

## Exemplar 8 : The Optimum Tariff Plan

**Objective :** To select the optimal solution to a problem

**Key Stage :** 3

**Learning Unit :** Graphs of Linear Equations in Two Unknowns

**Materials Required :** The Internet, graph papers

**Prerequisite Knowledge :** Plotting of graphs

**Description of the Activity :**

1. The teacher divides students into groups of 5 and distributes the worksheet to each group.
2. The teacher explains the problem to students and asks them to work out the optimal solution to this problem.
3. Students are asked to search for the required information on the Internet and complete the questions in the worksheet.
4. Group members discuss among themselves to find the optimal answer to the problem.
5. The teacher invites student representatives from some of the groups to present and explain how they obtain their answers.
6. The teacher gives comments when appropriate.
7. The teacher may discuss with students the following questions:
  - (a) How can you justify your solution? Please explain briefly.
  - (b) Is there any alternative solution?
  - (c) Do you make any assumptions to solve this problem? What are your assumptions? If your assumptions are disregarded, what will be the solution to this problem?

**Worksheet : The Optimun Tariff Plan**

Maggie has recently bought a new mobile phone. She wants to choose the cheapest tariff plan that satisfies her needs. After careful considerations, she needs approximately 150 minutes airtime per month. She only needs the following value-added services: call forwarding package, caller display and voice mail. You are going to help her choose the right plan.

1. Search the homepage of the three network service providing companies on the Internet for the information on tariff plans. Maggie needs approximately 150 minutes airtime per month. If there are no tariff plan of 150 minutes per month, she will choose the plan just lower than 150 minutes per month and pay the additional airtime charge. Record the information in the following table:

	Name of Service Provider	Monthly Charge of Tariff Plan (\$)	Free Airtime (minutes)	Charge per Minute on Additional Airtime (\$)	Charge for Value-added Service (\$)
1					
2					
3					

2. Use the above information to complete the following table that shows the fee charged by each of the above companies on the airtime used.

	Name of Service Provider	Charge up to the following airtimes (\$)					
		150 min.	180 min.	210 min.	240 min.	270 min.	300 min.
1							
2							
3							

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3. Using the above information, plot the graph of cost against airtime for each of the service providers on the same graph paper. Use different colours to represent the graphs of different service providers for easy comparison.

Read from the graph and answer the following questions:

- (a) If Maggie uses exactly 150 minutes in a month, which plan will she choose so that her payment is minimum?

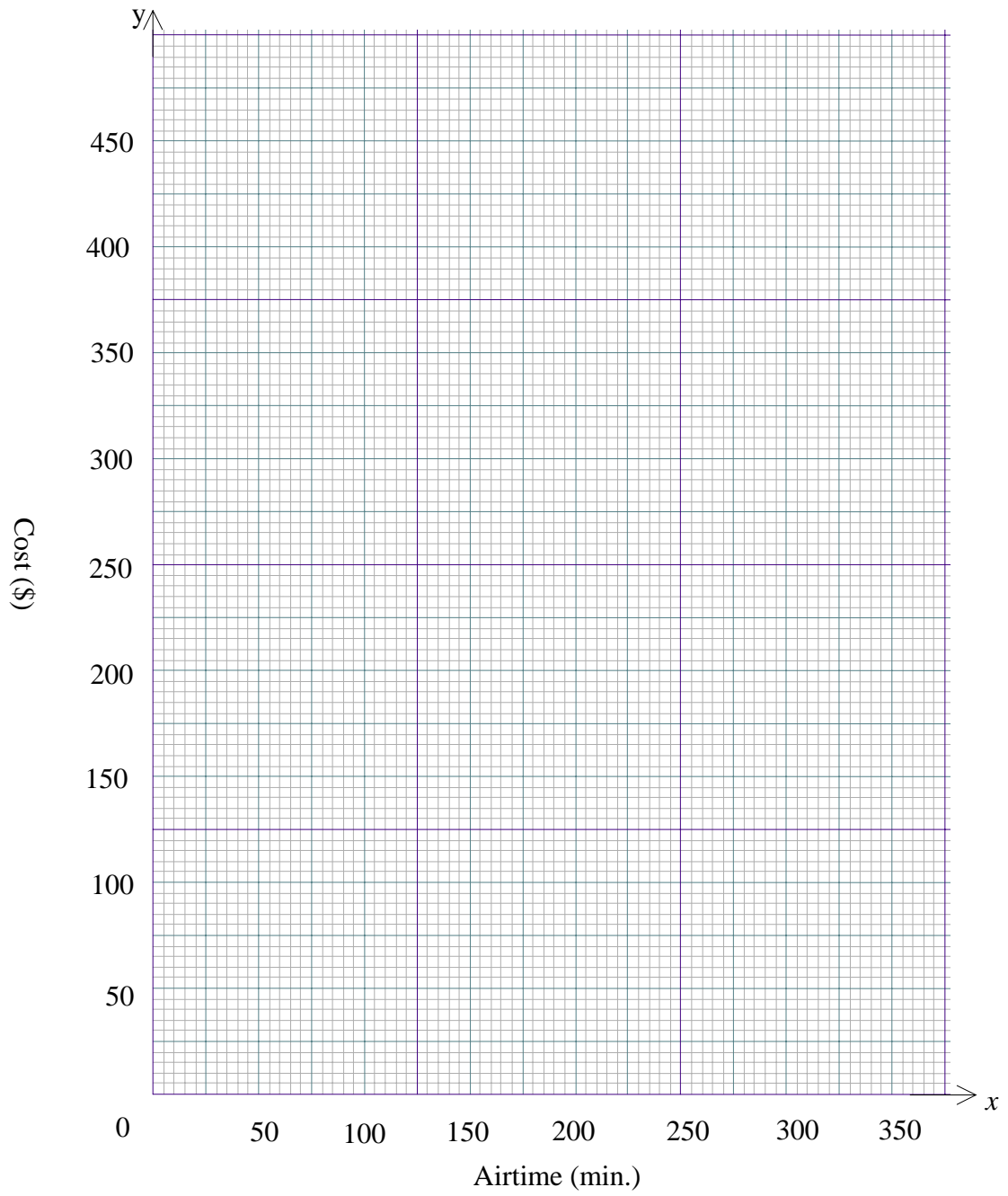
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- (b) If Maggie uses 200 minutes in a month, which plan will she choose so that her payment is minimum?

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- (c) If Maggie uses 300 minutes in a month, which plan will she choose so that her payment is minimum?

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**Notes for Teachers :**

1. The teacher should bring to the students' attention two of the most commonly used mobile phone networks in Hong Kong, namely the GSM and the PCS. However, the network service providers usually provide two kinds of services. They are the Dual Band (GSM900/1800) and the PCS(GSM1800). The charges of these two services vary greatly. For fair comparison, the teacher should give clear instructions to students on which services to use. For consistency in checking answers, the teacher may specify three mobile networks for the students to work on.
2. For simplicity, students may disregard other factors of mobile phone network service in this problem, e.g. the quality of transmission.
3. The teacher should remind students that the cost should be on the  $y$ -axis and the airtime on the  $x$ -axis for the graph in question 3.
4. Each graph consists of a number of line segments. It does not start from the origin.
5. This exemplar can also be used to foster students' problem solving skills.