Q5

- I am buying a stock which promised me dividend payments of 100$ every year. What is the (present) value of the stock with a rate of return of 10%?

$$PV = \frac{C}{r} = \frac{100}{0.1} = 1000\ \$$$

Q6

- What is your monthly payment (compounded monthly) if you take a 10-year loan for your house which costs 100,000$ with an annual rate of 12%.
- The monthly rate is 12%/12=1%

$$100{,}000 = \frac{C}{1\%} \times \left(1 - \frac{1}{(1+0.01)^{12*10}}\right)$$

$$C = \frac{100000*0.01}{(1-\frac{1}{1.01^{120}})} = 1434.7$$

Q7

- Suppose you borrow a student loan of \$7,000 at 3% annual rate and you are going to make a monthly payment of \$90 (monthly compounded). How long does it take before you can pay off the loan?

- The monthly rate is 3%/12=0.25%

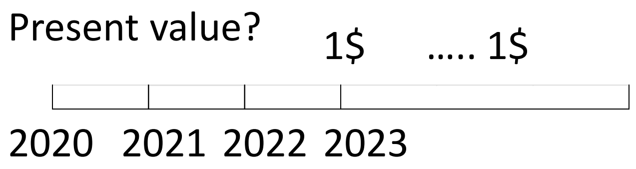
$$7000 = \frac{90}{0.25\%} \times \left(1 - \frac{1}{(1+0.25\%)^t}\right)$$

Solve for t

t=86.6 months

Q8

I am buying a share in the year of 2020. The share promised me payment of 1$ every year since the year of 2023. What is the present value of the share as of the year 2020 if the rate of return is 10%?



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

Step One:

$PV(t = 2022) = \frac{1}{10\%} = 10\$$ (note that the PV formula told you about the value one period before the first Cash Flow stream)

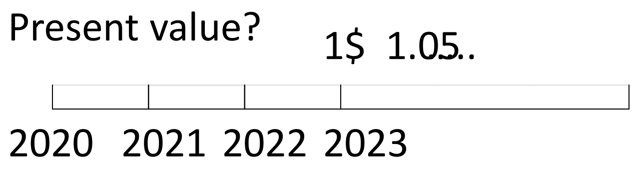
Step Two: However, even if we apply the PV formula for cash flows, the "PV" is located in the future periods (e.g., t=2022), hence to know what is the CURRENT value as of year 2020, we need to use $PV = \frac{FV}{(1+r)^N}$

$$PV(t = 2020) = \frac{10\$}{(1 + 10\%)^2} = 8.264\$$$

Q9

I am buying a share in the year of 2020. The share promised me payment of 1$ in the year of 2023 and grows at a rate of 5% thereafter. What is the present value of the share as of the year 2020 if the rate of return is 10%?

$$PV = \frac{C}{r-g}$$



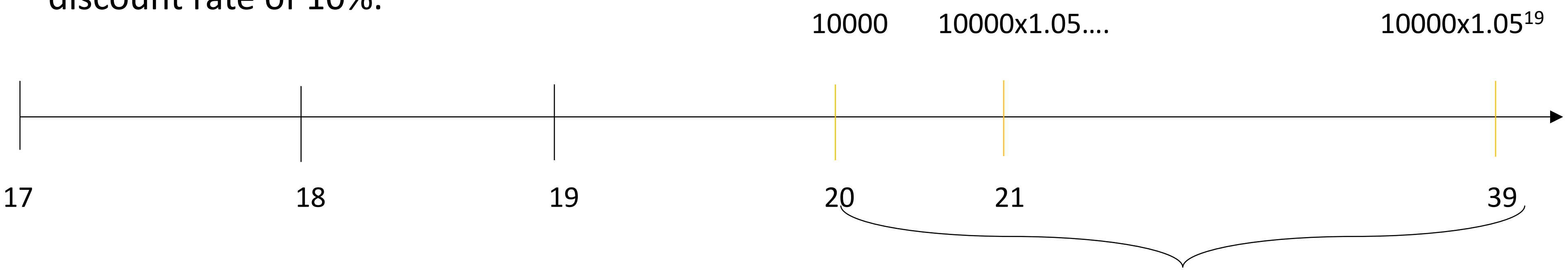
$PV(t=2022) = \frac{1}{10\%-5\%} = 20\$$ (note that the PV formula told you about the value <u>one period before</u> the first CF stream)

To know what is the CURRENT value, we need to use $PV = \frac{FV}{(1+r)^N}$

$$PV(t=2020) = \frac{20\$}{(1+10\%)^2} = 16.54\$$$

Q10

I am currently 17 years old, my aunt will give me 10,000$ as a gift starting from the age of 20 and the gifts will grow at a rate of 5% until I am 39. What is the value of the gift with the discount rate of 10%.



