1. Solve each of the following system of equations.

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

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

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

   d) $\begin{cases} (x-2)^2 + (y-5)^2 = (x+1)^2 + (y-8)^2 \\ \frac{x-1}{2} = \frac{y-1}{5} \end{cases}$

   e) $\begin{cases} 3x + 5y = -4 \\ 4x - 3y = -15 \end{cases}$

   f) $\begin{cases} 2x - y = 15 \\ x + 3y = -17 \end{cases}$

2. Find the prime factorization for 270^{20}.

3. Simplify each of the following.

   a) $\dfrac{-\frac{3}{4} - \frac{2}{5} \div \frac{8}{10}}{1 - \frac{7}{4}}$

   b) $\dfrac{\frac{1}{2} - \left(-\frac{1}{3}\right)^2}{\frac{1}{3} - \left(-\frac{1}{2}\right)^2}$

   c) $\left(\frac{2}{5}\right)^{-1} - \left(\frac{3}{4}\right)^{-2}$

4. Suppose that $A = 1.25 \cdot 10^{17}$ and $B = 3.2 \cdot 10^{-13}$. Compute each of the following. Present your answer using scientific notation.

   a) AB b) $\sqrt{AB}$ c) AB^2 d) $\dfrac{A}{B}$

5. The difference of squares theorem has some interesting practical applications. Use the difference of squares theorem to evaluate each of the following without the aide of calculator.

   a) $51^2 - 49^2$ b) $25^2 - 15^2$ c) $101^2 - 1$ d) $53^2 - 47^2$

6. Simplify each of the following.

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

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

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

   d) $\dfrac{\left(-2a^{-4}b^3\right)^{-2}\left(-b^0a^3\right)^{-5}}{\left(2a^2b^4\right)^{-3}}$

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

7. 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.

8. Expand each of the following.

   a) $(x-y)(x+y)$ b) $(5x-2)^2$ c) $(5x-2)^3$ d) $(x-y)\left(x^2+xy+y^2\right)$

9. Completely factor each of the following.

   a) $x^2 - 36$

   b) $25p^2 - 49q^{10}$

   c) $6x^2 - 15x + 8x - 20$

   d) $12x^3 + 3x$

   e) $2a^2x^5 - 32a^2x$

10. Solve each of the following equations.

    a) $(2x-1)^2 - (x+3)^2 = 2x^2 - 8$

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

    c) $3(x-1) + x^2 = (x+1)^2$

    d) $3x^8 = 12x^6$

    e) $4x^8 = 12x^7$

    f) $4x^8 = 12x^8$

    g) $(3x-1)(x-5)^2 = 0$

    h) $x^4 = 16$

11. Solve each of the following inequalities.

    a) $\dfrac{3x-1}{2} - \dfrac{x-4}{3} \geq x + 2$ b) $\dfrac{1}{2}(x-3) - \dfrac{2}{3}(2x+1) > \dfrac{1}{6}(x-1)$ c) $(x-5)^2 \geq (x+1)^2$

12. One number is four less than twice another. Find these numbers if their sum is 17.

13. If we increase all sides of a square by 1 feet, the square's area will increase by $15\,\mathrm{ft}^2$. How long are the sides of the original square?

14. The sum of three consecutive integers is -75. Find these numbers.

15. Five times a number is 28 greater than twice the opposite of the number. Find this number.

16. One side of a rectangle is $24\,\mathrm{cm}$ shorter than four times the other side. Find the length of the sides if the perimeter of the rectangle is $52\,\mathrm{cm}$.

17. We have 240 coins, all dimes and nickels. How many dimes and how many nickels do we have if the value of all coins is $\$18.80$?

18. If we cube a number, we get four times the number. Find all such numbers.

19. 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?

20. 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?

21. *Find the area of the triangle determined by the points $A\,(-7,4)$, $B\,(-3,-2)$, and $C\,(5,1)$.

Answers

1. a) $(4, 9)$ b) $(-2, 1)$ c) $(0, -4)$ d) $(5, 11)$ e) $(-3, 1)$ g) $(4, -7)$

2. $270^{20} = 2^{20} \cdot 3^{60} \cdot 5^{20}$

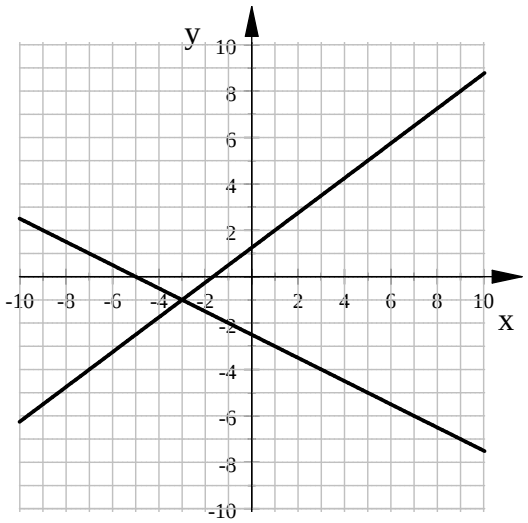
3. a) $\frac{5}{3}$ b) $\frac{14}{3}$ c) $\frac{13}{18}$

4. a) $4 \cdot 10^4$ b) $2 \cdot 10^2$ c) $1.28 \cdot 10^{-8}$ d) $3.906\,25 \cdot 10^{29}$

5. a) 200 b) 400 c) $10\,200$ d) 600

6. a) $\frac{4}{15}$ b) $\frac{8}{15}$ c) $\frac{c^2}{ab}$ d) $-\frac{2b^6}{a}$ f) $4b^8$

7. $(-3, -1)$



8. a) $x^2 - y^2$ b) $25x^2 - 20x + 4$
   c) $125x^3 - 150x^2 + 60x - 8$ d) $x^3 - y^3$

9. a) $(x + 6)(x - 6)$ b) $\left(5p - 7q^5\right)\left(5p + 7q^5\right)$
   c) $(3x + 4)(2x - 5)$ d) $3x\left(4x^2 + 1\right)$
   e) $2a^2x\left(x^2 + 4\right)(x + 2)(x - 2)$

10. a) $0, 10$ b) -5 c) 4 d) $2, 0, -2$ e) $0, 3$ f) 0
    g) $5, \frac{1}{3}$ h) $-2, 2$

11. a) $[7, \infty)$ b) $(-\infty, -2)$ c) $(-\infty, 2]$

12. 7 and 10 13. 7 ft 14. $-26, -25, -24$ 15. 4

16. 10 cm by 16 cm 17. 104 nickels and 136 dimes

18. $2, 0, -2$ 19. 8 adults and 52 children

20. Ann had \$35 and Betsy had \$25 21. 30 unit^2

Last revised: November 14, 2018