Negative indices worksheet gcse

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Negative Powers

Reciprocals
$x^{-1} = 1/x$

Learning Objective: Evaluate and simplify terms with a negative power.
Use the rules of indices to evaluate these expressions:

a) 4^{-1} b) 6^{-2}

c) 3^{-2} d) 5^{-2}

e) $\left(\frac{2}{3}\right)^{-1}$ f) $\left(\frac{1}{2}\right)^{-2}$

g) 0.5^{-1} h) 0.4^{-2}

i) $\left(1\frac{1}{2}\right)^{-3}$ j) $\left(\frac{2}{5}\right)^{-5}$

Question 1: Evaluate each of the following

(a) 5^{-2} $\frac{1}{25}$ (b) 2^{-1} $\frac{1}{2}$ (c) 2^{-3} $\frac{1}{8}$ (d) 4^{-2} $\frac{1}{16}$ (e) 3^{-3} $\frac{1}{27}$ (f) 6^{-1} $\frac{1}{6}$

(g) 10^{-2} $\frac{1}{100}$ (h) 2^{-4} $\frac{1}{16}$ (i) 9^{-2} $\frac{1}{81}$ (j) 3^{-4} $\frac{1}{81}$ (k) 10^{-1} $\frac{1}{10}$ (l) 7^{-2} $\frac{1}{49}$

(m) 2^{-5} $\frac{1}{32}$ (n) 5^{-3} $\frac{1}{125}$ (o) 2^{-6} $\frac{1}{64}$ (p) 10^{-4} $\frac{1}{10000}$ (q) 6^{-3} $\frac{1}{216}$ (r) 10^{-6} $\frac{1}{1000000}$

Question 2: Write each of the following in index form.

(a) $\frac{1}{5^2}$ 5^{-2} (b) $\frac{1}{3^4}$ 3^{-4} (c) $\frac{1}{8^3}$ 8^{-3} (d) $\frac{1}{4^5}$ 4^{-5} (e) $\frac{1}{10^3}$ 10^{-3} (f) $\frac{1}{2^6}$ 2^{-6}

Question 3: Write each of the following in the form 2^n

(a) $\frac{1}{2}$ 2^{-1} (b) $\frac{1}{4}$ 2^{-2} (c) $\frac{1}{32}$ 2^{-5} (d) $\frac{1}{8}$ 2^{-3} (e) $\frac{1}{64}$ 2^{-6} (f) $\frac{1}{256}$ 2^{-8}

Question 4: Write each of the following in the form 5^n

(a) $\frac{1}{125}$ 5^{-3} (b) $\frac{1}{25}$ 5^{-2} (c) $\frac{1}{5}$ 5^{-1} (d) $\frac{1}{3125}$ 5^{-5} (e) $\frac{1}{625}$ 5^{-4} (f) $\frac{1}{15625}$ 5^{-6}

Negative Indices

1. Write the following as fractions without indices:

a. 5^{-1} = b. 3^{-4} = c. 2^{-3} =

d. 10^{-2} = e. 4^{-3} = f. 3^{-3} =

g. 11^{-2} = h. 2^{-8} = i. 5^{-4} =

j. 2×3^{-2} = k. 3×3^{-4} = l. $2^5 \times 10^{-4}$ =

2. Write the following fractions in index form:

a. $\frac{1}{2}$ = b. $\frac{1}{3}$ = c. $\frac{1}{7}$ =

d. $\frac{1}{5^3}$ = e. $\frac{1}{2^2}$ = f. $\frac{1}{8^7}$ =

3. Fill in the gaps to convert these fractions into index form:

a. $\frac{1}{25} = 5^{\square}$ b. $\frac{1}{16} = 2^{\square}$ c. $\frac{1}{27} = 3^{\square}$

d. $\frac{1}{100} = \square^{-2}$ e. $\frac{2}{9} = 2 \times 3^{\square}$ f. $\frac{4}{36} = 2^{\square} \times 6^{\square}$

g. $\frac{25}{64} = 5^{\square} \times 4^{\square}$ h. $\frac{8}{121} = \square^{\square} \times 11^{\square}$ i. $\frac{125}{27} = \square^{3} \times \square^{-3}$

4. Convert the following decimals into index form using negative indices:

a. 0.1 = b. 0.25 = c. 0.125 =

d. 0.0001 = e. 0.04 = f. 0.0625 =

Number Indices: Zero and Negative
OnMaths Tutorials

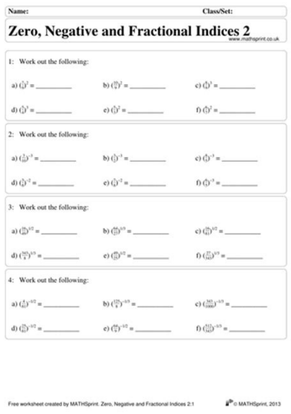
(a) Simplify 10^2 $10^2 \div 10^2 = 10^0 = 1$

