only take up 1/4 of the space - a most common error - 1/4 being 1/2 of the 1/2. There is no explanation of the solution other than the incorrect diagram.

Apprentice
This student is using a strategy that is partially useful. S/he uses fraction pieces for each of the sections and compares them to the one whole fraction bar. There is evidence of mathematical reasoning as s/he states that the missing piece is smaller than 1/4 and bigger than 1/6. However, s/he could not completely carry out the mathematical procedure and compare the space with 2/12 and 1/2 of 1/12 to come up with 5/24. There is some use of mathematical terminology.

Practitioner
This student has a broad understanding of the problem and the major concepts necessary for its solution. The student uses his/her knowledge of adding and subtracting fractions - finding a LCM of all the fractions (although not necessary for solving the problem if fraction pieces to twelfths are available). The student uses effective mathematical reasoning and procedures. There is a clear explanation and appropriate use of mathematical representation. There also is effective use of terminology and notation (LCM and the addition algorithm).

Expert
This student shows a deep understanding of the problem, including the ability to identify appropriate mathematical concepts and information necessary for its solution. Although this

student drags out the explanation (something I try to discourage), his/her use of making the circle graph was quite sophisticated. We had worked with central angles, but not formally making circle graphs. His/her explanation here showed refined reasoning. There is a clear (although drawn out) explanation detailing how the problem was solved. His/her mathematical terminology and notation is precise and appropriate and his/her representation was outstanding.

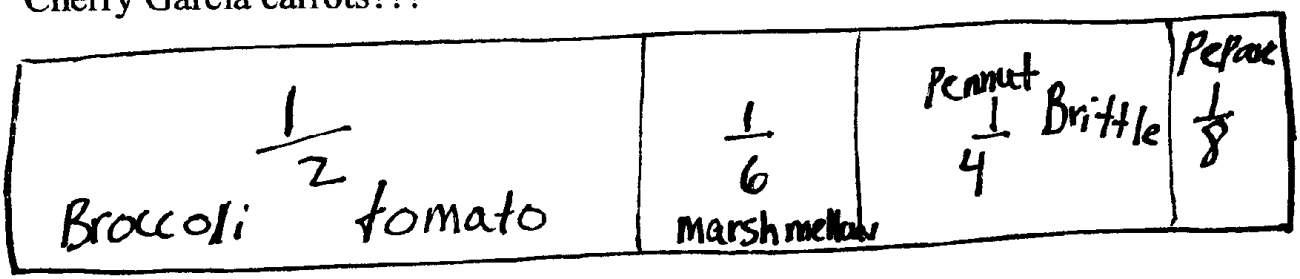
Novice

EASTER BUNNY FRACTIONS

Exhausted and hungry from hours of delivering chocolate eggs and yellow marshmallow chicks to children around the world, the Easter Bunny came upon Elmer Fudd's most amazing vegetable garden.

One sixth of the garden was planted with chocolate broccoli. One sixth was planted with marshmallow cauliflower and 1/8 of the garden was planted with peppermint peppers. One half of the space was planted with chocolate broccoli (already mentioned) and peanut brittle tomatoes.

What part of the garden was planted with his most favorite vegetable, Cherry Garcia carrots???



The student does not understand that s/he is supposed to find the part of the garden that is planted with carrots. His/Her garden has only broccoli, tomatoes, cauliflower and peppers.

Apprentice

Easter Bunny Fractions

The first step I took was tracing the 1 whole fraction block. Then inside of the whole I traced the 1/6 block for the marshmellow cauliflower. 1/8 for the Peppermint Peppers and 1/2 for the Chocolate broccoli and Peanut brittle tomatoes. I didn't trace the Chocolate broccoli which is 1/6 because I included that with the Peanut brittle tomatoes to form 1/2. So I had all of the vegetables down except for the cherry garcia carrots. They would fit into the empty space it had on my garden. The empty space was smaller then 1/4 and bigger then 1/6 so it had to be between them. Which is 1/5. So the cherry garcia carrots have 1/5 of the garden.

The strategy was useful to solve part of the problem. The student, however, could not continue to use the fraction pieces to find the remaining garden plot.

Some reasoning is used to find the solution to be >1/6, <1/4.

