Simplifying Square Roots of Monomial Expressions

Strand: Expressions and Operations

Topic: Simplifying square roots of algebraic expressions

Primary SOL: A.3 The student will simplify
a) square roots of whole numbers and monomial algebraic expression

Related SOL: A.2a

Materials

- Math MadLib activity (attached)
- One set of clue cards (attached)

Vocabulary

exponents, expression, monomial, perfect square, radicand, simplest radical form, square root

Student/Teacher Actions: What should students be doing? What should teachers be doing?

1. Review simplifying square roots of whole numbers by asking students how they would express $\sqrt{432}$ in its simplest radical form. Give them some time to find the answer on their own, and use think-pair-share to share their strategies.
2. Display $\sqrt{x^2y^3z^4}$, and ask students how they would express this algebraic expression in its simplest radical form. After allowing time to think, let them work with a partner or in small groups to find the answer. Emphasize that they will need to be able to explain their strategies.
3. Have students share strategies. As students are sharing, ask questions to help them connect simplifying the square root of a whole number to simplifying the square root of a monomial algebraic expression. Ask students how they are the same and how they are different. Once students have simplified the above monomial algebraic expression, give two-three more examples and gauge student readiness before moving on.
4. Distribute the Math MadLib activity sheet and post a set of 12 clues cards around the room.
5. Students should work with a partner to rewrite each square root of a monomial expression, presented on the clue cards, in its simplest form. Then, they can use their result to fill in the blanks on the Math MadLib. These clues can be approached in any order as long as the resulting word or phrase is recorded in the blank with the corresponding number.

Assessment

- **Questions**
  - Pick a replacement value for a, and use it to explain why the statement $\sqrt{a^4} = a^2$ is accurate.

  - Explain how you can tell whether you have simplified a square root of a monomial expression to its simplest form.
- **Journal/writing prompts**
  - Compare and contrast simplifying square roots of whole numbers and square roots of monomial expressions.
  - $\sqrt{\ ?\ } = 6mn\sqrt{2mn}$

    What monomial expression could replace the "?" in the statement above to make a true sentence? Explain your reasoning.
- **Other Assessments (include informal assessment ideas)**
  - Have students practice expressing square roots of monomial algebraic expressions in simplest form.

Extensions and Connections (for all students)

- Have students find the length of a side on a square with an area that is given in the form of a monomial expression.
- Prompt students to think of a square root in terms of a fractional exponent and see whether they can come up with the fraction that is used. $\sqrt{n^6} = (n^6)^{\frac{?}{?}} = n^3$
- Prompt students to think about how they would simplify a cube root of a monomial algebraic expression.

Strategies for Differentiation

- Have students create a flow chart showing the steps of their strategy for simplifying a square root.
- Suggest students expand out radicand expressions, and have them circle pairs when simplifying square roots.
- Selective grouping in order to complete the Math MadLib activity.
- Fill in the words for selected spaces, depending on student ability level and time.

Note: The following pages are intended for classroom use for students as a visual aid to learning.

Math MadLib
Simplifying Square Roots of Monomial Expressions

Name ___________________________________ **Date**_________________________

Use the clues provided to complete the Math MadLib below:

Today in ________________ class, we used my favorite math
1

________________, ________________. Typically, I work with
2 3

________________ on class assignments, but our teacher,
4

________________, picked our partners today. She paired me
5

with ________________. It was totally ________________
6 7

working with him. He could take any ________________
8

expression and determine its ________________ root in
9

________________ form with ________________. I ________________
10 11 12

a lot from him!

1

Record the word found beside the most simplified version of $\sqrt{45a^5b^6}$ in the appropriate blank on the Math MadLib page.

$5a^2b^3\sqrt{3a}$ . . . Statistics

$5a^4b^6\sqrt{3a}$ . . . Probability

$3ab\sqrt{5a^3b^4}$. . . Geometry

$3a^2b^3\sqrt{5a}$. . . Algebra

2

Record the word found beside the most simplified version of $\sqrt{72mn^4}$ in the appropriate blank on the Math MadLib page.

