Zero negative and rational exponents worksheet pdf

Negative Exponents

Name: ____________________ Score: __________

Solve and express your answer in a fraction.

$2^{-2} =$	$2^{-3} =$	$2^{-4} =$
$5^{-2} =$	$5^{-3} =$	$10^{-2} =$
$9^{-3} =$	$12^{-2} =$	$3^{-4} =$
$8^{-2} =$	$6^{-3} =$	$13^{-2} =$
$2^{-7} =$	$2^{-8} =$	$3^{-5} =$
$25^{-2} =$	$20^{-2} =$	$14^{-2} =$
$3^{-6} =$	$7^{-2} =$	$30^{-2} =$
$5^{-4} =$	$8^{-3} =$	$24^{-2} =$

K5 Learning

Zero or Negative Exponents with whole number, decimal and fractional bases

Grade 6 Exponents Worksheet

Evaluate the following expressions.

1) $\left(\frac{1}{4}\right)^0$ 2) 3^{-4}

3) 0.578^0 4) 8^0

5) 9^{-2} 6) 4^{-3}

7) $\left(\frac{1}{5}\right)^{-3}$ 8) $\left(\frac{1}{6}\right)^{-2}$

9) $\left(\frac{2}{3}\right)^{-2}$ 10) 0.8^{-3}

11) 0.5^{-2} 12) 0.01^{-2}

Name______________________

Properties of Exponents

Period____

Simplify. Your answer should contain only positive exponents.

1) $2m^2 \cdot 2m^3$ $4m^5$

2) $m^4 \cdot 2m^{-3}$ $2m$

3) $4r^{-3} \cdot 2r^2$ $\frac{8}{r}$

4) $4n^4 \cdot 2n^{-3}$ $8n$

5) $2k^4 \cdot 4k$ $8k^5$

6) $2x^3y^{-3} \cdot 2x^{-1}y^3$ $4x^2$

7) $2y^2 \cdot 3x$ $6y^2x$

8) $4v^3 \cdot vu^2$ $4v^4u^2$

9) $4a^3b^2 \cdot 3a^{-4}b^{-3}$ $\frac{12}{ab}$

10) $x^2y^{-4} \cdot x^3y^2$ $\frac{x^5}{y^2}$

11) $(x^2)^0$ 1

12) $(2x^2)^{-4}$ $\frac{1}{16x^8}$

13) $(4r^0)^4$ 256

14) $(4a^3)^2$ $16a^6$

15) $(3k^4)^4$ $81k^{16}$

16) $(4xy)^{-1}$ $\frac{1}{4xy}$

MA 160
Section R.5

Negative and Rational Exponents

I. Rewrite each expression using only positive exponents.

1. x^{-8}	2. $3x^{-8}$	3. $-3x^{-8}$
4. $x^{-1/2}$	5. $\frac{5}{x^{-3}}$	6. $\frac{-4}{x^{-3/2}}$

