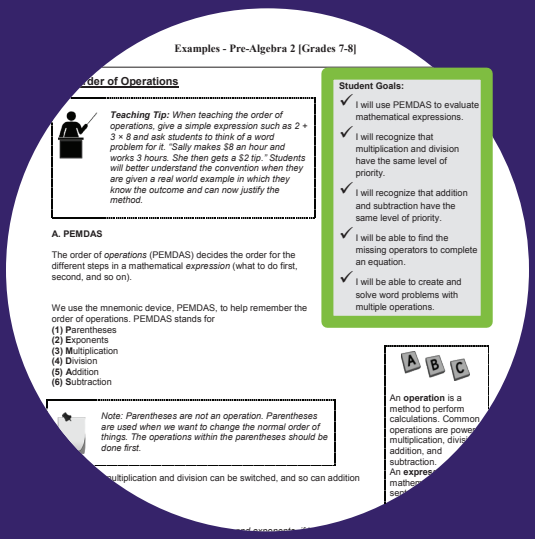
Pre–Algebra 2

Curriculum Sample

A Grade Ahead's rigorous, year-round math enrichment program is designed to challenge your child to a higher academic standard. Our monthly curriculum includes mathematical concepts that your child will see in school. Your child will learn and apply math concepts to real-world situations through word problems and develop strong critical thinking and analytical skills.

Each week will have an in-depth lesson (which we call Examples), homework, and answers. In these next pages, we offer a closer look at what our Examples, homework, and answers offer as well as a specific example of each.



Examples - Pre-Algebra 2 [Grades 7-8]

rder of Operations

Teaching Tip: When teaching the order of operations, give a simple expression such as 2 + 3 × 8 and ask students to think of a word problem for it. "Sally makes $8 an hour and works 3 hours. She then gets a $2 tip." Students will better understand the convention when they are given a real world example in which they know the outcome and can now justify the method.

A. PEMDAS

The order of *operations* (PEMDAS) decides the order for the different steps in a mathematical *expression* (what to do first, second, and so on).

We use the mnemonic device, PEMDAS, to help remember the order of operations. PEMDAS stands for
(1) **P**arentheses
(2) **E**xponents
(3) **M**ultiplication
(4) **D**ivision
(5) **A**ddition
(6) **S**ubtraction

Note: Parentheses are not an operation. Parentheses are used when we want to change the normal order of things. The operations within the parentheses should be done first.

ultiplication and division can be switched, and so can addition

Student Goals:

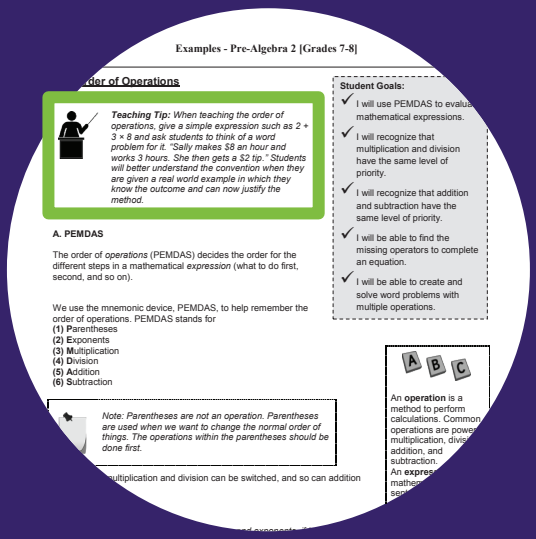
- ✓ I will use PEMDAS to evaluate mathematical expressions.
- ✓ I will recognize that multiplication and division have the same level of priority.
- ✓ I will recognize that addition and subtraction have the same level of priority.
- ✓ I will be able to find the missing operators to complete an equation.
- ✓ I will be able to create and solve word problems with multiple operations.

An **operation** is a method to perform calculations. Common operations are power multiplication, divis addition, and subtraction. An **expres** mathe sen

Student Goals

Student goals are listed at the top right of the Examples each week. These are topics that your child should understand by the end of the week.

Lesson pages are titled "Examples – Pre-Algebra 2 [Grades 7-8]," answer pages are titled "Answers – Pre-Algebra 2 [Grades 7-8]," and homework pages are simply titled "Pre-Algebra 2 [Grades 7-8]."



