

**HIGHER COLLEGES OF TECHNOLOGY
KEY COMMON ASSESSMENT**

**FOUNDATION MATHEMATICS
MATH 070**

Version A

Marking Scheme

CHALLENGE 2002

- 1 601 pens are shared equally between 145 students. How many pens are left over? [3 marks]

$$601 \div 145 = 4.14\dots$$

$$4 \times 145 = 580$$

$$\begin{aligned} \text{Left over} &= 601 - 580 \\ &= 21 \text{ pens} \end{aligned}$$

M1: division by 145

M1: subtract 580 from 601

A1: answer

Allow for long division method or alternative methods leading to the correct answer.

No working out has to be shown.

- 2 Use your calculator to find the answer to the following expression. Leave your answer in fractional form. [1 mark]

$$\frac{2}{5} \times \left(\frac{2}{3} - \frac{1}{4} \right) + \frac{1}{2}$$

$$\frac{2}{3}$$

A1

- 3 A boat uses $54\frac{3}{4}$ gallons of fuel on a 15-hour trip.

- a) How many gallons of fuel are used each hour? [2 marks]

$$54\frac{3}{4} \div 15$$

$$= 3\frac{13}{20} \text{ gal}$$

M1: division by 15

A1: answer in mixed no. or decimal. (3.65)

Do not penalize for omitting units

- b) How many gallons of fuel are needed for an 8-hour trip? [2 marks]

$$3\frac{13}{20} \times 8$$

$$= 29\frac{1}{5} \text{ gal}$$

M1: multiplying by 8

A1: answer in mixed no. or decimal (29.2)

Do not penalize for omitting units

Allow follow thru from part a) multiplied by 8.

Allow other methods, such as setting up a proportion using original information

- 4 Khalifa had a bank balance of Dh 3678 at the start of the month. Two weeks later his balance was Dh 453 overdrawn. How much money did he spend during those two weeks? [2 marks]

$$\begin{aligned} \text{He spent} \\ 3678 - (-453) \\ = 3678 + 453 \\ = \text{Dh } 4131 \end{aligned}$$

M1: adding up the two amounts
A1: answer including unit
(-1 for omitting unit)

No marks for
3678-453=Dh3225

- 5 A cake requires 250 grams of flour. How many cakes can you make using 2.2 kilograms of flour? [3 marks]

$$\begin{aligned} 2.2 \text{ kg} &= 2200 \text{ grams} \\ 2200 \div 250 &= 8.8 \\ \text{Only } 8 \text{ cakes} &\text{ can be made} \end{aligned}$$

M1: converting to kg or to g
M1: dividing
A1: 0 for an answer of "9" or "8.8"

Or: 250 g = 0.25 kg
2.2 \div 0.25 = 8.8

- 6 A nurse sets a drip to deliver 0.45 litres per hour. Write this rate in millilitres per second (mL/s). [3 marks]

$$1 \text{ h} = 3600 \text{ s}$$

$$0.45 \times 1000 = 450 \text{ mL}$$

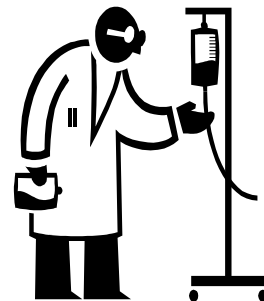
$$\begin{aligned} 0.45 \text{ L/h} &= 450 \text{ mL} / 3600 \text{ s} \\ &= 0.125 \text{ mL/s} \end{aligned}$$

M1: changing h to s

M1: changing L to mL

A1: answer

Omission of units not penalized



- 7 Ruqeya goes to South Africa on holiday. She returns to the UAE with 3200 South African rand. How many dirhams will she get from the bank?
The table below shows the rates in dirhams. [3 marks]

Currency	Buy	Sell
South African rand	0.3588	0.3695

Bank is buying, rate is 0.3588
She will get: 3200×0.3588
= Dh 1148.16

M1: identifying the correct rate
M1: multiplying by 3200
A1: answer to 2 d.p., must have units

