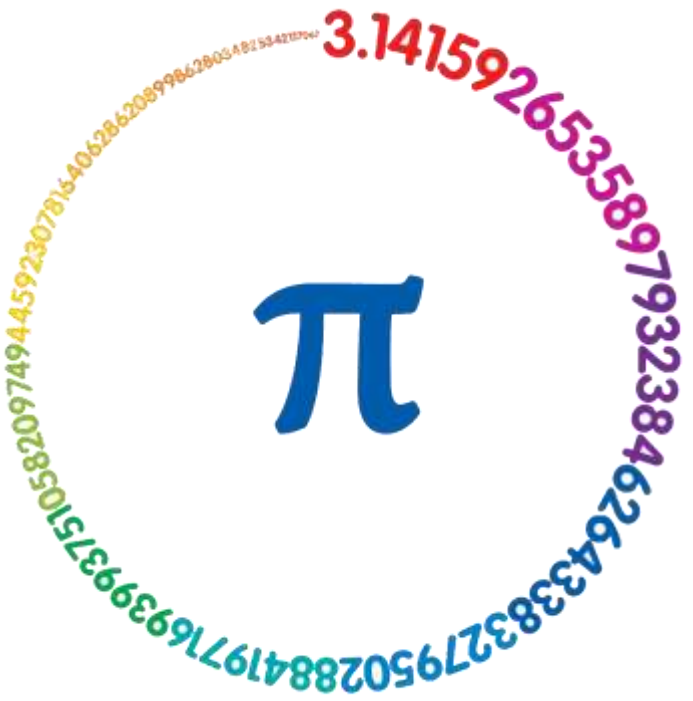
Matematika fanidan qo`llanma
To`plamlar nazariyasi



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TO`PLAM HAQIDA TUSHUNCHALAR

To`plam eng muhim matematik tushunchalardan biridir. Bu tushuncha matematika faniga to`plamlar nazariyasining asoschisi bo`lgan nemis matematigi Georg Kantor (1845-1918) tomonidan kiritilgan.

To`plam tushunchasi matematikaning boshlang‘ich (ta’riflanmaydigan) tushunchalaridan biridir. U chekli yoki cheksiz ko`p obyektlar (narsalar, buyumlar, shaxslar va h.k.) ni birgalikda bir butun deb qarash natijasida vujudga keladi.

To`plamlar odatda lotin alifbosining bosh harflari bilan, uning elementlari esa shu alifboning kichik harflari bilan belgilanadi.

Masalan: $A=\{a,b,c,d\}$ yozuvi A to`plam a, b, c, d elementlardan tashkil topganligini bildiradi.

x element X to`plamga tegishli ekanligi $x\in X$ ko`rinishda, tegishli emasligi esa $x\notin X$ ko`rinishda belgilanadi.

Masalan: barcha natural sonlar to`plami $N$ va 4, 5, $\frac{3}{4}$, $\pi$ sonlari uchun $4\in N$, $5\in N$, $\frac{3}{4}\notin N$, $\pi\notin N$ munosabatlar o`rinli.

Elementlari soniga bog‘liq holda to`plamlar chekli va cheksiz to`plamlarga ajratiladi. Elementlari soni chekli bo`lgan to`plam ***chekli to`plam***, elementlari soni cheksiz bo`lgan to`plam ***cheksiz to`plam*** deyiladi.

Misol: $A=\{x\,|\,x\in N,\ x^2>7\}$ to`plam 2 dan katta bo`lgan barcha natural sonlardan tuzilgan, ya’ni $A=\{3,4,5,6,7,...\}$. Bu to`plam – cheksiz to`plamdir.

Birorta ham elementga ega bo`lmagan to`plam ***bo`sh to`plam*** deyiladi. Bo`sh to`plam $\varnothing$ orqali belgilanadi. Bo`sh to`plam ham chekli to`plam hisoblanadi.

Misol: $x^2+3x+2=0$ tenglamaning ildizlari $X=\{-2;-1\}$ chekli to`plamni tashkil etadi. $x^2+3x+3=0$ tenglama esa haqiqiy ildizlarga ega emas, ya’ni uning haqiqiy yechimlar to`plami $\varnothing$ dir.

Ayni bir xil elementlardan tuzilgan to`plamlar ***teng to`plamlar*** deyiladi.

Misol: $X=\{x\,|\,x\in N,\ x\le 3\}$ va $Y=\{x\,|\,(x-1)(x-2)(x-3)=0\}$ to`plamlarning har biri faqat 1, 2, 3 sonlaridan tuzilgan. Shuninguchun bu to`plamlar tengdir: $X=Y$

QISM TO`PLAM VA UNIVERSAL TO`PLAMLAR

Agar B to`plamning har bir elementi $A$ to`plamning ham elementi bo`lsa, $B$ to`plam A to`plamning ***qism to`plami*** deyiladi va $B\subset A$ ko`rinishida belgilanadi. Ta’rifga ko`ra, istalgan to`plam o`zining qism to`plami bo`ladi: $A\subset A$ bo`sh to`plam esa, istalgan to`plamning qism to`plami bo`ladi $\varnothing\subset A$.

Qism to`plamlar ikki turga bo`linadi: ***xos*** va ***xosmas*** qism to`plamlar. To`plamning o`zi va bo`sh to`plam ***xosmas qism to`plam*** deyiladi. Ularda boshqa qism to`plamlar ***xos qism to`plam*** deyiladi.

Masalan: $A=\{a, b, c\}$ to`plamning xos qism to`plamlari: $\{a\}$, $\{b\}$, $\{c\}$, $\{a, b\}$, $\{a, c\}$, $\{b, c\}$; xosmas qism to`plamlari: $\{a, b, c\}$ va $\varnothing$ dir.

Agar $A_1, A_2, \dots, A_n$ to`plamlar $A$ to`plamning qism to`plami bo`lsa, A to`plam $A_1, A_2, \dots, A_n$ to`plamlar uchun ***universal to`plam*** deyiladi.

Universal to`plam, odatda, $J$ yoki $U$ harfilari bilan belgilanadi. Masalan, $N$-barcha natural sonlar to`plami; Z-barcha butun sonlar to`plami; $Q$-barcha ratsional sonlar to`plami; R-barcha haqiqiy sonlar to`plami bo`lib, $N \subset Z \subset Q \subset R$ shartlar bajariladi va R qolgan sonli to`plamlar uchun universal to`plam vazifasini bajaradi.

A to`plamning ***to`ldiruvchisi*** deb U universal to`plamning $A$ ga tegishli bo`lmagan barcha elementlari to`plamiga aytiladi va quyidagicha belgilanadi A'.

Masalan: $U=\{1, 2, 3, 4, 5, 6, 7, 8\}$ universal to`plam bo`lsa, $A=\{1, 3, 5, 7, 8\}$ to`plamning to`ldiruvchisi $A'=\{2, 4, 6\}$ to`plam bo`ladi.

