DAVLAT TEST MARKAZI

Bilimingga ishon va muvaffaqiyatga erish!

O‘ZBEKISTON RESPUBLIKASI VAZIRLAR MAHKAMASI
DAVLAT TEST MARKAZI

UMUMIY O‘RTA TA’LIM MAKTABLARI, AKADEMIK LITSEYLAR VA KASB-HUNAR KOLLEJLARI O‘QUVCHILARINING UMUMTA’LIM FANLARI BO‘YICHA OLIMPIADASINING IV (RESPUBLIKA) BOSQICHI ISHTIROKCHILARI UCHUN

MATEMATIKA

FANIDAN

TEST TOPSHIRIQLARI KITOBI

Ishtirokchining familiyasi, ismi va otasining ismi *Imzo*

3−variant

Ushbu test varianti 30 ta (1−30) topshiriqdan iborat.
Test topshirig‘i uchun ajratilgan ball har bir test topshirig‘ida aks ettirilgan.
Kitobda yopiq va ochiq turdagi test topshiriqlari mavjud:
− yopiq turdagi test topshiriqlarida bitta javobni (A, B, C yoki D) tanlang va javoblar varaqasidagi topshiriq raqamiga mos qatorga yozing;
− ochiq turdagi test topshiriqlarining javobini javoblar varaqasidagi topshiriq raqamiga mos qatorga aniq va tushunarli tarzda yozing;
− moslashtirishni talab qiluvchi yopiq test topshiriqlari uchun umumiy oltita (A−F) javob varianti berilgan, uchta topshiriqqa (28-, 29-, 30-test topshiriqlariga) ushbu javoblar orasidan mos ravishda bittadan javob tanlang va javoblar varaqasiga belgilang.

1. [2,4 ball]

a, b va c haqiqiy sonlarda $\frac{ac}{a+b}+\frac{ba}{b+c}+\frac{cb}{c+a}=-9$ va $\frac{bc}{a+b}+\frac{ca}{b+c}+\frac{ab}{c+a}=10$ tengliklar o‘rinli bo‘lsa,

$\frac{b}{a+b}+\frac{c}{b+c}+\frac{a}{c+a}$ **ifodaning qiymatini toping.**

A) *13*

B) *19*

C) *17*

D) *11*

2. [1,7 ball]

$$1\cdot\left(\frac{1}{1}+\frac{1}{2}+\frac{1}{3}+\frac{1}{4}+\frac{1}{5}+\frac{1}{6}+\frac{1}{7}+\frac{1}{8}+\frac{1}{9}+\frac{1}{10}\right)+$$
$$+3\cdot\left(\frac{1}{2}+\frac{1}{3}+\frac{1}{4}+\frac{1}{5}+\frac{1}{6}+\frac{1}{7}+\frac{1}{8}+\frac{1}{9}+\frac{1}{10}\right)+$$
$$+5\cdot\left(\frac{1}{3}+\frac{1}{4}+\frac{1}{5}+\frac{1}{6}+\frac{1}{7}+\frac{1}{8}+\frac{1}{9}+\frac{1}{10}\right)+$$
$$+7\cdot\left(\frac{1}{4}+\frac{1}{5}+\frac{1}{6}+\frac{1}{7}+\frac{1}{8}+\frac{1}{9}+\frac{1}{10}\right)+$$
$$+9\cdot\left(\frac{1}{5}+\frac{1}{6}+\frac{1}{7}+\frac{1}{8}+\frac{1}{9}+\frac{1}{10}\right)+$$
$$+11\cdot\left(\frac{1}{6}+\frac{1}{7}+\frac{1}{8}+\frac{1}{9}+\frac{1}{10}\right)+$$
$$+13\cdot\left(\frac{1}{7}+\frac{1}{8}+\frac{1}{9}+\frac{1}{10}\right)+$$
$$+15\cdot\left(\frac{1}{8}+\frac{1}{9}+\frac{1}{10}\right)+$$
$$+17\cdot\left(\frac{1}{9}+\frac{1}{10}\right)+$$
$$+19\cdot\left(\frac{1}{10}\right)$$

ni hisoblang.

