# Operational Recommendations

for

shuzworld

Presented by

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(operations consultant)

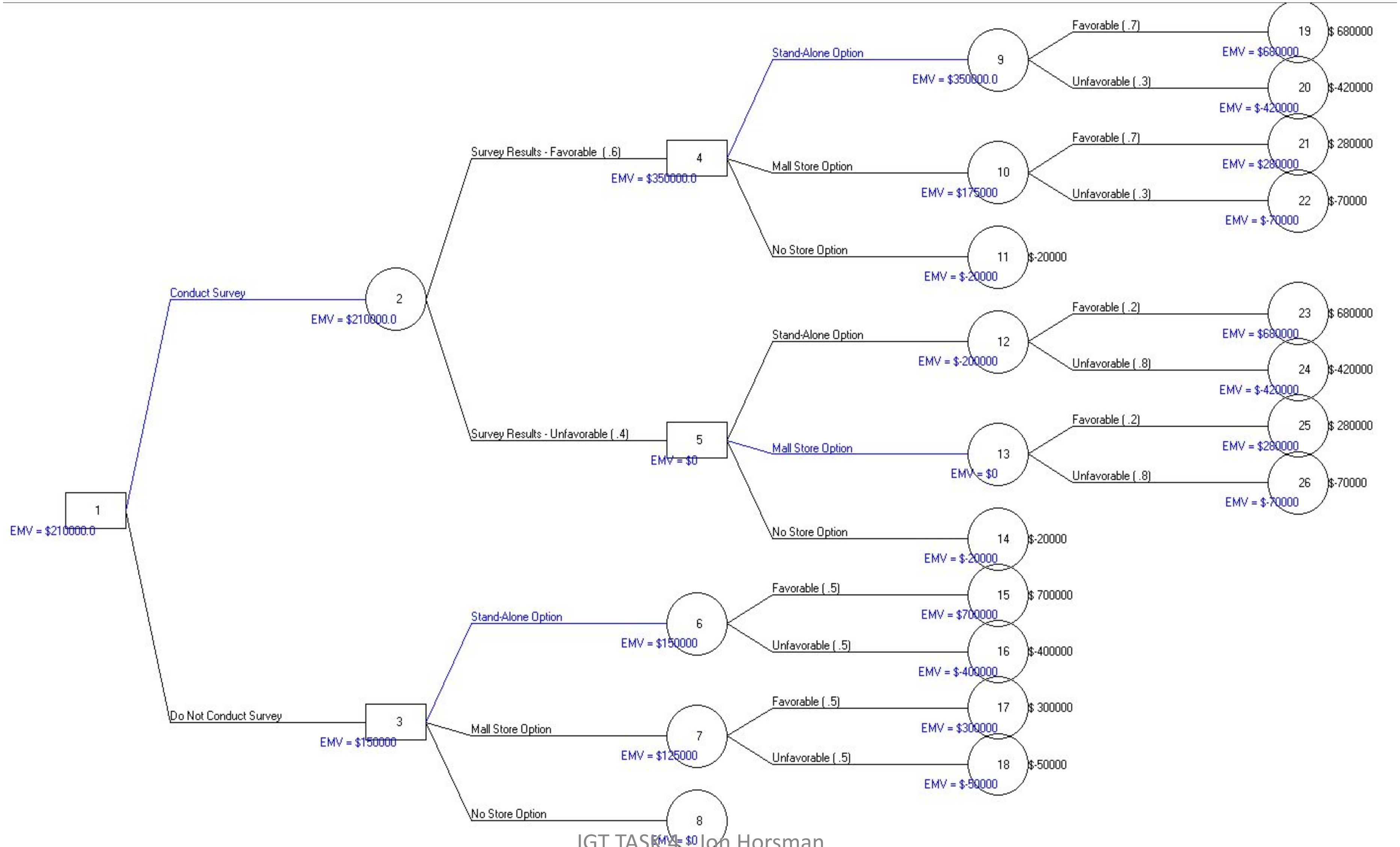
# Store Recommendations

**The first option** is the stand-alone option which is a lease option just outside of Auburn.


**The second option** is to open a store in the Auburn Mall.

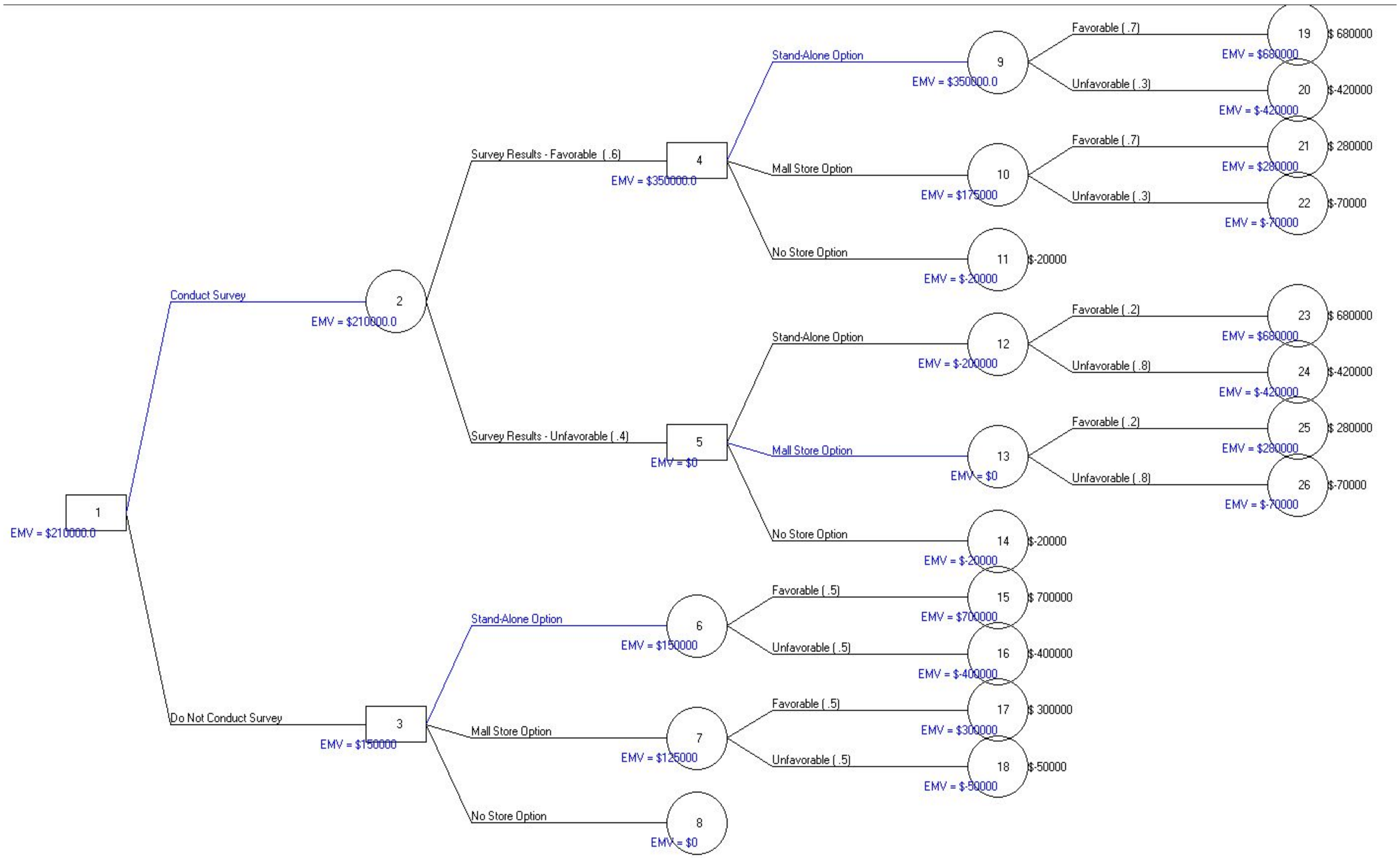

**The third option** is to do nothing at this time and wait for the market to improve.

# Store Decision Analysis Output



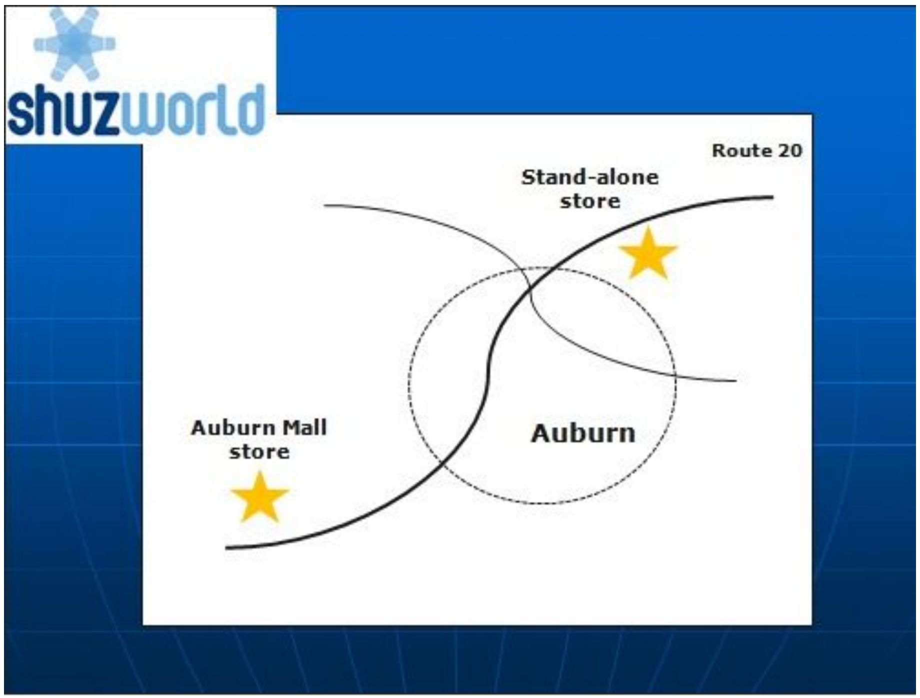

A1. Store: Output

# Explanation for Store Recommendation




A1a. Store Explanation

# Local Alternatives


Proximity to the Market

Proximity to the Suppliers

Proximity to the Competitors (Clustering)

# Project Techniques

## Planning

Determine the Project Activities
Task Sequence
Task Time

