

L01 - 4.1 Exponent Rules

Q5: The expression x^4x^8 simplifies to x^{ab} , and the expression $(x^3)^8$ simplifies to x^{cd} . The values of a , b , c , and d are __, __, __, and __.

(Record your four digit answer in the Numerical Response boxes below)

1	2	2	4
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$$x^4 \cdot x^8 = x^{4+8} = x^{12} \quad \text{so } a=1, b=2$$

$$(x^3)^8 = x^{(3 \times 8)} = x^{24} \quad \text{so } c=2, d=4$$

Q6: The expression $\frac{(x^2 \cdot x^3)^4}{x^5}$ simplifies to

- a. x^4
- b. x^5
- c. x^{15}
- d. x^{19}

$$\frac{(x^2 \cdot x^3)^4}{x^5} = \frac{(x^5)^4}{x^5} = \frac{x^{20}}{x^5} = x^{15}$$

Q7: The expression $\frac{(x^4y^2 \cdot x^2)^3}{(x^3)^3}$ can be simplified to x^ay^b , where a and b are __ and __.

(Record your two digit answer in the Numerical Response boxes below)

9	6		
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$$\frac{(x^4y^2 \cdot x^2)^3}{(x^3)^3} = \frac{(x^6y^2)^3}{x^9} = \frac{x^{18}y^6}{x^9} = x^9y^6$$

so $a=9$
 $b=6$

L02 - 4.2 Integral Exponents

Use the following information to answer Q8-Q9:

The expression $\frac{(x^2)^{-3} \cdot x^8}{x^{-2}}$ can be simplified.

Q8: The expression simplifies to x^a , where a is ____.

(Record your one digit answer in the Numerical Response boxes below)

4			
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$$\begin{aligned} \frac{(x^2)^{-3} \cdot x^8}{x^{-2}} &= \frac{x^{-6} \cdot x^8}{x^{-2}} \\ &= \frac{x^2}{x^{-2}} = \frac{x^2 \cdot x^2}{1} = x^4 \end{aligned}$$

so $a=4$

Q9: When $x = 4$, what does the expression evaluate to?

(Record your three digit answer in the Numerical Response boxes below)

2	5	6	
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$$(4)^4 = 256$$

Q10: The expression $\frac{(x^2y^{-3})^4 \cdot x^3z^2}{(xy^2)^{-4}}$ simplifies to $\frac{x^a y^b z^d}{y^c}$, where a , b , c , and d are ____, ____, ____, and ____.

(Record your four digit answer in the Numerical Response boxes below)

1	5	4	2
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$$\begin{aligned} \frac{(x^2y^{-3})^4 \cdot x^3z^2}{(xy^2)^{-4}} &= \frac{x^8y^{-12} \cdot x^3z^2}{x^{-4}y^{-8}} = \frac{x^{11}y^{-12}z^2}{x^{-4}y^{-8}} \\ &= \frac{x^{11} \cdot x^4 y^8 z^2}{y^{12}} = \frac{x^{15} y^8 z^2}{y^{12}} = \frac{x^{15} z^2}{y^4} \end{aligned}$$

so $a=15$, $b=8$
 $c=4$
 $d=2$

L04 - 4.3 Rational Exponents

Q11: The expression $x^{\frac{8}{3}} * x^{\frac{5}{9}}$ simplifies to $x^{\frac{ab}{c}}$, where a , b , and c are __, __, and __.

(Record your four digit answer in the Numerical Response boxes below)

2	9	9	
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$$x^{\frac{8}{3}} \cdot x^{\frac{5}{9}} = x^{\frac{8}{3} + \frac{5}{9}} = x^{\frac{24}{9} + \frac{5}{9}} = x^{\frac{29}{9}}$$

So $a=2, b=9$
 $c=9$

Use the following information to answer Q12-Q14:

The expression $\frac{x^{\frac{2}{3}} * x^{\frac{3}{5}}}{(x^{\frac{1}{4}})^{\frac{3}{2}}}$ can be simplified.

Q12: The *numerator* of the fraction simplifies to:

- a. $x^{\frac{5}{8}}$
- b. $x^{\frac{6}{15}}$
- c. $x^{\frac{19}{15}}$
- d. $x^{\frac{90}{225}}$

Numerator = top

$$x^{\frac{2}{3}} + \frac{3}{5} = x^{\frac{10}{15} + \frac{9}{15}} = x^{\frac{19}{15}}$$

Q13: The *denominator* of the fraction simplifies to $x^{\frac{a}{b}}$, where a and b are __ and __.