$3200 \times 0.3695 = \text{Dh } 1182.40$
two marks, must have zero

- 8 Write the following ratio in its simplest form. [2 marks]

6 days : 32 hours

6 days : 32 hours

$6 \times 24 \text{ hours} : 32 \text{ hours}$ *M1: multiply by 24 (hours need not be listed)*

144 : 32

9 : 2

A1: correctly simplifying, allow follow-through

$6:32=3:16$
1 mark

- 9 Saeed invests Dh 96 000 and Hussein invests Dh 76 800 in a business partnership. The business makes a profit of Dh 190 665. The profit is shared in the same ratio as their investments.

- a) Write the ratio of Saeed's to Hussein's investments in its simplest form. [2 marks]

Dh 96000 : Dh 76800
5 : 4

M1: setup ratio, units are not necessary

A1: answer in simplest form

- b) Find Hussein's share of the profit. [3 marks]

$5 + 4 = 9$

$\frac{4}{9} \times 190\,665$

= Dh 84 740

M1: adding up total shares

M1: multiplying by $\frac{4}{9}$ to get Hussein's share

A1: answer

(do not penalize for omitting unit)

$190665/9=$
21185 only:
no mark

10 Write down an expression for:

the product of x and twice y

[1 mark]

$$2xy$$

Al

11 Simplify:

$$\frac{b}{3} \left(\frac{1}{4} - \frac{2}{5} \right) - \frac{3b}{12}$$

[2 marks]

$$\frac{b}{3} \left(\frac{1}{4} - \frac{2}{5} \right) - \frac{3b}{12}$$

$$\frac{b}{12} - \frac{2b}{15} - \frac{3b}{12}$$

M1: expanding

$$\frac{-3b}{10}$$

*Al: reducing to a simplified answer
Allow follow-through*

12 Make α the subject of the formula:

$$R = R_0(1 + \alpha t)$$

[3 marks]

$$R = R_0(1 + \alpha t)$$

$$R = R_0 + R_0 \alpha t$$
$$R - R_0 = R_0 \alpha t$$

M1: expanding

M1: subtracting

$$a = \frac{R - R_0}{R_0 t}$$

Al

Alternative:

$$R/R_0 = 1 + \alpha t \quad \text{M1 dividing}$$

$$R/R_0 - 1 = \alpha t \quad \text{M1 subtracting}$$

$$a = \frac{\frac{R}{R_0} - 1}{t} \quad \text{or} \quad \frac{R}{R_0 t} - \frac{1}{t} \quad \text{Al}$$

13 Solve for x and y:

$$\begin{aligned}25x + 50y &= 450 \\ x + y &= 10\end{aligned}$$

[4 marks]

$$\begin{aligned}y &= 10 - x \\ 25x + 50(10 - x) &= 450 \\ 25x + 500 - 50x &= 450 \\ 500 - 25x &= 450 \\ -25x &= -50 \\ x &= 2 \\ y &= 8\end{aligned}$$

M1: re-arranging second equation for y or x

M1: substitution and expanding

A1: finding x or y

A1: finding y or x

Allow for alternative method:

$$\begin{aligned}25x + 50y &= 450 \\ 25x + 25y &= 250 & M1 \\ 25y &= 200 & M1 \\ y &= 8 & A1 \\ x &= 2 & A1\end{aligned}$$

14 Temperature in °F can be converted to °C using this formula:

$$C = \frac{5(F - 32)}{9}$$

a) What is 68°F in °C?

[2 marks]

$$\begin{aligned}C &= \frac{5(F - 32)}{9} \\ &= \frac{5(68 - 32)}{9} \\ &= 20^\circ C\end{aligned}$$

M1: substitution

A1: answer

Unit need not be displayed

b) What is 24°C in °F?