Examples - Pre-Algebra 2 [Grades 7-8]

Order of Operations

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A B C

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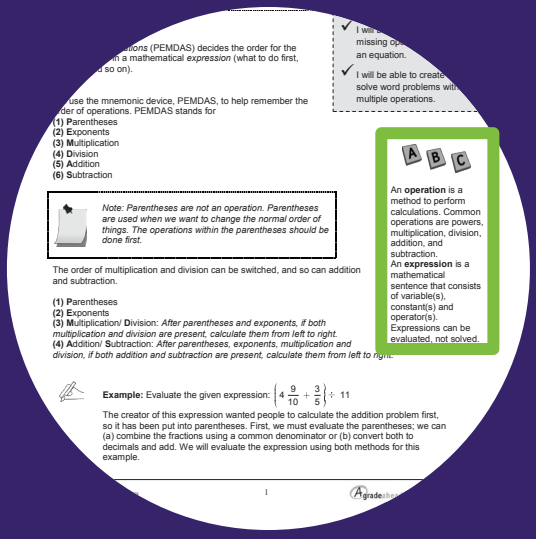
An **expres…** mathe… sent…

Teaching Tip

Teaching tips are suggestions to help you or your teacher present the topic to your child. These could include topics to review first or even an activity to do with your child.



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The order of multiplication and division can be switched, and so can addition and subtraction.

(1) Parentheses
(2) Exponents
(3) Multiplication/ **D**ivision: *After parentheses and exponents, if both multiplication and division are present, calculate them from left to right.*
(4) Addition/ **S**ubtraction: *After parentheses, exponents, multiplication and division, if both addition and subtraction are present, calculate them from left to right.*

Example: Evaluate the given expression: $\left(4\frac{9}{10}+\frac{3}{5}\right)\div 11$

The creator of this expression wanted people to calculate the addition problem first, so it has been put into parentheses. First, we must evaluate the parentheses; we can (a) combine the fractions using a common denominator or (b) convert both to decimals and add. We will evaluate the expression using both methods for this example.

1

missing op… an equation.
✓ I will be able to create… solve word problems wit… multiple operations.

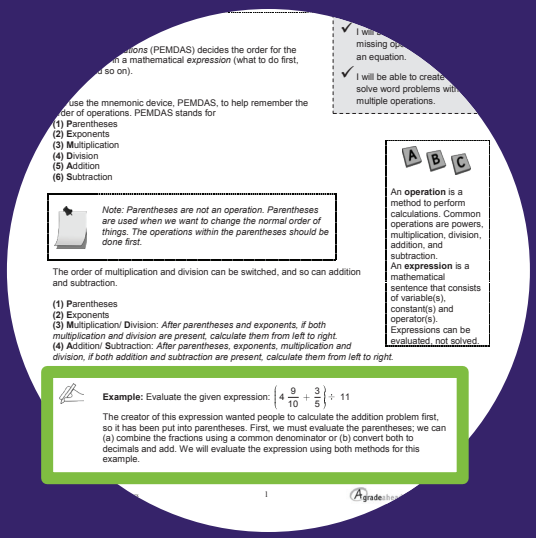
A B C

An **operation** is a method to perform calculations. Common operations are powers, multiplication, division, addition, and subtraction.
An **expression** is a mathematical sentence that consists of variable(s), constant(s) and operator(s). Expressions can be evaluated, not solved.

ABC Word Boxes

These word boxes define terms used within the lesson that your child may not know.

Each day's homework usually takes about 30 minutes to complete.



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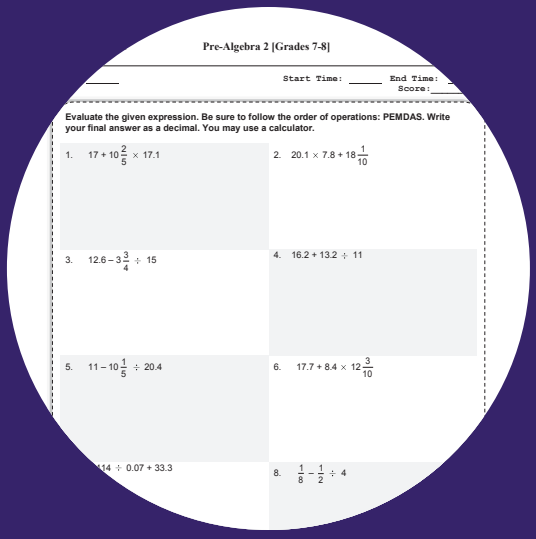
Example: Evaluate the given expression: $\left(4\frac{9}{10} + \frac{3}{5}\right) \div 11$

The creator of this expression wanted people to calculate the addition problem first, so it has been put into parentheses. First, we must evaluate the parentheses; we can (a) combine the fractions using a common denominator or (b) convert both to decimals and add. We will evaluate the expression using both methods for this example.

