**1.3 Compound Interest**

**By the end of the lesson you will be able to:**

* Define *compound interest*
* Calculate the interest earned and future value for investments with compound interest compounded semi-annually, quarterly and monthly.
* Use the “Rule of 72” to estimate doubling time

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**Compound** **interest** is the amount of interest earned or paid on both the \_\_\_\_\_\_\_\_\_\_\_\_\_ and the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

Recall, **simple interest** was only calculated based on the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

Investments can compound with different frequency:

* Annual (\_\_\_\_\_ time a year)

* semi-annually (\_\_\_\_\_ times a year)

* quarterly (\_\_\_\_\_ times a year)

* monthly (\_\_\_\_\_\_\_ times a year)

We can use our formula for finding the compound interest future value:

$$ A=P(1+\frac{r}{n})^{nt}$$

**Example #1**

Nathan invested $3000 at 1.5% interest compounded annually. How much money will he have after a 5 year term?

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**Comparing Interest on investments with different compounding periods**

**Example 2**

Bob invests $15,000 at 4.7% interest, compounded semi-annually, for 10 years.

How much is Bob’s investment worth after 10 years?

What if Bob investment had compounded quarterly, how much would his future value be the end of the term?

If it compounded monthly, what would his future value be at maturity?

What do you notice?

The **Rule of 72** is a simple formula for estimate the doubling time of an investment.

$$Approximate Doubling Time= \frac{72}{interest rate (as a \%)}$$

**Example 3**

Jake invests $540 at 4.5% compounded annually. **Estimate** the time it takes his investment to double.

How much is actually earned after this many years?

Actual doubling time:

$$1080=540 (1+0.045)^{n}$$

$$2=(1.045)^{n}$$

$$n=15.75$$

**Example 3**

Mary invests $600 at 3% compounded annually. Estimate the time it takes her investment to double.

How much is actually earned after this many years?

Practice:

