

1 . 次の計算をし，指数は正の整数にせよ。

- (1) $a^7 \times a^{-3}$
- (2) $a^{-8} \times a^6$
- (3) $(a^{-3})^2$
- (4) $(a^{-1})^{-2}$
- (5) $(a^{-2}b)^{-3}$
- (6) $(a^{-1}b^{-2})^{-1}$
- (7) $(a^{-1})^2 \times a^{-1} \times a^5$

2 . 次の計算をし，指数は正の整数にせよ。

- (1) $a^8 \div a^5$
- (2) $a \div a^4$
- (3) $a^2 \div a^{-3}$
- (4) $a^{-1} \div a^{-5}$

3 . 次の値を求めよ。

- (1) $\sqrt{25}$
- (2) $\sqrt{49}$
- (3) $\sqrt[3]{1}$
- (4) $\sqrt[3]{27}$
- (5) $\sqrt[3]{-27}$
- (6) $\sqrt[3]{-64}$

4 . 次の値を求めよ。

- (1) 8^0
- (2) $27^{\frac{2}{3}}$
- (3) $64^{\frac{2}{3}}$
- (4) $81^{\frac{3}{4}}$
- (5) 10^{-1}
- (6) $(0.1)^{-2}$
- (7) $32^{-\frac{1}{5}}$

5 . 次の計算をせよ。

- (1) $3^{\frac{1}{2}} \times 3^{\frac{3}{2}}$
- (2) $2^{\frac{1}{2}} \times 2^{-\frac{5}{2}}$
- (3) $4^{\frac{1}{3}} \times 4^{\frac{1}{6}}$
- (4) $5^{\frac{4}{3}} \div 5^{\frac{1}{3}}$
- (5) $32^{\frac{4}{5}} \div 32^{\frac{3}{5}}$
- (6) $6^{-\frac{5}{2}} \div 6^{-\frac{1}{2}}$
- (7) $(25^3)^{\frac{1}{2}}$
- (8) $(49^{-\frac{2}{3}})^{\frac{3}{4}}$
- (9) $(2^{\frac{2}{3}}3^{\frac{1}{2}})^6$

6. 次の計算をせよ。

- (1) $\sqrt[3]{5} \times \sqrt{5} \times \sqrt[6]{5}$
- (3) $\sqrt[3]{6} \times \sqrt{6} \times \sqrt[6]{6}$
- (5) $\sqrt[3]{2} \div \sqrt{2} \times \sqrt[6]{16}$
- (7) $\sqrt[4]{27} \times \sqrt{27} \div \sqrt[4]{3}$

- (2) $\sqrt[4]{25} \times \sqrt[6]{125}$
- (4) $\sqrt[3]{2} \times \sqrt[6]{2} \div \sqrt[4]{4}$
- (6) $\sqrt{27} \times \sqrt[3]{81} \div \sqrt[6]{243}$
- (8) $\sqrt[6]{243} \div \sqrt[3]{3} \div \sqrt[4]{9}$

7. 次の計算をせよ。

- (1) $\sqrt[3]{2} \times \sqrt[3]{32}$
- (4) $\sqrt[4]{64} \div \sqrt[4]{4}$
- (7) $\sqrt[3]{54} + \sqrt[3]{16}$

- (2) $\sqrt[4]{5} \times \sqrt[4]{125}$
- (5) $(\sqrt[4]{3})^8$
- (8) $\sqrt[4]{243} + \sqrt[4]{3} - \sqrt[4]{48}$

- (3) $\sqrt[3]{32} \div \sqrt[3]{4}$
- (6) $(\sqrt[3]{-2})^9$

8. $a > 0, \ b > 0$ とする。次の計算をせよ。

- (1) $3^{\frac{1}{3}} \times 3^{\frac{3}{2}} \div 3^{\frac{5}{6}}$

- (2) $5^{-\frac{1}{3}} \times 5^{\frac{5}{6}} \div 5^{\frac{1}{2}}$

- (3) $a^{-\frac{1}{3}} \times a^{\frac{11}{6}} \div a^{-\frac{1}{2}}$

- (4) $a^{\frac{8}{5}} \div a^{\frac{1}{10}} \times a^{\frac{1}{2}}$

- (5) $(a^{\frac{1}{2}} + b^{\frac{1}{2}})(a^{\frac{1}{2}} - b^{\frac{1}{2}})$

- (6) $(a^{\frac{1}{3}} + b^{\frac{1}{3}})(a^{\frac{2}{3}} - a^{\frac{1}{3}}b^{\frac{1}{3}} + b^{\frac{2}{3}})$

