

**REVIEW GUIDE
FOR
MATHEMATICS PLACEMENT TEST**

Topics taught in:

MAT 094 – PRE-ALGEBRA

MAT 095 – BEGINNING ALGEBRA

MAT 098 – INTERMEDIATE ALGEBRA

DEPARTMENT OF MATHEMATICS

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REVIEW GUIDE FOR MATHEMATICS PLACEMENT TEST

Why Mathematics Placement?

Parkland College is committed to helping students achieve success in their course work. In this effort, the college has designed a mathematics placement program to aid students in selecting the most appropriate mathematics course while taking into account their widely varied mathematics backgrounds.

Placement or credit in the listed prerequisite course is required prior to registering in any mathematics course.

Placement scores are valid for only two years; thereafter, the student must be reassessed.

Students with transfer credit in mathematics are not required to take the placement test, but can be placed on the basis of mathematics credits earned within the last five years (after a review of transcripts).

How Does the Placement Test Work?

Parkland uses a national test called the COMPASS test. It is given on a computer and is adaptive. This means that the test will base each new question on how well the student did on the preceding questions. If the student keeps answering questions correctly, they will end up with calculus questions. On the other hand, if the student misses a couple of questions, then they will be given easier questions. Once the computer finds a level that the student can reach but not go beyond, it assigns a placement score.

This is not a test to pass or fail --- it is an instrument to help select the best level for the student to have a reasonable chance of success --- not too low and not too high.

The scores on this instrument are not based on a 100-point scale. Thus each score assigned by the COMPASS test is much more significant than a point on a typical 100-point test.

What is the Purpose of this Review Guide?

The purpose of this review guide is to help students know what types of questions to expect on the COMPASS test. The sample questions are taken from our MAT 094, 095, and 098 courses. This review should help the student “knock the rust off” of skills that may not have been used for a while. This review is not intended to teach the material.

How to Use this Guide:

The student must decide what course they think is the highest level that they have already mastered, and then review this material. For example, if this course is Beginning Algebra MAT 095, then review the learning outcomes covered in MAT 095. If the student feels comfortable with all these topics, then they should try the sample questions for this course. If they are not comfortable, then they may want to review some before trying the sample questions. The student may use the answer key to determine how well they did on the sample questions.

One way to review this material is to work through the chapter reviews or mastery tests at the end of each chapter of the appropriate level textbooks. Other references are given below.

References to Other Sources:

SOFTWARE RESOURCES

1. MAT 094: Tutorial Program
 - Center for Academic Success
2. MAT 095: Tutorial Software to accompany Beginning Algebra, Hall, 2nd ed.
 - Center for Academic Success
3. MAT 095, MAT 098:
 - (a) Tutorial Software to accompany Beginning and Intermediate Algebra, Hall and Mercer
 - Room M108
 - (b) Tutorial Software to accompany Elementary and Intermediate Algebra: Discovery and Visualization, 2nd ed., Hubbard and Robinson
 - Center for Academic Success
4. MAT 098: Tutorial Software to accompany Intermediate Algebra, Hall, 2nd ed.
 - Center for Academic Success

VIDEOS

1. MAT 094:
 - (a) Videotapes to accompany Prealgebra, Lial and Hestwood, 3rd ed.
 - Center for Academic Success
 - (b) Videotapes to accompany Prealgebra, McKeague, 3rd ed.
 - Center for Academic Success
2. MAT 095, MAT 098: Videotapes to accompany Beginning and Intermediate Algebra, Hall and Mercer
 - Center for Academic Success

TEXTBOOKS

1. MAT 094:
 - (a) Prealgebra, Lial and Hestwood, 3rd ed.
 - Center for Academic Success
 - (b) Prealgebra, McKeague, 4th ed.
 - Center for Academic Success
2. MAT 095, 098:
 - a. Beginning and Intermediate Algebra, Hall and Mercer
 - Center for Academic Success
 - b. Elementary and Intermediate Algebra Discovery and Visualization, 2nd ed., Hubbard and Robinson
 - Center for Academic Success

MAT 094 – Pre-Algebra Skills – Learning Outcomes:

The student will be able to:

A. Whole Numbers and Whole Number Concepts

- Identify and make use of the properties of whole numbers.
- Interpret and solve word problems.
- Interpret bar graphs, line graphs, and pictographs.
- Find the mean, median, mode, and range of given data.
- Answer questions that require the use of a formula.
- Factor, find the least common multiple and greatest common factor.
- Simplify expressions involving exponents and roots.
- Simplify problems using the correct order of operations.
- Estimate the answers to some calculation problems and some word problems.

B. Fractions and Mixed Numbers

- Perform basic operations involving fractions and mixed numbers as well as interpret and solve word problems involving fractions.

C. Decimals

- Perform basic operations involving decimals, convert from fractions to decimals and vice-versa, and interpret and solve word problems involving decimals.

D. Ratios and Proportions

- Use the concepts of ratio and proportion, interpret and solve word problems, and convert measurements.

E. Percent

- Convert percents to fractions and/or decimals and vice-versa and, and solve word problems involving percents.

F. Simplifying Algebraic Expressions and Solving Linear Equations

- Simplify and solve algebraic equations involving more than one operation. Write algebraic phrases and set up and solve basic word problems.

G. Signed Numbers

- Graph signed numbers on the number line, perform the four basic operations with signed numbers, use the correct order of operations with signed numbers, simplify signed number expressions that include exponents, and evaluate algebraic expressions involving signed numbers.

