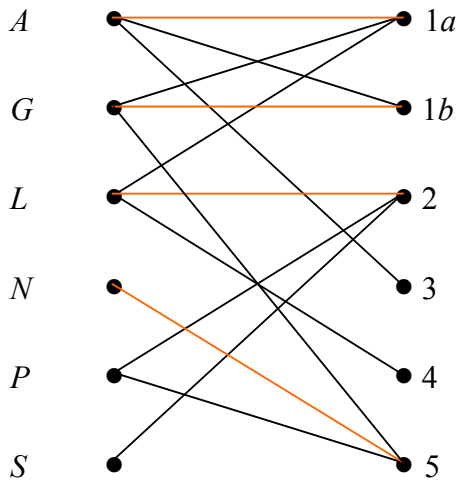
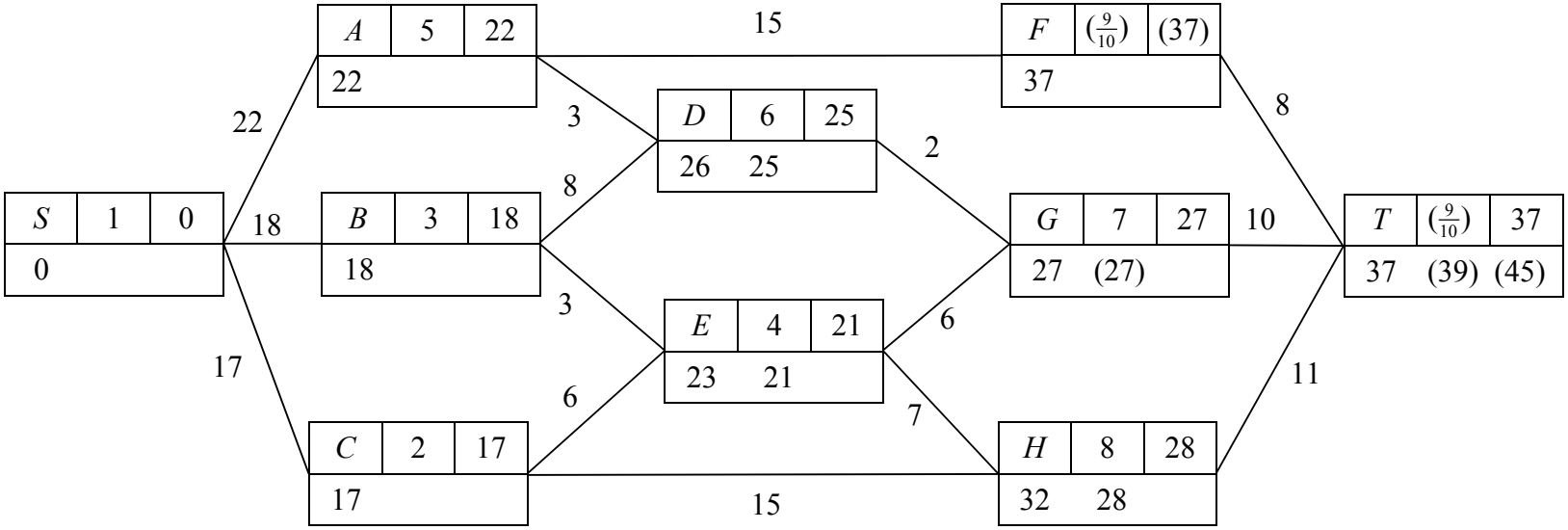
| Question Number | Scheme | Marks |
|---|---|---|
| **1.** (*a*) |  | B1 B1 (2) |
| (*b*) | For example:<br>(i) $P-2=L-4$ c.s. $P=2-L-4$<br>(ii) $S-2=L-1a=A-3$ c.s. $S=2-L=1a-A=3$<br>giving<br>$A-1,\ G-1,\ L-4,\ N-5,\ P-2$<br>$A-3,\ G-1,\ L-1,\ N-5,\ S-2$ | M1<br>A1<br><br><br>A1 (3) |
| (*c*) | Sam must do 2 and Nicola must do 5, leaving Philip without a task. | B2, 1, 0 (2) |
| | | **(7 marks)** |

