This program is about simulation of airport arrivals and departure planes. This program will calculate and estimate the wait time for the airplane to enter the runway and hopefully not crash due to running out of gas.

**Restrictions:**

1- Up to 5 planes may enter the arriving queue each time interval. Each plane require 1 time unit interval to initiate order of landing.

2- Unique ID number is given to each plane before it enter the landing queue.

3- The program will include queues. Some are for airplanes that want to land other are for the one ready to take off.

4- Each runway can process departure, arrival or both in each time interval unit. The program will calculate which flight have waited the most and give them the permission of the runaway to them, if the time of wait was the same, the priority is given to the landing planes. In addition to that, any other plane that want to arrive yet has low gas has the most priority before any other planes.

5- It should note that each upcoming plane that want to land has a gas fuel that can last up to 24 time unit. If a plane is about to run out of gas, it will be moved to the head of the land queue. But if there was another plane there, then it will be placed second to the head. In different side if the plane ran out of gas fuel then add the plane with its ID number to the crashed list.

**The Simulation:**

The program will run the simulation for about 120 time unit interval as it was asked for. If the time is done yet there are still some plane in the ether queues, the program will process them until they are over and clear. The program will not accept new entries during that time.

The program use a random generator to randomize the number of planes per event and assign each plane that want to arrive with gas amount.

**The program will print**: Current time, landing and departure queue size, ID of each plane in either queue with their fuel remaining time, total number of success land and depart planes, who landed successfully and who departed and number of crashed plane.

**At the end of the program the stats will be printed which will include:**

1- Average of single plane per queue length for departure and arrivals.

2- Average of elapsed time from arrival to landing and average elapsed time from the start of depart to the take off.

3- Total number of: success arrives, success departures and crashed planes.

**Summary:**

A simulation program that include two queues: depart and landing. With every queue there will be a plane with its ID number and time it has entered the runway. We must watch out for the airplanes that are running out of gas and try to let them land before they ran out to avoid the crash.

Summarized Output example:

  
 ----jGRASP exec: java Simulate  
<><><> Start <><><>  
Time: 0  
ID.1 has arrived.  
ID.1 Took Off.  
Size of landing queue: 1  
landing queue:  
ID.2:16   
Size of departing queue: 0  
departing queue:  
  
Counter of success landing: 1  
Current of success departs: 1  
Current crashed: 0  
<><><><><><><><><><><>  
Time: 1  
ID.2 has arrived.  
ID.2 Took Off.  
Size of landing queue: 0  
landing queue:  
  
Size of departing queue: 0  
departing queue:  
  
Counter of success landing: 1  
Current of success departs: 1  
Current crashed: 0  
<><><><><><><><><><><>  
Time: 2  
ID.4 has arrived.  
ID.4 Took Off.  
Size of landing queue: 2  
landing queue:  
ID.3:6 ID.5:15   
Size of departing queue: 0  
departing queue:  
  
Counter of success landing: 1  
Current of success departs: 1  
Current crashed: 0  
<><><><><><><><><><><>  
Time: 3  
ID.3 has arrived.  
ID.3 Took Off.  
Size of landing queue: 3  
landing queue:  
ID.6:9 ID.7:12 ID.5:14   
Size of departing queue: 0  
departing queue:  
  
Counter of success landing: 1  
Current of success departs: 1  
Current crashed: 0  
<><><><><><><><><><><>  
Time: 4  
ID.6 has arrived.  
ID.6 Took Off.  
Size of landing queue: 4  
landing queue:  
ID.9:10 ID.7:11 ID.5:13 ID.8:20   
Size of departing queue: 0  
departing queue:  
  
Counter of success landing: 1  
Current of success departs: 1  
Current crashed: 0  
<><><><><><><><><><><>  
Time: 5  
ID.9 has arrived.  
ID.9 Took Off.  
Size of landing queue: 3  
landing queue:  
ID.7:10 ID.8:19 ID.5:12   
Size of departing queue: 0  
departing queue:  
  
