

根号を含む式の加減 1 解答編

I. 次の計算を下さい。

- ① $2\sqrt{3} + 3\sqrt{3} = 5\sqrt{3}$
- ② $5\sqrt{3} - 2\sqrt{3} = 3\sqrt{3}$
- ③ $3\sqrt{3} + 2\sqrt{3} + 4\sqrt{3} = 9\sqrt{3}$
- ④ $2\sqrt{2} + 3\sqrt{2} - 6\sqrt{2} = -\sqrt{2}$
- ⑤ $3\sqrt{7} - 2\sqrt{7} = \sqrt{7}$
- ⑥ $4\sqrt{2} - \sqrt{2} = 3\sqrt{2}$
- ⑦ $2\sqrt{5} - 4\sqrt{5} = -2\sqrt{5}$
- ⑧ $\sqrt{3} + \sqrt{3} = 2\sqrt{3}$
- ⑨ $\sqrt{2} - \sqrt{2} = 0$
($1\sqrt{2} - 1\sqrt{2} = 0\sqrt{2} = 0$)
- ⑩ $4\sqrt{5} - \sqrt{5} = 3\sqrt{5}$

II. 次の計算を下さい。

- ① $3\sqrt{10} + 2\sqrt{5} + 3\sqrt{5} - 5\sqrt{10} = 5\sqrt{5} - 2\sqrt{10}$
- ② $3\sqrt{3} + 4\sqrt{2} - 2\sqrt{3} = 4\sqrt{2} + \sqrt{3}$
- ③ $6\sqrt{6} - 7\sqrt{6} + 2\sqrt{3} + 2\sqrt{6} - \sqrt{3} = \sqrt{3} + \sqrt{6}$
- ④ $4\sqrt{7} - \sqrt{7} + 3\sqrt{7} - 9\sqrt{7} = -3\sqrt{7}$
- ⑤ $2\sqrt{3} - \sqrt{3} + \sqrt{2} + \sqrt{3} = \sqrt{2} + 2\sqrt{3}$
- ⑥ $3\sqrt{2} + \sqrt{3} - \sqrt{2} + 2\sqrt{3} - 2\sqrt{2} = 3\sqrt{3}$
- ⑦ $1 + 4\sqrt{2} - 3 + 2\sqrt{2} - 8\sqrt{2} = -2 - 2\sqrt{2}$
- ⑧ $2\sqrt{7} - 3\sqrt{6} + 8\sqrt{7} - 4\sqrt{6} = -7\sqrt{6} + 10\sqrt{7}$
- ⑨ $3\sqrt{10} - 2\sqrt{7} + 4 - 2\sqrt{10} - \sqrt{10} = 4 - 2\sqrt{7}$
- ⑩ $-3\sqrt{7} - 2\sqrt{5} + 2\sqrt{7} - \sqrt{5} = -3\sqrt{5} - \sqrt{7}$
- ⑪ $2 - 4\sqrt{5} - 3 + 3\sqrt{5} + 2\sqrt{5} = -1 + \sqrt{5}$
- ⑫ $5\sqrt{3} - 3\sqrt{7} + 4\sqrt{7} - 4\sqrt{5} = 5\sqrt{3} - 4\sqrt{5} + \sqrt{7}$
- ⑬ $2\sqrt{11} - 2\sqrt{7} + 1 - 2\sqrt{11} - \sqrt{11} = 1 - 2\sqrt{7} - \sqrt{11}$
- ⑭ $-3\sqrt{2} - 2\sqrt{2} - 3\sqrt{2} - \sqrt{2} = -9\sqrt{2}$
- ⑮ $3\sqrt{7} + \sqrt{5} - \sqrt{7} + 2\sqrt{5} - 2\sqrt{7} = 3\sqrt{5}$

根号を含む式の加減

2 解答編

$$\begin{aligned} \textcircled{1} \sqrt{12} + \sqrt{27} \\ = \sqrt{2} \sqrt{2} \sqrt{3} + \sqrt{3} \sqrt{3} \sqrt{3} \\ = 2\sqrt{3} + 3\sqrt{3} = 5\sqrt{3} \end{aligned}$$

$$\begin{aligned} \textcircled{2} \sqrt{125} - \sqrt{5} \\ = \sqrt{5} \sqrt{5} \sqrt{5} - \sqrt{5} \\ = 5\sqrt{5} - \sqrt{5} = 4\sqrt{5} \end{aligned}$$

$$\begin{aligned} \textcircled{3} 3\sqrt{28} - 4\sqrt{7} \\ = 3\sqrt{2} \sqrt{2} \sqrt{7} - 4\sqrt{7} \\ = 6\sqrt{7} - 4\sqrt{7} = 2\sqrt{7} \end{aligned}$$

