

**Matematika talim yo‘nalishi 2 (o‘zbek) kurs talabalarining
«Diskret matematika va matematik mantiq» fanidan
yakuniy nazorat savollari**

1. To‘plam. Munosabat. Binar va ekvivalentlik munosabatlari.
2. Ayniyatni isbotlang. $A \cup A = A \cap A = A$.
3. Isbotlang. $\overline{A \cup B} = \overline{A} \cap \overline{B}$.
4. $(A \cap C) \cup (B \cap D) \subset (A \cup B) \cap (C \cup D)$ ekanligini ko‘rsating.
5. Mulohaza tushunchasi. Mulohazalar ustida mantiqiy amallar.
6. Quyidagi keltirilgan gaplar orasidan qaysilari rost mulohaza bo‘ladiganligini aniqlang: 1. Bugin nechanshi kun? . 2. Moskva-Rossiyaning paytoxti; 3. Bugin kechagidan qarongiroq; 4. Negrlar-oq tanli odamlar.
7. Mulohazalar algebrasining formulalari. Qism formula.
8. Agar $x=0$, $y=1$ va $z=1$ bo‘lsa, unda quyidagi murakkab mulohazalarning mantiq qiymatini toping. $(x \rightarrow y) \rightarrow z$.
9. Aynan rost va aynan yolg‘on formulalar.
10. $F = (x \rightarrow (y \rightarrow z)) \rightarrow ((x \rightarrow y) \rightarrow (x \rightarrow z))$ ning aynan rost formula ekanin isbotlang.
11. Mulohazalar algebrasining bajariluvchi formulasi.
12. Bul funktsiyasi.
13. $F(x_1, x_2) = (x_1 \wedge x_2) \vee \overline{x_2}$ formulasining bajariluvchi ekanligini ko‘rsating.
14. $F(x, y, z) = (x \rightarrow y) \rightarrow (\overline{x} \wedge (y \vee z))$ ni soddalashtiring.
15. Ikkiilik qonuni. Amallarning túliq sistemalari.
16. $F(x, y) = (x \vee y) \wedge (x \vee \overline{y})$ formulani tekshiring.
17. $F(a_1, a_2, a_3) = (a_0 \wedge a_1) a_2 \vee \overline{a_3}$ ifodasi formula bo‘ladimi?
18. Qism formulalarini yozing. $((a_0 \rightarrow a_1) \wedge (a_1 \rightarrow a_2)) \rightarrow (\overline{a_0} \vee a_2)$.
19. $F(x, y, z) = (x \vee y) \wedge z \rightarrow x \wedge z$ formulasining rostlik jadvalini tuzing.
20. Mantiqiy amallarning funktsiyalari túliq sistemalari.
21. $A(x, y) = (x \rightarrow y) \rightarrow (y \rightarrow x)$ formulasining rostlik jadvalini tuzing.
22. $F(x_1, x_2) = \overline{x_1} \rightarrow (x_2 \rightarrow x_1)$ qism formulalarini yozing.
23. Mulohazalar algebrasining bazibir tadbiqlari.
24. $\{(2;1), (3;4), (5;7), (7;9)\}$ to‘plamni ρ munosabati bilan berilgan bo‘lsa, unda uning aniqlanish sohasi D_ρ va qiymatlar sohasi E_ρ ni aniqlang.
25. Mulohaza. Mulohazalar ustida mantiqiy amallar.
26. Qism formulalarini yozing. $F(p, q, r) = (q \rightarrow r) \rightarrow ((p \vee q) \rightarrow (p \vee r))$.
27. $A(a, b, c) = a \vee (\overline{b} \rightarrow c)$ formulasining rostlik jadvalini tuzing.
28. Quyidagi tengligi o‘rinli bo‘ladiganday etib x va y larning mantiq qiymatini toping. $x \vee y = \overline{x}$.
29. Teng kúshli formulalar.
30. $x \leftrightarrow y \equiv \overline{x} \leftrightarrow \overline{y}$ teng kúshli formula ekanligini ko‘rsating.

