UniKL
UNIVERSITI
KUALA LUMPUR

MARA
Education
Group

Universiti Kuala Lumpur Malaysia France Institute (UniKL MFI), Malaysia

in collaboration with

Faculty of Engineering,Universitas Muhammadiyah Magelang (UNIMMA), Indonesia

Virtual Mobility Programme "Entrepreneurship: Theory and Practice"

Cost Analysis

Table of Content

- Brief of Technopreneur
- Cost Analysis: Cashflow & Time series of money
- Choose a business

Brief of technopreneur

Term of technopreneur

Technology + **Entrepreneur**

Technology:
The application of scientific knowledge for practical purposes in industry or society

Entrepreneur:
A person who organizes and operates a business, taking on greater than normal financial risks

Term of technopreneur

Someone who takes advantage of the **latest technological developments** to be optimized as a basis for developing a **business**.

Someone who manages **technology-based businesses**.

Competition in technology development and invention

Risk

Term of technopreneur

Someone who has an entrepreneurial spirit is able to present technological engineering products, not only beneficial to the community but also accepted by the market as a business field

Seseorang yang memiliki jiwa entrepreneur mampu menghadirkan produk perekayasaan teknologi, bukan saja bermanfaat bagi masyarakat namun juga diterima pasar sebagai lahan bisnis

Positive commercialization

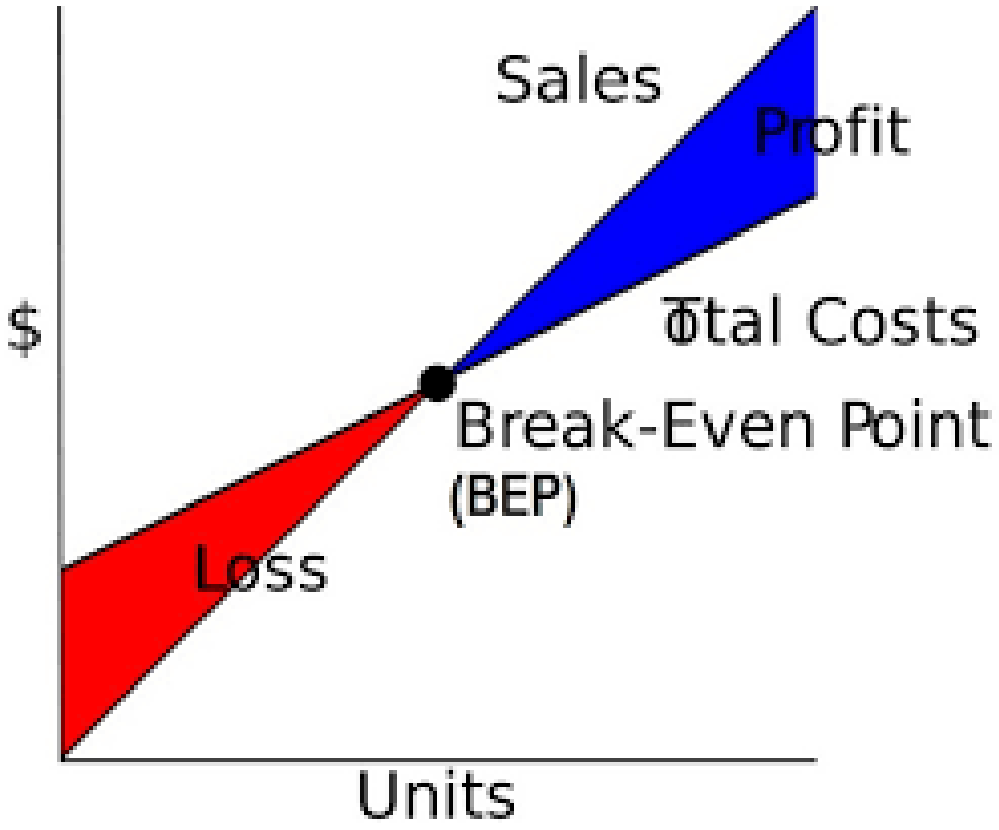
The invention creates solutions to community problems or improves the quality of life of the community

Inventions create new jobs

The invention generates benefits for inventors, businesses and users

Invention and business generate taxes for the state or at least an increase in public facilities

Cost Analysis #1 BEP



Case Study

We plan to produce a unique mouse, so there will be at least 2 types of costs:

1. Fixed costs (FC) that do not depend on number of production, and
2. Variable costs (VC) that depend on number of production

FC: Building rent, taxes, business insurance, employee salaries, depreciation, and so on

VC: Materials, electricity, packing, shipping, and so on

Case Study

If all costs can be identified, when will we receive the benefits?

Example:

FC	: $ 1000
VC per unit	: $ 1
Price per pcs	: $ 2.5

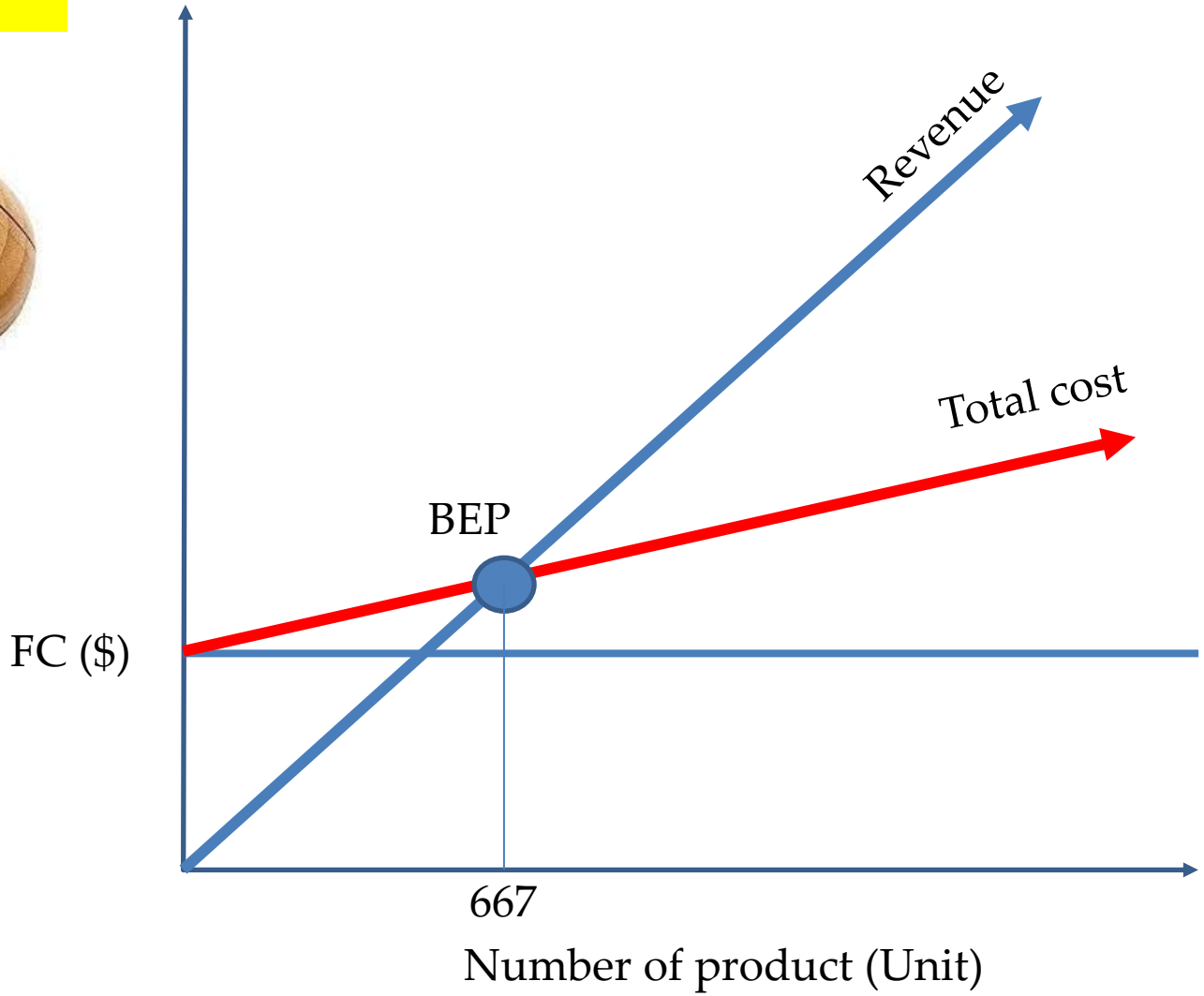
When do we receive benefits?

BEP = FC/(P-VC)

BEP = $1000/($2.5 - $1) = 667 pcs

Cost Analysis

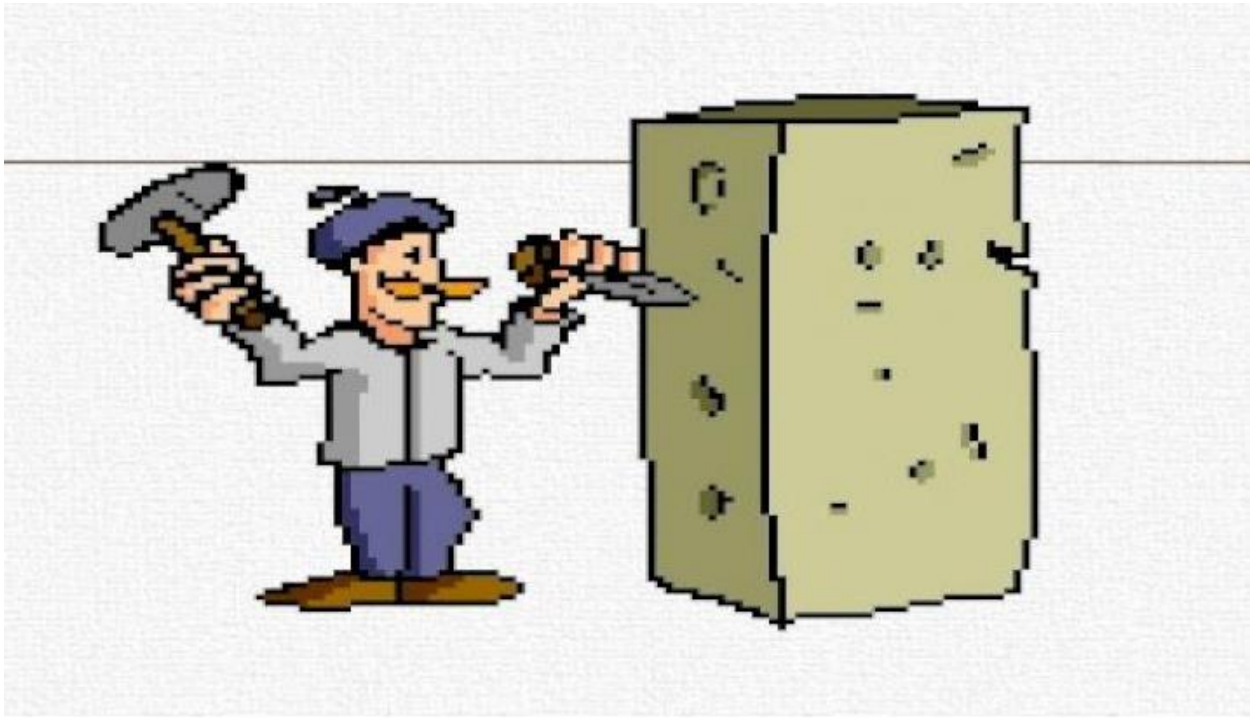
Case Study



Case Study

If the value of money changes over time, or if the capital is borrowed from the bank, what happens?

Cost Analysis #2 Time Series of Money



Constraint

In reality, every project, including an engineering project, must not only be technically realizable, but also economically feasible.

For a project / engineering design to be successful, it must be technically sound and produce benefits. These benefits must outweigh the design costs.

Case study 1

If you keep $100 under your pillow in 2021, how much will it be in the next 4 years (in 2025)?

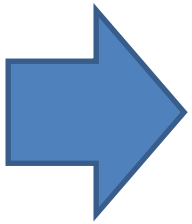
2021

2025

Case study 2

If $100 in 2021 can be used to buy 100 kg of rice, is it still possible to buy 100 kg of rice in 2025?

2021



2025

Time value of money with effective interest rates

- The term capital is wealth in the form of money or property which can be used to generate more wealth.
- Engineering economics involves a commitment to capital over a long period of time, so the effect of time needs to be considered.
- Now, current rate of money to the goods may be the same/balanced, but in the next one or two years it will be higher or lower. So, money has a time value.

