

**N.RN.A.2: Radicals and Rational Exponents 1**

1 For all positive values of  $x$ , which expression is equivalent to  $x^{\frac{3}{4}}$ ?

- 1)  $\sqrt[4]{x^3}$  2)  $\sqrt[3]{x^4}$  3)  $(x^3)^4$  4)  $3(x^4)$

2 The expression  $8^{\frac{x}{2}} \cdot 8^{\frac{x}{3}}$  is equivalent to

- 1)  $\sqrt[6]{8^{5x}}$  2)  $64^{\frac{5x}{6}}$  3)  $\sqrt[5]{8^{2x}}$  4)  $64^{\frac{x^2}{6}}$

3 Which expression is an equivalent form of  $a^5\sqrt{a^4}$ ?

- 1)  $a$  2)  $a^{\frac{9}{5}}$  3)  $a^{\frac{9}{4}}$  4)  $a^{\frac{1}{5}}$

4 Which expression is equivalent to  $2xy^2\sqrt[3]{x^2y}$ ?

- 1)  $2x^{\frac{5}{3}}y^{\frac{7}{3}}$  2)  $2xy$  3)  $2x^{\frac{2}{3}}y^{\frac{2}{3}}$  4)  $2x^7y^4$

5 The expression  $\sqrt[4]{81x^8y^6}$  is equivalent to

- 1)  $3x^2y^{\frac{3}{2}}$  2)  $3x^4y^2$  3)  $9x^2y^{\frac{3}{2}}$  4)  $9x^4y^2$

6 For all positive values of  $x$ , which expression is equivalent to  $\sqrt{x} \cdot \sqrt[4]{x^{11}}$ ?

- 1)  $x^{\frac{19}{22}}$  2)  $x^{\frac{11}{8}}$  3)  $x^{\frac{13}{4}}$  4)  $x^{\frac{2}{11}}$

7 Given  $x > 0$ , the expression  $\frac{x^{\frac{1}{5}}}{x^{\frac{1}{2}}}$  can be rewritten as

- 1)  $\sqrt[3]{x}$  2)  $-\sqrt[10]{x^3}$  3)  $\frac{1}{\sqrt[10]{x^3}}$  4)  $\sqrt[3]{x^{10}}$

8 If  $n = \sqrt{a^5}$  and  $m = a$ , where  $a > 0$ , an expression for  $\frac{n}{m}$  could be

- 1)  $a^{\frac{5}{2}}$  2)  $a^4$  3)  $\sqrt[3]{a^2}$  4)  $\sqrt{a^3}$

9 Given  $x > 0$ , the expression  $\left(\frac{1}{x^{-2}}\right)^{-\frac{3}{4}}$  is equivalent to

- 1)  $x\sqrt{x}$  2)  $\frac{1}{x\sqrt{x}}$  3)  $\sqrt[3]{x^2}$  4)  $\frac{1}{\sqrt[3]{x^2}}$

10 The expression  $\left(\frac{m^2}{m^{\frac{1}{3}}}\right)^{\frac{1}{2}}$  is equivalent to

- 1)  $-\sqrt[6]{m^5}$  2)  $\frac{1}{\sqrt[6]{m^5}}$  3)  $-m^5\sqrt{m}$  4)  $\frac{1}{m^5\sqrt{m}}$

11 When  $b > 0$  and  $d$  is a positive integer, the expression  $(3b)^{\frac{2}{d}}$  is equivalent to

- 1)  $\frac{1}{(\sqrt[d]{3b})^2}$  2)  $(\sqrt{3b})^d$  3)  $\frac{1}{\sqrt{3b^d}}$   
4)  $(\sqrt[d]{3b})^2$

12 Which equation is equivalent to  $P = 210x^{\frac{4}{3}}y^{\frac{7}{3}}$

- 1)  $P = \sqrt[3]{210x^4y^7}$  2)  $P = 70xy^2\sqrt[3]{xy}$   
3)  $P = 210xy^2\sqrt[3]{xy}$  4)  $P = 210xy^2\sqrt[3]{x^3y^5}$

- 13 What does  $\left(\frac{-54x^9}{y^4}\right)^{\frac{2}{3}}$  equal?
- 1)  $\frac{9ix^6\sqrt[3]{4}}{y\sqrt[3]{y^2}}$  2)  $\frac{9ix^6\sqrt[3]{4}}{y^2\sqrt[3]{y^2}}$  3)  $\frac{9x^6\sqrt[3]{4}}{y\sqrt[3]{y}}$
- 4)  $\frac{9x^6\sqrt[3]{4}}{y^2\sqrt[3]{y^2}}$

- 14 For  $x > 0$ , which expression is equivalent to  $\frac{\sqrt[3]{x^2} \cdot \sqrt{x^5}}{\sqrt[6]{x}}$ ?

