4)

p = tomorrow would be a snow storm

q = Patrick would wear a heavy coat

s = zipper is mended

4 implies that when tomorrow is snow and zipper is not mended, Patrick would not wear a heavy coat. Thus, Patrick would not wear heavy coat.

Proof by refutation:

Thus, Patrick would not wear heavy coat.

Truth table proof:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **p** | **q** | **s** | **¬p∨¬s∨q** | **¬q∨s** | **p∧¬s** | **KB** |
| FALSE | FALSE | FALSE | TRUE | TRUE | FALSE | FALSE |
| TRUE | FALSE | FALSE | TRUE | TRUE | TRUE | TRUE |
| FALSE | TRUE | FALSE | TRUE | FALSE | FALSE | FALSE |
| FALSE | FALSE | TRUE | TRUE | TRUE | FALSE | FALSE |
| FALSE | FALSE | FALSE | TRUE | TRUE | FALSE | FALSE |
| TRUE | TRUE | FALSE | TRUE | FALSE | TRUE | FALSE |
| TRUE | FALSE | TRUE | FALSE | TRUE | FALSE | FALSE |
| TRUE | FALSE | FALSE | TRUE | TRUE | TRUE | TRUE |
| FALSE | TRUE | TRUE | TRUE | TRUE | FALSE | FALSE |
| FALSE | TRUE | FALSE | TRUE | FALSE | FALSE | FALSE |
| FALSE | FALSE | TRUE | TRUE | TRUE | FALSE | FALSE |
| FALSE | TRUE | TRUE | TRUE | TRUE | FALSE | FALSE |
| TRUE | FALSE | TRUE | FALSE | TRUE | FALSE | FALSE |
| TRUE | TRUE | FALSE | TRUE | FALSE | TRUE | FALSE |
| TRUE | TRUE | TRUE | TRUE | TRUE | FALSE | FALSE |
| TRUE | TRUE | TRUE | TRUE | TRUE | FALSE | FALSE |

6)

p = Sally and Bob are of the same age

q = Sally is order than Bob

s = Nancy and Bob are not of the same age

r = Bob is older than Walter

Thus, either Nancy and Bob are not of the same age or Bob is older than Walter

Proof by refutation:

Thus, either Nancy and Bob are not of the same age or Bob is older than Walter.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **p** | **q** | **s** | **r** | **p∨q** | **¬p∨s** | **¬q∨r** | **KB** |
| FALSE | FALSE | FALSE | FALSE | FALSE | TRUE | TRUE | FALSE |
| TRUE | FALSE | FALSE | FALSE | TRUE | FALSE | TRUE | FALSE |
| FALSE | TRUE | FALSE | FALSE | TRUE | TRUE | FALSE | FALSE |
| FALSE | FALSE | TRUE | FALSE | FALSE | TRUE | TRUE | FALSE |
| FALSE | FALSE | FALSE | TRUE | FALSE | TRUE | TRUE | FALSE |
| TRUE | TRUE | FALSE | FALSE | TRUE | FALSE | FALSE | FALSE |
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| FALSE | TRUE | TRUE | TRUE | TRUE | TRUE | TRUE | TRUE |
| TRUE | FALSE | TRUE | TRUE | TRUE | TRUE | TRUE | TRUE |
| TRUE | TRUE | FALSE | TRUE | TRUE | FALSE | TRUE | FALSE |
| TRUE | TRUE | TRUE | FALSE | TRUE | TRUE | FALSE | FALSE |
| TRUE | TRUE | TRUE | TRUE | TRUE | TRUE | TRUE | TRUE |