Examples

To illustrate the topic, examples are provided to you and your child. These examples help demonstrate how to solve the problem or figure out the answer.



Pre-Algebra 2 [Grades 7-8]

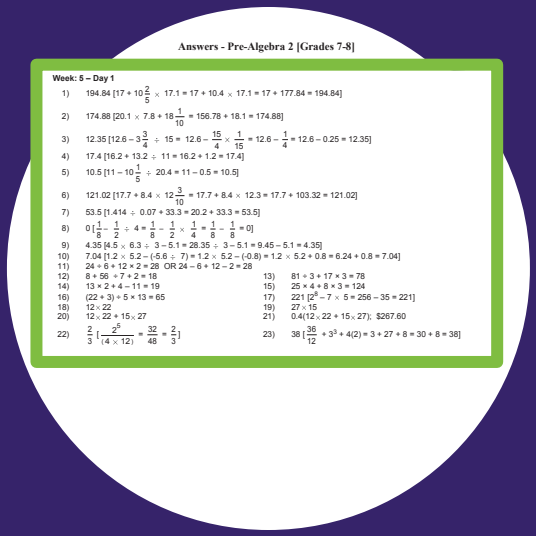
Start Time: _____ End Time: _____
Score: _____

Evaluate the given expression. Be sure to follow the order of operations: PEMDAS. Write your final answer as a decimal. You may use a calculator.

1. $17 + 10\frac{2}{5} \times 17.1$
2. $20.1 \times 7.8 + 18\frac{1}{10}$
3. $12.6 - 3\frac{3}{4} \div 15$
4. $16.2 + 13.2 \div 11$
5. $11 - 10\frac{1}{5} \div 20.4$
6. $17.7 + 8.4 \times 12\frac{3}{10}$
7. $14 \div 0.07 + 33.3$
8. $\frac{1}{8} - \frac{1}{2} \div 4$

Homework

Each week, four days of homework are given to apply concepts from that week's lesson and reinforce the topic.



Answers - Pre-Algebra 2 [Grades 7-8]

Week: 5 – Day 1

1) 194.84 [17 + $10\frac{2}{5}$ × 17.1 = 17 + 10.4 × 17.1 = 17 + 177.84 = 194.84]

2) 174.88 [20.1 × 7.8 + $18\frac{1}{10}$ = 156.78 + 18.1 = 174.88]

3) 12.35 [12.6 – $3\frac{3}{4}$ ÷ 15 = 12.6 – $\frac{15}{4} \times \frac{1}{15}$ = 12.6 – $\frac{1}{4}$ = 12.6 – 0.25 = 12.35]

4) 17.4 [16.2 + 13.2 ÷ 11 = 16.2 + 1.2 = 17.4]

5) 10.5 [11 – $10\frac{1}{5}$ ÷ 20.4 = 11 – 0.5 = 10.5]

6) 121.02 [17.7 + 8.4 × $12\frac{3}{10}$ = 17.7 + 8.4 × 12.3 = 17.7 + 103.32 = 121.02]

7) 53.5 [1.414 ÷ 0.07 + 33.3 = 20.2 + 33.3 = 53.5]

8) 0 [$\frac{1}{8} - \frac{1}{2} \div 4 = \frac{1}{8} - \frac{1}{2} \times \frac{1}{4} = \frac{1}{8} - \frac{1}{8} = 0$]

9) 4.35 [4.5 × 6.3 ÷ 3 – 5.1 = 28.35 ÷ 3 – 5.1 = 9.45 – 5.1 = 4.35]

10) 7.04 [1.2 × 5.2 – (-5.6 ÷ 7) = 1.2 × 5.2 – (-0.8) = 1.2 × 5.2 + 0.8 = 6.24 + 0.8 = 7.04]

11) 24 ÷ 6 + 12 × 2 = 28 OR 24 – 6 + 12 – 2 = 28

12) 8 + 56 ÷ 7 + 2 = 18

13) 81 ÷ 3 + 17 × 3 = 78

14) 13 × 2 + 4 – 11 = 19

15) 25 × 4 + 8 × 3 = 124

16) (22 + 3) ÷ 5 × 13 = 65

17) 221 [$2^8 - 7 \times 5 = 256 - 35 = 221$]