H. Polynomials

- Add, subtract, multiply, and divide monomials.

The purpose of the following questions is to help the student gauge their readiness on the topics taught in MAT 094. (The purpose is not to teach this material.)

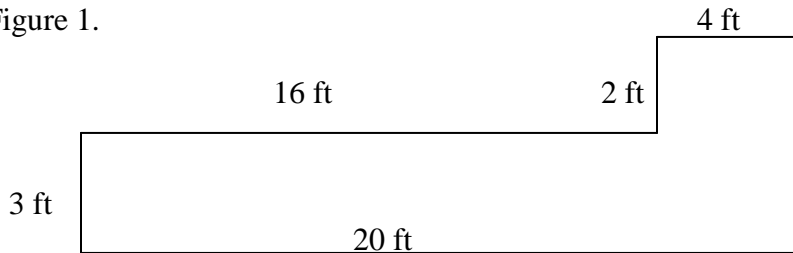
REVIEW QUESTIONS:

A. Whole Numbers and Whole Number Concepts

Simplify problems 1 – 5 without a calculator.

1. $|-10|$
2. $7 + 2(3 - 9)$
3. $18 \div (4 - 7) \cdot 2$
4. $\frac{-2(5) + 4(-3)}{-8 + 10}$
5. $18 + 3^3 - 30 \div 6$
6. Find the perimeter of a triangle with each side measuring 7 cm.
7. Find the volume of a box with length 15 m, width 12 m, and height 3 m.
8. Find the area of a triangle whose base is 34 inches and height is 12 inches.
9. Find the fencing costs of a square lot that is 85 meters on each side. The fencing costs \$14 per meter.
10. Find the perimeter of Figure 1.
11. Find the area of Figure 1.

Figure 1.



B. Fractions and Mixed Numbers

Simplify problems 1 – 9 without a calculator.

1. $1\frac{1}{4} + 1\frac{5}{8}$
2. $\frac{5}{6} - \left(-\frac{1}{4}\right)$
3. $4\frac{1}{5} - 1\frac{2}{3}$
4. $\frac{3}{11} \cdot \frac{5}{21} \cdot \frac{22}{25}$
5. $1\frac{7}{8} \div 6\frac{1}{4}$
6. $\frac{6}{5} \div \left(\frac{3}{5} - \frac{3}{10}\right)$
7. $\frac{1}{4} \cdot \frac{2}{3} + \left(\frac{1}{2}\right)^2$

8. Change $\frac{79}{6}$ to a mixed number.

9. Change 16.15 to a mixed number.

C. Decimals

Simplify problems 1 – 6 without a calculator.

1. $0.006(0.09)$

2. $(0.3)^2$

3. $34.8 \div 4$

4. $1.1 \overline{)56.375}$

5. $.09 + 0.5(6 + 0.02)$

6. $3\sqrt{4} - 2\sqrt{3}$

7. Round 5,525.2178 to the nearest:

a. hundred

b. thousandth

8. Change 0.275 to a fraction.

9. Change $\frac{3}{8}$ to a decimal.

10. $11 \text{ yd} = ? \text{ in}$

11. $\frac{66 \text{ mi}}{1 \text{ hr}} = \frac{? \text{ ft}}{1 \text{ sec}}$

12. If one cup of regular coffee contains 96 milligrams of caffeine, how much caffeine is contained in 2.4 cups of coffee?

13. If Richard makes \$6.50 per hour at the video store and works 22 hours in one week, how much money will he make (before deductions)?

14. Taryn goes shopping for new clothes and buys two sweaters for \$19.98 each, 1 pair of jeans for \$35.25, and three pairs of socks for \$1.45 each pair. If Taryn gives the cashier two \$50.00 bills, find the amount of change she will receive.

15. A consumer watchdog group priced a can of tomato soup at five different grocery stores. They found the following prices: \$.89, \$1.39, \$1.65, and \$1.89. What is the average selling price of a can of soup? Round to the nearest cent.

D. Ratios and Proportions

1. Write a ratio to compare 42 miles to 15 miles.

2. If Kristen is paid \$202.32 for 40 hours of work, how much will she be paid for 12 hours of work?

3. Solve the proportion: $\frac{6.2}{1.7} = \frac{12.4}{x}$

4. The ratio of songs to commercials on a local radio station is 3 to 8. How many commercials would you expect if you heard 9 songs played?

E. Percent

1. A 35 mm camera sells for \$329. During a sale, a photo store discounts the price \$79. What is the percent of the discount?
2. One hundred five percent of what number is 50.715?
3. The Gill family saves 15.5% of their monthly income. If their monthly income is \$4892.50, how much do they save each month?
4. Write 35.5 as a percent.
5. What number is 9.2% of 1803?
6. Write 0.035% as a decimal.

F. Simplifying Algebraic Expressions and Solving Linear Equations

1. Write the following in symbols: the quotient of 10 and x is y .
2. Find the value of the expression $7 - 2x$ when $x = 6$.
3. Use the equation $4x + 3y = 12$ to find y when $x = \frac{3}{2}$.

Solve problems 4 – 10.

- | | | |
|-------------------------|------------------------|-------------------|
| 4. $x + 3 = -5$ | 5. $\frac{2}{3}x = 12$ | 6. $-3x + 7 = -5$ |
| 7. $15x + 1 = -4x + 20$ | 8. $3(x - 2) + 1 = 4$ | 9. $0.6x = -0.12$ |
| 10. $2.5x - 3.7 = 18.8$ | | |

G. Signed Numbers

Simplify problems 1 – 10 without the use of a calculator.