- Istilah modal adalah kekayaan dalam bentuk uang atau harta yang dapat digunakan untuk menghasilkan lebih banyak kekayaan.
- Ekonomi teknik melibatkan komitmen terhadap modal dalam jangka waktu yang lama, sehingga pengaruh waktu perlu dipertimbangkan.
- Sekarang, tingkat uang saat ini untuk barang mungkin sama / seimbang, tetapi dalam satu atau dua tahun ke depan akan lebih tinggi atau lebih rendah. Jadi, uang memiliki nilai waktu.

Capital consideration

Capital in the form of money for employees, machines, materials, energy and others required in the operation of an organization can be classified into two basic categories, namely:

1. Equity capital: is owned by each person who is included in the business for a profit, and
2. Debt capital, often referred to as loan capital (borrowed capital), is obtained from parties that lend (for example, through the sale of securities) for investment purposes. In return, lenders receive interest from borrowers.

Simple interest

- If the total interest generated or charged is linearly proportional to the size of the initial loan, the interest rate, and the number of loan periods committed by the principal, the interest rate is said to be simple.
- Simple interest is rarely used in modern commercial practice.
- If simple interest is applied, the total interest (I) earned or paid can be calculated using the formula:

$$I = (P)(N)(i)$$

P = the number of principal borrowed or lent
N = number of interest periods (for example, years)
i = interest rate per period

Case study 3

$$I = (P)(N)(i)$$

So, if $ 5,000 is loaned out for 3 years at an interest rate of 10% per annum:

1. **How much interest will you get for 3 years?**
2. **How much the total amount owed at the end of the third year?**

Note that the cumulative amount of interest owed is a linear function of the time until the interest is paid back.

Cost Analysis

$$I = (P)(N)(i)$$

So, if $ 5,000 is loaned out for 3 years at an interest rate of 10% per annum:

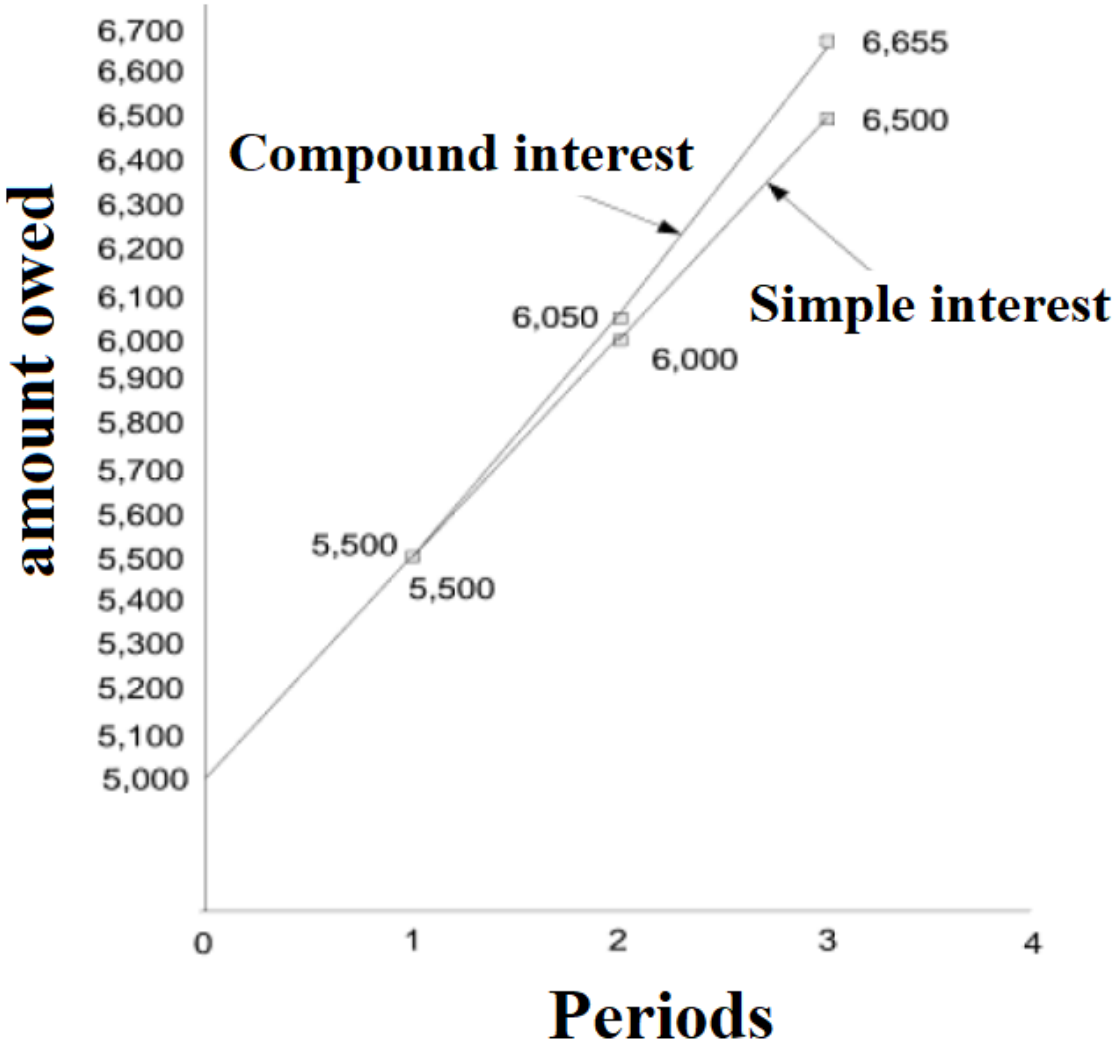
1. **How much interest will you get for 3 years?**
2. **How much the total amount owed at the end of the third year?**

Compound interest

- If the interest charged for each period (one year, for example) is based on the remaining principal loan, the interest is called compound interest.
- The effect of compound interest can be seen in the table below, which is a $ 5,000 loan for three years at an interest rate of 10% a year.