Practitioner

Easter bunny Fractions

I chose 24th as the fraction that I would break my garden into. I chose this because the LCM of 6th and 8th (these fractions are the denominators of 2 of the fractions that the garden is already divided into) is 24 and so that is the fraction that you can divide the garden into so that each part of the fractions that the garden is already divided into can all be the same. The part of my garden that is colored blue stands for the marshmellow cauliflower it takes up $\frac{11}{24}$ of the garden. The green part of this garden is for the Peppermint Peppers and they take up $\frac{3}{24}$ of the garden. The chocolate broccooli and the peanut brittle tomatoes take up $\frac{1}{2}$ of the garden which is equal to $\frac{12}{24}$. this is colored purple on my garden graph. If you add all of these sections of the garden together you are going to get $\frac{1}{24}$

$$\begin{array}{r} \frac{11}{24} \\ +\ \frac{3}{24} \\ \frac{12}{24} \\ \frac{19}{24} \end{array}$$

Because you are trying to find out how much of the garden is cherry Garcia carrots. the next thing you want to do is subtract

Clear explanation and good use of math language.

The student has a broad understanding of concepts: Knows to find 24th as LCM of 6th and 8th. Good use of effective mathematical language.

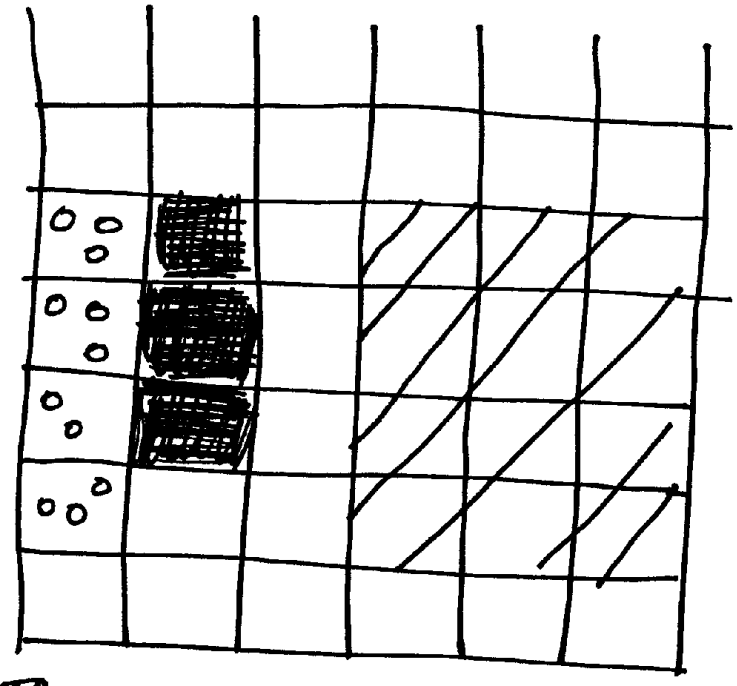
Practitioner

$\frac{24}{24}$
$-\frac{19}{24}$
$\frac{5}{24}$

So how you know that $\frac{5}{24}$ of the garden is cherry Garcia Carrots.

garden

Appropriate mathematical representation.



broccoli and the Peanut brittle tomatoes

marshmellow cauliflower

Peppermint Peppers

Expert

THE EASTER BUNNY DILEMMA

These are the steps I took to solve the Easter Bunny Dilemma:

1) First I listed all of the vegetables and their fraction of space compared to the whole garden:

BROCCOLI: $\frac{1}{6}$

CAULIFLOWER: $\frac{1}{6}$

PEPPERS: $\frac{1}{8}$

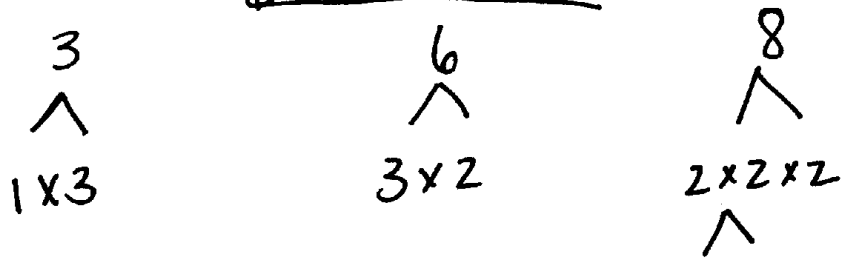
TOMATOES: $\frac{1}{3}$ (I know one half was equal to three sixths, so I subtracted the one sixth (of broccoli) from three sixths (the broccoli and tomatoes combined) and the difference was two sixths which I reduced to lowest terms, one third.)

