Exponential Functions in Banking - Compounding Interest

Exponential Functions in Banking - Compounding Interest

In Example 1 we found that if we borrow $10000 on student loans for college with an *annual interest rate* of 6%

Exponential Functions in Banking - Compounding Interest

▸ In Example 1 we found that if we borrow $10000 on student loans for college with an *annual interest rate* of 6%

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

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

Exponential Functions in Banking - Compounding Interest

In Example 1 we found that if we borrow $10000 on student loans for college with an *annual interest rate* of 6%

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

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

In doing this, we saw that as interest accrues, we start paying interest on previously earned interest.

Exponential Functions in Banking - Compounding Interest

In Example 1 we found that if we borrow $\$10000$ on student loans for college with an *annual interest rate* of 6%

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

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

In doing this, we saw that as interest accrues, we start paying interest on previously earned interest.

We called this *compound interest*

Exponential Functions in Banking - Compounding Interest

In Example 1 we found that if we borrow $10000 on student loans for college with an *annual interest rate* of 6%

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

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

In doing this, we saw that as interest accrues, we start paying interest on previously earned interest.

We called this *compound interest*

From the bank's perspective: compound interest is a good thing!

Exponential Functions in Banking - Compounding Interest

In Example 1 we found that if we borrow $10000 on student loans for college with an *annual interest rate* of 6%

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

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

In doing this, we saw that as interest accrues, we start paying interest on previously earned interest.

We called this *compound interest*

From the bank's perspective: compound interest is a good thing!

So, adding the interest to account more often than just at the end of the year means the interest is compounded more often!

Exponential Functions in Banking - Compounding Interest

▸ In Example 1 we found that if we borrow $^{\$}10000$ on student loans for college with an *annual interest rate* of 6%

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

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

In doing this, we saw that as interest accrues, we start paying interest on previously earned interest.

We called this *compound interest*

From the bank's perspective: compound interest is a good thing!

So, adding the interest to account more often than just at the end of the year means the interest is compounded more often!

What if we compound the interest each month instead of each year?

Exponential Functions in Banking - Compounding Interest

In Example 1 we found that if we borrow $10000 on student loans for college with an *annual interest rate* of 6%

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

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

In doing this, we saw that as interest accrues, we start paying interest on previously earned interest.

We called this *compound interest*

From the bank's perspective: compound interest is a good thing!

So, adding the interest to account more often than just at the end of the year means the interest is compounded more often!

What if we compound the interest each month instead of each year?

How much interest is added each month?

Exponential Functions in Banking - Compounding Interest

In Example 1 we found that if we borrow \$10000 on student loans for college with an *annual interest rate* of 6%

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

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

In doing this, we saw that as interest accrues, we start paying interest on previously earned interest.

We called this *compound interest*

From the bank's perspective: compound interest is a good thing!

So, adding the interest to account more often than just at the end of the year means the interest is compounded more often!

What if we compound the interest each month instead of each year?

How much interest is added each month?

Since the 6% is an **annual** interest rate we don't add the full amount.

Exponential Functions in Banking - Compounding Interest

In Example 1 we found that if we borrow $10000 on student loans for college with an *annual interest rate* of 6%

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

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

In doing this, we saw that as interest accrues, we start paying interest on previously earned interest.

We called this *compound interest*

From the bank's perspective: compound interest is a good thing!

So, adding the interest to account more often than just at the end of the year means the interest is compounded more often!

What if we compound the interest each month instead of each year?

How much interest is added each month?

Since the 6% is an **annual** interest rate we don't add the full amount.

In one month, the interest is $\frac{6\%}{12}$ since one month is $\frac{1}{12}$ of a year

Exponential Functions in Banking - Compounding Interest

In Example 1 we found that if we borrow $10000 on student loans for college with an *annual interest rate* of 6%

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

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

In doing this, we saw that as interest accrues, we start paying interest on previously earned interest.

We called this *compound interest*

From the bank's perspective: compound interest is a good thing!

So, adding the interest to account more often than just at the end of the year means the interest is compounded more often!

