Geometry

Chapter 13

Important Skills for Algebra 2

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13.1 Sets of Real Numbers

Name the set or sets to which each number belongs.

1) -15

2) 11

3) $\sqrt{30}$

4) $\frac{17}{3}$

5) 6

6) 0

7) -13

8) 3

9) $\frac{10}{11}$

10) 14

11) -13

12) π

13) $\sqrt{\frac{80}{2}}$

14) $\sqrt{77}$

15) $\frac{6}{7}$

16) $\sqrt{0}$

17) $-\sqrt{196}$

18) -1

19) $\frac{-16}{-2}$

20) $\frac{135}{-3}$

21) -8

22) $\frac{4}{3}$

23) -2.6

24) $\frac{-7}{2}$

25) 10

26) $\sqrt{10}$

27) 5.11

28) $\frac{-12}{3}$

29) -2.0

30) $\sqrt{16}$

13.2 Intersection and Union

Find each of the following:

1) $W \cap Z$

2) $Q \cup I$

3) $R \cap N$

4) $N \cup I$

5) $Z \cup W$

Let $A = \{1, 3, 5, 7, 9, 11, 13, 15\}$, $B = \{0, 3, 6, 9, 12, 15\}$, and $C = \{0, 2, 4, 6, 8, 10, 12, 14\}$.
Find each of the following.

6. $A \cap B$

7. $B \cup C$

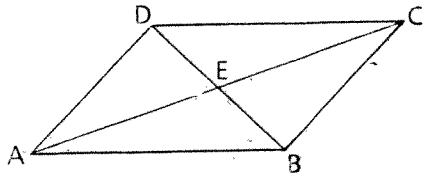
8. $A \cap C$

9. $A \cup B$

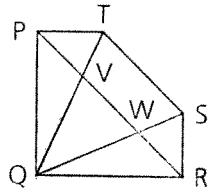
10. $B \cap C$

11. $A \cup C$

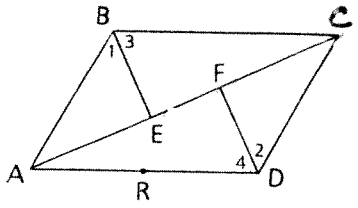
12.
a $\overline{AB} \cap \overline{BC} =$?
b $\overrightarrow{EC} \cup \overrightarrow{EA} =$?
c $\overleftrightarrow{AC} \cap \overleftrightarrow{DB} =$?
d $\overline{DC} \cap \overline{AB} =$?
e $\overrightarrow{AC} \cap \overrightarrow{EC} =$?
f $\overrightarrow{BA} \cup \overrightarrow{BC} =$?
g $\overline{EC} \cup \overline{CB} \cup \overline{BE} =$?



13.
a $\overrightarrow{QV} \cap \overleftrightarrow{TS} =$?
b $\overline{WP} \cap \overline{VR} =$?
c $\overrightarrow{WP} \cup \overrightarrow{VR} =$?
d $\overrightarrow{SQ} \cup \overrightarrow{SR} =$?



14.
h $\overrightarrow{EC} \cup \overrightarrow{FA} =$?
i $\overrightarrow{EC} \cap \overrightarrow{FA} =$?
j $\overrightarrow{BA} \cup \overrightarrow{BE} =$?
k $\overleftrightarrow{AC} \cap \overleftrightarrow{DR} =$?
l $\angle AFD \cap \overline{CE} =$?



Graph the solution to each of the following on a number line then write the solution in set notation.