- | | | |
|---------------------------------------------------------|-----------------------|--------------------------|
| 1. $7 + (-10)$ | 2. $-3 + (-12)$ | 3. $6 - 4 - 8 + 5$ |
| 4. $-5 - (-11)$ | 5. $-3(8)$ | 6. $-5(-3)$ |
| 7. $(7 - 4)(3 - 5)$ | 8. $3(-5) + 5(3 - 7)$ | 9. $\frac{7 - 4}{2 - 5}$ |
| 10. $\frac{-4 + 2(-3)}{5 - 3}$ | | |
| 11. Find the average of $-16, -28, 14, -10,$ and 30 . | | |

H. Polynomials

Simplify problems 1 – 10.

1. $4(2x - 3)$

2. $6x \cdot 5x$

3. $(x^6)^3$

4. $(2x^2y^3)^3$

5. $(6x^2 + 2x - 5) + (2x^2 - x - 1)$

6. $(2x^2 + 9x - 7) - (2x^2 + x - 5)$

7. $5x + 6x - 3 + 7$

8. $3(2x - 1)$

9. $4(x + 3) + 3(2x - 9)$

10. $\frac{10y^2}{3x} \div \frac{5y}{6x}$

MAT 094 REVIEW ANSWERS:

A:

1. 10
2. -5
3. -12
4. -11
5. 40
6. 21 cm
7. 540 m^3
8. 204 in^2
9. \$4,760
10. 50 ft
11. 68 ft^2

B:

1. $2\frac{7}{8}$
2. $\frac{13}{12}$
3. $2\frac{8}{15}$
4. $\frac{2}{35}$
5. $\frac{3}{10}$
6. 4
7. $\frac{5}{12}$
8. $13\frac{1}{6}$
9. $16\frac{3}{20}$

C:

1. .00054

2. .09
3. 8.7
4. 51.25
5. 3.1
6. -6
- 7.a. 5500
- 7.b. 5525.218
8. $\frac{11}{40}$
9. .375
10. 396
11. 96.8 ft/sec
12. 230.4 mg caffeine
13. \$143
14. \$20.44 change
15. \$1.46

D:

1. $\frac{14}{5}$
2. \$60.70 or \$60.72
3. $x = 3.4$
4. $x = 24$ commercials

E:

1. $x = 24\%$
2. $x = 48.3$
3. $x = \$758.34$
4. 3550%
5. $x = 165.876$
6. .00035

F:

1. $\frac{10}{x} = y$
2. -5

3. $y = 2$
4. $x = -8$
5. $x = 18$
6. $x = 4$
7. $x = 1$
8. $x = 3$
9. $x = -0.2$
10. $x = 9$

G:

1. -3
2. -15
3. -1
4. 6
5. -24
6. 15
7. -6
8. -35
9. -1
10. -5
11. -2

H:

1. $8x - 12$
2. $30x^2$
3. x^{18}
4. $8x^6y^9$
5. $8x^2 + x - 6$
6. $8x - 2$
7. $11x + 4$
8. $6x - 3$
9. $10x - 15$
10. $4y$

MAT 095 – Beginning Algebra – Learning Outcomes:

The student will be able to:

A. Exponents, Square Roots, Order of Operations; Properties of Real Numbers; Algebraic Expressions.

- Identify elements of subsets of real numbers.
- Identify and determine additive inverses and identities.
- Identify and determine multiplicative inverses and identities.
- Evaluate algebraic expressions given values for variables.
- Evaluate simple exponential expressions.
- Evaluate absolute values of real numbers.
- Evaluate absolute value expressions.
- Evaluate square roots of real numbers.
- Use interval notation for a solution set.
- Use inequality notation for a solution set.
- Graph intervals on a number line.
- Perform arithmetic operations with real numbers.
- Use the commutative and associative properties.
- Calculate terms of a sequence.
- Identify solutions of equations.
- Translate word phrases into mathematical expressions.
- Use grouping symbols to indicate the correct order of operations.
- Use the correct order of operations.
- Use the distributive property to factor and expand expressions.
- Use the distributive property to add like terms.

B. Addition and Multiplication Properties of Equality; Solving Linear Equations; Word Problems; Literal Equations, Linear Inequalities.

- Use algebraic formulas to solve word problems.
- Use function notation to evaluate a function.
- Identify linear equations.
- Use a linear equation to form a table of values and to graph a linear equation.
- Write a function to model an application.
- Write a solution to an equation as an ordered pair.
- Decide whether a given ordered pair is a solution of a given equation.
- Check possible solutions of a linear equation.
- Solve linear equations using the addition-subtraction principle.
- Solve linear equations using the multiplication-division principle.
- Classify an equation as a conditional, a contradiction, or an identity.
- Translate sentences into equations and solve the equations.
- Use ratios and proportions to solve application problems.
- Solve problems involving direct variation.
- Solve a formula for one variable given values of other variables.
- Determine specific terms of an arithmetic sequence.
- Check a possible solution of an inequality.
- Use linear equations with two variables to solve a linear inequality in one variable.
- Solve linear inequalities using the addition-subtraction principle.
- Solve linear inequalities using the multiplication-division principle.
- Solve linear inequalities using tables and graphs.
- Translate sentences into linear inequalities and solve the inequality.