What if we compound the interest each month instead of each year?

How much interest is added each month?

Since the 6% is an **annual** interest rate we don't add the full amount.

In one month, the interest is $\frac{6\%}{12}$ since one month is $\frac{1}{12}$ of a year

In other words, each month $\frac{6\%}{12} = \frac{1}{2}\%$ is earned

Exponential Functions in Banking - Compounding Interest

▸ In Example 1 we found that if we borrow $10000 on student loans for college with an *annual interest rate* of 6%

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

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

In doing this, we saw that as interest accrues, we start paying interest on previously earned interest.

We called this *compound interest*

From the bank's perspective: compound interest is a good thing!

So, adding the interest to account more often than just at the end of the year means the interest is compounded more often!

What if we compound the interest each month instead of each year?

How much interest is added each month?

Since the 6% is an **annual** interest rate we don't add the full amount.

In one month, the interest is $\frac{6\%}{12}$ since one month is $\frac{1}{12}$ of a year

In other words, each month $\frac{6\%}{12} = \frac{1}{2}\%$ is earned

Using this, we can find that the amount owed after one month is:

Exponential Functions in Banking - Compounding Interest

‣ In Example 1 we found that if we borrow $10000 on student loans for college with an *annual interest rate* of 6%

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

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

In doing this, we saw that as interest accrues, we start paying interest on previously earned interest.

We called this *compound interest*

From the bank's perspective: compound interest is a good thing!

So, adding the interest to account more often than just at the end of the year means the interest is compounded more often!

What if we compound the interest each month instead of each year?

How much interest is added each month?

Since the 6% is an **annual** interest rate we don't add the full amount.

In one month, the interest is $\frac{6\%}{12}$ since one month is $\frac{1}{12}$ of a year

In other words, each month $\frac{6\%}{12} = \frac{1}{2}\%$ is earned

Using this, we can find that the amount owed after one month is:

$$P\left(\frac{1}{12}\right) = 10000 + 10000 \cdot \frac{6\%}{12}$$

Exponential Functions in Banking - Compounding Interest

In Example 1 we found that if we borrow $10000 on student loans for college with an *annual interest rate* of 6%

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

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

In doing this, we saw that as interest accrues, we start paying interest on previously earned interest.

We called this *compound interest*

From the bank's perspective: compound interest is a good thing!

So, adding the interest to account more often than just at the end of the year means the interest is compounded more often!

What if we compound the interest each month instead of each year?

How much interest is added each month?

Since the 6% is an **annual** interest rate we don't add the full amount.

In one month, the interest is $\frac{6\%}{12}$ since one month is $\frac{1}{12}$ of a year

In other words, each month $\frac{6\%}{12} = \frac{1}{2}\%$ is earned

Using this, we can find that the amount owed after one month is:

$$P\left(\frac{1}{12}\right) = 10000 + 10000 \cdot \frac{6\%}{12} = 10000 \cdot \left(1 + \frac{6\%}{12}\right)$$

Exponential Functions in Banking - Compounding Interest

In Example 1 we found that if we borrow $10000 on student loans for college with an *annual interest rate* of 6%

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

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

In doing this, we saw that as interest accrues, we start paying interest on previously earned interest.

We called this *compound interest*

From the bank's perspective: compound interest is a good thing!

So, adding the interest to account more often than just at the end of the year means the interest is compounded more often!

What if we compound the interest each month instead of each year?

How much interest is added each month?

Since the 6% is an **annual** interest rate we don't add the full amount.

In one month, the interest is $\frac{6\%}{12}$ since one month is $\frac{1}{12}$ of a year

In other words, each month $\frac{6\%}{12} = \frac{1}{2}\%$ is earned

Using this, we can find that the amount owed after one month is:

$$P\left(\frac{1}{12}\right) = 10000 + 10000 \cdot \frac{6\%}{12} = 10000 \cdot \left(1 + \frac{6\%}{12}\right) = 10050$$

Exponential Functions in Banking - Compounding Interest

Exponential Functions in Banking - Compounding Interest

▸ In Example 1 we found that if we borrow $10000 on student loans for college with an *annual interest rate* of 6%

What if we compound the interest each month instead of each year?

