Pismeni: Potencije A grupa Učenik: _____ **Bodovi / ocjene:** _____

Tijekom pisanog ispita nije dozvoljeno koristiti kalkulator, mobitel niti pametni sat!

Bodovi

1. Izračunati $\dfrac{\left(\frac{3}{4}\right)^2-\left(\frac{2}{3}\right)^{-3}\cdot(-3)^0}{1-(-2)^{-4}}$. _____/3

$$= \frac{\frac{9}{16}-\left(\frac{3}{2}\right)^3\cdot 1}{1-\left(-\frac{1}{2}\right)^4} = \frac{\frac{9}{16}-\frac{27}{8}}{1-\frac{1}{16}} = \frac{\frac{9-54}{16}}{\frac{16-1}{16}} = \frac{-\frac{45}{16}\,3}{\frac{15}{16}\,1} = -\frac{3}{1} = \boxed{-3}$$

2. Pojednostavniti izraz $\left(\dfrac{a^3b^{-2}}{8c^4d^{-3}}\right)^{-2}:\left(\dfrac{a^{-2}c^5}{4b^4d^{-3}}\right)^{-3}$. _____/3

($8 = 2^3$, $4 = 2^2$)

$$= \frac{a^{-6}b^4}{2^{-6}c^{-8}d^6} : \frac{a^6c^{-15}}{2^{-6}b^{-12}d^9} = \frac{2^6b^4c^8}{a^6d^6} : \frac{2^6a^6b^{12}}{c^{15}d^9} =$$

$$= \frac{2^6b^4c^8}{a^6d^6}\cdot\frac{c^{15}d^9}{2^6a^6b^{12}} = \boxed{\frac{c^{23}d^3}{a^{12}b^8}}$$

3. Zapisati u obliku potencije:

a) broja 3 izraz $5\cdot 3^7-6\cdot 9^3$ _____/2

$$= 5\cdot 3^7 - 2\cdot 3\cdot (3^2)^3 =$$
$$= 5\cdot 3^7 - 2\cdot 3\cdot 3^6 =$$
$$= 5\cdot 3^7 - 2\cdot 3^7 =$$
$$= 3\cdot 3^7$$
$$= \boxed{3^8}$$

b) broja 10 izraz $100\cdot\dfrac{0.0001}{100^{-3}\cdot 0.1}$ _____/2

$$= 10^2\cdot\frac{10^{-4}}{(10^2)^{-3}\cdot 10^{-1}} =$$
$$= \frac{10^2}{1}\cdot\frac{10^{-4}}{10^{-6}\cdot 10^{-1}} =$$
$$= \frac{10^{-2}}{10^{-7}}$$
$$= 10^{-2-(-7)} = 10^{-2+7} = \boxed{10^5}$$

4. Poredati po veličini (od najmanjeg do najvećeg) brojeve 10^{-5}, -0.1^5, $(-10)^5$ i 0.1^{-5}. ____/2

$10^{-5} = \left(\frac{1}{10}\right)^5 = 0,00001$ (3.)

$-0.1^5 = -0,00001$ (2.)

$(-10)^5 = -100000$ (1.)

$0.1^{-5} = \left(\frac{1}{10}\right)^{-5} = 10^5 = 100000$ (4.)

$(-10)^5 < -0,1^5 < 10^{-5} < 0,1^{-5}$

5. Prikazati u znanstvenom zapisu navedene brojeve:

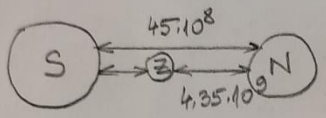
a) Starost svemira se procjenjuje na 13.8 milijardi godina. ____/1

$13,8 \cdot 10^9 = \boxed{1,38 \cdot 10^{10}}$

b) Električni naboj protona iznosi 0.000 000 000 000 000 000 1602 C. ____/1

$\boxed{1,602 \cdot 10^{-19}}$

c) Ako je prosječna udaljenost Neptuna od Sunca $45 \cdot 10^8$ km, a od Zemlje 4.35 milijardi km, kolika je prosječna udaljenost Zemlje od Sunca? ____/3



