SAXON

HOMESCHOOL

Middle Grades Sampler

Math 5/4, *Math 6/5*, *Math 7/6*, *Math 8/7*, and *Algebra 1/2*

Math 5/4, *Math 6/5*, *Math 7/6*, *Math 8/7*, and *Algebra ½* form a series of courses to move students from primary grades to algebra. Each course contains a series of daily lessons covering all areas of general math. Each lesson presents a small portion of math content (called an increment) that builds on prior knowledge and understanding.

Students are not required or expected to grasp a concept fully the first time it is presented. After an increment is introduced, it becomes a part of the student's daily work for the rest of the year. Students will have many opportunities to gain understanding and to achieve mastery. This cumulative, continual practice ensures that students will retain what they have learned.

This sampler includes materials that are representative of the Saxon math program, including samples of Lessons and Investigations.

We hope these materials will assist you in your evaluation of the Saxon program.

Math 7/6
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Sample taken from Math 7/6 (Fourth Edition), page 331

LESSON

62 Writing Mixed Numbers as Improper Fractions

WARM-UP

Facts Practice: 30 Fractions to Reduce (Test G)

Mental Math: Count by 12's from 12 to 144.

a. 5 × 40

b. 475 + 1200

c. 3 × 84

d. \$8.50 + \$2.50

e. $\frac{1}{3}$ of \$36.00

f. $\frac{\$25}{10}$

g. 6 × 8, − 4, ÷ 4, × 2, + 2, ÷ 6, ÷ 2

h. Hold your hands one foot apart.

Problem Solving:

The average number of people in each of two rows is 27. If the people are separated into three rows instead of two, what will be the average number of people per row?

NEW CONCEPT

Here is another story about pies. In this story a mixed number is changed to an improper fraction.

> *There were $3\frac{5}{6}$ pies on the shelf. The restaurant manager asked the server to cut the whole pies into sixths. Altogether, how many slices of pie were there after the server cut the pies?*

We illustrate this story with circles. There were $3\frac{5}{6}$ pies on the shelf.

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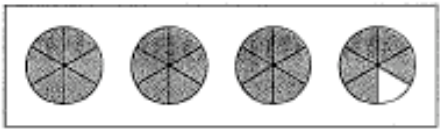
The server cut the whole pies into sixths. Each whole pie then had six slices.



The three whole pies contain 18 slices ($3 \times 6 = 18$). The 5 additional slices from the $\frac{5}{6}$ of a pie bring the total to 23 slices (23 sixths). This story illustrates that $3\frac{5}{6}$ is equivalent to $\frac{23}{6}$.

Now we describe the arithmetic for changing a mixed number such as $3\frac{5}{6}$ to an improper fraction. Recall that a mixed number has a whole-number part and a fraction part.

whole number — fraction

$$3\frac{5}{6}$$

The denominator of the mixed number will also be the denominator of the improper fraction.

$$3\frac{5}{6} = \frac{\quad}{6}$$

same denominator

The denominator indicates the size of the fraction "pieces." In this case the fraction pieces are sixths, so we change the whole number 3 into sixths. We know that one whole is $\frac{6}{6}$, so three wholes is $3 \times \frac{6}{6}$, which is $\frac{18}{6}$. Therefore, we add $\frac{18}{6}$ and $\frac{5}{6}$ to get $\frac{23}{6}$.

$$3\frac{5}{6}$$

$$\frac{6}{6} + \frac{6}{6} + \frac{6}{6} + \frac{5}{6} = \frac{23}{6}$$

$$\frac{18}{6} + \frac{5}{6} = \frac{23}{6}$$

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Example 1 Write $2\frac{3}{4}$ as an improper fraction.

Solution The denominator of the fraction part of the mixed number is fourths, so the denominator of the improper fraction will also be fourths.

$$2\frac{3}{4} = \frac{\quad}{4}$$

We change the whole number 2 into fourths. Since 1 equals $\frac{4}{4}$, the whole number 2 equals $2 \times \frac{4}{4}$, which is $\frac{8}{4}$. We add $\frac{8}{4}$ and $\frac{3}{4}$ to get $\frac{11}{4}$.

$$\overbrace{2\frac{3}{4}}$$

$$\frac{8}{4} + \frac{3}{4} = \mathbf{\frac{11}{4}}$$

Example 2 Write $5\frac{2}{3}$ as an improper fraction.