A) *50*

B) *45*

C) *55*

D) *66*

3. [2,4 ball]

$\operatorname{tg} 1^\circ + 2\operatorname{tg} 2^\circ + 4\operatorname{tg} 4^\circ + 8\operatorname{tg} 8^\circ + 16\operatorname{tg} 16^\circ +$
$+32\operatorname{tg} 58^\circ$ **ni hisoblang.**

A) $\operatorname{ctg} 1^\circ$

B) $\operatorname{tg} 64^\circ$

C) $\operatorname{tg} 1^\circ$

D) $\operatorname{ctg} 64^\circ$

4. [1,7 ball]

Agar $\log_9 x = \log_{12} y = \log_{16}(x+y)$ bo‘lsa, $\dfrac{y}{x}$ **ning qiymatini toping.**

A) $\dfrac{1}{2}$

B) $\dfrac{1+\sqrt{5}}{2}$

C) $\dfrac{1+\sqrt{3}}{2}$

D) $\dfrac{1+\sqrt{2}}{2}$

5. [1,7 ball]

$\dfrac{27 \cdot 9^x}{4^x} = \dfrac{3^x}{8^x}$ tenglamaning haqiqiy ildizi x_0 bo‘lsa,

$2^{-(1+\log_2 3)x_0}$ **ning qiymatini toping.**

A) *9*

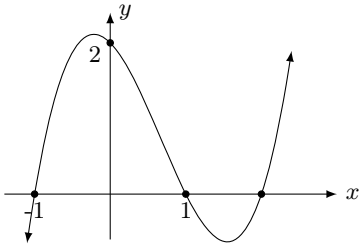
B) *4*

C) *27*

D) *8*

6. [1,7 ball]

Quyidagi grafik $y = ax^3 + bx^2 + cx + d$ funksiyaga tegishli.



Grafikda berilgan ma’lumotlardan foydalanib, a ning butun qiymatlari sonini toping.

A) *2*

B) *1*

C) *cheksiz ko‘p*

D) *4*

7. [2,4 ball]

Agar $x \neq 0$ da $3 \cdot f(x) + f\left(\frac{1}{x}\right) = 8x$ tenglik o‘rinli bo‘lsa,

$f(x) = 2$ **tenglamaning haqiqiy ildizlari *yig‘indisini* toping.**

A) $\frac{1}{3}$

B) $-\frac{1}{3}$

C) $\frac{2}{3}$

D) $-\frac{2}{3}$

8. [2,4 ball]

$f(x) = (\cos x)^{\sin x}$ bo‘lsa, $f'(x)$ **ni hisoblang.**

A) $(\cos x)^{\sin x}\left(\cos x \ln(\cos x) + \frac{\sin^2 x}{\cos x}\right)$

B) $(\cos x)^{\sin x}\left(\cos x \ln(\cos x) - \frac{\sin^2 x}{\cos x}\right)$

C) $(\cos x)^{\sin x}\left(\sin x \ln(\cos x) - \frac{\sin^2 x}{\cos x}\right)$

D) $(\cos x)^{\sin x}(\cos x \ln(\cos x) - \operatorname{tg} x)$

9. [0,9 ball]

Agar $x \neq 0$ da $3 \cdot f(x) + f\left(\frac{1}{x}\right) = 8x$ tenglik o‘rinli bo‘lsa,

$y = f(x)$ **funksiya uchun grafigi** $A(1;2)$ **nuqtadan o‘tadigan boshlang‘ich funksiyani toping.**

A) $F(x) = \frac{3x^2}{2} - \ln|x| + \frac{1}{2}$

B) $F(x) = \frac{3x^2}{2} + \ln|x| + \frac{1}{2}$

C) $F(x) = \frac{3x^2}{2} + \frac{1}{x^2} - \frac{1}{2}$

D) $F(x) = \frac{3x^2}{2} - \frac{1}{x^2} - \frac{3}{2}$

10. [2,4 ball]

$$\int \frac{dx}{3+\cos x}$$

Integralni hisoblang.

