

MATH REVIEW SHEETS
BEGINNING ALGEBRA

A Summary of Concepts Needed to be Successful in Mathematics

The following sheets list the key concepts which are taught in the specified math course. The sheets present concepts in the order they are taught and give examples of their use.

WHY THESE SHEETS ARE USEFUL –

- To help refresh your memory on old math skills you may have forgotten.
- To prepare for math placement test.
- To help you decide which math course is best for you.

HOW TO USE THESE SHEETS –

- Students who successfully review spend from four to five hours on this material. We recommend that you cover up the solutions to the examples and try working the problems one by one. Then, check your work by looking at the solution steps and the answer.

KEEP IN MIND –

- These sheets are not intended to be a short course. You should use them to simply help you determine at what skill level in math you should begin study. For many people, the key to success and enjoyment of learning math is in getting started at the right place. You will, most likely, be more satisfied and comfortable if you start onto the path of math and science by selecting the appropriate beginning stepping stone.

MATH REVIEW SHEETS – BEGINNING ALGEBRA REVIEW

The following concepts and types of problems are studied in Beginning Algebra. In order to be successful in the next course (Elementary Algebra), you should know the concepts shown here.

CONCEPTS –SAMPLE PROBLEMS OF CONCEPTS –

*Arithmetic Operations

Fractions:

1. $\frac{35}{25} = \frac{5 \cdot 7}{5 \cdot 5} = \frac{7}{5}$

2. $\left(\frac{8}{5}\right)\left(\frac{25}{12}\right) = \left(\frac{4 \cdot 2}{5}\right)\left(\frac{5 \cdot 5}{4 \cdot 3}\right) = \frac{10}{3}$

3. $\frac{9}{8} - \frac{7}{12} = \frac{9 \cdot 3}{8 \cdot 3} - \frac{7 \cdot 2}{12 \cdot 2} = \frac{27 - 14}{24} = \frac{13}{24}$

Decimals:

1. $\frac{4}{5} = 0.8$

2. $\frac{23}{9} = 2.\bar{5}$

Exponents:

1. $3^4 = 3 \cdot 3 \cdot 3 \cdot 3 = 81$

2. $2^3 \cdot 3^0 = 2 \cdot 2 \cdot 2 \cdot 1 = 8$

3. $\left(\frac{2}{5}\right)^0 3^2 = 1 \cdot 3 \cdot 3 = 9$

4. $\frac{4^7}{4^3} = 4^{7-3} = 4^4 = 4 \cdot 4 \cdot 4 \cdot 4 = 256$

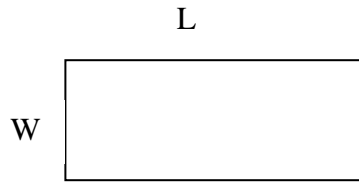
Percent Notation:

1. $45.6\% = \frac{45.6}{100} = \frac{456}{1000} = 0.456$

2. $\frac{1}{5}\% = \frac{1}{5}\left(\frac{1}{100}\right) = \frac{1}{500} = 0.002$

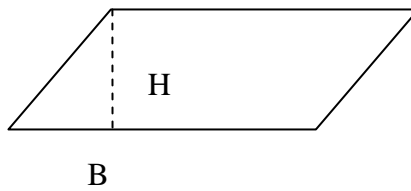
CONCEPTS –

*Basic Geometric Formulas

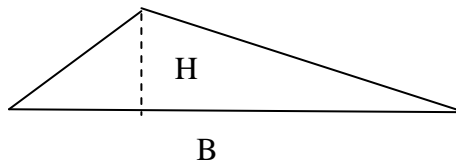
 P =Perimeter A =Area B =Base H =Height C =Circumference R =Radius

$$P = 2W + 2L$$

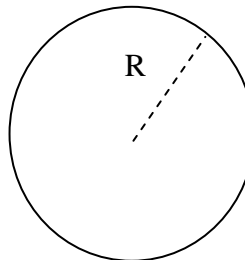
$$A = L \cdot W$$



$$A = B \cdot H$$



$$A = \frac{1}{2} B \cdot H$$



$$C = 2\pi R$$

$$A = \pi R^2$$

CONCEPTS –*Integer Expressions

1. $-9 + 5 = -4$
2. $-6 + (-2) = -8$
3. $-6 - 3 = -9$
4. $-5 - (-5) = 0$
5. $4 \cdot (-20) = -80$
6. $(-7) \cdot (-6) = 42$

