Name: ANSWER KEY Class: _____ Date: _____ ID: A

Roots and Powers Review

Short Answer

1. Which of these numbers is rational?

$\sqrt{\frac{4}{169}}$, $\sqrt{48}$, $\sqrt[3]{-16}$, $\sqrt{8.1}$

since $\sqrt{\frac{4}{169}} = \frac{\sqrt{4}}{\sqrt{169}} = \frac{2}{13}$

None of the others have perfect roots.

2. Which of these numbers is irrational?

$\sqrt{48}$, $\sqrt[3]{216}$, $\sqrt{\frac{49}{16}}$, -68

since it does not have an exact $\sqrt{\ }$

3. Between which two consecutive integers on a number line would you locate $\sqrt[3]{-18}$?

$\sqrt[3]{-18}$ is between $\sqrt[3]{-27}$ and $\sqrt[3]{-8}$

so $\sqrt[3]{-18}$ is between -2 and -3

4. Which of these numbers is an integer, but not a whole number?

-9, 0, 1, $\sqrt{5}$

whole #'s start at 0 and go up...: 0, 1, 2, 3, ...

5. Write $\sqrt{108}$ in simplest form.

$\sqrt{36 \cdot 3} = \sqrt{36} \cdot \sqrt{3} = 6\sqrt{3}$

6. Write $\sqrt[3]{80}$ in simplest form.

$\sqrt[3]{80} = \sqrt[3]{8} \cdot \sqrt[3]{10} = 2\sqrt[3]{10}$

7. Write $\sqrt[4]{405}$ in simplest form.

$\sqrt[4]{405} = \sqrt[4]{81 \cdot 5} = \sqrt[4]{81} \cdot \sqrt[4]{5} = 3\sqrt[4]{5}$

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8. Write $6\sqrt{5}$ as an entire radical.

$6\sqrt{5} = \sqrt{6^2 \cdot 5} = \sqrt{36 \cdot 5} = \sqrt{180}$

9. Write $3\sqrt[3]{4}$ as an entire radical.

$3\sqrt[3]{4} = \sqrt[3]{3^3 \cdot 4} = \sqrt[3]{27 \cdot 4} = \sqrt[3]{108}$

10. Order these numbers from greatest to least: $2\sqrt{30}, 3\sqrt{3}, 2\sqrt{7}, 5\sqrt{5}, 2\sqrt{13}$

② ⑤ ④ ① ③

$\sqrt{120}$ $\sqrt{27}$ $\sqrt{28}$ $\sqrt{125}$ $\sqrt{52}$

$5\sqrt{5}, 2\sqrt{30}, 2\sqrt{13}, 2\sqrt{7}, 3\sqrt{3}$

11. Evaluate $64^{\frac{1}{3}}$ without using a calculator.

$64^{1/3}$ means $\sqrt[3]{64} = 4$

12. Evaluate $(-27)^{\frac{1}{3}}$ without using a calculator.

$(-27)^{1/3}$ means $\sqrt[3]{(-27)} = -3$

13. Evaluate $\left(\frac{256}{625}\right)^{\frac{1}{4}}$ without using a calculator.

$\left(\frac{256}{625}\right)^{1/4}$ means $\sqrt[4]{\frac{256}{625}} = \frac{4}{5}$

14. Write $42^{\frac{5}{4}}$ as a radical.

$\left(\sqrt[4]{42}\right)^5$ or $\sqrt[4]{42^5}$

15. Write $\sqrt{\left(\frac{3}{4}\right)^9}$ as a power.

$\left(\frac{3}{4}\right)^{9/2}$

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16. Write $7.5^{1.25}$ as a radical.

$1.25 = \frac{125}{100} = \frac{5}{4}$

So $7.5^{5/4} = \sqrt[4]{7.5^5}$

17. Evaluate $4^{2.5}$.

$4^{\frac{25}{10}} = 4^{\frac{5}{2}} = \left(\sqrt[2]{4}\right)^5 = (2)^5 = 32$

18. Evaluate $\left(\frac{125}{8}\right)^{\frac{4}{3}}$.

means $\left(\sqrt[3]{\frac{125}{8}}\right)^4 = \left(\frac{5}{2}\right)^4 = \frac{625}{16}$

19. Evaluate 3^{-2} without using a calculator.

$3^{-2} = \frac{1}{3^2} = \frac{1}{9}$

20. Evaluate $\left(\frac{2}{3}\right)^{-3}$

$= \left(\frac{3}{2}\right)^3 = \frac{27}{8}$

21. Evaluate $\left(\frac{625}{256}\right)^{-\frac{3}{4}}$ without using a calculator.

$\left(\frac{625}{256}\right)^{-\frac{3}{4}} = \left(\frac{256}{625}\right)^{\frac{3}{4}} = \left(\sqrt[4]{\frac{256}{625}}\right)^3 = \left(\frac{4}{5}\right)^3 = \frac{64}{125}$

