# Exponents and Radicals Lesson #8:
## Practice Test

**1.** The number represented by ⊗ is irrational. The decimal representation of ⊗ is

**A.** terminating and repeating
**B.** terminating and non-repeating
**C.** non-terminating and repeating
**(D.)** non-terminating and non-repeating

*Use the following information to answer question #2.*

Consider the following numbers from the Real Number System.

**I.** 1.01001000100001..... **II.** $\sqrt[3]{\frac{8}{27}}$ **III.** $\sqrt{0.04}$ **IV.** $0.\overline{29}$

**2.** The numbers which are rational numbers are

I. non-terminating and non-repeating ✗
II $= \frac{2}{3}$ ✓
III $= 0.2$ ✓
IV repeating ✓

**A.** III and IV only
**(B.)** II, III and IV only
**C.** I, II, III and IV
**D.** some other combination of I, II, III and IV

**Numerical Response 1.** When $7\sqrt[3]{6}$ is written as an entire radical, the value of the radicand is _____.

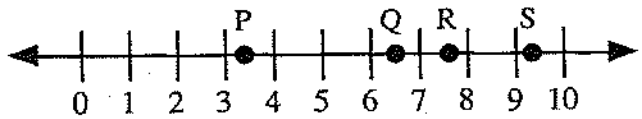
(Record your answer in the numerical response box from left to right)

| 2 | 0 | 5 | 8 |
|---|---|---|---|

$= \sqrt[3]{343}\sqrt[3]{6} = \sqrt[3]{2058}$

*Use the following information to answer the next question.*

$M$ and $N$ are fixed irrational numbers satisfying $30 < M < 40$ and $3 < N < 4$. The value of $\sqrt{M} + \sqrt{N}$ can be illustrated on a number line as shown.




**3.** The value of $\sqrt{M} + \sqrt{N}$ is best represented on the number line by

**A.** P
**B.** Q
**(C.)** R
**D.** S

$\sqrt{M}$ is approximately 6
$\sqrt{N}$ is approximately 2
$\sqrt{M} + \sqrt{N}$ is approximately $6 + 2 \rightarrow 8$

**Numerical Response** **2.** The volume of a cube of edge length $x$ cm is given by the formula $V=x^3$.
A die has a volume of $720\ \text{mm}^3$.

A student determined that the exact length of each edge of the die could be written in the form $a\sqrt[3]{b}$ where $a$ and $b$ are whole numbers.

The value of $a+b$ is _____ .
(Record your answer in the numerical response box from left to right)

| | | | |
|---|---|---|---|
| 9 | 2 | | |

$x^3 = 720$
$x = \sqrt[3]{720} = \sqrt[3]{8}\sqrt[3]{90} = 2\sqrt[3]{90}$ $\quad a=2$ $\quad b=90$ $\quad a+b=92$

**4.** Consider the following numbers: $\sqrt[3]{67}$, $\sqrt[4]{98}$, $\sqrt{19}$, $\sqrt[5]{201}$.
The largest of these numbers is

(A.) $\sqrt{19}$ **B.** $\sqrt[4]{98}$ **C.** $\sqrt[3]{67}$ **D.** $\sqrt[5]{201}$

$\sqrt[3]{67} = 4.06\ldots$ $\quad \sqrt{19} = 4.36\ldots$
$\sqrt[4]{98} = 3.14\ldots$ $\quad \sqrt[5]{201} = 2.89\ldots$

**5.** The length of a soccer field is $12\sqrt{4\,000}$ metres. In the number $12\sqrt{4\,000}$, the value of the index and the value of the radicand add up to

(A.) 4002 **B.** 4012 **C.** 4000 **D.** 4001

index = 2
radicand = 4000

*Use the following information to answer the next question.*

Three statements are made by a student and shown below.

**Statement 1:** $35 = 7\sqrt{5}$

**Statement 2:** $\sqrt{28} = 2\sqrt{7}$

**Statement 3:** $4\sqrt{3} = 48$

**6.** The statement(s) which is/are true are

**A.** 1 only (**B.**) 2 only **C.** 1 and 2 only **D.** 2 and 3 only

1. $35 = 7.5$ false
2. $\sqrt{28} = \sqrt{4}\sqrt{7} = 2\sqrt{7}$ true
3. $4\sqrt{3} = \sqrt{16}\sqrt{3} = \sqrt{48}$ false

*Use the following information to answer the next question.*

| | |
|---|---|
| $(2^a)^4 = 2^8$ | $(3^2)^b = 3^8$ |
| $\frac{4^c}{4^2} = 4^3$ | $5^d \cdot 5^3 = 5^9$ |

$4a = 8 \quad a = 2$

$2b = 8 \quad b = 4$

$c - 2 = 3 \quad c = 5$

$d + 3 = 9 \quad d = 6$

**Numerical Response**

**3.** Write the value of $a$ in the first box.
Write the value of $b$ in the second box.
Write the value of $c$ in the third box.
Write the value of $d$ in the fourth box.
(Record your answer in the numerical response box from left to right)

| 2 | 4 | 5 | 6 |
|---|---|---|---|

*Use the following information to answer the next question.*

Three students were asked to write the radical $\sqrt{4\,050}$ in another form.
Their answer are shown below.

