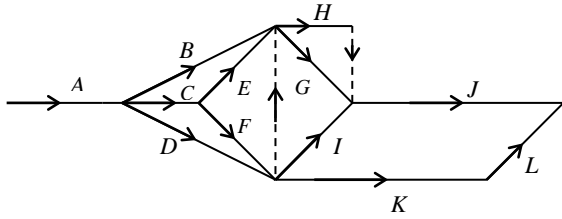


**EDEXCEL DECISION MATHEMATICS D1 (6689)  
PROVISIONAL MARK SCHEME NOVEMBER 2003**

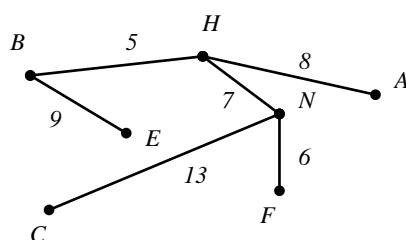
Question Number	Scheme	Marks
1.	<p>(a) All arcs must be traversed twice. (So no arc needs repeating more than twice.) All valencies therefore even.</p> <p>(b) e.g. <i>CECAEFEAFAFBACDBDGF</i> <i>GDC</i></p> <p>length = <math>2 \times 6</math> = <u>12km</u></p>	<p>B1 (1)</p> <p>M1 A1</p> <p>A1 (3)</p> <p><b>4</b></p>
2.	<p>(a)</p> <p>(b)</p> <p><math>\therefore</math> planar, so product can be built</p>	<p>B1 (1)</p> <p>M1</p> <p>A1</p> <p>A1</p> <p>A1 (4)</p> <p><b>5</b></p>

**EDEXCEL DECISION MATHEMATICS D1 (6689)  
PROVISIONAL MARK SCHEME NOVEMBER 2003**

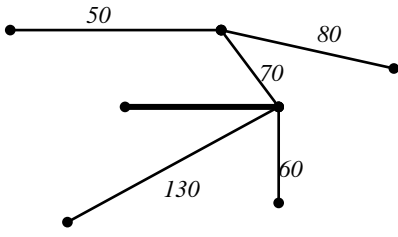
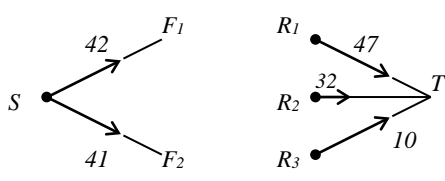
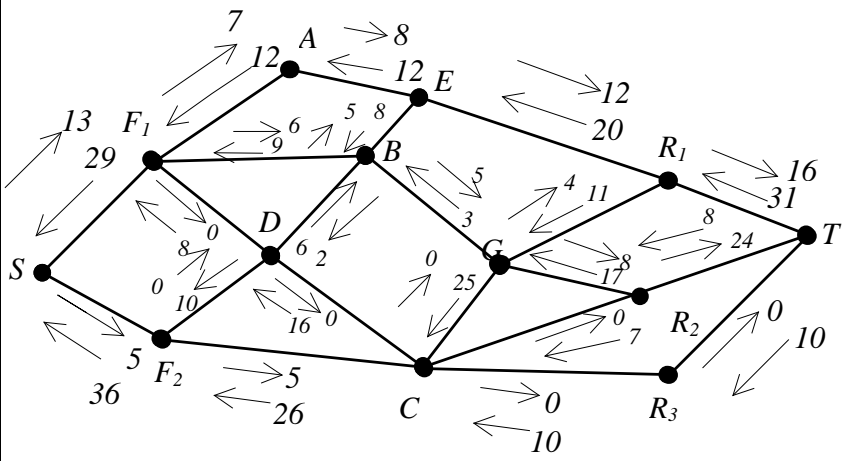
Question Number	Scheme	Marks
3.	<p>(a) Add A to 3, B to 4, C to 1 and F to 5 in a distinctive way</p> <p>(b) <u>e.g.</u> <math>D - 3 = A - 1 = C - 4 = B - 2</math></p> <p>C.S. <math>D = 3 - A = 1 - C = 4 - B = 2</math></p> <p><math>E - 5 = F - 6</math></p> <p>C.S. <math>E = 5 - F = 6</math></p> <p><math>A = 1 \quad B = 2 \quad C = 4 \quad D = 3 \quad E = 5 \quad F = 6</math></p>	<p>B1 (1)</p> <p>M1</p> <p>A1 (2)</p> <p>M1</p> <p>A1</p> <p>A1 (3)</p> <p><b>6</b></p>
4.	<p>(a) <u>e.g.</u></p>  <p>(b) D will only be critical if it lies on a longest route.</p> <p>ABEG – 14</p> <p>ACFG – 15</p> <p>ACDEG – 13 + x</p> <p>So D critical if <math>x \geq 2</math> (must be <math>\geq</math> not <math>&gt;</math>)</p>	<p>M1</p> <p>A1</p> <p>A1</p> <p>A1</p> <p>A1</p> <p>A1 (6)</p> <p>M1</p> <p>A1 (2)</p> <p><b>8</b></p>
5.	<p>(a) Bin 1 – 75+20</p> <p>Bin 2 – 70 +20</p> <p>Bin 3 – 60+40</p> <p>Bin 4 – 50+35</p> <p>Bin 5 – 20</p> <p>5 Planks needed: cost £15</p> <p>Wastage = 5+10+0+15+80 = 110cm</p>	<p>M1</p> <p>A1</p> <p>A1</p> <p>A1</p> <p>A1</p> <p>A1 (5)</p>

