Tikrit University

The College of Petroleum Processes Engineering

Petroleum and Gas Refining Engineering Department

Management and economics of petroleum projects

Fourth Class

Lecture (2)

By

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2-1 Engineering Science and Engineering Economy:

What is Engineering science?

Engineering is a science that uses and applies scientific principles to design and implement facilities, structures, machines, inventions, tools, systems, processes, and other elements required to reach a specific goal, and it is also the best way to harness natural resources for the service of man. In other words, it is the art of applying scientific principles and life experiences to our lives to improve the things we use or the facilities we live in.

Engineering Economy:

Engineering Economy is a collection of techniques that simplify comparison of alternatives on an economic basis.

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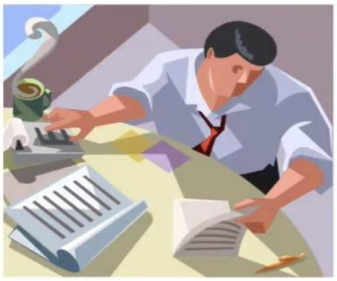
Economy Vs Accounting

Evaluating past performance

Evaluating and predicting future events



Accounting

Engineering Economy

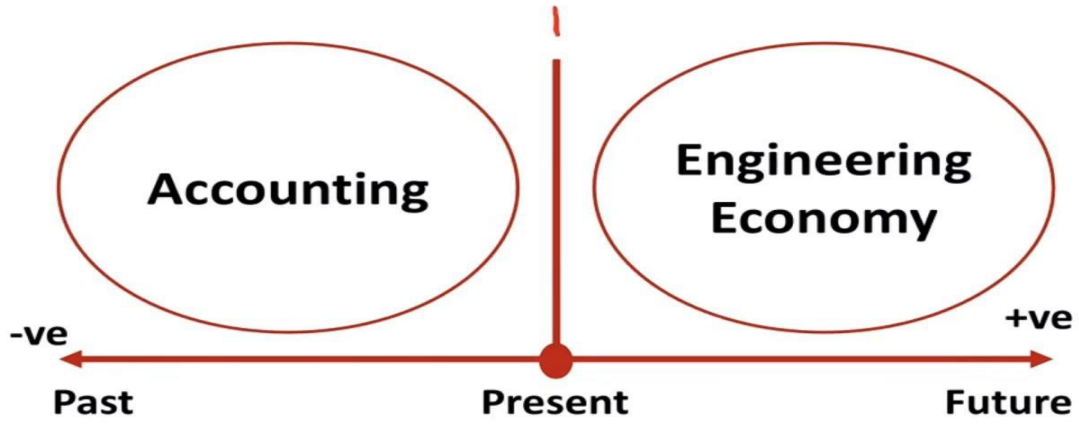
Past

Future

Present

3

Economy Vs Accounting



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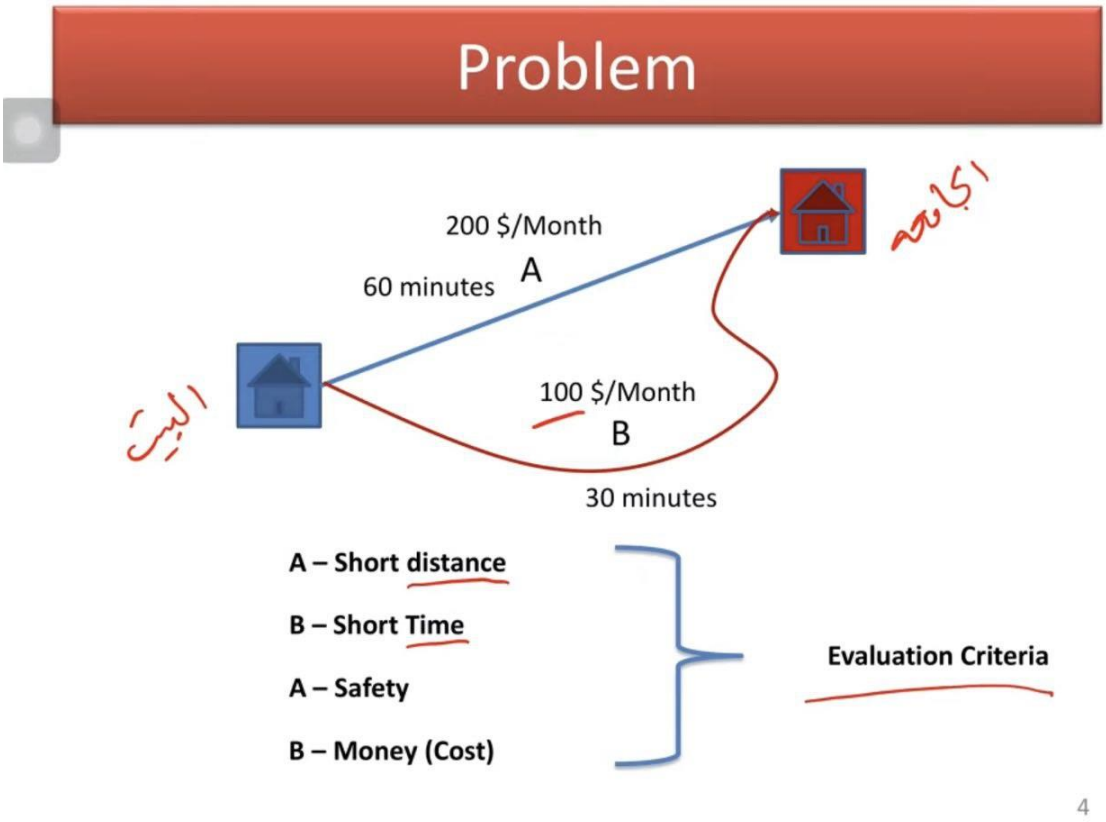

1.2 Performing an EE. Study

- **Time Value of Money**: is the principle that the purchasing power of money can vary over time; it is the most important concept in Engineering Economy.
- The value of money at a future point in time might be calculated by accounting for interest earned or inflation accrued.

1.2 Performing an EE. Study

- **Alternatives**: An alternative is a standalone solution for a given situation.
