



*“TOSHKENT IRRIGATSIYA VA QISHLOQ XO’JALIGINI MEXANIZATSIYALASH
MUXANDISLARI INSTITUTI” MILLIY TADQIQOT UNIVERSITETI*

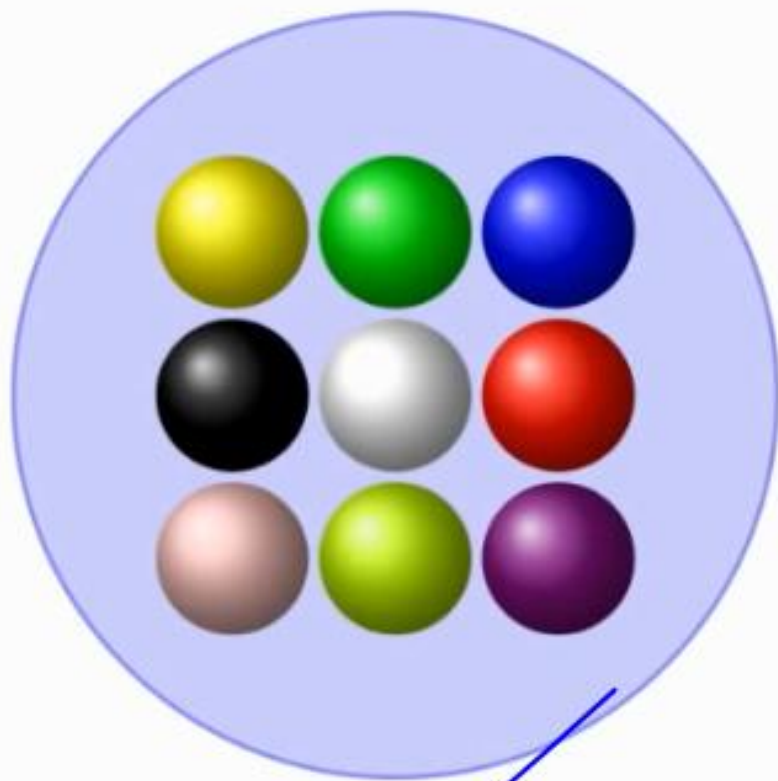
To’plam.

To’plam ustida amallar

Fan nomi: Hisob (Calculus)

REJA

1. To‘plam tushunchasi.
2. To‘plamlar ustida amallar.
3. To‘plamlarning turlari. Misollar.
4. To‘plamlar ustida amallarning xossalari.



Ta'rif 1. To'plam deb biror bir umumiy xususiyatga ega bo'lgan turli tabiatli ob'yektlar majmuasiga aytiladi. Turli tabiatga ega bo'lgan ob'yektlar esa to'planning elementlari deyiladi.

✓ 1 2 3 4 5
x ~~1~~ ~~2~~ 2 3 4 5

Belgilashlar

TO'PLAMLAR: A, B, C, \dots

TO'PLAM ELEMENTLARI a, b, c, \dots

$a \in B, \quad \underline{b \notin A}$

• BO'SH TO'PLAM

- \emptyset

• UNIVERSAL TO'PLAM

- U

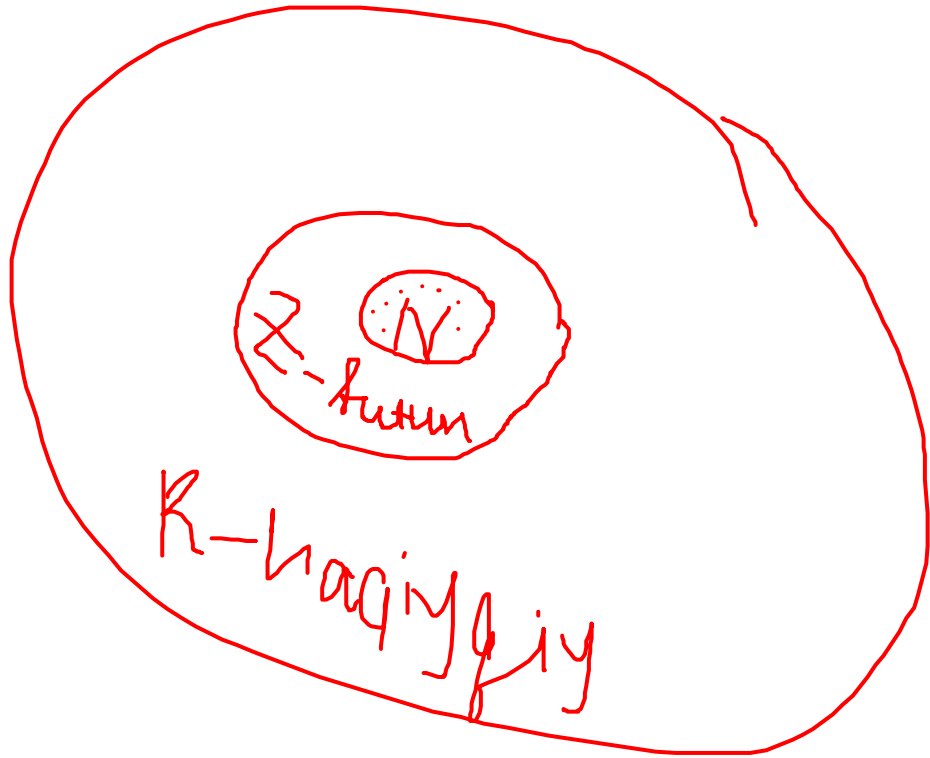
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2- ta'rif. Chekli to'planning elementlari soni shu to'planning quvvati deb ataladi.

