ST Math
Summer Immersion

Grade 4 | Problem Solving Journal Answer Key

Module 1

Day 1

Create a "Get to Know Our Class" chart.

Student charts will vary.

Ask the students questions to gather data about the class and record the information on a chart. For example:

- How many students are in this class?
- How many students have brown eyes? (Blue eyes? Green eyes?)
- How many students in the class have black hair? (Brown hair? Blonde hair? Red hair?)

Day 2

Describe the class mathematically.

Student descriptions will vary.

- Remind students about yesterday's Problem of the Day.
- Generate a list of 3-5 things students want to know about each other. For example:
    - Favorite ice cream flavor, favorite color, number of siblings, number of pets, favorite subject in school, month of birth, favorite sport, etc.

Day 3

Create a bar model of a scale fraction with fourths. Use Cuisenaire rods, connecting cubes, or paper strips to create your bar model. Build a number line using your bar model. Include numbers halves, fourths, and eighths up to 3.

Student models will vary. *Look for:*

- *The goal of this activity is for students to use a 3D or 2D bar model to build out the intervals on a number line using a consistent whole. In the model below, each whole can be turned on its side to match the intervals that the number line is counting by.*

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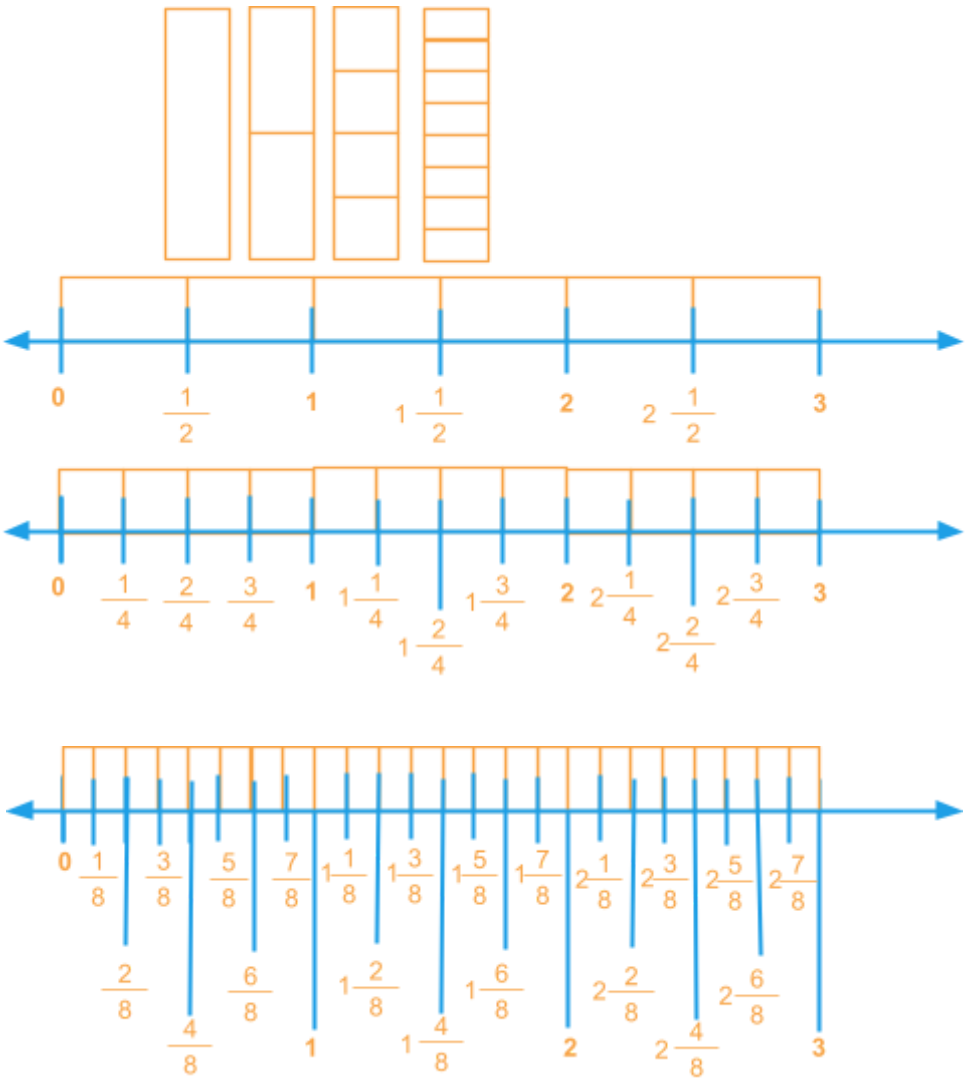
Possible student representations:

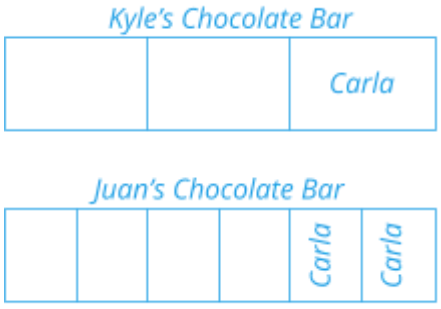


Day 4

Kyle and Juan each had the same size chocolate bar. Kyle cut his into 6 equal-sized pieces and gave 2 pieces to Carla. Juan cut his bar into 3 equal size pieces and gave 1 piece to Carla. Compare how much chocolate bar each friend has.

All three friends have an equal amount of chocolate.

Possible student strategies:



Kyle's Bar:

$\frac{6}{6} = \frac{2}{6}$ *(Carla)* + $\frac{4}{6}$ *(Kyle)*

Juan's Chocolate Bar

$\frac{3}{3} = \frac{1}{3}$ *(Carla)* + $\frac{2}{3}$ *(Juan)*

Carla's Total = $\frac{1}{3} + \frac{2}{6} = \frac{4}{6}$ *or* $\frac{2}{3}$

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Module 2

Day 1

Jana and Deklan each brought the same size pan of brownies for the class party. Jana cut her brownie into 4 equal size pieces. Deklan cut his brownie into 3 equal-sized pieces. They needed to give 24 students the same size piece. How could they do this with their two pans of brownies?

Student explanations will vary. *Look fors:*

- *24 total pieces, 12 in each pan, each student receives 1 piece*
- *48 total pieces, 24 in each pan, each student receives 2 pieces*
- *Skip Counting to find common factors*
  - *3, 6, 9, **12**, 15, 21, **24***
  - *4, 8, **12,** 16, 20, **24***
- *Partitioned pieces*
  - *3 pieces each partitioned into 4 more pieces yields 12 pieces.*
  - *3 pieces each partitioned into 8 more pieces yields 24 pieces.*
  - *4 pieces each partitioned into 3 more pieces yields 12 pieces.*
  - *4 pieces each partitioned into 6 more pieces yields 24 pieces.*
- *Multiplication, missing factor statements.*

  3 x ____ = 12 *4 x ____ = 12*

  3 x ____ = 24 *4 x ____ = 24*
- *Use of commutative property*
  - *"I know that 3 pieces each cut into 4 more pieces is 12 total pieces, so 4 pieces each cut into 3 more pieces also is 12 total pieces."*

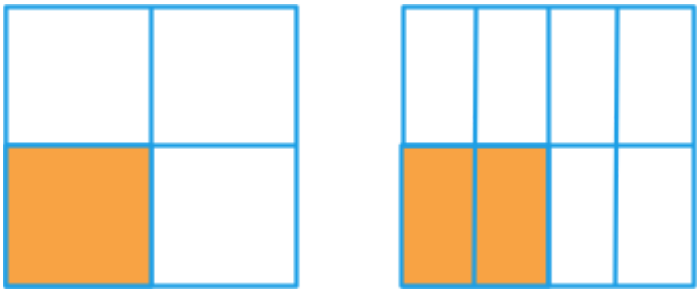
Day 2

Howard and Imani were in charge of dividing the clay for their table in Art class. Each table had 4 students. Howard divided the clay into 4 equal-sized pieces. Imani divided the clay into 8 equal-sized pieces. Both tables fair shared all of their clay. Compare and contrast the clay students at each table received.

