

P.1–P.3 Major Concepts

Section 1 Objective Students will be able to convert between decimals and fractions, write inequalities, apply the basic properties of algebra, and work with exponents and scientific notation.

Section 2 Objective Students will be able to graph points, find distances and midpoints on a number line and in a coordinate plane, and write standard-form equations of circles.

Section 3 Objective Students will be able to solve linear equations and inequalities in one variable.

1. Classify the interval $[3, \infty)$ as open, half-open, or closed. _____

Then classify it as unbounded or bounded. _____

2. Is the interval $(-\infty, \infty)$ open, closed, or both? _____

3. Complete the equation to give an example of the property.

a. Commutative property of addition: $3 + x =$ _____

b. Associative property of multiplication: $52(xy) =$ _____

c. Distributive property of multiplication over addition: $3(x + y) =$ _____

d. Symmetric property of equality: If $3x + 5y = 38$ then _____

e. Addition property of equality: If $2a = 7x$ and $3b = 8y$ then _____

4. Is the distance between points independent of their orders? In other words, is the distance between points P and Q the same as the distance between Q and P ? _____

5. Find the distance between $O(0, 0)$ and $P(x, y)$. _____

6. Find the midpoint of the line segment with endpoints $O(0, 0)$ and $P(x, y)$. _____

7. Explain why multiplying both sides of the equation $2x + 3 = 5$ by x does not produce an equivalent equation.

8. Fill in the blank: We reverse the direction of the inequality sign when we multiply or divide both sides of an inequality by a(n) _____ number.

9. How many solutions does a linear equation in one variable have? _____

10. How many solutions does a linear inequality in one variable have? _____

11. Are the inequalities $-5x + 2 \leq 12$ and $x \leq -2$ equivalent? Explain.

P.1–P.3 Group Activity Worksheet

For use with Exercise 65 on page 20. Write the name of the group member assigned to each role.

Facilitator

Drawer (sketches figures)

Recorder

Fourth group member

Show that the midpoint of the hypotenuse of any right triangle is equidistant from the three vertices as follows:

- a. As a group, determine how to choose three points A , B , and C in the coordinate plane so that you can be sure that triangle ABC can represent any right triangle. (*Hint:* You may wish to refer to Example 8 on page 16 for some ideas of how to do this.) Have the drawer sketch and label your figure as in Example 8.
- b. Have the fourth group member find the coordinates of the point D that is the midpoint of the hypotenuse. The other members of the group should verify that this has been done correctly. Have the drawer include this in the figure from step (a) and have the recorder summarize the procedure used.
- c. Find simplified expressions for the distances AD , BD , and CD . Have each group member find one of the distances, and label them on your figure.
- d. Compare your results. Are the distances the same?
- e. Have the recorder summarize steps (a)–(d) and make a conjecture about your results.

P.4–P.5 Major Concepts

Section 4 Objective Students will be able to use the concepts of slope and y-intercept to graph and write linear equations in two variables.

Section 5 Objective Students will be able to solve equations involving quadratic, absolute value, and fractional expressions by finding x -intercepts or intersections on graphs, by using algebraic technologies, or by using numerical technologies.

1. How does the value of b affect the graph of an equation of the form $y = 2x + b$?

2. A line has equation $ax + by = c$ where $a > 0$, $b < 0$, and $c < 0$.
What can you say about the x -intercept, y -intercept, and slope of the line?

3. Write an equation of a function that does *not* represent a linear function.

In Exercises 4–5, fill in the blank.

4. Two lines in the coordinate plane are _____ if they have the same slope, but different y -intercepts.

5. A line with slope $\frac{3}{5}$ is perpendicular to lines with slope _____.

6. Suppose the graphs of $y = g(x)$ and $y = h(x)$ intersect at $(-2, 3)$, $(1, -4)$, and $(5, 10)$. What are the solutions of $g(x) = h(x)$?

7. To solve an equation by finding x -intercepts, Cynthia graphed the function $y = x^3 - 5x + |2x - 3|$. Give several possibilities for the original equation.

