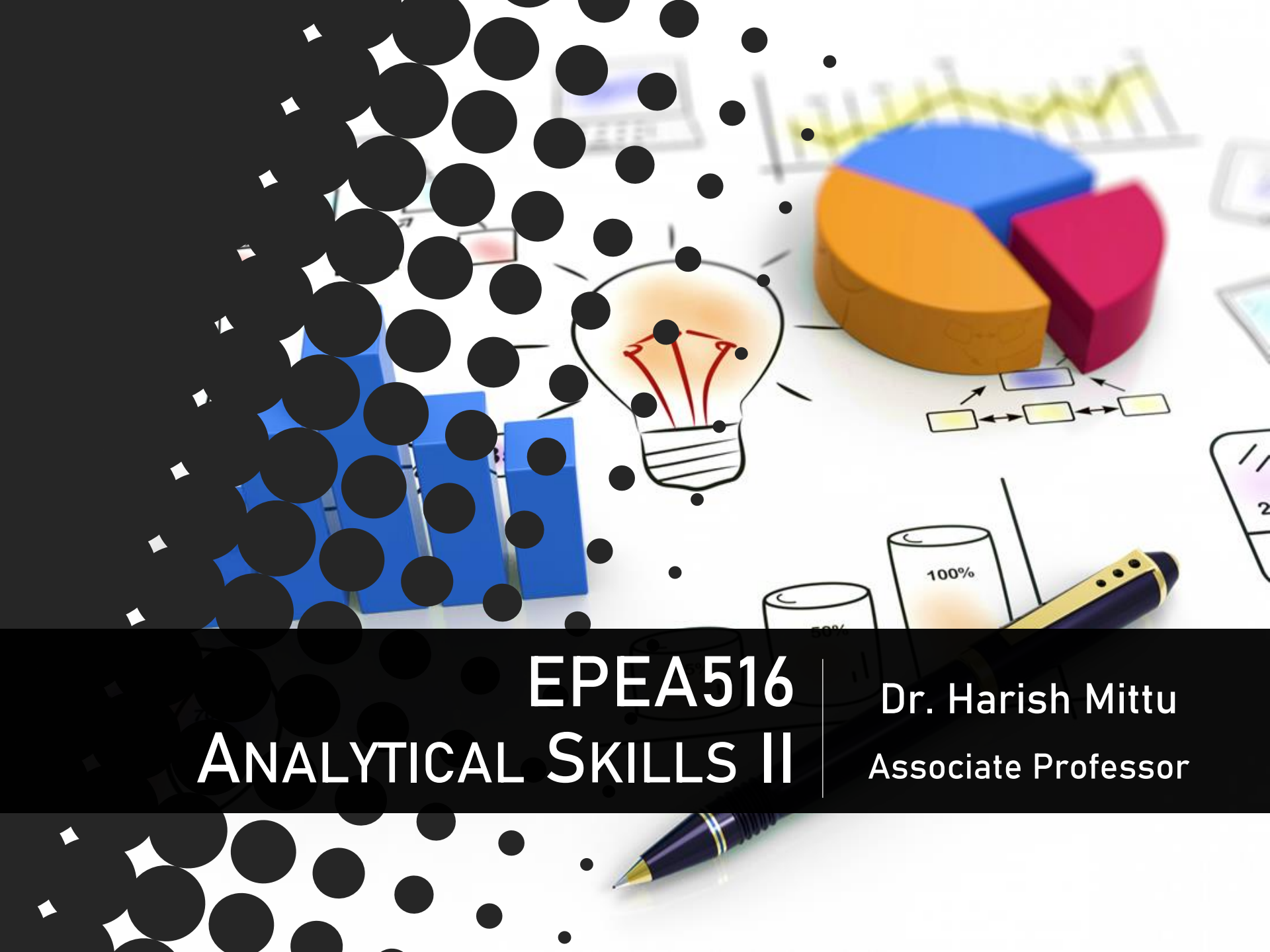

EPEA516
Analytical Skills II

Dr. Harish Mittu
Associate Professor

Learning Outcomes

After this lecture, you will be able to

- solve problems based on compound interest computation.

