

Math 101 Review on Equations and Inequalities

## Learning Goals

- (EQ-1) Linear Equations and Linear Models  
I can solve linear equations in one variable. I can model situations using linear equations and use linear models to form conclusions.
- (EQ-2) Quadratic Equations and Quadratic Models  
I can find all real and complex solutions to quadratic equations using a variety of methods, including factoring, completing the square, and using the quadratic formula. I can model situations using quadratic equations and use the model to form conclusions. I can describe the discriminant of a quadratic equation and use it to determine its number of solutions over the real numbers.
- (EQ-3) Radical Equations  
I can solve radical equations and check for extraneous solutions.
- (EQ-4) Factorable Equations and Equations in Quadratic Form  
I can use factoring to solve quadratic-like equations. I can solve equations in quadratic form.
- (EQ-5) Inequalities, Intervals, and Graphs  
I can convert between interval notation, inequality notation, and graphical notation for subsets of real numbers. I can use properties of inequalities to simplify, to solve inequalities, and to combine inequalities. I can graph solution sets on the real line. I can model real-world problems using inequalities and form conclusions using the model.
- (EQ-6) Absolute Value Equations and Inequalities  
I can solve equations involving absolute value. I can solve inequalities involving absolute value.

## Review Problems

1. Use the conversion formula  $C = \frac{5}{9}(F - 32)$  to convert  $F = 5^\circ$  to Celsius.
2. Find the length of a rectangle with a perimeter 148 cm if the length is 6 cm more than the width.
3. Alice is 18 kilometers away from Bob. Both begin to walk toward each other at the same moment in a straight line. Alice walks at 1.5 km per hour. They meet in four hours. How fast is Bob walking?
4. The height of a box is 7 inches. The length is three more than the width. Find the width if the volume is 280 cubic inches.
5. A rug is to fit in a room so that a border of even width is left on all four sides. If the room is 12 feet by 15 feet, and the area of the rug is 180 square feet, how wide will the border be?
6. The position of an object moving in a straight line is given by  $s = 2t^2 - 3t$ , where  $s$  is in meters and  $t$  is the time in seconds the object has been in motion. How long will it take the object to move 20 meters?
7. The profit made when  $x$  units are sold (where  $x > 0$ ) is given by  $P = x^2 - 30x + 216$ . Determine the number of units needed to be sold so a profit is made ( $P > 0$ ).

8. Solve each inequality. Graph the solution on a number line. Write the solution in interval notation. If there is no solution, write " $\emptyset$ ".

- (a)  $b \leq 2$                       (b)  $13 \leq 17 - \frac{5x}{3}$                       (c)  $-3(y+7) + 30 \leq 3(4-y)$   
 (d)  $3(5x+6) > 13x+10$                       (e)  $|v| < -2$                       (f)  $|A+4| > 5$   
 (g)  $|2w-3| \leq 5$

9. Solve each equation. Simplify your answers as much as possible. If there is no solution, write " $\emptyset$ ."

- (a)  $2(x+9) = -3(4x-8) + 6x$                       (b) Solve for  $g$ :  $\frac{1}{d} + \frac{3}{g} = \frac{5}{f}$   
 (c)  $3x^{-2} + 7x^{-1} + 2 = 0$                       (d)  $\frac{x-5}{2} = \frac{3}{5}$   
 (e)  $|x| + 10 = 25$                       (f)  $|v| - 13 = -19$   
 (g)  $\frac{3}{2v-6} - 4 = \frac{4}{v-3}$                       (h)  $|u+2| - 6 = 23$   
 (i)  $-5 = \sqrt{-2u+11} - 2$                       (j)  $x^2 = 13$   
 (k)  $w^2 - 2w - 3 = 0$                       (l)  $(7v+11)^{1/4} = 3$   
 (m)  $(s-2)^{3/2} = 5$                       (n)  $2x^2 + 2x + 9 = (x+4)^2$   
 (o)  $5x^2 - 4x - 2 = 0$                       (p)  $\frac{-28}{x} = \frac{-32}{x-1}$   
 (q)  $y - 2 = \sqrt{19-2y}$                       (r)  $6 = y - \frac{16}{y}$   
 (s)  $w^{1/4} = 2$                       (t)  $4u^2 - 12u = 0$   
 (u)  $\frac{3x+1}{2} = -4$                       (v)  $-6w + 36 = 3(w+3)$

10. Solve each equation.

- (a)  $x^2 = -25$                       (b)  $(x+9)^2 = -6$                       (c)  $x^2 - 4x = -20$

## Answers

1.  $C = -15^\circ$     2. 40 cm    3. 3 km/h    4.  $w = 5$  in    5.  $w = 1.5$  ft    6.  $t = 4$  s

7. Graphs have been omitted.

- (a)  $(-\infty, 2]$                       (d)  $(-4, \infty)$                       (g)  $[-1, 4]$   
 (b)  $(-\infty, 12/5]$                       (e)  $\emptyset$   
 (c)  $(-\infty, \infty)$                       (f)  $(-\infty, -9) \cup (1, \infty)$

8.  $x > 18$  or  $0 < x < 12$

9.

(a)  $x = 3/4$

(b)  $g = \frac{3df}{5d - f}$

(c)  $x = -3, x = -1/2$

(d)  $x = 31/5$

(e)  $x = -15, x = 15$

(f)  $\emptyset$

(g)  $v = 19/8$

(h)  $u = -31, u = 27$

(i)  $\emptyset$

(j)  $x = -\sqrt{13}, x = \sqrt{13}$

(k)  $w = 3, w = -1$

(l)  $v = 10$

(m)  $s = 2 + \sqrt[3]{25}$

(n)  $x = -1, x = 7$

(o)  $x = \frac{2 \pm \sqrt{14}}{5}$

(p)  $x = -7$

(q)  $y = 5$

(r)  $y = -2, y = 8$

(s)  $w = 16$

(t)  $u = 0, u = 3$

(u)  $x = -3$

(v)  $w = 3$

10. (a)  $\pm 5i$ , (b)  $-9 \pm \sqrt{6}i$ , (c)  $2 \pm 4i$