

# تلخيص الشاتب الخامس فا بنسب آدمي

# قو اتين ال Single amount

نستخدم هذه القوائين في حال طلب السؤال ~~فيه~~ <sup>فيه</sup> المصاري بعد مدة من الزمن ~~او~~ <sup>او</sup> ~~فيه~~ <sup>فيه</sup> المصاري هذا اليوم ككية واحدة ولا يوجد فيها دفعات

في حال طلب فيه افعال بعد مدة من الزمن [بغير في المبتد] لسخدم هذا القانون

$$FV = \frac{PV}{1} (1+r)^n$$

عدد الفترات  $n$

الفئة المصنفة  $FV$

الفئة الكمية  $PV$

نسبة الفائدة  $r$

وفي حال طلب فيه افعال اليوم لسخدم هذا القانون

$$PV = \frac{FV}{(1+r)^n}$$

1

سؤال على ذلك

What is the future value when present value \$1000 and interest rate 6% in time 10 year?

السؤال يطلب القيمة المستقبلية ولم يتحدث عن دفعات  
بالإشارة لعدم هذا القانون

$$FV = PV (1+r)^n$$
$$= 1000 \left(1 + \frac{6}{100}\right)^{10} = 1790.8 \$$$

هذه القانونية تنطبق على Single amount

ملاحظته: الدولار اليوم أكثر من الدولار عندنا

دائماً ما يعطى الـ FV ويطلب الـ PV  
لكونه PV أقل

يعني إذا سعر الآرني اليوم 10000 سيكون سعرها بعد 5 سنوات  
15000 مثلاً بالأسى ما يتم شراء اليوم بـ 10000 نفس هذا  
النبي يحتاج الـ سعر آني مع أنه نفس النبي (نقرأه زهراً)

# Annuities

# قوانين ال

نستخدم هذه القوانين في حال جلب القوال في يوم المعدي  
اليوم او بعد مدة من الزمن ولكن يوجد

هناك دفعا = سوا دفع او قبلها

مثل دفع دفعا = في البنك للحصول مبالغ بعد مدة من الزمن  
او اخذ قرض وتسدده كل دفعا =

{ آبي شي فيه دفعا =  
Payment }

في حال جلب الفيه الكالي (اليوم) نستخدم هنا القانونه

$$P_{VA} = \frac{PMT}{r} \left[ 1 - \frac{1}{(1+r)^n} \right]$$

$P_{VA}$  = الفيه الكاليه

$PMT$  = مقدار الدفعه في  
الوقت [ Cash flow  
نقد ]

$r$  = الفائد

$n$  = المده الزمنية (الوقت) (3)

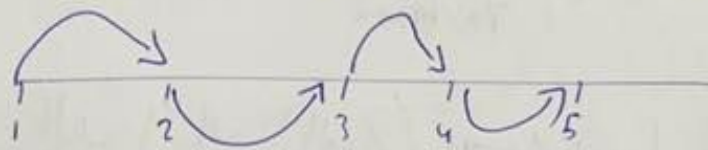
في حال طلب القيمة بعد صده من الزمن  
 نستخدم القانون

$$FV_A = PMT \left( \frac{(1+r)^n - 1}{r} \right)$$

ordinary  
 Annuity

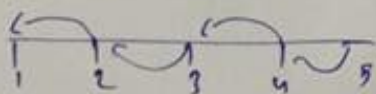
وهذه في عبارة كذا  
 القانون

أي أنها تكون في نهاية الفترة



أي أنها دفعة = الفترة الأولى ادفعها أو تسلياً في  
 بداية الفترة الثانية يعني في نهاية الفترة الأولى  
 دفعة = الفترة الرابعة تكون في نهاية الرابعة  
 أو بداية الخامسة تقريباً

يوجد دفعة تسمى Annuity due تكون في بداية الفترة



ولكن غير مطلوب منا  
 دفعة = الفترة الرابعة تكون  
 في بداية الثالثة.

