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| Task: Going to Math Competition | | 6th Grade |
| <p>There is one bus driver, two teachers, and three teams, each with four members going to the Math competition. Tommy writes the expression $1 + 2 + 3 \times 4$ to represent everyone that will be on the bus and solves it using the following steps:</p> $ \begin{aligned} &1 + 2 + 3 \times 4 \\ &= 3 + 3 \times 4 \\ &= 6 \times 4 \\ &= 24 \end{aligned} $ <p>a. Tommy concludes that 24 people will be on the bus going to the competition. Describe the mistake Tommy made when solving his expression. Then write an explanation and draw a picture to help Tommy understand how to solve his expression correctly.</p> <p>b. How would you write this expression if n represents the number of teams?</p> <p>c. How would this expression be different if there were two teachers for each team? Write an expression and draw a picture to support your expression.</p> | | |
| Teacher Notes: | | |
| <p>By asking students to use variables in expressions, our goal is to help them understand that variables can be used to write generalized equations or formulas to represent the same situation with changing quantities.</p> | | |
| Common Core State Standards for Mathematical Content | Common Core State Standards for Mathematical Practice | |
| <p>6.EE.2 Write, read, and evaluate expressions in which letters stand for numbers.</p> <p>6.EE.2a. Write expressions that record operations with numbers and with letters standing for numbers. <i>For example, express the calculation “Subtract y from 5” as $5 - y$.</i></p> <p>6.EE.2c. Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations). <i>For example, use the formulas $V = s^3$ and $A = 6s^2$ to find the volume and surface area of a cube with sides of length $s = 1/2$.</i></p> | <ol style="list-style-type: none"> 1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning. | |

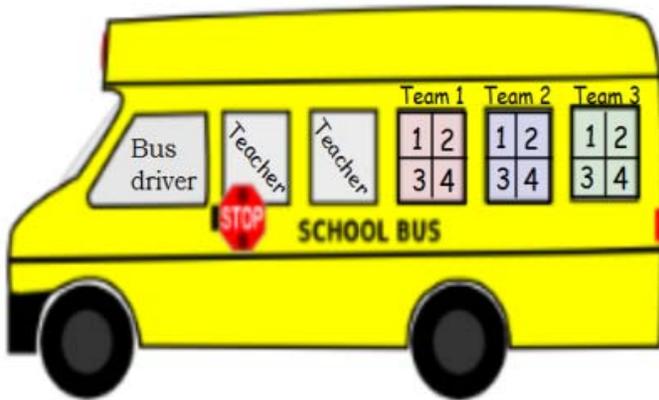
Essential Understandings

- Recognize that variables represent unknown quantities.
- Expressions must be solved according to order of operations

Explore Phase

Possible Solution Paths

Part a.



Tommy is incorrect because there are only 15 people on the bus. He should have found the total number of team members first and then added the teachers and bus driver.

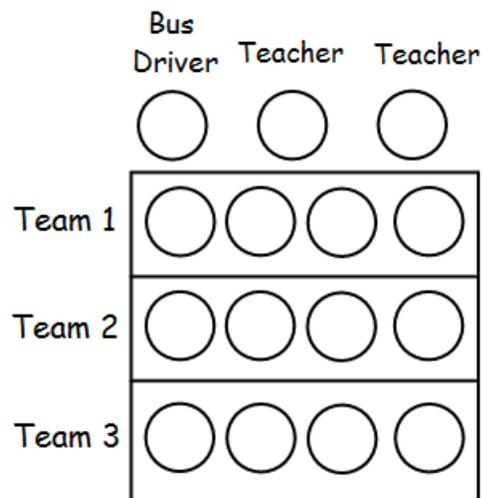
Assessing and Advancing Questions

Assessing:

Would you explain your drawing to me?

Advancing:

How does your drawing help you determine Tommy's mistake in solving the problem?



Tommy should have grouped the teams together first and then added the bus drivers and teachers.

Assessing:

Can you explain why your diagram?
Why did you draw your diagram this way?
How does this diagram help you see Tommy's mistake?

