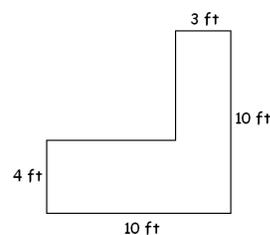


- Which of the following is a prime number? 91, 49, 101, 143, 2013
- List the first ten prime numbers.
- Find the prime factorization of 12^{100} .
- Perform the given division with remainder. $23 \div 5$
 - Convert the improper fraction $\frac{23}{5}$ to a mixed number.
- Perform the given division with remainder. $54 \div 15$
 - Convert the improper fraction $\frac{54}{15}$ to a mixed number.
- Convert the mixed number $3\frac{1}{3}$ to an improper fraction.
- Compute 48% of 5000.
 - Re-write 45% as a reduced fraction.
 - Re-write $\frac{2}{5}$ as a percent.
- The budget will be increased by 20%. If the budget is \$400 now, how much will it be after the increase?
- We placed \$2000 into a bank account with 6% yearly interest rate. How much money do we have in the account after one year?
- Suppose that A is the set of all integers divisible by 2 and B is the set of all integers divisible by 3. Describe $A \cap B$.
- Suppose that $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$. Find each of the following.
 - $A = \{a \in U : a < 3 \text{ and } a \leq 7\}$
 - $B = \{b \in U : a < 3 \text{ or } a \leq 7\}$
- Label each of the following statements as true or false.
 - $\sqrt{2}$ is an irrational number.
 - If a number is divisible by 10 and 12, then it is also divisible by 120.
 - If a number is divisible by 6 and by 8, then it is also divisible by 24.
 - If the product xy is divisible by 6, then x is divisible by 6 or y is divisible by 6.
 - If the product xy is divisible by 5, then x is divisible by 5 or y is divisible by 5.
 - -2 is an integer.
 - $-2 < -2$
 - $8 \geq 8$
 - Every square is a rectangle.
 - If $A \cup B = A$, then $B \subseteq A$
 - For all sets A and B , $A \subseteq A \cup B$.
 - The set of all points with x -coordinate zero is called the y -axis.
- What is the last digit of 8^{99} ?
- Compute the perimeter and area of the object shown on the picture. Angles that look like right angles are right angles.



15. Perform the following operations. Show all steps.

a) $18 - 2(-5) - 2(11 - 2(-5))$

d) $|-7 - 2| - |8 + 3|$

i) $\sqrt{3\sqrt{49} - \sqrt{25}}$

b) $\frac{-3^2 + (-1)^3}{7 - 3(-1)^3}$

e) $|-7 - 2 - |8 + 3||$

j) $(-1)^{2017}$

f) $|-7 - 2|-8 + 3||$

k) $(\sqrt{2})^6$

c) $-2^2(24 - 2(-3) - 5(-2)^2) - 12$

g) $|-7 - |2 - 8 + 3||$

h) $|-7|-2 - 8 + 3||$

l) $\left(\left(\left(3 - 2^2\right)^2 - 2^2\right)^2 - 2\right)^2$

16. Find the perimeter and area of the rectangle determined by the points $A(-5, -2)$, $B(3, -2)$, $C(3, 4)$, and $D(-5, 4)$.

17. Find the area of the triangle determined by the points $P(-3, 1)$, $Q(-3, -7)$ and $R(1, 0)$.

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

a) $x = 2$ and $y = -3$

b) $x = -1$ and $y = -2$

c) $x = -6$ and $y = 3$

19. Evaluate $-p^2 + |2pq + q - 3|$ if

a) $p = 2$ and $q = -5$

b) $p = -4$ and $q = 3$

20. 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?

21. Simplify each of the following.

a) $(x - y)^2$

b) $(x - y)^3$

c) $(x + y)(x - y)$

d) $(x - y)(x^2 + xy + y^2)$

22. Simplify each of the following.

a) $\frac{2^{100}}{4^{40}}$

b) $(-x^2)^3(-x^3)^2$

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

d) $\frac{(2x^2y)^3(-x^2y)^3}{(x^3y)^2(-2x^3y)^2}$

23. Solve each of the following equations.

a) $2(x + 3)(x - 7) = 0$

b) $x(x + 3)(x - 7) = 0$

c) $2(a - 5) - 3(1 - 5a) = 8(2a - 1)$

d) $4x - 3(2x - 1) - 3 + x = 5 - x$

e) $x^2 + 6 - (4x - 3)(1 - 2x) = (3x - 1)^2$

f) $2 - 3(5 - 2(-x + 2) - 1) + 8 = 12 - 3 - (4 - (8 - 3x))$

g) $4 - (1 - y)^2 = (2y - 1)(4y + 5) - 3y(3y + 1)$

h) $(x + 3)^2 - (2x - 3)^2 = 2 + 9x - (2 - 9x)$

24. Compute each of the following sums.

a) $100 + 105 + 110 + \dots + 845$

b) $17 + 27 + 37 + \dots + 737$

c) $2017 + 2020 + 2023 + \dots + 2311$

25. The first row in a theater consists of 19 seats. The second row has two more seats than the first row. The third row has two more seats than the second row. And so on, each row has two more seats than the row before. If the last row has 71 seats, how many seats are there in the entire theater?

