Alexander College
YOUR ROAD TO UNIVERSITY STARTS HERE!

Math Placement Test (MPT) Study Guide

WHAT IS THE MATH PLACEMENT TEST?

The Alexander College's Mathematics Placement Test (MPT) is an assessment to test equivalent knowledge of the BC Grade 11 & 12 Mathematics curriculum (Foundations of Mathematics and Pre-Calculus 11 & 12), which is required for success in university level Mathematics. Students are placed to a course based on their Math Placement Test score:

Math Placement Test Scoring Table

Subscale	Score	Math 099	Math 100	Math 104	Math 151
1. Math 100 Prerequisites Q1-Q25	/25	< 15	≥ 15	≥ 15	≥ 15
2. Calculus Prerequisites Q26-Q40	/15		< 8	≥ 8	≥ 10
	/40				

Note that calculator is not permitted for this test and maximum time allotted for completing the test is 80 minutes

DESCRIPTION OF TEXT CONTENT

The test includes topics that are prerequisite for Pre-calculus (Math 100) and Calculus (Math 104 and Math 151).

Math 100 Prerequisites (Q#1-25): This part of the test consists of questions from following topics:

- **Basic algebra including Number, Exponents, Variables and Algebraic operations**
- **Equations and Inequality**
- **Basic Coordinate and Plane Geometry**.

Calculus Prerequisites (Q#26-40): In addition to the above topics, calculus prerequisite part of the test consists of questions from the following topics:

- **Functions and their Graphs (Linear, quadratic, Polynomial, piecewise, Inverse, Rational, Exponential & Logarithm)**
- **Trigonometry**

Here is the detail list of skills and knowledge that may be assessed on the Math Placement Test (MPT). [Note that the actual test has 40 questions, and therefore only covers a subset of the list. However, you are expected to cover the list as questions will be randomly drawn from the list.]

Basic algebra including Number, Exponents, Variables and Algebraic operations

1. Identify and apply properties of real numbers (Commutative, Associative and distributive)
2. Use arithmetic operations with fractions, decimals, and integers and use the correct order of operations in situations where more than one operation is performed
3. Use fractions, decimals, and percent to solve problems
4. Add/Subtract/ Multiply/divide expressions involving radicals and simplify radical expressions
5. Rationalize numerators and denominators of rational expressions containing radicals
6. Use factors, multiples, prime factorization, and relatively prime numbers to solve problems

7. Use properties of exponents to simplify exponential expressions
8. Translate a verbal statement into algebraic language and vice versa
9. Add / Subtract/ multiply/ divide Polynomials
10. Factor completely: a quadratic trinomial, difference of two squares or the sum or difference of two cubes
11. Find the sum, difference, product and quotient of rational expressions in simplest form

Equations and Inequality

1. Solve rational equations; and word problems involving a rational equation or a proportion
2. Solve a formula for a specified variable
3. Solve linear equations and inequalities in one variable including those that involves absolute value; and graph their solution sets
4. Find and use the discriminate to determine the number and type of solutions of quadratic equations; and know how to solve the equation (by completing the square, by factoring method; and by using the quadratic formula)
5. Solve a system of two linear equations in two variables algebraically and graphically recognizing cases of no solutions or infinitely many solutions
6. Read, analyze, and solve verbal problems involving (linear and quadratic) equations and inequality

Basic Coordinate and Plane Geometry

1. Find measures of angles by using complementary and supplementary relations
2. Solve problems involving the measures of angles of triangles; recognize and apply properties of isosceles and equilateral triangles; recognize and apply properties of congruent and similar triangles
3. Apply the Pythagorean Theorem to solve problems involving right triangle in various contexts
4. Find the circumference/perimeters and the area of triangles, parallelograms, trapezoids, and circles
5. Find the surface area and volume of selected prisms, pyramids, spheres and cylinders
6. Given two points (x1, y1) and (x2, y2) , find the distance and midpoint between the two points; slope and equation of a line through the two given points
7. Find the slope (m) and y-intercept (b), given the equation of a line; and find the equation of a line given the slope (m) and y-intercept (b)
8. Given a point (x1, y1) and the slope m, find the equation of a line
9. Given the equations of two lines, determine if they are parallel, perpendicular or neither