- **Cash Flows**: The estimated Inflow (Revenues) and Outflows (Costs) of money are called cash flows.
- **Alternative Selection**: Every situation has at least two alternatives. In addition to the one or more formulated alternatives, there is always the alternative of inaction, called the Do Nothing (DN) alternative.

1.2 Performing an EE. Study

- **Evaluation Criteria**: Whether we are aware of it or not, we use criteria every day to choose between alternative. For example, when you drive to the faculty, you decide to take the "best" route. But how did you define best? Was the best route the safest, shortest, fastest or cheapest?

- **Intangible Factors**: In many cases, alternatives have noneconomic or intangible factors that are difficult to quantify; goodwill, convenience, and friendship.

Evaluation Criteria

ورشة حدادة A	محل ورود B
1000 $/Month	900 $/Month

Money	→	Tangible Factors
Convenience	→	Intangible Factors

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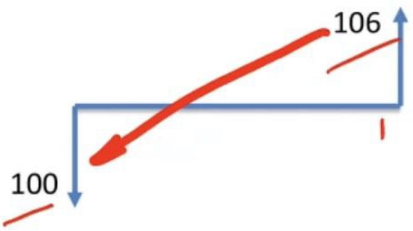
Evaluation Criteria

Project A



Interest A = 106 – 100 = 6 $

Interest Rate A = 6 / 100 = **6 %**

Project B

Interest B = 206 – 200 = 6 $

Interest Rate B = 6 / 200 = **3 %**

1.3 Interest Rate, and Rate of Return

- Interest = end amount – original amount
- Interest rate is interest over specified time period based on original amount
- Interest rate (%) = (interest accrued per time unit /original amount) x 100%

- **Example**: End amount = 112 $ and original amount = 100 $ then,
- Interest = 112 – 100 = 12 $
- Interest rate (%) = (12 /100) x 100% = 12%

1.3 Interest Rate, and Rate of Return

- **Interest period**: The time unit of the interest rate is called interest period. By far the most common interest period used to state an interest rate is 1 year. Shorter time periods can be used, such as 1% per month.