$$\begin{aligned} \textcircled{4} \sqrt{8} - \sqrt{32} \\ = \sqrt{2} \sqrt{2} \sqrt{2} - \sqrt{2} \sqrt{2} \sqrt{2} \sqrt{2} \sqrt{2} \\ = 2\sqrt{2} - 4\sqrt{2} = -2\sqrt{2} \end{aligned}$$

$$\begin{aligned} \textcircled{5} \sqrt{75} - \sqrt{27} \\ = \sqrt{3} \sqrt{5} \sqrt{5} - \sqrt{3} \sqrt{3} \sqrt{3} \\ = 5\sqrt{3} - 3\sqrt{3} = 2\sqrt{3} \end{aligned}$$

$$\begin{aligned} \textcircled{6} \sqrt{18} + \sqrt{8} - \sqrt{50} \\ = \sqrt{2} \sqrt{3} \sqrt{3} + \sqrt{2} \sqrt{2} \sqrt{2} \\ \quad - \sqrt{2} \sqrt{5} \sqrt{5} \\ = 3\sqrt{2} + 2\sqrt{2} - 5\sqrt{2} = 0 \end{aligned}$$

$$\begin{aligned} \textcircled{7} 2\sqrt{7} + \sqrt{49} + \sqrt{63} \\ = 2\sqrt{7} + 7 + \sqrt{3} \sqrt{3} \sqrt{7} \\ = 2\sqrt{7} + 7 + 3\sqrt{7} = 7 + 5\sqrt{7} \end{aligned}$$

$$\begin{aligned} \textcircled{8} \sqrt{18} + \sqrt{50} - 2\sqrt{32} \\ = \sqrt{2} \sqrt{3} \sqrt{3} + \sqrt{2} \sqrt{5} \sqrt{5} \\ \quad - 2\sqrt{2} \sqrt{2} \sqrt{2} \sqrt{2} \sqrt{2} \\ = 3\sqrt{2} + 5\sqrt{2} - 8\sqrt{2} = 0 \end{aligned}$$

以下、前の計算で得た結果を利用して
 $a\sqrt{b}$ の形にすぐに変形しています。

$$\begin{aligned} \textcircled{9} \sqrt{48} - \sqrt{12} + \sqrt{3} \\ = \sqrt{2} \sqrt{2} \sqrt{2} \sqrt{2} \sqrt{3} \\ \quad - 2\sqrt{3} + \sqrt{3} \\ = 4\sqrt{3} - 2\sqrt{3} + \sqrt{3} = 3\sqrt{3} \end{aligned}$$

$$\begin{aligned} \textcircled{10} \sqrt{18} - 2\sqrt{2} - \sqrt{50} \\ = 3\sqrt{2} - 2\sqrt{2} - 5\sqrt{2} \\ = -4\sqrt{2} \end{aligned}$$

$$\begin{aligned} \textcircled{11} 3\sqrt{3} - 2\sqrt{48} + \sqrt{27} \\ = 3\sqrt{3} - 2 \times 4\sqrt{3} + 3\sqrt{3} \\ = -2\sqrt{3} \end{aligned}$$

$$\begin{aligned} \textcircled{12} \sqrt{32} + 5\sqrt{2} - \sqrt{18} \\ = 4\sqrt{2} + 5\sqrt{2} - 3\sqrt{2} \\ = 6\sqrt{2} \end{aligned}$$

$$\begin{aligned} \textcircled{13} \sqrt{63} - \sqrt{7} - 3\sqrt{112} \\ = 2 \times 3\sqrt{7} - \sqrt{7} \\ \quad - 3 \times \sqrt{2} \sqrt{2} \sqrt{2} \sqrt{2} \sqrt{7} \\ = 6\sqrt{7} - \sqrt{7} - 12\sqrt{7} = -7\sqrt{7} \end{aligned}$$

$$\begin{aligned} \textcircled{14} \sqrt{54} - 2\sqrt{6} - 3\sqrt{24} \\ = \sqrt{2} \sqrt{3} \sqrt{3} \sqrt{3} - 2\sqrt{6} - 3 \times \sqrt{2} \sqrt{2} \sqrt{2} \sqrt{3} \\ = 3\sqrt{6} - 2\sqrt{6} - 6\sqrt{6} = -5\sqrt{6} \end{aligned}$$

