



YouTube Live Lessons

Getting ready for A-Level Maths...

*"We are what we repeatedly do.
Excellence is not an act, but a habit."*



Manipulating powers (1)

Getting ready for A-Level Maths...

What you need...

- Your brain and attention
- A device to watch connected to internet
- A pen and paper
- Can do attitude

Manipulating powers (1)

Important rules

$$a^1 = a$$

$$a^0 = 1$$

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

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

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

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

$$a^{-m} = \frac{1}{a^m}$$

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

$$a^{\frac{n}{m}} = \left(\sqrt[m]{a}\right)^n$$

Manipulating powers (1)

My turn

Write 243 as a power of 3.

$$243 = 3^5$$

$$243 = 3 \times 3 \times 3 \times 3 \times 3$$

$$\underline{\underline{243 = 3^5}}$$

Your turn

Write 256 as a power of 4.

$$256 = 4^4$$

$$256 = 4 \times 4 \times 4 \times 4$$

$$\underline{\underline{256 = 4^4}}$$

Manipulating powers (1)

My turn

Write $\frac{1}{243}$ as a power of 3.

$$\frac{1}{243} = 3^{-5}$$

$$\frac{1}{243} = \frac{1}{3 \times 3 \times 3 \times 3 \times 3}$$

$$\frac{1}{243} = \frac{1}{3^5}$$

$$\frac{1}{243} = \underline{\underline{3^{-5}}}$$

Your turn

Write $\frac{1}{625}$ as a power of 5.

$$\frac{1}{625} = 5^{-4}$$

$$\frac{1}{625} = \frac{1}{5 \times 5 \times 5 \times 5}$$

$$= \frac{1}{5^4}$$

$$\frac{1}{625} = \underline{\underline{5^{-4}}}$$

Manipulating powers (1)

My turn

Write 0.04 as a power of 5.

$$0.04 = 5^n$$

$$0.04 = \frac{4}{100}$$

$$= \frac{1}{25}$$

$$= \frac{1}{5 \times 5}$$

$$= \frac{1}{5^2}$$

$$\underline{\underline{0.04 = 5^{-2}}}$$

Your turn

Write 0.25 as a power of 2.

$$0.25 = 2^n$$

$$0.25 = \frac{25}{100}$$

$$= \frac{1}{4}$$

$$= \frac{1}{2 \times 2}$$

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

$$\underline{\underline{0.25 = 2^{-2}}}$$

Manipulating powers (1)

My turn

Write 32×128 as a power of 2.

$$32 \times 128 = 2^{12}$$

$$32 \times 128 = (2 \times 2 \times 2 \times 2 \times 2) \times (2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2)$$

$$= 2^5 \times 2^7$$

$$= 2^{5+7}$$

$$32 \times 128 = \underline{\underline{2^{12}}}$$

Your turn

Write 27×81 as a power of 3.

$$27 \times 81 = 3^7$$

$$27 \times 81 = (3 \times 3 \times 3) \times (3 \times 3 \times 3 \times 3)$$

$$= 3^3 \times 3^4$$

$$= 3^{3+4}$$

$$27 \times 81 = \underline{\underline{3^7}}$$

Manipulating powers (1)

My turn

Write 25^6 as a power of 5.

$$25^6 = 5^{12}$$

$$\begin{aligned} 25^6 &= (5^2)^6 \\ &= 5^{2 \times 6} \end{aligned}$$

$$\underline{\underline{25^6 = 5^{12}}}$$

Your turn

Write 64^3 as a power of 2.

$$64^3 = 2^{18}$$

$$\begin{aligned} 64^3 &= (2 \times 2 \times 2 \times 2 \times 2 \times 2)^3 \\ &= (2^6)^3 \\ &= 2^{6 \times 3} \\ &= \underline{\underline{2^{18}}} \end{aligned}$$

Manipulating powers (1)

