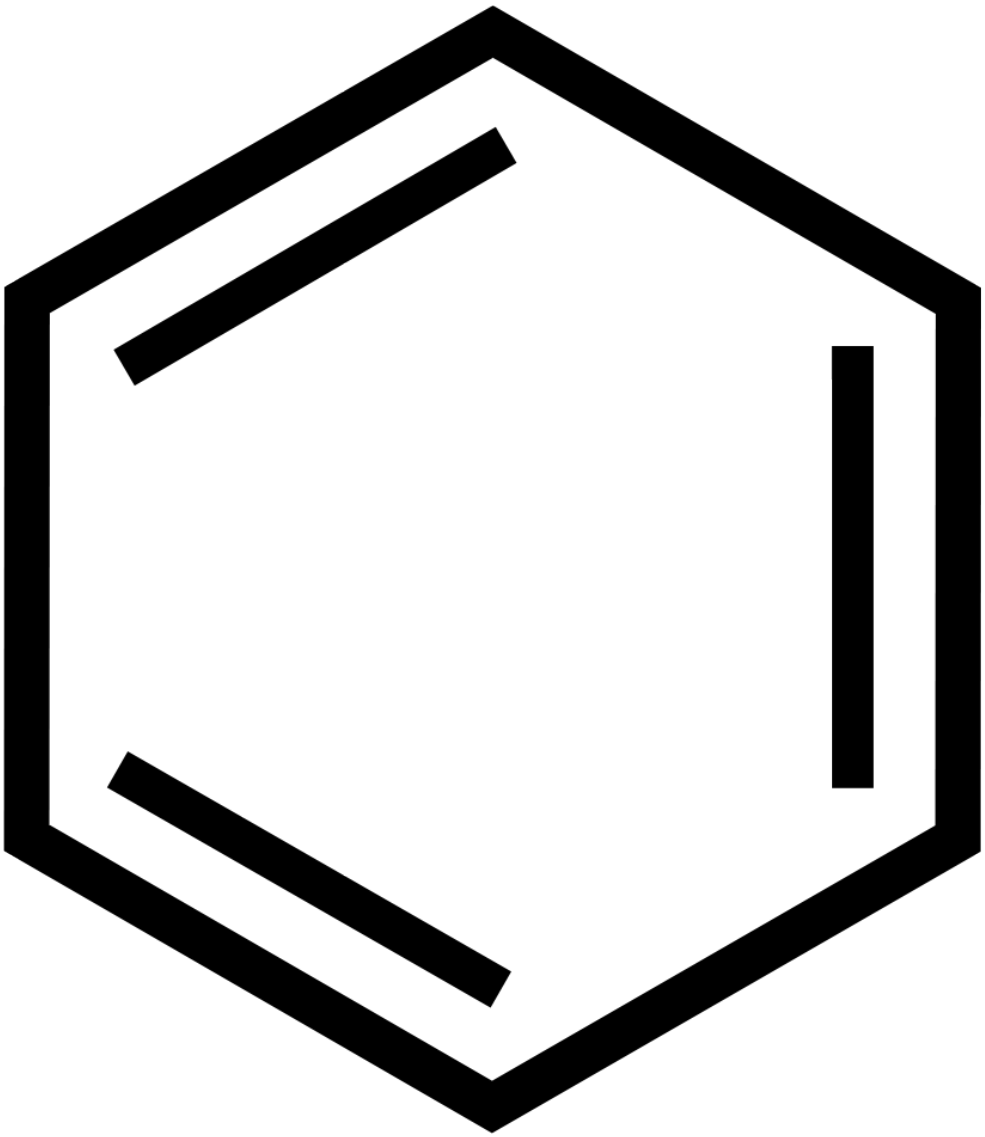

CLUTCH

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CONCEPT: TIME VALUE OF MONEY EQUATIONS

PRE-TEST: It's my money and I want it _____! a) Now b) Some other time

● A dollar ***today*** is worth more than a dollar ***tomorrow***. The two main concepts in Time Value of Money (TVM) are:

- □ _____: Taking current money and earning _____ as time passes into the future
- □ _____: Taking a future sum of money and removing _____ to find its value today

● ***Timelines*** are a helpful tool to visualize the timing of cash flows at different points in time:

EXAMPLE: Today, you invest **$100** at Clutch Bank at a **10%** interest rate for **three years**.