15) $x > -2 \cap x \leq 3$

16) $x > 1 \cup x < 4$

17) $x \geq 0 \cup x \leq -4$

18) $x < -1 \cap x > 1$

19) $x \leq 2 \cup x > 2$

20) $x > 4 \cap x < -2$

21) $x \geq -3 \cap x < -3$

22) $x < 2 \cup x > 5$

13.3 Writing Equations of Lines and Graphing Lines

Write an equation, in Standard Form, for the line that:

1. passes through the points (2, –6) and (–3, 4)

2. passes through the point (4, 6) and is perpendicular to the line $3x + 4y = 6$

3. has slope $-\frac{2}{3}$ and passes through the point (6, –4)

4. passes through the origin and is perpendicular to the line $x - 3y = -9$

5. has y-intercept 4 and slope $-\frac{2}{7}$

6. is parallel to the line $-2x + y = 6$ and passes through the point (–3, 8)

7. is perpendicular to the line through the points (2, –3) and (6, 4) and has the same y-intercept as the line $3x - 4y = 24$

8. passes through the points (6, –8) and (–4, 3)

9. has $m = -\frac{3}{5}$ and $b = 6$

10. is parallel to the line $-3x + y = 10$ and with y-intercept 7

11. is perpendicular to the line $-4x + y = -6$ and has the same y-intercept as the line $2x - y = 4$

12. passes through the point (–2, 6) is parallel to the line $5x - 4y = 20$

13. is the perpendicular bisector of the segment connecting the points (8, 4) and (14, 10)

Graph on your own graph paper. Label the y-intercept.

14. $y = x - 2$

15. $2x + 4 = y$

16. $y - 2x = 5$

17. $5y + 5x = 10$

18. $6y - 3x = 9$

19. $2y + 4x = 14$

20. $x = 2$

21. $y = -\frac{7}{2}$

22. $x = -\frac{1}{2}$

23. $3x - y = 4$

24. $y - 5 = 2x$

25. $x + y = 1$

13.4 Solving a System of Equations

Solve. Give your answer in set notation.

1. $y = 5 - x$
   $2x + 3y = 12$

2. $x + y = 6$
   $x + 4y = 3$

3. $2x + 5y = 2$
   $3x - 2y = 3$

4. $6x + 3y = 0$
   $8x + 5y = 8$

5. $x + y = 6$
   $x - y = 10$

6. $-x - y = 15$
   $4x - y = -5$

7. $x - 3y = 9$
   $3x + y = 7$

8. $x + y = 4$
   $2x - y = 5$

9. $x + 2y = 1$
   $2x - 3y = 16$

10. $3x - y = -13$
    $x + 5y = 17$

11. $2x + 3y = 12$
    $y - 2x = 4$

12. $5x + 2y = 22$
    $x + 2y = 14$

13. $y = 7 - 2x$
    $5y = -3x + 7$

14. $x - y = 9$
    $3x + y = 11$

Translate to a system of equations and solve.

15. The sum of two numbers is 14. Six times the first number minus three times the second number is 3. Find the numbers.

16. The sum of two numbers is 57.4. One number is six times the other. Find the numbers.

17. The sum of two numbers is 56. The difference is 22. Find the numbers.

18. Tanisha has 70 coins, all quarters and dimes. There are 30 more quarters than dimes. Find the number of each type of coin.

19) $x + 4y = 1$
$3x + 2y = -12$

20) $4x - 6y = 12$
$2x = 3y + 6$

21) $6x - 2y = 5$
$-3x + y = 7$

22) $5x - 3y = -3$
$2x + 6y = 0$

23) $4x - 10y = 18$
$-2x + 5y = -9$

24) $10x - 2y = 16$
$5x + 3y = -12$

25) $8x - 3y = 10$
$5x + 2y = 3$

26) $2x = 12 - 3y$
$3y = -21 - 2x$

27) $2x - y = 1$
$8x + 4y = 6$

13.5 Graphing Inequalities

Graph each inequality.

1. $y \geq x + 1$
2. $y < x + 2$
3. $x - y > 4$
4. $4x + 2y \geq 0$
5. $2x + y \leq -5$
6. $3x - y > -1$

Graph the solution of each system of inequalities.