18) 12 × 22

19) 27 × 15

20) 12 × 22 + 15 × 27

21) 0.4(12 × 22 + 15 × 27); $267.60

22) $\frac{2}{3}$ [$\frac{2^5}{(4 \times 12)} = \frac{32}{48} = \frac{2}{3}$]

23) 38 [$\frac{36}{12} + 3^3 + 4(2) = 3 + 27 + 8 = 30 + 8 = 38$]

Answers

Answers are provided to check your child's homework. Enter the scores into the Parent Portal to track progress and note which areas may need more work.

Fractions, Decimals, and Percents

Teaching Tip: *This week is a review of concepts covered in previous grades. Please focus on the concepts your students find to be the most challenging. Review Section A fast. Focus on Sections B & C, but even the concepts there might be a review to many students.*

Student Goals:

- ✓ I will recognize that fractions, decimals, and percents are three ways to represent the same number.
- ✓ I will be able to convert between fractions, decimals, and percents.
- ✓ I will be able to find the fraction, decimal, or percent of a number.
- ✓ I will be able to use fractions, decimals, and percents in word problems.

A. Quick recap

A ***fraction*** is a quotient of numbers expressed in two parts: the numerator and denominator. The *numerator* of a fraction is the number on the top. The *denominator* of a fraction, also called the *divisor*, is the number on the bottom. Fractions represent division, the numerator divided by denominator.

There are 3 types of fractions.

(1) Proper fractions $\frac{2}{3}$ The numerator is less than the denominator, so the fraction is less than 1.

(2) Improper fractions $\frac{12}{7}$ The numerator is greater than or equal to the denominator, so the fraction is greater than or equal to 1.

(3) Mixed numbers $3\frac{3}{4}$ Mixed numbers represent the sum of a whole number and a fraction. Mixed numbers can always be written as improper fractions.

A ***decimal*** is a number expressed in two parts:

- the *whole number* to the left of the decimal point and
- the *part of the whole* to the right of the decimal point.

Decimals have place values on both sides of the decimal point.

The decimal 52.209 is read "52 and 209 thousandths."

TENS	ONES	DECIMAL POINT	TENTHS	HUNDREDTHS	THOUSANDTHS
5	2	.	2	0	9

Decimals may

- *terminate* or end, such as 0.35
- *repeat*, such as 0.33333… = $0.\overline{3}$
- *never repeat or terminate*. These numbers are called *irrational numbers*. Numbers like π and $\sqrt{3}$ are irrational numbers.

A ***percent*** is a decimal expression that represents the number per 100. "Percent" means "per one hundred." Percents usually represent a portion out of the whole. If 60 out of 100 kids in a grade are girls, we would say that 60% of the grade is girls. For any calculations done with percents, you must first *convert* the percent to a decimal or fraction, then calculate. *60% is NOT equal to 60. 60% is 60 per 100.*

B. Conversions

Decimals to Percents

To convert a decimal to a percent, multiply the decimal by 100. This is the same as moving the decimal point two places (two digits) to the right. After moving the decimal, add the percent symbol.

In math, **convert** means to change from one form to another using multiplication or division.

Example: Convert 3.3 to a percent.

$3.3 = 3.3 \times 100 = 330\%$

Percents to Decimals

To convert a percent to a decimal, remove the percent symbol and divide the number by 100. This is the same as moving the decimal point two places (two digits) to the left.

Example: Convert 1.45% to a decimal.

$1.45\% = \frac{1.45}{100} = 0.0145$

Note: If there is no digit to the left of the decimal point, place a 0 there as a placeholder for clarity. The 0 does not change the value of the decimal.
Example: Write .65 as 0.65

Fractions to Decimals

To convert a fraction to a decimal, rewrite the fraction as a division problem and solve.

Example*:* Convert $\frac{1}{8}$ to a decimal.

$\frac{1}{8} = 1 \div 8 =$

$$\begin{array}{r} 0.125 \\ 8\overline{)\,1.000} \\ -\ 8 \\ \hline 20 \\ -\ 16 \\ \hline 40 \\ -\ 40 \\ \hline 00 \end{array}$$

Notes: 1 can be written as 1.000 without changing its value.

Just place the decimal in the quotient in the right place, and ignore it in the division.

