

Revision

A.

$$1. a) 2^4 \times 2^3$$

$$= 2^{4+3}$$

$$= 2^7$$

$$b) 2^6 \div 2^2 \times 2^5$$

$$= 2^{6-2+5}$$

$$= 2^9$$

$$c) (2^4)^3$$

$$= 2^{4 \cdot 3}$$

$$= 2^{12}$$

$$d) 2^{-3} \div 2^{-5}$$

$$= 2^{-3-(-5)}$$

$$= 2^2$$

$$e) 2^{-3} \times 2^6 \div 2^1$$

$$= 2^{-3+6-1}$$

$$= 2^2$$

$$f) (2^3)^{-1}$$

$$= 2^{3 \cdot -1}$$

$$= 2^{-3}$$

$$= \frac{1}{2^3}$$

$$2. a) 5^3 \div 5^7 \times 5^{10}$$

$$= 5^{3-7+10}$$

$$= 5^6$$

$$b) (-4)^0 \times (-4)^5 \times (-4)^{10}$$

$$= 1 \times (-4)^{5+10}$$

$$= (-4)^{15}$$

$$c) \frac{(-3)^3 \times (-3)^7}{(-3)^5}$$

$$= \frac{(-3)^{3+7}}{(-3)^5}$$

$$= \frac{(-3)^{10}}{(-3)^5}$$

$$= (-3)^{10-5}$$

$$= (-3)^5$$

$$3. a) 3^{-2}$$

$$= \frac{1}{3^2}$$

$$= \frac{1}{9}$$

$$b) 5^0$$

$$= 1$$

$$c) 2^{-3}$$

$$= \frac{1}{2^3}$$

$$= \frac{1}{8}$$

$$d) (-2)^{-4}$$

$$= \frac{1}{(-2)^4}$$

$$= \frac{1}{16}$$

$$\begin{aligned}
 \text{e) } (2^{-1})^2 & \\
 &= 2^{-1 \cdot 2} \\
 &= 2^{-2} \\
 &= \frac{1}{2^2} \\
 &= \frac{1}{4}
 \end{aligned}$$

$$\begin{aligned}
 \text{f) } -(-3)^0 & \\
 &= -1(1) \\
 &= -1
 \end{aligned}$$

$$\begin{aligned}
 \text{g) } \frac{1}{5^{-2}} & \\
 &= 5^2 \\
 &= 25
 \end{aligned}$$

$$\begin{aligned}
 \text{h) } -(2^3)^{-2} & \\
 &= -1(2^{3 \cdot -2}) \\
 &= -1(2^{-6}) \\
 &= -\frac{1}{2^6} \\
 &= -\frac{1}{64}
 \end{aligned}$$

$$\begin{aligned}
 \text{i) } \left(\frac{1}{5}\right)^{-3} & \\
 &= \left(\frac{5}{1}\right)^3 \\
 &= 125
 \end{aligned}$$

$$\begin{aligned}
 \text{j) } \left(\frac{4}{3}\right)^{-2} & \\
 &= \left(\frac{3}{4}\right)^2 \\
 &= \frac{9}{16}
 \end{aligned}$$

$$\begin{aligned}
 \text{4. a) } x^4 \cdot x^3 & \\
 &= x^{4+3} \\
 &= x^7
 \end{aligned}$$

$$\begin{aligned}
 \text{b) } c^4 \times c^3 \times c^1 & \\
 &= c^{4+3+1} \\
 &= c^8
 \end{aligned}$$

$$\begin{aligned}
 \text{c) } (m^6)(m^3) & \\
 &= m^{6+3} \\
 &= m^9
 \end{aligned}$$

$$\begin{aligned}
 \text{d) } (x^3)(y)(2y^2)(5x^2) & \\
 &= 10x^{3+2}y^{1+2} \\
 &= 10x^5y^3
 \end{aligned}$$

$$\begin{aligned}
 \text{e) } h^0 \div t^{-5} & \\
 &= 1 \div t^{-5} \\
 &= \frac{1}{t^{-5}} \\
 &= 1 \cdot t^5 \\
 &= t^5
 \end{aligned}$$