Solution We see that the denominator of the improper fraction will be thirds.

$$5\frac{2}{3} = \frac{\quad}{3}$$

Some people use a quick, mechanical method to find the numerator of the improper fraction. Looking at the mixed number, they multiply the denominator by the whole number and then add the numerator. The result is the numerator of the improper fraction.

$$5\frac{2}{3} = \mathbf{\frac{17}{3}}$$

Example 3 Write $1\frac{2}{3}$ and $2\frac{2}{5}$ as improper fractions. Then multiply the improper fractions. What is the product?

Solution First we write $1\frac{2}{3}$ and $2\frac{2}{5}$ as improper fractions.

$$\overbrace{1\frac{2}{3}} \qquad \overbrace{2\frac{2}{5}}$$

$$\frac{3}{3} + \frac{2}{3} = \mathbf{\frac{5}{3}} \qquad \frac{10}{5} + \frac{2}{5} = \mathbf{\frac{12}{5}}$$

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Next we multiply $\frac{5}{3}$ by $\frac{12}{5}$.

$$\frac{5}{3} \cdot \frac{12}{5} = \frac{60}{15}$$

The result is an improper fraction, which we simplify.

$$\frac{60}{15} = 4$$

So $1\frac{2}{3} \times 2\frac{2}{5}$ equals **4.**

LESSON PRACTICE

Practice set Write each mixed number as an improper fraction:

a. $2\frac{4}{5}$ **b.** $3\frac{1}{2}$ **c.** $1\frac{3}{4}$

d. $6\frac{1}{4}$ **e.** $1\frac{5}{6}$ **f.** $3\frac{3}{10}$

g. $2\frac{1}{3}$ **h.** $12\frac{1}{2}$ **i.** $3\frac{1}{6}$

j. Write $1\frac{1}{2}$ and $3\frac{1}{3}$ as improper fractions. Then multiply the improper fractions. What is the product?

MIXED PRACTICE

Problem set

(54) **1.** In music there are whole notes, half notes, quarter notes, and eighth notes.

(a) How many quarter notes equal a whole note?

(b) How many eighth notes equal a quarter note?

(62) **2.** Don is 5 feet $2\frac{1}{2}$ inches tall. How many inches tall is that?

(19) **3.** Which of these numbers is not a prime number?

A. 11 B. 21 C. 31 D. 41

(62) **4.** Write $1\frac{1}{3}$ and $1\frac{1}{2}$ as improper fractions, and multiply the improper fractions. What is the product?

(58) **5.** If the chance of rain is 20%, what is the chance that it will not rain?

(18) **6.** The prices for three pairs of skates were \$36.25, \$41.50, and \$43.75. What was the average price for a pair of skates?

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7. [43] Instead of dividing 15 by $2\frac{1}{2}$, Solomon doubled both numbers and then divided mentally. What was Solomon's mental division problem and its quotient?

Find each missing number:

8. [42, 50] $m - 4\frac{3}{8} = 3\frac{1}{4}$

9. [48, 56] $n + \frac{3}{10} = \frac{3}{5}$

10. [43, 45] $6d = 0.456$

11. [43, 49] $0.04w = 1.5$

12. [61] $\frac{1}{2} + \frac{3}{4} + \frac{5}{8}$

13. [57] $\frac{5}{6} - \frac{1}{2}$

14. [28] $\frac{1}{2} \cdot \frac{4}{5}$

15. [54] $\frac{2}{3} \div \frac{1}{2}$

16. [40] $1 - (0.2 - 0.03)$

17. [39] $(0.14)(0.16)$

18. [49] One centimeter equals 10 millimeters. How many millimeters does 2.5 centimeters equal?

19. [10] List all of the common factors of 18 and 24. Then circle the greatest common factor.

20. [58] Ten marbles are in a bag. Four of the marbles are red. If one marble is drawn from the bag, what ratio expresses the probability that it will be red?

21. [38] If the perimeter of a square is 40 mm, what is the area of the square?

22. [14] At 6 a.m. the temperature was −6°F. At noon the temperature was 14°F. From 6 a.m. to noon the temperature rose how many degrees?

23. [47] Lisa used a compass to draw a circle with a radius of $1\frac{1}{2}$ inches.

(a) What was the diameter of the circle?

(b) What was the circumference of the circle? (Use 3.14 for π.)

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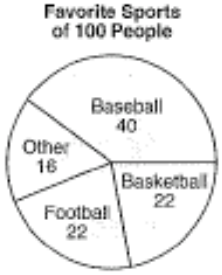
Sample taken from Math 7/6 (Fourth Edition), page 336

The circle graph below shows the favorite sports of 100 people. Refer to the graph to answer problems 24–27.



24. (40) How many more people favored baseball than favored football?

25. (40) What fraction of the people favored baseball?