[3 marks]

$$\begin{aligned}24 &= \frac{5(F - 32)}{9} \\ 216 &= 5F - 160 \\ 376 &= 5F \\ F &= 75.2^\circ F\end{aligned}$$

M1: substitution

M1: multiplying out brackets correctly

A1: answer with or without unit

Alternative:

$$\begin{aligned}216/5 &= F - 32 & M1 \text{ substitution} \\ & & M1 \text{ dividing by 5} \\ & & A1 \text{ answer}\end{aligned}$$

15 Solve the following equations:

a) $\frac{2a}{5} + 2 = 10$

[2 marks]

$$\frac{2a}{5} = 10 - 2$$

$$\frac{2a}{5} = 8 \quad * \quad M1: \text{ subtracting 2}$$

$$2a = 40$$

$$a = 20 \quad A1: \text{ answer}$$

*allow correct follow-through from **

b) $11.7x - 2(3x - 7.55) = 2.7x + 6.1$

[3 marks]

$$11.7x - 6x + 15.1 = 2.7x + 6.1 \quad *$$

$$11.7x - 6x - 2.7x = 6.1 - 15.1$$

$$3x = -9$$

$$x = -3$$

M1: multiplying out brackets correctly

M1: collecting like terms correctly

*(allow follow-through from working at *)*

A1: answer

16 George needs to be at a meeting in Dubai at 1:15 pm. It takes him 1 hour and 40 minutes to drive from Abu Dhabi. What is the latest time he should leave Abu Dhabi? Give your answer using the 12-hour clock. [3 marks]

$$1:15 = 13:15 = 12:75^*$$

$$\begin{array}{r} 12:75 \\ - 1:40 \\ \hline 11:35 \end{array}$$

He should leave Abu Dhabi at 11:35 am.

M1: changing to 12:75

M1: subtracting

*A1: answer in 12-hour clock with am written (allow follow-through from working at *)*

Allow for alternative method. Working out does not have to be shown.

- 17 Sudhakhir works as a security guard. He begins work at 19:45 and finishes at 04:15 the next morning. How long does Sudhakhir work? Give your answer in hours and minutes. [3 marks]

$$24:00 - 19:45 = 4:15$$

$$4:15 + 4:15 = 8:30$$

He works for **8 hours and 30 minutes**

M1: subtracting from 24 hours

M1: adding

A1: writing the answer in hours and minutes

Allow for alternative method.

Working out does not have to be shown.

- 18 The monthly salary of an accountant is increased by AED 850. The annual salary before the increase was AED 111 000. What is his new **annual** salary? [3 marks]

$$850 \times 12 = 10\,200$$

$$10\,200 + 111\,000$$

$$= 121\,200$$

His new **annual salary is AED 121 200**

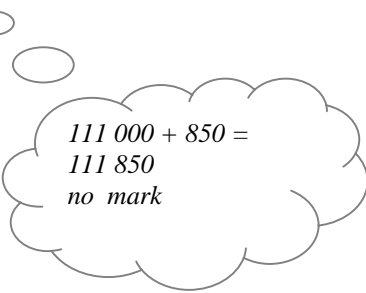
M1: sight of $\times 12$

M1: adding

A1

Allow for alternative steps leading to the correct result.

Don't penalize omission of unit.



$$111\,000 + 850 =$$

$$111\,850$$

no mark

19 Omar normally works 35 hours in a week and is paid an hourly rate of AED 120. Last week he worked 42 hours. He is paid overtime at one and a quarter times his normal hourly rate.

a) What is his overtime pay for one hour? [1 mark]

$$120 \times 1\frac{1}{4} = 150 \quad \text{AI: AED not needed}$$

b) What is his overtime pay for last week? [2 marks]

$$42 - 35 = 7 \quad \text{M1: finding overtime hours}$$

$$7 \times 150 = 1050 \quad \text{AI: AED not needed}$$

c) What is his total pay for last week? [3 marks]

$$35 \times 120 = 4200 \quad \text{M1: finding normal pay}$$

$$4200 + 1050 = 5250 \quad \text{M1: adding overtime and normal pay}$$

Allow for follow through marks with their answer from b

His total pay is AED 5250. AI: AED not needed.

