

Math 10 C: Test
Unit 2: Roots and Powers

Name: Key
Date: _____
Period: _____

FE B G A D H C

Matching: Complete the exponent rule by matching column A with Column B.
[1 mark each]

Column A:

1. $a^m \times a^n =$ F

2. $\frac{a^m}{a^n} =$ E

3. $(a^m)^n = a^{mn}$ B

4. $(ab)^m =$ G

5. $a^0 =$ A

6. $x^{\frac{m}{n}} =$ D

7. $a^{-m} =$ H

8. $\left(\frac{a}{b}\right)^{-m} =$ C

Column B:

A. 1

B. a^{mn}

C. $\frac{b^m}{a^m}$

D. $\sqrt[n]{x^m}$

E. a^{m-n}

F. a^{m+n}

G. $a^m b^m$

H. $\frac{1}{a^m}$

Multiple Choice: Select the best answer. [1 mark each]

d 1. Which of the following numbers is both a perfect square and a perfect cube?

- a) 8
- b) 16
- c) 32
- d) 64

d 2. 5 is the cube root of

- a) 5
- b) 10
- c) 25
- d) 125

3. The approximate side length of a square with area 34 cm^2 is

- a) 5.8 cm
- b) 8.5 cm
- c) 17.0 cm
- d) 23.3 cm

4. Which of the following numbers is NOT rational?

- a) $36^{\frac{1}{2}}$
- b) $(\sqrt[3]{64})^2$
- c) $(0.8)^{-3}$
- d) $(-27)^{\frac{-3}{2}}$

5. What is $5^{\frac{-3}{2}}$ expressed in radical form?

- a) $-\sqrt{5^3}$
- b) $(\sqrt[3]{-5})^2$
- c) $\frac{1}{\sqrt[3]{5^2}}$
- d) $\frac{1}{\sqrt{5^3}}$

Short answer: [1 mark each]

Given the following real numbers:

A = $\sqrt[5]{25}$

B = $2\sqrt{5}$

C = $\sqrt[11.2]{125}$

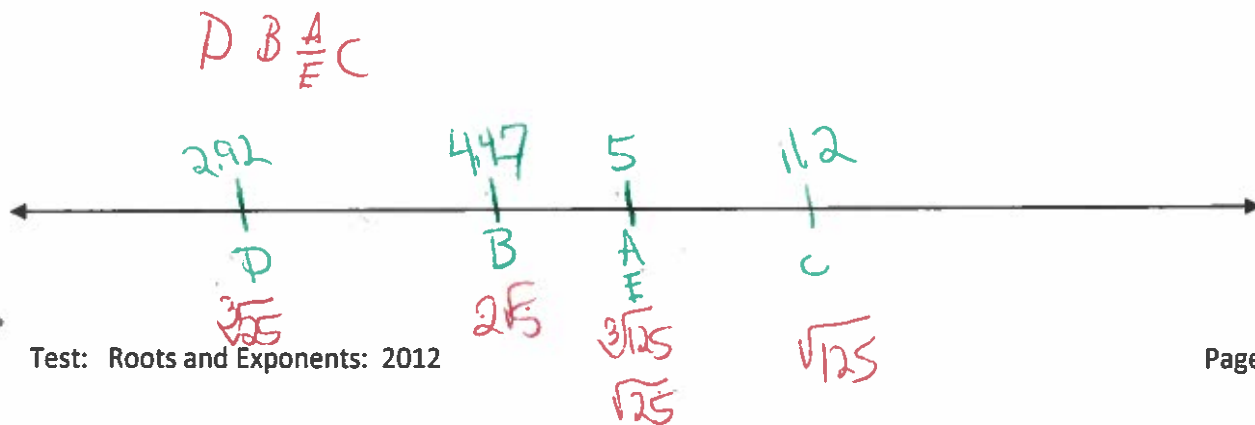
D = $\sqrt[2.92]{25}$

E = $\sqrt[5]{125}$

6. Identify the rational numbers: AE

7. Identify the irrational numbers: BCD

8. Place each number on the number line:



12/

both prime (mark) \Rightarrow L.C.M. G.C.F

9. Use **Prime Factorization** to answer the following questions:

a) Determine the G.C.F of 150 and 420

b) Determine the L.C.M. of 58 and 124

4

$$\begin{array}{r} 2 \overline{)150} \\ 5 \overline{)75} \\ 5 \overline{)15} \\ 3 \overline{)3} \\ \hline 1 \end{array}$$

$$\begin{array}{r} 2 \overline{)420} \\ 2 \overline{)210} \\ 5 \overline{)105} \\ 3 \overline{)21} \\ 7 \overline{)7} \\ \hline 1 \end{array}$$

$$\begin{array}{r} 2 \overline{)58} \\ 29 \overline{)29} \\ \hline 1 \end{array}$$

$2 \cdot 29$

$$\begin{array}{r} 2 \overline{)124} \\ 2 \overline{)62} \\ 31 \overline{)31} \\ \hline 1 \end{array}$$