1

(b) Simplify 3^{-1}

2^-

$\frac{1}{3}$


Name: Class/Set:

Zero, Negative and Fractional Indices 2

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1: Work out the following:

a) $(\frac{1}{2})^{0}$ = _____ b) $(\frac{1}{2})^{1}$ = _____ c) $(\frac{1}{2})^{2}$ = _____

d) $(\frac{1}{2})^{3}$ = _____ e) $(\frac{1}{2})^{4}$ = _____ f) $(\frac{1}{2})^{5}$ = _____

2: Work out the following:

a) $(\frac{1}{2})^{-1}$ = _____ b) $(\frac{1}{2})^{-2}$ = _____ c) $(\frac{1}{2})^{-3}$ = _____

d) $(\frac{1}{2})^{-4}$ = _____ e) $(\frac{1}{2})^{-5}$ = _____ f) $(\frac{1}{2})^{-6}$ = _____

3: Work out the following:

a) $(\frac{2}{3})^{0}$ = _____ b) $(\frac{2}{3})^{1}$ = _____ c) $(\frac{2}{3})^{2}$ = _____

d) $(\frac{2}{3})^{3}$ = _____ e) $(\frac{2}{3})^{4}$ = _____ f) $(\frac{2}{3})^{5}$ = _____

4: Work out the following:

a) $(\frac{1}{4})^{-1}$ = _____ b) $(\frac{1}{4})^{-2}$ = _____ c) $(\frac{1}{4})^{-3}$ = _____

d) $(\frac{1}{4})^{-4}$ = _____ e) $(\frac{1}{4})^{-5}$ = _____ f) $(\frac{1}{4})^{-6}$ = _____