**Student I** $405\sqrt{10}$ **Student II** $15\sqrt{18}$ **Student III** $45\sqrt{2}$

**7.** A correct answer was given by

$405\sqrt{10} = \sqrt{164025}\sqrt{10} = \sqrt{1640250}$ ×

$15\sqrt{18} = \sqrt{225}\sqrt{18} = \sqrt{4050}$ ✓

$45\sqrt{2} = \sqrt{2025}\sqrt{2} = \sqrt{4050}$ ✓

**A.** only Student III

**B.** only Students II and III

**C.** all three students

**D.** some other combination of students not given above

**8.** The area of a circle of radius, $r$, is given by the formula $A = \pi r^2$.
A circle of radius 6 cm has an area of $36\pi$ cm$^2$.
If a circle has an area of $120\pi$ cm$^2$, then the exact length of its radius in cm is

$A = \pi r^2 = 120\pi$

$r^2 = 120$

$r = \sqrt{120} = \sqrt{4}\sqrt{30} = 2\sqrt{30}$

**A.** 60

**B.** $12\sqrt{10}$

**C.** $2\sqrt{30}$

**D.** $2\sqrt{15}$

*Use the following information to answer question #9.*

Devon read in his physics book that the distance, $d$ kilometres, a person can see to the horizon on a clear day can be approximated by the formula $d = \sqrt{13h}$, where $h$ is the person's eye level distance above the ground in metres. When standing on the ground, Devon's eye level distance is 1.8 m above the ground.

**9.** The distance Devon can see to the horizon when he is standing on the roof of a building 698.2 m high can be represented in simplest form by the expression $a\sqrt{b}$.

The value of $a+b$ is

$h = 698.2 + 1.8 = 700$ m

**A.** 50

**B.** 51

**C.** 100

**(D.)** 101

$d = \sqrt{13h} = \sqrt{13 \cdot 700} = \sqrt{13}\sqrt{7}\sqrt{100}$

$= \sqrt{91} \cdot 10 = 10\sqrt{91}$

$a = 10 \quad b = 91 \quad a+b = 101$

**10.** Consider the following three equations.

$4\sqrt[3]{3} = \sqrt[3]{x} \qquad 5\sqrt{x} = y\sqrt{3} \qquad 16\sqrt{y} = z\sqrt{10}$

Which of the statements below is correct?

**A.** $x<y<z$ $\sqrt[3]{x} = 4\sqrt[3]{3} = \sqrt[3]{64}\sqrt[3]{3} = \sqrt[3]{192}$ $x = 192$

**B.** $z<x<y$ $y\sqrt{3} = 5\sqrt{192}$ $y = \frac{5\sqrt{192}}{\sqrt{3}} = 5\sqrt{64} = 5 \cdot 8 = 40$

**C.** $y<z<x$

**(D.)** $z<y<x$ $z\sqrt{10} = 16\sqrt{40}$ $z = \frac{16\sqrt{40}}{\sqrt{10}} = 16\sqrt{4} = 16 \cdot 2 = 32$

$x = 192 \quad y = 40 \quad z = 32$

**11.** Expressed in radical form, $x^{\frac{3}{5}}$ is equivalent to

**A.** $\sqrt[3]{x^5}$ **B.** $5\sqrt{x^3}$ **(C.)** $\sqrt[5]{x^3}$ **D.** $\frac{1}{5}\sqrt{x^3}$

**12.** If $a$ is positive, which of the following must be negative?

**A.** $a^{-\frac{4}{5}} = \frac{1}{\sqrt[5]{a^4}}$ **B.** $a^{-\frac{5}{4}} = \frac{1}{\sqrt[4]{a^5}}$ **C.** $(-a)^{-\frac{4}{5}} = \frac{1}{\sqrt[5]{(-a)^4}}$ **(D.)** $-a^{\frac{5}{4}} = -\sqrt[4]{a^5}$

$a^4$, $a^5$ and $(-a)^4$ are all positive so A, B, C are positive

**Numerical Response** **4.** If $p=4$ and $q=-8$, the value of $p^{\frac{3}{2}}-q^{-\frac{2}{3}}$ to the nearest hundredth is _____.

(Record your answer in the numerical response box from left to right)

| 7 | . | 7 | 5 |
|---|---|---|---|

$4^{3/2} - (-8)^{-2/3} = (\sqrt{4})^3 - \frac{1}{\sqrt[3]{(-8)^2}} = 2^3 - \frac{1}{\sqrt[3]{64}} = 8 - \frac{1}{4} = 7.75$

**13.** $5x^{-2}$ is equivalent to

**A.** $\frac{5}{x^2}$ **B.** $-10x$ **C.** $\frac{1}{25x^2}$ **D.** $\frac{1}{5x^2}$

$5 \cdot x^{-2} = 5 \cdot \frac{1}{x^2} = \frac{5}{x^2}$

**14.** Which of the following is equivalent to $(-x^3)^{-\frac{5}{3}}$?

**A.** $x^5$

**B.** $-x^{\frac{1}{5}}$

**C.** $\frac{1}{x^5}$

**D.** $-\frac{1}{x^5}$

$(-x^3)^{-\frac{5}{3}} = \frac{1}{(-x^3)^{5/3}} = \frac{1}{\left(\sqrt[3]{(-x^3)}\right)^5} = \frac{1}{(-x)^5} = \frac{1}{-x^5} = -\frac{1}{x^5}$

**Numerical Response** **5.** $\left(\sqrt[3]{a^4}\right)\left(\sqrt{a^3}\right)$ can be written in the form $a^{\frac{p}{6}}$. The value of $p$ is _____.

(Record your answer in the numerical response box from left to right)

| 1 | 7 | | |
|---|---|---|---|

$(a^{4/3})(a^{3/2}) = a^{4/3+3/2} = a^{17/6}$ $\quad p = 17$

**15.** For all positive integers $a$ and $b$, which of the following is not equivalent to $a^3\sqrt{b}$?

**A.** $a^3 b^{\frac{1}{2}}$ $\quad = a^3 b^{\frac{1}{2}}$

**B.** $(a^6 b)^{\frac{1}{2}}$ $\quad = a^3 b^{1/2}$

**C.** $\sqrt{a^6 b}$ $\quad = \sqrt{a^6}\sqrt{b} = a^3 b^{1/2}$

**D.** All of the expressions are equivalent to $a^3\sqrt{b}$.

## Written Response - 5 marks

*Use the following information to answer the Written Response.*

A group of students have invented a simple card game based on the real number system. There are 50 cards in the deck and each card has a number written on it.

Points are awarded as shown below.

| | | | |
|---|---|---|---|
| Natural Number | → 4 points | Whole Number | → 5 points |
| Rational Number | → 3 points | Integer Number | → 6 points |
| Non-real Number | → 1 point | Irrational Number | → 10 points |

**1.**

- A student selects a card. The number on the card is 7. Explain why this card is valued at 18 points.

  7 is a natural number, a whole number, an integer and a rational number

  Points = 4 + 5 + 6 + 3 = 18

- A second student selects a card which has the number –5 on it. How many points are awarded for this card?

  –5 is an integer and a rational number

  Points = 6 + 3 = 9

- In the game each student is dealt three cards and the student with the most points wins. Which of the following three students wins the game?

  Student *A* with the following cards: $\frac{3}{4}$, $\sqrt{15}$, and 0. $3 + 10 + 14 = 27$

  Student *B* with the following cards: –3, $\sqrt{\frac{4}{9}}$, and $\pi$. $9 + 3 + 10 = 22$

  Student *C* with the following cards: $-\sqrt{36}$, $\sqrt{-36}$, and 36. $9 + 1 + 18 = 28$ C WINS

| Number | $\frac{3}{4}$ | $\sqrt{15}$ | 0 | –3 | $\sqrt{4/9}$ | $\pi$ | $-\sqrt{36}$ | $\sqrt{-36}$ | 36 |
|---|---|---|---|---|---|---|---|---|---|
| Sets | Q | $\overline{Q}$ | W, I, Q | I, Q | Q | $\overline{Q}$ | I, Q | non-real | N, W, I, Q |
| Points | 3 | 10 | 5 + 6 + 3 = 14 | 6 + 3 = 9 | 3 | 10 | 6 + 3 = 9 | 1 | 4 + 5 + 6 + 3 = 18 |

***Answer Key***

1. D 2. B 3. C 4. A 5. A 6. B 7. B 8. C
9. D 10. D 11. C 12. D 13. A 14. D 15. D

1. 2058 2. 92 3. 2456 4. 7.75 5. 17

**Written Response**

1. • The number 7 is a natural number, a whole number, an integer, and a rational number. The point value is $4 + 5 + 6 + 3 = 18$.
   • The number –5 is an integer, and a rational number. The point value is $6 + 3 = 9$.
   • Student C wins the game.