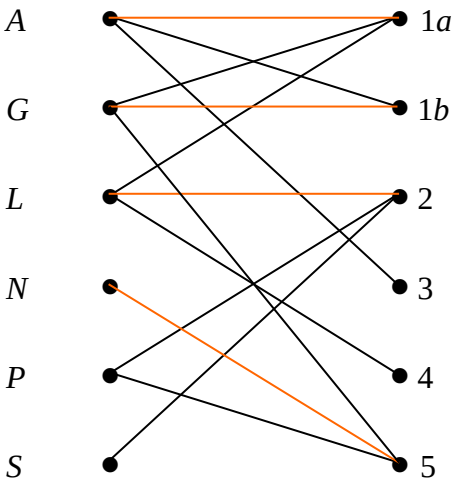
EDEXCEL DECISION MATHEMATICS D1 (6689) – JUNE 2004 PROVISIONAL MARK SCHEME

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

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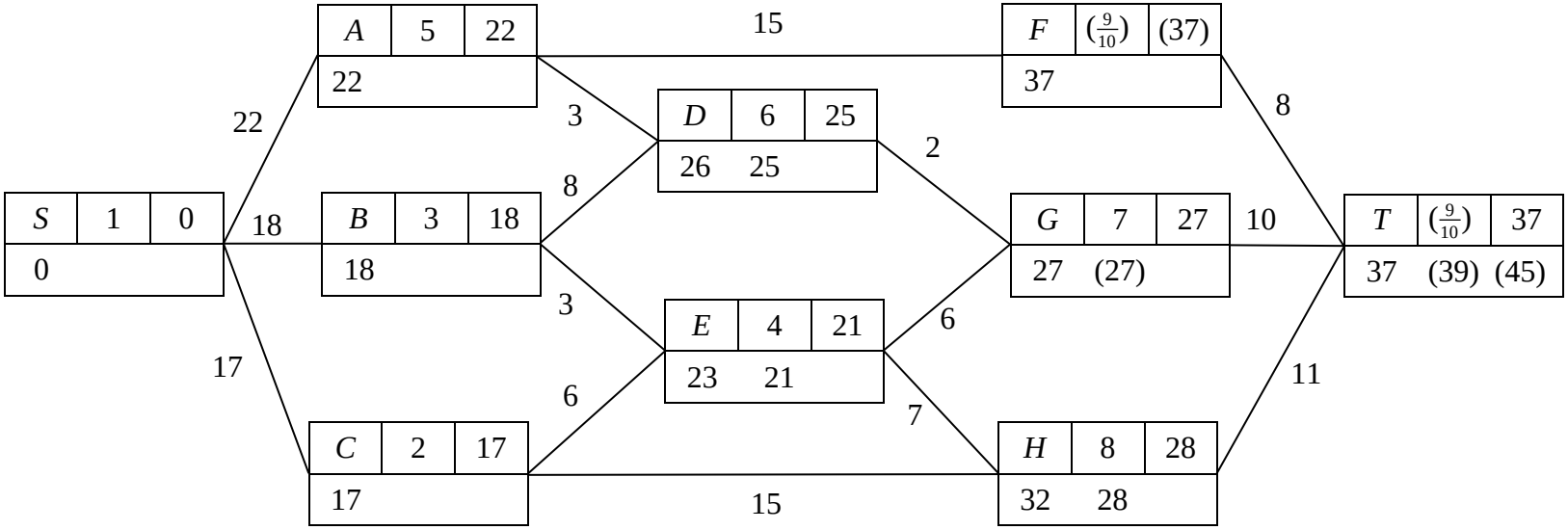
Question Number	Scheme	Marks
2. (*a*)		
	Time = 37 minutes	A1 ft (4)
(*b*)	Either $S – A – D – G – T$ or $S – B – E – G – T$	A1 ft
	Not unique, e.g. gives other path	A1 ft (2)
(*c*)	$S – C – E – G – T$ 39 minutes	M1 A1 (2)
		(8 marks)

M1
A1
A1 ft

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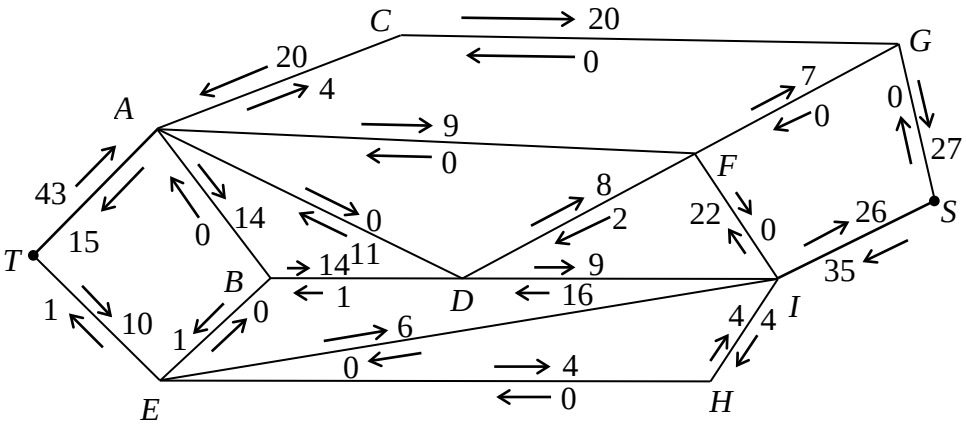
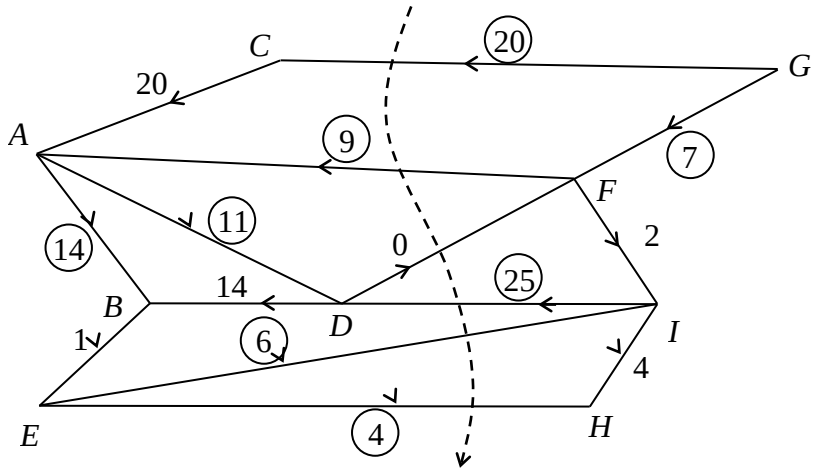
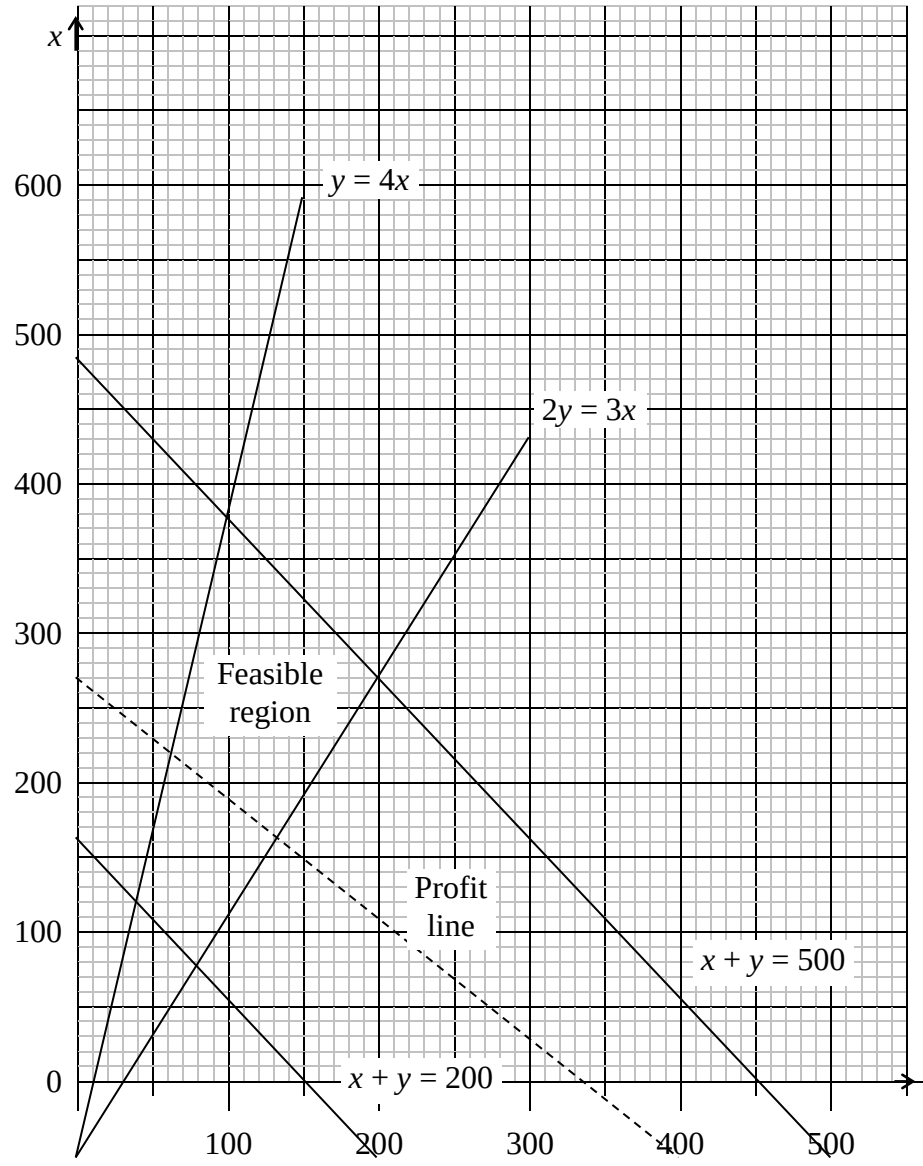
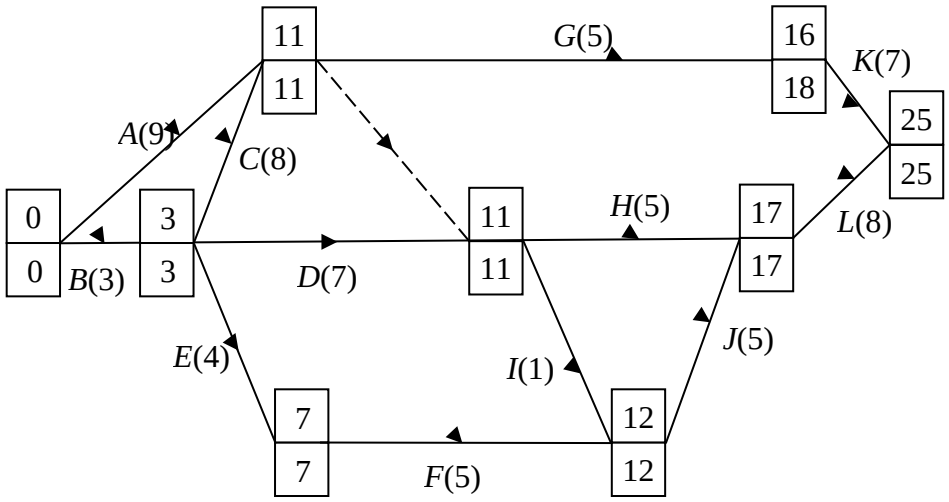
