Name ____ Date ______________________

1. The following equations involve different quantities and use different operations, yet produce the same result. Use a place value chart and words to explain why this is true.

$4.13 \times 10^3 = 4130$ $413{,}000 \div 10^2 = 4130$

2. Use an area model to explain the product of 4.6 and 3. Write the product in standard form, word form, and expanded form.

3. Compare using >, <, or =.

a. 2 tenths + 11 hundredths ◯ 0.13

b. 13 tenths + 8 tenths + 32 hundredths ◯ 2.42

c. 342 hundredths + 7 tenths ◯ 3 + 49 hundredths

d. $2 + 31 \times \frac{1}{10} + 14 \times \frac{1}{100}$ ◯ 2.324

e. $14 + 72 \times \frac{1}{10} + 4 \times \frac{1}{1000}$ ◯ 21.24

f. $0.3 \times 10^2 + 0.007 \times 10^3$ ◯ $0.3 \times 10 + 0.7 \times 10^2$

4. Dr. Mann mixed 10.357 g of chemical A, 12.062 g of chemical B, and 7.506 g of chemical C to make 5 doses of medicine.

   a. About how much medicine did he make in grams? Estimate the amount of each chemical by rounding to the nearest tenth of a gram before finding the sum. Show all your thinking.

   b. Find the actual amount of medicine mixed by Dr. Mann. What is the difference between your estimate and the actual amount?

   c. How many grams are in one dose of medicine? Explain your strategy for solving this problem.

   d. Round the weight of one dose to the nearest gram.

End-of-Module Assessment Task Standards Addressed	Topics A–F

Generalize place value understanding for multi-digit whole numbers.

5.NBT.1 Recognize that in a multi-digit number, a digit in one place represents 10 times as much as it represents in the place to its right and 1/10 of what it represents in the place to its left.

5.NBT.2. Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10.

5.NBT.3 Read, write, and compare decimals to thousandths.

a. Read and write decimals to thousandths using base-ten numerals, number names, and expanded form, e.g., $347.392 = 3 \times 100 + 4 \times 10 + 7 \times 1 + 3 \times (1/10) + 9 \times (1/100) + 2 \times (1/1000)$.

b. Compare two decimals to thousandths based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons.

5.NBT.4 Use place value understanding to round decimals to any place.

Perform operations with multi-digit whole numbers and with decimals to hundredths.

5.NBT.7 Add, subtract, multiply, and divide decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used.

Convert like measurement units within a given measurement system.

5.MD.1 Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real world problems.

Evaluating Student Learning Outcomes

A Progression Toward Mastery is provided to describe steps that illuminate the gradually increasing understandings that students develop on their way to proficiency. In this chart, this progress is presented from left (Step 1) to right (Step 4). The learning goal for students is to achieve Step 4 mastery. These steps are meant to help teachers and students identify and celebrate what the students CAN do now and what they need to work on next.

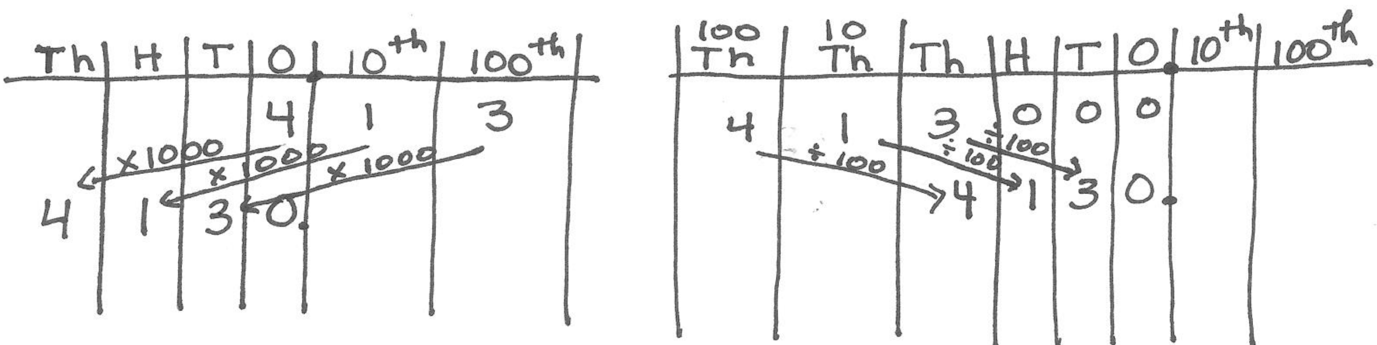
A Progression Toward Mastery				
Assessment Task Item and Standards Assessed	**STEP 1** **Little evidence of reasoning without a correct answer.** **(1 Point)**	**STEP 2** **Evidence of some reasoning without a correct answer.** **(2 Points)**	**STEP 3** **Evidence of some reasoning with a correct answer or evidence of solid reasoning with an incorrect answer.** **(3 Points)**	**STEP 4** **Evidence of solid reasoning with a correct answer.** **(4 Points)**
1 **5.NBT.1** **5.NBT.2**	Student is unable to provide a correct response.	Student attempts but is not able to accurately draw the place value chart or explain reasoning fully.	Student correctly draws the place value chart but does not show full reasoning or explains reasoning fully, but the place value chart does not match the reasoning.	Student correctly: ▪ Draws the place value chart showing movement of digits. ▪ Explains the movement of units to the left for multiplication and the movement of units to the right for division.
2 **5.NBT.7**	Student is unable to use the area model to find the product.	Student attempts to use an area model to multiply but does so inaccurately. Student attempts to write either the word or expanded form of an inaccurate product.	Student uses the area model to multiply but does not find the correct product. The student accurately produces a word and expanded form of an inaccurate product.	Student correctly: ▪ Draws an area model. ▪ Shows work to find the product of 13.8. ▪ Accurately expresses the product in both word and expanded form.
3 **5.NBT.3a** **5.NBT.3b**	Student answers none or one part correctly.	Student answers two or three answers correctly.	Student answers four or five answers correctly.	Student correctly answers all six parts. a. > d. > b. = e. < c. > f. <

A Progression Toward Mastery				
4 **5.NBT.1** **5.NBT.2** **5.NBT.3a** **5.NBT.3b** **5.NBT.4** **5.NBT.7** **5.MD.1**	The student answers none or one part correctly.	The student answers two parts correctly.	The student is able to find all answers correctly but is unable to explain the strategy in Part (c) or answers three of the four parts correctly.	The student correctly: a. Estimates 10.357 g to 10.4 g, 12.062 g to 12.1 g, and 7.506 g as 7.5 g; finds the sum 30 g; shows work or model. b. Finds the sum 29.925 g and the difference 0.075 g. c. Finds the quotient 5.985 g and explains accurately the strategy used. d. Rounds 5.985 g to 6 g.

Name Ruthie Date Oct. 2

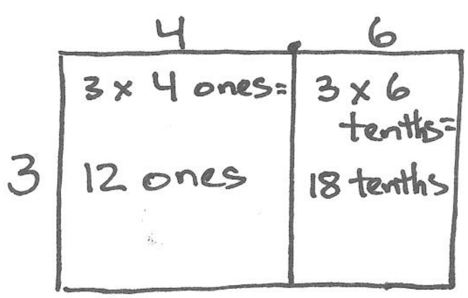
1. The following equations involve different quantities and use different operations, yet produce the same result. Use a place value chart and words to explain why this is true.

$4.13 \times 10^3 = 4130$ $413{,}000 \div 10^2 = 4130$



When I multiplied, the digits moved 3 places to the left, because they got larger. When I divided, the digits moved 2 places to the right, because they decreased.

2. Use an area model to explain the product of 4.6 and 3. Write the product in standard form, word form, and expanded form.



12 + 1.8 = 13.8

thirteen and eight tenths

$1 \times 10 + 3 \times 1 + 8 \times \frac{1}{10}$

3. Compare using >, <, or =.

   a. 2 tenths + 11 hundredths > 0.13

   b. 13 tenths + 8 tenths + 32 hundredths = 2.42

   c. 342 hundredths + 7 tenths > 3 + 49 hundredths

   d. $2 + 31 \times \frac{1}{10} + 14 \times \frac{1}{100}$ > 2.324

   e. $14 + 72 \times \frac{1}{10} + 4 \times \frac{1}{1000}$ < 21.24

   f. $0.3 \times 10^2 + 0.007 \times 10^3$ < $0.3 \times 10 + 0.7 \times 10^2$

4. Dr. Mann mixed 10.357 g of chemical A, 12.062 g of chemical B, and 7.506 g of chemical C to make 5 doses of medicine.

   a. About how much medicine did he make in grams? Estimate the amount of each chemical by rounding to the nearest tenth of a gram before finding the sum. Show all your thinking.

A 10.357 g ≈ 10.4 g

B 12.062 g ≈ 12.1 g

C 7.506 g ≈ 7.5 g

$$\begin{array}{r} 10.4 \\ 12.1 \\ +\ 7.5 \\ \hline 30.0 \end{array}$$

Dr. Mann made about 30 grams of medicine.

   b. Find the actual amount of medicine mixed by Dr. Mann. What is the difference between your estimate and the actual amount?

$$\begin{array}{r} 10.357 \\ 12.062 \\ +\ 7.506 \\ \hline 29.925 \end{array}$$

$$\begin{array}{r} \cancel{30}.\cancel{000} \\ -\ 29.925 \\ \hline 0.075 \end{array}$$

The difference in the estimated and actual amounts is 0.075 grams.

   c. How many grams are in one dose of medicine? Explain your strategy for solving this problem.

$$\begin{array}{r} 5.985 \\ 5\,\overline{)\,29.925} \\ -25 \\ \hline 49 \\ -45 \\ \hline 42 \\ -40 \\ \hline 25 \\ -25 \\ \hline 0 \end{array}$$

I used the algorithm to find my answer.

There are 5.985 grams of medicine in one dose.

   d. Round the weight of one dose to the nearest gram.

5.985 g ≈ 6 g

Name ____ Date ____________________

1. Express the missing divisor using a power of 10. Explain your reasoning using a place value model.

   a. 5.2 ÷ __________ = 0.052

   b. 7,650 ÷ __________ = 7.65

2. Estimate the quotient by rounding the expression to relate to a one-digit fact. Explain your thinking in the space below.

   a. 432 ÷ 73 ≈ __________

   b. 1,275 ÷ 588 ≈ __________

3. Generate and solve another division problem with the same quotient and remainder as the two problems below. Explain your strategy for creating the new problem.

$$\begin{array}{r|l} & \;\;\;\;3 \\ \hline 17 & 63 \\ & -51 \\ \hline & \;\;12 \end{array} \qquad \begin{array}{r|l} & \;\;\;\;\;\;\,3 \\ \hline 42 & 138 \\ & -126 \\ \hline & \;\;\;\;12 \end{array}$$

4. Sarah says that 26 ÷ 8 equals 14 ÷ 4 because both are “3 R2.” Show her mistake using decimal division.

5. A rectangular playground has an area of 3,392 square meters. If the width of the rectangle is 32 meters, find the length.

6. A baker uses 5.5 pounds of flour daily.

   a. How many ounces of flour will he use in two weeks? Use words, numbers, or pictures to explain your thinking. (1 lb = 16 oz)

b. The baker's recipe for a loaf of bread calls for 12 ounces of flour. If he uses all of his flour to make loaves of bread, how many full loaves can he bake in two weeks?

c. The baker sends all his bread to one store. If he can pack up to 15 loaves of bread in a box for shipping, what is the minimum number of boxes required to ship all the loaves baked in two weeks? Explain your reasoning.

d. The baker pays $0.80 per pound for sugar and $1.25 per pound for butter. Write an expression that shows how much the baker will spend if he buys 6 pounds of butter and 20 pounds of sugar.

e. Chocolate sprinkles cost as much per pound as sugar. Find $\frac{1}{10}$ the baker's total cost for 100 pounds of chocolate sprinkles. Explain the number of zeros and the placement of the decimal in your answer using a place value chart.

End-of-Module Assessment Task Standards Addressed	Topics A–H

Write and interpret numerical expressions.

5.OA.1 Use parentheses, brackets, or braces in numerical expressions, and evaluate expressions with these symbols.