8. True or false:

a. $|3x - 5| = |2x + 4|$ if and only if $3x - 5 = 2x + 4$ or $3x - 5 = -(2x + 4)$ _____

b. $|2x + 7| = -4$ if and only if $2x + 7 = 4$ or $2x + 7 = -4$ _____

9. Use the quadratic formula to find the roots of $x^2 + bx + c$. Then find the sum and the product of the roots.

Sum _____

Product _____

P.4–P.5 Group Activity Worksheet

For use with Exercise 45 on page 37. Write the name of the group member assigned to each task.

Task A

Task B

Task C

Task D

Real Estate Appreciation Bob Michaels purchased a house 8 years ago for \$42,000. This year it was appraised at \$67,500.

a. Task A A linear equation $V = mt + b$, $0 \leq t \leq 15$, models the value V of this house for 15 years after it was purchased. Find the slope and y -intercept, and then write the equation. Confirm your equation with your group by verifying that $V(0) = 42,000$ and $V(8) = 67,500$.

b. Task B Graph the equation with a grapher and trace to estimate in how many years after purchase this house will be worth \$72,500.

c. Task C Write and solve an equation algebraically to determine how many years after purchase this house will be worth \$74,000.

d. Task D Generate a table to determine how many years after purchase this house will be worth \$80,250.

Discuss the different methods as a group. Summarize, together, which method is fastest. Which is best for producing a precise answer?

P.6–P.7 Major Concepts

Section 6 Objective Students will be able to add, subtract, multiply, and divide complex numbers, and to find complex zeros of quadratic functions.

Section 7 Objective Students will be able to solve inequalities involving absolute value, quadratic polynomials, and expressions involving fractions.

1. Name *two* square roots of -1 .

2. Fill in the blanks.

For the complex number $a + bi$ in standard form, the real number a is called the _____ part and the real number _____ is called the imaginary part. The complex conjugate of $a + bi$ is the complex number _____.

3. Suppose that x and y are real numbers such that $(2 + 3x) - (5 - 3y)i = 11 + 7i$. Find the values of x and y .

$x =$ _____ $y =$ _____

4. Write an expression in standard form for the quotient $\frac{a + bi}{c + di}$ of two complex numbers.

5. Write an expression for the sum of a complex number $a + bi$ and its complex conjugate. _____. Is this sum a real number, a complex number, or both? _____

6. Write an expression for the product of a complex number $c + di$ and its complex conjugate. _____. Is this product a real number, a complex number, or both? _____

7. Brad says that a quadratic equation $ax^2 + bx + c = 0$ has complex roots only if $b^2 - 4ac < 0$. Do you agree? Explain.

8. A quadratic equation $x^2 + bx + c = 0$ has the complex roots $3 + 6i$ and $3 - 6i$. Find the values of b and c .

$b =$ _____ $c =$ _____

9. Find a value of a such that it is *not* true that $|x| < a$ if and only if $-a < x < a$. Solve $|x| < a$ for your values of a .

P.6–P.7 Group Activity Worksheet

For use with Exercise 51 on page 58. Write the name of the group member assigned to each role.

Facilitator _____

Reporter _____

Recorder _____

The Power of i

- a. Simplify the complex numbers i, i^2, \dots, i^8 by evaluating each one. Compare your answers with those in your group. The recorder should fill in the table below with your results.

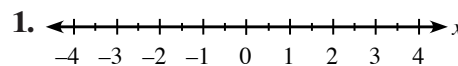
- b. Simplify the complex numbers $i^{-1}, i^{-2}, \dots, i^{-8}$ by evaluating each one. Compare your answers and record the results below.

- c. Evaluate i^0 .

- d. Write a summary statement about the integer powers of i . Does your answer to (c) agree with the pattern in the table?

i^{-8}	i^{-7}	i^{-6}	i^{-5}	i^{-4}	i^{-3}	i^{-2}	i^{-1}	i^0	i^1	i^2	i^3	i^4	i^5	i^6	i^7	i^8

1. Graph the interval $(-3, 2]$.



2. Write the statement using absolute value notation. The distance between 7 and x is at least 3 units.

2. _____

3. Name the algebraic property or properties illustrated by the equation.

3. _____

$$3x^2 + (-3x^2) = 0$$

4. Write the number in scientific notation. The People's Republic of China produced about 191,000,000 metric tons of rice in 1990.