Counter of success landing: 1  
Current of success departs: 1  
Current crashed: 0  
<><><><><><><><><><><>  
Time: 6  
ID.7 has arrived.  
ID.7 Took Off.  
Size of landing queue: 3  
landing queue:  
ID.5:11 ID.8:18 ID.10:22   
Size of departing queue: 0  
departing queue:  
  
Counter of success landing: 1  
Current of success departs: 1  
Current crashed: 0  
<><><><><><><><><><><>  
Time: 7  
ID.12 has arrived.  
ID.12 Took Off.  
Size of landing queue: 4  
landing queue:  
ID.5:10 ID.11:16 ID.10:21 ID.8:17   
Size of departing queue: 0  
departing queue:  
  
Counter of success landing: 1  
Current of success departs: 1  
Current crashed: 0  
<><><><><><><><><><><>  
Time: 8  
ID.5 has arrived.  
ID.5 Took Off.  
Size of landing queue: 4  
landing queue:  
ID.13:13 ID.11:15 ID.10:20 ID.8:16   
Size of departing queue: 0  
departing queue:  
  
Counter of success landing: 1  
Current of success departs: 1  
Current crashed: 0  
<><><><><><><><><><><>  
Time: 9  
ID.14 has arrived.  
ID.14 Took Off.  
Size of landing queue: 4  
landing queue:  
ID.13:12 ID.11:14 ID.10:19 ID.8:15   
Size of departing queue: 0  
departing queue:  
  
Counter of success landing: 1  
Current of success departs: 1  
Current crashed: 0