5.OA.2 Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them. *For example, express the calculation "add 8 and 7, then multiply by 2" as 2 × (8 + 7). Recognize that 3 × (18932 + 921) is three times as large as 18932 + 921, without having to calculate the indicated sum or product.*

Understand the place value system.

5.NBT.1 Recognize that in a multi-digit number, a digit in one place represents 10 times as much as it represents in the place to its right and 1/10 of what it represents in the place to its left.

5.NBT.2 Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10.

Perform operations with multi-digit whole numbers and with decimals to hundredths.

5.NBT.5 Fluently multiply multi-digit whole numbers using the standard algorithm.

5.NBT.6 Find whole-number quotients of whole numbers with up to four-digit dividends and two-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.

5.NBT.7 Add, subtract, multiply, and divide decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used.

Convert like measurement units within a given measurement system.

5.MD.1 Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real world problems.

Evaluating Student Learning Outcomes

A Progression Toward Mastery is provided to describe steps that illuminate the gradually increasing understandings that students develop on their way to proficiency. In this chart, this progress is presented from left (Step 1) to right (Step 4). The learning goal for students is to achieve Step 4 mastery. These steps are meant to help teachers and students identify and celebrate what the students CAN do now and what they need to work on next.

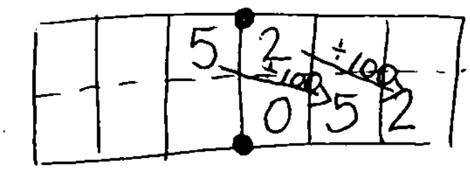
A Progression Toward Mastery				
Assessment Task Item	**STEP 1 Little evidence of reasoning without a correct answer. (1 Point)**	**STEP 2 Evidence of some reasoning without a correct answer. (2 Points)**	**STEP 3 Evidence of some reasoning with a correct answer or evidence of solid reasoning with an incorrect answer. (3 Points)**	**STEP 4 Evidence of solid reasoning with a correct answer. (4 Points)**
1 **5.NBT.1** **5.NBT.2** **5.NBT.7**	Student is unable to express the divisors as powers of 10 either as multiples of 10 or as exponents and produces a place value chart with errors.	Student either shows the divisors as powers of 10 (as multiples of 10 or exponents) or uses correct reasoning on the place value chart.	Student correctly expresses the divisors as powers of 10 either as multiples of 10 or exponents and uses correct reasoning on the place value chart for either Part (a) or Part (b).	Student correctly expresses the divisors as powers of 10 either as multiples of 10 or exponents. Student also shows correct reasoning on the place value chart for both Part (a) and Part (b). a. 100 and/or 10^2 b. 1000 and/or 10^3
2 **5.NBT.1** **5.NBT.2** **5.NBT.6**	Student is unable to round either the dividend or the divisor to a one-digit fact.	Student rounds the dividend and divisor but not to a one-digit fact.	Student correctly rounds to a one-digit fact for either Part (a) or Part (b) or rounds both parts correctly without a clear explanation.	Student correctly rounds both Part (a) and Part (b) to a one-digit fact and clearly explains thinking. a. 420 ÷ 70 = 6 b. 1,200 ÷ 600 = 2
3 **5.OA.1** **5.NBT.6**	Student is unable to generate a division problem with a quotient of 3 and remainder of 12.	Student generates a division problem with either a quotient of 3 or a remainder of 12 but is unable to explain reasoning used.	Student generates a division problem with both a quotient of 3 and a remainder of 12 but shows no evidence of a strategy other than guess and check.	Student generates a division problem with a quotient of 3 and remainder of 12 and describes a sound strategy (e.g., writes a checking equation ____ = 3 × _____ + 12).

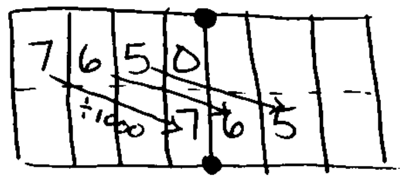
A Progression Toward Mastery				
4 **5.NBT.7**	Student is unable to perform the decimal division necessary to show non-equivalence of quotients.	Student is able to perform the division necessary to produce the whole number portion of the quotient but is unable to continue dividing the decimal places to show non-equivalence of quotients.	Student is able to explain the non-equivalence of the quotients but with errors in the division calculation.	Student divides accurately and shows the non-equivalence of the quotients. 26 ÷ 8 = 3.25 14 ÷ 4 = 3.5
5 **5.NBT.6**	Student does not divide to find the length of the playground.	Student makes two errors in division that lead to an incorrect length of the playground.	Student makes one error in division that leads to an incorrect length of the playground.	Student correctly divides and finds the length of the rectangle to be 106 m.
6 **5.OA.1** **5.OA.2** **5.NBT.1** **5.NBT.2** **5.NBT.5** **5.NBT.6** **5.NBT.7** **5.MD.1**	Student uses incorrect reasoning for all parts of the task.	Student uses correct reasoning for at least two parts of the task but makes errors in calculation.	Student uses correct reasoning for all parts of the task but makes errors in calculation.	Student describes correct reasoning using words, numbers, or pictures and correctly calculates for all parts of the task. a. 1,232 oz b. 102 loaves c. 7 boxes d. (20 × 0.80) + (6 × $1.25) e. $8.00

Name Garrett Date ____________

1. Express the missing divisor using an exponent. Explain your reasoning using a place value chart.

a. $5.2 \div \underline{10^2} = 0.052$ b. $7{,}650 \div \underline{10^3} = 7.65$





2. Estimate the quotient by rounding the equation to relate to a 1-digit fact. Explain your thinking in the space below.

a. $432 \div 73 \approx \underline{6}$

$420 \div 70 = 42 \div 7 = 6$

73 is close to 7 tens. The nearest multiple of 7 that's like 432 is 42 tens. So $42 \div 7 = 6$

b. $1275 \div 588 \approx \underline{2}$

$1200 \div 600 = 12 \div 6 = 2$

588 is close to 600. The nearest multiple of 600 that is close to 1275 is 12 hundreds. So $12 \div 6 = 2$

3. Generate and solve another division problem with the same quotient and remainder as the two problems below. Explain your strategy for creating the new problem.

$$\begin{array}{r} 3 \\ 17\overline{)63} \\ \underline{51} \\ 12 \end{array} \qquad \begin{array}{r} 3 \\ 42\overline{)138} \\ \underline{126} \\ 12 \end{array} \qquad \begin{array}{r} 3 \\ 27\overline{)93} \\ \underline{-81} \\ 12 \end{array}$$

To check division, I can multiply the answer and the divisor, then add the remainder. So I multiplied 3 X my number which was 27 and got 81 and then I added 12. So my dividend must be 93.

$$\begin{array}{r} 27 \\ \underline{\times\ 3} \\ 81 \\ \underline{+12} \\ 93 \end{array}$$

4. Sarah says that 26 ÷ 8 equals 14 ÷ 4 because both are "3 R2." Show her mistake using decimal division.

$$\begin{array}{r} 3.25 \\ 8\overline{)26.00} \\ -24 \\ \hline 20 \\ -16 \\ \hline 40 \\ -40 \\ \hline 0 \end{array} \qquad \begin{array}{r} 3.5 \\ 4\overline{)14.0} \\ -12 \\ \hline 20 \\ -20 \\ \hline 0 \end{array}$$

$26 \div 8 = 3.25$

$14 \div 4 = 3.5$

5. A rectangular playground has an area of 3,392 square meters. If the width of the rectangle is 32 meters, find the length.

?

32m | A = 3,392 m²

$32 \times ? = 3{,}392$

$$\begin{array}{r} 106 \\ 32\overline{)3{,}392} \\ -32 \\ \hline 19 \\ -0 \\ \hline 192 \\ -192 \\ \hline 0 \end{array}$$

The length of the rectangle is 106 meters.

6. A baker uses 5.5 pounds of flour daily.

a. How many ounces of flour will he use in two weeks? Use words, numbers, or pictures to explain your thinking. (1 lb = 16 oz.)

5.5 lbs = ___ oz

5.5 x (1 lb) = ___ oz

5.5 x (16 oz) = ___ oz

$$\begin{array}{r} 55 \text{ tenths} \\ \times 16 \\ \hline 330 \\ +550 \\ \hline 880 \text{ tenths} = 88 \end{array}$$

$$\begin{array}{r} 88 \text{ oz} \\ \times 14 \\ \hline 352 \\ +880 \\ \hline 1{,}232 \text{ oz} \end{array}$$

First, I found the ounces he uses every day. Then I multiplied by 14 days.

The baker uses 1,232 oz of flour in 2 weeks.

b. The baker's recipe for a loaf of bread calls for 12 ounces of flour. If he uses all of his flour to make loaves of bread, how many full loaves can he bake in two weeks?

$$
\begin{array}{r}
102 \text{ R}8 \\
12\overline{)1{,}232} \\
-12 \\
\hline
03 \\
-00 \\
\hline
32 \\
-24 \\
\hline
8
\end{array}
$$

The baker can bake 102 full loaves in two weeks.

c. The baker sends all his bread to one store. If he can pack up to 15 loaves of bread in a box for shipping, what is the minimum number of boxes required to ship all the loaves baked in two weeks. Explain your reasoning.

$$
\begin{array}{r}
6 \\
15\overline{)102} \\
-90 \\
\hline
12
\end{array}
$$

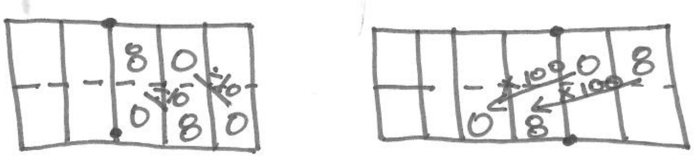
He needs 7 boxes to ship all the bread. The last box won't be full. It will only have 12 loaves in it.

d. The baker pays \$0.80 per pound for sugar and \$1.25 per pound for butter. Write an expression that shows how much the baker will spend if he buys 6 pounds of butter and 20 pounds of sugar.

$(6 \times \$1.25) + (20 \times \$0.80)$

e. Chocolate sprinkles cost as much per pound as sugar. Find $\frac{1}{10}$ the baker's total cost for 100 pounds of chocolate sprinkles. Explain the number of zeros and the placement of the decimal in your answer using a place value chart.

$\$0.80 \div 10 = \$0.08$



The baker pays \$8.00 for 100 lbs of sprinkles.

Name ____ Date ______________________

1. On Sunday, Sheldon bought $4\frac{1}{2}$ kg of plant food. He used $1\frac{2}{3}$ kg on his strawberry plants and used $\frac{1}{4}$ kg for his tomato plants.

   a. How many kilograms of plant food did Sheldon have left? Write one or more equations to show how you reached your answer.

   b. Sheldon wants to feed his strawberry plants 2 more times and his tomato plants one more time. He will use the same amounts of plant food as before. How much plant food will he need? Does he have enough left to do so? Explain your answer using words, pictures, or numbers.

2. Sheldon harvests the strawberries and tomatoes in his garden.

   a. He picks $1\frac{2}{5}$ kg less strawberries in the morning than in the afternoon. If Sheldon picks $2\frac{1}{4}$ kg in the morning, how many kilograms of strawberries does he pick in the afternoon? Explain your answer using words, pictures, or equations.

   b. Sheldon also picks tomatoes from his garden. He picked $5\frac{3}{10}$ kg, but 1.5 kg were rotten and had to be thrown away. How many kilograms of tomatoes were not rotten? Write an equation that shows how you reached your answer.

   c. After throwing away the rotten tomatoes, did Sheldon get more kilograms of strawberries or tomatoes? How many more kilograms? Explain your answer using an equation.

End-of-Module Assessment Task Standards Addressed	Topics A–D

Use equivalent fractions as a strategy to add and subtract fractions.

5.NF.1 Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators. *For example, 2/3 + 5/4 = 8/12 + 15/12 = 23/12. (In general, a/b + c/d = (ad + bc)/bd.)*

5.NF.2 Solve word problems involving addition and subtraction of fractions referring to the same whole, including cases of unlike denominators, e.g., by using visual fraction models or equations to represent the problem. Use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers. *For example, recognize an incorrect result 2/5 + 1/2 = 3/7, by observing that 3/7 < 1/2*.

