Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Grade & Section: \_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_

Topic: Laws of Radicals

Learning Competency: Derives the laws of radicals.

Code: M9AL-IIf-2

Concept:

The laws of radicals are derived directly from the laws of exponents. The laws are designed to make simplification much easier. To derive the law of radicals, follow the following steps:

Step 1: Transform the radical into exponential form.

Step 2: Factor the radicand if necessary.

The following are the laws of radicals with example:

1. ($\sqrt[n]{a}$)n = $α^{\left(\frac{1}{n}\right)n}$= $α^{\left(\frac{n}{n}\right)}$= a

Example: ($\sqrt[3]{5}$)3 = $5^{\left(\frac{1}{3}\right)3}$= $5^{\left(\frac{3}{3}\right)}$ = **5**

1. $\sqrt[n]{ab}$ = $αb^{\left(\frac{1}{n}\right)}$ = $α^{\left(\frac{1}{n}\right)}·$ $b^{\left(\frac{1}{n}\right)}$ = $\sqrt[n]{a}\sqrt[ n]{b}$

Example: $\sqrt{10}$ = $10^{\left(\frac{1}{2}\right)}$ = $(5·2)^{\left(\frac{1}{2}\right)}$= $5^{\left(\frac{1}{2}\right)} 2^{\left(\frac{1}{2}\right)}$ = $\sqrt{5}$$\sqrt{2}$

1. $\sqrt[n]{\frac{a}{b}}$ = $(\frac{a}{b })^{\left(\frac{1}{n}\right)}$= $\frac{a^{(\frac{1}{n})}}{b^{(\frac{1}{n})} }$ = $\frac{\sqrt[n]{a}}{\sqrt[n]{b}}$

Example: $\sqrt[3]{\frac{2}{5}}$ = $(\frac{2}{5 })^{\left(\frac{1}{3}\right)}$= $\frac{2^{(\frac{1}{3})}}{5^{(\frac{1}{3})} }$ = $\frac{\sqrt[3]{2}}{\sqrt[3]{5}}$

1. $\sqrt[m]{\sqrt[n]{a}}$ = $\sqrt[mn]{a}$ = $\sqrt[n]{\sqrt[m]{a}}$

Example: $\sqrt[3]{\sqrt[5]{2}}$ = $\sqrt[15]{2}$ = $\sqrt[5]{\sqrt[3]{2}}$

**Activity 1**

1. **Choose the letter that you think best answers the questions.**
2. Using the law of radical ($\sqrt[n]{a}$)n=a, which of the following is true?
3. ($\sqrt[4]{10}$)8 = $10^{\left(\frac{1}{4}\right)(\frac{8}{4})}$ c. ($\sqrt[5]{7}$)5 = $7^{\left(\frac{1}{5}\right)5}$
4. ($\sqrt[4]{x}$)6 = $x^{4\left(\frac{6}{4}\right)}$ d. ($\sqrt[3]{12}$)2 = $12^{\left(\frac{1}{3}\right)\left(\frac{2}{3}\right)}$
5. A radical expression $\frac{\sqrt{5}}{\sqrt{3}}$is an example of whatlaws of radical?
6. ($\sqrt[n]{a}$)n=a c. $\sqrt[n]{\frac{a}{b}}$ = $\frac{\sqrt[n]{a}}{\sqrt[n]{b}}$
7. $\sqrt[n]{ab}$ = $\sqrt[n]{a}\sqrt[ n]{b}$ d. $\sqrt[m]{\sqrt[n]{a}}$ = $\sqrt[mn]{a}$ = $\sqrt[n]{\sqrt[m]{a}}$
8. The following are the examples of the laws of radical $\sqrt[n]{ab}$ = $\sqrt[n]{a}\sqrt[ n]{b}$ except
9. $\sqrt[3]{14}$ = $\sqrt[3]{7}\sqrt[ 3]{2}$ c. $\sqrt[4]{15}$ = $\sqrt{3}$ $\sqrt{5}$
10. $\sqrt{6}$ = $\sqrt{2}$ $\sqrt{3}$ d. $\sqrt[3]{21}$ = $\sqrt[3]{7}\sqrt[ 3]{2}$
11. Which of the following is an example of the laws of radical $\sqrt[m]{\sqrt[n]{a}}$ = $\sqrt[mn]{a}$ = $\sqrt[n]{\sqrt[m]{a}}$ ?
12. $\sqrt[5]{\sqrt{3}}$ = $\sqrt[10]{3}$ = $\sqrt{\sqrt[5]{3}}$ c. $\sqrt[3]{\sqrt{11}}$ = $\sqrt[4]{11}$ = $\sqrt{\sqrt[3]{11}}$
13. $\sqrt{\sqrt{8}}$ =$\sqrt[5]{8}$ = $\sqrt{\sqrt{8}}$ d. $\sqrt[4]{\sqrt{17}}$ = $\sqrt[6]{17}$ = $\sqrt{\sqrt[4]{17}}$
14. A radical expression ($\sqrt[3]{7}$)3 = 7is an example of whatlaws of radical?
15. ($\sqrt[n]{a}$)n=a c. $\sqrt[n]{\frac{a}{b}}$ = $\frac{\sqrt[n]{a}}{\sqrt[n]{b}}$
16. $\sqrt[n]{ab}$ = $\sqrt[n]{a}\sqrt[ n]{b}$ d. $\sqrt[m]{\sqrt[n]{a}}$ = $\sqrt[mn]{a}$ = $\sqrt[n]{\sqrt[m]{a}}$

**Activity 2**

1. **Match the examples in column A to the laws of radicals in column B. Write only the letter before the number.**

