Project: FenDog

**Sample Only**

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1. **How the calculation works**

The FenDog model is designed to calculate outputs based on supplied inputs. The inputs are variables used in excel functions, which then drive the results referred to as outputs.

The model’s scenario is controlled by a table located on the “Inputs” worksheet, named, “Scenario Inputs” this controls the scenario of the model and can easily be changed with a “Yes” or “No” input. There are two scenarios, “High Product Mix” and “More Employees?”

High Product Mix - tells the scenario whether to consider an extended product line or not. When the cell is filled with “Yes,” the model considers all products in the product mix. An input of “No” will consider only sausage, water and soda as the full product line.

More Employees - determines if the business needs employees in addition to the owner of the cart. An input of “Yes” will run calculations using the inputs in the table called “Worker Information.” A response of “No” will run calculations with only the owner of the cart.

Descriptions of the Intermediate calculations within the FenDog model, along with an explanation of how they are computed are listed below. These items are organized in the same order as in the FenDog workbook. All intermediate calculations are filled in blue in the workbook.

ProfitPerOrder Worksheet

Cost Per Ingredient – Calculation that represents the price of individual ingredients required in each salable product. This number is calculated by referencing inputs from the input worksheet and using multiplication and division worksheet functions.

Total Cost Per Product – Calculation stream that represents the total cost of all ingredients required for each saleable product. This is calculated using the SUM worksheet function. It does not directly reference any inputs but it’s dependent on the Cost Per Ingredients, which does reference inputs.

Profit Per Product – Calculation stream that represents the difference (profit) between the cost and sale price of each product. This is computed by referencing the sale price on the Input worksheet and subtracting the total cost per product which is described above.

Games Worksheet

Percentage Who Purchase – Calculates the number of game attendees that purchase products from the sausage cart during each bi-week. This calculation stream is computed by using a combination of the “IF” and “Ceiling” functions. This number is calculated based on a winning or losing bi-week.

Temperature Effect on Demand – Calculation that represents the temperatures effect on customer demand, which is calculated by using the “IF” worksheet function.

Number Ordered with Temperature & Winning/Losing Considered – Calculation of orders after taking win/loss and temperature into consideration. Computed using the “Ceiling” worksheet function

Number Ordered with High or Low Mix- copies over the number ordered for the three basic products. For the rest of the items, it zeros out the total if the scenario isn’t the “High Product Mix” version, by using the “If” worksheet function.

Total Sales – Calculation that multiplies the array, “Number Ordered with High or Low Mix.” by the Sales Price, calculated by using the “MMULT” worksheet function.

Food Profits – Calculation that multiplies the array, “Subtract Out Extra Products” by the profit margin of each product, calculated by using the “MMULT” worksheet function.

Total Profits – Calculation that multiplies the “Food Profits” by the percentage determined to be the positive effect on throughput by hiring extra staff. If there is no extra staff, then this number will equal Food Profits. Calculated by using the “IF” worksheet function

Staffing Worksheet

Worker Bi-Weekly – Calculation that multiplies the hourly wage times the number of hours in a bi-week times the number of extra employees.

Cashier and Food Preparer – By using the “IF” function these cells determine if there needs to be extra workers. If it does, it returns the inputs Extra Cashier and Extra Preparer.

Total Workers - Calculation that adds the cashiers and food preparers together, using the “sum” worksheet function. .

Salary Costs – Calculation that multiplies the bi-weekly salary times, the number of employees times the number of periods to determine the cost for the whole season.

Ordering Worksheet

Ingredients Per Bi-Week – Calculation that uses the “MMULT” worksheet function to determine how many of each product is used each bi-week.

Packs to Order Per Bi-Week – Calculation that uses the “CELING” worksheet function and then divides the number of each product necessary for each bi-week by the amount in a package delivered from the vendor.

Cost Per Ingredient Per Bi-Week – Calculation that multiplies the total to order by the cost per package.

Bi-Weekly Supply Cost – Calculation that adds the total cost of products to order by using the “SUM” worksheet function.

