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N.RN.A.2: Radicals and Rational Exponents 4

1 The expression $\sqrt{90} \cdot \sqrt{40} - \sqrt{8} \cdot \sqrt{18}$ simplifies to
1) 22.9
2) 48
3) 864
4) 3,456

2 Which number is the largest?
1) $\left(\frac{1}{4}\right)^{-1}$
2) $\left(\frac{1}{4}\right)^{0}$
3) $\left(\frac{1}{4}\right)^{\frac{1}{2}}$
4) $\left(\frac{1}{4}\right)^{2}$

3 If $f(x) = x^{-\frac{3}{2}}$, then $f\left(\frac{1}{4}\right)$ is equal to
1) 8
2) –2
3) $-\frac{1}{8}$
4) –4

4 The expression $4^{\frac{1}{2}} \cdot 2^{3}$ is equal to
1) $4^{\frac{3}{2}}$
2) $8^{\frac{3}{2}}$
3) 16
4) 4

5 The expression $\frac{3^{\frac{1}{3}}}{3^{-\frac{2}{3}}}$ is equivalent to
1) 1
2) $\sqrt{3}$
3) 3
4) $\frac{1}{\sqrt[3]{3}}$

6 The value of $\left(\frac{3^{0}}{27^{\frac{2}{3}}}\right)^{-1}$ is
1) –9
2) 9
3) $-\frac{1}{9}$
4) $\frac{1}{9}$

7 Find the value of $(x+2)^{0} + (x+1)^{-\frac{2}{3}}$ when $x = 7$.

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8 Evaluate the expression $(x+3)^{\frac{1}{2}} + (x-3)^0 + (x+2)^{-\frac{2}{3}}$ when $x = 6$.

9 Classical mathematics uses the term "Golden Ratio" for the ratio $\left(1+\sqrt{5}\right):2$. The Golden Ratio was used by many famous artists to determine the dimensions of their paintings. If the ratio of the length to the width of a painting is $\left(1+\sqrt{5}\right):2$, find the length, in feet, of a painting that has a width of 14 feet. Express your answer in simplest radical form.

10 If $a > 0$, then $\sqrt{9a^2+16a^2}$ equals
1) $\sqrt{7a}$
2) $5\sqrt{a}$
3) $5a$
4) $7a$

11 If $x > 0$, the expression $\left(\sqrt{x}\right)\left(\sqrt{2x}\right)$ is equivalent to
1) $\sqrt{2x}$
2) $2x$
3) $x^2\sqrt{2}$
4) $x\sqrt{2}$

12 If x is a positive integer, $4x^{\frac{1}{2}}$ is equivalent to
1) $\frac{2}{x}$
2) $2x$
3) $4\sqrt{x}$
4) $4\frac{1}{x}$

13 The expression $b^{-\frac{3}{2}}$, $b > 0$, is equivalent to
1) $\frac{1}{\left(\sqrt[3]{b}\right)^2}$
2) $\frac{1}{\left(\sqrt{b}\right)^3}$
3) $-\left(\sqrt{b}\right)^3$
4) $\left(\sqrt[3]{b}\right)^2$

14 If $n > 0$, the expression $\left(\frac{1}{n}\right)^{-\frac{2}{3}}$ is equal to
1) $-n^{\frac{2}{3}}$
2) $-n^{\frac{3}{2}}$
3) $\sqrt[3]{n^2}$
4) $\sqrt{n^3}$

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15 The expression $\sqrt[4]{16a^6b^4}$ is equivalent to

1) $2a^2b$
2) $2a^{\frac{3}{2}}b$
3) $4a^2b$
4) $4a^{\frac{3}{2}}b$

16 The volume of a soap bubble is represented by the equation $V = 0.094\sqrt{A^3}$, where A represents the surface area of the bubble. Which expression is also equivalent to V?

1) $0.094A^{\frac{3}{2}}$
2) $0.094A^{\frac{2}{3}}$
3) $0.094A^6$
4) $\left(0.094A^3\right)^{\frac{1}{2}}$

17 When simplified, the expression $\left(\sqrt[3]{m^4}\right)\left(m^{-\frac{1}{2}}\right)$ is equivalent to

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

18 Which expression is equivalent to $\left(\sqrt{a^2b^{\frac{1}{2}}}\right)^{-1}$?

1) $a^{-2}b^{-\frac{1}{2}}$
2) $-ab^{\frac{1}{4}}$
3) $-ab^2$
4) $\frac{1}{ab^{\frac{1}{4}}}$

