

FULL LEGAL NAME	LOCATION (COUNTRY)	EMAIL ADDRESS	MARK X FOR ANY NON-CONTRIBUTING MEMBER
Marin Yordanov Stoyanov	Bulgaria	azonealerts@gmx.com	
Chia-Cheng Chang	Taiwan	xiong7238@gmail.com	
Azamat Zhaksylykov	USA	a.zhaksylykov@gmail.com	

Statement of integrity: By typing the names of all group members in the text boxes below, you confirm that the assignment submitted is original work produced by the group (excluding any non-contributing members identified with an "X" above).

Team member 1	Marin Yordanov Stoyanov
Team member 2	Chia-Cheng Chang
Team member 3	Azamat Zhaksylykov

Use the box below to explain any attempts to reach out to a non-contributing member. Type (N/A) if all members contributed.

Note: You may be required to provide proof of your outreach to non-contributing members upon request.

A 30-year fixed rate at 4%

Monthly Payment =

$$= (\text{Loan Amount} * (\text{Interest Rate} / 12)) / (1 - (1 + (\text{Interest Rate} / 12)) ^ (-\text{Loan Term in Months}))$$

$$\text{Monthly Payment} = (1,000,000 * (0.04 / 12)) / (1 - (1 + (0.04 / 12)) ^ (-30 * 12))$$

$$\text{Monthly Payment} = \$4,774.15$$

The cash flows, amortization, and total interest paid can be seen in the following table:

	Month	Fixed Payment	Principal Paydown	Interest Applied	Principal Balance
	0	0.000000	0.000000	0.000000	1.000000e+06
	1	4774.152955	1440.819621	3333.333333	9.985592e+05
	2	4774.152955	1445.622353	3328.530601	9.971136e+05
	3	4774.152955	1450.441095	3323.711860	9.956631e+05
	4	4774.152955	1455.275898	3318.877056	9.942078e+05

	356	4774.152955	4695.373283	78.779671	1.893853e+04
	357	4774.152955	4711.024527	63.128427	1.422750e+04
	358	4774.152955	4726.727943	47.425012	9.500776e+03
	359	4774.152955	4742.483702	31.669252	4.758292e+03
	360	4774.152955	4758.291981	15.860973	3.894911e-08

Table 1. Cash flows, amortization, and total interest paid for a 30-year 4% fixed-rate mortgage.

- The total interest paid is 718695.063675673 which is the summation of Interest Applied column

Ideal customer:

- A borrower with a stable income, who plans to stay in the home long-term and prefers predictable monthly payments. This type of customer typically has a lower risk tolerance and appreciates the certainty of a fixed interest rate over the entire loan term. They might have a moderate income level, making the lower monthly payments of a 30-year mortgage more manageable compared to shorter-term loans with higher monthly payments.

A 20-year fixed rate at 2.5%

Since it is a fixed rate mortgage, this means that the interest rate of 2.5% will not change during the 20-year period which makes it easier for calculations, approximations and analysis. The formula for the monthly payments is like this:

Monthly Payment =

$$= (\text{Loan Amount} * (\text{Interest Rate} / 12)) / (1 - (1 + (\text{Interest Rate} / 12)) ^ {(-\text{Loan Term in Months})})$$

When I apply it for my example: (for a 20-year fixed-rate loan of \$1,000,000 at an interest rate of 2.5%)

$$\text{Monthly Payment} = (1,000,000 * (0.025 / 12)) / (1 - (1 + (0.025 / 12)) ^ {(-20 * 12)})$$

Monthly Payment = \$5,299.03

The cash flows, amortization, and total interest paid can be seen in the following table:

Month	Fixed Payment	Interest Payment	Principal Payment	Balance
0	0.00	0	0	1000000
1	5299.03	2083.333333	3215.70	996784.30
2	5299.03	2076.633968	3222.39	993561.91
3	5299.03	2069.920645	3229.11	990332.80
4	5299.03	2063.193336	3235.84	987096.97
5	5299.03	2056.452012	3242.58	983854.39
...
236	5299.03	54.85489923	5244.17	21086.18
237	5299.03	43.92953666	5255.10	15831.08
238	5299.03	32.98141293	5266.05	10565.03
239	5299.03	22.0104806	5277.02	5288.01
240	5299.03	11.01669216	5288.01	0.00

Table 2. Cash flows, amortization, and total interest paid for a 20-year 2.5% fixed-rate mortgage.

