

OBJECTIVES FOR THE MPECA.
(Placement Exam For Math 1100 and Math 1120)

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NO CALCULATORS ARE ALLOWED ON THE MPECA.

PRACTICE THE FOLLOWING EXERCISES WITHOUT A CALCULATOR.

Topics from Pre-Algebra

- **Perform operations (+, -, x, ÷) with whole numbers, decimals, fractions and integers.**
Exs: $234.45 + 23.6 - 16.78 =$;

$$64.2 \times 0.23 =; \quad 2.3 \overline{)1297.2}; \quad \frac{0.003 \times 24,000}{3,600};$$
$$1 \frac{2}{12} - \frac{3}{16} =; \quad \frac{-(-2)(-3) + (-12) \div (-4)}{-(-3)} =;$$

- **Convert from standard notation to scientific notation and back.**

Exs: Express in scientific notation: 23 million; 15 hundredth; 12,500; 0.00047.

Perform the indicated operations and express the answer in scientific notation:

$$\frac{0.003 \times 24,000}{3,600}$$

Express in standard form: 2.45×10^3 ; 4.7×10^{-4} .

- **Find multiples and factors of integers.**

Exs: Express as a product of prime factors: 108

Find the LCM of 12 & 16; of 12, 16 & 18.

Find the GCF of 12 & 16; of 12, 16 & 18.

- **Work problems involving ratios, proportions and percents.**

Ex: A gourmet coffee shop offers a blend containing 2 pounds of Colombian coffee for every 3 pounds of Brazilian coffee. How many pounds of Colombian coffee are needed to prepare 120 pounds of this blend?

- **Evaluate arithmetic expressions involving absolute values.**

Ex: $-3 + 4 - |-8| = ?$

Topics from Elementary Algebra

- **Evaluate algebraic expressions for specified values of the variables.**

Ex: Evaluate: $\frac{-a^2 - b^3 - 4|2a - b|}{2a - 3b^c}$, for $a = -2$, $b = -1$, $c = 0$.

- **Evaluate one of the variables in a formula, given the values of all the other variables.**

Exs: The area A , of a trapezoid with bases a & b and height h is given by the formula:

$$A = \frac{1}{2}h(a + b). \text{ Find } b, \text{ if } A = \frac{12}{5}, h = \frac{2}{3}, \text{ and } a = \frac{5}{2}.$$

$A = P\left(1 + \frac{r}{n}\right)^{nt}$ is the formula for the balance A , when P dollars are invested for t years at an interest rate r , which is compounded n times a year. How much should be invested at a fixed interest rate of 8% compounded quarterly, if after 3 years the balance is to be \$25,000.00?

- **Perform operations with integral exponents.**

Exs: Assuming all variables positive, simplify the following expression. Give your

answer in terms of positive exponents only. $\left(\frac{x^{-2}y^3}{x^4y^{-4}}\right)^{-2}$;

$$(-2x^3)^{-3}; (-2x^3)^{-3} \cdot (3xy^{-2})^2; 5x^0 = ; (5x)^0 = ;$$

$$3x^{-2} = ; (3x)^{-2} = ; \frac{(x^3y^{-2})^{-3}(6xy^{-2})^2}{(36x^{-1}y)} = .$$

- **Perform basic operations (simplification, +, -, ×) on polynomials.**

Exs: Perform the indicated operations and simplify:

$$6x^2(x^2 - 2) - 2x(3x^3 - 4x + 5) = ; (x + 2)(x^2 - 2x + 4) = ;$$

$$(3x - 4y)(3x + 4y) = ; (x - 1)(x + 2)(2x - 3) = ;$$

- **Factor polynomials.**

Exs. Factor completely over the real numbers:

$$12x^4y^3 - 6x^3y^2; 2x^2 - 5x + 3 = ; 4x^2 - 12xy + 9y^2 = ;$$

$$ax^2 - byx - ax + by = ; x^4 - y^4 = ; x^3 + y^3 = .$$

Topics from Intermediate Algebra

- **Set up equations that model a problem situation.**

Ex 1: The longer leg of a right triangle is 4 more than the length of the shorter leg. The hypotenuse is 18 cm. If x is the measure in cm of the shorter leg, apply the Pythagorean theorem to write an equation, which models the problem situation.

This equation written in the form $ax^2 + bx + c = 0$ is: ??

Ex 2: A telephone company charges a flat fee of C cents for the first 3 minutes of a phone call. The cost of each additional minute over the first 3 minutes is A . If Jesse's call was M minutes long ($M \geq 3$). What was the cost D of his phone call? (Express D in terms of all the given variables.)

- **Solve linear inequalities & compound linear inequalities, and express their solutions: 1) in interval notation using the symbols \cup, \cap as deemed necessary; 2) using set notation. Finally, be able to draw the solution set on the number line.**

Exs: In the following exercises, solve the inequalities for x and express their solution using interval notation, set notation, and also draw the solution set on the number line.

$$\frac{x-3}{4} - \frac{x+2}{12} \geq \frac{x}{3}; \quad 5 \leq \frac{4x-1}{-3} < -1;$$

$$2x + 3 < 7 \text{ or } 5 - x \leq 2; \quad 2x + 3 < 7 \text{ and } 5 - x \leq 2.$$

- **Set up inequalities or compound inequalities that model a problem situation.**

Ex: To get a B, Rita's average on all 3 tests plus the final must be between 80 and 89 inclusively. Each test is out of 100 possible points, except for the final, which is out of 200 possible points. Let x represent Rita's grade on the final. If she got 92, 75, and 70 on her three tests, set up a compound inequality in x , which models the problem situation, and whose solution will provide Rita with a range of grades necessary to obtain a B in the course.

