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PROBLEM SOLVING	حل المشكلات
Paper 1 Problem Solving	الورقة 1 حل المشكلات

This mark scheme is published as an aid to teachers and students, to indicate the requirements of the National Examinations. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at the Examiners' meeting before marking began. All Examiners are instructed that alternative correct answers and unexpected approaches in students' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated, even if they do not appear in this mark scheme. Therefore, the Directorate of National Examinations, QQA will not enter into discussions or correspondence in connection with these mark schemes.

Mark schemes must be read in conjunction with the question papers and the Principal Examiner reports.

1	Key	D	The Pistachios and the walnuts belong to the same set of toppings (The Nuts).
	Distractors		
	A	One item is chosen from each set.	
	B	One item is chosen from each set.	
	C	One item is chosen from each set.	
2	Key	B	The reflection of the shape in a horizontal axis.
	Distractors		
	A	Incorrect shading in the middle section.	
	C	The middle section is not changed.	
	D	The middle section is not reflected but the shading is reversed.	
3	Key	C	The number of brown loaves sold in the second half of March is 39 (20 + 19). The number in the first half of January is 32 (14 + 18). So the difference is 7
	Distractors		
	A	Uses figures for the first half of March instead of the second half.	
	B	Uses figures for the second half of January instead of the first half.	
	D	Uses figures for white loaves instead of brown loaves.	
4	Key	B	If the full price of the other item was BD 4 or less, the total paid would be less than BD 18, so the BD 4 item is the cheapest, and the other full price must be $BD\ 18 - BD\ 9 - BD\ 2 = BD\ 7$.
	Distractors		
	A	The price of the third item if there were no discount.	
	C	The full price of the third item if it were the one that had been discounted.	
	D	The price paid for the other two items (BD 9 + half of BD 4).	

5	Key	D	The time until they meet is the lowest common multiple of the 3 lap times. The number of laps for each of them can be calculated by dividing the total time by the lap time.
	Distractors		
	A	The length of the track is only useful if the speeds are given.	
	B	The direction in which each of them walked would not enable the number of laps to be calculated.	
	C	The time that they had started walking would not enable the number of laps to be calculated.	
6	Key	D	On 1 st January 2012 the value of the account was 6 million dinars. On 1 st January 2013 the value of the account was 14 million dinars. On 1 st January 2014 the value of the account was 28 million dinars. On 1 st January 2015 the value of the account was 56 million dinars.
	Distractors		
	A	Ignoring adding the 2 million dinars.	
	B	Adding the 2 million dinars after the whole period.	
	C	Adding the 2 million dinars on 1 st January 2014 instead of 1 st January 2013.	
7	Key	A	Apples BD 0.800 Oranges BD 0.650 Bananas BD 0.600 Other fruits (mango & tomato) BD 0.900 Total BD 2.950
	Distractors		
	B	Uses BD 1.000 for the combined price of the other 2 fruits.	
	C	Uses BD 1.000 for the price of the apples.	
	D	Uses BD 1.000 for the price of the apples & uses BD 1.000 for the combined price of the other 2 fruits.	

8	Key	D	Anything that happens after the meeting time is irrelevant.
	Distractors		
	A	A and B together are needed to know at what time he will reach the cinema complex.	
	B	See above.	
	C	He needs to know which films finish before the meeting time.	
9	Key	B	19 correct answers would give a score of at least 95. If only 18 answers were correct, then the score would be 90, plus a maximum of 2 further points (if the other questions were not answered). If fewer than 18 answers were correct, then the score would be less than 90. Therefore 93 is not a possible score.
	Distractors		
	A	18 correct answers, and 2 unanswered questions.	
	C	19 correct answers, and 1 incorrect answer.	
	D	19 correct answers, and 1 unanswered question.	
10	Key	C	Length = $14 \times 1 + 2 + 2 = 18$ m. Width = $11 \times 1 + 2 + 2 = 15$ m.
	Distractors		
	A	The distance of the boundary only included on one side in each calculation.	
	B	Using 15 and 12 for the number of gaps between the trees and only including the distance to the boundary on one side in each calculation.	
	D	Using 15 and 12 for the number of gaps between the trees.	

