BASIC MATHEMATICS
FOR BAC CRAFTWORKERS

INTERNATIONAL UNION OF BRICKLAYERS AND ALLIED CRAFTWORKERS

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BASIC MATHEMATICS
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Unit 4

Decimal Fractions

$12\,^{11}/_{16} = 12.6875$

Objectives

1. Use a calculator to add, subtract, multiply, and divide whole numbers and decimal fractions.
2. Describe the fundamentals of decimal fractions.
3. Add decimal fractions.
4. Subtract decimal fractions.
5. Multiply decimal fractions.
6. Divide decimal fractions.
7. Perform combined operations with decimal fractions.

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Objective 1: Use a Calculator

- Use a calculator for decimal fraction problems.
- Use mental math whenever possible!

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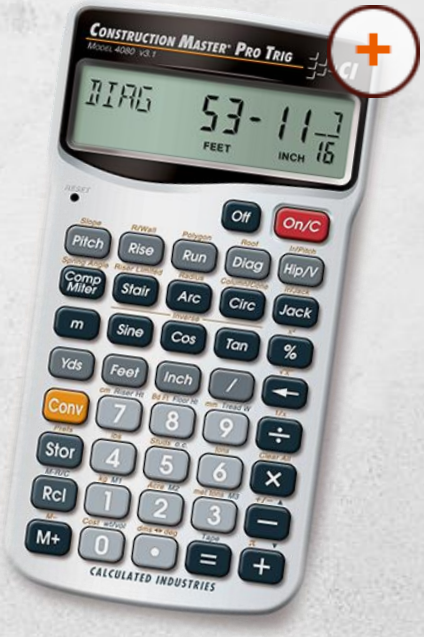
Calculators in this Course

Scientific Calculator

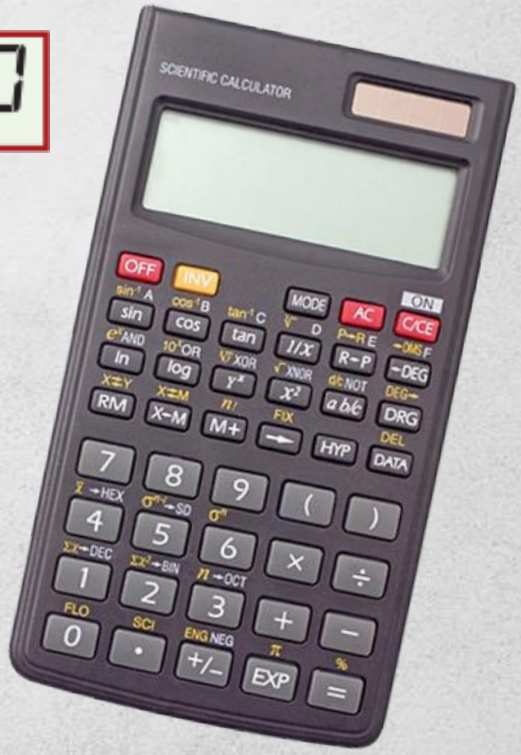


Construction Calculator

2 × 5 = 10

Calculator Keystroke Basics

1. Enter 2.
2. Press the × key.
3. Enter 5.
4. Press the = key.



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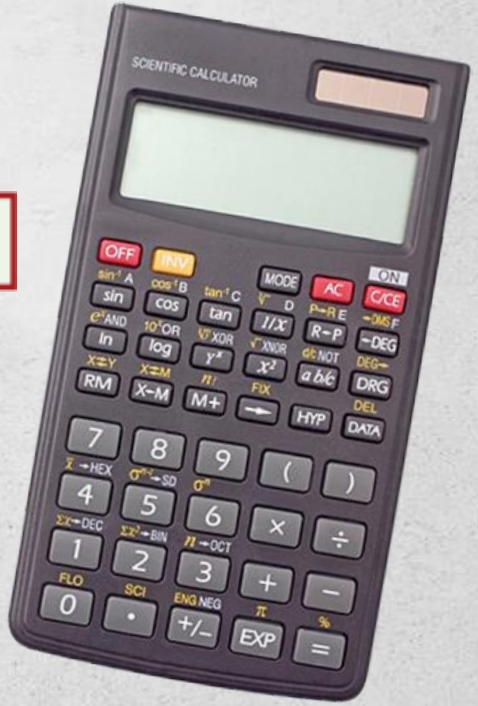
Calculator Keystroke Practice

What is the combined weight of two panels:
150 pounds and 256 pounds?



