Lottery Experiment
Looking at the Data

E-Data Aid step

1. Double click on the E-Data Aid icon.
2. Open your data file. Notice there are 90 rows for the 54 choices + the 36 selling price trials.
3. From the “Tools” menu, select “arrange columns”
4. Hide all of the columns except the following:

Column to keep	What it contains
Subject	Your subject number
aBetType	Whether the first lottery (or only lottery if it’s a selling price trial) is an H, X, or L lottery
aTopAmount	Amount to win in the first lottery
bBetType	Whether the second lottery (in choice trials) is an H, X, or L lottery
bTopAmount	Amount to win in the second lottery
SellingPrice	The selling price given, if it was a selling price trial
TripletNumber	Which of the triplets (1 – 18) this lottery or lottery pair came from.
ChoiceSelected(Trial)	Choice made on a choice trial

5. After hiding the columns click “OK.” You should now see the data spreadsheet showing only the columns you did not hide.
6. Save the file
7. From the “File” menu, select “Export”
8. From the “Export to” menu, select “Excel”
9. As the file name use “lottery” + subj# + “.xls” (e.g., lottery0001.xls)
10. Click save.

Excel Step

1. Double click on the Excel icon to open excel
2. Open the file you just created.
3. Look at it to make sure it looks OK.
4. Save the file, making sure that it is being saved as an Excel file.

SPSS Step

1. Double click on the SPSS icon to open it
2. Select “open new data file”
3. Select your Excel file name

4. Use the Import Wizard to open your file.
5. Also open the SPSS syntax file called “SyntaxLot.sps” and run the syntax file. To do so, from the “File” menu select “Open -> Syntax” and then select the “SyntaxLot.sps” file
6. Run the syntax file by highlighting all the text in the file and then clicking on the run arrow.
7. Look at the resulting output file.

<u>Data Analysis</u>. We want the choices and prices to be arranged according to triplet – some thing like this:

Triplet	H vs. L choice	H vs. X choice	L vs. X choice	H price	L price
1	H	X	X	1.50	7.78
2	H	H	X	2.25	4.37
3	L	X	X	1.92	5.19
4	H	X	X	3.75	2.88

<u>Tabulating Preference Reversals</u>. The first step is for each student to tabulate the number of preference reversals he or she made. To do this, ignore the X part of the triplet for the time being. For each H-L pair note two things: (1) which was chosen in the H vs. L choice and (2) which one got a higher price. (If the two prices are exactly tied, then delete that lottery pair from this analysis.) The SPSS output should contain a table like this. Fill in the table below to show what your output shows.

		Which had the higher price?		
		H-bet	L-bet	Total
Which was chosen?	H-bet			
	L-bet			
	Total			

In the example data file above, triplets 1 and 2 would go in the northeast (NE) cell, triplet 3 in the SE cell and triplet 4 in the NW cell.

Consider an example table below:

		Price: H-bet	Price: L-bet	Total
Choice	H-bet	3	9	12 (67%)
	L-bet	1	5	6 (33%)
	Total	4 (22%)	14 (78%)	18 (100%)

Of the 18 lottery pairs, 9 showed the predicted kind of preference reversal (H-bet chosen, but L-bet priced higher). One pair showed a counter-predicted reversal (L-bet chosen, but H-bet priced higher). In choice the H-bet was preferred 67% of the time (12 of 18), whereas in the pricing the H-bet was preferred only 22% of the time (4 of 18). We want to know whether the preference for the H-bet in choice is significantly greater than the preference for the H-bet in pricing. It turns out that this is the same as asking whether the number of predicted reversals (in the NE cell) is significantly greater than the number of counter-predicted reversals (in the SW cell). Think about why this is so.

We use the McNemar's χ^2 (chi square) test which has the following simple formula:

$$\chi^2(1, N=18) = (NE - SW)^2 / (NE + SW)$$

In this example, $\chi^2(1, N=18) = (9 - 1)^2 / (9 + 1) = 6.40$. A chi square (with 1 df) of 3.84 or greater is significant at $p<.05$. Degrees of freedom are calculated as (R-1)(C-1) where R is the number of rows and C is the number of columns in the table. We have a 2x2 table, so there is 1 df.

Each student should compute the χ^2 for his or her own data. When the data are compiled across all the students, we can't use a χ^2 for the compiled data as it would violate the assumption of independent observations (e.g., the 180 data points from 10 students are not independent, as they represent separate set of 18 data points from each student). So, we need a different test. An easy solution is to use a t-test for paired samples. For each student we will compute the number of predicted reversals and the number of counter-predicted reversals. We will use the t-test to test whether the number of predicted reversals is significantly larger than the number of counter-predicted reversals.

<u>Determining whether intransitivity or procedural variance cause preference reversals</u>. Next we will repeat the analysis that Tversky et al. (1990) did to see whether intranstivity or failure of procedural invariance is the more common pattern in preference reversals. This analysis will be limited to cases where (a) the subject showed a predicted preference reversal and (b) the X amount was between the prices for the L-bet and that for the H-bet.

Of those cases, we want to tabulate how many fit each of the following 4 patterns:

Intransitive	Price(L) > Price(H),	Choice: H≻L, L≻X, X≻H
Over-pricing of L	Price(L) > Price(H),	Choice: H≻L, X≻L, X≻H
Under-pricing of H	Price(L) > Price(H),	Choice: H≻L, L≻X, H≻X
Both OL and OH	Price(L) > Price(H),	Choice: H≻L, H≻X, X≻L

We'll do this tabulation separately for each subject. Your SPSS output should show this tabulation. For simplicity, we'll combine the three types of procedural variance into one category. Then each subject will have two numbers: the number of preference reversals caused by intransitivity and the number of preference reversals caused by procedural variance. (Note that if a particular subject showed no predicted preference reversals, both of these numbers would be 0.) Then we use a t-test for paired samples to compare these two numbers. If Tversky et al. (1990) are right, the number of procedural variance preference reversals will be larger.

<u>Discussion</u>

Why do violations of procedural invariance occur? What's the psychological mechanism? Tversky et al. (1990) propose scale compatibility as the explanation. A lottery has two parts: the probability to win an the amount to win. Both will influence a decision maker's evaluation, but one could be more influential than the other. According to scale compatibility, the relative influence depends on the compatibility (similarity) between the lottery feature and the response scale. In pricing, the response scale is the monetary scale. This scale is very compatible with the payoff of the lottery. Consequently, the payoff has a larger influence in pricing than does the probability to win. As a result, the L-bet (which has a large payoff) gets a higher price than does the H-bet (which has a small payoff). In choice the response scale is a qualitative selection of one lottery or the other. This response scale is not particularly compatible with either the payoff or the probability of the lottery, so the two have about equal influence. As a result, the probability to win has more of an influence in choice than it does in pricing (and the amount to win has less of an influence in choice than it does in pricing.)

As a though experiment, consider what would happen if instead of choice and pricing we used as response modes choice and attractiveness rating. In attractiveness rating subject would rate the overall attractiveness of each lottery on a scale from 0 to 36. What kind of preference reversals might result? (Hint: the rating scale is most compatible with which part of the lottery?)