

Goal: To think about what makes  
a diagram useful for solving a  
math problem

Specific Example: How can a  
diagram be useful in solving  
a challenging fraction word  
problem?



Sara had a bag of candies. She gave  $\frac{1}{3}$  of her candies to Rebecca. Then Sara gave  $\frac{1}{4}$  of the candies she had left to John. After giving candies to Rebecca and John, Sara had 24 candies left in her bag.

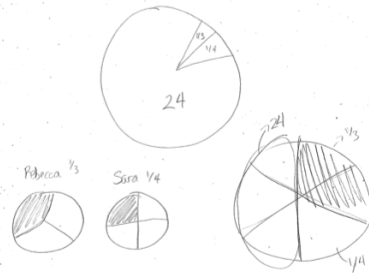
On your handout, INDIVIDUALLY circle the DIAGRAM that you think best represents the problem situation and helps you understand it.

EXAMPLE 1

$$S = 24 \quad J = 14$$

$$R = 1/3$$

EXAMPLE 2



EXAMPLE 3

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

$$\frac{1}{4} \times 14 = 3.5$$

$$24 - 8 - 3.5 = 12.5$$

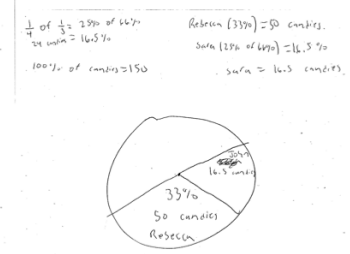
$$\frac{14}{24} = \frac{7}{12}$$

$$\frac{7}{12} \times 3 = \frac{7}{4} = 1.75$$

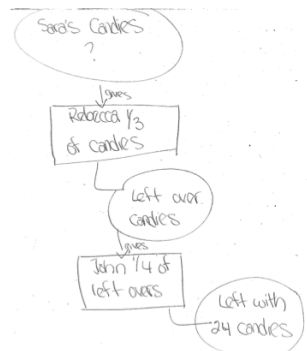
$$\frac{14}{24}$$

Rebecca  $\rightarrow \frac{1}{3}$  Candy left:  $\frac{14}{24}$

EXAMPLE 4



EXAMPLE 5



EXAMPLE 6



EXAMPLE 7



EXAMPLE 8

$$(x - \frac{1}{3}) - \frac{1}{4} = 24$$

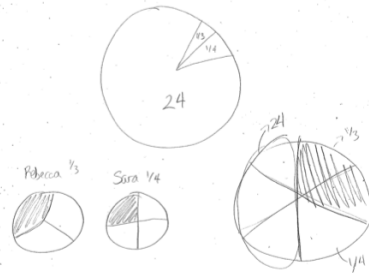
Why do you think the diagram you circled helps you understand the problem situation? What is omitted or could be misleading about the diagram you circled?

EXAMPLE 1

$$S = 24 \quad J = 14$$

$$R = 1/3$$

EXAMPLE 2



EXAMPLE 3

$$\frac{1}{3} + \frac{1}{4} = \frac{4}{12} + \frac{3}{12} = \frac{7}{12}$$

$$\frac{1}{4} \times 3 = \frac{3}{12}$$

$$\frac{7}{12} - \frac{3}{12} = \frac{4}{12} = \frac{1}{3}$$

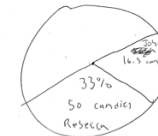
$$\frac{14}{24}$$

Rebecca  $\rightarrow \frac{1}{3}$  Candy left:  $\frac{14}{24}$   
John  $\rightarrow \frac{1}{4}$

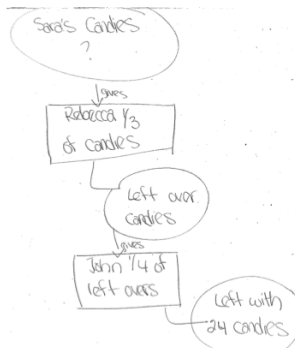
EXAMPLE 4

$\frac{1}{4}$  of  $\frac{1}{3}$  = 25% of 16.5 = 4.125 candies  
24 candies = 16.5%  
100% of candies = 150

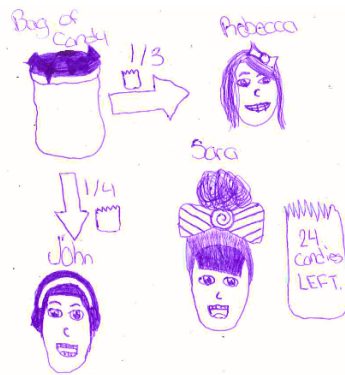
Rebecca (33%) = 50 candies  
Sara (25% of 150) = 37.5 candies  
Sara = 16.5 candies



EXAMPLE 5



EXAMPLE 6



EXAMPLE 7



EXAMPLE 8

$$(x - \frac{1}{3}) - \frac{1}{4} = 24$$



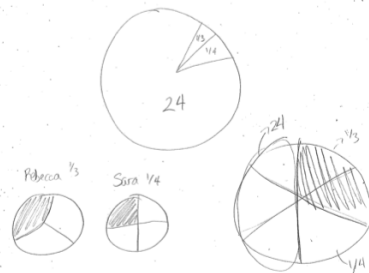
Identify the diagram you think is **least** helpful for understanding the problem situation. Be prepared to justify your choice.

