

Building Up to... A Harder Simultaneous Equations Question

Rewrite...

a) $2^3 \times 2^4 =$

b) $(2^3)^4 =$

What number does the # represent?

c) $2^{2x} = (2^x)^{\#}$

Solve...

d) $2^x = 32$

e) $2^{2x} = 64$

Now solve these simultaneous equations...

f) $x - 3y = 4$
 $x + 3y = 16$

Factorise (write as difference of two squares)...

g) $x^2 - 9y^2$

Solve these simultaneous equations...

h) $x - 2y = 3$
 $x^2 - 4y^2 = 33$

Now try solving these simultaneous equations...

i) $3^x - 2(3^y) = 3$
 $3^{2x} - 4(3^{2y}) = 45$

And now here's an A level version of this question. See how far you can get...

Solve the simultaneous equations

$$e^x - 2e^y = 3$$

$$e^{2x} - 4e^{2y} = 33.$$

Give your answer in an exact form.

More Practice... A Harder Simultaneous Equations Question

Rewrite...

a) $2^3 \times 2^7 =$

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

c) $(2^3)^5 =$

d) $((2^3)^4)^5 =$

e) $\frac{2^6}{2^2} =$

f) $\frac{2^{10}}{2^2} =$

g) $\frac{(2^3)^4 \times 2^5}{2^2} =$

What number does the # represent?

a) $2^{3x} = (2^x)^{\#}$

b) $2^{\frac{x}{2}} = (2^x)^{\#}$

c) $3^{2x} = (3^x)^{\#}$

d) $3^{\frac{2x}{3}} = (3^x)^{\#}$

Solve...

a) $2^x = 8$

b) $3^x = 81$

c) $3^{2x} = 81$

d) $2^{3x} = 64$

Now solve these simultaneous equations...

a) $2x - 5y = 5$

$2x + 5y = 35$

b) $2x - 5y = 10$

$x + 5y = 20$

c) $2x + 3y = 21$

$5x + 4y = 42$

d) $3x + 7y = -31$

$2x - 3y = 10$

Factorise (write as difference of two squares)...

a) $x^2 - 16y^2$

b) $9x^2 - y^2$

c) $4x^2 - 25y^2$

d) $100x^2y^2 - 49x^4$

Solve these simultaneous equations ...

a) $x - 2y = 3$

$$x^2 - 4y^2 = 33$$

b) $x - 2y = 2$

$$x^2 - 4y^2 = 28$$

c) $x - 3y = 1$

$$x^2 - 9y^2 = 19$$

d) $x - 3y = 5$

$$x^2 - 9y^2 = 15$$

Now try solving these simultaneous equations...

a) $3^x - 2(3^y) = 9$

$$3^{2x} - 4(3^{2y}) = 405$$

b) $2^x - 2(2^y) = 4$

$$2^{2x} - 4(2^{2y}) = 48$$

c) $2^x - 2(2^y) = 8$

$$2^{2x} - 4(2^{2y}) = 192$$

d) $3^x - 2(3^y) = \sqrt{3} - 2$

$$3^{2x} - 4(3^{2y}) = -1$$

e) $3^x - 2(3^y) = -\sqrt{3}$

$$3^{2x} - 4(3^{2y}) = -9$$

f) $3^x - 2(3^y) = 3 - 2\sqrt{3}$

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

Extension task. What's going on here?...

$$\begin{aligned}x - 2y &= 0 \\x^2 - 4y^2 &= 0\end{aligned}$$

So we're nearly there...

You just did...

$$\begin{aligned}3^x - 2(3^y) &= 9 \\3^{2x} - 4(3^{2y}) &= 405\end{aligned}$$

So how about?...

$$\begin{aligned}2.718^x - 2(2.718^y) &= 3 \\2.718^{2x} - 4(2.718^{2y}) &= 33\end{aligned}$$

Or perhaps?...

$$\begin{aligned}e^x - 2(e^y) &= 3 \\e^{2x} - 4(e^{2y}) &= 33\end{aligned}$$

Building Up to... A Harder Simultaneous Equations **Answers**

Rewrite...

a) $2^3 \times 2^4 = 2^7$

b) $(2^3)^4 = 2^{12}$

What number does the # represent?