\therefore G.C.F. = $2 \cdot 5 \cdot 3$
= 30

\therefore L.C.M. = $2 \cdot 2 \cdot 29 \cdot 31$
= 3596

10. Evaluate each radical. (express your answer as a fraction if necessary)

1

a) $\sqrt{\frac{25}{36}}$
 $\frac{5}{6}$

b) $\sqrt[3]{512}$
8

11. Evaluate each radical. (Round to two decimal places)

1

a) $\sqrt{205}$
14.32

b) $\sqrt[3]{440} = 3.38$

12. Write each entire radical as a mixed radical. *simplest form*

4

a) $\sqrt{180}$
 $6\sqrt{5}$

b) $\sqrt{72}$
 $6\sqrt{2}$

c) $5\sqrt{80}$
 $20\sqrt{5}$

d) $3\sqrt[3]{54}$
 $9\sqrt[3]{2}$

13. Write each mixed radical as an entire radical.

2

a) $8\sqrt{3}$
 $\sqrt{64 \cdot 3}$
 $\sqrt{192}$

b) $2\sqrt[3]{4}$
 $\sqrt[3]{8 \cdot 4}$
 $\sqrt[3]{32}$

14. Express each power as a radical.

1

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

b) $(3y)^{\frac{1}{4}}$
 $\sqrt[4]{3y}$

25

15. Express each radical as a power.

a) $\sqrt{(x^3)}$
 $x^{\frac{3}{2}}$

b) $\sqrt[3]{\left(\frac{3}{5}\right)^2}$
 $\left(\frac{3}{5}\right)^{\frac{2}{3}}$ Bracket

16. Evaluate each power without using a calculator (write as a radical and then evaluate where possible).

a) $625^{\frac{1}{4}}$
 $\sqrt[4]{625}$
 $= 5$

b) $(-27)^{\frac{4}{3}}$
 $(\sqrt[3]{-27})^4$
 $(-3)^4$
 $= 81$

c) $\left(\frac{-27}{64}\right)^{-\frac{2}{3}}$
 $\left(\frac{\sqrt[3]{-27}}{\sqrt[3]{64}}\right)^{-2}$
 $\left(\frac{-3}{4}\right)^{-2} = \left(\frac{4}{-3}\right)^2 = \frac{16}{9}$

d) $\left(\frac{x^2}{x^4}\right)^{\frac{3}{8}}$
 $= \frac{x^{\frac{2 \cdot 3}{8}}}{x^{\frac{4 \cdot 3}{8}}} = \frac{x^{\frac{3}{4}}}{x^{\frac{3}{2}}} = \frac{1}{x^{\frac{3}{4}}}$

17. Evaluate each power. (round to two decimal places)

a) $14^{\frac{3}{2}}$
 $(\sqrt{14})^3 = 52.38$

b) $5(0.8)^{\frac{1}{3}}$
 $= 5 = 4.64$

18. Evaluate each power. Express your answer as a fraction.

a) 6^{-2}
 $= \frac{1}{36}$

b) $\left[\left(\frac{3}{2}\right)^{-2}\right]^3$
 $\left(\frac{3}{2}\right)^{-6} = \left(\frac{2}{3}\right)^6 = \frac{64}{729}$

19. Write each power with positive exponents without using a calculator. Then evaluate.

a) $\left(\frac{6}{7}\right)^{-3}$
 $\left(\frac{7}{6}\right)^3 = \frac{343}{216}$

b) $\frac{1}{(-3)^{-2}}$
 $= (-3)^2 = 9$ many lower (-)

20. Evaluate each power without using a calculator. Write with positive exponents only.

a) $(2xy^2)(3x^{-1}y^0)$

$6x^0y^2$
 $6y^2$

b) $(xy^{-3})^{-2}$

$x^{-2}y^6$
 $\frac{y^6}{x^2}$

c) $(-2x^5y^3z^8)^{-2} \cdot (-2x^2y^{-8}z^{12})^3$ (11c)

$(-2)^{-2} x^{-10} y^{-6} z^{-16} \cdot (-2)^3 x^6 y^{-24} z^{36}$
 $= \frac{1}{4} \cdot 8 x^{-4} y^{-30} z^{20}$
 $= -2 x^4 y^{30} z^{20}$

2

4

2

2

2

8

16

\$10

d) $\left(x^{\frac{1}{3}}y^{\frac{4}{5}}\right)^0 \left(x^{\frac{1}{3}}\right)^6$
 (1) $(x^2)^{\frac{1}{3}}$

e) $(\sqrt{3} \cdot \sqrt[3]{4})^6$
 $\left(3^{\frac{1}{2}}\right)\left(4^{\frac{1}{3}}\right)^6$
 $(3^3)(4^2) = (27)(16) = 432$

f)

$\frac{(x^6)^{\frac{1}{2}}}{\left(x^{\frac{5}{2}}\right)^{\frac{1}{5}}} = \frac{x^3}{x^{\frac{1}{2}}} = x^{\frac{5}{2}}$

Applications:

21. Suppose you want \$10 000 in 4 years. Interest rate for a savings account is 2.8% compounded annually. The money, P dollars, you must invest now is given by the formula: $P = 10000(1.028)^{-4}$. How much must you invest now to have \$10 000 in 4 years? [2 marks]

$P = \$8954,22$

20. Identify the errors made in each solution, then write the correct solution. [2 marks each]

a) $\sqrt{160} = \sqrt{4 \times 40}$
 $= 2\sqrt{20 \times 20}$ *20x20 is not 40*
 $= 2\sqrt{4 \times 5 \times 4 \times 5}$
 $= 2 \times 4 \times 5$
 $= 40$

$\sqrt{160} = \sqrt{16 \cdot 10}$
 $= 4\sqrt{10}$

b) $\left(\frac{3x^4}{y^4}\right)^{-4} = \frac{12x^{-1}}{y^0}$ *use Not correct No need to be -16*

$= \frac{12}{x}$

$\frac{3^{-4}x^{-1}}{y^{-16}} = \frac{y^{16}}{21x}$