26. (40) Was any sport the favorite sport of the majority of the people surveyed? Write one or two sentences to explain your answer.

27. (40) Since baseball was the favorite sport of 40 out of 100 people, it was the favorite sport of 40% of the people surveyed. What percent of the people answered that football was their favorite sport?

28. (41) What number is 40% of 200?

29. (19) Here we show 18 written as a product of prime numbers:

$$2 \cdot 3 \cdot 3$$

Write 20 as a product of prime numbers.

30. (Inv. 5) Judges awarded Sandra these scores for her performance on the vault:

9.1, 8.9, 9.0, 9.2, 9.2

What is the median score?

Math 7/6, Lesson 89

Sample taken from Math 7/6 (Fourth Edition), page 473

LESSON

89 Estimating Square Roots

WARM-UP

Facts Practice: Linear Measurement (Test K)

Mental Math: Count up and down by 3's between −15 and 15.

a. 90 · 90 **b.** 1000 − 405 **c.** 6 × $7.99

d. Double $27.00. **e.** 87.5 ÷ 100 **f.** 20 × 36

g. 3 × 3, + 2, × 5, − 5, × 2, ÷ 10, + 5, ÷ 5

h. About how many meters tall is a classroom door?

Problem Solving:

The perimeter of this rectangle is 1 m. What is its length?

NEW CONCEPT

We have practiced finding square roots of perfect squares from 1 to 100. In this lesson we will find the square roots of perfect squares greater than 100. We will also use a guess-and-check method to estimate the square roots of numbers that are not perfect squares. As we practice, our guesses will improve and we will begin to see clues to help us estimate.

Example 1 Simplify: $\sqrt{400}$

Solution We need to find a number that, when multiplied by itself, has a product of 400.

$$\square \times \square = 400$$

We know that $\sqrt{400}$ is more than 10, because 10 × 10 equals 100. We also know that $\sqrt{400}$ is much less than 100, because 100 × 100 equals 10,000. Since $\sqrt{4}$ equals 2, the 4 in $\sqrt{400}$ hints that we should try 20.

$$20 \times 20 = 400$$

We find that $\sqrt{400}$ equals **20.**

Math 7/6, Lesson 89

Sample taken from Math 7/6 (Fourth Edition), page 474

Example 2 Simplify: $\sqrt{625}$

Solution In example 1 we found that $\sqrt{400}$ equals 20. Since $\sqrt{625}$ is greater than $\sqrt{400}$, we know that $\sqrt{625}$ is greater than 20. We find that $\sqrt{625}$ is less than 30, because 30×30 equals 900. Since the last digit is 5, perhaps $\sqrt{625}$ is 25. We multiply to find out.

$$\begin{array}{r} 25 \\ \times\ 25 \\ \hline 125 \\ 50 \\ \hline 625 \end{array}$$

We find that $\sqrt{625}$ equals **25.**

We have practiced finding the square roots of numbers that are perfect squares. Now we will practice estimating the square root of numbers that are not perfect squares.

Example 3 Between which two consecutive whole numbers is $\sqrt{20}$?

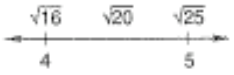
Solution Notice that we are not asked to find the square root of 20. To find the whole numbers on either side of $\sqrt{20}$, we can first think of the perfect squares that are on either side of 20. Here we show the first few perfect squares, starting with 1.

$$1, 4, 9, 16, 25, 36, 49$$

We see that 20 is between the perfect squares 16 and 25. So $\sqrt{20}$ is between $\sqrt{16}$ and $\sqrt{25}$.

$$\sqrt{16}, \sqrt{20}, \sqrt{25}$$

Since $\sqrt{16}$ is 4 and $\sqrt{25}$ is 5, we see that $\sqrt{20}$ is between **4** and **5.**



Using the reasoning in example 3, we know there must be some number between 4 and 5 that is the square root of 20. We try 4.5.

$$4.5 \times 4.5 = 20.25$$

We see that 4.5 is too large, so we try 4.4.

$$4.4 \times 4.4 = 19.36$$

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Sample taken from Math 7/6 (Fourth Edition), page 475

We see that 4.4 is too small. So $\sqrt{20}$ is greater than 4.4 but less than 4.5. (It is closer to 4.5.) If we continued this process, we would never find a decimal number or fraction that exactly equals $\sqrt{20}$. This is because $\sqrt{20}$ belongs to a number family called the **irrational numbers.**

Irrational numbers cannot be expressed exactly as a ratio (that is, as a fraction or decimal). We can only use fractions or decimals to express the *approximate* value of an irrational number.

$$\sqrt{20} \approx 4.5$$

Recall from Lesson 47 that the wavy equal sign means "is approximately equal to." The square root of 20 is approximately equal to 4.5.