- The term interest rate is more appropriate for the borrower's perspective, while Rate of return is better from the investor's perspective.

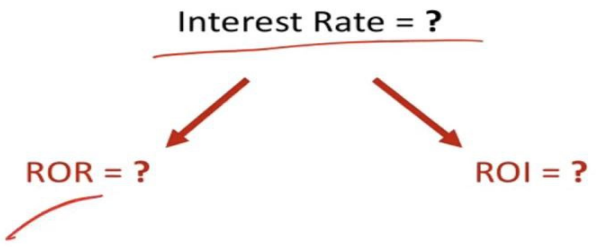
1.3 Interest Rate, and Rate of Return

- Interest rate and rate of return (ROR) have same numeric value, but different interpretations
- The term Return on Investment (ROI) is used equivalently with Rate of Return (ROR) in different industries.

Situation 2

Project A

Project B



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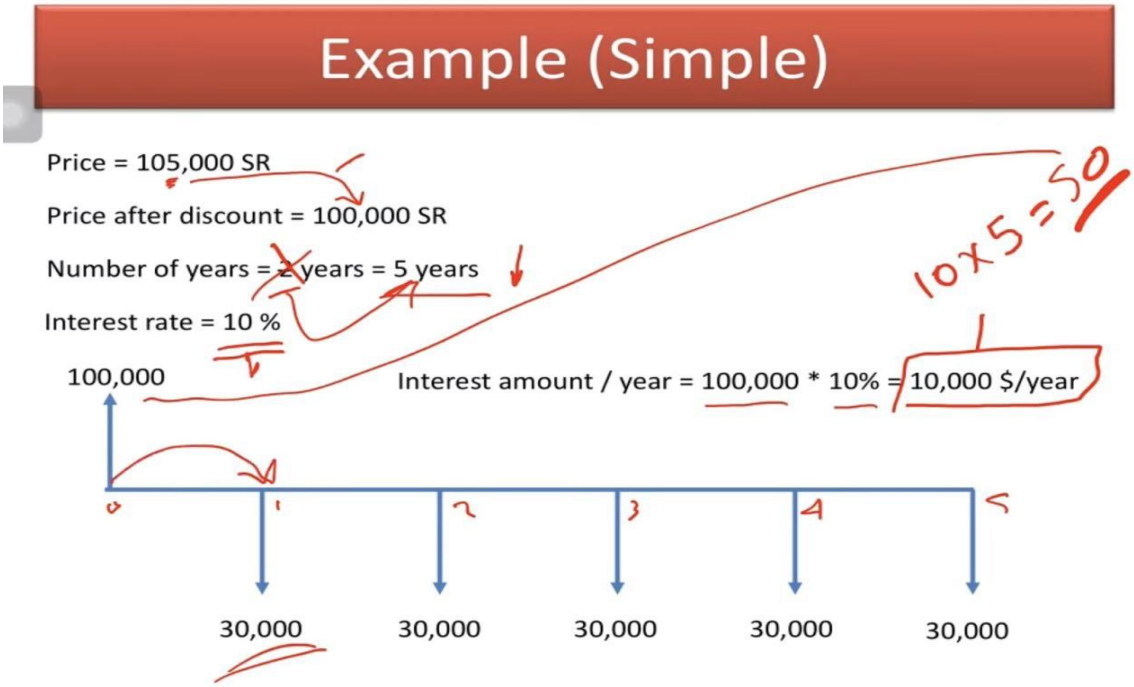
Interest rates:

1- Simple Interest rates.