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est. 2015. Specialists in Mathematics, Computing & Science resources for Primary and Secondary School aged children. Working in Conjunction with Soaring Stars Education since 2020. Last updated21 January 2021A GCSE Maths Worksheet covering fractional and negative induces Suitable for GCSE Students sitting the 9 – 1, A-Level Maths students revision and some Key Stage 3 students. Suitable for all the big examination boards including AQA, Edexcel, OCR and WJEC. This was taken from my 150 Page workbook which covers many more maths topics. Please check it out here Or alternatively Check my store for other individual free worksheets such as this one. If you like it please leave a comment below, use the rating system or send us a message. Also please let me know if you require answers. All feedback is valued & welcome. Enjoy! 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E.g. \[x^{3} \div x^{4}=\frac{x \times x \times x}{x \times x \times x \times x}\] When we cancel the common factors of x \[\frac{ot x \times ot x \times ot x}{ot x \times ot x \times ot x \times x}\] We are left with But using the division law of indices we know that \[x^{3} \div x^{4}=x^{3-4}=x^{-1}\] So, Get your free negative indices worksheet of 20+ questions and answers. Includes reasoning and applied questions. DOWNLOAD FREE Get your free negative indices worksheet of 20+ questions and answers. Includes reasoning and applied questions. DOWNLOAD FREE To make the negative index positive we put the term over 1 and flip it. It is known as finding the reciprocal of the term. E.g. \[x^{-2}=\frac{x^{-2}}{1}=\frac{1}{x^{2}}\] is the same as E.g. \[2^{-3}=\frac{2^{-3}}{1}=\frac{1}{2^{3}}=\frac{1}{8}\] Negative exponents will often be used in conjunction with other index laws, including the division, brackets and multiplication laws. Simplify and leave your answer in index form. Put the term from the question over 1. 2 Flip and change the power from -4 to +4. Simplify and leave your answer in index form. Notice how the index affects the entire bracket. \[\frac{(10 a)^{-3}}{1}\] Flip and change the power -3 to +3. Simplify the denominator. \[=\frac{1}{1000 a^{3}}\] Simplify and leave your answer in index form. Notice how the index only affects the variable b. \[\begin{aligned} 3 b^{-2} &=3 \times b^{-2} \\ &=3 \times \frac{b^{-2}}{1} \end{aligned}\] Flip and change the power -2 to +2. \[\begin{aligned} 3 \times \frac{b^{-2}}{1} &=3 \times \frac{1}{b^{2}} \\ &=\frac{3}{b^{2}} \end{aligned}\] The index only applies to the variable b and not the coefficient 3. When dealing with fractions it is easier to skip to step 2. Evaluate \[\left(\frac{4}{3}\right)^{-2}\] Flip and change the power -2 to +2. \[\left(\frac{4}{3}\right)^{-2}=\left(\frac{3}{4}\right)^{2}\] Simplify the numerator and denominator. \[\begin{aligned} &=\frac{3^{2}}{4^{2}} \\\\ &=\frac{9}{16} \end{aligned}\] Confusing integer and fractional powers Raising a term to the power of 2 means we square it. E.g. Raising a term to the power of ½ means we find the square root of it. E.g. \[a^{\frac{1}{2}}=\pm \sqrt{a}\] Raising a term to the power of 3 means we cube it. E.g. \[a^{3}=a \times a \times a\] Raising a term to the power of ⅓ means we find the cube root of it. E.g. \[a^{\frac{1}{3}}=\sqrt[3]{a}\] Indices, powers or exponents Indices can also be called powers or exponents. Not turning a negative index into a positive index when flipping the term Making a mistake when writing one over a fraction E.g When we find the reciprocal of \[\left(\frac{2}{3}\right)^{-2}\] we can follow the steps as outlined above 1 Put the term over 1 \[\frac{\left(\frac{2}{3}\right)^{-2}}{1}\] 2 Flip and change the power -2 to +2 \[\frac{1}{\left(\frac{2}{3}\right)^{2}}\] 3 Simplify the denominator \[\frac{1}{\left(\frac{2}{3}\right)^{2}}=\frac{1}{\frac{2^{2}}{3^{2}}}=\frac{1}{\frac{4}{9}}\] However, the fraction needs to be simplified further. \[\frac{1}{\frac{4}{9}}=1 \div \frac{4}{9}=1 \times \frac{9}{4}=\frac{9}{4}\] This is why when dealing with fractions it is easier to skip to step 2 and just flip the fraction: \[\left(\frac{2}{3}\right)^{-2}=\left(\frac{3}{2}\right)^{2}=\frac{3^{2}}{2^{2}}=\frac{9}{4}\] Practice negative indices questions The negative index number means we need to find the reciprocal, so x^{-5}=\frac{1}{x^{5}} The negative index number means we need to find the reciprocal, so \begin{aligned} &a(2 b)^{-4}\\ &=\frac{1}{(2b)^{4}}\\ &=\frac{1}{2b\times2b\times2b\times2b}\\ &=\frac{1}{16 b^{4}} \end{aligned} The negative index number means we need to find the reciprocal, so 3 b^{-3}=\frac{3}{b^{3}} The negative index number means we need to find the reciprocal, which means inverting the fraction, so \left(\frac{5}{8}\right)^{-1}=\frac{8}{5} Negative indices GCSE questions 1. Evaluate 9^{-2} (1 mark) 2. Evaluate \left(\frac{4}{5}\right)^{-2} (2 marks) \left(\frac{5}{4}\right)^{2} (1) \frac{25}{16} (1) 3. Evaluate \left(\frac{8}{125}\right)^{-\frac{2}{3}} (3 marks) \left(\sqrt[3]{\frac{125}{8}}\right)^{2} (1) \left(\frac{5}{2}\right)^{2} (1) \frac{25}{4}=6.25 (1) You have now learned how to: Simplify expressions involving the laws of indicesCalculate with roots, and with integer and fractional indices Proof mathsFunctions in algebraSequences Prepare your KS4 students for maths GCSEs success with Third Space Learning. Weekly online one to one GCSE maths revision lessons delivered by expert maths tutors. Find out more about our GCSE maths revision programme. September 2, 2019 corbettmaths Last updated4 February 2021Great for homework or revision. A detailed worksheet on evaluating negative indices. Includes combining them with the indices laws for multiplication, division and powers of powers. Does not include fractional indices. Plus Answers included + links to worked examples if students need a little help. School closures and replacement online classes have made a generation of students fall behind. Flow Mathematics uses clever psychology to help them catch up at home for just 1 hour per week. Click the link below to get our 5 point plan! Creative Commons "Sharealike"Select overall rating(no rating)Your rating is required to reflect your happiness.Write a reviewUpdate existing reviewIt's good to leave some feedback.Something went wrong, please try again later.This resource hasn't been reviewed yetTo ensure quality for our reviews, only customers who have downloaded this resource can review itReport this resourceto let us know if it violates our terms and conditions. Our customer service team will review your report and will be in touch. Question 4 Simplify the following expressions. (a) \(x^{-5} \times x^3 \) (b) \(5y^{-3} \times 2y^{-5} \) (c) \(8x^{-4} \div 4x^3 \) (d) \(12a^{-3} \div 4a^{-5} \) (e) \(32x^3 \div 8x^6 \) (f) \(10x^6 \div 5x^{-2} \) (g) \((a^4)^{-3} \) (h) \((x^{-3})^{-3} \) (i) \(3x^{-2} + 2x^{-2} \) (j) \((2a^{-2})^{-3} \) (k) \(5(2x^{-3})^2 \) (l) \(4x^3y^{-2} \times 3x^{-2}y^{-3} \) This video is about fractional negative indices for GCSE maths, and is aimed at around grade 7+. The questions are fairly tough although, if you follow the method, they should be straightforward … Please do – stop the video – work through the question – compare your solution

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