Example 4 Use a calculator to approximate the value of $\sqrt{20}$ to two decimal places.

Solution

We clear the calculator and then enter [√] [2] [0] [=] (or [2] [0] [√]).† The display will show 4.472135955. The actual value of $\sqrt{20}$ contains an infinite number of decimal places. The display approximates $\sqrt{20}$ to nine or so decimal places (depending on the model). We are asked to show two decimal places, so we round the displayed number to **4.47.**

LESSON PRACTICE

Practice set* Find each square root:

a. $\sqrt{169}$ **b.** $\sqrt{484}$ **c.** $\sqrt{961}$

Each of these square roots is between which two consecutive whole numbers? Find the answer without using a calculator.

d. $\sqrt{2}$ **e.** $\sqrt{15}$ **f.** $\sqrt{40}$

g. $\sqrt{60}$ **h.** $\sqrt{70}$ **i.** $\sqrt{80}$

Use a calculator to approximate each square root to two decimal places:

j. $\sqrt{3}$ **k.** $\sqrt{10}$ **l.** $\sqrt{50}$

†The order of keystrokes depends on the model of calculator. See the instructions for your calculator if the keystroke sequences described in this lesson do not work for you.

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Sample taken from Math 7/6 (Fourth Edition), page 476

MIXED PRACTICE

Problem set

1. (12, 72) What is the difference when the product of $\frac{1}{2}$ and $\frac{1}{2}$ is subtracted from the sum of $\frac{1}{4}$ and $\frac{1}{4}$?

2. (78) A dairy cow can give 4 gallons of milk per day. How many cups of milk is that (1 gallon = 4 quarts; 1 quart = 4 cups)?

3. (29) The recipe called for $\frac{3}{4}$ cup of sugar. If the recipe is doubled, how much sugar should be used?

4. (86) Draw a ratio box for this problem. Then solve the problem using a proportion.

The recipe called for sugar and flour in the ratio of 2 to 9. If the chef used 18 pounds of flour, how many pounds of sugar were needed?

5. (80) Which of these numbers is greater than 6 but less than 7?

A. $\sqrt{6.5}$ B. $\sqrt{67}$ C. $\sqrt{45}$ D. $\sqrt{76}$

6. (87) Express the missing factor as a mixed number:

$$7n = 30$$

7. (47) Amanda used a compass to draw a circle with a radius of 4 inches.

(a) What is the diameter of the circle?

(b) What is the circumference of the circle?

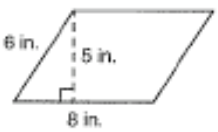
Use 3.14 for π.

8. (86) In problem 7 what is the area of the circle Amanda drew?

9. (79) What is the area of the triangle at right?

10. (71) (a) What is the area of this parallelogram?

(b) What is the perimeter of this parallelogram?



Math 7/6, Lesson 89

Sample taken from Math 7/6 (Fourth Edition), page 477

11. (63, 73) Write 0.5 as a fraction and subtract it from $3\frac{1}{4}$. What is the difference?

12. (74) Write $\frac{3}{4}$ as a decimal, and multiply it by 0.6. What is the product?

13. (64) $2 \times 15 + 2 \times 12$

14. (89) $\sqrt{900}$

15. (2) $\$6 \div 8$

16. (66) $1\frac{3}{5} \times 10 \times \frac{1}{4}$

17. (68) $37\frac{1}{2} \div 100$

18. (68) $3 \div 7\frac{1}{2}$

19. (34) What is the place value of the 7 in 987,654.321?

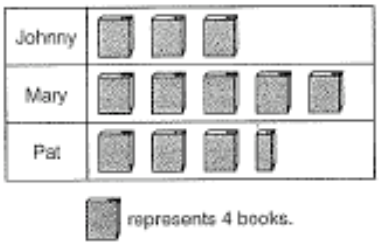
20. (35) Write the decimal number five hundred ten and five hundredths.

21. (2) $30 + 60 + m = 180$

22. (72) Half of the guests are girls. Half of the girls have brown hair. Half of the brown-haired girls wear their hair long. Of the 32 guests, how many are girls with long, brown hair?

Refer to the pictograph below to answer problems 23–25.

Books Read This Year



23. (Inv. 5) How many books has Johnny read?

24. (Inv. 5) Mary has read how many more books than Pat?

25. (Inv. 5) Write a question that relates to this graph and answer the question.

