**A113 – Mathematics**

**Worksheet for Problem 06: Barbecue**

**Cost Factors**

1. Refer to Table A and Table B in the Problem Statement.
   1. On average, how much did Fred pay for a packet of food item?

$6.04(2d.p.)

* 1. On average, how much did Ash, Bob, Carl and Dan each pay for a packet of food item?

Ash= $7.14(2d.p.)

Bob= $6

Carl= $7.06(2d.p.)

Dan= $5.91(2d.p.)

* 1. Is it necessary that the person who buys more packets of food items always pays more than the one who buys fewer packets? Explain your reasoning and state any assumptions made.

No. This is because there may be discounts when you purchase more items(Cash Discounts, Quantity Discounts). We also don’t know the unit price for each item.

**Information Required**

1. Refer to Tables 1 and 2 below (suppose all the food items were bought from YumYum).

Table 1

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Food Item**  **(in packets)** | **Chicken Wing** | **Fish** | **Prawn** | **Sausage** | **Total Price of Food Items\*** |
| **Ash** | 3 | 6 | 9 | 3 | **$150** |
| **Bob** | 2 | 6 | 4 | 8 | **$120** |
| **Carl** | 3 | 8 | 3 | 3 | **$120** |
| **Dan** | 5 | 4 | 6 | 7 | **$130** |

Table 2

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Food Item**  **(in packets)** | **Chicken Kebab** | **Fishball** | **Potatoes** | **Stingray** | **Total Price of Food Items\*** |
| **Francis** | 0 | 1 | 5 | 9 | **$76** |
| **Henry** | 0 | 0 | 0 | 1 | **$4** |
| **Ellen** | 1 | 4 | 3 | 8 | **$92** |
| **Grace** | 0 | 0 | 1 | 6 | **$30** |

* 1. From which table (i.e. Table 1 or Table 2) would it be easier to determine the unit price (per packet) for each of the food item? Why?

Table 2. This is because the unit pricing for 1 stingray is available.

* 1. Rearrange the 4 rows of information in the table you have identified in part (a) so that it would be easier to observe the unit price for each of the food item. Hence, determine each of the unit prices.

**Method of Elimination**

From Q2, the solution becomes simpler when there is less number of types of food in some of the purchases. Let us now explore how we can achieve this systematically by using the method of Elimination.

1. Let us start with Ash’s purchases. How can we simplify Ash’s purchases so that the number of packets of chicken wing becomes 1? Complete the table below (we can use “A” to denote the simplified expression for Ash’s purchase):

Table 3

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Food Item**  **(in packets)** | **Chicken Wing** | **Fish** | **Prawn** | **Sausage** | **Total Price of Food Items\*** |
| **Ash** | 3 | 6 | 9 | 3 | **$150** |
| **A** | 1 | 2 | 3 | 1 | **$50** |

1. Next we look at Bob’s purchases.
   1. How can we make use of Ash’s simplified purchase to modify Bob’s purchase so that it does not contain any chicken wing? Complete the table below (we can use “B” to denote the simplified expression for Bob’s purchase) :

Table 4

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Food Item**  **(in packets)** | **Chicken Wing** | **Fish** | **Prawn** | **Sausage** | **Total Price of Food Items\*** |
| **A** | 1 | 2 | 3 | 1 | **$50** |
| **Bob** | 2 | 6 | 4 | 8 | **$120** |
| **B (=Bob – A\*2)** | 0 | 1 | -1 | 3 | **$10** |

* 1. How does the step in Q3 (i.e. reducing the number of packets of chicken wing to 1) help to complete Table 4?

1. Using the approach similar to Q4, let us “eliminate” the food item “chicken wing” from Carl and Dan’s purchases. Complete the table below:

Table 5

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Food Item**  **(in packets)** | **Chicken Wing** | **Fish** | **Prawn** | **Sausage** | **Total Price of Food Items\*** |
| **A** | **1** | 2 | 3 | 1 | **$50** |
| **B** | **0** | 2 | -2 | 6 | **$20** |
| **C** | **0** | 0 | 5 | -5 | **$30** |
| **D** | **0** | ? |  | 1 | **$10** |

1. From Q3 to Q5, we have seen how we have reduced one type of food (i.e. chicken wing) from Bob, Carl and Dan’s purchases without losing essential information.

