

# Math 090 - Elementary Algebra

## Final Exam Review

**Objective 1:** Solve multistep linear equations, including those involving removing parentheses, combining like terms, using decimals, and clearing fractions. Also solve those with no solution or all real numbers as solutions.

1. Solve for  $r$ :  $0.5r + 2r - 0.3 = 5r + 8.2$

- (a)  $r = 4.25$
- (b)  $r = 6$
- (c)  $r = -1.2$
- (d)  $r = -3.4$

2. Solve for  $n$ :  $5(n - 4) - 1 = -7(-n + 3) - 2n$

- (a)  $n = 0$
- (b) all real numbers
- (c)  $n = -3$
- (d) no solution

3. Solve for  $h$ :  $\frac{1}{2}h + \frac{2h}{7} = 3$

- (a)  $h = \frac{3}{16}$
- (b)  $h = 1$
- (c)  $h = \frac{42}{11}$
- (d)  $h = \frac{3}{11}$

**Objective 2:** Solve a formula for a given variable.

4. Solve for  $g$ :  $A = \frac{gh}{2}$

- (a)  $g = \frac{A}{2h}$
- (b)  $g = \frac{2h}{A}$
- (c)  $g = 2A - h$
- (d)  $g = \frac{2A}{h}$

5. Solve for  $n$ :  $A = \frac{m+n}{2}$
- (a)  $n = 2A - m$
  - (b)  $n = \frac{2A}{m}$
  - (c)  $n = Am + 2$
  - (d)  $n = A + 2m$

**Objective 3:** Solve application problems that require setting up and solving linear equations.

6. The sum of two consecutive integers is 35. Which of the following equations could be used to find the smaller integer,  $n$ ?
- (a)  $n + n = 35$
  - (b)  $n + 2n = 35$
  - (c)  $n + n + 2 = 35$
  - (d)  $n + n + 1 = 35$
7. Zhen received a job offer that will pay him 28% more than his present salary. If the salary offer is \$30,200, which one of the following equations could be used to determine his present salary,  $x$ ?
- (a)  $30200 - 0.28 = x$
  - (b)  $30200 + 0.28x = x$
  - (c)  $30200 - 0.28(30200) = x$
  - (d)  $x + 0.28x = 30200$
8. With a calling plan, you pay \$4.95 per month plus 7 cents per minute of talk time. One monthly bill was \$29.45. How many minutes of talk time were used?
- (a) 3.5 minutes
  - (b) 25 minutes
  - (c) 270 minutes
  - (d) 350 minutes

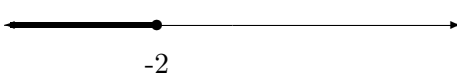
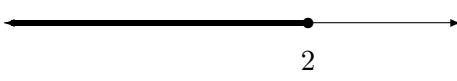


**Objective 4:** Solve linear inequalities, including those involving removing parentheses and combining like terms. Graph solutions on the number line, write solutions as inequalities, and write solutions in set-builder notation.

9. Solve the following inequality:  $4 - 7v \geq 13 + 2v$

- (a)  $\{v \mid v \geq 2\}$
- (b)  $\{v \mid v \leq -3\}$
- (c)  $\{v \mid v \geq 1\}$
- (d)  $\{v \mid v \leq -1\}$

10. Solve the following inequality and graph the solution set on a number line.

$$2x - 9 \leq 7x + 1$$

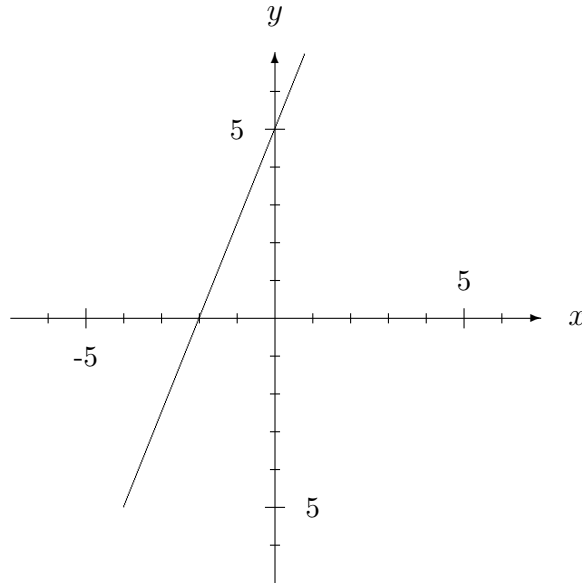
- (a) 
- (b) 
- (c) 
- (d) 

**Objective 5:** Given an equation or graph of a line, find points on the line. [Students should be able to find solutions of two-variable linear equations and find points including, but not limited to, the  $x$ - and  $y$ -intercepts of a line.]

11. Find the  $x$ - and  $y$ -intercepts of the line described by the equation  $8x - 5y = 20$ .

- (a)  $x$ -intercept  $(0, -4)$ ;  $y$ -intercept  $(5, -8)$
- (b)  $x$ -intercept  $(2.5, 0)$ ;  $y$ -intercept  $(0, -4)$
- (c)  $x$ -intercept  $(8, 0)$ ;  $y$ -intercept  $(0, -5)$
- (d)  $x$ -intercept  $(-5, 0)$ ;  $y$ -intercept  $(0, 8)$

12. Find the  $y$ -intercept of the line whose graph is shown below.



- (a)  $(5, 0)$
- (b)  $(-2, 0)$
- (c)  $(0, 5)$
- (d)  $(0, -2)$

13. Which one of the following points lies on the graph of  $4x - 3y = 10$ ?

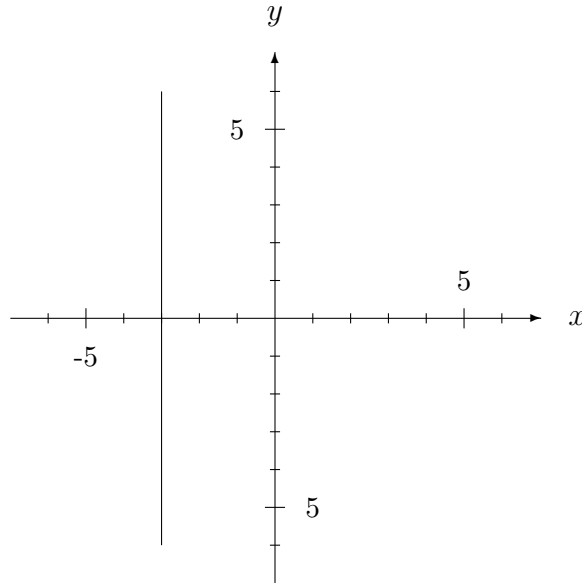
- (a)  $(2, -1)$
- (b)  $(-3, -7)$
- (c)  $(0, -3)$
- (d)  $(-5, -10)$

**Objective 6:** Given an equation of a line, sketch its graph. Identify equations corresponding to the graphs of horizontal or vertical lines. Identify quadrants in which certain points lie.

14. Find an equation of the horizontal line that passes through  $(-2, 4)$ .

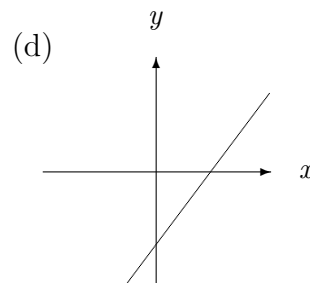
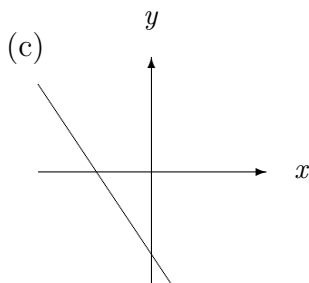
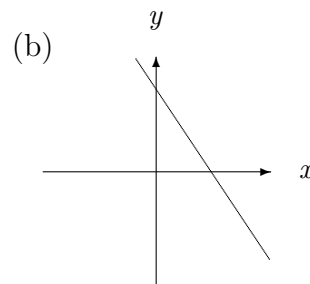
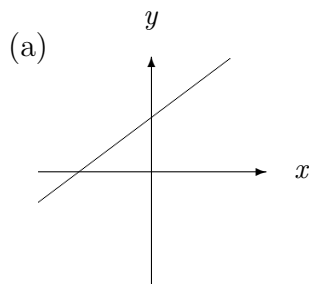
- (a)  $x = -2$
- (b)  $x = y$
- (c)  $y = 4$
- (d)  $x + y = 2$

15. Which one of the equations below is illustrated by the given graph?



- (a)  $x = 5$
- (b)  $y = -4$
- (c)  $x = -3$
- (d)  $y = 2$

16. Which one of the graphs below most closely resembles the graph of the equation  $3x + 2y = 9$ ? After you have identified the graph, label the  $x$ - and  $y$ -intercepts.