$\frac{1}{8} = 0.125$

Decimals to Fractions

If the decimal terminates, rewrite the decimal as a fraction based on place value. Always reduce the fraction if possible.

Example: Convert the decimal 0.37 to a fraction.

0.37 = 37 hundredths = $\frac{37}{100}$

Example: Convert the decimal 0.65 to a fraction.

$$0.65 = \frac{65}{100} = \frac{65 \div 5}{100 \div 5} = \frac{13}{20}$$

Example: Convert $0.\overline{6}$ to a fraction.

$$0.\overline{6} = 6(0.\overline{1}) = 6\left(\frac{1}{9}\right) = \frac{6}{9} = \frac{2}{3}$$

Every repeating decimal can be expressed as the repeating digits divided by the number of 9s given by the last place value. If the decimal expansion repeats, convert using products or quotients of 9.

Example: Convert $0.\overline{428571}$ to a fraction.

$$0.\overline{428571} = \frac{428571}{999999} = \frac{3}{7}$$

Fractions to Percents

Converting fractions to percents is a two step process. First, convert the fraction to a decimal by writing the fraction as a division problem and evaluating. Then, convert the decimal to a percent by multiplying by 100 or moving the decimal point two digits to the right and adding a percent symbol.

Example: Convert $\frac{4}{5}$ to a percent.

Step 1: $\frac{4}{5} = 4 \div 5 = 0.8$

Step 2: 0.8 = 80%

Percents to Fractions

Converting percents to fractions is also a two step process. First, convert the percent to a decimal by removing the percent symbol and dividing by 100 or moving the decimal two places to the left. Then, rewrite the decimal as a fraction based on place value.

Example: Convert 56% to a decimal.

Step 1: 56% = 0.56

Step 2: $0.56 = \frac{56}{100} = \frac{14}{25}$

C. Applications

Percent of a Number

To find the percent of a given number, multiply the decimal form of the percent by the number.

Example: What is 1.25% of 3,250,000?
1.25% = 0.0125
0.0125 × 3,250,000 = 40,625
40,625 is 1.25% of 3,250,000

Comparing Fractions

To compare fractions, cross multiply, then insert <, >, or =.

Example: Compare $\frac{13}{18}$ and $\frac{5}{6}$.

$\frac{13}{18}$? $\frac{5}{6}$

(13 × 6) ? (5 × 18) [Cross multiply]

78 < 90

Hence, $\frac{13}{18} < \frac{5}{6}$

Note: When comparing fractions $\frac{A}{B}?\frac{C}{D}$*, always compare AD ? BC.*

Comparing Decimals

When comparing decimals, you need to first write both decimals by matching the decimal point in the same place for each number. Then, start by comparing the digits with the greatest place value from left to right. Compare each digit until you reach a place with different values. Insert <, >, or =.

Example: 0.2854 ? 0.2845

0.2854 ⟵ 1st Decimal
0.2845 ⟵ 2nd Decimal
Compare each digit from left to right. They are equal until the thousandths place.
5 > 4 in the thousandths place
0.2854 > 0.2845

Finding a Number When a Percent is Known

To find a number when the percent is known, turn the percent into a reduced fraction. Then, multiply the number by the *reciprocal* of the fraction. [This is the same as dividing by the percent.]

Example: 40% of a number is 24. What is the number?

40% is $\frac{40}{100}$, which reduces to $\frac{2}{5}$.

Multiply 24 by the reciprocal of $\frac{2}{5}$: $24 \times \frac{5}{2} = 60$.

In math, the **reciprocal** of a number is the number you get by dividing 1 by that number.

Example: The reciprocal of $\frac{2}{3}$ is $1 \div \frac{2}{3} = \frac{3}{2}$

Essentially, you can reverse the denominator and the numerator to obtain the reciprocal.

Date: _____ **Start Time:** _____ **End Time:** _____

Score: ____/29

Find the percent of the number without a calculator.

1. What is 42% of 2,800?

2. What is 32% of 156,000?

3. What is 67% of 27?

4. What is 14% of 574?

Find the percent of the number. You may use a calculator.

5. What is 3.2% of 582,000?

6. What is 2.01% of 8,457,000

7. What is 4.43% of 4,787,000?

8. What is 2.92% of 5,016,000?

9. What is 69% of 688,000?

10. What is 0.89% of 631,000?

Convert the given fraction to a decimal without a calculator.

11. $\frac{5}{8}$

12. $\frac{4}{15}$

13. $3\frac{2}{3}$

14. $\frac{7}{20}$

Convert the given fraction to a decimal and a percent. You may use a calculator.