(Record your two digit answer in the Numerical Response boxes below)

3	8		
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$$(x^{\frac{1}{4}})^{\frac{3}{2}} = x^{(\frac{1}{4})(\frac{3}{2})} = x^{\frac{3}{8}}$$

So $a=3$
 $b=8$

Q14: (Long Answer) What does the *entire expression* simplify to, using positive exponents? (2 marks)

$$\frac{x^{\frac{19}{15}}}{x^{\frac{3}{8}}} = x^{\frac{19}{15} - \frac{3}{8}} = x^{\frac{152}{120} - \frac{45}{120}} = x^{\frac{107}{120}}$$

Q15: The expression $\frac{(x^3)^{\frac{1}{4}}}{x^{-\frac{2}{3}}}$ simplifies to $x^{\frac{ab}{cd}}$, where a, b, c and d are __, __, __ and __.

(Record your four digit answer in the Numerical Response boxes below)

1	7	1	2
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$$\frac{(x^3)^{\frac{1}{4}}}{x^{-\frac{2}{3}}} = \frac{x^{\frac{3}{4}}}{x^{-\frac{2}{3}}} = \frac{x^{\frac{3}{4}} \cdot x^{\frac{2}{3}}}{1} = x^{\frac{3}{4} + \frac{2}{3}} = x^{\frac{9}{12} + \frac{8}{12}} = x^{\frac{17}{12}}$$

So $a=1, b=7$
 $c=1, d=2$

Q16: (Long Answer) Simplify the expression $\frac{(x^{\frac{1}{4}}y^{-\frac{2}{3}})^{-\frac{5}{2}}}{xy^{\frac{1}{4}}}$ with only positive exponents. (2 marks)

$$\frac{(x^{\frac{1}{4}}y^{-\frac{2}{3}})^{-\frac{5}{2}}}{x \cdot y^{\frac{1}{4}}} = \frac{x^{-\frac{5}{8}} \cdot y^{\frac{5}{3}}}{x \cdot y^{\frac{1}{4}}} = \frac{y^{\frac{5}{3}} \cdot y^{\frac{1}{4}}}{x^1 \cdot x^{\frac{5}{8}}} = \frac{y^{\frac{5}{3} + \frac{1}{4}}}{x^{1 + \frac{5}{8}}}$$

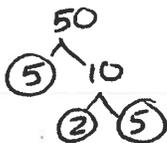
$$= \frac{y^{\frac{20}{12} + \frac{3}{12}}}{x^{\frac{8}{8} + \frac{5}{8}}} = \frac{y^{\frac{23}{12}}}{x^{\frac{13}{8}}}$$

L05 - Entire to Mixed Radicals

Q17: The entire radical $\sqrt{50}$ can be converted to a mixed radical in the form $a\sqrt{b}$, where a and b are ___ and ___.

(Record your two digit answer in the Numerical Response boxes below)

5	2		
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$$\begin{aligned}\sqrt{50} &= \sqrt{2 \cdot 5^2} \\ &= 5\sqrt{2}\end{aligned}$$

so $a=5, b=2$

Q18: The entire radical $\sqrt{50x^6}$ can be converted to a mixed radical in the form $ax^c\sqrt{b}$, where a, b and c are __, __ and __.

(Record your three digit answer in the Numerical Response boxes below)

5	2	3	
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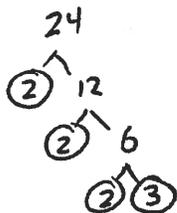
$$\begin{aligned}\sqrt{50x^6} &= \sqrt{2 \cdot 5^2 \cdot x^2 \cdot x^2 \cdot x^2} \\ &= 5 \cdot x \cdot x \cdot \sqrt{2} \\ &= 5x^3\sqrt{2}\end{aligned}$$

so $a=5, b=2, c=3$

Q19: The entire radical $\sqrt[3]{24x^8}$ can be converted to a mixed radical in the form $ax^b\sqrt[3]{cx^d}$, where $a, b, c,$ and d are __, __, __, and __.