Problem 1

- How much compound interest will be obtained on Rs.8,000 at the interest rate of 5 % p.a. after 2 years?
- P = Rs. 8,000
- R = 5 % p.a.
- n = 2 years
- A = ? and C.I. = ?
- $A = P\left[1 + \frac{R}{100}\right]^{n}$

Problem 1

- P = Rs. 8,000; R = 5 % p.a.; n = 2 years; A = ? and C.I. = ?
- $A = P\left[1 + \frac{R}{100}\right]^{n}$
- $A = 8000 \times \left[1 + \frac{\cancel{5}}{\cancel{100}\ 20}\right]^{2}$
- $A = 8000 \times \left\{\left[1 + \frac{1}{20}\right]^{2}\right\}$
- $A = 8000 \times \left\{\left[\frac{20+1}{20}\right]^{2}\right\}$

Problem 1

- $A = 8000 \times \left\{ \left[\frac{20 + 1}{20} \right]^2 \right\}$
- $A = 8000 \times \left\{ \left[\frac{\overset{1.05}{\cancel{21}}}{\cancel{20}} \right]^2 \right\}$
- $A = 8000 \times \{[1.05]^2\}$
- $A = 8000 \times \{1.1025\}$
- A =Rs. 8,820
- C.I. = A – P
- C.I. = 8,820 – 8,000 = Rs. 820

Problem 2

- Find compound interest on Rs. 3,000 at 5% p.a. for 2years compounded annually.
- P = Rs. 3,000
- R = 5% p.a.
- n = 2 years
- C.I. = ?
- $C.I. = P\left\{\left[1 + \frac{R}{100}\right]^{n} - 1\right\}$

Problem 2

- P = Rs. 3,000, R = 5% p.a., n = 2 years, and C.I. = ?
- $C.I. = P\left\{\left[1 + \frac{R}{100}\right]^{n} - 1\right\}$
- $C.I. = 3000 \times \left\{\left[1 + \frac{5}{100}\right]^{2} - 1\right\}$
- $C.I. = 3000 \times \left\{\left[1 + \frac{1}{20}\right]^{2} - 1\right\}$
- $C.I. = 3000 \times \left\{\left[\frac{20+1}{20}\right]^{2} - 1\right\}$

Problem 2

- C.I. = 3000 x $\left\{\left[\frac{20+1}{20}\right]^2 - 1\right\}$
- C.I. = 3000 x $\left\{\left[\frac{\overset{1.05}{\cancel{21}}}{\cancel{20}}\right]^2 - 1\right\}$
- C.I. = 3000 x $\{[1.05]^2 - 1\}$
- C.I. = 3000 x $\{1.1025 - 1\}$
- C.I. = 3000 x $\{0.1025\}$
- C.I. = $\overset{3}{\cancel{3000}}$ x $\left\{\frac{1025}{\cancel{10000}}\right\}_{10}$
- C.I. = Rs. 307.5

Problem 3

- Find the compound interest on Rs. 4,000 at 10% p.a. for 2years 6 months, compounded annually.
- P = Rs. 4,000
- R = 10 % p.a.
- $n\frac{1}{m}$ = 2 years 6 months = $2\frac{\cancel{6}}{\cancel{12}_{2}}$ years = $2\frac{1}{2}$ years
- C.I. = ?
- $\text{C.I.} = P\left\{\left[1+\frac{R}{100}\right]^{n} \times \left[1+\frac{\frac{1}{m}R}{100}\right] - 1\right\}$

Problem 3

- P = Rs. 4,000, R = 10 % p.a.,n $\frac{1}{m}$ = 2 $\frac{1}{2}$ years, and C.I. = ?

- $C.I. = P\left\{\left[1 + \frac{R}{100}\right]^{n} \times \left[1 + \frac{\frac{1}{m}R}{100}\right] - 1\right\}$

- $C.I. = 4000 \times \left\{\left[1 + \frac{10}{100}\right]^{2} \times \left[1 + \frac{\frac{1}{2} \times 10}{100}\right] - 1\right\}$

  (10 and 20)

- $C.I. = 4000 \times \left\{\left[1 + \frac{1}{10}\right]^{2} \times \left[1 + \frac{1}{20}\right] - 1\right\}$

Problem 3

- $\text{C.I.} = 4000 \times \left\{ \left[1 + \frac{1}{10} \right]^2 \times \left[1 + \frac{1}{20} \right] - 1 \right\}$
- $\text{C.I.} = 4000 \times \left\{ \left[\frac{10 + 1}{10} \right]^2 \times \left[\frac{20 + 1}{20} \right] - 1 \right\}$
- $\text{C.I.} = 4000 \times \left\{ \left[\frac{11}{10} \right]^2 \times \left[\frac{21}{20} \right] - 1 \right\}$
- $\text{C.I.} = 4000 \times \left\{ \frac{121}{100} \times \frac{21}{20} - 1 \right\}$