17. In the ordered pair  $(x, y)$ , the first coordinate is negative and the second coordinate is positive. When the point is graphed, in which quadrant does it lie?
- (a) Quadrant I (1st Quadrant)
  - (b) Quadrant II (2nd Quadrant)
  - (c) Quadrant III (3rd Quadrant)
  - (d) Quadrant IV (4th Quadrant)

**Objective 7:** Use the laws of exponents to rewrite and simplify expressions involving exponents.

18. Simplify:  $(-5u^4v^5)^2$

- (a)  $-10u^4v^5$
- (b)  $-25u^4v^5$
- (c)  $25u^8v^{10}$
- (d)  $\frac{1}{25u^8v^{10}}$

19. Express using positive exponents:  $k^{-5} \cdot k^{-3} \cdot k^2$

- (a) 1
- (b)  $k^{30}$
- (c)  $k^{13}$
- (d)  $\frac{1}{k^6}$

**Objective 8:** Perform the operations of addition, subtraction, multiplication, and division on single-variable and multi-variable polynomials.

20. Divide:  $\frac{x^3 + 2x^2 - 5x - 6}{x - 2}$

- (a)  $x^2 + 2x + 3$
- (b)  $x^2 + 4x + 3$
- (c)  $x^2 - 4x - 3$
- (d)  $x^2 + 6x - 3$

21. Subtract:  $(8p^2q^2 - 4pq + 2q^2) - (-p^2q^2 + 4pq - 8)$
- (a)  $9p^2q^2 - 8pq + 2q^2 + 8$
  - (b)  $9p^2q^2 + 2q^2 - 8$
  - (c)  $7p^2q^2 - 8pq + 8$
  - (d)  $7p^2q^2 - 8pq + 2q$
22. Multiply:  $(5u^4 - 6v^2)(5u^4 + 6v^2)$
- (a)  $25u^8 - 36v^4$
  - (b)  $10u^4 - 12v^2$
  - (c)  $10u^8 - 12v^4$
  - (d)  $25u^{16} - 36v^4$

**Objective 9:** Evaluate polynomial expressions.

23. Evaluate  $3g^2 + 2gh - 5h^2$  when  $g = 2$  and  $h = -1$ .
- (a) 9
  - (b)  $-4$
  - (c)  $-2$
  - (d) 3
24. In the movie *Castaway*, Tom Hanks has a volleyball friend named Wilson. Wilson has a diameter of approximately 8.3 inches. Find the volume of air in the volleyball if the volume of a sphere of radius  $r$  is given by  $V = \frac{4}{3}\pi r^3$ .
- (a)  $333 \text{ in}^3$
  - (b)  $42042 \text{ in}^3$
  - (c)  $2395 \text{ in}^3$
  - (d)  $299 \text{ in}^3$

**Objective 10:** Multiply and divide numbers in scientific notation, and convert between scientific notation and standard decimal notation.

25. Simplify and write this expression in decimal notation:  $\frac{(4.2 \times 10^5)(2.5 \times 10^{-2})}{3.5 \times 10^4}$
- (a) 3
  - (b) 0.3
  - (c) 0.003
  - (d) 3000
26. Write this number in scientific notation: 435,000
- (a)  $435 \times 10^3$
  - (b)  $4.35 \times 10^5$
  - (c)  $4.35 \times 10^{-5}$
  - (d)  $4.35 \times 10^{-3}$

