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My Dearest Friend,

It has come to my understanding when we previously discussed our retirement plans that I was unable to convince you of my argument. While decisions regarding your economic future are your own personal choices, as your friend I want to stress the importance of correctly planning for the future. While you did state that you are not planning on saving for your retirement until the age of forty I know statistically that this would be a mistake for the following reasons. When saving for retirement arguably the most important aspect is how long your money has the ability to accumulate interest while in the account. While the amount of your monthly investments does matter considerably, it is more beneficial to start investing money early which allows time for your money to grow. This saves you from being forced to invest hefty monthly sums later in life to make up for lost time. Not to mention as you grow older you may face unexpected financial emergencies that could inhibit your ability to invest as heavily as you want. Investing early allows you to give yourself some financial breathing room, though I do not necessarily expect you to take me at my word. I have prepared four possible investment situations that will illustrate the importance of early investment. Out of these four possible options presented I have highlighted the best route to secure your future after retirement.

I want to make you aware of some assumptions and limitations I have made regarding these scenarios. First, I have done all my calculations based on an account with 7.5% interest compounded monthly. Secondly, for each scenario I have proposed various monthly investments that may not be achievable due to your financial obligations. I have also assumed that you would be making equal monthly investments to your accounts when they could arguably vary from month to month. Concerning the limitations, I am aware that you may be able to invest more per month than the model suggests, so make sure to take that into account. I am assuming the ages at which you start/stop investing and that you will retire at sixty-five. I have also outlined a scenario that allows you to make withdrawals out of your retirement account during its period of growth before you retire.

The first route you could take would be to start investing early at the age of twenty-two. At this age you could invest \$275 per month until the age of forty. At the age of forty, based on your contributions and interest accumulated in the account, the total of the account would be \$125,015 (FV). This is calculated using the future value of annuity. Even though after the age of forty no more contributions would have been made, the money would continue to accrue interest until you retire at the age of sixty-five. The growth of the interest from age forty to age sixty-five is calculated using the compound interest formula. At the age of sixty-five the value of the account would be \$810,458 (CI). It is important to note that the vast majority of the account (\$685,443) would have been made in interest alone from the ages of forty to sixty-five. This scenario states that you would only have to personally invest a total of \$59,400 over a period of eighteen years to get the previously stated total at the age of sixty-five. Your total interest gained for the account would be \$751,058 at the age of sixty-five; this is significantly more than the

amount you would have personally invested. This scenario has both positive and negative aspects. The positive is that you would start to invest early allowing your money to grow for an extensive period of time. Another positive is that if you decide to stop investing at forty, then you would still have a sizeable account balance when you retire at sixty-five and you would have the freedom from forty to sixty-five to invest more or spend more. While this is an accomplishment the negative of the scenario is that the monthly contributions at such a young age, affecting the potential growth of the ending balance. If you were to remain committed and kept contributing to the account after the age of forty, your balance could be much higher.

The second scenario should look familiar to you since it models your plan for retirement which you mentioned at lunch. In this scenario, calculated using the future value of annuity, you would wait until the age of forty to start investing \$550 a month in your account until you retired at the age of sixty-five. This means that you would make steady investments for twenty-five years. You would invest a total amount \$165,000. Your ending balance in the account would be \$482,494 (FV) which means the account earned \$317,494 in interest. Hopefully by now you can see the staggering differences in the ending account balances between scenario one and two. While in scenario two you would personally invest more money per month for a longer period of time than you would in scenario one, it would not pay off. Due to beginning your investments so late in life, you would not be giving your money ample time to gain the same amount of interest. In scenario one you would gain considerably more money by simply letting your money grow untouched from the ages of forty to sixty-five than you would by investing a larger sum from the ages of forty to sixty-five in scenario two. Sadly, the ending balance in scenario two would not allow you to retire comfortably at the age of sixty-five, even though you invested a considerable amount of money to make up for lost time.

Of course, you could do both scenario one and two in order to come out with even more money by the time you decide to retire. Scenario three will prove to be the most financially beneficial as it combines the two scenarios. In scenario three you would start by making the monthly investments of \$275 from age twenty-two to forty (FV). At the age of forty you would stop making investments and your balance would gain compound interest until you turned sixty-five. To calculate this you would use the compound interest formula. At the age of forty you would open a second account and then make investments of \$550 per month from age forty to sixty-five. Then, at sixty-five your balance would be worth the combined value provided by each individual sequence of investments as well as the amount of interest compounded from the first investment from the age of forty to sixty-five. The first account would be worth \$810,458 and the second account would be worth \$482,494 (FV) for a combined balance of \$1,292,950. It is important to note that more than half of the ending balance would come from the interest earned from ages forty to sixty five by the investments you would have made from ages twenty-two to forty. You would have personally invested \$224,400 between the two accounts. This scenario is smart because you would not only start investing early, but you would increase your monthly investments when you could afford to at forty and you would keep investing into

your account until you retire. While this would be the most personally invested out of the other three scenarios, you would earn significantly more interest in the account totaling \$1,068,550. This is the only account where you would be able to earn over a million dollars in interest. Having this large sum of money would allow you to retire with little worry. All it takes is being committed to investing monthly and starting early.