7. $y > 2x$
   $x + y > -1$
8. $x + y \geq 2$
   $x \leq 2$
9. $y - 2x > -1$
   $y - 2x < 2$
10. $y > -\frac{1}{2}$
    $y > x + 2$
11. $3y - 2x > 6$
    $x + y \leq 2$
12. $2y + x > 2$
    $3y \leq 6$

13.6 Radicals

Simplify.

1. $\sqrt{64}$
2. $-\sqrt{144}$
3. $\sqrt{625}$
4. $-\sqrt{256}$
5. $-\sqrt{100}$
6. $\sqrt{49}$
7. $-\sqrt{1}$
8. $\sqrt{1}$
9. $\sqrt{48}$
10. $\sqrt{10}$
11. $\sqrt{36}$
12. $\sqrt{144}$
13. $\sqrt{120}$
14. $\sqrt{169}$
15. $\sqrt{400}$
16. $\sqrt{200}$

Simplify.

25. $\sqrt{a^2b^2c^2}$
26. $\sqrt{(x-2)^2}$
27. $\sqrt{(9m)^2}$
28. $\sqrt{(x+1)^2}$
29. $\sqrt[3]{8x^3}$
30. $\sqrt[4]{81x^8}$
31. $\sqrt[3]{x^6y^{12}z^{15}}$
32. $\sqrt[4]{x^{20}y^4z^8q^{12}}$
33. $\sqrt{27}$
34. $\sqrt{128}$
35. $\sqrt[3]{80}$
36. $\sqrt{16t}$
37. $\sqrt[4]{64y}$
38. $\sqrt{15y^2}$
39. $\sqrt{12a^2}$
40. $\sqrt{400y^2}$
41. $\sqrt{31y^2}$
42. $\sqrt{250b}$
43. $\sqrt{180}$
44. $\sqrt{18a^2b^2}$
45. $\sqrt{165}$
46. $\sqrt{1000}$
47. $\sqrt{75x}$
48. $\sqrt{44m^2}$
49. $\sqrt{50a}$
50. $\sqrt{60c^2}$
51. $\sqrt{200x}$
52. $\sqrt{90x^2}$
53. $\sqrt[3]{y^{24}}$
54. $\sqrt[4]{32m^{13}}$
55. $\sqrt[3]{54x^4y^2z^6}$
56. $\sqrt[3]{125x^5y^2}$
57. $\sqrt{y^{11}}$
58. $\sqrt{(a+b)^5}$
59. $\sqrt{64m^3}$
60. $\sqrt{27a^3b^3}$
61. $\sqrt[4]{80x^6y^{11}}$
62. $\sqrt[4]{x^7y^{12}}$

13.6 Radicals (con't)

Simplify. Assume all variables are non-negative.

