



University of Mount Union Mathematics Placement Review Problems – Fall 2022

- ✓ This is a Practice Placement test. It consists of problems similar to the actual placement test. You may use a calculator on the test.
- ✓ Work out each problem then check your answers using the provided key.
- ✓ For practice, you may look at the formula sheet, but the formulas will not be provided during the actual test.

1. Simplify the expression $(x^5y^{-3})^{-4}$.
2. Evaluate the expression $6x^2 + 8y - 2$ when $x = -7$ and $y = 5$.
3. Simplify $97 - 6 \cdot 16 + 105 \div (-7)$.
4. Simplify the expression $(5v^6 + 5v^3 + 3^2) - (-19v^3 + 7v^6 - 3)$.
5. Solve the equation below for W .

$$P = 2L + 2W$$

6. Find the slope of the line that contains the points $(-4, -5)$ and $(-1, 7)$.
7. Find the slope, x -intercept, and y -intercept of the line $3x + 4y = -5$.
8. Write an equation of the line passing through $(6, -2)$ with slope $\frac{1}{3}$. Write your answer in slope-intercept form.
9. Perform the indicated operation and reduce the answer to lowest terms:

$$\frac{2y}{4y + 2} \cdot \frac{10y + 5}{6}$$

10. Rationalize the denominator of the following expression:

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

11. Let $f(x) = 4x + 5$. Find the difference quotient $\frac{f(x+h)-f(x)}{h}$.

12. Solve the following equation for x .

$$\frac{1}{9}(3x + 2) = \frac{1}{11}(7x - 5)$$

13. Solve the following equation for x .

$$-1 + (2 - 4x) - (1 - x) = 5x - 2(x - 3)$$

14. Solve the following equation for x .

$$x^2 = 24 - 5x$$

15. Solve the following equation for x .

$$\sqrt{x + 6} + \sqrt{2 - x} = 4$$

16. Solve the following equation for x .

$$3^{3x+6} = \frac{1}{27}$$

17. Solve the following system of equations for x and y .

$$x + 2y = 7$$

$$5x - y = 2$$

18. The cost in dollars a particular phone company has in making x phones during a month is given by the function $C(x) = 400x + 50,000$. How many phones were produced if the costs reached \$290,000?

19. A small rocket is launched upward from the ground. After t seconds, its distance in feet above the ground is $s(t) = 36t - 4t^2$. After how many seconds will the object be 32 feet above the ground?

20. Solve the equation $\log_3(x + 15) - \log_3(x - 1) = 2$.

21. Use properties of logarithms to expand the following logarithmic expression as much as possible.

$$\log_a \left(\frac{x^5 y^2}{\sqrt{z}} \right)$$

22. Find the domain of the function $f(x) = \sqrt{22 - x}$.

23. Convert 54° to radians.

24. Find the exact value of $\sec(120^\circ)$.

25. If $\sin \theta = \frac{4}{5}$ and θ is in Quadrant II, find, $\sec \theta$.

26. Solve the equation in the interval $[0, 2\pi)$:

$$\sqrt{2} \sin \theta - 1 = 0$$

27. If $f(x) = 3x + 5$ and $g(x) = x^2 - 4x$, find $(f \circ g)(3)$.

28. The cost C in dollars of a gym membership is given by $C = 45x + 70$, where x represents the number of months of the membership. How much would an 8-month membership cost?

29. A rectangle has a length 2 ft less than twice its width. When 5 ft are added to the width, the resulting figure is a square with an area of 144 ft^2 . Find the dimensions of the original rectangle.

30. Factor completely: $16x^2 - 112xy + 196y^2$

31. Factor completely: $x^2(a - b) + 49(b - a)$

32. Multiply as indicated.

$$\sqrt[3]{4x^7} \cdot \sqrt[3]{6x}$$

33. Simplify the following expression. Assume that any variables represent positive numbers.

$$(144x^{10}y^4)^{1/2}$$

34. Subtract as indicated.

$$-\frac{8}{9} - \frac{4}{5}$$

35. Divide as indicated.

$$\frac{3x - 3}{x} \div \frac{5x - 5}{7x^2}$$

36. Simplify the complex fraction below.

$$\frac{9 + \frac{3}{x}}{\frac{x}{4} + \frac{1}{12}}$$

37. Given that $f(x) = x - 2$ and $g(x) = x - 7$, find $(f + g)(4)$.

38. Write the following English phrase as an algebraic expression. Let x represent the number.

4 less than 7 times a number

39. Bob needs to have his car towed. An auto shop charges a flat fee of \$75 plus \$2 per mile towed.

Write a function expressing Bob's towing cost, C , in terms of miles towed, x , and use the function

to find the cost of having the car towed 12 miles.

40. Solve the following equation:

$$\frac{x + 4}{2} = \frac{23}{10} - \frac{x - 2}{5}$$

41. Solve the following equation: $|8x + 1| - 4 = 2$

42. Solve the following equation: $1 + \frac{1}{x} = \frac{20}{x^2}$

43. Solve the following inequality: $6(x + 2) - 13 < 15 + 2x$
44. The height of Building A is 882 feet more than the height of Building B. The two buildings have a combined height of 1,474 feet. What are the heights of each building?
45. A student received scores of 88, 85, 90, and 87 on their first four exams. What is the minimum score they must receive on the fifth exam to have an overall exam average of at least 87?
46. Use properties of logarithms to expand the following logarithmic expression as much as possible.
(Assume all variable expressions represent positive real numbers).

$$\ln\left(\frac{e^x \sin^3 x}{(x^2 + 3)^4}\right)$$

47. Simplify: $e^{2 \ln(x+4)}$.
48. Given that $\tan \theta = -2/7$ and θ is in Quadrant II, find the exact value of $\cos \theta$.
49. Solve the equation below on the interval $[0, 2\pi)$.

$$2 \cos^2 \theta - 7 \cos \theta = -3$$

50. Solve the following equation: $\log(x + 1) + \log(x - 2) = 1$