11	Key	D	The heights of the bars should be 5, 10, 13, 18, 20 and 25 if the best option is taken at each point.
	Distractors		
	A	Once the third bar is added, the heights are assumed to increase by 5 each time.	
	B	Calculates the price of 4 hours as $4 \times \text{BD } 5$ instead of $\text{BD } 13 + \text{BD } 5$ Calculates the price of 6 hours as $2 \times \text{BD } 13$ instead of $\text{BD } 20 + \text{BD } 5$	
	C	One hour is $\text{BD } 5$ and each extra hour is an extra $\text{BD } 4$ (which gives the correct final value of $\text{BD } 25$)	
12	Key	B	The best solution is to buy 1 box of 15 bottles, 3 boxes of 9 bottles and 2 boxes of 4 bottles.
	Distractors		
	A	There is no way to do it with 5 boxes.	
	C	This is 2 boxes of 15 bottles and 5 boxes of 4 bottles.	
	D	This is 2 boxes of 9 bottles and 8 boxes of 4 bottles.	
13	Key	C	Living room area = $8 \times 10 = 80 \text{ m}^2$. Tile area = $0.4 \times 0.4 = 0.16 \text{ m}^2$ (after converting units from cm to m). Number of tiles = $80 \div 0.16 = 500$ tiles. Tile cost + installation cost = $(2 \times 500) + (1 \times 80) = \text{BD } 1080$.
	Distractors		
	A	Calculates the number of tiles along the length of the room as 40 divided by 10 (4) and the number of tiles along the width of the room as 40 divided by 8 (5), so calculates that 20 tiles are needed. Tile cost + installation cost = $(2 \times 20) + (1 \times 80) = \text{BD } 120$.	
	B	Applies the costs the wrong way round. Tile cost + installation cost = $(1 \times 500) + (2 \times 80) = \text{BD } 660$.	
	D	Applies a charge for installation of $\text{BD } 1$ per tile. Tile cost + installation cost = $(2 \times 500) + (1 \times 500) = \text{BD } 1500$.	

14	Key	B	This fulfills all conditions in the question The total number of students is 20 30% of them (6 students) visited exactly 2 countries
	Distractors		
	A	The total number of students is not correct	
	C	The total number of students is not correct	
	D	The number of students who visited exactly 2 countries is not correct	
15	Key	B	Only the price for 100 leaflets in colour is important, so company 3 will be the one that I use. The cost will be BD 27. Producing the leaflets myself will cost BD 32, so the company is BD 5 cheaper.
	Distractors		
	A	The cheapest leaflets overall will cost BD 20, but they are not on coloured paper.	
	C	The cheapest leaflets on coloured paper with pictures will cost BD 35.	
	D	If the BD 9 is taken as the whole cost, not the cost per hour, then the cost to produce them myself is BD 14, so the cheapest leaflets would be BD 13 more expensive.	
16	Key	B	When folded the three triangles meet at the same corner.
	Distractors		
	A	When folded the three triangles do not meet at the same corner.	
	C	When folded the three triangles do not meet at the same corner.	
	D	When folded the three triangles do not meet at the same corner.	

17	Key	B	Total profit was BD 2500. Khalid gets 10% of the profits. The bonus BD 250 was added to Khalid's basic salary (BD 200) last month.
	Distractors		
	A		Total profit would be BD 2700 and it would imply the salary BD 470.
	C		Total profit would be BD 2800 and it would imply the salary BD 480.
	D		Total profit would be BD 2400 and it would imply the salary BD 440.
18	Key	D	This chart is consistent with the given information
	Distractors		
	A		Visitors from Kuwait must be less than the visitors from KSA.
	B		Visitors from Bahrain must be less than the visitors from UAE.
	C		Visitors from Kuwait must be more than the visitors from Qatar.
19	Key	C	Cost of 200 text messages = $200 \times 0.025 =$ BD 5. So cost of phone calls = $15 - 5 =$ BD 10. Cost per minute of calls = 10 fils. Nasser sent 260 text messages with a cost of BD 6.500. What is left of the money on the bill = $20 - 6.500 =$ BD 13.500. Number of minutes of calls = 1350 minutes.
	Distractors		
	A		Calculates price per minute of calls as BD 15 divided by 1000 (ignoring texts in minimum charge of BD 15); BD 13.500 is 900 minutes at 15 fils per minute.
	B		260 texts would cost BD 6.500 and the bill is BD 5 more than the minimum charge of BD 15. Assumes that the BD 1.500 difference is the price of the additional calls.
	D		There are 60 extra texts, which cost BD 1.500. Taking this away from BD 20 is BD 18.500 which is assumed to be the price of the calls.

20	Key	C	The 5 points needs to be replaced, so $1.5 \times$ the final examination mark must be at least 60.
	A	The minimum score Wafa needed to get a C.	
	B	Including the 5 points as well as the replaced score means that $1.5 \times$ the final examination mark must be at least 55.	
	D	The minimum score Wafa needed to get an A.	
21	Key	D	For carrying the box on the airplane he paid for the extra weight $2 \times (40 - 20) = \text{BD } 40$ and for sending the bag on cargo he paid $0.600 \times 30 = \text{BD } 18$. In total he spent $\text{BD } 58$.
	Distractors		
	A	For the extra weight of the bag he paid $2 \times (30 - 20) = \text{BD } 20$, while for the box he paid $0.550 \times 40 = \text{BD } 22$, giving a total of $\text{BD } 42$.	
	B	For both the bag and the box he paid $0.600 \times 70 = \text{BD } 42$.	
	C	For the extra weight of the bag he paid $2 \times (30 - 20) = \text{BD } 20$, while for the box he paid $\frac{2.200 \times 40}{4} = \text{BD } 22$ giving a total of $\text{BD } 42$	
22	Key	B	At station Y, before the new passengers got on, there were 270 passengers ($320 - 50$) Before the passengers got off at station Y there were 405 passengers (50% more) At station X, before the new passengers got on, there were 195 passengers ($405 - 210$) Before the passengers got off at station X there were 390 passengers (100% more)
	Distractors		
	A	An increase by 33% (one third) at station Y and by 50% at station X	
	C	At each station calculates the increase and the decrease in the wrong order	
	D	Calculates with two thirds of the passengers getting off at station Y	