Berilgan A to'planning quvvati $|A|$ ko'rinishda belgilanadi.

1- misol. Ushbu to'plamlar berilgan bo'lsin: $A = \{a\}$,
 $B = \{a, b\}$, $C = \{a, b, c, d, e\}$, $D = \{1, 2, 3, \dots, n\}$,
 $E = \{m \mid m = 2z\}$, $F = \{2, 3, 5, 7, \dots, p, \dots\}$, bu yerda n –
natural son, z – butun son, p – tub son. Berilgan oltita
to'plamdan to'rttasi – A , B , C va D to'plamlar chekli, E va
 F to'plamlar esa cheksiz to'plamlardir. Bundan tashqari,
 $|A| = 1$, $|B| = 2$, $|C| = 5$ va $|D| = n$.

↙
 $|B| = 2$



$$N \subseteq Z$$

$$Z \subseteq R$$

$n=3$
 $A = \{1, 2, 3\}$

gism toplami

$\{1, 2, 3\}$
7

$\{1\}$, $\{2\}$, $\{3\}$, $\{1, 2\}$, $\{1, 3\}$, $\{2, 3\}$
1 2 3 4 5 6

$\{\emptyset\}$
8

2^3

XOS
gism
toplami

$n = |A| = 3$

$n=3$
 $2 = 8$

gism
toplami

XOS ma
gism
toplami

$2^5 - 2 = \text{XOS}$

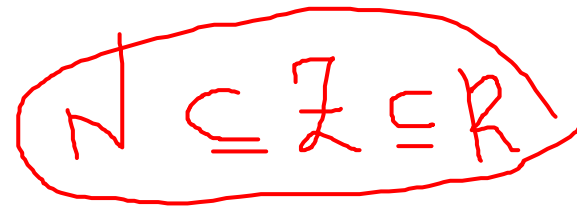
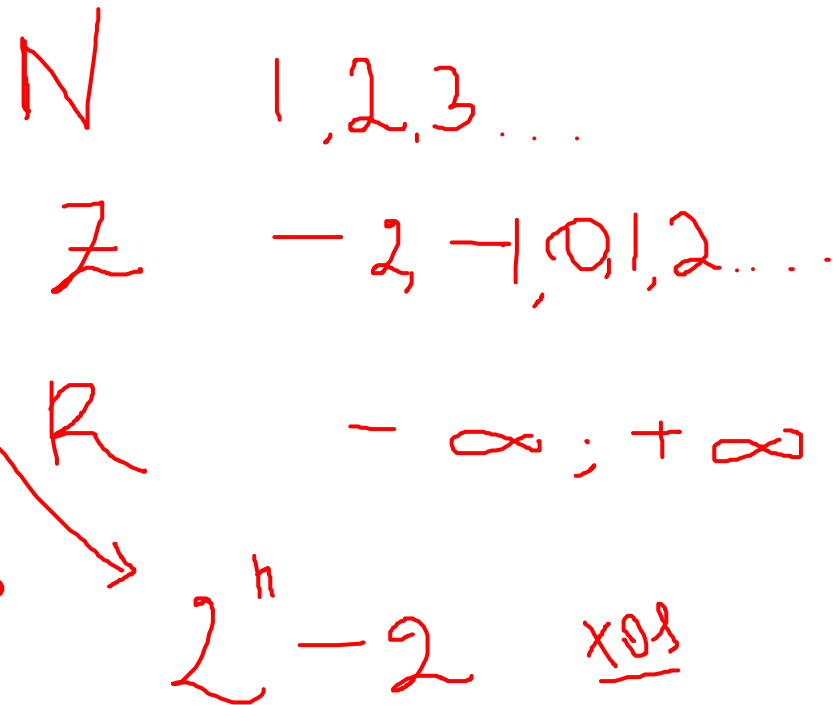
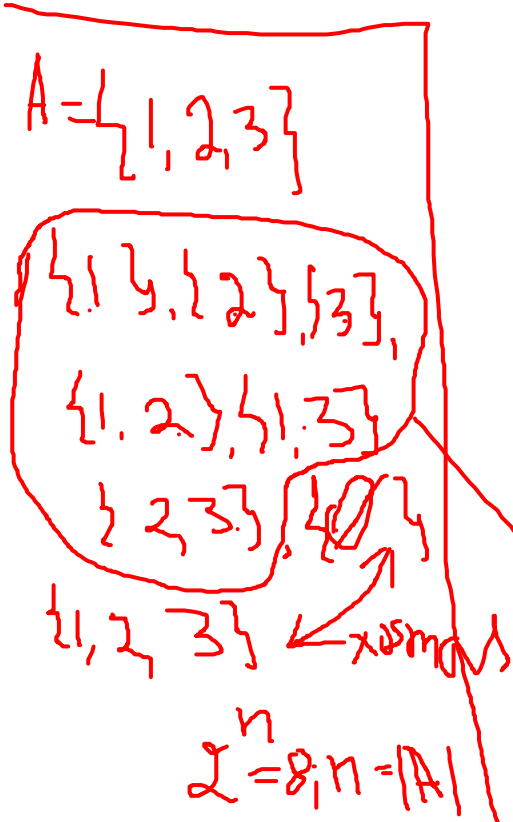
$n=5$