(4)

(5)

معلوماته هو حياً حياً

Annuities

في قوائم ال

تكون جميع الدفعات =  $(PMT)$  مساوية

equal payment

على طول الفترة

Mixed stream: هذه هي حال لحم لكن

الدفعات = مساوية

unequal payment

Unequal Payments

نقوم بجمع القوائد المتباينة في كل

$$PV = \sum \frac{FV}{(1+r)^n}$$

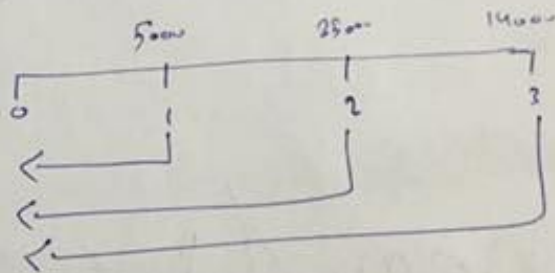
$$FV = \sum PV (1+r)^n$$

لا يكون  
equal Payments  
 إذا  
 ليرجع القوائد الى قبل

بما أن كل سنة (1) 25% و 5000 في السنة 1

Find the Present Value of the following, assuming the interest rate = 25% <sup>مثال</sup>

Year	Amount
1	5000
2	25000
3	14000



$$PV_1 = \frac{FV}{(1+r)^n} = \frac{5000}{(1+\frac{25}{100})^1} = 4000$$

$$PV_2 = \frac{FV}{(1+r)^n} = \frac{25000}{(1+25)^2} = 16000$$

$$PV_3 = \frac{FV}{(1+r)^n} = \frac{14000}{(1+25)^3} = 7168$$

$$PV_1 + PV_2 + PV_3 = 4000 + 16000 + 7168 = 27168$$

# Effective Annual Rate (EAR)

$$EAR = \left( 1 + \frac{r}{m} \right)^m - 1$$

Annual  
Percentage  
Rate  
(APR) =  $r \times m$   
↓  
عدد الفترات  
في السنة  
الواحد

حين حال كان عدد الفترات  $\rightarrow$   $\infty$  (اللانهاية)

$$PV = \frac{PMT}{r}$$

$$n = \infty$$

نستخدم هذا القانون

مثال ٥-

نستعمل ~~سحب~~ ليريه انه بسحب 6000 كل سنة من البنك

اي الامالة لانها (Perpetuity) فانها 16% كم يجب

ان يوضع حالياً في البنك حتى يستطع ان يقوم بهذه الاموال العبد

$$PV = \frac{PMT}{r} = \frac{6000}{16\%} = \underline{\underline{100,000}}$$

# # Loan amortization مما حدا

لكون نم هذا القوال في  $r$  أخذ قرا في  $n$  البك

مقد  $PV$  تكون هذا المبلغ هو عباد. عن

# اولاً نوفر هذا القانون

$$PV_A = \frac{PMT}{r} \left[ 1 - \frac{1}{(1+r)^n} \right]$$

ومن هذا القانون نوجد  $PMT$  التي تكون ثابتة مع الفتره

وبذلك نحل هذا الجود

Period [1]	Begining Balance [2]	Payment [3]	Interest amount [4]	Principle [5]	Ending Balance [6]
1	فقد القرض الذي أولاً فيه	هذه ثابتة في جميع الجود	في عباد عن $r \times \text{Begining Balance}$	Payment (5) - interest Rate	Begin - Principle
2	صلاطه هاهنا	⋮	لكل فتره	[3] - [4]	[2] - [5]
3	ال Begin للفتره الثانيه هو نفسه ال ending للفتره الاولى وكلنا	⋮	$r \times \text{Begining Balance}$ ↓ فتره		
⋮					
		[8]			



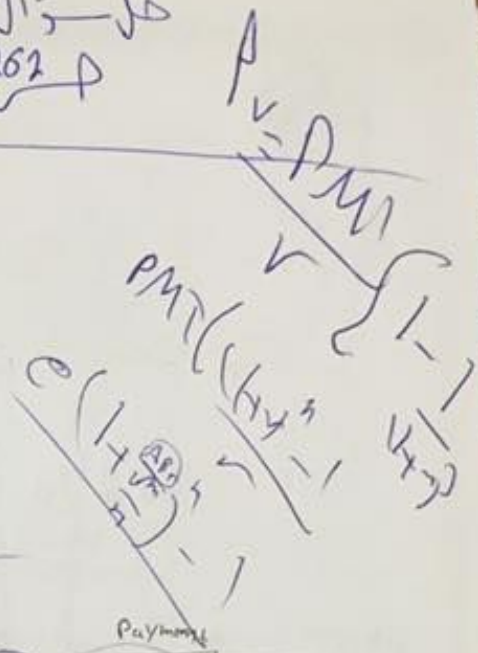
P5-48 Loan amortization  $r = 15\% \rightarrow 0.15$   
 $262 \rightarrow$

$$A) PVA = \frac{PMT}{r} \left[ 1 - \frac{1}{(1+r)^n} \right]$$

$$15000 = \frac{PMT}{0.14} \left[ 1 - \frac{1}{(1+0.14)^3} \right]$$

$$15000 = PMT \cdot 2.3$$

$$PMT = 6460.97 \text{ \$}$$



B) Period	Reg Balance	Payment	Interest amount 14% of Reg Bal	Principle Payment - interest	End Balance Reg - Principle
1	15000	6460.97	2100	4360.97	10639.03
2	10639.03	6460.97	1489.46	4971.51	5667.52
3	5667.52	6460.97	793.4	5667.57	0

