

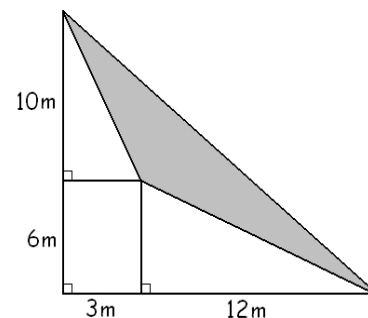
- List all factors of 56.
 - Find the prime factorization of 240.
 - Use the prime factorization to compute the greatest common divisor and least common multiple of 240 and 540.
- Find the prime factorization for x if
 - $x = 48^{99}$
 - $x = (5!)^3$ Recall that $5! = 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1$
- Perform the division with remainder: $2018 \div 11$
- Label each of the following as true or false.
 - There is no prime number divisible by 3.
 - For all sets A , $A \cup \emptyset = A$.
 - 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.
 - If a number x is divisible by 3, then its square x^2 is divisible by 9.
 - If n^2 is divisible by 18, then n is divisible 36.
 - Every rectangle is a square.
 - No rectangle is a square.

5. What is the last digit of 7^{2020} ?

6. a) Compute the perimeter and area of a right triangle with sides 34 cm, 16 cm, and 30 cm long. Include units in your computation and answer.

b) Compute the area of the right triangle determined by the points $A(-8, -3)$, $B(2, -3)$, and $C(-8, 4)$.

7. Compute the area of the shaded region on the picture. Include units in your computation and answer.



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

a) Draw a Venn diagram depicting these sets.

b) Find each of the following. i) $A \cap B$ ii) $A \cup (B \cap C)$ iii) $A \cap (B \cup C)$

9. Compute each of the following sets.

a) $(0, 5) \cup [3, 7]$

d) $(-\infty, 2) \cap (-4, \infty)$

g) $(-\infty, -3) \cup (1, 8)$

j) $(4, \infty) \cap [1, 6]$

b) $(0, 5) \cap [3, 7]$

e) $(3, 5) \cup [1, 8]$

h) $(-\infty, -3) \cap (1, 8)$

c) $(-\infty, 2) \cup (-4, \infty)$

f) $(3, 5) \cap [1, 8]$

i) $(4, \infty) \cup [1, 6]$

10. a) We place \$3000 into a bank account with an annual interest rate of 5%. How much money is in the account after a year?

b) Sally is currently making \$2000 a month. What will be her salary if she gets a pay increase of 2%?

c) A TV set is currently priced at \$810. What would be the sale price next week when the TV will go on a 20% off sale?

11. Simplify each of the following.

a) $|11 - 3| - 5|$

c) $|11| - 3 - 5|$

e) $-3^2 - 12 \div 2 \cdot 3$

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

b) $|11 - |3 - 5||$

d) $12 - 2(5 - 3(-2))$

f) $\frac{18 - 5 + 3}{-2^2 - (-2)^2}$

h) $\frac{6 - 2(-3)}{-2^2 - (-1)}$

12. Simplify each of the following.

a) $-3^2 - 4(-5) + 24 \div 3 \cdot 2$

b) $\frac{3}{8} - \frac{1}{4} \cdot \frac{3}{5}$

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

d) $2 - 5(8 - 3(2 - (-1)^3))$

e) $\frac{13 - 5 + 6}{-2^3 + 8}$

f) $\frac{\frac{1}{2} + \frac{1}{3}}{\frac{1}{2} - \frac{1}{3}}$

g) $\frac{\frac{7}{5} - \left(-\frac{3}{4}\right)^2 + 1}{\frac{1}{10} - \frac{1}{20} + \frac{1}{40}}$

h) $\frac{3 - \frac{1}{5}}{2 + \frac{1}{3}}$

i) $\left(-\frac{1}{2}\right)^2 - \left(-\frac{1}{2}\right)^3 - \left(-\frac{1}{2}\right)^4$