$$\begin{aligned} \textcircled{15} 3\sqrt{2} - \sqrt{27} - 3\sqrt{18} - \sqrt{12} \\ = 3\sqrt{2} - 3\sqrt{3} - 3 \times 3\sqrt{2} - 2\sqrt{3} \\ = -6\sqrt{2} - 5\sqrt{3} \end{aligned}$$

$$\begin{aligned} \textcircled{16} \sqrt{24} - \sqrt{45} - \sqrt{180} - \sqrt{150} \\ = \sqrt{2} \sqrt{2} \sqrt{2} \sqrt{3} - \sqrt{3} \sqrt{3} \sqrt{5} \\ \quad - \sqrt{2} \sqrt{2} \sqrt{3} \sqrt{3} \sqrt{5} - \sqrt{2} \sqrt{3} \sqrt{5} \sqrt{5} \\ = 2\sqrt{6} - 3\sqrt{5} - 6\sqrt{5} - 5\sqrt{6} = -9\sqrt{5} - 3\sqrt{6} \end{aligned}$$

$$\begin{aligned} \textcircled{17} \sqrt{200} - \sqrt{27} - \sqrt{32} - \sqrt{48} \\ = \sqrt{2} \sqrt{2} \sqrt{2} \sqrt{5} \sqrt{5} - 3\sqrt{3} - 4\sqrt{2} - 4\sqrt{3} \\ = 10\sqrt{2} - 3\sqrt{3} - 4\sqrt{2} - 4\sqrt{3} = 6\sqrt{2} - 7\sqrt{3} \end{aligned}$$

$$\begin{aligned} \textcircled{18} 5\sqrt{125} - \sqrt{72} - \sqrt{18} - \sqrt{45} \\ = 5 \times 5\sqrt{5} - \sqrt{2} \sqrt{2} \sqrt{2} \sqrt{3} \sqrt{3} - 3\sqrt{2} - 3\sqrt{5} \\ = 25\sqrt{5} - 6\sqrt{2} - 3\sqrt{2} - 3\sqrt{5} = -9\sqrt{2} + 22\sqrt{5} \end{aligned}$$

$$\begin{aligned} \textcircled{19} 3\sqrt{3} - \sqrt{27} + \sqrt{18} - \sqrt{48} \\ = 3\sqrt{3} - 3\sqrt{3} + 3\sqrt{2} - 4\sqrt{3} = -4\sqrt{3} + 3\sqrt{2} \end{aligned}$$

$$\begin{aligned} \textcircled{20} \sqrt{2} - \sqrt{8} - \sqrt{32} - \sqrt{50} \\ = \sqrt{2} - 2\sqrt{2} - 4\sqrt{2} - 5\sqrt{2} = -10\sqrt{2} \end{aligned}$$

この解答では $a\sqrt{b}$ の形に変形するために、基本的に素因数分解を用いています。

授業でもふれたように、平方数を見つけて $a\sqrt{b}$ の形にしてもかまいません。

$$\begin{aligned} \text{例 } \sqrt{48} &= \sqrt{16} \sqrt{3} = 4\sqrt{3} \\ \sqrt{48} &= \sqrt{4} \sqrt{4} \sqrt{3} = 2 \times 2 \times \sqrt{3} = 4\sqrt{3} \end{aligned}$$

根号を含む式の加減 3 解答編

I. 次の計算をなさい。

$$\begin{aligned} \textcircled{1} \quad & \frac{2}{\sqrt{5}} + \frac{\sqrt{5}}{2} \\ &= \frac{2 \times \sqrt{5}}{\sqrt{5} \times \sqrt{5}} + \frac{\sqrt{5}}{2} \\ &= \frac{2\sqrt{5}}{5} + \frac{\sqrt{5}}{2} = \frac{4\sqrt{5}}{10} + \frac{5\sqrt{5}}{10} \\ &= \frac{9\sqrt{5}}{10} \end{aligned}$$

$$\begin{aligned} \textcircled{2} \quad & \frac{3}{2\sqrt{6}} - \frac{2}{\sqrt{6}} \\ &= \frac{3 \times \sqrt{6}}{2\sqrt{6} \times \sqrt{6}} - \frac{2 \times \sqrt{6}}{\sqrt{6} \times \sqrt{6}} \\ &= \frac{3\sqrt{6}}{12} - \frac{2\sqrt{6}}{6} = \frac{3\sqrt{6}}{12} - \frac{4\sqrt{6}}{12} \\ &= -\frac{\sqrt{6}}{12} \end{aligned}$$

$$\begin{aligned} \textcircled{3} \quad & 3\sqrt{2} - \frac{4}{\sqrt{2}} \\ &= 3\sqrt{2} - \frac{4 \times \sqrt{2}}{\sqrt{2} \times \sqrt{2}} \\ &= 3\sqrt{2} - \frac{4\sqrt{2}}{2} \\ &= 3\sqrt{2} - 2\sqrt{2} = \sqrt{2} \end{aligned}$$

