

Entrepreneurship for Computer Science

15-390 - Spring 2020

Problem Set 3

Out: 23rd of March, 2020

Due: 1st of April, 2020

Problem	Points
Pricing	15
Compounding	10
Debt and Interest	15
Discounting	20
Startup Unit Economics and Analysis	40

Problem I: Pricing [15 Points]

Suppose that you are in a new startup whose product is a workplace management application, like Slack. Since you are based in Qatar, you and your team decided that your beachhead market will be Qatar. You are tasked with finding the ideal pricing for your product. The questions below will help you identify the right pricing.

- Are there competitors out there? Do some research and identify your competitors.
 - If there are any, how much the customer would pay for the product?
 - Many organizations do not use a workplace management application. How do they compensate for it? Does it incur them any cost?
- a) Considering all the points above, fill out the sections of the market segmentation matrix in the table below. **(10 points)**

Market Segment Name	
End User	
Task	
Benefit	
Urgency of Need	
Lead Customers	
Size of Market (# of End Users)	
Competition/Alternatives	
Other components needed for a full solution	

- b) What price would you set for your product? Explain your reasoning briefly. **(5 points)**

Problem II: Compounding [10 Points]

- a) Is it possible to compound \$300 to become \$600 over 7 years, assuming an interest rate of 10%? Explain all your reasoning and show all your calculations. **(5 points)**
- b) Compute $\lim_{n \rightarrow \infty} P \left(1 + \frac{r}{n}\right)^{tn}$, assuming P is the principal amount of money, r is the interest rate, t is the number of years, and n is the number of times P is compounded every year. **(5 points)**

Problem III: Debt and Interest [15 Points]

Erin recently graduated from CMU-Q with a BS in Computer Science. In August 2017, he borrowed \$50,000 and borrowed another \$50,000 in August 2018. His student loan has an annual interest rate of 2% compounded monthly. Erin will not make any payments on his debt until he starts a lucrative Google job (which he has been offered to start in September 2019). Then starting in September 2019, he will make a payment of \$1000 every month. Bonus time will come soon afterwards. For January 2020, he plans to

make another \$1000 payment and also apply his bonus to the debt. How big must his bonus be so that he will have completely paid-off the debt at the end of this January? Show and explain all your calculations.

Problem IV: Discounting [20 Points]

Assuming a discount rate of 9%, which of the following options do you prefer most? Show and explain all your calculations.

- a) Receive \$80 today and \$80 in 5 years. **(5 points)**
- b) Pay \$60 every year for 4 years, starting from next year, and after that receive \$40 every year for \$25 years. **(5 points)**
- c) Receive \$10 every year, forever, starting today. **(5 points)**
- d) Receive \$20 every other year, forever, starting today. **(5 points)**

Problem V: Startup Unit Economics and Analysis-- Med4You [40 Points]

Med4You is a new tech company located in Doha. It offers an app that allows patients to input their chief complaints and, accordingly schedule appointments with suitable doctors in Qatar. More precisely, the app leverages the input complaints of a patient and recommends a doctor with a particular specialty, who is the most suitable to handle this patient's case.

Med4You partners with health care facilities in Qatar to have their doctors recommended by its app. In particular, a clinic or a hospital can participate on Med4You's app via paying a fee of 2.5% from the revenue generated by every medical session resulting from an appointment scheduled over Med4You's app. Aside from the 2.5% commission fee, Med4You does not charge any other fee on integrating its system with any facility's system, let alone maintaining and updating such integration over time.

Med4You plans to cover only Qatar in the coming five years (now, 2019!). To this end, it hired only a single salesperson to try to convince hospitals and clinics in Qatar to participate on its app. The starting full package of this salesperson is \$110,000, but it increases 3% every year, for 5 consecutive years. In addition, Med4You hired a lawyer for 2 years, with a full package of \$90,000 per year. The lawyer is well versed in the regulations of medicine in Qatar and can work with the responsible government officials to obtain any required permission and ensure that all of Med4You's activities are in concordance with Qatar's health regulations. Lastly, Med4You hired a web developer who will design its website and develop all the ad material needed for a strong online presence. The web developer, the ad material, and the total price of distributing ads on various online platforms will cost Med4You \$100,000 per year for the coming 5 years.

Assume the following:

- The expected total number of appointments made through Med4You is 200,000 in year 2019 and it is expected to increase by 4%, 10%, 25%, and 45% in years 2020, 2021, 2022 and 2023 respectively.
- The average revenue made by health care facilities in Qatar from every medical session is \$35. You can assume that each patient makes 3 appointments per year.
- The gross margin of Med4You is 85%.

- The retention rates on Med4You's app are potentially 65%, 70%, 75%, 80%, and 90% in years 2019, 2020, 2021, 2022 and 2023 respectively.
 - Cost of capital rate is 45%.
 - All other costs can be ignored.
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- a) Explain the advantages and disadvantages of Med4You's business model from the perspectives of the economic seller, economic buyer, and end users. **(5 points)**
 - b) What is the LTV of Med4You over the given period of 5 years? Show and explain all supporting calculations. **(15 points)**
 - c) What is the COCA of Med4You over the given period of 5 years? Show and explain all supporting calculations (*hint*: calculate COCA for only 1 period of 5 years). **(10 points)**
 - d) Do you expect Med4You to be profitable in the given period of 5 years? Explain your reasoning. **(3 points)**
 - e) Suggest and discuss ways for Med4You to become a sustainable and attractive business in the coming few years. **(7 points)**