

練習問題 A

1 次の計算をなさい。

□(1) $2\sqrt{5} + 7\sqrt{5}$

□(2) $\sqrt{3} - 4\sqrt{3}$

□(3) $6\sqrt{7} + \sqrt{7}$

□(4) $3\sqrt{13} - 8\sqrt{13}$

□(5) $\sqrt{24} + 5\sqrt{6}$

□(6) $10\sqrt{10} - \sqrt{90}$

□(7) $\sqrt{96} + \frac{12}{\sqrt{6}}$

□(8) $\frac{\sqrt{2}}{2} - \frac{3}{\sqrt{2}}$

□(9) $-\sqrt{\frac{3}{5}} + \sqrt{\frac{5}{3}}$

□(10) $\sqrt{5} + \sqrt{45} - \sqrt{20}$

□(11) $-\sqrt{32} - \sqrt{50} + \sqrt{72}$

□(12) $2\sqrt{27} - \sqrt{48} + \sqrt{75}$

□(13) $-7\sqrt{6} + 4\sqrt{5} + 5\sqrt{6} - 6\sqrt{5}$

□(14) $8\sqrt{12} + 2\sqrt{18} - 4\sqrt{27} - 6\sqrt{8}$

2 次の計算をなさい。

□(1) $\sqrt{27} + \sqrt{18} \times \sqrt{6}$

□(2) $\sqrt{14} \times \sqrt{8} - 2\sqrt{28}$

□(3) $\sqrt{40} - 3\sqrt{5} \div \sqrt{18}$

□(4) $\sqrt{2}(\sqrt{3} + \sqrt{10})$

□(5) $\sqrt{6}(\sqrt{2} - \sqrt{12})$

□(6) $(\sqrt{21} + \sqrt{15}) \times (-\sqrt{3})$

□(7) $(\sqrt{6} - \sqrt{10}) \div \sqrt{2}$

□(8) $(\sqrt{15} + \sqrt{40}) \div \sqrt{5}$

□(9) $(\sqrt{24} - \sqrt{42}) \div (-\sqrt{6})$

□(10) $(\sqrt{5} - \sqrt{2})(\sqrt{10} + 2)$

□(11) $(\sqrt{2} + 2)(\sqrt{2} - 1)$

□(12) $(2\sqrt{3} - \sqrt{5})(\sqrt{3} - \sqrt{5})$

3 次の計算をなさい。

□(1) $(\sqrt{2} + 2)(\sqrt{2} + 6)$

□(2) $(\sqrt{3} - 4)(\sqrt{3} + 5)$

□(3) $(2\sqrt{5} - 1)(2\sqrt{5} - 3)$

□(4) $(\sqrt{3} - 4)^2$

□(5) $(\sqrt{6} + \sqrt{2})^2$

□(6) $(\sqrt{10} - \sqrt{5})^2$

□(7) $(\sqrt{11} + 3)(\sqrt{11} - 3)$

□(8) $(\sqrt{5} - \sqrt{2})(\sqrt{5} + \sqrt{2})$

□(9) $(\sqrt{7} + \sqrt{8})(\sqrt{8} - \sqrt{7})$

□(10) $(\sqrt{5} + 1)(\sqrt{5} - 2) - 3$

□(11) $(\sqrt{3} - \sqrt{15})^2 - 18$

□(12) $(\sqrt{2} + 3)(\sqrt{2} - 3) + 7$

4 次の数の分母を有理化しなさい。

□(1) $\frac{3}{\sqrt{7} + 2}$

□(2) $\frac{2\sqrt{6}}{\sqrt{6} - 2}$

□(3) $\frac{3\sqrt{10}}{5 - \sqrt{10}}$

練習問題 B

1 次の計算をなさい。

□(1) $\sqrt{32} + \sqrt{48} - \sqrt{75} + \sqrt{128}$

□(2) $3\sqrt{52} + \sqrt{56} - \sqrt{126} - 4\sqrt{117}$

□(3) $\sqrt{45} - 3\sqrt{54} - \sqrt{125} + 2\sqrt{150}$

□(4) $2\sqrt{98} - 4\sqrt{108} + \sqrt{147} - \sqrt{162}$

□(5) $\sqrt{32} + \frac{84}{\sqrt{72}} - \sqrt{128}$

□(6) $\sqrt{\frac{5}{3}} - \sqrt{60} + \frac{3\sqrt{10}}{2\sqrt{6}}$

□(7) $\sqrt{\frac{2}{7}} + \sqrt{\frac{7}{2}} - \frac{4\sqrt{126}}{7}$

2 次の計算をなさい。

□(1) $\sqrt{14} \times \sqrt{70} - 5\sqrt{72} \div \sqrt{40}$

□(2) $2\sqrt{42} \div \sqrt{24} + \sqrt{52} \times \sqrt{117} - \sqrt{7}$

□(3) $(\sqrt{30} - 2\sqrt{75}) \div \sqrt{6} - \sqrt{5}$

□(4) $(\sqrt{180} - 2\sqrt{162} - \sqrt{147}) \div (-\sqrt{18})$

□(5) $(2\sqrt{3} - \sqrt{2})(\sqrt{27} + \sqrt{32}) - \sqrt{48} \div \sqrt{8}$

□(6) $\sqrt{3}(\sqrt{2} + \sqrt{6}) - \sqrt{2}(3 - \sqrt{3})$

□(7) $\sqrt{150} \times \frac{5}{\sqrt{12}} - 4\sqrt{108} \div \sqrt{6}$

□(8) $\sqrt{126} \div 3\sqrt{7} \times \sqrt{160} - \frac{10}{\sqrt{20}}$

3 次の計算をなさい。

□(1) $(\sqrt{20} - 4\sqrt{6})(\sqrt{6} + 2\sqrt{5})$

□(2) $(3\sqrt{12} - \sqrt{18})(2\sqrt{27} + \sqrt{32})$

□(3) $(4\sqrt{5} - 2\sqrt{10})^2$

□(4) $(5\sqrt{2} - \sqrt{20})(\sqrt{50} + 2\sqrt{5})$

□(5) $\frac{16}{\sqrt{8}} - (\sqrt{2} - 4)(\sqrt{2} + 6)$

□(6) $(2\sqrt{6} - 3\sqrt{3})^2 - \frac{36}{\sqrt{18}}$

□(7) $(\sqrt{12} + 5)^2 - (\sqrt{12} - 5)^2$

□(8) $(3 + \sqrt{2})(3 - \sqrt{2}) - (\sqrt{5} - \sqrt{2})^2$

□(9) $(\sqrt{12} + \sqrt{18})(\sqrt{54} - 2) + (3\sqrt{2} - 4)^2$

□(10) $(\sqrt{6} - \sqrt{5})^2 + (\sqrt{7} - 3\sqrt{2})(\sqrt{7} + 3\sqrt{2})$

4 次の数の分母を有理化しなさい。

□(1) $\frac{\sqrt{15} + \sqrt{6}}{\sqrt{15} - \sqrt{6}}$

□(2) $\frac{\sqrt{48} - \sqrt{32}}{\sqrt{12} + \sqrt{8}}$

□(3) $\frac{\sqrt{75} + \sqrt{50}}{\sqrt{27} - \sqrt{18}}$

練習問題 A

1 次の計算をしなさい。

$$\square(1) \sqrt{11} \times \sqrt{13} \quad \square(2) \sqrt{2} \times \sqrt{32} \quad \square(3) \sqrt{119} \div \sqrt{17} \quad \square(4) \frac{\sqrt{171}}{\sqrt{19}}$$