c) $2^{2x} = (2^x)^2$

Solve...

d) $2^x = 32, x = 5$

e) $2^{2x} = 64, x = 3$

Now solve these simultaneous equations...

f) $x - 3y = 4$
 $x + 3y = 16$

Factorise (write as difference of two squares)...

g) $x^2 - 9y^2 = (x + 3y)(x - 3y)$

Solve these simultaneous equations...

h) $x - 2y = 3$
 $x^2 - 4y^2 = 33$

Now try solving these simultaneous equations...

i) $3^x - 2(3^y) = 3$
 $3^{2x} - 4(3^{2y}) = 45$

And now here's an A level version of this question. See how far you can get...

Solve the simultaneous equations

$$e^x - 2e^y = 3$$
$$e^{2x} - 4e^{2y} = 33.$$

Give your answer in an exact form.

More Practice... A Harder Simultaneous Equations **Answers**

Rewrite...

a) $2^3 \times 2^7 = 2^{10}$

b) $2^3 \times 2^4 \times 2^5 = 2^{12}$

c) $(2^3)^5 = 2^{15}$

d) $((2^3)^4)^5 = 2^{60}$

e) $\frac{2^6}{2^2} = 2^4$

f) $\frac{2^{10}}{2^2} = 2^8$

g) $\frac{(2^3)^4 \times 2^5}{2^2} = 2^{15}$

What number does the # represent?

a) $2^{3x} = (2^x)^3$

b) $2^{\frac{x}{2}} = (2^x)^{\frac{1}{2}}$

c) $3^{2x} = (3^x)^2$

d) $3^{\frac{2x}{3}} = (3^x)^{\frac{2}{3}}$

Solve...

a) $2^x = 8, x = 3$

b) $3^x = 81, x = 4$

c) $3^{2x} = 81, x = 2$

d) $2^{3x} = 64, x = 2$

Now solve these simultaneous equations...

a) $2x - 5y = 5 \quad x = 10, y = 3$

$$2x + 5y = 35$$

b) $2x - 5y = 10 \quad x = 10, y = 2$

$$x + 5y = 20$$

c) $2x + 3y = 21 \quad x = 6, y = 3$

$$5x + 4y = 42$$

d) $3x + 7y = -31 \quad x = -1, y = -4$

$$2x - 3y = 10$$

Factorise (write as difference of two squares)...

a) $x^2 - 16y^2 = (x + 4y)(x - 4y)$

b) $9x^2 - y^2 = (3x + y)(3x - y)$

c) $4x^2 - 25y^2 = (2x + 5y)(2x - 5y)$

d) $100x^2y^2 - 49x^4 = (10xy + 7x^2)(10xy - 7x^2)$

Solve these simultaneous equations ...

a) $x - 2y = 3$ $x = 7, y = 2$

$$x^2 - 4y^2 = 33$$

b) $x - 2y = 2$ $x = 8, y = 3$

$$x^2 - 4y^2 = 28$$

c) $x - 3y = 1$ $x = 10, y = 3$

$$x^2 - 9y^2 = 19$$

d) $x - 3y = 5$ $x = 4, y = -\frac{1}{3}$

$$x^2 - 9y^2 = 15$$

Now try solving these simultaneous equations...

a) $3^x - 2(3^y) = 9, x = 3, y = 2$

$$3^{2x} - 4(3^{2y}) = 405$$

b) $2^x - 2(2^y) = 4, x = 3, y = 1$

$$2^{2x} - 4(2^{2y}) = 48$$

c) $2^x - 2(2^y) = 8, x = 4, y = 2$

$$2^{2x} - 4(2^{2y}) = 192$$

d) $3^x - 2(3^y) = \sqrt{3} - 2, x = \frac{1}{2}, y = 0$

$$3^{2x} - 4(3^{2y}) = -1$$

e) $3^x - 2(3^y) = -\sqrt{3}, x = \frac{1}{2}, y = \frac{1}{2}$

$$3^{2x} - 4(3^{2y}) = -9$$

f) $3^x - 2(3^y) = 3 - 2\sqrt{3}, x = 1, y = \frac{1}{2}$

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

Extension task. What's going on here?...

$$\begin{aligned}x - 2y &= 0 \\x^2 - 4y^2 &= 0\end{aligned}$$