31. Agar $x \rightarrow y$ implikasiyasi rost, $x \leftrightarrow y$ ekvivalentsiyasi yolg'on ekanligi malum bo'lsa, unda $y \rightarrow x$ nega teng bo'ladi?
32. Formula tushunchasi. Mulohazalar algebrasining formulalari.
33. $F(x, y) = x \rightarrow (x \vee y)$ formulasining aynan rost formula ekanligini ko'rsating.
34. Ekvivalentlik va tartiplangan munosabatlar.
35. $\{(1;3), (3;4), (5;6), (7;8)\}$ to'plami ρ munosabat bilan berilgan bo'lsa, o'nda aniqlanish sohasi D_ρ va qiymatlar sohasi E_ρ ni aniqlang.
36. $(x \vee y) \wedge (x \vee \bar{y}) \equiv x$ teng kuchli formula ekanligini ko'rsating.
37. $F(p_1, p_2) = \overline{p_1 \rightarrow (p_2 \rightarrow p_1)}$ ning aynan yolg'on formula ekanligini ko'rsating.
38. $A(x) \equiv (x \rightarrow x) \rightarrow x$ formulasini soddalashtiring.
39. $A(x; y) \equiv x \wedge y \rightarrow x \equiv 1$ ga teng kuchli formula ekanligini ko'rsating.
40. $A(x; y) \equiv x \vee \bar{x} \rightarrow y \wedge \bar{y}$ formulasining aynan yolg'on formula ekanligini ko'rsating.
41. Aytaylik, F - aynan yolg'on formula bo'lsin. U holda $x \wedge \bar{y} \rightarrow F \equiv x \rightarrow y$ ekanligini isbotlang.
42. $x \rightarrow \bar{y} \equiv y \rightarrow \bar{x}$ teng kuchli formula ekanligini ko'rsating.
43. Agar $(\overline{x \vee a}) \vee (\overline{x \vee a}) \equiv b$ bo'lsa, unda x ni toping.
44. Asosiy teng kuchli formulalar.
45. $(x \vee y) \wedge (x \vee \bar{y}) \equiv x$ teng kuchli formula ekanligini ko'rsating.
46. Mantiqiy mulohazalarning formulalari.
47. $F(a, b, c) = ((a \rightarrow b) \rightarrow (c \rightarrow \bar{a}) \rightarrow (\bar{b} \rightarrow \bar{c}))$ formulasiga teng kuchli keltirilgan formulani toping.
48. Bul funktsiyasi.
49. $F(x, y, z)$ turidagi Bul algebrasiga mos keladigan mantiqa algebrasining formulasini aniqlang. $F(1, 0, 0) = F(1, 1, 0) = F(1, 1, 1) = 1$.
50. $F(x, y, z)$ turidagi Bul algebrasiga mos keladigan mantiqa algebrasining formulasini aniqlang. $F(1, 0, 1) = F(1, 0, 0) = F(1, 0, 1) = 1$.
51. $F(x, y, z)$ turidagi Bul algebrasiga mos keladigan mantiqa algebrasining formulasini aniqlang. $F(1, 1, 0) = F(1, 0, 1) = F(1, 1, 1) = 1$.
52. Ikkiilik qonuni. Ikkiilik qonuni haqida teoremlar.
53. $f_3(x, y) = x \wedge y$ ga ikkilamchi funksiya $f_3^*(x, y) = x \vee y$ ekanligini ko'rsating.
54. $f_4(x, y) = x \vee y$ ga ikkilamchi funksiya $f_4^*(x, y) = x \wedge y$ ekanligini ko'rsating.
55. $xy \vee zt \equiv (x \vee z)(y \vee z)(x \vee t)(y \vee t)$ teng kuchli formula ekanligini ko'rsating.
56. $f_5(x, y) = x \rightarrow y$ ga ikkilamchi funksiya $f_5^*(x, y) = \overline{y \rightarrow x}$ ekanligini ko'rsating.
57. $f(x, y, z) = (x \vee y) \wedge z$ funksiyasiga ikkilamchi funksiyani toping.
58. $f(x, y, z) = xy \vee yz \vee xz$ funksiyasining o'z-o'ziga ikkilamchi funksiya ekanligini ko'rsating.
59. $f(x) = (x \rightarrow x) \rightarrow x$ funksiyasiga teng kuchli funksiyani aniqlang va ularning ikkilamchi funksiyalarini toping.