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Sample taken from Math 7/6 (Fourth Edition), page 478

26. (85) Solve this proportion: $\frac{12}{8} = \frac{21}{m}$

27. (56) The face of this spinner is divided into 12 congruent regions. If the spinner is spun once, what is the probability that it will stop on a 3?

28. (28, 60) If two angles are complementary, and if one angle is acute, then the other angle is what kind of angle?

A. acute B. right C. obtuse

29. (81) Simplify:

(a) 100 cm + 100 cm (Write the answer in meters.)

(b) $\frac{(5 \text{ in.})(8 \text{ in.})}{2}$

30. (82) If each small block has a volume of 1 cubic inch, then what is the volume of this cube?

Math 7/6, Lesson 104

Sample taken from Math 7/6 (Fourth Edition), page 561

LESSON

104 Algebraic Addition Activity

WARM-UP

Note: Because the New Concept in this lesson takes more time than usual, today's Warm-Up has been omitted.

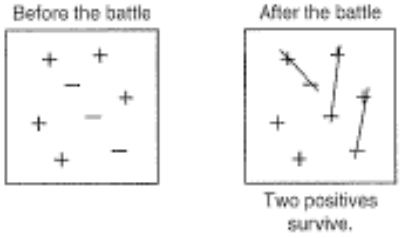
NEW CONCEPT

One model for the addition of signed numbers is the number line. Another model for the addition of signed numbers is the electrical-charge model, which is used in the Sign Wars game. In this model signed numbers are represented by positive and negative charges that can neutralize each other.

Activity: *Sign Wars Game*

In Sign Wars positives "battle" negatives. After each battle we ask ourselves, "Who survived?" and then write our answer. There are four skill levels to the game. Be sure you are successful at one level before moving to the next level.

Level 1 Positive and negative signs are placed randomly on a "screen." For the battle we neutralize positive and negative pairs by crossing out the signs as shown. (Appropriate sound effects strengthen the experience!)

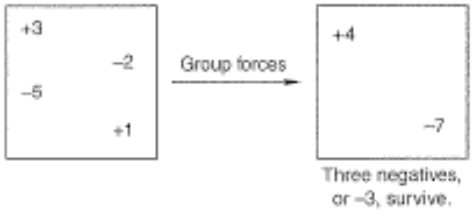


After the battle we count the remaining positives or negatives to determine who survived. In the battle shown above, there are two positive survivors. See whether you can determine the number and type of survivors for the following practice screens:

Math 7/6, Lesson 104

Sample taken from Math 7/6 (Fourth Edition), page 562

Level 2 Positives and negatives are displayed in counted clusters. The suggested strategy is to group forces before the battle. So +3 combines with +1 to form +4, and –5 combines with –2 to form –7.



In this battle there were three more negatives than positives, so –3 survived. See whether you can determine the number and type of survivors for the following practice screens:

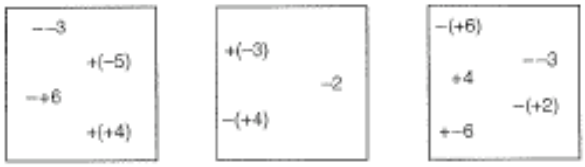
Level 3 Positive and negative clusters can be displayed with two signs, one sign, or no sign. Clusters appear "in disguise" by taking on an additional sign or by dropping a sign. The first step is to remove the disguise. A cluster with no sign, with "– –," or with "+ +" is a positive cluster. A cluster with "+ –" or with "– +" is a negative cluster. If a cluster has a "shield" (parentheses), look through the shield to see the sign.

Examples of Positives	Examples of Negatives
$-(-3) = +3$	$-(+2) = -2$
$--2 = +2$	$+(-3) = -3$
$4 = +4$	$+-1 = -1$
$++1 = +1$	$-+4 = -4$

Math 7/6, Lesson 104

Sample taken from Math 7/6 (Fourth Edition), page 563

See whether you can determine the number and type of survivors for the following practice screens:



Level 4 Extend Level 3 to a line of clusters without using a screen. Determine the survivors for this battle:

$$-3 + (-4) - (-5) - (+2) + (+6)$$

Use the following steps to find the answer:

Step 1: Remove the disguises: $-3 - 4 + 5 - 2 + 6$

Step 2: Group forces: $-9 + 11$

Step 3: Who survived? $+2$

LESSON PRACTICE

Practice set Simplify:

a. $-2 + -3 - -4 + -5$

b. $-3 + (+2) - (+5) - (-6)$

c. $+3 + -4 - +6 + +7 - -1$

d. $2 + (-3) - (-9) - (+7) + (+1)$

e. $3 - -5 + -4 - +2 + +8$

f. $(-10) - (+20) - (-30) + (-40)$

MIXED PRACTICE

Problem set

1. (Inv. 6) A pyramid with a square base has how many more edges than vertices?