- 1)  $x$  2)  $x^{\frac{3}{2}}$  3)  $x^3$  4)  $x^{10}$

- 15 For  $x \neq 0$ , which expressions are equivalent to one divided by the sixth root of  $x$ ?

I.  $\frac{\sqrt[6]{x}}{\sqrt[3]{x}}$  II.  $\frac{x^{\frac{1}{6}}}{x^{\frac{1}{3}}}$  III.  $x^{-\frac{1}{6}}$

- 1) I and II, only 2) I and III, only 3) II and III, only 4) I, II, and III

- 16 Given  $x$  and  $y$  are positive, which expressions are equivalent to  $\frac{x^3}{y}$ ?

I.  $\left(\frac{y}{x^3}\right)^{-1}$  II.  $\sqrt[3]{x^9}(y^{-1})$  III.  $\frac{x^6\sqrt[4]{y^8}}{x^3y^3}$

- 1) I and II, only 2) I and III, only 3) II and III, only 4) I, II, and III

- 17 For  $x \geq 0$ , which equation is *false*?

1)  $(x^{\frac{3}{2}})^2 = \sqrt[4]{x^3}$  2)  $(x^3)^{\frac{1}{4}} = \sqrt[4]{x^3}$

3)  $(x^{\frac{3}{2}})^{\frac{1}{2}} = \sqrt[4]{x^3}$  4)  $(x^{\frac{2}{3}})^2 = \sqrt[3]{x^4}$

- 18 The expression  $\left(a^3\sqrt[3]{2b^2}\right)\left(\sqrt[3]{4a^2b}\right)$  is equivalent to

1)  $2ab\sqrt[3]{a^2}$  2)  $2ab$  3)  $2ab\sqrt[3]{2a^2}$

4)  $2a^2b\sqrt[3]{2b}$

- 19 Given  $y > 0$ , the expression  $\sqrt{3x^2y} \cdot \sqrt[3]{27x^3y^2}$  is equivalent to

1)  $81x^5y^3$  2)  $3^{1.5}x^2y$  3)  $3^{\frac{5}{2}}x^2y^{\frac{5}{3}}$

4)  $3^{\frac{3}{2}}x^2y^{\frac{7}{6}}$

- 20 For positive values of  $x$ , which expression is

equivalent to  $\sqrt{16x^2} \cdot x^{\frac{2}{3}} + \sqrt[3]{8x^5}$

1)  $6\sqrt[5]{x^3}$  2)  $6\sqrt[3]{x^5}$  3)  $4\sqrt[3]{x^2} + 2\sqrt[3]{x^5}$

4)  $4\sqrt{x^3} + 2\sqrt[5]{x^3}$

## N.RN.A.2: Radicals and Rational Exponents 1

### Answer Section

1 ANS: 1 REF: 062201aii

2 ANS: 1

$$8^{\frac{x}{2}} \cdot 8^{\frac{x}{3}} = 8^{\frac{5x}{6}} = \sqrt[6]{8^{5x}}$$

REF: 082419aii

3 ANS: 2

$$a^5 \sqrt[5]{a^4} = a^{\frac{5}{5}} \cdot a^{\frac{4}{5}} = a^{\frac{9}{5}}$$

REF: 062306aii

4 ANS: 2

$$2xy^2 \sqrt[3]{x^2y} = 2x^{\frac{3}{3}} y^{\frac{6}{3}} x^{\frac{2}{3}} y^{\frac{1}{3}} = 2x^{\frac{5}{3}} y^{\frac{7}{3}}$$

REF: 062413aii

5 ANS: 1

$$\sqrt[4]{81x^8y^6} = 81^{\frac{1}{4}} x^{\frac{8}{4}} y^{\frac{6}{4}} = 3x^2y^{\frac{3}{2}}$$

REF: 012001aii

6 ANS: 3

$$\sqrt{x} \cdot \sqrt[4]{x^{11}} = x^{\frac{1}{2}} \cdot x^{\frac{11}{4}} = x^{\frac{2}{4}} \cdot x^{\frac{11}{4}} = x^{\frac{13}{4}}$$