My turn

Write $81^5 \times 27^2$ as a power of 3.

$$81^5 \times 27^2 = 3^n$$

$$= (3^4)^5 \times (3^3)^2$$

$$= 3^{20} \times 3^6$$

$$= 3^{20+6}$$

$$81^5 \times 27^2 = 3^{26}$$

Your turn

Write $64^2 \times 16^7$ as a power of 2.

$$64^2 \times 16^7 = 2^n$$

$$= (2^6)^2 \times (2^4)^7$$

$$= 2^{12} \times 2^{28}$$

$$= 2^{12+28}$$

$$64^2 \times 16^7 = 2^{40}$$

Manipulating powers (1)

My turn

Write $\frac{128^2}{32^5}$ as a power of 2.

$$\frac{128^2}{32^5} = 2^n$$

$$= \frac{(2^7)^2}{(2^5)^5}$$

$$= \frac{2^{14}}{2^{25}}$$

$$= 2^{14-25}$$

$$= 2^{-11}$$

$$\frac{128^2}{32^5}$$

$$= 2^{-11}$$

Your turn

Write $\frac{243^3}{27^6}$ as a power of 3.

$$\frac{243^3}{27^6} = 3^n$$

$$= \frac{(3^5)^3}{(3^3)^6}$$

$$= \frac{3^{15}}{3^{18}}$$

$$= 3^{15-18}$$

$$= 3^{-3}$$

$$\frac{243^3}{27^6}$$

$$= 3^{-3}$$

Manipulating powers (1)

My turn

Write $0.25^5 \times 0.5^4$ as a power of 2.

$$0.25^5 \times 0.5^4 = 2^n$$

$$\begin{aligned} 0.25^5 \times 0.5^4 &= \left(\frac{1}{4}\right)^5 \times \left(\frac{1}{2}\right)^4 \\ &= \left(\frac{1}{2^2}\right)^5 \times \left(\frac{1}{2^1}\right)^4 \\ &= (2^{-2})^5 \times (2^{-1})^4 \\ &= 2^{-10} \times 2^{-4} \\ &= 2^{-14} \end{aligned}$$

Your turn

Write $0.04^4 \times 0.2^3$ as a power of 5.

$$0.04^4 \times 0.2^3 = 5^n$$

$$\begin{aligned} 0.04^4 \times 0.2^3 &= \left(\frac{4}{100}\right)^4 \times \left(\frac{2}{10}\right)^3 \\ &= \left(\frac{1}{25}\right)^4 \times \left(\frac{1}{5}\right)^3 \\ &= \left(\frac{1}{5^2}\right)^4 \times \left(\frac{1}{5^1}\right)^3 \\ &= (5^{-2})^4 \times (5^{-1})^3 \\ &= 5^{-8} \times 5^{-3} \\ &= 5^{-11} \end{aligned}$$

Manipulating powers (1)

Review Exercise

1. Write 216 as a power of 6.
2. Write $\frac{1}{128}$ as a power of 2.
3. Write 0.5 as a power of 2.
4. Write 25×625 as a power of 5.
5. Write 27^8 as a power of 3.
6. Write $25^4 \times 125^3$ as a power of 5.
7. Write $\frac{64^3}{32^4}$ as a power of 2.
8. Write $0.125^3 \times 0.5^5$ as a power of 2.

Manipulating powers (1)

Review Exercise (Answers)

1. Write 216 as a power of 6. 6^3
2. Write $\frac{1}{128}$ as a power of 2. 2^{-7}
3. Write 0.5 as a power of 2. 2^{-1}
4. Write 25×625 as a power of 5. 5^6
5. Write 27^8 as a power of 3. 3^{24}
6. Write $25^4 \times 125^3$ as a power of 5. 5^{17}
7. Write $\frac{64^3}{32^4}$ as a power of 2. 2^{-2}
8. Write $0.125^3 \times 0.5^5$ as a power of 2. 2^{-14}