## Scheduling

Network Diagram
The Start and End Times
Slack and Flexibility in each task
Critical Path

## Controlling

Probability of Project Completion
Crashing the Project

### Project Management Tools

Gantt Charts
(PERT) Program Evaluation and Review Techniques
(CPM) Critical Path Method

# Network Diagram

Shuzworld One Expansion Project

| | | | Time Estimates (days) | | | |
|---|---|---|---|---|---|---|
| Activity | Description | Predecessors | Optimistic | Most Likely | Pessimistic | Crash Cost/Day |
| A | Funding/liability protection | - | 5 | 10 | 15 | $1,000 |
| B | Excavate grounds | A | 10 | 20 | 40 | 2,500 |
| C | Pour foundation | B | 10 | 15 | 30 | 2,000 |
| D | Inspect new equipment | B | 10 | 20 | 30 | 500 |
| E | Install utilities | C | 15 | 20 | 40 | 4,000 |
| F | Inspection(utilities) | E | 0.1 | 0.1 | 0.1 | 0 |
| G | Build out facility | D,F | 15 | 20 | 35 | 1,500 |
| H | Final inspection | G | 0.1 | 0.1 | 0.1 | 0 |
| I | Prep for operations-signs, etc. | H | 5 | 10 | 15 | 500 |
| J | Clean-up | I | 3 | 5 | 10 | 1,200 |



B1. Network Diagram

# Network Diagram

## Critical Path Results

PERT/CPM Entry of Information

Network type
(•) Immediate predecessor list
( ) Start/end node numbers

Method
Triple time estimate

(untitled)

| Activity | Optimistic time | Most Likely time | Pessimistic time | Predecessor 1 | Predecessor 2 | Predecessor 3 | Predecessor 4 |
|---|---|---|---|---|---|---|---|
| A | 5 | 10 | 15 | | | | |
| B | 10 | 20 | 40 | a | | | |
| C | 10 | 15 | 30 | b | | | |
| D | 10 | 20 | 30 | b | | | |
| E | 15 | 20 | 40 | c | | | |
| F | .1 | .1 | .1 | e | | | |
| G | 15 | 20 | 35 | d | f | | |
| H | .1 | .1 | .1 | g | | | |
| I | 5 | 10 | 15 | h | | | |
| J | 3 | 5 | 10 | i | | | |