2 次の数を変形して、 \sqrt{a} の形に表しなさい。

$$\square(1) 2\sqrt{2} \quad \square(2) 3\sqrt{6} \quad \square(3) 5\sqrt{0.4} \quad \square(4) 4\sqrt{1.75}$$

$$\square(5) \frac{1}{5}\sqrt{75} \quad \square(6) \frac{1}{4}\sqrt{40} \quad \square(7) \frac{\sqrt{45}}{3} \quad \square(8) \frac{\sqrt{48}}{6}$$

3 次の数を変形し、根号の中をできるだけ小さい自然数にして表しなさい。

$$\square(1) \sqrt{24} \quad \square(2) \sqrt{27} \quad \square(3) \sqrt{72} \quad \square(4) \sqrt{80}$$

$$\square(5) \sqrt{\frac{50}{81}} \quad \square(6) \sqrt{\frac{120}{121}} \quad \square(7) \sqrt{0.54} \quad \square(8) \sqrt{1.12}$$

4 次の数の分母を有理化しなさい。

$$\square(1) \frac{\sqrt{3}}{\sqrt{13}} \quad \square(2) \frac{6}{\sqrt{6}} \quad \square(3) \frac{5\sqrt{2}}{\sqrt{15}} \quad \square(4) \frac{42}{5\sqrt{7}}$$

$$\square(5) \frac{30}{\sqrt{40}} \quad \square(6) \frac{12}{\sqrt{45}} \quad \square(7) \frac{\sqrt{5}}{\sqrt{18}} \quad \square(8) \frac{4\sqrt{21}}{\sqrt{12}}$$

5 次の計算をしなさい。

$$\square(1) \sqrt{12} \times \sqrt{28} \quad \square(2) \sqrt{14} \times (-\sqrt{21}) \quad \square(3) \sqrt{30} \times \sqrt{\frac{35}{6}}$$

$$\square(4) \sqrt{54} \div \sqrt{3} \quad \square(5) (-\sqrt{78}) \div 3\sqrt{13} \quad \square(6) \sqrt{75} \div 5\sqrt{72}$$

$$\square(7) \sqrt{30} \times \sqrt{32} \times \sqrt{60} \quad \square(8) \sqrt{24} \div \sqrt{45} \times \sqrt{18} \quad \square(9) \sqrt{96} \div \sqrt{28} \div \sqrt{21}$$

6 $\sqrt{5} = 2.236$, $\sqrt{50} = 7.071$ として、次の値を求めなさい。

$$\square(1) \sqrt{5000000} \quad \square(2) \sqrt{50000000} \quad \square(3) \frac{5}{\sqrt{20}}$$

練習問題 B

1 次の数を変形して、 \sqrt{a} の形に表しなさい。

$$\square(1) 20\sqrt{5} \quad \square(2) 8\sqrt{0.625} \quad \square(3) \frac{1}{6}\sqrt{60} \quad \square(4) \frac{\sqrt{56}}{7}$$

2 次の数を変形し、根号の中をできるだけ小さい自然数にして表しなさい。

$$\square(1) \sqrt{320} \quad \square(2) \sqrt{675} \quad \square(3) \sqrt{\frac{189}{196}} \quad \square(4) \sqrt{0.4}$$

3 次の数の分母を有理化しなさい。

$$\square(1) \frac{10\sqrt{6}}{\sqrt{32}} \quad \square(2) \frac{7\sqrt{42}}{\sqrt{63}} \quad \square(3) \frac{5\sqrt{18}}{\sqrt{80}} \quad \square(4) \frac{6\sqrt{20}}{\sqrt{75}}$$

4 次の計算をしなさい。

$$\square(1) 3\sqrt{52} \times 2\sqrt{65} \quad \square(2) (-\sqrt{96}) \times \sqrt{98} \times \sqrt{48} \quad \square(3) \frac{\sqrt{94}}{16} \times \left(-\sqrt{\frac{49}{47}}\right) \times \frac{8}{7}$$

$$\square(4) 7\sqrt{72} \div \sqrt{112} \quad \square(5) \sqrt{126} \div (-\sqrt{32}) \div \sqrt{28} \quad \square(6) \frac{\sqrt{39}}{3} \div \frac{13}{\sqrt{91}} \div \left(-\sqrt{\frac{84}{81}}\right)$$

$$\square(7) \sqrt{68} \div \sqrt{102} \times \sqrt{48} \quad \square(8) \sqrt{65} \times \sqrt{90} \div (-\sqrt{78}) \quad \square(9) \left(-\frac{\sqrt{44}}{28}\right) \div \sqrt{\frac{99}{80}} \times \frac{21}{2}$$

5 $\sqrt{6} = 2.449$, $\sqrt{60} = 7.746$ として、次の値を求めなさい。

$$\square(1) \sqrt{0.0006} \quad \square(2) \sqrt{216} \quad \square(3) \frac{12}{5\sqrt{6}} \quad \square(4) \frac{\sqrt{21} \times \sqrt{18}}{\sqrt{28}}$$

6 次の問いに答えなさい。

$$\square(1) -\frac{3}{\sqrt{5}}, -\frac{\sqrt{19}}{3}, -\frac{\sqrt{7}}{2}, -\sqrt{2} \text{ を小さい順に並べなさい。}$$

$$\square(2) \frac{6}{\sqrt{3}} \text{ より大きく } 6\sqrt{3} \text{ より小さい整数をすべて答えなさい。}$$

- (7) 1 (8) -6 (9) 30
- 10** (1) $-4-4\sqrt{3}$ (2) -11
 (3) $-14-3\sqrt{5}$ (4) 8
 (5) $-9+4\sqrt{14}$ (6) $-17-\sqrt{15}$
 (7) $-21+2\sqrt{5}$ (8) $-1+3\sqrt{2}$
 (9) $31-6\sqrt{2}$ (10) $-5-2\sqrt{6}$
 (11) $-20-3\sqrt{15}$ (12) $12\sqrt{10}$
- 11** (1) $4\sqrt{3}-4$ (2) $2+\sqrt{2}$
 (3) $15-6\sqrt{5}$ (4) $4+2\sqrt{2}$
 (5) $-3+2\sqrt{3}$ (6) $3\sqrt{5}+5$
 (7) $5-2\sqrt{6}$ (8) $11+2\sqrt{30}$
 (9) $4-\sqrt{15}$ (10) $3\sqrt{3}+2\sqrt{6}$
 (11) $12-2\sqrt{35}$ (12) $2\sqrt{2}+\sqrt{6}$