EXAMPLE 1

$$S = 24 \quad J = 14$$

$$R = 1/3$$

EXAMPLE 2



EXAMPLE 3

$$\text{Rebecca: } \frac{1}{3} \times 24 = \frac{4}{12}$$

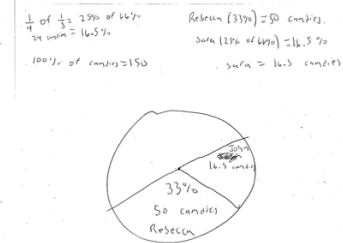
$$\text{John: } \frac{1}{4} \times 3 = \frac{3}{12}$$

$$\frac{4}{12} + \frac{3}{12} = \frac{7}{12}$$

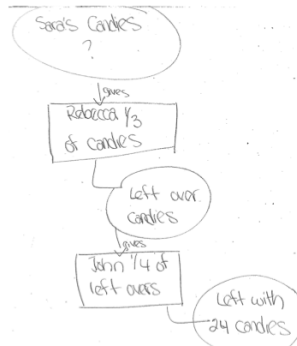
$$\frac{14}{24}$$

Rebecca →  $\frac{1}{3}$  Candy left:  $\frac{1}{4}$

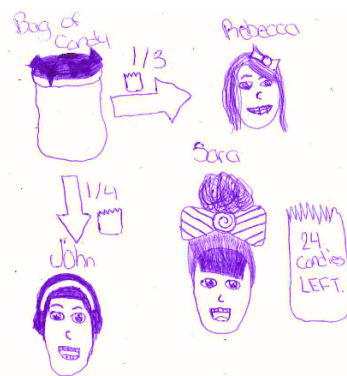
EXAMPLE 4



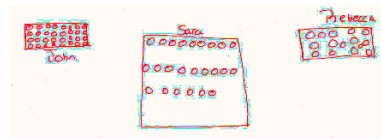
EXAMPLE 5



EXAMPLE 6



EXAMPLE 7



EXAMPLE 8

$$\left(x - \frac{1}{3}\right) - \frac{1}{4} = 24$$

# What is a Diagram (in math)?

A **DIAGRAM** is a tool that mathematicians use to represent a problem situation so that they can better understand a math problem.



Sara had a bag of candies. She gave  $\frac{1}{3}$  of her candies to Rebecca. Then Sara gave  $\frac{1}{4}$  of the candies she had left to John. After giving candies to Rebecca and John, Sara had 24 candies left in her bag.



Sara had a bag of candies. She gave  $\frac{1}{3}$  of her candies to Rebecca. Then Sara gave  $\frac{1}{4}$  of the candies she had left to John. After giving candies to Rebecca and John, Sara had 24 candies left in her bag.





Sara had a bag of candies. She gave  $\frac{1}{3}$  of her candies to Rebecca. Then Sara gave  $\frac{1}{4}$  of the candies she had left to John. After giving candies to Rebecca and John, Sara had 24 candies left in her bag.



## 3-READ PROTOCOL

Sara had a bag of candies.  
She gave  $\frac{1}{3}$  of her candies  
to Rebecca.

Then Sara gave  $\frac{1}{4}$  of the  
candies she had left to  
John.

After giving candies to  
Rebecca and John, Sara  
had 24 candies left in her  
bag.

- WHAT IS THE PROBLEM ABOUT?
- WHAT IS A GOOD MATHEMATICAL QUESTION?
- WHAT GIVEN INFORMATION IS NEEDED TO SOLVE THE PROBLEM?

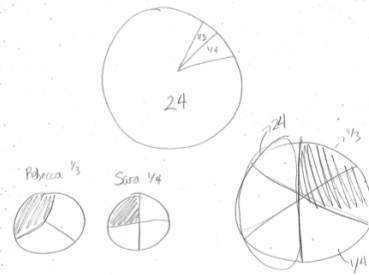
A really good DIAGRAM will help you to “see” a way to solve the problem. Suppose the question for the problem above was “How many candies did Sara have in her bag to start?” Which DIAGRAMS help you “see” a solution strategy?

EXAMPLE 1

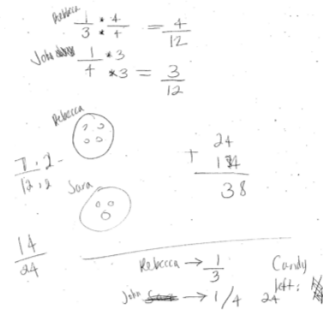
$$S = 24 \quad J = 1/4$$

$$R = 1/3$$

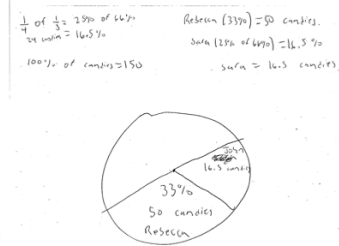
EXAMPLE 2



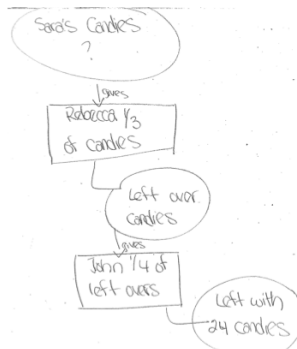
EXAMPLE 3



EXAMPLE 4



EXAMPLE 5



EXAMPLE 6



EXAMPLE 7



EXAMPLE 8

$$(x - \frac{1}{3}) - \frac{1}{4} = 24$$

# Possible Sentence Starters

- This DIAGRAM REPRESENTS...
- This DIAGRAM helps me understand the problem because...
- This DIAGRAM would help me solve the problem because it...
- The number of candies in Sara's bag to start is REPRESENTED by...

# What did you learn?

WRITE – PAIR - SHARE

A good DIAGRAM REPRESENTS \_\_\_\_\_.

The next time I make a DIAGRAM I will include \_\_\_\_\_.

The next time I make a DIAGRAM I will include \_\_\_\_\_ because \_\_\_\_\_.

So...: What DOES make a diagram useful for solving a math problem and communicating its solution?

Said another way:

What are the features of a math diagram that are useful for solving and/or communicating?