- **Perform basic operations with polynomial expressions.**

Exs: Perform the indicated operations and simplify:

$$2(2x - 3y)(2x + 3y) - 2(2x - 3y)^2 - 6xy;$$

- **Perform basic operations (simplification, +, -, x , \div) with rational expressions.**

Exs: Perform the indicated operations and/or simplify:

$$\frac{2a-3b}{3b-2a}; \quad \frac{2x}{x^2-9} - \frac{9+x}{9-x^2} = ; \quad \frac{3}{x^2-4} - \frac{2}{x^2-5x+6} = .$$

- **Solve linear equations and equations that reduce to linear.**

Exs: Solve for x : $7x + 4 = 5x - 12$

$$\text{Solve for } x: \frac{2}{3}(3x - 2) = \frac{1}{6} - \frac{x+3}{2}$$

$$\text{Solve for } x: 2(x - 3) = 4x - 2(x + 3)$$

$$\text{Solve for } x: 2(x - 3) = 4x - 2(x + 5)$$

$$\text{Solve for } x: 4(2x - 1)^2 = 36.$$

- **Solve quadratic equations or equations that reduce to quadratic ones, using factoring, &/or using the quadratic formula.**

Exs: Solve for x : $3x^2 - 5x + 2 = 0$; $x^2 - x = 20$; $\sqrt{7x-10} = x$; $4(2x-1)^2 = 36$.

Solve for x using the quadratic formula: $3x^2 - 4x = 2$. Give the **exact** solutions in their simplest form.

- **Find the roots or zeros of polynomials (by factoring).**

Ex: Find the zeros of the given polynomial using factoring along with the zero product property: $P(x) = 8x^3 - 12x^2 - 18x + 27$.

- **Solve literal equations (i.e., solve for one variable in terms of others).**

Ex: Solve for R_2 : $\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2}$.

- **Perform operations on rational exponents.**

Exs: Simplify $x^{\frac{1}{2}} \cdot x^{-\frac{1}{3}}$ and express the answer in terms of positive exponents only.

$$\left(\frac{1}{x}\right)^{-\frac{5}{6}}$$

Evaluate: $(-8)^{-\frac{2}{3}}$. (No calculators please)

- **Perform operations with radical expressions (simplification, +, -, x, ÷) and rationalize denominators or numerators.**

Exs: Simplify $\sqrt{125} - \frac{\sqrt{45}}{2}$;

Multiply out and simplify: $(2\sqrt{3} - \sqrt{5})(3\sqrt{5} + 3\sqrt{3})$.

Rationalize the denominator and simplify: $\frac{2}{\sqrt[3]{4x^2}}$; $\frac{3\sqrt{5}}{2\sqrt{2} - \sqrt{5}}$.

Perform all indicated operations and simplify: $\frac{\sqrt[3]{m^5 n^3} \times \sqrt[3]{m^3 n^4}}{\sqrt[3]{m^2 n}}$.

Topics from Coordinate Geometry

- **Be able to obtain information from the graph of a function in the coordinate plane.**

Exs: Given the graph of $y = f(x)$ and some value a , be able to determine from the graph the value of $f(a)$.

Given the graph of $y = f(x)$, find all the x values for which $f(x) = c$, where c is some given number.

Given the graph of $y = f(x)$, determine the x intervals over which the graph of the function is increasing, decreasing or is constant.

Given the graph of $y = f(x)$, determine the domain and the range of $y = f(x)$.

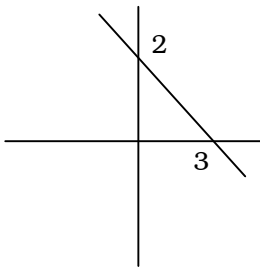
- **Determine and interpret slope of lines, equations of lines and their graphs.**

Exs: Find an equation of the vertical line through (5,3) and its slope.

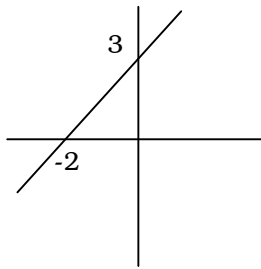
In the xy -coordinate plane, which straight lines have an undefined slope? Which straight lines have a slope equal to 0?

Find an equation of the straight line through (3,4) parallel (or perpendicular) to the line whose equation is $2y - 3x = 6$.

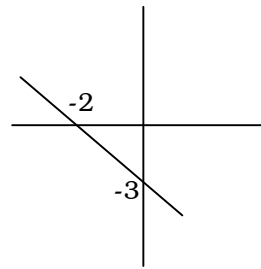
Which of the graphs below is the graph of the equation $2x + 3y = 6$?



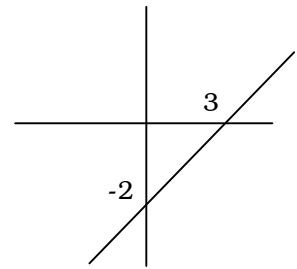
a)



b)



c)



d)

***Recommended resource
to help you review the above objectives***

Intermediate Algebra, by Martin-Gay, 4th edition, Prentice Hall, is the Math 0110 textbook starting this fall semester 2004. Its "chapter highlights" at the end of every chapter offer a quick review of Intermediate Algebra. Review Chapters 1, 2, 3, 5, 6, 7, & 8 (You may omit Chapter 4.).

Any high school Algebra II textbook, or any Elementary & Intermediate Algebra textbook would also help you review the above objectives.