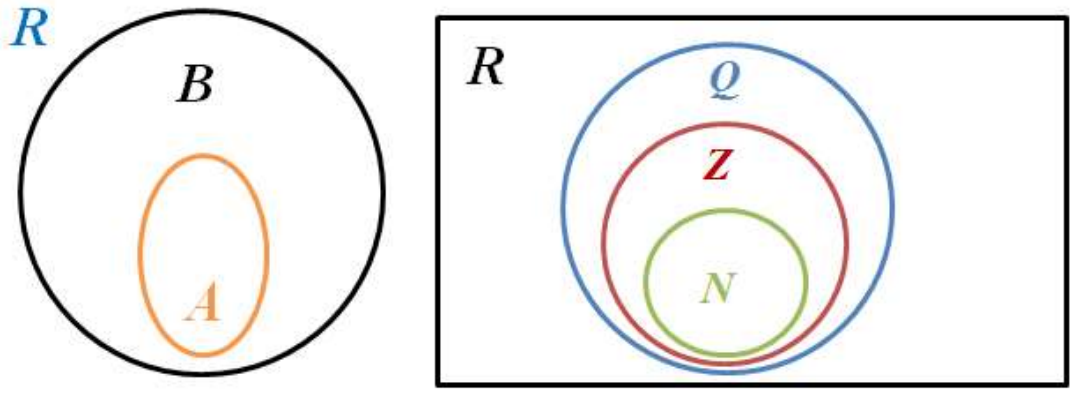
To`ldiruvchi to`plam quyidagi xossalarga ega:

1. $A \cap A' = \varnothing$
2. $A \cup A' = U$
3. $n(A)+n(A')=n(U)$

ya'ni A va A' to`plamlar umumiy elementlarga ega emas hamda ularni tashkil qilgan barcha elementlar U ni hosil qiladi.

TO`PLAMLAR USTIDA AMALLAR

To`plamlar orasidagi munosabatlarni yaqqolroq tasavvur qilish uchun Eyler–Venn diagrammasidan foydalaniladi. Bunda to`plamlar doira, oval yoki biror yopiq soha shaklida, universal to`plam esa, odatda, to`g`ri to`rtburchak shaklida tasvirlanadi.



TO`PLAMLARNING KESISHMASI

A va B to`plamlarning ***kesishmasi*** (yoki ***ko`paytmasi***) deb, bu to`plamlarning ikkalasiga ham bir vaqtda tegishli bo`lgan elementlar to`plamiga aytiladi va $A \cap B$ ko`rinishid belgilanadi. To`plamlar kesishmasi belgilar yordamida $A \cap B = \{x | x \in A \; va \; x \in B\}$ ko`rinishda yoziladi.

Masalan:

1) $A = \{a | 4 \le a \le 14, a \in N\}$ va $B = \{b | 10 < b < 19, b \in N\}$ bo`lsa,

$A \cap B = \{x | 11 \le x \le 14, x \in N\}$ bo`ladi.

2) $X = \{a; b; c; d; e\}$ va $Y = \{d; \; e; \; f; k\}$ bo`lsa, $X \cap Y = \{d; e\}$ bo`ladi.

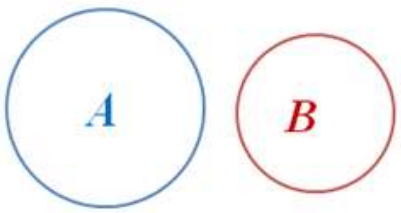
To`plamlar kesishmasi ularning umumiy qismidir. Umumiy qismga ega bo`lmagan to`plamlar kesishmasi bo`sh to`plamdir. Bu holda $A$ va $B$ to`plamlar ***kesishmaydi*** deyiladi va $A \cap B = \varnothing$ ko`rinishda yoziladi. Masalan, juft natural sonlar to`plami va toq natural sonlar to`plami umumiy elementga ega emas, ya'ni kesishmaydi.

Umumiy qismga ega bo`lgan to`plamlar kesishadi deyiladi va $A \cap B \neq \varnothing$, ya'ni A va B to`plamlar kesishmasi bo`sh emas, deb yoziladi. Masalan, 2 ga karrali natural sonlar va 5 ga karrali natural sonlar to`plamlari umumiy elementga ega, ya'ni kesishadi yoki kesishmasi bo`sh emas. Bu to`plamlar kesishmasi barcha 10 ga karrali natural sonlardan iborat bo`ladi.

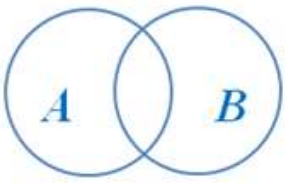
Ikki to`plamning o`zaro munosabatida to`rt hol bo`lishi mumkin.

1. To`plamlar kesishmaydi (**I**);
2. To`plamlar kesishadi (**II**);
3. To`plamning biri ikkinchisining qismi bo`ladi (**III**);
4. To`plamlar ustma-ust tushadi (**IV**);

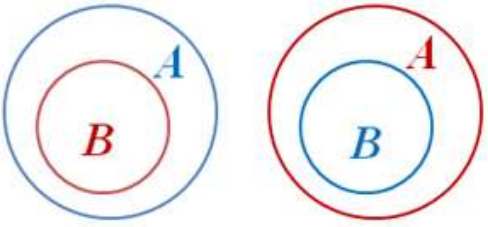
I. $A \cap B = \varnothing$



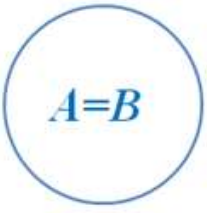
II. $A \cap B = \varnothing$



III. a) $A \subset B$ **b)** $B \subset A$

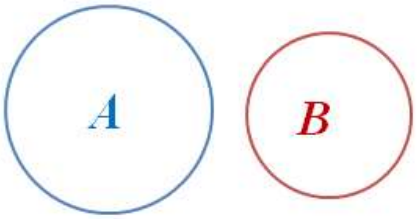


IV. $A = B$

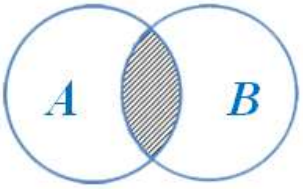


Quyida har bir hol uchun to`plamlar kesishmasi shtrixlab ko`rsatilgan.

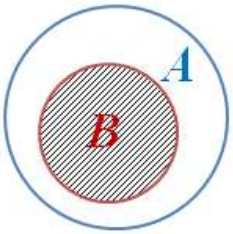
I. $A \cap B = \varnothing$



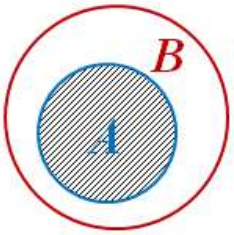
II. $A \cap B$



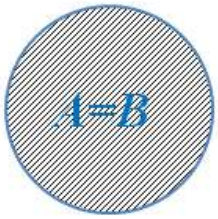
III. a) $A \cap B = B$



b) $A \cap B = A$



IV. $A \cap B = A = B$



To`plamlar kesishmasi quyidagi xossalarga ega:

1. $B \subset A$ bo`lsa, $A \cap B = B$ bo`ladi.

2. $A \cap B = B \cap A$

3. $A \cap (B \cap C) = (A \cap B) \cap C = A \cap B \cap C$

4. $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$

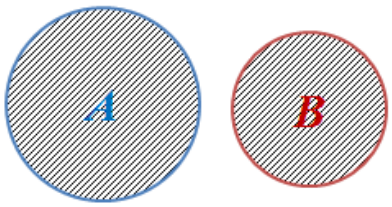
5. $A \cap \varnothing = \varnothing$

6. $A \cap A = A$

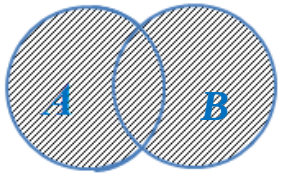
TO`PLAMLARNING BIRLASHMASI

A va B to`plamlarning ***birlashmasi*** (yoki ***yig`indisi***) deb, bu to`plamlarning hech bo`lmaganda biriga tegishli elementlar to`plamiga aytiladi va $A \cup B$ ko`rinishda belgilanadi. To`plamlarning birlashmasi belgilar yordamida $A \cup B = \{x \mid x \in A \; va \; x \in B\}$ ko`rinishda yoziladi.

