Topic 8

ANNUITY

Contents of This Topic

Learning Outcome

Explain the term ordinary annuity certain.

Calculate the future value of annuity, S

Calculate the present value of annuity, A

Solve for annuity payment/savings, R

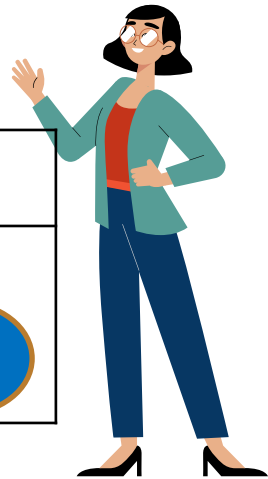
Introduction

01

Introduction

An annuity is a **series** of (usually) **equal payments/savings** made at (usually) **equal** intervals of **time**.

Compounded Interest	Annuity
P → S	R + R + R + ….+ R → S



Introduction

Differentiate the questions below:

1. Zaharah invested RM500 at simple interest rate of 9% per annum. Find the amount in the account after 4 years.

2. Zaharah invested RM500 at an interest rate of 9% compounded monthly. Find the amount in the account after 4 years.

3. Zaharah invested RM500 every month at an interest rate of 9% compounded monthly. Find the amount in the account after 4 years.

Future Value, S

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8.2 Future Value, S

$$i = \frac{k}{m}, \qquad n = mt$$

$$S = R\left[\frac{(1+i)^n - 1}{i}\right]$$

periodic payments/savings

- k= Annual nominal rate, %
- m= Frequency of conversion, m
- t=Time in year
- i=k/m = Periodic interest rate,
- n=mt = Number of interest period,

$$I = S - nR$$

Example 1

Zaharah invested RM500 every month at an interest rate of 9% compounded monthly. Find the amount in the account after 4 years.

$$S = R\left[\frac{(1+i)^n - 1}{i}\right]$$

Example 2

Mr Hariths plan to invest RM300 at the end of each year for 12 years in a saving account. If the account pays 8% compounded annually, how much will he have at the end of the 12 years? (Ans:RM5693.14)

$$S = R\left[\frac{(1+i)^n - 1}{i}\right]$$

Example 3

Sally decided to invest in an investment scheme which pays 10% compounded semi-annually. She invested RM1200 every six month.

a. How much is her investment for the next 15 years. (Ans:RM79726.62)

$$S = R\left[\frac{(1+i)^n - 1}{i}\right]$$

b. Calculate the interest earned.

$$I = S - nR$$

Exercise

1.Every three months Saiful saves the RM100 money he gets from MARA into BSN. The bank gives interest 6.5% compounded quarterly. How much will be in his account at the end of his three years studies at KPTM?

2. RM1000 was invested every six month in an account that pays 10% compounded semiannually for 8 years. Calculate the amount in the account after 8 years.

3. RM200 is deposited every month for 2 years 6 months at 10% compounded monthly. What is the future value of his annuity at the end of the investment period?

4. In order to save for a new car, Adam decide to put RM150 every 3 month in a saving account that pays interest at an annual rate of 8% compounded quarterly. How much will Adam have at the end of 5 years?

03

Present Value, A

8.3 Present Value, A

$$A = R\left[\frac{1-(1+i)^{-n}}{i}\right]$$

periodic payments/savings

$$I = nR - A$$

Example 4

What is the present value of an annuity if the size of each payment is RM300 payable at the end of each quarter for 5 years and interest rate is 4% compounded quarterly? (Ans: RM5413.67)

$$A = R\left[\frac{1-(1+i)^{-n}}{i}\right]$$

Example 5

Danial won an annuity that's pays RM1000 every 2 months for 3 years. What is the present value of this annuity if money is worth 16% compounded every 2 months.

$$A = R\left[\frac{1-(1+i)^{-n}}{i}\right]$$

Example 6

Afiq has to pay RM300 every month for 7 years to settle a loan at 12% compounded monthly.

a. What is the original value of the loan?

$$A = R\left[\frac{1-(1+i)^{-n}}{i}\right]$$

b. how much interest that have been charge to Afiq?

$$I = nR - A$$

Exercise

1. Pn. Maria has to pay RM1250 every month for 300 months to settle the housing loan at 4.5% compounded monthly. What is the original value of the loan.

2. Syifa has to pay RM200 every 3 month for 3 years to settle a loan at 4% compounded quarterly. What is the original value of the loan.

3. Farid has to pay RM880 every month for 9 years to settle a car loan at 6%compounded monthly. Find the original value of the loan and the total interest he has to pay.

The periodic payment, R

04

The periodic payment, R

Present Value, A

$$A = R\left[\frac{1-(1+i)^{-n}}{i}\right]$$

$$I = nR - A$$

Future Value, S

$$S = R\left[\frac{(1+i)^{n}-1}{i}\right]$$

$$I = S - nR$$

Example 7

Find the amount to be invested every three months at 10% compounded quarterly to accumulate RM10000 in three years.

(Ans: RM724.87)

Example 8

Fizo deposits RM20,000 now in bank that pays 14% compounded every 2 months. He intends to withdraw an equal amount every 2 months for 4 years. After the last withdrawal, his account will be empty. What is the size of these withdrawals? (Ans: RM1097.97)

Example 9

Rose borrow RM80,000 at 12% compounded monthly for three years. Find her monthly payment.

Example 10

Farish purchased an apartment costing RM120,000 and has made a down payment of RM10,000. The balance is financed through a bank which charges 9% interest compounded monthly for 25 years.

a. What is the loan amount?

b. Find his monthly payment

THANKS !