A) $\frac{1}{2\sqrt{2}} \cdot \operatorname{arctg}\left(\frac{1}{\sqrt{10}} \cdot \operatorname{tg}\frac{x}{2}\right) + C$

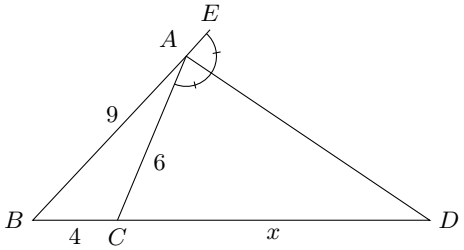
B) $\frac{1}{2\sqrt{2}} \cdot \operatorname{arctg}\left(\frac{1}{\sqrt{2}} \cdot \operatorname{tg}\frac{x}{2}\right) + C$

C) $\frac{1}{\sqrt{2}} \cdot \operatorname{arctg}\left(\sqrt{2} \cdot \operatorname{tg}\frac{x}{2}\right) + C$

D) $\frac{1}{\sqrt{2}} \cdot \operatorname{arctg}\left(\frac{1}{\sqrt{2}} \cdot \operatorname{tg}\frac{x}{2}\right) + C$

11. [0,9 ball]

Quyidagi chizmada AD kesma CAE burchakning bissektrisasi. Bunda B, A va E nuqtalar bir to‘g‘ri chiziqda yotadi. Agar $AB = 9$, $AC = 6$ va $BC = 4$ bo‘lsa,



$CD = x$ **ning uzunligini toping.**

A) *9*

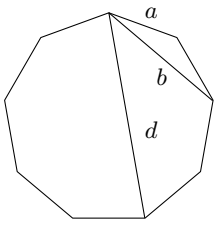
B) *8*

C) *7*

D) *10*

12. [2,4 ball]

Muntazam to‘qqizburchakning tomoni, eng kichik diagonali va eng katta diagonali mos ravishda a, b va d ga teng (chizma).



Berilgan ma’lumotlardan foydalanib, a, b va d lar uchun quyidagi munosabat(tenglik)lardan qaysi biri har doim o‘rinli bo‘ladi?

A) $d^2 = a^2 + b^2$

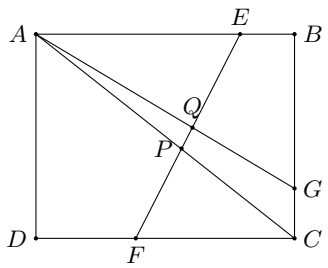
B) $b = \dfrac{a+d}{2}$

C) $d = a + b$

D) $b^2 = ad$

13. [0,9 ball]

$ABCD$ to‘g‘ri to‘rtburchakda AB=5, BC=4, $EB = CG$=1 va DF=2. AG kesma va AC diagonal EF kesmani Q va P nuqtalarda kesadi (chizma).



$\dfrac{PQ}{FE}$ **ni toping.**

A) $\dfrac{11}{91}$

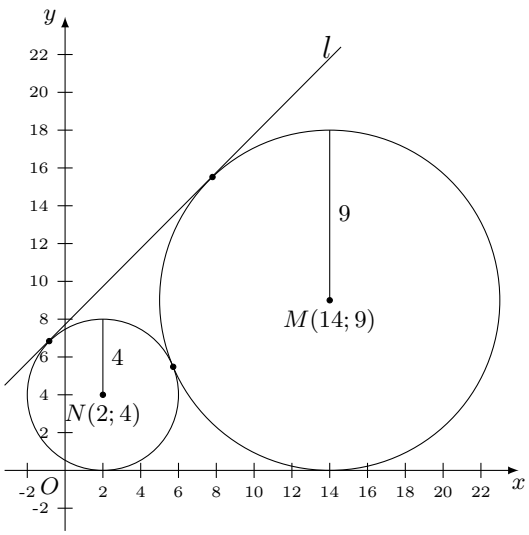
B) $\dfrac{12}{91}$

C) $\dfrac{10}{91}$

D) $\dfrac{9}{91}$

14. [2,4 ball]

Quyidagi chizmada radiuslari 4 va 9 ga teng bo‘lgan ikkita o‘zaro urinuvchi aylanalar va ularga o‘tkazilgan umumiy l urinma tasvirlangan. Bu aylanalarning markazlari $N\,(2;4)$ va $M\,(14;9)$ nuqtalarda joylashgan.



l to‘g‘ri chiziq (urinma) bilan Oy o‘qi kesishgan nuqtaning koordinatalarini toping.