20 There are 1700 teachers at the HCT. 1071 of these teachers are British. What percentage of the HCT teachers is **not** British? [3 marks]

$$\text{Non-Brits} = 1700 - 1071 = 629 \quad \text{M1: subtract}$$

$$\frac{629}{1700} \times 100\% = 37\% \quad \text{M1: setting up \% calculation}$$

AI: answer

Allow the method of $100\% - 63\%$ too.

$$\frac{1071}{1700} \times 100\% = 63\% \quad \text{M1 set up}$$

$$100\% - 63\% = 37\% \quad \text{M1 subtract}$$
 AI

- 21 Ali pays Dh 650 rent per month for his apartment. The rent went up by 8%. Find the new monthly rent. [3 marks]

$$\begin{aligned} \text{Amount of increase} &= 0.08 \times 650 = \text{Dh } 52 \\ \text{New rent} &= 52 + 650 \\ &= \text{Dh } 702 \end{aligned}$$

M1: for 0.08 x or 8/100 x
M1: adding the old rent to the amount of increase.
A1: answer.

Allow for alternative methods or a combination of the two steps.
Do not penalize for missing "Dh"

- 22 A 52 kg measurement is read incorrectly as 50 kg. Find the percentage error to the nearest hundredth percent. [4 marks]

$$\begin{aligned} \text{Error} &= 52 - 50 = 2 \text{ kg} \\ \frac{2}{52} \times 100\% \end{aligned}$$

$$= 3.85461538\%$$

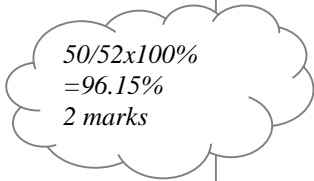
$$\cong 3.85\%$$

M1: subtracting

M1: setting up % calculation

M1: converting to a percentage

A1: answer rounded to 2 d.p.



$$\begin{aligned} 50/52 \times 100\% \\ = 96.15\% \\ 2 \text{ marks} \end{aligned}$$

- 23 A dinner bill of Dh 657.25 included 10% tax.

- a) What was the bill excluding (without) tax? [3 marks]

$$\begin{aligned} 657.25 &= x + 0.1x \\ 657.25 &= 1.1x \end{aligned}$$

M1: setting up the equation
M1: collecting like terms

$$x = \frac{657.25}{1.1} = \text{Dh } 597.50 \quad \text{A1: answer expressed in Dh to 2 d.p.}$$

- b) How much was the tax? [2 marks]

$$\begin{aligned} \text{Tax} &= 657.25 - 597.50 \\ &= \text{Dh } 59.75 \end{aligned}$$

M1: subtract new – old
A1: answer to 2 d.p.

Do not penalize for omitting unit.
Allow for 10% taking directly from 597.50 method.
Allow follow through if answer in (a) is wrong

24 The number of cars owned by 30 families in Ras Al Khaimah is listed below:

3 2 2 3 2
 4 4 1 2 2
 4 3 2 0 2
 2 1 3 3 1
 2 2 1 1 0
 3 1 1 4 0

a) Fill in the frequency distribution table below: [3 marks]

Number of Cars Owned	TALLY	FREQUENCY
0	III	3
1	IIII II	7
2	IIII IIII	10
3	IIII I	6
4	III	4
	TOTAL	30

M1: first column

M2: final column, minus 1 for each pair of mistakes.
 Award full marks if the tally column is skipped.

b) How many families owned at least 3 cars? [1 mark]

$6 + 4 = 10$ AI: answer

c) What percentage of families owned no more than 2 cars? [3 marks]

$3 + 7 + 10 = 20$

M1: adding up 3, 7 and 10

Allow follow through for the remainder of the question, if values taken from the table are incorrect

$\frac{20}{30} \times 100\%$

M1: setting up of % calculation

$= 66\frac{2}{3}\%$ or 66.7% or $66.\bar{6}\%$

AI: any answer correctly rounded, including 67%

d) Find the mean to 3 d.p. [3 marks]

$$\frac{0 \times 3 + 1 \times 7 + 2 \times 10 + 3 \times 6 + 4 \times 4}{30}$$

 $= 2.033$

M1: multiplying each x by f and adding, or using the table to sum up the numbers (61)

M1: division by 30

AI: answer to 3 d.p.