In one month, the interest is $\frac{6\%}{12}$ since one month is $\frac{1}{12}$ of a year

Using this, we can find that the amount owed after one month is:

$$P\left(\frac{1}{12}\right) = 10000 + 10000 \cdot \frac{6\%}{12} = 10000 \cdot \left(1 + \frac{6\%}{12}\right) = 10050$$

Exponential Functions in Banking - Compounding Interest

In Example 1 we found that if we borrow $10000 on student loans for college with an *annual interest rate* of 6%

What if we compound the interest each month instead of each year?

In one month, the interest is $\frac{6\%}{12}$ since one month is $\frac{1}{12}$ of a year

Using this, we can find that the amount owed after one month is:

$$P\left(\frac{1}{12}\right) = 10000 + 10000 \cdot \frac{6\%}{12} = 10000 \cdot \left(1 + \frac{6\%}{12}\right) = 10050$$

What about the amount owed after 2 months?

Exponential Functions in Banking - Compounding Interest

In Example 1 we found that if we borrow $10000 on student loans for college with an *annual interest rate* of 6%

What if we compound the interest each month instead of each year?

In one month, the interest is $\frac{6\%}{12}$ since one month is $\frac{1}{12}$ of a year

Using this, we can find that the amount owed after one month is:

$$P\left(\frac{1}{12}\right) = 10000 + 10000 \cdot \frac{6\%}{12} = 10000 \cdot \left(1 + \frac{6\%}{12}\right) = 10050$$

What about the amount owed after 2 months?

$$P\left(\frac{2}{12}\right)$$

Exponential Functions in Banking - Compounding Interest

In Example 1 we found that if we borrow \$10000 on student loans for college with an *annual interest rate* of 6%

What if we compound the interest each month instead of each year?

In one month, the interest is $\frac{6\%}{12}$ since one month is $\frac{1}{12}$ of a year

Using this, we can find that the amount owed after one month is:

$$P\left(\frac{1}{12}\right) = 10000 + 10000 \cdot \frac{6\%}{12} = 10000 \cdot \left(1 + \frac{6\%}{12}\right) = 10050$$

What about the amount owed after 2 months?

$$P\left(\frac{2}{12}\right) = P\left(\frac{1}{12}\right) \cdot \left(1 + \frac{6\%}{12}\right) =$$

Exponential Functions in Banking - Compounding Interest

In Example 1 we found that if we borrow \$10000 on student loans for college with an *annual interest rate* of 6%

What if we compound the interest each month instead of each year?

In one month, the interest is $\frac{6\%}{12}$ since one month is $\frac{1}{12}$ of a year

Using this, we can find that the amount owed after one month is:

$$P\left(\frac{1}{12}\right) = 10000 + 10000 \cdot \frac{6\%}{12} = 10000 \cdot \left(1 + \frac{6\%}{12}\right) = 10050$$

What about the amount owed after 2 months?

$$P\left(\frac{2}{12}\right) = P\left(\frac{1}{12}\right) \cdot \left(1 + \frac{6\%}{12}\right) = \underbrace{10000 \cdot \left(1 + \frac{6\%}{12}\right)}_{P\left(\frac{1}{12}\right)} \cdot \left(1 + \frac{6\%}{12}\right)$$

Exponential Functions in Banking - Compounding Interest

In Example 1 we found that if we borrow $\$10000$ on student loans for college with an *annual interest rate* of 6%

What if we compound the interest each month instead of each year?

In one month, the interest is $\frac{6\%}{12}$ since one month is $\frac{1}{12}$ of a year

Using this, we can find that the amount owed after one month is:

$$P\left(\frac{1}{12}\right) = 10000 + 10000 \cdot \frac{6\%}{12} = 10000 \cdot \left(1 + \frac{6\%}{12}\right) = 10050$$

What about the amount owed after 2 months?

$$P\left(\frac{2}{12}\right) = P\left(\frac{1}{12}\right) \cdot \left(1 + \frac{6\%}{12}\right) = \underbrace{10000 \cdot \left(1 + \frac{6\%}{12}\right)}_{P\left(\frac{1}{12}\right)} \cdot \left(1 + \frac{6\%}{12}\right)$$

$$= 10000 \cdot \left(1 + \frac{6\%}{12}\right)^2$$

Exponential Functions in Banking - Compounding Interest

In Example 1 we found that if we borrow $10000 on student loans for college with an *annual interest rate* of 6%

What if we compound the interest each month instead of each year?

