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0 ratings0% found this document useful (0 votes)2 viewsThe document contains a series of exam questions focused on fractional indices for the Higher GCSE (9-1) curriculum. Each question requires students to perform calculations or express number…SaveSave fractional-indices-1ma1-higher-exam-questions For Later0%0% found this document useful, undefined 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 Last updated9 February 2021A collection of exam questions from the GCSE (9-1) on fractional indices. A perfect resource to use at the end of a topic to assess a learners understanding, questions increase in difficulty. Some questions are repeated as these come directly from past paper questions, they vary in the number or marks which is often a good talking point for these types of questions. Prior knowledge needed to complete the worksheet are: Index laws Zero and negative powers Fractional indices Solving equations Standard form Surds Please review and feedback any worksheets used, we are happy to fix and update all content. 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.Really good questions.Thank you for the review! There are some additional questions you might like from the following worksheet

reply does not make any sense for the end userReport 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. Here we will learn how to simplify and evaluate with fractional indices for GCSE maths (Edexcel, AQA and OCR). Look out for the laws of indices worksheets and exam questions at the end. Fractional indices are powers of a term that are fractions. Both parts of the fractional power have a meaning. The denominator of the fraction (b) is the root of the number or letter. The numerator of the fraction (a) is the power to raise the answer to. Get your free fractional indices worksheet of 20+ questions and answers. Includes reasoning and applied questions. DOWNLOAD FREE x Get your free fractional indices worksheet of 20+ questions and answers. Includes reasoning and applied questions. DOWNLOAD FREE For example here we have a base number of 8 that has been raised to a fractional power As the denominator is 3 we have to find the cube root of 8 . Then, as the numerator is 2 we then square the answer. So, \[\begin{aligned} 8^{\frac{2}{3}} &=(\sqrt[3]{8})^{2} \\ &=4 \end{aligned}\] A value raised to the power of ½ means take the square root. \[x^{\frac{1}{2}}=\sqrt{x}\] E.g \[9^{\frac{1}{2}}=\sqrt{9}=\pm{3}\] A value raised to the power of ⅓ means take the cube root \[x^{\frac{1}{3}}=\sqrt[3]{x}\] E.g \[27^{\frac{1}{3}}=\sqrt[3]{27}=3\] A value raised to the power of 4 means take the fourth root. \[x^{\frac{1}{4}}=\sqrt[4]{x}\] E.g \[16^{\frac{1}{4}}=\sqrt[4]{16}=\pm{2}\] Etc. Simplify Use the denominator to find the root of the number or letter. 2 Raise the answer to the power of the numerator. In this case the numerator is 1 so the answer stays the same Evaluate Use the denominator to find the root of the number or letter. Raise the answer to the power of the numerator. So, This example uses negative numbers as the indices. It is a good idea to check our Laws of Indices page for more information before attempting this question. Evaluate First we need to make the index positive by writing the reciprocal. \[4^{-\frac{3}{2}}=\frac{1}{4^{\frac{3}{2}}}\] Then continue to use the steps, focusing on the denominator. Use the denominator to find the root of the number or letter. Raise the answer to the power of the numerator. So, \[4^{-\frac{3}{2}}=\frac{1}{8}\] 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. The index number tells us to find the square root, so 64^{\frac{1}{2}}=\sqrt{64}=8 Looking at the index number, the denominator tells us to cube root, and the numerator tells us to square, therefore \begin{aligned} &27^{\frac{2}{3}}\\ &=(\sqrt[3]{27})^{2}\\ &=3^{2}\\ &=9 \end{aligned} Looking at the index number, the denominator tells us to square root, the numerator tells us to cube, and as the index is negative we find the reciprocal, therefore \begin{aligned} &64^{-\frac{3}{2}}\\ &=(\sqrt[2]{64})^{-3}\\ &=\frac{1}{8^{3}}\\ &=\frac{1}{512} \end{aligned} Looking at the index number, the denominator