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Calculator Keystroke Practice

You have 27 fasteners, and someone picks up 11 of them. How many remain?

2 7 − 1 1 = 16

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Calculator Keystroke Practice

Simplify 12 + 3 (8 – 5) + 16.

1	2	+	3	×	(	8	−	5	)

+	1	6	=	37

NOTE: Each key on a Scientific Calculator can serve two different functions; another key is used to switch functions. Consult your manual for details.

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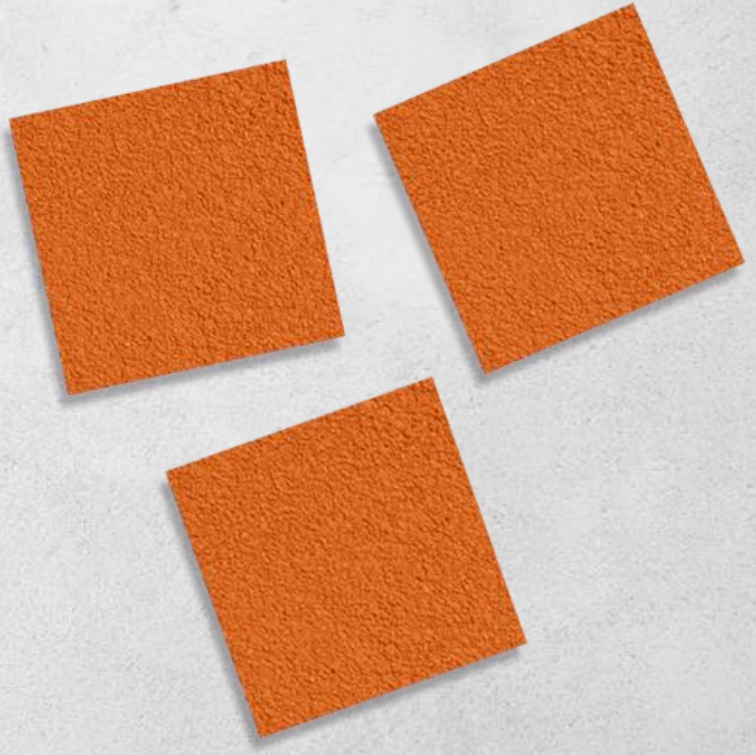
Assignment Sheet

Objective 2: Fundamentals of Decimal Fractions

Whole numbers vs. fractions

- 1 is a whole number:
  - Complete number
  - Represents a complete unit
- Every multiple of 1 is also a whole number.



Objective 2: Fundamentals of Decimal Fractions

Fractions

- Each is *part of* a whole.
- An instruction to *perform division*.

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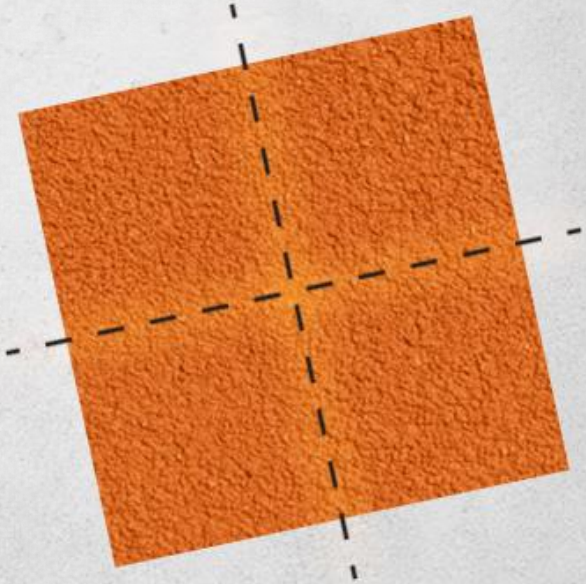
Objective 2: Fundamentals of Decimal Fractions

