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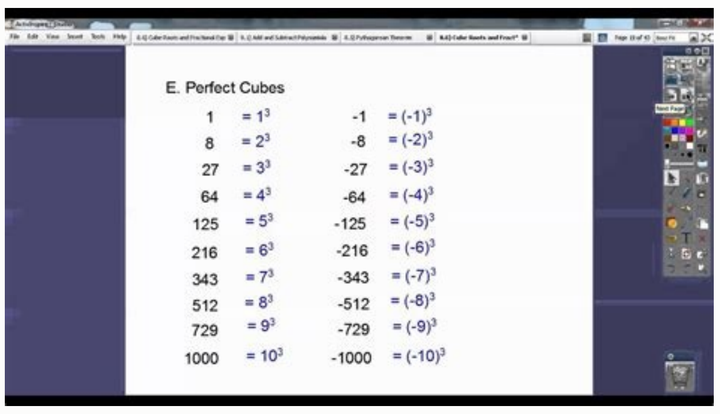
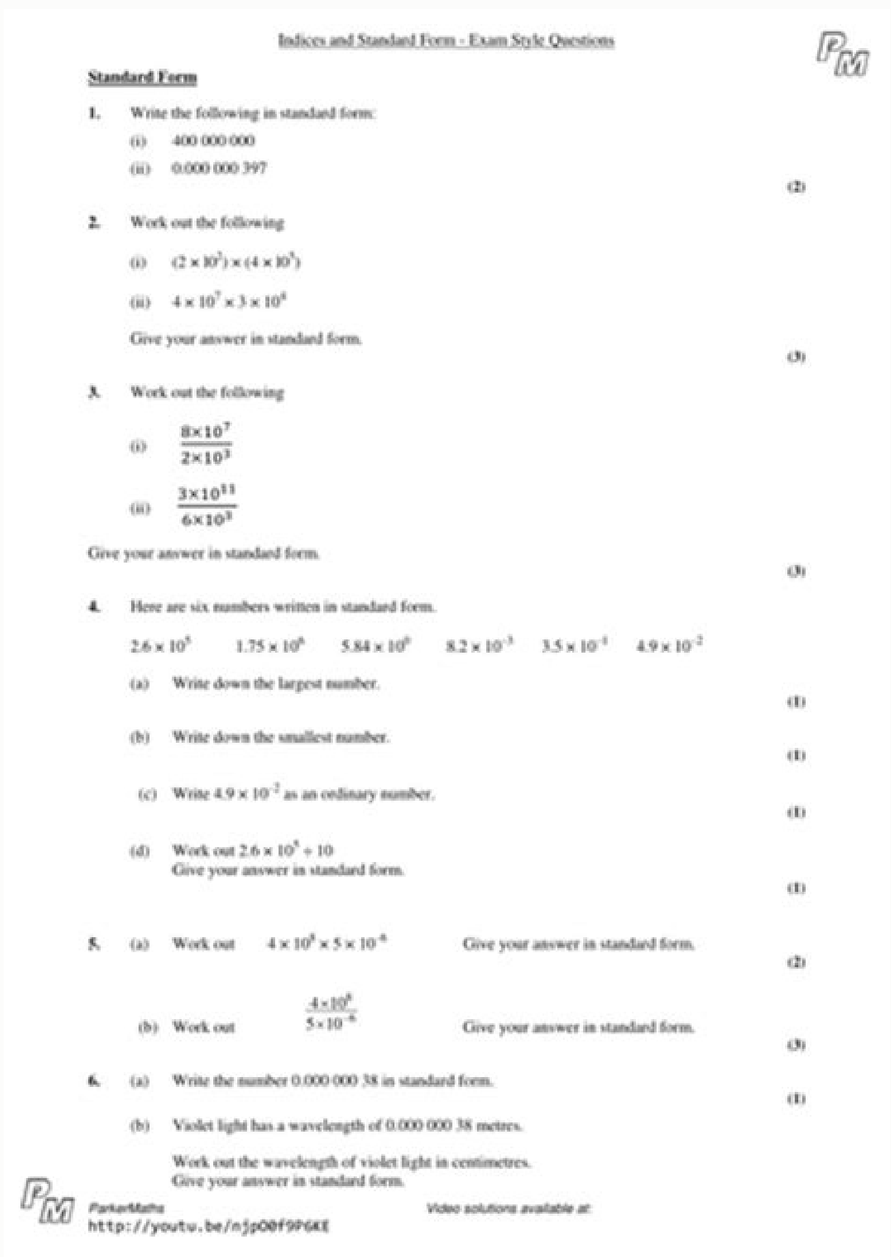
# Fractional indices worksheet and answers



Why didn't the number four get into the nightclub?