PERT/CPM Main Results Output from the Above Information

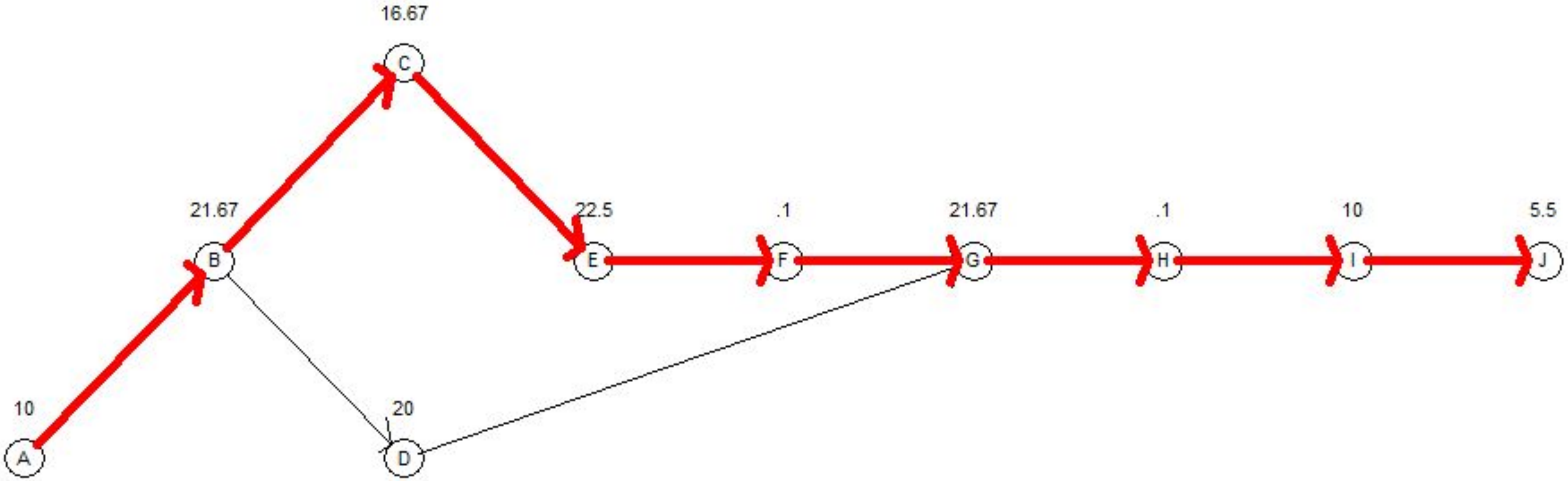
Project Management (PERT/CPM) Results

| Activity | Activity time | Early Start | Early Finish | Late Start | Late Finish | Slack | Standard Deviation |
|---|---|---|---|---|---|---|---|
| Project | 108.2 | | | | | | 8.46 |
| A | 10 | 0 | 10 | 0 | 10 | 0 | 1.67 |
| B | 21.67 | 10 | 31.67 | 10 | 31.67 | 0 | 5 |
| C | 16.67 | 31.67 | 48.33 | 31.67 | 48.33 | 0 | 3.33 |
| D | 20 | 31.67 | 51.67 | 50.93 | 70.93 | 19.27 | 3.33 |
| E | 22.5 | 48.33 | 70.83 | 48.33 | 70.83 | 0 | 4.17 |
| F | .1 | 70.83 | 70.93 | 70.83 | 70.93 | 0 | 0 |
| G | 21.67 | 70.93 | 92.6 | 70.93 | 92.6 | 0 | 3.33 |
| H | .1 | 92.6 | 92.7 | 92.6 | 92.7 | 0 | 0 |
| I | 10 | 92.7 | 102.7 | 92.7 | 102.7 | 0 | 1.67 |
| J | 5.5 | 102.7 | 108.2 | 102.7 | 108.2 | 0 | 1.17 |

# Network Diagram

## Critical Path Results

PERT/CPM Main Results  Output with the Precedence Graph




Due Date:

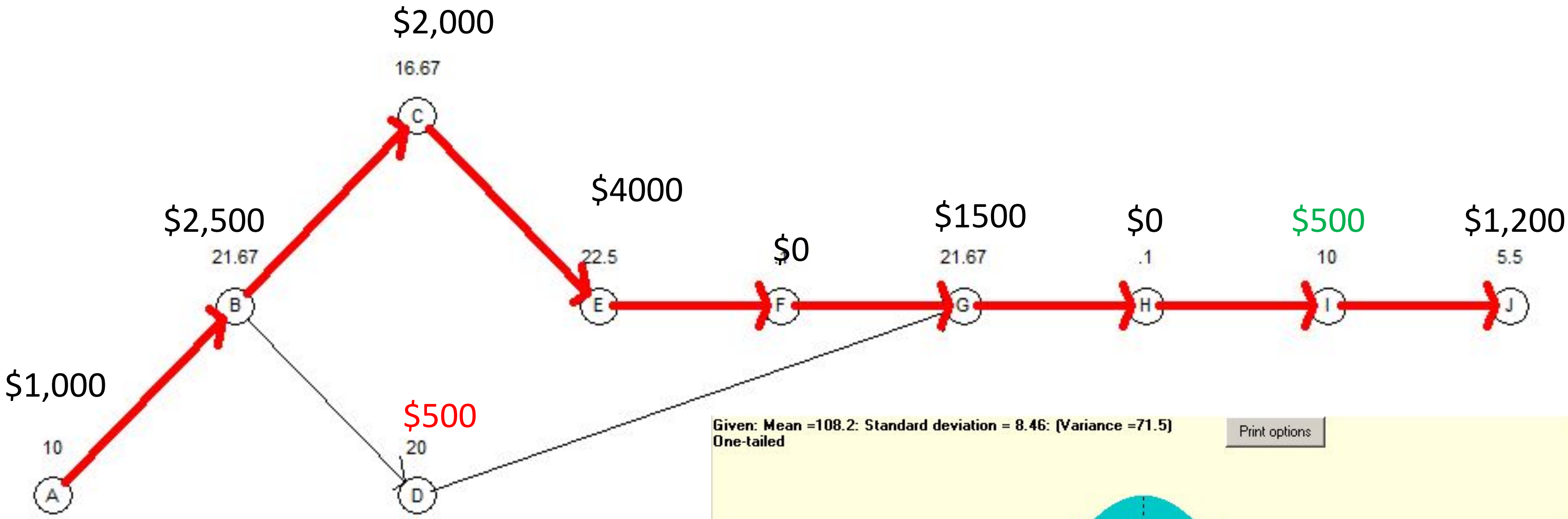
108.2 *days* + (1.64 *z-value* x 8.46 *stand deviation*) = 122.07 days (round-up to 123 days)

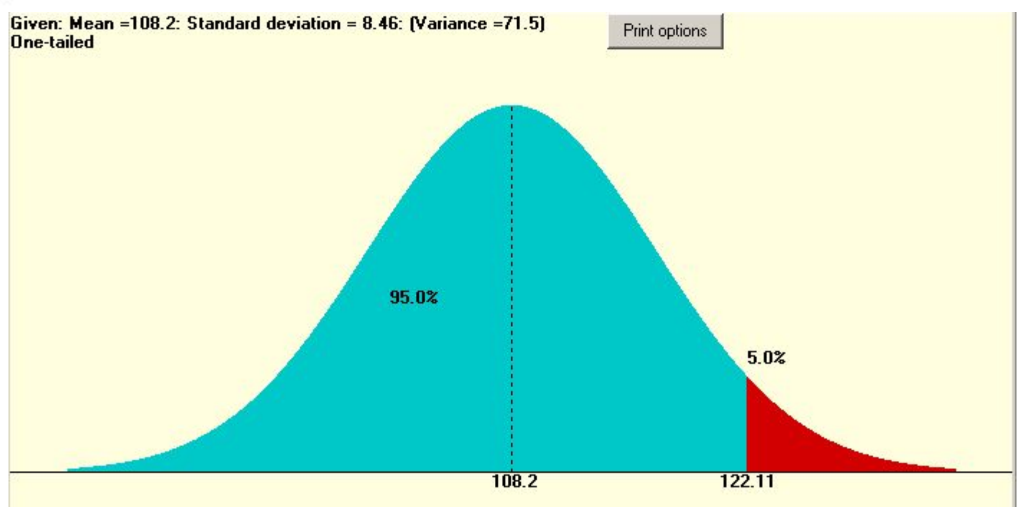
B1. Network Diagram

# Network Diagram

## Crashing the Project By 5 Days

**Crashing the Project**




Due Date:

Project Crashing:

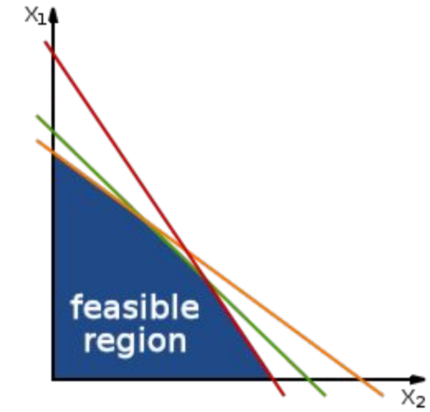
Max time reduction = Normal time – crashtime

Shuzworld should crash Activity **"I"** for the total cost of $2500.