$\text{XOS} = 30$

$\text{XOS} + \text{XOS ma} = 32$

3- ta'rif. Agar B to'plamning har bir elementi A to'plamda ham mavjud bo'lsa, u holda B to'plam A to'plamning **qism to'plami** deb ataladi.

B to'plam A to'plamning qism to'plami ekanligi $B \subseteq A$ yoki $A \supseteq B$ ko'rinishda belgilanadi.

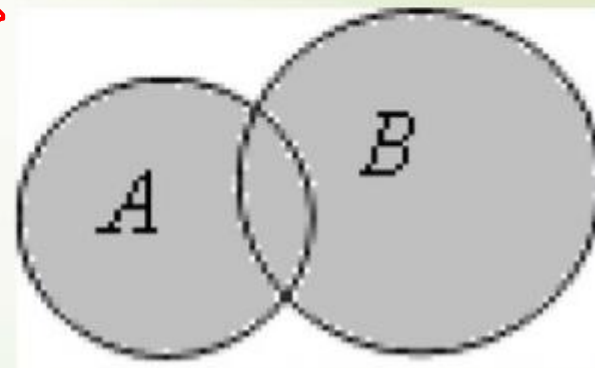


To'plamlar ustida amallar

Har qanday ikkita to'plamning barcha elementlaridan, ularni takrorlamasdan, tuzilgan to'plamga shu to'plamlarning birlashmasi (yoki yig'indisi) deb ataladi.

Agar $A = \{a, b\}$, $B = \{a, b, c\}$,
 $C = \{e, f, k\}$ bo'lsa, u holda $E = A \cup B = \{a, b, c\}$,
 $E \cup C = \{a, b, c, e, f, k\}$, $C \cup B = \{a, b, c, e, f, k\}$,
 $A \cup C = \{a, b, e, f, k\}$ bo'ladi.

$A \cup B$



1-shakl

~~a, b, c~~

$$A \cup B = \{a, b, a, b, c\} = \{a, b, c\}$$

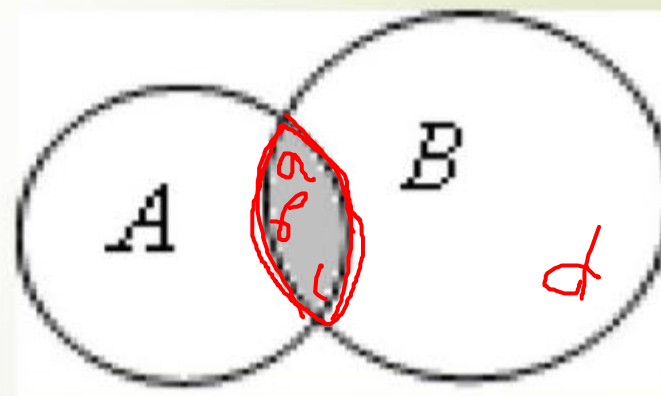
Har qanday ikkita to'plamning barcha umumiy elementlaridan tuzilgan to'plamga to'plamlarning kesishmasi (yoki ko'paytmasi) deyiladi.

