JOBWORKS

ADULT LEARNING CENTRE

INFORMATION AND PREPARATION FOR ESSENTIAL MATHEMATICS (40S)

For the best chance of success in this course, please be prepared to attend classes, study, and do homework regularly.

Students taking this course are **required** to have a calculator.

Only calculators can be used during quizzes, tests, and exams. Staff will not have any spare calculators to loan.

The use of cell phones/electronic devices as a calculator will not be permitted.

Teachers will focus on covering the content in the curriculum of this course. Limited time will be spent on reviewing skills and concepts that should have already been acquired by this level. To prepare for this course in advance, being familiar with the following topics would be beneficial:

- Place Value
- Rounding Numbers
- Order of Operations
- Operations with Fractions
- Operations with Signed Numbers
- Operations with Exponents
- Percents
- Solving Equations
- Metric Conversions

A basic review on the topics listed above is attached. Visit www.purplemath.com or www.khanacademy.org for tutorials. Additional resources can also be found online.

Free tutoring may be available if necessary. Visit the front desk staff to sign up after attending at least one class. Note that there is always a high demand for the limited number of spots. Students will be accommodated on a first come, first served basis if a tutor is available. Students interested in paying for a tutor can contact the Association of Independent Tutors at 204-226-3437 or at www.independenttutors.com.

Contact us at (204) 453-8351 or visit our website at www.jobworksschool.com if there are any questions or concerns.

Place Value

In the decimal numerical system each digit of a number has a place value 10 times more than the place value to the right and 10 times less than the place value to the left. For example, in the number 123, the digit "1" represents a value of 1 hundred and the digit "2" represents 2 tens and the digit "3" represents 3 ones.

Consider the number 450 237.916. The place value for each digit is shown below.

Digit	Place Value (in Words)	Place Value (in Numbers)
Digit 4:	hundred thousands	100 000
Digit 5:	ten thousands	10 000
Digit 0:	thousands	1000
Digit 2:	hundreds	100
Digit 3:	tens	10
Digit 7:	ones	1
Digit 9:	ten**ths**	0.1
Digit 1:	hundre**dths**	0.01
Digit 6:	thousand**ths**	0.001

Place value needs to be considered when a number in a specific position requires rounding. For example, all money amounts should be rounded to the nearest cent, which in decimal notation is the *hundredths* place value as one cent represents one hundredth of a dollar.

eg. $10.05 (ten dollars and five cents)

eg. What is the place value of each underlined digit shown below?

23<u>6</u>5.76	tens
34.0<u>8</u>	hundredths

Rounding Numbers

Round up when the digit following the place value to be rounded is 5, 6, 7, 8, or 9.

eg. Round the following number to the nearest tenth.

24.567

The 5 in the tenth position is followed by 6, therefore the rounded number is:

24.6

Round down when the digit following the place value to be rounded is 0, 1, 2, 3, or 4.

eg. Round the following number to the nearest hundredth.

24.563

The 6 in the hundredth position is followed by 3, therefore the rounded number is:

24.56

eg. Round the following numbers to the indicated place value.

45.768 to the nearest hundredth = 45.77

679.34 to the nearest unit = 679

31 234.22 to the nearest thousand = 31 000

Order of Operations

The four basic operations of arithmetic are addition, subtraction, multiplication and division. When more than one operation appears we must follow a prescribed order:

i) Division ii) Multiplication iii) Addition iv) Subtraction

However, brackets are used to force an operation. This means that we must do brackets, along with exponents, first. Thus the order of operations becomes:

Brackets
Exponents
Division
Multiplication
Addition
Subtraction

We can use the acronym "BEDMAS" to help us remember this order.

eg. $11 + \underbrace{20 \div 5} - \underbrace{3 \times 2}$

$= 11 + 4 - 6$

$= 15 - 6$

$= 9$

However, if we insert brackets and exponents we get:

eg. $11 + 20 \div (5-3)^2 \times 2$

$= 11 + 20 \div 2^2 \times 2$

$= 11 + \underbrace{20 \div 4} \times 2$

$= 11 + \underbrace{5 \times 2}$

$= 11 + 10$

$= 21$

Operations with Fractions

Addition:

eg. $\frac{4}{8}+\frac{1}{8}=\frac{4+1}{8}=\frac{5}{8}$

Rule: For addition of fractions with like denominators add the numerators together. The denominator will remain the same.

