

Negative Indices - Worksheet

Skill

Group A - algebraic and numerical terms

Rewrite these in ordinary form. Simplify / evaluate where possible:

1) a^{-2}

2) z^{-1}

3) 5^{-p}

4) 3^{-t}

5) z^{-x}

6) q^{-r}

7) 2^{-4}

8) 7^{-2}

9) $\left(\frac{2}{5}\right)^{-2}$

10) $\left(\frac{3}{8}\right)^{-3}$

11) $\left(\frac{3}{x}\right)^{-2}$

12) $\left(\frac{1}{x}\right)^{-1}$

Group B - algebraic terms with a coefficient

Rewrite these expressions in ordinary form. Simplify / evaluate where possible:

1) $5a^{-2}$

2) $9y^{-6}$

3) $12x^{-7}$

4) $(2x)^{-3}$

5) $(4x)^{-4}$

6) $(3c)^{-2}$

7) $\frac{1}{2}x^{-2}$

8) $\frac{3}{4}x^{-3}$

9) $\left(\frac{1}{3}y\right)^{-3}$

10) $\left(\frac{2}{5}p\right)^{-2}$

11) $(5x^2)^{-3}$

12) $\left(\frac{1}{5}f^2\right)^{-3}$

Group C - fractional negative indices

Rewrite these expressions in ordinary form. Simplify / evaluate where possible:

1) $x^{-\frac{1}{2}}$

2) $m^{-\frac{1}{3}}$

3) $f^{-\frac{3}{4}}$

4) $25^{-\frac{1}{2}}$

5) $64^{-\frac{2}{3}}$

6) $2a^{-\frac{1}{2}}$

7) $4k^{-\frac{1}{5}}$

8) $(8t)^{-\frac{1}{3}}$

9) $(16h)^{-\frac{1}{2}}$

10) $(64b)^{-\frac{2}{3}}$

11) $\left(\frac{25}{36}\right)^{-\frac{3}{2}}$

12) $\left(\frac{8}{125}\right)^{-\frac{4}{3}}$

Negative Indices - Worksheet

Group D - writing in index form

Rewrite these expressions in index form:

1) $\frac{1}{m^2}$

2) $\frac{1}{f}$

3) $\frac{1}{7}$

4) $\frac{1}{3^x}$

5) $\frac{1}{(3x)^2}$

6) $\frac{1}{(4x)^3}$

7) $\frac{5}{a^2}$

8) $\frac{8}{9y^5}$

9) $\frac{1}{\sqrt{b}}$

10) $\frac{7}{\sqrt[4]{t}}$

11) $\frac{1}{(\sqrt{m})^3}$

12) $\frac{1}{7\sqrt{7}}$

Negative Indices - Worksheet

Applied

1) a) Work out: $5^{-2} + 2^{-3}$

b) Work out: $3^{-3} \times 10^{-2}$

2) a) Arrange the following values in ascending order:

$$\frac{1}{60}, 8^{-2}, 2^{-5}, \frac{3}{120}$$

b) Arrange the following values in descending order:

$$\frac{1}{100}, 9^{-2}, 144^{-\frac{1}{2}}, \frac{8}{140}$$

3) Sandra answered the questions below for her maths homework.
Write down one mistake for each answer.

Evaluate the following:

$$7^{-2}$$
$$= -49$$

Evaluate the following:

$$16^{-\frac{1}{2}}$$
$$= \frac{1}{8}$$

4) If $x = 3$ and $y = -2$, work out $x^{-2} + 5^y + 4^{-y}$.

Negative Indices - Exam Questions

- 1) (a) Evaluate 7^{-2}

.....
(2)

- (b) Evaluate $8^{-\frac{1}{3}}$

.....
(3)
(5 marks)

-
- 2) (a) Evaluate $\left(\frac{3}{7}\right)^{-2}$

.....
(3)

- (b) Evaluate $\left(\frac{36}{81}\right)^{-\frac{1}{2}}$

.....
(3)
(6 marks)

-
- 3) (a) Work out $9^{-\frac{1}{2}} + 12^{-2}$

.....
(3)

Negative Indices - Exam Questions

(b) Work out $5^{-2} \times (27^2)^{-\frac{1}{3}}$

.....
(4)
(7 marks)

4) (a) Find the value of x such that $2^x = \frac{1}{4}$

.....
(2)

(b) Find the value of y such that $5^y = \frac{1}{\sqrt{125}}$

.....
(2)
(4 marks)