**EDEXCEL DECISION MATHEMATICS D1 (6689) – JUNE 2004 PROVISIONAL MARK SCHEME**

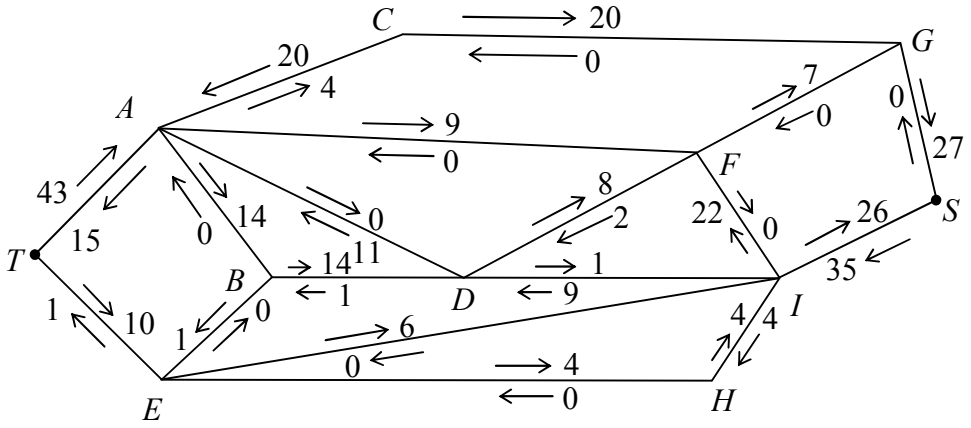
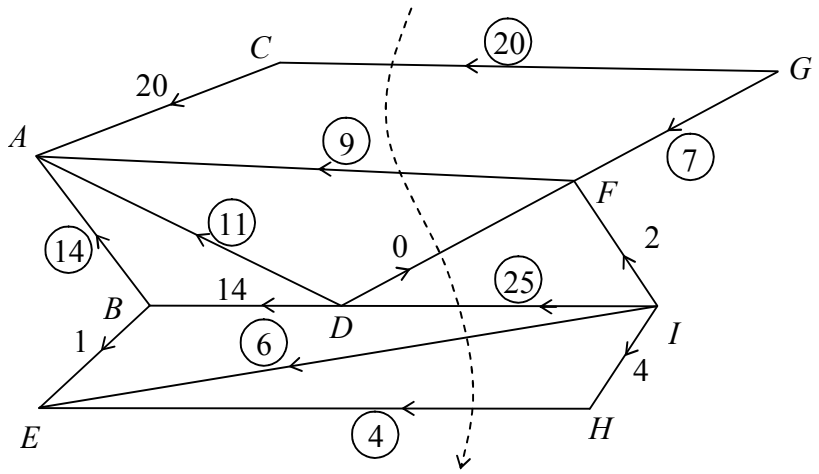
| Question Number | Scheme | Marks |
|---|---|---|
| **2.** (*a*) |  | |
| | Time = 37 minutes | A1 ft (4) |
| (*b*) | Either $S-A-D-G-T$ or $S-B-E-G-T$ | A1 ft |
| | Not unique, e.g. gives other path | A1 ft (2) |
| (*c*) | $S-C-E-G-T$ 39 minutes | M1 A1 (2) |
| | | **(8 marks)** |