In one month, the interest is $\frac{6\%}{12}$ since one month is $\frac{1}{12}$ of a year

Using this, we can find that the amount owed after one month is:

$$P\left(\frac{1}{12}\right) = 10000 + 10000 \cdot \frac{6\%}{12} = 10000 \cdot \left(1 + \frac{6\%}{12}\right) = 10050$$

What about the amount owed after 2 months?

$$P\left(\frac{2}{12}\right) = P\left(\frac{1}{12}\right) \cdot \left(1 + \frac{6\%}{12}\right) = \underbrace{10000 \cdot \left(1 + \frac{6\%}{12}\right)}_{P\left(\frac{1}{12}\right)} \cdot \left(1 + \frac{6\%}{12}\right)$$

$$= 10000 \cdot \left(1 + \frac{6\%}{12}\right)^2 = 10100.25$$

Exponential Functions in Banking - Compounding Interest

In Example 1 we found that if we borrow $10000 on student loans for college with an *annual interest rate* of 6%

What if we compound the interest each month instead of each year?

In one month, the interest is $\frac{6\%}{12}$ since one month is $\frac{1}{12}$ of a year

Using this, we can find that the amount owed after one month is:

$$P\left(\frac{1}{12}\right) = 10000 + 10000 \cdot \frac{6\%}{12} = 10000 \cdot \left(1 + \frac{6\%}{12}\right) = 10050$$

What about the amount owed after 2 months?

$$P\left(\frac{2}{12}\right) = P\left(\frac{1}{12}\right) \cdot \left(1 + \frac{6\%}{12}\right) = \underbrace{10000 \cdot \left(1 + \frac{6\%}{12}\right)}_{P\left(\frac{1}{12}\right)} \cdot \left(1 + \frac{6\%}{12}\right)$$

$$= 10000 \cdot \left(1 + \frac{6\%}{12}\right)^2 = 10100.25$$

Following this pattern, after 6 months the amount owed is:

Exponential Functions in Banking - Compounding Interest

In Example 1 we found that if we borrow $\$10000$ on student loans for college with an *annual interest rate* of 6%

What if we compound the interest each month instead of each year?

In one month, the interest is $\frac{6\%}{12}$ since one month is $\frac{1}{12}$ of a year

Using this, we can find that the amount owed after one month is:

$$P\left(\frac{1}{12}\right) = 10000 + 10000 \cdot \frac{6\%}{12} = 10000 \cdot \left(1 + \frac{6\%}{12}\right) = 10050$$

What about the amount owed after 2 months?

$$P\left(\frac{2}{12}\right) = P\left(\frac{1}{12}\right) \cdot \left(1 + \frac{6\%}{12}\right) = \underbrace{10000 \cdot \left(1 + \frac{6\%}{12}\right)}_{P\left(\frac{1}{12}\right)} \cdot \left(1 + \frac{6\%}{12}\right)$$

$$= 10000 \cdot \left(1 + \frac{6\%}{12}\right)^2 = 10100.25$$

Following this pattern, after 6 months the amount owed is:

$$P\left(\frac{6}{12}\right) = 10000 \cdot \left(1 + \frac{6\%}{12}\right)^6$$

Exponential Functions in Banking - Compounding Interest

In Example 1 we found that if we borrow \$10000 on student loans for college with an *annual interest rate* of 6%

What if we compound the interest each month instead of each year?

