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**THINKING SKILLS**

**9694/31**

Paper 3 Problem and Analysis Solution

**October/November 2017**

MARK SCHEME

Maximum Mark: 50

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**Published**

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This document consists of **5** printed pages.

Question	Answer	Marks
1(a)	The <u>scenic route</u> loses $20 \times 25 = 500$ g, whereas the direct route loses $60 \times 10 = 600$ g.  <i>Award 1 mark for either of these masses, or for 'scenic by 100 g'. No marks for unsupported answer.</i>	<b>2</b>
1(b)	With the better-insulated box, the direct route loses $10 \times 20 = 200$ g, whereas the scenic route loses $5 \times 50 = 250$ g. So Faridah could save $500 \text{ g} - 200 \text{ g} = \underline{300 \text{ g}}$ .	<b>1</b>
1(c)	It would take 2 days, each day saving 300 g of ice cream, to recoup \$1, so it would take 30 days to recoup the \$15, which corresponds to <u>6 weeks</u> .  <i>Award 1 mark for 50¢ per day or equivalent.</i>	<b>2</b>
1(d)	In terms of ice-cream saving, the \$0.80 bus fare corresponds to $600 \times 0.8 \text{ g} = 480$ g of ice cream. Currently, Faridah is losing 500 g of ice cream a day, so the bus journey would be an improvement if she lost less than 20 g of ice cream on the journey, which means that the journey would have to take <u>less than 20 minutes</u> .  <i>Award 1 mark for comparing the net cost of taking a bus journey (for an arbitrary number of minutes) and the net cost of not; this includes consideration of 0 minutes, which reduces to the equivalence between the bus fare and 480 g of ice cream OR for an algebraic representation: <math>(t/600) + 0.8 = 500/600</math>.</i>	<b>2</b>
1(e)	The total quantity needed is <u>2300 g</u>  <i>1 mark for any comparison of profit from n normal ice-creams on scenic route (500 g lost, \$1 for 600 g) with profit from n luxury ice creams on direct route (800 g lost, \$1 for 500 g). e.g.: 800 g of luxury gives no money, whereas 800 g of normal yields 50 cents.  1 further mark for any improved comparison of quantities, or a comparison of rates (e.g. every additional 300 g of ice cream would be sold for 10¢ more if it is the better quality ice cream, so 1500 g is needed to compensate for the 50¢ loss).  Alternatively: <math>(q - 500)/600 = (q - 800)/500</math> [2 marks; 1 mark for either side correct]</i>	<b>3</b>

Question	Answer	Marks
2(a)	<u>5</u>	<b>1</b>
2(b)	<u>03:30 on 21st December</u>	<b>1</b>

Question	Answer	Marks
2(c)	<u>11:25 on 2nd July</u>  <i>1 mark for an otherwise correct answer which fails to deal with BST or DST correctly. Alternatively: 1 mark for correct time AND incorrect date or date omitted.</i>	<b>2</b>
2(d)(i)	<u>28 days</u> BST: 29 March to 25 October DST: .... to 5 April and 4 October to ... Overlap = 29 March to 5 April (7 days) + 4 October to 25 October (21 days)  <i>Award 1 mark for 7 days or 21 days or 3 correct dates given. SC: 1 mark for 156 days (using complement of one DST or BST time period)</i>	<b>2</b>
2(d)(ii)	<u>35 days</u> Always 7 days in March/April. Maximum number of days overlap in October = 28 days, for example, when first Sunday is on 2nd October and last Sunday is on 30th October.	<b>1</b>
2(e)	<u>20:12 on 18th March</u>  Total flight time = 31 h 12 min + 24 h stop-overs. Time difference NY to Sydney (DST applies) = 15 hours. Total time elapsed = 2 days 22 h 12 min. From a 22:00 start on 15th March, this gives arrival time of 20:12 on 18th March.  <i>1 mark for travel time correct 31h 12min (+24) or final answer of 10:46 (which uses the direct time from NY to Sydney) OR evidence of correct local date and time for arrival/departure at London or Perth in clearly stated time system. OR 2 marks for 2 days 22h 12 min (or equivalent) OR 19:12 OR 21:12 on 18th March (one incorrect application of DST) OR correct time (with working) but incorrect date/lack of date</i>	<b>3</b>