解答

- 1** (7) 与式 $= 3\sqrt{5} + 4\sqrt{5} - 2\sqrt{2} - 5\sqrt{2}$
 (8) 与式 $= -2\sqrt{3} + 4\sqrt{3} - 5\sqrt{7} + 3\sqrt{7}$
- 2** (1) 与式 $= 3\sqrt{2} + 4\sqrt{2}$
 (4) 与式 $= 4\sqrt{3} - 2\sqrt{3}$
 (7) 与式 $= 6\sqrt{2} - 2 \times 5\sqrt{2} + 7\sqrt{2}$
 $= 6\sqrt{2} - 10\sqrt{2} + 7\sqrt{2}$
 (8) 与式 $= 2 \times 2\sqrt{15} + 2\sqrt{10} + 3\sqrt{15} - 3 \times 3\sqrt{10}$
 $= 4\sqrt{15} + 2\sqrt{10} + 3\sqrt{15} - 9\sqrt{10}$
 (9) 与式 $= 3 \times 3\sqrt{2} - 3\sqrt{5} - 8\sqrt{2} + 2 \times 2\sqrt{5}$
 $= 9\sqrt{2} - 3\sqrt{5} - 8\sqrt{2} + 4\sqrt{5}$
 (10) 与式 $= 4\sqrt{7} + 2 \times 5\sqrt{3} - 6\sqrt{3} - 3 \times 2\sqrt{7}$
 $= 4\sqrt{7} + 10\sqrt{3} - 6\sqrt{3} - 6\sqrt{7}$
- 3** (1) 与式 $= 3\sqrt{5} + \frac{10 \times \sqrt{5}}{\sqrt{5} \times \sqrt{5}}$
 $= 3\sqrt{5} + \frac{10\sqrt{5}}{5} = 3\sqrt{5} + 2\sqrt{5}$
 (3) 与式 $= \frac{\sqrt{7}}{3} + \frac{5 \times \sqrt{7}}{\sqrt{7} \times \sqrt{7}} = \frac{\sqrt{7}}{3} + \frac{5\sqrt{7}}{7} = \frac{7\sqrt{7} + 15\sqrt{7}}{21}$
 (4) 与式 $= \frac{3\sqrt{15}}{2} - \frac{\sqrt{3} \times \sqrt{5}}{\sqrt{5} \times \sqrt{5}}$
 $= \frac{3\sqrt{15}}{2} - \frac{\sqrt{15}}{5} = \frac{15\sqrt{15} - 2\sqrt{15}}{10}$
 (5) 与式 $= \frac{4 \times \sqrt{16}}{\sqrt{5}} + \frac{3}{2\sqrt{5}} = \frac{4 \times 4 \times \sqrt{5}}{\sqrt{5} \times \sqrt{5}} + \frac{3 \times \sqrt{5}}{2\sqrt{5} \times \sqrt{5}}$
 $= \frac{16\sqrt{5}}{5} + \frac{3\sqrt{5}}{10} = \frac{32\sqrt{5} + 3\sqrt{5}}{10}$
 (6) 与式 $= -\frac{\sqrt{2} \times \sqrt{7}}{\sqrt{7} \times \sqrt{7}} + \frac{\sqrt{7} \times \sqrt{2}}{\sqrt{2} \times \sqrt{2}}$
 $= -\frac{\sqrt{14}}{7} + \frac{\sqrt{14}}{2} = \frac{-2\sqrt{14} + 7\sqrt{14}}{14}$

- 4** (1) 与式 $= 3\sqrt{3} + \sqrt{6} \times 2\sqrt{2}$
 $= 3\sqrt{3} + 4\sqrt{3}$
 (3) 与式 $= 3 \times 2\sqrt{7} - 2 \times 2\sqrt{2} \times \sqrt{14}$
 $= 6\sqrt{7} - 4\sqrt{2} \times \sqrt{14} = 6\sqrt{7} - 8\sqrt{7}$
 (4) 与式 $= 6 \div 3\sqrt{2} + 2\sqrt{2} = \frac{6}{3\sqrt{2}} + 2\sqrt{2}$
 $= \frac{2 \times \sqrt{2}}{\sqrt{2} \times \sqrt{2}} + 2\sqrt{2} = \sqrt{2} + 2\sqrt{2}$
 (6) 与式 $= 3 \times 3\sqrt{5} - \frac{4\sqrt{35}}{2\sqrt{7}} = 9\sqrt{5} - 2\sqrt{5}$
 (7) 与式 $= \frac{2\sqrt{5}}{2\sqrt{2}} + 2\sqrt{2} \times 3\sqrt{5}$
 $= \frac{\sqrt{5} \times \sqrt{2}}{\sqrt{2} \times \sqrt{2}} + 6\sqrt{10} = \frac{\sqrt{10}}{2} + 6\sqrt{10}$
 (8) 与式 $= \sqrt{15} \times 4\sqrt{5} - \frac{3 \times 2\sqrt{7}}{\sqrt{21}} = 20\sqrt{3} - \frac{6}{\sqrt{3}}$
 $= 20\sqrt{3} - \frac{6 \times \sqrt{3}}{\sqrt{3} \times \sqrt{3}} = 20\sqrt{3} - 2\sqrt{3}$
 (9) 与式 $= \frac{4\sqrt{3} \times 7}{\sqrt{6}} - \frac{2\sqrt{6}}{2\sqrt{3}} = \frac{28}{\sqrt{2}} - \sqrt{2}$
 $= \frac{28 \times \sqrt{2}}{\sqrt{2} \times \sqrt{2}} - \sqrt{2} = 14\sqrt{2} - \sqrt{2}$
 (10) 与式 $= \frac{\sqrt{70} \times \sqrt{10}}{5} + \sqrt{35} \times 4\sqrt{5}$
 $= \frac{10\sqrt{7}}{5} + 20\sqrt{7} = 2\sqrt{7} + 20\sqrt{7}$
- 5** (1) 与式 $= \sqrt{2} \times \sqrt{3} + \sqrt{2} \times 2\sqrt{2} = \sqrt{6} + 4$
 (3) 与式 $= (-2\sqrt{3}) \times 2\sqrt{6} - (-2\sqrt{3}) \times 2\sqrt{15}$
 (4) 与式 $= \frac{\sqrt{6}}{\sqrt{3}} - \frac{6}{\sqrt{3}} = \sqrt{2} - \frac{6 \times \sqrt{3}}{\sqrt{3} \times \sqrt{3}} = \sqrt{2} - \frac{6\sqrt{3}}{3}$
 (6) 与式 $= -\frac{\sqrt{14}}{\sqrt{7}} + \left(-\frac{7 \times 2\sqrt{2}}{\sqrt{7}} \right)$
 $= -\sqrt{2} - \frac{14\sqrt{2} \times \sqrt{7}}{\sqrt{7} \times \sqrt{7}}$
 $= -\sqrt{2} - \frac{14\sqrt{14}}{7}$
 (7) 与式 $= \sqrt{2} \times (-\sqrt{10}) - 2\sqrt{5} \times (-\sqrt{10})$
 $+ 2\sqrt{10} \times (-\sqrt{10})$
 $= -2\sqrt{5} + 10\sqrt{2} - 20$
 (8) 与式 $= -\frac{5\sqrt{3}}{2\sqrt{3}} + \frac{5\sqrt{2}}{2\sqrt{3}} + \frac{2\sqrt{15}}{2\sqrt{3}}$
 $= -\frac{5}{2} + \frac{5\sqrt{2} \times \sqrt{3}}{2\sqrt{3} \times \sqrt{3}} + \sqrt{5}$
 (9) 与式 $= 3\sqrt{2} \times 2\sqrt{3} - 3\sqrt{2} \times \sqrt{14} - \frac{14 \times \sqrt{7}}{\sqrt{7} \times \sqrt{7}}$
 $= 6\sqrt{6} - 6\sqrt{7} - 2\sqrt{7}$

