

LUYỆN THI VÀO LỚP 10 MÔN TOÁN

GIÁO VIÊN: NGUYỄN THÀNH LONG

SỬ DỤNG BIẾN ĐỔI HẰNG ĐẲNG THỨC BIỂU THỨC TRONG CĂN (PHẦN 2)

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Câu 1: rút gọn các biểu thức sau:

a) $\sqrt{\sqrt{3}-\sqrt{1-\sqrt{21-12\sqrt{3}}}}$

b) $\sqrt{6+2\sqrt{5-\sqrt{13+\sqrt{48}}}}$

c) $\sqrt{\sqrt{5}+\sqrt{3+\sqrt{29-12\sqrt{5}}}}$

Câu 2: rút gọn biểu thức sau:

a) $A = \sqrt{4+\sqrt{10+2\sqrt{5}}} + \sqrt{4-\sqrt{10+2\sqrt{5}}}$

b) $B = \sqrt{8\sqrt{3}} - 2\sqrt{25\sqrt{12}} + 4\sqrt{\sqrt{192}}$

c) $C = 2\sqrt{2}(\sqrt{3}-2) + (1+2\sqrt{2})^2 - 2\sqrt{6}$

d) $D = (\sqrt{20} - \sqrt{45} + \sqrt{5}) \cdot \sqrt{5}$

Câu 3: rút gọn các biểu thức sau:

a) $A = (\sqrt{14} - \sqrt{10})(6 - \sqrt{35})\sqrt{6 + \sqrt{35}}$

b) $B = \sqrt{2-\sqrt{3}}(\sqrt{3}+1)$

c) $C = (5+2\sqrt{6})(49-20\sqrt{6})\sqrt{5-2\sqrt{6}}$

d) $D = (2+\sqrt{3}-\sqrt{2})(2-\sqrt{3}-\sqrt{2})(3+\sqrt{2})\sqrt{3-2\sqrt{2}}$

Giải

Câu 1: rút gọn các biểu thức sau:

a)
$$\begin{aligned} \sqrt{\sqrt{3}-\sqrt{1-\sqrt{21-12\sqrt{3}}}} &= \sqrt{\sqrt{3}-\sqrt{1-\sqrt{21-2.3.2\sqrt{3}}}} \\ &= \sqrt{\sqrt{3}-\sqrt{1-\sqrt{12-2.3.2\sqrt{3}+9}}} = \sqrt{\sqrt{3}-\sqrt{1-\sqrt{(2\sqrt{3}-3)^2}}} \end{aligned}$$

$$\begin{aligned}
 &= \sqrt{\sqrt{3} - \sqrt{1 - 2\sqrt{3} + 3}} = \sqrt{\sqrt{3} - \sqrt{4 - 2\sqrt{3}}} = \sqrt{\sqrt{3} - \sqrt{(\sqrt{3} - 1)^2}} \\
 &= \sqrt{\sqrt{3} - (\sqrt{3} - 1)} = \sqrt{1} = 1
 \end{aligned}$$

$$\begin{aligned}
 \text{a)} \quad &\sqrt{6 + 2\sqrt{5 - \sqrt{13 + \sqrt{48}}}} = \sqrt{6 + 2\sqrt{5 - \sqrt{13 + 4\sqrt{3}}}} \\
 &= \sqrt{6 + 2\sqrt{5 - \sqrt{12 + 2 \cdot 2\sqrt{3} + 1}}} = \sqrt{6 + 2\sqrt{5 - \sqrt{(2\sqrt{3} + 1)^2}}} \\
 &= \sqrt{6 + 2\sqrt{5 - 2\sqrt{3} - 1}} = \sqrt{6 + 2\sqrt{4 - 2\sqrt{3}}} = \sqrt{6 + 2\sqrt{(\sqrt{3} - 1)^2}} \\
 &= \sqrt{6 + 2(\sqrt{3} - 1)} = \sqrt{6 + 2\sqrt{3} - 2} = \sqrt{4 + 2\sqrt{3}} = \sqrt{(\sqrt{3} + 1)^2} = \sqrt{3} + 1
 \end{aligned}$$

$$\begin{aligned}
 \text{b)} \quad &\sqrt{\sqrt{5} + \sqrt{3} + \sqrt{29 - 12\sqrt{5}}} = \sqrt{\sqrt{5} + \sqrt{3} + \sqrt{20 - 2 \cdot 3 \cdot 2\sqrt{5} + 9}} \\
 &= \sqrt{\sqrt{5} + \sqrt{3} + \sqrt{(2\sqrt{5} - 3)^2}} = \sqrt{\sqrt{5} + \sqrt{3} + 2\sqrt{5} - 3} = \sqrt{\sqrt{5} + 2\sqrt{5}} = \sqrt{3\sqrt{5}}
 \end{aligned}$$

Câu 2: rút gọn biểu thức:

$$\text{a)} \quad A = \sqrt{4 + \sqrt{10 + 2\sqrt{5}}} + \sqrt{4 - \sqrt{10 + 2\sqrt{5}}}$$