$$\begin{aligned} \textcircled{4} \quad & 2\sqrt{60} - \sqrt{\frac{5}{3}} \\ &= 2 \times \sqrt{2} \sqrt{2} \sqrt{3} \sqrt{5} - \frac{\sqrt{5}}{\sqrt{3}} \\ &= 4\sqrt{15} - \frac{\sqrt{5} \times \sqrt{3}}{\sqrt{3} \times \sqrt{3}} \\ &= \frac{12\sqrt{15}}{3} - \frac{\sqrt{15}}{3} = \frac{11\sqrt{15}}{3} \end{aligned}$$

$$\begin{aligned} \textcircled{5} \quad & \sqrt{50} - \frac{8}{\sqrt{2}} \\ &= 5\sqrt{2} - \frac{8 \times \sqrt{2}}{\sqrt{2} \times \sqrt{2}} \\ &= 5\sqrt{2} - \frac{8\sqrt{2}}{2} \\ &= 5\sqrt{2} - 4\sqrt{2} = \sqrt{2} \end{aligned}$$

$$\begin{aligned} \textcircled{6} \quad & \sqrt{6} - \frac{\sqrt{3}}{3\sqrt{2}} + \frac{1}{\sqrt{6}} \\ &= \sqrt{6} - \frac{\sqrt{3} \times \sqrt{2}}{3\sqrt{2} \times \sqrt{2}} + \frac{1 \times \sqrt{6}}{\sqrt{6} \times \sqrt{6}} \\ &= \sqrt{6} - \frac{\sqrt{6}}{6} + \frac{\sqrt{6}}{6} = \sqrt{6} \end{aligned}$$

$$\textcircled{7} \quad \sqrt{48} - \frac{6}{\sqrt{3}} + 5\sqrt{3}$$

$$\begin{aligned} &= 4\sqrt{3} - \frac{6 \times \sqrt{3}}{\sqrt{3} \times \sqrt{3}} + 5\sqrt{3} \\ &= 4\sqrt{3} - \frac{6\sqrt{3}}{3} + 5\sqrt{3} \\ &= 4\sqrt{3} - 2\sqrt{3} + 5\sqrt{3} = 7\sqrt{3} \end{aligned}$$

$$\textcircled{8} \quad \sqrt{3} - \sqrt{27} - \frac{12}{\sqrt{3}}$$

$$\begin{aligned} &= \sqrt{3} - 3\sqrt{3} - \frac{12\sqrt{3}}{\sqrt{3} \times \sqrt{3}} \\ &= \sqrt{3} - 3\sqrt{3} - \frac{12\sqrt{3}}{3} \\ &= \sqrt{3} - 3\sqrt{3} - 4\sqrt{3} = -6\sqrt{3} \end{aligned}$$

$$\textcircled{9} \quad \frac{2}{\sqrt{2}} - \sqrt{18} + (-\sqrt{2})^3 - \sqrt{\frac{6}{27}}$$

$$\begin{aligned} &= \frac{2 \times \sqrt{2}}{\sqrt{2} \times \sqrt{2}} - 3\sqrt{2} - 2\sqrt{2} - \sqrt{\frac{2}{9}} \\ &= \frac{2\sqrt{2}}{2} - 3\sqrt{2} - 2\sqrt{2} - \frac{\sqrt{2}}{\sqrt{9}} \\ &= \sqrt{2} - 3\sqrt{2} - 2\sqrt{2} - \frac{\sqrt{2}}{3} = \frac{3\sqrt{2} - 9\sqrt{2} - 6\sqrt{2} - \sqrt{2}}{3} \\ &= -\frac{13\sqrt{2}}{3} \end{aligned}$$

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$$\begin{aligned} & 2\sqrt{54} \div \left(\frac{10}{\sqrt{2}} - 2\sqrt{32} \right) = -\frac{6\sqrt{6}}{3\sqrt{2}} \\ &= 2 \times 3\sqrt{6} \div \left(\frac{10 \times \sqrt{2}}{\sqrt{2} \times \sqrt{2}} - 2 \times 4\sqrt{2} \right) = -\frac{6\sqrt{2}\sqrt{3}}{3\sqrt{2}} \\ &= 6\sqrt{6} \div \left(\frac{10\sqrt{2}}{2} - 8\sqrt{2} \right) = -2\sqrt{3} \\ &= 6\sqrt{6} \div (-3\sqrt{2}) \end{aligned}$$