- (10) 与式 $= 2\sqrt{3} \times \sqrt{5} - 2\sqrt{3} \times \sqrt{3}$
 $+ (-\sqrt{5}) \times \sqrt{2} + (-\sqrt{5}) \times 2\sqrt{3}$
 $= 2\sqrt{15} - 6 - \sqrt{10} - 2\sqrt{15}$
- 6** (1) 与式 $= \sqrt{2} \times \sqrt{6} - \sqrt{2} \times 1$
 $+ (-\sqrt{3}) \times \sqrt{6} - (-\sqrt{3}) \times 1$
 $= 2\sqrt{3} - \sqrt{2} - 3\sqrt{2} + \sqrt{3}$
 (2) 与式 $= \sqrt{3} \times 2\sqrt{3} - \sqrt{3} \times 1 + 2 \times 2\sqrt{3}$
 $- 2 \times 1$
 (3) 与式 $= 2\sqrt{5} \times 3\sqrt{2} + 2\sqrt{5} \times \sqrt{5}$
 $+ (-\sqrt{2}) \times 3\sqrt{2} + (-\sqrt{2}) \times \sqrt{5}$
- 7** (1) 与式 $= (\sqrt{6})^2 + (4+3) \times \sqrt{6} + 4 \times 3$
 (4) 与式 $= (3\sqrt{2})^2 + (2-7) \times 3\sqrt{2} + 2 \times (-7)$
 (7) 与式 $= (\sqrt{2})^2 + (-\sqrt{5} + 2\sqrt{5}) \times \sqrt{2}$
 $+ (-\sqrt{5}) \times 2\sqrt{5}$
 (10) 与式 $= 4^2 + (3\sqrt{2} - 5\sqrt{2}) \times 4$
 $+ 3\sqrt{2} \times (-5\sqrt{2})$
 (12) 与式 $= (2\sqrt{6} - 3\sqrt{2})(2\sqrt{6} + \sqrt{2})$
 $= (2\sqrt{6})^2 + (-3\sqrt{2} + \sqrt{2}) \times 2\sqrt{6}$
 $+ (-3\sqrt{2}) \times \sqrt{2}$
- 8** (1) 与式 $= (\sqrt{2})^2 + 2 \times 2 \times \sqrt{2} + 2^2$
 (5) 与式 $= (3\sqrt{5})^2 - 2 \times 1 \times 3\sqrt{5} + 1^2$
 (7) 与式 $= (\sqrt{2})^2 + 2 \times \sqrt{3} \times \sqrt{2} + (\sqrt{3})^2$
 (10) 与式 $= (2\sqrt{3})^2 - 2 \times \sqrt{5} \times 2\sqrt{3} + (\sqrt{5})^2$
 (12) 与式 $= (3\sqrt{5})^2 + 2 \times 2\sqrt{7} \times 3\sqrt{5} + (2\sqrt{7})^2$
- 9** (1) 与式 $= (\sqrt{6})^2 - 2^2 = 6 - 4$
 (3) 与式 $= (\sqrt{10} + 8)(\sqrt{10} - 8) = (\sqrt{10})^2 - 8^2$
 (4) 与式 $= (\sqrt{5})^2 - (\sqrt{3})^2$
 (6) 与式 $= (\sqrt{2} - \sqrt{6})(\sqrt{2} + \sqrt{6})$
 $= (\sqrt{2})^2 - (\sqrt{6})^2$
 (7) 与式 $= (2\sqrt{2})^2 - (\sqrt{7})^2$
 (8) 与式 $= (2\sqrt{3} + 3\sqrt{2})(2\sqrt{3} - 3\sqrt{2})$
 $= (2\sqrt{3})^2 - (3\sqrt{2})^2$
 (9) 与式 $= (5\sqrt{2} - 2\sqrt{5})(5\sqrt{2} + 2\sqrt{5})$
 $= (5\sqrt{2})^2 - (2\sqrt{5})^2$
- 10** (1) 与式 $= (3-4\sqrt{3}+4) - 11$
 (3) 与式 $= 3\sqrt{5} - (5+6\sqrt{5}+9)$
 $= 3\sqrt{5} - 14 - 6\sqrt{5}$
 (5) 与式 $= 2\sqrt{14} - (7-2\sqrt{14}+2)$
 $= 2\sqrt{14} - 9 + 2\sqrt{14}$
 (6) 与式 $= 3\sqrt{15} - (12+4\sqrt{15}+5)$
 $= 3\sqrt{15} - 17 - 4\sqrt{15}$
 (7) 与式 $= (5-4\sqrt{5}+4) - (30-6\sqrt{5})$
 $= 9 - 4\sqrt{5} - 30 + 6\sqrt{5}$
 (8) 与式 $= (3\sqrt{2} - 2) - (3-4) = 3\sqrt{2} - 2 + 1$
 (10) 与式 $= (6-16) + (2-2\sqrt{6}+3)$

- $= -10 + 5 - 2\sqrt{6}$
- (11) 与式 $= (5 + \sqrt{15} - 6) - (15 + 4\sqrt{15} + 4)$
 $= -1 + \sqrt{15} - 19 - 4\sqrt{15}$
- (12) $\sqrt{10} + 3 = M, \sqrt{10} - 3 = N$ とおく。
 与式 $= M^2 - N^2 = (M+N)(M-N)$
 $= \{(\sqrt{10}+3) + (\sqrt{10}-3)\}$
 $\{(\sqrt{10}+3) - (\sqrt{10}-3)\}$
 $= 2\sqrt{10} \times 6$
- 11** (1) 与式 $= \frac{8(\sqrt{3}-1)}{(\sqrt{3}+1)(\sqrt{3}-1)} = \frac{8\sqrt{3}-8}{3-1}$
 (4) 与式 $= \frac{4(2+\sqrt{2})}{(2-\sqrt{2})(2+\sqrt{2})} = \frac{8+4\sqrt{2}}{4-2}$
 (6) 与式 $= \frac{4\sqrt{5}(3+\sqrt{5})}{(3-\sqrt{5})(3+\sqrt{5})} = \frac{12\sqrt{5}+20}{9-5}$
 (7) 与式 $= \frac{(\sqrt{3}-\sqrt{2})^2}{(\sqrt{3}+\sqrt{2})(\sqrt{3}-\sqrt{2})} = \frac{3-2\sqrt{6}+2}{3-2}$
 (10) 与式 $= \frac{(\sqrt{6}+\sqrt{3})(\sqrt{2}+1)}{(\sqrt{2}-1)(\sqrt{2}+1)}$
 $= \frac{2\sqrt{3}+\sqrt{6}+\sqrt{6}+\sqrt{3}}{2-1}$
 (11) 与式 $= \frac{(2\sqrt{7}-2\sqrt{5})(\sqrt{7}-\sqrt{5})}{(\sqrt{7}+\sqrt{5})(\sqrt{7}-\sqrt{5})}$
 $= \frac{2(\sqrt{7}-\sqrt{5})^2}{7-5} = \frac{2(7-2\sqrt{35}+5)}{2}$
 (12) 分母の $\sqrt{6}-\sqrt{2}$ を $\sqrt{2}$ でくくる。
 与式 $= \frac{2(\sqrt{3}+1)}{\sqrt{2}(\sqrt{3}-1)} = \frac{2(\sqrt{3}+1)^2}{\sqrt{2}(\sqrt{3}-1)(\sqrt{3}+1)}$
 $= \frac{2(3+2\sqrt{3}+1)}{2\sqrt{2}} = \frac{4+2\sqrt{3}}{\sqrt{2}}$

