

① (1) 5, -5 (2) $\frac{3}{4}$, $-\frac{3}{4}$ (3) 0.7, -0.7

② 左から順に,

(1) 49, 7, -7 (2) $\frac{4}{9}$, $\frac{2}{3}$, $-\frac{2}{3}$

③ (1) 6, -6 (2) 10, -10 (3) 1, -1

(4) $\frac{3}{7}$, $-\frac{3}{7}$ (5) $\frac{4}{11}$, $-\frac{4}{11}$ (6) 0.9, -0.9

④ (1) $\pm\sqrt{5}$ (2) $\pm\sqrt{\frac{2}{7}}$ (3) $\pm\sqrt{0.8}$

⑤ 左から順に, 3, 3

⑥ (1) $\pm\sqrt{6}$ (2) $\pm\sqrt{\frac{3}{5}}$ (3) $\pm\sqrt{0.7}$

(4) 5 (5) 1 (6) $-\frac{4}{5}$

⑦ (1) $3 > \sqrt{8}$ (2) $-\sqrt{15} > -4$

解説

(1) $3^2 = 9$, $(\sqrt{8})^2 = 8$ より, $3 > \sqrt{8}$

(2) $(-\sqrt{15})^2 = 15$, $(-4)^2 = 16$ より,
 $-\sqrt{15} > -4$

⑧ (1) $-\sqrt{5}$, $\sqrt{2}$ (2) $-\sqrt{7}$, 0, $\sqrt{5}$

(3) $\sqrt{4}$, $\sqrt{9}$ (4) $-\sqrt{10}$, $-\sqrt{8}$

⑨ (1) $4 > \sqrt{9}$ (2) $-\sqrt{10} > -5$

⑩ (1) $\frac{5}{3}$, 2, $\sqrt{5}$ (2) -3, $-\sqrt{6}$, $-\sqrt{5}$

⑪ (1) $\sqrt{6}$ (2) $10\sqrt{3}$

(3) $\sqrt{5}$ (4) 2

解説

(1) 与式 $= \sqrt{2 \times 3} = \sqrt{6}$

(2) 与式 $= 2 \times 5 \times \sqrt{3} = 10\sqrt{3}$

(3) 与式 $= \sqrt{10 \div 2} = \sqrt{5}$

(4) 与式 $= \sqrt{12 \div 3} = \sqrt{4} = \sqrt{2^2} = 2$

⑫ (1) $\sqrt{15}$ (2) $\sqrt{10}$

(3) $12\sqrt{2}$ (4) $-10\sqrt{3}$

(5) 2 (6) 5

⑬ (1) $\sqrt{10}$ (2) 6

(3) 2 (4) 15

⑭ (1) $\sqrt{18}$ (2) $2\sqrt{5}$

解説

(1) $3\sqrt{2} = \sqrt{3^2 \times 2} = \sqrt{18}$

(2) $\sqrt{20} = \sqrt{2^2 \times 5} = 2\sqrt{5}$

⑮ (1) $\sqrt{32}$ (2) $-\sqrt{12}$

(3) $\sqrt{\frac{2}{9}}$ (4) $\sqrt{\frac{27}{2}}$

⑯ (1) $3\sqrt{2}$ (2) $-2\sqrt{2}$

(3) $\frac{\sqrt{3}}{2}$ (4) $\frac{2\sqrt{5}}{3}$

⑰ (1) 14.14 (2) 2.828

解説

(1) $\sqrt{200} = 10\sqrt{2} = 10 \times 1.414 = 14.14$

(2) $\sqrt{8} = 2\sqrt{2} = 2 \times 1.414 = 2.828$

⑱ (1) 17.32 (2) 54.77

(3) 0.5477 (4) 0.1732

解説

(3) $\sqrt{0.3} = \sqrt{\frac{30}{100}} = \frac{\sqrt{30}}{10} = \frac{5.477}{10} = 0.5477$

(4) $\sqrt{0.03} = \sqrt{\frac{3}{100}} = \frac{\sqrt{3}}{10} = \frac{1.732}{10} = 0.1732$

⑲ (1) 4.242 (2) 3.464

(3) 10.392 (4) 1.1312

解説

(1) $\sqrt{18} = 3\sqrt{2} = 3 \times 1.414 = 4.242$

(2) $\sqrt{12} = 2\sqrt{3} = 2 \times 1.732 = 3.464$

(3) $\sqrt{108} = 6\sqrt{3} = 6 \times 1.732 = 10.392$

(4) $\sqrt{\frac{32}{25}} = \frac{4\sqrt{2}}{5} = \frac{4}{5} \times 1.414 = 1.1312$