- Write an inequality to model an application.
- Identify an inequality that is a contradiction or an unconditional inequality.
- Solve compound inequalities involving intersection and union.
- Solve absolute value equations and inequalities algebraically.

C. Exponents; Quotient Rule and Integer Exponents; Scientific Notation; Polynomials; Multiplication of Polynomials; Products of Binomials.

- Express ratios in lowest terms.
- Use natural number exponents.
- Identify numerical coefficients and like terms.
- Combine like terms.
- Use exponents.
- Use the product, power, and quotient rules for exponents.
- Simplify expressions with zero exponents and negative exponents.
- Combine the properties of exponents to simplify expressions.
- Express numbers in scientific notation and use scientific notation on a calculator.
- Convert numbers from scientific notation to standard notation.
- Use terminology associated with polynomials.
- Add, subtract, multiply, and divide polynomials.
- Write polynomials for verbal expressions.
- Evaluate polynomials.

D. Factor; Greatest Common Factors; Factoring Trinomials of the form $ax^2 + bx + c$ where $a = 1, 2, 3, 5$.

- Find the greatest common factor.
- Factor using the distributive property.
- Factor by grouping.
- Factor trinomials of the form $ax^2 + bx + c$, $a = 1, 2, 3, 5$.
- Solve equations of the form $ax^2 + bx + c = 0$, $a = 1, 2, 3, 5$.

E. Rectangular Coordinate System; Evaluating Expressions Using Graphs and Tables, Linear Equations in Two Variables; Graphing Linear Equations; Slope of a Line; Equation of a Line, Arithmetic Sequences, Graphing Linear Inequalities.

- Plot ordered pairs on a rectangular coordinate system.
- Draw a scatter diagram.
- Identify an arithmetic sequence.
- Complete ordered pairs for a given equation and plot the ordered pairs to graph the equation.
- Determine intercepts algebraically, graphically, and numerically.
- Interpret intercepts of a graph.
- Rewrite a linear equation in slope-intercept form.
- Determine the slope of a line given two points.
- Determine the slope of a line from its graph and its equation.
- Interpret slope as a constant rate of change.
- Interpret arithmetic sequences as linear relationships with constant growth.
- Construct an arithmetic sequence.
- Use slope to determine if two lines are parallel, perpendicular, or neither.
- Use slope-intercept and point-slope forms of a linear equation to determine intercepts algebraically, graphically, and numerically.
- Graph linear equations of the form $y = b$ or $x = a$.
- Graph a line given one point and its slope.
- Write an equation of a line given its slope and y-intercept.
- Write an equation of a line given its slope and any point on the line.

- Write an equation of a line given two points on the line.
- Solve absolute value equations and inequalities using tables and graphs.
- Graph a linear inequality in two variables.
- Graph a system of linear inequalities.

F. Solving Linear Systems of Two Equations by Graphing; Solving Linear Systems by Substitution; Applications of Linear Systems.

- Determine the point where two lines intersect.
- Solve a system of linear equations using graphs and tables.
- Identify systems with no solutions or with an infinite number of solutions.
- Identify inconsistent systems and systems of dependent linear equations without graphing.
- Solve linear systems by substitution.
- Solve linear systems by the addition method.
- Use systems of linear equations to solve word problems.

The purpose of the following questions is to help the student gauge their readiness on the topics taught in MAT 095. (The purpose is not to teach this material.)

REVIEW QUESTIONS:

A. Exponents, Square Roots, Order of Operations; Properties of Real Numbers; Algebraic Expressions.

1. Simplify: $-\frac{5}{8} + \left(-\frac{7}{4}\right)$.
2. Simplify: $|-7| - |-9|$.
3. Simplify: $-5(-3)(2)(-4)$.
4. Evaluate: $-5^2 + 2 - 3 \cdot 4$.
5. Evaluate: $4 - 2[3 - (2 - 1)]$.
6. $\frac{16 + 2^2}{2^3 - 3} =$
7. Write “four less than the square root of the product of twenty-five and four” as a numerical expression, then give the expression’s value.
8. Evaluate: $\sqrt{x^2 - 4x + 4}$ for $x = -5$.

9. Evaluate: $\frac{x+y}{x-y}$ for $x=6$ and $y=-2$.
10. Write as an equation, "If a number is decreased by five, the result is twice the sum of the number and ten." Let x represent the unknown number.
11. Simplify the given expression: $4y - 2[y - 5(6 - y)]$.

B. Addition and Multiplication Properties of Equality; Solving Linear Equations; Word Problems; Literal Equations, Linear Inequalities.

1. Solve for x : $\frac{x}{3} - \frac{1}{6} = \frac{x+1}{9}$.
2. Solve: $2(x+1) - (x-7) = 3(x-1) - 2$.
3. Solve: $\frac{3a+5}{3} + 5 = \frac{11}{3}$.
4. Solve the following formula for C : $F = \frac{9}{5}C + 32$.
5. Solve and express the answer in interval notation: $\frac{1}{2}x + \frac{2}{3} < \frac{5}{6}x + 1$.

C. Exponents; Quotient Rule and Integer Exponents; Scientific Notation; Polynomials; Multiplication of Polynomials; Products of Binomials.

Write all answers using positive exponents.

1. Simplify: $(-3a^2b^5)^2$.
2. Simplify: $\frac{30c^{18}d^{12}}{12c^6d^4}$.
3. Simplify: $\frac{9y^{13}}{(3y^4)^3}$.
4. Simplify: $(2a^{-2}b^4)^{-3}$.
5. Evaluate: -5^{-2} .
6. Find the product to the nearest tenth: $(5.87 \cdot 10^{-6})(6.73 \cdot 10^7)$.

