

EXERCISES FOR SMU MATHEMATICS PLACEMENT TEST –TEST 1  
(Corresponds to M100 Elementary Mathematical Ideas and M102 Intermediate Algebra)

Placement test problems will be multiple choice. The exercises in this part deal with the subject matter of Test 1 and of M100 and M102. Answers begin on page 7 of this packet.

Major Topics: Add, subtract, multiply, divide, raise fractions and integers to powers.

Know use of parentheses and priority of operations.

Add, subtract, multiply, and divide polynomials.

Solve linear (1<sup>st</sup> degree) equations.

Solve inequalities in one variable.

Work with formulas, ratios, and proportions.

Factor polynomials.

Add, subtract, multiply, divide, reduce rational expressions (fractions).

Simplify complex fractions.

Solve equations containing rational expressions.

Know slope-intercept and point-slope forms of linear equations.

Graph linear equations and linear inequalities.

Add, subtract, multiply, and divide square roots and higher-order roots.

Solve quadratic equations by factoring, by completing the square, and by the quadratic formula.

Solve and graph linear systems of equations and inequalities in two variables.

Solve word problems appropriate to this level.

1. Perform the indicated operations. Reduce answers to lowest terms.

a)  $\frac{3}{5} \cdot \frac{5}{6}$

b)  $\frac{2}{5} \div \frac{10}{9}$

c)  $\frac{5}{6} + \frac{1}{3}$

d)  $\frac{3}{8} - \frac{1}{6}$

2. Insert <, >, or = to make the expression true.

a)  $-3 < -5$

b)  $-2 > 1$

c)  $0.50 < 0.509$

d)  $|-2.5| > \left|\frac{5}{2}\right|$

3. Evaluate each.

a)  $-3 + 6$

b)  $-4 + (-5)$

c)  $-8 - (-2)$

d)  $-7 - 5$

e)  $-4(7)$

f)  $\left[\frac{10}{11}\right]\left[\frac{3}{-5}\right]$

g)  $15 \div (-3)$

h)  $[4 + 3(-2) - 6]$

i)  $4^2$

j)  $(-4)^2$

k)  $-4^2$

l)  $(-3)^3$

m)  $\left[\frac{-3}{5}\right]^2$

n)  $2 - (8 - 3)$

o)  $2^3 \div 4 + 6 \cdot 3$

4. Express each in exponential form.

a.)  $xxxy$

b.)  $xyxyz$

5. Evaluate  $x^2 - 2x - 3$ , when  $x = -2$ .

6. Use the distributive property to remove parentheses and simplify each.

a.)  $-3(2x - 5)$

b)  $6 - (-x + 2) + x$

c)  $3(x^2 - 7x) + 4(2 - x)$

7. Find the set of solutions of each.

a.)  $x + 3 = -5$

b)  $-5x + 3 = 2x + 10$

c)  $2(x - 3) - 5 = 7(x + 1)$

8. Find the set of solutions for each.

a.)  $\frac{x}{9} = \frac{8}{-3}$

b)  $\frac{x+1}{x} = \frac{1}{3}$

9. Use the formula  $IR = E + Rr$  to find  $r$  when  $I$  is 5,  $E$  is 100, and  $R$  is 200.

10. Solve the formula  $i = prt$  for  $t$ .

11. a) Solve  $2x - y = 12$  for  $y$ .

b) Then find the value of  $y$  if  $x$  is 10.