◆ 練習問題 A ◆

→ p.66

- 1** (1) $9\sqrt{5}$ (2) $-3\sqrt{3}$ (3) $7\sqrt{7}$
 (4) $-5\sqrt{13}$ (5) $7\sqrt{6}$ (6) $7\sqrt{10}$
 (7) $6\sqrt{6}$ (8) $-\sqrt{2}$ (9) $\frac{2\sqrt{15}}{15}$
 (10) $2\sqrt{5}$ (11) $-3\sqrt{2}$ (12) $7\sqrt{3}$
 (13) $-2\sqrt{6} - 2\sqrt{5}$ (14) $4\sqrt{3} - 6\sqrt{2}$
- 2** (1) $9\sqrt{3}$ (2) 0
 (3) $\frac{3\sqrt{10}}{2}$ (4) $\sqrt{6} + 2\sqrt{5}$
 (5) $2\sqrt{3} - 6\sqrt{2}$ (6) $-3\sqrt{7} - 3\sqrt{5}$
 (7) $\sqrt{3} - \sqrt{5}$ (8) $\sqrt{3} + 2\sqrt{2}$

(3) $\sqrt{0.02} = \sqrt{\frac{2}{100}} = \frac{\sqrt{2}}{10}$
 (4) $\sqrt{0.2} = \sqrt{\frac{2}{10}} = \frac{\sqrt{2 \times 10}}{\sqrt{10 \times 10}} = \frac{\sqrt{20}}{10}$
 (6) $\frac{100}{\sqrt{20}} = \frac{100 \times \sqrt{20}}{\sqrt{20} \times \sqrt{20}} = \frac{100\sqrt{20}}{20} = 5\sqrt{20}$
17 (1) $\sqrt{30000} = \sqrt{10000} \times \sqrt{3} = 100\sqrt{3}$
 (2) $\sqrt{300000} = \sqrt{10000} \times \sqrt{30} = 100\sqrt{30}$
 (4) $\sqrt{0.003} = \sqrt{\frac{3}{1000}} = \frac{\sqrt{3}}{10\sqrt{10}} = \frac{\sqrt{3} \times \sqrt{10}}{10\sqrt{10} \times \sqrt{10}}$
 (6) $\frac{9\sqrt{8}}{\sqrt{54}} = \frac{9 \times 2\sqrt{2}}{3 \times \sqrt{6}} = \frac{6}{\sqrt{3}} = \frac{6 \times \sqrt{3}}{\sqrt{3} \times \sqrt{3}}$

◆ 練習問題 A ◆

→p.60

1 (1) $\sqrt{143}$ (2) 8 (3) $\sqrt{7}$
 (4) 3
2 (1) $\sqrt{8}$ (2) $\sqrt{54}$ (3) $\sqrt{10}$
 (4) $\sqrt{28}$ (5) $\sqrt{3}$ (6) $\sqrt{\frac{5}{2}}$
 (7) $\sqrt{5}$ (8) $\sqrt{\frac{4}{3}}$
3 (1) $2\sqrt{6}$ (2) $3\sqrt{3}$ (3) $6\sqrt{2}$
 (4) $4\sqrt{5}$ (5) $\frac{5\sqrt{2}}{9}$ (6) $\frac{2\sqrt{30}}{11}$
 (7) $\frac{3\sqrt{6}}{10}$ (8) $\frac{2\sqrt{7}}{5}$
4 (1) $\frac{\sqrt{39}}{13}$ (2) $\sqrt{6}$ (3) $\frac{\sqrt{30}}{3}$
 (4) $\frac{6\sqrt{7}}{5}$ (5) $\frac{3\sqrt{10}}{2}$ (6) $\frac{4\sqrt{5}}{5}$
 (7) $\frac{\sqrt{10}}{6}$ (8) $2\sqrt{7}$
5 (1) $4\sqrt{21}$ (2) $-7\sqrt{6}$ (3) $5\sqrt{7}$
 (4) $3\sqrt{2}$ (5) $-\frac{\sqrt{6}}{3}$ (6) $\frac{\sqrt{6}}{12}$
 (7) 240 (8) $\frac{4\sqrt{15}}{5}$ (9) $\frac{2\sqrt{2}}{7}$
6 (1) 2236 (2) 7071 (3) 1.118

解説

1 (2) 与式 $= \sqrt{2 \times 32} = \sqrt{64} = 8$
 (4) 与式 $= \sqrt{\frac{171}{19}} = \sqrt{9} = 3$

2 (3) $5\sqrt{0.4} = \sqrt{25} \times \sqrt{\frac{4}{10}} = \sqrt{\frac{25 \times 4}{10}} = \sqrt{10}$
 (4) $4\sqrt{1.75} = \sqrt{16} \times \sqrt{\frac{175}{100}} = \sqrt{\frac{16 \times 175}{100}} = \sqrt{28}$
3 (4) $\sqrt{80} = \sqrt{16 \times 5} = 4\sqrt{5}$
 (6) $\sqrt{\frac{120}{121}} = \sqrt{\frac{4 \times 30}{121}} = \frac{2\sqrt{30}}{11}$
 (7) $\sqrt{0.54} = \sqrt{\frac{54}{100}} = \sqrt{\frac{9 \times 6}{100}} = \frac{3\sqrt{6}}{10}$
 (8) $\sqrt{1.12} = \sqrt{\frac{112}{100}} = \sqrt{\frac{16 \times 7}{100}} = \frac{4\sqrt{7}}{10} = \frac{2\sqrt{7}}{5}$
4 (3) $\frac{5\sqrt{2}}{\sqrt{15}} = \frac{5 \times \sqrt{2} \times \sqrt{15}}{\sqrt{15} \times \sqrt{15}} = \frac{5\sqrt{30}}{15}$
 (5) $\frac{30}{\sqrt{40}} = \frac{30}{2\sqrt{10}} = \frac{15}{\sqrt{10}} = \frac{15 \times \sqrt{10}}{\sqrt{10} \times \sqrt{10}} = \frac{15\sqrt{10}}{10}$
 (8) $\frac{4\sqrt{21}}{\sqrt{12}} = \frac{4 \times \sqrt{3} \times \sqrt{7}}{2 \times \sqrt{3}} = 2\sqrt{7}$
5 (8) 与式 $= \frac{\sqrt{24 \times 18}}{\sqrt{45}} = \frac{2\sqrt{6} \times 3\sqrt{2}}{3\sqrt{5}} = \frac{4\sqrt{3}}{\sqrt{5}} = \frac{4\sqrt{3} \times \sqrt{5}}{\sqrt{5} \times \sqrt{5}}$
 (9) 与式 $= \frac{\sqrt{96}}{\sqrt{28} \times \sqrt{21}} = \frac{4\sqrt{6}}{2\sqrt{7} \times \sqrt{21}} = \frac{4\sqrt{2}}{14}$
6 (1) $\sqrt{5000000} = \sqrt{1000000 \times 5} = 1000\sqrt{5}$
 (2) $\sqrt{50000000} = \sqrt{1000000 \times 50} = 1000\sqrt{50}$
 (3) $\frac{5}{\sqrt{20}} = \frac{5 \times \sqrt{5}}{2\sqrt{5} \times \sqrt{5}} = \frac{\sqrt{5}}{2}$

◆ 練習問題 B ◆

→p.61

1 (1) $\sqrt{2000}$ (2) $\sqrt{40}$
 (3) $\sqrt{\frac{5}{3}}$ (4) $\sqrt{\frac{8}{7}}$
2 (1) $8\sqrt{5}$ (2) $15\sqrt{3}$
 (3) $\frac{3\sqrt{21}}{14}$ (4) $\frac{\sqrt{10}}{5}$
3 (1) $\frac{5\sqrt{3}}{2}$ (2) $\frac{7\sqrt{6}}{3}$
 (3) $\frac{3\sqrt{10}}{4}$ (4) $\frac{4\sqrt{15}}{5}$
4 (1) $156\sqrt{5}$ (2) -672 (3) $-\frac{\sqrt{2}}{2}$
 (4) $\frac{3\sqrt{14}}{2}$ (5) $-\frac{3}{8}$ (6) $-\frac{3}{2}$
 (7) $4\sqrt{2}$ (8) $-5\sqrt{3}$ (9) $-\sqrt{5}$
5 (1) 0.02449 (2) 14.694

