Fractional indices - Worksheet

Skill

Group A - Unit fractional indices of numbers

Evaluate:

1) $4^{\frac{1}{2}}$ **2)** $9^{\frac{1}{2}}$ **3)** $64^{\frac{1}{2}}$

4) $8^{\frac{1}{3}}$ **5)** $125^{\frac{1}{3}}$ **6)** $1000^{\frac{1}{3}}$

7) $81^{\frac{1}{4}}$ **8)** $10000^{\frac{1}{4}}$ **9)** $256^{\frac{1}{4}}$

10) $64^{\frac{1}{6}}$ **11)** $100000^{\frac{1}{5}}$ **12)** $1^{\frac{1}{7}}$

Group B - Fractional indices of numbers

Evaluate:

1) $9^{\frac{3}{2}}$ **2)** $25^{\frac{3}{2}}$ **3)** $4^{\frac{5}{2}}$

4) $8^{\frac{2}{3}}$ **5)** $27^{\frac{4}{3}}$ **6)** $125^{\frac{4}{3}}$

7) $16^{\frac{3}{4}}$ **8)** $10000^{\frac{5}{4}}$ **9)** $256^{\frac{2}{4}}$

10) $1^{\frac{4}{3}}$ **11)** $100000^{\frac{2}{5}}$ **12)** $64^{\frac{5}{6}}$

Fractional indices - Worksheet

Group C - Fractional indices and fractions

Evaluate:

1) $\left(\frac{1}{81}\right)^{\frac{1}{2}}$

2) $\left(\frac{1}{125}\right)^{\frac{1}{3}}$

3) $\left(\frac{1}{256}\right)^{\frac{1}{4}}$

4) $\left(\frac{9}{4}\right)^{\frac{1}{2}}$

5) $\left(\frac{27}{64}\right)^{\frac{1}{3}}$

6) $\left(\frac{81}{16}\right)^{\frac{1}{4}}$

7) $\left(\frac{1}{9}\right)^{\frac{3}{2}}$

8) $\left(\frac{1}{64}\right)^{\frac{2}{3}}$

9) $\left(\frac{1}{16}\right)^{\frac{3}{4}}$

10) $\left(\frac{4}{9}\right)^{\frac{3}{2}}$

11) $\left(\frac{27}{125}\right)^{\frac{2}{3}}$

12) $\left(\frac{625}{16}\right)^{\frac{3}{4}}$

Group D - Algebraic expressions and fractional indices

Simplify fully:

1) $(49a)^{\frac{1}{2}}$

2) $(64b)^{\frac{1}{3}}$

3) $(16c)^{\frac{1}{4}}$

4) $(1000d)^{\frac{1}{3}}$

5) $(8e)^{\frac{2}{3}}$

6) $(36f)^{\frac{3}{2}}$

7) $(27g)^{\frac{2}{3}}$

8) $(100000h)^{\frac{2}{5}}$

9) $\left(4a^{6}b^{2}\right)^{\frac{1}{2}}$

10) $\left(81a^{4}b^{8}\right)^{\frac{1}{4}}$

11) $\left(64a^{3}b^{6}\right)^{\frac{2}{3}}$

12) $\left(4a^{2}b^{6}\right)^{\frac{3}{2}}$

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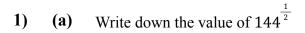## Fractional indices - Worksheet

Applied

1) Sally simplifies an algebraic expression $(25x^{16})^{\frac{1}{2}} = 5x^4$

    (a) What mistake has she made?

    (b) Write down the correct solution.

2)   **(a)** Write $\sqrt[4]{x}$ in index form.

    (b) Write $x\sqrt{x}$ in index form.

3)   **(a)** Solve $9^x = 3$

    (b) Solve $25^x = 125$

4)   **(a)** Keira has evaluated this fraction. What mistake has she made?

$$\left(\frac{64}{9}\right)^{\frac{3}{2}} = \frac{4}{3}$$

    (b) Evaluate $16^{0.25}$

Fractional indices - Exam Questions

1) **(a)** Write down the value of $144^{\frac{1}{2}}$

....

