

Olimpiada topshiriqlari

MATEMATIKA 11

1-qism: Har bir topshiriq 0,9 balldan baholanadi.

- Soddalashtiring: $\frac{|a^2-9|}{3+a} - \frac{|4+a^2-5a|}{a-4}$ bunda, $|a| < 1$. A) $2a + 4$ B) -2 C) $2 - 2a$ D) $4 - 2a$
- $f(3) \cdot (x - 2) + f(x - 1) = 3x$ bo'lsa, $f(1)$ ni toping. A) 4 B) 2 C) 3 D) 6
- Soddalashtiring: $\frac{\sin 12^\circ + \sin 14^\circ}{\sin 12^\circ - \sin 14^\circ} \cdot \operatorname{ctg} 1^\circ \cdot \operatorname{ctg} 13^\circ$
A) -1 B) $-\operatorname{ctg} 1^\circ$ C) $-\operatorname{ctg} 13^\circ$ D) $-\operatorname{ctg}^2 1^\circ$
- Soatning minut mili 144° ga burilganda, soatning soat mili qanday burchakka burilada?
A) 6° B) 12° C) 18° D) 8°
- To'g'ri burchakli uchburchakning bir burchagi 60° ga teng. Bu burchakdan chiqarilgan bissektrisaning uzunligi 2 m. Uchburchakning gipotenuzasi uzunligini toping.
A) $2\sqrt{3}$ B) $\sqrt{5}$ C) $\sqrt{3}$ D) $\sqrt{5} + 1$
- Soddalashtiring: $\sqrt{-16a} + \sqrt[3]{-27a} + \sqrt{-9a} + 3\sqrt[3]{a}$
A) $-7\sqrt{a}$ B) $-\sqrt{-a} - 6\sqrt[3]{a}$ C) $7\sqrt{-a}$ D) $-\sqrt[3]{a} - \sqrt{-a}$
- Tenglamani yeching: $\frac{211-4x}{21} - \frac{221-3x}{22} = \frac{20+3x}{22} - \frac{30+4x}{21}$ A) 0 B) $\frac{29}{462}$ C) $\frac{10}{21}$ D) $\emptyset$
- Uchlari $A(2; -3)$, $B(6; -1)$, $C(6; 4)$ va $D(2; 2)$ nuqtalarda bo'lgan $ABCD$ to'rtburchak yuzini toping.
A) 20 B) 18 C) 16 D) 15
- x soniga teskari bo'lgan son x ning 9%ini tashkil qiladi. x ni toping. (bu yerda, $x > 0$)
A) $4\frac{1}{3}$ B) $5\frac{1}{3}$ C) $2\frac{2}{3}$ D) $3\frac{1}{3}$
- Arifmetik progressiyada $a_2 = 12$, $a_7 - a_4 = 9$ bo'lsa, a_{19} ni toping A) 63 B) 54 C) 61 D) 56

2-qism: Har bir topshiriq 1,5 balldan baholanadi

- Nargizada 2 ta olma va 3 ta nok bor. U 5 kun ketma-ket har kuni singliga bittadan meva beradi. Bu ishni necha usul bilan amalga oshirish mumkin? A) 10 B) 8 C) 12 D) 6
- Tengsizliklar sistemasining butun yechimlari sonini toping $\begin{cases} \log_2(x-4)^2 \leq 4 \\ (x-2)^2 \geq 4 \end{cases}$
A) 5 B) 4 C) 6 D) 7
- $y = x^2 - 2x + 3$ parabolaga $y = 3$ to'g'ri chiziqqa nisbatan simmetrik bo'lgan parabola tenglamasini tuzing. A) $y = x^2 - 2x - 3$ B) $y = -x^2 + 2x - 3$ C) $y = -x^2 - 2x + 3$ D) $y = -x^2 + 2x + 3$
- Agar $\sin 2\alpha = \frac{1}{3}$, $\alpha \in \left[\frac{\pi}{4}; \frac{\pi}{2}\right]$ bo'lsa $\sin^2 \alpha$ ni toping.
A) $\frac{1}{2} + \frac{\sqrt{2}}{3}$ B) $\frac{\sqrt{2}}{2} + \frac{1}{3}$ C) $-\frac{1}{2} + \frac{\sqrt{2}}{3}$ D) $\frac{1}{2} - \frac{\sqrt{2}}{3}$
- $x_n = \frac{2n+1}{3}$ formula bilan berilgan sonli ketma-ketlikning dastlabki 20 ta hadining o'rta arifmetigini toping. A) $\frac{25}{6}$ B) $\frac{20}{3}$ C) $\frac{22}{3}$ D) $\frac{23}{6}$

