Week 2 & 3
Term 3
2021

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MM2
Exponential Functions
Indices and the index laws

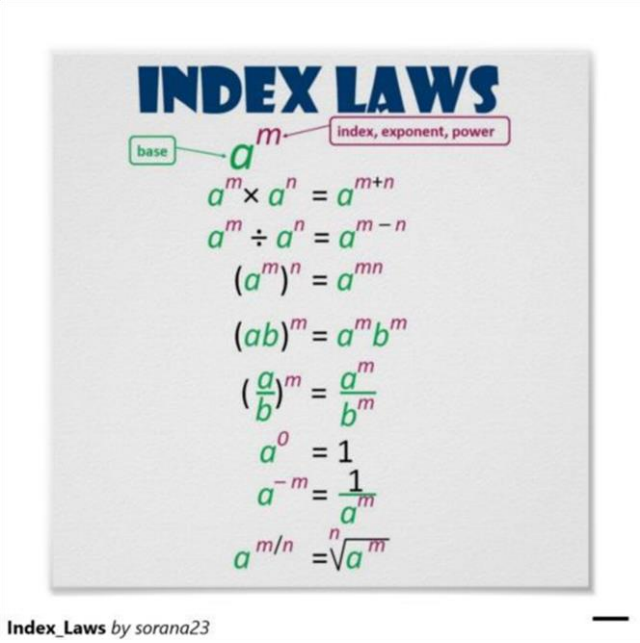
Goals

By the end of this fortnight, you should be able to:

- establish and use the algebraic properties of exponential functions
- recognise the qualitative features of the graph of $y = a^x$ $(a > 0)$ including asymptotes, and of its translations $(y = a^x + b \text{ and } y = a^{x+c})$
- identify contexts suitable for modelling by exponential functions and use them to solve practical problems
- solve equations involving exponential functions using technology, and algebraically in simple cases

Theoretical Components

Resources:
Maths Quest 11 Mathematical Methods
Chapter 5 Exponential and Logarithmic Functions (see Google classroom)
Read and make notes:
5C Indicial equations
5D Graphs of exponential equations
5H Applications of exponential functions



Index_Laws *by sorana23*

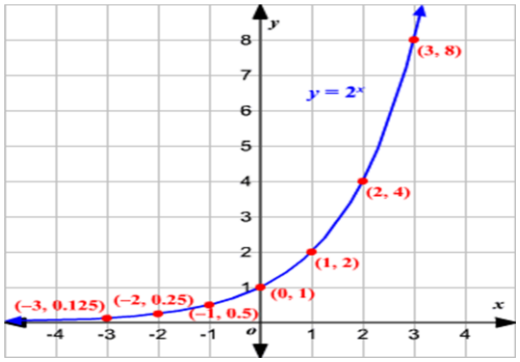
Practical Components

Complete the following from:
Chapter 5 Exponential and Logarithmic Functions (see Google classroom). Organise your solutions neatly in your exercise book.

Ex 5C Indicial equations
- Q's 1 – 4 (any 2 from each), 10

Ex 5D Graphs of exponential equations
- Q's 1 (a,b), 2 (c,d), 3 (a,h), 4, 5 (any 2)

Ex 5H Applications of exponential functions
- Q's 1, 2, 4 – 8, 12.



Investigation

See the following pages.

And work on your assignment (due week 4).

QFO

No Mathspace this fortnight 😊
Remember to check hawkermaths.com for each week's learning brief.

Check-in with your teacher every lesson.

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MM2 Investigation week 2

Some equations involving powers or indices can be solved using logarithms… but not all.

The example below illustrates how to solve an indicial equation using logarithms.

WORKED EXAMPLE 22

Solve for x correct to 3 decimal places, if $2^x = 7$.

THINK	WRITE
1 Write the equation.	$2^x = 7$
2 Take $\log_{10}$ of both sides.	$\log_{10}(2^x) = \log_{10}(7)$
3 Use the 'logarithm of a power' law to bring the power, x, to the front of the logarithmic equation.	$x \log_{10}(2) = \log_{10}(7)$
4 Divide both sides by $\log_{10}(2)$ to get x by itself.	Therefore $x = \frac{\log_{10}(7)}{\log_{10}(2)}$
5 Evaluate the logarithms correct to 4 decimal places, at least one more than the answer requires.	$x = \frac{0.8451}{0.3010}$
6 Solve for x.	$x = 2.808$

Summary: If $b^x = N$, then $x = \frac{log_a(N)}{log_a(b)}$

Note: The log button [log] on your scientific calculator is log_{10} ("log base 10").

The following equations can be solved using indices or logarithms. For each:

- state whether it can be solved using indices, or must be solved using logarithms, then proceed to solve.

$3^x = 81$	$x^5 = 50$
$3^x = 43$	$0.6^{2x-1} = 2$
$3^{2x} - 3 = 24$	$16^{\frac{3}{x}} = 10$

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MM2 Investigation week 3

The following data is an extract from a planetary fact sheet published by NASA.

	Distance from sun, r $(10^6$ km)	Orbital period, P (days)
Mercury	57.9	88
Venus	108.2	224.7
Earth	149.6	365.2
Mars	227.9	687
Jupiter	778.6	4331
Saturn	1433.5	10 747
Uranus	2872.5	30 589

Physics suggests that the orbital period, P, and distance from the sun, r, are related by a formula of the form

$$P = Ar^k$$

You job is to construct a suitable graph using the data provided by NASA and then, **use your graph** to predict the orbital period of Boomer, a fake planet in the asteroid belt with $r = 2500$.