Indices and Standard Form - Exam Style Questions

**Standard Form**

1. Write the following in standard form:
   (i) 400 000 000
   (ii) 0.000 000 397
   **(2)**

2. Work out the following
   (i) $(2 \times 10^3) \times (4 \times 10^5)$
   (ii) $4 \times 10^7 \times 3 \times 10^4$
   Give your answer in standard form.
   **(3)**

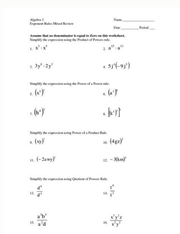
3. Work out the following
   (i) $\frac{8\times10^7}{2\times10^3}$
   (ii) $\frac{3\times10^{11}}{6\times10^3}$
   Give your answer in standard form.
   **(3)**

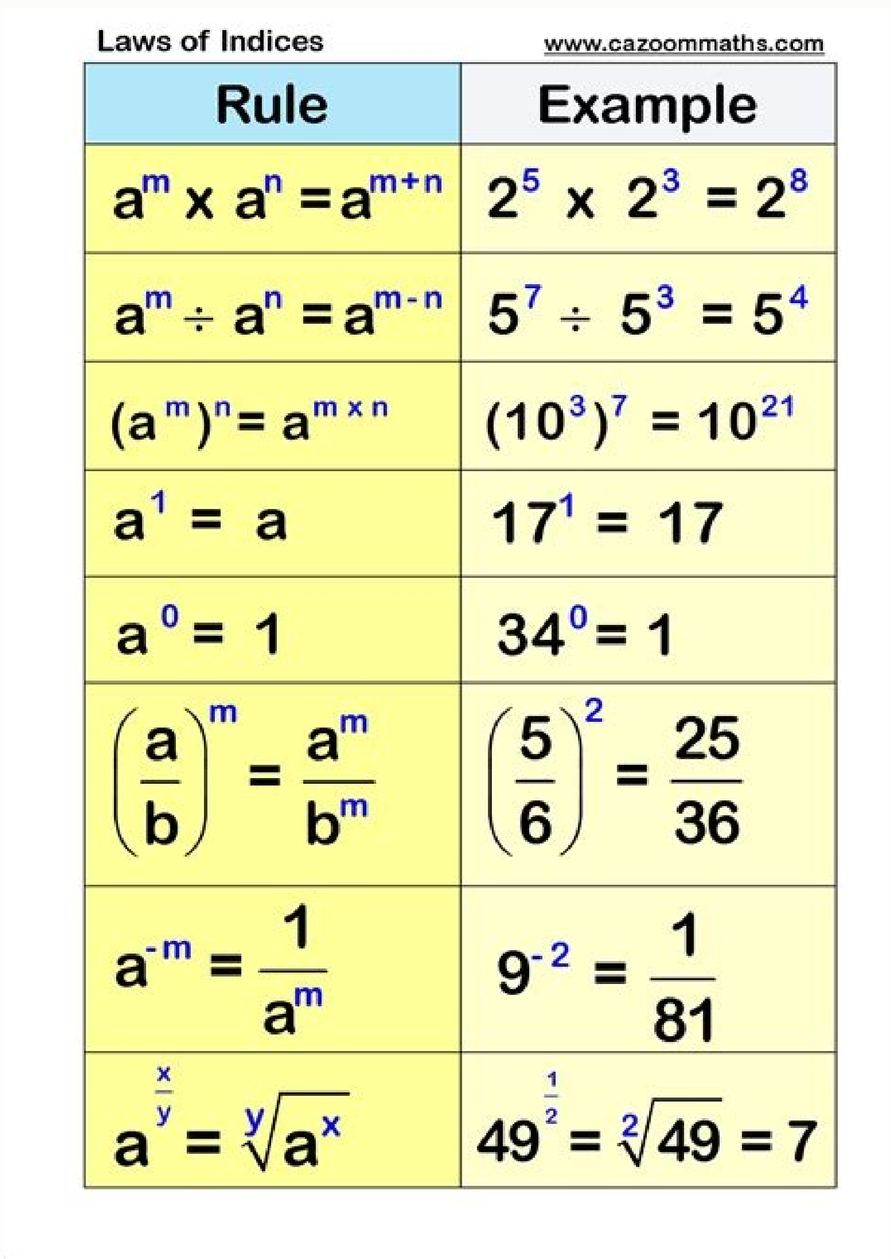
4. Here are six numbers written in standard form.
   $2.6 \times 10^5$ $1.75 \times 10^6$ $5.84 \times 10^0$ $8.2 \times 10^{-3}$ $3.5 \times 10^{-1}$ $4.9 \times 10^{-2}$
   (a) Write down the largest number. **(1)**
   (b) Write down the smallest number. **(1)**
   (c) Write $4.9 \times 10^{-2}$ as an ordinary number. **(1)**
   (d) Work out $2.6 \times 10^5 \div 10$
   Give your answer in standard form. **(1)**