$45 \cdot 10^8 - 4,35 \cdot 10^9 = 4,5 \cdot 10^9 - 4,35 \cdot 10^9 =$

$= 0,15 \cdot 10^9 = \boxed{1,5 \cdot 10^8}$

d) $\frac{(51 \cdot 10^{-9}) \cdot (3,6 \cdot 10^{53})}{4 \cdot 10^{-7}} = \frac{183,6 \cdot 10^{44}}{4 \cdot 10^{-7}} = 45,9 \cdot 10^{44-(-7)} = 45,9 \cdot 10^{51} =$ ____/2

$= \boxed{4,59 \cdot 10^{52}}$

6. Izvršiti navedene pretvorbe i rezultate prikazati u znanstvenom obliku:

a) 0.476 km = $4,76 \cdot 10^{-1}$ km $= 4,76 \cdot 10^{-1} \cdot 10^4$ dm $= \boxed{4,76 \cdot 10^3}$ dm ____/1

b) 2.5 dm = $2,5 \cdot 10^{-1}$ m $= 2,5 \cdot 10^{-1} \cdot 10^6$ µm $= \boxed{2,5 \cdot 10^5}$ µm ____/1

c) 100 GB = $1 \cdot 10^2$ GB $= 1 \cdot 10^2 \cdot 10^6$ kB $= \boxed{1 \cdot 10^8}$ kB ____/1

d) 0.1 kB = $1 \cdot 10^{-1}$ kB $= 1 \cdot 10^{-1} \cdot 10^{-3}$ MB $= \boxed{1 \cdot 10^{-4}}$ MB ____/1

Bodovna ljestvica – ukupno 23 boda:
9 bodova – dovoljan (2), 13 bodova – dobar (3), 17 bodova – vrlo dobar (4), 21 bod – odličan (5)

Pismeni: Potencije B grupa Učenik: _____ **Bodovi / ocjene:** _____

Tijekom pisanog ispita nije dozvoljeno koristiti kalkulator, mobitel niti pametni sat!

Bodovi

1. Izračunati $\dfrac{\left(\frac{4}{5}\right)^{-3} - (-3)^0 \cdot \left(\frac{3}{4}\right)^3}{2-(-5)^{-2}}$. _____/3

$$= \frac{\left(\frac{5}{4}\right)^3 - 1 \cdot \frac{27}{64}}{2-\left(-\frac{1}{5}\right)^2} = \frac{\frac{125}{64} - \frac{27}{64}}{2-\frac{1}{25}} = \frac{\frac{98}{64}}{\frac{50-1}{25}} = \frac{\frac{98}{64}}{\frac{49}{25}} = \frac{50}{64} = \boxed{\frac{25}{32}}$$

2. Pojednostavniti izraz $\left(\dfrac{16a^{-2}b^3}{c^5d^{-4}}\right)^{-3} : \left(\dfrac{8b^{-5}c^3}{a^2d^{-4}}\right)^{-4}$. _____/3

($16 = 2^4$, $8 = 2^3$)

$$= \frac{2^{-12}a^6b^{-9}}{c^{-15}d^{12}} : \frac{2^{-12}b^{20}c^{-12}}{a^{-8}d^{16}} = \frac{a^6c^{15}}{2^{12}b^9d^{12}} : \frac{a^8b^{20}}{2^{12}c^{12}d^{16}} =$$

$$= \frac{a^6c^{15}}{2^{12}b^9d^{12}} \cdot \frac{2^{12}c^{12}d^{16}}{a^8b^{20}} = \boxed{\frac{c^{27}d^4}{a^2b^{29}}}$$