tells us to take the fourth root, and the numerator tells us to cube, therefore \begin{aligned} &81^{\frac{3}{4}}\\ &=(\sqrt[4]{81})^{3}\\ &=3^{3}\\ &=27 \end{aligned} 1. Evaluate 9^{\frac{1}{2}} (1 mark) 2. Evaluate (27)^{\frac{2}{3}} (2 marks) (\sqrt[3]{27})^{2} \\ (1) 9 (1) 3. Evaluate \left(\frac{16}{81}\right)^{-\frac{3}{4}} (3 marks) \left(\sqrt[4]{\frac{81}{16}}\right)^{3} \\ (1) \left(\frac{3}{2}\right)^{3} \\ (1) \frac{27}{8}=3.375 (1) You have now learned how to: Simplify expressions involving the laws of indices Calculate with roots, and with integer and fractional indices Mathematical proof Functions in algebra Sequences 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 tuition programme. We use essential and non-essential cookies to improve the experience on our website. Please read our Cookies Policy for information on how we use cookies and how to manage or change your cookie settings.AcceptPrivacy & Cookies Policy The main topics in GCSE Maths are:NumbersAlgebra Ratio, Proportion and Rates of Change Geometry and MeasuresStatistics Probability Statistical Measures Data Visualisation With regular practice of GCSE Maths topic-wise questions and GCSE Maths past pacers, you can easily score high marks.Although many people think of GCSE maths as a difficult subject, with the correct training and preparation,you can master it in time. You can practice GCSE Maths topic-wise questions daily to improve speed, accuracy, and time and to score high marks in the GCSE Maths exam.A grade of 4 or 5 would be considered "good" because the government has established a 4 as the passing grade; a grade of 5 is seen as a strong pass. Therefore, anything that exceeds this level would be considered good. You can practice GCSE Maths topic-wise questions to score good grades in the GCSE Maths exam. The main topics in GCSE Maths are:NumbersAlgebra Ratio, Proportion and Rates of Change Geometry and MeasuresStatistics Probability Statistical Measures Data Visualisation With regular practice of GCSE Maths topic-wise questions and GCSE Maths past pacers, you can easily score high marks.Although many people think of GCSE maths as a difficult subject, with the correct training and preparation,you can master it in time. You can practice GCSE Maths topic-wise questions daily to improve speed, accuracy, and time and to score high marks in the GCSE Maths exam.A grade of 4 or 5 would be considered "good" because the government has established a 4 as the passing grade; a grade of 5 is seen as a strong pass. Therefore, anything that exceeds this level would be considered good. You can practice GCSE Maths topic-wise questions to score good grades in the GCSE Maths exam. GCSELevel 4-5Level 6-7AQACambridge iGCSEEdexcelEdexcel iGCSEOCRWJEC Level 6-7GCSEAQAEdexcelOCRWJECCambridge iGCSEEdexcel iGCSE The fractional indices laws apply when the power is a fraction. \textcolor{red}{a}^{\large{\frac{\textcolor{blue}{b}}{\textcolor{limegreen}{c}}}} = \sqrt[\textcolor{limegreen}{c}]{\textcolor{red}{a}^\textcolor{blue}{b}} This is commonly use to show square and cube roots. \textcolor{red}{x}^{\large{\frac{\textcolor{limegreen}{1}}{\textcolor{blue}{2}}}}= \sqrt[\textcolor{blue}{2}]{\textcolor{red}{x}^\textcolor{limegreen}{1}} =\sqrt[\textcolor{blue}{2}]{\textcolor{red}{x}} \textcolor{red}{x}^{\large{\frac{\textcolor{limegreen}{1}}{\textcolor{blue}{3}}}}= \sqrt[\textcolor{blue}{3}]{\textcolor{red}{x}^\textcolor{limegreen}{1}} =\sqrt[\textcolor{blue}{3}]{\textcolor{red}{x}} Note: it doesn't matter which order you carry out the square root and multiplication operations. In other words, the rule can also be written as \textcolor{red}{a}^{\large{\frac{\textcolor{blue}{b}}{\textcolor{limegreen}{c}}}} = (\sqrt[\textcolor{limegreen}{c}]{\textcolor{red}{a}})^\textcolor{blue}{b} You should try to carry out the operations in the order that makes the calculation as simple as possible. Level 6-7GCSEAQAEdexcelOCRWJECCambridge iGCSEEdexcel iGCSE You may also be asked to simplify expressions where the numerator is not \bf{1}. \textcolor{red}{64}^{\large{\frac{\textcolor{limegreen}{2}}{\textcolor{blue}{3}}}}= \sqrt[\textcolor{blue}{3}]{\textcolor{red}{64}^\textcolor{limegreen}{2}} \sqrt[\textcolor{blue}{3}]{\textcolor{red}{64}} = \textcolor{red}{4} \textcolor{red}{4}^\textcolor{limegreen}{2} = \textcolor{red}{16} Level 