2. (102) Becki weighed 7 lb 8 oz when she was born and 12 lb 6 oz at 3 months. How many pounds and ounces did Becki gain in 3 months?

Math 7/6, Lesson 104

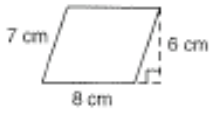
Sample taken from Math 7/6 (Fourth Edition), page 564

3. (23) The team won 6 games and lost 10. What was its win-loss ratio?

4. (101) Another team's win-loss ratio was 3 to 2. If the team had played 20 games without a tie, how many games had it won?

5. (Inv. 10) If Molly tosses a coin and rolls a number cube, what is the probability of the coin landing heads up and the number cube stopping with a 6 on top?

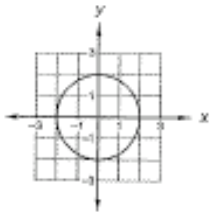
6. (71) (a) What is the perimeter of this parallelogram?



(b) What is the area of this parallelogram?

7. (71) If each acute angle of a parallelogram measures 59°, then what is the measure of each obtuse angle?

8. (86) The center of this circle is the origin. The circle passes through (2, 0).



(a) Estimate the area of the circle in square units by counting squares.

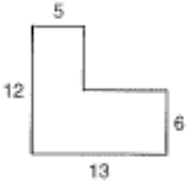
(b) Calculate the area of the circle by using 3.14 for π.

9. (83) Which ratio forms a proportion with $\frac{2}{3}$?

A. $\frac{2}{4}$ B. $\frac{3}{4}$ C. $\frac{4}{6}$ D. $\frac{3}{2}$

10. (85) Complete this proportion: $\frac{6}{8} = \frac{a}{12}$

11. (103) What is the perimeter of the hexagon at right? Dimensions are in centimeters.



Math 7/6, Lesson 104

Sample taken from Math 7/6 (Fourth Edition), page 565

Complete the table to answer problems 12–14.

	Fraction	Decimal	Percent
12. (89)	$\frac{3}{20}$	(a)	(b)
13. (89)	(a)	1.2	(b)
14. (89)	(a)	(b)	10%

15. (41) Sharon bought a notebook for 40% off the regular price of \$6.95. What was the sale price of the notebook?

16. (89) Between which two consecutive whole numbers is $\sqrt{200}$?

17. (92, Inv. 10) Compare:

$\left(\frac{1}{2}\right)^3$ ◯ the probability of 3 consecutive "heads" coin tosses

18. (49) Divide 0.624 by 0.05 and round the quotient to the nearest whole number.

19. (18) The average of three numbers is 20. What is the sum of the three numbers?

20. (73) Write the prime factorization of 450 using exponents.

21. (104) $-3 + -5 - -4 - +2$

22. (92) $3^4 + 5^2 \times 4 - \sqrt{100} \times 2^3$

23. (82) How many blocks 1 inch on each edge would it take to fill a shoe box that is 12 inches long, 6 inches wide, and 5 inches tall?

24. (77) Three fourths of the 60 athletes played in the game. How many athletes did not play?

25. (95) The distance a car travels can be found by multiplying the **speed** of the car by the amount of **time** the car travels at that speed. How far would a car travel in 4 hours at 88 kilometers per hour?

$$\frac{88 \text{ km}}{1 \text{ hr}} \times \frac{4 \text{ hr}}{1}$$

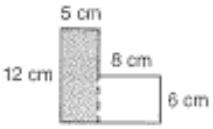
Math 7/6, Lesson 104

Sample taken from Math 7/6 (Fourth Edition), page 566

26. (31) (a) What is the area of the shaded rectangle?

(b) What is the area of the unshaded rectangle?

(c) What is the combined area of the two rectangles?



27. (28, 51) Kobe measured the circumference and diameter of four circles. Then he divided the circumference by the diameter of each circle to find the number of diameters in a circumference. Here are his answers:

3.12, 3.2, 3.15, 3.1

Find the average of Kobe's answers. Round the average to the nearest hundredth.

28. (58) Norton was thinking of a two-digit counting number, and he asked Simon to guess the number. Describe how you can find the probability that Simon will guess correctly on the first try.

29. (Inv. 7, 75) The coordinates of three vertices of a triangle are (3, 5), (–1, 5), and (–1, –3). What is the area of the triangle?

