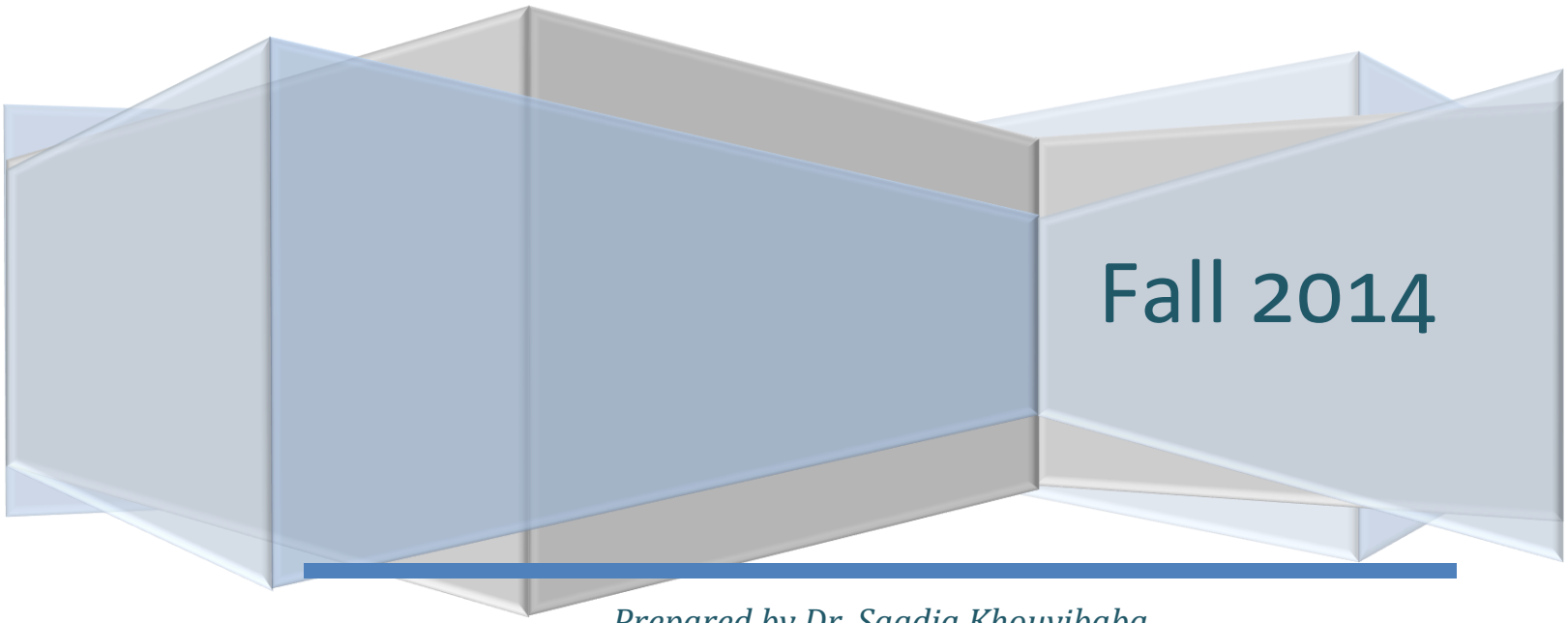
AUS | الجامعة الأميركية في الشارقة
American University of Sharjah
College of Arts and Sciences

PRACTICE PROBLEM SET FOR MATH PLACEMENT TEST FOR ENGINEERS



Prepared by Dr. Saadia Khouyibaba

Prepared by Dr. Saadia Khouyibaba

DEPARTMENT HEAD'S MESSAGE

Dear Student:

While the Department of Mathematics and Statistics at the American University of Sharjah promotes the use of appropriate technology in teaching mathematics it believes that technology should not compromise the development of necessary mathematical thinking. The department faculty members who teach first year mathematics courses have been observing the extensive use of calculators by students in solving the very basic and simple mathematical problems. There was clear evidence that students were unable to demonstrate sufficient understanding of the underlying principles. The failing rates in these courses were rising.

The department took careful measures to examine the use of calculators in first year mathematics courses at AUS and in mathematics placement tests. Several factors were considered in the investigation. As a result, it was decided that calculators should be disallowed in all mathematics placement tests. Consequently the placement test has been redesigned to measure and predict students' success in first year mathematics courses at AUS. It is not formulated after any particular high school curriculum. Students with adequate mathematical skills in algebra and basic mathematics should be able to easily answer the test questions without the aid of calculators.

The attached problem set is for your practice and preparation of the placement test. To increase your chance of passing the test, you are urged to solve the questions without the aid of calculators. You are advised to spend no more than three minutes per question.