This is from the cost of $500 per day for a total of $2,500 for the 5 days.

B1. Network Diagram

# Trade-Offs




Linear Programming is a mathematical technique to help make and plan decisions.

These decisions which are relative to their Trade-offs help determine the best allocation of resources.

As a result, Linear Programming will discover the minimum and Maximum values for the objective.

By using Linear Programming, it will guarantee the optimal solution for the selected model.

**Example of Trade-off would be:**

Having Fewer Production Line Workers would Minimize Cost Of the Production Line.

Allocating those Production Line Workers to other Projects that are being Crashed to meet the goal.

Creating a Work/Staffing Schedule that meets the Line Production Goals while Minimizing Staff.

# Production Recommendation

## Production Mix for KidsShuz Shoes and Sneakers

Shuzworld has a production plan of 50 batches of shoes and sneakers for this period. We have found the best solution to meet the requirements as well as minimizing production costs.

The first thing we did was to define our variables.

Shuzworld needs a production plan for 50 batches that will meet all requirements and minimize production costs.

Forecasted demand requires 25 Batches of Kidshuz shoes and at least 10 batches of Kidshuz sneakers for this month.

Shoes Cost $2000 per batch and Sneaker are $1,500 per batch.

Company needs Production Contraints to minimize production costs.

# Production Output

## Production Mix for KidsShuz Shoes and Sneakers

Objective
- ( ) Maximize
- (•) Minimize

Instruction
Enter the value for constraint 3 for rhs. Any non-negative valu

| | X1 (shoes) | X2 (sneakers) | | RHS | Equation form |
|---|---|---|---|---|---|
| Minimize | 2000 | 1500 | | | Min 2000X1 (shoes) + 1500X2 |
| Constraint 1 | 1 | 0 | >= | 25 | X1 (shoes) >= 25 |
| Constraint 2 | 0 | 1 | >= | 10 | X2 (sneakers) >= 10 |
| Constraint 3 | 1 | 1 | >= | 50 | X1 (shoes) + X2 (sneakers) >= 0 |

This is the information about the Variables and the Constraints Required to find the best solution

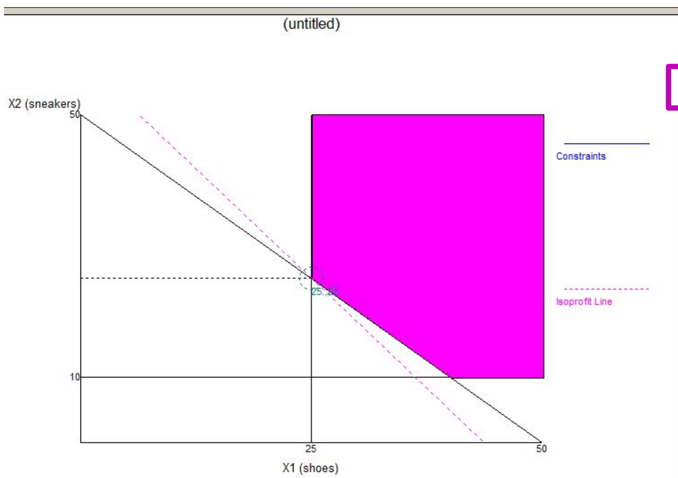
This is the information about the Variables and the Constraints Required to find the best solution:

The Optimal minimized production cost is $87,500
It also shows that the best solution is 25 batches of shoes and 25 batches of sneakers

Objective
- ( ) Maximize
- (•) Minimize

Instruction
There are more res

| | X1 (shoes) | X2 (sneakers) | | RHS | Dual |
|---|---|---|---|---|---|
| Minimize | 2000 | 1500 | | | |
| Constraint 1 | 1 | 0 | >= | 25 | -500 |
| Constraint 2 | 0 | 1 | >= | 10 | 0 |
| Constraint 3 | 1 | 1 | >= | 50 | -1500 |
| Solution-> | 25 | 25 | Optimal Z-> | 87500 | |




Corner Points

| X1 (shoes) | X2 (sneakers) | Z |
|---|---|---|
| 25 | 25 | 87,500. |
| 40 | 10 | 95,000. |

