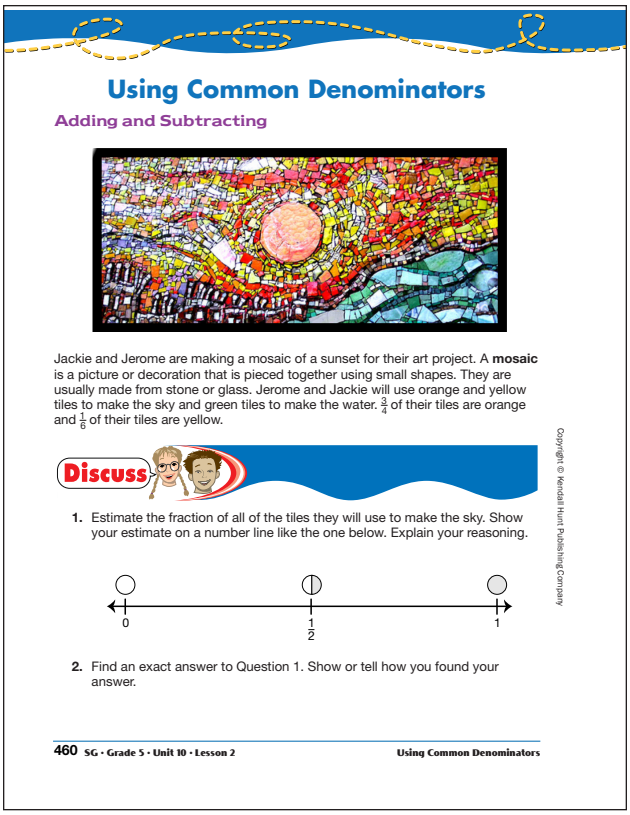
Student Guide

Using Common Denominators
Questions 1–13 (SG pp. 460–464)

1.* Answers will vary. Possible response: $\frac{1}{6}$ is a little less than $\frac{1}{4}$ because one aqua circle piece is smaller than a yellow piece, so the sum of $\frac{1}{6}$ and $\frac{3}{4}$ will be a little less than 1.

2. $\frac{11}{12}$. Possible strategy: I used the *Fractions on Number Lines Chart* to find fractions equivalent to $\frac{3}{4}$ and $\frac{1}{6}$ that have the same denominator. The ones with a common denominator of 12 are $\frac{9}{12}$ and $\frac{2}{12}$. $\frac{9}{12} + \frac{2}{12} = \frac{11}{12}$.



Using Common Denominators

Adding and Subtracting

Jackie and Jerome are making a mosaic of a sunset for their art project. A **mosaic** is a picture or decoration that is pieced together using small shapes. They are usually made from stone or glass. Jerome and Jackie will use orange and yellow tiles to make the sky and green tiles to make the water. $\frac{3}{4}$ of their tiles are orange and $\frac{1}{8}$ of their tiles are yellow.

Discuss

1. Estimate the fraction of all of the tiles they will use to make the sky. Show your estimate on a number line like the one below. Explain your reasoning.

0 $\frac{1}{2}$ 1

2. Find an exact answer to Question 1. Show or tell how you found your answer.

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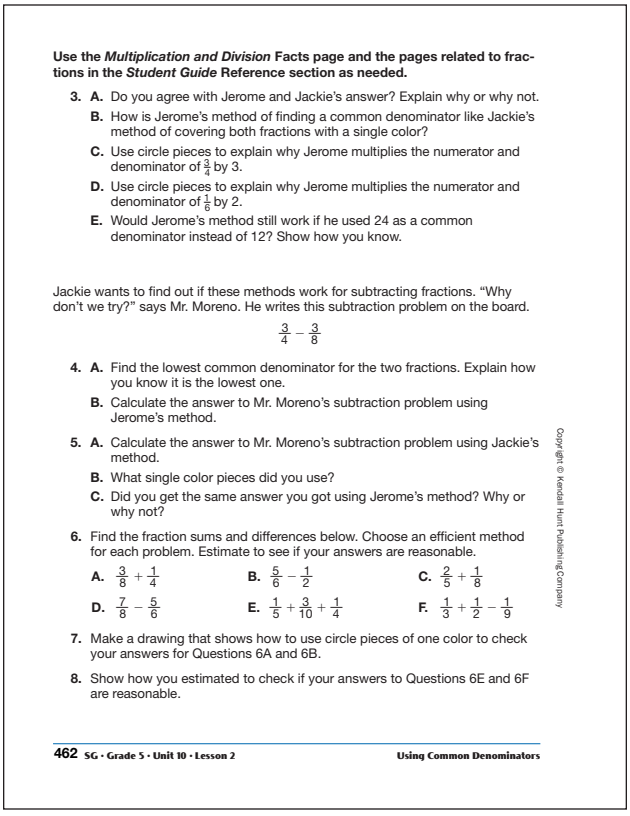
*Answers and/or discussion are included in the lesson.



