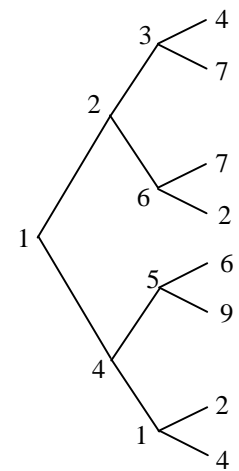


# Mark Scheme

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1.

<p>(i)</p>  <p>(ii) 1 (T) 4 (H) 5 (T) 9</p> <p>(iii) 2; 4; 6; 7; 9</p> <p>(iv) e.g. <math>1 \rightarrow 4 \rightarrow 1 \rightarrow \dots</math></p>	<p>M1  A1 first branch  A1 second branch  A1 third branch</p> <p>B1</p> <p>M1 at least four different  A1 complete and no repeats  B1</p>
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2.

(i)

M1 Dijkstra  
 A1 order of labelling  
 A1 labels  
 A1 working values

ABCDGF 12

(ii)

M1  
 A1

Total weight = 13

B1

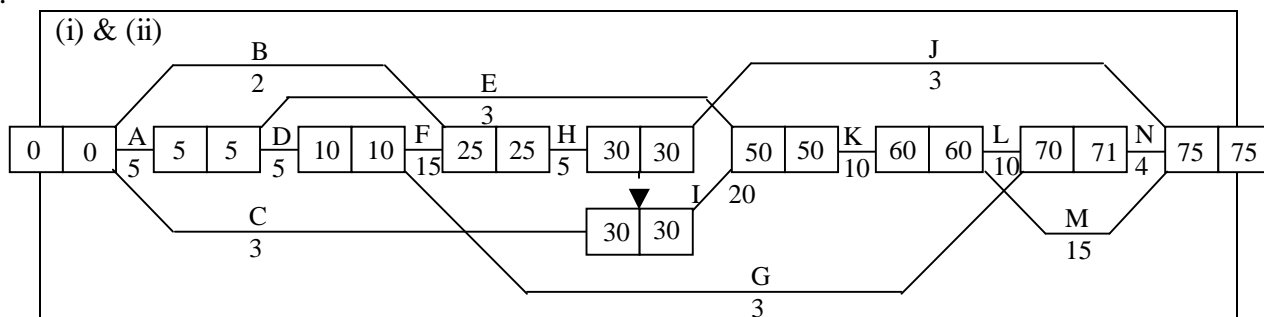
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3.

(i)	A	B	Q	R1	R2	
	84	660	7	72		M1
	72	84	1		12	A1
				12		
	12	72	6		0	
	Print	12				B1√ their 12
(ii)	A	B	Q	R1	R2	M1
	660	84	0	84		
	84	660	etc.			A1
(iii)	Line 2 says $6 = 30 - 2 \times 12$					B1
	Substituting $6 = 30 - 2 \times (42 - 30) = 3 \times 30 - 2 \times 42$					B1 3
						B1 2

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4.



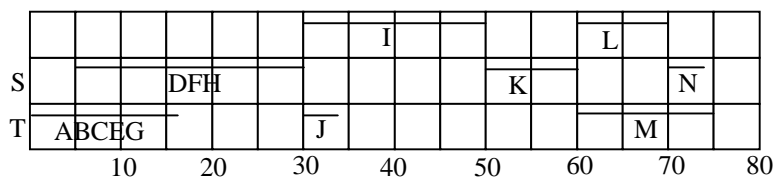
Critical: A, D, F, H, I, K, M      75 minutes

- M1
- A1 single start/end
- A1 I and J
- A1 A D F H K L N
- A1 B C E G M
- M1 A1 forward pass
- M1 A1 backward pass
- B1 B1 results

(iii) Total float for G = 58

B1✓

(iv)



- M1
- A1 stylist
- A1 trainee

(v) C – make coffee

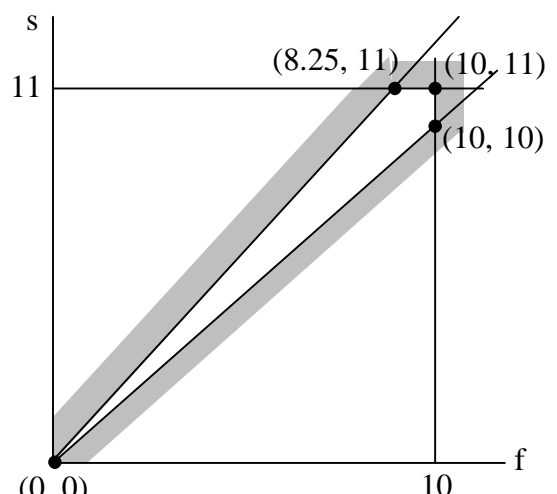
B1

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5.