Periode	(1) Jumlah Terhutang Pada awal Periode	(2) Besarnya Bunga Pada Periode	(3) Jumlah Terhutang Pada Akhir Periode
1	$5,000	$500	$5,500
2	$5,500	$550	$6,050
3	$6,050	$605	$6,655

Case study 4


amount owed
6,700
6,600
6,500
6,400
6,300
6,200
6,100
6,000
5,900
5,800
5,700
5,600
5,500
5,400
5,300
5,200
5,100
5,000
Compound interest
Simple interest
6,655
6,500
6,050
6,000
5,500
5,500
0
1
2
3
4
Periods

Cost Analysis

The notation used in compound interest calculation formulas:

- i, the effective interest rate per interest period
- N, the number of compounding periods, is often denoted as n.
- P, present value
- F, future value
- A, The cash flows at the end of the period in a uniform series

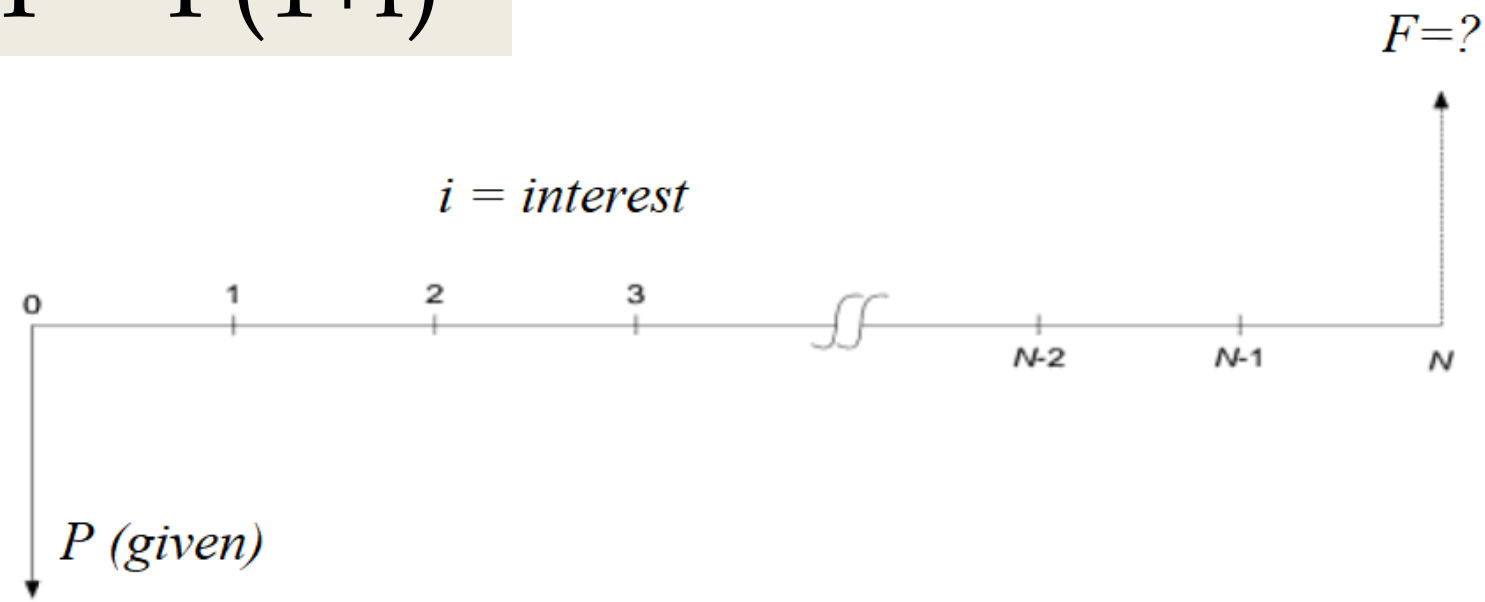
Cost Analysis

Notation and Equations

Factor		Find/Given	Factor Formula	Standard Notation Eq.	Excel Functions
Notation	Name				
(F/P,i,n)	Single-payment compound amount	F/P	$(1+i)^n$	F=P(F/P,i,n)	FV(i%,n,,P)
(P/F,i,n)	Single-payment Present worth	P/F	$\frac{1}{(1+i)^n}$	P = F(P/F,i,n)	PV(i%,n,,F)
(P/A,i,n)	Uniform-series present worth	P/A	$\frac{(1+i)^n-1}{i(1+i)^n}$	P=A(P/A,i,n)	PV(i%,n,A)
(A/P,i,n)	Capital recovery	A/P	$\frac{i(1+i)^n}{(1+i)^n-1}$	A=P(A/P,i,n)	PMT(i%,n,P)
(F/A,i,n)	Uniform-series Compound amount	F/A	$\frac{(1+i)^n-1}{i}$	F=A(F/A,i,n)	FV(i%,n,A)
(A/F,i,n)	Singking fund	A/F	$\frac{i}{(1+i)^n-1}$	A=F(A/F,i,n)	PMT(i%,n,F)

1. Find F if P is known

$$F = P(1+i)^n$$

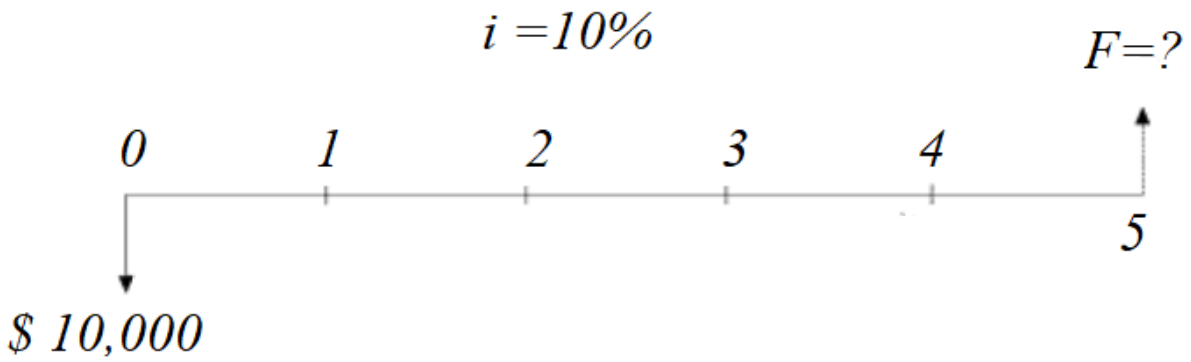


Case study 5 (10 minutes)

If you borrow $ 10,000 right now. Then you will return the principal plus the accumulated interest for five years at an interest rate of i = 10% per annum. How much will you have to pay at the end of the fifth year?