Use the *Multiplication and Division* Facts page and the pages related to fractions in the *Student Guide* Reference section as needed.

3. **A.** Do you agree with Jerome and Jackie's answer? Explain why or why not.
   B. How is Jerome's method of finding a common denominator like Jackie's method of covering both fractions with a single color?
   C. Use circle pieces to explain why Jerome multiplies the numerator and denominator of $\frac{3}{4}$ by 3.
   D. Use circle pieces to explain why Jerome multiplies the numerator and denominator of $\frac{1}{6}$ by 2.
   E. Would Jerome's method still work if he used 24 as a common denominator instead of 12? Show how you know.

Jackie wants to find out if these methods work for subtracting fractions. "Why don't we try?" says Mr. Moreno. He writes this subtraction problem on the board.

$$\frac{3}{4} - \frac{3}{8}$$

4. **A.** Find the lowest common denominator for the two fractions. Explain how you know it is the lowest one.
   B. Calculate the answer to Mr. Moreno's subtraction problem using Jerome's method.
5. **A.** Calculate the answer to Mr. Moreno's subtraction problem using Jackie's method.
   B. What single color pieces did you use?
   C. Did you get the same answer you got using Jerome's method? Why or why not?
6. Find the fraction sums and differences below. Choose an efficient method for each problem. Estimate to see if your answers are reasonable.
   A. $\frac{3}{8} + \frac{1}{4}$ **B.** $\frac{5}{6} - \frac{1}{2}$ **C.** $\frac{2}{5} + \frac{1}{8}$
   D. $\frac{7}{8} - \frac{5}{6}$ **E.** $\frac{1}{5} + \frac{3}{10} + \frac{1}{4}$ **F.** $\frac{1}{3} + \frac{1}{2} - \frac{1}{9}$
7. Make a drawing that shows how to use circle pieces of one color to check your answers for Questions 6A and 6B.
8. Show how you estimated to check if your answers to Questions 6E and 6F are reasonable.

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3. A. Responses will vary.

B. Both Jerome and Jackie started by finding a common denominator. Jerome did it by listing multiples of both denominators then seeing that 12 was the lowest multiple shared by 4 and 6. Jackie did it by finding one color of circle pieces (black pieces or twelfths) that cover the yellow and aqua pieces exactly.

C.* 3 of the $\frac{1}{12}$ black pieces fit over one $\frac{1}{4}$ yellow piece exactly.

D.* 2 of the $\frac{1}{12}$ black pieces fit over one $\frac{1}{6}$ blue piece exactly.

E. Yes, $\frac{3 \times 6}{4 \times 6} = \frac{18}{24}$ $\frac{1 \times 4}{6 \times 4} = \frac{4}{24}$

$\frac{18}{24} + \frac{4}{24} = \frac{24}{24} = \frac{11}{12}$

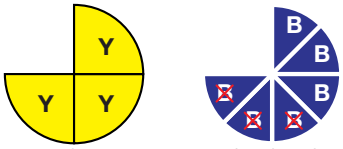
4. A. Possible strategies: $\frac{3}{8}$ can't be simplified any more, and $\frac{6}{8}$ is equivalent to $\frac{3}{4}$, so 8 is the lowest common denominator.

Or, multiples of 4: 4, 8, 12, 16
multiples of 8: 8, 16, 24

B. $\frac{6}{8} - \frac{3}{8} = \frac{3}{8}$

5. A. $\frac{3}{8}$

B. I used the blue ($\frac{1}{8}$) pieces.



$\frac{3}{4}$ $\frac{6}{8} - \frac{3}{8} = \frac{3}{8}$

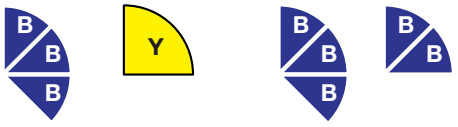
C. Yes, I got the same answer.