60. $f(x, y) = x \rightarrow y$ funksiyasiga teng kuchli funksiyani aniqlang va ularning ikkilamchi funksiyalarini toping.
61. Mantiqiy amallarning funksiyalari túliq sistemalari.
62. $a \rightarrow (b \rightarrow c) \equiv a \wedge b \rightarrow c$ teng kuchli formula ekanligini ko'rsating.
63. Elementar konyuktsiya. To'g'ri elementar konyuktsiya va dizyuktsiyalar.
64. Konyuktiv va dizyuktiv normal shakllar (KNSh va DNSh).
65. $A(x, y) = x \wedge (x \rightarrow y)$ formulasining konyuktiv normal formasini toping.
66. $(x \wedge y \rightarrow z) \rightarrow (x \rightarrow (y \rightarrow z))$ formulasining aynan rostligini isbotlang.
67. $A(x, y) = x \wedge (x \rightarrow y)$ formulasining konyuktiv normal formasini (KNF) aniqlang.
68. Normal formani sodda ko'rinishga keltiring. $A(x, y) = (x \vee \bar{y})(\bar{x} \vee y)(x \vee \bar{y})$.
69. $F(a, b, c) = ((a \rightarrow b) \rightarrow (c \rightarrow \bar{a}) \rightarrow (\bar{b} \rightarrow \bar{c}))$ formulasiga teng kuchli keltirilgan formulani toping.
70. $A(x, y, z) = x \vee y \rightarrow z$ formulasining DNSh va KNSh ni toping.
71. $A(x, y) = (x \rightarrow y) \rightarrow (y \rightarrow x)$ formulasining KNSh ni toping.
72. Mukammal konyuktiv normal shakllar (MKNSh).
73. Ayniyatni isbotlang. $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$.
74. Mukammal dizyuktiv normal shakllar (MDNSh).
75. $A \equiv x \wedge (x \rightarrow y)$ mukammal dizyuktiv va konyuktiv normal shakllarini toping.
76. $(A \vee \bar{B}) \wedge C \rightarrow (\bar{A} \vee B) \wedge C$ formulasining MDNSh aniqlang.
77. $A \equiv a(bc \rightarrow ab)$ ifodasining DNSh va KNSh ni toping.
78. $F(x, y) = (x \rightarrow y) \rightarrow (y \rightarrow x)$ formulasiniń shınlıq kestesindeń dúziń.
79. $F(a, b, c) = (\bar{a} \rightarrow c) \rightarrow (\bar{b} \rightarrow \bar{c})$ formulasiniń DNF hám TKNF sını tabıń.
80. Ayniyatni isbotlang. $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$.
81. $A(a, b, c) = (a \rightarrow b) \rightarrow (\bar{a} \wedge (b \vee c))$ formulasini soddalashtiring.
82. $A(a, b, c) = (a \rightarrow \bar{b}) \rightarrow (\bar{a} \rightarrow c)$ formulasining MKNSh va DNShni toping.
83. Agar $x=1$, $y=0$ va $z=1$ bo'lsa, unda quyidagi murakkab mulohazalarning mantiq qiymatini toping: $F(x, y, z) = (x \rightarrow y) \rightarrow z$.
84. $A(x, y) = (x \rightarrow y) \rightarrow (y \rightarrow x)$ formulasining dizyuktiv normal shaklni toping.
85. Ikkilik qonuniga doir teoremlar.
86. Mulohazalar algebrasi berilgan funksiyalari ikkilamchi funksiyalar ekanligini isbotlang. $f_1(x, y) = x \leftrightarrow y$ uchun $f_1^*(x, y) = \overline{x \leftrightarrow y}$ ham da $f_2(x) = 1$ uchun $f_2^*(x) = 0$.
87. Formulaning aynan rost yoki aynan yolg'on ekanligini tekshiring. $(x \rightarrow y) \wedge (x \rightarrow \bar{y}) \rightarrow \bar{x}$
88. $f(x, y, z) = (x \vee y) \wedge z$ funksiyasiga $f^*(x, y, z) = (x \wedge y) \vee z$ ikkilamchi funksiya ekanligini ko'rsating.
89. Mulohazalar algebrasining KNSh va MKNSh larini toping. $(A \vee \bar{B}) \wedge C \rightarrow (\bar{A} \vee B) \wedge C$.

90. $f_1 = x \vee (\bar{x} \wedge y)$ va $f_2 = x \vee y$ formulalari o'zaro teng kushli ekanligi ma'lum bo'lsa, unda ularning ikki tomonlama formulalari ham teng kuchli ekanligini ko'rsating.
91. Mulohazalar algebrasining bazibir tadbiqlari.
92. $F = xy \vee \bar{x}\bar{y}z \vee yz$ va $Q = y$ formulalari RKS tuzing. Tekshiring.
93. $F(a, b, c) = (a \vee b) \rightarrow (a \wedge b) \vee c$ formulasi uchun RKS tuzing.
94. Mulohazalar algebrasi formulasining turini aniqlang. $(x \wedge y \rightarrow z) \rightarrow (x \rightarrow (y \rightarrow z))$
95. $\overline{(x \rightarrow z)} \rightarrow ((y \rightarrow z) \rightarrow (x \vee y \rightarrow z))$ formulasi uchun rostlik jadvalini tuzing.
96. Aynan rost formula ekanligini isbotlang. $F(x, y) = (x \rightarrow y) \rightarrow (\bar{y} \rightarrow \bar{x})$.
97. Aynan yolg'on formula ekanligini isbotlang. $L(x, y) = x \wedge (x \rightarrow y) \wedge (x \rightarrow \bar{y})$.
98. $(x \rightarrow (y \rightarrow z)) \rightarrow ((x \rightarrow y) \rightarrow (x \rightarrow z))$ formulasining aynan rostligini isbotlang.
99. $\overline{\overline{\overline{A(x; y) \equiv (x \wedge \bar{x} \rightarrow y_1 \rightarrow y_2 \rightarrow \dots \rightarrow y_{n-1} \rightarrow y_n) \rightarrow (z \wedge \bar{z})}}}}$ mulohazalar algebrasining formulasini soddalashtiring.
100. Formulani soddalashtiring. $F(x, y, z) = x \rightarrow (y \rightarrow z)$.