The Time Value of Money Equation:

$FV = PV * (1 + r)^n$
● FV = _____ = The value of a current amount of money at a future date
● PV = _____ = The current value of a sum of money (i.e. the PV of $1,000 today is $1,000)
● r = _____ = The _____ interest rate expressed as a decimal
● n = _____ = The amount of time passing between the PV and FV

PRACTICE: The formula $FV = PV * (1 + r)^n$ is best used for:

a) Compounding
b) Discounting
c) Rebounding
d) Converting

PRACTICE: You invest $4,545 in Clutch Bank today earning a juicy 10% annual interest. What is the value of your investment in one year? What is the value of the investment after two years?

- Using a little bit of algebra, we can rearrange the time value of money formula:

$$FV = PV * (1 + r)^n$$

PRACTICE: The formula $PV = \frac{FV}{(1+r)^n}$ is best used for:

a) Compounding
b) Discounting
c) Rebounding
d) Converting

PRACTICE: You are saving up $12,000 for a luxurious European vacation two years from now. How much money would you need to invest today at Clutch Bank, earning their juicy 10% annual interest, to have enough for your vacation?

How much would you need to invest today, if instead you could only earn 6% interest?

- The formulas we have used so far are for finding the value of a _____ of money.
  - □ _____: Payments of the same amount of money at regular intervals (i.e. annually)
  - □ The formulas for calculating PV and FV of an annuity are beyond the scope of this course.
    - We use PV and FV tables to find the values of lump-sums and annuities.

EXAMPLE: You have reached retirement and have earned a pension that will pay you $10,000 annually for the next five years. Visualize this information on a timeline.

PRACTICE: Today, you purchased a $1,000 bond that matures in 5 years. The bond pays annual interest of 10%. Visualize these cash flows on a timeline.

CONCEPT: USING TIME VALUE OF MONEY TABLES

- We use tables to help expedite the calculation of present value and future value of sums of money
  - In this course, we are concerned with finding the present value of future sums of money
  - Specifically, we focus on finding the present value of future interest and principal payments on bonds payable

Present Value of Lump Sum	$PV\ of\ Lump\ Sum = \frac{FV}{(1+r)^n} = FV * (PV\ Factor)$
Present Value of Annuity	$PV\ of\ Annuity = Annuity\ Payment * (PV\ Factor)$

EXAMPLE: Your grandmother is giving you a graduation gift, but has given you two options.

1. She will give you $5,000 one year from now
2. She will give you $1,000 per year for the next six years, the first payment occurs one year from now.

Assuming the interest rate is 10%, which is the better option?

PRACTICE: You have won the lottery! You are given two options for your payout:

1. You can receive $540,000 today
2. You can receive $50,000 annually each year for the next twenty years

Assuming the interest rate is 6%, which is the better option?

- A bond has two cash flow streams:
  - □ Annual (or semi-annual) interest payments are an _____
  - □ The principal payment at maturity is a _____
- Bonds also have two important interest rates:
  - □ The _____ interest rate is used to calculate actual cash payments of interest
  - □ The _____ interest rate is used to calculate the selling price of the bonds and interest expense
  - □ NOTE: If bonds pay interest semi-annually, you must do the following before using the PV tables:
    - Divide the interest rates by _____
    - Multiply the number of years by _____

EXAMPLE: Your Company, Inc. issues $100,000 of 10% bonds due in 10 years. The bonds pay interest semi-annually and the current market rate of interest is 8%. What is the present value (current selling price) of the bonds?

PRACTICE: ABC Company issues 1,000 bonds with a face value of $1,000 maturing in eight years. The bonds pay 8% interest semi-annually and the current market rate of interest is 12%. What is the total amount of cash received from the bond issuance?