6. A. $\frac{5}{8}$ **B.** $\frac{1}{3}$

C.* $\frac{31}{40}$ **D.*** $\frac{1}{24}$

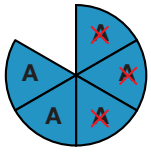
E.* $\frac{3}{4}$ **F.** $\frac{13}{18}$

7. Drawing for 6A:



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

Drawing for 6B:



$\frac{5}{6} - \frac{1}{2} = \frac{2}{6} = \frac{1}{3}$

8. Responses will vary. One strategy is given for each.

Estimate for 6E: I thought of circle pieces. $\frac{1}{5}$ or 1 green is the same as 2 purple or $\frac{2}{10}$. $\frac{2}{10} + \frac{3}{10}$ is $\frac{5}{10}$ or $\frac{1}{2}$. $\frac{1}{2} + \frac{1}{4}$ is the same as 3 yellow or $\frac{3}{4}$. So the answer is correct.

Estimate for 6F: I looked on the *Fractions on Number Lines Chart*. $\frac{1}{3} + \frac{1}{2}$ is a little less than 1. Subtracting $\frac{1}{9}$ still leaves an answer between $\frac{1}{2}$ and 1. $\frac{13}{18}$ is reasonable because it is more than $\frac{9}{18}$ ($\frac{1}{2}$) and less than $\frac{18}{18}$ (1).

***Answers and/or discussion are included in the lesson.**

9. Common denominators may vary. One possible solution is shown for each.

A. $\frac{5}{12} > \frac{4}{12}$, so $\frac{5}{12} > \frac{1}{3}$. Check: 5 blacks are larger than 1 orange

B. $\frac{36}{60} > \frac{35}{60}$, so $\frac{6}{10} > \frac{7}{12}$. Check: 6 purples are larger than 7 blacks

C. $\frac{9}{15} < \frac{10}{15}$, so $\frac{3}{5} < \frac{2}{3}$. Check: 3 greens are smaller than 2 oranges

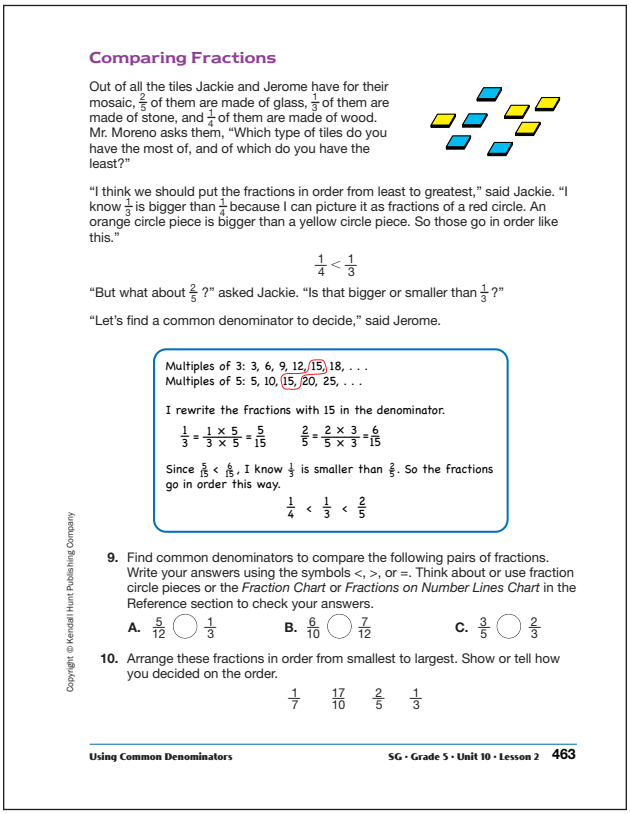
10. $\frac{1}{7}, \frac{1}{3}, \frac{17}{20}$

Possible strategy: I knew $\frac{17}{20}$ was the largest right away because it is a lot bigger than $\frac{1}{2}$ and all the others are less than $\frac{1}{2}$. I know that $\frac{1}{7}$ is less than $\frac{1}{3}$ because dividing the whole up into more pieces (7) will make the fractions smaller. Then I used common denominators to compare $\frac{2}{5}$ and $\frac{1}{3}$. $\frac{2}{5} = \frac{6}{15}$ and $\frac{1}{3} = \frac{5}{15}$, so $\frac{1}{3}$ is less than $\frac{4}{5}$. So, $\frac{1}{7} < \frac{1}{3} < \frac{2}{5} < \frac{17}{20}$.

