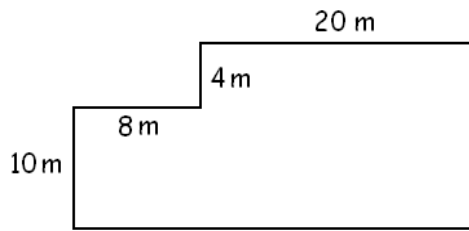
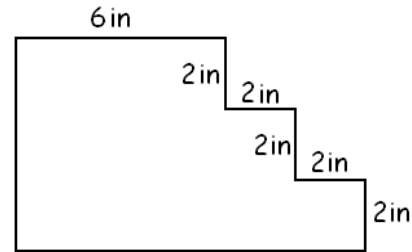


- Suppose that $A = \{2, 5, 8, 9\}$. Label each of the following statements as true or false. ($5 \notin A$ means: 5 is not an element of A)
 - $5 \in A$
 - $8 \notin A$
 - $7 \notin A$
 - $9 \in A$
 - If $B = \{2, 5, 9\}$, then $B \subseteq A$
- Label each of the following statements as true or false.
 - 3 is odd and 2019 is divisible by 3.
 - 12 is even and -7 is a natural number.
 - 5 is greater than 7 or 5 is equal to 7. (We write this as $5 \geq 7$ read: 5 is greater than or equal to 7)
 - 8 is less than 8 or 8 is equal to 8. (We write this as $8 \leq 8$ read: 8 is less than or equal to 8)
 - If a number is divisible by 2 and by 3, then it is also divisible by 6.
 - If a number is divisible by 4 and by 6, then it is also divisible by 24.
- List all natural numbers x with the given property.
 - $x < 6$
 - $x < 7$ and $x > 3$
 - $x < 7$ or $x > 3$
 - $x \leq 10$ and x is even
- Suppose that $U = \{0, 1, 2, 3, \dots, 19, 20\}$. Find each of the following sets.
 - $A = \{x \in U : x \text{ is divisible by } 3\}$
 - $B = \{x \in U : x \text{ is divisible by } 5 \text{ or } x < 8\}$
 - $C = \{x \in U : x \text{ is divisible by } 5 \text{ and } x < 8\}$
 - $D = \{x \in U : x < 12 \text{ or } x \geq 7\}$
 - $E = \{x \in U : x < 12 \text{ and } x \geq 7\}$
 - $F = \{x \in U : x < 4 \text{ or } x < 8\}$
 - $G = \{x \in U : x < 4 \text{ and } x < 8\}$
 - $H = \{x \in U : x \text{ is divisible by } 4\}$
 - $I = \{x \in U : x \text{ is divisible by } 3 \text{ or } x \text{ is divisible by } 4\}$
 - $J = \{x \in U : x \text{ is divisible by } 3 \text{ and } x \text{ is divisible by } 4\}$
- Simplify each of the following expressions by applying the order of operations agreement. **Show all steps. For each step, write a separate line!**
 - $8 - 2 + 3$
 - $\frac{15 - 2^3 + 3}{3^2 - 2^3}$
 - $120 \div (4 + 3(5 \cdot 2^2 - 2(5 + 2^2)))$
 - $\frac{3^2 - 2^2}{(3 - 2)^2}$
 - $(3 - (10 - 3^2)^2)^2$
 - $\frac{100 \div 5 \cdot 2}{25 - 10 + 5}$
 - $32 - 3(28 - 2^2(20 - 5 \cdot 3))$
 - $\left(\left((10 - 8)^2 - 1\right)^2 - 2\right)^2$
 - $1^2 + 1^3 - 1^4 + 1^5$
 - $2^2 + 2^3$
 - $2^5 - 3(12 - 3^2)^2$
 - $5 \cdot 2^3 - (10 - (7 - 2 \cdot 3 + 1)) \div 2 + 2^2$
 - $\left(2 - \left(2 - (10 - 3^2)^2\right)^2\right)^2$
- Consider the numbers 678 678, 53 019, 983 305, 46 228, 49 740. Find all numbers from this list that are divisible by
 - 3
 - 4
 - 5
 - 9
- List all factors of 40.
- Find all the prime numbers from the given list: 71, 79, 91, 103, 133, 207

9. Compute the perimeter and area of each of the objects shown. Angles that look like right angles are right angles. Include units in your computation and answer.



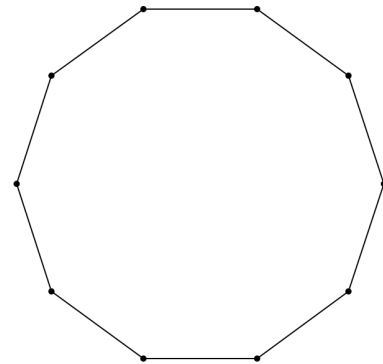
a)



b)

10. The technology conference this year had lots of attendees! We counted 80 women and 100 men.
- If everyone shook hands with everyone else, how many handshakes took place?
 - If men shook only all other men's hands and women shook only all other women's hands, how many handshakes took place?
 - If men shook every women's hands, how many handshakes took place?
11. Suppose we have 20 points on a circle. If we connect every point to every other point on the circle, how many lines do we draw? (Hint: if you can't solve it for 20, start with 2,3,4 points etc.)
12. *Recall that a **diagonal** of a polygon is a straight line connecting two points (vertices) that is not a side. Suppose we draw a regular polygon with 10 sides. (A polygon is **regular** if all of its sides are equal to each other and all of its angles are equal to each other.) How many diagonals does this polygon have?
13. *Insert parentheses in the expression on the left-hand side to make the equation true.

$$36 - 2 \cdot 5 - 2^2 + 4 = 10$$



Answers

1. a) true b) false c) true d) true e) true
2. a) true b) false c) false d) true e) true f) false
3. a) 1, 2, 3, 4, 5 b) 4, 5, 6 c) all natural numbers d) 2, 4, 6, 8, 10
4. 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, ..., 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}
5. a) 9 b) 10 c) 12 d) 5 e) 4 f) 2 g) 8 h) 49 i) 2 j) 12 k) 5 l) 27 m) 1
6. a) 678 678, 53 019, 49 740 b) 46 228, 49 740 c) 983 305, 49 740 d) 53 019
7. 1, 2, 4, 5, 8, 10, 20, 40
8. 71, 79, 103
9. a) $P = 84 \text{ m}$, $A = 360 \text{ m}^2$ b) $P = 32 \text{ in}$, $A = 48 \text{ in}^2$
10. a) 16 110 b) 8110 c) 8000
11. 190
12. 35
13. $36 - 2 \cdot ((5 - 2)^2 + 4) = 10$