Good luck

Dr. Hana Sulieman

Department Head & Professor of Statistics
Department of Mathematics and Statistics
American University of Sharjah
hsulieman@aus.edu

IMPORTANT

1. THIS PLACEMENT TEST IS ONLY FOR:

- ✓ Architecture/Interior Design majors
- ✓ Computer Science majors
- ✓ All Engineering majors
- ✓ Environmental Science/Biology/Chemistry majors
- ✓ Mathematics majors

2. INSTRUCTIONS (READ CAREFULLY)

- ✓ The test consists of 30 questions. Each question is followed by five suggested answers designated by (A), (B), (C), (D) and (E).
- ✓ Calculators are not allowed
- ✓ Spend no more than three minutes per question

Question 1: If $y = (x + 3)^2$, then $(-2x - 6)^2$ must equal which of the following?

A) $-4y^2$

B) $-2y^2$

C) $-4y$

D) $2y$

E) $4y$

Question 2: Which of the following is factor of $3x^2 + 10x - 8$

A) $3x + 2$

B) $3x + 4$

C) $3x - 2$

D) $x - 2$

E) $x - 4$

Question 3: Simplify the following expression completely:

$$\frac{x^2 - 4}{2x^2 - x - 6} \times \frac{6x^2 + 11x + 3}{3x^2 - 8x - 3}$$

A) 1

B) $\frac{x-2}{x-3}$

C) $\frac{x+2}{x-3}$

D) $\frac{x+2}{3x+1}$

E) None of these

Question 4: The value of k that will make the expression $9x^2 - 12x + k$ a perfect square is:

A) 36

B) 4

C) 81

D) 16

E) None of these

Question 5: Simplify the expression

$$\frac{24a^{9/5}b^{3/5} - 16a^{4/5}b^{8/5}}{8a^{4/5}b^{3/5}}$$

A) $3a - 2b$

B) $8a^{4/5}b^{3/5}$

C) $\frac{8a}{b}$

D) $2b - 3a$

E) None of these

Question 6: Simplify the expression

$$\frac{\left(9a^{-1/4}b^{4}c^{9}\right)^{1/2}}{(3^{-1/3}a^{1/2}b^{1/2}c)^{3}}$$

A) $9a^{-13/8}b^{1/2}c^{3/2}$

B) $a^{-5/8}b^{17}c^{2}$

C) $9a^{-5/8}b^{17/8}$

D) $\frac{9a^{-5/8}b^{17/8}}{9a^{\frac{3}{4}}}$

E) None of these

Question 7: Simplify the expression

$$\frac{\frac{x^2 + 2x - 3}{x + 2}}{\frac{x - 1}{x^2 - 4}}$$

A) $(x^2 - 3)(x - 4)$

B) $(x - 3)(x^2 - 4)$

C) $\frac{1}{(x+2)^2}$

D) $(x - 3)(x - 2)$

E) $(x - 2)(x + 3)$

Question 8: Which of the following statements is/are true?

P: $\sqrt{x^2 + y^2} = x + y$

Q: $\sqrt{x + y} = \sqrt{x} + \sqrt{y}$

A) P only
B) Q only
C) P and Q
D) None of them
E) None of these

Question 9: Simplify the expression: $\frac{\sqrt{12}}{6} + \sqrt{\frac{1}{3}} + \frac{\sqrt{3}}{3}$

A) $\frac{4}{3}$
B) $3\sqrt{3}$
C) $\sqrt{3}$
D) $\frac{1}{3}$
E) None of these

Question 10: Rationalize the denominator and simplify the expression

$$\frac{\sqrt{5}}{5\sqrt{2} - \sqrt{5}}$$

A) $\frac{1}{9}(\sqrt{10} - 1)$
B) $\frac{1}{9}(\sqrt{2} + 1)$
C) $\frac{1}{9}(\sqrt{10} + 1)$
D) $\frac{1}{11}(\sqrt{10} + 1)$
E) None of These

Question 11: If $xy = 2$ *and* $xy^2 = 8$, what is the value of x?

A) $\frac{1}{2}$
B) 2
C) 4
D) 8
E) 1

Question 12: If $\frac{5x}{x-2} = \frac{a}{x^2-5x+6}$ then a equals

A) $5x^2 - 15x$
B) $x - 3$
C) $5x^3 - 25x^2 + 30x$
D) $x - 2$
E) None of these

Question 13: Find the value(s) for which the expression $\frac{x+3}{x^2+4x+3}$ is undefined:

A) None
B) 1 and 3
C) -3
D) 1
E) -3 and -1

Question 14: A person had a rectangular-shaped garden with sides of lengths 16 feet and 9 feet. The garden was changed into a square design with the same area as the original rectangular-shaped garden. How many feet in length are each of the sides of the new square-shaped garden?

A) 7
B) 9
C) 12
D) $5\sqrt{7}$
E) 16

Question 15: If five times the square of a positive integer is added to 11 times the integer, the result is 12. What is the integer?

A) -3
B) $\frac{4}{5}$
C) there is no such integer
D) $\frac{3}{4}$
E) None of these

Question 16: Find the slope of the line given by the equation $6x - 2y = 12 - 2y$?