Advancing:

What could Tommy have included in his expression to remind him to multiply first?
Which math skill does this task address?

Part b.

$$1 + 2 + n \times 4$$

$$3 + n \times 4$$

Assessing:

Why did you use substitute the n there?

Advancing:

How can you simplify this expression?
Can you identify what each number or variable in your expression represents?

$$4n + 3$$

$$3 + 4n$$

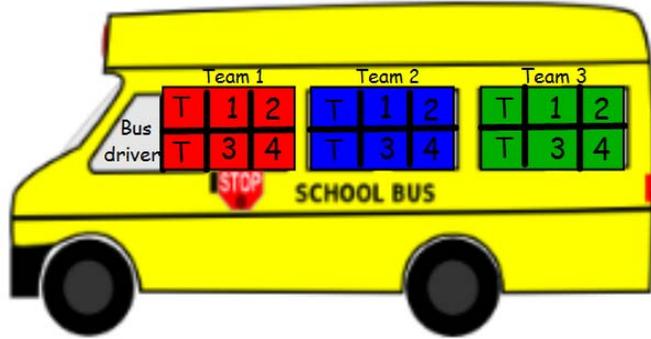
Assessing:

What do the numbers in your expression represent?

Advancing:

Can we simplify this expression? Why or why not?
Would our expression change if we put parenthesis around $n + 3$? How?

Part c.



$$1 + (2 + 4) \times 3$$

Assessing:

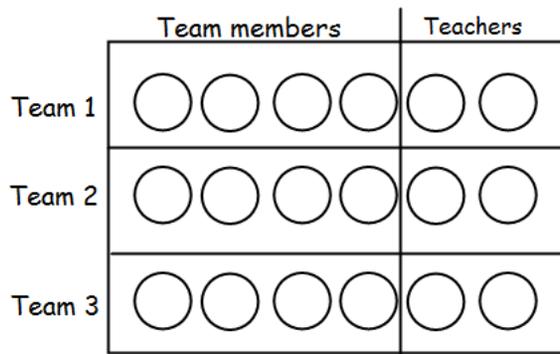
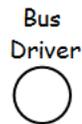
Would you explain your drawing to me?

How will your drawing help you come up with your expression?

Can you identify what each number in your expression represents?

Advancing:

How would you rewrite this expression using a variable for the number of teams? Teachers?



$$1 + 3 (4 + 2)$$

Assessing:

Can you explain your diagram to me?

How will your diagram help you write and or solve the expression?

Why did you put parenthesis around the $4 + 2$?

Advancing:

Would your answer be the same if you did not use parenthesis in your expression?

How do each of the numbers in your expression relate to your diagram?

Possible Student Misconceptions

The first misconception could be that the students do not see the flaw in Tommy's work.

Assessing:

Can you draw a picture to represent all of the people on the bus?

Can you explain to me how you set up your problem?

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| <p>Another misconception may be that the students either initially use two teachers per team in part a, or that they do not use two teachers per team for part c.</p> | <p>How many teachers are on the bus?</p> <p>Advancing: Can you explain your thinking in how you drew your picture?</p> |
| <p>Entry/Extensions</p> | <p>Assessing and Advancing Questions</p> |
| <p>If students can't get started....</p> | <p>Assessing: What does the problem say? What information is the problem giving me? What could I do to help me organize or set up the problem?</p> <p>Advancing: Can you make a table to organize the information? Which tool would you like to use to organize this information to compare the rates, a table or graph? Why?</p> |
| <p>If students finish early....</p> | <p>Advancing: If a bus will hold a maximum of 72 people, what is the maximum amount of teams that could ride on the bus?</p> <p>Can you write a general equation to represent this?</p> |
| <p>Discuss/Analyze</p> | |
| <p>Whole Group Questions</p> <ul style="list-style-type: none"> • Can someone explain to the class where Tommy made his mistake? • Which math skills does this task address? • What does a variable represent in an expression? • Could we have chosen to use a variable for another part of the problem? • How does using a variable, affect the answer in an expression? | |