SOLVER HELP FILE

Hypothetical Problem (Six Flags)

You have a six flags where you have three kinds of areas – area for park rides (R), area for food (F) and area for shops (S). Management wants to know how to best utilize the area. And they have constraints that they must meet.

1. They have a total of 500 acres available
2. At least 60% of the area must be for park rides
3. At least 85 acres must be devoted to shops

Other data: Each acre of R generates $100/hour. Each acre of F generates $150/hour. Each acre of S generates $110/hour.

How to allocate acres between rides, food and shops in order to maximize *hourly* profit of the park?

System of Equations

The stated problem can be broken down into a mathematical system of equations. One of the goals of this class is to teach you how to formulate word problems in a mathematical manner. And after you formulated the system of equation, Excel Solver can solve it for you – if a solution exists.

Decision Variables – R, F, S
Non-decision Variables – T (Total Area)

The system of equation we have for our hypothetical problem:

T = R + F + S (will be useful in constraint 1, 2)

1. R + F +S <= 500	(Total area constraint)
2. R >= 0.6 T	(Min ride area constraint)
3. S >= 85	(Min shop area constraint)
4. R >= 0	(Non-negative constraint)
5. F >= 0	(Non-negative constraint)
6. S >= 0	(Non-negative constraint)

Objective function:

MAX 100R + 150F + 85S

Setting up Excel

	A	B	C	D
1				
2	***Decision***	***Variables: -***		
3	**R**	**F**	**S**	
4				
5				
6	***Non-Decision***	***Variables: -***		
7	**T**			
8	=A4+B4+C4			
9				
10	***Constraints: -***			
11	*Total*	=A8	<=	500
12	*Ride*	=A4	>=	=0.6*A8
13	*Shop*	=C4	>=	85
14	Non-negative R	=A4	>=	0
15	Non-negative F	=B4	>=	0
16	Non-negative S	=C4	>=	0
17				
18	***Objective***	***Function: -***		
19	*MAX*	=(100*A4) +(150*B4) +(110*C4)		
20				

Using Solver

1. Tools -> Solver
2. Equal To: Max
3. Set Target Cell: B19
4. By Changing Cells: A4 : C4
5. Add B11 <= D11
6. Add B12 >= D12
7. Add B13 >= D13
8. Add B14 >= D14, Add B15 >= D15, Add B16 >= D16
9. Ok
10. Solve

A note about INT Constraint *(can only be applied to decision variables)*

If for example, the number of acres devoted to shops had to be an integer, we would add that constraint as this:

Add -> C4 int integer

Where "C4" is in the *cell reference* field, "int" is the chosen comparison option and we type in "integer" in the *constraint* field.