

1. Solve each of the following system of equations.

$$\text{a) } \begin{cases} 2x - y = -1 \\ 5x - 2y = 2 \end{cases}$$

$$\text{b) } \begin{cases} 2x - 5y = -9 \\ x - y = -3 \end{cases}$$

$$\text{c) } \begin{cases} 3x + 5y = -20 \\ \frac{1}{3}x - \frac{1}{2}y = 2 \end{cases}$$

2. Simplify each of the following compound inequalities.

$$\text{a) } 3 < p \text{ and } p > -1$$

$$\text{c) } x > 0 \text{ and } x \leq 5$$

$$\text{e) } m > 4 \text{ and } m \leq -7$$

$$\text{b) } 3 < p \text{ or } p > -1$$

$$\text{d) } x > 0 \text{ or } x \leq 5$$

$$\text{f) } m > 4 \text{ or } m \leq -7$$

3. Simplify each of the following.

$$\text{a) } \frac{3^{-1}5^{-1}}{2^{-2}}$$

$$\text{d) } \frac{a^{-1} - b^{-1}}{c^{-2}}$$

$$\text{g) } \frac{3x - 5}{5 - 3x}$$

$$\text{b) } \frac{3^{-1} - 5^{-1}}{2^{-2}}$$

$$\text{e) } \frac{(-2a^{-4}b^3)^{-2} (-b^0a^3)^{-5}}{(2a^2b^4)^{-3}}$$

$$\text{h) } \frac{x^2 + x - 6}{x^2 - 5x + 6}$$

$$\text{c) } \frac{a^{-1}b^{-1}}{c^{-2}}$$

$$\text{f) } \left(\frac{-3a^0b^{-4}a^{-1}b^2}{6b^5a^{-2}ab^{-3}} \right)^{-2}$$

$$\text{i) } \frac{x^2 - 2x}{x^2 - 4} \div \frac{-x^3 + 2x^2}{x^2(x + 2)}$$

4. Simplify each of the following.

$$\text{a) } (\sqrt{5} - 2)^3 (5 + 2)^3$$

$$\text{c) } \sqrt{50} - 3\sqrt{8} + \sqrt{18}$$

$$\text{e) } \frac{1}{\sqrt{5}} \left(\left(\frac{\sqrt{5} + 1}{2} \right)^2 - \left(\frac{\sqrt{5} - 1}{2} \right)^2 \right)$$

$$\text{b) } \frac{\sqrt{5} - 1}{2} + \frac{2}{\sqrt{5} + 1}$$

$$\text{d) } \frac{\sqrt{40} - 12}{6}$$

5. Rationalize the denominator in $\frac{\sqrt{5} - \sqrt{2}}{\sqrt{5} + \sqrt{2}}$.

6. Re-write each of the following decimals as a fraction of two integers. You do NOT have to bring the fraction to lowest terms.

$$\text{a) } 1.04\bar{3} \quad \text{b) } 6.\bar{3} = 6.3333\dots \quad \text{c) } 0.41\bar{2} = 0.412222\dots \quad \text{d) } 0.7\bar{35} = 0.735353535\dots \quad \text{e) } 0.\bar{735} = 0.735735735\dots$$

7. Compute each of the following sums.

$$\text{a) } 5 + 10 + 15 + 20 + \dots + 500$$

$$\text{b) } 27 + 36 + 45 + \dots + 99$$

$$\text{c) } 99 + 103 + 107 + \dots + 2015$$

8. Factor each of the following over the real numbers by completing the square.

$$\text{a) } x^2 - 3x - 10$$

$$\text{c) } 9x^2 - 3x - 2$$

$$\text{e) } x^2 - \frac{4}{3}x + \frac{4}{9}$$

$$\text{b) } 6x^2 - 7x - 3$$

$$\text{d) } 4x^2 - 20x + 34$$

9. Solve each of the following equations.

$$\text{a) } (2x - 1)^2 - (x + 3)^2 = 2x^2 - 8$$

$$\text{c) } 3(x - 1) + x^2 = x + 1$$

$$\text{f) } 4x^8 = 12x^8$$

$$\text{b) } \frac{3x - 1}{2} - \frac{x - 1}{3} = 2x + 4$$

$$\text{d) } 4x^8 = 12x^6$$

$$\text{g) } (3x - 1)(x - 5)^2 = 0$$

$$\text{e) } 4x^8 = 12x^7$$

$$\text{h) } x^4 = 16$$

10. Solve each of the following inequalities.

$$\text{a) } \frac{3x - 1}{2} - \frac{x - 4}{3} \geq x + 2$$

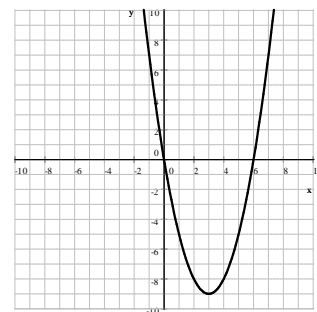
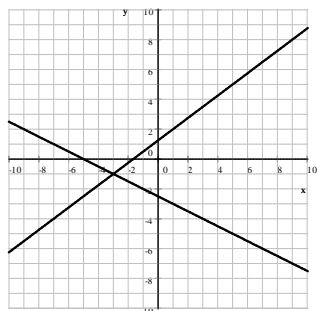
$$\text{b) } \frac{1}{2}(x - 3) - \frac{2}{3}(2x + 1) > \frac{1}{6}(x - 1)$$