**EDEXCEL DECISION MATHEMATICS D1 (6689)  
PROVISIONAL MARK SCHEME NOVEMBER 2003**

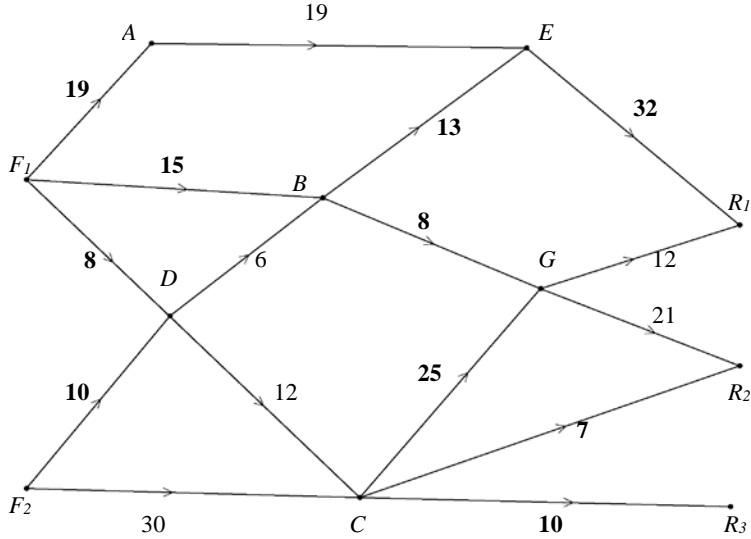
Question Number	Scheme	Marks
<p><b>5.</b> <b>(cont)</b></p>	<p><b>(b)</b> Bin 1 (1.5m) – 75+70      Bin 1 (1m) –75+20            Bin 2 (1.5m) – 60+50+40    or    Bin 2 (1.5m) –70+60+20            Bin 3 (1m) – 35+20+20+20    Bin 3 (1.5m) –50+40+35+20</p> <p>Cost £11            1.5m lengths better value than 1m lengths to use as many as possible</p>	<p>M1            A1            A1</p> <p>A1      (4)</p> <p style="text-align: right;"><b>9</b></p>
<p><b>6.</b></p>	<p><b>(a) i</b> A connected graph with no cycles, loops or multiple edges</p> <p><b>ii</b> A tree that includes all vertices</p> <p><b>iii</b> A spanning tree of minimum total length</p> <p><b>(b)</b> E.g.</p> <ul style="list-style-type: none"> <li>• In Kruskal the shortest <u>arc</u> is added (unless it completes a cycle), in Prim the nearest unattached <u>vertex</u> is added</li> <li>• There is no need to check for cycles when using Prim, but there is when using Kruskal</li> <li>• In Prim the tree always “grows” in a connected fashion</li> <li>• Kruskal starts with the shortest edge, Prim with any vertex</li> </ul> <p><b>(c)</b> BH, NF, HN, HA, BE, NC; length = 48</p>	<p>B1</p> <p>B1</p> <p>B1      (3)</p> <p>B1      (1)</p> <p>M1    A1;    A1</p> <p>A1      (4)</p>



**EDEXCEL DECISION MATHEMATICS D1 (6689)  
PROVISIONAL MARK SCHEME NOVEMBER 2003**

Question Number	Scheme	Marks
6. (cont)	<p>(d)</p>  <p><u>New cable – 390m</u></p>	<p>B1</p> <p>M1 A1 (3)</p> <p><b>11</b></p>
7.	<p>(a) <math>x = 3</math> , <math>y = 26</math></p> <p>(b)</p>  <p>(c)</p> 	<p>B1, B1 (2)</p> <p>M1 A1 A1 (3)</p> <p>M1 A1 A1 (3)</p>

**EDEXCEL DECISION MATHEMATICS D1 (6689)  
PROVISIONAL MARK SCHEME NOVEMBER 2003**

Question Number	Scheme	Marks
<p><b>7.</b> <b>(cont)</b></p>	<p><b>(c)</b> <b>(cont.)</b> <u>e.g.</u> S F<sub>1</sub> A E R<sub>1</sub> T - 7 S F<sub>1</sub> B E R<sub>1</sub> T - 5 S F<sub>1</sub> B G R<sub>1</sub> T - 1 S F<sub>2</sub> C D B G R<sub>2</sub> T - 4</p> <p><b>(d)</b> <u>e.g.</u></p>  <p style="text-align: right;"><u>Max Flow 82</u></p>	<p>DM1 A1 A1 A1 (4)</p> <p>B1 B1 (2)</p> <p>M1 A1 (2)</p> <p><b>16</b></p>
	<p><b>(e)</b> <u>e.g.</u> F<sub>1</sub> A, BE, BG, CG, CR<sub>2</sub>, CR<sub>3</sub> (=82) Or ER<sub>1</sub>, BG, CG, CR<sub>2</sub>, CR<sub>3</sub> (=82)</p>	