⑳ (1) $\frac{2}{5}\sqrt{5}$ (2) $\frac{\sqrt{2}}{2}$ (3) $\sqrt{7}$

解説

(1) $\frac{2}{\sqrt{5}} = \frac{2 \times \sqrt{5}}{\sqrt{5} \times \sqrt{5}} = \frac{2}{5}\sqrt{5}$

(2) $\frac{2}{\sqrt{8}} = \frac{2}{2\sqrt{2}} = \frac{1}{\sqrt{2}} = \frac{1 \times \sqrt{2}}{\sqrt{2} \times \sqrt{2}} = \frac{\sqrt{2}}{2}$

(3) $\frac{\sqrt{3}}{\sqrt{21}} = \frac{\sqrt{3}}{\sqrt{7} \times \sqrt{3}} = \frac{1}{\sqrt{7}} = \frac{\sqrt{7}}{7}$

㉑ (1) $\frac{2}{3}\sqrt{3}$ (2) $2\sqrt{5}$

(3) $\frac{\sqrt{3}}{3}$ (4) $\sqrt{5}$

㉒ (1) $3\sqrt{2}$ (2) $4\sqrt{21}$

(3) $\frac{5}{3}$ (4) $\frac{4}{15}\sqrt{6}$

解説

(1) 与式 $= \sqrt{3} \times \sqrt{3} \times \sqrt{2} = 3\sqrt{2}$

(2) 与式 $= \sqrt{4 \times 3} \times \sqrt{4 \times 7} = 4\sqrt{21}$

(3) 与式 $= \frac{5\sqrt{2}}{3\sqrt{2}} = \frac{5}{3}$

(4) 与式 $= \frac{4\sqrt{2}}{5\sqrt{3}} = \frac{4\sqrt{2} \times \sqrt{3}}{5\sqrt{3} \times \sqrt{3}} = \frac{4}{15}\sqrt{6}$

㉓ (1) $5\sqrt{2}$ (2) $3\sqrt{14}$ (3) $18\sqrt{2}$

(4) $16\sqrt{3}$ (5) $10\sqrt{7}$ (6) 18

㉔ (1) $\frac{3}{2}$ (2) $\frac{3}{2}$ (3) $\frac{\sqrt{6}}{3}$

(4) $\frac{\sqrt{6}}{4}$ (5) $6\sqrt{2}$ (6) $\frac{9}{2}\sqrt{3}$

㉕ (1) $4\sqrt{2}$ (2) $\sqrt{2}$

解説

(1) 与式 $= (1+3)\sqrt{2} = 4\sqrt{2}$

(2) 与式 $= 4\sqrt{2} - 3\sqrt{2} = (4-3)\sqrt{2} = \sqrt{2}$

㉖ (1) $5\sqrt{3}$ (2) $-5\sqrt{5}$ (3) $7\sqrt{3}$

(4) $\sqrt{2}$ (5) $5\sqrt{5}$ (6) $-\sqrt{2}$

㉗ (1) $3\sqrt{2}$ (2) $-\sqrt{2}$

28 (1) $2+\sqrt{6}$ (2) $\sqrt{7}-1$
 (3) $4\sqrt{3}$ (4) $-\sqrt{2}$

解説

(1) 与式 $=\sqrt{2} \times \sqrt{2} + \sqrt{2} \times \sqrt{3} = 2 + \sqrt{6}$

(2) 与式 $=\sqrt{35} \div \sqrt{5} - \sqrt{5} \div \sqrt{5} = \sqrt{7} - 1$

(3) 与式 $=5\sqrt{3} - \sqrt{3} = 4\sqrt{3}$

(4) 与式 $=\sqrt{18} - \sqrt{32} = 3\sqrt{2} - 4\sqrt{2} = -\sqrt{2}$

29 (1) $2\sqrt{3} + 3$ (2) $\sqrt{15} - 6\sqrt{2}$
 (3) 5 (4) $1 - \sqrt{6}$

30 (1) $4\sqrt{2}$ (2) $-\sqrt{6}$
 (3) $-6\sqrt{3}$ (4) $6 - 3\sqrt{3}$

31 (1) $8 - 2\sqrt{15}$ (2) 5
 (3) $-5 + 2\sqrt{3}$ (4) 4

解説

(1) 与式 $=(\sqrt{5})^2 - 2 \times \sqrt{5} \times \sqrt{3} + (\sqrt{3})^2$
 $= 8 - 2\sqrt{15}$