$6n^2\sqrt{2m}$ . . . concept

$6n\sqrt{2m}$ . . . manipulative

$2n^2\sqrt{6m}$ . . . tool

$2n\sqrt{6m}$ . . . weapon

3

Record the words found beside the most simplified version of $\sqrt{81x^3y^5}$ in the appropriate blank on the Math MadLib page.

$3xy^2\sqrt{9xy}$ . . . Algebra tiles

$3xy\sqrt{9xy^3}$ . . . a compass

$9xy^2\sqrt{xy}$ . . . prime factorization

$9xy\sqrt{xy^3}$ . . . a protractor

4

Record the name found beside the most simplified version of $\sqrt{288abc^2}$ in the appropriate blank on the Math MadLib page.

$4c\sqrt{18abc}$ . . . Al Gebra

$7c\sqrt{2ab}$ . . . Cal Culus

$12c\sqrt{2abc}$ . . . Poly Gon

$12c\sqrt{2ab}$ . . . Poly Nomial

5

Record the name found beside the most simplified version of $\sqrt{12p^8z^5}$ in the appropriate blank on the Math MadLib page.

$p^2z\sqrt{12z}$ . . . Mrs. Coefficient

$p^4z^2\sqrt{12z}$ . . . Mrs. Constant

$2p^2z\sqrt{3z}$ . . . Mrs. Degree

$2p^4z^2\sqrt{3z}$ . . . Mrs. Term

6

Record the name found beside the most simplified version of $\sqrt{75a^6b^9}$ in the appropriate blank on the Math MadLib pag

$5a^3b^4\sqrt{3b}$ . . . Al Gebra

$5ab^2\sqrt{3a^2b}$ . . . Cal Culus

$3a^3b^4\sqrt{5b}$ . . . Poly Gon

$3ab^7\sqrt{5ab}$ . . . Poly Nomial

7

Record the word found beside the most simplified version of $\sqrt{180cd^2e}$ in the appropriate blank on the Math MadLib page.

$5d\sqrt{5ce}$ . . . *awesome*

$5\sqrt{5cd^2e}$ . . . *cool*

$6d\sqrt{5ce}$ . . . *radical*

$5\sqrt{6cd^2e}$ . . . *square*

8

Record the word found beside the most simplified version of $\sqrt{360w^{12}z}$ in the appropriate blank on the Math MadLib page.

$10w^6\sqrt{6z}$ . . . *binomial*

$6w^6\sqrt{10z}$ . . . *monomial*

$5w^6\sqrt{7z}$ . . . *polynomial*

$7w^6\sqrt{5z}$ . . . *trinomial*

9

Record the word found beside the most simplified version of $\sqrt{294g^7k}$ in the appropriate blank on the Math MadLib page.

$7g^6\sqrt{6gk}$ . . . cube

$6g^3\sqrt{7gk}$ . . . grass

$7g^3\sqrt{6gk}$ . . . square

$5g^6\sqrt{7gk}$ . . . tree

10

Record the word(s) found beside the most simplified version of $\sqrt{200xy^{10}z^2}$ in the appropriate blank on the Math MadLib page.

$5y^5z\sqrt{8x}$ . . . expanded

$5y^{10}z^2\sqrt{8x}$ . . . prime factorization

$10y^5z\sqrt{2x}$ . . . simplest

$2y^5z\sqrt{10x}$ . . . standard

11

Record the word(s) found beside the most simplified version of $\sqrt{225ur^2}$ in the appropriate blank on the Math MadLib page.

$15r\sqrt{u}$ . . . *ease*

$5r\sqrt{9u}$ . . . *finesse*

$3r\sqrt{25u}$ . . . *a pen*

$15r^2\sqrt{u}$ . . . *a pencil*

12

Record the word found beside the most simplified version of $\sqrt{96w^7x^9}$ in the appropriate blank on the Math MadLib page.

$6wx^2\sqrt{4w^3x}$ . . . *gained*

$4w^3x^4\sqrt{6wx}$ . . . *learned*

$4w^3x^4\sqrt{5wx}$ . . . *stole*

$4wx^2\sqrt{5w^3x}$ . . . *won*