Negative Indices - Answers

	Question	Answer
	Skill Questions	
Group A	<p>Rewrite these expressions in ordinary form. Simplify / evaluate where possible:</p> <p>1) a^{-2}</p> <p>2) z^{-1}</p> <p>3) 5^{-p}</p> <p>4) 3^{-t}</p> <p>5) z^{-x}</p> <p>6) q^{-r}</p> <p>7) 2^{-4}</p> <p>8) 7^{-2}</p> <p>9) $\left(\frac{2}{5}\right)^{-2}$</p> <p>10) $\left(\frac{3}{8}\right)^{-3}$</p> <p>11) $\left(\frac{3}{x}\right)^{-2}$</p> <p>12) $\left(\frac{1}{x}\right)^{-1}$</p>	<p>1) $\frac{1}{a^2}$</p> <p>2) $\frac{1}{z}$</p> <p>3) $\frac{1}{5^p}$</p> <p>4) $\frac{1}{3^t}$</p> <p>5) $\frac{1}{z^x}$</p> <p>6) $\frac{1}{q^r}$</p> <p>7) $\frac{1}{16}$</p> <p>8) $\frac{1}{49}$</p> <p>9) $\frac{25}{4}$</p> <p>10) $\frac{512}{27}$</p> <p>11) $\frac{x^2}{9}$</p> <p>12) x</p>

Negative Indices - Answers

Group B	Rewrite these expressions in ordinary form. Simplify / evaluate where possible:	
	1) $5a^{-2}$	1) $\frac{5}{a^2}$
	2) $9y^{-6}$	2) $\frac{9}{y^6}$
	3) $12x^{-7}$	3) $\frac{12}{x^7}$
	4) $(2x)^{-3}$	4) $\frac{1}{8x^3}$
	5) $(4x)^{-4}$	5) $\frac{1}{256x^4}$
	6) $(3c)^{-2}$	6) $\frac{1}{9c^2}$
	7) $\frac{1}{2}x^{-2}$	7) $\frac{1}{2x^2}$
	8) $\frac{3}{4}x^{-3}$	8) $\frac{3}{4x^3}$
	9) $\left(\frac{1}{3}y\right)^{-3}$	9) $\frac{27}{y^3}$
	10) $\left(\frac{2}{5}p\right)^{-2}$	10) $\frac{25}{4p^2}$
	11) $(5x^2)^{-3}$	11) $\frac{1}{125x^6}$
	12) $\left(\frac{1}{5}f^2\right)^{-3}$	12) $\frac{125}{f^6}$

Negative Indices - Answers

Group C	Rewrite these expressions in ordinary form. Simplify / evaluate where possible:	
	1) $x^{-\frac{1}{2}}$	1) $\frac{1}{\sqrt{x}}$
	2) $m^{-\frac{1}{3}}$	2) $\frac{1}{\sqrt[3]{m}}$
	3) $f^{-\frac{3}{4}}$	3) $\frac{1}{\sqrt[4]{f^3}}$
	4) $25^{-\frac{1}{2}}$	4) $\frac{1}{5}$
	5) $64^{-\frac{2}{3}}$	5) $\frac{1}{16}$
	6) $2a^{-\frac{1}{2}}$	6) $\frac{2}{\sqrt{a}}$
	7) $4k^{-\frac{1}{5}}$	7) $\frac{4}{\sqrt[5]{k}}$
	8) $(8t)^{-\frac{1}{3}}$	8) $\frac{1}{2\sqrt[3]{t}}$
	9) $(16h)^{-\frac{1}{2}}$	9) $\frac{1}{4\sqrt{h}}$
	10) $(64b)^{-\frac{2}{3}}$	10) $\frac{1}{16\sqrt[3]{b^2}}$
	11) $\left(\frac{25}{36}\right)^{-\frac{3}{2}}$	11) $\frac{216}{125}$
	12) $\left(\frac{8}{125}\right)^{-\frac{4}{3}}$	12) $\frac{625}{16}$

Negative Indices - Answers

Group D	Rewrite these expressions in index form:	
	1) $\frac{1}{m^2}$	1) m^{-2}
	2) $\frac{1}{f}$	2) f^{-1}
	3) $\frac{1}{7}$	3) 7^{-1}
	4) $\frac{1}{3^x}$	4) 3^{-x}
	5) $\frac{1}{(3x)^2}$	5) $(3x)^{-2}$
	6) $\frac{1}{(4x)^3}$	6) $(4x)^{-3}$
	7) $\frac{5}{a^2}$	7) $5a^{-2}$
	8) $\frac{8}{9y^5}$	8) $\frac{8}{9}y^{-5}$
	9) $\frac{1}{\sqrt{b}}$	9) $b^{-\frac{1}{2}}$
	10) $\frac{7}{\sqrt[4]{t}}$	10) $7t^{-\frac{1}{4}}$
	11) $\frac{1}{(\sqrt{m})^3}$	11) $m^{-\frac{3}{2}}$
	12) $\frac{1}{7\sqrt{7}}$	12) $7^{-\frac{3}{2}}$

