



Let the universe set  $U = \{1, 2, 3, \dots, 10\}$ .

Let  $A = \{1, 4, 7, 10\}$   $B = \{1, 2, 3, 4, 5\}$   
 $C = \{2, 4, 6, 8\}$

List the elements of each set.

$$A \cup B = \{1, 2, 3, 4, 7, 5, 10\}$$

$$B - A = \{2, 3, 5\}$$

$$\overline{U} = \emptyset$$

$$A \cup U = U$$

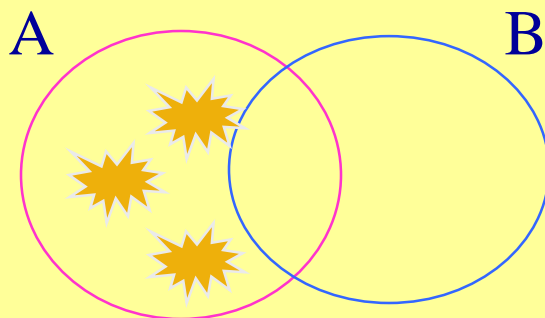
$$\overline{B} \cap (C - A) = \{6, 8\}$$

$$(A \cup B) - (C - B) = \{1, 2, 3, 4, 5, 7, 10\}$$

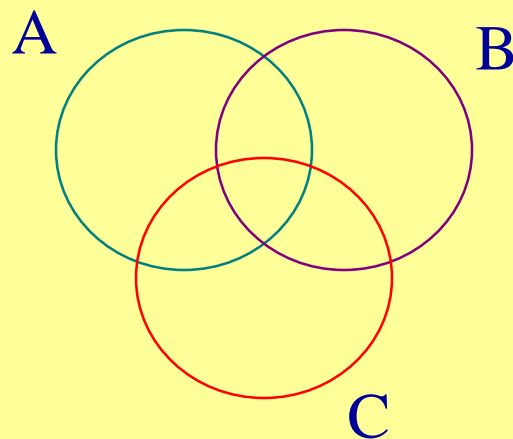


Draw a Venn diagram and shade the given set.

$$A \cap \overline{B}$$



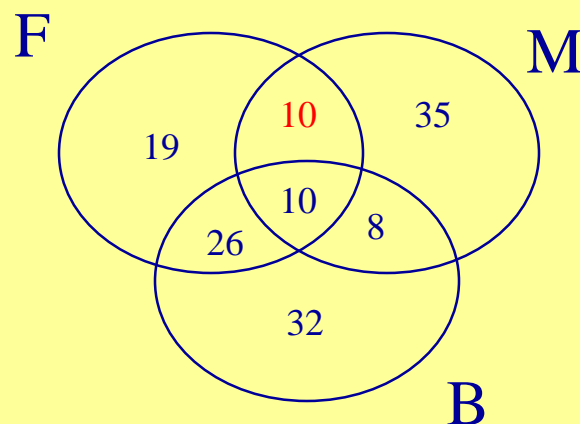
$$((C \cap A) - \overline{(B - A)}) \cap C$$





There is a group of 191 students. 10 students are taking French, Business and Music; 36 are taking French and Business; 20 are taking French and Music; 18 are taking Business and Music; 65 are taking French; 76 are taking Business and 63 are taking Music.

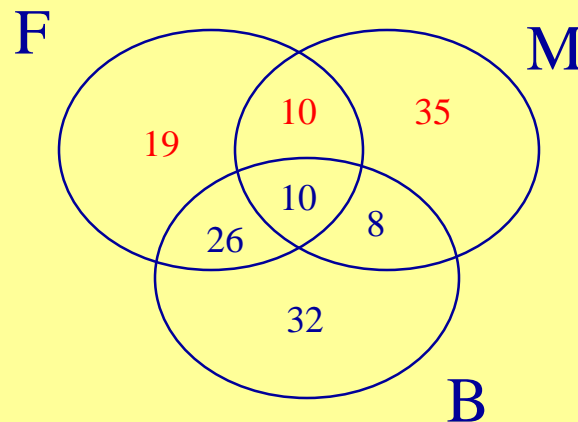
How many are taking French and Music not Business ?





There is a group of 191 students. 10 students are taking French, Business and Music; 36 are taking French and Business; 20 are taking French and Music; 18 are taking Business and Music; 65 are taking French; 76 are taking Business and 63 are taking Music.

How many are taking Music or French (or both) but not Business?





Write "true" if the statement is true; otherwise give a counterexample. The sets  $X$ ,  $Y$  and  $Z$  are subsets of a universal set  $U$ . Assume that the universe for Cartesian products is  $U \times U$ .

$$(X \cap Y) \cup (Y - X) = X \text{ for all sets } X \text{ and } Y$$

False

$$X = \{1\} \quad Y = \{1, 2\}$$



For the sequence  $a$  defined by

$$a_i = i^2 - 3i + 3 \quad i \geq 1$$

Find  $\sum_{i=1}^4 a_i = 12$

Find  $\prod_{i=3}^4 a_i = 21$



Using the sequences  $y$  and  $z$  defined by

$$y_i = 2^i - 1$$

$$z_i = i(i-1)$$

Find  $\left( \sum_{i=1}^3 y_i \right) \left( \sum_{i=1}^3 z_i \right) = 88$

Find  $\left( \sum_{i=1}^4 y_i \right) \left( \prod_{i=2}^4 z_i \right) = 3744$



Does 9450 represent a number in binary? In octal?

In decimal ? In hexadecimal?

H

H

E

E



1101010 represents in decimal, in hexadecimal.

E





For the relation  $R$  on the set  $\{1,2,3,4,5\}$  defined by the rule  
 $(x,y) \in R$  if  $x+y \leq 6$

List the elements of  $R$

$R = \{(1,1)(1,3)(1,2)(1,4)(1,5)(2,2)(2,1)(2,3)(2,4)(3,3)(3,2)$   
 $(3,1)(4,1)(4,2)(5,1)\}$

Find the range of  $R$

$R = \{1,2,3,4,5\}$

Find the range of  $R^{-1}$

$\text{Dom}(R) = \text{Rng}(R) = \text{Rng}(R^{-1}) = \{1,2,3,4,5\}$



Give examples of relations on  $\{1,2,3,4\}$  having the properties specified

Reflexive, symmetric and non transitive

$$R = \{(1,1)(2,2)(3,3)(4,4)(1,2)(2,1)(2,3)(3,2)\}$$

Non reflexive, symmetric, not antisymmetric and transitive

$$R = \{(1,1)(1,2)(2,1)(2,2)\}$$



Let  $R$  and  $S$  be relations on  $X$ . Determine statement is true or false?

If the statement is false give a counterexample

If  $R$  and  $S$  are antisymmetric, then  $R \cup S$  is antisymmetric

FALSE

$$R = \{(1, 2)\} \quad S = \{(2, 1)\} \quad R \cup S = \{(1, 2), (2, 1)\}$$



Determine whether the given relation is an equivalence relation on  $\{1,2,3,4,5\}$ . Given relation is true or false ?

$\{(1,1)(2,2)(3,3)(4,4)(5,5)(1,5)(5,1)(3,5)(5,3)(1,3)(3,1)\}$

TRUE

$\{(x,y) \mid 3 \text{ divides } x+y\}$

FALSE



Each function is one-to-one. Find each inverse function

$$f(x) = 4x + 2$$

$$f(x)^{-1} = (x-2)/4$$

$$f(x) = 3 + 1/x$$

$$f(x)^{-1} = 1/(x-3)$$