

Mini-Lecture 1.1

Study Skill Tips for Success in Mathematics

Learning Objectives:

1. Get ready for this course.
2. Understand some general tips for success.
3. Know how to use this text.
4. Know how to use video and notebook organizer resources.
5. Get help as soon as you need it.
6. Learn how to prepare for and take an exam.
7. Develop good time management.

Examples:

1. Get ready for this course.
 - a) Positive attitude
 - b) Be familiar with course structure
 - c) Avoid schedule conflicts
 - d) Allow adequate time for class arrival
 - e) Bring all required materials
2. Understand some general tips for success.
 - a) Organize materials
 - b) Make contact with other students
 - c) Choose to attend all classes
 - d) Do your homework
 - e) Check your work
 - f) Learn from mistakes
 - g) Ask questions
 - h) Hand in assignments on time
3. Know how to use this text.
 - a) Each example in every section has a Practice exercise associated with it.
 - b) At beginning of each section, a list of icons shows availability of support materials.
 - c) Each chapter ends with Chapter Highlights, Reviews, and Practice Tests.
4. Know how to use video and notebook organizer resources.
 - a) Video resources include interactive lectures, test prep, and student success tips.
 - b) Notebook organizer resources include video and student organizers
5. Get help as soon as you need it.
6. Learn how to prepare for and take an exam.
 - a) Review previous homework assignments, class notes, quizzes, etc.
 - b) Read Chapter Highlights to review concepts and definitions.
 - c) Practice working out exercises in the end-of-the-chapter Review and Test.
 - d) When taking a test, read directions and problems carefully.
7. Develop good time management.
 - a) Make a list of all weekly commitments with estimated time needed.
 - b) Be sure to schedule study time. Don't forget eating, sleeping, and relaxing!

Teaching Notes:

- Many developmental students are hesitant to ask questions and seek extra help.
- Be sure to include your expectations. Keep your expectations clear and concise.

Mini-Lecture 1.2

Place Value, Names for Numbers, and Reading Tables

Learning Objectives:

1. Find the place value of a digit in a whole number.
2. Write a whole number in words and in standard form.
3. Write a whole number in expanded form.
4. Read tables.
5. Key Vocabulary: *whole numbers, place value, standard form, period, expanded form, tables*

Examples:

1. Find the place value of the digit 7 in each whole number.

a) 7,352 b) 607 c) 702,433 d) 17,009,321

2. Write each whole number in words.

a) 62 b) 698 c) 17,403 d) 1,067,599

Write each number in standard form.

- e) nine hundred fifty-two
f) three hundred sixty-two thousand, five hundred eighty-six
g) three million, four hundred thousand, one hundred two

3. Write each number in expanded form.

a) 398 b) 2,907 c) 4,089,347

4. Use the following table of Number of Students Enrolled to answer the questions.

Subject	Section 1	Section 2	Section 3	Total
Basic Mathematics	23	27	19	69
Statistics	20	25	22	67

- a) How many total students are enrolled in Basic Mathematics?
b) How many students are enrolled in Section 3 of Statistics?

Teaching Notes:

- Students who do not have English as their first language will need additional assistance learning place value vocabulary.
- Students who do not have English as their first language may use periods instead of commas in writing numbers.

Answers: 1a) thousands, b) ones, c) hundred thousands, d) ten million; 2a) sixty-two, b) six hundred ninety-eight, c) seventeen thousand, four hundred three, d) one million, sixty-seven thousand, five hundred ninety-nine, e) 952, f) 362,586, g) 3,400,102; 3a) $300+90+8$, b) $2000+900+7$, c) $4,000,000+80,000+9,000+300+40+7$; 4a) 69, b) 22

Mini-Lecture 1.3

Adding Whole Numbers and Perimeter

Learning Objectives:

1. Add whole numbers.
2. Find the perimeter of a polygon.
3. Solve problems by adding whole numbers.
4. Key Vocabulary: *sum, addend, commutative property of addition, associate property of addition, polygon, perimeter*

Examples:

1. Add.

a) $3 + 9$

b) $40 + 70$

c) $1900 + 17$

d) $5703 + 0$

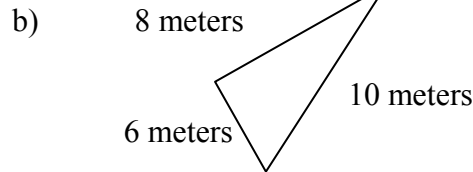
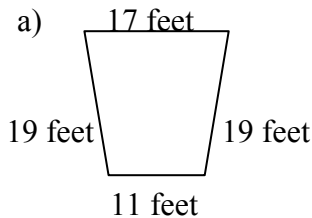
e)
$$\begin{array}{r} 51 \\ +27 \\ \hline \end{array}$$

f)
$$\begin{array}{r} 7329 \\ + 683 \\ \hline \end{array}$$

g) $93 + 145 + 69$

h)
$$\begin{array}{r} 6,403 \\ + 793 \\ \hline 17,187 \end{array}$$

2. Find the perimeter of each figure.



3. Solve the following word problems.

a) What is the sum of 8,932 and 14,799?

b) What is 830 plus 4,562 plus 88?

c) On Monday, Karen drove 57 miles; on Tuesday, she drove 39 miles; and on Wednesday, Karen drove 92 miles. How many total miles did Karen drive?