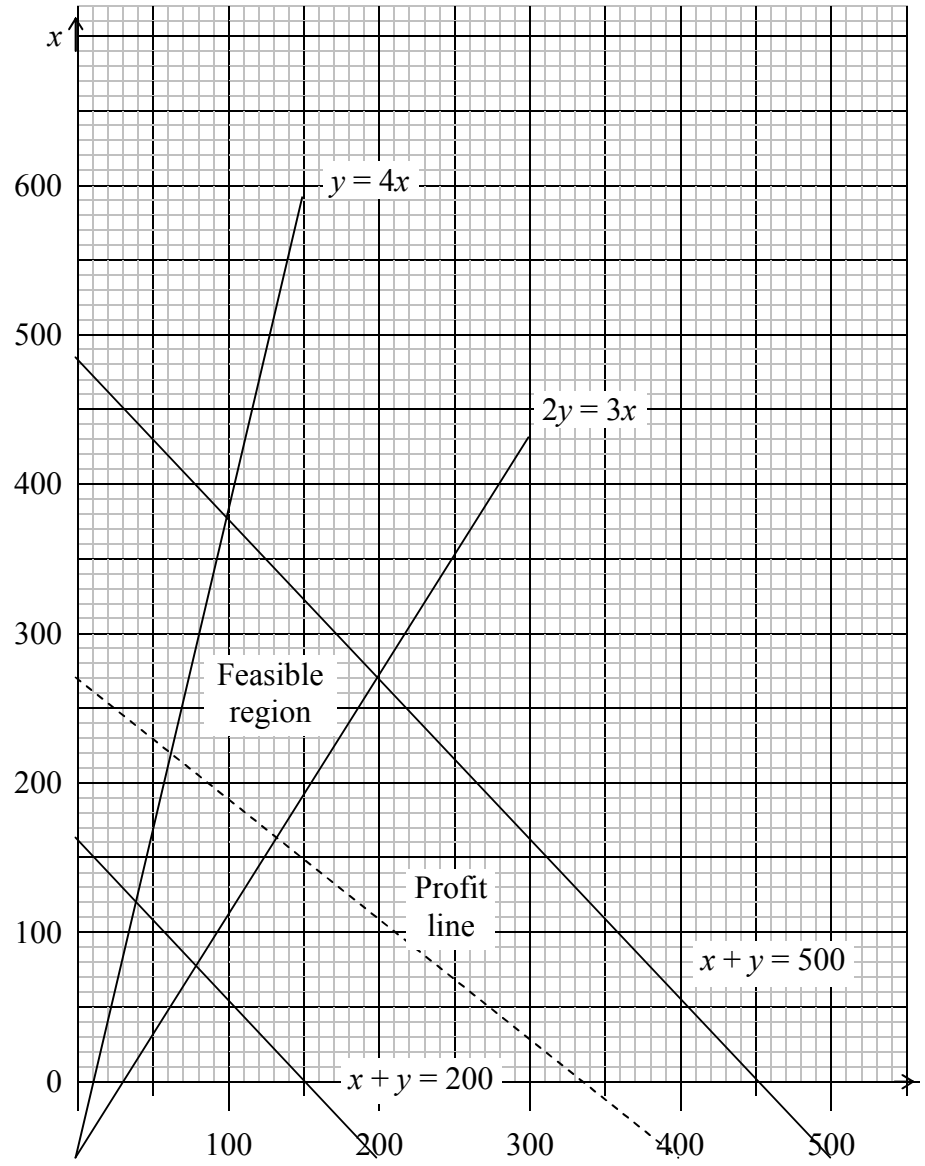


M1
A1
A1 ft

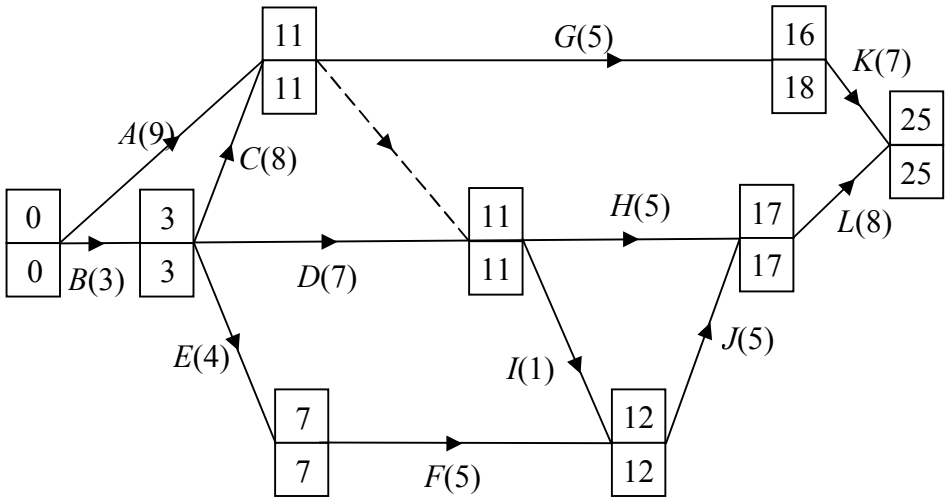
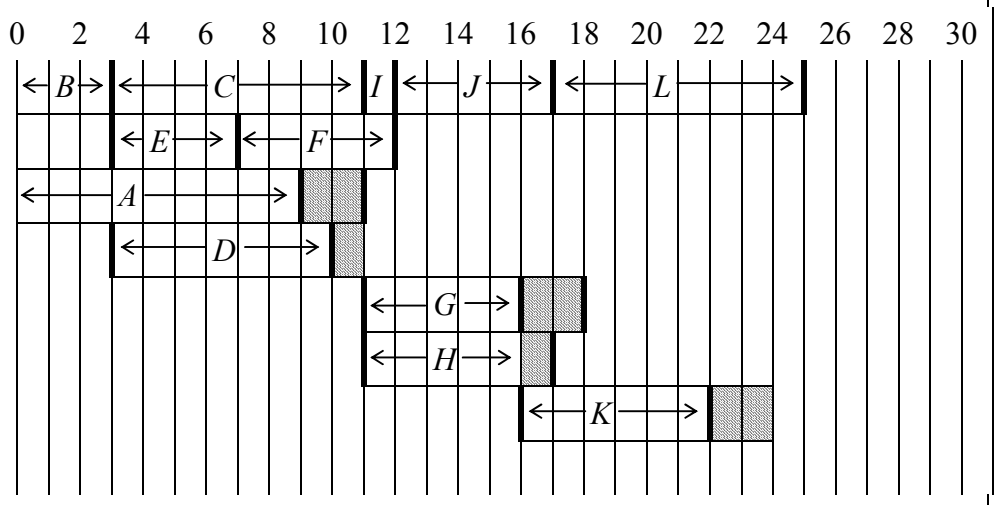
| Question Number | Scheme | Marks |
|---|---|---|
| **3.** (*a*) | Idea of travelling along each *arc* at least once and seeking to do so in a minimum total. *Practical* meaning of arcs/numbers. | B1 (1) |
| (*b*) | $AB + DF = 32 + 9 = 41$ | M1 A1 |
| | $AD + BF = 25 + 15 = 41$ | |
| | $AF + BD = 18 + 24 = 42$ | A1 |
| | Repeat *either* $AE + EB$ and $DF$ or $AD$ and $BF$ | A1 ft (4) |
| (*c*) | Not unique, e.g. gives other solution | A1 ft |
| (*d*) | $258 + 41 = 299$ | B1 (2) |
| (*e*) | $DF$ is the shortest so start/finish at $A$/$B$ | M1 A1 (2) |
| | | **(9 marks)** |

