

1. Perform each of the operations on intervals.

a) $(3, 8) \cup (-2, 5)$ c) $[-2, 7] \cap (3, 5)$ e) $[-3, \infty) \cup (-\infty, 10)$

b) $(3, 8) \cap (-2, 5)$ d) $[-2, 7] \cup (3, 5)$ f) $[-3, \infty) \cap (-\infty, 10)$

2. Suppose that $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$, $A = \{2, 5, 7, 9\}$, $B = \{1, 5, 6, 8, 9, 10\}$, and $C = \{1, 2, 4, 5, 7, 9\}$.

a) Draw a Venn diagram depicting these sets.

b) Find each of the following.

i) $(A \cap B) \cap C$ ii) $B \cap C$ iii) $A \cup B$ iv) $(A \cap B) \cup (A \cap C)$

c) Label each of the following statements as true or false.

i) $A \subseteq B \cup C$ ii) $A \subseteq C$ iii) $\emptyset \subseteq A \cap B$

3. Find the prime factorization of each of the following. a) 1200 b) 48^{100}

4. Compute the least common multiple and greatest common factor of 270 and 420

5. Find the average of $-\frac{2}{3}$, $3\frac{1}{6}$, 4, and $-\frac{1}{2}$.

6. Suppose that $x = 0.000\,000\,025$ and $y = 64\,000\,000$. Write each of the following in scientific notation.

a) x b) y c) y^3 d) $\sqrt{10x}$ e) \sqrt{y} f) xy g) $\frac{y}{x}$

7. Simplify each of the following expressions. Show all steps.

a) $(-1)^4 - 2 \cdot 3^2 \div (-2) \cdot 6 + (-3)^2$	e) $\frac{20 - 5x^2}{6x^2 + 3x^3}$	
b) $\left(3\frac{3}{5}\right) \div \left(1\frac{1}{3}\right) + \frac{3}{10}$	f) $\frac{(x^2y^{-2})^4 xy^{-1} (xy)^{-1}}{xy^0 (x^{-2}y)^{-2}}$	i) $\frac{\left(\frac{1}{2}\right)^{-1} + \left(\frac{1}{3}\right)^{-1}}{\left(\frac{1}{2}\right)^{-2} - \left(\frac{1}{3}\right)^{-2}}$
c) $\left -3^2 + 3 - \left (-6)^2 + (-2)^3\right - 2\right + 1$	g) $\frac{2x - 5}{5 - 2x}$	j) $\frac{2^{-1} + 2^{-2}}{(-2)^{-1} + (-2)^{-2}}$
d) $(x + 6)(x^2 - 6x + 36)$	h) $\frac{a^2b^0a^{-2}(ab^{-1})^3}{b^2a^0b^{-4}a^2}$	

8. Evaluate $\frac{-x^2 + 4x - 3}{x - 3}$ if a) $x = 0$ b) $x = -5$ c) $x = 3$ d) $x = \frac{3}{2}$

9. Perform the indicated operations.

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

b) $(p - 1)(p + p^2 + p^3 + p^4 + 1)$

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

10. Completely factor each of the following expressions.

a) $2ax^2 - 18ay^2 - bx^2 + 9by^2$

d) $a^4 - 16$

g) $x^2 - 2x - 48$

b) $600ab^2 - 6ab^4$

e) $15x^2 - 4x - 4$

h) $x^2 - 16x - y^2 + 64$

c) $60st^2 - 44st^2x + 8st^2x^2$

f) $4a^4 - 16a^2$

i) $-4x^4 - 2x^3 + 100x^2 + 50x$

11. Solve each of the following equations. Make sure to check your solutions.

a) $15x^3 = 55x^2 + 20x$

e) $3x^3 = 75x^2$

b) $5(2x - 3) - 3(4x - 7) = -2x$

f) $x^2 + 2x = 15$

c) $2(x - 3)^2 - (x + 1)^2 = -4(3x - 4)$

g) $2x^2 + x = 15$

d) $3x^3 = 75x$

h) $6x^2 = x + 1$

k) $2(3x - 5(-10x + 4(3x - 1))) = 2(-1 - 7(x - 3))$

i)
$$\frac{\frac{3x+1}{4} - 7}{3} + 5 = 2$$

j)
$$\frac{2}{5}x - \frac{3}{4} = \frac{1}{3}x + \frac{1}{20}$$

12. Solve each of the following inequalities. Make sure to check your solutions.

a) $\frac{2x+1}{3} - \frac{1-5x}{7} < 2x - 6$

b) $-\frac{2}{3}x + \frac{3}{5} \leq -3\frac{2}{5}$

13. Solve the system of linear equations. Make sure to check your solutions.

a)
$$\begin{cases} 2x - 3y = 13 \\ 3x + 2y = 13 \end{cases}$$

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

14. Find the slope of the line connecting the points $A(-3, 7)$ and $B(9, 4)$.

15. Find the slope of the line $3x - 5y = 12$.

16. Find the value of p if the slope connecting $(2, 5)$ and $(8, p)$ is -2 .

17. Compute the distance between the points $P(3, -5)$ and $Q(-2, 7)$.

18. Graph the straight lines $2x - y = 7$ and $x + 2y = 6$ in the same coordinate system.

a) Use your graph to find the coordinates of the point where the lines intersect.

b) Use algebraic methods to check your answer for part a).

19. One number is 3 less than twice the other. The sum of the two numbers is 42. Find these numbers.

20. The shortest side of a right triangle is 20 units long. Find the other two sides if we also know that the difference between the other two sides is 8 units.