(3) 0.9796 (4) 3.6735
6 (1) $-\frac{\sqrt{19}}{3}, -\sqrt{2}, -\frac{3}{\sqrt{5}}, -\frac{\sqrt{7}}{2}$
 (2) 4, 5, 6, 7, 8, 9, 10

解説

1 (2) $8\sqrt{0.625} = \sqrt{64} \times \sqrt{\frac{625}{1000}} = \sqrt{\frac{64 \times 5}{8}} = \sqrt{40}$
 (3) $\frac{1}{6}\sqrt{60} = \sqrt{\frac{1}{36} \times 60} = \sqrt{\frac{60}{36}} = \sqrt{\frac{5}{3}}$
2 (4) $\sqrt{0.4} = \sqrt{\frac{4}{10}} = \frac{\sqrt{4} \times \sqrt{10}}{\sqrt{10} \times \sqrt{10}} = \frac{2\sqrt{10}}{10} = \frac{\sqrt{10}}{5}$
3 (2) $\frac{7\sqrt{42}}{\sqrt{63}} = \frac{7\sqrt{6} \times \sqrt{7}}{3\sqrt{7}} = \frac{7\sqrt{6}}{3}$
 (4) $\frac{6\sqrt{20}}{\sqrt{75}} = \frac{6 \times 2\sqrt{5}}{5\sqrt{3}} = \frac{6 \times 2\sqrt{5} \times \sqrt{3}}{5\sqrt{3} \times \sqrt{3}} = \frac{4\sqrt{15}}{5}$
4 (3) 与式 $= -\frac{\sqrt{94} \times 7 \times 8}{16 \times \sqrt{47} \times 7}$
 (6) 与式 $= \frac{\sqrt{39}}{3} \div \frac{13}{\sqrt{91}} \div \left(-\frac{2\sqrt{21}}{9}\right)$
 $= -\frac{\sqrt{39} \times \sqrt{91} \times 9}{3 \times 13 \times 2\sqrt{21}}$
 (7) 与式 $= \frac{2\sqrt{17} \times 4\sqrt{3}}{\sqrt{2} \times \sqrt{3} \times \sqrt{17}} = \frac{8}{\sqrt{2}} = \frac{8 \times \sqrt{2}}{\sqrt{2} \times \sqrt{2}}$
 (9) 与式 $= -\frac{2\sqrt{11}}{28} \div \frac{3\sqrt{11}}{4\sqrt{5}} \times \frac{21}{2}$
 $= -\frac{2\sqrt{11} \times 4\sqrt{5} \times 21}{28 \times 3 \times \sqrt{11} \times 2}$
5 (1) $\sqrt{0.0006} = \sqrt{\frac{6}{10000}} = \frac{\sqrt{6}}{100}$
 (2) $\sqrt{216} = \sqrt{36 \times 6} = 6\sqrt{6}$
 (4) $\frac{\sqrt{21} \times \sqrt{18}}{\sqrt{28}} = \frac{\sqrt{3} \times \sqrt{7} \times 3\sqrt{2}}{2\sqrt{7}} = \frac{3\sqrt{6}}{2}$
6 (1) $\left(\frac{3}{\sqrt{5}}\right)^2 = \frac{9}{5} = 1.8,$
 $\left(\frac{\sqrt{19}}{3}\right)^2 = \frac{19}{9} = 2.11\dots,$
 $\left(\frac{\sqrt{7}}{2}\right)^2 = \frac{7}{4} = 1.75, (\sqrt{2})^2 = 2$ となる。
 (2) $\frac{6}{\sqrt{3}} = \frac{6 \times \sqrt{3}}{\sqrt{3} \times \sqrt{3}} = \frac{6\sqrt{3}}{3} = 2\sqrt{3}$
 だから、求める整数を x とすると、
 $(2\sqrt{3})^2 < x^2 < (6\sqrt{3})^2$
 これより、 $12 < x^2 < 108$
 これにあてはまる x^2 の値は、
 $x^2 = 16, 25, 36, 49, 64, 81, 100$

8 根号をふくむ式の計算

◆ 問題 ◆

→p.62~p.65

1 (1) $7\sqrt{3}$ (2) $6\sqrt{6}$ (3) $6\sqrt{7}$
 (4) $-2\sqrt{2}$ (5) $2\sqrt{5}$ (6) $-3\sqrt{10}$
 (7) $7\sqrt{5} - 7\sqrt{2}$ (8) $2\sqrt{3} - 2\sqrt{7}$
2 (1) $7\sqrt{2}$ (2) $5\sqrt{3}$ (3) $6\sqrt{5}$
 (4) $2\sqrt{3}$ (5) $-2\sqrt{5}$ (6) $-2\sqrt{7}$
 (7) $3\sqrt{2}$ (8) $7\sqrt{15} - 7\sqrt{10}$
 (9) $\sqrt{2} + \sqrt{5}$ (10) $-2\sqrt{7} + 4\sqrt{3}$
3 (1) $5\sqrt{5}$ (2) $\frac{4\sqrt{6}}{3}$ (3) $\frac{22\sqrt{7}}{21}$
 (4) $\frac{13\sqrt{15}}{10}$ (5) $\frac{7\sqrt{5}}{2}$ (6) $\frac{5\sqrt{14}}{14}$
4 (1) $7\sqrt{3}$ (2) $2\sqrt{2}$ (3) $-2\sqrt{7}$
 (4) $3\sqrt{2}$ (5) $\frac{5\sqrt{3}}{3}$ (6) $7\sqrt{5}$
 (7) $\frac{13\sqrt{10}}{2}$ (8) $18\sqrt{3}$ (9) $13\sqrt{2}$
 (10) $22\sqrt{7}$
5 (1) $\sqrt{6} + 4$ (2) $10\sqrt{2} + \sqrt{30}$
 (3) $-12\sqrt{2} + 12\sqrt{5}$ (4) $\sqrt{2} - 2\sqrt{3}$
 (5) $\sqrt{5} + 5\sqrt{3}$ (6) $-\sqrt{2} - 2\sqrt{14}$
 (7) $-2\sqrt{5} + 10\sqrt{2} - 20$
 (8) $-\frac{5}{2} + \frac{5\sqrt{6}}{6} + \sqrt{5}$
 (9) $6\sqrt{6} - 8\sqrt{7}$ (10) $-6 - \sqrt{10}$
6 (1) $3\sqrt{3} - 4\sqrt{2}$ (2) $4 + 3\sqrt{3}$
 (3) $4 + 5\sqrt{10}$
7 (1) $18 + 7\sqrt{6}$ (2) $-13 + \sqrt{7}$
 (3) $-2 - 4\sqrt{10}$ (4) $4 - 15\sqrt{2}$
 (5) $2 + 6\sqrt{5}$ (6) $84 - 33\sqrt{6}$
 (7) $-8 + \sqrt{10}$ (8) $-3 + 4\sqrt{3}$
 (9) $25 - 4\sqrt{42}$ (10) $-14 - 8\sqrt{2}$
 (11) $22 + 6\sqrt{14}$ (12) $18 - 8\sqrt{3}$
8 (1) $6 + 4\sqrt{2}$ (2) $28 - 10\sqrt{3}$
 (3) $21 + 8\sqrt{5}$ (4) $17 + 12\sqrt{2}$
 (5) $46 - 6\sqrt{5}$ (6) $49 - 20\sqrt{6}$
 (7) $5 + 2\sqrt{6}$ (8) $11 - 2\sqrt{30}$
 (9) $10 + 2\sqrt{21}$ (10) $17 - 4\sqrt{15}$
 (11) $25 + 6\sqrt{14}$ (12) $73 + 12\sqrt{35}$
9 (1) 2 (2) -18 (3) -54
 (4) 2 (5) 6 (6) -4