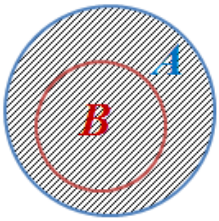
I. $A \cup B$



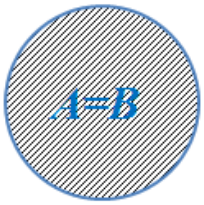
II. $A \cup B$



III. $A \cup B$



IV. $A = B$



Masalan:

1) A - barcha juft sonlar to`plami, ya'ni $A = \{a \mid a = 2n, n \in N\}$ va $B$ - barcha toq sonlar to`plami, ya'ni $B = \{b \mid b = 2n-1, \; n \in N\}$ bo`lsa, ularning birlashmasi $A \cup B = N$ bo`ladi.

2) $X = \{m; n; p; k; l\}$ va $Y = \{p; r; s; n\}$ bo`lsa, ularning birlashmasi $X \cup Y = \{m; n; p; k; l; r; s\}$ bo`ladi.

To`plamlar birlashmasining tasvirlari.

To`plamlar birlashmasi quyidagi xossalarga ega:

1. $B \subset A \Rightarrow A \cup B = A$

2. $A \cup B = B \cup A$

3. $A \cup (B \cup C) = (A \cup B) \cup C = A \cup B \cup C$

4. $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$

5. $A \cup \varnothing = A$

6. $A \cup A = A$

7. $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$

TO`PLAMLAR AYIRMASI

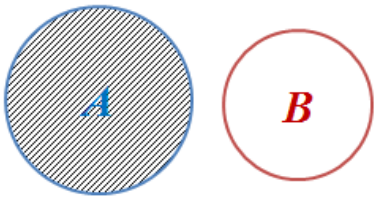
A va B to`plamlarning ***ayirmasi*** deb, $A$ ning $B$ da mavjud bo`lmagan barcha elementlaridan tuzilgan to`plamga aytiladi. $A$ va $B$ to`plamlarning ayirmasi $A \setminus B$ ko`rinishda belgilanadi: $A \setminus B = \{x | x \in A \; va \; x \in B\}$.

Masalan:

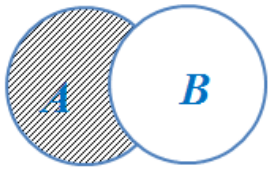
1) $A = \{a \mid |a| < 4, a \in R\} = \{-4 < a < 4, a \in R\}$, $B = \{b \mid |b| \le 2, b \in R\} = \{-2 \le b \le 2, b \in R\}$ bo`lsa, $A \setminus B = \{x | -4 < x < -2 \cup 2 < x < 4\}$ bo`ladi.

2) $X = \{a; b; c; d; e\}$, $Y = \{d; e; f; k; l\}$ bo`lsa, $X \setminus Y = \{a; b; c\}$ va $Y \setminus X = \{f; k; l\}$ bo`ladi.

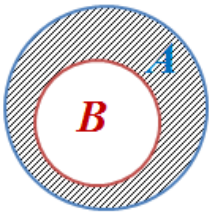
I.



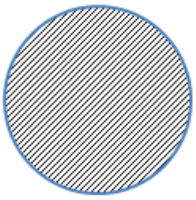
II.



III.



IV. $A = B \quad A \setminus B = \varnothing$



To`plamlar ayirmasi quyidagi xossalarga ega:

1. $A \cap B = \varnothing \Rightarrow A \setminus B = A$

2. $A = B \Rightarrow A \setminus B = \varnothing$

3. $A \setminus (B \cup C) = (A \setminus B) \cap (A \setminus C) = A \setminus B \setminus C$

4. $A \setminus (B \cap C) = (A \setminus B) \cup (A \setminus C)$

5. $A \setminus \varnothing = A$

6. $\varnothing \setminus A = \varnothing$

7. $A \setminus A = \varnothing$

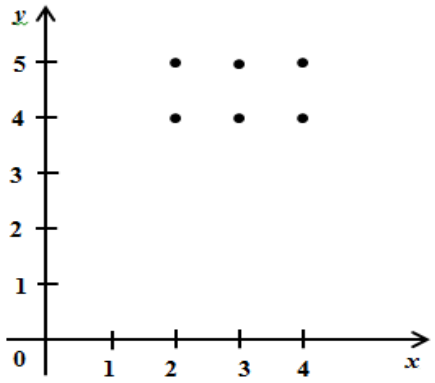
TO`PLAMLARNING DEKART KO`PAYTMASI

A va B to`plamlarning ***dekart ko`paytmasi*** deb, 1-elementi A to`plamdan, 2 – elementi $B$ to`plamdan olingan $(a;b)$ ko`rinishdagi barcha tartiblangan juftliklar to`plamiga aytiladi. Dekart ko`paytma $A\times B$ ko`rinishda belgilanadi: $A\times B=\{(a;b)|a\in A\ va\ b\in B\}$.

Masalan: $A=\{2;3;4;5\}$, $B=\{a;b;c\}$ bo`lsa, $A\times B=\{(2;a),(2;b),(2;c),(3;a),(3;b),(3;c),(4;a),(4;b),(4;c),(5;a),(5;b),(5;c)\}$ bo`ladi.

Sonli to`plamlar dekart ko`paytmasini koordinata tekisligida tasvirlash qulay.

Masalan: $A=\{2;3;4\}$, $B=\{4;5\}$ bo`lsin, u holda $A\times B=\{(2;4),(2;5),(3;4),(3;5),(4;4),(4;5)\}$ bo`ladi.



Koordinata tekisligida shunday koordinatali nuqtalarni tasvirlaymizki, bunda A to`plam $Ox$ o`qida va B to`plam $Oy$ o`qida olinadi.

A to`plamning $B$ to`plamga tegishli bo`lmagan elementlaridan va $B$ to`plamning A to`plamga tegishli bo`lmagan elementlaridan tuzilgan to`plamn $A$ va $B$ to`plamlarning **simmetrik ayirmasi** deb ataladi va $A\triangle B$ kabi belgilanadi, ya'ni $A\triangle B=(A\setminus B)\cup(B\setminus A)$.

<u>Misol:</u> $A=\{1,2,3,4,5,6,7\}$, $B=\{6,7,8,9,10\}$ bo`lsa, $A\triangle B=\{1,2,3,4,5\}\cup\{8,9,10\}=\{1,2,3,4,5,8,9,10\}$ bo`ladi.

X chekli to`plam elementlar sonini $n(X)$ orqali belgilaymiz. $k$ ta elementli $X$ to`plamni k **elementli to`plam** deb ataymiz.

<u>Misol:</u> X to`plam 10 dan kichik tub sonlar to`plami bo`lsin: $X=\{2,3,5,7\}$. Demak, $X$ to`plamda 4 ta elementdan tuzilgan ekan va u quyidagicha belgilanadi $n(X)=4$.

BERILGAN TO`PLAMNING QISM TO`PLAMLARINI TOPPISH UCHUN QUYIDAGI FORMULADAN FOYDALANAMIZ

Agar to`plam elementlari $n(X)=m$ bo`lsa, u holda qism to`plamlar soni $2^m$ ko`rinishda bo`ladi.

