## Section 4 – 1 Decimal Notation

Place Value Chart

| 100 | 10 | 1 | $\frac{1}{10}$ | $\frac{1}{100}$ | $\frac{1}{1000}$ | $\frac{1}{10000}$ | $\frac{1}{100000}$ |
|---|---|---|---|---|---|---|---|
| | | | 0.1 | 0.01 | 0.001 | 0.0001 | 0.00001 |
| hundred | ten | one | ten**th** | hundred**th** | thousand**th** | Ten thousand**th** | Hundred thousand**th** |

Identify the place value for underlined digit:

24.38<u>6</u> thousandths

218.021684 millionths

1<u>3</u>16.42 hundreds

Where is the decimal point for 65 ? After the one's place. 65.

WORD NAMES FOR DECIMALS

1) Left of decimal point – Read as a whole number
2) Decimal Point = AND
3) Right of decimal point – Read as whole number but followed by name of last decimal place.

1004.6 one thousand, four AND six tenths

3.042 three AND forty-two thousandths

0.0063 sixty-three ten-thousands

Two hundred AND two hundreds 200.02

Seventy-nine and sixteen thousandths 79.016

CONVERTING A DECIMAL TO A MIXED NUMBER

1) Digits to right of the decimal point are written as the NUMERATORS.
2) Place value of last digit determines the DENOMINATOR.
3) Whole number left unchanged.
4) Simply, if possible.

0.034 → $\frac{34}{1000} = \frac{2x17}{2x500} = \frac{17}{500}$

0.00086 → $\frac{86}{100000} = \frac{2x43}{2x50000} = \frac{43}{50000}$

3.184 → $3\frac{184}{1000} = 3\frac{2x2x2x23}{2x2x2x125} = 3\frac{23}{125}$

WRITING A DECIMAL NUMBER GREATER THAN 1 AS A IMPROPER FRACTON

1) DENOMINATOR is determined by the place value of the last digit.
2) NUMERATOR is determined by removing the decimal point.
3) Simplify

3.17 → $3\frac{17}{100}$ $3\frac{17}{100}$ → $\frac{3x100+17}{100} = \frac{317}{100}$ 3.17 = $3\frac{17}{100}$ $or$ $\frac{317}{100}$

6.38 → $\frac{638}{100}$ → $\frac{2x319}{2x50} = \frac{319}{50}$

15.1 → $\frac{151}{10}$

ORDER

1) Start at left move to the right compare digits.
2) First instance where there is a difference. Larger = larger

Write the number from least to greatest.

3.7, 3.07, 3.69

| | | | |
|---|---|---|---|
| 3 | . | 7 | |
| 3 | . | 0 | 7 |
| 3 | . | 6 | 9 |

Compare tenth place: 0, 6, 9 therefore 3.07, 3.69, 3.7

4.163 [ ] 4.159 >

218.38 [ ] 218.41 <

ROUNDING DECIMALS TO A PLACE VALUE

1) Identify the digit one to RIGHT of place value.
2) If 5 to 9, then add "1" to digit, discard the digits to right.
3) If 1 to 4, discard digits to right.

187.26498 Round to:

Hundredths 187.264 → 187.26

Ten-Thousandths 187.26498 → 187.2650 → 187.265

Hundredths 45.372 → 45.37

Thousandths 134.9996 → 135.000

**Section 4 – 2 Addition and Subtraction of Decimals**

ADDING AND SUBTRACTING

1) Line up the decimal point and write the numbers in columns. Add zeros as place holders after the last digit to right if needed.
2) Add or subtract. Decimal point aligns with the other decimal points.

184.218 + 14.12

| | | | | | | |
|---|---|---|---|---|---|---|
| 1 | 8 | 4 | . | 2 | 1 | 8 |
| + | 1 | 4 | . | 1 | 2 | |
| 1 | 8 | 8 | . | 3 | 3 | 8 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 1 | 8 | 4 | . | 2 | 1 | 8 |
| + | 1 | 4 | . | 1 | 2 | 0 |
| 1 | 9 | 8 | . | 3 | 3 | 8 |

2.90741 + 15.13 + 3

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | 2 | . | 9 | 0 | 7 | 4 | 1 |
| 1 | 5 | . | 1 | 3 | | | |
| + | 3 | . | | | | | |
| 2 | 1 | . | 0 | 3 | 7 | 4 | 1 |

3.194 – 0.512

| | | | | | |
|---|---|---|---|---|---|
| | 3 | . | 1 | 9 | 4 |
| - | 0 | . | 5 | 1 | 2 |
| | 2 | . | 6 | 8 | 2 |

0.397 – 0.1584

| | | | | | | |
|---|---|---|---|---|---|---|
| | 0 | . | 3 | 9 | 7 | 0 |
| - | 0 | . | 1 | 5 | 8 | 4 |
| | 0 | . | 2 | 3 | 8 | 6 |

566.4 – 414.231

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | 5 | 6 | 6 | . | 4 | 0 | 0 |
| - | 4 | 1 | 4 | . | 2 | 3 | 1 |
| | 1 | 5 | 2 | . | 1 | 6 | 9 |