$\frac{a}{b}+\frac{c}{d}=\frac{ad+bc}{bd}$

eg. $\frac{1}{3}+\frac{2}{5}=\frac{5+6}{15}=\frac{11}{15}$

Rule: When the fractions DO NOT have the same denominator, create equivalent fractions that have the same denominator, and then add the numerators.

eg. $\frac{5}{8}+\frac{1}{2}=\frac{5}{8}+\frac{1\times4}{2\times4}=\frac{5}{8}+\frac{4}{8}=\frac{5+4}{8}=\frac{9}{8}$

Subtraction:

eg. $\frac{5}{7}-\frac{1}{7}=\frac{5-1}{7}=\frac{4}{7}$

Rule: For subtraction of fractions with like denominators subtract the numerators. The denominator will remain the same.

$\frac{a}{b}-\frac{c}{d}=\frac{ad-bc}{bd}$

eg. $\frac{4}{5}-\frac{1}{2}=\frac{8-5}{10}=\frac{3}{10}$

Rule: When the fractions DO NOT have the same denominator, create equivalent fractions that have the same denominator, and then subtract the numerators.

Multiplication:

$$\frac{a}{b} \times \frac{c}{d} = \frac{ac}{bd}$$

eg. $\frac{5}{8} \times \frac{3}{5} = \frac{5\times3}{8\times5} = \frac{15}{40}$

eg. $\frac{5}{7} \times \frac{3}{8} = \frac{5\times3}{7\times8} = \frac{15}{56}$

Rule: For multiplication of fractions multiply the numerators and multiply the denominators.

Division:

$$\frac{a}{b} \div \frac{c}{d} = \frac{a}{b} \times \frac{d}{c} = \frac{ad}{bc}$$

eg. $\frac{1}{9} \div \frac{3}{4} = \frac{1}{9} \times \frac{4}{3} = \frac{1 \times 4}{9 \times 3} = \frac{4}{27}$

Rule: For division of fractions multiply the first fraction by the reciprocal of the second fraction. Start by finding the reciprocal of the second fraction (reverse the numerator and denominator). Then multiply the two numerators and the two denominators.

Reducing Fractions:

- Final answers of fractions must be reduced to lowest terms.
- To reduce a fraction to lowest terms divide the numerator and the denominator by the greatest common factor.

  eg. $\frac{\cancel{15}^{3}}{\cancel{40}_{8}} = \frac{3}{8}$

  Divide 15 and 40 by the greatest common factor which is 5 to get the fraction in lowest terms.

- For multiplication only, cancel common factors before beginning the process.

  eg. $\frac{\cancel{5}^{1}}{8} \times \frac{3}{\cancel{5}_{1}} = \frac{1\times3}{8\times1} = \frac{3}{8}$

- In the case that a fraction is not reduced to lowest terms after dividing by a common factor (that is not the greatest common factor) continue dividing by common factors until the fraction is reduced to lowest terms.

  eg. $\frac{30}{100} = \frac{30\div2}{100\div2} = \frac{15}{50} = \frac{15\div5}{50\div5} = \frac{3}{10}$

Operations with Signed Numbers

Addition:

Rules:

1) If signs are both the same then add the numbers and keep the same sign.

eg. $3 + 5 = 8$

$(-3) + (-5) = -8$

2) If signs are different then subtract the smaller number from the larger number and attach the sign of the larger number.

eg. $3 + (-5) = -2$

$(-3) + 5 = 2$

Subtraction:

Subtraction means adding the opposite. We change the subtraction operation "-" to adding the opposite "+-" and use the rules for addition.

eg. $(-5) - 3 = (-5) + (-3) = -8$

$5 - (-3) = 5 + -(-3) = 5 + 3 = 8$

Multiplication & Division:

Rules:

1) An even number of negative signs results in a positive answer.
2) An odd number of negative signs results in a negative answer.

eg. $(-2) \times (-3) = 6$

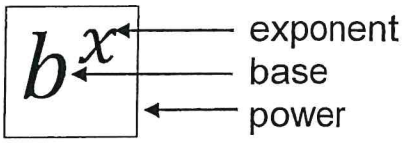
$2 \times (-3) = -6$

eg. $8 \div (-4) = -2$

$(-8) \div (-4) = 2$

Operations with Exponents

A power is made up of a base and an exponent.