Misol: $X=\{1,2,3\}$ to`plamning $n(X)=3$ ta elementi bor. Qism to`plamlari soni $2^3=8$ bo`ladi va ular quyidagilardir:

$\{1\}$ $\{2\}$ $\{3\}$ $\{1, 2, 3\}$ hamda $\varnothing$

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

$\{1, 3\}$

MUSTAQIL YECHISH UCHUN MISOLLAR

I. BERILGAN A VA B TO`PLAMLARGA KO`RA $A\cup B$, $A\cap B$, $A\setminus B$, $B\setminus A$ TO`PLAMLARNI TOPING

1. $A=\{2,\ 4,\ 6,\ 8,\ 10\}$
$B=\{4,\ 8,\ 12,\ 16\}$

2. $A=\{1,\ 3,\ 5,\ 7,\ 9,\ ...,\ 2n-1,...\}$
$B=\{3,\ 6,\ 9,\ ...3n,...\}$

3. $A=\{x:(x-2)(x-3)=0\}$
$B=\{x:(x-2)(x+4)=0\}$

4. $A=\{x:x^2-4=0\}$
$B=\{x:x-2=0\}$

5. $A=\{x|x\in R,\ 0<x\le 9\}$
$B=\{x|x\in R,\ 5<x\le 12\}$

6. A- raqamlar to`plami.
B- yigirmadan kichik juft sonlar to`plami.

7. $A=\{x|x\in R,\ x>5\}$
$B=\{x|x\in R,\ x\le 3\}$

8. $A=\{a,b,c,d,e\}$
$B=\{d,e,n,m\}$

9. $A=\{x|x\in R,\ 0<x\le 7\}$
$B=\{x|x\in R,\ 6\le x\le 9\}$

10. $A=\{0,1,2,3,4,5\}$
$B=\{3,4,5,6,7\}$

11. $A=\{x|x\in R,\ x\le 9\}$
$B=\{x|x\in R,\ 0\le x\le 8\}$

12. $A=\{x|x\in R,\ 5<x\le 12\}$
$B=\{x|x\in R,\ -5\le x\le 7\}$

13. $A=\{x|x\in N,\ x\le 12\}$
$B=\{x|x\in N,\ 6\le x\le 15\}$

14. $A=\{x|x\in N,-2\le x\le 12\}$
$B=\{x|x\in N,\ 5<x\le 12\}$

15. A- uchburchaklar to`plami.
B-teng tomonli uchburchaklar to`plami.

16. $A=\{x|x\in Z,-6<x<6\}$
$B=\{x|x\in Z,\ 0<x\le 8\}$

17. A-ikki xonali juft sonlar to`plami.
B- 6 ga karrali 100 dan kichik natural sonlar to`plami.

18. $A=\{x|x\in N,\ x\le 10\}$
$B=\{x|x\in N,\ x\ge 4\}$

19. A-to`g`ri to`rtburchaklar to`plami.
B-kvadratlar to`plami.

20. $A=\{x|x\in R,\ 1\le x\le 9\}$
$B=\{x|x\in R,\ 5<x\le 12\}$

21. A- 3 ga karrali sonlar to`plami.
B- 5 ga karrali sonlar to`plami.

22. $A=\{x|x\in R,\ -2<x\le 0\}$
$B=\{x|x\in R,\ -1\le x\le 5\}$

23. A- oxiri nol bilan tugallanadigan sonlar to`plami.
B- 5 ga karrali sonlar to`plami.

24. $A=\{x|x\in N,\ 1<x<5\}$
$B=\{x|x\in R,\ x>3\}$

25. $A=\{x|x\in R,\ x\le 7\}$
$B=\{x|x\in R,\ x\ge 9\}$

26. A- daraxtlar to`plami
B- olma va o`rik daraxtlari to`plami.

27. $A=\{x|x\in Z,\ x<1\}$
$B=\{x|x\in Z,\ 0\le x<11\}$

28. A- O`zbekistondagi viloyatlar to`plami
B={Buxoro, Toshkent, Xorazm, Samarqand}

29. $A=\{x|x\in R,\ x\ge 0\}$
$B=\{x|x\in R,\ -1\le x<1\}$

30. A- sinfdagi o`g`il bolalar to`plami
B- sinfdagi qiz bolalar to`plami.

31. $A=\{x|x\in R,\ x\le -12\}$
$B=\{x|x\in R,\ -9<x\le -1\}$

32. A- qish oylari to`plami
B={Yanvar, Mart, Noyabr, Dekabr}

33. $A=\{x|x\in N,\ x\le 1\}$
$B=\{x|x\in N,\ x>5\}$

34. A- aylanalar to`plami
B- tekislikdagi figuralar to`plami

35. $A=\{x|x\in Z,\ x<0\}$
$B=\{x|x\in Z,\ x\ge 0\}$

36. $A=\{l,m,n,o,p\}$
$B=\{o,x,y,z\}$

37. $A=\{x|x\in N,\ x\le 4\}$
$B=\{x|x\in N,\ 2<x<4\}$

38. A- 6 ga bo`linadigan sonlar to`plam
B- 2 ga va 3 ga bo`linmaydigan sonlar to`plami.

39. $A=\{x|x\in R,\ 18\le x\le 25\}$
$B=\{x|x\in R,\ -25<x<-18\}$

40. A- 20 gacha bo`lgan natural sonlar to`plami.
B- 20 dan kichik bo`lmagan natural sonlar to`plami.

41. $A=\{x|x\in N,\ x\le 8\}$
$B=\{x|x\in N,\ x\ge 3\}$

42. $A=\{x|x\in R,\ x\le 23\}$
$B=\{x|x\in R,\ x\le 13\}$

43. A - butun sonlar to`plami.
$B=\{0;\ 9;\ 13;\ -5;\ -7;\ 55\}$

44. $A=\{x \mid x\in Z,\ 2{,}5<x<3{,}8\}$
$B=\{x \mid x\in Z,\ -11\le x\le 10\}$

45. A - 11 ga bo`linuvchi sonlar to`plami
$B=\{111, 121, 131, 141, ...,\ 291\}$

46. $A=\{x \mid x\in R,\ x>9\}$
$B=\{x \mid x\in R,\ 10\le x\le 68\}$

47. A - ikki xonali sonlar to`plami
B - 5 raqami bilan tugallanuvchi sonlar to`plami.

48. $A=\{x \mid x\in N,\ 3<x\le 4\}$
$B=\{x \mid x\in N,\ 6\le x\le 7\}$

49. A - qiz bolalar to`plami
B ={Dilnoza, Sherali, Nozima, Fayoz, Zarif}

50. $A=\{x \mid x\in N,\ 1\le x\le 12\}$
$B=\{x \mid x\in N,\ x\le -8\}$

51. A - transport vositalari to`plami
B - velosiped va yengil mashinalar to`plami.

52. $A=\{x \mid x\in R,\ 81\le x\le 91\}$
$B=\{x \mid x\in R,\ 5<x\le 15\}$

53. $A=\{x \mid x\in Z,\ x>-1\}$
$B=\{x \mid x\in Z,\ x\le 0\}$

54. $A=\{18, 21, 24, ..., 48\}$
B - 3 ga karrali 50 dan kichik va 20 dan katta natural sonlar to`plami

55. $A=\{x \mid x\in N,\ x\le 22\}$
$B=\{x \mid x\in N,\ x\ge -22\}$

56. A - romblar to`plami
B - kvadratlar to`plami.

57. $A=\{x \mid x\in R,\ -8\le x\le 48\}$
$B=\{x \mid x\in N,\ -2<x\le 42\}$

58. A - 36 ning bo`luvchilaridan tashkil topgan sonlar to`plami
B - 3 ga karrali sonlar to`plami

II. BERILGAN TO`PLAMLARGA KO`RA TO`LDIRUVCHI TO`PLAMLARNI TOPING

1. C' ni toping?
$U=\{$*ingliz tili harflari*$\}$,
$C=\{$*unli harflar*$\}$

2. $U=\{x|\ 0<x\le 12,\ \ x\in\mathbb{Z}\}$,
$A=\{x|\ -2\le x\le 7,\ \ x\in\mathbb{Z}\}$ bo`lsa, A' ni toping?