$$F = P(1+i)^n$$

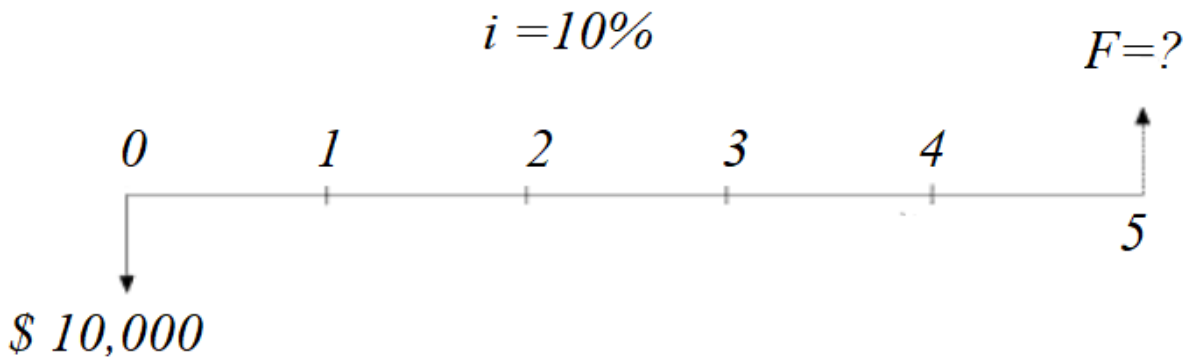
Case study 5 (10 minutes)



$$F = P(1+i)^n$$

Ans.

Cost Analysis

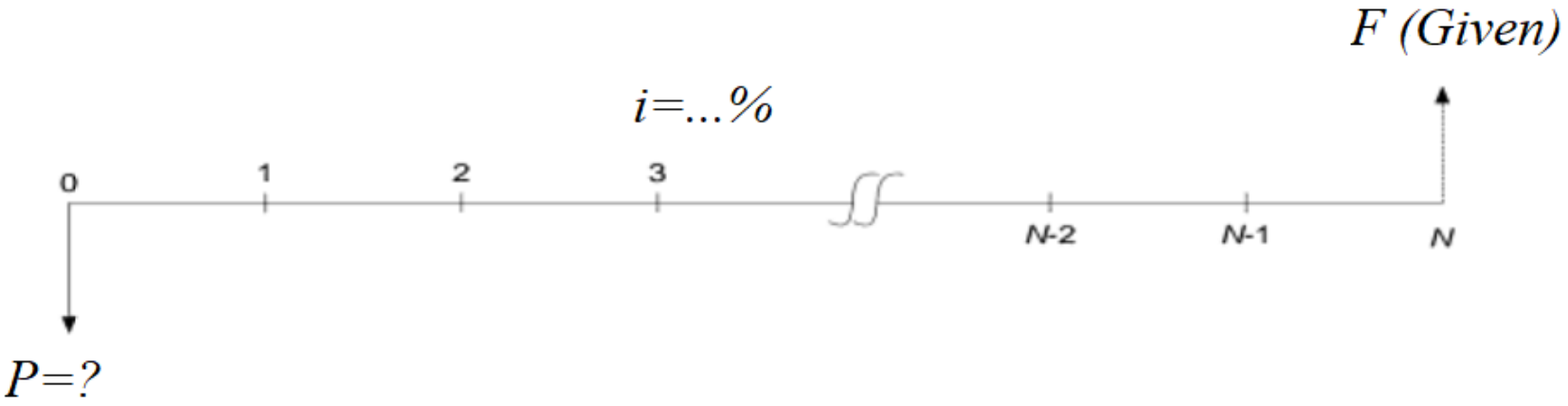


$$F = P(1+i)^n$$

Tahun	Jumlah ter-hutang di Awal Tahun	Bunga Terhutang untuk Setiap Tahun	Jumlah Terhutang pada Akhir Tahun	Pemb.Total Akhir Tahun
1	P = \$10,000	iP = \$1,000	$P(1+i)$ = \$1,000	0
2	$P(1+i)$ = \$11,000	$iP(1+i)$ = \$ 1,100	$P(1+i)^2$ = \$12,100	0
3	$P(1+i)^2$ = \$12,100	$iP(1+i)^2$ = \$1,210	$P(1+i)^3$ = \$13,310	0
4	$P(1+i)^3$ = \$13,310	$iP(1+i)^3$ = \$1,331	$P(1+i)^3$ = \$14,641	F = \$14,641

2. Find P if F is known

$$P = F(1+i)^{-n}$$

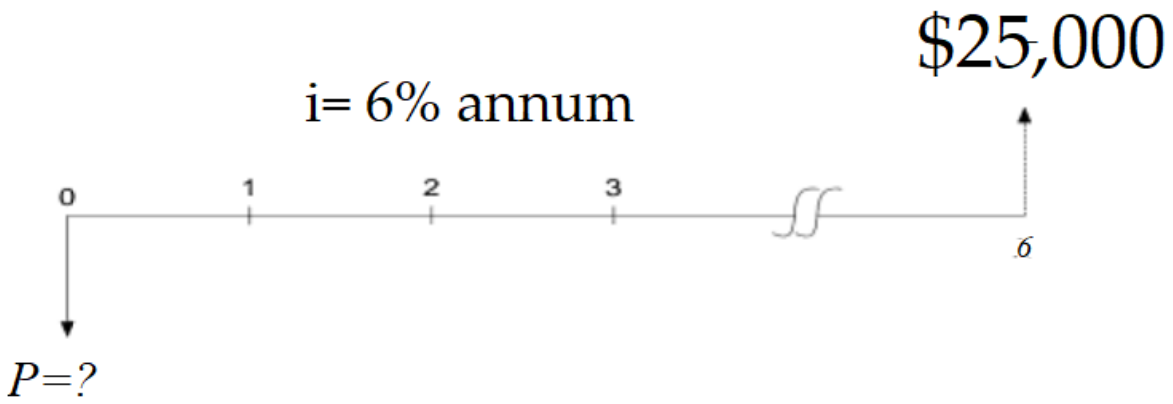


Case study 6 (10 minutes)

An investor has an option to buy land that will be worth $25,000 in six years. If land prices increase by 6% every year, how much will the investor pay for this property, now?

$$P = F(1+i)^{-n}$$

Case study 6 (10 minutes)

