

1.3 Solving Exponential Equations

Method: Convert to a common base using exponent rules, then solve.

?

Remember that for an equation to be true, both sides must be equal.

So, if the bases are the same, then the exponents must be equal to each other in order for LS=RS.

>>

To find the value(s) of the unknown variable(s)!

a) $2^x = 32$

$$2^x = 2^5$$

$$\therefore x = 5$$

b) $(-4)^x = -1024$

$$(-4)^x = (-4)^5$$

$$\therefore x = 5$$

c) $-3^y = -81$

$$3^y = 3^4$$

$$\therefore y = 4$$

d) $5^{4-3x} = 25^{x+1}$

$$5^{4-3x} = (5^2)^{x+1}$$

$$5^{4-3x} = 5^{2x+2}$$

$$\therefore 4-3x = 2x+2$$

$$2 = 5x$$

$$x = \frac{2}{5}$$

e) $3^{3x+1} = 1$

$$3^{3x+1} = 3^0$$

$$\therefore 3x+1 = 0$$

$$3x = -1$$

$$x = -\frac{1}{3}$$

f) $4^{x+5} = 8^{1-3x}$

$$(2^2)^{x+5} = (2^3)^{1-3x}$$

$$2^{2x+10} = 2^{3-9x}$$

$$\therefore 2x+10 = 3-9x$$

$$11x = -7$$

$$x = -\frac{7}{11}$$

g) $7^{3-x} = \frac{1}{49}$

$$7^{3-x} = 7^{-2}$$

$$\therefore 3-x = -2$$

$$x = 5$$

Now it's your turn!

h) $\frac{1}{256} = 4^{5x+1}$

$$4^{-4} = 4^{5x+1}$$

$$\therefore -4 = 5x+1$$

$$x = -1$$

i) $9^{2x+3} = 27^{\frac{x}{4}}$

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

$$3^{4x+6} = 3^{\frac{3x}{4}}$$

$$\therefore 4x+6 = \frac{3x}{4}$$

$$16x+24 = 3x$$

$$13x = -24$$

$$x = -\frac{24}{13}$$

j) $4(3^{5x-1}) = 36$

$$3^{5x-1} = 9$$

$$3^{5x-1} = 3^2$$

$$\therefore 5x-1 = 2$$

$$x = \frac{3}{5}$$

Sometimes, we must find a common factor before solving using a common base.

Ex 2: Solve

a) $2^{x+4} + 2^x = 136$

$$(2^x)(2^4) + 2^x = 136$$

$$2^x(2^4 + 1) = 136$$

$$2^x(17) = 136$$

$$2^x = 8$$

$$2^x = 2^3$$

$$\therefore x = 3$$

$$\begin{aligned} 3x + x \\ = x(3+1) \end{aligned}$$

$$\begin{aligned} (2^x)(2^2) \\ = 2^{x+2} \end{aligned}$$

Aside

b) $3^{x+1} - 3^{x+4} = -702$

$$3^x(3) - 3^x(3^4) = -702$$

$$3^x(3 - 3^4) = -702$$

$$3^x(-78) = -702$$

$$3^x = 9$$

$$\therefore x = 2$$

You try...

c) $7^{x+1} + 7^{x+2} = 392$

$$7^x(7) + 7^x(7^2) = 392$$

$$7^x(7 + 7^2) = 392$$

$$7^x(56) = 392$$

$$7^x = 7$$

$$\therefore x = 1$$

Homework: You choose....you should be able to do all of these questions....

page 23

1-11, 19, 20

! CAUTION

Tomorrow is a work period (1.3B)
Day after 1.4A is note is long,
you may want to print it
(double sided paper is a good idea)