$$\begin{aligned}
 \text{f) } \frac{m^{-4}}{m^{-6}} & \\
 &= m^{-4-(-6)} \\
 &= m^2
 \end{aligned}$$

$$\begin{aligned}
 \text{g) } \left(\frac{x^2}{5y}\right)^3 & \\
 &= \frac{x^{2 \cdot 3}}{5^3 y^3} \\
 &= \frac{x^6}{125y^3}
 \end{aligned}$$

$$\begin{aligned}
 \text{h) } \left(\frac{xy^2}{x^3y^{-4}}\right)^0 & \\
 &= 1
 \end{aligned}$$

5. a) $2^{\frac{1}{3}}$
 $= \sqrt[3]{2}$

b) $7^{\frac{3}{2}}$
 $= \sqrt{7^3}$
 ou
 $(\sqrt{7})^3$

c) $x^{\frac{1}{2}}$
 $= \sqrt{x}$

d) $2x^{\frac{3}{4}}$
 $= 2\sqrt[4]{x^3}$
 ou
 $2(\sqrt[4]{x})^3$

e) $9^{-\frac{2}{3}}$
 $= \frac{1}{9^{\frac{2}{3}}}$
 $= \frac{1}{\sqrt[3]{9^2}}$
 ou
 $\frac{1}{(\sqrt[3]{9})^2}$

f) $-5^{\frac{5}{3}}$
 $= -1 \cdot 5^{\frac{5}{3}}$
 $= -1\sqrt[3]{5^5}$
 ou
 $-1(\sqrt[3]{5})^5$

g) $(-5)^{\frac{1}{3}}$
 $= \sqrt[3]{(-5)^1}$
 ou
 $(\sqrt[3]{-5})^1$

h) $3x^{-\frac{1}{2}}$
 $= \frac{3}{x^{\frac{1}{2}}}$
 $= \frac{3}{\sqrt{x}}$

b. a) $\sqrt[3]{4}$
 $= 4^{\frac{1}{3}}$

b) $\sqrt[7]{24}$
 $= 2^{\frac{4}{7}}$

c) $\sqrt[5]{-3}$
 $= (-3)^{\frac{1}{5}}$

d) $-\sqrt[4]{x^3}$
 $= -1 \cdot x^{\frac{3}{4}}$
 ou
 $-x^{\frac{3}{4}}$

e) $(\sqrt[3]{2m})^5$
 $= (2m)^{\frac{5}{3}}$

f) $\sqrt[3]{(3p)^5}$
 $= (3p)^{\frac{5}{3}}$

B.

$$\begin{aligned} 7. a) & (-10)^2 \times (-10)^6 \div (-10)^3 \\ & = (-10)^{2+6-3} \\ & = (-10)^5 \\ & = \boxed{-100000} \end{aligned}$$

$$\begin{aligned} b) & 5^6 \div 5^8 \times 5^1 \\ & = 5^{6-8+1} \\ & = 5^{-1} \\ & = \boxed{\frac{1}{5}} \end{aligned}$$

$$\begin{aligned} c) & \frac{2^6 \times 2^5}{2^9} \\ & = \frac{2^{6+5}}{2^9} \\ & = \frac{2^{11}}{2^9} \\ & = 2^{11-9} \\ & = 2^2 \\ & = \boxed{4} \end{aligned}$$

$$\begin{aligned} 8. a) & \frac{10^7}{10^3} - 10^3 \\ & = 10^{7-3} - 10^3 \\ & = 10^4 - 10^3 \\ & = 10000 - 1000 \\ & = \boxed{9000} \end{aligned}$$

$$\begin{aligned} b) & (4^3 \div 4^1)^2 + (5^2 \times 5^3)^2 \\ & = (4^{3-1})^2 + (5^{2+3})^2 \\ & = (4^2)^2 + (5^5)^2 \\ & = 4^4 + 5^{10} \\ & = 256 + 9765625 \\ & = \boxed{9765881} \end{aligned}$$