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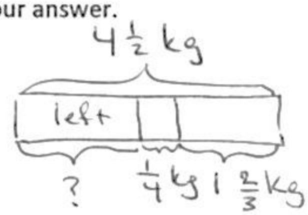
A Progression Toward Mastery				
Assessment Task Item and Standards Assessed	**STEP 1 Little evidence of reasoning without a correct answer. (1 Point)**	**STEP 2 Evidence of some reasoning without a correct answer. (2 Points)**	**STEP 3 Evidence of some reasoning with a correct answer or evidence of solid reasoning with an incorrect answer. (3 Points)**	**STEP 4 Evidence of solid reasoning with a correct answer. (4 Points)**
1(a) 5.NF.1 5.NF.2	The work shows little evidence of conceptual or procedural strength.	Student obtains an incorrect answer and has trouble manipulating the units or setting up the problem.	Student obtains the correct answer but does not show an equation or does not obtain the correct answer through a very small calculation error. The part–whole thinking is completely accurate.	Student displays complete confidence in applying part–whole thinking to a word problem with fractions, giving the correct answer of $2\frac{14}{24}$ kg or $2\frac{7}{12}$ kg.
1(b) 5.NF.1 5.NF.2	Student was unable to make sense of the problem in any intelligible way.	Student's solution is incorrect and, though showing signs of real thought, is not developed or does not connect to the story's situation.	Student has the correct answer to the first question but fails to answer the second question. OR Student has reasoned through the problem well, setting up the equation correctly, but making a careless error.	Student correctly: ▪ Calculates that Sheldon needs $3\frac{7}{12}$ kg of plant food. ▪ Notes that $3\frac{7}{12}$ kg is more than $2\frac{7}{12}$ kg, so Sheldon does not have enough plant food.
2(a) 5.NF.1 5.NF.2	The solution is incorrect and shows little evidence of understanding of the need for like units.	Student shows evidence of beginning to understand adding fractions with unlike denominators but cannot apply that knowledge to this part–whole comparison.	Student calculates correctly and sets up the part–whole situation correctly but fails to write a complete statement. OR Student fully answers the question but makes one small calculation error that is clearly careless, such as copying a number wrong.	Student is able to apply part–whole thinking to correctly answer $3\frac{13}{20}$ kg and explains the answer using words, pictures, or numbers.

A Progression Toward Mastery				
2(b) **5.NF.1** **5.NF.2**	The solution is incorrect and shows no evidence of being able to work with decimals and fractions simultaneously.	Student shows evidence of recognizing how to convert fractions to decimals or decimals to fractions but fails to do so correctly.	Student calculates correctly but may be less than perfectly clear in stating his solution. For example, "The answer is $3\frac{4}{5}$," is not a clearly stated solution.	Student gives a correct equation and correct answer of $3\frac{8}{10}$ kg or $3\frac{4}{5}$ kg and explains the answer using words, pictures, or numbers.
2(c) **5.NF.1** **5.NF.2**	The solution is incorrect and shows little evidence of understanding of fraction comparison.	Student may have compared correctly but calculated incorrectly and/or does not explain the meaning of her numerical solution in the context of the story.	Student may have compared correctly but calculated incorrectly and/or does not explain the meaning of her numerical solution in the context of the story.	Student correctly: ▪ Responds that the garden produced more strawberries. ▪ Responds that there were $2\frac{1}{10}$ kg or 2.1 kg more strawberries. ▪ Gives an equation such as $5\frac{9}{10} - 3\frac{8}{10} = 2\frac{9}{10} - \frac{8}{10} = 2\frac{1}{10}$.

Name Jacqueline Date ____________

1) On Sunday, Sheldon bought $4\frac{1}{2}$ kg of plant food. He used $1\frac{2}{3}$ kg on his strawberry plants, and used $\frac{1}{4}$ kg for his tomato plants.

a) How many kilograms of plant food did Sheldon have left? Write one or more equations to show how you reached your answer.



$$4\frac{1}{4} - 1\frac{2}{3} = 3\frac{1}{4} - \frac{2}{3}$$
$$= 3\frac{3}{12} - \frac{8}{12}$$
$$= 2\frac{15}{12} - \frac{8}{12}$$
$$= 2\frac{7}{12}$$

Sheldon had $2\frac{7}{12}$ kg left.

b) Sheldon wants to feed his strawberry plants 2 more times, and his tomato plants one more time. He will use the same amounts of plant food as before. How much plant food will he need? Does he have enough left to do so? Explain your answer using words, pictures or numbers.

$$1\frac{2}{3} + 1\frac{2}{3} = 2\frac{2}{3} + \frac{2}{3}$$
$$= 3\frac{1}{3}$$
$$3\frac{1}{3} + \frac{1}{4} = 3\frac{4}{12} + \frac{3}{12}$$
$$= 3\frac{7}{12}$$

No, Sheldon does not have enough because.

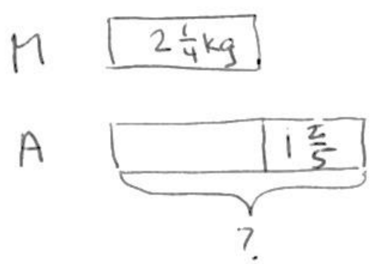
$$2\frac{7}{12} < 3\frac{7}{12}.$$

↓ what he has left

↓ what he needs.

2) Sheldon harvests the strawberries and tomatoes in his garden.

a. He picks $1\frac{2}{5}$ kg less strawberries in the morning than in the afternoon. If Sheldon picks $2\frac{1}{4}$ kg in the morning, how many kilograms of strawberries does he pick in the afternoon? Explain your answer using words, pictures or equations.



$$2\frac{1}{4} + 1\frac{2}{5} = 3\frac{1}{4} + \frac{2}{5}$$
$$= 3\frac{5}{20} + \frac{8}{20}$$
$$= 3\frac{13}{20}$$

Sheldon picked $3\frac{13}{20}$ kg strawberries in the afternoon.

b) Sheldon also picks tomatoes from his garden. He picked $5\frac{3}{10}$ kg but 1.5 kg were rotten and had to be thrown away. How many kilograms of tomatoes were not rotten? Write an equation that shows how you reached your answer.

$$5\frac{3}{10} - 1\frac{5}{10} = 4\frac{3}{10} - \frac{5}{10}$$
$$= 3\frac{13}{10} - \frac{5}{10}$$
$$= 3\frac{8}{10}$$

$3\frac{8}{10}$ kg or $3\frac{4}{5}$ kg were not rotten.

c) After throwing away the rotten tomatoes, did Sheldon get more kilograms of strawberries or tomatoes? How many more kilograms? Explain your answer using an equation.

Tomatoes: $3\frac{8}{10}$ kg

Strawberries: $2\frac{1}{4}$ kg + $2\frac{1}{4}$ kg + $1\frac{2}{5}$ kg

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

$= 4\frac{5}{10}$ kg + $1\frac{4}{10}$ kg

$= 5\frac{9}{10}$ kg

$5\frac{9}{10}$ kg $> 3\frac{8}{10}$ kg

Sheldon got more strawberries than tomatoes.

$5\frac{9}{10} - 3\frac{8}{10} = 2\frac{1}{10}$

He got $2\frac{1}{10}$ kg more strawberries.

Name ____________________________________ Date ____________________

1. Multiply or divide. Draw a model to explain your thinking.

a. $\frac{1}{3} \times \frac{1}{4}$

b. $\frac{3}{4}$ of $\frac{1}{3}$

c. $\frac{3}{4} \times \frac{3}{5}$

d. $4 \div \frac{1}{3}$

e. $5 \div \frac{1}{4}$

f. $\frac{1}{4} \div 5$

2. Multiply or divide using any method.

a. 1.5×32

b. 1.5×0.32

c. $12 \div 0.03$

d. $1.2 \div 0.3$

e. $12.8 \times \frac{3}{4}$

f. $102.4 \div 3.2$

3. Fill in the chart by writing an equivalent expression.

a.	One-fifth the sum of one-half and one-third	
b.	Two and one-half times the sum of nine and twelve	
c.	Twenty-four divided by the difference between $1\frac{1}{2}$ and $\frac{3}{4}$	

4. A castle has to be guarded 24 hours a day. Five knights are ordered to split each day's guard duty equally. How long will each knight spend on guard duty in one day?

   a. Record your answer in hours.

   b. Record your answer in hours and minutes.

   c. Record your answer in minutes.

5. On the blank, write a division expression that matches the situation.

   a. __________________ Mark and Jada share 5 yards of ribbon equally. How much ribbon will each get?

   b. ___________________ It takes half of a yard of ribbon to make a bow. How many bows can be made with 5 yards of ribbon?

   c. Draw a diagram for each problem and solve.

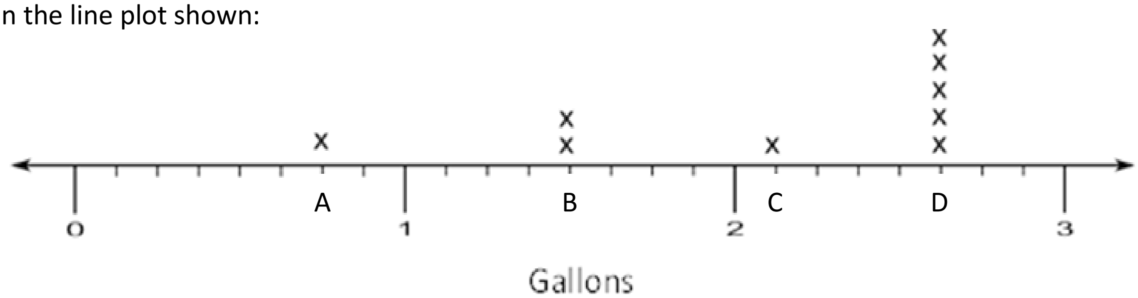
   d. Could either of the problems also be solved by using $\frac{1}{2} \times 5$? If so, which one(s)? Explain your thinking.

6. Jackson claims that multiplication always makes a number bigger. He gave the following examples:

   - If I take 6, and I multiply it by 4, I get 24, which is bigger than 6.
   - If I take $\frac{1}{4}$, and I multiply it by 2 (whole number), I get $\frac{2}{4}$, or $\frac{1}{2}$, which is bigger than $\frac{1}{4}$.

   Jackson's reasoning is incorrect. Give an example that proves he is wrong, and explain his mistake using pictures, words, or numbers.

7. Jill collected honey from 9 different beehives and recorded the amount collected, in gallons, from each hive in the line plot shown:



   a. She wants to write the value of each point marked on the number line above (Points A–D) in terms of the largest possible whole number of gallons, quarts, and pints. Use the line plot above to fill in the blanks with the correct conversions. (The first one is done for you.)

      A. __0__ gal __3__ qt __0__pt

      B. _______ gal ______ qt _______pt

      C. _______ gal ______ qt _______pt

      D. _______ gal ______ qt _______pt

b. Find the total amount of honey collected from the five hives that produced the most honey.

c. Jill collected a total of 19 gallons of honey. If she distributes all of the honey equally between 9 jars, how much honey will be in each jar?

d. Jill used $\frac{3}{4}$ of a jar of honey for baking. How much honey did she use baking?

e. Jill's mom used $\frac{1}{4}$ of a gallon of honey to bake 3 loaves of bread. If she used an equal amount of honey in each loaf, how much honey did she use for 1 loaf?

f. Jill's mom stored some of the honey in a container that held $\frac{3}{4}$ of a gallon. She used half of this amount to sweeten tea. How much honey, in cups, was used in the tea? Write an equation, and draw a tape diagram.

g. Jill uses some of her honey to make lotion. If each bottle of lotion requires $\frac{1}{4}$ gallon, and she uses a total of 3 gallons, how many bottles of lotion does she make?

End-of-Module Assessment Task **Topics A–H**
Standards Addressed

Write and interpret numerical expressions.

5.OA.1 Use parentheses, brackets, or braces in numerical expressions, and evaluate expressions with these symbols.

5.OA.2 Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them. *For example, express the calculation "add 8 and 7, then multiply by 2" as 2 × (8 +7). Recognize that 3 × (18932 + 921) is three times as large as 18932 + 921, without having to calculate the indicated sum or product.*

Perform operations with multi-digit whole numbers and with decimals to hundredths.

