## The Ohio State University

## Ratio, Proportion,

\&

## Mathematical Representations

The ratio of boys to girls in a class is 5 to 3 . After six girls join the class, the number of boys and girls in the class is the same. How many students are in the class now?

Post solutions on chart paper.

Sponsored by Ohio $\left\lvert\, \begin{aligned} & \text { Department } \\ & \text { of Education }\end{aligned}\right.$

## Consider Student Work Samples

- What mathematics does each student know?
- What do we learn about each child based on their responses?
- What are the advantages and disadvantages of each representation?

I took $\frac{5}{8}$ and multiplied
it by $2^{\frac{5}{8}}$ which gives me $\frac{10}{16}$ then I added
6 (the number of new girls) to it and it
gives me $\frac{16}{16}$, the number of Students in the class is 32 , 16 girl \& 16 boys.

| in class | $B$ | $G$ |
| :---: | :---: | :---: |
| 8 | 5 | 3 |
| 16 | 10 | 6 |
| 24 | 15 | 9 |
| 32 | 20 | 12 |
| 40 | $2 S$ | 15 |
| 48 | 30 | 18 |

$F$ of sings
plus 6.
which wile
equal the
\# of bays

$$
15=9+6
$$

Sponsored by Olnํ

$$
\begin{aligned}
& \frac{5}{8}=\text { boys }+6 \mathrm{gii} \\
& \frac{5}{8}+\frac{3}{8}=\frac{8}{8} \\
& 50 \\
& \frac{5}{8}=\frac{3}{8}+6 \\
& \frac{5}{8}+6=A \\
& 46 \frac{5}{8}=
\end{aligned}
$$

Student Work Sample \#4




Sponsored by Ohio \(\left\lvert\, \begin{aligned} \& Department<br>\& of Education\end{aligned}\right.\)



Student Work Sample \#6

# If instruction emphasizes only one model or one representational type, then the mathematical tools that children acquire is limited. 

## Proportional Situations \& <br> Graphs

- When we talk about graphing ratios, would the graph be continuous or discrete, and why?
- Is graphing a relationship defined by a ratio different from graphing a proportional relationship?

| Andy has a |
| :--- |
| ratio of books |
| to DVDS of $3: 2$ |
| in his room. |
| Books | DVDs


| 3 | 2 |
| :---: | :---: |
| 6 | 4 |
| 9 | 6 |
| 12 | 8 |



## Ratios

- Discrete
- Uses additive and multiplicative reasoning patterns!


Ratios vs. Proportions

- Discrete vs. continuous
- Additive
vs. multiplicative reasoning (a.k.a. constant of proportionality)

DVDs


## Discussions

1. Can all ratios be represented by tables and graphs?
2. Is the graph of a ratio always linear?
3. How is the slope of a line related to the ratio between the vertical and horizontal distance between two points on the line?

4. A Metric Conversion: If 6 inches is $15.24 \mathrm{~cm}, 9$ inches is how many centimeters?
5. A Candy company is developing packaging for their Chocolates. If they place 60 candies in a long box, there can be 6 rows of 10 candies. If the company decides to use a different box with 4 rows, how many candies would there be in each of 4 rows?
6. Sal is hosting a party for 50 people. He will have people sit at a long line of tables. Each table can seat 4 people, plus one person can sit at each end of the line of tables, as shown. Find the number of tables he will need to seat 50 people. (OAA, 2005)


Solve the above problems. Record your solution strategy and discuss the following:

- Of the above problems, which are proportion problems and which are not? Briefly justify your answers.
- How do you graph each situation?


## Consider Student Work Samples

- What mathematics does each student know?
- What are the themes emerged from the samples below?
- What do we learn about each child based on their responses?

Mathematics Teaching Institute July 27-31, 2015


| $6 P=t$ table |  |
| :--- | :--- |
| $12 P=2$ tables | Sal will need 9 tables to seat 50 |
| $18 P=3$ tables | People. There would be 4 seats |
| $24 P=4$ tables | left over |
| $30 P=5$ tables | Se |
| $36 p=6$ tables |  |
| $42 P=7$ tables |  |
| $48 P=8$ tables |  |
| $50 P=9$ tables |  |




Mathematics Teaching Institute July 27-31, 2015
24


Student Work Sample \#6


- In the discussion above, what mathematical points are important to be made explicitly in class?
- What other problems might be used to help children acquire these different representational schemes?
- How might we make the different types of representations accessible to children?