Teaching Notes:

- Some students need additional practice with basic addition facts.
- Remind students that it is acceptable to write the carry digit in order to obtain the correct answer.
- Most students will find this section easy but may need assistance with word problems.

Answers: 1a) 12, b) 110, c) 1917, d) 5703, e) 78, f) 8012, g) 307, h) 24,383; 2a) 66 ft., b) 24 m.; 3a) 23,731, b) 5,480, c) 188 miles

Mini-Lecture 1.4

Subtracting Whole Numbers

Learning Objectives:

1. Subtract whole numbers.
2. Solve problems by subtracting whole numbers.
3. Key Vocabulary: *subtraction, minuend, subtrahend, difference, borrowing, regrouping, less than, take away, decreased by, subtracted from*

Examples:

1. Subtract. Check by adding.

a) $11 - 7$

b) $15 - 8$

c) $22 - 22$

d) $31 - 0$

e)
$$\begin{array}{r} 27 \\ - 13 \\ \hline \end{array}$$

f)
$$\begin{array}{r} 198 \\ - 94 \\ \hline \end{array}$$

g)
$$\begin{array}{r} 5936 \\ - 803 \\ \hline \end{array}$$

h)
$$\begin{array}{r} 16,395 \\ - 5,132 \\ \hline \end{array}$$

i)
$$\begin{array}{r} 71 \\ - 32 \\ \hline \end{array}$$

j)
$$\begin{array}{r} 712 \\ - 285 \\ \hline \end{array}$$

k)
$$\begin{array}{r} 3004 \\ - 2965 \\ \hline \end{array}$$

l)
$$\begin{array}{r} 20,003 \\ - 16,867 \\ \hline \end{array}$$

m) $53,425 - 7977$

n) $71,217 - 56,839$

o) $60,000 - 26,386$

2. Find the difference of 93 and 27.

a) Subtract 376 from 803.

- b) The Library Renovation Project has set a goal of \$75,000 to fundraise. To date, \$47,908 has been fundraised. How much more money does the Library Renovation Project need to fundraise?

Teaching Notes:

- Some students need additional practice with basic subtraction facts.
- Most students find subtraction without borrowing easy.
- Many students need to write the borrowing/regrouping step to maintain accuracy.
- Many students are challenged when borrowing with zeros.

Answers: 1a) 4, b) 7, c) 0, d) 31, e) 14, f) 104, g) 5,133, h) 11,263, i) 39, j) 427, k) 39, l) 3,136, m) 45,448, n) 14,378, o) 33,614; 2a) 66, b) 427, c) \$27,092

Mini-Lecture 1.5

Rounding and Estimating

Learning Objectives:

1. Round whole numbers.
2. Use rounding to estimate sums and differences.
3. Solve problems by estimating.
4. Key Vocabulary: *rounding, estimating*

Examples:

1. Round to the nearest ten.

a) 31 b) 57 c) 346 d) 2,795

Round to the nearest hundred.

e) 312 f) 6,658 g) 8,672 h) 1,899

2. Round to the nearest thousand to find the estimated sum or difference.

a)	$\begin{array}{r} 4892 \\ -2305 \\ \hline \end{array}$	b)	$\begin{array}{r} 2731 \\ + 3020 \\ \hline \end{array}$	c)	$\begin{array}{r} 17,032 \\ - 12,513 \\ \hline \end{array}$	d)	$\begin{array}{r} 24,803 \\ + 14,587 \\ \hline \end{array}$
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3. a) At the last 3 dances, attendance was 657 students, 403 students, and 559 students. Estimate the total attendance by rounding each to the nearest hundred.

b) Enrollment figures at the Town of Johnson's School Department increased from 6,721 students to 7,653 students. Round each number to the nearest hundred to estimate the increase.

c) The Carlisle family needs to buy a refrigerator for \$999, a stove for \$459, and a dishwasher for \$449. Round each cost to the nearest hundred to estimate the total cost.

Teaching Notes:

- Some students need to be repeatedly reminded to look at the digit to the right of the rounding position. Have students draw a line after the digit in the rounding position.
- A common error students make is to leave the digits to the right of the rounding position the same instead of changing them to zeros after rounding.
- Stress the importance of rounding and estimating with applications.