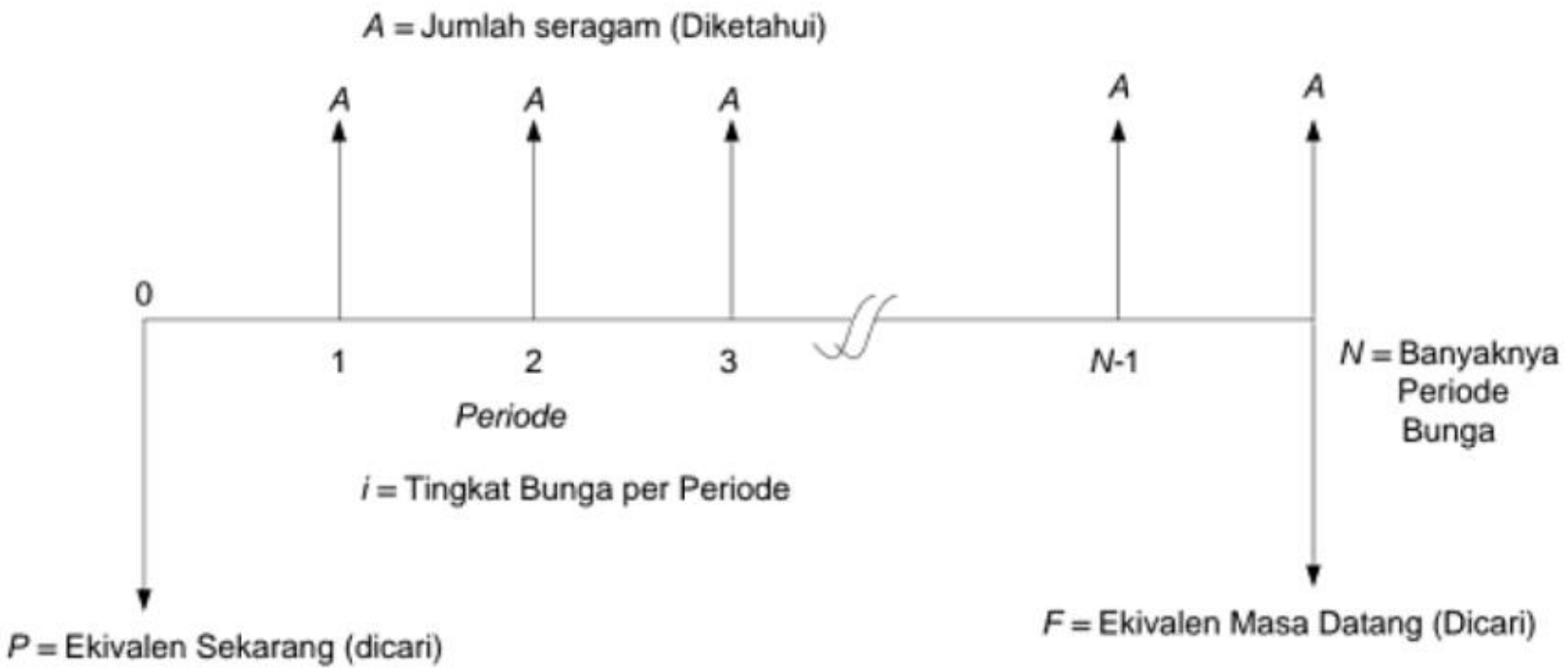


$P = F(1+i)^{-n}$

Ans.

3. Find F if A is known

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

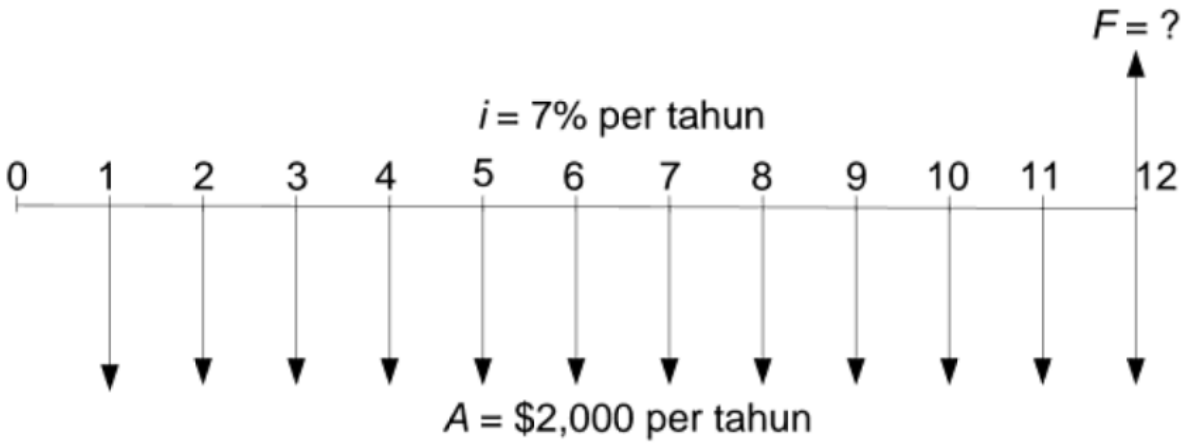


Case study 7 (10 minutes)

A person makes 12 annual deposits of $ 2,000 each to a bank that pays interest of 7% per annum. The first deposit is made one year after today. How much money can be withdrawn from the Bank immediately after the 12th deposit?

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

Case study 7 (10 minutes)

