

1. List all factors of 42.
2. Which of the following is a prime number? 91, 49, 101, 143, 2013
3. List the first ten prime numbers.
4. Find the prime factorization of 420.
5. Use prime-factorization to find the least common multiple and greatest common divisor of 180 and 135.
6. a) Compute 48% of 5000.
b) Re-write 45% as a reduced fraction.
c) Re-write $\frac{2}{5}$ as a percent.
7. The budget will be increased by 20%. If the budget is \$400 now, how much will it be after the increase?
8. Suppose that A is the set of all integers divisible by 2 and B is the set of all integers divisible by 3. Describe $A \cap B$.
9. Suppose that $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$. Find each of the following.
a) $A = \{a \in U : a < 3 \text{ and } a \leq 7\}$ b) $B = \{b \in U : a < 3 \text{ or } a \leq 7\}$
10. Label each of the following statements as true or false.

(a) $\sqrt{2}$ is an irrational number.	(f) -2 is an integer.
(b) If a number is divisible by 10 and 12, then it is also divisible by 120.	(g) $-2 < -2$
(c) If a number is divisible by 6 and by 8, then it is also divisible by 24.	(h) $8 \geq 8$
(d) If the product xy is divisible by 6, then x is divisible by 6 or y is divisible by 6.	(i) Every square is a rectangle.
(e) If the product xy is divisible by 5, then x is divisible by 5 or y is divisible by 5.	(j) Every rational number has a reciprocal.
	(k) Every integer has an opposite.
	(l) For all sets A and B , $A \subseteq A \cup B$.
11. What is the last digit of 8^{99} ?
12. Perform the following operations. Show all steps.

a) $18 - 2(-5) - 2(11 - 2(-5))$	d) $ -7 - 2 - 8 + 3 $	h) $ -7 - 2 - 8 + 3 $
b) $\frac{-3^2 + (-1)^3}{7 - 3(-1)^3}$	e) $ -7 - 2 - 8 + 3 $	i) $\sqrt{3\sqrt{49} - \sqrt{25}}$
c) $-2^2(24 - 2(-3) - 5(-2)^2) - 12)$	f) $ -7 - 2 -8 + 3 $	
	g) $ -7 - 2 - 8 + 3 $	
13. Perform the indicated operations.

a) $\left(-\frac{2}{3}\right)^3$	b) $(-1)^{2017}$	c) $\sqrt{\frac{9}{49}}$	d) $\sqrt[5]{-\frac{1}{32}}$
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14. Perform the following operations. Show all steps.

$$\text{a) } \left(-\frac{1}{2}\right)^2 - \frac{3}{4} \div \left(-\frac{2}{5}\right) \quad \text{b) } \frac{\frac{1}{2} - \frac{1}{3}}{\frac{1}{2} \cdot \frac{1}{3}} \quad \text{c) } \frac{2 - \frac{3}{5}}{2 \cdot \frac{3}{5}} \quad \text{d) } -\frac{2}{5} + \frac{1}{3} \left(5\frac{3}{10} - 4\frac{1}{6}\right)$$

15. Evaluate $\frac{3xy + 2x^2 - 2y^2}{x + 2y}$ if

$$\begin{array}{lll} \text{a) } x = 2 \text{ and } y = -3 & \text{c) } x = -6 \text{ and } y = 3 & \text{e) } x = \frac{1}{3} \text{ and } y = -\frac{3}{4} \\ \text{b) } x = -1 \text{ and } y = -2 & \text{d) } x = -\frac{1}{2} \text{ and } y = \frac{2}{3} & \end{array}$$

16. Evaluate $-p^2 + |2pq + q - 3|$ if: a) $p = 2$ and $q = -5$ b) $p = -4$ and $q = 3$

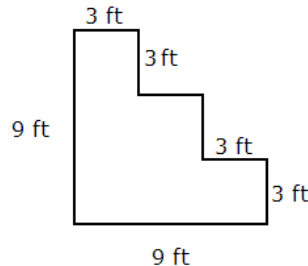
17. Consider the equation $3x^3 - 7x + 18 = -x + 3(x^2 + 6)$.

- a) Is the number 2 a solution of this equation? c) Is the number 1 a solution of this equation?
 b) Is the number -2 a solution of this equation? d) Is the number -1 a solution of this equation?

18. Consider a rectangle with sides 5 m and 12 m long.

- a) Compute the perimeter of the rectangle. Include units in your computation and answer.
 b) Compute the area of the rectangle. Include units in your computation and answer.

19. Compute the area of the object shown on the picture. Include units in your computation and answer.



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

$$\begin{array}{lllll} \text{a) } 2x + 3 = 17 & \text{c) } \frac{a}{2} - 3 = 5 & \text{e) } -2x + 5 = 17 & \text{g) } \frac{2}{3}x - \frac{1}{6} = \frac{2}{5} & \text{i) } 3\frac{2}{5}x - \frac{1}{2} = 2\frac{1}{3} \\ \text{b) } \frac{a-3}{2} = 5 & \text{d) } 9z - 98 = 1 & \text{f) } \frac{x}{-7} + 1 = -2 & \text{h) } \frac{1}{2}x - 3 = \frac{3}{4} & \end{array}$$

21*. Compute each of the following.

$$\begin{array}{l} \text{a) } -99 + (-98) + (-97) + \dots + 98 + 99 + 100 \\ \text{b) } -99(-98)(-97)\dots 98 \cdot 99 \cdot 100 \end{array}$$

22*. Suppose that a and b are natural numbers with $a < b$. If the greatest common factor of a and b is 5, and the least common multiple of a and b is 60, then how many different values are possible for a ?

23*. Suppose that A is a set. Let us introduce a notation for the size of a set: let $|A|$ denote the number of elements of set A . Find an example for sets P and Q so that $|P| = 5$, $|Q| = 4$, $|P \cup Q| = 7$, and $|P \cap Q| = 3$.

Answers

1. 1, 2, 3, 6, 7, 14, 21, 42
2. 101
3. 2, 3, 5, 7, 11, 13, 17, 19, 23, 29
4. $420 = 2^2 \cdot 3 \cdot 5 \cdot 7$
5. $\text{lcm}(135, 180) = 540$ $\text{gcd}(135, 180) = 45$
6. a) 2400 b) $\frac{9}{20}$ c) 40%
7. \$480
8. the set of all integers divisible by 6
9. a) {1, 2} b) {1, 2, 3, 4, 5, 6, 7}
10. a) true b) false c) true
d) false e) true f) true
g) false h) true i) true
j) false k) true l) true
11. 2
12. a) -14 b) -1 c) -40 d) -2
e) 20 f) 17 g) 10 h) 49 i) 4
13. a) $-\frac{8}{27}$ b) -1 c) $\frac{3}{7}$ d) $-\frac{1}{2}$
14. a) $\frac{17}{8}$ b) 1 c) $\frac{7}{6}$ d) $-\frac{1}{45}$
15. a) 7 b) 0 c) undefined d) $-\frac{5}{3}$ e) $\frac{17}{12}$
16. a) 24 b) 8
17. a) yes, since $28 = 28$ b) no, since $8 \neq 32$
c) no, since $14 \neq 20$ d) yes, since $22 = 22$
18. a) 34 m b) 60m^2
19. a) 54ft^2
20. a) 7 b) 13 c) 16 d) 11 e) -6
f) 21 g) $\frac{17}{20}$ h) $\frac{15}{2}$ i) $\frac{5}{6}$
- 21*. a) 100 b) 0
- 22*. two possibilities: $a = 5$ with $b = 60$ and $a = 15$ with $b = 20$