

## Happy Friday! Reflect on the week :)

	Assignment Effort Grade (Circle One)	Comments (What was interesting or challenging?)
<b>Monday</b> Date: <u>1/29</u> Topic: _____	0 1 2	I rested after FINALS :)
<b>Tuesday</b> Date: <u>1/30</u> Topic: _____	0 1 2	New Semester!
<b>Wednesday</b> Date: <u>1/31</u> Topic: <u>2B Index Laws</u>	0 1 2	
<b>Thursday</b> Date: <u>2/1</u> Topic: <u>Applying Index laws</u>	0 1 2	
<b>Friday</b> Date: <u>2/2</u> Topic: <u>2D Rational Indices</u>	0 1 2	

## Add the fractions

$$1) \frac{1}{3} + \frac{1}{2} = \frac{2+3}{6} = \frac{5}{6}$$

$$2) \frac{4}{1} + \frac{1}{5} = \frac{20+1}{5} = \frac{21}{5} = 4\frac{1}{5}$$

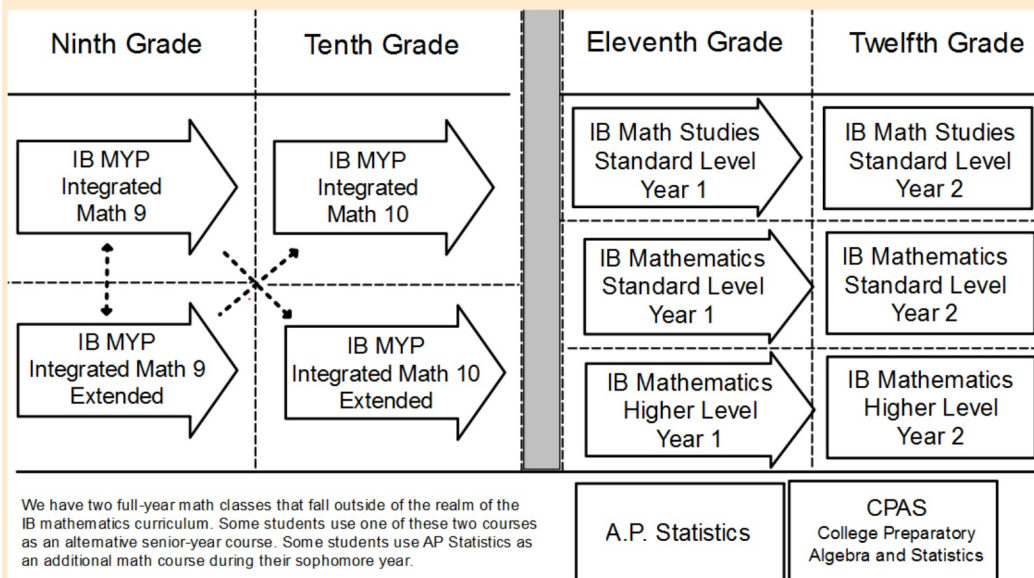
3) Rationalize the denominator!

$$\frac{2}{\sqrt{x}} \left( \frac{1x}{1x} \right) = \frac{2x}{x} \cdot \frac{4x^{-\frac{1}{3}}}{1} = \frac{4}{x^{\frac{1}{3}}} \left( \frac{x^{\frac{2}{3}}}{x^{\frac{2}{3}}} \right)$$

## Class Plan:

1. Homework Questions?  
10th grade courses questions?
2. Applying Properties of  
Exponents Examples
3. Practice

## Where will you go next year?.....



**Product Property of Exponents**

$$a^m \cdot a^n = a^{m+n}$$

**Quotient Property of Exponents**

$$\frac{a^m}{a^n} = a^{m-n}$$

**Definition of Negative Exponents**

$$a^{-n} = \frac{1}{a^n} \quad \text{or} \quad \left(\frac{a}{b}\right)^{-n} = \left(\frac{b}{a}\right)^n$$