10. $\sqrt{3}\sqrt{21}$

11. $\sqrt{12}\sqrt{14}$

12. $\sqrt{10x^2y}\sqrt{5xy}$

13. $\sqrt{6a}\sqrt{30b}$

14. $\sqrt{45x}\sqrt{3x}$

15. $\sqrt{3x^3}\sqrt{6x}$

16. $\sqrt{3a}\sqrt{15a}$

17. $\sqrt{az}\sqrt{bz}$

18. $\sqrt{24m^3n}\sqrt{6m^2n^2}$

19. $\sqrt{\frac{1}{100}}$

20. $\sqrt{\frac{36}{100}}$

21. $\sqrt{\frac{500}{720}}$

22. $-\sqrt{\frac{49}{64}}$

23. $\sqrt{\frac{20}{405}}$

24. $\sqrt{\frac{27}{48}}$

25. $\sqrt{\frac{18x^2}{2}}$

26. $\sqrt{\frac{64}{t^2}}$

27. $\frac{\sqrt{28}}{\sqrt{7}}$

28. $\frac{\sqrt{108}}{\sqrt{12}}$

29. $\frac{\sqrt{3}}{\sqrt{108}}$

30. $\frac{\sqrt{54}}{\sqrt{150}}$

31. $\frac{\sqrt{75x}}{\sqrt{3x}}$

32. $\frac{\sqrt{72x^7}}{\sqrt{2x}}$

33. $\frac{\sqrt{32x^5}}{\sqrt{8x^2}}$

34. $\frac{\sqrt{132x^4}}{\sqrt{11x^2}}$

35. $\sqrt{\frac{1}{6}}$

36. $\sqrt{\frac{3}{7}}$

37. $\sqrt{\frac{5}{12}}$

38. $\sqrt{\frac{7}{18}}$

39. $\sqrt{\frac{12}{5}}$

40. $\sqrt{\frac{5}{x}}$

41. $\sqrt{\frac{3x}{5}}$

42. $\sqrt{\frac{x^2}{28}}$

43. $\frac{\sqrt{3}}{\sqrt{8}}$

44. $\frac{\sqrt{3}}{\sqrt{10}}$

45. $\frac{\sqrt{15}}{\sqrt{2}}$

46. $\frac{\sqrt{y^3}}{\sqrt{8}}$

47. $-2\sqrt{x}+4\sqrt{x}$

48. $11\sqrt{3}+4\sqrt{3}$

49. $\sqrt{48x^3}+\sqrt{75x^3}$

50. $\sqrt{32}-\sqrt{18}$

51. $\sqrt{7}-2\sqrt{\frac{1}{7}}$

52. $6\sqrt{x^2y}-x\sqrt{64y}$

53. $-12\sqrt{8}+7\sqrt{18}+2\sqrt{50}$

54. $\sqrt{\frac{1}{3}}+\sqrt{\frac{1}{12}}$

55. $\sqrt{16x+32}+\sqrt{4x+8}$

56. $3\sqrt{24}+2\sqrt{54}-2\sqrt{27}$

57. $\sqrt{36a}+3\sqrt{4a}$

58. $2b\sqrt[3]{a^3b}+a\sqrt[3]{ab^3}+b\sqrt[3]{a^3b}$

13.7 Factoring Quadratics

Factor.