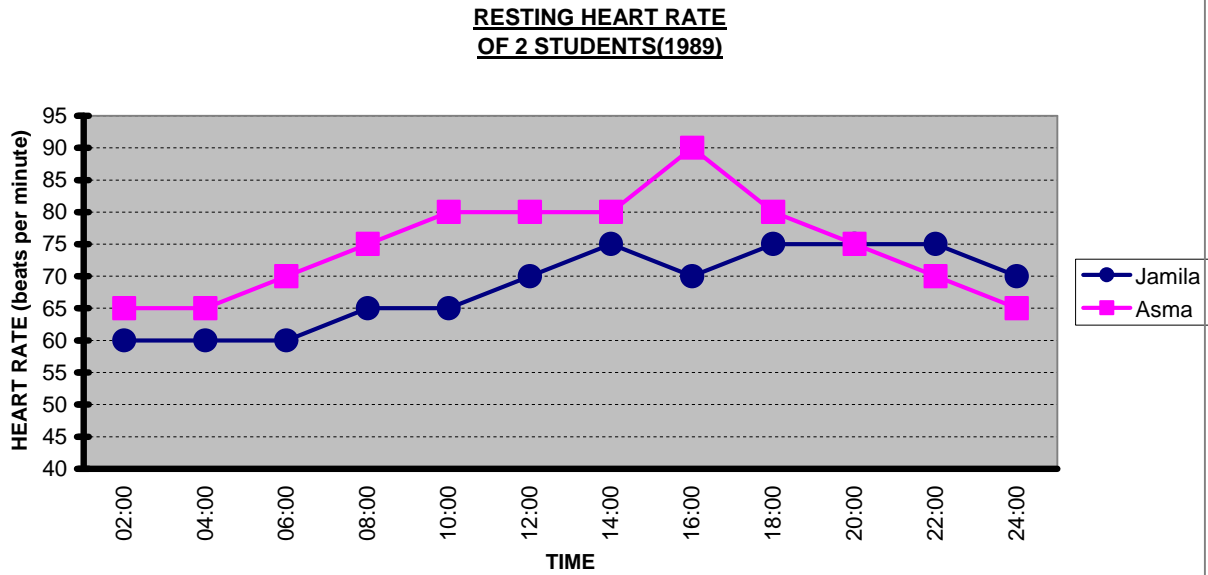
$(1+2+3+4)/30 = 0.333$
 1 mark only

e) What is the mode? [1 mark]

