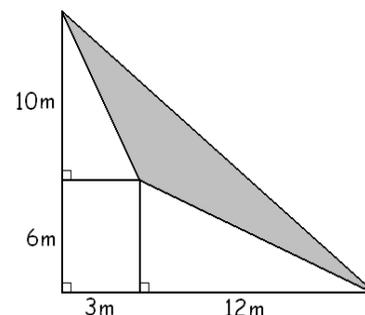
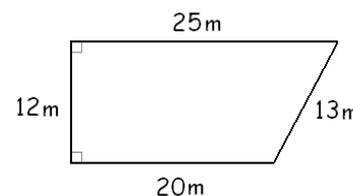


- List all factors of 56.
 - Find the prime factorization of 2400.
 - Use the prime factorization to compute the greatest common factor and least common multiple of 2400 and 2520.
- Find the prime factorization for x if
 - $x = 48^{99}$
 - $x = (5!)^3$ Recall that $5! = 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1$
- Perform the division with remainder: $2016 \div 11$
- Label each of the following as true or false.
 - There is no prime number divisible by 3.
 - For all sets A , $A \cup \bar{A} = U$ where U is the universal set.
 - 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.
 - Every rectangle is a square.
 - No rectangle is a square.

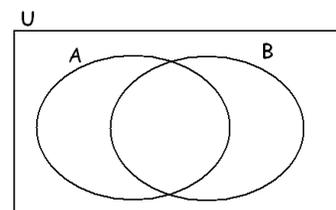
- What is the last digit of 7^{2020} ?
 - What is the last digit of $3^{85} + 3^{86} + 3^{87} + 3^{88}$?
- Compute the area of a right triangle with sides 34 cm, 16 cm, and 30 cm long. Include units in your computation and answer.
- Compute the area of the shaded region on the picture. Include units in your computation and answer.



- Compute the perimeter and area of the object shown in the picture. Include units in your computation and answer.
- Suppose that we denote 3^{1000} by X . Express each of the following in terms of X .
 - $3^{1002} + 3^{1000}$
 - 3^{998}
 - 27^{1000}
 - 3^{500}
 - 9^{500}



- Suppose that $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$, $A = \{1, 2, 3, 4, 5\}$, and $B = \{2, 5, 7, 10\}$. Find each of the following.
 - $A \cap B$
 - $A \cup B$
 - $A \cap \bar{B}$
 - $\bar{A} \cap \bar{B}$
 - $\bar{A} \cup \bar{B}$
 - $(A \cap \bar{B}) \cup (\bar{A} \cap B)$
- 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 $C = \{1, 3, 5, 8, 10\}$.
 - Draw a Venn diagram depicting these sets.
 - Find each of the following.
 - $A \cap B$
 - $A \cup (B \cap C)$
 - $A \cap (B \cup C)$
- A Venn diagram depicting a universal set U and sets A and B is shown on the picture. For each of the given expression, draw such a Venn diagram and shade the region(s) corresponding to the expression.
 - $A \cap B$
 - $\bar{A} \cap \bar{B}$
 - $(A \cap \bar{B}) \cup (\bar{A} \cap B)$
 - $A \cap \bar{B}$
 - $\bar{A} \cup \bar{B}$
 - $(A \cap B) \cup (\bar{A} \cap \bar{B})$



- What number do we get if we increase 5000 by
 - 2%
 - 12%
 - 20%

14. 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?

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

16. Simplify each of the following. a) $\frac{12}{1}$ b) $\frac{0}{3}$ c) $\frac{7}{7}$

17. Equivalent fractions.

- a) Reduce $\frac{32}{48}$ to lowest terms. c) Re-write $\frac{3}{8}$ with a denominator 24.
 b) Re-write $\frac{3}{8}$ with a numerator 24. d) Re-write $\frac{4}{5}$ as a percent.
 e) Re-write 28% as a reduced fraction.

18. Simplify each of the following.

a) $-3^2 - 4(-5) + 24 \div 3 \cdot 2$ b) $\sqrt{11 - 5(8 - 3(2 - (-1)^3))}$

19. Simplify each of the following.

a) $(-x)^2$ c) $-(-x)^2$ e) $\sqrt[3]{-8}$ g) $(\sqrt[3]{5})^3$ h) $(\sqrt[5]{2})^{15}$ j) $\sqrt{x^{20}}$
 b) $(-x)^3$ d) $-(-x)^3$ f) $\sqrt[4]{-16}$ i) $(\sqrt[3]{-5})^9$ k) $\sqrt[5]{x^{20}}$

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

- a) Write x and y using scientific notation.
 b) Compute each of the following. Present your answers using scientific notation.
 i) xy ii) xy^2 iii) \sqrt{y} iv) $\frac{x}{y}$

21. Compute each of the following sums.

a) $27 + 34 + 41 + \dots + 727$ b) $135 + 146 + 157 + \dots + 685$ c) $-100 + (-95) + (-90) + \dots + 1500$

22. Paul is starting at his new job today. His starting salary is \$2000 a month (after all deductions and taxes). If this amount is expected to increase by \$100 after each year, how much money in total would he make at this company during the next 10 years?