Answers: 1a) 30, b) 60, c) 350, d) 2,800, e) 300, f) 6,700, g) 8,700, h) 1,900; 2a) 3000, b) 6000, c) 4000, d) 40,000; 3a) 177, b) 1,000, c) \$1,900

Mini-Lecture 1.6

Multiplying Whole Numbers and Area

Learning Objectives:

1. Use the properties of multiplication.
2. Multiply whole numbers.
3. Multiply by whole numbers ending in zero(s).
4. Find the area of a rectangle.
5. Solve problems by multiplying whole numbers.
6. Key Vocabulary: *multiplication sign, product, multiplication property of 0, multiplication property of 1, commutative property of multiplication, associative property of multiplication, distributive property, partial products, area*

Examples:

1. Multiply.

a) $37 \cdot 1$

b) $1 \cdot 22$

c) $0 \cdot 183$

d) $9 \cdot 5 \cdot 0$

Use the distributive property to rewrite each expression.

e) $2(5 + 4)$

f) $5(1 + 9)$

g) $10(9 + 6)$

h) $15(0 + 14)$

2. Multiply.

a)
$$\begin{array}{r} 37 \\ \times 6 \\ \hline \end{array}$$

b) 412×4

c)
$$\begin{array}{r} 1708 \\ \times 9 \\ \hline \end{array}$$

d)
$$\begin{array}{r} 337 \\ \times 25 \\ \hline \end{array}$$

e)
$$\begin{array}{r} 643 \\ \times 27 \\ \hline \end{array}$$

f)
$$\begin{array}{r} 2,477 \\ \times 963 \\ \hline \end{array}$$

3. Multiply.

a)
$$\begin{array}{r} 309 \\ \times 800 \\ \hline \end{array}$$

b) $825 \times 1,000$

4. Find the area of a rectangle with length 14 feet and width 8 feet.

5. At a recent football game, 413 adult tickets were sold at a price of \$5 each. There were 127 child tickets sold at a price of \$3 each. How much total amount of money in ticket sales for the game?

Teaching Notes:

- Some students need additional practice with basic multiplication facts.
- Some students do not know the different types of symbols used for multiplication.
- When using distributive property, many students forget to distribute over both terms.
- When multiplying, remind students to carefully line up the ones, tens, hundreds, etc.

Answers: 1a) 37, b) 22, c) 0, d) 0, e) 18, f) 50, g) 150, h) 210; 2a) 222, b) 1648, c) 15,372, d) 8,425, e) 17,361, f) 2,385,351; 3a) 247,200 b) 825,000; 4) 112 sq. ft.; 5) \$2,446

Mini-Lecture 1.7

Dividing Whole Numbers

Learning Objectives:

1. Divide whole numbers.
2. Perform long division.
3. Solve problems that require dividing by whole numbers.
4. Find the average of a list of numbers.
5. Key Vocabulary: *division, fraction bar, quotient, divisor, dividend, division by zero, undefined, long division, remainders, divide, quotient, divided by, divided or shared equally among, average*

Examples:

1. Find each quotient. Check by multiplying.

a) $3\overline{)12}$ b) $13 \div 1$ c) $\frac{5}{5}$ d) $15 \div 15$ e) $0\overline{)5}$

2. Divide. Check by multiplying.

a) $228 \div 4$ b) $\frac{572}{7}$ c) $1570 \div 3$
d) $14\overline{)7070}$ e) $97\overline{)41,270}$ f) $603\overline{)604,911}$

3. a) Find the quotient of 94 and 5.
b) Recently, Amy earned \$1,722 selling calendars. If each calendar cost \$14, how many calendars did Amy sell?
4. a) During the semester, Kyle's test scores were: 87, 93, 62, 83 and 100. What was Kyle's average for the semester?

Teaching Notes:

- Some students need additional practice with basic division facts.
- Many students confuse division by zero (undefined) and zero divided by any non-zero number ($= 0$).
- Many students need to be cautious with placement of digits in quotient and dividend. Be sure appropriate place values are lined up. Stress organization!

Answers: 1a) 4, b) 13, c) 1, d) 1, e) undefined; 2a) 57, b) 81r5, c) 523 r1; d) 505, e) 425 r45, f) 1003 r102;
3a) 18 r4, b) 123; 4a) 85

Mini-Lecture 1.8

An Introduction to Problem Solving

Learning Objectives:

1. Solve problems by adding, subtracting, multiplying, or dividing whole numbers.
2. Solve problems that require more than one operation.
3. Key Vocabulary: *understand, translate, solve, interpret*

Examples:

1. Using Problem-Solving Steps, solve problems involving one type of operation.
 - a) Alicia owns a home that is 4,500 square feet. Anastasia owns a home that is 2,300 square feet. How much larger is Alicia's house than Anastasia's?
 - b) How many 16-ounce cans of tomato sauce can be made from a vat of tomato sauce containing 361 ounces? Will there be any sauce leftover?
 - c) Recently, Jason purchased a DVD for \$18, a CD for \$12, a set of headphones for \$19, and a magazine for \$6. How much money did Jason spend?
 - d) Last week, Tyler worked 38 hours at his job and is paid \$17/hour. How much money did Tyler earn last week?
2. Using Problem-Solving Steps, solve problems involving more than one operation.
 - a) Find the total cost of 5 calculators at \$69 each and 5 protective cases at \$8 each.
 - b) Andrea has \$1040 in her checking account. She spent \$130 at Matt's Sports Supplies, \$170 at The Pool Center, and \$80 at the grocery store. Finally, she stopped at her bank and deposited her paycheck for \$270. How much money is in Andrea's checking account?
 - c) In preparation for school, Kayla purchased two pairs of pants at \$59 each, four shirts at \$26 each, two pairs of shoes at \$69 each, and three pairs of socks at \$6 each. What was the total cost of these items?