A) $\left(0;\dfrac{911}{119}\right)$

B) $\left(0;\dfrac{922}{119}\right)$

C) $\left(0;\dfrac{913}{119}\right)$

D) $\left(0;\dfrac{912}{119}\right)$

15. [0,9 ball]

Barcha to‘rt xonali natural sonlar ichida raqamlaridan faqat uchtasi (ixtiyoriy tartibda) teng bo‘lgan va to‘rtinchi raqam bu uchta teng raqamdan kichik bo‘lgan **sonlar jami nechta**?

A) *162*

B) *153*

C) *180*

D) *171*

16. [1,7 ball]

Uchlari muntazam yettiburchakning ixtiyoriy 3 ta uchida joylashgan uchburchak tasodifiy tanlandi. So‘ngra uchlari yettiburchakning qolgan uchlaridan ixtiyoriy 3 tasida joylashgan uchburchak tanlandi.

Bu tanlangan uchburchaklarning tomonlari kesishmaslik ehtimolligini toping.

A) $\frac{1}{4}$

B) $\frac{19}{70}$

C) $\frac{3}{10}$

D) $\frac{3}{14}$

17. [0,9 ball]

2024 ta to‘plam berilgan bo‘lib, bu to‘plamlarning har birida 135 tadan element mavjud. Bu to‘plamlardan ixtiyoriy ikkitasining birlashmasi 269 ta elementga ega bo‘ladi.

2024 ta to‘plamning *birlashmasi* eng ko‘pi bilan nechta elementdan iborat bo‘ladi?

A) $2024 \cdot 135 - 2023$

B) $2024 \cdot 135 - 1$

C) $134 \cdot 2023 + 1$

D) $134 \cdot 2023 + 136$

18. [0,9 ball]

$\frac{2022^3 - 2021^3 - 1}{2021 \cdot 2022}$ **ni hisoblang.**

Javob: _____

Diqqat! Javobingizni javoblar varaqasiga ko‘chirib yozing.

19. [1,7 ball]

Ikki xonali natural sonni, shu son raqamlarining o‘rnini almashtirib yozishdan hosil bo‘lgan songa ko‘paytmasi 2430 ga teng.

Shu ikki xonali sonning raqamlari yig‘indisini toping.

Javob: _____

Diqqat! Javobingizni javoblar varaqasiga ko‘chirib yozing.

20. [0,9 ball]

Agar a va b natural sonlar uchun $3\sqrt{2+\sqrt{2+\sqrt{3}}} = a\cos\frac{\pi}{b}$ tenglik o‘rinli bo‘lsa,

$a + b$ **ni toping**.

Javob: _____

Diqqat! Javobingizni javoblar varaqasiga ko‘chirib yozing.

21. [1,7 ball]

Agar $a, b, c \neq 0$ da $\dfrac{8a^2}{a^2+9} = b$, $\dfrac{10b^2}{b^2+16} = c$ va $\dfrac{6c^2}{c^2+25} = a$ tengliklar o‘rinli bo‘lsa,

$a+b+c$ **ning qiymatini toping.**

Javob: _____

Diqqat! Javobingizni javoblar varaqasiga ko‘chirib yozing.

22. [0,9 ball]

$\left(\sqrt{x+1}+\sqrt{x-2}\right)\left(x-2\sqrt{x-2}+2\right) = 9$

Tenglamaning haqiqiy ildizlari *yig‘indisini* (agar yagona bo‘lsa, ildizini) toping.

Javob: _____

Diqqat! Javobingizni javoblar varaqasiga ko‘chirib yozing.

23. [1,7 ball]

x, y, z musbat haqiqiy sonlarda

$$\begin{cases} xyz = 1 \\ x + \dfrac{1}{z} = 5 \\ y + \dfrac{1}{x} = 29 \\ z + \dfrac{1}{y} = \dfrac{m}{n} \end{cases}$$

tenglamalar sistemasi o‘rinli bo‘lsin. Agar m va n o‘zaro tub natural sonlar bo‘lsa,

$m+n$ **ning qiymatini toping.**

Javob: _____

Diqqat! Javobingizni javoblar varaqasiga ko‘chirib yozing.