Student models will vary. *Look fors:*

- *Equal-sized pieces*
- $\frac{4}{4} = \frac{8}{8}$
- *Two* $\frac{1}{8}$ *pieces = one* $\frac{1}{4}$ *piece.*

Possible student models:



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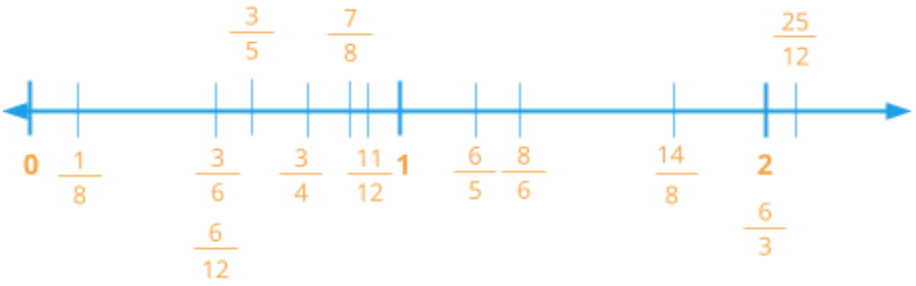
Day 3

Draw a number line. Place the following fractions $\frac{3}{6}, \frac{7}{8}, \frac{11}{12}, \frac{8}{6}, \frac{1}{8}, \frac{3}{4}, \frac{25}{12}, \frac{6}{3}, \frac{6}{12}, \frac{6}{5}, \frac{3}{5}$, and $\frac{14}{8}$ on the number line. Select three of the fractions you placed on the number line and explain how you and your partner determined where to place these fractions on the number line. Challenge yourself.



Student explanations will vary. *Look fors:*

- *Benchmarks*
  - $\frac{1}{2} = \frac{3}{6} = \frac{3}{12}$
  - *2 wholes* $= \frac{6}{3}$
- *Common Numerator Comparison*
  - $\frac{3}{4} > \frac{3}{5} > \frac{3}{6}$
- *Pieces away from one whole:*
  - $\frac{11}{12} > \frac{7}{8} > \frac{3}{4}$
  - $\frac{25}{12} >$ *2 wholes*
  - $\frac{6}{5} = 1\frac{1}{5}$, $\frac{8}{6} = 1\frac{1}{3}$, $1\frac{1}{5} < 1\frac{1}{3}$

Day 4

Isabella baked a pan of lasagna for her family of 4. She cut the lasagna into eight equal pieces. Explain how much lasagna each family member might eat. Write equations/inequalities to compare how much each family member ate. Find at least 3 different ways the family could share the lasagna.

Student explanations will vary. *Look fors:*

- *Equal-sized pieces (eighths)*
- *Different combinations of eighths, including leftovers at times.*
- *Comparisons are represented by <, > or = sign.*
- *Pieces are represented as eighths ($\frac{1}{8}$) or multiple eighths (such as $\frac{3}{8}$).*
- *Understanding that one whole piece of lasagna is $\frac{1}{8}$ of the whole lasagna.*

Module 3

Day 1

Keyton wanted to make 2 gallons of punch to take to the school picnic. He found a recipe that called for $\frac{3}{4}$ gallon of fruit punch, 2 quarts of orange juice, 3 quarts of 7UP, and $\frac{1}{2}$ gallon of water. If Keyton makes this recipe, will he have as much punch as he wants? Justify your solution.

Yes, Keyton will have more than 2 gallons of punch to take to the school picnic.

