

1. a) List all factors of 56.
b) Find the prime factorization of 2400.
c) Use the prime factorization to compute the greatest common divisor of 2400 and 2520.

2. Find the prime factorization for x if
a) $x = 48^{99}$ b) $x = (5!)^3$ Recall that $5! = 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1$

3. Compute each of the following.

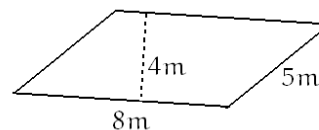
a)
$$\frac{\frac{7}{5} - \left(-\frac{3}{4}\right)^2 + 1}{\frac{1}{10} - \frac{1}{20} + \frac{1}{40}}$$

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

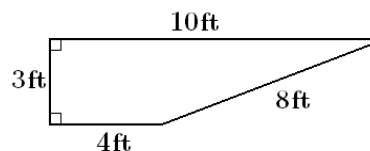
c)
$$\frac{1}{2} - \left(\frac{1}{2}\right)^2 - \left(-\frac{1}{2}\right)^3 - \left(-\frac{1}{2}\right)^4$$

4. Perform the division with remainder: $2016 \div 11$
5. What is the last digit of 7^{2020} ?
6. Label each of the following as true or false.
 - a) There is no prime number divisible by 3.
 - b) For all sets A , $A \cup \bar{A} = U$ where U is the universal set.
 - c) If the product xy is divisible by 6, then x is divisible by 6 or y is divisible by 6.
 - d) If the product xy is divisible by 5, then x is divisible by 5 or y is divisible by 5.
 - e) If a number x is divisible by 3, then its square x^2 is divisible by 9.
 - f) Every rectangle is a square.
 - g) No rectangle is a square.
7. Compute the area of a right triangle with sides 34 cm, 16 cm, and 30 cm long. Include units in your computation and answer.

8. Compute the perimeter and area of the parallelogram shown in the picture. Include units in your computation and answer.



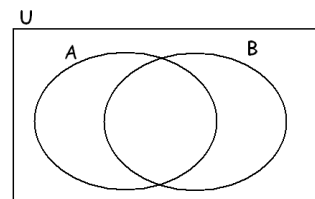
9. Compute the perimeter and area of the trapezoid shown in the picture. Include units in your computation and answer.



10. 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) $A \cap B$ b) $A \cup B$ c) $A \cap \bar{B}$ d) $\overline{A \cap B}$ e) $\overline{A \cup B}$ f) $(A \cap \bar{B}) \cup (\bar{A} \cap B)$

11. 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) $A \cap B$ b) $A \cap \bar{B}$ c) $\overline{A \cap B}$ d) $\overline{A \cup B}$ e) $(A \cap \bar{B}) \cup (\bar{A} \cap B)$ f) $(A \cap B) \cup (\bar{A} \cap \bar{B})$

12. 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?

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

14. Simplify each of the following.

a) $-3^2 - 4(-5) + 24 \div 3 \cdot 2$ d) $2 - 5(8 - 3(2 - (-1)^3))$ f) $\frac{\frac{1}{2} + \frac{1}{3}}{\frac{1}{1} - \frac{1}{1}}$
 b) $\frac{3}{8} - \frac{1}{4} \cdot \frac{3}{5}$
 c) $\left(-\frac{2}{5}\right)^2 - \frac{1}{3} + \frac{1}{5}$ e) $\frac{13 - 5 + 6}{-2^3 + 8}$

15. Compute each of the following sums.

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

16. 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?

17. Suppose that $A = \{2, 3, 5, 8, 9, 10\}$.

- a) How many subsets does the set A have?
 b) List all two-element subsets of A .
 c) How many different ways can we list the elements of A ? (Don't list them.)

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

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

19. 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) $\frac{(a^3b^5)^2}{a^5b^3a}$ d) $\frac{2x^2 - 18}{x^2 - 2x - 15}$

20. Factor completely over the real numbers by completing the square or state if the expression does not factor.

a) $12x - 2x^2 - 16$ b) $12x - 2x^2 - 20$ c) $3x^2 - 6x + 3$

21. Completely factor each of the following over the real numbers.

a) $4ab^2x - 30ab^2 + 2ab^2x^2$ c) $x^2 - 6x + 13$ e) $432x + 6x^2 - x^3$ g) $x^{16} - 25$
 b) $12a^2x^2 - 75x^2$ d) $5a^7 - 5a^3$ f) $20m - 2m^2 - 50$