Fractions

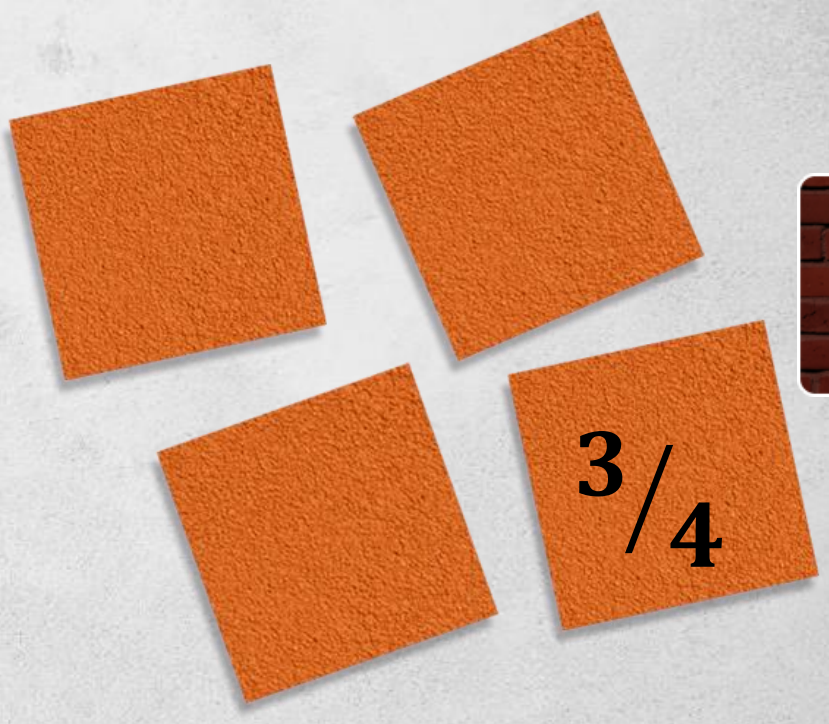
- Each is *part of* a whole.
- An instruction to *perform division*.



Objective 2: Fundamentals of Decimal Fractions

Fractions

- Each is *part of* a whole.
- An instruction to *perform division*.



Fractions Indicate Division

Results are often decimal fractions.

$$^{3}/_{4} = 3 \div 4$$

$$4 \overline{)\,3.00}$$

decimal point

Step 1: Insert decimal point and zeros.

Fractions Indicate Division

Results are often decimal fractions.

$$^{3}/_{4} = 3 \div 4$$

$$\begin{array}{r} .7 \\ 4 \overline{)\ 3.00} \end{array}$$

Step 2: Divide 4 into 30.

Fractions Indicate Division

Results are often decimal fractions.

$$^{3}/_{4} = 3 \div 4$$

$$\begin{array}{r} .7 \\ 4\overline{)\,3.00} \\ -28 \\ \hline \end{array}$$

Step 3: Multiply 7 in the quotient times the divisor.

Fractions Indicate Division

Results are often decimal fractions.

$$^{3}/_{4} = 3 \div 4$$

$$\begin{array}{r} .7 \\ 4\overline{)\,3.00} \\ -28 \\ \hline 20 \end{array}$$

Step 4: Subtract and “bring down” the zero.

Fractions Indicate Division

Results are often decimal fractions.

$$^{3}/_{4} = 3 \div 4$$

$$\begin{array}{r} .75 \\ 4\overline{)\,3.00} \\ -28 \\ \hline 20 \end{array}$$

Step 5: Divide again.

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Fractions Indicate Division

Results are often decimal fractions.

$$^{3}/_{4} = 3 \div 4$$

$$
\begin{array}{r}
.75 \\
4\overline{)\,3.00} \\
-28 \\
\hline
20 \\
-\,20 \\
\hline
0
\end{array}
$$

Step 6: Multiply 5 in the quotient times the divisor (4).

Fractions Indicate Division

Results are often decimal fractions.

$$^{3}/_{4} = 3 \div 4$$

$$^{3}/_{4} = 3 \div 4 = 0.75$$

Step 7: .75 is a decimal fraction.

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Fractions on the Job

Craftworkers use decimal fractions every day

Position and Decimal Number Value

The value of a number depends on its position in the number.

Place Values for Whole Numbers

Millions	Hundred Thousands	Ten Thousands	Thousands	Hundreds	Tens	Units (or Ones)	Decimal Point
3	5	8	4	9	6	2	.

Whole numbers

Decimal fractions

Place Values for Decimal Fractions

Decimal Point	Tenths	Hundredths	Thousandths	Ten Thousandths	Hundred-Thousandths	Millionths
.	1	6	3	5	7	4

Position and Decimal Number Value

- Decimal fraction of greatest value is the one immediately following the decimal point.
- As you move right, the numbers become smaller.