30. (95) $\frac{2\text{ gal}}{1} \times \frac{4\text{ qt}}{1\text{ gal}} \times \frac{2\text{ pt}}{1\text{ qt}}$

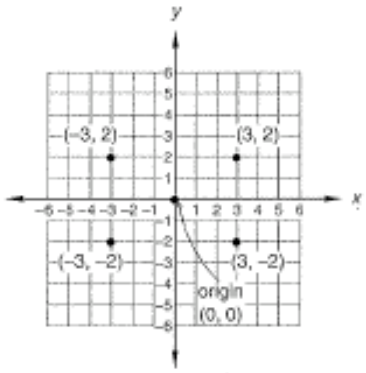
Math 7/6, Investigation 7

Sample taken from Math 7/6 (Fourth Edition), page 374

Focus on

The Coordinate Plane

By drawing two number lines perpendicular to each other and by extending the unit marks, we can create a grid called a **coordinate plane.**



The point at which the number lines intersect is called the **origin.** The horizontal number line is called the ***x*-axis**, and the vertical number line is called the ***y*-axis.** We **graph** a point by marking a dot at the location of the point. We can name the location of any point on this coordinate plane with two numbers. The numbers that tell the location of a point are called the **coordinates** of the point.

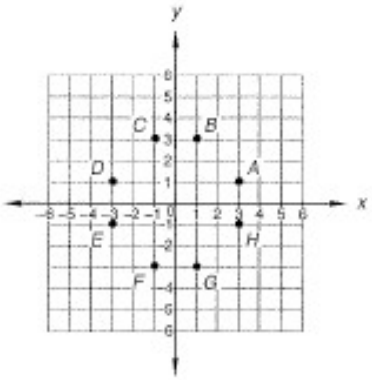
The coordinates of a point are written as an **ordered pair** of numbers in parentheses; for example, (3, −2). The first number is the *x*-coordinate. It shows the horizontal (↔) direction and distance from the origin. The second number, the *y*-coordinate, shows the vertical (↕) direction and distance from the origin. The sign of the coordinate shows the direction. Positive coordinates are to the right or up, and negative coordinates are to the left or down.

Math 7/6, Investigation 7

Sample taken from Math 7/6 (Fourth Edition), page 375

To graph (3, –2), we begin at the origin and move three units to the right along the *x*-axis. From there we move down two units and mark a dot. We may label the point we graphed (3, –2). On the previous coordinate plane, we have graphed three additional points and identified their coordinates. Notice that each pair of coordinates is different and designates a unique point.

Refer to the coordinate plane below to answer problems 1–6.



1. What are the coordinates of point *A*?

2. Which point has the coordinates (–1, 3)?

3. What are the coordinates of point *E*?

4. Which point has the coordinates (1, –3)?

5. What are the coordinates of point *D*?

6. Which point has the coordinates (3, –1)?

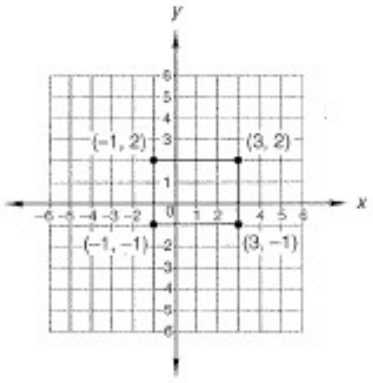
The coordinate plane is useful in many fields of mathematics, including algebra and geometry.

In the next section of this investigation we will designate points on the plane as vertices of rectangles. Then we will calculate the perimeter and area of each rectangle.

Math 7/6, Investigation 7

Sample taken from Math 7/6 (Fourth Edition), page 376

Suppose we are told that the vertices of a rectangle are located at (3, 2), (−1, 2), (−1, −1), and (3, −1). We graph the points and then draw segments between the points to draw the rectangle.



We see that the rectangle is four units long and three units wide. Adding the lengths of the four sides, we find that the perimeter is **14 units.** To find the area, we can count the unit squares within the rectangle. There are three rows of four squares, so the area of the rectangle is 3×4, which is **12 square units.**

For problems 7–9, use Activity Sheets 10–12 (available in *Saxon Math 7/6—Homeschool Tests and Worksheets*).

7. The vertices of a rectangle are located at (−2, −1), (2, −1), (2, 3), and (−2, 3).

(a) Graph the rectangle. What do we call this special type of rectangle?

(b) What is the perimeter of the rectangle?

(c) What is the area of the rectangle?