1. 次の計算をし、指数は正の整数にせよ。

- (1) $a^7 \times a^{-3}$
- (2) $a^{-8} \times a^6$
- (3) $(a^{-3})^2$
- (4) $(a^{-1})^{-2}$
- (5) $(a^{-2}b)^{-3}$
- (6) $(a^{-1}b^{-2})^{-1}$
- (7) $(a^{-1})^2 \times a^{-1} \times a^5$

【解答】 (1) a^4 (2) $\frac{1}{a^2}$ (3) $\frac{1}{a^6}$ (4) a^2 (5) $\frac{a^6}{b^3}$ (6) ab^2 (7) a^2

【解説】

- (1) $a^7 \times a^{-3} = a^{7-3} = a^4$
- (2) $a^{-8} \times a^6 = a^{-8+6} = a^{-2} = \frac{1}{a^2}$
- (3) $(a^{-3})^2 = a^{(-3) \times 2} = a^{-6} = \frac{1}{a^6}$
- (4) $(a^{-1})^{-2} = a^{(-1) \times (-2)} = a^2$
- (5) $(a^{-2}b)^{-3} = a^{(-2) \times (-3)} b^{-3} = a^6 b^{-3} = \frac{a^6}{b^3}$
- (6) $(a^{-1}b^{-2})^{-1} = a^{(-1) \times (-1)} b^{(-2) \times (-1)} = ab^2$
- (7) $(a^{-1})^2 \times a^{-1} \times a^5 = a^{-2} \times a^{-1} \times a^5 = a^{-2-1+5} = a^2$

2. 次の計算をし、指数は正の整数にせよ。

- (1) $a^8 \div a^5$
- (2) $a \div a^4$
- (3) $a^2 \div a^{-3}$
- (4) $a^{-1} \div a^{-5}$

【解答】 (1) a^3 (2) $\frac{1}{a^3}$ (3) a^5 (4) a^4

【解説】

- (1) $a^8 \div a^5 = a^{8-5} = a^3$
- (2) $a \div a^4 = a^{1-4} = a^{-3} = \frac{1}{a^3}$
- (3) $a^2 \div a^{-3} = a^{2-(-3)} = a^{2+3} = a^5$
- (4) $a^{-1} \div a^{-5} = a^{-1-(-5)} = a^{-1+5} = a^4$

3. 次の値を求めよ。

- (1) $\sqrt{25}$
- (2) $\sqrt{49}$
- (3) $\sqrt[3]{1}$
- (4) $\sqrt[3]{27}$
- (5) $\sqrt[3]{-27}$
- (6) $\sqrt[3]{-64}$

【解答】 (1) 5 (2) 7 (3) 1 (4) 3 (5) -3 (6) -4

【解説】

- (1) $\sqrt{25} = \sqrt{5^2} = 5$
- (2) $\sqrt{49} = \sqrt{7^2} = 7$
- (3) $\sqrt[3]{1} = \sqrt[3]{1^3} = 1$
- (4) $\sqrt[3]{27} = \sqrt[3]{3^3} = 3$
- (5) $\sqrt[3]{-27} = \sqrt[3]{(-3)^3} = -3$
- (6) $\sqrt[3]{-64} = \sqrt[3]{(-4)^3} = -4$

4. 次の値を求めよ。

- (1) 8^0
- (2) $27^{\frac{2}{3}}$
- (3) $64^{\frac{2}{3}}$
- (4) $81^{\frac{3}{4}}$
- (5) 10^{-1}
- (6) $(0.1)^{-2}$
- (7) $32^{-\frac{1}{5}}$