11.* John's brother ate more pizza. Possible strategy: John ate $\frac{4}{6}$ or $\frac{2}{3}$ pizza and his brother ate $\frac{3}{4}$. John left $\frac{1}{3}$ of the pizza and his brother left $\frac{1}{4}$. $\frac{1}{3}$ is greater than $\frac{1}{4}$, so John left more pizza uneaten, so his brother ate more.

12.* Harmony Falls is closer. $\frac{2}{5} = \frac{16}{40}$ and $\frac{3}{8} = \frac{15}{40}$, so $\frac{15}{40}$ mi. is less than $\frac{16}{40}$ mi.

13. Trail C is the shortest distance to Ruby Falls. Strategies will vary. Trail A is $\frac{19}{20}$ ($\frac{38}{40}$) of a mile, Trail B is $\frac{33}{40}$ of a mile, Trail C is $\frac{9}{10}$ ($\frac{32}{40}$) of a mile.



Comparing Fractions

Out of all the tiles Jackie and Jerome have for their mosaic, $\frac{2}{5}$ of them are made of glass, $\frac{1}{3}$ of them are made of stone, and $\frac{1}{4}$ of them are made of wood. Mr. Moreno asks them, "Which type of tiles do you have the most of, and of which do you have the least?"

"I think we should put the fractions in order from least to greatest," said Jackie. "I know $\frac{1}{3}$ is bigger than $\frac{1}{4}$ because I can picture it as fractions of a red circle. An orange circle piece is bigger than a yellow circle piece. So those go in order like this."

$$\frac{1}{4} < \frac{1}{3}$$

"But what about $\frac{2}{5}$?" asked Jackie. "Is that bigger or smaller than $\frac{1}{3}$?"

"Let's find a common denominator to decide," said Jerome.

Multiples of 3: 3, 6, 9, 12, 15, 18, . . .
Multiples of 5: 5, 10, 15, 20, 25, . . .

I rewrite the fractions with 15 in the denominator.

$\frac{1}{3} = \frac{1 \times 5}{3 \times 5} = \frac{5}{15}$ $\quad$ $\frac{2}{5} = \frac{2 \times 3}{5 \times 3} = \frac{6}{15}$

Since $\frac{5}{15} < \frac{6}{15}$, I know $\frac{1}{3}$ is smaller than $\frac{2}{5}$. So the fractions go in order this way.

$$\frac{1}{4} < \frac{1}{3} < \frac{2}{5}$$

9. Find common denominators to compare the following pairs of fractions. Write your answers using the symbols <, >, or =. Think about or use fraction circle pieces or the *Fraction Chart* or *Fractions on Number Lines Chart* in the Reference section to check your answers.

A. $\frac{5}{12} \bigcirc \frac{1}{3}$ $\quad$ **B.** $\frac{6}{10} \bigcirc \frac{7}{12}$ $\quad$ **C.** $\frac{3}{5} \bigcirc \frac{2}{3}$

10. Arrange these fractions in order from smallest to largest. Show or tell how you decided on the order.

$\frac{1}{7}$ $\quad$ $\frac{17}{10}$ $\quad$ $\frac{2}{5}$ $\quad$ $\frac{1}{3}$

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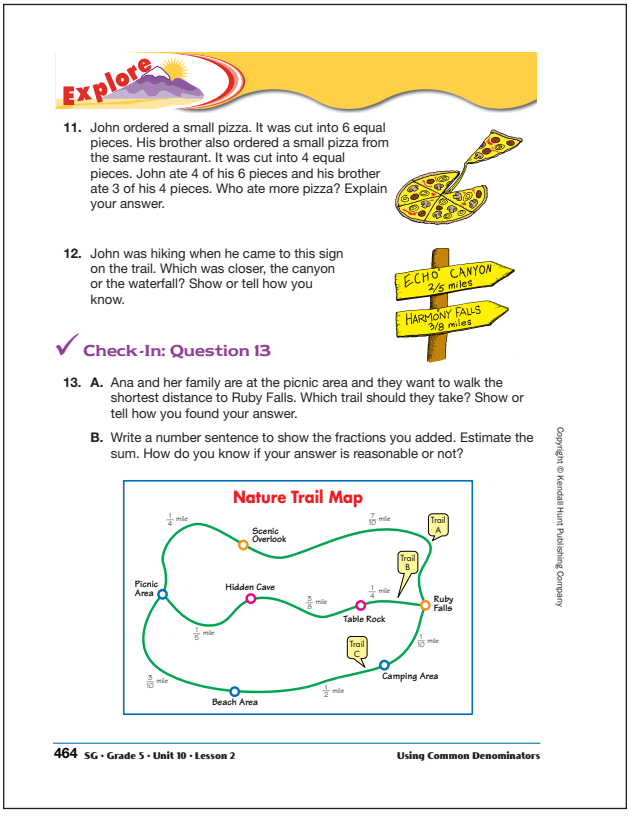