C) Because the Reg Balance declining by the passage of time and the Interest amount depend of the Reg Balance

9 ~~10~~

## Notes :-

① Interest Rate :- معدلات فائدة العتق

- a. Discount Rate
  - b. Compound Rate
  - c. Cost of Capital
  - d. Opportunity Cost
  - e. Required Rate of Return.
- = r

② لو ذكر السؤال هذه الكلمات يجب أن تقر ب  
"عدد السنوات" (n) بقرص معين أو بقرص (الفائدة) على قرص معين

a. Semi Annually :-

$$n \times 2$$

$$i \div 2$$

b. monthly  $\Rightarrow$   $n \times 12$   
 $i \div 12$

c. Daily  $\Rightarrow$   $n \times 365$   
 $i \div 365$

أو حسب عدد أيام  
السنة بالسؤال

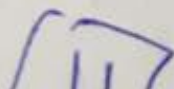
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of. weekly :-  
 $n \times 52$   
 $i \div 52$

e. by weekly :-

$n \times 26$   
 $i \div 26$

أسر النبائي  
عبد الشرفه



Finance 130- Time Value of Money- Practice Questions- ~~Answers~~

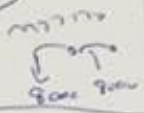
Questions:

1. What is the future value, where present value is \$1,000, interest rate is 6% and time is 10 years?
2. What is the present value, where future value is \$1,000, interest rate is 6% and time is 1 year?
3. What is the present value, where future value is \$1,000, interest rate is 6% and time is 5 years?
4. Calculate the interest rate, when the present value is \$1,000 and Future value is \$1,436 and time is 5 years.
5. Calculate the interest rate, when the present value is \$1000 and future value is \$1,750 and time is 11 years.
6. How long will it take for \$500 to grow to \$1,000 at an interest rate of 8%?

$P + I$

Word Problems:

7. You invest \$5,000 today. You will earn 8% interest. How much will you have in 4 years?
8. You have \$450,000 to invest. If you think you can earn 7% interest, how much could you accumulate in 10 years?
9. If a commodity costs \$500 now and inflation is expected to go up at a rate of 10% how much will the commodity cost in 5 years?
10. If you think you can sell an asset for \$25,000 in five years and you think that the appropriate discount rate is 5%, how much would you be willing to pay for the asset today?
11. Find the value of \$10,000 in ten years. The investment earns 5% interest.
12. A principal of \$7,100 has a maturity value of \$13,966.77 in 10 years. What is the interest rate?



Annuity:

13. You expect that your new home will cost you \$100,000. A down payment of \$20,000 is needed, and a mortgage loan could be taken for the remaining balance. The loan's maturity is 10 years and the mortgage rate is 12%. The loan is to be paid in 10 equal end of year annual installments. What is the annual loan payment?
14. Congrats! You just won the \$64 million Florida lottery. Now the Surely Company is offering you \$30 million in exchange for your 20 installments on your winnings. If your opportunity cost of funds is 8%, should you agree to this deal?

Frequent Compounding:

$PV = \frac{PMT}{r}$

15. You borrow \$50,000 and will make monthly payments for 2 years and 12% interest. How much will those payments be?
16. You invest \$8,000 at 6% interest, which will be compounded semi-annually. How much will you have in three years?

Two - Step Problems:

84872

17. Haneen plans on retiring on her 60th birthday. She wants to put the same amount of funds aside each year for the next twenty years -- starting next year -- so that she will be able to withdraw \$50,000 per year for twenty years once she retires, with the first withdrawal on her 61st birthday. Haneen is 30 years old today. How much must she set aside each year for her retirement if she can earn 10% on her funds?
18. Your parents are planning for your brother's education to begin 5 years from today. You estimate the yearly tuition, books and living expenses to be \$8,000 per year for a four-year degree. How much must your parents deposit today at an interest rate of 6% for your brother to be able to withdraw \$8,000 per year for four years of college?