**Objective 11:** Factor (over the integers) trinomials of the form  $ax^2 + bx + c$ .

27. Find one of the factors of  $3t^2 - 5t - 2$

- (a)  $3t - 2$
- (b)  $3t + 1$
- (c)  $2t - 1$
- (d)  $t + 2$

28. Find one of the factors of  $24y^3 + 20y^2 - 84y$

- (a)  $3y - 7$
- (b)  $3y + 2$
- (c)  $2y - 3$
- (d)  $4y^2$

**Objective 12:** Factor by grouping, and factor the difference of two squares.

29. Find one of the factors of  $25n^2 - 9$

- (a)  $5n + 9$
- (b)  $5n + 3$
- (c)  $25n - 3$
- (d)  $5n - 9$

30. Find one of the factors of  $3t - 3r + t^2 - tr$

- (a)  $3t$
- (b)  $t + 3$
- (c)  $t + r$
- (d)  $t - 3$

**Objective 13:** Factor sums and differences of two cubes.

31. Find one of the factors of  $1 + 8w^3$

- (a)  $1 + 2w + 4w^2$
- (b)  $1 - 2w + 4w^2$
- (c)  $1 + 8w$
- (d)  $1 - 2w$

32. Find one of the factors of  $3v^3 - 81$

- (a)  $v + 3$
- (b)  $v^2 - 6v + 9$
- (c)  $3$
- (d)  $v - 9$

**Objective 14:** Solve quadratic equations by factoring.

33. Solve the equation  $5r^2 + 9r = 18$ . Which one of the following is the sum of the solutions?

(a)  $-\frac{9}{5}$

(b)  $-\frac{8}{5}$

(c)  $1\frac{3}{5}$

(d)  $\frac{9}{5}$

34. Solve the equation  $7h^2 = 4h$ . Which solution has the lesser value?

(a)  $h = \frac{7}{4}$

(b)  $h = -\frac{4}{7}$

(c)  $h = 0$

(d)  $h = \frac{4}{7}$

**Objective 15:** Solve application problems that require setting up and solving quadratic equations.

35. In a sports league of  $t$  teams in which each team plays every other team twice, the total number of games to be played,  $N$ , is given by  $N = t^2 - t$ . If a basketball league plays a total of 132 games, find the number of teams in the league.

(a) 17,292 teams

(b) 13 teams

(c) 12 teams

(d) 37 teams

36. The width of a rectangle is 8 ft less than the length. The area of the rectangle is  $65\text{ft}^2$ . Find the width.

(a) 5 ft

(b) 8 ft

(c) 11 ft

(d) 16 ft

**Objective 16:** Perform the operations of addition, subtraction, multiplication, and division on rational expressions, and simplify complex rational expressions.

37. Simplify:  $\frac{1 + \frac{1}{h}}{1 - \frac{1}{h^2}}$

(a)  $\frac{h+1}{h-1}$

(b)  $\frac{h}{h-1}$

(c)  $-h$

(d)  $1+h$

38. Subtract and simplify:  $\frac{3-y}{y-7} - \frac{3-y}{7-y}$

(a)  $\frac{6-2y}{y-7}$

(b) 0

(c)  $\frac{2y-3}{2y-7}$

(d)  $\frac{6}{7}$

39. Divide and simplify:  $\frac{z^2-25}{24z} \div \frac{z-5}{6z}$

(a)  $4(z+5)$

(b)  $\frac{z+5}{8}$

(c)  $4z-5$

(d)  $\frac{z+5}{4}$

**Objective 17:** Recognize that a rational expression is not defined when its denominator is zero, and find all input values for which a rational expression is not defined.

40. List all real numbers for which  $\frac{5x}{x^2-2x-8}$  is not defined.

(a) 0, -2, and 8

(b) 5 and 8

(c) 0, 2, and 4

(d) -2 and 4

41. Which one of the following is true of the expression  $\frac{p-7}{p-8}$ ?
- (a)  $p$  cannot be replaced by 7 and it cannot be replaced by 8 because, in both cases, the result would be undefined.
  - (b)  $p$  cannot be replaced by 8 because  $\frac{8-7}{8-8} = 0$ .
  - (c)  $p$  cannot be replaced by 8 because division by 0 is undefined.
  - (d)  $p$  cannot be replaced by 7 because  $\frac{7-7}{7-8}$  is undefined.