C1a. Production Output & C1ai Explanation

# Production Recommendation

## Production Mix for Kiltie Tassel Loafer and the Classic Penny Loafer

| Product | Assembly Department | Finishing Department | Profit per batch |
|---|---|---|---|
| **Batches of Tassel Loafers** | 2 hours | 8 hours | $800 |
| **Batches of Penny Loafers** | 6 hours | 4 hours | $1,200 |

| Department | Capacity Hours | Product | Min. Production Level |
|---|---|---|---|
| **Assembly** | 1200 | Batches of Tassel Loafers | 50 |
| **Finishing** | 1600 | Batches of Penny Loafers | 100 |

This is the information about the Variables and the Constraints Required to find the best solution

Objective
- (•) Maximize
- ( ) Minimize

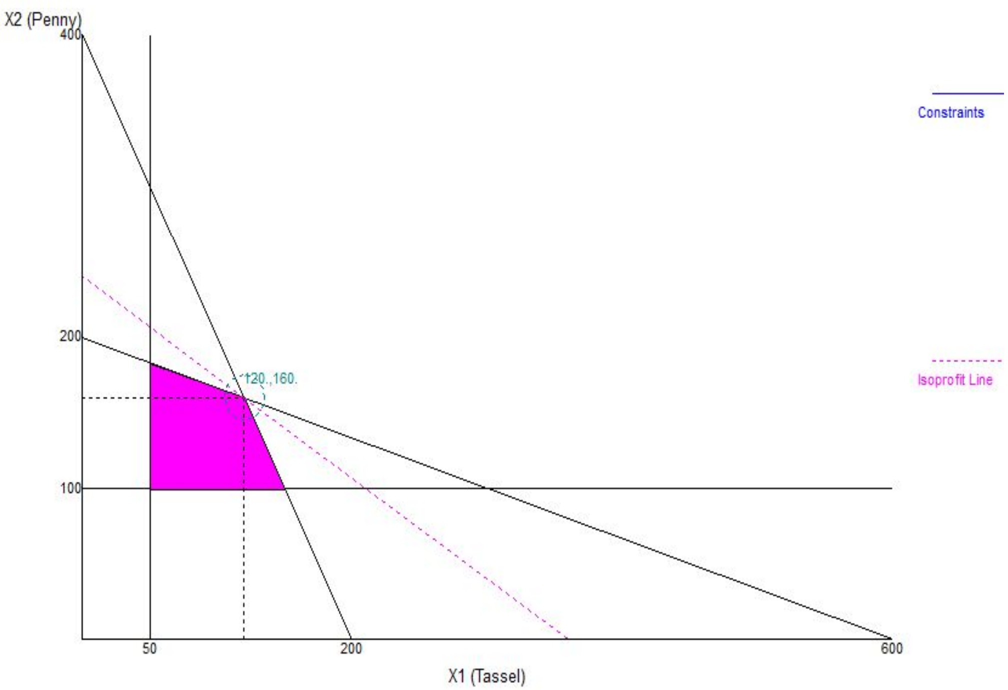
Instruction
Enter the name for this variable. Almost any cha

| | X1 (Tassel) | X2 (Penny) | | RHS | Equation form |
|---|---|---|---|---|---|
| Maximize | 800 | 1200 | | | Max 800X1 (Tassel) + 1200X2 (Penny) |
| Constraint 1(assembly) | 2 | 6 | <= | 1200 | 2X1 (Tassel) + 6X2 (Penny) <= 1200 |
| Constraint 2 (finishing) | 8 | 4 | <= | 1600 | 8X1 (Tassel) + 4X2 (Penny) <= 1600 |
| Constraint 3 | 1 | 0 | >= | 50 | X1 (Tassel) >= 50 |
| Constraint 4 | 0 | 1 | >= | 100 | X2 (Penny) >= 100 |

# Production Output

## Production Mix for Kiltie Tassel Loafer and the Classic Penny Loafer

| | X1 (Tassel) | X2 (Penny) | | RHS | Dual |
|---|---|---|---|---|---|
| Maximize | 800 | 1200 | | | |
| Constraint 1(assembly) | 2 | 6 | <= | 1200 | 160 |
| Constraint 2 (finishing) | 8 | 4 | <= | 1600 | 60 |
| Constraint 3 | 1 | 0 | >= | 50 | 0 |
| Constraint 4 | 0 | 1 | >= | 100 | 0 |
| Solution-> | 120 | 160 | Optimal Z-> | 288000 | |




