Decision Maths 1   Solution Bank   Pearson

Exercise 3D

1 a

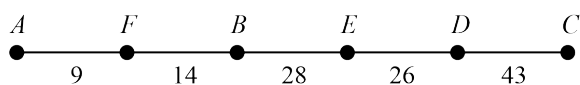|	1	3	6	5	4	2
	A	*B*	*C*	*D*	*E*	*F*
A	–	15	20	34	25	9
B	15	–	36	38	28	14
C	20	36	–	43	38	22
D	34	38	43	–	26	40
E	25	28	38	26	–	31
F	9	14	22	40	31	–

The first arc is *AF* (9).
The second arc is *FB* (14).
The third arc is *BE* (28).
The fourth arc is *ED* (26).
The fifth arc is *DC* (43).
The path created is

Its weight is 9 + 14 + 28 + 26 + 43 = 120

b

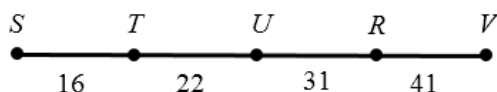|	4	1	2	3	5
	R	*S*	*T*	*U*	*V*
R	–	28	30	31	41
S	28	–	16	19	43
T	30	16	–	22	41
U	31	19	22	–	37
V	41	43	41	37	–

The first arc is *ST* (16).
The second arc is *TU* (22).
The third arc is *UR* (31).
The fourth arc is *RV* (41).
The path created is

Its weight is 16 + 22 + 31 + 41 = 110

2 Starting at *A*

	1	4	5	6	2	3
	A	*B*	*C*	*D*	*E*	*F*
A	–	20	30	32	12	15
B	20	–	10	25	32	(16)
C	30	(10)	–	15	35	19
D	32	25	(15)	–	20	34
E	(12)	32	35	20	–	16
F	15	16	19	34	(16)	–

The first arc is *AE* (12).
The second arc is *EF* (16).
The third arc is *FB* (16).
The fourth arc is *BC* (10).
The fifth arc is *CD* (15).
The path created is *AEFBCD* and its weight is 12 + 16 + 16 + 10 + 15 = 69

Starting at *B*

	5	1	2	3	4	6
	A	*B*	*C*	*D*	*E*	*F*
A	–	20	30	32	(12)	15
B	20	–	10	25	32	16
C	30	(10)	–	15	35	19
D	32	25	(15)	–	20	34
E	12	32	35	(20)	–	16
F	(15)	16	19	34	16	–

The first arc is *BC* (10).
The second arc is *CD* (15).
The third arc is *DE* (20).
The fourth arc is *EA* (12).
The fifth arc is *AF* (15).
The path created is *BCDEAF* and its weight is 10 + 15 + 20 + 12 + 15 = 72

Decision Maths 1 — Solution Bank

Starting at C

4	2	1	6	5	3
A	B	C	D	E	F

	A	B	C	D	E	F
A	–	20	30	32	12	15
B	20	–	10	25	32	16
C	30	10	–	15	35	19
D	32	25	15	–	20	34
E	12	32	35	20	–	16
F	15	16	19	34	16	–

The first arc is *CB* (10).
The second arc is *BF* (16).
The third arc is *FA* (15).
The fourth arc is *AE* (12).
The fifth arc is *ED* (20).
The path created is *CBFAED* and its weight is $10 + 16 + 15 + 12 + 20 = 73$

Starting at D

5	3	2	1		4
A	B	C	D	E	F

	A	B	C	D	E	F
A	–	20	30	32	12	15
B	20	–	10	25	32	16
C	30	10	–	15	35	19
D	32	25	15	–	20	34
E	12	32	35	20	–	16
F	15	16	19	34	16	–

The first arc is *DC* (15).
The second arc is *CB* (10).
The third arc is *BF* (16).
The fourth arc is *FA* (15).
The fifth arc is *AE* (12).
The path created is *DCBFAE* and its weight is $15 + 10 + 16 + 15 + 12 = 68$