Effective Annual Interest Rate:

19. You have seen a credit card advertisement that states that the annual percentage rate is 12%. If the credit card requires monthly payments, what is the effective annual rate of interest on the loan?
20. Your bank will charge you 14% annual interest on a car loan, what will be the effective financing cost if the rate is compounded a. semi-annually b. monthly?

حل تمارين الورقة  
20-30

$$\left(1 + \frac{APR}{m}\right)^n - 1$$

أمر زید  
البنك

$$\left(1 + \frac{r}{m}\right)^n$$

### Basic Questions :-

$$\begin{aligned} \text{① } FV &= PV (1+r)^n \\ &= 1000 \left(1 + \frac{6}{100}\right)^{10} \\ &= 1790.8 \text{ \$} \end{aligned}$$

$$\begin{aligned} \text{② } PV &= \frac{FV}{(1+r)^n} \\ &= \frac{1000}{\left(1 + \frac{6}{100}\right)^5} \\ &= \frac{1000}{1.3382} \\ &= 747.258 \text{ \$} \end{aligned}$$

$$\begin{aligned} \text{③ } PV &= \frac{FV}{(1+r)^n} \\ &= \frac{1000}{\left(1 + \frac{6}{100}\right)^5} \\ &= 747.258 \text{ \$} \end{aligned}$$

$$\begin{aligned} \text{④ } PV &= \frac{FV}{(1+r)^n} \\ 1000 &= \frac{1436}{(1+r)^5} \end{aligned}$$

$$\begin{aligned} (1+r)^5 &= \frac{1436}{1000} \\ \left((1+r)^5\right)^{\frac{1}{5}} &= \left(\frac{1436}{1000}\right)^{\frac{1}{5}} \end{aligned}$$

$$\begin{aligned} 1+r &= 1.075 \\ r &= 7.5\% \end{aligned}$$

$$\begin{aligned} \text{⑤ } PV &= \frac{FV}{(1+r)^n} \\ 1000 &= \frac{1750}{(1+r)^{11}} \end{aligned}$$

$$\begin{aligned} (1+r)^{11} &= \frac{1750}{1000} \\ 1+r &= \left(\frac{1750}{1000}\right)^{\frac{1}{11}} \end{aligned}$$

$$\begin{aligned} 1+r &= 1.05 \\ r &= 5\% \end{aligned}$$

1

6

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

$$1000 = 500 \left(1 + \frac{8}{100}\right)^n$$

$$\frac{1000}{500} = \left(1 + \frac{8}{100}\right)^n$$

$$2 = \left(1 + \frac{8}{100}\right)^n$$

$$2 = (1.08)^n$$

$$\ln 2 = \ln 1.08^n$$

$$\ln 2 = n \ln 1.08$$

$$n = \frac{\ln 2}{\ln 1.08}$$

$$n = 9$$

## Word Problems :-

$$\boxed{7} \quad PV = \frac{FV}{(1+r)^n}$$

$$5000 = \frac{FV}{\left(1 + \frac{8}{100}\right)^4} \quad , \quad FV = 5000 \left(1 + \frac{8}{100}\right)^4 = 6802.44 \text{ \$}$$

$$\boxed{8} \quad FV = PV(1+r)^n$$

$$= 450,000 \left(1 + \frac{7}{100}\right)^{10} = 885,218.11 \text{ \$}$$

$$\boxed{9} \quad FV = PV(1+r)^n$$

$$= 500 \left(1 + \frac{10}{100}\right)^6$$

$$= 805.255 \text{ \$}$$

$$\boxed{10} \quad PV = \frac{FV}{(1+r)^n}$$

$$PV = \frac{25000}{\left(1 + \frac{5}{100}\right)^5} = \frac{25000}{(1.05)^5} = 19588.15 \text{ \$}$$

$$\begin{aligned} \text{11) } FV &= PV (1+r)^n \\ FV &= 10,000 \left(1 + \frac{5}{100}\right)^{10} \\ &= 16,288.95 \$ \end{aligned}$$

$$\begin{aligned} \text{12) } FV &= PV (1+r)^n \\ 13,986.77 &= 7100 (1+r)^{10} \\ (1+r)^{10} &= \frac{13,986.77}{7100} \end{aligned}$$