5. (a) Work out $4 \times 10^5 \times 5 \times 10^{-6}$ Give your answer in standard form. **(2)**
   (b) Work out $\frac{4\times10^8}{5\times10^{-6}}$ Give your answer in standard form. **(3)**

6. (a) Write the number 0.000 000 38 in standard form. **(1)**
   (b) Violet light has a wavelength of 0.000 000 38 metres.
   Work out the wavelength of violet light in centimetres.
   Give your answer in standard form.

ParkerMaths Video solutions available at:
http://youtu.be/njpO0f9PGKE




Laws of Indices www.cazoommaths.com

| Rule | Example |
|---|---|
| $a^m \times a^n = a^{m+n}$ | $2^5 \times 2^3 = 2^8$ |
| $a^m \div a^n = a^{m-n}$ | $5^7 \div 5^3 = 5^4$ |
| $(a^m)^n = a^{m \times n}$ | $(10^3)^7 = 10^{21}$ |
| $a^1 = a$ | $17^1 = 17$ |
| $a^0 = 1$ | $34^0 = 1$ |
| $\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$ | $\left(\frac{5}{6}\right)^2 = \frac{25}{36}$ |
| $a^{-m} = \frac{1}{a^m}$ | $9^{-2} = \frac{1}{81}$ |
| $a^{\frac{x}{y}} = \sqrt[y]{a^x}$ | $49^{\frac{1}{2}} = \sqrt[2]{49} = 7$ |

No 6-7 GCSE The fractional basic laws apply when energy is © a fraction. Text Color {Red} {A} {large {fra c {red text {blue} {b} {text {limegreen} {c}}}} sqrt \color {c}{text {red} {a} color blue color {b} {b} {this color} { © commonly used to show square roots and cubes. {large {\\\frac {\\text color {limegreen} {1} {text color {blue} {2}}}}}}}}}}}} \sqrt \text color {red} {{x} {\\\\text color {{{red} {{x} {\\\\\text {{{color {{{{green}}}}} {{{{{{{green}}}}}}} {{{{{{{{{{1}}}}}}}}}}}}} {{{{{{{{{{{{{{{{{x} {x} {large {\frac {textcolor {limegreen} {1} {text {blue} {3}}}}} \sqrt \textcolor {blue}] {blue} {text {red} {} {text} {text color {limegreen} {1} sqrt \text {blue} {3}{{text} {text} {x}} Note: it doesn't matter which order you get square root and operation of multiplying. In other words, too. © can be written as \TextColor {Red} {A} {\\\GRAND} {\textcolor {blue} {text color {limegreen} {c}}}}}}}}} {{sqrt \\\limeegreen} {c}{text color {red}}}}} \\\text color blue} {color {color {color color color color {color color color {blue} {b} {you must try t o perform the opera \as easily as possible you can \as easily as a string string} {as string}}} {as string}} {as easily as string}}} {you can N o 6-7 GCSE You too © m can be asked to simplify the expressions where the numerator is not © \ bf {1}. {red} {large {\\frac {\\\text color {green}