5.NBT.7 Add, subtract, multiply, and divide decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used.

Apply and extend previous understandings of multiplication and division to multiply and divide fractions.

5.NF.3 Interpret a fraction as division of the numerator by the denominator ($\frac{a}{b} = a \div b$). Solve word problems involving division of whole numbers leading to answers in the form of fractions or mixed numbers, e.g., by using visual fraction models or equations to represent the problem. *For example, interpret* $\frac{3}{4}$ *as the result of dividing 3 by 4, noting that* $\frac{3}{4}$ *multiplied by 4 equals 3, and that when 3 wholes are shared equally among 4 people each person has a share of size* $\frac{3}{4}$*. If 9 people want to share a 50-pound sack of rice equally by weight, how many pounds of rice should each person get? Between what two whole numbers does your answer lie?*

5.NF.4 Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction.

a. Interpret the product of $(\frac{a}{b}) \times q$ as a parts of a partition of q into b equal parts; equivalently, as the result of a sequence of operations $a \times q \div b$. *For example, use a visual fraction model to show* $(\frac{2}{3}) \times 4 = \frac{8}{3}$*, and create a story context for this equation. Do the same with* $(\frac{2}{3}) \times (\frac{4}{5}) = \frac{8}{15}$*. (In general,* $(\frac{a}{b}) \times (\frac{c}{d}) = \frac{ac}{bd}$*.)*

5.NF.5 Interpret multiplication as scaling (resizing) by:

a. Comparing the size of a product to the size of one factor on the basis of the size of the other factor, without performing the indicated multiplication.

b. Explaining why multiplying a given number by a fraction greater than 1 results in a product greater than the given number (recognizing multiplication by whole numbers greater than 1 as a familiar case); explaining why multiplying a given number by a fraction less than 1 results in a product smaller than the given number; and relating the principle of fraction equivalence $\frac{a}{b} = \frac{n \times a}{n \times b}$ to the effect of multiplying $\frac{a}{b}$ by 1.

5.NF.6 Solve real world problems involving multiplication of fractions and mixed numbers, e.g., by using visual fraction models or equations to represent the problem.

5.NF.7 Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions. (Students capable of multiplying fractions can generally develop strategies to divide fractions by reasoning about the relationship between multiplication and division. However, division of a fraction by a fraction is not a requirement at this grade level.)

a. Interpret division of a unit fraction by a non-zero whole number, and compute such quotients. *For example, create a story context for $(\frac{1}{3}) \div 4$, and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that $(\frac{1}{3}) \div 4 = \frac{1}{12}$ because $(\frac{1}{12}) \times 4 = \frac{1}{3}$.*

b. Interpret division of a whole number by a unit fraction, and compute such quotients. *For example, create a story context for $4 \div (\frac{1}{5})$, and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that $4 \div (\frac{1}{5}) = 20$ because $20 \times (\frac{1}{5}) = 4$.*

c. Solve real world problems involving division of unit fractions by non-zero whole numbers and division of whole numbers by unit fractions, e.g., by using visual fraction models and equations to represent the problem. *For example, how much chocolate will each person get if 3 people share $\frac{1}{2}$ lb of chocolate equally? How many $\frac{1}{3}$-cup servings are in 2 cups of raisins?*

Convert like measurement units within a given measurement system.

5.MD.1 Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real world problems.

Represent and interpret data.

5.MD.2 Make a line plot to display a data set of measurements in fractions of a unit $(\frac{1}{2}, \frac{1}{4}, \frac{1}{8})$. Use operations on fractions for this grade to solve problems involving information presented in line plots. *For example, given different measurements of liquid in identical beakers, find the amount of liquid each beaker would contain if the total amount in all the beakers were redistributed equally.*

Evaluating Student Learning Outcomes

A Progression Toward Mastery is provided to describe steps that illuminate the gradually increasing understandings that students develop *on their way to proficiency.* In this chart, this progress is presented from left (Step 1) to right (Step 4). The learning goal for students is to achieve Step 4 mastery. These steps are meant to help teachers and students identify and celebrate what the students CAN do now and what they need to work on next.

A Progression Toward Mastery

Assessment Task Item and Standards Assessed	STEP 1 Little evidence of reasoning without a correct answer. (1 Point)	STEP 2 Evidence of some reasoning without a correct answer. (2 Points)	STEP 3 Evidence of some reasoning with a correct answer or evidence of solid reasoning with an incorrect answer. (3 Points)	STEP 4 Evidence of solid reasoning with a correct answer. (4 Points)
1 **5. NF.4** **5. NF.7**	The student draws valid models and/or arrives at the correct answer for two or more items.	The student draws valid models and/or arrives at the correct answer for three or more items.	The student draws valid models and/or arrives at the correct answer for four or more items.	The student correctly answers all eight items and draws valid models: a. $\frac{1}{12}$ b. $\frac{3}{12}$ c. $\frac{9}{20}$ d. 12 e. 20 f. $\frac{1}{20}$
2 **5.NBT.7**	The student has two or fewer correct answers.	The student has three correct answers.	The student has four correct answers.	The student correctly answers all six items: a. 48 b. 0.48 c. 400 d. 4 e. 9.6 or $\frac{384}{40}$ or any equivalent fraction f. 32

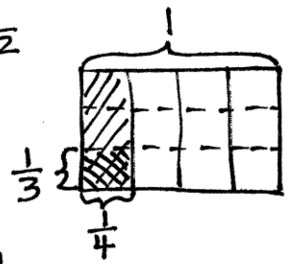
A Progression Toward Mastery				
3 **5.OA.2**	The student has no correct answers.	The student has one correct answer.	The student has two correct answers.	The student correctly answers all three items: a. $\frac{1}{5} \times \left(\frac{1}{2} + \frac{1}{3}\right)$ b. $(9 + 12) \times 2\frac{1}{2}$ or $2\frac{1}{2} \times (9 + 12)$ c. $24 \div \left(1\frac{1}{2} - \frac{3}{4}\right)$
4 **5.NF.3** **5.NF.6** **5.MD.1**	The student has no correct answers.	The student has one correct answer.	The student has two correct answers.	The student correctly answers all three items: a. 4.8 hours b. 4 hours, 48 minutes c. 288 minutes
5 **5.NF.6** **5.NF.7**	The student gives one or fewer correct responses among Parts (a), (b), (c), and (d).	The student gives at least two correct responses among Parts (a), (b), (c), and (d).	The student gives at least three correct responses among Parts (a), (b), (c), and (d).	The student correctly answers all four items: a. $5 \div 2$ b. $5 \div \frac{1}{2}$ c. Draws a correct diagram for both expressions and solves. d. Correctly identifies $5 \div 2$ and offers solid reasoning.
6 **5.NF.5**	The student gives both a faulty example and faulty explanation.	The student gives either a faulty example or explanation.	The student gives a valid example or clear explanation.	The student is able to give a correct example and clear explanation.

A Progression Toward Mastery				
7 **5.NF.3** **5.NF.4** **5.NF.6** **5.NF.7** **5.MD.1** **5.MD.2**	The student has two or fewer correct answers.	The student has three correct answers.	The student has five correct answers.	The student correctly answers all seven items: a. A. 0 gal, 3 qt, 0 pt B. 1 gal, 2 qt, 0 pt C. 2 gal, 0 qt, 1 pt D. 2 gal, 2 qt, 1 pt b. 13 gal, 1 pt c. $2\frac{1}{9}$ gal d. $1\frac{7}{12}$ gal e. $\frac{1}{12}$ gal f. 6 c g. 12 bottles

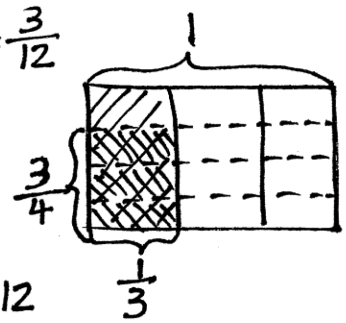
Name Seth Date ____________

1. Multiply or divide. Draw a model to explain your thinking.

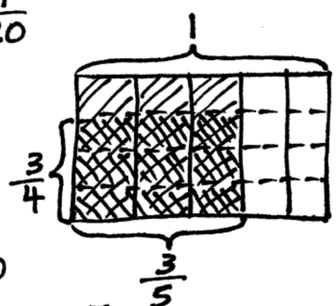
a. $\frac{1}{3} \times \frac{1}{4} = \frac{1}{12}$



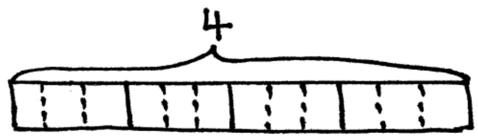
b. $\frac{3}{4}$ of $\frac{1}{3} = \frac{3}{12}$



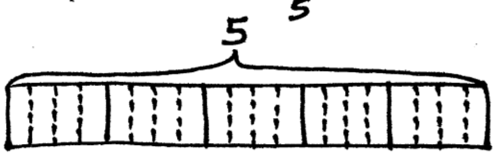
c. $\frac{3}{4} \times \frac{3}{5} = \frac{9}{20}$



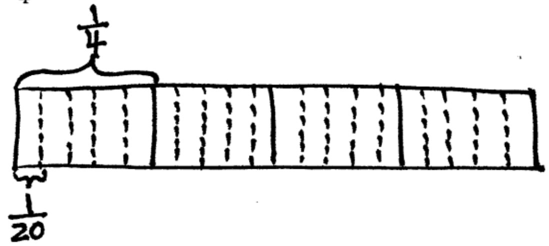
d. $4 \div \frac{1}{3} = 12$



e. $5 \div \frac{1}{4} = 20$



f. $\frac{1}{4} \div 5 = \frac{1}{20}$



2. Multiply or divide using any method.

a. $1.5 \times 32 = 48.0$

$$\begin{array}{r} 15\text{(tenths)} \\ \times\ 32 \\ \hline 30 \\ +\ 450 \\ \hline 480\text{(tenths)} \end{array}$$

b. 1.5×0.32

$= (1 \times 0.32) + (0.5 \times 0.32)$

$= 0.32 + 0.16$

$= 0.48$

c. $12 \div 0.03$

$= (12 \times 100) \div (0.03 \times 100)$

$= 1{,}200 \div 3$

$= 400$

d. $1.2 \div 0.3$

$= (1.2 \times 10) \div (0.3 \times 10)$

$= 12 \div 3$

$= 4$

e. $12.8 \times \frac{3}{4}$

$= (12 \times \frac{3}{4}) + (\frac{8}{10} \times \frac{3}{4})$

$= 9 + \frac{24}{40}$

$= 9\frac{24}{40} = 9\frac{3}{5}$

f. $102.4 \div 3.2$

$= (102.4 \times 10) \div (3.2 \times 10)$

$= 1{,}024 \div 32$

$= 32$

$$\begin{array}{r} 32 \\ 32\overline{)1{,}024} \\ -96 \\ \hline 64 \\ -64 \\ \hline 0 \end{array}$$

3. Fill in the chart by writing an equivalent expression.

a.	One-fifth the sum of one-half and one-third	$\frac{1}{5} \times (\frac{1}{2} + \frac{1}{3})$
b.	Two and one-half times the sum of nine and twelve	$2\frac{1}{2} \times (9 + 12)$
c.	Twenty-four divided by the difference between $1\frac{1}{2}$ and $\frac{3}{4}$	$24 \div (1\frac{1}{2} - \frac{3}{4})$

4. A castle has to be guarded 24 hours a day. Five knights are ordered to split each day's guard duty equally. How long will each knight spend on guard duty in one day?

a. Record your answer in hours.

$$\begin{array}{r} 4.8 \\ 5\overline{)24.0} \\ -20 \\ \hline 40 \\ -40 \\ \hline 0 \end{array}$$

Each Knight will spend 4.8 hours on guard duty in one day.

b. Record it in hours and minutes.

$\frac{1}{10}$ of 60 min = 6 min

$\frac{8}{10}$ of 60 min = 48 min

4.8 hours = 4 hours 48 minutes

Each Knight will spend 4 hours and 48 minutes on guard duty in one day.

c. Record your answer in minutes.

