

OLIMPIADA DE MATEMATICĂ A SATELOR DIN ROMÂNIA
BAREM CORECTARE - ETAPA JUDEȚEANĂ
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Problema 1. (7 puncte)

a) $a = 1 + \frac{1}{1 \cdot 2} + \frac{1}{2 \cdot 3} + \frac{1}{3 \cdot 4} + \dots + \frac{1}{n \cdot (n+1)} = 2 - \frac{1}{n+1} < 2 \dots \dots \dots (4p)$

b) $2 - \frac{1}{n+1} = \frac{4047}{2024} \Rightarrow n = 2023 \dots \dots \dots (3p)$

Problema 2. (7 puncte)

a) $b = \sqrt{(\sqrt{2} - \sqrt{6})^2} + \sqrt{(\sqrt{2} + \sqrt{6})^2} = |\sqrt{2} - \sqrt{6}| + |\sqrt{2} + \sqrt{6}| = \sqrt{6} - \sqrt{2} + \sqrt{6} + \sqrt{2} = 2\sqrt{6} \dots \dots \dots (4p)$

b) $\sqrt{b^2 + 1} = 5, \sqrt{b^2 - 8} = 4, m_g = 2\sqrt{5} \dots \dots \dots (3p)$

Problema 3. (7 puncte)

Desen corect.....(1p)

Fie M mijloc BC și $BF \perp DC, F \in DC \Rightarrow \Delta BFC$ dr. is.(1p)

ΔBFC is., FM mediană $\Rightarrow FM$ mediat. segmentului BC(1p)

$BF = AD \Rightarrow AD = FC$ (1).....(1p)

$\sphericalangle DFE = \sphericalangle MFC = 45^\circ \Rightarrow \Delta DFE$ dr. is. $\Rightarrow DE = DF$ (2)(2p)

Din (1), (2) $\Rightarrow AE = DC$ (1p)

Problema 4. (7 puncte)

Desen corect.....(1p)

a) $\left. \begin{array}{l} \sphericalangle MAB \equiv \sphericalangle MNC \text{ (alt. int)} \\ \sphericalangle AMB \equiv \sphericalangle NMC \text{ (op. la varf)} \end{array} \right\} \stackrel{U.U.}{\Rightarrow} \Delta ABM \sim \Delta NCM \dots \dots \dots (1p)$

b) $\Delta ABM \sim \Delta NCM \Rightarrow \frac{AB}{CN} = \frac{BM}{MC}$ (1)(1p)

$DC \parallel BP \stackrel{T.F.A}{\Rightarrow} \Delta CDM \sim \Delta BPM \Rightarrow \frac{BP}{CD} = \frac{BM}{MC}$ (2)(1p)

Din (1) și (2) $\Rightarrow \frac{AB}{CN} = \frac{BP}{CD}$, dar $AB = CD \Rightarrow AB^2 = BP \cdot CN$ (1p)

c) $L = 3l, A_{drept} = L \cdot l = 3l^2, l_{patrat} = \frac{l}{3} \Rightarrow A_{patrat} = \frac{l^2}{9} \dots \dots \dots (1p)$

Nr. pătrate = $3l^2 : \frac{l^2}{9} = 27 \dots \dots \dots (1p)$

Se acordă cele 2 puncte și dacă se demonstrează prin desen.