*Rational Expressions

1. $\frac{-32}{-4} = 8$
2. $26 \div (-13) = \frac{26}{-13} = -2$

*Arithmetic of Integer/Rational Expressions

1. $-3.6 + 1.9 = -1.7 = -1\frac{7}{10} = -\frac{17}{10}$
2. $-\frac{5}{9} + \left(-\frac{1}{18}\right) = -\frac{10}{18} - \frac{1}{18} = -\frac{11}{18}$
3. $\left(-\frac{1}{2}\right)\left(-\frac{4}{3}\right)\left(-\frac{5}{2}\right) = -\frac{4 \cdot 5}{4 \cdot 3} = -\frac{5}{3}$
4. $-\frac{12}{7} \div \left(\frac{-3}{4}\right) = -\frac{12}{7} \cdot \left(-\frac{4}{3}\right) = -\frac{4}{7}(-4) = \frac{16}{7}$

*Using the Distributive LawMultiplying:

1. $-2(5-3) = (-2)(5) + (-2)(-3) = -10 + 6 = -4$
2. $5(2-7) = 10 - 35 = -25$
3. $3(x-5) = 3x - 15$
4. $3b(2x-3y+4) = 6bx - 9by + 12b$

Factoring:

1. $4x - 8 = 4 \cdot x - 4 \cdot 2 = 4(x - 2)$
2. $3x - 6y + 9 = 3(x - 2y + 3)$

CONCEPTS –SAMPLE PROBLEMS OF CONCEPTS –***Solving Simple Equations**

1. $7x = 42$

$$\frac{7x}{7} = \frac{42}{7}$$

$$x = 6$$

2. $9x + 5 = 86$

$$9x = 86 - 5$$

$$9x = 81$$

$$x = 9$$

3. $\frac{3}{4}x = 21$

$$\left(\frac{4}{3}\right)\frac{3}{4}x = \left(\frac{4}{3}\right)21$$

$$x = 4 \cdot 7$$

$$x = 28$$

4. *20% of 40 is what?*

$$20\% \cdot 40 = x$$

$$20\left(\frac{1}{100}\right) \cdot 40 = x$$

$$\frac{20}{100} \cdot 40 = x$$

$$8 = x$$

5. *45 is 60% of what?*

$$45 = 60\% \cdot x$$

$$45 = \frac{60}{100} \cdot x$$

$$\frac{10}{6} \cdot 45 = x$$

$$75 = x$$

6. *What percent of 10 is 5?*

$$x\% \cdot 10 = 5$$

$$x \cdot \frac{10}{100} = 5$$

$$x = 5 \cdot 10$$

$$x = 50$$

CONCEPTS –

*Scientific Notation

SAMPLE PROBLEMS OF CONCEPTS –

1. $5,000,000 = 5 \times 10^6$
2. $4.2 \times 10^{-3} = 0.0042$
3.
$$\begin{aligned} \frac{1.2 \times 10^{-4}}{2.0 \times 10^{-7}} &= 0.6 \times \frac{10^{-4}}{10^{-7}} \\ &= 0.6 \times 10^{-4-(-7)} \\ &= 0.6 \times 10^3 \\ &= 6.0 \times 10^{-1} \times 10^3 \\ &= 6.0 \times 10^2 \end{aligned}$$

