

# COMP 3649 - Project Testing Document

## Test Cases Which Should Generate Solutions

Test Case	Purpose	Expected Result	Actual Result
<b>1: Single Package, Single Airplane</b>	Verifies basic functionality with minimal complexity.	Single plane delivers one package, total distance/cost = <b>200km</b> .	✓ Matches expected.
<b>2: Two Packages, Single Airplane (Same Destination)</b>	Tests handling multiple packages going to the same location.	Plane carries both packages, total distance/cost = <b>200km</b> .	✓ Matches expected.
<b>3: 2 Packages, 2 Airplanes, Same Destination (Weight Capacity Test)</b>	Ensures proper handling when weight capacity limits a single plane.	<b>Each plane carries one package</b> to the same destination.	✓ Matches expected.
<b>4: 2 Packages, 2 Airplanes, 2 Destinations (Weight Capacity Test)</b>	Ensures each plane delivers to separate destinations.	<b>Each plane flies to a different destination.</b>	✓ Matches expected.
<b>5: 2 Packages, 2 Airplanes, 2 Destinations (Deadline Test)</b>	Ensures multiple airplanes are used to meet deadlines.	<b>Each plane meets its deadline</b> with separate destinations.	✓ Matches expected.
<b>6: 2 Packages, 2 Airplanes, 2 Destinations (Deadline Test, One Plane Feasible)</b>	Ensures one plane can carry multiple packages if time allows.	<b>One plane carries both packages</b> and meets the deadlines.	✓ Matches expected.
<b>7: 2 Packages, 2 Airplanes, Multiple Destinations (Cost Test)</b>	Ensures cost minimization is optimal.	<b>Total distance = 3200km</b> (not reduced due to the cost structure).	✓ Matches expected.

<b>8: 4 Packages, 3 Airplanes, Multiple Destinations (Deadline Test)</b>	Ensures package assignments follow deadline constraints.	<b>Plane 0 → Destination 3, Plane 1 → Dest. 1 (2 packages), Plane 2 → Dest. 2.</b>	✓ Matches expected.
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### Test Cases Which Should Not Generate Solutions

Test Case	Purpose	Expected Result	Actual Result
<b>9: 4 Packages, 3 Airplanes, Multiple Destinations (Deadline Test)</b>	Test failure case when not enough planes + tight deadlines with many packages makes delivery impossible.	<b>No solution.</b>	✓ Matches expected.
<b>10: 1 Package, 1 Plane (Weight Test)</b>	Ensures a plane cannot carry a package exceeding its weight limit.	<b>No solution.</b>	✓ Matches expected.
<b>11: 1 Package, 1 Plane (Deadline Test)</b>	Ensures a package arriving too late cannot be delivered.	<b>No solution.</b>	✓ Matches expected.

### Test Cases Where Input Files Are Not in the Correct Format

Test Case	Purpose	Expected Result	Actual Result
<b>12: Invalid Constraints Format</b>	Tests invalid fields in constraints file.	<b>Error: Invalid constraints format.</b>	✓ Matches expected.
<b>13: Invalid Package Format</b>	Tests additional unexpected fields in package data.	<b>Error: Invalid package format.</b>	✓ Matches expected.
<b>14: Incorrect Parameter Count</b>	Ensures the program requires exactly three file parameters.	<b>Error: Incorrect number of parameters.</b>	✓ Matches expected.
<b>15: Missing File Error</b>	Ensures a missing file triggers an error.	<b>Error: File not found.</b>	✓ Matches expected.

## Test Cases for Solution Performance

Test Case	Purpose	Expected Result	Actual Result
<b>16: Large distance matrix with many planes and packages</b>	Tests the performance of the solution program.	Since our problem is a Traveling Salesman Variant, we expect $O(n!)$ time complexity where $n$ is the number of nodes.	✔ Matches expected.