Teaching Notes:

- Many students have a very difficult time with word problems.
- Refer students to **Problem-Solving Steps** in the textbook.
- Encourage students to use estimation to check whether their answers are reasonable.

Answers: 1a) 2,200, b) 22, 9 oz., c) \$55, d) \$646; 2a) \$385, b) \$930, c) \$378

Mini-Lecture 1.9

Exponents, Square Roots, and Order of Operations

Learning Objectives:

1. Write repeated factors using exponential notation.
2. Evaluate expressions containing exponents.
3. Evaluate the square root of a perfect square.
4. Use the order of operations.
5. Find the area of a square.
6. Key Vocabulary: *exponential notation, exponent, base, order of operations, square root, perfect square, area of a square*

Examples:

1. Write using exponential notation.
a) $2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2$ b) $(7)(7)(7)$ c) $4 \cdot 4 \cdot 3 \cdot 3 \cdot 3$ d) $5 \cdot 5 \cdot 8 \cdot 8 \cdot 5 \cdot 5$
2. Evaluate.
a) 5^2 b) 7^3 c) 3^6 d) 10^4
3. Find each square root.
a) $\sqrt{9}$ b) $\sqrt{49}$ c) $\sqrt{1}$ d) $\sqrt{225}$
4. Using order of operations, simplify.
a) $3 \cdot 4 - 10 \div 2$ b) $6^2 \div 3 \cdot 2$ c) $8 \cdot 4 + \{27 \div [8 - (3 + 2)]\}$
5. a) Find the area of a square whose side measures 6 feet.
b) A square floor measures 12 feet on each side. If 1 can of floor finish can cover 16 square feet, how many cans are needed to finish this floor?

Teaching Notes:

- Students may confuse exponent and base.
- Many students have trouble with order of operations.
- Avoid “PEMDAS” as many students will multiply before dividing and add before subtracting.

Answers: 1a) 2^6 , b) 7^3 , c) $3^3 \cdot 4^2$, d) $5^4 \cdot 8^2$; 2a) 25, b) 343, c) 729, d) 10,000; 3a) 3, b) 7, c) 1, d) 15; 4a) 7, b) 24, c) 41; 5a) 36 sq. ft.; b) 9 cans

Mini-Lecture 2.1

Introduction to Fractions and Mixed Numbers

Learning Objectives:

1. Identify the numerator and the denominator of a fraction and review division properties of 0 and 1.
2. Write a fraction to represent parts of figures or real-life data.
3. Identify proper fractions, improper fractions, and mixed numbers.
4. Write mixed numbers as improper fractions.
5. Write improper fractions as mixed numbers or whole numbers.
6. Key Vocabulary: *numerator, denominator, proper fraction, improper fraction, mixed number*

Examples:

1. Identify the numerator and the denominator of each fraction.

a) $\frac{1}{7}$

b) $\frac{11}{17}$

c) $\frac{27}{13}$

d) $\frac{12}{12}$

Simplify.

e) $\frac{5}{1}$

f) $\frac{8}{0}$

g) $\frac{14}{14}$

h) $\frac{19}{0}$

2. a) Write a fraction to represent the shaded part: 
b) Of the 18 employees at a restaurant, 11 are women. What fraction of the employees are women?
3. Determine whether each fraction is proper, improper, or a mixed number.
a) $\frac{4}{9}$ b) $7\frac{1}{3}$ c) $\frac{12}{5}$ d) $\frac{9}{9}$
4. Write each mixed number as an improper fraction.
a) $4\frac{1}{2}$ b) $10\frac{5}{8}$ c) $14\frac{3}{4}$ d) $121\frac{6}{11}$
5. Write each improper fraction as a mixed number.
a) $\frac{13}{2}$ b) $\frac{57}{12}$ c) $\frac{161}{7}$ d) $\frac{207}{17}$

Teaching Notes:

- Most students find this material easy. Remind students that division by zero is undefined.
- As students progress in their study of fractions, they will need to be reminded how to convert between improper fractions and mixed numbers, and vice-versa.

Answers: 1a) $n=1, d=7$, b) $n=11, d=17$, c) $n=27, d=13$, d) $n=12, d=12$, e) 5, f) undefined, g) 1, h) undefined; 2a) $\frac{3}{7}$, b) $\frac{11}{18}$; 3a) proper, b) mixed, c) improper, d) improper; 4a) $9\frac{1}{2}$, b) $8\frac{5}{8}$, c) $59\frac{3}{4}$, d) $133\frac{6}{11}$; 5a) $6\frac{1}{2}$, b) $4\frac{9}{12}$, c) 23, d) $12\frac{3}{17}$

Mini-Lecture 2.2

Factors and Prime Factorization

Learning Objectives:

1. Find the factors of a number.
2. Identify prime and composite numbers.
3. Find the prime factorization of a number.
4. Key Vocabulary: *natural numbers, factors, factorization, prime numbers, composite numbers, prime factorization, divisibility tests (2, 3, 4, 5, 6, 9)*

Examples:

1. List all the factors of each number.
a) 15 b) 64 c) 43 d) 144
2. Identify each number as prime, composite or neither.
a) 6 b) 47 c) 123 d) 1
3. Find the prime factorization of each number. Use exponents with any repeated factors.
a) 16 b) 50 c) 72 d) 132
e) 76 f) 200 g) 480 h) 12,600

Teaching Notes:

- Review the first 10 or so primes and have students be able to recognize them.
- Many students will not factor completely. For example: $72 = 2^3 \times 9$
- Prime factorization is an important skill as students progress into the study of fractions.

Answers: 1a) 1,3,5,15, b) 1,2,4,8,32,64 c) 1,43 d) 1,2,3,4,6,8,9,12, 16,18,24, 36 48, 72, 144 ; 2a) composite, b) prime, c) composite, d) neither; 3a) 2^4 , b) $2 \cdot 5^2$, c) $2^3 \cdot 3^2$, d) $2^2 \cdot 3 \cdot 11$, e) $2^2 \cdot 19$, f) $2^3 \cdot 5^2$, g) $2^5 \cdot 3 \cdot 5$, h) $2^3 \cdot 3^2 \cdot 5^2 \cdot 7$

Mini-Lecture 2.3

Simplest Form of a Fraction

Learning Objectives:

1. Write a fraction in simplest form or lowest terms.
2. Determine whether two fractions are equivalent.
3. Solve problems by writing fractions in simplest form.
4. Key Vocabulary: *equivalent fractions, simplest form, lowest form, simplifying, cross products, equality of fractions*

Examples:

1. Write each fraction in simplest form or lowest terms.

a) $\frac{8}{8}$

b) $\frac{2}{4}$

c) $\frac{18}{45}$

d) $\frac{24}{150}$

e) $\frac{14}{84}$

f) $\frac{35}{20}$

g) $\frac{98}{14}$

h) $\frac{138}{42}$

2. Determine whether each pair of fractions is equivalent.

a) $\frac{3}{6}$ and $\frac{11}{22}$

b) $\frac{12}{20}$ and $\frac{21}{35}$

c) $\frac{14}{21}$ and $\frac{5}{15}$

d) $\frac{3}{9}$ and $\frac{7}{21}$

e) $\frac{30}{46}$ and $\frac{15}{24}$

f) $\frac{9}{27}$ and $\frac{12}{36}$

3. a) There are 36 inches in a yard. What fraction of a yard is represented by 9 inches?
b) Twenty-eight students are enrolled in Math Class. On Monday, only 21 students attended class. What fraction of the class attended on Monday?

Teaching Notes:

- Remind students to check their final answer to be sure it is completely reduced.
- Many students prefer to simplify rather than use cross products.
- Refer students to Section 1.8 for a review of **Problem-Solving Steps**.

Answers: 1a) 1, b) $\frac{1}{2}$, c) $\frac{2}{5}$, d) $\frac{4}{25}$, e) $\frac{1}{6}$, f) $\frac{7}{4}$, g) 7, h) $\frac{23}{7}$; 2a) yes, b) yes, c) no, d) yes, e) no, f) yes; 3a) $\frac{1}{4}$, b) $\frac{3}{4}$

Mini-Lecture 2.4

Multiplying Fractions and Mixed Numbers

Learning Objectives:

1. Multiply fractions.
2. Multiply fractions and mixed numbers or whole numbers.
3. Solve problems by multiplying fractions.
4. Key Vocabulary: *of, is*

Examples:

1. Multiply. Write each answer in simplest form.

a) $\frac{1}{2} \cdot \frac{3}{7}$ b) $\frac{2}{5} \cdot \frac{2}{7}$ c) $\frac{2}{9} \cdot \frac{3}{8}$ d) $\frac{7}{3} \cdot \frac{9}{14} \cdot \frac{8}{15}$

2. Multiply. Write each answer in simplest form.

a) $2\frac{1}{2} \cdot \frac{1}{10}$ b) $5\frac{1}{4} \cdot \frac{3}{7}$ c) $\frac{2}{3} \cdot 4\frac{1}{2}$ d) $7\frac{3}{4} \cdot 2\frac{2}{3}$

e) $6 \cdot \frac{2}{3}$ f) $\frac{7}{10} \cdot 5$ g) $\frac{7}{7} \cdot 28$ h) $\frac{1}{6} \cdot 0$

3. a) Find $\frac{2}{5}$ of 75.

- b) A tiled wall is built 6 tiles wide. If the side of the square tile measures $2\frac{5}{8}$ ", what is the width of the wall?

Teaching Notes:

- Suggest to students that they always write their fractions with a horizontal bar ($\frac{2}{3}$) instead of a vertical bar ($2/3$).
- Students will need a review of converting mixed numbers to improper fractions.
- Most students will need to be shown how to convert a whole number to a fraction.
- Students need to be reminded to always convert mixed numbers to improper fractions before beginning multiplication.