24. [2,4 ball]

$$x^4 = \frac{11x-6}{6x-11}$$

Tenglamaning haqiqiy ildizlari *yig‘indisini* toping.

Javob: _____

Diqqat! Javobingizni javoblar varaqasiga ko‘chirib yozing.

25. [2,4 ball]

$$\frac{(x+1)^4}{x\left(x^2+1\right)} < \frac{128}{15}$$

Tengsizlikning $[-2; 100)$ **oraliqqa tegishli bo‘lgan barcha *butun* yechimlarining o‘rta arifmetik qiymatini toping.**

Javob: _____

Diqqat! Javobingizni javoblar varaqasiga ko‘chirib yozing.

26. [0,9 ball]

Agar $x \neq 0$ da $f(x) + 2 \cdot f\left(\frac{1}{x}\right) = 3x$ tenglik o‘rinli bo‘lsa,

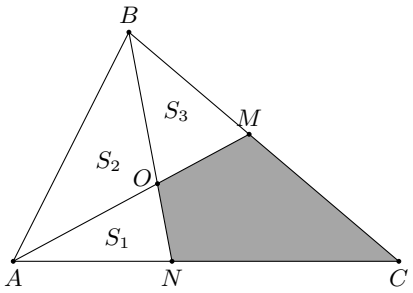
$f'(x) = -4$ **tenglamaning haqiqiy ildizlari *ko‘paytmasini* toping.**

Javob: _____

Diqqat! Javobingizni javoblar varaqasiga ko‘chirib yozing.

27. [1,7 ball]

Quyidagi chizmada $\triangle ABC$ berilgan bo‘lib, uchburchakning BC va AC tomonlaridan mos ravishda M va N nuqtalar olingan. AM va BN kesmalar O nuqtada kesishgan. Agar AON, AOB va BOM uchburchaklarning yuzlari mos ravishda $S_1 = 6$, $S_2 = 12$ va $S_3 = 8$ bo‘lsa,



chizmada bo‘yalgan $NCMO$ to‘rtburchakning yuzini toping.

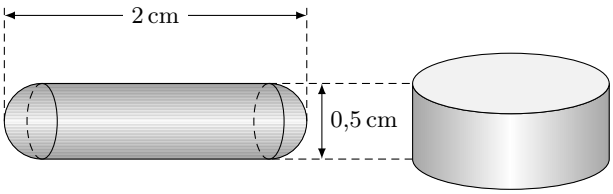
Javob: _____

Diqqat! Javobingizni javoblar varaqasiga ko‘chirib yozing.

28-30.

Berilgan ma’lumotlar asosida quyidagi uchta 28-, 29-, 30-test topshiriqlarini bajaring.

Quyidagi rasmda to‘la sirti yuzlari teng bo‘lgan ikkita turli shakldagi dorilar tasvirlangan. 1-rasmda ikki yoni ikki yarimshardan va o‘rta qismi silindrsimon bir butun jismdan iborat bo‘lgan kapsulali dori tasvirlangan. Uning umumiy uzunligi 2 cm ga va yarimshardan iborat bo‘lgan qismining diametri esa 0,5 cm ga teng. 2-rasmda tasvirlangan silindrsimon tabletkaning balandligi 0,5 cm ga teng.



1-rasm 2-rasm

Topshiriqlar	Javoblar
28. [0,9 ball] 2-rasmdagi silindrsimon tabletka asosining radiusini (cm) **toping**. **29.** [1,7 ball] 2-rasmda tasvirlangan tabletkaning yon sirti yuzini (cm^2) **toping**. ($\pi \approx 3$ deb oling). **30.** [2,4 ball] 2-rasmda tasvirlangan tabletkaning hajmini (cm^3) **toping**. ($\pi \approx 3$ deb oling).	A) $\frac{1}{4}$ B) $\frac{3}{4}$ C) $\frac{3}{8}$ D) $\frac{1}{2}$ E) $2\frac{1}{4}$ F) $1\frac{1}{2}$