(2) 与式 $=(\sqrt{7})^2 - (\sqrt{2})^2 = 7 - 2 = 5$

(3) $\sqrt{3}$ を x とおく。

与式 $= (x+4)(x-2) = x^2 + 2x - 8$
 $= (\sqrt{3})^2 + 2 \times \sqrt{3} - 8 = -5 + 2\sqrt{3}$

(4) 与式 $= (\sqrt{3})^2 + 2 \times \sqrt{3} \times 1 + 1 - 2\sqrt{3} = 4$

32 (1) $7 + 4\sqrt{3}$ (2) $9 - 2\sqrt{14}$
 (3) 3 (4) 2

33 (1) $8 + 5\sqrt{2}$ (2) $16 - 12\sqrt{2}$
 (3) 3 (4) $4 - 2\sqrt{5}$

34 (1) 1 (2) 10

解説

(1) 与式 $= x(x+2)$ これに $x = \sqrt{2} - 1$ を代入して,
 $(\sqrt{2}-1)(\sqrt{2}-1+2) = (\sqrt{2}-1)(\sqrt{2}+1)$
 $= (\sqrt{2})^2 - 1^2 = 2 - 1 = 1$

(2) 与式 $= (x+y)^2 - 2xy$

ここで, $x+y = (\sqrt{3}+\sqrt{2}) + (\sqrt{3}-\sqrt{2}) = 2\sqrt{3}$

$xy = (\sqrt{3}+\sqrt{2})(\sqrt{3}-\sqrt{2}) = (\sqrt{3})^2 - (\sqrt{2})^2$
 $= 1$

よって, $(2\sqrt{3})^2 - 2 \times 1 = 12 - 2 = 10$

35 (1) 21 (2) 4

36 (1) 16 (2) 13

解説

(1) 与式 $= (x+y)^2$

$x+y = (2+\sqrt{3}) + (2-\sqrt{3}) = 4$ より,
 $4^2 = 16$

(2) 与式 $= (x+y)^2 - 3xy$

$x+y = 4$, $xy = (2+\sqrt{3})(2-\sqrt{3}) = 1$ より,
 $4^2 - 3 \times 1 = 13$

37 (1) $\sqrt{3}-\sqrt{2}$ (2) $\frac{3\sqrt{5}+3}{4}$

解説

(1) 与式 $= \frac{1 \times (\sqrt{3}-\sqrt{2})}{(\sqrt{3}+\sqrt{2})(\sqrt{3}-\sqrt{2})} = \frac{(\sqrt{3}-\sqrt{2})}{3-2}$
 $= \sqrt{3}-\sqrt{2}$

(2) 与式 $= \frac{3 \times (\sqrt{5}+1)}{(\sqrt{5}-1)(\sqrt{5}+1)} = \frac{3(\sqrt{5}+1)}{5-1}$
 $= \frac{3\sqrt{5}+3}{4}$

38 (1) $\frac{\sqrt{6}+\sqrt{3}}{3}$ (2) $3\sqrt{2}+3$

(3) $2\sqrt{5}-2\sqrt{3}$ (4) $\frac{4\sqrt{2}+2\sqrt{5}}{3}$

39 (1) $2\sqrt{3}$ (2) 10

解説

$x = \frac{1 \times (\sqrt{3}-\sqrt{2})}{(\sqrt{3}+\sqrt{2})(\sqrt{3}-\sqrt{2})} = \frac{(\sqrt{3}-\sqrt{2})}{3-2}$
 $= \sqrt{3}-\sqrt{2}$

$y = \frac{1 \times (\sqrt{3}+\sqrt{2})}{(\sqrt{3}-\sqrt{2})(\sqrt{3}+\sqrt{2})} = \frac{(\sqrt{3}+\sqrt{2})}{3-2}$
 $= \sqrt{3}+\sqrt{2}$

(1) $x+y = (\sqrt{3}-\sqrt{2}) + (\sqrt{3}+\sqrt{2}) = 2\sqrt{3}$

(2) $x^2+y^2 = (x+y)^2 - 2xy$
 $= (2\sqrt{3})^2 - 2(\sqrt{3}-\sqrt{2})(\sqrt{3}+\sqrt{2}) = 10$