Possible student strategies:

$\frac{3}{4}$ *gallon = 3 quarts (Fruit Punch)*

2 quarts (Orange Juice)

3 quarts (7UP)

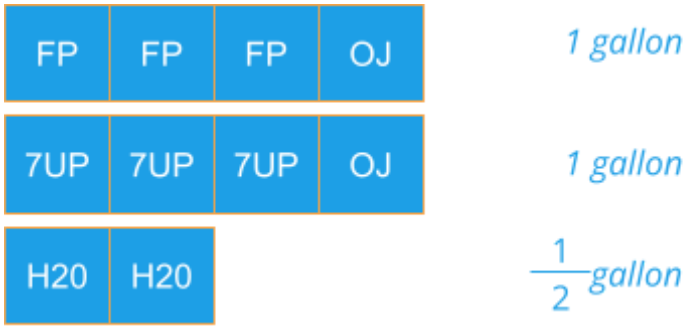
$\frac{1}{2}$ *gallon = 2 quarts (Water)*

3 + 2 + 3 + 2 = 10 quarts altogether

Quarts in one gallon = 4

Quarts in two gallons = 8

10 > 8



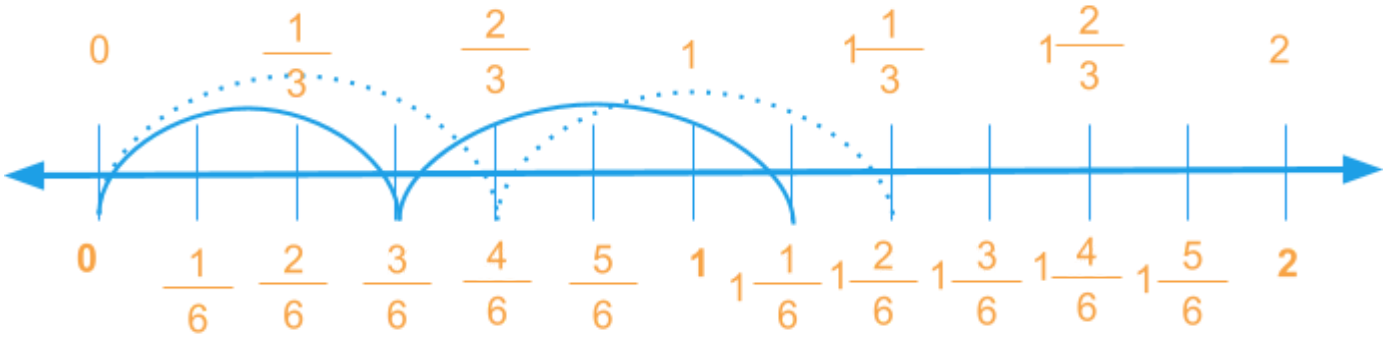
Day 2

Fill in the blank with the correct symbol (>, <, or =). Explain how you determined the symbol to use. Then use a number line to compare these two addition expressions. $\frac{3}{6} + \frac{4}{6}$ _____ $\frac{2}{3} + \frac{2}{3}$

$\frac{3}{6} + \frac{4}{6} < \frac{2}{3} + \frac{2}{3}$

Student explanations will vary. *Look fors:*

- $\frac{3}{6} + \frac{4}{6}$ is less than $\frac{2}{3} + \frac{2}{3}$ because the sum is farther to the right on the number line.
- $\frac{2}{3} = \frac{4}{6}$, so $\frac{2}{3} + \frac{2}{3} = \frac{4}{6} + \frac{4}{6}$. $\frac{3}{6} + \frac{4}{6}$ is less than $\frac{4}{6} + \frac{4}{6}$.