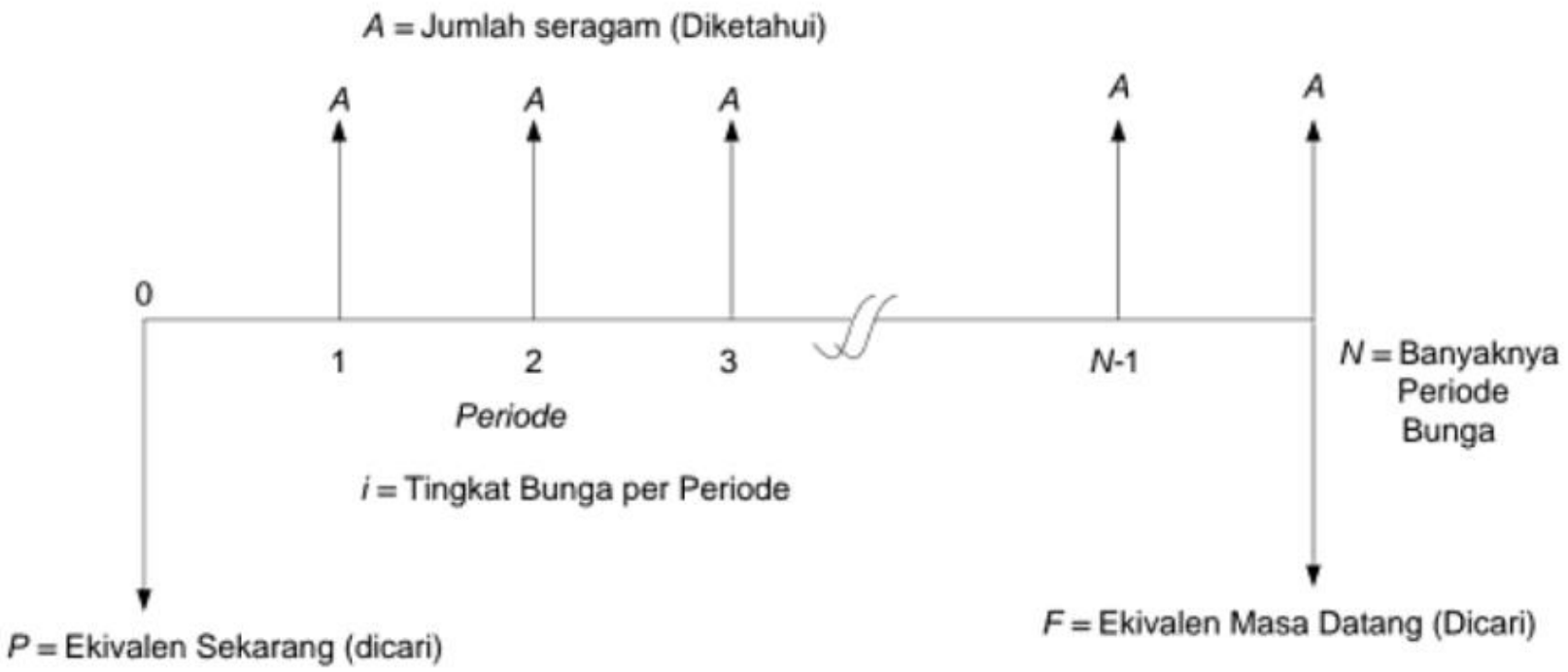


$$F = A\left[\frac{(1+i)^N - 1}{i}\right]$$

Ans.

4. Find P if A is known

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

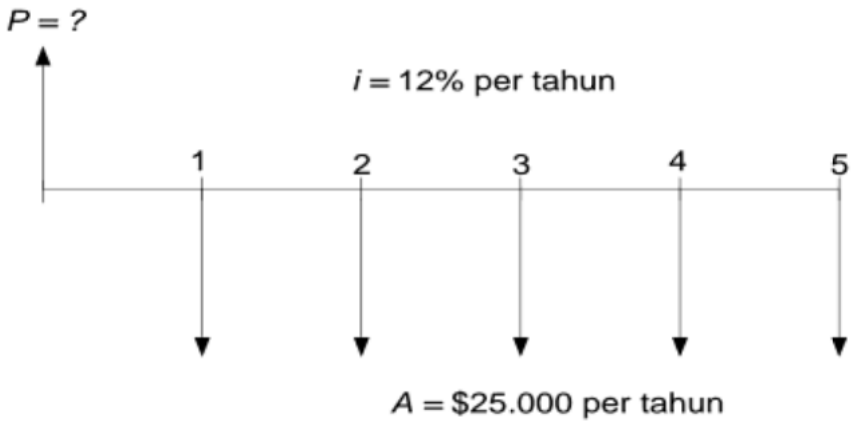


Case study 8 (10 minutes)

If a machine had a breakdown repair now, then its output could be increased by 20% - which means an additional $ 25,000 in cash flow at the end of each year for 5 years. If i = 12% per year, how much can we invest in the total repair of the machine?

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

Case study 8 (10 minutes)

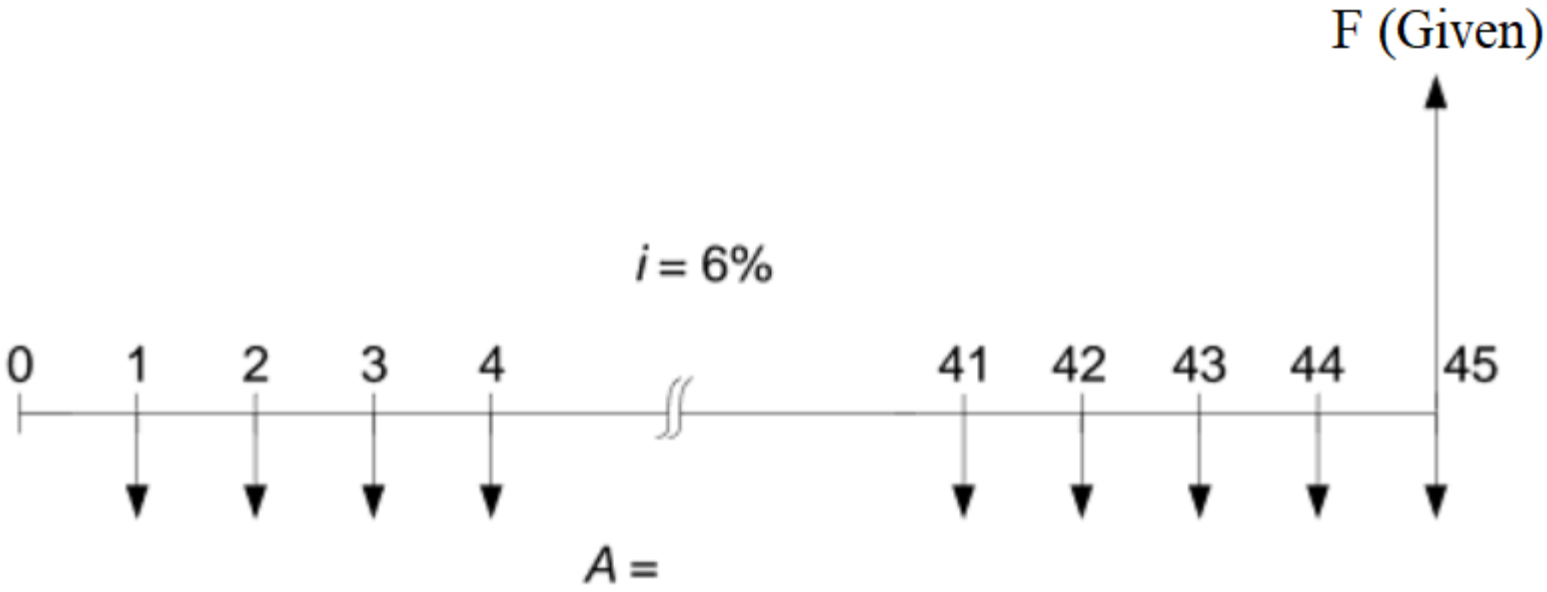


$$P = A\left[\frac{(1+i)^N - 1}{i(1+i)^N}\right]$$

Ans.