2- Compound Interest rates:



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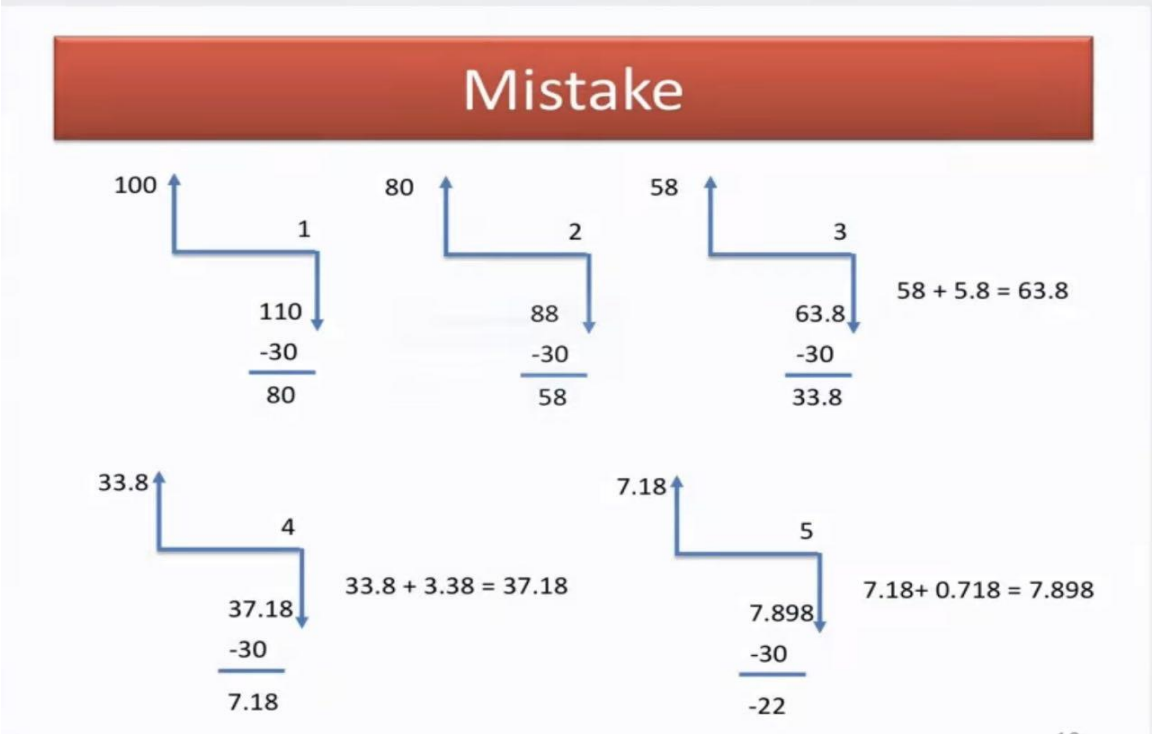