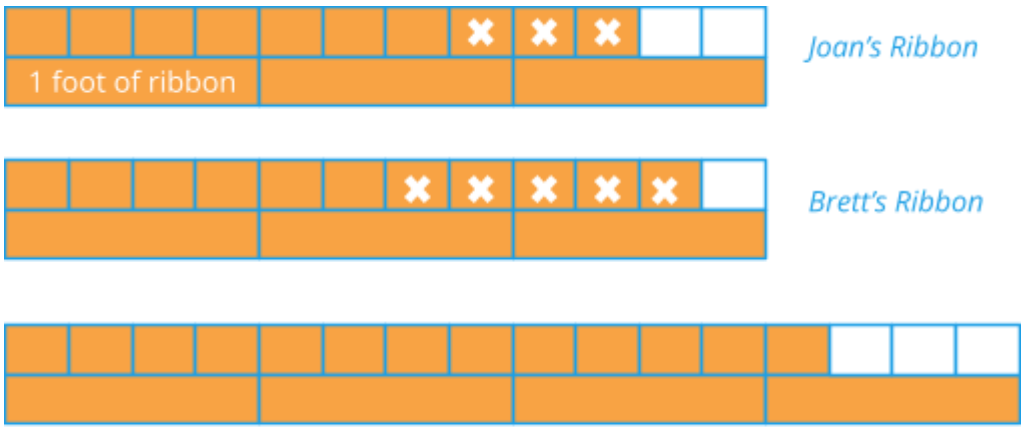


Day 3

Joan and Brett were decorating picture frames for a class store project. They needed $3\frac{1}{4}$ feet of ribbon to decorate all their frames. Joan had $2\frac{1}{2}$ feet of ribbon but used ¾ of a foot of her ribbon for another project. Brett had $2\frac{3}{4}$ feet of ribbon but used $\frac{5}{4}$ of a foot of his ribbon for another project. Do they have enough ribbon for their project? Justify your solution.

Yes, Joan and Brett have enough ribbon for their project.

Possible student solutions:



$2\frac{1}{2} + 2\frac{3}{4} = 5\frac{1}{4}$

Original amount of total ribbon

$\frac{3}{4} + \frac{5}{4} = \frac{8}{4}$

Amount of ribbon used

$\frac{8}{4}$ = 2 wholes

$5\frac{1}{4} - 2 = 3\frac{1}{4}$

Remaining ribbon

$2\frac{1}{2} - \frac{3}{4} = 1\frac{3}{4}$

Joan's remaining ribbon

$2\frac{3}{4} - \frac{5}{4} = 1\frac{1}{2}$

Brett's remaining ribbon

$1\frac{1}{2} + 1\frac{3}{4} = 3\frac{1}{4}$

Combined Ribbon

Day 4

Iris and her brother needed $2\frac{1}{2}$ bags of popcorn kernels to make enough popcorn to sell at the school bake sale. Iris had $1\frac{1}{4}$ bags and her brother had $1\frac{3}{8}$ bags. Do they have enough bags of popcorn kernels? Explain how you know.

Yes, Iris and her brother have enough bags of popcorn kernels.

Possible student strategies:

$1\frac{1}{4} = 1\frac{2}{8}$ *(Iris)*

$1\frac{3}{8}$ *(Brother)*

$1\frac{2}{8} + 1\frac{3}{8} = 2\frac{5}{8}$

$2\frac{5}{8} > 2\frac{1}{2}$

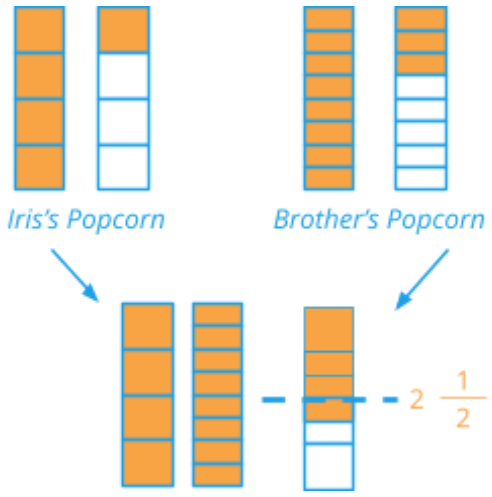
$1\frac{3}{8} = 1\frac{2}{8} + \frac{1}{8}$

Brother's Amount

$1\frac{2}{8} = 1\frac{1}{4}$

$1\frac{1}{4} + 1\frac{1}{4} = 2\frac{1}{2}$

They have enough and ⅛ bag extra.