Problem 3

- C.I. = $4000 \times \left\{\frac{121}{100} \times \frac{21}{20} - 1\right\}$
- C.I. = $4000 \times \left\{\frac{121}{100} \times \frac{21}{20} - 1\right\}$
- C.I. = $4000 \times \left\{\frac{2541}{2000} - 1\right\}$ (1.2705)
- C.I. = $4000 \times \{1.2705 - 1\}$
- C.I. = $4000 \times \{0.2705\}$
- C.I. = Rs. 1,082

Problem 4

- Find compound interest on Rs. 5,000 at 4% p.a. for 2 years compounded half-yearly.
- P = Rs. 5,000
- R = 4 % p.a. or $\frac{R}{2} = \frac{4}{2}$ % half-yearly =2% half-yearly
- n = 2 years (4 half years)
- C.I. = ?
- C.I. = $P\left\{\left[1+\frac{\frac{R}{2}}{100}\right]^{2n} - 1\right\}$

Problem 4

- P = Rs. 5,000, $\frac{R}{2}$ = 2, 2n = 4, & C.I. = ?
- $C.I. = P\left\{\left[1 + \frac{\frac{R}{2}}{100}\right]^{2n} - 1\right\}$
- $C.I. = 5000 \times \left\{\left[1 + \frac{\cancel{2}}{\cancel{100}\ 50}\right]^{4} - 1\right\}$
- $C.I. = 5000 \times \left\{\left[1 + \frac{1}{50}\right]^{4} - 1\right\}$

Problem 4

- C.I. = 5000 x $\left\{\left[1+\frac{1}{50}\right]^{4}-1\right\}$
- C.I. = 5000 x $\left\{\left[\frac{50+1}{50}\right]^{4}-1\right\}$
- C.I. = 5000 x $\left\{\left[\frac{\overset{1.02}{\cancel{51}}}{\cancel{50}}\right]^{4}-1\right\}$
- C.I. = 5000 x$\{[1.02\ ]^{4}-1\}$
- C.I. = 5000 x$\{1.082-1\}$

Problem 4

- C.I. = 5000 x{1.082– 1}
- C.I. = 5000 x{0.082}
- C.I. = Rs. 410

Problem 5

- Compute the compound interest on Rs. 3,000 at 20% p.a. compounded quarterly for 1 year.
- P = Rs. 3,000
- R = 20 % p.a. compounded quarterly
- n = 1 year (4 quarters)
- C.I. = ?
- $\text{C.I.} = P\left\{\left[1 + \frac{\frac{R}{4}}{100}\right]^{4n} - 1\right\}$

Problem 5

- P = Rs. 3,000, R = 20, 4n = 4 x 1 = 4, C.I. = ?
- $\text{C.I.} = P\left\{\left[1 + \frac{\frac{R}{4}}{100}\right]^{4n} - 1\right\}$
- $\text{C.I.} = 3000 \times \left\{\left[1 + \frac{\frac{\cancel{20}^{5}}{\cancel{4}}}{\cancel{100}_{20}}\right]^{4} - 1\right\}$
- $\text{C.I.} = 3000 \times \left\{\left[1 + \frac{1}{20}\right]^{4} - 1\right\}$

Problem 5

- C.I. = 3000 x $\left\{\left[1+\frac{1}{20}\right]^{4}-1\right\}$
- C.I. = 3000 x $\left\{\left[\frac{20+1}{20}\right]^{4}-1\right\}$
- C.I. = 3000 x $\left\{\left[\frac{\cancel{21}}{\cancel{20}}\right]^{4}-1\right\}$ (1.05)
- C.I. = 3000 x $\{[1.05]^{4}-1\}$
- C.I. = 3000 x $\{1.22-1\}$

Problem 5

- C.I. = 3000 x {1.22 – 1}
- C.I. = 3000 x {0.22}
- C.I. = Rs. 660

Problem 6

- Compute the compound interest on Rs. 12000 at 16% p.a. for 9 months, compounded quarterly.
- P = Rs. 12000
- n = 9 months = 3 quarters
- R = 16% p.a. compounded quarterly
- C.I. = ?
- $\text{C.I.} = P\left\{\left[1 + \frac{\frac{R}{4}}{100}\right]^{n} - 1\right\}$

Problem 6

- P = Rs. 12000, n = 3 quarters, $\frac{R}{4} = \frac{16}{4}$, and C.I. = ?

