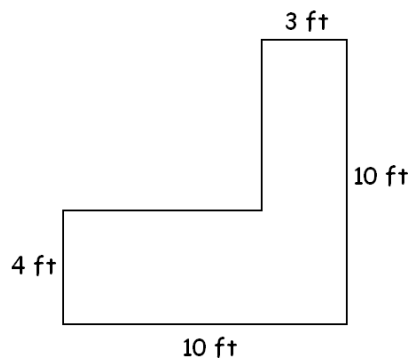


1. Find all prime numbers from the list: 91, 49, 101, 143, 2013
2. List the first ten prime numbers.
3. Find the prime factorization of 12^{100} .
4. Find the greatest common factor and least common multiple of 240 and 500.
5. Suppose that x and y are positive integers such that $x < y$. The greatest common factor of x and y is 2, and their least common multiple is 60. Find at least two possibilities for x and y .
6. a) Perform the given division with remainder. $23 \div 5$ b) Convert the improper fraction $\frac{23}{5}$ to a mixed number.
7. a) Perform the given division with remainder. $54 \div 15$ b) Convert the improper fraction $\frac{54}{15}$ to a mixed number.
8. Convert the mixed number $3\frac{1}{3}$ to an improper fraction.
9. a) Compute 48% of 5000.
b) Re-write 45% as a reduced fraction.
c) Re-write $\frac{2}{5}$ as a percent.
10. The budget will be increased by 20%. If the budget is \$400 now, how much will it be after the increase?
11. We placed \$2000 into a bank account with 6% yearly interest rate. How much money do we have in the account after one year?
12. Suppose that A is the set of all integers divisible by 2 and B is the set of all integers divisible by 3. Describe $A \cap B$.
13. Label each of the following statements as true or false.

a) For all sets A and B , $A \cap B \subseteq A \cup B$. b) If a number is divisible by 10 and 12, then it is also divisible by 120. c) If a number is divisible by 6 and by 8, then it is also divisible by 24. d) If the product xy is divisible by 6, then x is divisible by 6 or y is divisible by 6. e) If the product xy is divisible by 5, then x is divisible by 5 or y is divisible by 5.	f) -2 is an integer. g) $-2 < -2$ h) $8 \geq 8$ i) Every square is a rectangle. j) If $A \cup B = A$, then $B \subseteq A$ k) For all sets A and B , $A \subseteq A \cup B$. l) There exists a prime number divisible by 7.
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14. What is the last digit of 8^{99} ?
15. Suppose that $A = \frac{10^{300} - 1}{9}$. What is the sum of all digits of A ?
16. Compute the perimeter and area of the object shown on the picture. Angles that look like right angles are right angles.
17. Perform the indicated operations.

a) $\frac{2}{3} - \frac{3}{4} + \frac{1}{6}$ b) $1 - \frac{5}{8} + \frac{3}{4}$



18. 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) $(\sqrt[3]{-8})^2$

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

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

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

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

19. a) A TV set is priced at \$700. Next week, the store plans to offer a 15% off sale. What is the sale price?

b) Compute 85% of 700.

c) Can you explain why you got the same result in parts a) and b)?

20. a) The population of a small town is 62 000. The mayor is hoping that during this year, the population will increase by 20%. What would be the population of the town after such increase?

b) Compute 120% of 62 000.

c) Can you explain why you got the same result in parts a) and b)?

21. First the value of our stocks went up by 30%. Then it lost 20% of its value. Express the two changes as a single change. Is it an increase or a decrease?

22. Expand each of the following.

a) $(x - y)^2$

b) $(x - y)^3$

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

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

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

e) $\frac{5^{102} - 5^{100}}{5^{100} - 5^{99}}$

24. Suppose that $x = 1250\,000\,000$ and $y = 50\,000\,000$. Write each of the following in scientific notation.

a) x

b) y

c) xy

d) \sqrt{xy}

e) $\frac{x}{y}$

25. Find the smallest possible value of the given expressions.

a) $x^2 - 12x + 34$

b) $a^2 + 4a + 30$

26. The difference between two numbers a and b is 10. We do not know the values of a and b . What is the possible lowest value of the product ab ?