(1)

(b) Work out the value of $144^{\frac{1}{2}} \times 27^{\frac{1}{3}}$

....

(2)

(3 marks)

2) **(a)** Write down the value of $125^{\frac{2}{3}}$

....

(2)

(b) Simplify $(125a^9)^{\frac{2}{3}}$

....

(2)

(4 marks)

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Fractional indices - Exam Questions

3) **(a)** Solve $8^x = 2$

....

(1)

(b) Solve $16^{2x} = 2$

....

(2)

(3 marks)

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4) **(a)** Work out the value of $\left(\frac{1}{216}\right)^{\frac{1}{3}}$

....

(1 mark)

(b) Simplify $\left(\frac{16a^2}{9b^4}\right)^{\frac{3}{2}}$

....

(2)

(3 marks)

Fractional indices - Answers

	Question	Answer
	Skill Questions	
Group A	Evaluate:	
	1) $4^{\frac{1}{2}}$	**1)** 2
	2) $9^{\frac{1}{2}}$	**2)** 3
	3) $64^{\frac{1}{2}}$	**3)** 8
	4) $8^{\frac{1}{3}}$	**4)** 2
	5) $125^{\frac{1}{3}}$	**5)** 5
	6) $1000^{\frac{1}{3}}$	**6)** 10
	7) $81^{\frac{1}{4}}$	**7)** 3
	8) $10000^{\frac{1}{4}}$	**8)** 10
	9) $256^{\frac{1}{4}}$	**9)** 4
	10) $64^{\frac{1}{6}}$	**10)** 2
	11) $100000^{\frac{1}{5}}$	**11)** 10
	12) $1^{\frac{1}{7}}$	**12)** 1

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Fractional indices - Answers

Group B	Evaluate:	
	1) $9^{\frac{3}{2}}$	**1)** 27
	2) $25^{\frac{3}{2}}$	**2)** 125
	3) $4^{\frac{5}{2}}$	**3)** 32
	4) $8^{\frac{2}{3}}$	**4)** 4
	5) $27^{\frac{4}{3}}$	**5)** 81
	6) $125^{\frac{4}{3}}$	**6)** 625
	7) $16^{\frac{3}{4}}$	**7)** 8
	8) $10000^{\frac{5}{4}}$	**8)** 100000
	9) $256^{\frac{2}{4}}$	**9)** 16
	10) $1^{\frac{4}{3}}$	**10)** 1
	11) $100000^{\frac{2}{5}}$	**11)** 100
	12) $64^{\frac{5}{6}}$	**12)** 32

Fractional indices - Answers

Group C	Evaluate:	
	1) $(\frac{1}{81})^{\frac{1}{2}}$	**1)** $\frac{1}{9}$
	2) $(\frac{1}{125})^{\frac{1}{3}}$	**2)** $\frac{1}{5}$
	3) $(\frac{1}{256})^{\frac{1}{4}}$	**3)** $\frac{1}{4}$
	4) $(\frac{9}{4})^{\frac{1}{2}}$	**4)** $\frac{3}{2}$
	5) $(\frac{27}{64})^{\frac{1}{3}}$	**5)** $\frac{3}{4}$
	6) $(\frac{81}{16})^{\frac{1}{4}}$	**6)** $\frac{3}{2}$
	7) $(\frac{1}{9})^{\frac{3}{2}}$	**7)** $\frac{1}{27}$
	8) $(\frac{1}{64})^{\frac{2}{3}}$	**8)** $\frac{1}{16}$
	9) $(\frac{1}{16})^{\frac{3}{4}}$	**9)** $\frac{1}{8}$
	10) $(\frac{4}{9})^{\frac{3}{2}}$	**10)** $\frac{8}{27}$
	11) $(\frac{27}{125})^{\frac{2}{3}}$	**11)** $\frac{9}{25}$
	12) $(\frac{625}{16})^{\frac{3}{4}}$	**12)** $\frac{125}{8}$