j) $2^{-3} - 3^{-1}$

13. Evaluate $\frac{-x^2 + 10x - 21}{3 - x}$ if

a) $x = 2$ b) $x = 3$ c) $x = \frac{5}{2}$ d) $x = -\frac{3}{8}$

14. Simplify each of the following.

a) $(-x)^2$

d) $-(-x)^3$

g) $(\sqrt[3]{5})^3$

j) $\sqrt{x^{20}}$

l) $\left(\frac{2}{5}\right)^{-2}$

n) $\frac{x^{-3}}{x^{-2}}$

b) $(-x)^3$

e) $\sqrt[3]{-8}$

h) $(\sqrt[5]{2})^{15}$

k) $\sqrt[5]{x^{20}}$

m) $\frac{x^3}{x^{-2}}$

o) -3^0

c) $-(-x)^2$

f) $\sqrt[4]{-16}$

i) $(\sqrt[3]{-5})^9$

k) $\sqrt[5]{x^{20}}$

m) $\frac{x^3}{x^{-2}}$

o) -3^0

15. Suppose that we denote 3^{1000} by X . Express each of the following in terms of X .

a) $3^{1002} + 3^{1000}$ b) 3^{998} c) 27^{1000} d) 3^{500} e) 9^{500}

16. Find each of the following.

a) 35% of 400 b) 120% of 75 c) 250% of 60

17. What number do we get if we increase 5000 by

a) 2% b) 12% c) 20% d) 120% e) 200%

18. Express each of the following as a single change.

a) First a 20% increase and then a 25% increase.

b) First a 30% decrease and then a 40% decrease

c) First a 20% increase and then a 20% decrease

d) First a 20% decrease and then a 20% increase

19. Suppose that $x = 1250\,000\,000\,000$ and $y = 0.000\,000\,000\,25$

a) Write x and y using scientific notation.

b) Compute each of the following. Present your answers using scientific notation.