27. Solve each of the following equations.

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

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

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

i) $2x^4 = 18x^3$

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

j) $2x^4 = 18x^2$

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

k) $(x - 3)(x + 7) = 75$

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

l) $x(x - 1) + 23 = -5(x - 2)$

f) $2(x + 5) = (3 + x)(3 - x)$

m) $(2x - 5)^2 = (x + 2)^2$

g) $5x - 1 - 3(2x - 1) = -2x + 10$

n) $y - 53 = (2y - 1)(4y + 5) - 3y(3y + 1)$

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

28. Compute each of the following sums.

- a) $100 + 105 + 110 + \dots + 845$ b) $17 + 27 + 37 + \dots + 737$ c) $2017 + 2020 + 2023 + \dots + 2311$

29. 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?

30. How many diagonals are there in a polygon of 10 sides?

31. 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!

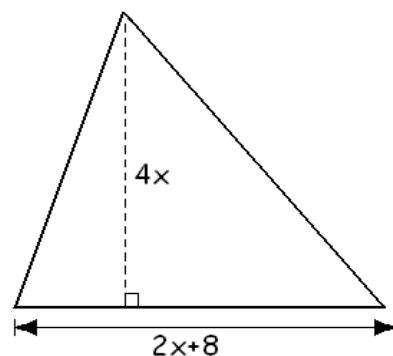
c) In how many different orders can we arrange the numbers 1,2, 3, and 4? List them!

32. We throw a small object upward from the top of a 640 ft tall building. The vertical location of the object, (measured in feet) t seconds after we threw it is

$$L = -16t^2 + 96t + 640$$

How long does it take for the object to hit the ground?

33. Find the value of x if the area of the triangle shown on the picture is 180 unit^2 .



34. If we increase each side of a square by 3 units, its area increases by 81 unit^2 . How long is each side of the square?

35. The tickets for the field trip were purchased yesterday for both students and instructors. Student tickets cost \$8, adult tickets cost \$15. The number of student ticket purchased was four less than five times the number of adults tickets purchased. How many of each were purchased if all of the tickets cost a total of \$353 dollars?

36. Amy's age is 24 less than three times Betsy's age. How old are they if the product of their ages is 720?

37. 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. $\text{gcd} = 20$ and $\text{lcm} = 1200$
5. $x = 4, y = 30$ or $x = 10, y = 12$
or $x = 6, y = 20$ or $x = 2, y = 60$
6. a) $23 \div 5 = 4 \text{ R } 3$ b) $\frac{23}{5} = 4\frac{3}{5}$
7. a) $54 \div 15 = 3 \text{ R } 9$ b) $\frac{54}{15} = 3\frac{9}{15} = 3\frac{3}{5}$
8. $\frac{10}{3}$
9. a) 2400 b) $\frac{9}{20}$ c) 40%
10. \$480
11. \$2120
12. the set of all integers divisible by 6
13. a) true b) false c) true
d) false e) true f) true
g) false h) true i) true
j) true k) true l) true
14. 2
15. 300
16. $P = 40 \text{ ft}$ $A = 58 \text{ ft}^2$
17. a) $\frac{1}{12}$ b) $\frac{9}{8}$
18. a) -14 b) -1 c) -40 d) -2 e) 20 f) 17
g) 10 h) 49 i) 4 j) -1 k) 4 l) 49
19. a) 595 b) 595
c) If the price is lowered by 15%, then the remaining part that we need to pay, is 85%. ($100 - 15 = 85$)
20. a) 74 400 b) 74 400 c) If a quantity is increased by 20%, then it went up from 100% to 120%. So, instead of computing the 20% and add to the original quantity, we can just compute 120% of the original quantity.
21. 4% increase
22. a) $x^2 - 2xy + y^2$ b) $x^3 - 3x^2y + 3xy^2 - y^3$
c) $x^2 - y^2$ d) $x^3 - y^3$
23. a) 2^{20} b) $-x^{12}$ c) 0 d) $-2y^2$ e) 30
24. a) $1.25 \cdot 10^9$ b) $5 \cdot 10^7$ c) $6.25 \cdot 10^{16}$ d) $2.5 \cdot 10^8$
e) $2.5 \cdot 10$
25. a) -2 b) 26
26. -25
27. a) -3, 7 b) -3, 0, 7 c) 5 d) no solution e) 2
f) -1 g) 8 h) 0 i) 0, 9 j) -3, 0, 3 k) -12, 8
l) no solution m) 1, 7 n) -6, 8 o) -1
28. a) 70 875 b) 27 521 c) 214 236
29. 1215
30. 35
31. 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
32. 10 seconds 33. 5 34. 12 units
35. 7 teachers and 31 students
36. Betsy is 20, Amy is 36
37. 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.