In one month, the interest is $\frac{6\%}{12}$ since one month is $\frac{1}{12}$ of a year

Using this, we can find that the amount owed after one month is:

$$P\left(\frac{1}{12}\right) = 10000 + 10000 \cdot \frac{6\%}{12} = 10000 \cdot \left(1 + \frac{6\%}{12}\right) = 10050$$

What about the amount owed after 2 months?

$$P\left(\frac{2}{12}\right) = P\left(\frac{1}{12}\right) \cdot \left(1 + \frac{6\%}{12}\right) = \underbrace{10000 \cdot \left(1 + \frac{6\%}{12}\right)}_{P\left(\frac{1}{12}\right)} \cdot \left(1 + \frac{6\%}{12}\right)$$

$$= 10000 \cdot \left(1 + \frac{6\%}{12}\right)^2 = 10100.25$$

Following this pattern, after 6 months the amount owed is:

$$P\left(\frac{6}{12}\right) = 10000 \cdot \left(1 + \frac{6\%}{12}\right)^6 \approx 10303.76$$

Exponential Functions in Banking - Compounding Interest

In Example 1 we found that if we borrow $\$10000$ on student loans for college with an *annual interest rate* of 6%

What if we compound the interest each month instead of each year?

In one month, the interest is $\frac{6\%}{12}$ since one month is $\frac{1}{12}$ of a year

Using this, we can find that the amount owed after one month is:

$$P\left(\frac{1}{12}\right) = 10000 + 10000 \cdot \frac{6\%}{12} = 10000 \cdot \left(1 + \frac{6\%}{12}\right) = 10050$$

What about the amount owed after 2 months?

$$P\left(\frac{2}{12}\right) = P\left(\frac{1}{12}\right) \cdot \left(1 + \frac{6\%}{12}\right) = \underbrace{10000 \cdot \left(1 + \frac{6\%}{12}\right)}_{P\left(\frac{1}{12}\right)} \cdot \left(1 + \frac{6\%}{12}\right)$$

$$= 10000 \cdot \left(1 + \frac{6\%}{12}\right)^2 = 10100.25$$

Following this pattern, after 6 months the amount owed is:

$$P\left(\frac{6}{12}\right) = 10000 \cdot \left(1 + \frac{6\%}{12}\right)^6 \approx 10303.76$$

What about the amount owed after 1 year?

Exponential Functions in Banking - Compounding Interest

▸ In Example 1 we found that if we borrow \$10000 on student loans for college with an *annual interest rate* of 6%

What if we compound the interest each month instead of each year?

In one month, the interest is $\frac{6\%}{12}$ since one month is $\frac{1}{12}$ of a year

Using this, we can find that the amount owed after one month is:

$$P\left(\frac{1}{12}\right) = 10000 + 10000 \cdot \frac{6\%}{12} = 10000 \cdot \left(1 + \frac{6\%}{12}\right) = 10050$$

What about the amount owed after 2 months?

$$P\left(\frac{2}{12}\right) = P\left(\frac{1}{12}\right) \cdot \left(1 + \frac{6\%}{12}\right) = \underbrace{10000 \cdot \left(1 + \frac{6\%}{12}\right)}_{P\left(\frac{1}{12}\right)} \cdot \left(1 + \frac{6\%}{12}\right)$$

$$= 10000 \cdot \left(1 + \frac{6\%}{12}\right)^2 = 10100.25$$

Following this pattern, after 6 months the amount owed is:

$$P\left(\frac{6}{12}\right) = 10000 \cdot \left(1 + \frac{6\%}{12}\right)^6 \approx 10303.76$$

What about the amount owed after 1 year?

$$P(1) = 10000 \cdot \left(1 + \frac{6\%}{12}\right)^{12}$$

Exponential Functions in Banking - Compounding Interest

In Example 1 we found that if we borrow \$10000 on student loans for college with an *annual interest rate* of 6%

What if we compound the interest each month instead of each year?