*Solving More Equations

1.
$$\begin{aligned} x - \frac{2}{3} &= \frac{7}{3} \\ x &= \frac{7}{3} + \frac{2}{3} \\ x &= \frac{9}{3} \\ x &= 3 \end{aligned}$$
2.
$$\begin{aligned} -3.1y &= 21.7 \\ y &= \frac{21.7}{-3.1} \\ y &= -7 \end{aligned}$$
3.
$$\begin{aligned} 8x - 4 &= 28 \\ 8x &= 32 \\ x &= 4 \end{aligned}$$
4.
$$\begin{aligned} 5(x + 4) &= 3(x - 2) \\ 5x + 20 &= 3x - 6 \\ 2x &= -26 \\ x &= -13 \end{aligned}$$
5.
$$\begin{aligned} (x + 9)(x - 3) &= 0 \\ x + 9 = 0 \text{ or } x - 3 = 0 \\ x = -9 \text{ or } x = 3 \end{aligned}$$

CONCEPTS –

*Solving More Equations
continued

$$6. \quad \frac{5}{7}x\left(\frac{3}{4}x - 6\right) = 0$$

$$\frac{5}{7}x = 0 \quad \text{or} \quad \frac{3}{4}x - 6 = 0$$

$$x = 0 \quad \text{or} \quad x = 6\left(\frac{4}{3}\right) = 8$$

*Solving Formulas

1. Solve $I = PRT$ for T

$$\frac{I}{PR} = \frac{PRT}{PR}$$

$$\frac{I}{PR} = T$$

2. Solve $P = 2L + 2W$ for L

$$P = 2L + 2W$$

$$P - 2W = 2L$$

$$\frac{P - 2W}{2} = \frac{2L}{2}$$

$$\frac{P - 2W}{2} = L$$

*Polynomials
Addition

$$1. \quad (3x^2 + 2x) + (-2x^2 + 5) = x^2 + 2x + 5$$

$$2. \quad (4x^2 - 5x + 3) + (-2x^2 + 2x - 4) = 2x^2 - 3x - 1$$

Subtraction

$$(7x^3 - 2x^2 + 6) - (7x^2 + 2x - 4) = 7x^3 - 9x^2 - 2x + 10$$

Multiplication

$$1. \quad (x + 5)(x - 4) = x^2 + 5x - 4x - 20$$

$$= x^2 + x - 20$$

$$2. \quad (2x^3 + 6x + 1)(2x + 1) = 4x^4 + 2x^3 + 12x^2 + 6x + 2x + 1$$

$$= 4x^4 + 2x^3 + 12x^2 + 8x + 1$$

CONCEPTS –

*Polynomials continued
Special Products

SAMPLE PROBLEMS OF CONCEPTS –

1. $a^2 - b^2 = (a - b)(a + b)$
2. $a^2 + b^2$ is not factorable
3. $(a + b)^2 = a^2 + 2ab + b^2$
4. $(a - b)^2 = a^2 - 2ab + b^2$
5. $(x + 4)(x - 4) = x^2 - 16$
6. $(2x - 1)^2 = 4x^2 - 4x + 1$

*Factoring Polynomials

1. $x^2 + 3x = x(x + 3)$
2. $2x^2 + 2x - 8 = 2(x^2 + x - 4)$
3. $x^5 + x^4 + x^3 - x^2 = x^2(x^3 + x^2 + x - 1)$
4. $16x^2 + 20x - 12x - 15 = 4x(4x + 5) - 3(4x + 5)$
 $= (4x + 5)(4x - 3)$
5. $x^2 - x - 2 = (x - 2)(x + 1)$
6. $2x^2 + 4x - 6 = 2(x^2 + 2x - 3)$
 $= 2(x + 3)(x - 1)$
7. $x^2 - 64 = (x + 8)(x - 8)$
8. $9x^2 + 16y^2$ is not factorable
9. $3x^2 - 12x + 12 = 3(x^2 - 4x + 4)$
 $= 3(x - 2)(x - 2)$