$A = \{a, b, c\}$, $B = \{a, b, c, d\}$,
 $C = \{e, f, k\}$ bo'lsa, u holda
 $D = A \cap B = \{a, b, c\}$, $D \cap C = \emptyset$, $A \cap C = \emptyset$,
 $B \cap C = \emptyset$, $D \cap B = \{a, b, c\}$ bo'ladi.

$$A \cap B = \{a, b, c\}$$

$$D = \{a, b, c\} \quad D \cap C = \emptyset$$

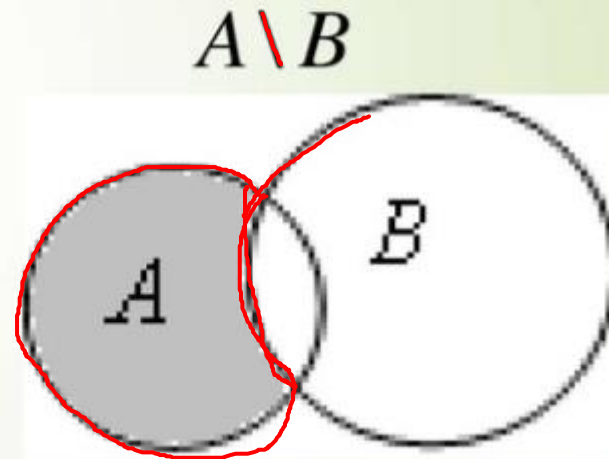
$A \cap B$



2-shakl

A to'plamning B to'plamda bo'lmagan barcha elementlaridan tuziladigan to'plamni hosil qilish A to'plamdan B to'plamni ayirish deb, tuzilgan to'plam esa, shu A va B to'plamlarning ayirmasi deb ataladi.

$A = \{a, b\}$, $B = \{a, b, c\}$,
 $C = \{e, f, k\}$ bo'lsa, u holda $A \setminus B = \emptyset$,
 $B \setminus A = \{c\}$, $B \setminus C = \emptyset$ bo'ladi.



$$\frac{A}{B} = \frac{\cancel{a, b}}{\cancel{a, b}, c} = \emptyset$$

$$\frac{B}{A} = \frac{\cancel{a, b}, c}{\cancel{a, b}} = \{c\}$$

A va B to'plamlarning simmetrik ayirmasi (halqali yig'indisi) deb, A to'plamning B to'plamga, B to'plamning A to'plamga tegishli bo'lmagan elementlaridan iborat to'plamga aytiladi va $A \Delta B$ kabi belgilanadi. Shunday qilib,

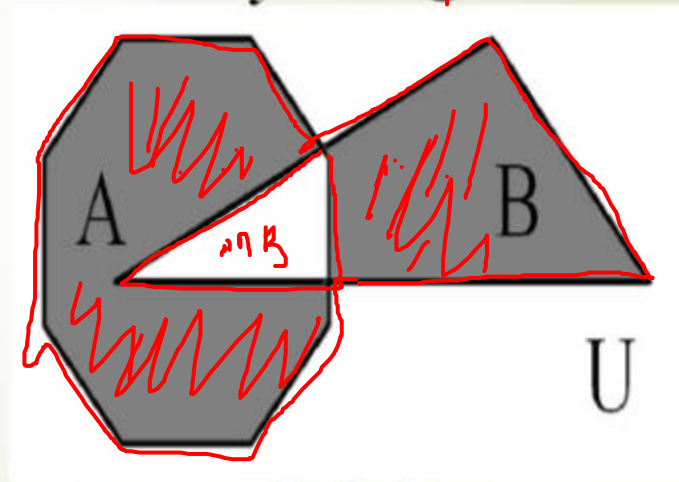
$$A \Delta B = A \oplus B = (A \setminus B) \cup (B \setminus A)$$

$$A = \{a, b\}, \quad B = \{a, b, c\},$$

$C = \{e, f, k\}$ bo'lsa, u holda $A \Delta B = \{c\}$,

$B \Delta C = \{a, b, c, e, f, k\}$ bo'ladi.

$A \Delta B$ yoki $A \oplus B$



4-shakl

$$(A \cup B) \setminus (A \cap B)$$

$$A \cup B = \{a, b, c\}$$

$$A \cap B = \{a, b\}$$

$$A \Delta B = \{c\}$$

To'plamlar uchun asosiy tengliklar

1. $\overline{\overline{A}} = A$

2. $A \cap B = B \cap A$ – ko'paytmaga nisbatan kommutativlik qonuni.