1 hour = 60 minutes

4.8 hour = ___ min.

= 4.8 × 1 hr

= 4.8 × 60 min

= 288.0 min

$$\begin{array}{r} 48\text{(tenths)} \\ \times 60 \\ \hline 00 \\ +2880 \\ \hline 2{,}880\text{(tenths)} \end{array}$$

Each Knight will spend 288 minutes on guard duty in one day.

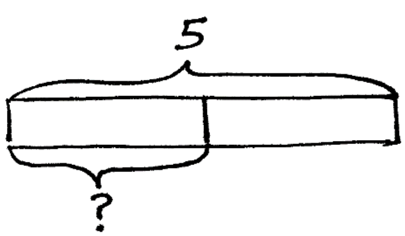
5. On the blank, write a division expression that matches the situation.

a. $5 \div 2$ Mark and Jada share 5 yards of ribbon equally. How much ribbon will each get?

b. $5 \div \frac{1}{2}$ It takes half of a yard of ribbon to make a bow. How many bows can be made with 5 yards of ribbon?

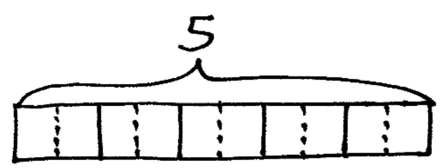
c. Draw a diagram for each problem and solve.

$5 \div 2 = 2\frac{1}{2}$



2 units = 5
1 unit = $5 \div 2$
$= \frac{5}{2} = 2\frac{1}{2}$

$5 \div \frac{1}{2} = 10$



d. Could either of the problems also be solved by using $\frac{1}{2} \times 5$? If so, which one(s)? Explain your thinking.

$5 \div 2 = 5 \times \frac{1}{2}$

Dividing by 2 is the same as taking $\frac{1}{2}$ of something, which means multiplying.

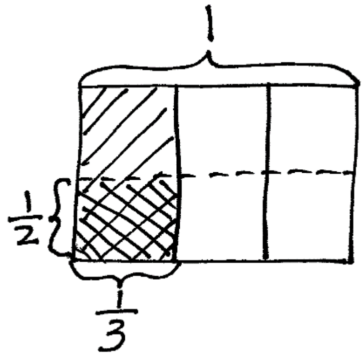
$\frac{1}{2} \times 5$ is the same as $5 \times \frac{1}{2}$.

6. Jackson claims that multiplication always makes a number bigger. He gave the following examples:

- If I take 6, and I multiply it by 4, I get 24, which is bigger than 6.
- If I take $\frac{1}{4}$, and I multiply it by 2 (whole number), I get $\frac{2}{4}$, or $\frac{1}{2}$ which is bigger than $\frac{1}{4}$.

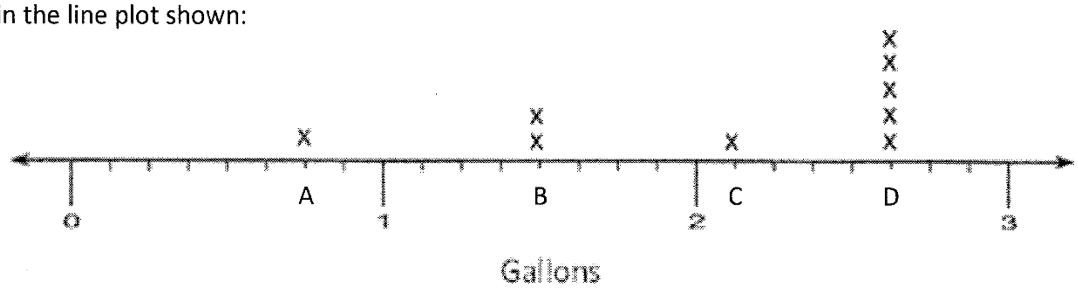
Jackson's reasoning is incorrect. Give an example that proves he is wrong, and explain his mistake using pictures, words, or numbers.

$\frac{1}{2} \times \frac{1}{3} = \frac{1}{6}$



$\frac{1}{6}$ is smaller than $\frac{1}{2}$ and $\frac{1}{3}$.

7. Jill collected honey from 9 different beehives, and recorded the amount collected, in gallons, from each hive in the line plot shown:



a. She wants to write the value of each point marked on the number line above (Points A–D) in terms of the largest possible whole number of gallons, quarts, and pints. Use the line plot above to fill in the blanks with the correct conversions. (The first one is done for you.)

A. ___0___ gal ___3___ qt ___0___ pt

B. ___1___ gal ___2___ qt ___0___ pt

C. ___2___ gal ___0___ qt ___1___ pt

D. ___2___ gal ___2___ qt ___1___ pt

b. Find the total amount of honey collected from the five hives that produced the most honey.

1 unit $= 2\frac{5}{8}$ gallons

5 units $= 5 \times 2\frac{5}{8}$ gallons

$= (5 \times 2) + (5 \times \frac{5}{8})$ gallons

$= 10 + \frac{25}{8}$ gallons

$= 10 + 3\frac{1}{8}$ gallons

$= 13\frac{1}{8}$ gallons

$13\frac{1}{8}$ gallons or 13 gallons and 1 pint were collected from the five hives that produced the most honey.

c. Jill collected a total of 19 gallons of honey. If she distributes all of the honey equally between 9 jars, how much honey will be in each jar?

$19 \div 9 = \frac{19}{9} = 2\frac{1}{9}$

There will be $2\frac{1}{9}$ gallons of honey in each jar.

d. Jill used $\frac{3}{4}$ of a jar for baking. How much honey did she use baking?

$\frac{3}{4}$ of $2\frac{1}{9}$ gallons

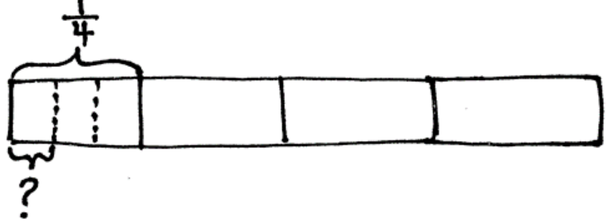
$= \frac{3}{4} \times \frac{19}{9}$ gallons

$= \frac{\cancel{3}^{1} \times 19}{4 \times \cancel{9}_{3}}$ gallons

$= \frac{19}{12} = 1\frac{7}{12}$ gallons

She used $1\frac{7}{12}$ gallons of honey for baking.

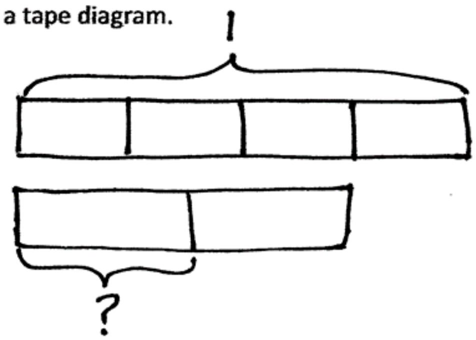
e. Jill's mom used $\frac{1}{4}$ of a gallon of honey to bake 3 loaves of bread. If she used an equal amount of honey in each loaf, how much honey did she use for 1 loaf?



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

She used $\frac{1}{12}$ of a gallon of honey for 1 loaf.

f. Jill's mom stored some of the honey in a container that held $\frac{3}{4}$ of a gallon. She used half of this amount to sweeten tea. How much honey, in cups, was used in the tea? Write an equation and draw a tape diagram.



$$\frac{1}{2} \times \frac{3}{4} \text{ gallon} = \frac{3}{8} \text{ gallon}$$
$$\frac{3}{8} \text{ gallon} = \frac{3}{8} \times 1 \text{ gallon}$$
$$= \frac{3}{8} \times 16 \text{ cups}$$
$$= \frac{3 \times \cancel{16}^{2}}{\cancel{8}_{1}} \text{ cups}$$
$$= 6 \text{ cups}$$

She used 6 cups of honey in the tea.

g. Jill uses some of her honey to make lotion. If each bottle of lotion requires $\frac{1}{4}$ gallon, and she uses a total of 3 gallons, how many bottles of lotion does she make?

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

She makes 12 bottles of lotion.

Name ____ Date ________________________

1. Use your ruler to draw a rectangle that measures $4\frac{1}{2}$ by $2\frac{3}{4}$ inches, and find its area.

2. Heather has a rectangular yard. She measures it and finds out it is $24\frac{1}{2}$ feet long by $12\frac{4}{5}$ feet wide.

   a. She wants to know how many square feet of sod she will need to completely cover the yard. Draw the yard, and label the measurements.

   b. How much sod will Heather need to cover the yard?

   c. If each square foot of sod costs 65 cents, how much will she have to pay to cover her yard?

3. A rectangular container that has a length of 30 cm, a width of 20 cm, and a height of 24 cm is filled with water to a depth of 15 cm. When an additional 6.5 liters of water are poured into the container, some water overflows. How many liters of water overflow the container? Use words, pictures, and numbers to explain your answer. (Remember: $1 \text{ cm}^3 = 1 \text{ mL}$.)

4. Jim says that a $2\frac{1}{2}$ inch by $3\frac{1}{4}$ inch rectangle has a section that is 2 inches × 3 inches and a section that is $\frac{1}{2}$ inch × $\frac{1}{4}$ inch. That means the total area is just the sum of these two smaller areas, or $6\frac{1}{8}$ in^2. Why is Jim incorrect? Use an area model to explain your thinking. Then, give the correct area of the rectangle.

5. Miguel and Jacqui built towers out of craft sticks. Miguel's tower had a 4-inch square base. Jacqui's tower had a 6-inch square base. If Miguel's tower had a volume of 128 cubic inches and Jacqui's had a volume of 288 cubic inches, whose tower was taller? Explain your reasoning.

6. Read the statements. Circle True or False. Explain your choice for each using words and/or pictures.

a. All parallelograms are quadrilaterals. True False

b. All squares are rhombuses. True False

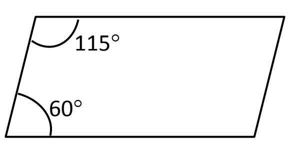
c. Squares are rhombuses but not rectangles. True False

d. The opposite angles in a parallelogram have the same measure. True False

e. Because the angles in a rectangle are 90°, it is not a parallelogram. True False

f. The sum of the angle measures of any trapezoid is greater than the sum of the angle measures of any parallelogram. True False

g. The following figure is a parallelogram. True False



End-of-Module Assessment Task Standards Addressed	Topics A–D

Apply and extend previous understandings of multiplication and division to multiply and divide fractions.

5.NF.4 Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction.

b. Find the area of a rectangle with fractional side lengths by tiling it with unit squares of the appropriate unit fraction side lengths, and show that the area is the same as would be found by multiplying the side lengths. Multiply fractional side lengths to find areas of rectangles, and represent fraction products as rectangular areas.

5.NF.6 Solve real world problems involving multiplication of fractions and mixed numbers, e.g., by using visual fraction models or equations to represent the problem.

Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition.

5.MD.3 Recognize volume as an attribute of solid figures and understand concepts of volume measurement.

a. A cube with side length 1 unit, called a “unit cube,” is said to have “one cubic unit” of volume, and can be used to measure volume.

b. A solid figure which can be packed without gaps or overlaps using n unit cubes is said to have a volume of n cubic units.

5.MD.4 Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and improvised units.

5.MD.5 Relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume.

a. Find the volume of a right rectangular prism with whole-number side lengths by packing it with unit cubes, and show that the volume is the same as would be found by multiplying the edge lengths, equivalently by multiplying the height by the area of the base. Represent threefold whole-number products as volumes, e.g., to represent the associative property of multiplication.

b. Apply the formulas $V = l \times w \times h$ and $V = b \times h$ for rectangular prisms to find volumes of right rectangular prisms with whole-number edge lengths in the context of solving real world and mathematical problems.

c. Recognize volume as additive. Find volumes of solid figures composed of two non-overlapping right rectangular prisms by adding the volumes of the non-overlapping parts, applying this technique to solve real world problems.

Classify two-dimensional figures into categories based on their properties.