6-7GCSEAQAEdexcelOCRWJECCambridge iGCSEEdexcel iGCSE Level 4-5GCSEAQAEdexcelOCRWJECCambridge iGCSEEdexcel iGCSE Negative powers flip the fraction and put 1 over the number In general, the result of a negative power is "\bf{1} over that number to the positive power", i.e. \textcolor{red}{a}^{-\textcolor{limegreen}{b}} = \dfrac{1}{\textcolor{red}{a}^\textcolor{limegreen}{b}} for any value of a or b. When the power is \textcolor{blue}{-1}, this takes the form, \textcolor{red}{a}^{\textcolor{blue}{-1}}=\dfrac{1}{\textcolor{red}{a}} or \textcolor{red}{10}^{\textcolor{blue}{-1}} = \dfrac{1}{\textcolor{red}{10}} When the number is a fraction, the negative power flips the fraction. \bigg(\dfrac{\textcolor{blue}{a}}{\textcolor{limegreen}{b}}\bigg)^{-\textcolor{red}{x}} = \bigg(\dfrac{\textcolor{limegreen}{b}}{\textcolor{blue}{a}}\bigg)^\textcolor{red}{x} Level 4-5GCSEAQAEdexcelOCRWJECCambridge iGCSEEdexcel iGCSE Level 4-5GCSEAQAEdexcelOCRWJECCambridge iGCSEEdexcel iGCSE Simplify the following, 4^{-3}. [2 marks] We now know that 4^{-3} is equal to \dfrac{1}{4^3}. We also know that 4^3=4\times 4\times 4=16\times 4=64. So, we get that 4^{-3}=\frac{1}{64}. Level 4-5GCSEAQAEdexcelOCRWJECCambridge iGCSEEdexcel iGCSE Simplify the following, 9^{\frac{3}{2}}. [2 marks] So, we know that 9^{\frac{3}{2}} is equal to \sqrt[2]{9^3} or (\sqrt[2]{9})^3. So, to work out (\sqrt[2]{9})^3, we first have to square root 9, which is easy enough – the square root of 9 is 3. So, (\sqrt[2]{9})^3 becomes 3^3, which is 3^3=3\times 3\times 3 = 27 Level 6-7GCSEAQAEdexcelOCRWJECCambridge iGCSEEdexcel iGCSE Write 2^{15}\times 8^{-4} as a power of 2, and hence evaluate the expression. (Non calculator) [3 marks] The first part of the expression is a power of 2, whilst the second part is a power of 8. we know that 8 = 2^3 This means we can rewrite the following, 8^{-4}=\left(2^3\right)^{-4} Next, using Rule 3, we can simplify, \left(2^3\right)^{-4}=2^{3\times(-4)}=2^{-12} So the whole expression can be written as 2^{15}\times2^{-12}, Finally using Rule 1 we simplify the expression further. 2^{15}\times2^{-12}=2^{15+(-12)}=2^3 Thus, we have written the expression as a power of 2. Evaluating this final answer gives 2^3 = 8 Level 6-7GCSEAQAEdexcelOCRWJECCambridge iGCSEEdexcel iGCSE Rules of Indices Example Questions So, we can't use any laws straight away since the terms don't have the same base. However, if we recognise that 9=3^2, then we can write the first term as \left(3^2\right)^5 Using the power law, we get \left(3^2\right)^5=3^{2\times5}=3^{10} Therefore, the whole expression becomes 3^{10}\times3^{-5} Applying the multiplication law, this simplifies to 3^{10+(-5)}=3^5 Thus, we have written the expression as a power of 3. Save your answers with Gold Standard Education Firstly, as 3^2=9, the inverse operation gives, \sqrt{9}=3 So, that leaves 6^{-2}, this becomes the following fraction, 6^{-2}=\dfrac{1}{6^2} We know that 6^2=6\times 6=36, so 6^{-2}=\dfrac{1}{36} Multiplying our two answers together, we get \sqrt{9}\times 6^{-2}=3\times\dfrac{1}{36}=\dfrac{3}{36}=\dfrac{1}{12} Save your answers with Gold Standard Education This expression can be rewritten as, \sqrt4 \times (\sqrt4)^3 Given we know that \sqrt4=2 , this becomes, 2\times2^3 Hence, 2\times2^3=2\times8=16 Notice that in this example we chose to perform the \sqrt{4} operation before cubing the answer. We could alternatively write the expression as \sqrt{4^3}, but in this case the first option is easier. Save your answers with Gold Standard Education As it is a negative power we can rewrite this as, 8^{-\frac{5}{3}}=\frac{1}{8^{\frac{5}{3}}} Now, we can work out the denominator, which we will write as, 8^{\frac{5}{3}}=\sqrt[3]{8^5}=(\sqrt[3]{8})^5 We know that \sqrt[3]{8}=2. So this simplifies to, (\sqrt[3]{8})^5=2^5 Counting up in powers of 2: 4, 8, 16, 32 – we see that 32 is the 5th power of 2, so \sqrt[3]{8}^5=32 Therefore, the answer is, 8^{-\frac{5}{3}}=\dfrac{1}{32} Save your answers with Gold Standard Education Rules of Indices Worksheet and Example Questions Rules of Indices Drill Questions . .