Question	Answer	Marks
3(a)(i)	Midnight – 22:00 cars, with one person per car: $168 - 85 = \underline{83}$ .	<b>1</b>
3(a)(ii)	<u>85</u>	<b>1</b>
3(a)(iii)	Mean number of cars in the staff car park over the three days: 10645 Discount shiftworkers cars: $10645 - 85 = 10560$ Average 1.1 occupants per car <i>1 mark each for up to two of the above if final answer incorrect</i> $10560 \times 1.1 = \underline{11616}$	<b>3</b>

Question	Answer	Marks
3(b)	All staff travel by car. Absence rate the same. Car occupancy ratios are the same. Hours for non-shiftworkers are the same / all non-shiftworkers are in by 10:00. Shiftworker employee:position ratio is the same. Shifts follow same pattern (hours and/or uniformity).  <i>1 mark each (max 2)</i>	2
3(c)(i)	5 positions require 27 employees. Each shift has 10 positions. So 54 shift-workers needed. [1 mark] $3233 - 54 = \underline{3179}$	2
3(c)(ii)	There are $2730 - 10 = 2720$ non-shiftworking staff cars in the car park $1.1 \times 2720 = 2992$ $3179 - 2992 = \underline{187}$  <i>1 mark for "1.1 × their estimate of non-shift-working staff cars"</i> <i>OR</i> <i>SC: 1 mark for 176 (forgets to subtract 10)</i>	2
3(d)	Number of shiftworkers: $27 \times 85/5 = 459$ [1 mark] Absence rate for non-shiftworking staff = $187/3179$ [1 mark] So total non-shiftworking employees = $11616 \times (3179/2992) = 12342$ [1 mark] Total employees is therefore $459 + 12342 = \underline{12801}$	4

Question	Answer	Marks
4(a)	<u>The Last Straw</u> (4:30)	1
4(b)	<u>1983</u>	1
4(c)	History could have been $11 - 8 = 3$ weeks at number 2. [1 mark] Water could have spent all 12 of its weeks in the Top Ten at number 2.  <u>15</u>	2
4(d)(i)	<u>First and Safety</u>  <i>Award 1 mark for each</i>	2
4(d)(ii)	<u>2nd Night</u> (Goose)	1
4(e)	Sum of 4:30, 4:10, 3:30, 3:20, 4:30, 3:30 and 3:20 is 26:50 [1 mark] $35 - 26:50 = \underline{8 \text{ minutes } 10 \text{ seconds}}$ / <u>8:10</u> / <u>490 seconds</u>  <i>Accept 8 minutes, provided it is clear that the answer has been rounded down to the nearest minute.</i>	2

Question	Answer	Marks
4(f)(i)	<p><i>Award 1 mark each of the following (maximum 2 marks):</i></p> <ul style="list-style-type: none"> <li>• Cooks has not been performed for three nights / must be performed tonight.</li> <li>• Late has not been performed for three nights / must be performed tonight.</li> <li>• Straw has been performed for the last three nights / cannot be performed tonight.</li> </ul>	<b>2</b>
4(f)(ii)	<p><i>For 4 marks to be awarded:</i></p> <ul style="list-style-type: none"> <li>• <i>the running order must include Cooks, Stitch, Water and Late;</i></li> <li>• <i>the other three songs must have a total time of no more than 11 minutes and must <b>not</b> include Hope or Straw;</i></li> <li>• <i>no more than two songs can come from the same year of release;</i></li> <li>• <i>the songs must be listed in order of release.</i></li> </ul> <p>For example, {Cooks; Goose; Sky; Stitch; Water; Late; Milk} (28:10).</p> <p><i>If 4 marks cannot be awarded, award 1 mark for each of the following (maximum 3 marks):</i></p> <ul style="list-style-type: none"> <li>• Any running order that has seven songs in order of their release <b>and</b> has no more than two from the same year.</li> <li>• Any running order of seven songs containing Cooks, Stitch, Water <b>and</b> Late.</li> <li>• Evidence of recognition that these four songs have a total time of 18 minutes / the other three songs must have a total time of 11 minutes or less.</li> <li>• Evidence that Hope <b>and</b> Straw have been left out of the running order deliberately.</li> </ul>	<b>4</b>