$$\text{c) } (x - 5)^2 \geq (x + 1)^2$$

11. a) Graph the lines $3x - 4y = -5$ and $x + 2y = -5$ in the same coordinate system. Use your graph to find the coordinates of the point where the graphs intersect each other.
- b) Graph the parabola $y = x^2 - 6x$. State the coordinates of at least five points, including vertex and intercepts.
12. Compute the exact value of the area of a triangle if it has sides 16 cm, 13 cm, and 13 cm long.
13. What is the smallest possible value of the expression given?
- a) $x^2 + 20x + 70$ b*) $x^4 + 10x^2 + 22$
14. Solve each of the following word problems.
- a) We invested a total of \$4000 in two bank accounts. One account earns an annual interest of 3%, the other account earns an annual interest of 5%. How much was invested into each account if the combined interest from the two accounts after one year was \$183?
- b) One number is four less than twice another. Find these numbers if their product is 70.
- c) The digits in a two-digit number add up to 9. If we interchange the digits in the number, we obtain a new number that is 45 greater than the original number. Find the original number.
- d) The sum of three consecutive integers is -75 . Find these numbers.
- e) The square of a number is 8 greater than twice the opposite of the number. Find this number.
- f) Fatuma invests a total of \$27 000 in two accounts. The first account earned a rate of return of 10% (after a year). However, the second account suffered a 4% loss in the same time period. At the end of one year, the total amount of money gained was \$1370. How much was invested into each account?
- g) One side of a rectangle is 24 cm shorter than four times the other side. Find the length of the sides if the area of the rectangle is 160 cm.
- h) The ten's digit in a two-digit number is 2 greater than the one's digit. If we interchange the digits in the number, we obtain a new number that, when added to the original number, results in the sum 44. Find this number.
- i) Children's tickets cost \$7 each and adults' tickets cost \$12 each. We purchased 60 tickets for a total of \$460. How many of each tickets did we buy?
- j) The hypotenuse of a right triangle is 52 cm long. The difference between the other two sides is 28 cm. Find the sides of this triangle.
- k) One side of a rectangle is 12 cm long. Find the exact value of the length of the other side if we know that its diagonal is 37 cm long.
- l) The shortest side of a right triangle is 20 cm long. The difference between the other two sides is 8 cm. Find the sides of this triangle.
15. Ann and Betsy are friends. One day Betsy tells Ann: "*If you gave me five dollars, we would end up with the same amount of money.*" Ann responds: "*Yes, but if you gave me five dollars instead, then I would have twice as much money as you.*" How much money did they have?

Answers

1. a) $x = 4, y = 9$ b) $x = -2, y = 1$ c) $x = 0, y = -4$
2. a) $p > 3$ b) $p > -1$ c) $0 < x \leq 5$ d) \mathbb{R} e) \emptyset f) $m > 4$ or $m \leq -7$ (can not be simplified)
3. a) $\frac{4}{15}$ b) $\frac{8}{15}$ c) $\frac{c^2}{ab}$ d) $\frac{c^2(b-a)}{ab}$ e) $-\frac{2b^6}{a}$ f) $4b^8$ g) -1 h) $\frac{x+3}{x-3}$ i) $-\frac{x}{x-2}$
4. a) 1 b) $\sqrt{5} - 1$ c) $2\sqrt{2}$ d) $\frac{\sqrt{10}-6}{3}$ e) 1
5. $\frac{7-2\sqrt{10}}{3}$
6. a) $\frac{1043}{1000}$ b) $\frac{57}{9}$ c) $\frac{371}{900}$ d) $\frac{728}{990}$ e) $\frac{735}{999}$
7. a) 25 250 b) 567 c) 507 360
8. a) $(x-5)(x+2)$ b) $6\left(x-\frac{3}{2}\right)\left(x+\frac{1}{3}\right)$ c) $9\left(x-\frac{2}{3}\right)\left(x+\frac{1}{3}\right)$ d) $2(2x^2-10x+17)$ e) $\left(x-\frac{2}{3}\right)^2$
9. a) 0, 10 b) -5 c) $-1 \pm \sqrt{5}$ d) $0, -\sqrt{3}, \sqrt{3}$ e) 0, 3 f) 0 g) $5, \frac{1}{3}$ h) $-2, 2$
10. a) interval notation: $[7, \infty)$ inequality notation: $x \geq 7$
 b) interval notation: $(-\infty, -2)$ inequality notation: $x < -2$
 c) interval notation: $(-\infty, 2]$ inequality notation: $x \leq 2$
11. a) $(-3, -1)$
- b) vertex: $(3, -9)$
 y-intercept: $(0, 0)$
 x-intercepts: $(0, 0)$ and $(6, 0)$
 additional points: $(2, -8), (4, -8)$



12. $\sqrt{6720} \text{ cm} = 8\sqrt{105} \text{ cm}^2$

13. a) -30 b) 22

14. a) \$3150 at 5% and \$850 at 3% b) -5 with -14 and 7 with 10 c) 27 d) $-26, -25, -24$
 e) -4 or 2 f) \$17 500 at 10% and \$9500 at a 4% loss g) 10 cm by 16 cm h) 13
 i) 8 adults and 52 children j) 20 cm, 48 cm, and 52 cm k) 35 cm l) 20 cm, 21 cm, and 29 cm

15. Ann had \$35 and Betsy had \$25