

1. Perform each of the divisions with remainder.

a) $2017 \div 31$ b) $99 \div 7$ c) $1355 \div 24$

2. Suppose that $A = \{1, 2, 3, 4, 5\}$ and $B = \{1, 3, 5, 7, 9\}$. Find each of the following.

a) $A \cup B$ b) $A \cap B$

3. List all factors of 60.

4. Which of the following numbers is a prime number?

39, 91, 71, 45, 81, 201

5. Consider the following numbers: 72, 99, 40, 150, 135, 190, 360

List all the numbers from the given list that are divisible by a) 2 b) 3 c) 5 d) 9

6. Label each of the following statements as true or false.

a) 3 is a multiple of 3.

f) Every rectangle is a square.

b) $4 < 4$

g) Every square is a rectangle.

c) $5 \geq 5$

h) Every number divisible by 12 is also divisible by 6.

d) 14 is a multiple of 4 or 7 is a prime number

i) $\mathbb{N} \subseteq \mathbb{Z}$

e) 14 is a multiple of 4 and 7 is a prime number

7. Perform the operations as indicated. Show all steps.

a) $(-2)^2$ d) $-2(-5)$ g) $20 - 3(-8)$

b) -2^2 e) $-2 - (-5)$ h) $\frac{(-2)^3 - 5(-3) - (-1)^4 + (-3)^2}{-2^2 - (-1)}$

c) $-2 - 5$ f) $-2(-(-5))$ i) $-3^2 - (-24) \div (5 - (-1)^3) \cdot 2$

8. Simplify each of the following expressions by applying the order of operations agreement. **Show all steps. Perform only one operation in each step.**

a) $7 \cdot 3^2 - (3 - 2^2 \cdot 5 - 1) \div 2$

g) $\frac{4^2 + 5^2 - 6 \div 2 \cdot 3}{4^2 - 8 \cdot 2}$

m) $|-10 - 7| - |1 - 4|$

b) $\frac{5 - 1 + 2}{-1^2 + (-1)^2}$

h) $3 + 2(5 + 3(15 - 2^3) - 2^2 - 1)$

n) $|-10 - 7 - |1 - 4||$

c) $\sqrt{169 - 144}$

i) $4(3(2(2^2 - 1) - 1) - 1) + 5$

o) $|-10 - 7| |1 - 4||$

d) $\sqrt{169} - \sqrt{144}$

j) $\sqrt{\sqrt{36} + 5\sqrt{9} - \sqrt{25}}$

p) $|-10 - |7 - 1 - 4||$

e) $2^3 - 2(5 - (-3)^2)^2$

k) $-2^2 - 3(5 - (-2)^2) - (-1)^3$

q) $|-10| - 7 - 1 - 4||$

f) $\left(\left(\left((8 - 5)^2 - 7\right)^2 - 2\right)^2 - 1\right)$

l) $-2 - 5(-3^2 - 2(-7))$

r) $\sqrt{4\sqrt{64} - \sqrt{49}}$

9. Let $p = 4$, $q = -3$, and $s = 1$. Evaluate each of the following expressions.

a) $\frac{p - q - s}{p + q + s}$ b) $\frac{2p - q}{p - (s - q)}$ c) $p^2 - 2s^2$ d) $p^2 - (2s)^2$ e) $2pq^2$

10. Suppose that $x = 4$ and $y = -3$. Evaluate each of the algebraic expressions.

a) $2x - y + 1$ b) $-y^2 - 3x^2y$ c) $\sqrt{x^2 + y^2}$ d) $5x - 2y + 2x + y$ e) $\left| \frac{x^2 - y^2}{y^2 - x^2} \right|$

11. Consider the equation $x^3 - x^2 + 7 = x^2 + 5x + 1$. Which of the given numbers are solutions of the equation? The given numbers: 0, 1, -1, 2, and -2

12. Consider the inequality $x^2 + 3x \leq x + 24$. Which of the given numbers are solutions of the inequality? The given numbers: 5, 6, 0, -10, 3, and 4

13. Simplify each of the following.

a) $(4a - b) + (-3a + 2b)$ d) $5(4a - b) + 2(-3a + 2b)$ g) $5(3x - 1) - 7(2x - 1)$
 b) $(4a - b) - (-3a + 2b)$ e) $(3x - 1) + (2x - 1)$ h) $(2m + 5) + (2m - 5)$
 c) $5(4a - b) - 2(-3a + 2b)$ f) $(3x - 1) - (2x - 1)$ i) $(2m + 5) - (2m - 5)$

14. Solve each of the given equations. Make sure to check your solutions.

a) $3x - 8 = 10$ e) $4(5m + 1) - 3(2m - 7) = 2(m - 1) - (3 - 2m)$
 b) $\frac{x + 7}{2} = -3$ f) $3(2y - 5) - (y - 8) = 5(y - 2) - 3$
 c) $\frac{x}{2} + 7 = -3$ g) $8(x - 3) - 5(2x - 7) = 1 + 2(x + 5)$
 d) $5x - 13 = -2x + 8$ h) $5x - (3 - 4x) + 2 = 9(x + 1) - 10$
 i) $a - 3(a - 5) = 6(2a - 1) + 7$

15*. (Enrichment) Two mathematicians are having a conversation. Mathematician A asks B about his kids. B answers: "I have three children, the product of their ages is 36." A says: "I still don't know how old your children are." Then B tells A the sum of his three kids' ages. A answers: "I still don't know how old they are. Then B adds: "The youngest one has red hair." Now A knows how old the kids are. Do you?

Answers

1. a) 65 R 2 b) 14 R 1 c) 56 R 11
 2. a) {1, 2, 3, 4, 5, 7, 9} b) {1, 3, 5}
 3. 1, 2, 3, 4, 5, 6, 10, 12, 15, 20, 30, 60
 4. 71
 5. a) 72, 40, 150, 190, 360
 b) 72, 99, 150, 135, 360
 c) 40, 150, 135, 190, 360
 d) 72, 99, 135, 190, 360
 6. a) true b) false c) true d) true
 e) false f) false g) true h) true i) true
 7. a) 4 b) -4 c) -7 d) 10 e) 3
 f) -10 g) 44 h) -5 i) -1
 8. a) 72 b) undefined c) 5 d) 1 e) -24
 f) 3 g) undefined h) 45 i) 61 j) 4
 k) -6 l) -27 m) 14 n) 20 o) 31
 p) 12 q) 120 r) 5
 9. a) 3 b) undefined c) 14 d) 12 e) 72
 10. a) 12 b) 135 c) 5 d) 31 e) 1
 11. -2 and 1
 12. 0, 3, and 4
 13. a) $a + b$ b) $7a - 3b$ c) $26a - 9b$ d) $14a - b$
 e) $5x - 2$ f) x g) $x + 2$ h) $4m$ i) 10
 14. a) 6 b) -13 c) -20 d) 3 e) -3
 f) no solution g) 0 h) all numbers are solution i) 1