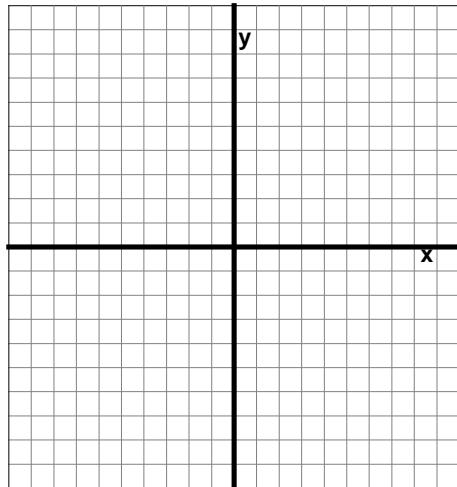
7. Express as a decimal number: 2.37×10^4 .
8. Simplify: $6^{-1} - \left(\frac{1}{4}\right)^{-1}$.
9. Simplify: $\left(\frac{2x^2y^4}{3xy^{-2}}\right)^{-3}$.
10. Simplify: $-3^0 + 5(-3)^0$.
11. Write in scientific notation: 0.0030417
12. A rectangle has length y and width x . A square with sides x is drawn inside the rectangle. Write a polynomial that describes the area inside the rectangle and outside the square.
13. Subtract $-2x^2 + 3x - 7$ from $5x^2 - x + 1$.
14. Multiply: $(2x - 3)(4x + 5)$.
15. Multiply: $(3x - 7)^2$.
16. Multiply: $(8x^2 - 5y^2)(3x^2 - 2xy + y^2)$.

D. Factor; Greatest Common Factors; Factoring Trinomials of the form $ax^2 + bx + c$ where $a = 1, 2, 3, 5$.

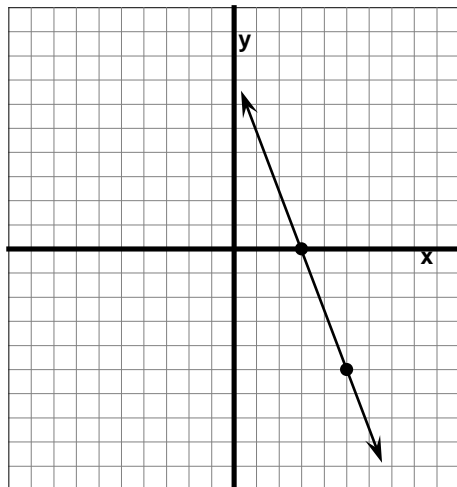
1. Factor completely: $6x^3 - 33x^2 + 42x$.
2. Factor completely: $2x^3 + 12 - 3x - 8x^2$.
3. Factor completely: $x^2 - 8xy + 16y^2$.
4. Factor completely: $x^2 - 3x - 18$.
5. Factor completely: $-x^2 + 3x + 28$.
6. Solve algebraically: $(2x - 5)(3x + 7) = 0$.
7. Solve algebraically: $(x + 1)^2 = 37 - 3x$.

E. Rectangular Coordinate System; Evaluating Expressions Using Graphs and Tables, Linear Equations in Two Variables; Graphing Linear Equations; Slope of a Line; Equation of a Line, Arithmetic Sequences, Graphing Linear Inequalities.

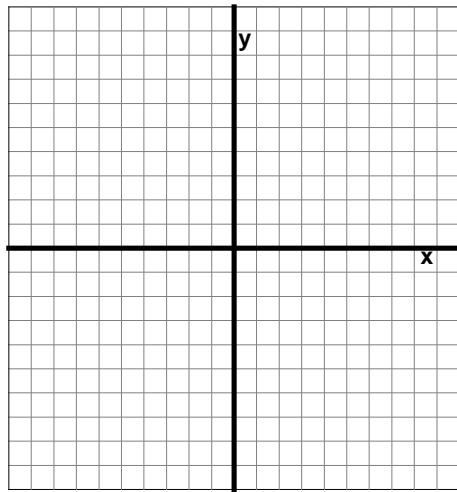
1. Which quadrant or axis contains the point (a,b) if $a < 0$ and $b < 0$?
2. Sketch the graph $y = -2x + 4$.



3. Given the line $2x - 3y = 6$, state:
slope _____ x-intercept _____ y-intercept _____
4. From the graph of this line, determine the slope.

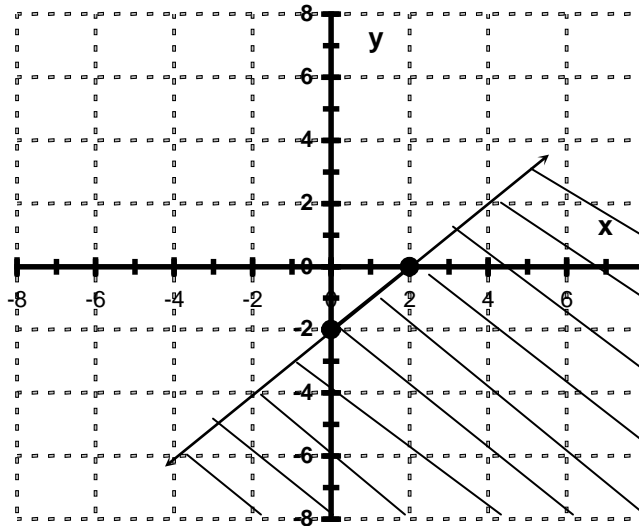


5. The slope of the line L1 is -2 . Determine the slope of L2 so that:
- L2 is perpendicular to L1.
 - L2 is parallel to L1.
6. According to Hooke's Law, the force F in pounds required to stretch a spring x inches is directly proportional to x . If 20 pounds of force stretches a spring three inches then what is the force required to stretch it five inches?
7. Write the equation of the line through the points $(-2,1)$ and $(2,3)$. Write the answer in slope-intercept form.
8. Graph the inequality $y > -3x + 5$.