The notation above means b multiplied by itself x times.

eg. $3^2 = 3 \times 3 = 9$

$(-2)^3 = (-2)(-2)(-2) = -8$

$-3^2 = -(3 \times 3) = -9$ .... only the '3' is squared

$(-3)^2 = (-3) \times (-3) = 9$ .... here "-3" is squared.

If the exponent is negative then:

eg. $3^{-2} = \frac{1}{3^2} = \frac{1}{3 \times 3} = \frac{1}{9}$

$-3^{-2} = -\frac{1}{3^2} = \frac{-1}{3 \times 3} = \frac{-1}{9}$

eg. $(1+x)^3 = (1+x)(1+x)(1+x)$

$(1+x)^{-3} = \frac{1}{(1+x)^3} = \frac{1}{(1+x)(1+x)(1+x)}$

Percents

$$0.25 = \frac{25}{100} = 25\%$$

As a decimal — As a fraction — As a percent

The symbol "%" means "for every 100" OR "divided by 100"

eg. $12\% = \frac{12}{100} = 0.12$

$\frac{15.5}{100} = 0.155 = 15.5\%$

$0.16 = 16\% = \frac{16}{100}$

$0.013 = \frac{1.3}{100} = 1.3\%$

eg. What is 15% of $68.00?

0.15 x 68 = $10.20

eg. What percent is $30 of $40?

$\frac{30}{40} = \frac{3}{4} = \frac{75}{100} = 75\%$

or Using a calculator

$\frac{30}{40} = 0.75 = 75\%$

eg. What percentage do the following represent?

24 of 30 = 80%

0.15 of 0.76 = 20%

Solving Equations

To solve an equation means to find a value for the unknown variable that satisfies the equation. This process involves isolating the unknown variable.

eg. Solve for x:

$x + 3 = 5$ Subtracting '3' from both sides of the equation we get:

$x = 2$

Isolating involves undoing every operation that was done to the unknown variable. Undoing means performing the inverse operation to both sides of the equation.

ie In the eg above '3' was added to 'x' to give '5' so to undo adding '3' we must 'subtract 3' from both sides of the equation to get x = 2.

Notes:

1) Addition and Subtraction are inverse operations of each other.
2) Multiplication and Division are inverse operations of each other.

eg. $x - 1 = 4$

$x = 4 + 1$ (Add '1' to both sides)

$x = 5$

eg. $5x = 10$

$x = \frac{10}{5}$ (Divide both sides by '5')

eg. $20 = \frac{x}{2}$

$x = 20(2)$ (Multiply both sides by '2')

$x = 40$

eg. $2 - x = 5$

$2 = 5 + x$ (Add 'x' to both sides)

$-3 = x$ (Subtract '5' from both sides)

or $x = -3$

Solve for 'x' in each eg below.

eg. $x + c = b$

$\boxed{x = b - c}$

eg. $\frac{x + a}{b} = c$

$x + a = bc$

$\boxed{x = bc - a}$

eg. $\frac{x - A}{M} = y + B$

$x - A = M(y + B)$

$\boxed{x = A + M(y + B)}$

eg. $C - B = \frac{A + D}{x}$

$x(C - B) = A + D$

$\boxed{x = \frac{A + D}{C - B}}$

When the variable appears on both sides of the equation we must combine like terms first, then factor, in order to isolate.