II. Rewrite each of the following as an equivalent expression using radical notation.

7. $x^{1/2}$	8. $x^{-1/2}$	9. $x^{2/3}$

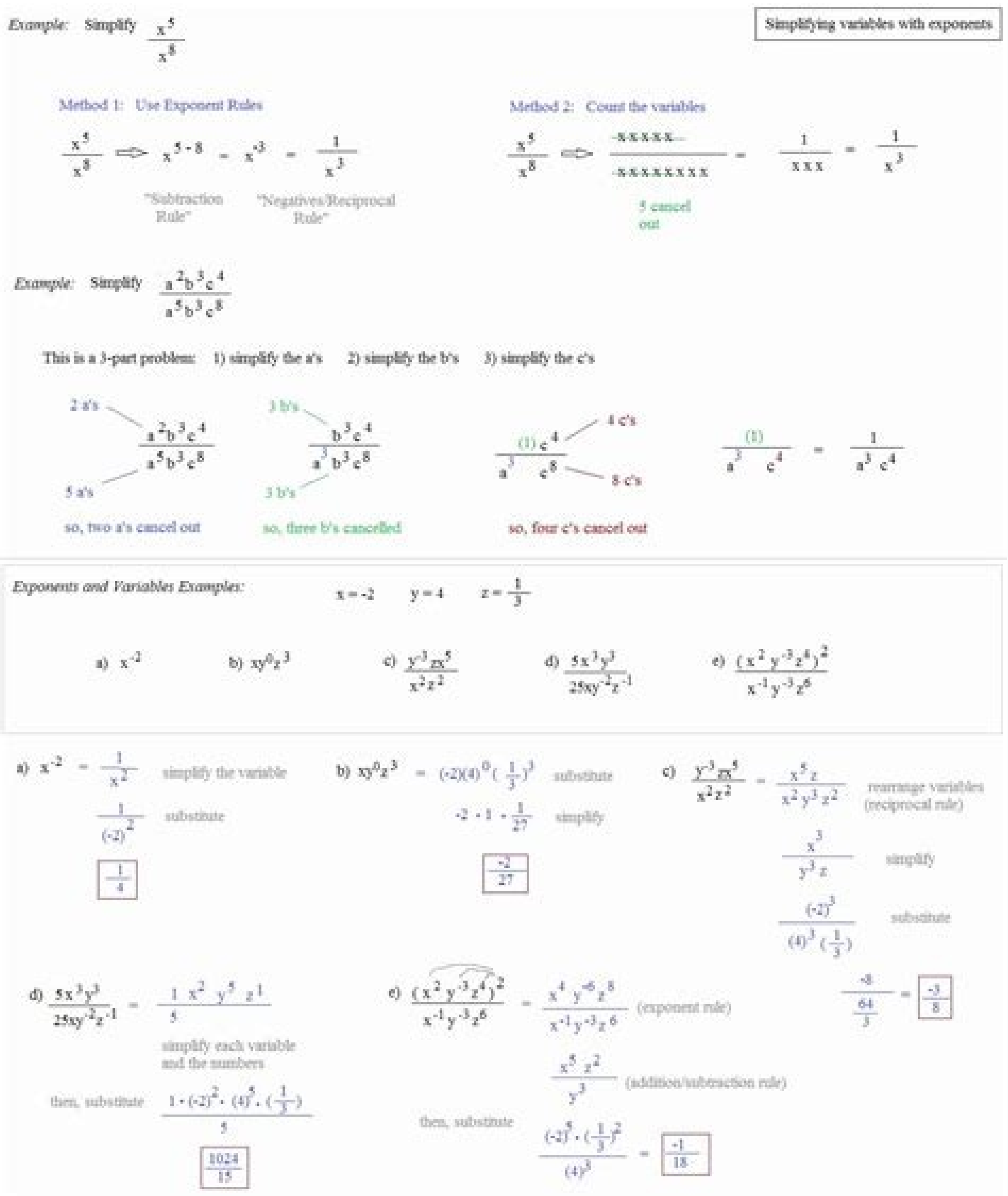
III. Evaluate each of the following without using a calculator. Your answer should be a fraction or an integer, not a decimal number. If the expression does not represent a real number, state this.

10. 5^{-2}	11. -5^2	12. $(-5)^2$
13. $36^{1/2}$	14. $36^{-1/2}$	15. $4^{3/2}$
16. $4^{-3/2}$	17. $-4^{3/2}$	18. $8^{5/3}$

III. Rewrite each radical using rational exponents.

19. $\sqrt{x^3}$	20. $\frac{1}{\sqrt{x}}$	21. $\sqrt[3]{x^4}$
22. $\sqrt{x^2+4}$	23. $\frac{5}{\sqrt[3]{x^2}}$	24. $\frac{-5}{\sqrt[3]{x^2}}$

Please turn over for answers.