9. Determine which of the following ordered pairs are a solution to $5x - 3y \leq 30$.
- a. $(5,3)$ b. $(5,-3)$ c. $(3,-5)$

10. Write an inequality to represent the shaded portion of the graph below:



F. Solving Linear Systems of Two Equations by Graphing; Solving Linear Systems by Substitution; Applications of Linear Systems.

- Solve: $6x - 4y = 42$
 $10x + 8y = 26$
- The total receipts for a concert were \$650. Adult tickets cost \$3, and children's tickets cost \$2. Seventy-five more adult tickets were sold than children's tickets. How many of each type were sold?
- One number is 3 less than another number. If one-fifth of the larger number is added to one-half of the smaller number, the result is 9. What is the smaller number?
- Two cars departed from the same intersection, one headed east, the other west. The first car traveled at 78 mph and the second traveled at 64 mph. How many hours will pass before they are 497 miles apart?
- After a 10% raise, your new monthly salary is \$1,000. What was your old monthly salary?
- How many gallons of a 60% acidic solution must be added to 15 gallons of a 30% solution to obtain a 51% solution?
- You and a friend started jogging at the same location but headed in opposite directions. After 45 minutes, you were 12 miles apart. If your rate was 6 mph faster than that of your friend, what was your rate?

MAT 095 REVIEW ANSWERS:

A:

1. $-\frac{19}{8}$
2. -2
3. -120
4. -35
5. 0
6. 4
7. $\sqrt{25 \cdot 4} - 4, 6$
8. 7
9. $\frac{1}{2}$
10. $(x-5) = 2(x+10)$
11. $-8y + 60$

B:

1. $x = \frac{5}{4}$
2. $x = 7$
3. $a = -3$
4. $C = \frac{5}{9}(F - 32)$
5. $(-1, \infty)$

C:

1. $9a^4b^{10}$
2. $\frac{5c^{12}d^8}{2}$
3. $\frac{y}{3}$
4. $\frac{a^6}{8b^{12}}$
5. $-\frac{1}{25}$
6. 395.1
7. $23,700$

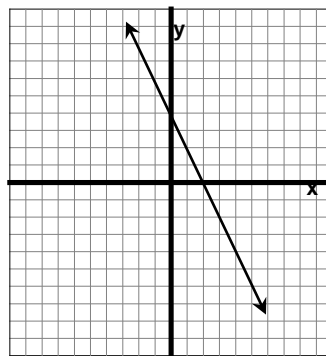
8. $-\frac{23}{6}$
9. $\frac{27}{8x^3y^{18}}$
10. 4
11. $3.0417 \cdot 10^{-3}$
12. $xy - x^2$
13. $7x^2 - 4x + 8$
14. $8x^2 - 2x - 15$
15. $9x^2 - 42x + 49$
16. $24x^4 - 16x^3y - 7x^2y^2 + 10xy^3 - 5y^4$

D:

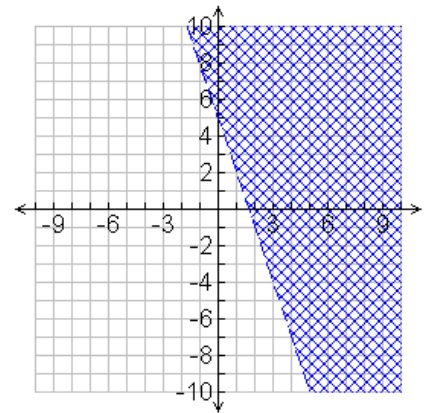
1. $3x(2x-7)(x-2)$
2. $(2x^2-3)(x-4)$
3. $(x-4y)^2$
4. $(x-6)(x+3)$
5. $-(x-7)(x+4)$
6. $\frac{5}{2}, -\frac{7}{3}$
7. $-9, 4$

E:

1. III
- 2.



3. slope = $\frac{2}{3}$, x-intercept = $(3, 0)$, y-intercept = $(0, -2)$
4. $-\frac{5}{2}$
- 5.a. $\frac{1}{2}$
- 5.b. -2
6. $\frac{100}{3}$ pounds
7. $y = \frac{1}{2}x + 2$
- 8.



9. a, c
10. $y \leq x - 2$

F:

1. $(5, -3)$
2. 85 children's tickets, 160 adults' tickets
3. 12
4. 3.5 hrs
5. \$909.09
6. 35 gallons
7. 11 miles per hour

MAT 098 – Intermediate Algebra – Learning Outcomes:

A. Function Notation, Graphs of Common Algebraic Functions, Linear and Quadratic Regression

- Determine whether a relation is a function.
- Determine the domain and range of a function.
- Use function notation.
- Graph a linear function.
- Write a linear function to model given information.
- Graph an absolute value function.
- Graph quadratic, square root, cubic, and cube root functions.
- Determine the domain of a function from the defining equation.
- Select a linear function that best fits a set of data.
- Select a quadratic function that best fits a set of data.
- Factor the GCF out of a polynomial.
- Use zeros of a function to factor a polynomial.
- Use the x-intercepts of the graph of a polynomial function to factor a polynomial.