- C.I. = $P\left\{\left[1 + \frac{\frac{R}{4}}{100}\right]^{n} - 1\right\}$

- C.I. = $12000 \times \left\{\left[1 + \frac{\frac{16}{4}}{100}\right]^{3} - 1\right\}$

- C.I. = $12000 \times \left\{\left[1 + \frac{1}{25}\right]^{3} - 1\right\}$

Problem 6

- C.I. = 12000 x $\left\{\left[1+\frac{1}{25}\right]^{3}-1\right\}$
- C.I. = 12000 x $\left\{\left[\frac{26}{25}\right]^{3}-1\right\}$
- C.I. = 12000 x $\{[1.04]^{3}-1\}$
- C.I. = 12000 x $\{1.12-1\}$
- C.I. = 12000 x $\{0.12\}$ = Rs. 1,440

Problem 7

- Harish invests Rs. 5,000 in a bond which gives interest at 2% p.a. during the first year, 5% p.a. during the second year and 10% p.a. during the third year. Calculate compound interest.
- P = Rs. 5,000
- R_1 = 2% p.a.
- R_2 = 5% p.a.
- R_3 = 10% p.a.
- C.I. = ?

Problem 7

- P = Rs. 5,000; R_1 = 2% p.a.; R_2 = 5% p.a.; R_3 = 10% p.a. & C.I. = ?
- $C.I. = P\left\{\left[1+\frac{R_1}{100}\right] x \left[1+\frac{R_2}{100}\right] x \left[1+\frac{R_3}{100}\right] - 1\right\}$
- $C.I. = 5000 \times \left\{\left[1+\frac{\cancel{2}}{\cancel{100}_{50}}\right] x \left[1+\frac{\cancel{5}}{\cancel{100}_{20}}\right] x \left[1+\frac{\cancel{10}}{\cancel{100}_{10}}\right] - 1\right\}$
- $C.I. = 5000 \times \left\{\left[1+\frac{1}{50}\right] x \left[1+\frac{1}{20}\right] x \left[1+\frac{1}{10}\right] - 1\right\}$

Problem 7

- C.I. = 5000 x $\left\{\left[1+\frac{1}{50}\right] x \left[1+\frac{1}{20}\right] x \left[1+\frac{1}{10}\right] - 1\right\}$
- C.I. = 5000 x $\left\{\left[\frac{50+1}{50}\right] x \left[\frac{20+1}{20}\right] x \left[\frac{10+1}{10}\right] - 1\right\}$
- C.I. = 5000 x $\left\{\left[\frac{51}{50}\right] x \left[\frac{21}{20}\right] x \left[\frac{11}{10}\right] - 1\right\}$
- C.I. = 5000 x $\left\{\left[\frac{11781}{10000}\right] - 1\right\}$
- C.I. = 5000 x $\{1.1781 - 1\}$

Problem 7

- C.I. = 5000 x {1.1781– 1}
- C.I. = 5000 x {0.1781}
- C.I. = Rs. 890.50

Conclusion

- C.I. = A – P
- When interest is compounded annually
  - $C.I. = P\left\{\left[1 + \frac{Rate}{100}\right]^{n} - 1\right\}$
- When interest is compounded annually but time is in fraction, $n\frac{1}{m}$ years.
  - $C.I. = P\left\{\left[1 + \frac{R}{100}\right]^{n} \times \left[1 + \frac{\frac{1}{m}R}{100}\right] - 1\right\}$

Conclusion

- When interest is compounded Half-yearly
- $$C.I. = P\left\{\left[1 + \frac{\frac{R}{2}}{100}\right]^{2n} - 1\right\}$$
- When interest is compounded Quarterly
- $$C.I. = P\left\{\left[1 + \frac{\frac{R}{4}}{100}\right]^{4n} - 1\right\}$$

Conclusion

- When rates are different for different years
  - $$C.I. = P\left\{\left[1+\frac{R_1}{100}\right] x \left[1+\frac{R_2}{100}\right] x \left[1+\frac{R_3}{100}\right] x \ \ldots - 1\right\}$$

Summary

- Computation of Compound Interest

That’s all for now…