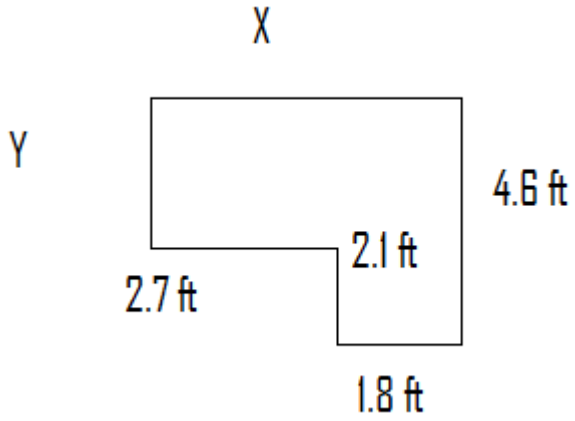
416.04 + 76.2 – 291. 76 = 483.24 – 291.76 = 191.48

Average Height of Girls

| Inches | 38.5 | 44 | 48 | 53.25 | 58.5 | 61.25 |
|---|---|---|---|---|---|---|
| Age (years) | 3 | 5 | 7 | 9 | 11 | 13 |

| | |
|---|---|
| What is the difference (-) in heights between 9 and 3 ? | 53.25 – 38.5 = 14.75 inches |
| What is the difference (-) between 11 and 9 ? | 58.5 – 53.25 = 5.25 inches |

| Check | Debit | Credit | Balance |
|---|---|---|---|
| | | | $437.80 |
| 1426 | $82.50 | | $355.30 |
| Pay | | $514.02 | $869.32 |
| 1427 | $26.04 | | $843.28 |




| | |
|---|---|
| What is X ? | X = 2.7+1.8 = 4.5 feet |
| What is Y ? | Y = 4.6 – 2.1 = 2.5 feet |
| What is perimeter? | P = 2.7+2.1+1.8+4.6+4.5+2.5=18.2 |

## Section 4 – 3 Multiplication of Decimals

MULTIPLYING TWO DECIMALS

1) Multiply as if whole number.
2) Count ALL the decimal places in all numbers.
3) Move the decimal point to the LEFT. May have to add ZERO's

2.72 (two) * 1.4 (one) = 3808 (three) = 3.808

19.7 * 4.1 = 80.77 est 20x4 = 80

1.9 * 29.1 = 55.29 est 2x30 = 60

4.6 * 0.00008 = 0.000368

MULTIPLYING BY FACTORS OF 10 (Divide by "0.1"s)

Move the decimal point to the RIGHT the same number of ZERO's:

81.6 * 1000 = 81,600

0.0000085 * 10,000 = 0.085

2.396 * 10,000,000 = 23,960,000

MULTIPLYING BY FACTORS OF 0.1 (Divide by 10's)

Move the decimal point to the LEFT the same number of DECIMAL PLACES.

471.034 * 0.01 = 4.71034

9,437,214.5 * 0.00001 = 94.372145

0.0004 * 0.001 = 0.0000004

NAMING LARGE NUMBERS

Million = 1,0000,000 = 6 ZERO's

Billion = 1,000,000,000 = 9 ZERO's

Trillion = 1,000,000,000,000 = 12 ZERO's

1.6 million → 1.6 * 1,000,000 = 1,600,000

5.9 trillion → 5.9 * 1,000,000,000,000 = 5,900,000,000,000

31 thousand → 31 * 1,000 = 31,000

| | |
|---|---|
| A book club ordered 12 book for $8.99 each (*) and shipping cost (+) $4.95. What was the total bill? | T.B. = $8.99 * 12 + $4.95<br>T.B. = $107.88 + $4.95<br>T.B. = $112.83 |

| | |
|---|---|
| What is the area of the IMAX screen (A = LxW) which is 18m by 24.4m ? | A = 18m *24.4m = 439.2 $m^2$ |

**Section 4 – 4 Division of Decimals**

DIVIDING A DECIMAL BY A WHOLE NUMBER

1) Place the decimal point in the quotient directly above the decimal point in the dividend.
2) Divide as you would whole numbers.

502.96 ÷ 8 = 62.87

6.8 ÷ 5 = 1.36

3 ÷ 20 = 0.15

How far to go in dividing? Look at answers on test. Have as many decimal places as the most of the problem.

Terminating Decimal – stop, i.e., end with ZERO's. Divisors with JUST Factors of "2" and/or "5" terminate.

$1 \div 2 = 0.50000000000 = 0.5$

Repeating Decimal – end in a repeating pattern – FOREVER.

$1 \div 3 = 0.333333333 \ldots = 0.\overline{3}$

$2.4 \div 9 = 0.26666 = 0.2\overline{6}$

$57 \div 11 = 5.1818181818 = 5.\overline{18}$

DIVIDING WHEN THE DIVISOR IS NOT A WHOLE NUMBER

1) Move the decimal point of the divisor to make it a whole number.
2) Move the decimal point of the dividend the SAME number of PLACES to RIGHT.
3) Divide.