3. C' ni toping?
$U=\mathbb{Z},\ \ C=\{x|x\le -5,\ \ x\in\mathbb{Z}\}$

4. $U=\{x|\ 0\le x\le 8,\ \ x\in\mathbb{Z}\}$,
$A=\{x|\ 2\le x\le 7,\ \ x\in\mathbb{Z}\}$,
$B=\{x|\ 5\le x\le 8,\ \ x\in\mathbb{Z}\}$ bo`lsa, $A\cap B'=?$

5. C' ni toping?
$U=\{$*butun sonlar*$\}$
$C=\{$*manfiy butun sonlar*$\}$

6. $U=\{x|\ 0<x\le 12,\ \ x\in\mathbb{Z}\}$,
$A=\{x|\ -2\le x\le 7,\ \ x\in\mathbb{Z}\}$,
$C=\{x|\ -5\le x\le 11,\ \ x\in\mathbb{Z}\}$ bo`lsa,
$A'\cap C$ ni toping?

7. C' ni toping?
$U=\mathbb{Q},\ \ C=\{x|x\le 2$ *yoki* $x\ge 8,\ \ x\in\mathbb{Q}\}$

8. $n(U)=15,\ n(P)=6$ bo`lsa, $n(P')=?$

9. $U=\{x|\ 0<x\le 12,\ \ x\in\mathbb{Z}\}$,
$A=\{x|\ -2\le x\le 7,\ \ x\in\mathbb{Z}\}$,
$B=\{x|\ -3\le x\le 9,\ \ x\in\mathbb{Z}\}$,
$C=\{x|\ -5\le x\le 11,\ \ x\in\mathbb{Z}\}$ bo`lsa,
$(A\cup C)\cap B'$ ni toping?

10. $n(U)=15,\ \ n(Q')=4$ bo`lsa, $n(Q)=?$

11. $U=\mathbb{N},\ P=\{$*25 dan kichik bo`lgan tub sonlar*$\}$ bo`lsa, $n(P')$ ni toping?

12. $U=\{x|\ 0\le x\le 8,\ \ x\in\mathbb{Z}\}$,
$A=\{x|\ 2\le x\le 7,\ \ x\in\mathbb{Z}\}$ bo`lsa, $A'=?$

13. $U=\{x|\ -5\le x\le 5,\ \ x\in\mathbb{Z}\}$,
$A=\{x|\ -2\le x\le 7,\ \ x\in\mathbb{Z}\}$,
$B=\{x|\ -3\le x<2,\ \ x\in\mathbb{Z}\}$ bo`lsa,
$A'\cup B'$ ni toping?

14. $U=\{x|\ 0\le x\le 8,\ \ x\in\mathbb{Z}\}$,
$B=\{x|\ 5\le x\le 8,\ \ x\in\mathbb{Z}\}$ bo`lsa, $B'=?$

15. $U=\mathbb{N},\ \ Q=\{2;\ 4;\ 5;\ 11;\ 12;\ 15\}$ bo`lsa, Q' ni toping?

16. $U=\{x|\ 0<x\le 12,\ \ x\in\mathbb{Z}\}$,
$A=\{x|\ -2\le x\le 7,\ \ x\in\mathbb{Z}\}$,
$B=\{x|\ -3\le x\le 9,\ \ x\in\mathbb{Z}\}$ bo`lsa,
$(A\cup B')$ ni toping?

17. $U=\{x|-5\le x\le 5,\ \ x\in\mathbb{Z}\}$,
$A=\{x|1\le x\le 5,\ \ x\in\mathbb{Z}\}$ bo`lsa, A' ni toping?

18. $U=\{x|-5\le x\le 5,\ \ x\in\mathbb{Z}\}$,
$A=\{x|1\le x\le 5,\ \ x\in\mathbb{Z}\}$,
$B=\{x|-3\le x<2,\ \ x\in\mathbb{Z}\}$ bo`lsa
$A'\cap B$ ni toping?

19. $U=\{x|0<x\le 12,\ \ x\in\mathbb{Z}\}$,
$A=\{x|-2\le x\le 7,\ \ x\in\mathbb{Z}\}$,
$B=\{x|-3\le x\le 9,\ \ x\in\mathbb{Z}\}$ bo`lsa,
$(A\cap B)'$ ni toping?

20. $U=\{x|-5\le x\le 5,\ \ x\in\mathbb{Z}\}$,
$A=\{x|1\le x\le 5,\ \ x\in\mathbb{Z}\}$,
$B=\{x|-3\le x<2,\ \ x\in\mathbb{Z}\}$ bo`lsa,
$A'\cap B'$ ni toping?

21. $U=\{x|0<x\le 12,\ \ x\in\mathbb{Z}\}$,
$C=\{x|-5\le x\le 11,\ \ x\in\mathbb{Z}\}$ bo`lsa,
$n(C')$ ni toping?

22. $U=\{x|-5\le x\le 5,\ \ x\in\mathbb{Z}\}$,
$A=\{x|1\le x\le 5,\ \ x\in\mathbb{Z}\}$,
$B=\{x|-3\le x<2,\ \ x\in\mathbb{Z}\}$ bo`lsa,
$A\cup B'$ ni toping?

23. $U=\{x|0<x\le 12,\ \ x\in\mathbb{Z}\}$,
$C=\{x|-5\le x\le 11,\ \ x\in\mathbb{Z}\}$,
$B=\{x|-3\le x\le 9,\ \ x\in\mathbb{Z}\}$ bo`lsa,
$B'\cup C$ ni toping?

24. $U=\{x|0<x\le 12,\ \ x\in\mathbb{Z}\}$,
$B=\{x|-3\le x\le 9,\ \ x\in\mathbb{Z}\}$ bo`lsa,
$n(B')$ ni toping?

25. $U=\{x|0\le x\le 8,\ \ x\in\mathbb{Z}\}$,
$A=\{x|2\le x\le 7,\ \ x\in\mathbb{Z}\}$,
$B=\{x|5\le x\le 8,\ \ x\in\mathbb{Z}\}$ bo`lsa, $A'\cup B$ ni toping?