Explore

11. John ordered a small pizza. It was cut into 6 equal pieces. His brother also ordered a small pizza from the same restaurant. It was cut into 4 equal pieces. John ate 4 of his 6 pieces and his brother ate 3 of his 4 pieces. Who ate more pizza? Explain your answer.

12. John was hiking when he came to this sign on the trail. Which was closer, the canyon or the waterfall? Show or tell how you know.

ECHO CANYON 2/5 miles
HARMONY FALLS 3/8 miles

✓ Check-In: Question 13

13. A. Ana and her family are at the picnic area and they want to walk the shortest distance to Ruby Falls. Which trail should they take? Show or tell how you found your answer.

B. Write a number sentence to show the fractions you added. Estimate the sum. How do you know if your answer is reasonable or not?

Nature Trail Map
Scenic Overlook
Trail A
Trail B
Picnic Area
Hidden Cave
Table Rock
Ruby Falls
Trail C
Camping Area
Beach Area

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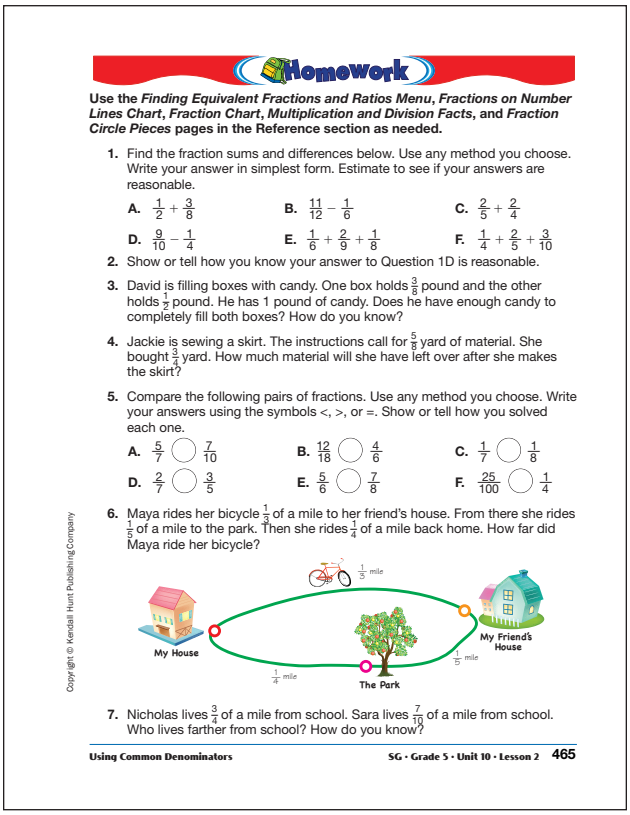
***Answers and/or discussion are included in the lesson.**



Homework

Use the *Finding Equivalent Fractions and Ratios Menu*, *Fractions on Number Lines Chart*, *Fraction Chart*, *Multiplication and Division Facts*, and *Fraction Circle Pieces* pages in the Reference section as needed.

1. Find the fraction sums and differences below. Use any method you choose. Write your answer in simplest form. Estimate to see if your answers are reasonable.

   A. $\frac{1}{2}+\frac{3}{8}$ B. $\frac{11}{12}-\frac{1}{6}$ C. $\frac{2}{5}+\frac{2}{4}$

   D. $\frac{9}{10}-\frac{1}{4}$ E. $\frac{1}{6}+\frac{2}{9}+\frac{1}{8}$ F. $\frac{1}{4}+\frac{2}{5}+\frac{3}{10}$

2. Show or tell how you know your answer to Question 1D is reasonable.

3. David is filling boxes with candy. One box holds $\frac{3}{8}$ pound and the other holds $\frac{1}{2}$ pound. He has 1 pound of candy. Does he have enough candy to completely fill both boxes? How do you know?