Present Value of $1									
Periods	4%	5%	6%	7%	8%	10%	12%	14%	16%
1	0.962	0.952	0.943	0.935	0.926	0.909	0.893	0.877	0.862
2	0.925	0.907	0.890	0.873	0.857	0.826	0.797	0.769	0.743
3	0.889	0.864	0.840	0.816	0.794	0.751	0.712	0.675	0.641
4	0.855	0.823	0.792	0.763	0.735	0.683	0.636	0.592	0.552
5	0.822	0.784	0.747	0.713	0.681	0.621	0.567	0.519	0.476
6	0.790	0.746	0.705	0.666	0.630	0.564	0.507	0.456	0.410
7	0.760	0.711	0.665	0.623	0.583	0.513	0.452	0.400	0.354
8	0.731	0.677	0.627	0.582	0.540	0.467	0.404	0.351	0.305
9	0.703	0.645	0.592	0.544	0.500	0.424	0.361	0.308	0.263
10	0.676	0.614	0.558	0.508	0.463	0.386	0.322	0.270	0.227
11	0.650	0.585	0.527	0.475	0.429	0.350	0.287	0.237	0.195
12	0.625	0.557	0.497	0.444	0.397	0.319	0.257	0.208	0.168
13	0.601	0.530	0.469	0.415	0.368	0.290	0.229	0.182	0.145
14	0.577	0.505	0.442	0.388	0.340	0.263	0.205	0.160	0.125
15	0.555	0.481	0.417	0.362	0.315	0.239	0.183	0.140	0.108
16	0.534	0.458	0.394	0.339	0.292	0.218	0.163	0.123	0.093
17	0.513	0.436	0.371	0.317	0.270	0.198	0.146	0.108	0.080
18	0.494	0.416	0.350	0.296	0.250	0.180	0.130	0.095	0.069
19	0.475	0.396	0.331	0.277	0.232	0.164	0.116	0.083	0.060
20	0.456	0.377	0.312	0.258	0.215	0.149	0.104	0.073	0.051

Present Value of Ordinary Annuity of $1									
Periods	4%	5%	6%	7%	8%	10%	12%	14%	16%
1	0.962	0.952	0.943	0.935	0.926	0.909	0.893	0.877	0.862
2	1.886	1.859	1.833	1.808	1.783	1.736	1.690	1.647	1.605
3	2.775	2.723	2.673	2.624	2.577	2.487	2.402	2.322	2.246
4	3.630	3.546	3.465	3.387	3.312	3.170	3.037	2.914	2.798
5	4.452	4.329	4.212	4.100	3.993	3.791	3.605	3.433	3.274
6	5.242	5.076	4.917	4.767	4.623	4.355	4.111	3.889	3.685
7	6.002	5.786	5.582	5.389	5.206	4.868	4.564	4.288	4.039
8	6.733	6.463	6.210	5.971	5.747	5.335	4.968	4.639	4.344
9	7.435	7.108	6.802	6.515	6.247	5.759	5.328	4.946	4.608
10	8.111	7.722	7.360	7.024	6.710	6.145	5.650	5.216	4.833
11	8.760	8.306	7.887	7.499	7.139	6.495	5.938	5.453	5.029
12	9.385	8.863	8.384	7.943	7.536	6.814	6.194	5.660	5.197
13	9.986	9.394	8.853	8.358	7.904	7.103	6.424	5.842	5.342
14	10.563	9.899	9.295	8.745	8.244	7.367	6.628	6.002	5.468
15	11.118	10.380	9.712	9.108	8.559	7.606	6.811	6.142	5.575
16	11.652	10.838	10.106	9.447	8.851	7.824	6.974	6.265	5.669
17	12.166	11.274	10.477	9.763	9.122	8.022	7.120	6.373	5.749
18	12.659	11.690	10.828	10.059	9.372	8.201	7.250	6.467	5.818
19	13.134	12.085	11.158	10.336	9.604	8.365	7.366	6.550	5.877
20	13.590	12.462	11.470	10.594	9.818	8.514	7.469	6.623	5.929