There (39-20+1)=20 number of points/payments/gifts
T=20

$$PV = \frac{C}{r-g}\left(1 - \frac{(1+g)^T}{(1+r)^T}\right)$$

$PV(t=19) = \frac{10000}{10\%-5\%}\left(1 - \frac{1.05^{20}}{1.1^{20}}\right) = 121120.8\$$ (note that the PV formula told you about the value one period before the first CF stream)

To know what is the CURRENT value, we need to use $PV = \frac{FV}{(1+r)^N}$

$$PV(t=17) = \frac{121120.8\$}{(1+10\%)^{19-17}} = 100099.9\$$$

Q1. Your firm plans to buy a warehouse for 100,000$. The bank offers you a 30-year loan with equal annual payments and an interest rate of 8% per year. The bank requires that your firm pay 20% of the purchase price as a down payment, so you can borrow the rest. What is the annual loan payment?

Loan/ borrowing => cash inflows

Loan payment => cash outflows

= – PMT(0.08,30,80000,0)

Manual solution:

$$80000=\frac{C}{0.08}\times\left(1-\frac{1}{(1+0.08)^{30}}\right)\ solve\ for\ C$$

$$C=\frac{80000\times 0.08}{\left(1-\frac{1}{(1+0.08)^{30}}\right)}=7106.19$$

Q2. Jessica has just graduated with her MBA. She decided to go into business for herself. A bank was so impressed with Jessica that it has decided to fund her business. In return for an initial business loan of $1 million, Jessica has agreed to pay back 125,000 at the end of each year for the next 30 years, what is the internal rate of return?

Receiving loan of 1million => cash inflows
Payback 125,000 => cash outflows

=RATE(30, – 12500, 1000000)

Q3. You are saving a down payment for a house. You have 10,500 saved already, and you can afford to save an additional 5000 per year at the end of each year. If you earn 7.25% per year on your savings, how long will it take for you to have/withdraw 60,000?

Savings of 10,500 initially and 5000 every year => cash outflows
Have (you can withdraw) 60,000 => cash inflows

NPER(7.25%, – 5000, – 10500, 60000)

Manual solution (not required for the exam):

Future value of Annuity $= C\left[\frac{(1+r)^T - 1}{r}\right]$

$$10500 \times (1+0.0725)^t + \frac{5000}{0.0725} \times ((1+0.0725)^t - 1) = 60000$$

Solve for t, t= 6.92

Q4. Suppose that you invest 20,000 in an account paying 8% interest. You plan to withdraw 2000 at the end of each year for 15 years. How much money will it be left in the account after 15 years?

Investment 20,000 => cash outflows
Withdraw 2000=> cash inflows
How much left to be withdrawn in 15 years=> cash inflows
=FV(0.08,15, 2000, − 20000)

Manual solution (not required for the exam):

Future value of Annuity $= C\left[\frac{(1+r)^T - 1}{r}\right]$

In 15 years, you withdraw a total of $\frac{2000 \text{ x} (1.08^{15}-1)}{0.08}$= 54304.23

In 15 years, your investment of 20000 give you: 20,000 x 1.08^{15}= 63443.38

What is left after withdraw: 63443.38 – 54304.23=9139.15

Q5. You want to purchase a new car and you are willing to pay 10,000. If you can invest at 10% per year and you currently have 7500, how long will it be before you have enough money to pay cash for the car?

Investing 7500 => cash outflows
Have/can withdraw 10000 => cash inflows
=NPER(10%, 0, – 7500, 10000)

Manual solution:

$$t = \frac{\log(\frac{FV}{PV})}{\log(1+r)}$$

$$t = \frac{\log(10000/7500)}{\log(1+10\%)} = 3.02$$