REF: 012511aii

7 ANS: 3

$$\frac{x^{\frac{1}{5}}}{x^{\frac{1}{2}}} = x^{\frac{1}{5} - \frac{1}{2}} = x^{-\frac{3}{10}} = \frac{1}{x^{\frac{3}{10}}} = \frac{1}{\sqrt[10]{x^3}}$$

REF: 012312aii

8 ANS: 4

$$\frac{n}{m} = \frac{\sqrt{a^5}}{a^{\frac{2}{2}}} = \frac{a^{\frac{5}{2}}}{a^{\frac{2}{2}}} = a^{\frac{3}{2}} = \sqrt{a^3}$$

REF: 011811aii

9 ANS: 2

$$\left(\frac{1}{x^{-2}}\right)^{-\frac{3}{4}} = \frac{1}{x^{\frac{3}{2}}} = \frac{1}{x^{\frac{2}{2}} \cdot x^{\frac{1}{2}}} = \frac{1}{x\sqrt{x}}$$

REF: 082412aii

10 ANS: 2

$$\left(m^{\frac{5}{3}}\right)^{-\frac{1}{2}} = m^{-\frac{5}{6}} = \frac{1}{\sqrt[6]{m^5}}$$

REF: 011707aii

11 ANS: 4

REF: 061601aii

12 ANS: 3

$$P = 210x^{\frac{4}{3}}y^{\frac{7}{3}} = 210x^{\frac{3}{3}}x^{\frac{1}{3}}y^{\frac{6}{3}}y^{\frac{1}{3}} = 210x \cdot x^{\frac{1}{3}}y^2y^{\frac{1}{3}} = 210xy^2\sqrt[3]{xy}$$

REF: 012413aii

13 ANS: 4

$$\left(\frac{-54x^9}{y^4}\right)^{\frac{2}{3}} = \frac{(2 \cdot -27)^{\frac{2}{3}}x^{\frac{18}{3}}}{y^{\frac{8}{3}}} = \frac{2^{\frac{2}{3}} \cdot 9x^6}{y^2 \cdot y^{\frac{2}{3}}} = \frac{9x^6\sqrt[3]{4}}{y^2\sqrt[3]{y^2}}$$

REF: 081723aii

14 ANS: 3

$$\frac{x^{\frac{2}{3}} \bullet x^{\frac{5}{2}}}{x^{\frac{1}{6}}} = \frac{x^{\frac{4}{6}} \bullet x^{\frac{15}{6}}}{x^{\frac{1}{6}}} = x^{\frac{18}{6}} = x^3$$

REF: 081812aii

15 ANS: 4

REF: 061716aii

16 ANS: 4

$$\text{I. } \left(\frac{y}{x^3}\right)^{-1} = \frac{x^3}{y}; \text{ II. } \sqrt[3]{x^9}(y^{-1}) = \frac{x^{\frac{9}{3}}}{y} = \frac{x^3}{y}; \text{ III. } \frac{x^{64}\sqrt[4]{y^8}}{x^3y^3} = \frac{x^3y^{\frac{8}{4}}}{y^3} = \frac{x^3}{y}$$

REF: 062320aii

17 ANS: 1

$$(x^{\frac{3}{2}})^2 = x^3$$

REF: 061908aii

18 ANS: 1

$$\left(a\sqrt[3]{2b^2}\right)\left(\sqrt[3]{4a^2b}\right) = a\sqrt[3]{8a^2b^3} = 2ab\sqrt[3]{a^2}$$

REF: 082213aaii

19 ANS: 4

$$\sqrt{3x^2y} \cdot \sqrt[3]{27x^3y^2} = 3^{\frac{1}{2}}x^{\frac{1}{2}}y^{\frac{1}{2}} \cdot 3^{\frac{2}{3}}x^{\frac{2}{3}}y^{\frac{2}{3}} = 3^{\frac{3}{2}}x^{\frac{7}{6}}y^{\frac{7}{6}}$$

REF: 081914aaii

20 ANS: 2

$$4x \cdot x^{\frac{2}{3}} + 2x^{\frac{5}{3}} = 4x^{\frac{5}{3}} + 2x^{\frac{5}{3}} = 6x^{\frac{5}{3}} = 6\sqrt[3]{x^5}$$

REF: 061820aaii