Answers: 1a) $3/14$, b) $4/35$, c) $1/12$, d) $4/5$; 2a) $1/4$, b) $2\frac{1}{4}$, c) 3, d) $20\frac{2}{3}$, e) 4, f) $3\frac{1}{2}$, g) 28, h) 0; 3a) 30, b) $15\frac{3}{4}$ "

Mini-Lecture 2.5

Dividing Fractions and Mixed Numbers

Learning Objectives:

1. Find the reciprocal of a fraction.
2. Divide fractions.
3. Divide fractions and mixed numbers or whole numbers.
4. Solve problems by dividing fractions.
5. Key Vocabulary: *reciprocal*

Examples:

1. Find the reciprocal of each number.

a) $\frac{2}{7}$

b) $\frac{15}{8}$

c) 6

d) $\frac{1}{10}$

2. Divide and simplify.

a) $\frac{1}{3} \div \frac{5}{6}$

b) $\frac{7}{8} \div \frac{3}{4}$

c) $\frac{5}{9} \div \frac{10}{9}$

d) $\frac{6}{17} \div \frac{6}{17}$

3. Divide and simplify.

a) $3\frac{2}{9} \div \frac{3}{2}$

b) $1\frac{3}{7} \div \frac{2}{7}$

c) $2\frac{3}{5} \div 1\frac{3}{5}$

d) $4\frac{1}{6} \div 3\frac{3}{4}$

e) $27 \div 4\frac{1}{2}$

f) $2\frac{8}{9} \div 13$

g) $5\frac{5}{9} \div 10$

h) $6\frac{1}{3} \div 0$

4. a) How many $\frac{5}{8}$ -pound boxes of pasta can be made from 7880 pounds of pasta?
b) Ally drove 262 miles on $8\frac{1}{6}$ gallons of gasoline. How many miles per gallon did she average?

Teaching Notes:

- Remind students that mixed numbers must be changed to improper fractions.
- Some students simplify before taking the reciprocal of the second fraction.
- Some students change division to multiplication but do not multiply by reciprocal.
- Many students have trouble deciding which number does the dividing in word problems.

Answers: 1a) $7/2$, b) $8/15$, c) $1/6$, d) $10/1$; 2a) $2/5$, b) $1\frac{1}{6}$, c) $1/2$, d) 1; 3a) $2\frac{4}{27}$, b) 5, c) $1\frac{5}{8}$, d) $1\frac{1}{9}$, e) 6, f) $2/9$, g) $1\frac{5}{9}$, h) undefined; 4a) 12,608 boxes, b) $32\frac{4}{49}$ miles per gallon

Mini-Lecture 3.1

Adding and Subtracting Like Fractions

Learning Objectives:

1. Add like fractions.
2. Subtract like fractions.
3. Solve problems by adding or subtracting like fractions.
4. Key Vocabulary: *like fractions, unlike fractions*

Examples:

1. Add and simplify.

a) $\frac{1}{9} + \frac{4}{9}$	b) $\frac{1}{12} + \frac{5}{12}$	c) $\frac{11}{17} + \frac{6}{17}$	d) $\frac{5}{32} + \frac{3}{32} + \frac{4}{32}$
e) $\frac{3}{15} + \frac{5}{15}$	f) $\frac{1}{10} + \frac{3}{10}$	g) $\frac{8}{11} + \frac{7}{11}$	h) $\frac{1}{7} + \frac{5}{7} + \frac{3}{7}$

2. Subtract and simplify.

a) $\frac{13}{21} - \frac{5}{21}$	b) $\frac{11}{15} - \frac{6}{15}$	c) $\frac{27}{35} - \frac{20}{35}$	d) $\frac{47}{54} - \frac{19}{54}$
e) $\frac{11}{12} - \frac{5}{12}$	f) $\frac{25}{20} - \frac{13}{20}$	g) $\frac{14}{43} - \frac{13}{43}$	h) $\frac{47}{50} - \frac{47}{50}$

3. a) A recipe calls for $\frac{1}{8}$ cup of a sugar and later $\frac{3}{8}$ cup of sugar. How much sugar is needed for the entire recipe?

b) How much greater is $\frac{49}{100}$ than $\frac{38}{100}$?

Teaching Notes:

- Even though many students can determine like and unlike fractions, they tend to add or subtract both the numerator and denominator.
- Remind students to always check to be sure final answer is completely simplified.