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16. O'tkir burchakli uchburchakning ikki tomon uzunliklari ayirmasi 8, bu tomonlarning uchinchi tomondagi proyeksiyalari mos ravishda 8 va 20 ga teng. Berilgan uchburchakka tashqi chizilgan aylana radiusini toping. A) $13\frac{5}{6}$ B) $12\frac{1}{3}$ C) $14\frac{1}{6}$ D) $11\frac{2}{3}$

17. Agar $4^{\frac{a+1}{b}} = 125$ va $5^{\frac{b}{a}} = 2$ bo'lsa, $\frac{25^{b+1}}{5a^2}$ ifodaning qiymatini toping.

- A) 0,8 B) 4 C) 20 D) 0,05

18. Hisoblang: $\frac{1}{1^2 \cdot 3^2} + \frac{2}{3^2 \cdot 5^2} + \frac{3}{5^2 \cdot 7^2} + \dots + \frac{n}{(2n-1)^2(2n+1)^2}$

- A) $\frac{n(n-1)}{(2n+1)^2}$ B) $\frac{n(n+1)}{(2n+1)^2}$ C) $\frac{n(n+1)}{2(2n+1)^2}$ D) $\frac{n(n-1)}{2(2n+1)^2}$

19. $BC = BE = CD$, $\angle DAE = 20^\circ$, $\angle BCD = 60^\circ$, $\angle ADE = ?$ (chizmaga qarang)

- A) 30° B) 20° C) 50° D) 40°

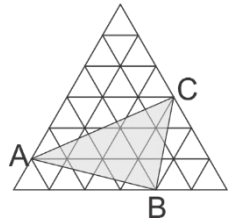
20. $a^2b^5 = 6^{20}$ tenglikni qanoatlantiruvchi nechta ($a; b$) butun sonlar juftligi mavjud?

- A) 10 B) 18 C) 14 D) 12

3-qism: Har bir topshiriq 2,6 balldan baholanadi

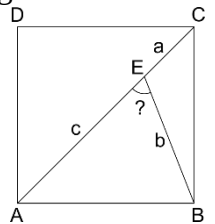
21. $P(x^2 - 5x) = x + \frac{1}{x} + x^3 + \frac{1}{x^3}$ bo'lsa, $P(-1)$ ni toping.

22. Muntazam uchburchak 36 ta yuzi 1 ga teng bo'lgan kichkina muntazam uchburchaklardan iborat (chizmaga qarang!). ABC uchburchak yuzini toping.



23. Raqamlari yig'indisi 10 dan kam bo'lmagan, raqamlari ko'paytmasi esa 10 dan katta bo'lmagan uch xonali sonlar nechta?

24. ABCD - kvadrat, AC-diagonal. Agar $AE = BE + CE$ ($a + b = c$) bo'lsa, $\angle AEB$ burchakni toping (chizmaga qarang!).



25. $(3 - \cos^2 x - 2 \sin x)(\lg^2 y + 2 \lg y + 4) \leq 3$ bo'lsa, $\sin^2 x + 20y + 1$ ni toping.

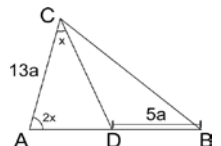
26. Natural son roppa-rosa 2 ta tub bo'luvchiga, bu sonning kvadrati esa 45 ta turli natural bo'luvchiga ega. Berilgan sonning kubi eng ko'pi bilan nechta natural bo'luvchiga ega bo'lishi mumkin?

27. ABC uchburchakda $\operatorname{ctg} A + \operatorname{ctg} B = 3$ va $AB = 12$ bo'lsa, ABC uchburchak yuzini toping.

28. Doskaga $a_1, a_2, a_3, \dots, a_{200}$ sonlari yozilgan. Ma'lumki, $a_1 = 3$, $a_2 = 9$. Agar ixtiyoriy n natural son uchun $a_{n+2} = a_{n+1} - a_n$ tenglik o'rinli bo'lsa, a_{200} ni toping.

29. $\angle CAD = 2\angle ACD$, $AC = 13a$, $BD = 5a$ va $AB = CD$ bo'lsa,

$20 \cdot \cos \angle ACD$ ni toping. (chizmaga qarang!)



30. (u_n) ketma-ketlik quyidagicha berilgan: $u_1 = 1$, $u_{n+1} = u_n + 8n$.

U holda, $u_{50} - u_{30}$ ni toping.