I did this to see it visually and to make it organized.

Expert

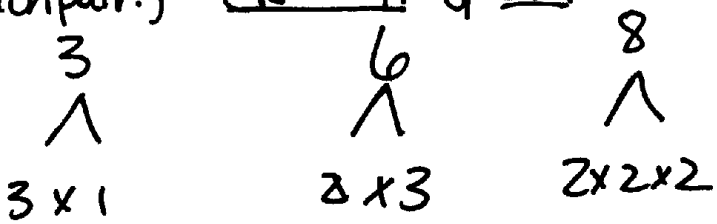
2) Since the denominators were not the same, I found the least common denominator, twenty-four. These are the steps I took to find the LCD:

DENOMINATORS



a) I made factor trees for all the denominators.

b). I crossed out one of each pair of factors that were the same. (The digits have to be in seperate trees in each pair.) CROSSING OUT



c) I multiplied all the remaining numbers:
1 x 3 x 2 x 2 x 2. The product was twenty-four.

3) I then multiplied the original denominators by a number that would make them be twenty-four:

$1 \times 4 = 4$
$6 \times 4 = 24$

$1 \times 8 = 8$
$3 \times 8 = 24$

$\frac{1}{6} \times \frac{4}{4} = \frac{4}{24}$

$\frac{1}{8} \times \frac{3}{3} = \frac{3}{24}$

Good use of mathematical language and notation.

Expert

4) I added all the fractions together and the sum was nineteen twenty-fourths.

$\frac{4}{24}$ BROCCOLI

$+\frac{4}{24}$ CAULIFLOWER

$+\frac{8}{24}$ PEPPERS

$+\frac{3}{24}$ TOMATOES

$\frac{19}{24}$ sum

Good math notation.

5) So then I subtracted nineteen twenty-fourths from one whole (twenty-four twenty fourths) and the difference was five twenty-fourths. I did this because one whole is the garden and the sum of the other plants fractions minus one whole will leave the answer to the problem:

$\frac{24}{24}$ (one whole)

$-\frac{19}{24}$

$\frac{5}{24}$

Five twenty-fourths of the garden was planted with Cherry Garcia Carrots!

Expert

5) To challenge myself further, I decided to make other graphs. I first tried a square graph, but twenty-four is not a square number. So I tried a circle graph. At first it didn't work, because I forgot the cauliflower, but the second time, it worked. Here are the steps I took to make it:

a) First I took the LCD of all of the fractions, twenty-four, and divided it by three hundred sixty degrees, the degrees of a circle. The quotient was fifteen degrees:

$$24\overline{)360^\circ} \quad 15^\circ$$

$$\begin{array}{r} 24 \\ \hline 120 \\ -120 \\ \hline 0 \end{array}$$

Effective use of connecting some prior knowledge to a new situation. Shows deep understanding of the concepts of fractions and geometry.

b) Then I multiplied all of the numerators by fifteen degrees because if three hundred sixty degrees by twenty-four the LCD, each twenty-fourth would equal fifteen degrees.

$15^\circ \times 4 = 60^\circ$ $\left(\frac{4}{24}\right)$ $15^\circ \times 4 = 60^\circ$ $\left(\frac{4}{24}\right)$ $15^\circ \times 3 = 45^\circ$ $\left(\frac{3}{24}\right)$ $15^\circ \times 8 = 120$ $\left(\frac{8}{24}\right)$

Expert

c) Then I added all the products and the sum was two hundred eighty-five degrees:

$$\begin{array}{r} 60^\circ \\ 60^\circ \\ 45^\circ \\ 120^\circ \\ \hline 285^\circ \end{array}$$