……………. **Due to long output I have summarize it**   
<><><><><><><><><><><>  
Time: 54  
ID.67 has arrived.  
ID.57 Took Off.  
Size of landing queue: 16  
landing queue:  
ID.63:2 ID.62:2 ID.82:3 ID.83:3 ID.77:3 ID.89:6 ID.68:5 ID.84:4 ID.81:15 ID.78:5 ID.85:11 ID.92:23 ID.90:16 ID.70:7 ID.87:15 ID.93:24   
Size of departing queue: 20  
departing queue:  
ID.35 ID.42 ID.73 ID.75 ID.41 ID.56 ID.54 ID.80 ID.46 ID.48 ID.66 ID.58 ID.69 ID.60 ID.65 ID.79 ID.91 ID.71 ID.88 ID.67   
Counter of success landing: 1  
Current of success departs: 1  
Current crashed: 0  
<><><><><><><><><><><>  
Time: 55  
ID.63 has arrived.  
ID.62 has arrived.  
Size of landing queue: 16  
landing queue:  
ID.77:2 ID.83:2 ID.82:2 ID.94:2 ID.78:4 ID.89:5 ID.68:4 ID.84:3 ID.95:2 ID.81:14 ID.85:10 ID.92:22 ID.90:15 ID.70:6 ID.87:14 ID.93:23   
Size of departing queue: 22  
departing queue:  
ID.35 ID.42 ID.73 ID.75 ID.41 ID.56 ID.54 ID.80 ID.46 ID.48 ID.66 ID.58 ID.69 ID.60 ID.65 ID.79 ID.91 ID.71 ID.88 ID.67 ID.63 ID.62   
Counter of success landing: 2  
Current of success departs: 0  
Current crashed: 0  
<><><><><><><><><><><>  
Time: 56  
ID.77 has arrived.  
ID.82 has arrived.  
Size of landing queue: 16  
landing queue:  
ID.83:1 ID.94:1 ID.68:3 ID.95:1 ID.78:3 ID.89:4 ID.70:5 ID.84:2 ID.96:19 ID.81:13 ID.85:9 ID.92:21 ID.90:14 ID.97:12 ID.87:13 ID.93:22   
Size of departing queue: 24  
departing queue:  
ID.35 ID.42 ID.73 ID.75 ID.41 ID.56 ID.54 ID.80 ID.46 ID.48 ID.66 ID.58 ID.69 ID.60 ID.65 ID.79 ID.91 ID.71 ID.88 ID.67 ID.63 ID.62 ID.77 ID.82   
Counter of success landing: 2  
Current of success departs: 0  
Current crashed: 0  
<><><><><><><><><><><>  
Time: 57  
The Plane83 ran out of fuel and there for crashed  
The Plane94 ran out of fuel and there for crashed  
The Plane95 ran out of fuel and there for crashed  
ID.84 has arrived.  
ID.35 Took Off.  
Size of landing queue: 14  
landing queue:  
ID.68:2 ID.78:2 ID.89:3 ID.98:16 ID.85:8 ID.87:12 ID.70:4 ID.96:18 ID.99:17 ID.81:12 ID.93:21 ID.92:20 ID.90:13 ID.97:11   
Size of departing queue: 24  
departing queue:  
ID.42 ID.73 ID.75 ID.41 ID.56 ID.54 ID.80 ID.46 ID.48 ID.66 ID.58 ID.69 ID.60 ID.65 ID.79 ID.91 ID.71 ID.88 ID.67 ID.63 ID.62 ID.77 ID.82 ID.84   
Counter of success landing: 1  
Current of success departs: 1  
Current crashed: 3  
<><><><><><><><><><><>  
Time: 58  
ID.68 has arrived.  
ID.78 has arrived.  
Size of landing queue: 15  
landing queue:  
ID.89:2 ID.85:7 ID.70:3 ID.98:15 ID.81:11 ID.87:11 ID.97:10 ID.102:16 ID.99:16 ID.96:17 ID.93:20 ID.92:19 ID.90:12 ID.101:22 ID.100:12   
Size of departing queue: 26  
departing queue:  
ID.42 ID.73 ID.75 ID.41 ID.56 ID.54 ID.80 ID.46 ID.48 ID.66 ID.58 ID.69 ID.60 ID.65 ID.79 ID.91 ID.71 ID.88 ID.67 ID.63 ID.62 ID.77 ID.82 ID.84 ID.68 ID.78   
Counter of success landing: 2  
Current of success departs: 0  
Current crashed: 0  
<><><><><><><><><><><>  
Time: 59  
ID.89 has arrived.  
ID.42 Took Off.  
Size of landing queue: 15  
landing queue:  
ID.70:2 ID.85:6 ID.97:9 ID.103:10 ID.81:10 ID.87:10 ID.100:11 ID.98:14 ID.99:15 ID.96:16 ID.93:19 ID.92:18 ID.90:11 ID.101:21 ID.102:15   
Size of departing queue: 26  
departing queue:  