◆ 問題 ◆

→p.68~p.71

- 1 (1) $8\sqrt{5}-9$ (2) 18 (3) 21
 2 (1) 28 (2) $2-13\sqrt{2}$
 (3) 25 (4) 10
 3 (1) -3 (2) 6
 4 (1) $4\sqrt{35}$ (2) $144\sqrt{2}$
 5 (1) $2\sqrt{2}$ (2) 4 (3) -2
 (4) $8\sqrt{2}$ (5) 10 (6) 12
 6 (1) $2\sqrt{6}$ (2) $2\sqrt{7}$ (3) -4
 (4) 24 (5) 23 (6) 31
 7 (1) 1 (2) 8
 8 (1) $\sqrt{5}-2$ (2) $\sqrt{8}-2$
 (3) $\sqrt{10}-3$ (4) $\sqrt{17}-4$
 (5) $\sqrt{29}-5$ (6) $\sqrt{47}-6$
 (7) $5\sqrt{2}-7$ (8) $4\sqrt{3}-6$
 (9) $4\sqrt{5}-8$ (10) $\sqrt{2}-1$
 (11) $\sqrt{15}-3$ (12) $3\sqrt{5}-6$
 9 (1) $3\sqrt{2}-4$ (2) $18-12\sqrt{2}$
 (3) 2 (4) 14
 (5) $14-12\sqrt{2}$ (6) 9
 10 (1) 2 (2) $\sqrt{6}-2$
 (3) $2\sqrt{6}-4$ (4) $4-\sqrt{6}$
 (5) $14-4\sqrt{6}$ (6) $4\sqrt{6}-6$
 11 (1) 3 (2) $\sqrt{3}-1$
 (3) $3\sqrt{3}-3$ (4) 3
 (5) 2 (6) $10+\sqrt{3}$
 12 (1) $n=2$ (2) $n=6$
 (3) $n=14$ (4) $n=2$
 (5) $n=42$ (6) $n=21$
 13 (1) $n=6$ (2) $n=14$
 (3) $n=15$ (4) $n=105$
 (5) $n=105$ (6) $n=154$
 14 (1) $n=3, 10, 15, 18, 19$
 (2) $n=10, 19, 26, 31, 34, 35$
 (3) $n=16, 31, 44, 55, 64, 71, 76, 79, 80$
 (4) $n=7, 13, 15$ (5) $n=6, 15, 18$
 (6) $n=10, 19, 26, 31, 34, 35$
 15 (1) $a=60$
 (2) $n=5, 20, 45, 180$
 (3) $a=18, 50, 74, 90, 98$

◆ 練習問題 B ◆

→p.67

- 1 (1) $12\sqrt{2}-\sqrt{3}$ (2) $-6\sqrt{13}-\sqrt{14}$
 (3) $-2\sqrt{5}+\sqrt{6}$ (4) $5\sqrt{2}-17\sqrt{3}$
 (5) $3\sqrt{2}$ (6) $-\frac{7\sqrt{15}}{6}$
 (7) $-\frac{15\sqrt{14}}{14}$
 2 (1) $11\sqrt{5}$ (2) 78
 (3) $-5\sqrt{2}$ (4) $-\sqrt{10}+6+\frac{7\sqrt{6}}{6}$
 (5) $10+4\sqrt{6}$ (6) $2\sqrt{6}$
 (7) $\frac{\sqrt{2}}{2}$ (8) $7\sqrt{5}$
 3 (1) $-4-6\sqrt{30}$ (2) $84+6\sqrt{6}$
 (3) $120-80\sqrt{2}$ (4) 30
 (5) $22+2\sqrt{2}$ (6) $51-42\sqrt{2}$
 (7) $40\sqrt{3}$ (8) $2\sqrt{10}$
 (9) $34-12\sqrt{2}+14\sqrt{3}$
 (10) $-2\sqrt{30}$
 4 (1) $\frac{7+2\sqrt{10}}{3}$ (2) $10-4\sqrt{6}$
 (3) $\frac{25+10\sqrt{6}}{3}$
 解説
 1 (2) 与式 = $3 \times 2\sqrt{13} + 2\sqrt{14} - 3\sqrt{14} - 4 \times 3\sqrt{13}$
 $= 6\sqrt{13} + 2\sqrt{14} - 3\sqrt{14} - 12\sqrt{13}$
 (4) 与式 = $2 \times 7\sqrt{2} - 4 \times 6\sqrt{3} + 7\sqrt{3} - 9\sqrt{2}$
 $= 14\sqrt{2} - 24\sqrt{3} + 7\sqrt{3} - 9\sqrt{2}$
 (5) 与式 = $4\sqrt{2} + \frac{84}{6\sqrt{2}} - 8\sqrt{2}$
 $= 4\sqrt{2} + \frac{14 \times \sqrt{2}}{\sqrt{2} \times \sqrt{2}} - 8\sqrt{2}$
 $= 4\sqrt{2} + 7\sqrt{2} - 8\sqrt{2}$
 (6) 与式 = $\frac{\sqrt{5}}{\sqrt{3}} - 2\sqrt{15} + \frac{3\sqrt{5}}{2\sqrt{3}}$
 $= \frac{\sqrt{5} \times \sqrt{3}}{\sqrt{3} \times \sqrt{3}} - 2\sqrt{15} + \frac{3\sqrt{5} \times \sqrt{3}}{2\sqrt{3} \times \sqrt{3}}$
 $= \frac{\sqrt{15}}{3} - 2\sqrt{15} + \frac{3\sqrt{15}}{6}$
 (7) 与式 = $\frac{\sqrt{2} \times \sqrt{7}}{\sqrt{7} \times \sqrt{7}} + \frac{\sqrt{7} \times \sqrt{2}}{\sqrt{2} \times \sqrt{2}} - \frac{4 \times 3\sqrt{14}}{7}$
 $= \frac{\sqrt{14}}{7} + \frac{\sqrt{14}}{2} - \frac{12\sqrt{14}}{7}$

- (9) $-2+\sqrt{7}$ (10) $3\sqrt{2}$
 (11) $\sqrt{2}$ (12) $11-3\sqrt{15}$
 3 (1) $14+8\sqrt{2}$ (2) $-17+\sqrt{3}$
 (3) $23-8\sqrt{5}$ (4) $19-8\sqrt{3}$
 (5) $8+4\sqrt{3}$ (6) $15-10\sqrt{2}$
 (7) 2 (8) 3
 (9) 1 (10) $-\sqrt{5}$
 (11) $-6\sqrt{5}$ (12) 0
 4 (1) $\sqrt{7}-2$ (2) $6+2\sqrt{6}$
 (3) $\sqrt{10}+2$