【解答】 (1) 1 (2) 9 (3) 16 (4) 27 (5) $\frac{1}{10}$ (6) 100 (7) $\frac{1}{2}$

【解説】

- (1) $8^0 = 1$
- (2) $27^{\frac{2}{3}} = (\sqrt[3]{27})^2 = (\sqrt[3]{3^3})^2 = 3^2 = 9$
- (3) $64^{\frac{2}{3}} = (\sqrt[3]{64})^2 = (\sqrt[3]{4^3})^2 = 4^2 = 16$
- (4) $81^{\frac{3}{4}} = (\sqrt[4]{81})^3 = (\sqrt[4]{3^4})^3 = 3^3 = 27$
- (5) $10^{-1} = \frac{1}{10}$
- (6) $(0.1)^{-2} = \frac{1}{(0.1)^2} = \frac{1}{0.01} = \frac{1 \times 100}{0.01 \times 100} = \frac{100}{1} = 100$
- (7) $32^{-\frac{1}{5}} = \frac{1}{32^{\frac{1}{5}}} = \frac{1}{\sqrt[5]{32}} = \frac{1}{\sqrt[5]{2^5}} = \frac{1}{2}$

5. 次の計算をせよ。

- (1) $3^{\frac{1}{2}} \times 3^{\frac{3}{2}}$
- (2) $2^{\frac{1}{2}} \times 2^{-\frac{5}{2}}$
- (3) $4^{\frac{1}{3}} \times 4^{\frac{1}{6}}$
- (4) $5^{\frac{4}{3}} \div 5^{\frac{1}{3}}$
- (5) $32^{\frac{4}{5}} \div 32^{\frac{3}{5}}$
- (6) $6^{-\frac{5}{2}} \div 6^{-\frac{1}{2}}$
- (7) $(25^3)^{\frac{1}{2}}$
- (8) $(49^{-\frac{2}{3}})^{\frac{3}{4}}$
- (9) $(2^{\frac{2}{3}}3^{\frac{1}{3}})^6$

【解答】 (1) 9 (2) $\frac{1}{4}$ (3) 2 (4) 5 (5) 2 (6) $\frac{1}{36}$ (7) 125

(8) $\frac{1}{7}$ (9) 432

【解説】

- (1) $3^{\frac{1}{2}} \times 3^{\frac{3}{2}} = 3^{\frac{1}{2} + \frac{3}{2}} = 3^2 = 9$
- (2) $2^{\frac{1}{2}} \times 2^{-\frac{5}{2}} = 2^{\frac{1}{2} - \frac{5}{2}} = 2^{-2} = \frac{1}{2^2} = \frac{1}{4}$
- (3) $4^{\frac{1}{3}} \times 4^{\frac{1}{6}} = 4^{\frac{1}{3} + \frac{1}{6}} = 4^{\frac{2}{6} + \frac{1}{6}} = 4^{\frac{3}{6}} = 4^{\frac{1}{2}} = (2^2)^{\frac{1}{2}} = 2^{2 \times \frac{1}{2}} = 2^1 = 2$
- (4) $5^{\frac{4}{3}} \div 5^{\frac{1}{3}} = 5^{\frac{4}{3} - \frac{1}{3}} = 5^{\frac{3}{3}} = 5^1 = 5$
- (5) $32^{\frac{4}{5}} \div 32^{\frac{3}{5}} = 32^{\frac{4}{5} - \frac{3}{5}} = 32^{\frac{1}{5}} = (2^5)^{\frac{1}{5}} = 2^{5 \times \frac{1}{5}} = 2^1 = 2$
- (6) $6^{-\frac{5}{2}} \div 6^{-\frac{1}{2}} = 6^{-\frac{5}{2} - (-\frac{1}{2})} = 6^{-\frac{5}{2} + \frac{1}{2}} = 6^{-2} = \frac{1}{6^2} = \frac{1}{36}$
- (7) $(25^3)^{\frac{1}{2}} = 25^{3 \times \frac{1}{2}} = 25^{\frac{3}{2}} = (5^2)^{\frac{3}{2}} = 5^{2 \times \frac{3}{2}} = 5^3 = 125$
- (8) $(49^{-\frac{2}{3}})^{\frac{3}{4}} = 49^{-\frac{2}{3} \times \frac{3}{4}} = 49^{-\frac{1}{2}} = (7^2)^{-\frac{1}{2}} = 7^{2 \times (-\frac{1}{2})} = 7^{-1} = \frac{1}{7}$
- (9) $(2^{\frac{2}{3}}3^{\frac{1}{3}})^6 = 2^{\frac{2}{3} \times 6} 3^{\frac{1}{3} \times 6} = 2^4 \times 3^3 = 16 \times 27 = 432$