$$(1+r)^{10} = 1.967$$

$$1+r = 1.069$$

$$r = \del{6.9\%}$$

$$r = 6.9\%$$



13

$$P_{VA} = \frac{PMT}{r} \left[ 1 - \frac{1}{(1+r)^n} \right]$$

$$[100,000 - 20,000] = \frac{PMT}{0.12} \left[ 1 - \frac{1}{(1+0.12)^{10}} \right]$$

$$80,000 = PMT (5.65)$$

$$PMT = 14,158.73 \$$$

14

$$PMT = \frac{64,000,000}{20} = 3,200,000$$

$$P_{VA} = \frac{PMT}{r} \left[ 1 - \frac{1}{(1+r)^n} \right]$$

$$= \frac{3,200,000}{0.08} \left[ 1 - \frac{1}{(1+0.08)^{20}} \right]$$

$$= 31,418,071.7$$

You ~~should~~ should not ~~agree~~ agree to this deal  
Because you can  
get 31 million  
Instead of 30 million offer

## Frequent Compounding

$n \times r$   
 $i \div$

$$\boxed{15} \quad PV_A = \frac{PMT}{r} \left[ 1 - \frac{1}{(1+r)^n} \right]$$

$$\Rightarrow 50,000 = \frac{PMT}{\frac{0.12}{12}} \left[ 1 - \frac{1}{\left(1 + \frac{0.12}{12}\right)^{2 \times 12}} \right]$$

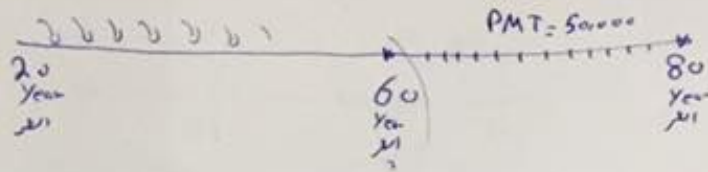
$$PMT = 2353.67$$

$$\boxed{16} \quad FV = PV \left( 1 + \frac{r}{2} \right)^{2n}$$

$$FV = 8000 \left( 1 + \frac{0.06}{2} \right)^{2 \times 3}$$

$$FV = 9552.4 \$$$

(17)



$$PVA = \frac{PMT}{r} \left[ 1 - \frac{1}{(1+r)^n} \right]$$

$$PVA = \frac{50,000}{0.1} \left[ 1 - \frac{1}{(1+0.1)^{20}} \right]$$

$$PVA = 425678.2$$

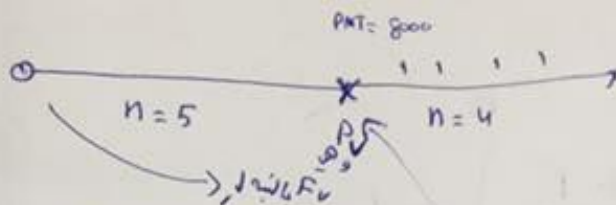
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$$FVA = PMT \left[ \frac{(1+r)^n - 1}{r} \right]$$

$$425678.2 = PMT \left[ \frac{(1+0.1)^{40} - 1}{0.1} \right]$$

$$PMT = 961.8 \$$$

18



$$PVA = \frac{PMT}{r} \left[ 1 - \frac{1}{(1+r)^n} \right]$$

$$PVA = \frac{8000}{0.06} \left[ 1 - \frac{1}{(1+0.06)^4} \right]$$

$$PVA = 27,720.85$$

$$Pv = \frac{FV}{(1+r)^n}$$

$$Pv = \frac{27,720.85}{(1+0.06)^5}$$

$$Pv = 20714.6 \quad \text{must } \overset{\text{they}}{\text{be}} \text{ sub.}$$

19

$$\begin{aligned} \text{EAR} &= \left(1 + \frac{r}{m}\right)^m - 1 \\ &= \left(1 + \frac{0.12}{12}\right)^{12} - 1 \\ &= 0.126 \\ &= 12.6\% \end{aligned}$$

$$(1+r)^m - 1$$

ARR:  $r = 12\%$

$$r = \frac{12\%}{12} = 1\%$$

20 a

$$\begin{aligned} \text{EAR} &= \left(1 + \frac{r}{m}\right)^m - 1 \\ &= \left(1 + \frac{0.14}{2}\right)^2 - 1 \\ &= 0.1449 \\ &= 14.49\% \end{aligned}$$

13

$$\begin{aligned} \text{EAR} &= \left(1 + \frac{r}{m}\right)^m - 1 \\ &= \left(1 + \frac{0.14}{12}\right)^{12} - 1 \\ &= 14.93\% \end{aligned}$$