Now, adopt this method of elimination (Q3 to Q5) to reduce the next type of food item (i.e. fish) and complete the table below:

Table 6

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Food Item**  **(in packets)** | **Chicken Wing** | **Fish** | **Prawn** | **Sausage** | **Total Price of Food Items\*** |
| **A** | 1 | 2 | 3 | 1 | **$50** |
| **B’** | 0 | **1** | ? | ? | **$?** |
| **C’** | 0 | **0** | ? | ? | **$?** |
| **D’** | 0 | **0** | ? | ? | **$?** |

1. Continue to use this method of elimination until you can simplify the purchase information of Dan such that he has bought only sausages.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***Practice Questions***  *(It is essential to complete these practice questions so that you can understand the concepts of this lesson better and be more confident and competent in handling related questions.)*  Representing Information   1. 5 small bottles and 2 large bottles of a particular drink add up to a total of 3.1 litres in volume. Suppose *x* represents the volume of one small bottle and *y* represents the volume of one large bottle, which of the following expression best represents the relationship?      Option:  Method of Elimination  [You may want to watch the following [video](https://docs.google.com/file/d/0Bz3uuAzRqxSLSkpNbW9aeHA0N0U/edit?usp=sharing) which would help to recap some of the key concepts learnt before attempting the following question.]   1. The total weight of 5 small bricks, 10 medium bricks and 15 large bricks is 35 kg. What is the total weight of 1 small brick, 2 medium bricks and 3 large bricks? 2. Suppose 2 apples and 5 oranges cost $3.70 whereas 3 apples and 4 oranges cost $3.80. Assuming that each type of fruits has the same unit price, determine the total price of 5 apples and 9 oranges. 3. The cost of three purchases involving three items, pens, rulers and notepads are summarized in the table below, in which the price for each of the same type of stationery bought is the same.   M   |  |  |  |  | | --- | --- | --- | --- | | Pens | Rulers | Notepads | Total Cost ($) | | 3 | 3 | 4 | 10.00 | | 4 | 2 | 8 | 13.70 | | 5 | 5 | 2 | 13.40 |  1. What is the total cost of 2 pens, 1 ruler and 4 notepads? 2. What is the total cost of 7 pens, 5 rulers and 12 notepads? 3. What is the total cost of 7 pens and 7 rulers? 4. What is the total cost of 3 pens and 8 notepads? 5. Jack purchased 12 pens, 10 rulers and 14 notepads. He was given a discount and paid only $35.30 for his items purchased. How much discount, in $, did Jack obtained? 6. Students from class A and class B ordered a combination of hamburgers, pies and drinks from BurgerQueen as shown in the table below.  |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | Hamburgers | Pies | Drinks | Total Cost | | Class A | 26 | 14 | 20 | $61.20 | | Class B | 11 | 6 | 10 | $27.20 |  1. How much do 2 hamburgers and 1pie cost?      1. How much do 7 hamburgers, 4 pies and 10 drinks cost?      1. Sandy, Lindy, Mandy and Emily bought chocolate bars, lollipops, chewing gums and ice creams from a candy store. For each type of item, they are charged the same unit price. All of them are charged the correct total amount for their respective purchases. The quantity that they bought for each item and their total bills are shown in the table below.  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Shopper | Chocolate bar | Lollipop | Chewing gum | Ice cream | Total bill | | Sandy | 2 | 4 | 4 | 4 | $18.40 | | Lindy | 5 | 6 | 4 | 0 | $18.80 | | Mandy | 3 | 7 | 6 | 8 | $31.90 | | Emily | 20 | 24 | 16 | 0 | $75.20 |  1. Find the total cost of 1 chocolate bar, 1 lollipop and 2 chewing gums. 2. Find the total cost of 3 chocolate bars and 4 lollipops. 3. Find the total cost of 6 chocolate bars, 9 lollipops, 6 chewing gums and 4 ice cream. 4. Is the information provided in the table above sufficient to find the unit price for each item? Justify your answer.   Finding Unit Values  [You may want to watch the following [video](https://docs.google.com/file/d/0Bz3uuAzRqxSLU01VRHdWT1JNbUU/edit?usp=sharing) which would help to recap some of the key concepts learnt before attempting the following question.]   1. Determine the values of *w*, *x*, *y* and *z* for the following system of linear equations:   … (1)  … (2)   … (3)    … (4)  *w* =  *x* =  *y* =  *z* =   1. Determine the values of *x*, *y* and *z* for the following system of linear equations:   … (1)  … (2)  … (3)  *x* =  *y* =  *z* = |

**Putting It Together**

1. Using what you have found in Q7 and the same ideas and approach in Q2:
2. Determine the unit price of each of the food items.
3. Based on your answers to part (a), would you say that the unit prices have gone up/down in Fred’s purchases? Justify your answers.
4. List down all assumption(s) you have made when solving the problem.
5. Suppose you have the following sets of purchase information (refer to Table 7). Will you be able to determine the unit price of the different food items? Justify your answer. (Hint: check independent equations and number of unknowns.)

Table 7

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Food Item**  **(in packets)** | **Chicken Wing** | **Fish** | **Prawn** | **Sausage** | **Total Price of Food Items\*** |
| **Ash** | 3 | 6 | 9 | 3 | **$150** |
| **Bob** | 2 | 6 | 4 | 8 | **$120** |
| **Carl** | 3 | 8 | 3 | 3 | **$120** |
| **Daniel** | 2 | 4 | 6 | 2 | **$100** |

**Exploring Further**

1. Suppose you have found out that the unit prices have gone up in Fred’s purchases based on your answer in Q8, would you be able to exactly determine which food item’s unit price has gone up and by how much? Why/Why not?