Temperature is typically thought of as the average energy of individual atoms or molecules within a given collection. For atoms of similar mass, this “kinetic temperature” would basically be their speed at equilibrium. For a group of molecules, we have just a little extra accounting to do. Their total energy is also partitioned into the relative motions of their constituent atoms oscillating about their bonds, typically either bending or translating motions.These familiar ideas of temperature work pretty well for most solids, liquids, and gases, and conform to the general expectation that it should always be greater than absolute zero. What are we to make of a recent claim by a group of German researchers that they have created an experimental system where negative (as in below absolute zero) temperatures can actually be observed and measured?Despite the near universal desire to find the other-worldly in the everyday, there is unfortunately no real new bizarro with the idea of negative temperature. Negative temperatures were first created back in 1951 by Ed Purcell, who won the Nobel Prize the next year. Among other related pursuits, he had previously been the first person to observe nuclear magnetic resonance (NMR) — the heart of the modern MRI scanner — which uses a large magnetic field to polarize nuclear spins. In fact the negative temperature systems Purcell created were nuclear spins in a crystal of lithium fluoride that was itself at room temperature. The novelty of the negative temperature system created by the German group is that instead of nuclear spins, they used ultracold atoms. They describe their system as having “motional degrees of freedom,” in contrast to nuclear spins which do not move in any conventional sense.So what is negative temperature, then?Describing negative temperature as “hotter than infinity” or simply appealing to more nebulous definitions via entropy and the second law of thermodynamics, as is often done, is not going to cut it for our purposes. It is not that we lack the sophistication to discuss entropy, but more that an understanding in more familiar terms will give greater satisfaction.Entropy is a convenient mathematical construct which indicates that if heat is added to a system, the atoms become less ordered. In other words, they have more states, or shall we say, options, available to them. All a negative absolute temperature really means is that with the addition of heat, instead of becoming more random, atoms become more ordered. This can occur, for example, if the number of high energy spots available is limited, and therefore likely to be quickly filled.If, for example, we had a bunch of numbered lottery balls blowing around inside a big chamber and turned up the blower speed so that they might reach to the whole upper extent of the chamber, their entropy and temperature could be observed to have increased. If, however, we had also secretly applied some sticky silicone rubber to the underside of the roof of the chamber, the balls having enough energy could reach the silicone layer and become immobilized, thereby effectively lowering this measure of temperature.Could creating negative temperatures really be as simple as this?The problem with invoking entropy and trying to actually count all the states available to a system is just that — counting all those states. That is something easier said than done, and rarely even possible to say exactly. To illustrate the confusion, consider Claude Shannon, the Bell Labs employee who founded information theory. Shannon developed a formula to quantify signal attenuation in early telephone lines. He initially chose to call his measure “uncertainty,” but changed it to “entropy” after a meeting with John Von Neumann — Von Neumann, himself a founder of modern computing, had observed, “no one really understands entropy anyway so you will always have advantage in debate.”Next page: But does below-absolute-zero change the laws of physics? You are here: Home → Worksheets → Negative and zero exponent Create free worksheets for practicing negative and zero exponents — for grades 8-9 and algebra courses. The worksheets can be made in html or PDF format. Both are easy to print — and the html form is editable. These worksheets are typically used in 8th and 9th grades. Note: variables with exponents are not included (such as practiced in an algebra course). You can also make the worksheets yourself and choose the exact layout of the worksheet. Options include the number of problems, amount of workspace, and border around the problems. You can also choose to use fractions, decimals, or negative numbers as bases. See the generator down this page. Basic instructions for the worksheets Each worksheet is randomly generated and thus unique. The answer key is automatically generated and is placed on the second page of the file. You can generate the worksheets either in html or PDF format — both are easy to print. To get the PDF worksheet, simply push the button titled "Create PDF" or "Make PDF worksheet". To get the worksheet in html format, push the button "View in browser" or "Make html worksheet". This has the advantage that you can save the worksheet directly from your browser (choose File → Save) and then edit it in Word or other word processing program. Sometimes the generated worksheet is not exactly what you want. Just try again! To get a different worksheet using the same options: PDF format: come back to this page and push the button again. Html format: simply refresh the worksheet page in your browser window. Use the generator below to create even more variety of worksheets. For example, you can include problems with negative numbers as bases. Key to Algebra offers a unique, proven way to introduce algebra to your students. New concepts are explained in simple language, and examples are easy to follow. Word problems relate algebra to familiar situations, helping students to understand abstract concepts. Students develop understanding by solving equations and inequalities intuitively before formal solutions are introduced. Students begin their study of algebra in Books 1-4 using only integers. Books 5-7 introduce rational numbers and expressions. Books 8-10 extend coverage to the real number system. => Learn more Copyright © 2021 K5 Learning Negative exponents and zero exponents often show up when applying formulas or simplifying expressions. In this section, we will define the Negative Exponent Rule and the Zero Exponent Rule and look at a couple of examples. Negative Exponent Rule: In other words, when there is a negative exponent, we need to create a fraction and put the exponential expression in the denominator and make the exponent positive. For example, But working with negative exponents is just rule of exponents that we need to be able to use when working with exponential expressions. Example: Simplify: 3-2 Solution: 3-2 = Example: Simplify: Solution: Apply the Negative Exponent Rule to both the numerator and the denominator. Example: Simplify: 3-1 + 5-1 Solution: Apply the Negative Exponent Rule to each term and then add fractions by finding common denominators. Zero Exponent Rule: a0 = 1, a not equal to 0. The expression 00 is indeterminate, or undefined. In the following example, when we apply the product rule for exponents, we end up with an exponent of zero. x5x-5 = x5 + (-5) = x0 To help understand the purpose of the zero exponent, we will also rewrite x5x-5 using the negative exponent rule. x5x-5 = The zero exponent indicates that there are no factors of a number. Example: Simplify each of the following expressions using the zero exponent rule for exponents. Write each expression using only positive exponents. a) 30 b) -30 + n0 Solution: a) Apply the Zero Exponent Rule. 30 = 1 b) Apply the Zero Exponent Rule to each term, and then simplify. The zero exponent on the first term applies to the 3 only and not the negative in front of the 3. -30 + n0 =-(30) + n0 = - 1 + 1 = 0 Math worksheets and visual curriculum By now, employers should know they have a legal responsibility to protect their employees from sexual harassment and to act on any complaints, including those against independent contractors, vendors and anyone else who frequents the workplace.A recent case at Washington County Hospital in Nashville, Illinois, involved a doctor who had a habit of intimidating female nurses. When one of the nurses sued her employer, the district judge ruled that because the doctor was an independent contractor, the hospital was not responsible for his conduct. This TikTok-Famous Funeral Director Might Bury 10 People a Day, But He Still Finds Time to Write Beautiful Songs A Plea From Job Applicants: Please Reject Us! 'Rules Are Suggestions': This Fashion Founder Is Using AI to Eliminate the Industry's Massive Sizing and Waste Problems Being an Introvert Doesn't Make You a Bad Leader. In Fact, It Just Might Be Your Secret Weapon. What Entrepreneurs Can Learn From Paul Newman I Built Over 10 Million Followers on TikTok in 1 Year. Here's How You Can, Too. This Mediation Expert Reveals the Power Move That Will Give You Control in Any Situation — and Help You Get What You Want

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