{{2} {\color color {blue} {3}}}}}}}} \\sqrt \\text {blue} {\blue} {\\\\text color {red} {{green} {{{64} {{64} {{{{64}} {2} {{{2}} {{{2}} {{{2} {{2}} {{{{{{{2}}}}}}}} {{{{{{{{{2}}}}}}}} {{{{{{{{{\textcolor} {4} textcolor {red} {4} textcolor {limegreen} {2} textcolor {red} {16} the negative powers of the No 6-7 gac turn the fraction and put 1 o n the number in general, the result of a result Power © '\ bf {1} about this number for positive potency is, ie textcolor {red} {a} {a} {text {limeegreen} {b} dfac {1} {color {RED} {A} textcolor {limegreen} {b} {to} { value of A or B. When energy Ã© \ TextColor {Blue} {- 1}, this assumes the form, \ TextColor} {RED} {RED} {\ textcolor {blue} {- 1}} = \ dFRAC {1} {\ textcolor {red} {a}} or \ textcolor {red} {10} ^ {}}} {}} {blue} {} } = =. When number one © a fraction, the negative potency reverses the fraction. bigg (if{i}{bigg}{bigg}{bigg}{bigg}{bigg}{bigg}{bigg}{x}{x}{x}{x}{x}}{x}}{x}{x}{x}{x}{x}{x}{x}{x}{x}} {{{{{{x}}}}} {{{{{{{{{{{{{{{{{{{x}}}}}}}}}}}}}}}}}}}}}bigg g \\\\\\\\\\\\\\\\\\\\\\\\3}. [2 marks] We now know that 4{3} is © equal to ^dfrac{1}{4^3}. Also © We know that 43=4=4=16=64=64 times 4=64 times 4=64 times 4=64 times 4=64 times 4=64 times 4=64 So we get that 4{3}==Frac{1}{64}. So we know that 9{frac{3}{2}{3}{2}{6-7 GCSE Simplify the following: © equal to sqrt[2]{9^3} or (^sqrt[2]{9}^3. So to work (sqrt[2]{9}^3, we first have to adjust the square root 9, which is © easy enough is the square root of 9 © 3. Thus, (sqrt[2]{9}^3 becomes 3^3, which © 33=3=3=3=3 times 3=27 N o 6-7 GCSE Write 2{15} times 84} as a 2 power, and thus evaluate the expression. (No calculator) [3 marks] The first part of the expression is © a power of 2, while the second part is © power of eight. We know that 82^3 This means that we can rewrite the following, 84}==Left (23=right)4} Then, using Rule 3, we can simplify, 23=right(2^3==2^3^3 times(-4)}=212} So the whole expression can be written as 215}=2{2{2}{12}, finally, Using Rule 1we further simplify the expression. 2{15}=2{15+(-12}=2^3 So we write the expression as a 2 power. Evaluate this final answer by 2'-3= 8-Level 6-7 GCSE So we can use any laws immediately as the terms d o not have the same basis. However, if we recognize that 9=3^2, then we can write the first term as "left" (3^2=right)5 Using the law of multiplication, we get ^left(3^2=right)53^55}=310} So the whole expression becomes 3{10}=10}=355Applying the law of multiplication, simplifying this to 31055 We wrote the expression as a power of three. First of all, like 3'-2=9, the reverse operation of the operation is, Therefore, this leaves 6 ^ {2}, this becomes the following fraction, fraction, We know that 6^2=6\times 6=36, then 6^{-2}=\dfrac{1}{36} Multiplying our two responses together, we get \sqrt{9}\times 6^{-2}=3\times\dfrac{1}{36}=\dfrac{3}{36}=\dfrac{1}{12} This expression can be rewritten as, \sqrt4 \times (\sqrt4)^3 Since we know that \sqrt4=2, this becomes, 2\times2^3 Hence, 2\times2^3=2\times8=16 Note that in this example we choose to perform the \sqrt{4} operation before cubing the response. We can alternatively write the expression as \sqrt{4^3}, but in this case the first option is easier. As 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. Thus, this simplifies, (\sqrt[3]{8})^5=2^5 With powers of 2: 4, 8, 16, 32 – we see that 32 is the 5th power of 2, then \sqrt[3]{8}^5=32 Therefore, the answer is, 8^{-\frac{5}{3}}=\dfrac{1}{32} Related topics Indices Rules. Indices Rules builds on the 7 rules from Powers and Roots.We will cover 3 more complicated rules here. Make sure you are confident with the following topics before moving onto laws and indices.. Collecting like terms Fractional Indices. Here we will learn how to simplify and evaluate with fractional indices for GCSE maths (Edexcel, AQA and OCR). 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