

- List all factors of 90.
- Find all the prime numbers from the given list. 2019, 73, 301, 111, 97
- Label each of the following statements as true or false.
 

a) $\{1, 2\} \subseteq \mathbb{N}$	d) $\mathbb{N} \subseteq \mathbb{Z}$	g) $-3 \in \mathbb{N}$ and $7 \in \mathbb{Z}$
b) $4 < 4$	e) $-5 \in \mathbb{Z}$	h) For all sets $S$ , $\emptyset \subseteq S$ .
c) $5 \geq 5$	f) $-3 \in \mathbb{N}$ or $7 \in \mathbb{Z}$	i) $\mathbb{Z} \subseteq \mathbb{N}$
- Suppose that  $A = \{1, 2, 3, 4, 5\}$ . Label each of the following statements as true or false.
 

a) $1 \in A$	c) $7 \notin A$	e) $\{1, 3, 5, 6\} \subseteq A$	g) $A \subseteq A$
b) $1 \subseteq A$	d) $\{1, 2\} \in A$	f) $A \subseteq \mathbb{N}$	h) $\{3, 4\} \not\subseteq A$
- Suppose that  $U = \{0, 1, 2, 3, \dots, 19, 20\}$ . Find each of the following sets.
 

a) $A = \{x \in U : x \text{ is divisible by } 3\}$	f) $F = \{x \in U : x < 4 \text{ or } x < 8\}$
b) $B = \{x \in U : x \text{ is divisible by } 5 \text{ or } x < 8\}$	g) $G = \{x \in U : x < 4 \text{ and } x < 8\}$
c) $C = \{x \in U : x \text{ is divisible by } 5 \text{ and } x < 8\}$	h) $H = \{x \in U : x \text{ is divisible by } 4\}$
d) $D = \{x \in U : x < 12 \text{ or } x \geq 7\}$	i) $I = \{x \in U : x \text{ is divisible by } 3 \text{ or } x \text{ is divisible by } 4\}$
e) $E = \{x \in U : x < 12 \text{ and } x \geq 7\}$	j) $J = \{x \in U : x \text{ is divisible by } 3 \text{ and } x \text{ is divisible by } 4\}$
- Recall the following definitions. A **rectangle** is a four-sided polygon with four right angles. A **square** is a rectangle with four equal sides. Let  $R$  be the set of all rectangles and  $S$  the set of all squares.
  - Label each of the following statements as true or false.
 

i) Every square is a rectangle.	iii) $R \subseteq S$
ii) Every rectangle is a square.	iv) $S \subseteq R$
  - Describe  $x$  if we know that  $x \in R$  and  $x \notin S$ .
- Find each of the following sets and if possible, present them by listing their elements.
 

a) $A = \{a \in \mathbb{N} \mid a < 6\}$	c) $C = \{c \in \mathbb{N} \mid c < 7 \text{ or } c > 3\}$
b) $B = \{b \in \mathbb{N} \mid b < 7 \text{ and } b > 3\}$	d) $D = \{x \in \mathbb{N} \mid x \leq 10 \text{ and } x \text{ is even}\}$
- Evaluate each of the given numerical expressions.
 

a) $-2 - 3$	e) $(-2)^2$	i) $-2^2$	m) $3^2 - 7^2$	q) $10 - 3(-8)$	t) $(10 - 3)(-8)$
b) $-2(-3)$	f) $(-2)^3$	j) $-2^3$	n) $(3 - 7)^2$	r) $10 - (3 - 8)$	u) $10 - (3 - 8)$
c) $-(2 - 3)$	g) $(-2)^4$	k) $-2^4$	o) $3^2 + 7^2$	s) $10(-3 - 8)$	
d) $(-2) - 3$	h) $(-2)^5$	l) $-2^5$	p) $(3 + 7)^2$		
- Evaluate each of the given numerical expressions.
 

a) $(-2)^2$	e) $5(-2)^2$	i) $2^2 + 5^2$	m) $(2 - 5)^2$	q) $(2^2 - 5)^2$	u) $(2 - (-5)^2)$
b) $-2^2$	f) $5 - 2^2$	j) $(2 + 5)^2$	n) $(2 - 5^2)$	r) $2^2 - (-5)^2$	v) $2^2 - (-(-5)^2)$
c) $(-2^2)$	g) $5(-2^2)$	k) $(2 + 5^2)$	o) $2^2(-5)^2$	s) $2^2 - (-5^2)$	w) $2^2(-(-5)^2)$
d) $-(2)^2$	h) $5 - (2)^2$	l) $2^2 - 5^2$	p) $2^2(-5^2)$	t) $(2 - (-5))^2$	x) $2^2(-(-5))^2$

