Question 1

Assuming that the demand for some product X changes with its price according to this relation.

$$D = 840 - 8.37\,P$$

Where D is **demand** for product X and P is **price** in SGD

Each product X costs SGD $38 to make. This company is contemplating charging a price somewhere between $47 and $78. Create an Excel spreadsheet model that can calculate **product profit** as a function of profit using the reference model below.

	A	B	C
1			
2		**Demand Constant**	840
3		**Demand Coefficient**	8.37
4			
5		**Manufacture Cost**	
6		**Sales Price**	
7		**Demand**	
8		**Per-Unit Profit**	
9		**Total Profit**	

a) Determine the **Sales Price** which yields the highest **Total Profit**.

Sales Price: _____

Total Profit: _____

b) Create another similar model to track the same information (Sales Price, Demand, Per-Unit Profit & Total Profit) for sales prices ranging between $47 and $78 (both amounts inclusive). Use this model to create a plot of **Total Profit** against the **Sales Price**. Sketch this plot below and indicate clearly the **Sales Price** that results in zero profit (break even).

Question 2

You wanted to join a newly opened executive club for a period of 6 years but are undecided which membership plan to take up.

You worked out 3 possible options as follow:

Plan A - Join 1-year membership plan and renew up to 6 years
Plan B - Join 2-year membership plan and renew every other year for up to 6 years
Plan C - Join 6-year membership plan straight away

Using an interest rate of 2.5%, create a model using the reference in figure 2 to determine which plan is most cost-effective assuming that all payments are made at the beginning of the period? (Hint: PV formula can be found in class presentation slide if needed)

		Year		
Membership period (year)	1	2	6
Initial Payment	$2,000	$2,500	$7,500
Membership Renewal Fee (yearly, every 2 years, every 6 years)	$500	$750	$1,000
Monthly Subscription Fee	$200	$175	$150

Interest Rate = 2.50%

	PLAN A		PLAN B		PLAN C	
Year	Cash Flow	PV	Cash Flow	PV	Cash Flow	PV
1						
2						
3						
4						
5						
6						
PMT (Monthly Subscription Fee)						
NPV						

Figure 2

a) Which plan should you take up?

_____ (1 mark)

b) Fill in values (round off to integer) of Cash Flow and PV into figure 2.
(3 marks)

Question 3

Kevin's favorite activity is watching TV and does it daily from 8pm to 11pm without fail. He subscribed to only 3 channels and habitually starts watching Channel 1 at 8pm after his dinner. Whenever he feels bore or when a commercial break occurs, he will switch channel. He switches randomly to any of the other 2 channels with equal likelihood.

Kevin does not have any favorite TV program, his time spend watching any channel follows a **normal distribution** with a mean of 20 minutes and standard deviation of 5 minutes. There is a 50% chance that a commercial break may occur when he is watching a particular channel. If a commercial break does occur, it can be assumed that it will only occur 5 minutes into the start of watching a new channel.

a) Create a model using the reference in figure 3 to capture the clock time from 8pm to 12 pm, TV channel, watching time and likelihood of commercial break occurring.

	Clock Time	Channel	Watching Time (minutes)	Commercial (1 or 0)?	Icon Appearing Time	Play game (Yes or No)?
3	8:00:00 PM					
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
25				Likelihood of Playing Game		

Figure 3