40 (1) -2 (2) $a=3$

解説

(1) $1 < \sqrt{2} < 2$ なので, $x = \sqrt{2} - 1$ となる。

$x^2 + 2x - 3 = (x+3)(x-1)$ これに x の値を代入して,
 $(\sqrt{2}-1+3)(\sqrt{2}-1-1) = (\sqrt{2}+2) \times (\sqrt{2}-2) = 2-4 = -2$

(2) $12a$ が (整数)² の形になればよい。 $12 = 2^2 \times 3$ より, 最小の a は 3

41 (1) 2 (2) 4

解説

(2) $a = \sqrt{5} - 2$ となる。与式 $= (a+1)(a+3)$ で, これに a の値を代入する。

$(\sqrt{5}-2+1)(\sqrt{5}-2+3) = (\sqrt{5}-1)(\sqrt{5}+1)$
 $= 5 - 1 = 4$

42 (1) $x=15$ (2) $a=35$

章のまとめ

- ① (1) ① ± 4 ② ± 0.6 ③ $\pm \frac{7}{4}$
 (2) ① 5 ② 4 ③ 3
 (3) ① $\sqrt{45}$ ② $-\sqrt{48}$ ③ $2\sqrt{6}$ ④ $3\sqrt{5}$
 (4) ① $\sqrt{15} < 4$ ② $\sqrt{15} < 4 < 2\sqrt{5}$
 ③ $-8 < -3\sqrt{7} < -\sqrt{60}$
- ② (1) 0.1414 (2) 4.472 (3) 70.7
- ③ (1) $\frac{5}{2}\sqrt{2}$ (2) $\frac{\sqrt{21}}{15}$ (3) $\frac{2}{3}\sqrt{3}$
- ④ (1) $3\sqrt{14}$ (2) $4\sqrt{6}$ (3) $6\sqrt{3}$
 (4) $\frac{3}{4}$ (5) $\frac{\sqrt{2}}{2}$ (6) $\frac{\sqrt{3}}{3}$
- ⑤ (1) $7\sqrt{3}$ (2) $-6\sqrt{2}$ (3) $-3\sqrt{6}$
 (4) $6\sqrt{2}$ (5) $-3\sqrt{5}$ (6) $2\sqrt{3}$
- ⑥ (1) $2\sqrt{3} - 15$ (2) $2\sqrt{3} - 1$
 (3) $\sqrt{3}$ (4) $-3\sqrt{2}$

- ⑦ (1) $4 - 2\sqrt{3}$ (2) $5 + 2\sqrt{6}$
 (3) $22 - 4\sqrt{10}$ (4) $30 - 12\sqrt{6}$
 (5) 2 (6) 35
 (7) $5 + 3\sqrt{3}$ (8) $57 - 3\sqrt{7}$

- ⑧ (1) $5 + 2\sqrt{3} - 2\sqrt{6}$ (2) 0
 (3) $14 - 6\sqrt{2}$ (4) $4\sqrt{14}$
- ⑨ (1) $5 + \sqrt{5}$ (2) 22

解説

$$\begin{aligned} (2) \text{与式} &= a^2 + 4ab + 4b^2 + 4a^2 - 4ab \\ &= 5a^2 + 4b^2 = 5 \times (\sqrt{2})^2 + 4 \times (-\sqrt{3})^2 \\ &= 22 \end{aligned}$$

- ⑩ (1) $a + b = 2\sqrt{7}$, $a - b = 4$, $ab = 3$
 (2) $8\sqrt{7}$ (3) 31

解説

$$(2) \text{与式} = (a + b)(a - b) = 2\sqrt{7} \times 4 = 8\sqrt{7}$$

$$(3) \text{与式} = (a + b)^2 + ab = (2\sqrt{7})^2 + 3 = 31$$

- ⑪ (1) $a = \sqrt{3} - 1$ (2) 3 (3) $3 + \sqrt{3}$

解説

$$\begin{aligned} (3) \text{与式} &= (a + 2)(a + 1) = (\sqrt{3} - 1 + 2)(\sqrt{3} - 1 + 1) \\ &= 3 + \sqrt{3} \end{aligned}$$

- ⑫ (1) $a = 10$ (2) $x = 2, 8$ (3) $m = 30$

解説

$$(2) 18 = 2 \times 3^2 \text{ より, } x = 2, 2 \times 2^2 \text{ となる。}$$