**EDEXCEL DECISION MATHEMATICS D1 (6689)  
PROVISIONAL MARK SCHEME NOVEMBER 2003**

Question Number	Scheme	Marks																													
<b>8.</b>	(a) $x + 2y + 4z \leq 24$	B1																													
	(b)																														
	i $x + 2y + 4z + s = 24$	B1 $\sqrt{\phantom{x}}$																													
	ii $s (\geq 0)$ is the slack time on the machine in hours	B1																													
	(c) 1 Euro	B1																													
		(4)																													
	(d)																														
	<table border="1" style="display: inline-table; margin-right: 10px;"> <thead> <tr><th>b.v</th><th>x</th><th>y</th><th>z</th><th>r</th><th>s</th><th>value</th></tr> </thead> <tbody> <tr><td>r</td><td><math>\frac{3}{2}</math></td><td>2</td><td>0</td><td>1</td><td><math>-\frac{3}{2}</math></td><td>14</td></tr> <tr><td>z</td><td><math>\frac{1}{4}</math></td><td><math>\frac{1}{2}</math></td><td>1</td><td>0</td><td><math>\frac{1}{4}</math></td><td>6</td></tr> <tr><td>p</td><td>0</td><td>-1</td><td>0</td><td>0</td><td>1</td><td>24</td></tr> </tbody> </table> <div style="display: inline-block; vertical-align: middle;"> <math>R_1 - 6R_2</math>  <math>R_2 \div 4</math>  <math>R_3 + 4R_2</math> </div>	b.v	x	y	z	r	s	value	r	$\frac{3}{2}$	2	0	1	$-\frac{3}{2}$	14	z	$\frac{1}{4}$	$\frac{1}{2}$	1	0	$\frac{1}{4}$	6	p	0	-1	0	0	1	24	M1	$A1\sqrt{\phantom{x}}$ A1 (3)
	b.v	x	y	z	r	s	value																								
	r	$\frac{3}{2}$	2	0	1	$-\frac{3}{2}$	14																								
z	$\frac{1}{4}$	$\frac{1}{2}$	1	0	$\frac{1}{4}$	6																									
p	0	-1	0	0	1	24																									
<table border="1" style="display: inline-table; margin-right: 10px;"> <thead> <tr><th>b.v</th><th>x</th><th>y</th><th>z</th><th>r</th><th>s</th><th>value</th></tr> </thead> <tbody> <tr><td>y</td><td><math>\frac{3}{4}</math></td><td>1</td><td>0</td><td><math>\frac{1}{2}</math></td><td><math>-\frac{3}{4}</math></td><td>7</td></tr> <tr><td>z</td><td><math>-\frac{1}{8}</math></td><td>0</td><td>1</td><td><math>-\frac{1}{4}</math></td><td><math>\frac{5}{8}</math></td><td><math>\frac{5}{2}</math></td></tr> <tr><td>p</td><td><math>\frac{3}{4}</math></td><td>0</td><td>0</td><td><math>\frac{1}{2}</math></td><td><math>\frac{1}{4}</math></td><td>31</td></tr> </tbody> </table> <div style="display: inline-block; vertical-align: middle;"> <math>R_1 \div 2</math>  <math>R_2 - \frac{1}{2}R_1</math>  <math>R_3 + R_1</math> </div>	b.v	x	y	z	r	s	value	y	$\frac{3}{4}$	1	0	$\frac{1}{2}$	$-\frac{3}{4}$	7	z	$-\frac{1}{8}$	0	1	$-\frac{1}{4}$	$\frac{5}{8}$	$\frac{5}{2}$	p	$\frac{3}{4}$	0	0	$\frac{1}{2}$	$\frac{1}{4}$	31	M1	$A1\sqrt{\phantom{x}}$ A1 (3)	
b.v	x	y	z	r	s	value																									
y	$\frac{3}{4}$	1	0	$\frac{1}{2}$	$-\frac{3}{4}$	7																									
z	$-\frac{1}{8}$	0	1	$-\frac{1}{4}$	$\frac{5}{8}$	$\frac{5}{2}$																									
p	$\frac{3}{4}$	0	0	$\frac{1}{2}$	$\frac{1}{4}$	31																									
Profit = 31 Euros $y = 7$ $z = 2.5$ $x = r = s = 0$ <div style="margin-left: 100px;"> <small>medium      large</small> </div>	M1	$A1\sqrt{\phantom{x}}$ $A1\sqrt{\phantom{x}}$ (3)																													
(e) Cannot make $\frac{1}{2}$ a lamp	B1	(1)																													
(f) e.g. (0, 10, 0) or (0, 6, 3) or (1, 7, 2)	B1																														
checks in <b>both</b> inequalities	B1	(2)																													
		<b>16</b>																													