22. Evaluate $(0.81)^{-\frac{3}{2}}$ without using a calculator.

oops

$(.81)^{-3/2} = \left(\frac{81}{100}\right)^{-3/2} = \left(\frac{100}{81}\right)^{3/2} = \left(\frac{10}{9}\right)^3 = \frac{1000}{729}$

23. Simplify $\frac{\left(3.5^{-6}\right)\left(3.5^5\right)}{3.5^{-1}}$ by writing as a single power.

$\frac{3.5^{-1}}{3.5^{-1}} = 1$

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24. Simplify $m^{-2}n^{6} \cdot m^{3}n^{-8}$. Write using powers with positive exponents.

$mn^{-2} = \frac{m}{n^2}$

25. Simplify $\frac{12p^{3}q^{-7}}{15pq^{6}}$. Write using powers with positive exponents.

$\frac{4p^2q^{-13}}{5} = \frac{4p^2}{5q^{13}}$

26. Simplify $\left(64a^{12}b^{15}\right)^{\frac{2}{3}}$. $64^{2/3}a^8b^{10} = (\sqrt[3]{64})^2a^8b^{10}$

$= 16a^8b^{10}$

27. Simplify $\left(7s^{\frac{7}{4}}t^{-\frac{5}{3}}\right)\left(-6s^{-\frac{11}{4}}t^{\frac{7}{3}}\right)$. $-42s^{-1}t^{2/3} = \frac{-42t^{2/3}}{s}$

28. Simplify $\left(\frac{36x^{4}y^{3}}{4x^{8}y^{-1}}\right)^{\frac{1}{2}}$. $\left[9x^{-4}y^{4}\right]^{1/2} = 9^{1/2}x^{-2}y^{2} = \frac{3y^2}{x^2}$

29. Evaluate $\left(-\frac{8}{5}\right)^{\frac{7}{4}} \cdot \left(-\frac{8}{5}\right)^{\frac{1}{4}}$ $= \left(-\frac{8}{5}\right)^{8/4} = \left(-\frac{8}{5}\right)^{2} = \frac{64}{25}$

30. Evaluate $\frac{0.64^{\frac{7}{2}}}{0.64^{\frac{5}{2}}}$ $= (.64)^{-3/2} = \left(\frac{64}{100}\right)^{-3/2} = \left(\frac{100}{64}\right)^{3/2}$

$\frac{7}{2} \quad \frac{10}{2} - \frac{3}{2}$

$= \left(\frac{10}{8}\right)^3 = \left(\frac{5}{4}\right)^3$

$= \frac{125}{64}$

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31. Simplify $\dfrac{\left(m^3n^{-3}\right)^{-1}}{\left(m^{-2}n\right)^4}$.

$\dfrac{m^{-3}n^3}{m^{-8}n^4} = m^5n^{-1} = \dfrac{m^5}{n}$

32. Simplify $\left(\dfrac{w^{-15}y^{12}}{-64x^3}\right)^{-\frac{1}{3}}$.

$\dfrac{w^5y^{-4}}{(-64)^{-1/3}x^{-1}} = -\dfrac{4xw^5}{y^4}$

33. Evaluate $\dfrac{\left(a^{-\frac{7}{2}}b^{\frac{10}{3}}\right)}{\left(a^{-5}b^4\right)}$ for $a = 4$ and $b = -27$.

$\left(a^{3/2}\cdot b^{-2/3}\right) = \dfrac{(4)^{3/2}}{(-27)^{2/3}} = \dfrac{8}{9}$

34. Simplify $\dfrac{-3a^{-3}b^{-7}c^{-6}}{12a^{-6}b^{-3}c^{-3}}$. Write using powers with positive exponents.

$\dfrac{-1a^3b^{-4}c^{-3}}{4} = \dfrac{-a^3}{4b^4c^3}$

35. Simplify $\left(\dfrac{3}{4}m^{-3}n^{-7}p^{-2}\right)^{-4}$.

$\left(\dfrac{3}{4}\right)^{-4}m^{12}n^{28}p^8 = \left(\dfrac{4}{3}\right)^4m^{12}n^{28}p^8$

$\dfrac{256}{81}m^{12}n^{28}p^8$

36. Evaluate $\left[\left(-\dfrac{16}{19}\right)^{\frac{2}{5}}\cdot\left(-\dfrac{16}{19}\right)^{-\frac{2}{5}}\right]^7$.

$= 1$