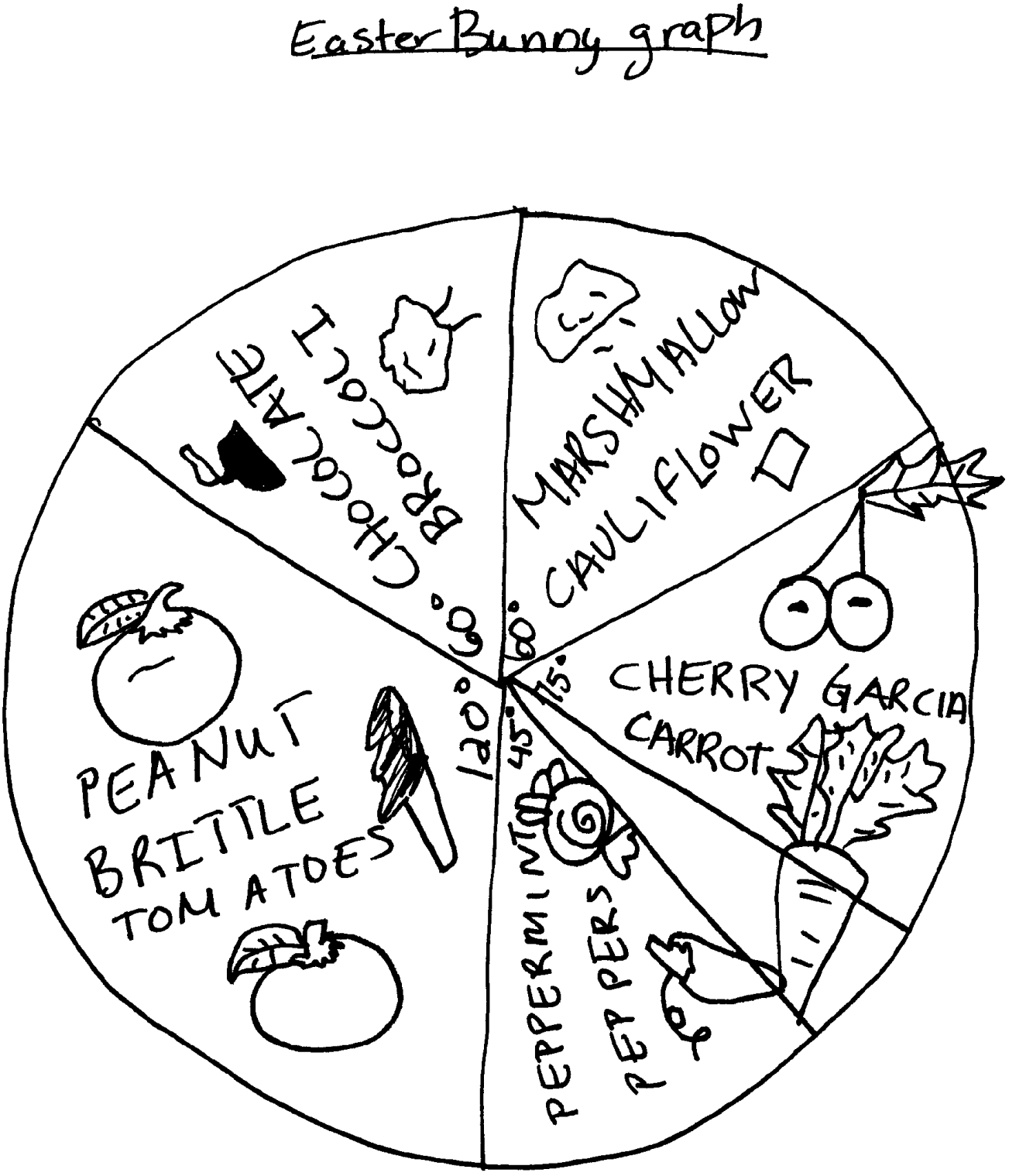
d) Then I subtracted two hundred eighty-five degrees from three hundred sixty degrees because the difference, seventy-five degrees.

$$\begin{array}{r} {}^{3}\cancel{3}{}^{5}\cancel{6}0^\circ \\ -\ 285^\circ \\ \hline 75^\circ \end{array}$$

e) I took a white sheet of paper and drew a circle with a compass. I drew a dot in the middle of the paper where the point had been and with a ruler, I drew the diameter of the circle, which had divided the circle in half. That was good because the tomatoes and broccoli equaled half of the circle.

f) I divided the circle into catergories by degrees with a ruler and protractor. On the following page is how it turned out.

Expert



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