Place Values for Decimal Fractions

Decimal Point	Tenths	Hundredths	Thousandths	Ten Thousandths	Hundred-Thousandths	Millionths
.	1	6	3	5	7	4

0.1 = 1 tenth
0.25 = 25 hundredths
0.625 = 625 thousandths
0.8045 = 8,045 ten-thousandths

Writing Mixed Numbers as Decimal Fractions

Mixed numbers may be written as decimal fractions:

$$3\,{}^{3}/_{4} = 3.75$$

$$5\,{}^{5}/_{8} = 5.625$$

$$12\,{}^{11}/_{16} = 12.6875$$

Rounding With Decimal Fractions

Rules for rounding off numbers:

1. Locate the **value to be rounded**, look at the number ***immediately to the right.***

Round 0.714285714 to the nearest thousandth

1. If the number is 4 or less, *the number to be rounded remains the same*, and all numbers to the right are dropped or removed.

2. If the number is 5 or more, *the number to be rounded is increased by 1*, and all numbers to the right are dropped or removed.

0.714285714 ▶ 0.714

Rounding With Decimal Fractions

Rules for rounding off numbers:

1. Locate the **value to be rounded**, look at the number ***immediately to the right.***

   Round 0.6**8**7**5** to the nearest hundredth (second decimal place).

1. If the number is 4 or less, *the number to be rounded remains the same*, and all numbers to the right are dropped or removed.

2. If the number is 5 or more, *the number to be rounded is increased by 1*, and all numbers to the right are dropped or removed.

0.6**8**7**5** ▶ 0.69

Rounding With Decimal Fractions

Rules for rounding off numbers:

1. Locate the **value to be rounded**, look at the number ***immediately to the right.***

Round 3.16**9**5 to the nearest thousandth.

1. If the number is 4 or less, *the number to be rounded remains the same*, and all numbers to the right are dropped or removed.

2. If the number is 5 or more, *the number to be rounded is increased by 1*, and all numbers to the right are dropped or removed.

3.169**5** ▶ 3.17

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Converting from Common to Decimal Fractions

$$1 + (7 \div 8) = 1.875$$

Convert $1\frac{7}{8}$ to a decimal fraction.

Converting from Common to Decimal Fractions

$$1 + (7 \div 8) = 1.875$$

$$4 + 3 \div 4 = 4.75$$

Convert $4\ ^{3}/_{4}$ to a decimal fraction.

Converting from Common to Decimal Fractions

$$1 + (7 \div 8) = 1.875$$

$$2 + 15 \div 16 = 2.9375 \text{ or } 2.938$$

Convert $2\,{}^{15}/_{16}$ and round to the nearest thousandth.

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Finding the Common Fraction Equivalent

Express as a common fraction and reduce to lowest term.

$$0.8 = {}^{8}/_{10} = {}^{4}/_{5}$$

Convert 0.8 to a common fraction.

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Finding the Common Fraction Equivalent

Express as a common fraction and reduce to lowest term.

$$1.25 = 1 + 0.25$$

$$1 + {}^{25}/_{100} = 1{}^{1}/_{4}$$

Convert 1.25 to a common fraction.

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Finding the Common Fraction Equivalent

Express as a common fraction and reduce to lowest term.

Convert 17.4375 to a common fraction.

$$17.4375 = 17 + {}^{4375}/_{10000}$$

$$17.4375 = 17\,{}^{7}/_{16}$$

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Assignment Sheet

Objective 3: Addition of Decimal Fractions

Similar steps to adding whole numbers:

- **Step 1:** Align the decimal points and place values in vertical columns.
- **Step 2:** Add the numbers in each column from far right, and carry values left.

Adding Decimal Fractions

$$0.75 + 0.375\left(\frac{3}{4} + \frac{3}{8} \right)$$

$$\begin{array}{r} .750 \\ +\ .375 \\ \hline \end{array}$$

Step 1: Align decimal points.

Adding Decimal Fractions

$$0.75 + 0.375\left(\frac{3}{4} + \frac{3}{8} \right)$$

$$\begin{array}{r} .750 \\ +\ .375 \\ \hline 5 \end{array}$$

Step 2: Begin at right and add thousandths.

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Adding Decimal Fractions

$$0.75 + 0.375\left(\frac{3}{4} + \frac{3}{8} \right)$$

$$\begin{array}{r} {\scriptstyle 1} \\ .750 \\ +\ .375 \\ \hline .25 \end{array}$$

Step 3: Add the hundreds.