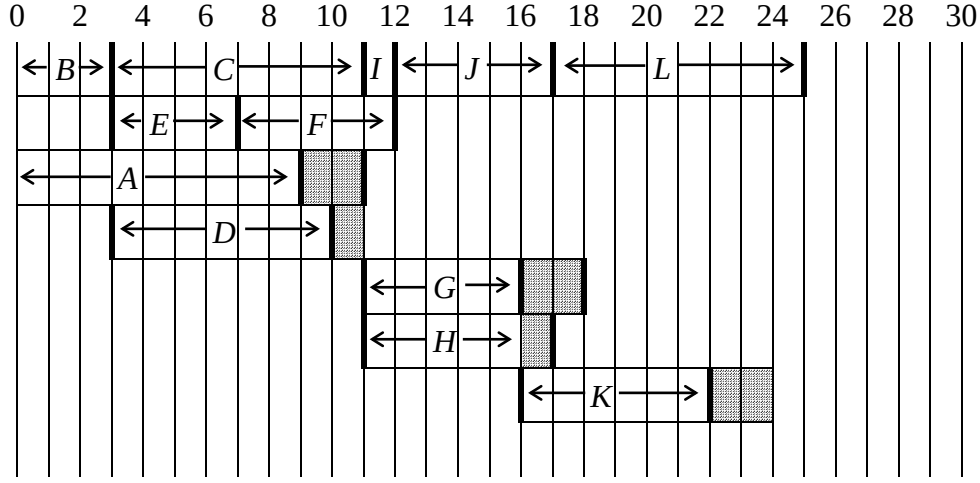
Question Number	Scheme	Marks
3. (*a*)	Idea of travelling along each *arc* at least once and seeking to do so in a minimum total. *Practical* meaning of arcs/numbers.	B1 (1)
(*b*)	$AB + DF = 32 + 9 = 41$	M1 A1
	$AD + BF = 25 + 15 = 41$	
	$AF + BD = 18 + 24 = 42$	A1
	Repeat *either* $AE + EB$ and DF or 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 *G N M Y L B C E S P* *B G N M Y L C E P S* 1st pass *B C G N M Y L E P S* 2nd pass *B C E G N M Y L P S* 3rd pass *B C E G L N M Y P S* 4th pass *B C E G L M N P Y S* 5th pass *B C E G L M N P S Y* 6th pass No more changes	A1
	Quick sort *G N M Y L (B) C E S P* *[B] G N M Y (L) C E S P* 1st pass *B G (C) E [L] N M (Y) S P* 2nd pass *B [C] G (E) L N M (S) P [Y]* 3rd pass *B C [E] G L N (M) P [S] Y* 4th pass *B C E [G] L [M] N (P) S Y* 5th pass *B C E G L M N [P] S Y* 6th pass No sublists > 2 and no more changes	A1 A1 (4)
(*c*)	1 2 3 4 5 6 7 8 9 10 *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 ($x + y = 200$, $x + y = 500$) B1 ft ($y = 4x$) B1 ft ($2y = 3x$) B1 ft (shading) 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 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 *D*: 11 – 3 – 7 = 1 *G*: 18 – 11 – 5 = 2 * *H*: 17 – 11 – 5 = 1 *K*: 25 – 16 – 7 = 2 *	M1 A1 (non *) A1 (*) (3)
(*e*)		M1 A1 A1 A1 (4)
(*f*)	Gantt chart at time 8 *C*, *F*, *A* and *D* , must be happening ∴ 4 workers needed	M1 A1 (2) **(15 marks)**