

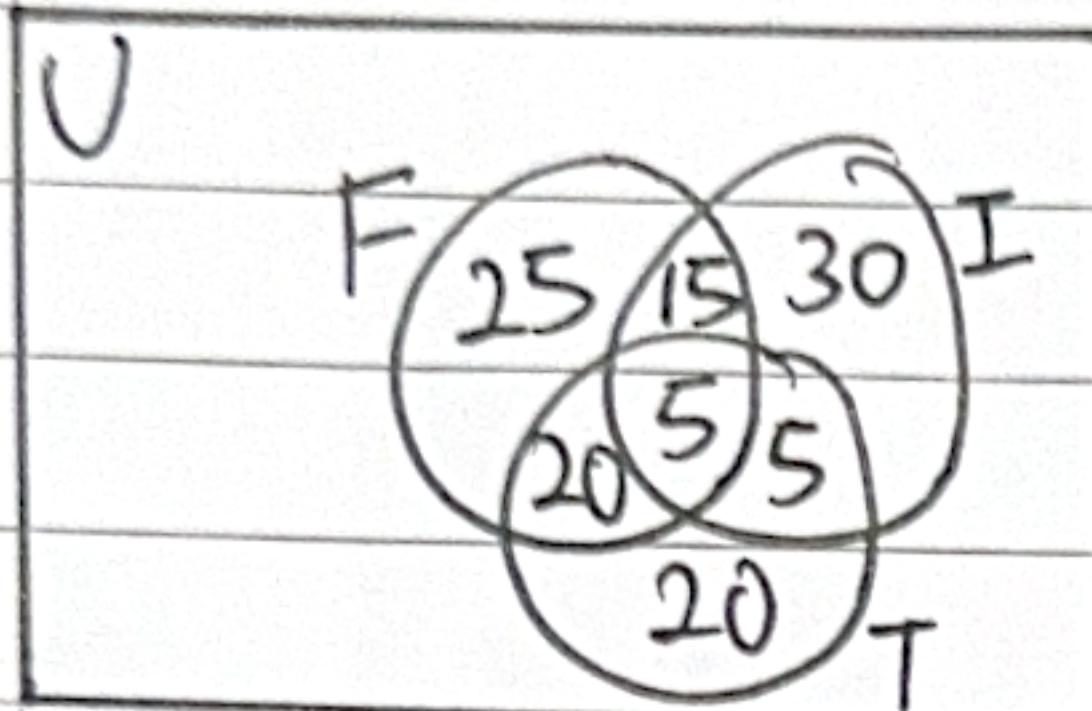
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### Assignment

I(a)(i) Let  $F = \text{Facebook}$

$I = \text{Instagram}$

$T = \text{Twitter}$



(ii)  $|U| = |U - (F \cup I \cup T)|$

$$= 150 - (25 + 15 + 5 + 20 + 30 + 5 + 20)$$

$$= 150 - 120$$

$$= 30$$

(iii)  $(F \cap T) + (F \cap I) + (T \cap I)$

$$= 20 + 15 + 5$$

$$= 40$$

(iv)  $(I \cup T) - F$

$$= 30 + 20 + 5$$

$$= 55$$

(b)(i)  $|A|=4$   $|B|=4$   $|C|=3$

(i)  $2^4 - 1 = 15$

(ii)  $\{3, 6, 9\} \times \{2, 3, 5, 7\} = \{(3, 2), (3, 3), (3, 5), (3, 7), (6, 2), (6, 3), (6, 5), (6, 7), (9, 2), (9, 3), (9, 5), (9, 7)\}$

2(a)  $\neg(p \vee q) \vee (\neg p \wedge q)$

$p$	$q$	$p \vee q$	$\neg(p \vee q)$	$\neg p$	$\neg p \wedge q$	$\neg(p \vee q) \vee (\neg p \wedge q)$
F	F	T	F	T	F	T
F	T	T	F	T	T	T
T	F	T	F	F	F	F
T	T	F	F	F	F	F

$$(b)(i) r \wedge q \rightarrow p$$

$$(ii) (\neg r \vee \neg q) \rightarrow \neg p$$

$$(iii) \neg p \rightarrow (\neg r \vee \neg q)$$

$$(c) \exists n (n^2 + m - 3 \neq 0)$$

when  $n=2$

$$2^2 + 2(2) - 3 = 5 \neq 0$$

True

(d)  $A(x)$ : Student at school

$B(x)$ : speak Russian

$C(x)$ : know C++

$$(i) \exists x (A(x) \wedge B(x) \wedge \neg C(x))$$

$$(ii) \forall x (B(x) \vee C(x))$$

$$(iii) \neg \exists x (B(x) \vee C(x))$$

3(a)  $C = a^2 - 3b$  is even

$A = a$  is even

$B = b$  is even

$C \rightarrow A \wedge B$

Let  $a = 4(\text{even})$ ,  $b = 2(\text{even})$

$$4^2 - 3(2) = 16 - 6$$

$$= 10(\text{even})$$

$\therefore$  Proved