6. 次の計算をせよ。

- (1) $\sqrt[3]{5} \times \sqrt{5} \times \sqrt[6]{5}$
- (2) $\sqrt[4]{25} \times \sqrt[6]{125}$
- (3) $\sqrt[3]{6} \times \sqrt{6} \times \sqrt[6]{6}$
- (4) $\sqrt[3]{2} \times \sqrt[6]{2} \div \sqrt[4]{4}$
- (5) $\sqrt[3]{2} \div \sqrt{2} \times \sqrt[6]{16}$
- (6) $\sqrt{27} \times \sqrt[3]{81} \div \sqrt[6]{243}$
- (7) $\sqrt[4]{27} \times \sqrt{27} \div \sqrt[4]{3}$
- (8) $\sqrt[6]{243} \div \sqrt[3]{3} \div \sqrt[4]{9}$

【解答】 (1) 5 (2) 5 (3) 6 (4) 1 (5) $\sqrt{2}$ (6) 9 (7) 9 (8) 1

【解説】

- (1) $\sqrt[3]{5} \times \sqrt{5} \times \sqrt[6]{5} = 5^{\frac{1}{3}} \times 5^{\frac{1}{2}} \times 5^{\frac{1}{6}} = 5^{\frac{1}{3} + \frac{1}{2} + \frac{1}{6}} = 5^{\frac{2}{6} + \frac{3}{6} + \frac{1}{6}} = 5^{\frac{6}{6}} = 5^1 = 5$
- (2) $\sqrt[4]{25} \times \sqrt[6]{125} = 25^{\frac{1}{4}} \times 125^{\frac{1}{6}} = (5^2)^{\frac{1}{4}} \times (5^3)^{\frac{1}{6}} = 5^{\frac{2}{4}} \times 5^{\frac{3}{6}} = 5^{\frac{1}{2}} \times 5^{\frac{1}{2}} = 5^{\frac{1}{2} + \frac{1}{2}} = 5^{\frac{2}{2}} = 5^1 = 5$
- (3) $\sqrt[3]{6} \times \sqrt{6} \times \sqrt[6]{6} = 6^{\frac{1}{3}} \times 6^{\frac{1}{2}} \times 6^{\frac{1}{6}} = 6^{\frac{1}{3} + \frac{1}{2} + \frac{1}{6}} = 6^{\frac{2}{6} + \frac{3}{6} + \frac{1}{6}} = 6^{\frac{6}{6}} = 6^1 = 6$
- (4) $\sqrt[3]{2} \times \sqrt[6]{2} \div \sqrt[4]{4} = 2^{\frac{1}{3}} \times 2^{\frac{1}{6}} \div 4^{\frac{1}{4}} = 2^{\frac{1}{3} + \frac{1}{6}} \div (2^2)^{\frac{1}{4}} = 2^{\frac{2}{6} + \frac{1}{6}} \div 2^{2 \times \frac{1}{4}} = 2^{\frac{3}{6}} \div 2^{\frac{1}{2}} = 2^{\frac{1}{2} - \frac{1}{2}} = 2^0 = 1$
- (5) $\sqrt[3]{2} \div \sqrt{2} \times \sqrt[6]{16} = 2^{\frac{1}{3}} \div 2^{\frac{1}{2}} \times 16^{\frac{1}{6}} = 2^{\frac{1}{3} - \frac{1}{2}} \times (2^4)^{\frac{1}{6}} = 2^{\frac{2}{6} - \frac{3}{6}} \times 2^{\frac{4}{6}} = 2^{-\frac{1}{6} + \frac{4}{6}} = 2^{\frac{3}{6}} = 2^{\frac{1}{2}} = \sqrt{2}$
- (6) $\sqrt{27} \times \sqrt[3]{81} \div \sqrt[6]{243} = 27^{\frac{1}{2}} \times 81^{\frac{1}{3}} \div 243^{\frac{1}{6}} = (3^3)^{\frac{1}{2}} \times (3^4)^{\frac{1}{3}} \div (3^5)^{\frac{1}{6}} = 3^{\frac{3}{2}} \times 3^{\frac{4}{3}} \div 3^{\frac{5}{6}} = 3^{\frac{3}{2} + \frac{4}{3} - \frac{5}{6}} = 3^{\frac{9}{6} + \frac{8}{6} - \frac{5}{6}} = 3^{\frac{12}{6}} = 3^2 = 9$
- (7) $\sqrt[4]{27} \times \sqrt{27} \div \sqrt[4]{3} = 27^{\frac{1}{4}} \times 27^{\frac{1}{2}} \div 3^{\frac{1}{4}} = (3^3)^{\frac{1}{4}} \times (3^3)^{\frac{1}{2}} \div 3^{\frac{1}{4}} = 3^{\frac{3}{4}} \times 3^{\frac{3}{2}} \div 3^{\frac{1}{4}} = 3^{\frac{3}{4} + \frac{3}{2} - \frac{1}{4}} = 3^{\frac{3}{4} + \frac{6}{4} - \frac{1}{4}} = 3^{\frac{8}{4}} = 3^2 = 9$
- (8) $\sqrt[6]{243} \div \sqrt[3]{3} \div \sqrt[4]{9} = 243^{\frac{1}{6}} \div 3^{\frac{1}{3}} \div 9^{\frac{1}{4}} = (3^5)^{\frac{1}{6}} \div 3^{\frac{1}{3}} \div (3^2)^{\frac{1}{4}} = 3^{\frac{5}{6}} \div 3^{\frac{1}{3}} \div 3^{\frac{1}{2}} = 3^{\frac{5}{6} - \frac{1}{3} - \frac{1}{2}} = 3^{\frac{5}{6} - \frac{2}{6} - \frac{3}{6}} = 3^0 = 1$