4. _____

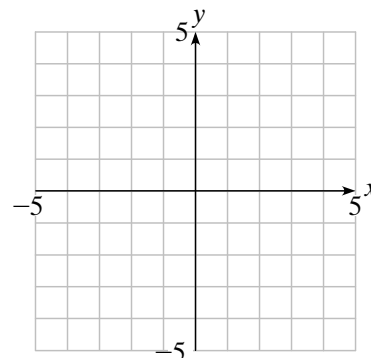
5. Find the value of x and the value of y for which $(x, 10)$ and $(-7, y)$ are points on the graph of $y = \frac{1}{7}x + 10$.

5. _____

6. Draw the graph of $y = \frac{1}{2}x + 4$.

6. _____

Find the equation of the line that is perpendicular to $y = \frac{1}{2}x + 4$ at $(-2, 3)$. Draw the graph of the new line.



7. Solve the equation.

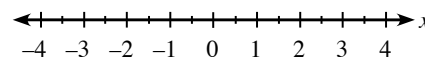
7. _____

$$3x + 8 = -2x + 5$$

8. Solve the inequality, and draw a number line graph of the solution.

8. _____

$$-2 \leq 3x + 4 \leq 5$$



9. Find the distance between $P(-4, 2)$ and $Q(4, -13)$. Then find the midpoint of the segment with endpoints P and Q .

9. Distance: _____

Midpoint: _____

10. Find the radius and the center of the circle.

$$(x + 5)^2 + (y - 2)^2 = 49$$

10. Radius: _____

Center: _____

11. Solve the inequality $|3 - 7x| - 1 > 5$ algebraically.
Write your answer in interval notation.

11. _____

12. Write the sum $(3 + 2i) + (7 - 5i)$ in standard form.

12. _____

13. Solve: $\left| \frac{x + 6}{3} \right| < 8$

13. _____

14. Solve: $x^2 - 3x + 1 = 0$

14. _____

15. Solve: $4(x - 2)^2 = 9$

15. _____

16. Solve: $4x^3 \geq 16x$

16. _____

17. Write the quotient $\frac{2 + 5i}{1 - 4i}$ in standard form.

17. _____

1. Simplify the expression (assuming the denominator is non-zero).

$$\frac{(2x^2)^3 y^2}{x^3 y^4}$$

A. $\frac{6x^3}{y^2}$

B. $\frac{8x^3}{y^2}$

C. $\frac{8x^2}{y^4}$

D. $\frac{6x^2}{y^2}$

2. Write the equation of the line through the points $(-3, 2)$ and $(1, -2)$.

A. $y = -x + 5$

B. $y = x - 1$

C. $y = -\frac{4}{3}x - 5$

D. $y = -x - 1$

3. Write the equation of the circle with center $(3, 5)$ going through the point $(1, 2)$.

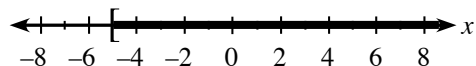
A. $(x + 3)^2 + (y + 5)^2 = 13$

B. $(x - 1)^2 + (y - 2)^2 = 13$

C. $(x - 3)^2 + (y - 5)^2 = 13$

D. $(x - 3)^2 + (y - 5)^2 = \sqrt{13}$

4. Use interval notation to describe the interval of real numbers shown on the number line below.



A. $(-5, \infty)$

B. $(\infty, -5]$

C. $[-5, \infty)$

D. $[-5, \infty)$

5. Write the mathematical expression for the statement:

The distance between a and -3 is at least 5.

A. $|a + 3| \geq 5$

B. $a + 3 \geq 5$

C. $a - 3 \geq 5$

D. $|a + 3| \leq 5$

6. Which of the following is not a solution to the inequality $3x - 1 \geq 2x + 5$?

A. $x = 4$

B. $x = 6$

C. $x = 6.1$

D. $x = 32$

7. Which of the following is an irrational number?

A. $0.4\overline{13}$

B. $\frac{22}{7}$

C. $\sqrt{3}$

D. -13

8. Determine c so that, in the diagram to the right, the line segment AB is perpendicular to the line segment CD.

A. $c = 6$

B. $c = 4$

C. $c = 3$

D. $c = 7$

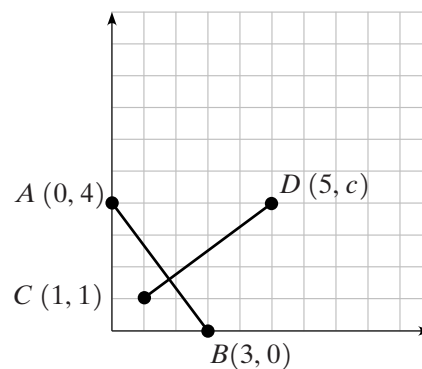
9. Solve the inequality $3x^3 < 24x$.