i) xy ii) x^2y iii) $\sqrt{10y}$ iv) $\frac{1}{y}$

20. Simplify each of the following.

a) $\frac{(2xy^2)^5 (-xy^2x^3)}{(-2^3x^3y^4)^2}$

c) $\frac{(a^3b^5)^2}{a^5b^3a}$

e) $\left(\frac{a^3b^{-2}}{a^{-5}ba^2}\right)^{-3}$

b) $\frac{(-2ax^3)^3 (-3axa^2)^2}{(-2a^4x)^2}$

d) $\frac{(2xy^{-2})^{-3} (-xy^2x^{-3})^{-1}}{x^{-2} (-2^{-3}x^0y^{-4})^2}$

f) $\frac{(-2ax^3)^0 (-3axa^2)^3}{(-2a^4x)^2}$

21. Simplify each of the following.

a) $(3x - 8) + (-2x + 1)$

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

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

b) $(3x - 8) - (-2x + 1)$

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

j) $(x - 2)(x + 3)(x - 1)$

c) $2(3x - 8) - 3(-2x + 1)$

g) $(3x^2 + 5)(3x^2 - 5)$

k) $(x + 2)^2(x - 2)^2$

d) $(3x - 8)(-2x + 1)$

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

22. Completely factor each of the following.

a) $2x^2 - 18$

b) $12a^2x^2 - 75x^2$

c) $x^2 + 9$

d) $5a^7 - 5a^3$

e) $-x^3 + 16x$

f) $x^{16} - 25$

23. Solve each of the following equations.

a) $(3x - 1)(x + 1) - 2(x - 2)^2 = 14x - 9$

i) $x^2 - 2x = -5$

b) $5m^6 = 80m^2$

j) $2 - (2x - 5) = (x - 4)^2$

c) $(3x - 1)^2 - (2x + 5)^2 = 24 - 5x(4 - x)$

k) $(3a + 1)^2 - (3a + 4)(3a - 2) = 3(a + 3)$

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

l) $(3 - 4(5 - (6 - x) + 1) - 1) + 1 = x^2 + 3$

e) $\frac{1}{2}(3x - 5) - \frac{3}{4}(2x + 1) = x - \frac{1}{4}$

m) $3(x - 2)^2 - (2x - 1)^2 = 15 - (x + 6)^2$

f) $3((9x - 1) - 5(2x + 1)) = -18$

n) $x(x + 1)^2(x - 5) = 0$

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

o) $(2x - 5)^2 = (5x - 2)^2$

h) $\frac{2}{5}x - \frac{3}{4} - \frac{1}{3}\left(x + \frac{3}{5}\right) = -\frac{13}{15}$

p) $2(x - 3(x - 2(x - (3x - 1)))) = 4(5 - 7(x - 2))$

24. We throw a small object upward from the top of a 1200 ft tall building. The vertical location of the object, (measured in feet) t seconds after we threw it is

$$L = -16t^2 + 160t + 1200$$

Where is the object 3 seconds after we threw it?

25. One side of a rectangle is 4 ft shorter than three times the other side. Find the sides if the perimeter is 64 ft.

26. The freshman class had 60 students. 45 students took English, 38 students took Mathematics, and 28 took both English and Mathematics. How many students took neither of these subjects?

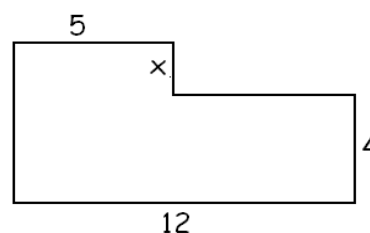
27. The population in our town has increased by 20%. If the town has now 72 000 people, how many lived there before the increase?

28. A bank teller has 23 more five-dollar bills than ten-dollar bills. The total value of the money is \$610. How much of each denomination of bill does he have?

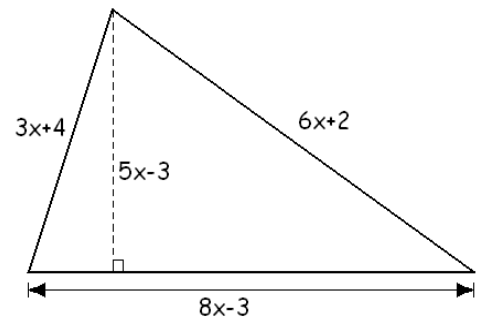
29. Three times a number is one less than twice the difference of the number and three. Find this number.

30. Amy's age is three less than five times her son's age. How old are they if the sum of their ages is 33?

31. Consider the figure shown on the picture. Angles that look like right angles are right angles. Find the value of x if we know that the area of this object is 58 unit^2 .

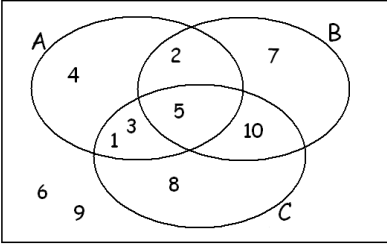


32. a) Find the value of x if the triangle shown on the picture has a perimeter 54 units.
b) Given the value of x you found, compute the area of the triangle.
33. There were a lot of coins in that jar, all quarters and dimes. The number of dimes was two less than five times the number of quarters. How many of each coins were there if all the coins in the jar were worth 8 dollars and 80 cents? (Hint: think in terms of cents)



34. If we increase each side of a square by 4 units, its area increases by 200 unit². How long is each side if the square?
35. A living room set went to a 15% off sale. The sale price is \$1062.50. What was the price before the sale?
36. The tickets for the field trip were purchased yesterday for both students and instructors. Children tickets cost \$12, adult tickets cost \$19. The number of children ticket purchased was three more than four times the number of adults tickets purchased. How many of each were purchased if all of the tickets cost a total of \$304 dollars?