Adding Decimal Fractions

$$0.75 + 0.375\left(\frac{3}{4} + \frac{3}{8} \right)$$

$$\begin{array}{r} {\scriptstyle 1} \\ .750 \\ +\ .375 \\ \hline 1125 \end{array}$$

Step 4: Add the tenths.

Adding Decimal Fractions

$$0.75 + 0.375\left(\frac{3}{4} + \frac{3}{8} \right)$$

$$\begin{array}{r} 1 \\ .750 \\ +\ .375 \\ \hline 1.125 \end{array}$$

Step 5: Bring the decimal point down.

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Adding Decimal Fractions

1.873 + 2.128

$$\begin{array}{r} 1.873 \\ +\ 2.128 \\ \hline \end{array}$$

Step 1: Align decimal points.

Adding Decimal Fractions

1.873 + 2.128

$$\begin{array}{r} {\scriptstyle 1} \\ 1.873 \\ +\ 2.128 \\ \hline 1 \end{array}$$

Step 2: Begin at right and add thousandths.

Adding Decimal Fractions

1.873 + 2.128

$$\begin{array}{r} {\scriptstyle 11} \\ 1.873 \\ +\ 2.128 \\ \hline 0{\scriptstyle 01} \end{array}$$

Step 3: Add the hundredths.

Adding Decimal Fractions

1.873 + 2.128

$$\begin{array}{r} {\scriptstyle 1\ 11} \\ 1.873 \\ +\ 2.128 \\ \hline 001 \end{array}$$

Step 4: Add the tenths.

Adding Decimal Fractions

1.873 + 2.128

$$\begin{array}{r} {\scriptstyle 1\ 11} \\ 1.873 \\ +\ 2.128 \\ \hline 4.001 \end{array}$$

Step 5: Bring the decimal point down.

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Adding Decimal Fractions

1.873 + 2.128

$$\begin{array}{r} {\scriptstyle 1\ 11} \\ 1.873 \\ +\ 2.128 \\ \hline 4.001 \end{array}$$

Step 6: Bring the decimal point down.

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Adding Decimal Fractions Calculator

1.873 + 2.128

$$13.875 + 7.096 = 20.971$$

$$5\,{}^{3}\!/_{4} + 6\,{}^{7}\!/_{8} = 5.75 + 6.875 = 12.625$$

$$4.892 + 0.67 + 1.203 = 6.765$$

$$10.7854 + 2.386 + 17.0942 = 30.2656$$

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Assignment Sheet

Objective 4: Subtraction of Decimal Fractions

Steps for subtracting fractions

- **Step 1:** Align the decimal points and place values in vertical columns.
- **Step 2:** Beginning at far right, subtract numbers in each column, borrowing from the left when needed.

$$\begin{array}{r} .868 \\ -\ .147 \\ \hline 0.721 \end{array}$$

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Steps for Subtracting Fractions

7.068 – 4.159

$$\begin{array}{r} 7.068 \\ -\ 4.159 \\ \hline \end{array}$$

Step 1: Line up the decimal points.

Steps for Subtracting Fractions

7.068 – 4.159

$$\begin{array}{r} {}^{1}\,{}_{8} \\ 7.0\cancel{68} \\ -\ 4.159 \\ \hline 9 \end{array}$$

Step 2: Subtract, starting at far right.

Steps for Subtracting Fractions

7.068 – 4.159

$$\begin{array}{r} {}^{5}\,{}^{1}8 \\ 7.0\cancel{68} \\ -\ 4.159 \\ \hline 09 \end{array}$$

Step 3: Subtract the hundredths.

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Steps for Subtracting Fractions

7.068 – 4.159

$$\begin{array}{r} {}^{1}0\,5\,{}^{1}8 \\ 7.\cancel{068} \\ -\ 4.159 \\ \hline 909 \end{array}$$

Step 4: Subtract the tenths.

Steps for Subtracting Fractions

7.068 – 4.159

$$
\begin{array}{r}
6^{1}0\,5^{1}8 \\
\cancel{7.068} \\
-\ 4.159 \\
\hline
2.909
\end{array}
$$

Step 5: Subtract the ones.

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Steps for Subtracting Fractions

7.068 – 4.159

$$\begin{array}{r} {}^{6}\,{}^{1}0\,{}^{5}\,{}^{1}8 \\ \not{7}.\not{0}\not{6}\not{8} \\ -\ 4.159 \\ \hline 2.909 \end{array}$$

Step 6: Bring down the decimal point.