Group Number: 2791

And to be more precise:

The cash flow is: 5299.03 per month (every month because it is a fixed-rate mortgage)

The amortization is shown in the column: “remaining balance” where it is visible how the value of the loan is deteriorating.

And the total interest paid is the amount of money that is derived by the subtraction of the total cost (\$1,271,766.94) of the entire payment minus the loan value (1,000,000) which equals: \$271,766.94

And for the sake of being more detailed you can see it in the following table:

Annual rate	2.50%
years	20
payments	240
loan	1000000
monthly payment	\$5,299.03
total cost	\$1,271,766.94
total interest	\$271,766.94

Table 3. Side calculations for the 20-year 2.5% fixed-rate mortgage

As I have said this before, this is a fixed-rate mortgage and is for 20 years which makes it suitable for people with serious income like the people working in the Silicon Valley and especially the IT people. It is suitable for them as an investment home because they have steady and enormous (compared to the rest of the society) income cash flows. Thus, this is a suitable investment for them because they can relatively quickly pay the mortgage and furthermore if this is their second home they can even put it as a rental home and manage to repay it even quicker with the additional income from the rent.

A 30-year, 7-1 Adjustable Rate Mortgage (ARM)

The simulated rates from April 2, 1971 to June 9, 2022 used to calculate interest rates for 30 years from 1971 to 2000. In the given excel file, information about rates are given weekly. Average rate calculated using excel AVERAGE formula to calculate interest rate. Initial 7 years had different rates but because we are dealing with 7-1 ARM, those rates were replaced by the initial rate.

Year	Rates (%)
0	7.54
1	7.54
2	7.54
3	7.54
4	7.54
5	7.54
6	7.54
7	9.64
8	11.20
9	13.74
10	16.63
11	16.04
12	13.23
13	13.88
14	12.43

Year	Rates (%)
15	10.19
16	10.21
17	10.34
18	10.32
19	10.13
20	9.25
21	8.39
22	7.31
23	8.38
24	7.93
25	7.81
26	7.60
27	6.94
28	7.44
29	8.05

Table 4. 30 years, 7-1 adjustable interest rates.

Monthly payments were calculated using the following equation.

Monthly Payment = $(\text{Loan Amount} * (\text{Interest Rate} / 12)) / (1 - (1 + (\text{Interest Rate} / 12)) ^ (-\text{Loan Term in Months}))$

For initial 7 years (84 months):

Monthly Payment = $(\$1000000 * (0.0754/12)) / (1 - (1 + 0.0754/12) ^ (-30*12))$

Monthly Payment = \$7019.56

Group Number: 2791

From 8th year (12 months): By the end of 7th year loan amount decreased to \$918871.44.

$$\text{Monthly Payment} = (\$918870.34 * (0.0964/12)) / (1 - (1 + 0.0964/12)^{-23*12})$$

$$\text{Monthly Payment} = \$8292.83$$

From 9th year (12 months): By the end of 8th year loan amount decreased to \$819357.36.

$$\text{Monthly Payment} = (\$907439.16 * (0.112/12)) / (1 - (1 + 0.112/12)^{-22*12})$$

$$\text{Monthly Payment} = \$9267.07$$

Other monthly payment calculations were done using similar equations and methods. They are shown in the table below.

Year	Monthly payment (\$)
Initial 7 years	7019.56
8	8292.83
9	9267.07
10	10893.01
11	12796.88
12	12408.66
13	10650.66
14	11037.33
15	10209.50
16	9031.29
17	9041.03
18	9101.15

Year	Monthly payment (\$)
19	9092.43
20	9015.22
21	8686.90
22	8398.51
23	8077.93
24	8359.58
25	8255.66
26	8232.28
27	8199.03
28	8119.41
29	8160.59
30	8187.11

Table 5. Monthly payment of a 30-year, 7-1 ARM.

The cash flows, amortization, and total interest paid can be seen in the following table:

Month	Monthly Payment (\$)	Interest Payment (\$)	Principal Payment (\$)	Principal Balance (\$)
0	0.00	0	0	1000000
1	7019.56	6283.333333	736.23	999263.77
2	7019.56	6278.707376	740.85	998522.92
3	7019.56	6274.052352	745.51	997777.41
4	7019.56	6269.368079	750.19	997027.22
5	7019.56	6264.654373	754.91	996272.32

355	8187.11	321.9302672	7865.18	40124.43
356	8187.11	269.1680198	7917.94	32206.48
357	8187.11	216.0518257	7971.06	24235.43
358	8187.11	162.5793105	8024.53	16210.89
359	8187.11	108.7480837	8078.36	8132.53
360	8187.11	54.55573922	8132.55	-0.02

Table 6. Cash flow, interest payment and amortization of a 30 year, 7-1 ARM.