Functions and their Graphs

1. Determine whether a relation represents a function; and evaluate the value of a function
2. Determine the domain and range of a function
3. Make connections between the graphical, tabular, verbal, and symbolic representations of a function
4. Find the sum, difference, product, quotient and composition of two functions
5. Determine the interval where a function is increasing, decreasing, or constant
6. Identify a function as odd, even, or neither
7. Graph linear, quadratic, piecewise, polynomial and rational functions as well as basic exponential and logarithmic functions
8. Know the meaning of inverse functions and find inverse of a function algebraically and graphically
9. Graph functions using transformations such as vertical and horizontal shift; reflection; rotation, compression and stretches
10. Know the properties of exponential and logarithmic functions and simplify the expressions using their properties/ laws
11. Solve logarithmic and exponential equations using their properties
12. Solve real world problems involving exponential and logarithmic function (i.e. compound interest, growth and decay etc)

Trigonometry

1. Convert between radian measure and degree measure
2. Know the unit circle definition as well as right triangle definition of six trigonometric functions
3. Learn the values at important angles based on unit circle
4. Solve right triangles using six trig functions
5. Solve application problems involving navigation and surveying, including angles of elevation and depression
6. Understand and sketch the graph of trig functions and their transformation
7. Simplify trig expressions using the standard formulas and identities (Pythagorean formulas, complementary angle formulas, sums and differences formulas, and double- and half-angle formulas)
8. Solve trigonometric equations
9. Evaluate expressions involving inverse trigonometric functions
10. Sketch the graphs of the inverse trig functions and state the domain and range
11. Solve triangle using Law of Sine and Law of Cosine

Study Resources:

Please check the following ministry web site for the most current list of recommended learning resources in the Mathematics 10- 12 Grade Collections:

https://curriculum.gov.bc.ca/curriculum/mathematics/10/foundations-of-mathematics-and-pre-calculus
https://curriculum.gov.bc.ca/curriculum/mathematics/11/foundations-of-mathematics
https://curriculum.gov.bc.ca/curriculum/mathematics/11/pre-calculus
https://curriculum.gov.bc.ca/curriculum/mathematics/12/foundations-of-mathematics
https://curriculum.gov.bc.ca/curriculum/mathematics/12/pre-calculus

Other resources:

Blitzer, Robert F. Precalculus, 6th ed., Pearson, 2017. ISBN 13: 9780134469140
Baratto, Stefan, and Barry Bergman. *Beginning Algebra*. 9th ed., McGraw-Hill, 2013. **SBN-13:** 9780073384450
Foundations of Mathematics 11: Student Resource and eBook CD–ROM. **Nelson Education.**[ISBN: 9780176352684]
Pre-calculus 11: Student Resource, **McGraw-Hill Ryerson.** [ISBN: 9780070738737]
Foundations of Mathematics 12 Student Resource and eBook online. **Nelson Education.** [ISBN: 9780176504229]
Pre-calculus 12: Student Resource. **McGraw-Hill Ryerson.** [ISBN: 0070738726]

Sample Questions- Math Placement Test

Choose the one alternative that best completes the statement or answers the question. *Calculator is not required for this test.*

1) Perform the indicated operations in the proper order: $\frac{1}{2} \div [\left(-\frac{4}{5}\right)\left(-\frac{1}{4}\right)] + \left(-\frac{1}{8}\right)$ 1) _____

A) $-\frac{8}{25}$

B) $-\frac{4}{25}$

C) $\frac{19}{8}$

D) $\frac{21}{8}$

E) $\frac{8}{5}$

2) Simplify the exponential expression: $\left(\frac{-30x^7y^6}{10x^{12}y^{-2}}\right)^3$ 2) _____