Subtracting Fractions With a Calculator

7.068 – 4.159

6.428 – 5.907 = 0.521

16.625 – 3.75 = 12.875

0.98 – 0.076 = 0.904

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Assignment Sheet

Objective 5: Multiplication of Decimal Fractions

Steps for multiplying fractions

- **Step 1:** Multiply, ignoring the decimal points.
- **Step 2:** Add the number of decimal places in the original numbers.
- **Step 3:** From the right side of the product, count off the same number of places and insert the decimal point.

$$\begin{array}{r} .75 \\ \times\ .\ 5 \\ \hline 0.375 \end{array}$$

Steps for Multiplying Fractions

Multiply 0.875 × 0.25.

$$875 \times 25 = 21875$$

Step 1: Multiply, ignoring the decimal points.

Steps for Multiplying Fractions

Multiply 0.875 × 0.25.

0.875 × 0.25 = 5 decimal places

Step 2: Add the total number of original decimal places.

Steps for Multiplying Fractions

Multiply 0.875 × 0.25.

0.21875

Step 3: Count off the same number of decimal places and insert the decimal point.

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Steps for Multiplying Fractions

Multiply 0.875 × 0.25.

Steps for Multiplying Fractions

Multiply 5.75 × 3.125, round to hundredths.

$$575 \times 3125 = 1796875$$

Step 1: Multiply, ignoring the decimal points.

Steps for Multiplying Fractions

Multiply 5.75 × 3.125, round to hundredths.

5.75 × 3.125 = 5 decimal places

Step 2: Add the total number of original decimal places.

Steps for Multiplying Fractions

Multiply 5.75 × 3.125, round to hundredths.

17.96875

Step 3: Count off the same number of decimal places and insert the decimal point.

Steps for Multiplying Fractions

Multiply 5.75 × 3.125, round to hundredths.

17.97

Step 4: Round to the hundredths place.

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Assignment Sheet

Objective 6: Division of Decimal Fractions

Steps for dividing fractions

- **Step 1:** Move the decimal point in the divisor to the right until the divisor is a whole number.
- **Step 2:** Move the decimal point in the dividend the same number of places.
- **Step 3**: Divide, then place the decimal in the quotient at the same place that the decimal point appears in the dividend.

$$3.87 \div 0.4 = 9.675$$

Steps for Dividing Fractions

$$3.87 \div 0.4 =$$

$$3.87 \div 4 =$$

Step 1: Move the decimal point in the divisor to the right until the divisor is a whole number.

Steps for Dividing Fractions

$$3.87 \div 0.4 =$$

$$38.7 \div 4 =$$

Step 2: Move the decimal point in the dividend the same number of places.

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Steps for Dividing Fractions

$$
\begin{array}{r}
9 \\
4\overline{)\,38.700} \\
-\,36 \\
\hline
\end{array}
$$

Step 3: Divide, then place the decimal in the quotient at the same place that the decimal point appears in the dividend.

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Steps for Dividing Fractions

$$
\begin{array}{r}
9 \\
4\overline{)\,38.700} \\
-\,36 \\
\hline
27
\end{array}
$$

Step 4: Divide, then place the decimal in the quotient at the same place that the decimal point appears in the dividend.

Steps for Dividing Fractions

$$
\begin{array}{r}
9.6 \\
4\overline{)\,38.700} \\
-\,36 \\
\hline
27 \\
-\,24 \\
\hline
\end{array}
$$

Step 5: Divide, then place the decimal in the quotient at the same place that the decimal point appears in the dividend.

Steps for Dividing Fractions

$$
\begin{array}{r}
9.675 \\
4\overline{)\,38.700} \\
-\,36 \\
\hline
27 \\
-\,24 \\
\hline
30
\end{array}
$$

Step 6: Divide, then place the decimal in the quotient at the same place that the decimal point appears in the dividend.