1. **How to locate inputs, outputs and intermediate results**

All inputs and input streams are located on the input worksheet within the workbook. All inputs are in a yellow fill color, so they can be easily identified. The inputs drive the formulas in the workbook. They are the only cells in the workbook that should be manually changed. By adhering to this rule, the model’s integrity will remain intact. This protocol is helpful in various ways including the following: It allows a user to manipulate the entire model by testing different variables in one place (also known as the ripple effect). It keeps the model accurate and free of errors (also known as parameter sprinkling). And lastly, the model can easily be transferred and used by another user. All inputs have been assigned a name or name range, so they can be easily identified when looking at inner parts of the formulas within the workbook.

Intermediate results and intermediate result streams are found in all worksheets other than the info, input and output worksheets. These worksheets with their respective intermediate calculations are listed below in the same order as in the model. Intermediate calculations are significant because they are the model’s means to the end. They are used to determine the information needed to calculate the overall outputs of the model and can be used individually to make important business or project decisions. All intermediate calculations are in a blue fill color, so they can be quickly identified. When applicable, arrays are used in intermediate calculations, so cell references cannot be overwritten with hard numbers.

ProfitPerOrder worksheet - Intermediate calculations include: Ingredients Per Product, Cost per Ingredient, Total Cost per Product and Profit per Product

Games – Intermediate calculations include: Percentage Who Purchase, Temperature Effects on Demand, Number Ordered with Temperature & Winning/Losing Considered, Subtract Out Extra Products, Total Sales, Food Profits, Total Profits (Including Extra Throughput from Extra Staff)

Staffing - Intermediate calculations include: Worker Bi-weekly Salary, Cashier, Food Preparer, Total Workers and Salary Costs

Ordering - Intermediate calculations include: Ingredients Per Bi-week, Packs to Order Per Bi-week, Cost Per Ingredient Per Bi-Week, Bi-Weekly Supplies Cost

Outputs and output streams are the overall results that the model was created to generate. These numbers are more significant compared to the intermediate calculations, as they will have a greater impact on overall decision making. Outputs are located in the last worksheet of the workbook named “Outputs.” Cells with outputs in them are in a green fill color, so they can be easily identified. Like intermediate calculations, if possible, arrays are used when calculating outputs. The outputs in the model are listed below in the order they appear on the output worksheet.

Total Profits for the Seasons – Calculates the “Total Bi-Weekly Profits” from the game worksheet by using the SUM worksheet function.

Total Salary Costs – References “Salary Costs” from the staffing worksheet.

Gross Profit – Calculation that subtracts “Season Profits” from “Total Salary Costs”

Total Cost of Supplies - Calculates the total “Bi-Weekly Supply Cost” from the ordering worksheet by using the SUM worksheet function.

 Total Bi-Weekly Profits – References “Total Bi-Weekly Profits” from the games worksheet.

Ingredient Packages to Order – References “Packs To Order Per Bi-week” from the ordering worksheet.

1. **Guide to visual cues and naming conventions**

In each worksheet of the workbooks FenDog-scenario1.xls and FenDog-scenario2.xls, there is a key that displays the color-coding used in the model. If a cell is yellow, it is an input and may be changed by the user. If a cell is purple, then it references an input. If a cell is light blue, it is a calculation. If it is light red, then it is a reference to a calculation done elsewhere in the workbook. If a cell is green, then it is an output. A maintainer of the model should be particularly familiar with the items in light blue and light red which are the calculation and calculation references, respectively. Headings and labels are in white cells and all fonts are in black. It’s important that the colors of the key match the colors of the respective cells throughout the workbook. As the maintainer, the colors can be changed for preference or better contrast, as long as they’re changed simultaneously.