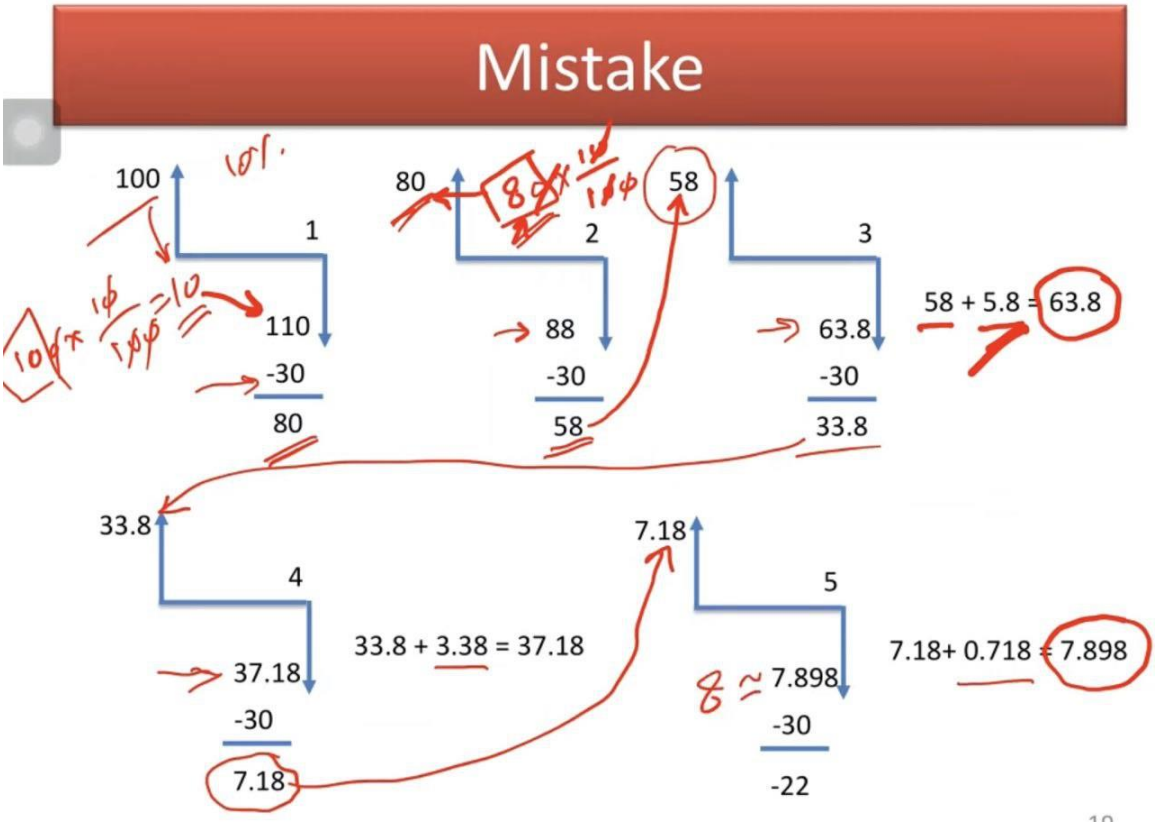

Let A = (n * (P*i)+ P) / n

So F1 = (P+(P*i))- A

F2= (F1+ (F1*i))-A

F3= (F2+(F2*i) – A

Fn= (F_{n-1} +(F_{n-1} * i) –A

Derivation of the equation of future value with Interest rates:

To Calculate the future value or the amount received or paid by a period of time, we illustrate this with an example:

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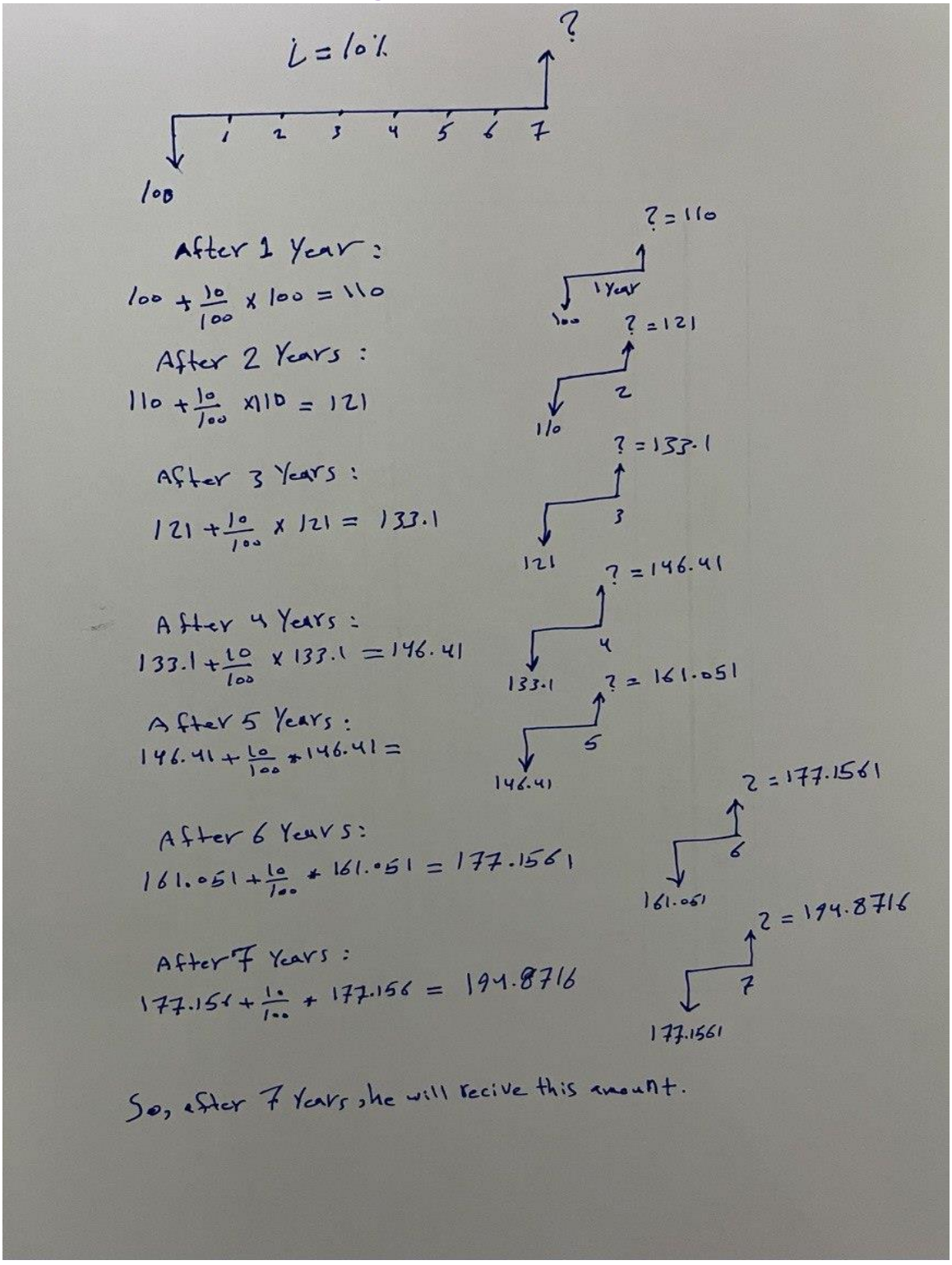