| Question Number | Scheme | Marks |
|---|---|---|
| **4.** (*a*) | The list is not in *alphabetical* order | B1 (1) |
| (*b*) | Use of Bubble Sort or Quick Sort | M1 |
| | For example: | |
| | **Bubble sort**<br>*G N M Y L B C E S P*<br>*B G N M Y L C E P S* 1st pass<br>*B C G N M Y L E P S* 2nd pass<br>*B C E G N M Y L P S* 3rd pass<br>*B C E G L N M Y P S* 4th pass<br>*B C E G L M N P Y S* 5th pass<br>*B C E G L M N P S Y* 6th pass<br>No more changes | A1 |
| | **Quick sort**<br>*G N M Y L (B) C E S P*<br>*[B] G N M Y (L) C E S P* 1st pass<br>*B G (C) E [L] N M (Y) S P* 2nd pass<br>*B [C] G (E) L N M (S) P [Y]* 3rd pass<br>*B C [E] G L N (M) P [S] Y* 4th pass<br>*B C E [G] L [M] N (P) S Y* 5th pass<br>*B C E G L M N P S Y* 6th pass<br>No sublists > 2 and no more changes | A1<br>A1 (4) |
| (*c*) | 1 2 3 4 5 6 7 8 9 10<br>*B C E G L M N P S Y* | |
| | $\frac{[10+1]}{2} = 6$ Manchester discard first half of list and pivot | M1 A1 |
| | $\frac{[7+10]}{2} = 9$ Southampton discard last half of list and pivot | |
| | $\frac{[7+8]}{2} = 8$ Plymouth discard last half of list and pivot | A1 |
| | Final term 7 Newcastle, therefore word found at 7 | A1 (4) |
| | | **(9 marks)** |

| Question Number | Scheme | Marks |
|---|---|---|
| **5.** (*a*) | $x = 9$, $y = 16$ | B1 B1 (2) |
| (*b*) | Initial flow = 53 – either finds a flow-augmenting route or demonstrates not enough saturated arcs for a minimum cut | B1 B1 (2) |
| (*c*) |  | M1 A1 (2) |
| | e.g. *IDA* – 9 | A1 |
| | *IFDA* – 24 | A1 |
| | max flow – 64 | B1 (3) |
| (*d*) |  | M1 A1 (2) |
| (*e*) | Max flow – min cut | M1 |
| | Finds a cut *GC*, *AF*, *DF*, *DJ*, *EI*, *EH* value 64 | A1 (2) |
| | Note: must not use supersource or supersink arcs. | **(13 marks)** |

| Question Number | Scheme | Marks |
|---|---|---|
| **6.** (*a*) | Maximise $P = 30x + 40y$ (or $P = 0.3x + 0.4y$) | B1 |
| | subject to $x + y \geq 200$ | B1 |
| | $x + y \leq 500$ | B1 |
| | $x \geq \frac{20}{100}(x + y) \Rightarrow 4x \geq y$ | M1 A1 |
| | $x \leq \frac{40}{100}(x + y) \Rightarrow 3x \geq 2y$ | A1 (6) |
| (*b*) |  | B1 ft ($x + y = 200$, $x + y = 500$)<br>B1 ft ($y = 4x$)<br>B1 ft ($2y = 3x$)<br>B1 ft (shading)<br>B1 (labels) |
| | (NB: Graph looks OK onscreen at 75% magnification but may print out misaligned) | |

| Question Number | Scheme | Marks |
|---|---|---|
| **6.** (*c*) *(cont.)* | Point testing or profit line | A1 |
| | Intersection of $y = 4x$ and $x + y = 500$ | A1 |
| | (100, 400) Profit = £190 (units must be clear) | A1 (3) |
| | | **(11 marks)** |

| Question Number | Scheme | Marks |
|---|---|---|
| **7.** (*a*) | E.g. It shows dependence but is not an activity; *G* depends on *A* and *C* only but *H* and *I* depend on *A*, *C* and *D*. | B1 (1) |
| (*b*) |  | M1 A1<br>M1 A1 |
| (*c*) | $B \begin{cases} C - I \\ E - F \end{cases} J - L$ so *B*, *C*, *E*, *F*, *I*, *J*, *L* | A1 (5) |
| (*d*) | *A*: 11 – 0– 9 = 2<br>*D*: 11 – 3 – 7 = 1<br>*G*: 18 – 11 – 5 = 2 *<br>*H*: 17 – 11 – 5 = 1<br>*K*: 25 – 16 – 7 = 2 * | M1 A1 (non *)<br>A1 (*) (3) |
| (*e*) |  | M1<br>A1<br>A1<br>A1 (4) |
| (*f*) | Gantt chart at time 8 *C*, *F*, *A* and *D* , must be happening<br>∴ 4 workers needed | M1<br>A1 (2)<br>**(15 marks)** |