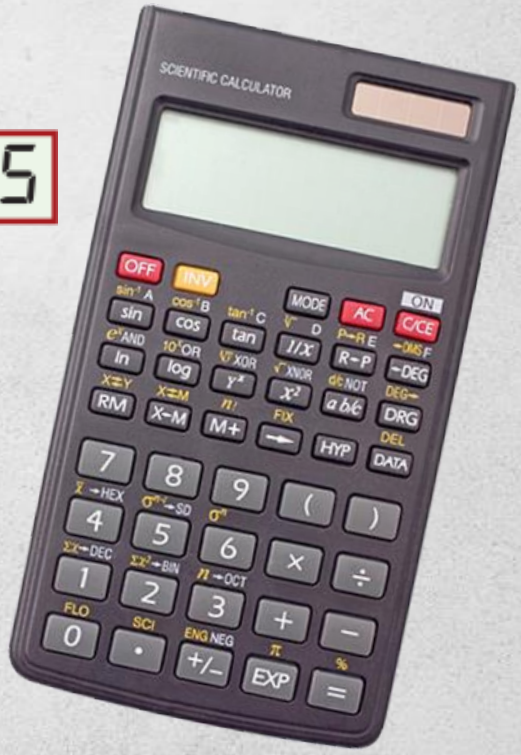
Steps for Dividing Fractions

$$
\begin{array}{r}
9.675 \\
4\overline{)\,38.700} \\
-\,36 \\
\hline
27 \\
-\,24 \\
\hline
30 \\
-\,28 \\
\hline
20 \\
-\,20 \\
\hline
0
\end{array}
$$

Step 7: Divide, then place the decimal in the quotient at the same place that the decimal point appears in the dividend.

Dividing Decimal Fractions With a Calculator

$$3.87 \div 0.4 =$$



$$0.2 \div 0.8 =$$

$$2 \div 8 = 0.25$$

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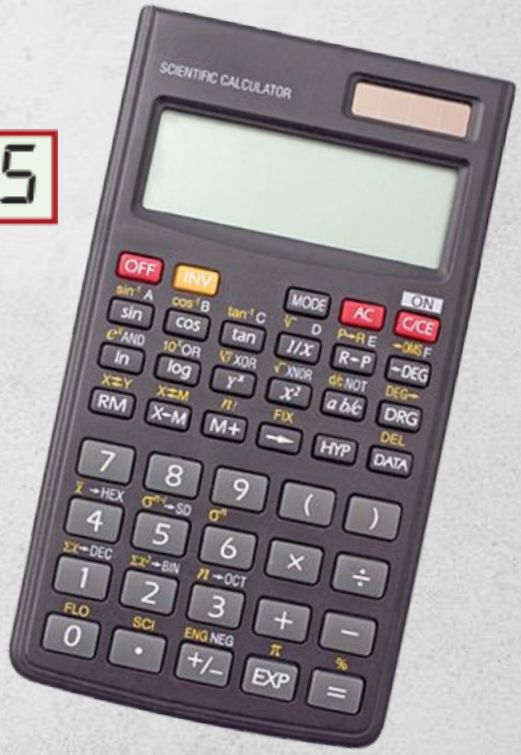
Dividing Decimal Fractions With a Calculator

$$3.87 \div 0.4 =$$



$$6.052 \div 3.56 =$$

$$605.2 \div 356 = 1.7$$

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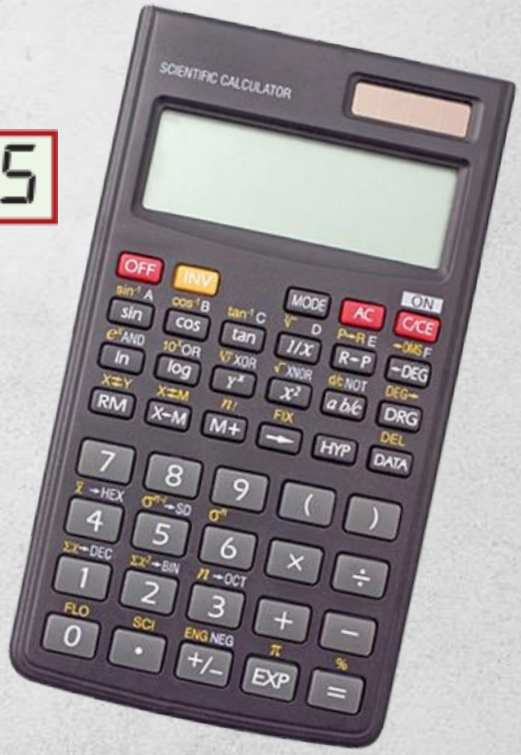
Dividing Decimal Fractions With a Calculator

3.87 ÷ 0.4 =



6.5 ÷ 3.25 = 2

46.35 ÷ 45 = 1.03

51.012 ÷ 14.17 = 3.6

7.209 ÷ 0.9 = 8.01

80.64 ÷ 16.8 = 4.8

980.4 ÷ 2.15 = 456

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Assignment Sheet

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Objective 7: Combined Operations With Decimal Fractions