A) $\frac{27y^{24}}{x^{15}}$

B) $\frac{-27y^{12}}{x^{15}}$

C) $\frac{-27}{x^{15}y^{24}}$

D) $\frac{-27y^{24}}{x^{15}}$

E) $\frac{3\,y^{24}}{x^{15}}$

3) Factor the trinomial: $8x^2 - 59x + 21$ 3) _____

A) (x - 7)(8x - 3)

B) (8x + 18)(8x - 3)

C) (3 - 8x)(8x - 3)

D) (x + 7)(8x - 3)

E) (3 + 7x)(8x - 3)

4) Simplify and express in lowest terms: $\dfrac{\dfrac{3}{x^2 - 4x - 21} - \dfrac{1}{x - 7}}{\dfrac{1}{x + 3} + 1}$ 4) _____

A) $-\dfrac{x}{x^2 - 4x - 21}$

B) $-\dfrac{x}{x^2 - 3x - 28}$

C) $\dfrac{x}{x^2 - 5x - 28}$

D) -1

E) 3

5) Peter is making monthly mortgage payments of $985 for his home mortgage. He noticed on his monthly statement that $946 is used to pay off the interest charge. Only $39 is used to pay off the principal. What percent of his monthly mortgage payment is used to pay off the interest charge? Round to the nearest tenth of a percent, if necessary. 5) _____

A) 9.6%

B)

C) 0.0096%

D) 96%

E) 0.96%

6) Sarah has grades of 78 and 91 on her first two tests. If she wants an average of at least 80 after her third test, what score must she make on that test? 6) _____

A) 80 or more

B) 47 or more

C) 83 or more

D) 85 or more

E) 71 or more

7) A standard train ticket in a certain city costs $3.00 per ride. People who use the train also have the option of purchasing a frequent-rider pass for $15.00 each month. With the pass, a ticket costs only $2.25 per ride. How many train rides in a month make the frequent-rider pass a better deal than standard train tickets? 7) _____

A) 21 or more rides

B) 20 or more rides

C) 19 or more rides

D) 29 or more rides

E) 22 or more rides

8) Solve the exponential equation : $2^{x+7} = 6$ 8) _____

A) $\{\ln 6 - \ln 2 - \ln 7\}$

B) $\left\{\frac{\ln 2}{\ln 6} + \ln 7\right\}$

C) $\left\{\frac{\ln 6}{\ln 2} - 7\right\}$

D) $\left\{\frac{\ln 2}{\ln 6} + 7\right\}$

E) $\left\{\frac{\ln 2}{\ln 6} - 7\right\}$

9) Find the equation of the line (in slope intercept form) passing through $(4, 4)$ and perpendicular to the line whose equation is $-4x + y - 8 = 0$. 9) _____