III. BERILGAN A VA B TO`PLAMLARGA KO`RA $A\times B$ DEKART KO`PAYTMANI TOPING

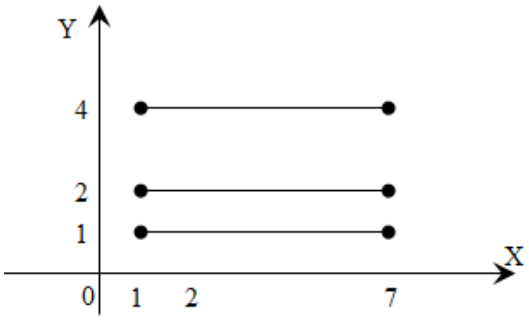
1. $A=\{1,3\}$, $B=\{2,4\}$

2. $A=\{x:0<x<2\}=(0;2)$,
$B=\{x:1\le x\le 3\}=[1;3]$

3. $A=\{x|x\in\mathbb{R},\ 0\le x\le 7\}$,
$B=\{x|x\in\mathbb{Z},\ -3<x<2\}$

4. $A=\{x|\ x\in\mathbb{Z}\ -7\le x\le 7\}$
$B=\{x|\ x\in\mathbb{Z}\ -3<x<3\}$

5. To`plamlar dekart ko`paytmasining tasviriga qarab, to`plamlarni yozing.



6. $A=\{x:x(x-3)<0\}$,
$B=\{x:(x-3)(x-1)\ge 0\}$

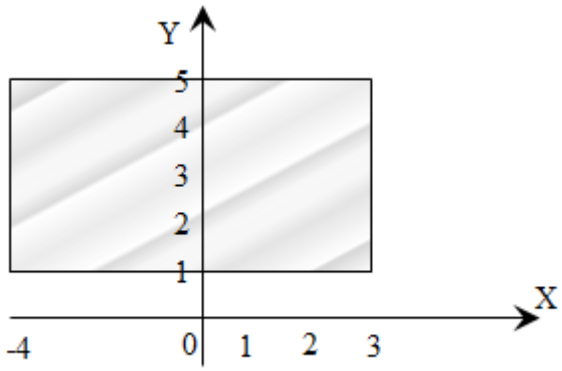
7. $A=\{x:x\in R,\ x^2-8x+15\le 0\}$,
$B=\{x:x\in N,\ x^2-6x<0\}$

8. $A=\{x:x\in Z,-2<x<4\}$,
$B=\{x:x\in N,1\le x\le 7\}$

9. $A=\{x|x\in\mathbb{R},\ |x|=2\}$,
$B=\{x|x\in\mathbb{R},\ |x|\le 2\}$

10. $A=\{x|x\in\mathbb{R},\ -3<x\le 4\}$
$B=\{x|x\in\mathbb{R},\ 3<x<2\}$

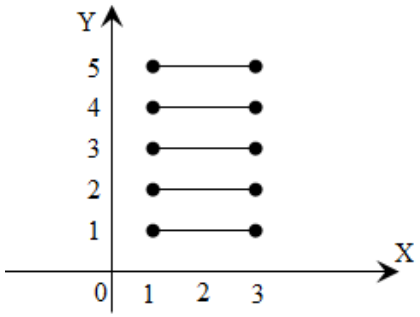
11. To`plamlar dekart ko`paytmasining tasviriga qarab, to`plamlarni yozing.



12. $A=\{4;5;6;7;8;9;10;11\}$,
$B=\{-5;-4;-3;-2;-1;0;1;2;3\}$

13. $A=\{x|\ x\in\mathbb{R}\ \ 4\le x\le 10\}$,
$B=\{x|\ x\in\mathbb{Z}\ \ 9\le x<10\}$

14. To`plamlar dekart ko`paytmasining tasviriga qarab, to`plamlarni yozing.



15. $A=\{x|\ x\in\mathbb{N}\ \ 0<x<2\}$,
$B=\{x|\ x\in\mathbb{Z}\ \ -3<x<12\}$

16. $A=\{x \mid x\in\mathbb{R}\ \ 2\le x\le 6\}$,
$B=\{x \mid x\in\mathbb{R}\ \ -5<x<5\}$

17. $A=\{1;\ 2;\ 3;\ 4;\ 5;\ 6\}$,
$B=\{-2;\ -1;\ 0;\ 1;\ 2;\ 3;\ 4\}$

18. $A=\{x \mid 1\le x\le 5,\ \ x\in\mathbb{Z}\}$,
$B=\{x \mid -3\le x<2,\ \ x\in\mathbb{Z}\}$

19. $A=\{a,b,c,d,e\}$, $B=\{d,e,n,m\}$

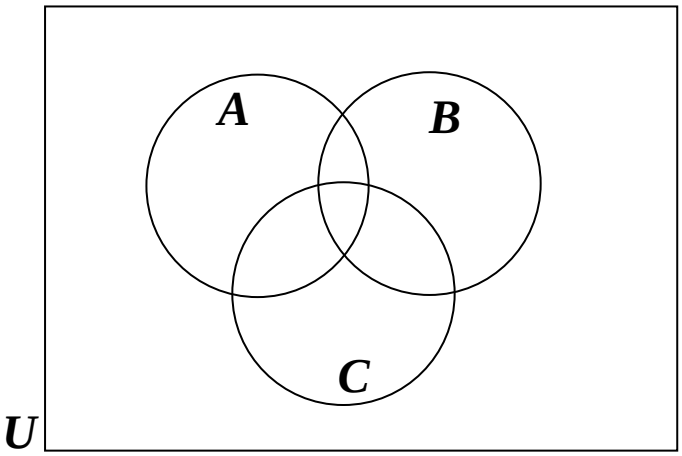
20. $A=\{2,\ 4,\ 6,\ 8,\ 10\}$, $B=\{4,\ 8,\ 12,\ 16\}$

IV. TO`PLAMLARNI EYLER–VENN DIAGRAMMALARI YORDAMIDA TASVIRLANG

1. $U=\{1,\ 2,\ 3,\ 4,\ 5,\ 6,\ 7,\ 8\}$ bo`lsa, quyidagi to`plamni Venn diagrammasida tasvirlang va $A\cap B$ ni toping? $A=\{1,\ 3,\ 6,\ 8\}$ va $B=\{2,\ 3,\ 4,\ 5,\ 8\}$

2. A va B to`plamlarni Venn diagrammasida tasvirlang:
$U=\{2,\ 3,\ 4,\ 5,\ 6,\ 7\}$, $A=\{2,\ 4,\ 6\}$, $B=\{5,\ 7\}$

3. Quyida berilgan to`plamlarni Venn diagrammasida bo`yab tasvirlang:



1) A; 2) B; 3) C; 4) B';
5) A'; 6) C' 7) $A\cap B$; 8) $A\cup B$;
9) $B\cup C$; 10) $B\cap C$; 11) $A\cup C$;
12) $A\cap C$; 13) $A\cup B\cup C$;
14) $A\cap B\cap C$; 15) $(A\cap B\cap C)'$;
16) $(A\cup B)\cup C$; 17) $(B\cap C)\cap A$;
18) $(A\cup B)'\cup C$; 19) $(B\cap C)'\cap A$;
20) $(A\cap C)\cap B$.

