



Name:

Gr 10

Date:

Term 1

Time:

1 HR

CAPS Reference

Exponents

Topic

Exponential equations



1. GOT IT! [15 MIN]

Solve for x , in the following exponential equations.

Example 1:

$$3^{x+1} = 9$$

$$3^{x+1} = 3^2$$

$$x + 1 = 2$$

$$x = 2 - 1$$

$$x = 1$$

Take Nota!!!

$x + 1$ is the exponent.

Express both sides of the equal sign as powers of the same base.

As soon as the bases are the same, we equate exponents

Then make use of basic rule of solving for x .

Example 2:

$$2 \cdot 7^{x-2} = 686$$

$$7^{x-2} = 686 \div 2$$

$$7^{x-2} = 343$$

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

$$x - 2 = 3$$

$$x = 3 + 2$$

$$x = 5$$

1) Take the 2 over, the idea is to get the power on its own.

2) The base of the power is 7...that is

your hint.... You should change 343 to a power with 7 as a base

3) Bases are the same solve for x by equating exponents.

Example 3:

$$4. \left(\frac{1}{27}\right)^{x-2} = 36$$

$$\left(\frac{1}{3^3}\right)^{x-2} = 36 \div 4$$

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

$$3^{-3x+6} = 3^2$$

$$-3x + 6 = 2$$

$$-3x = 2 - 6$$

$$-3x = -4$$

$$x = \frac{4}{3}$$

Take Nota

$$\frac{1}{27} = 3^{-3}$$

**2. GO AHEAD [20 MIN]**

Solve for x , in the following exponential equations.: Make sure you show all your work

2.1 $3 \cdot 2^x = 12$

2.2 $6^{x+3} = 1$

2.3 $7^{x+4} = 49$

2.4 $9^{x+2} = \frac{1}{81}$

2.5 $(5^{2x})^2 = 125$

2.6 $4^{x+5} = 16^{x-2}$

2.7 $5^x + 5^{x+1} = 30$

2.8 $3^{x+2} - 3^x = 72$

2.9 $(2^x)^{x-2} = 8$

2.10 $4^{x^2} = 16^{x-4}$

**3. CHECK YOUR WORK! [10 MIN]**



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$$\begin{aligned}2.1 \quad 3 \cdot 2^x &= 12 \\ 2^x &= 12 \div 3 \\ 2^x &= 4 \\ 2^x &= 2^2 \\ x &= 2\end{aligned}$$

$$\begin{aligned}2.2 \quad 6^{x+3} &= 1 \\ 6^{x+3} &= 6^0 \\ x + 3 &= 0 \\ x &= -3\end{aligned}$$

$$\begin{aligned}2.3 \quad 7^{x+4} &= 49 \\ 7^{x+4} &= 7^2 \\ x + 4 &= 2 \\ x &= 2 - 4 \\ x &= -2\end{aligned}$$

$$\begin{aligned}2.4 \quad 9^{x+2} &= \frac{1}{81} \\ 9^{x+2} &= \frac{1}{9^2} \\ 9^{x+2} &= 9^{-2} \\ x + 2 &= -2 \\ x &= -2 - 2 \\ x &= -4\end{aligned}$$

$$\begin{aligned}2.5 \quad (5^{2x})^2 &= 125 \\ 5^{4x} &= 5^3 \\ 4x &= 3 \\ x &= \frac{3}{4}\end{aligned}$$

$$\begin{aligned}2.6 \quad 4^{x+5} &= 16^{x-2} \\ 4^{x+5} &= (4^2)^{x-2} \\ 4^{x+5} &= 4^{2x-4} \\ x + 5 &= 2x - 4 \\ 5 + 4 &= 2x - x \\ 9 &= x\end{aligned}$$

$$\begin{aligned}2.7 \quad 5^x + 5^{x+1} &= 30 \\ 5^x(1 + 5^1) &= 30 \\ 5^x(6) &= 30 \\ 5^x &= 30 \div 6 \\ 5^x &= 5 \\ x &= 1\end{aligned}$$

$$\begin{aligned}2.8 \quad 3^{x+2} - 3^x &= 72 \\ 3^x(3^2 - 1) &= 72 \\ 3^x(9 - 1) &= 72 \\ 3^x(8) &= 72 \\ 3^x &= 72 \div 8 \\ 3^x &= 9 \\ 3^x &= 3^2 \\ x &= 2\end{aligned}$$

$$\begin{aligned}2.9 \quad (2^x)^{x-2} &= 8 \\ 2^{x^2-2x} &= 2^3 \\ x^2 - 2x - 3 &= 0 \\ (x-3)(x+1) &= 0 \\ x-3 &= 0 \quad \text{or} \quad x+1 = 0 \\ x &= 3 \quad \quad \quad x = -1\end{aligned}$$

$$\begin{aligned}2.10 \quad 4^{x^2} &= 16^{x-4} \\ 4^{x^2} &= (4^2)^{x-4} \\ 4^{x^2} &= 4^{2x-8} \\ x^2 &= 2x - 8 \\ x^2 - 2x + 8 &= 0 \\ (x+2)(x-4) &= 0 \\ x+2 &= 0 \quad \text{or} \quad x-4 = 0 \\ x &= -2 \quad \quad \quad x = 4\end{aligned}$$