23. Suppose that $A = \{2, 3, 5, 8, 9, 10\}$. List all two-element subsets of A .

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

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

25. Simplify each of the following.

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

26. 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) $(2x - 3)^2$

27. Completely factor each of the following.

a) $2x^2 - 18$

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

g) $4ab^2x - 30ab^2 + 2ab^2x^2$

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

b) $20m - 2m^2 - 50$

e) $x^2 - 6x + 13$

h) $-x^3 + 16x$

c) $x^2 + 9$

f) $x^{16} - 25$

i) $432x + 6x^2 - x^3$

28. Factor completely over the real numbers by completing the square or state if the expression can not be factored.

a) $12x - 2x^2 - 16$

b) $12x - 2x^2 - 20$

c) $3x^2 - 6x + 3$

29. 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) $(p - 4)(p - 8) = 60$

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

f) $8x = x^2 + 7$

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) $630x - 12x^2 = 2x^3$

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

30. 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

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

a) Where is the object 3 seconds after we threw it?

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

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

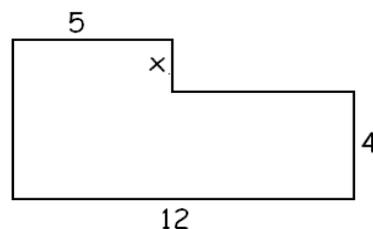
b) One side of a rectangle is 12 ft shorter than three times the other side. Find the sides if the area is 180 ft^2 .

32. 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?

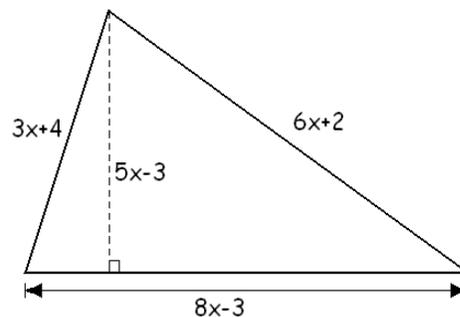
33. Three times a number is one less than twice the difference of the number and three. Find this number.

34. 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?

35. 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 .



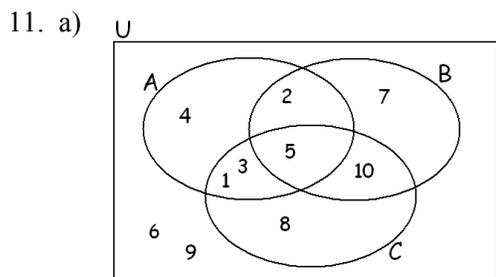
36. a) Find the value of x if the triangle shown on the picture has a perimeter 54 units.
 b) Given the value of x you found, compute the area of the triangle.
37. There were a lot of coins in that jar, all quarters and dimes. The number of dimes was two less than five times the number of quarters. How 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)



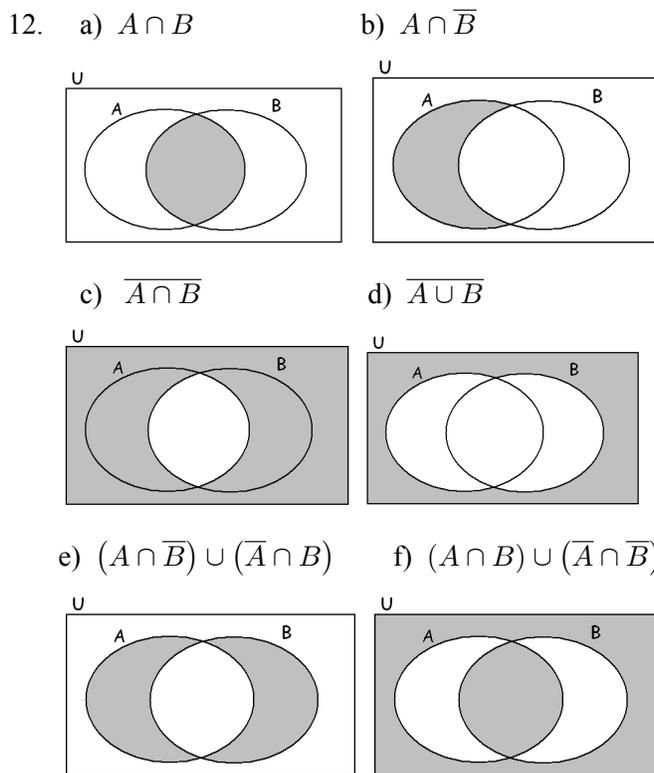
38. If we increase each side of a square by 4 units, its area increases by 200 unit². How long is each side of the square?
39. The tickets for the field trip were purchased yesterday for both students and instructors. Children tickets cost \$12, adult tickets cost \$19. The number of children ticket 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?
40. 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?