Ta có:

$$\begin{aligned}
 A^2 &= 4 + \sqrt{10 + 2\sqrt{5}} + 4 - \sqrt{10 + 2\sqrt{5}} + 2\sqrt{(4 + \sqrt{10 + 2\sqrt{5}})(4 - \sqrt{10 + 2\sqrt{5}})} \\
 &= 8 + 2\sqrt{16 - (10 + 2\sqrt{5})} = 8 + 2\sqrt{6 - 2\sqrt{5}} = 8 + 2\sqrt{5 - 2\sqrt{5} + 1} \\
 &= 8 + 2\sqrt{(\sqrt{5} - 1)^2} = 8 + 2(\sqrt{5} - 1) = 8 + 2\sqrt{5} - 2 = 6 + 2\sqrt{5} \\
 \Rightarrow A &= \sqrt{6 + 2\sqrt{5}} = \sqrt{5 + 2\sqrt{5} + 1} = \sqrt{(\sqrt{5} + 1)^2} = \sqrt{5} + 1
 \end{aligned}$$

$$\begin{aligned}
 \text{b)} \quad B &= \sqrt{8\sqrt{3}} - 2\sqrt{25\sqrt{12}} + 4\sqrt{\sqrt{192}} = \sqrt{4 \cdot 2\sqrt{3}} - 2\sqrt{5 \cdot 5\sqrt{12}} + 4\sqrt{\sqrt{16 \cdot 12}} \\
 &= 2\sqrt{\sqrt{12}} - 10\sqrt{\sqrt{12}} + 8\sqrt{\sqrt{12}} = 0
 \end{aligned}$$

$$\text{c)} \quad C = 2\sqrt{2}(\sqrt{3} - 2) + (1 + 2\sqrt{2})^2 - 2\sqrt{6} = 2\sqrt{6} - 4\sqrt{2} + 1 + 4\sqrt{2} + 8 - 2\sqrt{6} = 9$$

$$\text{d)} \quad D = (\sqrt{20} - \sqrt{45} + \sqrt{5}) \cdot \sqrt{5} = (2\sqrt{5} - 3\sqrt{5} + \sqrt{5}) \cdot \sqrt{5} = 0 \cdot \sqrt{5} = 0$$

Câu 3: rút gọn biểu thức:

$$\text{a)} \quad A = (\sqrt{14} - \sqrt{10})(6 - \sqrt{35})\sqrt{6 + \sqrt{35}} = (\sqrt{7} - \sqrt{5})(6 - \sqrt{35})\sqrt{12 + 2\sqrt{35}}$$

$$\begin{aligned}
 &= (\sqrt{7} - \sqrt{5})(6 - \sqrt{35})\sqrt{(\sqrt{7} + \sqrt{5})^2} = (\sqrt{7} - \sqrt{5})(6 - \sqrt{35})(\sqrt{7} + \sqrt{5}) \\
 &= (7 - 5)(6 - \sqrt{35}) = 2(6 - \sqrt{35}) = 12 - 2\sqrt{35}
 \end{aligned}$$

$$\begin{aligned}
 \text{b) } B &= \sqrt{2 - \sqrt{3}}(\sqrt{3} + 1) = \frac{\sqrt{4 - 2\sqrt{3}}(\sqrt{3} + 1)}{\sqrt{2}} = \frac{\sqrt{3 - 2\sqrt{3} + 1}(\sqrt{3} + 1)}{\sqrt{2}} \\
 &= \frac{(\sqrt{3} - 1)(\sqrt{3} + 1)}{\sqrt{2}} = \frac{3 - 1}{\sqrt{2}} = \sqrt{2}
 \end{aligned}$$

$$\begin{aligned}
 \text{c) } C &= (5 + 2\sqrt{6})(49 - 20\sqrt{6})\sqrt{5 - 2\sqrt{6}} = (5 + 2\sqrt{6})(25 - 2 \cdot 5 \cdot 2\sqrt{6} + 24)\sqrt{3 - 2\sqrt{3} \cdot \sqrt{2} + 2} \\
 &= (5 + 2\sqrt{6})(5 - 2\sqrt{6})^2(\sqrt{3} - \sqrt{2}) = (5^2 - (2\sqrt{6})^2)(5 - 2\sqrt{6})(\sqrt{3} - \sqrt{2}) \\
 &= (5 - 2\sqrt{6})(\sqrt{3} - \sqrt{2}) = 5\sqrt{3} - 5\sqrt{2} - 6\sqrt{2} + 4\sqrt{3} = 9\sqrt{3} - 11\sqrt{2}
 \end{aligned}$$

$$\begin{aligned}
 \text{d) } D &= (2 + \sqrt{3} - \sqrt{2})(2 - \sqrt{3} - \sqrt{2})(3 + \sqrt{2})\sqrt{3 - 2\sqrt{2}} \\
 &= ((2 - \sqrt{2}) + \sqrt{3})((2 - \sqrt{2}) - \sqrt{3})(3 + \sqrt{2})\sqrt{2 - 2\sqrt{2} + 1} \\
 &= ((2 - \sqrt{2})^2 - 3)(3 + \sqrt{2})(\sqrt{2} - 1) \\
 &= (4 - 4\sqrt{2} + 2 - 3)(3\sqrt{2} - 3 + 2 - \sqrt{2}) = (3 - 4\sqrt{2})(2\sqrt{2} - 1) \\
 &= 6\sqrt{2} - 3 - 16 + 4\sqrt{2} = 10\sqrt{2} - 19
 \end{aligned}$$

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