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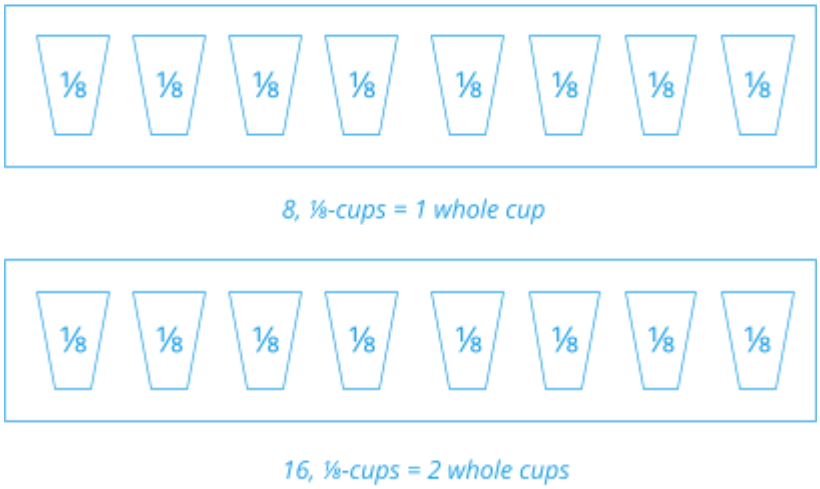
Module 4

Day 1

Kevin poured 16 glasses of water from a jug. Each glass held $\frac{1}{8}$ cup of water. How much water was in Kevin's jug?

Kevin's jug had 2 cups of water in it.

Possible student strategies:

<table>
<tr>
<td>


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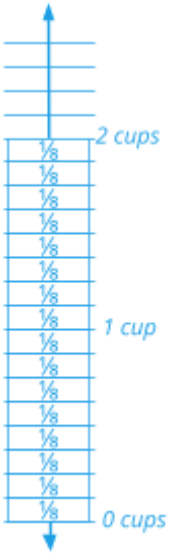

</td>
</tr>
<tr>
<td>$\frac{1}{8} x\ 16 = \frac{16}{8}$
$16 \div 8 = 2$</td>
<td>$\frac{1}{8} x\ 8 = 1$ whole
$8 + 8 = 16$
$\frac{1}{8} x\ 16 = 2$ wholes</td>
</tr>
</table>

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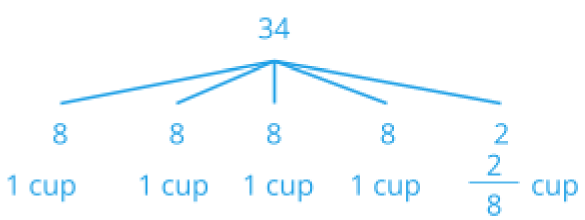
Day 2

Demarius made cupcakes for his sister's birthday. He made 34 cupcakes. If Demarius used $\frac{1}{8}$ cup of icing on each cupcake, how much icing did he use?

Demarius used $4\frac{2}{8}$ or $4\frac{1}{4}$ cups of icing.

Possible student strategies:

8 groups of $\frac{1}{8}$ = 1 whole cup, so:

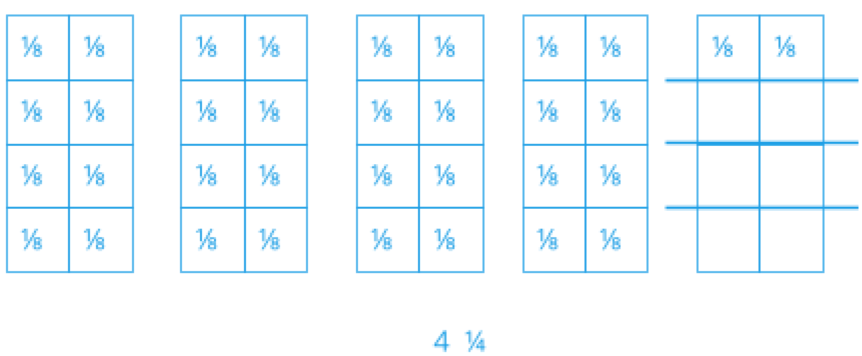


$$\frac{1}{8}+\frac{1}{8}=\frac{34}{8}$$

$32 \div 8 = 4$

Leftover 2 pieces = $\frac{2}{8}$

Total = $4\frac{2}{8}$



$34 \times \frac{1}{8} = \frac{34}{8}$

$32 \div 8 = 4$

Leftover 2 pieces = $\frac{2}{8}$

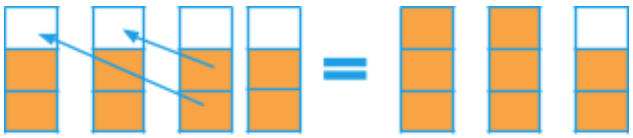
Total = $4\frac{2}{8}$

Day 3

Carlos drinks $\frac{2}{3}$ cup of milk at every meal and snack. How much milk does Carlos drink in 1 day if he eats breakfast, lunch, dinner, and an afternoon snack?

Carlos drinks 2 ⅔ cups of milk each day.

Possible student strategies:



Key

$\frac{2}{3} + \frac{2}{3} + \frac{2}{3} + \frac{2}{3} = \frac{8}{3}$

$2\frac{2}{3}$

$\frac{2}{3} \times 4 = \frac{8}{3}$

$2\frac{2}{3}$

Day 4

Bev is knitting a scarf for her mother. She knits $\frac{1}{3}$ of a foot every day. How long will it take her to knit 2 feet of her scarf? Write a multiplication equation to show how long it will take her to make a scarf 4 feet long.

It will take Bev 6 days to knit 2 feet of her scarf.

$\frac{1}{3}$ **x 12 = 4**

Possible student strategies:

Day 1	*Day 2*	*Day 3*	*Day 4*	*Day 5*	*Day 6*	*Day 7*	*Day 8*	*Day 9*	*Day 10*	*Day 11*	*Day 12*
One Foot			*Two Feet*			*Three Feet*			*Four Feet*		

$\frac{1}{3} + \frac{1}{3} + \frac{1}{3} = 1$; *It takes three days to make one foot of a scarf.*

4 x 3 = 12; Each foot of scarf takes three days, so four feet of scarf is three times that amount.

Module 5

Day 1

Barry had $4.00. He earned $2.75 a day for 5 days taking care of his neighbor's dog. How much money does he have now? Use a number line to show how much money Barry has now.

Barry has $17.75.

Possible student strategies:

Number Line: Jumps of $2.75

Open Number Line: Decomposed $2.75 into $2.00 and $0.75

Day 2

Loretta keeps time for each lap she runs around a track. The first lap she ran in 1.83 minutes. In the second lap, she ran in 1.9 minutes. She ran for three laps. Her total time for the three laps was 4.48 minutes. How long was her third lap?

Loretta's third lap was 0.75 minutes.

Possible student strategies:

1.83 + 1.9 = 3.73 *Combined time for first two laps* 3.73 + 0.27 = 4.00 *Difference to nearest whole* 4.00 + 0.48 = 4.48 *Difference to total time* 0.27 + 0.48 = 0.75 *Total difference (third lap)*	4.48 - 1.83 *Total time minus first lap time* 1.83 = 1.43 + 0.4 *Decomposing first lap into friendly values* 4.48 - 1.43 = 3.05 3.05 - 0.4 = 1.65 *Subtracting the total time by the first lap using friendly values.* 1.9 = 1.6 + 1.3 *Decomposing the second lap into friendly values* 1.65 - 1.6 = 1.05 1.05 - 0.3 = 0.75 *Subtracting the remaining time by the second lap using friendly values.*