$$\begin{aligned} c) & (2^2)^4 + (2^{-4} \div 2^3)^{-2} \\ & = 2^8 + (2^{-7})^{-2} \\ & = 2^8 + 2^{14} \\ & = 256 + 16384 \\ & = \boxed{16640} \end{aligned}$$

$$\begin{aligned} d) & (2 \times 7)^3 - (3^2)^3 \\ & = 14^3 - 3^6 \\ & = 2744 - 729 \\ & = \boxed{2015} \end{aligned}$$

$$\begin{aligned} e) & 4^{-1} + 3^{-3} \\ & = \frac{1}{4} + \frac{1}{3^3} \\ & = \frac{1^{27}}{4^{27}} + \frac{1^{24}}{27^{24}} \\ & = \frac{27}{108} + \frac{4}{108} \\ & = \boxed{\frac{31}{108}} \end{aligned}$$

$$\begin{aligned} f) & 2^{-2} + 5^{-1} \\ & = \frac{1}{2^2} + \frac{1}{5} \\ & = \frac{1^{25}}{4^{25}} + \frac{1^{24}}{5^{24}} \\ & = \frac{5}{20} + \frac{4}{20} \\ & = \boxed{\frac{9}{20}} \end{aligned}$$

$$\begin{aligned}
 g) \quad & 4^5 \div 4^2 - 3^5 \\
 & = 4^3 - 3^5 \\
 & = 64 - 243 \\
 & = -179
 \end{aligned}$$

$$\begin{aligned}
 h) \quad & 3^0 - 2^2 \div 2^4 \\
 & = 1 - 2^{-2} \\
 & = 1 - \frac{1}{2^2} \\
 & = \frac{1}{1 \times 4} - \frac{1}{4} \\
 & = \frac{4}{4} - \frac{1}{4} \\
 & = \frac{3}{4}
 \end{aligned}$$