3. $(A \cap B) \cap C = A \cap (B \cap C)$ – ko'paytmaga nisbatan assotsiativlik qonuni.

4. $A \cup B = B \cup A$ – yig'indiga nisbatan kommutativlik qonuni.

5. $(A \cup B) \cup C = A \cup (B \cup C)$ – yig'indiga nisbatan assotsiativlik qonuni.

6. $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$ – ko'paytmaga nisbatan distributivlik qonuni.

7. $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$ – yig'indiga nisbatan distributivlik qonuni.

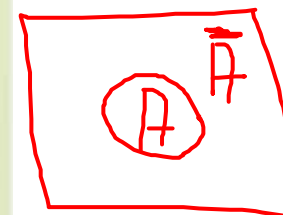
8. $A \cap A = A$

9. $A \cap U = A$

10. $A \cup A = A$

11. $A \cup U = U$

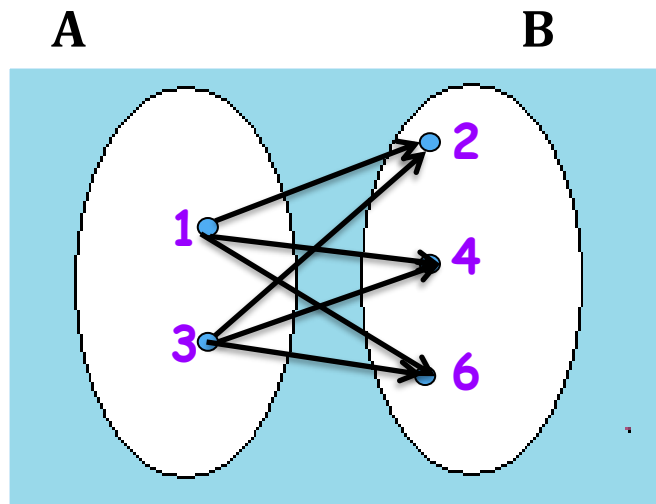
\overline{A}



To'plamlarning dekart ko'paytmasi

$A = \{1, 2, 3\}$

$B = \{3, 5\}$



graf

	B		
A		3	5
1		(1, 3)	(1, 5)
2		(2, 3)	(2, 5)
3		(3, 3)	(3, 5)

jadval

Uyga vazifa

5. Quyida keltirilgan to'plamlarning chekli, cheksiz va bo'sh to'plam ekanligini aniqlang. Toplam elementlari sohasini ko'rsating.

a) $A = \{x \mid x \in \mathbb{Z}, -3 \leq x \leq 5\}$,

b) $B = \{x \mid x \in \mathbb{N}, -3 \leq x \leq 5\}$,

c) $C = \{x \mid x \in \mathbb{N}, x + 2 = 0\}$,

d) $D = \{x \mid x \in \mathbb{Z}, x + 3 \in \mathbb{N}\}$,

e) $E = \{x \mid x \in \mathbb{R}, x + \frac{1}{2} \leq 2 \wedge x > 0\}$,

f) $F = \{x \mid x \in \mathbb{N}, \log_{\frac{1}{2}} \frac{1}{x} \leq 4\}$,

g) $G = \{x \mid x \in \mathbb{R}, \cos^2 2x = 1 \wedge 0 \leq x \leq 2\pi\}$.

* 6. Koordinatalar tekisligida quyidagi to'plamlarni tasvirlang:

a) $\{(x, y) \in \mathbb{R}^2 \mid x^2 - y^2 > 0\}$,

b) $\{(x, y) \in \mathbb{R}^2 \mid (x^2 - 1)(y + 2) \leq 0\}$,

c) $\{(x, y) \in \mathbb{R}^2 \mid (y^2 - 1)(x + 3) > 0\}$.

* 7. A va B toplamlarning tengligini tekshiring, javobingizni asoslang.

a) $A = \{2, 5, 4\}$, $B = \{5, 4, 2\}$,

b) $A = \{1, 2, 4, 2\}$, $B = \{1, 2, 4\}$,

c) $A = \{2, 4, 5\}$, $B = \{2, 4, 3\}$,

d) $A = \{1, \{2, 5\}, 6\}$, $B = \{1, \{5, 2\}, 6\}$,

e) $A = \{1, \{2, 5\}, 6\}$, $B = \{1, 2, 5, 6\}$.

8. $\{1, 2, 3\}$ to'plamning barcha qism to'plamlarini aniqlang.

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$A = B$

~~1, 2, 3 1, 2, 3~~