Foldover exercise

I encourage you to refer to the supplemental material on the website to help you with the following exercises.

1. Analyze the shot put data in Minitab to confirm the results reported in the lecture notes. You'll want to start by analyzing the first 8 runs separately. Note that the design we used (D=AB, E=AC, F=BC and G=ABC) is Minitab's default design for 7 factors in 8 runs, so you can use the default generator rather than specifying the generator. Simply specify 7 factors and then select 8 runs (1/16 fraction) under Designs... and then check that the effects are the same as reported in our handout.

   To analyze the entire design, refer to the notes on the course webpage; there are two methods for doing this, and the more efficient method is presented last, so be sure to read through the entire set of notes before proceeding. If you choose the first approach, the last effect estimated in the output (ABD+...) is the difference between the mean of the two sets of experiments–it should properly be considered a blocking effect rather than an experimental effect; it will be identified as a significant effect in your effects plot. If you choose the second approach, the Block effect will not be included in your effects plot. Again, confirm that the factor effects agree with those in your handout.

2. A bank tested the effects of the presence/absence of seven different customer incentives. One bank branch apiece was randomly assigned to a package of incentives as shown below. The response measured growth in customer accounts after the packages had been in place for 6 months.

A	B	C	D	E	F	G	Growth
-1	-1	-1	-1	1	1	1	6.1
1	-1	-1	1	-1	1	-1	4.8
-1	1	-1	1	1	-1	-1	3.9
1	1	-1	-1	-1	-1	1	6.5
-1	-1	1	1	-1	-1	1	5.4
1	-1	1	-1	1	-1	-1	26.1
-1	1	1	-1	-1	1	-1	4.4
1	1	1	1	1	1	1	24.7

   (a) You won't need the computer for this part. To which columns in the 8-run effects table were D, E, F and G assigned? (Hint: It's not the usual assignment of D=AB, E=AC, F=BC and G=ABC).

   (b) Generate the first design and compute effects by completing the following steps in Minitab. From the Create Factorial Design menu, select Specify Generators and choose *only* 3 factors. In the Designs menu, select Full Factorial and click on Generators. In the first box, enter your column assignments from your answer to Part 1; if you had thought the column assignment was D=ABC E=BC F=AC G=AB, for example, then you would enter exactly that text in the box (do not use commas to separate the generators). Have Minitab analyze the design.

   (c) Generate the foldover design (preferably using Modify Design..). Enter data from the second run (26.3, 3.1, 24.5, 6.0, 5.0, 5.4, 4.0, 6.6). Analyze the design (there are no additional commands needed to analyze a foldover design).

(d) Analyze the second half of the foldover separately. Create a new worksheet. Copy and paste the entries for factors A through G and the response corresponding to the second half of the foldover (rows 9 through 16) from the worksheet containing the full foldover experiment into the new worksheet. Select Define Custom Factorial Design from the DOE menu. Select the columns containing A through G as Factors, click on the Low/High box and then click OK (the new design won't be generated if you don't do this). You will see that Minitab has created additional columns in your worksheet. You can now analyze the fractional factorial design as you usually would.