(Record your three digit answer in the Numerical Response boxes below)

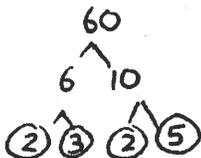
2	2	3	2
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$$\begin{aligned}\sqrt[3]{24x^8} &= \sqrt[3]{2^3 \cdot 3 \cdot x^3 \cdot x^3 \cdot x^2} \\ &= 2 \cdot x \cdot \sqrt[3]{3x^2} \\ &= 2x^2\sqrt[3]{3x^2}\end{aligned}$$

so $a=2, b=2, c=3, d=2$

Q20: (Long Answer) Convert the entire radical $\sqrt{60x^7y^3z}$ to a mixed radical. (2 marks)



$$\begin{aligned}\sqrt{60x^7y^3z} &= \sqrt{2^2 \cdot 3 \cdot 5 \cdot x^2 \cdot x^2 \cdot x^2 \cdot x \cdot y^2 \cdot y \cdot z} \\ &= 2 \cdot x \cdot x \cdot y \sqrt{3 \cdot 5 \cdot x \cdot y \cdot z} \\ &= 2x^3y\sqrt{15xyz}\end{aligned}$$

L06 - Mixed to Entire Radicals

Q21: The mixed radical $x^3\sqrt{5x}$ can be written as an entire radical in the form $\sqrt{5x^a}$, where a is ____.

(Record your one digit answer in the Numerical Response boxes below)

7			
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$$\begin{aligned} x^3\sqrt{5x} &= \sqrt{(x^3)^2} \cdot \sqrt{5x} \\ &= \sqrt{x^6} \cdot \sqrt{5x} \\ &= \sqrt{5x^7} \\ &= \sqrt{5x^a} \text{ so } a=7 \end{aligned}$$

Q22: The mixed radical $2x^2y^3\sqrt{2x}$ can be written as an entire radical in the form $\sqrt{ax^by^c}$, where a , b , and c are ____, ____, and ____.

(Record your three digit answer in the Numerical Response boxes below)

8	5	6	
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$$\begin{aligned} 2x^2y^3\sqrt{2x} &= \sqrt{(2x^2y^3)^2} \cdot \sqrt{2x} \\ &= \sqrt{4x^4y^6} \cdot \sqrt{2x} \\ &= \sqrt{8x^5y^6} \\ &= \sqrt{ax^by^c} \text{ so } a=8, b=5, c=6 \end{aligned}$$

Q23: (Long Answer) Convert the mixed radical $15x^2y^3z\sqrt[3]{2x^2z}$ (2 marks)

$$\begin{aligned} &\sqrt[3]{(15x^2y^3z)^3} \cdot \sqrt[3]{2x^2z} \\ &\sqrt[3]{3375x^6y^9z^3} \cdot \sqrt[3]{2x^2z} \\ &\sqrt[3]{6750x^8y^9z^4} \end{aligned}$$

L07 - Exponents to Radicals

Q24: The expression $\left(x^{\frac{9}{4}}\right)^{\frac{2}{3}}$, when simplified, can be written as the entire radical $\sqrt[a]{x^b}$, where a and b are ___ and ___.

(Record your two digit answer in the Numerical Response boxes below)

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

$$x^{\frac{3}{2}} = \left(x^3\right)^{\frac{1}{2}} = \sqrt{x^3}$$

$$\sqrt[a]{x^b} \quad \text{so } a=2$$

$$b=3$$

Q25: (Long Answer) Simplify the expression $5x^{-\frac{3}{2}} * \left(2x^{\frac{1}{3}}\right)^8$ and write as a mixed radical. (2 marks)

$$\begin{aligned} & 5x^{-\frac{3}{2}} \left(2x^{\frac{1}{3}}\right)^8 \\ & 5x^{-\frac{3}{2}} \cdot 2^8 \cdot x^{\frac{8}{3}} \\ & = 2^8 \cdot 5 \cdot x^{-\frac{3}{2}} \cdot x^{\frac{8}{3}} \\ & = 1280 x^{-\frac{3}{2}} \cdot x^{\frac{8}{3}} \\ & = 1280 x^{-\frac{3}{2} + \frac{8}{3}} \\ & = 1280 x^{\frac{7}{6}} \\ & = 1280 \left(x^7\right)^{\frac{1}{6}} \\ & = 1280 \sqrt[6]{x^7} \\ & = 1280 \sqrt[6]{x^6 \cdot x} \\ & = 1280 x \sqrt{x} \end{aligned}$$