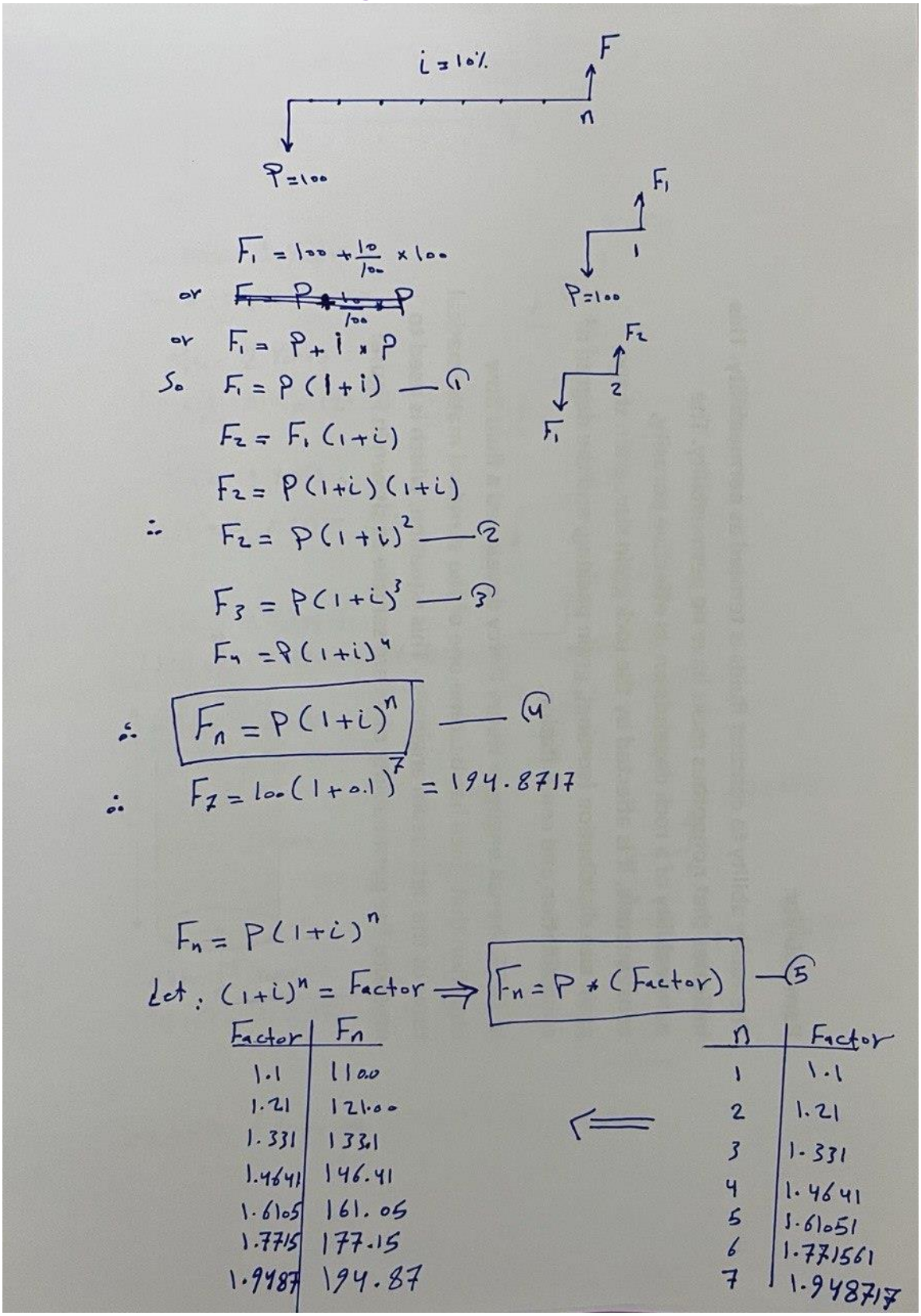

$F_1 = 100 + \frac{10}{100} \times 100$

or ~~$F_1 = P + \frac{i}{100} P$~~

or $F_1 = P + i \times P$

So $F_1 = P(1+i)$ — (1)

$F_2 = F_1(1+i)$

$F_2 = P(1+i)(1+i)$

$\therefore F_2 = P(1+i)^2$ — (2)

$F_3 = P(1+i)^3$ — (3)

$F_4 = P(1+i)^4$

$\therefore \boxed{F_n = P(1+i)^n}$ — (4)

$\therefore F_7 = 100(1+0.1)^7 = 194.8717$

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

Let: $(1+i)^n = \text{Factor} \Rightarrow \boxed{F_n = P * (\text{Factor})}$ — (5)

Factor	F_n
1.1	110.0
1.21	121.00
1.331	1331
1.4641	146.41
1.6105	161.05
1.7715	177.15
1.9487	194.87

n	Factor
1	1.1
2	1.21
3	1.331
4	1.4641
5	1.61051
6	1.771561
7	1.948717