<p>(i) eg. 00–41 → 2 42–69 → 5 70–83 → 15 84–97 → 25 98–99 → ignore</p> <p>(ii) 2 2 25 15 2 2 4 29 44 46</p> <p>(iii)</p> <table border="1" data-bbox="261 611 1233 1066"> <thead> <tr> <th>Car no.</th> <th>Arrival time at 1<sup>st</sup> lights</th> <th>Departure time from 1<sup>st</sup> lights</th> <th>Arrival time at 2<sup>nd</sup> lights</th> <th>Departure time from 2<sup>nd</sup> lights</th> </tr> </thead> <tbody> <tr><td>1</td><td>25</td><td>29</td><td>52</td><td>52</td></tr> <tr><td>2</td><td>27</td><td>31</td><td>54</td><td>54</td></tr> <tr><td>3</td><td>29</td><td>33</td><td>56</td><td>70</td></tr> <tr><td>4</td><td>44</td><td>44</td><td>67</td><td>72</td></tr> <tr><td>5</td><td>46</td><td>46</td><td>69</td><td>74</td></tr> <tr><td>6</td><td>48</td><td>48</td><td>71</td><td>76</td></tr> <tr><td>7</td><td>53</td><td>65</td><td>88</td><td>88</td></tr> <tr><td>8</td><td>78</td><td>78</td><td>101</td><td>101</td></tr> <tr><td>9</td><td>80</td><td>80</td><td>103</td><td>103</td></tr> <tr><td>10</td><td>85</td><td>85</td><td>108</td><td>120</td></tr> </tbody> </table>	Car no.	Arrival time at 1 <sup>st</sup> lights	Departure time from 1 <sup>st</sup> lights	Arrival time at 2 <sup>nd</sup> lights	Departure time from 2 <sup>nd</sup> lights	1	25	29	52	52	2	27	31	54	54	3	29	33	56	70	4	44	44	67	72	5	46	46	69	74	6	48	48	71	76	7	53	65	88	88	8	78	78	101	101	9	80	80	103	103	10	85	85	108	120	<p>M1 some ignored A1 proportions A1 efficient</p> <p>M1 A1 applying rule M1 A1 accumulating</p>
Car no.	Arrival time at 1 <sup>st</sup> lights	Departure time from 1 <sup>st</sup> lights	Arrival time at 2 <sup>nd</sup> lights	Departure time from 2 <sup>nd</sup> lights																																																				
1	25	29	52	52																																																				
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3	29	33	56	70																																																				
4	44	44	67	72																																																				
5	46	46	69	74																																																				
6	48	48	71	76																																																				
7	53	65	88	88																																																				
8	78	78	101	101																																																				
9	80	80	103	103																																																				
10	85	85	108	120																																																				
<p>(iv) Mean delay at first lights = 2.4 seconds Mean delay at second lights = 4.1 seconds</p> <p>(v) More repetitions (cars)</p>	<p>M1 A1 departure 1 (1 error allowed) A1 arrival 2 (ditto) A1 departure 2 (ditto) A1 all correct (cao)</p> <p>M1 A1 (cao)</p> <p>A1 (cao)</p> <p>B1</p>																																																							

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6.	<p>(i) Let <math>f</math> be the number of kg of fruit used. Let <math>s</math> be the number of kg of sugar used.</p> $s \geq f$ $s \leq 4f/3$ $f \leq 10$ $s \leq 11$ <p>(ii)</p>  <p>(iii) <math>(0, 0), (8.25, 11), (10, 11), (10, 10)</math></p> <p>(a) 21 kg at <math>(10, 11)</math></p> <p>(b) 20 kg at 50% concentration at <math>(10, 10)</math></p> <p>(c) 19.25 kg at <math>4/7</math> concentration at <math>(8.25, 11)</math></p> <p>(d) 20.5 kg at <math>(9.5, 11)</math></p>	<p>B1</p> <p>B1</p> <p>B1</p> <p>B1</p> <p>B1</p> <p>B1 labels and scales</p> <p>B1 <math>s = f</math></p> <p>B1 <math>s = 4f/3</math> (<math>\sqrt{3/4}</math>)</p> <p>B1 <math>f = 10</math> and <math>s = 11</math></p> <p>B1 shading</p> <p>B1✓</p> <p>B1✓</p> <p>B1✓</p> <p>B1✓</p> <p>M1 A1 (cao)</p>
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