4. $U=\{x \mid 1\le x\le 10,\ \ x\in\mathbb{Z}\}$, $A=\{$*10 dan kichik bo`lgan toq sonlar*$\}$ va $B=\{$*10 dan kichik bo`lgan tub sonlar*$\}$ bo`lsa, quyidagi to`plamlarni Venn diagrammasida tasvirlang:

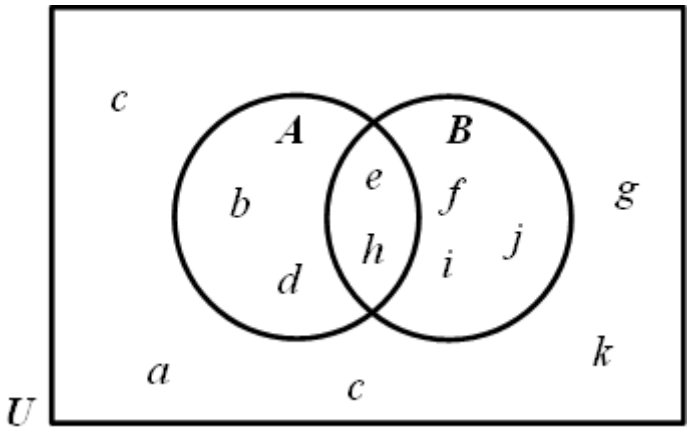
1) $A\cup B$; 2) $A'\cup B$; 3) $A'\cap B$; 4) $A\cap B$; 5) $A\cup B'$;
6) $A\cap B'$; 7) $(A\cup B)'$; 8) $(A\cap B)'$; 9) $A'\cup B'$; 10) $A'\cap B'$.

5. A va B to`plamlarni Venn diagrammasida tasvirlang: $U=\{3,\ 4,\ 5,\ 7\}$, $A=\{3,\ 4,\ 5,\ 7\}$, $B=\{3,\ 5\}$.

6. A va B to`plamlar Venn diagrammasida tasvirlangan. Quyidagi to`plamlarning elementlarini yozing:

1) A; 2) B; 3) A'; 4) B'; 5) $A\cup B$; 6) $A\cap B$; 7) $A'\cup B$; 8) $A'\cap B$;

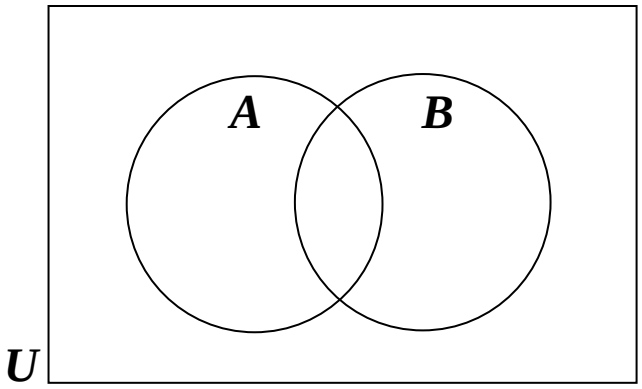
9) $(A\cap B)'$; 10) $(A\cup B)'$; 11) $A'\cap B'$; 12) $A'\cup B'$; 13) $A\cup B'$; 14) $A\cap B'$;



7. $U=\{1, 2, 3, 4, 5, 6, 7, 8\}$ bo`lsa, quyidagi to`plamni Venn diagrammasida tasvirlang va $(A\cap B)'$ ni toping? $A=\{1, 3, 6, 7, 8\}$ va $B=\{3, 6, 8\}$

8. A va B to`plamlarni Venn diagrammasida tasvirlang:
$U=\{1, 2, 3, 4, 5, 6, 7\}$, $A=\{2, 4, 5, 6\}$, $B=\{1, 4, 6, 7\}$.

9. Quyida berilgan to`plamlarni Venn diagrammasida bo`yab tasvirlang:



1) $A\cap B$; 2) $A\cup B$;
3) $A\cap B'$; 4) $A'\cup B$;
5) $A'\cap B$; 6) $A\cup B'$;
7) $(A\cap B)'$; 8) $(A\cup B)'$

10. A va B to`plamlarni Venn diagrammasida tasvirlang: $U=\{2, 3, 4, 5, 6, 7\}$, $A=\{2, 4, 6\}$, $B=\{3, 5, 7\}$.

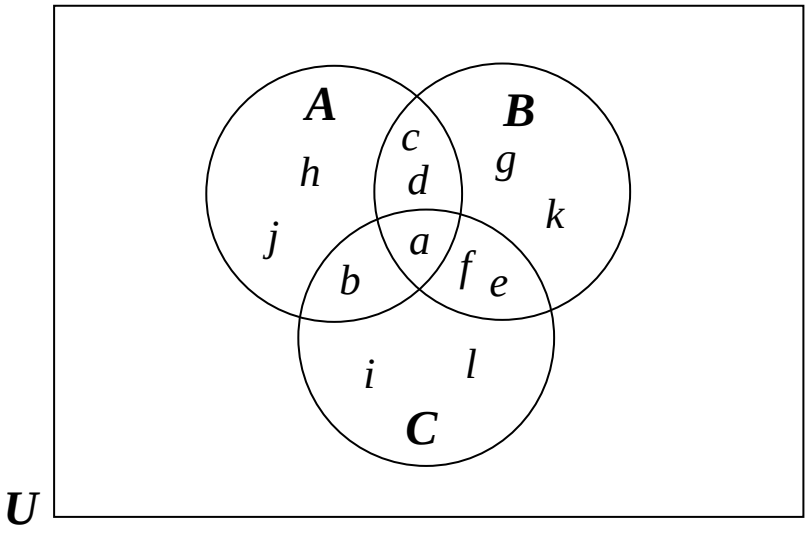
11. $U=\{x\,|\,1\le x\le 10,\ \ x\in\mathbb{Z}\}$, $A=\{$*10 dan kichik bo`lgan toq sonlar*$\}$ va $B=\{$*10 dan kichik bo`lgan tub sonlar*$\}$ bo`lsa, $A$ va $B$ to`plamlarning elementlarini yozing va Venn diagrammasida tasvirlang?

12. A, B va C to`plamlar Venn diagrammasida tasvirlangan. Quyidagi to`plamlarning elementlarini yozing:

1) A; 2) B; 3) C; 4) $A\cap B$; 5) $A\cup B$; 6) $B\cap C$; 7) $B\cup C$;

8) $A\cap C$ 9) $A\cup C$; 10) $A\cap B\cap C$; 11) $A\cup B\cup C$; 12) $n(A\cup B\cup C)$;

13) $n(A)+n(B)+n(C)-n(A\cap B)-n(A\cap C)-n(B\cap C)+n(A\cap B\cap C)$



V. BERILGAN TO`PLAMNING QISM TO`PLAMLARINI TOPPISH UCHUN MISOLLAR

1. $\{x|x\in N, -5\le x<5\}$ to`plamni nechta usul bilan ikkita kesishmaydigan qism to`plamlarga ajratish mumkin?

2. $M=\{36, 29, 15, 68, 27\}$, $P=\{4, 15, 27, 47, 36, 90\}$, $Q=\{90, 4, 47\}$ to`plamlar berilgan. $M\cap P$, $M\cap Q$, $P\cap Q$, $M\cap P\cap Q$ larni toping.

3. $A=\{2, 3, 4, 5, 7, 10\}$, $B=\{3, 5, 7, 9\}$, $C=\{4, 9, 11\}$ bo`lsin. Quyidagi to`plamlarda nechtadan element mavjud:

a) $A\cup(B\cup C)$ b) $A\cap(C\cup B)$

c) $A\cap(B\cap C)$ d) $C\cup(A\cap B)$

4. $\{x|x\in N, x^2\le 23\}$ to`plamning nechta qism to`plamlari mavjud?

5. $A=\{x|-5\le x\le 10\}$, $B=\{x|x\in N, 3\le x\le 15\}$ bo`lsa, $A\setminus B$ va $B\setminus A$ to`plam elementlarini toping.

6. $\{x|x\in N, 6\le x^2\le 40\}$ to`plamning nechta qism to`plamlari mavjud?