All the above scenarios assume that you would not withdraw any money from your retirement account for any reason, allowing it to grow. In scenario four however, we allow the possibility that you would make three withdrawals to pay for your children's college education. In this scenario, beginning at the age of twenty-two and continuing until you turn forty, you would invest \$275 per month into an account(FV). This is identical to scenario one so the account would continue to accrue interest from forty until you turned sixty-five. The ending balance would also be the same as scenario one totaling \$810,458(CI). Then, at the age of forty, you would invest \$600 per month into another account and continue making these investments until you turn fifty (FV). These funds that invest from ages forty through fifty would be used as discretionary funding during ages fifty through sixty-five which you would use to fund your children's education. The established balance (\$70,758) would continue to earn compound interest until you would retire at the age of sixty-five (CI). While it is accumulating interest, you would make three withdrawals at the ages of fifty, fifty-five, and sixty for the amount of \$36,000 each time. For account two, the balance at sixty-five would be \$88,836 after the three withdrawals are made. In account two, you would have personally invested \$72,000 which is barely less than the ending balance of \$88,836. This lack of a considerable increase in funds is due to the fact that you withdrew \$36,000 three times, preventing your money from growing considerably. Therefore, due to your withdraws, the money could not compound enough interest to show a big increase in the account. Even when you combine the two accounts for a total of \$899,294, it is considerably less than account two. You would have personally invested \$131,400 in total between the two accounts which means that together, the accounts would earn \$767,894 in interest. The positive to this scenario is that you would have established a good sum in account one at an early age, allowing the money to grow. By investing in the second account from the age of forty to fifty, you allow yourself to make three withdraws from the account to invest for your child's college. You would have in this scenario created your first account for retirement purposes and your second account for discretionary funds.

Referring back to our conversation at lunch, you stated that you wanted to start investing into your retirement account when you turned forty. I have calculated the monthly investments you would need to make for scenarios one, three, and four to gain the total you would get from investing as early as the scenarios stated. By choosing to delay contributions to your account, you would need to make large investments monthly to get the same sum as you would if you started investing earlier. If you hoped to have \$810,458 in your account by the time you retire, as calculated in scenario one, you would need to invest \$924 per month for twenty-five years (ages forty to sixty-five) to reach this sum. In contrast, if you invested \$275 monthly from the ages of

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twenty-two to forty and then let it compound interest monthly until sixty-five, you would have the same ending balance; the only difference being that much more of it would be earned in interest. In scenario two, if you needed a bit more for retirement, you might strive for the ending balance we already calculated (\$1,292,950). If you chose to delay your investments until the age of forty, you would need to invest \$1,474 per month until you retired at the age of sixty-five. This amount of monthly investments would be considerably more difficult to make than if you steadily invested a lower amount at a younger age. If you want to have close to \$899,294 in your account when you retire (scenario four) you would need to make monthly investments of \$1,025 from the age of forty until you retire at sixty-five to get this amount. This monthly investment is significantly larger than if you started investing \$275 at the age of twenty-two. Even if you would have started to invest more money monthly in another account at the age of forty (\$600), it would be nowhere near the amount you would need to invest monthly if you waited until you turned forty to start investing. The lesson here is that you do not have to personally invest as much if you invest early and allow your money time to grow. To calculate these situations I used the future value of annuity.

I hope that you will take this into consideration when you are planning for your future. Best of luck to you and your investments. Please make sure to contact me if further help is needed.

Sincerely,

Stella Morris and Skylar Old

Scenario number	Amount earned	Personal amount invested	Interest earned
Scenario one	\$810,458	\$59,400	\$751,058
Scenario two	\$482,494	\$165,000	\$317,494
Scenario three	Account one: \$810,457 Account two: \$482,494 Total amount in accounts: \$1,292,950	\$224,400	\$,1068,550
Scenario four	Account one: \$810,458 Account two: \$88,836 Combined Amount in accounts:\$899,294	\$131,400	\$767,894

Future Value Formula: $FV = PMT \frac{(1+r/n)^{nt} - 1}{r/n}$

Compound interest formula: $A = P(1+r/n)^{nt}$

Interest earned: ending balance- personal investment=interest earned

To calculate investments needed if you started at 40.

Scenario	Desired ending balance	Monthly contributions needed if you started to invest at forty.
Scenario one	\$810,458	\$924
Scenario three	\$1,292,950	\$1,474
Scenario four	\$899,294	\$1,025