Answers: 1a) $\frac{5}{9}$, b) $\frac{1}{2}$, c) 1, d) $\frac{3}{8}$, e) $\frac{8}{15}$, f) $\frac{2}{5}$, g) $\frac{15}{11}$ or $1 \frac{4}{11}$, h) $\frac{9}{7}$ or $1 \frac{2}{7}$; 2a) $\frac{8}{21}$, b) $\frac{1}{3}$, c) $\frac{1}{5}$, d) $\frac{14}{27}$, e) $\frac{1}{2}$, f) $\frac{3}{5}$, g) $\frac{1}{43}$, h) 0; 3a) $\frac{1}{2}$, b) $\frac{11}{100}$

Mini-Lecture 3.2

Least Common Multiple

Learning Objectives:

1. Find the least common multiple (LCM) using multiples.
2. Find the LCM using prime factorization.
3. Write equivalent fractions.
4. Key Vocabulary: *least common multiple (LCM)*

Examples:

1. Find the least common multiple using multiples.

a) 3, 5

b) 4, 6

c) 6, 42

d) 15, 28

e) 16, 36

f) 10, 15, 35

2. Find the Least Common Multiple using prime factorization.

a) 6, 15

b) 12, 32

c) 28, 20

d) 54, 42

e) 7, 14, 21, 36

f) 34, 36, 48

3. Write each fraction as an equivalent fraction with the given denominator.

a) $\frac{1}{2} = \frac{\quad}{8}$

b) $\frac{2}{3} = \frac{\quad}{12}$

c) $\frac{2}{7} = \frac{\quad}{21}$

d) $\frac{3}{10} = \frac{\quad}{60}$

e) $\frac{11}{15} = \frac{\quad}{165}$

f) $\frac{12}{7} = \frac{\quad}{105}$

Teaching Notes:

- Most students prefer to find the LCD by listing multiples until a common multiple appears.
- Most students will need a review of prime factorization.
- A common mistake in prime factorization is to not factor completely.
- Some students find the product of all the numbers rather than the LCM.

Answers: 1a) 15, b) 12, c) 42, d) 420, e) 144, f) 210; 2a) 30, b) 96, c) 140, 3) 378, e) 255, f) 2448; 3a) 4, b) 8, c) 6, d) 18, e) 121, f) 180

Mini-Lecture 3.3

Adding and Subtracting Unlike Fractions

Learning Objectives:

1. Add unlike fractions.
2. Subtract unlike fractions.
3. Solve problems by adding or subtracting unlike fractions.
4. Key Vocabulary: *least common denominator (LCD)*

Examples:

1. Add and simplify.

a) $\frac{3}{4} + \frac{1}{8}$

b) $\frac{1}{5} + \frac{18}{35}$

c) $\frac{1}{9} + \frac{11}{27}$

d) $\frac{2}{7} + \frac{3}{19}$

e) $\frac{1}{2} + \frac{15}{42} + \frac{2}{3}$

f) $\frac{13}{14} + \frac{3}{7} + \frac{11}{28}$

2. Subtract and simplify.

a) $\frac{5}{8} - \frac{1}{16}$

b) $\frac{6}{11} - \frac{1}{2}$

c) $\frac{5}{6} - \frac{3}{8}$

d) $\frac{1}{30} - \frac{1}{300}$

e) $\frac{7}{9} - \frac{1}{12}$

f) $\frac{1}{6} - \frac{1}{11}$

3. a) Raymond read $\frac{1}{15}$ of the report on Monday and $\frac{1}{6}$ of the report on Wednesday.
How much of the report has Raymond read?

- b) Kari had $\frac{8}{9}$ bag of pretzels. She ate $\frac{3}{5}$ of the bag of pretzels. What fractional part of the bag of pretzels is left?

Teaching Notes:

- Some students will try to cross cancel instead of finding the LCD.
- Some students will add/subtract the denominators instead of finding the LCD.
- Some students will find the common denominator but forget to multiply the numerator when building equivalent fractions.

Answers: 1a) $\frac{7}{8}$, b) $\frac{5}{7}$, c) $\frac{14}{27}$, d) $\frac{59}{133}$, e) $1\frac{4}{21}$, f) $1\frac{3}{4}$; 2a) $\frac{9}{16}$, b) $\frac{1}{22}$, c) $\frac{11}{24}$, d) $\frac{3}{100}$, e) $\frac{25}{36}$, f) $\frac{5}{66}$; 3a) $\frac{7}{30}$, b) $\frac{13}{45}$

Mini-Lecture 3.4

Adding and Subtracting Mixed Numbers

Learning Objectives:

1. Add mixed numbers.
2. Subtract mixed numbers.
3. Solve problems by adding or subtracting mixed numbers.

Examples:

1. Add.

a) $14\frac{1}{4} + 17\frac{2}{5}$

b) $9\frac{1}{2} + 18\frac{1}{3}$

c) $14\frac{6}{7} + 19\frac{2}{3}$

d) $16\frac{5}{6} + 6\frac{5}{9} + \frac{4}{9}$

2. Subtract.

a) $14\frac{5}{6} - 9\frac{2}{3}$

b) $11 - 7\frac{1}{7}$

c) $16\frac{2}{15} - 7\frac{2}{9}$

d) $17\frac{7}{25} - 8\frac{7}{15}$

3. a) Ray played hockey for $3\frac{1}{2}$ hours on Monday and played hockey on Wednesday for $4\frac{5}{9}$ hours. What was the total amount of time Ray played hockey?
- b) Chris cut a board $13\frac{3}{5}$ feet long from a board that was 20 feet long. How long is the remaining piece?

