Test 1

1. An experimenter studied the effects of factors A, B, and C upon a response variable. Values are recorded in the table below.

A	B	C	Response
-1	1	1	10.3
-1	-1	1	11.7
1	1	1	14.0
1	-1	1	16.7
-1	1	-1	13.8
-1	-1	-1	15.4
1	1	-1	10.5
1	-1	-1	12.8

   (a) Construct a cube plot and interpret it.

   (b) Compute effects, and construct a normal effects plot. Which effects are significant?

   (c) Construct an AC interaction plot with factor C on the horizontal axis. Discuss the A effect at each of the levels of C, and compare these effects to the overall A effect.

   (d) Multiply each of the observations by 2. Compute effects, and construct an effects plot. Discuss and explain any changes from results in (a).

   (e) Add 20 to the last observation. Compute effects, and construct an effects plot. Discuss and explain any changes from results in (a) and (b).

2. A farmer in Oman tested the effect of irrigation pumps (Pump 1 and Pump 2), inlet pipe diameter (1.5" vs. 2.0"), and outlet pipe diameter (1.0" vs. 1.5") by recording the time it took in minutes for each combination of factors to fill a 500-gallon tank.

Pump	Inlet Pipe Diamater (in.)	Outlet Pipe Diameter (in.)	Fill Time (min.)
1	1.5	1.0	52
2	1.5	1.0	46
1	2.0	1.0	60
2	2.0	1.0	36
1	1.5	1.5	50
2	1.5	1.5	44
1	2.0	1.5	53
2	2.0	1.5	36

   (a) Compute effects. Which effects are significant? Construct interaction plots for significant effects and interpret them.

   (b) Using only the significant effects, which combination of factor levels minimizes the response? What is the EMR? Compare the EMR to observed response(s) for this combination of factor levels and discuss any differences.

   (c) Suppose Pump 2 is much more expensive than Pump 1. Using only significant effects, which combination of factor levels for B and C minimizes the response for Pump 1? What is the EMR?