5. Find A if F is known

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

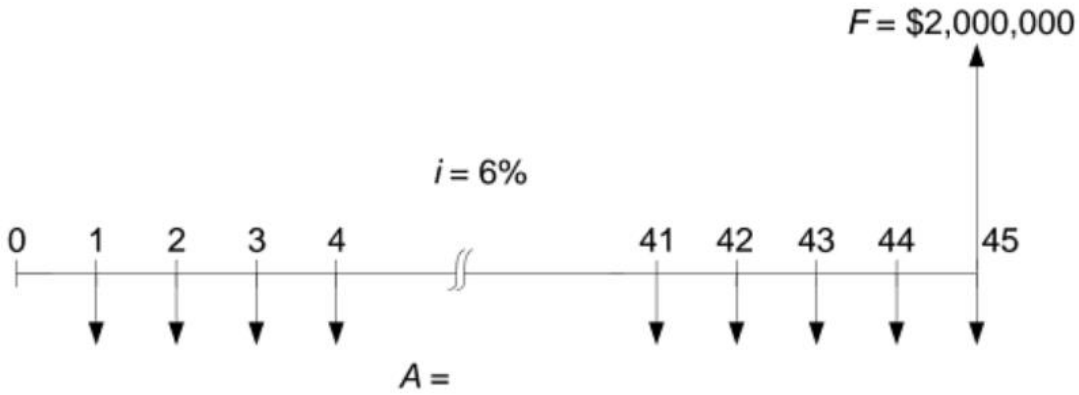


Case study 9 (10 minutes)

A person who works plans to have a total savings of $ 2,000,000 when he retires at the age of 65. Now he is 20 years old. If the average annual interest rate is to be 6% over the next 45 years on the desired amount of savings, what amount at the end of each year would he have to deposit to reach his goal?

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

Case study 9 (10 minutes)

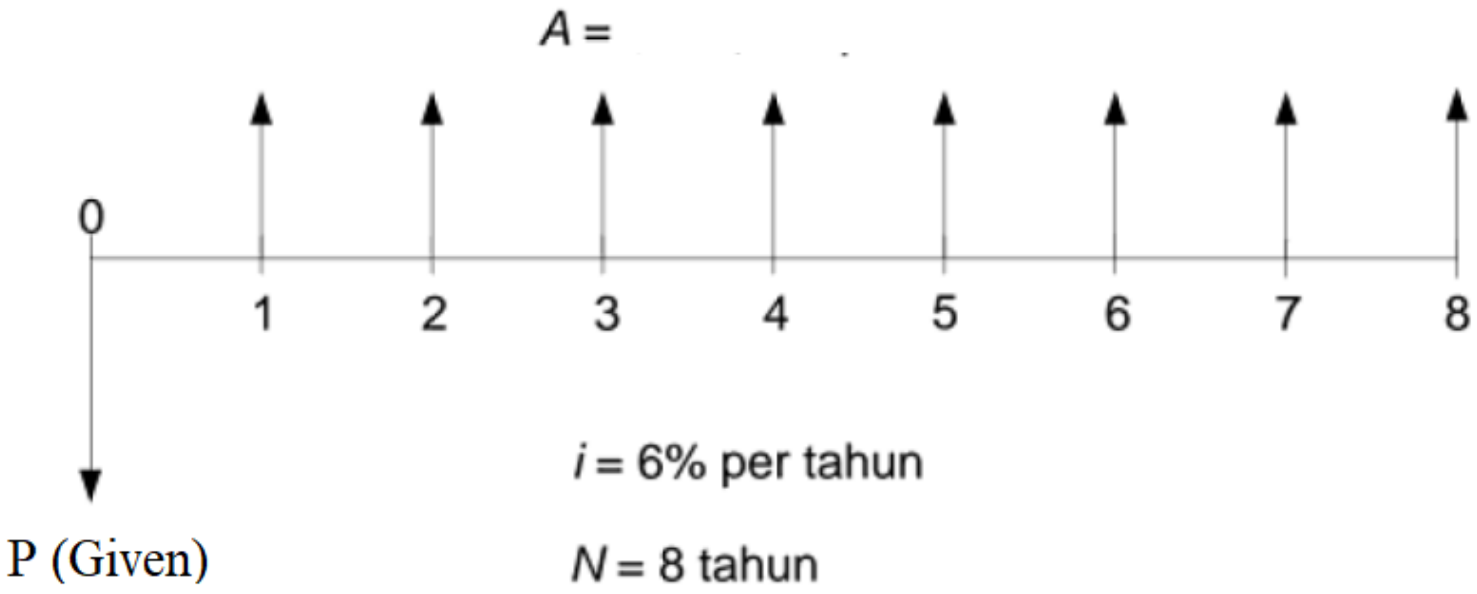


$$A = F\left[\frac{i}{(1+i)^N - 1}\right]$$

Ans.

6. Find A if P is known

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

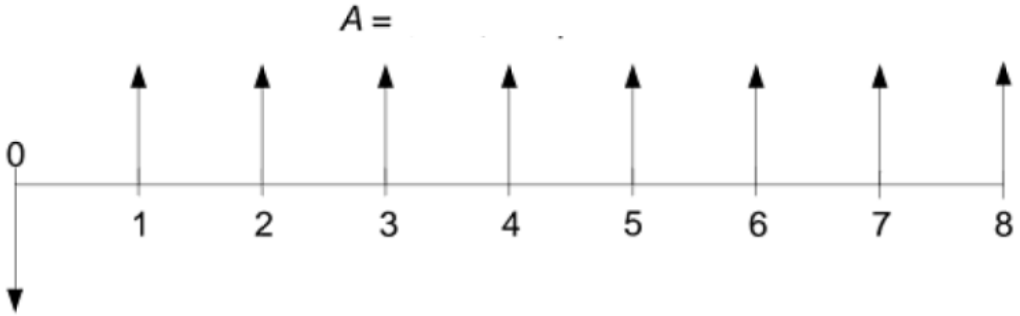


Case study 10 (10 minutes)

A person invests $ 1,000,000 in the bank at an interest rate of 6% per annum. How much must be received for 8 consecutive years with a uniform amount, A?

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

Case study 10 (10 minutes)



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

Ans.

Choosing a business (Case Study)

Please choose 1 unique business and its production needs. We discuss and simulate at the next meeting.


Thank you