Teaching Notes:

- Many students are challenged by this section.
- Some students need to be shown the following approach for borrowing or re-grouping:

$$11\frac{2}{9} \longrightarrow 10\overset{10}{\cancel{11}}1\frac{2}{9} \longrightarrow 10\frac{11}{9}$$

Answers: 1a) $31\frac{13}{20}$, b) $27\frac{5}{6}$, c) $34\frac{11}{21}$, d) $23\frac{5}{6}$; 2a) $5\frac{1}{6}$, b) $3\frac{6}{7}$, c) $8\frac{41}{45}$, d) $8\frac{61}{75}$; 3a) $8\frac{1}{18}$ hours, b) $6\frac{2}{5}$ feet

Mini-Lecture 3.5

Order, Exponents, and the Order of Operations

Learning Objectives:

1. Compare fractions.
2. Evaluate fractions raised to powers.
3. Review operations on fractions.
4. Use the order of operations.
5. Key Vocabulary: *less than (<), greater than (>), order of operations*

Examples:

1. Insert < or > to form a true statement.

a) $\frac{1}{18}$ $\frac{1}{3}$ b) $\frac{2}{3}$ $\frac{4}{14}$ c) $\frac{19}{20}$ $\frac{9}{10}$ d) $1\frac{3}{12}$ $1\frac{4}{7}$

2. Evaluate each expression.

a) $\left(\frac{1}{8}\right)^2$ b) $\left(\frac{3}{7}\right)^3$ c) $\left(\frac{5}{6}\right)^3$ d) $\left(\frac{2}{5}\right)^3\left(\frac{3}{4}\right)^2$

3. Perform each indicated operation.

a) $\frac{1}{8} + \frac{5}{16}$ b) $\frac{3}{5} \div \frac{14}{15}$ c) $\frac{9}{10} - \frac{1}{3}$ d) $\frac{2}{3} \cdot \frac{5}{12}$

4. Use the order of operations to simplify each expression.

a) $\left(\frac{1}{3} + \frac{1}{6}\right) \cdot \frac{3}{2}$ b) $\frac{1}{2} \cdot \frac{3}{4} + \frac{1}{8} \cdot \frac{1}{6}$
c) $\frac{12}{7} \div \frac{9}{4} \cdot \frac{11}{3}$ d) $\left(\frac{3}{7}\right)^2 \div \left(\frac{3}{7} - \frac{1}{13}\right)$

e) Find the average of the list of numbers: $\frac{1}{3}$, $\frac{11}{18}$, and $\frac{5}{6}$

Teaching Notes:

- Many students will make the following mistake: $\left(\frac{1}{3}\right)^2 = \frac{1 \times 2}{3 \times 2} = \frac{3}{6}$
- Review operations on fractions.
- Remind students to multiply or divide from left to right; add or subtract from left to right.

Answers: 1a) <, b) >, c) >, d) <; 2a) 1/64, b) 27/343, c) 125/216, d) 9/250; 3a) 7/16, b) 9/14, c) 17/30, d) 5/18;
4a) 3/4, b) 19/48, c) 2 50/63, d) 117/224, e) 16/27

Mini-Lecture 3.6

Fractions and Problem Solving

Learning Objectives:

1. Solve problems by performing operations on fractions or mixed numbers.
2. Key Vocabulary: *perimeter, units, area, square units, volume, cubic units*

Examples:

1. Translate each to an expression. Then simplify the expression.
 - a) Find the quotient of 49 and 8.
 - b) Find 89 increased by 27.
 - c) Find the product of 27 and 3.
 - d) Subtract 43 from 102.
2. A recipe calls for $\frac{3}{8}$ cup of sugar. If you triple the recipe, how much sugar is needed?
3. Find the perimeter of a rectangular room that measures $14\frac{1}{3}$ feet long and $12\frac{1}{2}$ feet wide.
4. Find the volume of a cereal box that measures $11\frac{1}{4}$ inches by $7\frac{1}{2}$ inches by 2 inches.
5. A contractor purchased 48 acres of land to develop. How many houses can be built if each lot will be $1\frac{1}{2}$ acres.
6. Find the area of a picture frame $13\frac{3}{4}$ inches by $6\frac{1}{5}$ inches.
7. A factory produces bags of sand. Three bags of sand were randomly selected and they weighed $15\frac{1}{3}$, $16\frac{1}{6}$, and $14\frac{5}{6}$ pounds. What is the average weight of the bags of sand?

Teaching Notes:

- Many students have difficulty with word problems.
- Encourage students to estimate their answers before solving.
- Refer students to textbook for Problem-Solving Steps: Understand, Translate, Solve, Interpret.

Answers: 1a) $49 \div 8 = 6r1$, b) $89 + 27 = 116$, c) $27 \cdot 3 = 81$, d) $102 - 43 = 59$; 2) $1\frac{1}{8}$ cup; 3) $53\frac{2}{3}$ feet; 4) $168\frac{3}{4}$ inches; 5) 32 houses; 6) $85\frac{1}{4}$ inches; 7) $46\frac{1}{3}$ pounds