$$9. a) \frac{m^?}{m^2} = m^7$$

$$\begin{array}{r}
 ? - 2 = 7 \\
 +2 \quad +2
 \end{array}$$

$$? = 9$$

$$b) y^{-3} \times y^? = y^4$$

$$\begin{array}{r}
 -3 + ? = 4 \\
 +3 \quad \quad +3
 \end{array}$$

$$? = 7$$

$$c) \frac{p^3 p^?}{p^4} = p^7$$

$$3 + ? - 4 = 7$$

$$\begin{array}{r}
 ? - 1 = 7 \\
 +1 \quad +1
 \end{array}$$

$$? = 8$$

$$d) n^? \div n^5 = 1$$

$$n^? \div n^5 = n^0$$

$$\begin{array}{r}
 ? - 5 = 0 \\
 +5 \quad +5
 \end{array}$$

$$? = 5$$

$$10. a) (-2x^2y^3)(-5x^1y^5)$$

$$= 10x^3y^8$$

$$b) (-2a^4b^3)^2$$

$$= (-2)^2 a^8 b^6$$

$$= 4a^8b^6$$

$$c) \left(\frac{3m^2}{2n^2}\right)^3$$

$$= \frac{3^3 m^6}{2^3 n^6}$$

$$= \frac{27m^6}{8n^6}$$

$$d) \frac{(4xy^2)^2}{(2x^3y^3)^3}$$

$$= \frac{4^2 x^2 y^4}{2^3 x^9 y^9}$$

$$= \frac{16 x^{2-9} y^{4-9}}{8}$$

$$= \frac{2}{x^7 y^5}$$

$$e) \left(\frac{6p^2q^3}{3p^4q^5}\right)^{-2}$$

$$= (2p^{-2}q^{-2})^{-2}$$

$$= 2^{-2} p^4 q^4$$

$$= \frac{p^4 q^4}{2^2}$$

$$= \frac{p^4 q^4}{4}$$

$$f) \frac{2}{(2xy^6)^{-2}}$$

$$= 2(2xy^6)^2$$

$$= 2^1 (2^2) (x^2) (y^{12})$$

$$= 2^3 x^2 y^{12}$$

$$= 8x^2 y^{12}$$

$$g) (3m^{-2}n^3)^{-3}$$

$$= 3^{-3}m^6n^{-9}$$

$$= \frac{m^6}{3^3n^9}$$

$$= \frac{m^6}{27n^9}$$

$$h) \frac{(-2s^{-2}t^3)(5s^3t^{-4})}{(4s^5t^{-3})}$$

$$= \frac{-10s^1t^{-1}}{4s^5t^{-3}}$$

$$= \frac{-5s^{-4}t^2}{2}$$

$$= \frac{-5t^2}{2s^4}$$

$$i) \left(\frac{6a^{-2}b^{-3}}{2a^2b^{-1}}\right)^{-2}$$

$$= (3a^{-4}b^{-2})^{-2}$$

$$= 3^{-2}a^8b^4$$

$$= \frac{a^8b^4}{3^2}$$

$$= \frac{a^8b^4}{9}$$

$$11. a) x^{\frac{1}{2}} \cdot x^{\frac{2}{3}}$$

$$= x^{\frac{1}{2} \cdot \frac{2}{3} + \frac{2}{3} \cdot \frac{1}{2}}$$

$$= x^{\frac{3}{6} + \frac{4}{6}}$$

$$= x^{\frac{7}{6}}$$

$$b) \frac{m^{4/5}}{m^{3/2}}$$

$$= m^{\frac{4}{5} \cdot \frac{2}{2} - \frac{3}{2} \cdot \frac{5}{5}}$$

$$= m^{\frac{8}{10} - \frac{15}{10}}$$

$$= m^{-\frac{7}{10}}$$

$$= \frac{1}{m^{7/10}}$$

$$c) (p^2q^{1/3})^{2/3}$$

$$= p^{2 \cdot \frac{2}{3}} q^{1/3 \cdot \frac{2}{3}}$$

$$= p^{4/3} q^{2/9}$$

$$d) \left(p^{2/3}q^{4/5}\right)^{-2}$$

$$= p^{2/3 \cdot -2} q^{4/5 \cdot -2}$$

$$= p^{-4/3} q^{-8/5}$$

$$= \frac{1}{p^{4/3}q^{8/5}}$$

$$\begin{aligned}
 12. a) \quad & 4^{\frac{3}{2}} \\
 & = (\sqrt{4})^3 \\
 & = 2^3 \\
 & = \boxed{8}
 \end{aligned}$$

$$\begin{aligned}
 b) \quad & 25^{0.5} \\
 & = 25^{\frac{1}{2}} \\
 & = \sqrt{25} \\
 & = \boxed{5}
 \end{aligned}$$

$$\begin{aligned}
 c) \quad & 16^{-\frac{1}{2}} \\
 & = \frac{1}{16^{\frac{1}{2}}} \\
 & = \frac{1}{\sqrt{16}} \\
 & = \boxed{\frac{1}{4}}
 \end{aligned}$$

$$\begin{aligned}
 d) \quad & \frac{(6^4 + 4^6)^0}{3^{-1}} \\
 & = \frac{1}{3^{-1}} \\
 & = \boxed{3}
 \end{aligned}$$

$$\begin{aligned}
 e) \quad & \frac{1}{36^{-\frac{3}{2}}} \\
 & = 36^{\frac{3}{2}} \\
 & = (\sqrt{36})^3 \\
 & = 6^3 \\
 & = \boxed{216}
 \end{aligned}$$

$$\begin{aligned}
 f) \quad & 8^{\frac{2}{3}} \\
 & = (\sqrt[3]{8})^2 \\
 & = 2^2 \\
 & = \boxed{4}
 \end{aligned}$$

$$\begin{aligned}
 g) \quad & \left(\frac{27}{8}\right)^{-\frac{1}{3}} \\
 & = \left(\frac{8}{27}\right)^{\frac{1}{3}} \\
 & = \sqrt[3]{\frac{8}{27}} \\
 & = \boxed{\frac{2}{3}}
 \end{aligned}$$

$$\begin{aligned}
 h) \quad & \frac{38}{a^0 + b^0} \\
 & = \frac{38}{1+1} \\
 & = \frac{38}{2} \\
 & = \boxed{19}
 \end{aligned}$$