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Fractional indices - Answers

Group D	Simplify fully:	
	1) $(49a)^{\frac{1}{2}}$	**1)** $7\sqrt{a}$
	2) $(64b)^{\frac{1}{3}}$	**2)** $4\sqrt[3]{b}$
	3) $(16c)^{\frac{1}{4}}$	**3)** $2\sqrt[4]{c}$
	4) $(1000d)^{\frac{1}{3}}$	**4)** $10\sqrt[3]{d}$
	5) $(8e)^{\frac{2}{3}}$	**5)** $4\sqrt[3]{e^2}$
	6) $(36f)^{\frac{3}{2}}$	**6)** $216\sqrt{f^3}$
	7) $(27g)^{\frac{2}{3}}$	**7)** $9\sqrt[3]{g^2}$
	8) $(100000h)^{\frac{2}{5}}$	**8)** $100\sqrt[5]{h^2}$
	9) $(4a^6b^2)^{\frac{1}{2}}$	**9)** $2a^3b$
	10) $(81a^4b^8)^{\frac{1}{4}}$	**10)** $3ab^2$
	11) $(64a^3b^6)^{\frac{2}{3}}$	**11)** $16a^2b^4$
	12) $(4a^2b^6)^{\frac{3}{2}}$	**12)** $8a^3b^9$

Fractional indices - Answers

	Question		Answer	
	Applied Questions			
1)	**a)**	Sally simplifies an algebraic expression $$(25x^{16})^{\frac{1}{2}} = 5x^4$$	**a)**	She has square rooted the power when she should have halved it.
	b)	What mistake has she made? Write down the correct solution.	**b)**	$5x^8$
2)	**a)**	Write $\sqrt[4]{x}$ in index form.	**a)**	$x^{\frac{1}{4}}$
	b)	Write $x\sqrt{x}$ in index form.	**b)**	$x^{\frac{3}{2}}$
3)	**a)**	Solve $9^x = 3$	**a)**	$x = \frac{1}{2}$
	b)	Solve $25^x = 125$	**b)**	$x = \frac{3}{2}$
4)	**a)**	Keira has evaluated this fraction. What mistake has she made? $$\left(\frac{64}{9}\right)^{\frac{3}{2}} = \frac{4}{3}$$	**a)**	Keira cube rooted the numerator and square rooted the denominator. She should have square rooted 64 and 9 and then cubed each of them. The solution should be $\frac{512}{27}$.
	b)	Evaluate $16^{0.25}$	**b)**	$16^{0.25} = 16^{\frac{1}{4}} = \sqrt[4]{16} = 2$

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Fractional indices - Mark Scheme

		Question	Answer	
		Exam Questions		
1)	**(a)**	Write down the value of $144^{\frac{1}{2}}$	**(a)** 12	**(1)**
	(b)	Work out the value of $144^{\frac{1}{2}} \times 27^{\frac{1}{3}}$	**(b)** 12 **or** 3	**(1)**
			36	**(1)**
2)	**(a)**	Write down the value of $125^{-\frac{2}{3}}$	**(a)** $\sqrt[3]{125} = 5$	**(1)**
			$5 \times 5 = 25$	**(1)**
	(b)	Simplify $(125a^9)^{\frac{2}{3}}$	**(b)** 25 **or** a^6	**(1)**
			$25a^6$	**(1)**
3)	**(a)**	Solve $8^x = 2$	**(a)** $x = \frac{1}{3}$	**(1)**
	(b)	Solve $16^{2x} = 2$	**(b)** $2x = \frac{1}{4}$	**(1)**
			$x = \frac{1}{8}$	**(1)**
4)	**(a)**	Work out the value of $(\frac{1}{216})^{\frac{1}{3}}$	**(a)** $\frac{1}{6}$	**(1)**
	(b)	Simplify $(\frac{16a^2}{9b^4})^{\frac{3}{2}}$	**(b)** 64 **and** 27 **or** a^3 **and** b^6	**(1)**
			$\frac{64a^3}{27b^6}$	**(1)**

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