**Column A Column B**

 \_\_\_\_\_6. $\sqrt{\frac{5}{6}}$ = $\frac{\sqrt{5}}{\sqrt{6}}$ a. ($\sqrt[n]{a}$)n=a

 \_\_\_\_\_7.$ $($\sqrt[3]{19}$)3 = 19 b. $\sqrt[n]{ab}$ = $\sqrt[n]{a}\sqrt[ n]{b}$

 \_\_\_\_\_8. $\sqrt{30}$ = $\sqrt{6}$ $\sqrt{5}$ c. $\sqrt[n]{\frac{a}{b}}$ = $\frac{\sqrt[n]{a}}{\sqrt[n]{b}}$

 \_\_\_\_\_9.$ \sqrt[3]{\sqrt[4]{13}}$ = $\sqrt[12]{13}$ = $\sqrt[4]{\sqrt[3]{13}}$ d. $\sqrt[m]{\sqrt[n]{a}}$ = $\sqrt[mn]{a}$ = $\sqrt[n]{\sqrt[m]{a}}$

 \_\_\_\_\_10.$ \sqrt[3]{\frac{4}{3}}$ = $\frac{\sqrt[3]{4}}{\sqrt[3]{3}}$

References:

1. Nivera, G. C. & Lapinid, M. C.(2013). Patterns and Practicalities. Makati City: SalesianaBooks by Don Bosco, Inc.
2. Department of Education - Mathematics Learners Material 9

Notes: a) This is exclusively for the use of Digos City Division.

 b) The division welcomes suggestions for the improvement of this worksheet. Kindly email to

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**ANSWER KEY**

**Activity 1**

1. **Choose the letter that you think best answers the questions.**
2. Using the law of radical ($\sqrt[n]{a}$)n=a, which of the following is true?
3. ($\sqrt[4]{10}$)8 = $10^{\left(\frac{1}{4}\right)(\frac{8}{4})}$ **c. (**$\sqrt[5]{7}$**)5 =** $7^{\left(\frac{1}{5}\right)5}$
4. ($\sqrt[4]{x}$)6 = $x^{4\left(\frac{6}{4}\right)}$ d. ($\sqrt[3]{12}$)2 = $12^{\left(\frac{1}{3}\right)\left(\frac{2}{3}\right)}$
5. A radical expression $\frac{\sqrt{5}}{\sqrt{3}}$is an example of whatlaws of radical?
6. ($\sqrt[n]{a}$)n=a **c.** $\sqrt[n]{\frac{a}{b}}$ **=** $\frac{\sqrt[n]{a}}{\sqrt[n]{b}}$
7. $\sqrt[n]{ab}$ = $\sqrt[n]{a}\sqrt[ n]{b}$ d. $\sqrt[m]{\sqrt[n]{a}}$ = $\sqrt[mn]{a}$ = $\sqrt[n]{\sqrt[m]{a}}$
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9. $\sqrt[3]{14}$ = $\sqrt[3]{7}\sqrt[ 3]{2}$ **c.** $\sqrt[4]{15}$ **=** $\sqrt{3}$$\sqrt{5}$
10. $\sqrt{6}$ = $\sqrt{2}$ $\sqrt{3}$ d. $\sqrt[3]{21}$ = $\sqrt[3]{7}\sqrt[ 3]{2}$
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12. $\sqrt[5]{\sqrt{3}}$ **=** $\sqrt[10]{3}$ **=** $\sqrt{\sqrt[5]{3}}$ c. $\sqrt[3]{\sqrt{11}}$ = $\sqrt[4]{11}$ = $\sqrt{\sqrt[3]{11}}$
13. $\sqrt{\sqrt{8}}$ =$\sqrt[5]{8}$ = $\sqrt{\sqrt{8}}$ d. $\sqrt[4]{\sqrt{17}}$ = $\sqrt[6]{17}$ = $\sqrt{\sqrt[4]{17}}$
14. A radical expression ($\sqrt[3]{7}$)3 = 7is an example of whatlaws of radical?
15. **(**$\sqrt[n]{a}$**)n=a**  c. $\sqrt[n]{\frac{a}{b}}$ = $\frac{\sqrt[n]{a}}{\sqrt[n]{b}}$
16. $\sqrt[n]{ab}$ = $\sqrt[n]{a}\sqrt[ n]{b}$ d. $\sqrt[m]{\sqrt[n]{a}}$ = $\sqrt[mn]{a}$ = $\sqrt[n]{\sqrt[m]{a}}$

**Activity 2**

1. **Match the examples in column A to the laws of radicals in column B. Write only the letter before the number.**

**Column A Column B**

 \_\_**c**\_\_6. $\sqrt{\frac{5}{6}}$ = $\frac{\sqrt{5}}{\sqrt{6}}$ a. ($\sqrt[n]{a}$)n=a

 \_\_**a**\_\_7.$ $($\sqrt[3]{19}$)3 = 19 b. $\sqrt[n]{ab}$ = $\sqrt[n]{a}\sqrt[ n]{b}$

 \_\_**b**\_\_8. $\sqrt{30}$ = $\sqrt{6}$ $\sqrt{5}$ c. $\sqrt[n]{\frac{a}{b}}$ = $\frac{\sqrt[n]{a}}{\sqrt[n]{b}}$

 \_\_**d**\_\_9.$ \sqrt[3]{\sqrt[4]{13}}$ = $\sqrt[12]{13}$ = $\sqrt[4]{\sqrt[3]{13}}$ d. $\sqrt[m]{\sqrt[n]{a}}$ = $\sqrt[mn]{a}$ = $\sqrt[n]{\sqrt[m]{a}}$

 \_\_**c**\_\_10.$ \sqrt[3]{\frac{4}{3}}$ = $\frac{\sqrt[3]{4}}{\sqrt[3]{3}}$

References:

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