In one month, the interest is $\frac{6\%}{12}$ since one month is $\frac{1}{12}$ of a year

Using this, we can find that the amount owed after one month is:

$$P\left(\frac{1}{12}\right) = 10000 + 10000 \cdot \frac{6\%}{12} = 10000 \cdot \left(1 + \frac{6\%}{12}\right) = 10050$$

What about the amount owed after 2 months?

$$P\left(\frac{2}{12}\right) = P\left(\frac{1}{12}\right) \cdot \left(1 + \frac{6\%}{12}\right) = \underbrace{10000 \cdot \left(1 + \frac{6\%}{12}\right)}_{P\left(\frac{1}{12}\right)} \cdot \left(1 + \frac{6\%}{12}\right)$$

$$= 10000 \cdot \left(1 + \frac{6\%}{12}\right)^2 = 10100.25$$

Following this pattern, after 6 months the amount owed is:

$$P\left(\frac{6}{12}\right) = 10000 \cdot \left(1 + \frac{6\%}{12}\right)^6 \approx 10303.76$$

What about the amount owed after 1 year?

$$P(1) = 10000 \cdot \left(1 + \frac{6\%}{12}\right)^{12} \approx 10616.78$$

Exponential Functions in Banking - Compounding Interest

▸ In Example 1 we found that if we borrow $^\$$10000 on student loans for college with an *annual interest rate* of 6%

What if we compound the interest each month instead of each year?

In one month, the interest is $\frac{6\%}{12}$ since one month is $\frac{1}{12}$ of a year

Using this, we can find that the amount owed after one month is:

$$P\left(\frac{1}{12}\right) = 10000 + 10000 \cdot \frac{6\%}{12} = 10000 \cdot \left(1 + \frac{6\%}{12}\right) = 10050$$

What about the amount owed after 2 months?

$$P\left(\frac{2}{12}\right) = P\left(\frac{1}{12}\right) \cdot \left(1 + \frac{6\%}{12}\right) = \underbrace{10000 \cdot \left(1 + \frac{6\%}{12}\right)}_{P\left(\frac{1}{12}\right)} \cdot \left(1 + \frac{6\%}{12}\right)$$

$$= 10000 \cdot \left(1 + \frac{6\%}{12}\right)^2 = 10100.25$$

Following this pattern, after 6 months the amount owed is:

$$P\left(\frac{6}{12}\right) = 10000 \cdot \left(1 + \frac{6\%}{12}\right)^6 \approx 10303.76$$

What about the amount owed after 1 year?

$$P(1) = 10000 \cdot \left(1 + \frac{6\%}{12}\right)^{12} \approx 10616.78$$

Note: Compounding yearly, the amount owed after 1 year was $^\$$10600

Exponential Functions in Banking - Compounding Interest

Exponential Functions in Banking - Compounding Interest

▸ In Example 1 we found that if we borrow $10000 on student loans for college with an *annual interest rate* of 6%

What if we compound the interest each month instead of each year?

In one month, the interest is $\frac{6\%}{12}$ since one month is $\frac{1}{12}$ of a year

Using this, we can found that:

Exponential Functions in Banking - Compounding Interest

In Example 1 we found that if we borrow $10000 on student loans for college with an *annual interest rate* of 6%

What if we compound the interest each month instead of each year?

In one month, the interest is $\frac{6\%}{12}$ since one month is $\frac{1}{12}$ of a year

Using this, we can found that:

$$P\left(\frac{1}{12}\right) = 10000 \cdot \left(1 + \frac{6\%}{12}\right) = 10050$$

Exponential Functions in Banking - Compounding Interest

In Example 1 we found that if we borrow \$10000 on student loans for college with an *annual interest rate* of 6%

What if we compound the interest each month instead of each year?

In one month, the interest is $\frac{6\%}{12}$ since one month is $\frac{1}{12}$ of a year

Using this, we can found that:

$P\left(\frac{1}{12}\right) = 10000 \cdot \left(1 + \frac{6\%}{12}\right) = 10050$

$P\left(\frac{2}{12}\right) = 10000 \cdot \left(1 + \frac{6\%}{12}\right)^2 \approx 10303.76$

Exponential Functions in Banking - Compounding Interest

▸ In Example 1 we found that if we borrow $10000 on student loans for college with an *annual interest rate* of 6%

What if we compound the interest each month instead of each year?