解説

- 1 (7) 与式 = $4\sqrt{6} + \frac{12 \times \sqrt{6}}{\sqrt{6} \times \sqrt{6}} = 4\sqrt{6} + 2\sqrt{6}$
 (8) 与式 = $\frac{\sqrt{2}}{2} - \frac{3 \times \sqrt{2}}{\sqrt{2} \times \sqrt{2}} = \frac{\sqrt{2}}{2} - \frac{3\sqrt{2}}{2}$
 (9) 与式 = $-\frac{\sqrt{3} \times \sqrt{5}}{\sqrt{5} \times \sqrt{5}} + \frac{\sqrt{5} \times \sqrt{3}}{\sqrt{3} \times \sqrt{3}}$
 $= -\frac{\sqrt{15}}{5} + \frac{\sqrt{15}}{3} = \frac{-3\sqrt{15} + 5\sqrt{15}}{15}$
 (11) 与式 = $-4\sqrt{2} - 5\sqrt{2} + 6\sqrt{2}$
 (12) 与式 = $2 \times 3\sqrt{3} - 4\sqrt{3} + 5\sqrt{3}$
 $= 6\sqrt{3} - 4\sqrt{3} + 5\sqrt{3}$
 (14) 与式 = $8 \times 2\sqrt{3} + 2 \times 3\sqrt{2} - 4 \times 3\sqrt{3} - 6 \times 2\sqrt{2}$
 $= 16\sqrt{3} + 6\sqrt{2} - 12\sqrt{3} - 12\sqrt{2}$
 2 (1) 与式 = $3\sqrt{3} + 3\sqrt{2} \times \sqrt{6} = 3\sqrt{3} + 6\sqrt{3}$
 (2) 与式 = $\sqrt{14} \times 2\sqrt{2} - 2 \times 2\sqrt{7} = 4\sqrt{7} - 4\sqrt{7}$
 (3) 与式 = $2\sqrt{10} - \frac{3\sqrt{5}}{3\sqrt{2}}$
 $= 2\sqrt{10} - \frac{\sqrt{5} \times \sqrt{2}}{\sqrt{2} \times \sqrt{2}} = 2\sqrt{10} - \frac{\sqrt{10}}{2}$
 (6) 与式 = $\sqrt{21} \times (-\sqrt{3}) + \sqrt{15} \times (-\sqrt{3})$
 $= -3\sqrt{7} - 3\sqrt{5}$
 (9) 与式 = $-\frac{2\sqrt{6}}{\sqrt{6}} - \left(-\frac{\sqrt{42}}{\sqrt{6}}\right) = -2 + \sqrt{7}$
 (10) 与式 = $5\sqrt{2} + 2\sqrt{5} - 2\sqrt{5} - 2\sqrt{2}$
 3 (3) 与式 = $(2\sqrt{5})^2 + (-1-3) \times 2\sqrt{5}$
 $+ (-1) \times (-3)$
 (6) 与式 = $(\sqrt{10})^2 - 2 \times \sqrt{5} \times \sqrt{10} + (\sqrt{5})^2$
 (9) 与式 = $(\sqrt{8} + \sqrt{7})(\sqrt{8} - \sqrt{7}) = (\sqrt{8})^2 - (\sqrt{7})^2$
 (12) 与式 = $(\sqrt{2})^2 - 3^2 + 7$
 4 (2) 与式 = $\frac{2\sqrt{6}(\sqrt{6}+2)}{(\sqrt{6}-2)(\sqrt{6}+2)} = \frac{12+4\sqrt{6}}{6-4}$
 (3) 与式 = $\frac{3\sqrt{10}(5+\sqrt{10})}{(5-\sqrt{10})(5+\sqrt{10})} = \frac{15\sqrt{10}+30}{25-10}$

- 2 (2) 与式 = $\frac{2\sqrt{42}}{2\sqrt{6}} + 2\sqrt{13} \times 3\sqrt{13} - \sqrt{7}$
 $= \sqrt{7} + 78 - \sqrt{7}$
 (4) 与式 = $-\frac{6\sqrt{5}}{3\sqrt{2}} + \frac{2 \times 9\sqrt{2}}{3\sqrt{2}} + \frac{7\sqrt{3}}{3\sqrt{2}}$
 $= -\frac{6\sqrt{5} \times \sqrt{2}}{3\sqrt{2} \times \sqrt{2}} + 6 + \frac{7\sqrt{3} \times \sqrt{2}}{3\sqrt{2} \times \sqrt{2}}$
 $= -\sqrt{10} + 6 + \frac{7\sqrt{6}}{6}$
 (5) 与式 = $(2\sqrt{3} - \sqrt{2})(3\sqrt{3} + 4\sqrt{2}) - \frac{\sqrt{48}}{\sqrt{8}}$
 $= 18 + 5\sqrt{6} - 8 - \sqrt{6}$
 (7) 与式 = $\frac{5\sqrt{6} \times 5}{2\sqrt{3}} - \frac{4 \times 3\sqrt{12}}{\sqrt{6}}$
 $= \frac{25\sqrt{2}}{2} - 12\sqrt{2}$
 (8) 与式 = $\frac{3\sqrt{14} \times 4\sqrt{10}}{3\sqrt{7}} - \frac{10}{2\sqrt{5}}$
 $= 8\sqrt{5} - \frac{5 \times \sqrt{5}}{\sqrt{5} \times \sqrt{5}} = 8\sqrt{5} - \sqrt{5}$
 3 (2) 与式 = $(6\sqrt{3} - 3\sqrt{2})(6\sqrt{3} + 4\sqrt{2})$
 $= (6\sqrt{3})^2 + (-3\sqrt{2} + 4\sqrt{2}) \times 6\sqrt{3}$
 $+ (-3\sqrt{2}) \times 4\sqrt{2}$
 (3) 与式 = $(4\sqrt{5})^2 - 2 \times 2\sqrt{10} \times 4\sqrt{5} + (2\sqrt{10})^2$
 (4) 与式 = $(5\sqrt{2} - 2\sqrt{5})(5\sqrt{2} + 2\sqrt{5})$
 $= (5\sqrt{2})^2 - (2\sqrt{5})^2$
 (6) 与式 = $(2\sqrt{6})^2 - 2 \times 3\sqrt{3} \times 2\sqrt{6} + (3\sqrt{3})^2$
 $= 24 - 36\sqrt{2} + 27 - \frac{12 \times \sqrt{2}}{\sqrt{2} \times \sqrt{2}}$
 $= 51 - 36\sqrt{2} - 6\sqrt{2}$
 (7) $\sqrt{12} + 5 = M, \sqrt{12} - 5 = N$ とおく。
 (9) 与式 = $(2\sqrt{3} + 3\sqrt{2})(3\sqrt{6} - 2) + (3\sqrt{2} - 4)^2$
 $= 18\sqrt{2} - 4\sqrt{3} + 18\sqrt{3} - 6\sqrt{2}$
 $+ (18 - 24\sqrt{2} + 16)$
 4 (2) 与式 = $\frac{4\sqrt{3} - 4\sqrt{2}}{2\sqrt{3} + 2\sqrt{2}} = \frac{4(\sqrt{3} - \sqrt{2})}{2(\sqrt{3} + \sqrt{2})}$
 $= \frac{2(\sqrt{3} - \sqrt{2})^2}{(\sqrt{3} + \sqrt{2})(\sqrt{3} - \sqrt{2})}$
 (3) 与式 = $\frac{5\sqrt{3} + 5\sqrt{2}}{3\sqrt{3} - 3\sqrt{2}} = \frac{5(\sqrt{3} + \sqrt{2})}{3(\sqrt{3} - \sqrt{2})}$
 $= \frac{5(\sqrt{3} + \sqrt{2})^2}{3(\sqrt{3} - \sqrt{2})(\sqrt{3} + \sqrt{2})}$