CONCEPTS –SAMPLE PROBLEMS OF CONCEPTS –

*Solving Polynomial Equations
Factoring

1. *Solve*: $x^2 - 3x = 28$

$$\begin{aligned}x^2 - 3x &= 28 \\x^2 - 3x - 28 &= 0 \\(x - 7)(x + 4) &= 0 \\x - 7 = 0 \text{ or } x + 4 = 0 \\x = 7 \text{ or } x &= -4\end{aligned}$$

2. *Solve*: $-4x + x^2 = 0$

$$\begin{aligned}-4x + x^2 &= 0 \\x(-4 + x) &= 0 \\x = 0 \text{ or } -4 + x &= 0 \\x &= 4\end{aligned}$$

Completing the Square

Solve: $x^2 - 16x + 64 - 100 = 0$

$$\begin{aligned}(x - 8)^2 - (10)^2 &= 0 \\(x - 8 - 10)(x - 8 + 10) &= 0 \\(x - 18)(x + 2) &= 0 \\x - 18 = 0 \text{ or } x + 2 &= 0 \\x &= -2\end{aligned}$$

CONCEPTS –

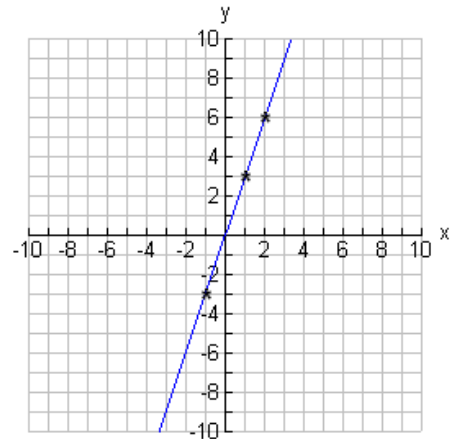
SAMPLE PROBLEMS
OF CONCEPTS –

*Graphs

Graphing Equations

Graph: $y = 3x$

x	y
-1	-3
0	0
1	3
2	6



Graph using intercepts:

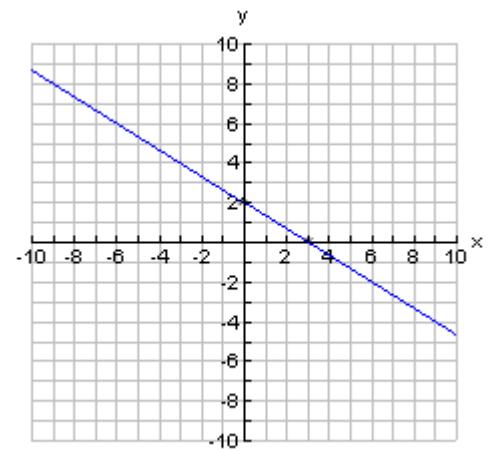
$$2x + 3y = 6$$

$$x = 0, \quad 3y = 6$$

$$y = 2 \quad (0, 2)$$

$$y = 0, \quad 2x = 6$$

$$x = 3 \quad (3, 0)$$



*Solving Systems of Equations

Substitution Method

Solve: $x + y = 5$
 $x = y + 1$

$$(y + 1) + y = 5$$

$$2y + 1 = 5$$

$$2y = 4$$

$$y = 2$$

$$x = y + 1 = (2) + 1 = 3 \quad \text{Answer : } (3, 2)$$

Addition Method

Solve: $5x + 3y = 17$
 $5x - 2y = -3$

$$-5x - 3y = -17 \quad \text{multiplied by } (-1)$$

$$\underline{5x - 2y = -3}$$

$$-5y = -20$$

$$y = 4$$

$$5x - 2y = -3 \rightarrow 5x - 2(4) = -3$$

$$5x - 8 = -3$$

$$5x = 5$$

$$x = 1 \quad \text{Answer : } (1, 4)$$