In one month, the interest is $\frac{6\%}{12}$ since one month is $\frac{1}{12}$ of a year

Using this, we can found that:

$$P\left(\frac{1}{12}\right) = 10000 \cdot \left(1 + \frac{6\%}{12}\right) = 10050$$

$$P\left(\frac{2}{12}\right) = 10000 \cdot \left(1 + \frac{6\%}{12}\right)^2 \approx 10303.76$$

$$P(1) = 10000 \cdot \left(1 + \frac{6\%}{12}\right)^{12} \approx 10616.78$$

Exponential Functions in Banking - Compounding Interest

▸ In Example 1 we found that if we borrow $10000 on student loans for college with an *annual interest rate* of 6%

What if we compound the interest each month instead of each year?

In one month, the interest is $\frac{6\%}{12}$ since one month is $\frac{1}{12}$ of a year

Using this, we can found that:

$$P\left(\frac{1}{12}\right) = 10000 \cdot \left(1 + \frac{6\%}{12}\right) = 10050$$

$$P\left(\frac{2}{12}\right) = 10000 \cdot \left(1 + \frac{6\%}{12}\right)^2 \approx 10303.76$$

$$P(1) = 10000 \cdot \left(1 + \frac{6\%}{12}\right)^{12} \approx 10616.78$$

Since interest is compounded every month, it is compounded 12 times each year.

Exponential Functions in Banking - Compounding Interest

In Example 1 we found that if we borrow \$10000 on student loans for college with an *annual interest rate* of 6%

What if we compound the interest each month instead of each year?

In one month, the interest is $\frac{6\%}{12}$ since one month is $\frac{1}{12}$ of a year

Using this, we can found that:

$$P\left(\frac{1}{12}\right) = 10000 \cdot \left(1 + \frac{6\%}{12}\right) = 10050$$

$$P\left(\frac{2}{12}\right) = 10000 \cdot \left(1 + \frac{6\%}{12}\right)^2 \approx 10303.76$$

$$P(1) = 10000 \cdot \left(1 + \frac{6\%}{12}\right)^{12} \approx 10616.78$$

Since interest is compounded every month, it is compounded 12 times each year.

After t years interest compounds $12t$ times

Exponential Functions in Banking - Compounding Interest

In Example 1 we found that if we borrow $\$10000$ on student loans for college with an *annual interest rate* of 6%

What if we compound the interest each month instead of each year?

In one month, the interest is $\frac{6\%}{12}$ since one month is $\frac{1}{12}$ of a year

Using this, we can found that:

$$P\left(\frac{1}{12}\right) = 10000 \cdot \left(1 + \frac{6\%}{12}\right) = 10050$$

$$P\left(\frac{2}{12}\right) = 10000 \cdot \left(1 + \frac{6\%}{12}\right)^2 \approx 10303.76$$

$$P(1) = 10000 \cdot \left(1 + \frac{6\%}{12}\right)^{12} \approx 10616.78$$

Since interest is compounded every month, it is compounded 12 times each year.

After t years interest compounds $12t$ times

In General: the amount of money owed after t years is given by:

Exponential Functions in Banking - Compounding Interest

In Example 1 we found that if we borrow $\$10000$ on student loans for college with an *annual interest rate* of 6%

What if we compound the interest each month instead of each year?

In one month, the interest is $\frac{6\%}{12}$ since one month is $\frac{1}{12}$ of a year

Using this, we can found that:

$$P\left(\frac{1}{12}\right) = 10000 \cdot \left(1 + \frac{6\%}{12}\right) = 10050$$

$$P\left(\frac{2}{12}\right) = 10000 \cdot \left(1 + \frac{6\%}{12}\right)^2 \approx 10303.76$$

$$P(1) = 10000 \cdot \left(1 + \frac{6\%}{12}\right)^{12} \approx 10616.78$$

Since interest is compounded every month, it is compounded 12 times each year.

After t years interest compounds $12t$ times

In General: the amount of money owed after t years is given by:

$$P(t) = 10000 \cdot \left(1 + \frac{6\%}{12}\right)^{12t}$$