ID.73 ID.75 ID.41 ID.56 ID.54 ID.80 ID.46 ID.48 ID.66 ID.58 ID.69 ID.60 ID.65 ID.79 ID.91 ID.71 ID.88 ID.67 ID.63 ID.62 ID.77 ID.82 ID.84 ID.68 ID.78 ID.89   
Counter of success landing: 1  
Current of success departs: 1  
Current crashed: 0  
<><><><><><><><><><><>  
Time: 60  
ID.70 has arrived.  
ID.73 Took Off.  
Size of landing queue: 16  
landing queue:  
ID.85:5 ID.104:7 ID.97:8 ID.103:9 ID.81:9 ID.87:9 ID.100:10 ID.98:13 ID.99:14 ID.96:15 ID.93:18 ID.92:17 ID.90:10 ID.101:20 ID.102:14 ID.105:24   
Size of departing queue: 26  
departing queue:  
ID.75 ID.41 ID.56 ID.54 ID.80 ID.46 ID.48 ID.66 ID.58 ID.69 ID.60 ID.65 ID.79 ID.91 ID.71 ID.88 ID.67 ID.63 ID.62 ID.77 ID.82 ID.84 ID.68 ID.78 ID.89 ID.70   
Counter of success landing: 1  
Current of success departs: 1  
Current crashed: 0  
<><><><><><><><><><><>  
Time: 113  
ID.111 Took Off.  
ID.98 Took Off.  
Size of landing queue: 6  
landing queue:  
ID.171:2 ID.177:3 ID.169:4 ID.168:4 ID.172:5 ID.178:11   
Size of departing queue: 56  
departing queue:  
ID.99 ID.102 ID.96 ID.119 ID.115 ID.130 ID.92 ID.93 ID.114 ID.101 ID.113 ID.122 ID.121 ID.133 ID.105 ID.106 ID.128 ID.137 ID.110 ID.118 ID.117 ID.127 ID.131 ID.124 ID.129 ID.123 ID.125 ID.147 ID.154 ID.138 ID.142 ID.161 ID.139 ID.162 ID.151 ID.149 ID.152 ID.135 ID.141 ID.150 ID.166 ID.148 ID.155 ID.163 ID.179 ID.140 ID.144 ID.143 ID.156 ID.170 ID.175 ID.157 ID.158 ID.145 ID.176 ID.174   
Counter of success landing: 0  
Current of success departs: 2  
Current crashed: 0  
<><><><><><><><><><><>  
Time: 114  
ID.171 has arrived.  
ID.99 Took Off.  
Size of landing queue: 5  
landing queue:  
ID.177:2 ID.168:3 ID.169:3 ID.178:10 ID.172:4   
Size of departing queue: 56  
departing queue:  
ID.102 ID.96 ID.119 ID.115 ID.130 ID.92 ID.93 ID.114 ID.101 ID.113 ID.122 ID.121 ID.133 ID.105 ID.106 ID.128 ID.137 ID.110 ID.118 ID.117 ID.127 ID.131 ID.124 ID.129 ID.123 ID.125 ID.147 ID.154 ID.138 ID.142 ID.161 ID.139 ID.162 ID.151 ID.149 ID.152 ID.135 ID.141 ID.150 ID.166 ID.148 ID.155 ID.163 ID.179 ID.140 ID.144 ID.143 ID.156 ID.170 ID.175 ID.157 ID.158 ID.145 ID.176 ID.174 ID.171   
Counter of success landing: 1  
Current of success departs: 1  
Current crashed: 0  
<><><><><><><><><><><>  
Time: 115  
ID.177 has arrived.  
ID.102 Took Off.  
Size of landing queue: 4  
landing queue:  
ID.168:2 ID.172:3 ID.169:2 ID.178:9   
Size of departing queue: 56  
departing queue:  
ID.96 ID.119 ID.115 ID.130 ID.92 ID.93 ID.114 ID.101 ID.113 ID.122 ID.121 ID.133 ID.105 ID.106 ID.128 ID.137 ID.110 ID.118 ID.117 ID.127 ID.131 ID.124 ID.129 ID.123 ID.125 ID.147 ID.154 ID.138 ID.142 ID.161 ID.139 ID.162 ID.151 ID.149 ID.152 ID.135 ID.141 ID.150 ID.166 ID.148 ID.155 ID.163 ID.179 ID.140 ID.144 ID.143 ID.156 ID.170 ID.175 ID.157 ID.158 ID.145 ID.176 ID.174 ID.171 ID.177   
Counter of success landing: 1  
Current of success departs: 1  
Current crashed: 0  
<><><><><><><><><><><>  
  
<><><> Results <><><>  
Arrival Average queue length: 13.37  
Departure Average queue length: 23.99  
Arrival Average elapsed time: 11.39  
Departure Average elapsed time: 20.26  
Arrivals successed: 148  
Departure successed: 148  
Number of crashed planes: 31  
End of simulation  
  
 ----jGRASP: operation complete.  