5.G.3 Understand that attributes belonging to a category of two-dimensional figures also belong to all subcategories of that category. *For example, all rectangles have four right angles and squares are rectangles, so all squares have four right angles.*

5.G.4 Classify two-dimensional figures in a hierarchy based on properties.

Evaluating Student Learning Outcomes

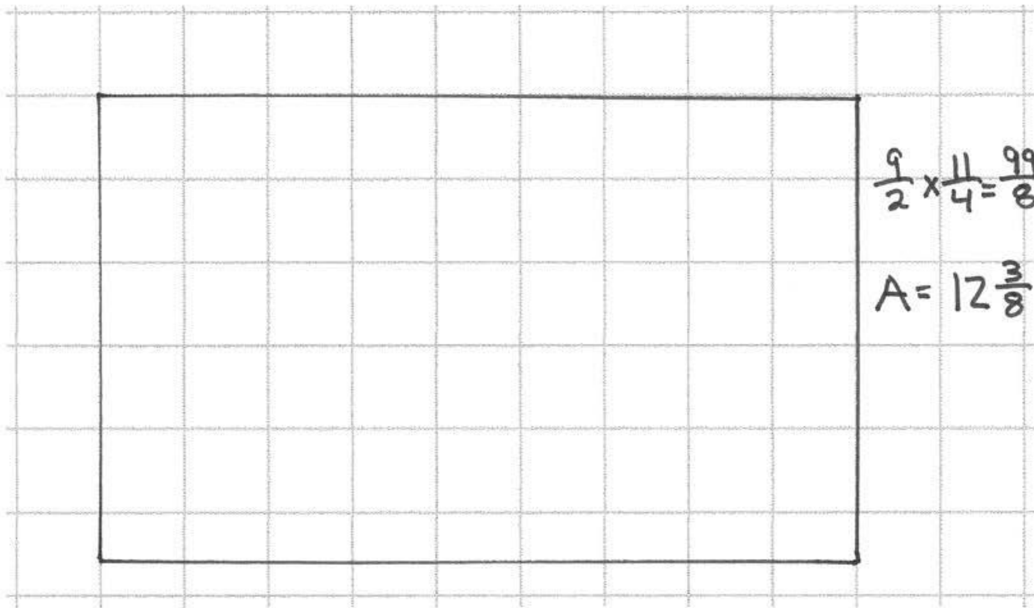
A Progression Toward Mastery is provided to describe steps that illuminate the gradually increasing understandings that students develop *on their way to proficiency.* In this chart, this progress is presented from left (Step 1) to right (Step 4). The learning goal for students is to achieve Step 4 mastery. These steps are meant to help teachers and students identify and celebrate what the students CAN do now and what they need to work on next.

A Progression Toward Mastery				
Assessment Task Item and Standards Assessed	**STEP 1** **Little evidence of reasoning without a correct answer.** **(1 Point)**	**STEP 2** **Evidence of some reasoning without a correct answer.** **(2 Points)**	**STEP 3** **Evidence of some reasoning with a correct answer or evidence of solid reasoning with an incorrect answer.** **(3 Points)**	**STEP 4** **Evidence of solid reasoning with a correct answer.** **(4 Points)**
1 **5.NF.4b**	The student is unable to draw the rectangle and unable to find the area.	The student draws one dimension accurately but is unable to find the area.	The student accurately draws both dimensions of the rectangle but makes a calculation error when finding the area.	The student correctly does the following: ▪ Draws the rectangle. ▪ Calculates the area as $12\frac{3}{8}$ in^2.
2 **5.NF.4b** **5.NF.6**	The student is unable to draw the yard, calculate the area using appropriate units, or calculate the cost of the sod.	The student does one of the following: ▪ Draws and labels the yard. ▪ Calculates the area of the yard with or without the correct units (square feet). ▪ Finds the cost of the sod.	The student is able to correctly perform two of the following actions in any combination: ▪ Draws and labels the yard. ▪ Calculates the area of the yard with the correct units (square feet). ▪ Finds the cost of the sod.	The student correctly does the following: ▪ Draws the yard and labels correctly with the length as $24\frac{1}{2}$ ft and the width as $12\frac{4}{5}$ ft. ▪ Calculates the area of the yard using appropriate units as $313\frac{6}{10}$ ft^2 or $313\frac{3}{5}$ ft^2. ▪ Finds the cost of the sod to be \$203.84.
3 **5.MD.3** **5.MD.5**	The student is unable to find the volume of the water that has overflowed and is unable to explain the reasoning used.	The student finds the volume of the water that has overflowed but is unable to explain the reasoning used.	The student makes a calculation error in finding the volume of the water that has overflowed but is able to clearly explain the reasoning used.	The student finds the volume of the water that has overflowed to be 1.1 L and uses words, numbers, and pictures to clearly explain the reasoning used.

A Progression Toward Mastery				
4 **5.NF.4b** **5.NF.6**	The student is not able to draw an area model, provide an explanation of Jim's error, or give the correct area.	The student does one of the following: ▪ Accurately partitions the area model in both dimensions. ▪ Provides a clear explanation of Jim's error. ▪ Calculates the correct area of the rectangle.	The student does two of the following: ▪ Accurately partitions the area model in both dimensions. ▪ Provides a clear explanation of Jim's error. ▪ Calculates the correct area of the rectangle.	The student does the following: ▪ Accurately partitions the area model in both dimensions. ▪ Provides a clear explanation of Jim's error. ▪ Calculates the correct area of the rectangle as $8\frac{1}{8}$ in^2.
5 **5.MD.5**	The student is neither able to find the heights of the towers nor able to answer which tower is taller.	The student makes an attempt to calculate the towers' heights but makes errors in both calculations. Explanation of the reasoning used is unclear.	The student calculates the heights of the towers but makes a calculation error that causes an error in the determination of the taller tower. However, the explanation of the reasoning used is clear.	The student does the following: ▪ Accurately calculates the heights of both towers (8 inches). ▪ Explains clearly that the towers are equal in height.
6 **5.G.3** **5.G.4**	The student provides a combination of at least three correct true or false responses and/or explanations.	The student provides a combination of at least six correct true or false responses and/or explanations.	The student provides a combination of at least seven correct true or false responses and/or explanations.	The student provides seven correct true or false responses and clear explanations for all seven items. a. True b. True c. False d. True e. False f. False g. False

Name Jean Date ____________

1. Use your ruler to draw a rectangle that measures $4\frac{1}{2}$ by $2\frac{3}{4}$ inches, and find its area.

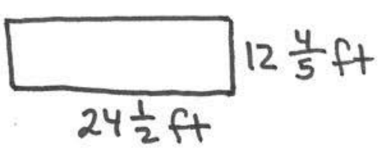


$\frac{9}{2} \times \frac{11}{4} = \frac{99}{8} = 12\frac{3}{8}$

$A = 12\frac{3}{8}$ in^2

2. Heather has a rectangular yard. She measures it and finds out it is $24\frac{1}{2}$ feet long by $12\frac{4}{5}$ feet wide.

   a. She wants to know how many square feet of sod she will need to completely cover the yard. Draw the yard, and label the measurements.



$$\begin{array}{r} 64 \\ \times\ 49 \\ \hline 576 \\ +\ 2560 \\ \hline 3{,}136 \end{array}$$

$$\begin{array}{r} 1568 \\ 2\overline{)3136} \\ -2 \\ \hline 11 \\ -10 \\ \hline 13 \\ -12 \\ \hline 16 \\ -16 \\ \hline 0 \end{array}$$

$$\begin{array}{r} 313\frac{3}{5} \\ 5\overline{)1568} \\ -15 \\ \hline 6 \\ -5 \\ \hline 18 \\ -15 \\ \hline 3 \end{array}$$

   b. How much sod will Heather need to cover the yard?

$12\frac{4}{5} \times 24\frac{1}{2} = \frac{64}{5} \times \frac{49}{2} = \frac{3136}{10} = \frac{1568}{5} = 313\frac{3}{5}$

She'll need $313\frac{3}{5}$ ft^2 of sod to cover her yard.

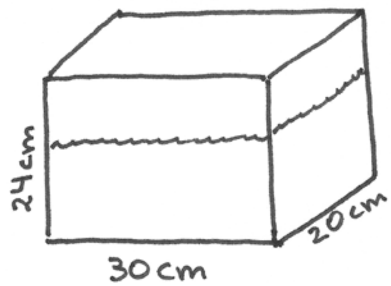
   c. If each square foot of sod costs 65 cents, how much will she have to pay to cover her yard?

$313\frac{3}{5} = 313.6$

$$\begin{array}{r} 313.6 \\ \times\ .65 \\ \hline 15680 \\ +\ 188160 \\ \hline 203.840 \end{array}$$

Heather will have to pay \$203.84 to cover her yard.

3. A rectangular container that has a length of 30 cm, a width of 20 cm, and a height of 24 cm is filled with water to a depth of 15 cm. When an additional 6.5 liters of water is poured into the container, some water overflows. How many liters of water overflow the container? Use words, pictures, and numbers to explain your answer. **(Remember 1 cm^3 = 1 mL.)**



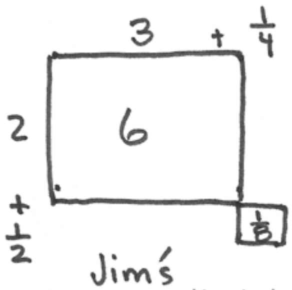
$30 \times 20 \times 24 = 720 \times 20 = 14{,}400$
Volume of the container = 14,400 cm^3

$30 \times 20 \times 15 = 450 \times 20 = 9{,}000$
Volume of water 9,000 cm^3

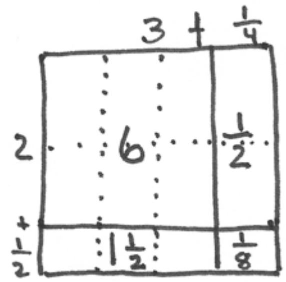
$14{,}400 - 9{,}000 = 5{,}400$
Room left in the container = 5,400 cm^3 or 5.4 L

6.5 L − 5.4 L = 1.1 L The water overflowed by 1.1 L or 1,100 cm^3.

4. Jim says that a $2\frac{1}{2}$ inch by $3\frac{1}{4}$ inch rectangle has a section that is 2 inches × 3 inches and a section that is $\frac{1}{2}$ inch × $\frac{1}{4}$ inches. That means the total area is just the sum of these two smaller areas, or $6\frac{1}{8}$ in^2. Why is Jim incorrect? Use an area model to explain your thinking. Then, give the correct area of the rectangle.



Jim's Incorrect Model



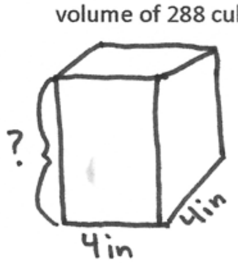
Correct Model

In order to find the area, all sections of the area model must be calculated and added.

$6 + \frac{1}{2} + 1\frac{1}{2} + \frac{1}{8} = 8\frac{1}{8}$

The area of the rectangle is $8\frac{1}{8}$ in^2.

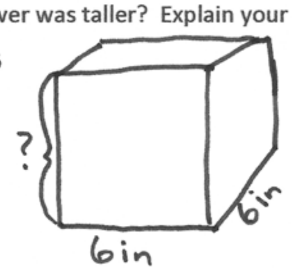
5. Miguel and Jacqui built towers out of craft sticks. Miguel's tower had a 4-inch square base. Jacqui's tower had a 6-inch square base. If Miguel's tower had a volume of 128 cubic inches and Jacqui's had a volume of 288 cubic inches, whose tower was taller? Explain your reasoning.



Miguel

V = 128 in^3

$128 \div 16 = 8$; $128 - 128 = 0$



V = 288 in^3

$288 \div 36 = 8$; $288 - 288 = 0$

Both towers have the same height of 8 in. I divided the volumes by the bases and got a height of 8 in.

6. Read the statements. Circle *True* or *False*. Explain your choice for each using words and/or pictures.

a. All parallelograms are quadrilaterals. True False

All parallelograms have 4 straight sides, so all parallelograms are a type of quadrilateral.