Negative Indices - Answers

	Question	Answer
	Applied Questions	
1)	<p>a) Work out $5^{-2} + 2^{-3}$.</p> <p>b) Work out $3^{-3} \times 10^{-2}$.</p>	<p>a) $\frac{1}{25} + \frac{1}{8} = \frac{33}{200}$</p> <p>b) $\frac{1}{27} \times \frac{1}{100} = \frac{1}{2700}$</p>
2)	<p>a) Arrange the following values in ascending order: $\frac{1}{60}, 8^{-2}, 2^{-5}, \frac{3}{120}$</p> <p>b) Arrange the following values in descending order: $\frac{1}{100}, 9^{-2}, 144^{-\frac{1}{2}}, \frac{8}{140}$</p>	<p>a) $8^{-2} = \frac{1}{64}, 2^{-5} = \frac{1}{32}, \frac{3}{120} = \frac{1}{60}$ $8^{-2}, \frac{1}{60}, \frac{3}{120}, 2^{-5}$</p> <p>b) $144^{-\frac{1}{2}} = \frac{1}{12}, 9^{-2} = \frac{1}{3}, \frac{8}{140} = \frac{2}{35}$ $\frac{1}{100}, 9^{-2}, \frac{8}{140}, 144^{-\frac{1}{2}}$</p>
3)	<p>Sandra answered the questions below for her maths homework. Write down one mistake for each answer.</p> <p>a) Evaluate the following: 7^{-2} $= -49$</p> <p>b) Evaluate the following: $16^{-\frac{1}{2}}$ $= \frac{1}{8}$</p>	<p>a) Answer should be $\frac{1}{49}$. The 7 needs to be flipped (be written as its reciprocal) and squared. She has squared and made the value negative instead.</p> <p>b) Answer should be $\frac{1}{4}$. She has halved 16 instead of square rooting it.</p>
4)	<p>If the value of $x = 3$ and the value of $y = -2$ work out the following: $x^{-2} + 5^y + 4^{-y}$.</p>	$3^{-2} + 5^{-2} + 4^2$ $= \frac{1}{9} + \frac{1}{25} + 16$ $= \frac{3634}{225} = 16\frac{34}{225}$

Negative Indices - Answers

	Question	Answer	
	Exam Questions		
1) (a)	Evaluate 7^{-2}	(a) $\frac{1}{7^2}$ seen oe $\frac{1}{49}$	(1) (1)
(b)	Evaluate $8^{-\frac{1}{3}}$	(b) $\frac{1}{8^{\frac{1}{3}}}$ seen oe $8^{\frac{1}{3}} = 2$ seen $\frac{1}{2}$	(1) (1) (1)
2) (a)	Evaluate $\left(\frac{3}{7}\right)^{-2}$	(a) $\frac{1}{\left(\frac{3}{7}\right)^2}$ seen oe $3^2 = 9$ or $7^2 = 49$ seen $\frac{49}{9}$	(1) (1) (1)
(b)	Evaluate $\left(\frac{36}{81}\right)^{-\frac{1}{2}}$	(b) $\frac{1}{\left(\frac{36}{81}\right)^{\frac{1}{2}}}$ seen oe $81^{\frac{1}{2}} = 9$ or $36^{\frac{1}{2}} = 6$ seen $\frac{9}{6}$ or $\frac{3}{2}$ or $1\frac{1}{2}$	(1) (1) (1)

Negative Indices - Answers

3) (a)	Work out $9^{-\frac{1}{2}} + 12^{-2}$	<p>(a) $9^{-\frac{1}{2}} = \frac{1}{3}$ seen or $12^{-2} = \frac{1}{144}$ seen (1)</p> <p>$\frac{1}{3} + \frac{1}{144} = \frac{144+3}{432}$ or evidence of finding a common denominator (1)</p> <p>$\frac{147}{432}$ oe (1)</p>
(b)	Work out $5^{-2} \times (27^2)^{-\frac{1}{3}}$	<p>(b) $5^{-2} = \frac{1}{25}$ seen (1)</p> <p>$27^{-\frac{2}{3}} = \frac{1}{9}$ seen (1)</p> <p>Evidence of multiplying the denominators seen (1)</p> <p>$\frac{1}{225}$ (1)</p>
4) (a)	Find the value of x such that $2^x = \frac{1}{4}$	<p>(a) $2^2 = 4$ seen (1)</p> <p>$x = -2$ (1)</p>
(b)	Find the value of y such that $5^y = \frac{1}{\sqrt{125}}$	<p>(b) $5^3 = 125$ seen (1)</p> <p>$y = -\frac{3}{2}$ or -1.5 (1)</p>

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