23	Key	B	The base can be either black or white The sides can be coloured as follows: BBBB, WWWW, BBBW, WWWB, BBWW or BWWB There are $2 \times 6 = 12$ possibilities.
	Distractors		
	A	$2 \times 5 = 10$, misses either BBWW or BWWB.	
	C	$2 \times 7 = 14$, counts an extra BBWW or BWWB as a reflection.	
	D	$2^5 = 16$, thinks reflections of WWWB and WBWB are different.	
24	Key	D	The profit for a sofa is BD 320. The profit for a desk is BD 210. The profit for a bookcase is BD 80. The best profit is from 2 sofas and 2 desks. $2 \times 320 + 2 \times 210 = \text{BD } 1060$.
	Distractors		
	A	The profit from 1 sofa, 3 desks, and 1 bookcase.	
	B	The profit from 3 sofas and 1 bookcase.	
	C	The profit from 5 desks.	

25	Key	A	<p>For every BD 1.000 spent on the price of a meal before the reduction, the service charge was 200 fils.</p> <p>For every BD 1.000 spent on the price of a meal before the reduction, BD 1.100 was spent on the price of a meal after the reduction.</p> <p>For every BD 1.100 spent on the price of a meal after the reduction, the service charge was 110 fils.</p> <p>So the reduction is 90 fils, which is 45% of 200 fils.</p>
	Distractors		
	B	10% decrease in service charge, 10% increase in the total amount received from meal prices: $0.9 \times 1.1 = 0.99$	
	C	10% decrease in service charge, 10% increase in the total amount received from meal prices: $10 - 10 = 0$	
	D	10% increase in the total amount received from meal prices, 10% service charge added: $0.1 \times 1.1 = 0.11$	

26	Key	B	<p>The percentage changes are:</p> $\frac{N - O}{O} \times 100 \%$ <p>Red Party: $\frac{107 - 99}{99} \times 100 = 8.1 \%$</p> <p>Blue Party: $\frac{88 - 73}{73} \times 100 = 13.7 \%$</p> <p>Yellow Party: $\frac{50 - 68}{68} \times 100 = - 26.5\%$</p>
Distractors			
	A	Is the percentage of seats after minus the percentage of seats before	$\frac{N - O}{240} \times 100 \%$
	C	Is a percentage based on the number after rather than the number before	$\frac{N - O}{N} \times 100 \%$
	D	Is seats after minus seats before (i.e. reads the numbers in the tables as percentages)	$N - O$

27	Key	B	A search shows that there are only 2 solutions: 3 m x 10 m and 4 m x 6 m. The latter is smaller at 24 m ² .
	Distractors		
	A	The smallest rectangle whose area is the same as its perimeter. (ignoring the units) is a square with area and perimeter both equal to 16.	
	C	The larger option of the 2 valid solutions.	
	D	The correct area of the smaller option plus the path.	
28	Key	A	The profit is 150 fils per kilogram of bananas until the amount reaches 30 kilograms (a profit of BD 4.500). Once he exceeds 30 kilograms the profit will jump by BD 1.500 (due to the discount that he receives on the initial 30 kilograms of bananas) and from this point the profit will increase by 200 fils per kilogram.
	Distractors		
	B	The slope of the graph stays the same after the jump in profit.	
	C	The profit drops at 30 kilograms.	
	D	The profit drops at 30 kilograms and the slope of the graph stays the same after the drop in profit.	

29	Key	B	<p>Since Ibrahim rode for 0.5 hr = 30 mins at 12 km/hr (from 8:30 till 9:00) Ibrahim covered: $0.5 \times 12 = 6$ km The remaining distance between Ibrahim and Hassan is: $62 - 6 = 56$ km This distance decreases at $12 + 16 = 28$ km/hr Thus, the time Ibrahim and Hassan take to get to the meeting point is:</p> $\text{Time} = \frac{\text{distance}}{\text{speed}} = \frac{56}{28} = 2 \text{ hr}$ <p>Meaning they will meet at: $9:00 + 2 = 11:00$</p>
	Distractors		
	A	Correct calculation of 2 hours, but added to 8:30 instead of 9:00.	
	C	Dividing 56 by 16 instead of 28 gives 3 hours 30 minutes, which is then added to 9:00.	
	D	Dividing 56 by 12 instead of 28 gives 4 hours 40 minutes, which is then added to 9:00.	
30	Key	A	If his first round was 65 strokes, the only possibility that matches all the information in the stimulus is a second round of 69 strokes, and a third round of 71 strokes.
	Distractors		
	B	(66, 69, 70) is a possible alternative to (65, 69, 71)	
	C	(64, 70, 71) and (66, 68, 71) are possible alternatives to (65, 69, 71)	
	D	(67, 68, 70) is a possible alternative to (65, 69, 71)	