B. Review Polynomial Operations, Factoring Polynomials, and Solving Equations by Factoring

- Factor common trinomials, including perfect square trinomials.
- Factor the difference of two squares.
- Factor the sum or difference of two cubes.
- Factor polynomials by the method of grouping.
- Determine the most appropriate technique for factoring a polynomial.
- Use factoring to solve selected second and third-degree equations.
- Use the x-intercepts of the graph of a quadratic function to solve the corresponding quadratic equation and inequalities.
- Write a quadratic equation whose roots are given.

C. Rational Exponents, Radical Expressions, Complex Numbers, and Quadratic Equations

- Interpret and use rational exponents.
- Interpret and use radical notation.
- Add and subtract radical expressions.
- Simplify radical expressions.
- Multiply radical expressions.
- Divide and simplify radical expressions.
- Rationalize radical expression.
- Express complex numbers in standard form.
- Add, subtract, multiply, and divide complex numbers.
- Solve a quadratic equation by extraction of roots and completing the square.
- Solve a quadratic equation using the quadratic formula.
- Use the discriminant to determine the nature of the solutions of a quadratic equation.
- Solve a quadratic inequality.
- Solve equations involving radical expressions.
- Use the Pythagorean Theorem.
- Calculate the distance between two points.
- Use quadratic equations to solve word problems.

D. Rational Expressions and Rational Equations

- Determine the domain of a rational function.
- Reduce a rational expression to lowest terms.
- Multiply and divide rational expressions.
- Add and subtract rational expressions.

- Simplify rational expressions in which the order of operations must be determined.
- Simplify complex fractions.
- Solve equations containing rational expressions.
- Solve problems involving inverse variation.
- Solve applied problems that yield equations with fractions.

The purpose of the following questions is to help the student gauge their readiness on the topics taught in MAT 098. (The purpose is not to teach this material.)

REVIEW QUESTIONS:

A. Function Notation, Graphs of Common Algebraic Functions, Linear and Quadratic Regression

Determine the domain of each function.

1. $f(x) = \frac{x+2}{2x-12}$

2. $f(x) = \sqrt{3-4x}$

Answer the following.

3. Let $f(x) = 2x^2 + 5x - 12$. Determine the value of $f(2)$.

4. Find the slope of the line $2x + 3y = 7$.

5. Write the equation of the line connecting the points $(-4, 3)$ and $(5, -7)$.

6. Find the x - and y -intercepts of the line $4x - 5y = 40$.

7. Factor out the Greatest Common Factor of $3x(x-5y) - 2y(x-5y)$.

8. Factor out the Greatest Common Factor of $24x^5y^7 - 8x^8y^3 + 12x^2y^9$.

B. Review Polynomial Operations, Factoring Polynomials, and Solving Equations by Factoring

Completely factor each polynomial.

1. $144x^4 - 25$

2. $2x^2 + 7x - 30$

3. $5x^2 - 20y^2$

4. $2xm - 3ym + 2xn - 3yn$

Solve.

5. $(x-12)(x+1) = -40$

C. Rational Exponents, Radical Expressions, Complex Numbers, and Quadratic Equations

Simplify the following.

1. $(-8)^{-4/3}$

2. $(81x^{4/5}y^{4/3})^{3/4}$

3. $(2\sqrt{2} - 5\sqrt{3})(2\sqrt{2} + 5\sqrt{3})$

4. $\frac{3}{\sqrt{7}-2}$

5. $(3-2i)(5+i)$

6. i^{99}

7. $\frac{7}{3+2i}$

8. $(-3a^{1/4}k^{2/3})(6a^{1/2}k^{4/3})$

Solve for x.

9. $\sqrt{x^2 - 4x + 9} - x = -1$

Answer the following.

10. Write the quadratic formula.

11. Find the solutions to the nearest tenth: $5x^2 - 7x - 2 = 0$.

12. Find the exact solutions: $3x^2 + 2x + 1 = 0$

13. Calculate the distance between the points $(-4, 3)$ and $(2, -3)$.

Solve the inequality.

14. $-x^2 < 15 - 8x$

Solve the following application.

15. Two airplanes depart simultaneously from an airport. One flies due south; the other flies due east at a rate 10 miles per hour faster than that of the first airplane. After 2 hours radar indicates that the airplanes are 580 miles apart. What is the ground speed of each airplane?

D. Rational Expressions and Rational Equations

Simplify the following.

1. $\frac{3-x^2}{x^2-3}$

2. $\frac{15x^2-15y^2}{11x^3+11y^3} \div \frac{5x^3y^2-5x^2y^3}{4x^3-4x^2y+4xy^2}$

3. $\frac{x+2}{x+3} \div \frac{x^3-8}{x^2-9} \cdot \frac{x^2+2x+4}{x-3}$

4. $\frac{12x^{-2}-x^{-1}-1}{8x^{-2}+6x^{-1}+1}$

Solve for x.

5. $\frac{4}{x^2+7x+10} - \frac{3}{x+2} + \frac{8}{x+5} = 0$

6. $\frac{15}{x^2+5x} + \frac{x+4}{x+5} = \frac{x+3}{x}$

Solve the following applications.