**Zero Exponents**

$$a^0 = 1$$

**Power of a Power Property**

$$(a^m)^n = a^{mn}$$

**Power of a Product Property**

$$(ab)^m = a^m b^m$$

**Power of a Quotient Property**

$$\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$$

**\*\*\*Important:**  
Recognize how  
connected the  
properties are.

## D Chapter 2

## RATIONAL INDICES

$$a^{\frac{1}{2}} = \sqrt{a}$$

and

$$a^{\frac{1}{3}} = \sqrt[3]{a}$$

$$a^{\frac{1}{n}} = \sqrt[n]{a} \quad \text{where } \sqrt[n]{a} \text{ is called the } n\text{th root of } a.$$

### Rational Exponents

For any real number  $a$  and integers  $m$  and  $n > 1$

$$a^{\frac{m}{n}} = \sqrt[n]{a^m}$$

**Example 21**

Evaluate:

**a**  $16^{\frac{1}{2}}$

**b**  $8^{\frac{1}{3}}$

**c**  $16^{-\frac{1}{2}}$

**d**  $8^{-\frac{1}{3}}$

$$16^{\frac{1}{2}} = \frac{1}{\sqrt{16}} = \frac{1}{4}$$

**a**  $16^{\frac{1}{2}}$   
 $= \sqrt{16}$   
 $= 4$

**b**  $8^{\frac{1}{3}}$   
 $= \sqrt[3]{8}$   
 $= 2$

**c**  $16^{-\frac{1}{2}}$   
 $= \frac{1}{16^{\frac{1}{2}}}$   
 $= \frac{1}{\sqrt{16}}$   
 $= \frac{1}{4}$

**d**  $8^{-\frac{1}{3}}$   
 $= \frac{1}{8^{\frac{1}{3}}}$   
 $= \frac{1}{\sqrt[3]{8}}$   
 $= \frac{1}{2}$

**Example 22**

Write in index form:

**a**  $\sqrt{3}$

**b**  $\sqrt[3]{7}$

**c**  $\frac{1}{\sqrt[4]{7}}$

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

**a**  $\sqrt{3}$   
 $= 3^{\frac{1}{2}}$

**b**  $\sqrt[3]{7}$   
 $= 7^{\frac{1}{3}}$

**c**  $\frac{1}{\sqrt[4]{7}}$   
 $= \frac{1}{7^{\frac{1}{4}}}$   
 $= 7^{-\frac{1}{4}}$

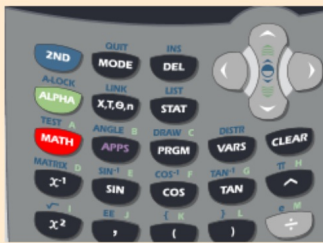


### Example 23

Use your calculator to find  $\sqrt[4]{50}$ , rounded to 2 decimal places.

```
50^(1/4)
2.659147948
```

**OR...**



```
MODE NUM CPX PRB
0: Frac
1: Dec
2: °
3: °
4: °
5: °
6: °
7: °
8: °
9: °
```

```
 $\sqrt[4]{50}$ 
2.659147948
```

Additional Examples:

$$64^{\frac{2}{3}}$$

$$(16x^2)^{\frac{1}{2}}$$

$$16^{\frac{1}{2}}(x^2)^{\frac{1}{2}}$$

$$4x$$

$$\sqrt[3]{1000n^9}$$
$$(1000n^9)^{\frac{1}{3}}$$

$$1000^{\frac{1}{3}}(n^9)^{\frac{1}{3}}$$

$$10n^3$$

## Additional Examples:

$$64^{\frac{2}{3}}$$

$$\sqrt[3]{64^2}$$

$$\sqrt[3]{4096}$$

$$\boxed{16}$$

$$(16x^2)^{\frac{1}{2}}$$

$$16^{\frac{1}{2}} \cdot x^{2 \cdot \frac{1}{2}}$$

$$\sqrt{16} \cdot x$$

$$\boxed{4x}$$

$$(1000n^9)^{\frac{1}{3}}$$

$$1000^{\frac{1}{3}} \cdot n^{9 \cdot \frac{1}{3}}$$

$$\sqrt[3]{1000} = 10$$

$$n^{9 \cdot \frac{1}{3}} = n^3$$

$$\boxed{10n^3}$$

## Additional Examples:

$$(49r^6)^{\frac{3}{2}}$$

$$(64n^9)^{\frac{5}{3}}$$

$$625^{\frac{3}{4}}$$

## Additional Examples:

$$(49r^6)^{\frac{3}{2}}$$

$$\begin{aligned} &49^{\frac{3}{2}} \cdot r^{6 \cdot \frac{3}{2}} \\ &49^{\frac{3}{2}} \cdot r^9 \\ &\sqrt[2]{49^3} \cdot r^9 \\ &\sqrt[2]{7649} r^9 \\ &\boxed{343r^9} \end{aligned}$$

$$(64n^9)^{\frac{5}{3}}$$

$$\begin{aligned} &64^{\frac{5}{3}} \cdot n^{9 \cdot \frac{5}{3}} \\ &64^{\frac{5}{3}} \cdot n^{15} \end{aligned}$$

$$\boxed{1024n^{15}}$$

$$625^{\frac{3}{4}}$$

$$\begin{aligned} &\text{Calculator!} \\ &625 \wedge \left(\frac{3}{4}\right) \\ &\text{OR} \\ &\sqrt[4]{625^3} \end{aligned}$$

## DQ: Applying Rational Indices Review

$$a^{\frac{1}{2}} = \sqrt{a} \quad \text{and} \quad a^{\frac{1}{3}} = \sqrt[3]{a}$$

$$a^{\frac{1}{n}} = \sqrt[n]{a} \quad \text{where } \sqrt[n]{a} \text{ is called the } n\text{th root of } a.$$

### Rational Exponents

For any real number  $a$  and integers  $m$  and  $n > 1$

$$a^{\frac{m}{n}} = \sqrt[n]{a^m}$$

Done?  
Create  
your own  
problem

## Applying Rational Indices Review

Write each expression in radical form.

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

2)  $10^{\frac{1}{4}}$

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

4)  $4^{\frac{2}{3}}$

5)  $4^{\frac{5}{3}}$

6)  $5^{\frac{7}{4}}$

$$\sqrt[4]{5^7}$$

## Applying Rational Indices Review

Show conversion to radical form and simplify.

7)  $25^{\frac{1}{2}}$

8)  $64^{\frac{1}{2}}$



## Applying Rational Indices Review

Show conversion to radical form and simplify.

9)  $216^{\frac{1}{3}}$

10)  $64^{\frac{1}{3}}$

## Applying Rational Indices Review

Show conversion to radical form and simplify.

11)  $25^{\frac{3}{2}}$

12)  $49^{\frac{3}{2}}$

$$49^{\frac{3}{2}} = \sqrt[2]{49^3}$$

$$\sqrt[2]{117,649} = \boxed{343}$$

## Applying Rational Indices Review

Simplify.

$$13) (x^6)^{\frac{1}{2}}$$

$$14) (27a^9)^{\frac{1}{3}}$$

## Applying Rational Indices Review

Simplify.

$$15) (49x^4)^{\frac{1}{2}}$$

$$16) (81n^8)^{\frac{3}{4}}$$

$$(n^8)^{\frac{3}{4}} = n^{\frac{24}{4}}$$

$$\begin{aligned} & \sqrt[4]{(81n^8)^3} \\ & \sqrt[4]{531,441n^{24}} \\ & \boxed{27n^6} \end{aligned}$$

## Applying Rational Indices Review

Simplify.

$$17) (x^6)^{\frac{5}{3}}$$

$$18) (81v^4)^{\frac{3}{2}}$$

## Applying Rational Indices Review

Simplify.

$$19) (64n^6)^{\frac{5}{3}}$$

$$20) (64m^6)^{\frac{4}{3}}$$

## Applying Rational Indices Review

Simplify. Your answer should contain only positive exponents with no fractional exponents in the denominator.