Answers

1. a) 1, 2, 4, 7, 8, 14, 28, 56 b) $2^5 \cdot 3 \cdot 5^2$
 c) GCF = 120 LCM = 50 400
2. a) $2^{396} \cdot 3^{99}$ b) $2^9 \cdot 3^3 \cdot 5^3$ 3. 183 R 3
4. a) false b) true c) false d) true
 e) true f) false g) false
5. a) 1 b) 0 6. $A = 240 \text{ cm}^2$ 7. $A = 51 \text{ m}^2$
8. $P = 70 \text{ m}$ $A = 270 \text{ m}^2$
9. a) $10X$ b) $\frac{X}{9}$ c) X^3 d) \sqrt{X} e) X
10. a) {2, 5} b) {1, 2, 3, 4, 5, 7, 10}
 c) {1, 3, 4} d) {1, 3, 4, 6, 7, 8, 9, 10}
 e) {6, 8, 9} f) {1, 3, 4, 7, 10}



- b) i) {2, 5} ii) {1, 2, 3, 4, 5, 10} iii) {1, 2, 3, 5}



13. a) 5100 b) 5600 c) 6000

14. a) \$3150 b) \$2040 c) \$648

15. a) 4 b) 9 c) 88 d) -10 e) -27
f) -2 g) 2 h) -4
16. a) 12 b) 0 c) 1
17. a) $\frac{2}{3}$ b) $\frac{24}{64}$ c) $\frac{9}{24}$ d) 80% e) $\frac{7}{25}$
18. a) 27 b) 4
19. 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}
20. a) $x = 1.25 \cdot 10^{12}$, $y = 2.5 \cdot 10^7$
b) i) $3.125 \cdot 10^{19}$ ii) 7.8125×10^{26} iii) $5 \cdot 10^3$
iv) $5 \cdot 10^4$
21. a) 38 077 b) 20 910 c) 224 700 22. \$294 000
23. $\{1, 2\}$
 $\{1, 3\}$ $\{2, 3\}$
 $\{1, 4\}$ $\{2, 4\}$ $\{3, 4\}$
 $\{1, 5\}$ $\{2, 5\}$ $\{3, 5\}$ $\{4, 5\}$
 $\{1, 6\}$ $\{2, 6\}$ $\{3, 6\}$ $\{4, 6\}$ $\{5, 6\}$
24. a) -5 b) undefined c) $-\frac{9}{2}$ d) $-\frac{59}{8}$
25. a) $-\frac{1}{2}x^3y^4$ b) $-18ax^9$ c) b^7
26. 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) $x^4 - 8x^2 + 16$
27. a) $2(x + 3)(x - 3)$ b) $-2(m - 5)^2$
c) can not be factored d) $5a^3(a^2 + 1)(a + 1)(a - 1)$
e) can not be factored f) $(x^8 + 5)(x^8 - 5)$
g) $2ab^2(x - 3)(x + 5)$ h) $-x(x - 4)(x + 4)$
i) $-x(x + 18)(x - 24)$ j) $3x^2(2a - 5)(2a + 5)$
28. a) $-2(x - 2)(x - 4)$ b) can not be factored
c) $3(x - 1)^2$
29. a) 0, 4 b) $-2, 0, 2$ c) -8 d) 7 e) -2 ,
f) 1, 7 g) all real numbers h) 15, 0, -21
i) no solution j) 3 k) 0 l) 0, -4 m) 1, 3
n) $-1, 0, 5$ o) $-1, 1$ p) no solution
30. a) 1536 ft b) 15 seconds
31. a) 9 ft and 23 ft b) 10 ft by 18 ft 32. 5 33. -7
34. 6 and 27 35. 2 units 36. a) 3 units b) 126 unit²
37. 12 quarters, 58 dimes 38. 23 units
39. 4 adult and 19 children tickets
40. 33 ten-dollar bills and 56 five-dollar bills