Exponential Functions in Banking - Introduction

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The amount of interest we pay back depends on how much we borrow, and is given as a percentage.

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The amount of money owed in the beginning is given by:

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After 1 year we owe:

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The amount of money owed in the beginning is given by:

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After 1 year we owe:

$P(1) = 10000 + .06 \cdot 10000$

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Notice: We can factor out 10000

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How much money do we owe after 2 years?

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Notice: We can factor out 10000

This means that we pay $^{\$}600$ in interest in the first year.

How much money do we owe after 2 years?

$$P(2) = \underbrace{10600}_{P(1)} + .06 \cdot \underbrace{10600}_{P(1)}$$

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How much money do we owe after 2 years?

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But remember, $P(1) = 10000 \cdot (1 + .06)$

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But remember, $P(1) = 10000 \cdot (1 + .06)$

This leaves us with: $P(2) = 10000 \cdot (1 + .06)^2$

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Notice: We can factor out 10600

But remember, $P(1) = 10000 \cdot (1 + .06)$

This leaves us with: $P(2) = 10000 \cdot (1 + .06)^2 = 11236$

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But remember, $P(1) = 10000 \cdot (1 + .06)$

This leaves us with: $P(2) = 10000 \cdot (1 + .06)^2 = 11236$

Note: We paid another $^\$$600 in interest on the original $^\$$10000 we borrow, and an extra $^\$$36 which was interest on the first $^\$$600 interest.

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This means that we pay $\$600$ in interest in the first year.

How much money do we owe after 2 years?

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Notice: We can factor out 10600

But remember, $P(1) = 10000 \cdot (1 + .06)$

This leaves us with: $P(2) = 10000 \cdot (1 + .06)^2 = 11236$

Note: We paid another $\$600$ in interest on the original $\$10000$ we borrow, and an extra $\$36$ which was interest on the first $\$600$ interest.

Interest earned on previous interest is called *compound interest*

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How much money do we owe after 3 years?

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$P(0) = 10000$

$P(1) = 10000 \cdot (1 + .06) = 10600$

$P(2) = 10000 \cdot (1 + .06)^2 = 11236$

How much money do we owe after 3 years?

$P(3) = P(2) \cdot (1 + .06)$

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$P(0) = 10000$

$P(1) = 10000 \cdot (1 + .06) = 10600$

$P(2) = 10000 \cdot (1 + .06)^2 = 11236$

How much money do we owe after 3 years?

$$P(3) = P(2) \cdot (1 + .06) = \underbrace{10000 \cdot (1 + .06)^2}_{P(2)} \cdot (1 + .06)$$

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$P(0) = 10000$

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$P(2) = 10000 \cdot (1 + .06)^2 = 11236$

How much money do we owe after 3 years?

$$P(3) = P(2) \cdot (1 + .06) = \underbrace{10000 \cdot (1 + .06)^2}_{P(2)} \cdot (1 + .06) = 10000 \cdot (1 + .06)^3$$

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How much money do we owe after 3 years?

$$P(3) = P(2) \cdot (1 + .06) = \underbrace{10000 \cdot (1 + .06)^2}_{P(2)} \cdot (1 + .06) = 10000 \cdot (1 + .06)^3$$

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$P(0) = 10000 \cdot (1 + .06)^0$

$P(1) = 10000 \cdot (1 + .06)^1 = 10600$

$P(2) = 10000 \cdot (1 + .06)^2 = 11236$

How much money do we owe after 3 years?

$$P(3) = P(2) \cdot (1 + .06) = \underbrace{10000 \cdot (1 + .06)^2}_{P(2)} \cdot (1 + .06) = 10000 \cdot (1 + .06)^3$$

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How much money do we owe after 3 years?

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$P(3) = 10000 \cdot (1 + .06)^3$

What do we expect is how much money do we owe after 4 years?

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$P(2) = 10000 \cdot (1 + .06)^2 = 11236$

How much money do we owe after 3 years?

$$P(3) = P(2) \cdot (1 + .06) = \underbrace{10000 \cdot (1 + .06)^2}_{P(2)} \cdot (1 + .06) = 10000 \cdot (1 + .06)^3$$

$P(3) = 10000 \cdot (1 + .06)^3$

What do we expect is how much money do we owe after 4 years?

$P(4) = 10000 \cdot (1 + .06)^4$

Exponential Functions in Banking - Introduction

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How much money do we owe after 3 years?

$$P(3) = P(2) \cdot (1 + .06) = \underbrace{10000 \cdot (1 + .06)^2}_{P(2)} \cdot (1 + .06) = 10000 \cdot (1 + .06)^3$$

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What do we expect is how much money do we owe after 4 years?

$P(4) = 10000 \cdot (1 + .06)^4$

In General: The amount of money we owe after t years is:

Exponential Functions in Banking - Introduction

Suppose that we plan to borrow $\$10000$ on student loans for college

For our example, let's assume that the *annual interest rate* is 6%

$P(t)$ is the amount owed. (often called Principle)

And t is the number of years the money is borrowed.

$P(0) = 10000 \cdot (1 + .06)^0$

$P(1) = 10000 \cdot (1 + .06)^1 = 10600$

$P(2) = 10000 \cdot (1 + .06)^2 = 11236$

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This question would have been very difficult to answer without find our formula first!