$$21) x^{\frac{2}{3}} \cdot 4x^{\frac{1}{2}} = 4x^{\frac{2}{3}} \cdot x^{\frac{1}{2}} = 4x^{\frac{7}{6}}$$

$$\frac{2}{3} + \frac{1}{2} = \frac{4+3}{6} = \frac{7}{6}$$

## Applying Rational Indices Review

Simplify. Your answer should contain only positive exponents with no fractional exponents in the denominator.

$$22) a^{-2} \cdot 4a^{\frac{2}{3}} = 4a^{-2 + \frac{2}{3}}$$
$$\frac{4}{a^{\frac{4}{3}}} \left( \frac{a^{\frac{2}{3}}}{a^{\frac{2}{3}}} \right) = \frac{4a^{\frac{2}{3}}}{a^{\frac{4}{3}}} = \frac{4a^{\frac{2}{3}}}{a^2} = \frac{4}{3} a^{-2 + \frac{2}{3}} = \frac{4}{3} a^{-\frac{6}{3} + \frac{2}{3}} = \frac{4}{3} a^{-\frac{4}{3}} = \frac{4}{3} a^{\frac{4}{3}}$$



## Applying Rational Indices Review

Simplify. Your answer should contain only positive exponents with no fractional exponents in the denominator.

$$\begin{aligned} 23) \quad x^{-4} \cdot \left(x^{-\frac{5}{4}}\right)^{\frac{1}{3}} &= x^{-4} \cdot x^{-\frac{5}{12}} = x^{-\frac{53}{12}} = \frac{1}{x^{\frac{53}{12}}} \\ &= \frac{1}{x^{\frac{53}{12}} \cdot x^{\frac{7}{12}}} = \frac{1}{x^5} \end{aligned}$$

$\frac{-5}{4} \cdot \frac{1}{3} = \frac{-5}{12}$

$\frac{-4}{1} - \frac{5}{12} = \frac{-48 - 5}{12} = \frac{-53}{12}$

## Applying Rational Indices Review

Simplify. Your answer should contain only positive exponents with no fractional exponents in the denominator.

$$24) \left(x^{\frac{1}{2}}\right)^2 \cdot x^{\frac{7}{4}}$$

## Applying Rational Indices Review

Simplify. Your answer should contain only positive exponents with no fractional exponents in the denominator.

$$25) \frac{3x^2 \cdot 2x^2}{2x^{\frac{2}{3}}}$$

## Applying Rational Indices Review

Simplify. Your answer should contain only positive exponents with no fractional exponents in the denominator.

$$26) \frac{3n^{\frac{1}{3}}}{4n \cdot 2n^{\frac{3}{4}}}$$

## Applying Rational Indices Review

Simplify. Your answer should contain only positive exponents with no fractional exponents in the denominator.

$$27) \frac{4a}{2a^2 \cdot a^{\frac{1}{3}}}$$

## Applying Rational Indices Review

Simplify. Your answer should contain only positive exponents with no fractional exponents in the denominator.

$$28) \frac{4v^{-\frac{5}{3}}}{4v^{-1}} = \frac{v^{-\frac{5}{3}}}{1} = \frac{1}{v^{\frac{5}{3}}} \left( \frac{v^{\frac{1}{3}}}{v^{\frac{1}{3}}} \right) = \frac{v^{\frac{1}{3}}}{v^2}$$

$$\frac{5}{3} + \frac{1}{3} = \frac{6}{3} = 2$$

## Applying Rational Indices Review

Simplify. Your answer should contain only positive exponents with no fractional exponents in the denominator.

$$29) \frac{yx^{-\frac{3}{2}}}{\left(xy^{-\frac{2}{3}}\right)^2}$$

## Applying Rational Indices Review

Simplify. Your answer should contain only positive exponents with no fractional exponents in the denominator.

$$30) \frac{\left(y^{\frac{4}{3}}\right)^{-2}}{x^{\frac{1}{2}} y^{\frac{2}{3}} \cdot \left(x^{\frac{1}{2}} y^{\frac{7}{4}}\right)^4}$$