A) 6
B) $\frac{1}{6}$
C) 0
D) Undefined
E) None of these

Question 17: Find an equation for the line with slope $\frac{4}{3}$ and y-intercept 3.

A) $4x - 3y = -3$
B) $4x - 3y = -9$
C) $3y - 4x = -9$
D) $3y - 4x = -3$
E) none of these

Question 18: If $7x - 10 < -10$ or $7x + 9 > 16$ then

A) $x < -\frac{20}{7}$ or $x > 1$
B) $x < 0$ or $x > \frac{25}{7}$
C) $x < 0$ or $x > 1$
D) $x < -\frac{20}{7}$ or $x > \frac{25}{7}$
E) None of these

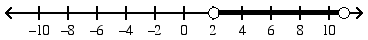
Question 19: Solve the inequality $\frac{3}{2}(5x - 2) < \frac{4}{3}(2x + 5)$

A) $x < 2$
B) $x > 2$
C) $x < 12$
D) $x > 12$

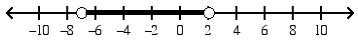
E) None of these

Question 20: Solve the inequality $-5 < 2x - 9 < 13$ and graph the solution set

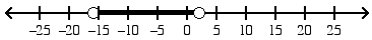
A) $2 < x < 11$



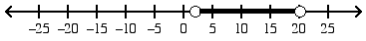
B) $-7 < x < 2$



C) $-16 < x < 2$



D) $2 < x < 20$



E) None of these

Question 21: The inequality $x^2 - 14x > 15$ is equivalent to

A) $-3 < x < 5$

B) $-1 < x < 15$

C) $3 < x < 15$
D) $x < -1 \; or \; x > 15$
E) $x < 3 \; or \; x > 5$

Question 22: Solve the logarithmic equation $\log(3x + 10) = 2$.

A) 30

B) 110
C) $-\frac{8}{3}$

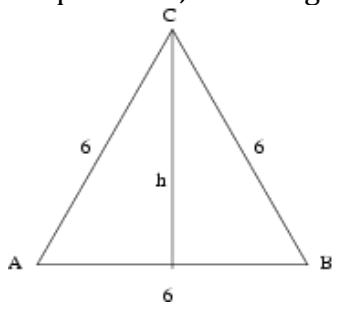
D) -3.23

E) None of these

Question 23: Solve the exponential equation $2^{9n-11} = \frac{1}{16}$

A) $n = \frac{7}{9}$
B) $n = \frac{5}{3}$
C) $n = \frac{8}{9}$
D) $n = 7$
E) None of these

Question 24: If the triangle ABC is equilateral, then height h is



A) 3
B) $3\sqrt{3}$
C) $6\sqrt{3}$
D) $3\sqrt{2}$
E) $6\sqrt{2}$

Question 25: Find the value of $\cos\theta$ if θ lies in the 3rd quadrant and $\csc\theta = \frac{-4}{3}$

A) $\frac{-3}{4}$

B) $\frac{3}{4}$

C) $\frac{-\sqrt{7}}{4}$

D) $\frac{\sqrt{7}}{4}$

E) None of these

Question 26: If $0 < \theta < \frac{\pi}{2}$ and $\tan^2\theta - 2\tan\theta + 1 = 0$, find the value of θ

A) $\frac{\pi}{6}$

B) $\frac{\pi}{3}$

C) 0

D) $\frac{\pi}{4}$

E) None of these

Question 27: The tables of values for the 2 functions f and g are shown below, what is the value of $f(g(3))$?

x	$f(x)$
−5	7
−2	−5
1	3
3	2

x	$g(x)$
−2	3
1	−1
2	−3
3	−5

A) -5

B) -3

C) -1

D) 2

E) 7

Question 28: Let $f(x) = 3x - 6$ and $g(x) = x - 2$. Find $\frac{f}{g}$ and its domain

A) 3, all real numbers

B) 3, all real numbers except x = 2

C) 1, all real numbers

D) −3, all real numbers except x = 3

E) None of these

Question 29: The inverse function of the one-to-one function $f(x) = 5x^{1/3} - 1$ is:

A) $f^{-1}(x) = \frac{5}{x} - 1$

B) $f^{-1}(x) = \frac{1}{5x^3 - 1}$

C) $f^{-1}(x) = \left(\frac{x+1}{5}\right)^3$

D) $f^{-1}(x) = \sqrt[3]{\frac{x+1}{5}}$

E) $f^{-1}(x) = 5x^3 + 1$

Question 30: Multiply $(2 + 3i)(4 - 5i)$ and write your answer in $a + ib$ form

A) $8 - 13i$

B) $23 + 2i$

C) $10 - 12i$

D) $8 - 15i$

E) $8 + 15i$

ANSWERS

Question #	Answer
1	E
2	C
3	C
4	B
5	A
6	A
7	E
8	D
9	C
10	C
11	A
12	A
13	E
14	C
15	C
16	D
17	B
18	C
19	A
20	A
21	D
22	A
23	A
24	B
25	C
26	D
27	E
28	B
29	C
30	B