12. Simplify and express each without negative exponents.

a)  $x^3x^5$

b)  $x^4x^{-7}$

c)  $\frac{x^5}{x^{-2}}$

d)  $x^0$

e)  $(-5x^{-2})^3$

f)  $\left[\frac{3x^4}{2y}\right]^3$

g)  $(x^{-2/3}y^{1/2})^2$

h)  $\left[\frac{x^{1/3}y^{1/2}}{z^2}\right]^{-2}$

13. Perform each indicated operation and simplify.

a)  $(-x^2 + 6x - 7) + (-2x^2 + 4x - 8)$

b)  $(x^2 + 7x - 3) - (x^2 + 3x - 5)$

c)  $(2x + 4)(x - 3)$

d)  $(x - 1)(3x^2 + 4x - 6)$

e)  $\frac{8x^2 + 4x}{x}$

f)  $\frac{x^2 + x - 12}{x - 3}$

14. Factor each. If an expression cannot be factored, so state.

a)  $9x + 33$

b)  $18x^2y + 18x^3y^2$

c)  $x^2 - 3x - 18$

d)  $x^3 - 13x^2 + 40x$

e)  $3x^2 - 5x - 12$

f)  $x^2 - 64$

g)  $x^3 + 8$

h)  $x^3 - 27$

15. Find the set of solutions for each.

a)  $3x + 7 < 19$

b)  $-2x + 3 \leq 10$

16. Reduce each to its lowest terms.

a)  $\frac{2x}{4x + 8}$

b)  $\frac{x^2 - 4}{x - 2}$

17. Perform each indicated operation and reduce to lowest terms.

a)  $\frac{15x^2y^3}{3z} \cdot \frac{6z^3}{5xy^3}$

b)  $\frac{8xy^2}{z} \div \frac{x^4y^2}{4z^2}$

c)  $\frac{x}{x+2} - \frac{2}{x+2}$

d)  $\frac{6x^2 - 4x}{2x - 3} - \frac{-3x + 12}{2x - 3}$

e)  $\frac{4}{3x} + \frac{8}{5x^2}$

f)  $\frac{x+3}{x^2-9} + \frac{2}{x+3}$

g)  $\frac{4 - \frac{9}{16}}{1 + \frac{5}{8}}$

h)  $\frac{x - \frac{x}{y}}{\frac{1+x}{y}}$

18. Find the set of solutions for each.

a)  $\frac{3}{x} = \frac{8}{24}$

b)  $\frac{4}{x} - \frac{1}{6} = \frac{1}{x}$

19. Determine which ordered pairs satisfy the equation  $3y = 5x - 9$ .

- a) (3, 2)                      b)  $(\frac{9}{5}, 0)$                       c) (-2, -6)                      d) (0, 3)

20. Find the slope and y-intercept of the graph of  $6x - 2y = 10$ .

21. Write an equation of the line with a slope of 3 and passing through the point (1,3).

22. Write an equation of the line passing through the points (3,3) and (6, -3).

23. Sketch the 2-dimensional graph of  $y = 3x - 2$ .

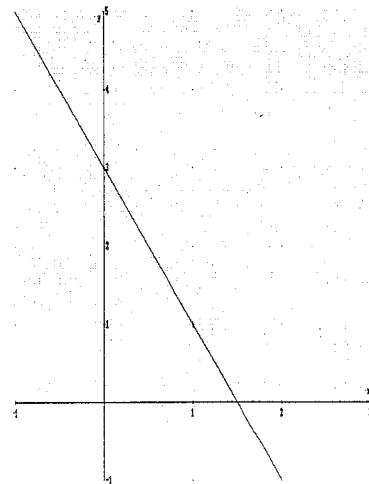
24. Sketch the 2-dimensional graph of  $x = -5$ .

25. Sketch the 2-dimensional graph of  $3x + 5y = 15$ .

26. Sketch the 2-dimensional graph of  $y \geq -3x + 5$ .

27. Sketch the 2-dimensional graph of  $y \leq 4x - 2$ .

28. Write an equation of the graph in the figure to the right.



29. Simplify each. (All variables have only nonnegative values.)

- a)  $\sqrt{60}$                       b)  $\sqrt{12x^2}$                       c)  $\sqrt{32x^4y^5}$                       d)  $\sqrt{8x^2y}\sqrt{6xy}$
- e)  $\sqrt{\frac{5}{125}}$                       f)  $\sqrt{\frac{3xy^2}{48x^3}}$                       g)  $\sqrt{48} + \sqrt{75} + 2\sqrt{3}$                       h)  $4\sqrt{x} - 6\sqrt{x} - \sqrt{x}$

30. Write  $\frac{6}{\sqrt{x} - 3}$  in a form with no radical in the denominator.

31. Find the set of solutions for each.

a)  $\sqrt{x+5} = 9$

b)  $2\sqrt{x+4} + 4 = x$

32. Simplify each.

a)  $\sqrt[3]{8}$

b)  $8^{2/3}$

c)  $\sqrt[3]{x} \sqrt[3]{x}$

33. Find the set of solutions for each.

a)  $x^2 + 1 = 26$

b)  $(2x - 3)^2 = 35$

34. Find the set of solutions for  $x^2 - 4x = 60$  by completing the square.

35. Find the set of solutions for  $x^2 - 5x - 3 = 0$  by the quadratic formula.

36. Find the set of solutions for each by the method of your choice.

a)  $3x^2 - 5x = 0$

b)  $x^2 - 5x - 6 = 0$

c)  $6x^2 + 13x - 5 = 0$

d)  $x(x+1) = 4 + 2(x+3)$

37. Determine whether  $3x^2 - 4x + 2 = 0$  has two distinct real solutions, a single unique solution, or no real solution.

