



MUAMMOLI MASALA VA TOPSHIRIQLAR:

1. $M = \{3, 4, 5, 6, 7, 8\}$ to'plamda ikkita $A(x)$: « x – tub son» va $B(x)$: « x – toq son» predikatlar berilgan. Bu predikatlarining chinlik jadvalini tuzing.

2. $M = \{1, 2, 3, \dots, 20\}$ to'plamda quyidagi predikatlar berilgan: $A(x)$: « x son 5ga qoldiqsiz bo'linmaydi»; $B(x)$: « x – juft son»; $C(x)$: « x – tub son»; $D(x)$: « x son 3ga karrali». Quyidagi predikatlarining har biri uchun chinlik to'plamni aniqlang:

- a) $A(x) \wedge B(x)$; b) $C(x) \wedge B(x)$; d) $C(x) \wedge D(x)$;
- e) $B(x) \wedge D(x)$; f) $\overline{B(x)} \wedge D(x)$; g) $A(x) \wedge \overline{D(x)}$;
- h) $\overline{B(x)} \wedge \overline{D(x)}$; i) $A(x) \wedge B(x) \wedge D(x)$; j) $A(x) \vee B(x)$;
- k) $B(x) \vee C(x)$; l) $C(x) \vee D(x)$; m) $B(x) \vee D(x)$;
- n) $\overline{B(x)} \vee D(x)$; o) $B(x) \wedge \overline{D(x)}$; p) $A(x) \vee B(x) \vee D(x)$;
- q) $C(x) \rightarrow A(x)$ r) $D(x) \rightarrow \overline{C(x)}$; s) $A(x) \rightarrow B(x)$;
- t) $(A(x) \wedge C(x)) \rightarrow \overline{D(x)}$; u) $(A(x) \wedge D(x)) \rightarrow \overline{C(x)}$.

3. R to'plamda $P(x)$: « $x^2 + x + 1 > 0$ » va $Q(x)$: « $x^2 - 4x + 3 = 0$ » predikatlar berilgan bo'lsin. Quyidagi mulohazalarning qaysilari chin, qaysilari esa yolg'on ekanligini aniqlang:

- a) $\forall x P(x)$; b) $\exists x P(x)$; d) $\forall x Q(x)$; e) $\exists x Q(x)$.

4. Quyidagi predikatlarining qaysi birlari aynan chin qiymatga ega bo'ladi:

- a) $x^2 + y^2 + (x + y)^2 \geq 0$; b) $x^2 + y^2 + (x + y)^2 > 0$;
- d) $\cos^2 x - \sin^2 x = \cos 2x$; e) $\sin 2x = 2 \sin x \cos x$;
- f) $(x+1)^2 < x-3$; h) $x^2 + 1 \leq (x+1)^2$.

5. Quyidagi ifodalarning qaysilari predikatlar mantiqining formulasi bo'lishini aniqlang. Har bir formula uchun erkin va bog'langan o'zgaruvchilarni aniqlang.

- a) $\exists x \exists y P(x, y)$; b) $\forall x P(x) \vee \forall y Q(x, y)$; d) $\forall x \exists y P(x, y)$;
- e) $p \rightarrow \forall x P(x, y)$; f) $\exists x P(x, y) \wedge Q(y, z)$.

6. $P(x, y): \ll x < y \gg$ predikat $M = N \times N$ to'plamda aniqlangan bo'lsin. Quyida berilgan predikatlarning qaysilari aynan chin va qaysilari aynan yolg'onligini aniqlang:

- a) $\exists x P(x, y)$; b) $\forall x P(x, y)$; d) $\exists y P(x, y)$;
 e) $\forall y P(x, y)$ f) $\exists x \forall y P(x, y)$; g) $\forall x \exists y P(x, y)$;

7. Quyidagi teng kuchliliklarning to'g'riligini isbot qiling:

- a) $\forall x A(x) \equiv \overline{\overline{\exists x \overline{A(x)}}}$; b) $C \wedge \forall x A(x) \equiv \forall x (C \wedge A(x))$;
 d) $\exists x A(x) \equiv \overline{\overline{\forall x \overline{A(x)}}}$; e) $C \vee \forall x A(x) \equiv \forall x (C \vee A(x))$;
 f) $\exists x (A(x) \vee B(x)) \equiv \exists x A(x) \vee \exists x B(x)$; g) $\exists x (C \vee A(x)) \equiv C \vee \exists x A(x)$.

8. $A(x)$ va $B(x)$ ixtiyoriy predikatlari bo'lsin. Quyida berilgan formulalarning qaysilari $A(x) \rightarrow \overline{B(x)}$ formulaga teng kuchli bo'lishini aniqlang.

- a) $A(x) \vee B(x)$; b) $\overline{A(x)} \vee \overline{B(x)}$; d) $\overline{A(x)} \rightarrow B(x)$;
 e) $\overline{B(x)} \rightarrow A(x)$; f) $\overline{\overline{A(x)} \wedge B(x)}$; g) $\overline{A(x) \wedge \overline{B(x)}}$.