Mathematical Order of Operations (PEMDAS)

- **Step 1:** Simplify any expression inside a grouping symbol (e.g. **parentheses**).
- **Step 2:** Simplify **expressions** with exponents.
- **Step 3**: Carry out **multiplication** or division *from left to right.*
- **Step 4:** Simplify **addition** or **subtraction** *from left to right.*

Combined Operations With Decimal Fractions

Follow the mathematical order of operations (PEMDAS)

$$4.7 + 3.6(8.1 \div 1.5) - 14 \div 2.5 =$$

$$4.7 + 3.6(5.4) - 14 \div 2.5 =$$

Step 1: Simplify the expression inside the parentheses.

Combined Operations With Decimal Fractions

Follow the mathematical order of operations (PEMDAS)

$$4.7 + 3.6(8.1 \div 1.5) - 14 \div 2.5 =$$

$$4.7 + 19.44 - 14 \div 2.5 =$$

Step 2: Perform the multiplication.

Combined Operations With Decimal Fractions

Follow the mathematical order of operations (PEMDAS)

$$4.7 + 3.6(8.1 \div 1.5) - 14 \div 2.5 =$$

$$4.7 + 19.44 - 5.6 =$$

Step 3: Perform the division.

Combined Operations With Decimal Fractions

Follow the mathematical order of operations (PEMDAS)

$$4.7 + 3.6(8.1 \div 1.5) - 14 \div 2.5 =$$

$$24.14 - 5.6 =$$

Step 4: Perform the addition.

Combined Operations With Decimal Fractions

Follow the mathematical order of operations (PEMDAS)

$$4.7 + 3.6(8.1 \div 1.5) - 14 \div 2.5 =$$

$$24.14 - 5.6 = 18.54$$

Step 5: Perform the subtraction.

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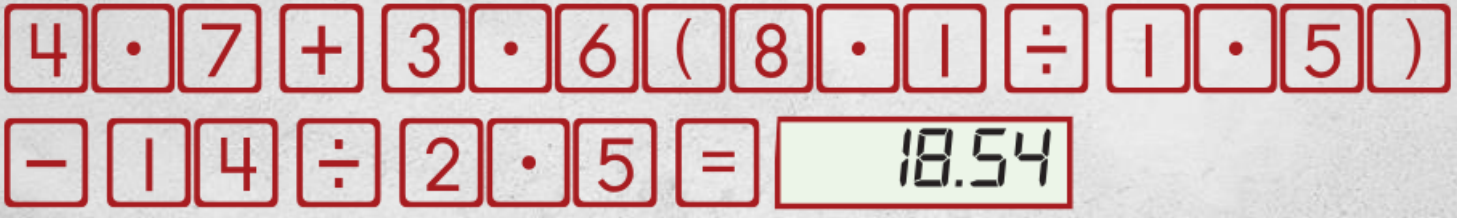
Combined Operations With Decimal Fractions

Solve with a calculator

$$4.7 + 3.6(8.1 \div 1.5) - 14 \div 2.5 =$$



NOTE: Scientific calculators are programmed to follow the rules for order of operations. Basic calculators will result in incorrect answers.

Combined Operations With Decimal Fractions

Solve with a calculator

$$(4.2 \div 2.1) \times 8.3 - 10$$ original problem

$$2 \times 8.3 - 10$$ divide $4.2 \div 2.1$

$$16.6 - 10$$ multiply 2×8.3

$$6.6$$ answer

Combined Operations With Decimal Fractions

Solve with a calculator

$256 - 3.2(4.8 \div 0.06) + 1$	original problem
$256 - 3.2\ (80) + 1$	perform division
$256 - 256 + 1$	perform multiplication
1	answer (after subtraction & addition)

Combined Operations With Decimal Fractions

Solve with a calculator

$$150 - 7.3 \times 6.9 + 0.85 = 100.48$$

$$16 + 14.72 \div 4 - 19 = 0.68$$

$$[81 \div (6 \times 1.5)] + 7.5 \times 2 = 24$$

$$(1.8 \times 2.6) \div (1.17 \times 4) = 1$$

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Mathematics for BAC Craftworkers

Basic Mathematics

Advanced Mathematics

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Help

For additional assistance, please contact: **mathhelp@imtef.org**