eg. $Ax + B = Cx + D$

$Ax - Cx = D - B$

$x(A - C) = D - B$

$\boxed{x = \frac{D - B}{A - C}}$

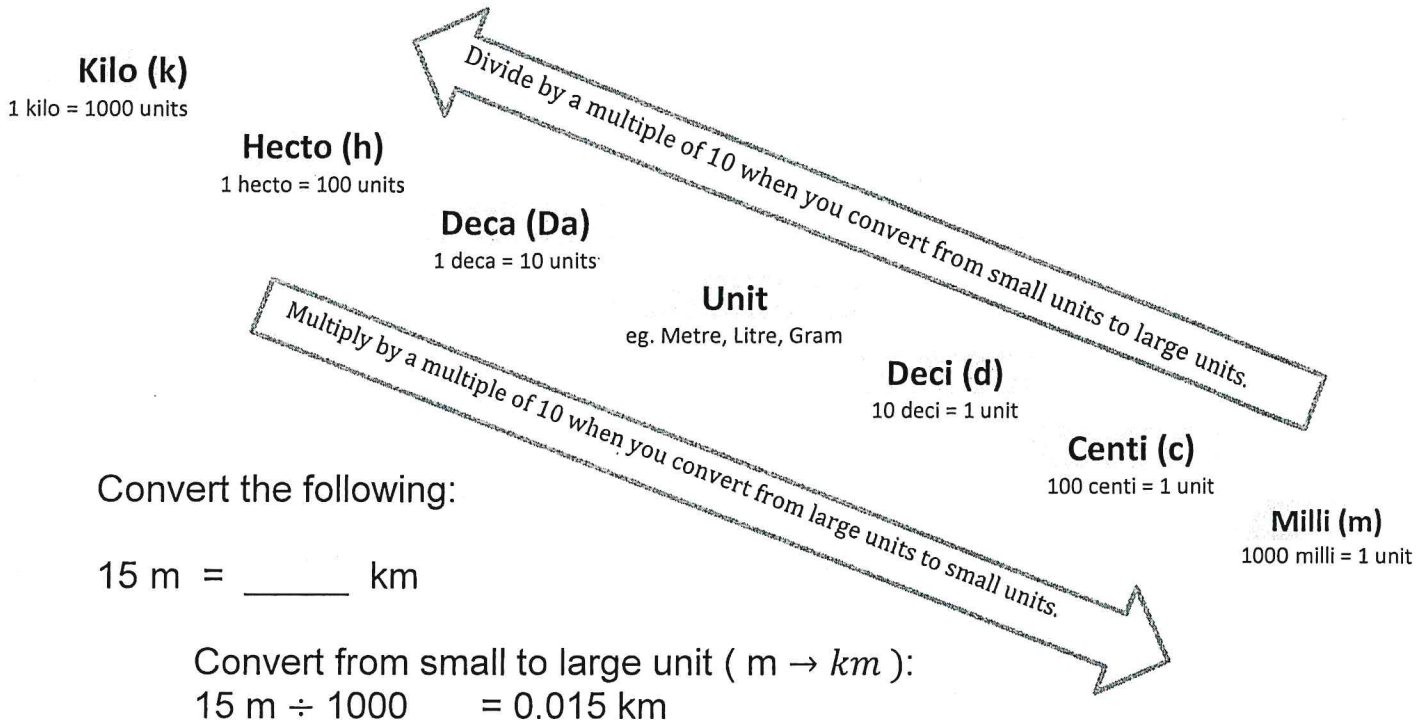
eg. $5x - A = 3B - x$

$5x + x = 3B + A$

$6x = 3B + A$

$\boxed{x = \frac{3B + A}{6}}$

Metric Conversions



Convert the following:

15 m = _____ km

Convert from small to large unit (m → km):
15 m ÷ 1000 = 0.015 km

5 m = _____ cm

Convert from large to small unit (m → cm):
5 m × 100 = 500 cm

1478 cm =_____ km

Convert from small to large unit (cm → m → km):
1478 cm ÷ 100 = 14.78 m
14.78 m ÷ 1000 = 0.01478 km

OR (cm → km)

1478 cm ÷ 100 000 = 0.01478 km

Convert:

7.5 L to ml	= 7500 ml
0.65 kg to g	= 650 g
45211 cm to dam (decameters)	= 45.211 dam