## Applying Rational Indices Review

Simplify. Your answer should contain only positive exponents with no fractional exponents in the denominator.

$$31) \left( \frac{x}{x^{-\frac{1}{2}} y^{-\frac{2}{3}} \cdot x^{\frac{1}{4}} y^{\frac{5}{4}}} \right)^{\frac{1}{2}}$$

$$\frac{-2}{8} + \frac{1}{8} = -\frac{1}{8}$$

$$= \frac{x^{\frac{1}{2}}}{x^{-\frac{1}{4}} y^{-\frac{2}{6}} x^{\frac{1}{4}} y^{\frac{5}{8}}} \quad -\frac{2}{6} + \frac{5}{8}$$

$$\frac{x^{\frac{1}{2}}}{x^{-\frac{1}{8}} y^{\frac{7}{24}}} \cdot \left( \frac{y^{\frac{17}{24}}}{y^{\frac{17}{24}}} \right)$$

$$= \frac{x^{\frac{5}{8}} y^{\frac{17}{24}}}{y} = \frac{-8+15}{24} = \frac{7}{24}$$

## Applying Rational Indices Review

Simplify. Your answer should contain only positive exponents with no fractional exponents in the denominator.

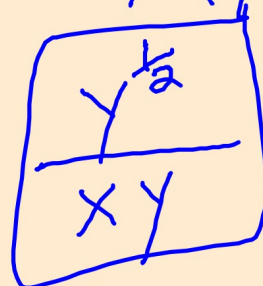
$$32) \frac{\left(x^{-\frac{1}{2}} y^{\frac{1}{2}}\right)^{\frac{2}{3}}}{x^{\frac{2}{3}} y^{-\frac{1}{2}} \cdot y^{\frac{4}{3}}}$$

$$= \frac{x^{-\frac{1}{3}} y^{\frac{1}{3}}}{x^{\frac{2}{3}} y^{\frac{5}{6}}} = x^{-1} y^{-\frac{1}{2}} = \frac{1}{x y^{\frac{1}{2}}}$$

$$\frac{0/4}{0/6} + \frac{1/2}{0/6} = \frac{0/6}{0/6}$$

$$\begin{aligned} &-\frac{1}{2} + \frac{4}{3} \\ &-\frac{3}{6} + \frac{8}{6} = \frac{5}{6} \end{aligned}$$

$$\frac{0/2}{0/6} - \frac{5/6}{0/6} = \frac{-3}{6} = -\frac{1}{2}$$



# Solutions

1)  $\sqrt{6}$

5)  $(\sqrt[3]{4})^5$

9) 6

13)  $x^3$

17)  $x^{10}$

21)  $4x^{\frac{7}{6}}$

25)  $3x^{\frac{10}{3}}$

29)  $\frac{y^2}{x^3}$

2)  $\sqrt[4]{10}$

6)  $(\sqrt[4]{5})^7$

10) 4

14)  $3a^3$

18)  $729v^6$

22)  $\frac{4a^{\frac{2}{3}}}{a^2}$

26)  $\frac{3n^{\frac{7}{12}}}{8n^2}$

30)  $\frac{y^{\frac{2}{3}}x^{\frac{1}{2}}}{y^{11}x^3}$

3)  $\sqrt[3]{7}$

7) 5

11) 125

15)  $7x^2$

19)  $1024n^{10}$

23)  $\frac{x^{\frac{7}{12}}}{x^5}$

27)  $\frac{2a^{\frac{2}{3}}}{a^2}$

31)  $\frac{y^{\frac{17}{24}}x^{\frac{5}{8}}}{y}$

4)  $(\sqrt[3]{4})^2$

8) 8

12) 343

16)  $27n^6$

20)  $256m^8$

24)  $x^{\frac{11}{4}}$

28)  $\frac{v^{\frac{1}{3}}}{v^2}$

32)  $\frac{y^{\frac{1}{2}}}{xy}$

Exercises...  
Finish Handout &  
Enjoy Your Wknd!