A) $y = -4x - 20$

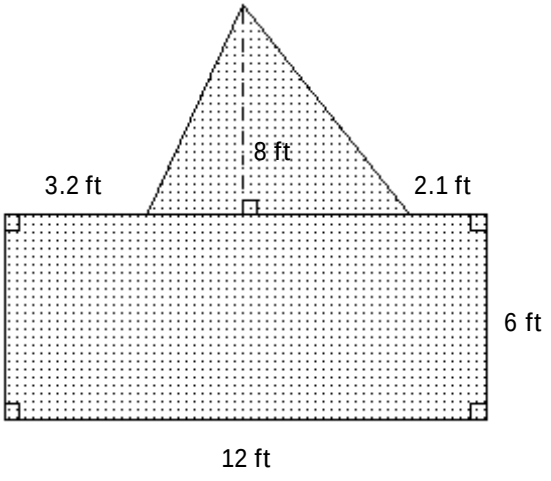
B) $y = \frac{1}{4}x + \frac{15}{4}$

C) $y = -\frac{1}{4}x - 5$

D) $y = \frac{1}{4}x - 5$

E) $y = -\frac{1}{4}x + 5$

10) Find the area of the shaded region. 10) _____



A) 76.9 ft^2

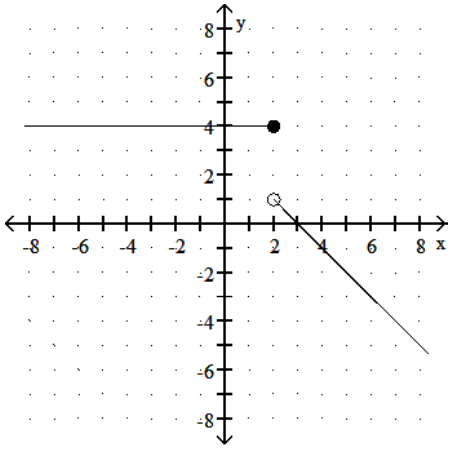
B) 98.8 ft^2

C) 125.6 ft^2

D) 114.4 ft^2

E) not enough information given

11) Consider the graph of peicewise function f(x). 11) _____



Which of the following function describes the graph as shown above?

A) $f(x) = \begin{cases} 4 & \text{for } x \le 2 \\ 3 - x & \text{for } x > 2 \end{cases}$

B) $f(x) = \begin{cases} 4 & \text{for } x \le 2 \\ 1 - x & \text{for } x > 2 \end{cases}$

C) $f(x) = \begin{cases} 4 & \text{for } x < 2 \\ x - 3 & \text{for } x \ge 2 \end{cases}$

D) $f(x) = \begin{cases} 4 & \text{for } x < 0 \\ 3 - x & \text{for } x \ge 0 \end{cases}$

E) None of the above/ below

12) Expand the logarithmic expression as much as possible: $\log_a \left(\frac{x^4 \sqrt[3]{x+5}}{(x-2)^2} \right)$ 12) _____

A) $4 \log_a x - 3 \log_a (x + 5) - 2 \log_a (x - 2)$

B) $4 \log_a x + \log_a (x + 5) - 2 \log_a (x - 2)$

C) $\log_a x^4 + \log_a (x + 5)^{1/3} - \log_a (x - 2)^2$

D) $4 \log_a x + \frac{1}{3} \log_a (x + 5) - 2 \log_a (x - 2)$

E) $\log_a x^4 + \log_a (x + 5)^{-3} - \log_a (x - 2)^2$

13) Find all real numbers in the interval $[0, 2\pi)$ that satisfy the equation: $\tan^2 x = \sqrt{3} \tan x$ 13) _____

A) $\left\{ \frac{\pi}{3}, \frac{\pi}{2}, \frac{4\pi}{3}, \frac{3\pi}{2} \right\}$

B) $\left\{ 0, \frac{\pi}{3}, \pi, \frac{4\pi}{3} \right\}$

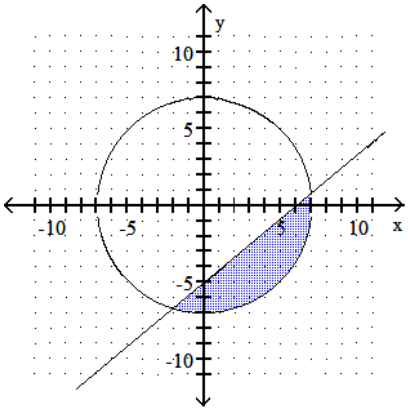
C) $\left\{ 0, \frac{\pi}{3}, \frac{2\pi}{3}, \pi \right\}$

D) $\left\{ 0, \frac{\pi}{6}, \pi, \frac{5\pi}{6} \right\}$

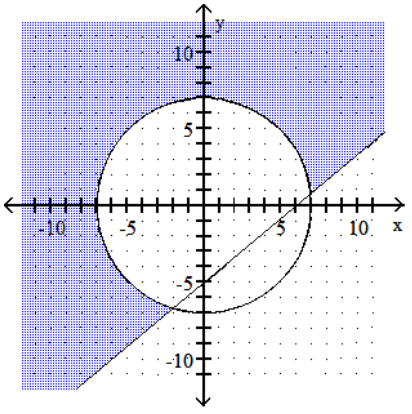
E) $\left\{ 0, \frac{\pi}{6}, \pi \right\}$