Starting at *E*

	2	4	5	6	1	3
	A	*B*	*C*	*D*	*E*	*F*
A	–	~~20~~	~~30~~	~~32~~	12	~~15~~
B	~~20~~	–	~~10~~	~~25~~	~~32~~	16
C	~~30~~	10	–	~~15~~	~~35~~	~~19~~
D	~~32~~	~~25~~	15	–	~~20~~	~~34~~
E	~~12~~	~~32~~	~~35~~	~~20~~	–	~~16~~
F	15	~~16~~	~~19~~	~~34~~	~~16~~	–

The first arc is *EA* (12).
The second arc is *AF* (15).
The third arc is *FB* (16).
The fourth arc is *BC* (10).
The fifth arc is *CD* (15).
The path created is *EAFBCD* and its weight is 12 + 15 + 16 + 10 + 15 = 68

Starting at *F*

	2	6	5	4	3	1
	A	*B*	*C*	*D*	*E*	*F*
A	–	~~20~~	~~30~~	~~32~~	~~12~~	15
B	~~20~~	–	10	~~25~~	~~32~~	~~16~~
C	~~30~~	~~10~~	–	15	~~35~~	~~19~~
D	~~32~~	~~25~~	~~15~~	–	20	~~34~~
E	12	~~32~~	~~35~~	~~20~~	–	~~16~~
F	~~15~~	~~16~~	~~19~~	~~34~~	~~16~~	–

The first arc is *FA* (15).
The second arc is *AE* (12).
The third arc is *ED* (20).
The fourth arc is *DC* (15).
The fifth arc is *CB* (10).
The path created is *FAEDCB* and its weight is 15 + 12 + 20 + 15 + 10 = 72
Therefore, there are two shortest routes: *DCBFAE* and *EAFBCD,* both of length 68. Note that they are the same routes but in reverse

3   Starting at *A*

	1	3	2	4	5
	A	*B*	*C*	*D*	*E*
A	–	153	98	124	115
B	153	–	74	131	149
C	98	74		82	103
D	124	131	82	–	134
E	115	149	103	134	–

The first arc is *AC* (98).
The second arc is *CB* (74).
The third arc is *BD* (131).
The fourth arc is *DE* (134).
The path created is *ACBDE* and its weight is 98 + 74 + 131 + 134 = 437

Starting at *B*

	4	1	2	3	5
	A	*B*	*C*	*D*	*E*
A	–	153	98	124	115
B	153	–	74	131	149
C	98	74	=	82	103
D	124	131	82	–	134
E	115	149	103	134	–

The first arc is *BC* (74).
The second arc is *CD* (82).
The third arc is *DA* (124).
The fourth arc is *AE* (115).
The path created is *BCDAE* and its weight is 74 + 82 + 124 + 115 = 395

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Starting at *C*

	4	2	1	3	5
	A	*B*	*C*	*D*	*E*
A	–	153	98	⟨124⟩	115
B	153	–	⟨74⟩	131	149
C	98	74	–	82	103
D	124	⟨131⟩	82	–	134
E	⟨115⟩	149	103	134	–

The first arc is *CB* (74).
The second arc is *BD* (131).
The third arc is *DA* (124).
The fourth arc is *AE* (115).
The path created is *CBDAE* and its weight is 74 + 131 + 124 + 115 = 444

Starting at *D*

	5	3	2	1	4
	A	*B*	*C*	*D*	*E*
A	–	153	98	124	⟨115⟩
B	153	–	⟨74⟩	131	149
C	98	74	–	⟨82⟩	103
D	124	131	82	–	134
E	115	⟨149⟩	103	134	–

The first arc is *DC* (82).
The second arc is *CB* (74).
The third arc is *BE* (149).
The fourth arc is *EA* (115).
The path created is *DCBEA* and its weight is 82 + 74 + 149 + 115 = 420

Starting at *E*

	5	3	2	4	1
	A	*B*	*C*	*D*	*E*
A	–	~~153~~	~~98~~	(124)	~~115~~
B	~~153~~	–	(74)	~~131~~	~~149~~
C	~~98~~	~~74~~	–	~~82~~	(103)
D	~~124~~	(131)	~~82~~	–	~~134~~
E	~~115~~	~~149~~	~~103~~	~~134~~	–

The first arc is *EC* (103).
The second arc is *CB* (74).
The third arc is *BD* (131).
The fourth arc is *DA* (124).
The path created is *ECBDA* and its weight is $103 + 74 + 131 + 124 = 432$