# EXERCISE SOLUTIONS

## EP/BVA exercise

The first thing to do is to establish exactly what the boundaries are between the full fare and saver fare. Let's put these in a table to organize our thoughts:

| Scheduled departure time | ≦ 9:29 am | 9:30 am – 4:00 pm | 4:01 pm – 7:30 pm | ≧ 7:31 pm |
|---|---|---|---|---|
| Ticket type | full | saver | full | saver |

We have assumed that the boundary values are: 9:29 am, 9:30 am, 4:00 pm, 4:01 pm, 7:30 pm and 7:31 pm. By setting out exactly what we think is meant by the specification, we may highlight some ambiguities or, at least, raise some questions – this is one of the benefits of using the technique! For example:

'When does the morning rush hour start? At midnight? At 11:30 pm the previous day? At the time of the first train of the day? If so, when is the first train? 5:00 am?'

This is a rather important omission from the specification. We could make an assumption about when it starts, but it would be better to find out what is correct.

- If a train is due to leave at exactly 4:00 pm, is a saver ticket still valid?
- What if a train is due to leave before 4:00 pm but is delayed until after 4:00 pm? Is a saver ticket still valid? (i.e. if the actual departure time is different to the scheduled departure time)

Our table above has helped us to see where the partitions are. All of the partitions in the table above are valid partitions. It may be that an invalid partition would be a time that no train was running, e.g. before 5:00 am, but our specification didn't mention that! However it would be good to show this possibility also. We could be a bit more formal by listing all valid and invalid partitions and boundaries in a table, as we described in Section 4.3.1, but in this case it doesn't actually add a lot, since all partitions are valid.

Here are the test cases we can derive for this example:

| Test case reference | Input | Expected outcome |
|---|---|---|
| 1 | Depart 4:30 am | Pay full fare |
| 2 | Depart 9:29 am | Pay full fare |
| 3 | Depart 9:30 am | Buy saver ticket |
| 4 | Depart 11:37 am | Buy saver ticket |
| 5 | Depart 4:00 pm | Buy saver ticket |
| 6 | Depart 4:01 pm | Pay full fare |
| 7 | Depart 5:55 pm | Pay full fare |
| 8 | Depart 7:30 pm | Pay full fare |
| 9 | Depart 7:31 pm | Buy saver ticket |
| 10 | Depart 10:05 pm | Buy saver ticket |

Note that test cases 1, 4, 7 and 10 are based on equivalence partition values; test cases 2, 3, 5, 6, 8 and 9 are based on boundary values. There may also be other information about the test cases, such as preconditions, that we have not shown here.