21. One number is 3 less than twice the other. The product of the two numbers is 104. Find these numbers.

22. Ann is four years younger than Tina. How old is Ann if the sum of their ages is 62?

23. The age of Maribel is eight less than twice Bethany's age. How old are they if the product of their ages is 120?

24. The difference between two numbers is 7, their product is 228. Find these numbers.

25. If we increase the sides of a square by 1 unit, its area will increase by 10 unit². What is the length of the side of the original square?

26. One side of a rectangle is 4 in shorter than 3 times the other side. Find the sides of the rectangle if its perimeter is 48 in.

27. One side of a rectangle is 4 in shorter than 3 times the other side. Find the sides of the rectangle if its area is 319 in².

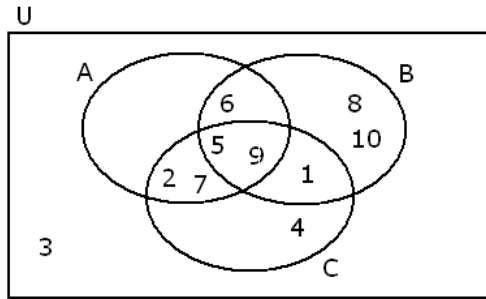
28. If we cube a number, we get exactly four times the number. Find all numbers with this property.

29. We have some ten-dollar bills and some twenty-dollar bills. All together, we have 47 bills, in the value of \$620. How many twenty-dollar bills do we have?

30. We are standing on the top of a 720 ft tall building and throw a small object upward. The object's distance from the ground, measured in feet, after t seconds is $h = -16t^2 + 192t + 720$. How long does it take for the object to hit the ground?
31. We have invested \$3500 into two bank accounts. One account earns 7% interest per year, the other account earns 11% interest per year. How much did we invest in each account if the combined interest was \$333?
32. A number is twelve less than its own square. Find this number.
33. Find the perimeter and area of the triangle determined by the points $A(-7, -2)$, $B(8, -2)$, and $C(8, 16)$.

Answers

1. a) $(-2, 8)$ b) $(3, 5)$ c) $(3, 5)$ d) $[-2, 7]$ e) $(-\infty, \infty)$ f) $[-3, 10]$
2. a)



- b) i) $\{5, 9\}$ ii) $\{1, 5, 9\}$ iii) $\{1, 2, 5, 6, 7, 8, 9, 10\}$
iv) $\{2, 5, 7, 9\}$
- c) i) true ii) false iii) true
3. a) $2^4 \cdot 3 \cdot 5^2$ b) $2^{400} \cdot 3^{100}$
4. gcd = 30 lcm = 3780
5. $\frac{3}{2}$

6. a) $2.5 \cdot 10^{-8}$ b) $6.4 \cdot 10^7$ c) $4.096 \cdot 10^{15}$ d) $5 \cdot 10^{-4}$ e) $8 \cdot 10^3$ f) $1.6 \cdot 10^0$ g) $2.56 \cdot 10^{15}$

7. a) 64 b) 3 c) 37 d) $x^3 + 216$ e) $-\frac{5(x-2)}{3x^2}$ f) $\frac{x^3}{y^8}$ g) -1 h) $\frac{a}{b}$ i) -1 j) -3

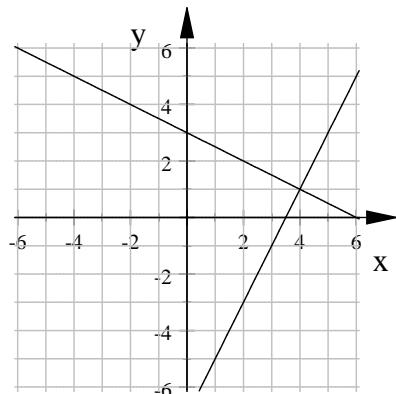
8. a) 1 b) 6 c) undefined d) $-\frac{1}{2}$ 9. a) $3x^3 - 8x^2 - 1$ b) $p^5 - 1$ c) $-5x^2$

10. a) $(2a - b)(x + 3y)(x - 3y)$ b) $-6ab^2(b - 10)(b + 10)$ c) $60st^2 - 44st^2x + 8st^2x^2$ d) $(a - 2)(a + 2)(a^2 + 4)$
e) $(3x - 2)(5x + 2)$ f) $4a^2(a - 2)(a + 2)$ g) $(x + 6)(x - 8)$ h) $(x - y - 8)(x + y - 8)$
i) $-2x(x^2 - 25)(2x + 1)$

11. a) $4, 0, -\frac{1}{3}$ b) no solution c) 1 d) $-5, 0, 5$ e) $0, 25$ f) $3, -5$ g) $\frac{5}{2}, -3$ h) $\frac{1}{2}, -\frac{1}{3}$ i) 5
j) 12 k) all numbers are solution

12. a) $(10, \infty)$ b) $[6, \infty)$ 13. a) $(5, -1)$ b) $(5, 7)$ 14. $-\frac{1}{4}$ 15. $\frac{3}{5}$ 16. -7 17. 13 units

18. a) $2x - y = 7$ and $x + 2y = 6$



- b) $(4, 1)$
- c) $2 \cdot 4 - 1 = 8 - 1 = 7$ thus $(4, 1)$ is on the line $2x - y = 7$ and $4 + 2 \cdot 1 = 6$, therefore $(4, 1)$ is on the line $x + 2y = 6$ so $(4, 1)$ must be the intersection point

19. 15 and 27 20. 21 and 29 units 21. 8, 13 and $-\frac{13}{2}, -16$
22. 29 23. Maribel is 10, Bethany is 12 24. 12, 19 and $-19, -12$
25. 4.5 unit 26. 7 in by 17 in 27. 11 in by 29 in 28. 2, 0, -2
29. 15 30. 15 seconds 31. \$2200 at 11% and \$1300 at 7%
32. -3, 4 33. $P = 40$ unit, $A = 60$ unit²