Answers

1. a) 1, 2, 4, 7, 8, 14, 28, 56 b) $2^4 \cdot 3 \cdot 5$
c) 60 and 2160
2. a) $2^{396} \cdot 3^{99}$ b) $2^9 \cdot 3^3 \cdot 5^3$
3. 183 R 5
4. a) false b) true c) false d) true
e) true f) true g) false h) false
5. 1
6. a) $P = 80 \text{ cm}$ $A = 240 \text{ cm}^2$ b) $A = 35 \text{ unit}^2$
7. $A = 51 \text{ m}^2$
8. a) 
- b) i) $\{2, 5\}$ ii) $\{1, 2, 3, 4, 5, 10\}$ iii) $\{1, 2, 3, 5\}$
9. a) $(0, 7]$ b) $[3, 5)$ c) $(-\infty, \infty)$ d) $(-4, 2)$
e) $[1, 8]$ f) $(3, 5)$ g) $(-\infty, -3) \cup (-1, 12)$
h) \emptyset i) $[1, \infty)$ j) $(4, 6]$
10. a) \$3150 b) \$2040 c) \$648
11. a) 4 b) 9 c) 88 d) -10 e) -27 f) -2
g) 2 h) -4
12. a) 27 b) $\frac{9}{40}$ c) $\frac{2}{75}$ d) 7 e) undefined
f) 5 g) $\frac{49}{2}$ h) $\frac{6}{5}$ i) $\frac{5}{16}$ j) $-\frac{5}{24}$
13. a) -5 b) undefined c) $-\frac{9}{2}$ d) $-\frac{59}{8}$
14. a) x^2 b) $-x^3$ c) $-x^2$ d) x^3 e) -2
f) undefined g) 5 h) 8 i) -125 j) x^{10}
k) x^4 l) $\frac{25}{4}$ m) x^5 n) $\frac{1}{x}$ o) -1
15. a) $10X$ b) $\frac{X}{9}$ c) X^3 d) \sqrt{X} e) X
16. a) 140 b) 90 c) 150
17. a) 5100 b) 5600 c) 6000 d) 11 000 e) 15 000
18. a) 50% increase b) 58% decrease
c) 4% decrease d) 4% decrease
19. a) $x = 1.25 \cdot 10^{12}$ and $y = 2.5 \cdot 10^{-10}$
b) i) $3.125 \cdot 10^2$ ii) $3.90625 \cdot 10^{14}$
iii) $5 \cdot 10^{-5}$ iv) $4 \cdot 10^9$
20. a) $-\frac{1}{2}x^3y^4$ b) $-18ax^9$ c) b^7
d) $-8xy^{12}$ e) $\frac{b^9}{a^{18}}$ f) $-\frac{27ax}{4}$
21. a) $x - 7$ b) $5x - 9$ c) $12x - 19$ d) $-6x^2 + 19x - 8$
e) $6x^2$ f) 10 g) $9x^4 - 25$ h) $4x^2 - 12x + 9$
i) $8x^3 - 36x^2 + 54x - 27$ j) $x^3 - 7x + 6$ k) $x^4 - 8x^2 + 16$
22. a) $2(x + 3)(x - 3)$ b) $3x^2(2a - 5)(2a + 5)$
c) can not be factored d) $5a^3(a^2 + 1)(a + 1)(a - 1)$
e) $-x(x - 4)(x + 4)$ f) $(x^8 + 5)(x^8 - 5)$
23. a) 0, 4 b) -2, 0, 2 c) -8 d) 7 e) -3
f) 0 g) all real numbers h) $\frac{5}{4}$
i) no solution j) 3 k) 0 l) 0, -4 m) -8
n) -1, 0, 5 o) -1, 1 p) no solution
24. 1536 ft
25. 9 ft and 23 ft
26. 5
27. 60 000
28. 33 ten-dollar bills and 56 five-dollar bills
29. -7
30. 6 and 27
31. 2 units
32. a) 3 units b) 126 unit²
33. 12 quarters, 58 dimes
34. 23 units
35. \$1250
36. 4 adult and 19 children tickets