19 Which expression is equivalent to b in the equation $V = \sqrt{a^4b^{\frac{1}{3}}}$?

1) $\frac{V^6}{a^{12}}$
2) $\frac{V^5}{a^7}$
3) $\frac{V^2}{a^4}$
4) $\frac{V}{a^2}$

20 Simplify: $\sqrt{50r^2s^4}$

21 Simplify the expression $\left(m^6\right)^{-\frac{2}{3}}$ and write your answer using a positive exponent.

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Answer Section

1 ANS: 2

$\sqrt{90} \cdot \sqrt{40} - \sqrt{8} \cdot \sqrt{18} = \sqrt{3600} - \sqrt{144} = 60 - 12 = 48$

REF: 060218a

2 ANS: 1 REF: 061002b

3 ANS: 1

$f(\frac{1}{4}) = (\frac{1}{4})^{-\frac{3}{2}} = 4^{\frac{3}{2}} = 8$

REF: 060602b

4 ANS: 3

$4^{\frac{1}{2}} \cdot 2^3 = \sqrt{4} \cdot 8 = 16$

REF: 080601b

5 ANS: 3

$\frac{3^{\frac{1}{3}}}{3^{-\frac{2}{3}}} = 3^{\frac{1}{3}-(-\frac{2}{3})} = 3^1 = 3$

REF: 080218b

6 ANS: 2

$(\frac{3^0}{27^{\frac{2}{3}}})^{-1} = \frac{27^{\frac{2}{3}}}{3^0} = 3^2 = 9$

REF: 010217b

7 ANS:

1.25. $(7+2)^0 + (7+1)^{-\frac{2}{3}} = 1 + 8^{-\frac{2}{3}} = 1 + (\frac{1}{8})^{\frac{2}{3}} = 1 + \frac{1^{\frac{2}{3}}}{8^{\frac{2}{3}}} = 1\frac{1}{4}$

REF: 080322b

8 ANS:

4.25. $(6+3)^{\frac{1}{2}} + (6-3)^0 + (6+2)^{-\frac{2}{3}} = 9^{\frac{1}{2}} + 3^0 + 8^{-\frac{2}{3}} = 3 + 1 + \frac{1}{4} = 4\frac{1}{4}$

REF: 080921b

9 ANS:

$$\frac{1+\sqrt{5}}{2} = \frac{x}{14}$$

$7+7\sqrt{5}$.

$$x = \frac{14(1+\sqrt{5})}{2}$$

$$x = 7(1+\sqrt{5})$$

$$x = 7+7\sqrt{5}$$

REF: 080724b

10 ANS: 3

$\sqrt{9a^2+16a^2} = \sqrt{25a^2} = \sqrt{25}\sqrt{a^2} = 5a$

REF: 010422a

11 ANS: 4

$(\sqrt{x})(\sqrt{2x}) = \sqrt{2x^2} = \sqrt{2}\sqrt{x^2} = x\sqrt{2}$

REF: 010103a

12 ANS: 3 REF: 060208b

13 ANS: 2

$b^{-\frac{3}{2}} = \frac{1}{b^{\frac{3}{2}}} = \frac{1}{(\sqrt{b})^3}$

REF: 010413b

14 ANS: 3

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

REF: 080807b

15 ANS: 2

$\sqrt[4]{16a^6b^4} = (16a^6b^4)^{\frac{1}{4}} = 16^{\frac{1}{4}} \cdot (a^6)^{\frac{1}{4}} \cdot (b^4)^{\frac{1}{4}} = 2a^{\frac{6}{4}}b^1 = 2a^{\frac{3}{2}}b$

REF: 060419b

16 ANS: 1

$0.094\sqrt{A^3} = 0.094(A^3)^{\frac{1}{2}} = 0.094\,A^{\frac{3}{2}}$

REF: 060708b

17 ANS: 4

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

REF: 010617b

18 ANS: 4

$$(\sqrt{a^2 b^{\frac{1}{2}}})^{-1} = \frac{1}{\sqrt{a^2 b^{\frac{1}{2}}}} = \frac{1}{(a^2 b^{\frac{1}{2}})^{\frac{1}{2}}} = \frac{1}{ab^{\frac{1}{4}}}$$

REF: 060912b

19 ANS: 1 REF: 011015b

20 ANS:

$5rs^2\sqrt{2}$. $\sqrt{50r^2s^4} = \sqrt{25}\sqrt{2}\sqrt{r^2}\sqrt{s^4} = 5rs^2\sqrt{2}$

REF: 080125a

21 ANS:

$$\frac{1}{m^4}$$

REF: 010824b