14) Consider the systme of ineualities: $x^2 + y^2 \leq 49$ and $-5x + 6y \leq -30$. Which of the following is the solution set of the system of inequalities? 14) _____

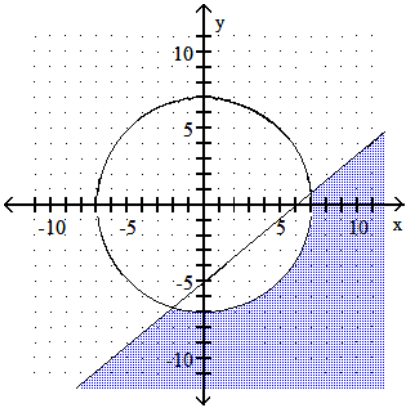
A)



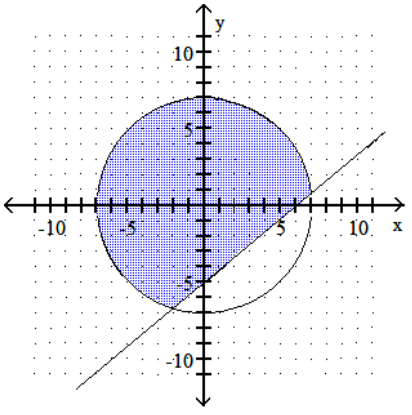
B)



C)



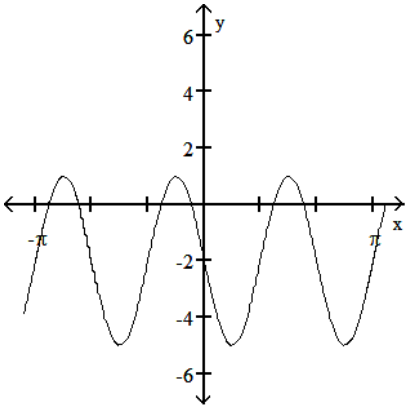
D)



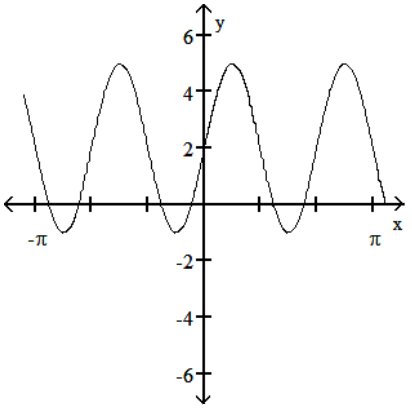
E) No solution

15) Which of the following is the graph of: $y = -3\cos\left(3x - \frac{\pi}{2}\right) + 2$? 15) _____

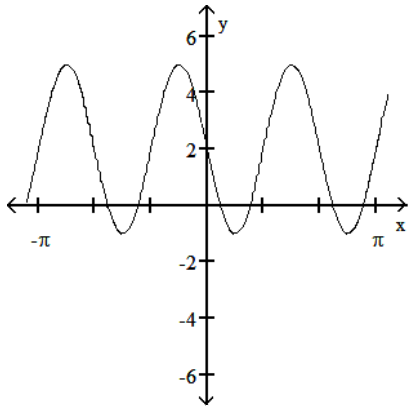
A)



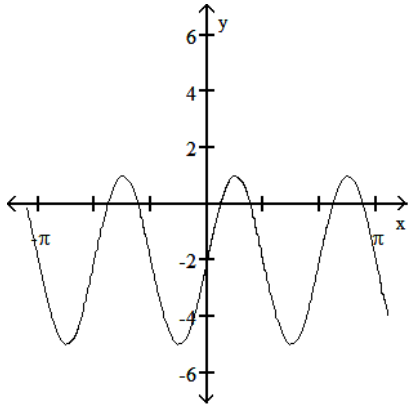
B)



C)



D)



E) None of the above

Answer Key
Testname: MPT SAMPLE QUESTIONS

1) C
2) D
3) A
4) B
5) D
6) E
7) A
8) C
9) E
10) B
11) A
12) D
13) B
14) A
15) C