HW Problem 4: **SOLUTION** **2005**

Solid waste planning students in Dusseau's Folly often gather at a restaurant called Cleary's Cajun Cantonese. Here students may be found engaged in heated debate on cutting edge environmental issues, such as the best means of addressing cumulative environmental impacts, or the pronunciation of Tchobanoglous. Cleary's CC, offers a unique and tasty menu, unfortunately, it has been implicated as a major greenhouse gas contributor due to the spicy nature of it's cuisine.

Select the least cost container size (follow ex. 7-2 and 6-3, use arithmetic probability paper).
Evaluate 25, 30, 35, 40, 45, and 50 cu-yd containers
Use the following data:

Week	Waste (yd^3/ wk)
1	39
2	35
3	38
4	40
5	37
6	25
7	34
8	27
9	42
10	37
11	41
12	29
13	32
14	30
15	46

Cost per container collection = $ 50
Useful life of container = 10 yr
Discount rate = 10 %
Capital recovery factor = 0.162745

The Capital and O & M costs are:

	Capacity (cu-yd)					
Cost	25	30	35	40	45	50
Capital,$	2750	3000	3500	4000	4900	6100
O & M,$	135	155	180	230	300	400

a. Rank the waste generation data and determine the plotting position

Rank	Waste Amount cu-yd/wk	Plotting Position %
1	25	6.25
2	27	12.5
3	29	18.75
4	30	25
5	32	31.25
6	34	37.5
7	35	43.75
8	37	50
9	37	56.25
10	38	62.5
11	39	68.75
12	40	75
13	41	81.25
14	42	87.5
15	46	93.75

Plotting position =
Rank / (Max Rank+1)

b. Graph plotting position versus waste amount (use Normal probability paper)

You have to do your own Probability Paper!

c. Determine the percentage and number of extra container collections for each container

Container Capacity	Capacity exceeded: Percent	Number: real	Number: round up
1	2	3	4
25	93.5	48.62	49
30	79	41.08	42
35	54	28.08	29
40	26	13.52	14
45	9	4.68	5
50	2	1.04	2

Calculations

Column	Description
1	Container capacity, cu-yd (given)
2	Percentage of weeks given capacity is expected to be exceeded (100 - % read off of graph)
3	Number of weeks capacity exceeded (52 x column 2/100)
4	Round up of column 3

d. Estimate the yearly cost for each container

Cost	Container Capacity (cu-yd) 25	30	35	40	45	50
Annual Capital Cost	448	488	570	651	797	993
Annual Maintenance Cost	135	155	180	230	300	400
Regular Haul trips	2600	2600	2600	2600	2600	2600
Extra Haul trips	2450	2100	1450	700	250	100
Total	5633	5343	4800	4181	3947	4093

Calculations

Column	Description
1	capital cost x capital recovery factor
2	given
3	$50 x 52
4	$50 x extra trips (see part c)

e. Identify the low cost container

The lowest cost container has a capacity of 45 cu-yd

However, the 40 and 50 cu-yd containers are not much more expensive.