Radical Expressions with an Index

Background

After completing the *1. How to Read and Write a Radical Expression* focused lesson, you are ready to learn how to read and write a radical expression with an index other than 2.

Remember, the **radical expression** $\sqrt[n]{x}$ has three major components, the **radical symbol** (it looks like a check mark in print), the **index** (the small n tucked outside the radical symbol), and the **radicand** (x, the quantity written beneath the horizontal bar of the radical symbol in print).

An index of 5 means that we are looking for the fifth root. An index of 3 means that we are looking for the cube root. As we already learned, an index of 2 is the **square root**, and we usually don't show the 2.

For this lesson, we are going to concentrate on learning how to read and write radical expressions with an index other than 2.

Basic Rules for Writing a Radical Expression with an Index

When writing a radical with an index, you follow these simple steps. You would braille:

1. ⠣ (dots 1-2-6) the index-of-radical indicator
2. the index of the radical
3. ⠜ (dots 3-4-5) the radical symbol
4. the radicand, value inside/under a radical symbol, which you want to find the root of
5. ⠻ (dots 1-2-4-5-6) the termination indicator

So to write $\sqrt[3]{27}$ (the cube root of 27) in Nemeth Code, you would write:

⠣⠒⠜⠆⠶⠻ or index-of-radical indicator, three, radical symbol, twenty-seven, termination indicator.

Basic Rules for Reading a Radical Expression with an Index

For most radical expressions with an index, you will just say "the nth root of" and then read the radicand, where "n" stands for the designated index of the radical. Of course, we have already learned that we usually say "the cube root of" when the index is 3, instead of the third root.

Examples

1. $\sqrt[3]{64}$ would be read: the cube root of sixty-four.

   ⠣⠒⠜⠖⠲⠻

2. $\sqrt[7]{x}$ would be read: the seventh root of x.

   ⠣⠶⠜⠭⠻

3. $\sqrt[5]{\dfrac{1}{32}}$

   would be read: the fifth root of open fraction one over thirty-two close fraction.

   ⠣⠢⠜⠹⠂⠌⠒⠆⠼⠻

4. $\sqrt[4]{0.0016}$

   would be read: the fourth root of zero point zero zero one six.

   ⠣⠲⠜⠴⠨⠴⠴⠂⠖⠻

However, things get a bit more complicated when you have something following the termination indicator. Notice that when reading the next two problems we included the words “end root” to indicate where the radicand ends. Otherwise, it would be very difficult to tell whether the minus one was inside/under the radical or not.

5. $\sqrt[3]{y-1}$ would be read: the cube root of y minus one end root.

   ⠣⠒⠜⠽⠤⠂⠻

6. $\sqrt[3]{y}-1$ would be read: the cube root of y end root minus one.

   ⠣⠒⠜⠽⠻⠤⠂

As we have already seen, the radicand doesn’t always have to be a specific number. The radicand could contain one or more variables and these variables could even have **superscripts** or **exponents**. Notice below in Problems 7 to 11 that we need to use the **superscript indicator** (dots 4-5) to start the exponent and the **baseline indicator** (dot 5) in order to show that the exponent has ended and that we have returned to baseline.

7. $\sqrt[7]{z^7}$

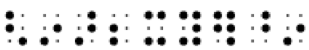
would be read: the seventh root of z to the seventh power end root.

8. $\sqrt[5]{(x-2)^5}$

would be read: the fifth root of open parenthesis x minus two close parenthesis to the fifth power end root.

9. $\sqrt[9]{2xy}^{\,9}$

would be read: the ninth root of two x y end root to the ninth power.



10. $\sqrt[3]{\frac{1}{125}z^6}$

would be read: the cube root of open fraction one over one hundred twenty-five close fraction z to the sixth power end root.

11. $\sqrt[4]{\frac{81x^4}{16y^8}}$

would be read: the fourth root of open fraction eighty-one x to the fourth power over sixteen y to the eighth power close fraction end root.

12. $\sqrt[3]{-27}$ would be read: the cube root of negative twenty-seven.

Activity time: See if you can re-create the radical expressions in examples 1 to 12.