38. Find the set of solutions for each by the method of your choice.

a)  $\begin{cases} 3x - 2y = 13 \\ x + y = 6 \end{cases}$

b)  $\begin{cases} 3x - 2y = -1 \\ x + y = 1 \end{cases}$

c)  $\begin{cases} 3x + 4y = 10 \\ 4x + 5y = 14 \end{cases}$

39. Graph the system of inequalities  $\begin{cases} y \leq 2x - 5 \\ x - 3y \leq 2 \end{cases}$ .

40. The sum of a number and its reciprocal is  $\frac{13}{6}$ . Find the number.

41. The sum of an integer and twice its square is 15. Find the integer.

42. The sum of two consecutive even integers is 78. Find the integers.

## Answers for the Exercises for Test 1

1. a)  $\frac{1}{2}$                       b)  $\frac{9}{25}$                       c)  $\frac{7}{6}$                       d)  $\frac{5}{24}$
2. a)  $-3 > -5$                       B)  $-2 < 1$                       c)  $0.50 < 0.509$                       d.)  $|-2.5| = \left| \frac{5}{2} \right|$
3. a) 3                      b) -9                      c) -6                      d) -12
- e) -28                      f)  $\frac{-6}{11}$                       g) -5                      h) -8
- i) 16                      j) 16                      k) -16                      l) -27
- m)  $\frac{9}{25}$                       n) -3                      o) 20
4. a)  $x^2y$                       b)  $x^2y^2z$
5. 5
6. a)  $-6x + 15$                       b)  $2x + 4$                       c)  $3x^2 - 25x + 8$
7. a)  $\{-8\}$                       b)  $\{-1\}$                       c)  $\left\{ \frac{-18}{5} \right\}$
8. a)  $\{-24\}$                       b)  $\left\{ \frac{-3}{2} \right\}$
9.  $r$  is  $\frac{9}{2}$ .
10.  $t = \frac{i}{pr}$
11. a)  $y = 2x - 12$                       b)  $y$  is 8.
12. a)  $x^8$                       b)  $\frac{1}{x^3}$                       c)  $x^7$                       d) 1
- e)  $\frac{-125}{x^6}$                       f)  $\frac{27x^{12}}{8y^3}$                       g)  $\frac{y}{x^{4/3}}$                       h)  $\frac{z^4}{x^{2/3}y}$
13. a)  $-3x^2 + 10x - 15$                       b)  $4x + 2$                       c)  $2x^2 - 2x - 12$                       d)  $3x^3 + x^2 - 10x + 6$
- e)  $8x + 4$                       f)  $x + 4$

14. a)  $3(3x + 11)$       b)  $18x^2y(1 + xy)$       c)  $(x + 3)(x - 6)$       d)  $x(x - 5)(x - 8)$   
 e)  $(3x + 4)(x - 3)$       f)  $(x + 8)(x - 8)$       g)  $(x + 2)(x^2 - 2x + 4)$       h)  $(x - 3)(x^2 + 3x + 9)$

15. a)  $\{x \mid x < 4\}$  or  $(-\infty, 4)$       b)  $\left\{x \mid x \geq \frac{-7}{2}\right\}$  or  $\left[\frac{-7}{2}, \infty\right)$

16. a)  $\frac{x}{2x + 4}$       b)  $x + 2$

17. a)  $6xz^2$       b)  $\frac{32z}{x^3}$       c)  $\frac{x - 2}{x + 2}$       d)  $3x + 4$

- e)  $\frac{4(5x + 6)}{15x^2}$       f)  $\frac{3(x - 1)}{(x + 3)(x - 3)}$       g)  $\frac{55}{26}$       h)  $\frac{x(y - 1)}{1 + x}$

18. a)  $\{9\}$       b)  $\{18\}$

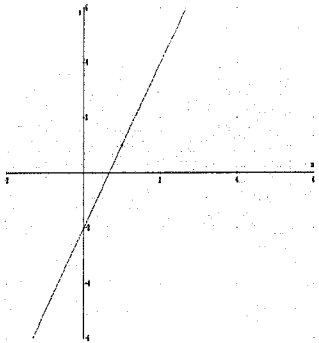
19. a) Yes      b) Yes      c) No      d) No