15. $\frac{1}{8}$

16. $\frac{5}{9}$

17. $\frac{2}{3}$

18. $\frac{5}{6}$

19. $\frac{19}{20}$

20. $\frac{5}{12}$

Convert the given decimal to a fraction <u>without a calculator</u>. Reduce when possible and express as a mixed number if applicable.

21. $1.\overline{6}$

22. 0.35

23. $0.\overline{24}$

24. 2.55

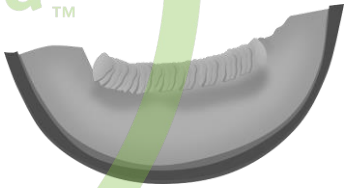
Word Problems: Do not use a calculator.

25. Sarah bought a binder at the store. The price of the binder is marked $6.50. At the register, Sarah pays $6.89. What percent is the sales tax?

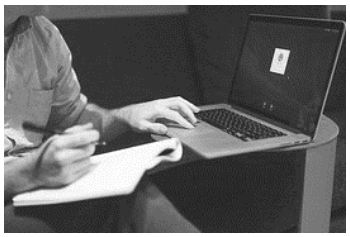
26. The price of a box of chocolates is $4.99. The sales tax is 6.5%. How much is the box of chocolates after tax? Round to the nearest cent.

27. Mike's railroad game has nine pieces of tracks. Six pieces are $4\frac{1}{2}$ in. long and the rest are $6\frac{1}{2}$ in. long. What is the total length of the tracks? Write your answer as a decimal.

28. Cathy buys two cantaloupes. One of them weighs $3\frac{1}{3}$ lb. The other one is three times heavier. What is the total weight of the two cantaloupes?



29. CHALLENGE! A group project needs to be at least 240 pages. Sam typed three-fifths of that number. Ram typed three-fourths of the number of pages that Sam typed. Did Sam and Ram type enough pages together to meet the minimum requirement?



Week: 1 – Day 1

For questions 1-10, convert the percent to a decimal. Find the product of the decimal and the given number.

1) 1,176 [0.42 × 2,800]
2) 49,920 [0.32 × 156,000]
3) 18.09 [0.67 × 27]
4) 80.36 [0.14 × 574]
5) 18,624 [0.032 × 582,000]
6) 169,985.7 [0.0201 × 8,457,000]
7) 212,064.1 [0.0443 × 4,787,000]
8) 146,467.2 [0.0292 × 5,016,000]
9) 474,720 [0.69 × 688,000]
10) 5,615.9 [0.0089 × 631,000]

For questions 11-20, write the fraction as a division problem and evaluate.

11) 0.625 [5 ÷ 8]
12) $0.2\overline{6}$ [4 ÷ 15]
13) $3.\overline{6}$ [3 + 2 ÷ 3]
14) 0.35 [7 ÷ 20]
15) 0.125; 12.5% [1 ÷ 8]
16) $0.\overline{5}$; $55.\overline{5}$% [5 ÷ 9]
17) $0.\overline{6}$; $66.\overline{6}$% [2 ÷ 3]
18) $0.8\overline{3}$; $83.\overline{3}$% [5 ÷ 6]
19) 0.95; 95% [19 ÷ 20]
20) $0.41\overline{6}$; $41.\overline{6}$ % [5 ÷ 12]
21) $1\frac{2}{3}$ [$1\frac{6}{9} = 1\frac{2}{3}$]
22) $\frac{7}{20}$ [$\frac{35}{100} = \frac{7}{20}$]
23) $\frac{8}{33}$ [$\frac{24}{99} = \frac{8}{33}$]
24) $2\frac{11}{20}$ [$2\frac{55}{100} = 2\frac{11}{20}$]
25) 6% [6.89 – 6.50 = 0.39; 0.39 ÷ 6.50 = 0.06 = 6%]
26) $5.31 [Convert 6.5% to decimal: 0.065; Total price: 4.99 × 1.065]
27) 46.5 in. [$6 \times 4\frac{1}{2} + 3 \times 6\frac{1}{2}$]
28) $13\frac{1}{3}$ lb [$3\frac{1}{3} + 3 \times 3\frac{1}{3}$]
29) Yes [Sam typed $240 \times \frac{3}{5} = 144$; Ram typed $144 \times \frac{3}{4} = 108$; Total: 144 + 108 = 252 pages.]