7. 次の計算をせよ。

- (1) $\sqrt[3]{2}\times\sqrt[3]{32}$
- (2) $\sqrt[4]{5}\times\sqrt[4]{125}$
- (3) $\sqrt[3]{32}\div\sqrt[3]{4}$
- (4) $\sqrt[4]{64}\div\sqrt[4]{4}$
- (5) $(\sqrt[4]{3})^8$
- (6) $(\sqrt[3]{-2})^9$
- (7) $\sqrt[3]{54}+\sqrt[3]{16}$
- (8) $\sqrt[4]{243}+\sqrt[4]{3}-\sqrt[4]{48}$

【解答】 (1) 4 (2) 5 (3) 2 (4) 2 (5) 9 (6) -8 (7) $5\sqrt[3]{2}$
(8) $2\sqrt[4]{3}$

【解説】

- (1) $\sqrt[3]{2}\times\sqrt[3]{32}=\sqrt[3]{2\times32}=\sqrt[3]{64}=\sqrt[3]{4^3}=4$
- (2) $\sqrt[4]{5}\times\sqrt[4]{125}=\sqrt[4]{5\times125}=\sqrt[4]{5\times5^3}=\sqrt[4]{5^4}=5$
- (3) $\sqrt[3]{32}\div\sqrt[3]{4}=\sqrt[3]{32\div4}=\sqrt[3]{8}=\sqrt[3]{2^3}=2$
- (4) $\sqrt[4]{64}\div\sqrt[4]{4}=\sqrt[4]{64\div4}=\sqrt[4]{16}=\sqrt[4]{2^4}=2$
- (5) $(\sqrt[4]{3})^8=\{(\sqrt[4]{3})^4\}^2=3^2=9$
- (6) $(\sqrt[3]{-2})^9=\{(\sqrt[3]{-2})^3\}^3=(-2)^3=-8$
- (7) $\sqrt[3]{54}+\sqrt[3]{16}=\sqrt[3]{3^3\times2}+\sqrt[3]{2^3\times2}=\sqrt[3]{3^3}\times\sqrt[3]{2}+\sqrt[3]{2^3}\times\sqrt[3]{2}=3\sqrt[3]{2}+2\sqrt[3]{2}=5\sqrt[3]{2}$
- (8) $\sqrt[4]{243}+\sqrt[4]{3}-\sqrt[4]{48}=\sqrt[4]{3^4\times3}+\sqrt[4]{3}-\sqrt[4]{2^4\times3}=\sqrt[4]{3^4}\times\sqrt[4]{3}+\sqrt[4]{3}-\sqrt[4]{2^4}\times\sqrt[4]{3}$
 $=3\sqrt[4]{3}+\sqrt[4]{3}-2\sqrt[4]{3}=2\sqrt[4]{3}$