10. Simplify each of the following expressions by applying the order of operations agreement. **Show all steps. Perform only one operation in each step.**

a)  $7 \cdot 3^2 - (3 - 2^2 \cdot 5 - 1) \div 2$

f)  $\left(\left(\left(8 - 5\right)^2 - 7\right)^2 - 2\right)^2 - 1$

k)  $-2^2 - 3\left(5 - (-2)^2\right) - (-1)^3$

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

g)  $\frac{4^2 + 5^2 - 6 \div 2 \cdot 3}{4^2 - 8 \cdot 2}$

l)  $-2 - 5(-3^2 - 2(-7))$

c)  $\frac{(-2)^3 - 5(-3) - (-1)^4 + (-3)^2}{-2^2 - (-1)}$

h)  $3 + 2(5 + 3(15 - 2^3) - 2^2 - 1)$

m)  $|-10 - 7| - |1 - 4|$

d)  $|3 - 8| - (|3| - |8|)$

i)  $4(3(2(2^2 - 1) - 1) - 1) + 5$

n)  $|-10 - 7 - |1 - 4||$

o)  $|-10 - 7| |1 - 4||$

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

j)  $-3^2 - (-24) \div (5 - (-1)^3) \cdot 2$

p)  $|-10 - |7 - 1 - 4||$

q)  $|-10| - |7 - 1 - 4||$

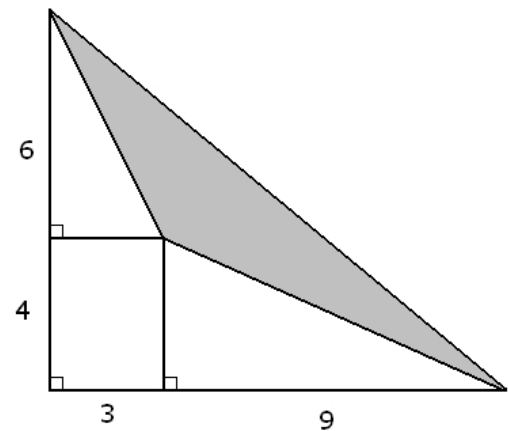
11. Compute the perimeter and area of a right triangle with sides 7 feet, 24 feet, and 25 feet long.

12. Compute the area of the shaded region shown on the picture.

13. Compute each of the following.

a)  $-100 + (-99) + (-98) + \dots + 98 + 99 + 100 + 101 + 102$

b)  $-100(-99)(-98)\dots \cdot 98 \cdot 99 \cdot 100 \cdot 101 \cdot 102$



14. Schools A and B decided to hold a chess tournament. They agree to compete in teams of 5 players. In other words, both schools send their 5 best players to play against the other school's five best players. School A has 12 chess players, school B has 18. First school A has its own tournament, in which every chess player plays one game with every other player in school A. Similarly, school B has its own tournament. After these games, both schools send their 5 best players to play students from the other school. This time all 5 students from team A will play a game with all 5 students from team B. How many games took place?

## Answers

1. 1, 2, 3, 5, 6, 9, 10, 15, 18, 30, 45, 90
2. 73 and 97
3. a) true b) false c) true d) true e) true f) true g) false h) true i) false
4. a) true b) false c) true d) false e) false f) true g) true h) false
5. a)  $\{0, 3, 6, 9, 12, 15, 18\}$  b)  $\{0, 1, 2, 3, 4, 5, 6, 7, 10, 15, 20\}$  c)  $\{0, 5\}$  d)  $U$  or  $\{0, 1, 2, 3, \dots, 19, 20\}$   
e)  $\{7, 8, 9, 10, 11\}$  f)  $\{0, 1, 2, 3, 4, 5, 6, 7\}$  g)  $\{0, 1, 2, 3\}$  h)  $\{0, 4, 8, 12, 16, 20\}$   
i)  $\{0, 3, 4, 6, 8, 9, 12, 15, 16, 18, 20\}$  j)  $\{0, 12\}$
6. a) i) true ii) false iii) false iv) true  
b)  $x$  is a rectangle that is NOT a square, i.e. a rectangle that has two sides with different lengths.
7. a)  $\{1, 2, 3, 4, 5\}$  b)  $\{4, 5, 6\}$  c)  $\mathbb{N}$  (all natural numbers) d)  $\{2, 4, 6, 8, 10\}$
8. a)  $-5$  b)  $6$  c)  $1$  d)  $-5$  e)  $4$  f)  $-8$  g)  $16$  h)  $-32$  i)  $-4$  j)  $-8$  k)  $-16$   
l)  $-32$  m)  $-40$  n)  $16$  o)  $58$  p)  $100$  q)  $34$  r)  $15$  s)  $-110$  t)  $-56$  u)  $50$
9. a)  $4$  b)  $-4$  c)  $-4$  d)  $-4$  e)  $20$  f)  $1$  g)  $-20$  h)  $1$  i)  $29$  j)  $49$  k)  $27$  l)  $-21$  m)  $9$   
n)  $-23$  o)  $100$  p)  $-100$  q)  $1$  r)  $-21$  s)  $29$  t)  $49$  u)  $-23$  v)  $100$  w)  $-100$  x)  $100$
10. a)  $72$  b) undefined c)  $5$  d)  $10$  e)  $-24$  f)  $3$  g) undefined h)  $45$  i)  $61$  j)  $-1$  k)  $-6$   
l)  $-27$  m)  $14$  n)  $20$  o)  $31$  p)  $12$  q)  $120$
11.  $P = 56$  ft,  $A = 84$  ft<sup>2</sup>
12.  $21$  unit<sup>2</sup>
13. a)  $203$  b)  $0$
14.  $244$