All inputs and calculations are assigned a local name or local name range. Only local names are used in this model, compared to the alternative of global names. Each named cell corresponds with the text in the cell to its left. Each named range corresponds to either the heading to the left or to the name of the table in which it occupies. The Key at the top of each worksheet is also a named range and is referenced from the original key found on the input worksheet, on the subsequent worksheets. As the maintainer, it’s important to know that changing the text in a header or label cell will not automatically change the name of the cell or range it identifies. Names can be changed using the name manager on the formula menu/ribbon or by typing directly into the name box located at the top left. Cells and cell ranges can have more than one name, so it is a good practice to delete irrelevant names via the name manager. The local names within each worksheet are listed below in the same order as in each worksheet’s name-box’s drop down menu. All words in local names are created without spaces between them and use a multi-case font.

Inputs Worksheet – The list of named ranges in this worksheet are: AverageTemperature, DegreeBreak, ExtraCashier, ExtraEmployees, ExtraPrepar, ExtraStaffPercent, FrindgeBenefit, GameAttendance, GameWeeks, HighProductMix, HoursPerBiWeek, Ingredients, IntemsPProducts, LosingPercent, NumberOfWins, OverBreakPctg(Pctg is an abbreviation for percentage), Periods, PricePPack, ProductLine, SalaryPerHour, SalePrice, UnderBreakPctg, UnitsPPackage, UnitsPServing, WinningPercent, WinNumber.

ProfitPerOrder Worksheet – The list of named ranges in this worksheet are: CostPerItem, ProfitPerProduct, TotalCostPerProduct

Games Worksheet - The list of named ranges in this worksheet are: ChickensOrdered, ClamChowderOrdered, CocoaOrdered, DegreeDemand, FinalItemsOrdered, FoodProfits, FunnelCakesOrdered, LemonadeOrdered, NumberItemsOrd (Ord is an abbreviation for ordered), PercentPurchased, PretzelsOrdered, SausagesOrderd, SodaOrdered, TotalBiWeeklyProfits, WaterOrdered, and Wins

Staffing Worksheet - The list of named ranges in this worksheet are: SalaryCosts, TotalWorkers, Workers, WorkerSalary

Ordering Worksheet – IngredPerBiWeek (Ingred is an abbreviation for ingredients), PacksToOrder and WeeklySupplyCost

In addition to the cells having names, each worksheet is also named. When a cells or cell ranges are referenced in another worksheet you will see the name of that worksheet listed in the formula preceding the name of the cell referenced. There are many examples of this in the model. In fact, the inputs worksheet is referenced on every worksheet other than outputs, where intermediate calculations are referenced instead. You will also see references to Games, Staffing and Ordering as well.

1. **How to make changes**

As mentioned earlier, to keep the model intact the only variables you should change are the inputs, located on the input worksheet. However, as the maintainer you may find it necessary to expand the model to as the business becomes more complex. Expanding the model may include, adding input streams, input parameters outputs and output steams. Instruction on how to add inputs and outputs are listed below, along with several ideas to expand the model.

Adding inputs and input streams – An input or input stream can easily be added by manually entering hard data into the input worksheet. Inserting columns or rows may be necessary to accommodate the new inputs under the proper headings. When inserting columns and rows, it’s important to pay particular attention to the impact the change has on the rest of the workbook. By referencing specific named cells and ranges you will avoid a new created column or row replacing parts of original formulas. After new input and input streams are created it’s essential that they are added throughout the model where applicable. Including new data in a calculation that uses an array, will require the entire calculation to be deleted and re-written, as arrays are protected from overwriting. Remember to label the new parameters and input streams, as well as assign local names to them. All inputs and input streams should be filled with the same yellow as in the key, which can be found in the fill menu.

Adding outputs – An Output or Output stream is added by creating a formula in a cell or series of cells that will calculate and display results. The results will be based on referenced data from other areas of the workbook. If outputs are added within an array of outputs, the entire calculation will need to be deleted and re-written, since arrays are protected from overwriting. Remember to label the new output and output streams, as well as assign local names to them. All Outputs and Output streams should be filled with the same green as in the key, which can be found in the fill menu.

Ideas to extend the model:

Add an additional cart(s)

Add additional periods to the model (the model is currently on bi-weeks but could be changed to weekly)

Add nonfood products such as Boston or Red Sox souvenirs to the product mix

Create an inventory model within the overall model

Create a service system within the overall model