8. $a>0, b>0$ とする。次の計算をせよ。

- (1) $3^{\frac{1}{3}}\times3^{\frac{2}{3}}\div3^{\frac{5}{6}}$
- (2) $5^{-\frac{1}{3}}\times5^{\frac{5}{6}}\div5^{\frac{1}{2}}$
- (3) $a^{-\frac{1}{3}}\times a^{\frac{11}{6}}\div a^{-\frac{1}{2}}$
- (4) $a^{\frac{8}{9}}\div a^{\frac{1}{10}}\times a^{\frac{1}{2}}$
- (5) $(a^{\frac{1}{2}}+b^{\frac{1}{2}})(a^{\frac{1}{2}}-b^{\frac{1}{2}})$
- (6) $(a^{\frac{1}{3}}+b^{\frac{1}{3}})(a^{\frac{2}{3}}-a^{\frac{1}{3}}b^{\frac{1}{3}}+b^{\frac{2}{3}})$

【解答】 (1) 3 (2) 1 (3) a^2 (4) a^2 (5) $a-b$ (6) $a+b$

【解説】

- (1) $3^{\frac{1}{3}}\times3^{\frac{2}{3}}\div3^{\frac{5}{6}}=3^{\frac{1}{3}+\frac{2}{3}-\frac{5}{6}}=3^{\frac{2}{6}+\frac{9}{6}-\frac{5}{6}}=3^{\frac{6}{6}}=3^1=3$
- (2) $5^{-\frac{1}{3}}\times5^{\frac{5}{6}}\div5^{\frac{1}{2}}=5^{-\frac{1}{3}+\frac{5}{6}-\frac{1}{2}}=5^{-\frac{2}{6}+\frac{5}{6}-\frac{3}{6}}=5^0=1$
- (3) $a^{-\frac{1}{3}}\times a^{\frac{11}{6}}\div a^{-\frac{1}{2}}=a^{-\frac{1}{3}+\frac{11}{6}-(-\frac{1}{2})}=a^{-\frac{2}{6}+\frac{11}{6}+\frac{3}{6}}=a^{\frac{12}{6}}=a^2$
- (4) $a^{\frac{8}{9}}\div a^{\frac{1}{10}}\times a^{\frac{1}{2}}=a^{\frac{8}{9}-\frac{1}{10}+\frac{1}{2}}=a^{\frac{16}{10}-\frac{1}{10}+\frac{5}{10}}=a^{\frac{20}{10}}=a^2$
- (5) $(a^{\frac{1}{2}}+b^{\frac{1}{2}})(a^{\frac{1}{2}}-b^{\frac{1}{2}})=(a^{\frac{1}{2}})^2-(b^{\frac{1}{2}})^2=a^{\frac{1}{2}\times2}-b^{\frac{1}{2}\times2}=a-b$
- (6) $(a^{\frac{1}{3}}+b^{\frac{1}{3}})(a^{\frac{2}{3}}-a^{\frac{1}{3}}b^{\frac{1}{3}}+b^{\frac{2}{3}})=a^{\frac{1}{3}}(a^{\frac{2}{3}}-a^{\frac{1}{3}}b^{\frac{1}{3}}+b^{\frac{2}{3}})+b^{\frac{1}{3}}(a^{\frac{2}{3}}-a^{\frac{1}{3}}b^{\frac{1}{3}}+b^{\frac{2}{3}})$
 $=a^{\frac{1}{3}+\frac{2}{3}}-a^{\frac{1}{3}+\frac{1}{3}}b^{\frac{1}{3}}+a^{\frac{1}{3}}b^{\frac{2}{3}}+a^{\frac{2}{3}}b^{\frac{1}{3}}-a^{\frac{1}{3}}b^{\frac{1}{3}+\frac{1}{3}}+b^{\frac{1}{3}+\frac{2}{3}}$
 $=a^{\frac{3}{3}}-a^{\frac{2}{3}}b^{\frac{1}{3}}+a^{\frac{1}{3}}b^{\frac{2}{3}}+a^{\frac{2}{3}}b^{\frac{1}{3}}-a^{\frac{1}{3}}b^{\frac{2}{3}}+b^{\frac{3}{3}}$
 $=a+b$