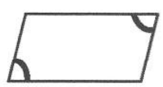
b. All squares are rhombuses. True False

All rhombuses have 4 equal sides, and so do all squares. Some rhombuses do not have 4 right angles, so not all rhombuses are squares.

c. Squares are rhombuses, but not rectangles. True False

All squares are both rhombuses and rectangles. Squares and rhombuses both have 4 equal sides. Squares and rectangles both have 4 right angles.

d. The opposite angles in a parallelogram have the same measure. True False



The opposite sides of parallelograms are parallel and equal in length. The four angles always add up to 360°. Opposite angles are always equal.

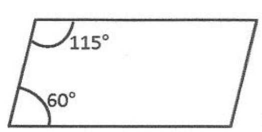
e. Because the angles in a rectangle are 90°, it is not a parallelogram. True False

All rectangles are parallelograms because all rectangles have 2 pairs of parallel sides.

f. The sum of the angle measures of any trapezoid is greater than the sum of the angle measures of any parallelogram. True False

The sum of the 4 angles of any quadrilateral, including trapezoids and parallelograms, is always 360°.

g. The following figure is a parallelogram. True False



Opposite angles in a parallelogram are always equal. If you add up these angles (60° + 60° + 115° + 115°) the sum is only 350°. Therefore, the opposite angles can't be equal, and this isn't a parallelogram. The angles need to add up to 360°.

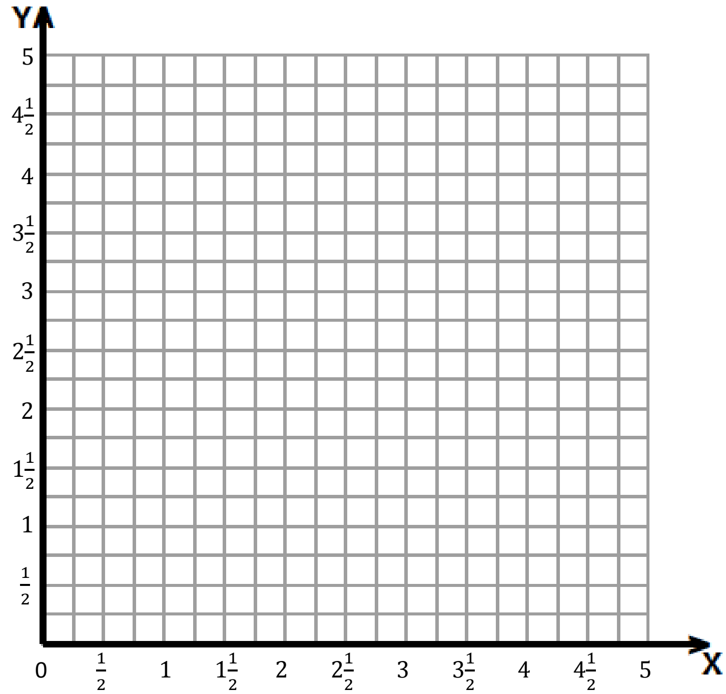
Name ______________________________   Date ________________

1. Follow the directions.

   a. Draw a ray that starts at point L at $(1\frac{1}{2}, 3)$ and includes point K at $(5, 3)$. Label points K and L.

   b. Give the coordinates of three other points on the ray.

   c. Draw a second ray with the same initial point and containing point M with coordinates $(3\frac{1}{2}, 4\frac{1}{4})$. Label point M.

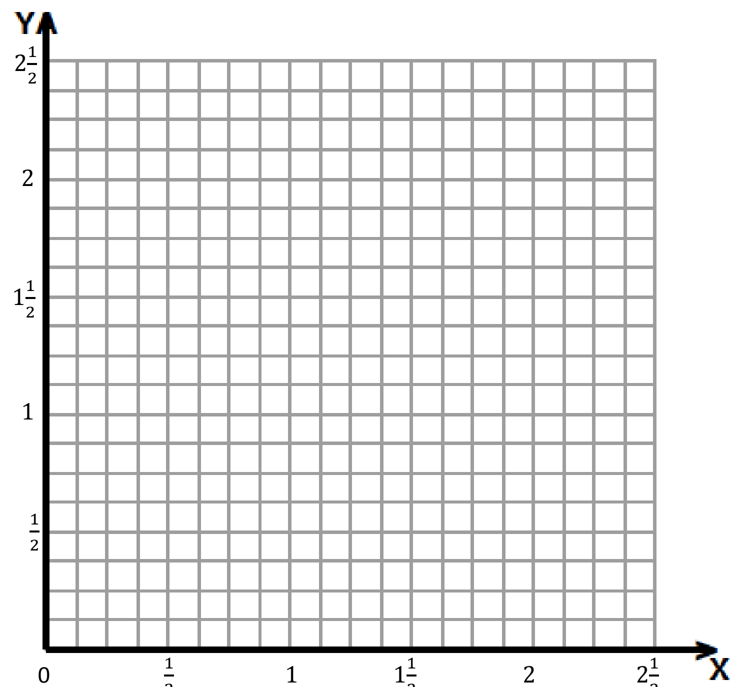


2. David draws a line segment from point Q $(\frac{1}{4}, \frac{7}{8})$ to point R $(\frac{5}{8}, \frac{1}{2})$. He then draws a line perpendicular to the first segment that intersects segment $\overline{QR}$ and includes point S $(\frac{3}{4}, 1)$.

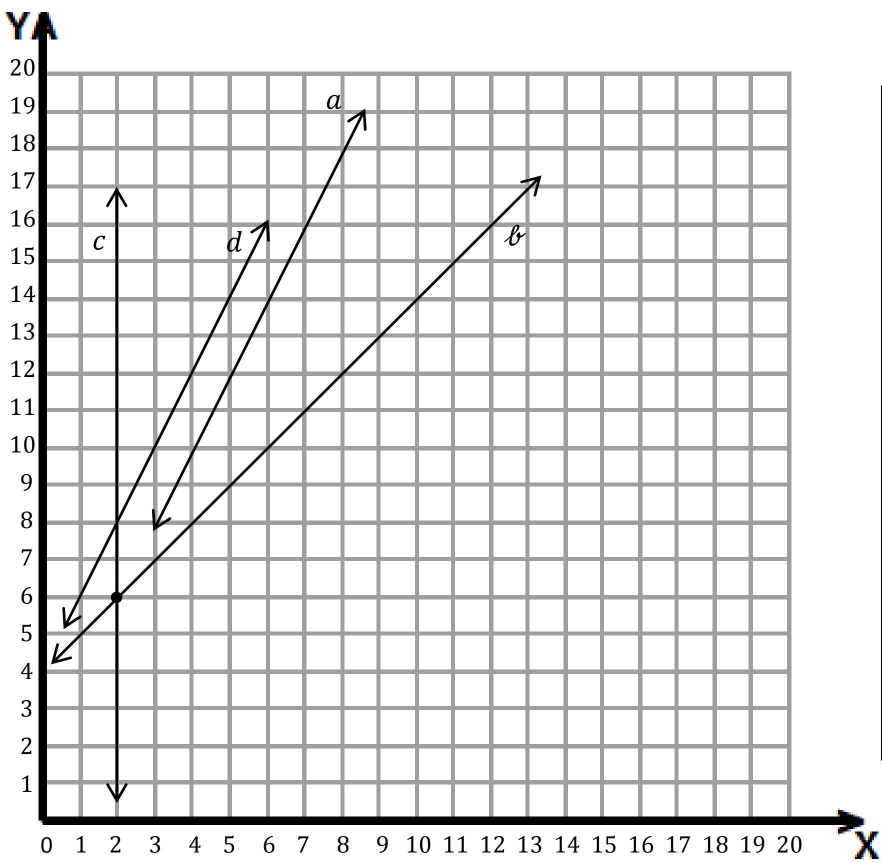
   a. Draw $\overline{QR}$, and label the endpoints on the grid.

   b. Draw the perpendicular line, and label point S.

   c. Name another point that lies on the perpendicular line whose x-coordinate is between 1 and $1\frac{1}{2}$.



3. Complete the table for the rule *multiply by 2 and then add 2* for the values of x from 0 to 4. Then, use the coordinate plane to answer the questions.



x	y	(x, y)
0		
1		
2		
3		
4		

a. Which line shows the rule in the table?

b. Give the coordinates for the intersection of lines b and c.

c. Draw a line on the graph such that any point on the line has a y-coordinate of 2. Label your line as e.

d. Which coordinate is 2 for any point on line c?

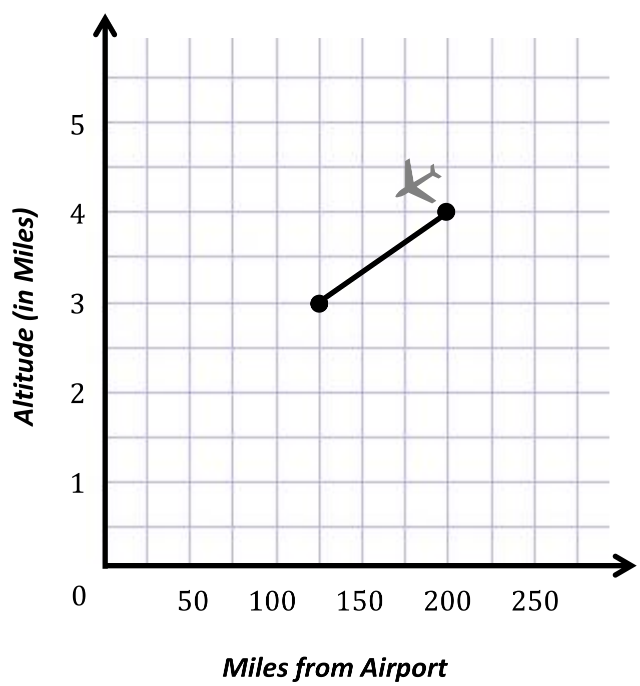
e. Write a rule that tells how to find the y-coordinate when the x-coordinate is given for the points on line $\mathcal{b}$.

f. Kim and Lacy want to draw a line on the coordinate plane that is parallel to line a. Kim uses the rule *multiply by 4 and add 2* to generate her y-coordinates. Lacy uses the rule *multiply by 2 and add 4* to generate her y-coordinates. Which girl's line will be parallel to line a? Without graphing the lines, explain how you know.

4. An airplane is descending into an airport. When its altitude is 5 miles, it is 275 miles from the airport. When its altitude is 4 miles, it is 200 miles from the airport. At 3 miles, it is 125 miles from the airport.

a. If the pilot follows the same pattern, what will the plane's altitude be at 50 miles from the airport?

b. For the plane to land at the airport, the altitude will need to be 0, and the distance from the airport will need to be 0. Should the pilot continue this pattern? Why or why not?



End-of-Module Assessment Standards Addressed	Topics A–D

Write and interpret numerical expressions.

5.OA.2 Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them. *For example, express the calculation "add 8 and 7, then multiply by 2" as 2 × (8 + 7). Recognize that 3 × (18932 + 921) is three times as large as 18932 + 921, without having to calculate the indicated sum or product*.

Analyze patterns and relationships.

5.OA.3 Generate two numerical patterns using two given rules. Identify apparent relationships between corresponding terms. Form ordered pairs consisting of corresponding terms from the two patterns, and graph the ordered pairs on a coordinate plane. *For example, given the rule "Add 3" and the starting number 0, and given the rule "Add 6" and the starting number 0, generate terms in the resulting sequences, and observe that the terms in one sequence are twice the corresponding terms in the other sequence. Explain informally why this is so.*

Graph points on the coordinate plane to solve real-world and mathematical problems.

5.G.1 Use a pair of perpendicular number lines, called axes, to define a coordinate system, with the intersection of the lines (the origin) arranged to coincide with the 0 on each line and a given point in the plane located by using an ordered pair of numbers, called its coordinates. Understand that the first number indicates how far to travel from the origin in the direction of one axis, and the second number indicates how far to travel in the direction of the second axis, with the convention that the names of the two axes and the coordinates correspond (e.g., x-axis and x-coordinate, y-axis and y-coordinate).

5.G.2 Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation.

Evaluating Student Learning Outcomes

A Progression Toward Mastery is provided to describe steps that illuminate the gradually increasing understandings that students develop *on their way to proficiency.* In this chart, this progress is presented from left (Step 1) to right (Step 4). The learning goal for students is to achieve Step 4 mastery. These steps are meant to help teachers and students identify and celebrate what the students CAN do now and what they need to work on next.