1) $8a^2 + 10a - 16$

2) $a^2 + 4a - 5$

3) $t^2 - 10t + 25$

4) $y^2 + 10y + 21$

5) $64 - 25c^2$

6) $m^2 + 23m - 24$

7) $c^2 + 14c + 49$

8) $n^2 - 12n + 35$

9) $y^5 + 9y^2$

10) $y^2 + 2y + 1$

11) $a^2 + 2a - 24$

12) $a^3 - 8a^2 + 16a$

13) $2x^2 - 13x - 45$

14) $4y^2 - 16y + 16$

15) $x^2 - 121$

16) $6a^2b^3 - 14abc$

17) $y^2 - 15y + 54$

18) $y^2 - 10y + 16$

19) $2x^2 - 3x - 2$

20) $a^2 - 3a - 18$

21) $a^2 + 10a + 25$

22) $16 - 8a + a^2$

23) $100a^2 - 9$

24) $5y^2 + 25y + 30$

25) $3y^2 - 20y + 12$

26) $m^2 + 6m + 9$

27) $3c^4 - 6c^2 - 15c$

28) $16c^3 - 9c$

29) $3a^2 - 10a + 3$

30) $x^2 + x - 42$

31) $2y^2 - 10y + 8$

32) $n^2 - 20n + 100$

33) $x^2 - 49$

34) $5x^2 - 15$

35) $t^2 - 7t + 12$

36) $x^2 + 2x - 15$

37) $25m^2 + 30m + 9$

38) $t^2 + 8t + 15$

39) $x^2 + 16x + 64$

40) $2x^2 + 2c - 84$

41) $64 - 25c^2$

42) $x^2 + 9x + 14$

43) $x^3 - 2x^2 + 3x - 6$

44) $2x^2 - 12x + 10$

45) $40x^2 + 10x - 15$

46) $y^8 - 4y^2$

47) $4m^4n^2 - 6n$

48) $9a^2 - 400$

49) $y^3 - y + 3y^2 - 3$

50) $y^3 + y + 2y^2 + 2$

51) $18n^2 + 33n - 6$

52) $10t^2 - 20t + 10$

53) $a^4 + 4a^2 + 4$

54) $a^2 + 2a - 3$

55) $10x^2 - x - 21$

56) $c^3 + 16c^2 + 64c$

57) $x^6 - 9x^4$

58) $5m^2 - 20$

59) $n^3 - 2n^2 + 4n - 8$

60) $c^3 + 3c^2 - 9c - 27$

61) $8a^2 + 22a + 15$

62) $x^3 + 6x^2 + 9x$

63) $m^2 + 5m + 6$

64) $t^3 + 2t^2 - 7t - 14$

65) $16y^3 + 48y^2 + 36y$

66) $x^8 - 5x^2$

67) $100 - 36n^2$

68) $4a^3 + 28a^2 + a + 7$

69) $4 - 28x + 49x^2$

13.8 Solving Quadratic Equations

Solve

1) $x^2 + 2x - 35 = 0$

2) $5x^2 - 45 = 0$

3) $2x^2 - 11x + 12 = 0$

4) $3x^2 - 15x = 0$

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

6) $x^2 = 5$

7) $3x^2 - x - 10 = 0$

8) $6x^2 + 15x = 0$

9) $(x + 4)^2 = 15$

10) $7x^2 = 3$

11) $x^2 + 5x - 36 = 0$

12) $2x^2 - x - 21 = 0$

13) $x^2 + 8x + 16 = 5$

14) $x^2 + 10x + 25 = 33$

15) $8x^2 - 10x = 0$

16) $x^2 - 11x + 24 = 0$

17) $8x^2 = 36$

18) $4x^2 - 5x + 1 = 0$

19) $x^2 + 4x - 45 = 0$

20) $2x^2 - 10x + 9 = 0$

21) $2x^2 + 9x - 5 = 0$

22) $x^2 - 3x - 2 = 0$

23) $4x^2 = 48$

24) $16y^2 + 25 = 25$

25) $3x^2 + 12x + 8 = 0$

26) $x^2 - 4x + 4 = 16$

27) $x^2 - 49 = 0$

28) $x^2 + 8x + 16 = 25$

29) $6y^2 - 13y + 6 = 0$

30) $5x^2 = 6 + 2x$

13.9 Completing the Square on Circles

Write the equation of the circle in the form $(x - h)^2 + (y - k)^2 = r^2$ then state it's center and radius.

1. $2x^2 + 2y^2 = 18$

2. $x^2 + y^2 - 8y = 9$

3. $x^2 + y^2 - 4x = 0$

4. $x^2 + y^2 - 6x - 8y = 0$

5. $(x + 7)^2 + y^2 + 6y = 27$

6. $x^2 + y^2 + 2x - 4y - 4 = 0$

7. $x^2 + 10x + y^2 - 12y = -10$

8. $x^2 + y^2 + 6y = 0$

9. $x^2 + y^2 + 6x + 2y + 6 = 0$

10. $x^2 + y^2 = 8x - 14y + 35$

11. $2x^2 + 2y^2 + 2x - 6y - 3 = 0$

12. $4x^2 + 4y^2 - 16x - 12y + 21 = 0$

13.10 Solving Absolute Value Equations and Inequalities

Solve

1) $|x + 5| = 16$

2) $|5m + 1| = 13$

3) $|2x - 1| = 5$

4) $|x + 1| = -3$

5) $|3x + 2| = 14$

6) $|2x + 14| = 8$

Graph on a number line.

7) $|y| \geq 2$

8) $|y| \leq 5$

9) $|x| < 3$

10) $|c| > 4$

Solve. State answer in set notation. Graph on a number line.

11) $|y + 4| > 2$

12) $|2x + 6| \leq 8$

13) $|4y - 1| < 11$

14) $|4m - 3| > 9$

15) $|2y + 6| \geq 8$

16) $|x + 2| < 3$