7. A- 18 ning hamma natural bo`luvchilari to`plami, B- 24 ning hamma natural bo`luvchilari to`plami bo`lsa, $A\cap B$ to`plam elementlarini ko`rsating.

8. $\{x \mid x \in N, 2 \le x^2 \le 44\}$ to`plamning nechta qism to`plamlari mavjud?

9. $P = \{a, b, c, d, e, f\}$, $E = \{a, g, z, e, k\}$ to`plamlar birlashmasini toping.

10. $\{x \mid x \in N, -2 < x \le 5\}$ to`plamning nechta qism to`plamlari mavjud?

11. $\{x \mid x \in N, x^2 < 17\}$ to`plamning nechta qism to`plamlari mavjud?

✭TAKRORLASH UCHUN TEST✭

1. A to`plam $x^2-11x+18\le 0$ tengsizlikning yechimlari to`plami, B to`plam esa $x^2-15x+50\le 0$ tengsizlikning yechimlari to`plami bo`lsa, $A\cup B$ to`plamni toping.
   A) $[2;10]$ B) $[5;10]$
   C) $[2;9]$ D) $[5;9]$

2. A to`plam $(x^2-9x+20)(x^2-5x+6)=0$ tenglamaning ildizlari to`plami, B to`plam esa $1\le x\le 12$ tengsizlikni qanoatlantiruvchi tub sonlar to`plami bo`lsin. $A\cap B$ to`plamni toping?
   A) $\{2,3,7,11\}$ B) $\{2,3,5\}$
   C) $\{2,3\}$ D) $\varnothing$

3. A to`plam 28 sonining barcha natural bo`luvchilari to`plami, $B$ to`plam esa 42 sonining barcha natural bo`luvchilari to`plami bo`lsa, $A\cap B$ to`plamni toping.
   A) $\{2, 7, 14\}$ B) $\{4, 6, 7\}$
   C) $\{1, 2, 7, 14\}$ D) $\{7, 14\}$

4. $A=\{2, 4, 6, ...\}$, $B=\{1, 3, 5, ...\}$ bo`lsa, $A\cup B$ to`plamni toping.
   A) $\{2, 12, 30, ...\}$ B) $\{3, 7, 11, ...\}$
   C) $\varnothing$ D) $N=\{1, 2, 3, ...\}$

5. 26 o`quvchining 14 tasi shaxmatga, 16 tasi shashkaga qiziqadi. Ham shashkaga, ham shaxmatga qiziqadigan o`quvchilar nechta?
   A) 5 ta B) 4 ta C) 6 ta D) 7 ta

6. $A=\{2; 3; 4; 5; 7; 10\}$, $B=\{3; 5; 7; 9\}$, $C=\{4; 9; 11\}$ bo`lsin. $A\cap(B\cup C)$ to`plamning nechta elementi mavjud.
   A) 4 B) 8 C) 16 D) 9

7. $\{x\,|\,x\in N, -2<x\le 5\}$ to`plamning nechta qism to`plamlari mavjud?
   A) 30 B) 8 C) 16 D) 32

8. A to`plam $y=\sqrt{x^2-2x-24}$ funksiyaning aniqlanish sohasi, $B$ to`plam esa $y=\sqrt{4-x^2}$ funksiyaning aniqlanish sohasi bo`lsin. $A\cap B$ to`plamni toping.
   A) $\varnothing$ B) $x\le -4,\ x\ge 6$
   C) $-2\le x\le 2$ D) $2<x<6$

9. A - barcha tub sonlar to`plami, $B$ - barcha juft sonlar to`plami bo`lsa, $A\cap B$ to`plamni toping.
   A) $\varnothing$ B) $\{2\}$
   C) $\{2, 3, 5, 6, 7, ...\}$ D) $\{4, 12, 30, ...\}$

10. $A=\{a, b, c\}$ to`plamning xosmas qism to`plamlari soni nechta?
    A) 2 ta B) 6 ta C) 8 ta D) 4 ta

11. $A=\{x\,|\,0\le x\le 5\}$, $B=\{x\,|\,2\le x\le 8\}$ bo`lsa, $A\cup B$ ni toping.
    A) $[2;13)$ B) $[5;8)$
    C) $[0;8]$ D) $[2;5]$

12. $\{x\,|\,x\in N, x^2<17\}$ to`plamning nechta qism to`plamlari mavjud?
    A) 12 B) 16 C) 8 D) 32

13. $A=\{x|2\le x\le 7\}$, $B=\{x|3\le x\le 9\}$ bo`lsa, $A\cap B$ ni toping.
A) $[2;9)$ B) $[7;9]$
C) $(2;3]$ D) $[3;7]$

14. $A=\{p-tub\ son|2\le x\le 32\}$, $B=\{p-tub\ son|7\le x\le 28\}$ bo`lsa, $B$ to`plamning A to`plamgacha to`ldiruvchisini – A ning B ga tegishli bo`lmagan barcha elementlaridan tuzilgan to`plamni toping.
A) $\{2, 3, 5, 29, 31\}$ B) $\{29, 31\}$
C) $\{p-tup\ son|9\le x\le 30\}$ D) $\varnothing$

15. $1\le x\le 100$ kesmadagi 10 ga bo`linadigan barcha natural sonlar to`plami A bo`lsa, shu kemadagi 25 ga bo`linadigan barcha natural sonlar to`plami $B$ bo`lsa, $A\cup B$ to`plamning elementlari soni nechta?
A) 14 B) 12 C) 4 D) 18

16. $A=\{x|x=2k+1,\ k\in Z\}$ to`plamning $Z$ to`plamga to`ldiruvchisini toping?
A) $A=\{x|x=2k-1,\ k\in Z\}$
B) $A=\{x|x=k,\ k\in Z\}$
C) $A=\{x|x=2k,\ k\in Z\}$
D) $A=\{x|x=k+1,\ k\in Z\}$

17. $1\le x\le 50$ kesmadagi 3 ga; 4 ga; 7 ga bo`linadigan barcha natural sonlar to`plami mos ravishda A, B, C bo`lsin. $A\cup B\cup C$ to`lam elementlari sonini toping.
A) 23 B) 19 C) 28 D) 35

18. 10-sinf o`quvchilarining hammasi 3 ta to`garakka qatnashadi. Matematika to`garagiga 18 ta, fizika to`garagiga 15 ta, adabiyot to`garagiga 14 ta o`quvchi qatnashadi. Ham matematika, ham fizika to`garaklariga 6 ta o`quvchi, ham matematika ham adabiyot to`garagiga 4 ta o`uvchi, ham fizika ham adabiyot to`garagiga esa 5 ta o`quvchi qatnashadi. 1 ta o`quvchi uchala to`garakka ham qatnashadi. 10-sinfda necha nafar o`quvchi bor?
A) 36 B) 40 C) 38 D) 33

19. $A=\{a, b, c\}$ to`plamning barcha qism to`plamlari soni nechta?
A) 8 B) 27 C) 9 D) 6

20. $A=\{a, b, c, d\}$ to`plamning barcha qism to`plamlari soni nechta?
A) 64 B) 16 C) 81 D) 8

TAKRORLASH UCHUN TEST JAVOBLARI

1	2	3	4	5	6	7	8	9	10
A	B	C	D	B	A	D	A	B	A
11	12	13	14	15	16	17	18	19	20
C	B	D	A	B	C	C	D	A	B

QO`SHIMCHA MA’LUMOTLAR UCHUN

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