Mode = 2

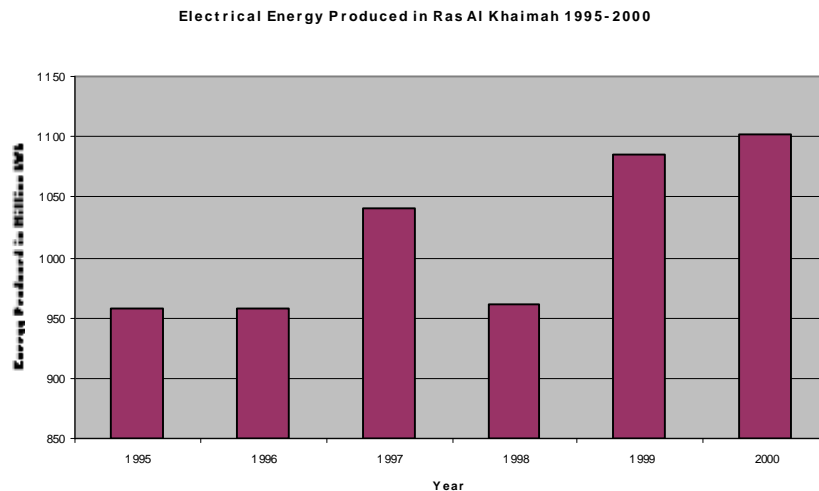
AI

25 Use the graph below to answer the following:



- a) When was Jamila's heart rate 65 beats per minute? [2 marks]
08:00 and 10:00 *A2, 1 mark each*
- b) When were their heartbeats the same? [1 mark]
20:00 *A1*
- c) Between what times was Jamila's heart rate less than Asma's heart rate? [1 mark]
02:00 - 20:00 *A1*
- d) What was Asma's maximum heart rate? [1 mark]
90 bpm *A1*
unit not important
- e) When was the difference between their heartbeats 15 beats per minute? [1 mark]
10:00 *A1*

26 Look at the graph below and answer the questions that follow.



a) What is the title of the y-axis? [1 mark]

Energy produced in million kWh AI

b) What are the y-axis intervals? [1 mark]

50 Million kWh AI

no credit if million kWh is not written

c) In which year was the greatest amount of electrical energy produced? [1 mark]

2000 AI

d) What was the difference in electrical energy produced between 1996 and 1999? [2 marks]

1085 – 960 M1: *reading the two values*
= 125 million kWh AI: *answer*

Accept answers in the range 120-130 million kWh. Penalize once only if million kWh is not stated in parts b) d) & e).

e) What was the total amount of electrical energy produced in Ras Al Khaimah from 1998 to 2000? [2 marks]

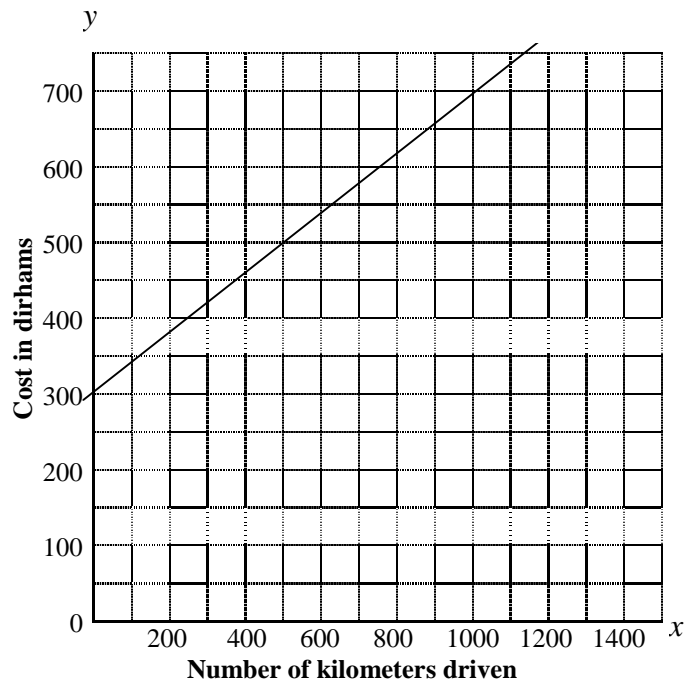
965 + 1085 + 1105 M1: *adding up the three values*
= 3155 million kWh AI: *answer*

Accept any answers in the range 3100-3200 million kWh

f) In which year did the amount of electrical energy decrease, compared with the year before? [1 mark]

1998 AI

- 27 Happy Taxi Company uses the following graph to find out how much it costs to operate each taxi.



- a) How many kilometers did the taxi drive for a cost of AED 700? [1 mark]

1000 km

AI: unit need not be shown

- b) What is the y-intercept of the graph? [1 mark]

Dh 300

AI: unit need not be shown

- c) Find the slope of the graph. [3 marks]

Using the two points (500, 500) and (0, 300)

$$\frac{500 - 300}{500 - 0} = \frac{200}{500} = 0.4 \text{ or } \frac{2}{5}$$

M1: correct numerator (rise)
M1: correct denominator (run)
AI: answer

Allow follow through using the ss selected points or the rise/run method without selecting two points.