Total interest payment is equal to \$2151799.74.

An ideal customer for a 30-year, 7-1 adjustable rate mortgage is a person who thinks that current interest rate is high and expects interest rate to fall in the future. This mortgage has an interest rate risk when it rises. Therefore, this mortgage is not for everyone. You should have enough savings, so you can continue paying mortgage payments even in a high interest rate environment. You should also have steady income, so you can make monthly payments.

A marketing piece.

As a marketing expert and advisor, I can give you three options and you can choose one of them depending on what your situation is. Also, I will tell you to whom they are most suitable and depending on your current cash flow income or your debt profile, you will be able to choose properly.

So let's start with the first choice. I am talking about a 30 year fixed-rate mortgage with a 4% interest. This option is suitable for people that are looking for stability and predictability in their monthly payments. A 30 year fixed-rate mortgage will allow them to spread out their payments over a longer period, which can make them more affordable by lowering the monthly payment. However, they will pay more interest over the life of the loan than with a shorter-term mortgage, but we will discuss that with our second option. A 30 year fixed-rate mortgage is suitable for buyers who plan to stay in their home for a long time and want to lock in a low interest rate.

Now as I told you there is a second option that basically has almost the same characteristics with the only difference being a 20-year fixed mortgage with a 2.5% interest. It is more suitable for people who want to pay off their mortgage faster and save on interest. With this option they will pay a lower interest rate than with a 30 year term mortgage, and for a shorter period of time. Thus, they save thousands of dollars in interest over the loan term. However, their monthly payments will be higher than with a longer term, which means that they must have a better debt profile and a higher income in order to qualify for the loan terms. A 20 year fixed-rate mortgage is suitable for buyers who have a stable income and can afford higher payments. Usually these types of people take such a type of mortgage for an investment home and they place it for rental usage so that they could repay the mortgage by generating additional income by the rent cash flows.

The third option is a 30 year 7-1 Adjustable Rate Mortgage which is a bit different from the previous two options because the first 7 years are fixed with a lower interest and the rest are with an adjustable interest rate that adjust annually according to the market condition. This is a riskier option because the cash flows are much more difficult to be predicted, calculated and analyzed. So, having said that you have to take into consideration that you will be exposed to some uncertainty and potential of higher payments in the period after the first 7 years. This option will be suitable for you if you plan on moving to a different city and just buying this house like an investment.

Take your time to think it all through and be wise with your choice.

REFERENCES:

1. *"What Is a Mortgage? Types, How They Work, and Examples."* Investopedia, <https://www.investopedia.com/terms/m/mortgage.asp>. Accessed 4 April 2023.
2. *"Mortgage Comparison & Mortgage Rates."* MoneySuperMarket, <https://www.moneysupermarket.com/mortgages/>. Accessed 4 April 2023.
3. *Mortgage Calculator*, <https://www.mortgagecalculator.org/>. Accessed 4 April 2023
4. *"Mortgage Calculator."* Bankrate, <https://www.bankrate.com/mortgages/mortgage-calculator/>. Accessed 4 April 2023.
5. De Vita, Suzanne. *"What Is A 7/1 Adjustable-Rate Mortgage?"* Bankrate, 18 May 2022, <https://www.bankrate.com/mortgages/what-is-a-7-1-arm/>. Accessed 4 April 2023.
6. *"Compare Today's 7/1 ARM Mortgage Rates."* SmartAsset.com, <https://smartasset.com/mortgage/7-1-arm-mortgage-rates>. Accessed 4 April 2023.
7. *"Fixed-Rate vs. Adjustable-Rate Mortgages: What's the Difference?"* Investopedia, <https://www.investopedia.com/mortgage/mortgage-rates/fixed-versus-adjustable-rate/>. Accessed 4 April 2023.
8. Lewis, Holden. *"Compare Today's 7/1 ARM Mortgage Rates."* NerdWallet, <https://www.nerdwallet.com/mortgages/mortgage-rates/7-1-arm>. Accessed 4 April 2023.