A. $0 \leq x \leq \sqrt{8}$

B. $-\sqrt{8} \leq x \leq \sqrt{8}$

C. $x \leq -\sqrt{8}$

D. $x \leq -\sqrt{8}$ or $0 \leq x \leq \sqrt{8}$



10. Solve the equation $x^2 + 12x + 5 = 0$.

A. $x = -6 + \sqrt{31}$

B. $x = -6 - \sqrt{31}$

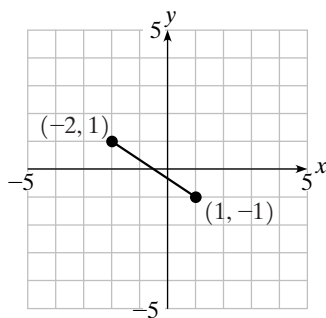
C. $x = -6 + \sqrt{31}, x = -6 - \sqrt{31}$

D. This equation has no real solutions.

11. A rectangular garden is to be built so that the length of the garden is twice its width. If 24 feet of fencing is available to fence the garden, what should the dimensions of the rectangle be?
- A. $w = 2\sqrt{3}$ ft, $\ell = 4\sqrt{3}$ ft B. $w = 4$ ft, $\ell = 8$ ft
 C. $w = 8$ ft, $\ell = 16$ ft D. $w = \sqrt{6}$ ft, $\ell = 2\sqrt{6}$ ft
12. Completing the square for the expression $3x^2 - 6x - 5$ yields
- A. $3(x - 1)^2 - 6$ B. $3(x - 3)^2 - 14$ C. $3(x - 1)^2 - 5$ D. $3(x - 1)^2 - 8$
13. A projectile launched straight up has height s at time t where $s(t) = -16t^2 + 140t + 75$. Which of the following is true?
- A. The initial height of the projectile was 140 ft above the ground.
 B. The initial velocity was 32 ft/sec.
 C. The initial height of the projectile was 75 ft above the ground.
 D. The initial velocity was 70 ft/sec.
14. Write the equation of the line with slope 3 going through the point $(-2, 1)$.
- A. $3x - y + 7 = 0$ B. $y - 1 = 3(x - 2)$
 C. $y + 2 = 3(x - 1)$ D. $y - 2 = 3(x - 1)$
15. When Jose bought his car 5 years ago, he paid \$16,000 and now it is worth \$13,200. Assuming this is a linear relation, what will his car be worth in another 3 years?
- A. \$1680 B. \$1280 C. \$12,640 D. \$11,520

For Problems 16–20, give the exact answer or, if necessary, approximate to two decimal places.

16. Write the complex number $\frac{2}{3 - i}$ in standard form. 16. _____
17. Evaluate $\frac{6(-3.2) - 2}{5^2 - 4^{-2}}$. 17. _____
18. Find the distance between the points $(-3.2, 2.1)$ and $(2.5, -6)$. 18. _____
19. Solve the equation $\frac{x - 1}{5} + 3(x + 2) = \frac{x}{2}$. 19. $x =$ _____
20. Find the midpoint of the line segment below. 20. _____



1. If the line L in the xy -plane has one-third the slope and five times the y -intercept of the line $5x - 3y = 15$, then the equation for L is

A. $y = \frac{5}{9}x - \frac{5}{3}$

B. $y = \frac{5}{9}x - 25$

C. $y = \frac{25}{3}x - \frac{5}{3}$

D. $y = \frac{25}{3}x - 25$

E. $y = 5x - 25$

2. A parabola $y = ax^2 + bx + c$ has vertex $(5, -3)$. If $(6, 0)$ is on the parabola, then $a + b + c =$

A. 0

B. -30

C. 15

D. 45

E. -10