4. Jackie is sewing a skirt. The instructions call for $\frac{5}{8}$ yard of material. She bought $\frac{3}{4}$ yard. How much material will she have left over after she makes the skirt?

5. Compare the following pairs of fractions. Use any method you choose. Write your answers using the symbols <, >, or =. Show or tell how you solved each one.

   A. $\frac{5}{7}$ ◯ $\frac{7}{10}$ B. $\frac{12}{18}$ ◯ $\frac{4}{6}$ C. $\frac{1}{7}$ ◯ $\frac{1}{8}$

   D. $\frac{2}{7}$ ◯ $\frac{3}{5}$ E. $\frac{5}{6}$ ◯ $\frac{7}{8}$ F. $\frac{25}{100}$ ◯ $\frac{1}{4}$

6. Maya rides her bicycle $\frac{1}{3}$ of a mile to her friend's house. From there she rides $\frac{1}{5}$ of a mile to the park. Then she rides $\frac{1}{4}$ of a mile back home. How far did Maya ride her bicycle?

7. Nicholas lives $\frac{3}{4}$ of a mile from school. Sara lives $\frac{7}{10}$ of a mile from school. Who lives farther from school? How do you know?

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Homework (SG p. 465)
Questions 1–7

1. A. $\frac{7}{8}$ B. $\frac{3}{4}$ C. $\frac{9}{10}$ D. $\frac{13}{20}$ E. $\frac{37}{72}$ F. $\frac{19}{20}$
2. Possible strategy: $\frac{9}{10}$ is close to 1. $1-\frac{1}{4}$ is $\frac{3}{4}$, so $\frac{9}{10}-\frac{1}{4}$ will be between $\frac{1}{2}$ and 1. $\frac{13}{20}$ is more than $\frac{10}{20}$ or $\frac{1}{2}$, so it is reasonable.
3. Yes, he has more than enough to fill both boxes. The two boxes together hold less than 1 pound because $\frac{3}{8}$ is less than $\frac{1}{2}$, so $\frac{3}{8}+\frac{1}{2}$ will be less than 1.
4. $\frac{1}{8}$ yd; $\frac{3}{4}-\frac{5}{8}=\frac{6}{8}-\frac{5}{8}=\frac{1}{8}$ yd.
5. A. $\frac{5}{7}>\frac{7}{10}$; Possible strategy: $\frac{50}{70}>\frac{49}{70}$
   B. $\frac{12}{18}=\frac{4}{6}$; Simplifying both fractions to lowest terms: $\frac{12}{18}=\frac{2}{3}$ and $\frac{4}{6}=\frac{2}{3}$.
   C. $\frac{1}{7}>\frac{1}{8}$; Possible strategy: I know that 7ths are larger than 8ths because dividing a circle into 7 pieces will give larger pieces than if the circle is divided into 8 pieces.
   D. $\frac{2}{7}<\frac{3}{5}$; Possible strategy: $\frac{2}{7}$ is less than $\frac{1}{2}$ and $\frac{3}{5}$ is greater than $\frac{1}{2}$.
   E. $\frac{5}{6}<\frac{7}{8}$; Possible strategy: I thought of circle pieces. $\frac{5}{6}$ is $\frac{1}{6}$ of the way from 1 whole and $\frac{7}{8}$ is $\frac{1}{8}$ of the way. $\frac{1}{6}$ is larger than $\frac{1}{8}$, so $\frac{5}{6}$ is farther away from one whole, so it is smaller.
   F. $\frac{25}{100}=\frac{1}{4}$; Possible strategy: $\frac{25}{100}$ reduced to simplest form is $\frac{1}{4}$.
6. $\frac{47}{60}$ of a mile; $\frac{1}{3}+\frac{1}{4}+\frac{1}{5}=\frac{20}{60}+\frac{15}{60}+\frac{12}{60}=\frac{47}{60}$.
7. Nicholas lives farther from school. $\frac{3}{4}$ mi > $\frac{7}{10}$ mi because $\frac{3}{4}=\frac{15}{20}$, and $\frac{7}{10}=\frac{14}{20}$.