26. How many diagonals are there in a polygon of 10 sides?
27. a) In how many different orders can we arrange the numbers 1 and 2? List them!
b) In how many different orders can we arrange the numbers 1,2, and 3? List them!
c) In how many different orders can we arrange the numbers 1,2, 3, and 4? List them!
28. 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 $|P \cap Q| = 3$.
- 29*. (The following problem is from my colleague, Professor Shuaibi). Two travelers meet a third one, who is very hungry. He offers 8 dollars for a meal. One traveler has three pieces of bread, the other one has five. So the hungry man gives them the 8 dollars, they all sit down and eat all 8 pieces of bread together. Afterwards, the two get into an argument about how to divide up the money. The one who contributed 5 pieces of bread wants to split it to 5 and 3. The other wants to divide the money evenly, 4 and 4. They go to a wise man for advice. They tell him their story and ask him to divide the money between them. The wise man gives the man who had 3 pieces of bread 1 dollar and 7 to the man with 5 pieces of bread. Why is this a reasonable and just decision?
- 30*. 2-powers. A number is sometimes called a 2-power if its only prime factor is 2.
- a) List all factors of 32.
b) List all factors of 16.
c) If $x = 2^n$ for a natural number n , then x has how many divisors? (Hint: investigate a few more 2-powers!)
d) True or False? If n and m are divisors of a 2-power with $n < m$, then n is a divisor of m .
e) Is this true for other numbers?

Answers

1. 101
2. 2, 3, 5, 7, 11, 13, 17, 19, 23, 29
3. $2^{200} \cdot 3^{100}$
4. a) $23 \div 5 = 4 \text{ R } 3$ b) $\frac{23}{5} = 4\frac{3}{5}$
5. a) $54 \div 15 = 3 \text{ R } 9$ b) $\frac{54}{15} = 3\frac{9}{15} = 3\frac{3}{5}$
6. $\frac{10}{3}$
7. a) 2400 b) $\frac{9}{20}$ c) 40%
8. \$480
9. \$2120
10. the set of all integers divisible by 6
11. a) $\{1, 2\}$ b) $\{1, 2, 3, 4, 5, 6, 7\}$
12. a) true b) false c) true
 d) false e) true f) true
 g) false h) true i) true
 j) true k) true l) true
13. 2
14. $P = 40 \text{ ft}$ $A = 58 \text{ ft}^2$
15. a) -14 b) -1 c) -40 d) -2
 e) 20 f) 17 g) 10 h) 49 i) 4
 j) -1 k) 8 l) 49
16. $P = 28 \text{ unit}$ $A = 48 \text{ unit}^2$
17. 16 unit^2
18. a) 7 b) 0 c) undefined
19. a) 24 b) 8
20. a) yes, since $28 = 28$ b) no, since $8 \neq 32$
 c) no, since $14 \neq 20$ d) yes, since $22 = 22$
21. a) $x^2 - 2xy + y^2$ b) $x^3 - 3x^2y + 3xy^2 - y^3$
 c) $x^2 - y^2$ d) $x^3 - y^3$
22. a) 2^{20} b) $-x^{12}$ c) 0 d) $-2y^2$
23. a) -3, 7 b) -3, 0, 7 c) 5 d) no solution
 e) 2 f) -1 g) 8 h) 0
24. a) 70 875 b) 27 521 c) 214 236
25. 1215
26. 35
27. a) 2 ways: 12 and 21
 b) 6 ways

123	213	312
132	231	321

 c) 24 ways

1234	2134	3124	4123
1243	2143	3142	4132
1324	2314	3214	4213
1342	2341	3241	4231
1423	2413	3412	4312
1432	2431	3421	4321
28. Not possible. Why not?
29. Not tellin'
30. a) 1, 2, 4, 8, 16, 32 b) 1, 2, 4, 8, 16 c) $n + 1$
 d) true
 e) No. For example, 4 and 5 are both divisors of 20 and 4 is not a factor of 5.