- One pipe can fill a cooling tank in 3 hours less than a second pipe can. If the two pipes together can fill seven-ninths of the tank in 4 hours, how many hours would it take each pipe alone to fill the tank?
- A boat completes a trip from Riverton to Clear Creek and back each weekday. The distance one way is 60 miles, and the speed of the current in the river is 4 miles per hour. If the round trip takes 8 hours, determine the speed of the boat in still water.
- The sum of the reciprocals of two consecutive even integers is $\frac{13}{84}$. Find these integers.
- A window washer can wash the windows on one side of a building in 112 working hours. With an assistant he can do the job in 63 hours. How many hours would the assistant need to do the job alone?

Answer the following.

- If y is directly proportional to the square of x , and y is 37.5 when x is 5, find y when x is 12.
- If y varies inversely as x , and y is 36 when x is 22, find y when x is 33.

MAT 098 REVIEW ANSWERS:

A:

1. $(-\infty, 6) \cup (6, \infty)$

2. $\left(-\infty, \frac{3}{4}\right]$

3. 6

4. $-\frac{2}{3}$

5. $y = \frac{-10}{9}x - \frac{13}{9}$

6. x -intercept: $(10, 0)$

y -intercept: $(0, -8)$

7. $(x - 5y)(3x - 2y)$

8. $4x^2y^3(6x^3y^4 - 2x^6 + 3y^6)$

B:

1. $(12x^2 - 5)(12x^2 + 5)$

2. $(2x - 5)(x + 6)$

3. $5(x + 2y)(x - 2y)$

4. $(m + n)(2x - 3y)$

5. $x = 7, x = 4$

C:

1. $\frac{1}{16}$

2. $27x^{\frac{3}{5}}y$

3. -67

4. $\sqrt{7} + 2$

5. $17 - 7i$

6. $-i$

7. $\frac{21}{13} - \frac{14}{13}i$

8. $-18a^{\frac{3}{4}}k^2$

9. $x = 4$

10. $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

11. $x = 1.6, x = -0.2$

12. $x = \frac{-1 \pm i\sqrt{2}}{3}$

13. $6\sqrt{2}$

14. $(-\infty, 3) \cup (5, \infty)$

15. The southbound plane has a groundspeed of 200 mi/h, and the eastbound plane has a groundspeed of 210 mi/h.

D:

1. -1

2. $\frac{12}{11xy^2}$

3. $\frac{x+2}{x-2}$

4. $\frac{3-x}{x+2}$

5. $x = -1$

6. No solution.

7. The first pipe can fill the tank in 9 hours and the second pipe can fill the tank in 12 hours.

8. The speed of the boat in still water is 16 mi/h.

9. The two even integers are 12 and 14.

10. The assistant would need 144 hours to do the job alone.

11. $y = 216$

12. $y = 24$

Center for Academic Success D 120



The Center for Academic Success (CAS) in D120 is Parkland College's one-stop learning center. CAS provides many learning and student development support services to empower students to achieve their academic goals.

Preparation for Parkland's assessment tests for entering students is highly recommended. Assessment results determine course placements; low assessment scores may result in several semesters in pre-college or developmental academic skill (reading, writing, and mathematics) courses. Help in reviewing math skills is available in CAS for prospective students as well as current students who wish to re-assess. We invite you to use any of the following services.

FREE WALK-IN TUTORING HELP: CAS has tutoring services for currently enrolled Parkland students as well as prospective students preparing for assessment tests. Tutoring services are intended to help students complete assignments and review for tests. They are not instructional sessions to teach new material.

- **Academic Development Lab (ADL):** The ADL has a computer-based math program, *ModuMath*. This program has diagnostic as well as instructional functions. It analyzes where a student is in terms of math skills, provides instruction and practice, and assesses learning through mastery tests. *ModuMath* has proven effective in helping students to review and practice math skills for assessment. The use of this software program is free. ADL learning specialists provide help with using the program and in answering math-related questions.
Hours: The Academic Development Lab is open Mondays through Fridays, 8:00 a.m. to 5:00 p.m. On selected evenings during the fall and spring semesters, it stays open through 6:00 p.m.
- **Math Faculty Tutoring (MFT):** Experienced math faculty provide free tutoring services for students enrolled in pre-college math courses at Parkland. Students preparing to take the Parkland math assessment may use MFT services to ask questions as they work through the Mathematics Department's Math Placement Review Guide.
Hours: Math Faculty Tutoring is available Mondays through Fridays, 10:00 a.m. to 1:00 p.m.
- **Peer Tutoring:** Trained student tutors provide free walk-in tutoring services for currently enrolled Parkland students. Students preparing for math assessment may use Peer Tutoring services to ask questions as they review with the Math Placement Review Guide.
Hours: Math Faculty Tutoring is available Mondays through Thursdays, 9:00 a.m. to 9:00 p.m., Fridays, 9:00 a.m. to 5:00 p.m.

FOR-CREDIT TUTORIALS: Students who need extended instruction to learn and/or review math knowledge and skills are invited to enroll for CAS one-credit hour tutorials.

- **Supplemental Tutorials:** A one-credit hour tutorial lasts 8 weeks. Interested students will take a diagnostic to ascertain level of math ability. The tutorial consists of a weekly one-hour conference with an instructor in a small group setting. Students complete an additional hour or more of homework in CAS each week. A letter grade is assigned to each tutorial taken.

For more information about CAS and its services, call 217/353-2005 or visit www.parkland.edu/cas.