A Progression Toward Mastery				
Assessment Task Item and Standards Assessed	**STEP 1 Little evidence of reasoning without a correct answer. (1 Point)**	**STEP 2 Evidence of some reasoning without a correct answer. (2 Points)**	**STEP 3 Evidence of some reasoning with a correct answer or evidence of solid reasoning with an incorrect answer. (3 Points)**	**STEP 4 Evidence of solid reasoning with a correct answer. (4 Points)**
1 **5.G.1**	Student accurately completes at least three of the tasks embedded in the question.	Student accurately completes at least four of the tasks embedded in the question.	Student accurately completes at least five of the tasks embedded in the question.	Student accurately completes each task embedded in the question. ▪ Draws a ray with points at coordinates $(1\frac{1}{2}, 3)$ and $(5, 3)$. ▪ Labels point L. ▪ Labels point K. ▪ Gives the coordinates of three other points on the ray. (Correct answers are any two coordinates with the y-coordinate of 3.) ▪ Draws a second ray with one point at the coordinates $(1\frac{1}{2}, 3)$ and point M at $(3\frac{1}{2}, 4\frac{1}{4})$. ▪ Labels point M.
2 **5.G.1** **5.G.2**	Student accurately completes at least two of the tasks embedded in the question.	Student accurately completes at least three of the tasks embedded in the question.	Student accurately completes at least four of the tasks embedded in the question.	Student accurately completes all of the tasks embedded in the question: ▪ Draws $\overline{QR}$. ▪ Labels $\overline{QR}$. ▪ Draws a line perpendicular to $\overline{QR}$.

<table>
<tr><th colspan="5">A Progression Toward Mastery</th></tr>
<tr><td></td><td></td><td></td><td></td><td>Labels point S.
Names one of the following coordinates:
$1\frac{1}{8}, 1\frac{3}{8}$
$1\frac{1}{4}, 1\frac{1}{2}$ or equivalent
$1\frac{3}{8}, 1\frac{5}{8}$.</td></tr>
<tr><td>3

5.G.1
5.OA.2
5.OA.3</td><td>Student accurately completes at least two of the tasks embedded in the question. The table counts as one task.</td><td>Student accurately completes at least three of the tasks embedded in the question. The table counts as one task.</td><td>Student accurately completes at least five of the tasks embedded in the question. The table counts as one task.</td><td>Student accurately completes all of the tasks embedded in the question and gives correct responses.
Completes the table:
<table><tr><th>x</th><th>y</th><th>(x, y)</th></tr><tr><td>0</td><td>2</td><td>(0,2)</td></tr><tr><td>1</td><td>4</td><td>(1,4)</td></tr><tr><td>2</td><td>6</td><td>(2,6)</td></tr><tr><td>3</td><td>8</td><td>(3,8)</td></tr><tr><td>4</td><td>10</td><td>(4,10)</td></tr></table>a. Line a.
b. (2, 6).
c. Draws and labels line e parallel to the x-axis, and the y-coordinates are 2 for any point.
d. The x-coordinate.
e. Add 4 or plus 4.
f. Lacy's rule will make a line parallel to line a. The rule for line a is multiply x by 2, and then add 2. The rule for Lacy's line is multiply x-coordinate by 2, and then add 4.</td></tr>
</table>

A Progression Toward Mastery				
				Lacy's line is parallel because the steepness of the line is the same. (That is, the multiplication part of the rule is the same.) The adding part of the rule will make the y-coordinates two more than those in line a.)
4 **5.G.1** **5.G.2** **5.OA.3**	Student has no correct answers for either part (a) or part (b).	Student has correctly answered either part (a) or part (b) but may not have a clear answer of *why* for part (b).	Student has correctly answered both part (a) and part (b) but lacks a clear answer of *why* for part (b).	Student has accurately completed part (a) and part (b), including a clear explanation of *why* for part (b). a. The plane's altitude will be 2 miles. b. No. The pilot should not continue this pattern. If he continues this pattern, his plane will have 0 altitude between 1 and 2 miles past the airport (or other correct response).

Name Julian Date ____________

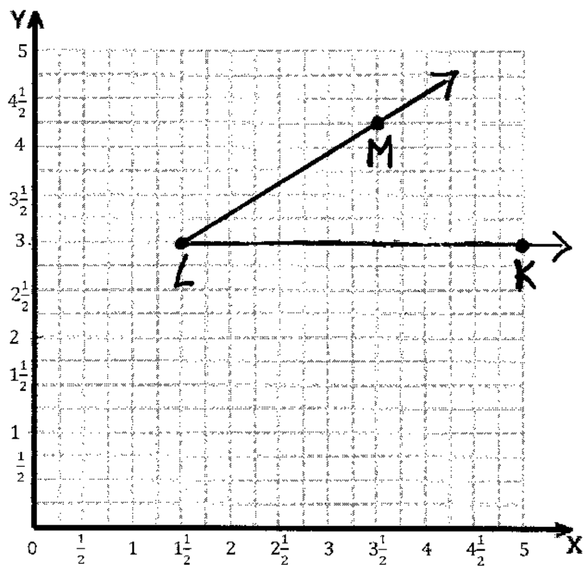
1. Follow the directions.

   a. Draw a ray that starts at point L at $(1\frac{1}{2}, 3)$ and includes point K at $(5, 3)$. Label points K and L.

   b. Give the coordinates of three other points on the ray.

   $(2\frac{1}{3},3)$ $(4,3)$ $(4\frac{3}{4},3)$

   c. Draw a second ray with the same initial point and containing point M with coordinates $(3\frac{1}{2}, 4\frac{1}{4})$. Label point M.



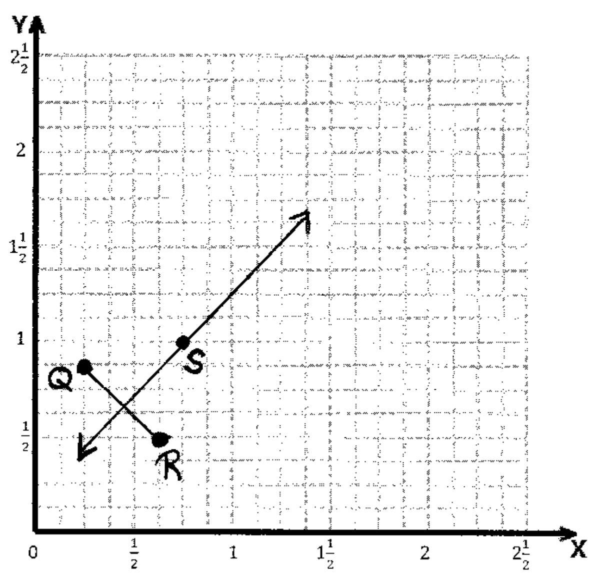
2. David draws a line segment from point Q $(\frac{1}{4}, \frac{7}{8})$ to point R $(\frac{5}{8}, \frac{1}{2})$. He then draws a line perpendicular to the first segment that intersects segment $\overline{QR}$ and includes point S $(\frac{3}{4}, 1)$.

   a. Draw $\overline{QR}$ and label the endpoints on the grid.

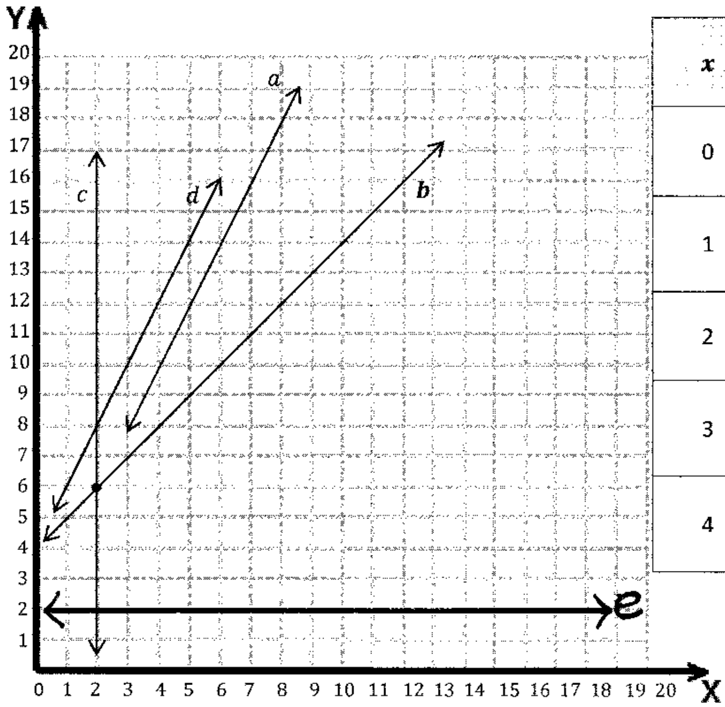
   b. Draw the perpendicular line and label point S.

   c. Name another point that lies on the perpendicular line whose x-coordinate is between 1 and $1\frac{1}{2}$.

   $(1\frac{1}{8}, 1\frac{3}{8})$



3. Complete the table for the rule *multiply by 2 then add 2* for the values of x from 0 to 4. Then use the coordinate plane to answer the questions.



x	y	(x, y)
0	2	(0,2)
1	4	(1,4)
2	6	(2,6)
3	8	(3,8)
4	10	(4,10)

a. Which line shows the rule in the table?

Line a

b. Give the coordinates for the intersection of lines ***b*** and ***c***.

(2,6)

c. Draw a line on the graph such that any point on the line has a y-coordinate of 2. Label your line as ***e***.

d. Which coordinate is 2 for any point on line ***c***?

x-Coordinate

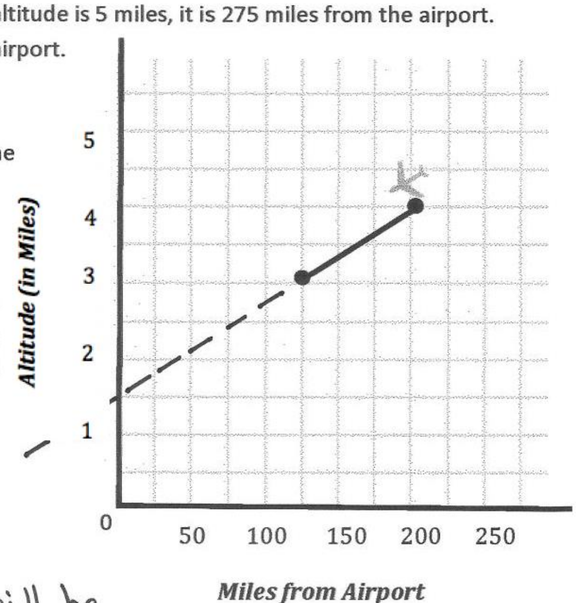
e. Write a rule that tells how to find the y-coordinate when the x-coordinate is given for the points on line b.

(1,5) Add 4 to the x-coordinate to get the
(2,6) y-coordinate.
(3,7)

f. Kim and Lacy want to draw a line on the coordinate plane that is parallel to line a. Kim uses the rule, *multiply by 4 and add 2* to generate her y-coordinates. Lacy uses the rule *multiply by 2 and add 4* to generate her y-coordinates. Which girl's line will be parallel to line a? Without graphing the lines, explain how you know.

Lacy's line will be parallel, because Line a's rule is to multiply by 2, then add 2. Lacy kept the multiplication the same (x 2), so the new line will be the same steepness as Line a. Lacy only changed the addition part of the rule. That's going to make the new line above Line a on the plane if she graphs it.

4. An airplane is descending into an airport. When its altitude is 5 miles, it is 275 miles from the airport. When its altitude is 4 miles, it is 200 miles from the airport. At 3 miles, it is 125 miles from the airport.



a. If the pilot follows the same pattern, what will the plane's altitude be at 50 miles from the airport?

The plane's altitude will be 2 miles when it's 50 miles from the airport.

b. For the plane to land at the airport, the altitude will need to be 0 and the distance from the airport will need to be 0. Should the pilot continue this pattern? Why or why not?

The pilot should not keep this pattern. He will be way past the airport when his altitude is 0 miles.