WHODUNNIT?*

CHARLESDUNNIT!

Solution by P. Crump (Sydney Grammar):

Of the 4 suspects, one is the murderer, one is totally innocent, and the other two are witnesses. There are 12 combinations of the 4 suspects:

	murderer	innocent	witnesses
1	A	B	C,D
2	A	C	B,D
3	A	D	B,C
4	B	A	C,D
5	B	C	A,D
6	B	D	A,C
7	C	A	B,D
8	C	B	A,D
9	C	D	A,B
10	D	A	B,C
11	D	B	A,C
12	D	C	A,B

If A is the murderer, he always lies, so C is a witness. This eliminates (2) above. If B is the murderer, he always lies, so A was in town, so is a witness. This eliminates (4). If D is the murderer, A is a witness, eliminating (10).

By his second statement, B cannot be totally innocent. Thus we can eliminate (1), (8) and (11). Similarly C cannot be innocent, eliminating (2), (5) and (12). If D is innocent, then A is the murderer, eliminating (6) and (9).

Thus we are left with the two possibilities

murderer	A	C
innocent	D	A
witnesses	B,C	B,D

From these, it can be seen that B is a witness, but which witness? It is now necessary to distinguish the witnesses. Let witness #1 be "lie first", witness #2 "truth first". We now have 4 possibilities:

	(α)	(β)	(γ)	(δ)
murderer	A	A	C	C
innocent	D	D	A	A
witness #1	B	C	B	D
witness #2	C	B	D	B

If C is witness #2, B is the murderer. But this is not true, so (α) can be eliminated. By his first statement, D cannot be witness #2, eliminating (γ). If B is witness #2, A is innocent, eliminating (β).

This leaves only (δ), which is consistent with all the statements.

So the murderer is Charles, the witnesses are Bob and Dick (starting with true and false statements respectively), and Alan is totally innocent.

Also solved by D. Dowe (Geelong Grammar) and S. Tolhurst (Year 11, Springwood High).