- d) What is the equation of the graph? [2 marks]

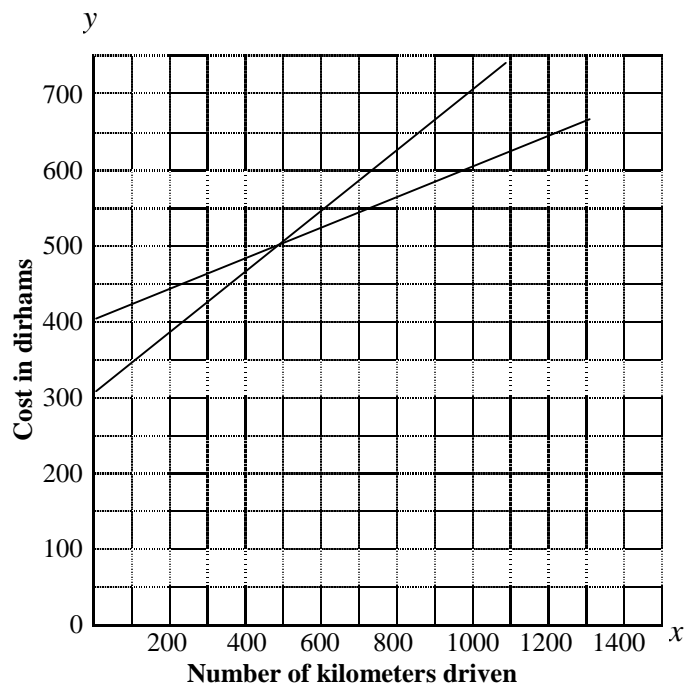
$$y = mx + b$$

$$y = 0.4x + 300$$

M1: slope-intercept equation
AI: correct substitution into the equation

Also accept for full credit: $y = \frac{2}{5}x + 300$ or $5y = 2x + 1500$
Allow follow through from answers obtained in parts (b) and (c)

Speedy Taxi Company wants to use the same grid as Happy Taxi Company:



- e) The cost of operating each taxi at Speedy Taxi Company is AED 400 plus 20 fils per kilometre. The equation for finding the weekly cost, y dirhams, for x kilometres is given by [2 marks]

$$y = 0.2x + 400$$

Complete the table below:

x	0	500	1000	1500
y	400	500	600	700

A2: *minus one for each error to a max. of 2*

- f) Draw this graph on the grid above. [2 marks]
M1: to plot the points
M1: to draw the line
Allow follow through from (e)

- g) What is the difference in cost for the two companies for a taxi driving 1000 kilometres? [2 marks]

Cost at Happy Taxi is : Dh 700 (from graph)

M1: identifying the costs

Cost at Speedy Taxi is: Dh 600 (from table or graph)

Difference = 700 – 600 = Dh 100

A1: answer, do not penalize missing unit

Allow follow through from the students' readings

28. Mohammed bought two bags of popcorn and three soft drinks and paid AED 20.75.
 Ali paid AED 29.50 for three bags of popcorn and four soft drinks.
 Find the price of a bag of popcorn. [5 marks]

Let the price of a popcorn bag be **P**

Let the price of a soft drink be **D**

$$2P + 3D = 20.75$$

M1: for correct equation

$$3P + 4D = 29.50$$

M1: for correct equation

$$2P + 3D = 20.75$$

$$\times (3) \quad P \quad 6P + 9D = 62.25$$

$$3P + 4D = 29.50$$

$$\times (2) \quad P \quad \frac{6P + 8D = 59}{D = 3.25}$$

M1: matching coefficients

M1: answer for D

$$P = \text{Dh } 5.50$$

Popcorn costs Dh 5.50

AI: answer, including unit and rounded to 2 d.p.

Allow for other methods to reach a solution:

x -3 and 2

x 4 and 3

x -4 and 3

Allow substitution method

Follow-through at all stages given