$0.64 \div 0.4 = 1.6$

$5.4 \div 0.03 = 180$

$70 \div 0.6 = 116.\overline{6}$

DIVIDING BY POWERS OF 10 (Multiply by powers of "0.1"s)

Move the Decimal Point to the LEFT the same number of ZERO's

$162.8 \div 1000 = 0.1628$

$0.0039 \div 10 = 0.00039$

Round a Repeating Decimal.

Use enough repeats of the decimal so that rounding is possible.

Round to thousandths: $2.\overline{315}$ $2.31\underline{5}315$ 2.315

Round quotient to hundreds: 42.68 ÷ 5.1 = 8.3$\underline{6}$862 = 8.37

| | |
|---|---|
| A 46.5 ft cable is cut into 6 pieces (÷), how long is each piece? | 46.5 ft ÷ 6 = 7.75 ft |

| | |
|---|---|
| 200 m run in 21.3 sec. What is the speed in m/sec. Round to nearest tenth. | $\frac{200\ m}{21.3\ sec}$ = 9.38 m/sec<br>9.4 m/sec |

**Section 4 – 5** **Fractions as Decimals**

Writing Fractions as Decimals:

Just Divide.

$$\frac{3}{8} = 0.375$$

$$\frac{43}{20} * \frac{5}{5} = \frac{215}{100} = 2.15$$ Just divide.

$$12\frac{5}{16} = 12 + \frac{5}{16} = 12 + 0.3125 = 12.3125$$

$$\frac{8}{9} = 0.8888 \ldots = 0.\overline{8}$$

$$\frac{1}{12} = 0.0833 \ldots = 0.08\overline{3}$$

$$\frac{3}{7} = 0.428571428571 = 0.\overline{428571}$$

Round to tenths $\frac{9}{7} = 1.28 = 1.3$

Round to hundredths $\frac{17}{37} = 0.459 = 0.46$

| Decimal | Fraction |
|---|---|
| 0.875 | $\frac{7}{8}$ |
| 0.35 | $\frac{7}{20}$ |
| $2.\overline{3}$ | $2\frac{1}{3}$ |
| $0.\overline{7}$ | $\frac{7}{9}$ |

## Section 4 – 6 Order of Operations and Application of Decimals

PSMDAS – nothing changed.

$(5.8 - 4.3)^2 - 2 = (1.5)^2 - 2 = 2.25 - 2 = 0.25$

Calculation with Decimals and Fractions

1) Change everything to Decimal
2) Change everything to Fraction
3) Just Do it.

$4.2 \div \frac{4}{3}$

Method 1: $4.2 \div \frac{4}{3} = 4.2 * \frac{3}{4} = 4.2 * 0.75 = 3.15$

Method 2: $4.2 \div \frac{4}{3} = \frac{42}{10} * \frac{3}{4} = \frac{126}{40} = \frac{63}{20} = 3.15$

Method 3: $4.2 \div \frac{4}{3} = \frac{4.2}{1} * \frac{3}{4} = \frac{12.6}{4} = 3.15$

$2.6 * \frac{3}{13} \div (1\frac{1}{2})^2 = \frac{2.6}{1} * \frac{3}{13} \div (1.5)^2 =$

$$0.6 \div 2.25 = 0.26666 \ldots = 0.2\overline{6}$$

$2.6 * \frac{3}{13} \div (1\frac{1}{2})^2 = \frac{26}{10} * \frac{3}{13} \div (\frac{3}{2})^2 = \frac{26*3*4}{10*13*9} = \frac{2*2}{5*3} = \frac{4}{15}$

Calculations with Round-0ff Errors

$18.9 * \frac{4}{9} = 18.9 * 0.\overline{4} = 7.56$ or 18.9*0.44=8.316 or 18.9*0.444=8.3916

$18.9*\frac{4}{9} = \frac{75.6}{9} = 8.4$ (NO ERROR)

Round to hundredths $4.1 \div \frac{12}{5} = 4.1 * \frac{5}{12} = \frac{20.5}{12} = 1.7083 \ldots$=1.71

| | |
|---|---|
| Odometer read 46,125.9 mi, after $13\frac{1}{4}$ hr trip, the odometer read 46,947.4 mi.<br>a) what is total distance (end-start)<br>b) What is average speed in mph? | a) 46,947.4 – 46125.9 = 821.5 mi<br>b) $\frac{miles}{hours} = \frac{821.5\ mi}{13.25\ hours} = 62\ mph$ |

| | |
|---|---|
| A marathon is 26.2 miles long, an runner stops $\frac{3}{5}$ of the way (*).<br>a) How many miles had he run?<br>b) How many miles left? (-) | a) 26.2 mi $* \frac{3}{5} = 26.2 * 0.6 =$ $15.72\ miles$<br>b) 26.2 – 15.72 = 10.48 miles |

| | |
|---|---|
| What is the average of wages: \$489.25, \$645.90, \$392.50, and \$410.00 . | $\frac{489.25 + 645.90 + 392.50 + 410.00}{4}$<br>$\frac{1937.65}{4}$ = 484.4125 = \$484.41 |