8. The vertices of a rectangle are located at (−4, 2), (0, 2), (0, 0), and (−4, 0).

(a) Graph the rectangle. Notice that one vertex is located at (0, 0). What is the name for this point on the coordinate plane?

(b) What is the perimeter of the rectangle?

(c) What is the area of the rectangle?

Math 7/6, Investigation 7

Sample taken from Math 7/6 (Fourth Edition), page 377

9. Three vertices of a rectangle are located at (3, 1), (−2, 1), and (−2, −3).

(a) Graph the rectangle. What are the coordinates of the fourth vertex?

(b) What is the perimeter of the rectangle?

(c) What is the area of the rectangle?

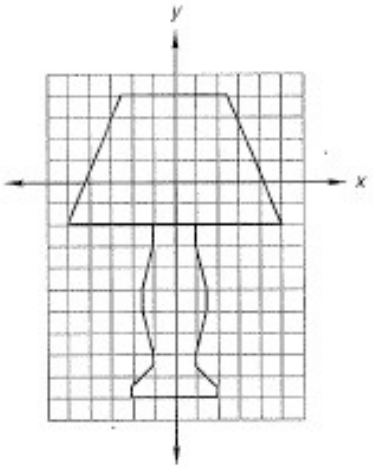
As the following activity illustrates, we can use coordinates to give directions for making a drawing.

Activity: *Drawing on the Coordinate Plane*

Materials needed:

- Activity Sheets 13–15 (available in *Saxon Math 7/6—Homeschool Tests and Worksheets*)

10. Christy made this drawing on a coordinate plane. Then she wrote directions for making the drawing. Follow Christy's directions below to make a similar drawing on your coordinate plane. The coordinates of the vertices are listed in order, as in a "dot-to-dot" drawing.



Draw segments to connect the following points in order:

a. (−1, −2)	**b.** (−1, −3)	**c.** $(-1\frac{1}{2}, -5)$	**d.** $(-1\frac{1}{2}, -6)$
e. (−1, −8)	**f.** $(-1, -8\frac{1}{2})$	**g.** $(-2, -9\frac{1}{2})$	**h.** (−2, −10)
i. (2, −10)	**j.** $(2, -9\frac{1}{2})$	**k.** $(1, -8\frac{1}{2})$	**l.** (1, −8)
m. $(1\frac{1}{2}, -6)$	**n.** $(1\frac{1}{2}, -5)$	**o.** (1, −3)	**p.** (1, −2)

Math 7/6, Investigation 7

Sample taken from Math 7/6 (Fourth Edition), page 378

Lift your pencil and restart:

a. $(-2\frac{1}{2}, 4)$ b. $(2\frac{1}{2}, 4)$ c. $(5, -2)$

d. $(-5, -2)$ e. $(-2\frac{1}{2}, 4)$

11. Jenny wrote the following directions for a drawing. Follow her directions to make the drawing on your own paper. Draw segments to connect the following points in order:

a. $(-9, 0)$ b. $(6, -1)$ c. $(8, 0)$

d. $(7, 1)$ e. $(6, \frac{1}{2})$ f. $(6, -1)$

g. $(9, -2\frac{1}{2})$ h. $(10, -2)$ i. $(7, 1)$

j. $(6, 1\frac{1}{2})$ k. $(-10\frac{1}{2}, 3)$ l. $(-11, 2)$

m. $(-10\frac{1}{2}, 0)$ n. $(-10, -1\frac{1}{2})$ o. $(9, -2\frac{1}{2})$

p. $(-3, -3\frac{1}{2})$ q. $(-7, -8)$ r. $(-10, -8)$

s. $(-9, -1\frac{1}{2})$

Lift your pencil and restart:

a. $(-10\frac{1}{2}, 0)$ b. $(-11, -\frac{1}{2})$ c. $(-12, \frac{1}{2})$

d. $(-11\frac{1}{2}, 1)$ e. $(-12, 1\frac{1}{2})$ f. $(-11\frac{1}{2}, 2)$

g. $(-12, 2\frac{1}{2})$ h. $(-11, 3\frac{1}{2})$ i. $(-10\frac{1}{2}, 3)$

j. $(-11\frac{1}{2}, 8)$ k. $(-9\frac{1}{2}, 8)$ l. $(-7, 3)$

m. $(-6, 2\frac{1}{2})$ n. $(-7, 3)$ o. $(-6, 5)$

p. $(-4, 5)$ q. $(-1, 2)$

12. On a coordinate plane, make a straight-segment drawing. Then write directions for making the drawing by listing the coordinates of the vertices in "dot-to-dot" order.

Note: Problems intended for additional exposure to the concepts in this investigation are available in the appendix.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