**Objective 18:** Solve rational equations by converting to polynomial equations and factoring.

42. Solve the equation  $\frac{14}{k} - \frac{16}{k-3} = -2$ . Which one of the following is the sum of the solutions?
- (a)  $-4$
  - (b)  $6$
  - (c)  $4$
  - (d)  $-9$
43. Solve the equation  $\frac{p}{p+2} = \frac{2}{p-1}$ . Which solution has the greater value?
- (a)  $p = 3$
  - (b)  $p = 4$
  - (c)  $p = -5$
  - (d)  $p = -1$

**Objective 19:** Solve problems that require setting up and solving rational equations.

44. The larger number is  $w$ . The smaller number is 1 less than the larger number. The sum of their reciprocals is  $-3/2$ . Find all possible values for  $w$ .
- (a)  $w = -\frac{2}{3}$  and  $w = 1$
  - (b)  $w = -2$  and  $w = 1$
  - (c)  $w = -\frac{2}{3}$  and  $w = 2$
  - (d)  $w = -1$  and  $w = \frac{2}{3}$

45. A number,  $n$ , plus 4 times its reciprocal is  $-5$ . Find all possible values for  $n$ .
- (a)  $n = 1$  and  $n = 4$
  - (b)  $n = -1$  and  $n = 4$
  - (c)  $n = -4$  and  $n = 1$
  - (d)  $n = -4$  and  $n = -1$

**Objective 20:** Solve conceptual problems involving absolute value.

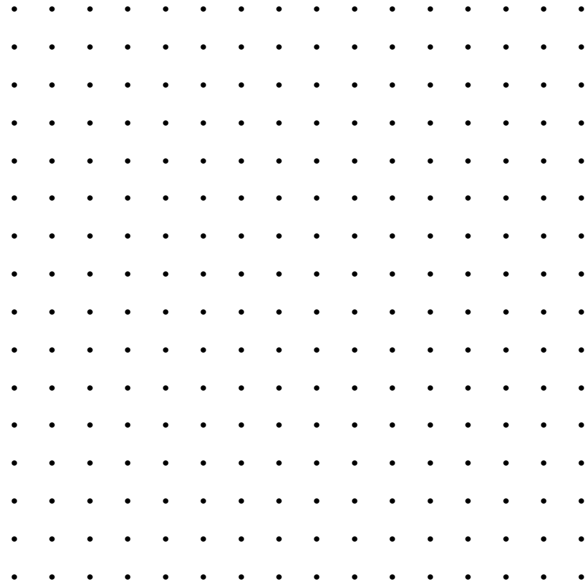
46. Circle all that are false.
- (a)  $|x|$  represents that distance from  $x$  to zero on the number line.
  - (b)  $|x| = x$  if  $x$  is zero or a positive number.
  - (c)  $|x| = -x$  if  $x$  is a negative number.
  - (d)  $|x|$  is always a positive number.
  - (e)  $-|x| = |-x|$
  - (f) If  $|a|$  is greater than  $|b|$ , then  $a$  must be greater than  $b$ .

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**Free Response Problems:** On your final exam you must show all work to receive full credit for the free response problems.

47. The length of a rectangle is 4 meters more than twice the width. The perimeter of the rectangle is 73 m. Find the length and the width.
- (a) Using a complete sentence, define a variable and state what it represents.
  - (b) Using your variable, write an equation corresponding to the problem situation.
  - (c) Solve your equation.
  - (d) Write a summary sentence explaining the problem's solution.
48. Completely factor  $6r^3 - 2r^2 - 4r$ .

49. Labeling axes and tick marks, graph the equation  $2x - 5y = 15$ .



50. Solve for  $v$ :  $-5v + 17 - v = 4 - 2(v - 1)$

51. Multiply and simplify:  $(7h - 4)(2h + 5)$

52. Using the properties of exponents, simplify:  $(2ab^2)(a^3b)^2$

# Answer Key

- |                            |       |             |
|----------------------------|-------|-------------|
| 1. d                       | 17. b | 33. a       |
| 2. b                       | 18. c | 34. c       |
| 3. c                       | 19. d | 35. c       |
| 4. d                       | 20. b | 36. a       |
| 5. a                       | 21. a | 37. b       |
| 6. d                       | 22. a | 38. a       |
| 7. d                       | 23. d | 39. d       |
| 8. d                       | 24. d | 40. d       |
| 9. d                       | 25. b | 41. c       |
| 10. d                      | 26. b | 42. c       |
| 11. b                      | 27. b | 43. b       |
| 12. c                      | 28. c | 44. d       |
| 13. d                      | 29. b | 45. d       |
| 14. c                      | 30. b | 46. d, e, f |
| 15. c                      | 31. b |             |
| 16. b; (3, 0) and (0, 4.5) | 32. c |             |

For problems 47–52, see your instructor for help and evaluation of your work.

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*May 27, 2005*

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