3. Zapisati u obliku potencije:

a) broja 2 izraz $5\cdot 2^{15} - 6\cdot 4^7$ _____/2

$$= 5\cdot 2^{15} - 3\cdot 2\cdot (2^2)^7 =$$
$$= 5\cdot 2^{15} - 3\cdot 2\cdot 2^{14} =$$
$$= 5\cdot 2^{15} - 3\cdot 2^{15} =$$
$$= 2\cdot 2^{15} =$$
$$= \boxed{2^{16}}$$

b) broja 10 izraz $100^2 : \dfrac{100000}{10^{-4}\cdot 0.001}$ _____/2

$$= (10^2)^2 : \frac{10^5}{10^{-4}\cdot 10^{-3}} =$$
$$= 10^4 : \frac{10^5}{10^{-7}} =$$
$$= 10^4 : 10^{5-(-7)} =$$
$$= 10^4 : 10^{5+7} =$$
$$= 10^4 : 10^{12} = \boxed{10^{-8}}$$

4. Poredati po veličini (od najmanjeg do najvećeg) brojeve -10^{-5}, 0.1^5, 10^5 i $(-0.1)^{-5}$. /2

$-10^{-5} = -\left(\frac{1}{10}\right)^5 = -0.00001$ (2.)

$0.1^5 = 0.00001$ (3.)

$10^5 = 100000$ (4.)

$(-0.1)^{-5} = \left(-\frac{1}{10}\right)^{-5} = (-10)^5 = -100000$ (1.)

$(-0.1)^{-5} < -10^{-5} < 0.1^5 < 10^5$

5. Prikazati u znanstvenom zapisu navedene brojeve:

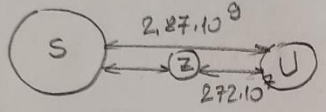
a) Asteroid koji je uništio dinosaure udario je u Zemlju prije otprilike 66 milijuna godina. /1

$66 \cdot 10^6 = \boxed{6.6 \cdot 10^7}$

b) Masa protona iznosi 0.000 000 000 000 000 000 000 000 001 672 kg. /1

$\boxed{1.672 \cdot 10^{-27}}$

c) Ako je prosječna udaljenost Urana od Sunca 2.87 milijardi km, a od Zemlje $272 \cdot 10^7$ km, kolika je prosječna udaljenost Zemlje od Sunca? /3



$2.87 \cdot 10^9 - 272 \cdot 10^7 = 2.87 \cdot 10^9 - 2.72 \cdot 10^9 = 0.15 \cdot 10^9 = \boxed{1.5 \cdot 10^8}$

d) $\frac{(31 \cdot 10^{-8}) \cdot (4.9 \cdot 10^{47})}{7 \cdot 10^{-5}} = \frac{151.9 \cdot 10^{39}}{7 \cdot 10^{-5}} = 21.7 \cdot 10^{39-(-5)} = 21.7 \cdot 10^{44} = \boxed{2.17 \cdot 10^{45}}$ /2

6. Izvršiti navedene pretvorbe i rezultate prikazati u znanstvenom obliku:

a) 0.476 m = $4.76 \cdot 10^{-1}$ m = $4.76 \cdot 10^{-1} \cdot 10^3$ mm = $\boxed{4.76 \cdot 10^2}$ mm /1

b) 2.5 μm = $\boxed{2.5 \cdot 10^{-3}}$ mm /1

c) 100 kB = $1 \cdot 10^2$ kB = $1 \cdot 10^2 \cdot 10^{-6}$ GB = $\boxed{1 \cdot 10^{-4}}$ GB /1

d) 0.1 TB = $1 \cdot 10^{-1}$ TB = $1 \cdot 10^{-1} \cdot 10^6$ MB = $\boxed{1 \cdot 10^5}$ MB /1

Bodovna ljestvica – ukupno 23 boda:
9 bodova – dovoljan (2), 13 bodova – dobar (3), 17 bodova – vrlo dobar (4), 21 bod – odličan (5)