

Laws of Exponents

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Law	Example
$x^1 = x$	$6^1 = 6$
$x^0 = 1$	$7^0 = 1$
$x^{-1} = 1/x$	$4^{-1} = 1/4$
$x^m x^n = x^{m+n}$	$x^2 x^3 = x^{2+3} = x^5$
$x^m / x^n = x^{m-n}$	$x^6 / x^2 = x^{6-2} = x^4$
$(x^m)^n = x^{mn}$	$(x^2)^3 = x^{2 \times 3} = x^6$
$(xy)^n = x^n y^n$	$(xy)^3 = x^3 y^3$
$(x/y)^n = x^n / y^n$	$(x/y)^2 = x^2 / y^2$
$x^{-n} = 1/x^n$	$x^{-3} = 1/x^3$
And the law about Fractional Exponents:	
$x^{\frac{m}{n}} = \sqrt[n]{x^m}$ $= (\sqrt[n]{x})^m$	$x^{\frac{2}{3}} = \sqrt[3]{x^2}$ $= (\sqrt[3]{x})^2$

This technology tool thoroughly explains all of the laws of exponents. It goes into detail describing what an exponent is and how it is used to interpret numbers. There are examples that accompany each law followed by a set of 10 practice problems. There is a detailed chart, the one displayed above, that outlines all of the laws that are covered within the application.

Grade Level: Grades 8-12

PSSM Content Standard: Number: develop a deeper understanding of very large and very small numbers and of various representations of them

Algebra: understand and compare the properties of classes of functions, including exponential, polynomial, rational, logarithmic, and periodic functions

CCSSM Content Standard:

[CCSS.Math.Content.8.EE.A.1](#)

[CCSS.Math.Content.HSA-SSE.B.3c](#)

Math Content: exponents: adding, subtracting, negative, multiplication, division, etc.

Evaluation

What is being learned? What mathematics is the focus of the activity/technology? Is relational or instrumental understanding emphasized?

The mathematics that is the central focus of this technology is that of explaining the laws of exponents. Students learn the various laws that apply to exponents and exponential functions. Laws of multiplication, division, negative exponents, and more are demonstrated through examples and explained thoroughly using language that students can connect with. Students learn how to use the laws effectively. Instrumental understanding is definitely emphasized in using this technology due to the fact that users receive explicit instruction on how to apply the laws given specific problems. There are not application problems present.

How does learning take place? What are the underlying assumptions (explicit or implicit) about the nature of learning?

Learning is implicit with this particular technology, due to the fact that the website aims for students to interpret the definitions and examples provided independently. Students should be able to follow the laws quite easily and demonstrate their learning through completing the practice problems and applying their knowledge to additional work provided in the classroom. This particular technology is harder to gauge understanding due to the fact that several exponent laws are explained and tested in the practice problems.

What role does technology play? What advantages or disadvantages does the technology hold for this role? What unique contribution does the technology make in facilitating learning?

This application plays the role of instructor by distributing thoughtful definitions of each of the laws as well as examples of how they would be used in computation problems. The advantages to using this technology are that all the laws are in one place with an example provided for each law. The disadvantage is that there is only one example for each law which does not allow for students to have multiple sources to reference to. There are also no dynamic videos illustrating the laws. The unique contribution that the technology makes in facilitating learning is that the explanations of the laws are articulated in a way that students can understand without feeling like they are being inundated with tons of mathematical vocabulary.

How does it fit within existing school curriculum? (e.g., is it intended to supplement or supplant existing curriculum? Is it intended to enhance the learning of something already central to the curriculum or some new set of understandings or competencies?)

Students in middle school could easily use this technology to gain exposure on the laws of exponents while ninth grade Algebra I students could reference this website to review the laws and to freshen up their skills at using the laws. It is intended to supplement pre-existing curriculum. This website would need additional instruction on the laws to be effective in facilitating learning.

How does the technology fit or interact with the social context of learning? (e.g., Are computers used by individuals or groups? Does the technology/activity support collaboration or individual work? What sorts of interaction does the technology facilitate or hinder?)

If students were to view this website individually they might struggle with interpreting the laws individually. They might utilize fellow classmates or peers to interpret the laws if they were seeing them for the first time. This would increase collaborative work among learners. Otherwise, if this technology was being used to review the laws it could be used for independent work and practice of using the laws.

How are important differences among learners taken into account?

This technology takes into account the differences among learners by carefully crafting definitions for each of the laws that are easily understood and in language that is manageable for all learners. The examples provided are thoroughly explained and not rigorous.

What do teachers and learners need to know? What demands are placed on teachers and other "users"? What knowledge is needed? What knowledge supports does the innovation provide (e.g., skills in using particular kinds of technology)?

Teachers need to know that there is only one basic example for each law provided on the instruction page. They should be prepared to share more rigorous examples for each law in addition to using this website. This website is user friendly and does not require extra training. Students who use this technology will find it to be a great resource to utilize at home while completing homework.