20. Slope is 3; y-intercept is -5.

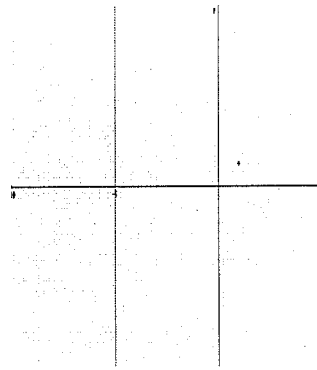
21.  $y - 3 = 3(x - 1)$  or  $y = 3x$

22.  $y - 3 = -2(x - 3)$  or  $y + 3 = -2(x - 6)$  or  $y = -2x + 9$

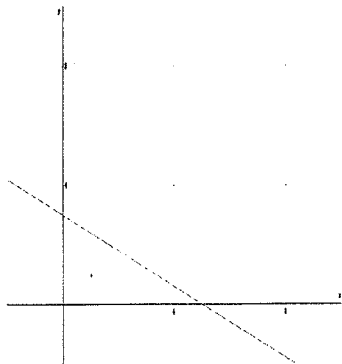
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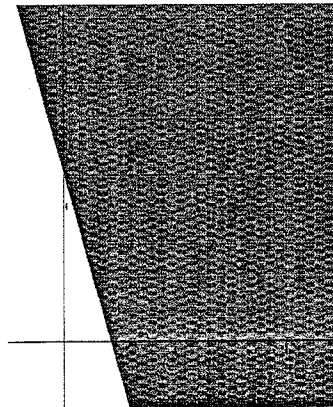
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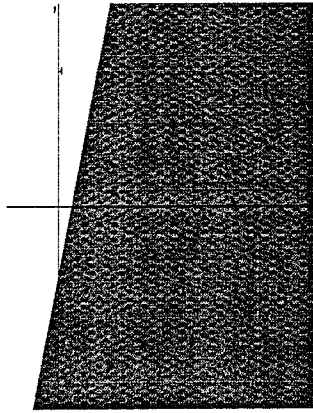


26.





27.



28. The slope is -2 and the y-intercept is 3, so an equation of the line is  $y = -2x + 3$ .

29. a)  $2\sqrt{15}$                       b)  $2x\sqrt{3}$                       c)  $4x^2 y^2 \sqrt{2y}$                       d)  $4xy\sqrt{3x}$

e)  $\frac{1}{5}$                       f)  $\frac{y}{4x}$                       g)  $11\sqrt{3}$                       h)  $-3\sqrt{x}$

30.  $\frac{6(\sqrt{x} + 3)}{x - 9}$

31. a) {76}                      b) {12}

32. a) 2                      b) 4                      c)  $\sqrt[3]{x^2}$  or  $x^{2/3}$

33. a) {-5, 5}                      b)  $\left\{ \frac{3 - \sqrt{35}}{2}, \frac{3 + \sqrt{35}}{2} \right\}$

34. {-6, 10}

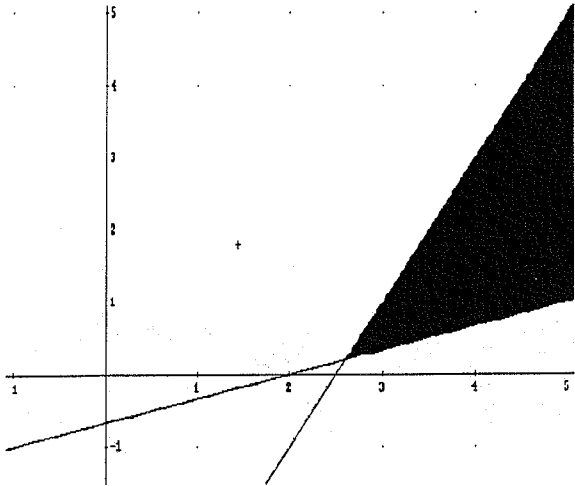
35.  $\left\{ \frac{5 - \sqrt{37}}{2}, \frac{5 + \sqrt{37}}{2} \right\}$

36. a)  $\left\{ 0, \frac{5}{3} \right\}$                       b) {-1, 6}                      c)  $\left\{ \frac{-5}{2}, \frac{1}{3} \right\}$                       d)  $\left\{ \frac{1 - \sqrt{41}}{2}, \frac{1 + \sqrt{41}}{2} \right\}$

37. There are no real solutions since the discriminant is  $(-4)^2 - 4(3)(2) = -8 < 0$ .

38. a) {(5, 1)}                      b)  $\left\{ \left( \frac{1}{5}, \frac{4}{5} \right) \right\}$                       c) {(6, -2)}

39.



40. The number is  $\frac{2}{3}$  or  $\frac{3}{2}$ .

41. The integer is -3.

42. The integers are 38 and 40.