22. Solve each of the following equations.

a) $(3x - 1)(x + 1) - 2(x - 2)^2 = 14x - 9$ c) $(3x - 1)^2 - (2x + 5)^2 = 24 - 5x(4 - x)$
 b) $5m^6 = 80m^2$ d) $(2x - 3(4x + 5(-x + 2) - 3)) = 2(3(x - 5) + 1)$

e) $(p - 4)(p - 8) = 60$

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

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

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

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

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

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

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

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

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

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

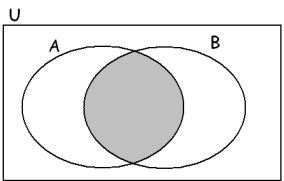
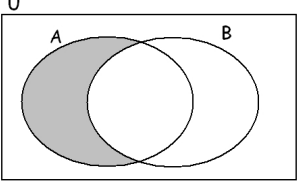
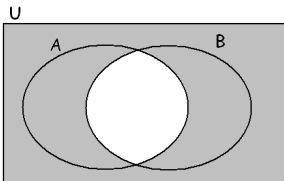
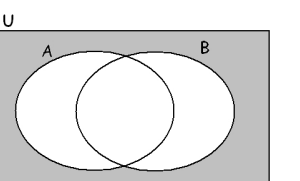
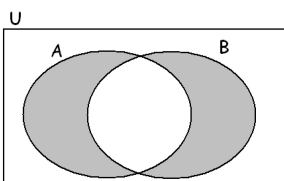
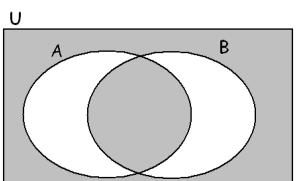
p) $2(x - 3(x - 2(x - (3x - 1)))) = 4(5 - 7(x - 2))$

23. 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?

Answers

1. a) 1, 2, 4, 7, 8, 14, 28, 56 b) $2^5 \cdot 3 \cdot 5^2$ c) 120 12. a) \$3150 b) \$2040 c) \$648
2. a) $2^{396} \cdot 3^{99}$ b) $2^9 \cdot 3^3 \cdot 5^3$ 13. a) 4 b) 9 c) 88 d) -10 e) -27
3. a) $\frac{49}{2}$ b) $\frac{6}{5}$ c) $\frac{5}{16}$ 4. 183 R 3 5. 1 f) -2 g) 2 h) -4
6. a) false b) true c) false d) true 14. a) 27 b) $\frac{9}{40}$ c) $\frac{2}{75}$ d) 7 e) undefined f) 5
7. $A = 240 \text{ cm}^2$ 8. $P = 26 \text{ m}$ $A = 32 \text{ m}^2$ 15. a) 38 077 b) 20 910 c) 224 700 16. \$294 000
9. $P = 25 \text{ ft}$ $A = 21 \text{ ft}^2$ 17. a) 64 b) c) 720
10. a) {2, 5} b) {1, 2, 3, 4, 5, 7, 10} {1, 2} {1, 3} {2, 3}
- c) {1, 3, 4} d) {1, 3, 4, 6, 7, 8, 9, 10} {1, 4} {2, 4} {3, 4}
- e) {6, 8, 9} f) {1, 3, 4, 7, 10} {1, 5} {2, 5} {3, 5} {4, 5}
11. a) $A \cap B$ b) $A \cap \bar{B}$ {1, 6} {2, 6} {3, 6} {4, 6} {5, 6}
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18. a) -5 b) undefined c) $-\frac{9}{2}$ d) $-\frac{59}{8}$
19. a) $-\frac{1}{2}x^3y^4$ b) $-18ax^9$ c) b^7 d) $\frac{2(x-3)}{x-5}$
20. a) $-2(x-2)(x-4)$ b) can not be factored
- c) $3(x-1)^2$
21. a) $2ab^2(x-3)(x+5)$ b) $3x^2(2a-5)(2a+5)$
- c) can not be factored d) $5a^3(a^2+1)(a+1)(a-1)$
- e) $-x(x-24)(x+18)$ f) $-2(m-5)^2$
- g) $(x^8+5)(x^8-5)$
22. 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
23. a) 1536 ft b) 15 seconds
- c) $\overline{A \cap B}$ d) $\overline{A \cup B}$
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- e) $(A \cap \bar{B}) \cup (\bar{A} \cap B)$ f) $(A \cap B) \cup (\bar{A} \cap \bar{B})$
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