The Optimal Z(maximize total profit) is $288,000

To achieve this Maximized Total Profit:
120 Batches of the Tassel Loafers
160 Batches of the Penny Loafers

C1a. Production Output & C1ai Explanation

# Monte Carlo Simulation

Orders by the Case (one Dozen Shoes)
Daily Demand is: 7 to 12 cases per Day

| Cases sold per day | Frequency of days given cases sold |
|---|---|
| 7 | 34 |
| 8 | 36 |
| 9 | 38 |
| 10 | 42 |
| 11 | 26 |
| 12 | 24 |
| **Total Days = 200** | |

This is the Aggregated Sales Over the Last 200 Days

Lead time Delivery Variance: 1 to 3 days
(delivery next morning is counted as day 1)

| Lead time for delivery | Frequency of days for delivery time |
|---|---|
| 1 | 12 |
| 2 | 20 |
| 3 | 8 |
| **Total Days = 40**<br>Note: Delivery next morning constitutes Day # 1 | |

This is the 40 day-snapshot
with the Frequency of days for delivery time.

We will be trying to determine if the Reordering of 30 case when the Inventory Level drops down to 12 or under in this simulation based upon the information supplied by Shuzworld

# Monte Carlo Simulation

Monte Carlo Simulation for 20 day Inventory Simulation

Number of Trials is 20

Random numbers: Computer generated | Number of trials: 20 | Seed: 0

**Simulation Results**

| Category name | Value | Frequency | Probability | Cumulative Probability | Value * Frequency | :currences | 'ercentage | ccurences * Value |
|---|---|---|---|---|---|---|---|---|
| Cases 7 per day | 1 | 34 | .17 | .17 | .17 | 3 | .15 | 3 |
| Cases 8 per day | 2 | 36 | .18 | .35 | .36 | 5 | .25 | 10 |
| Cases 9 per day | 3 | 38 | .19 | .54 | .57 | 4 | .2 | 12 |
| Cases 10 per day | 4 | 42 | .21 | .75 | .84 | 5 | .25 | 20 |
| Cases 11 per day | 5 | 26 | .13 | .88 | .65 | 3 | .15 | 15 |
| Cases 12 per day | 6 | 24 | .12 | 1 | .72 | 0 | 0 | 0 |
| Total | | 200 | 1 | Expected | 3.31 | 20 | 1 | 60 |
| Random Number 1 | | | | | | | Average | 3 |

**Individual Runs**

(untitled) Solution

| Number | Random Number | Category | Value |
|---|---|---|---|
| 1 | .72 | Cases 10 per day | 4 |
| 2 | .28 | Cases 8 per day | 2 |
| 3 | .74 | Cases 10 per day | 4 |
| 4 | .13 | Cases 7 per day | 1 |
| 5 | .66 | Cases 10 per day | 4 |
| 6 | .27 | Cases 8 per day | 2 |
| 7 | .37 | Cases 9 per day | 3 |
| 8 | .34 | Cases 8 per day | 2 |
| 9 | .29 | Cases 8 per day | 2 |
| 10 | .86 | Cases 11 per day | 5 |
| 11 | .76 | Cases 11 per day | 5 |
| 12 | .41 | Cases 9 per day | 3 |
| 13 | .43 | Cases 9 per day | 3 |
| 14 | .72 | Cases 10 per day | 4 |
| 15 | .14 | Cases 7 per day | 1 |
| 16 | .14 | Cases 7 per day | 1 |
| 17 | .47 | Cases 9 per day | 3 |
| 18 | .6 | Cases 10 per day | 4 |
| 19 | .81 | Cases 11 per day | 5 |
| 20 | .27 | Cases 8 per day | 2 |

The Value Column is the Simulated Days Sales



D. Monte Carlo

# Monte Carlo Simulation

Monte Carlo Simulation for Lead Time

Random numbers: Computer generated | Number of trials: 20 | Seed: 0

**Simulation Results**

| Category name | Value | Frequency | Probability | Cumulative Probability | Value * Frequency | :currences | Percentage | ccurences * Value |
|---|---|---|---|---|---|---|---|---|
| Lead Time for Delivery 1 | 1 | 12 | .3 | .3 | .3 | 6 | .3 | 6 |
| Lead Time for Delivery 2 | 2 | 20 | .5 | .8 | 1 | 8 | .4 | 16 |
| Lead Time for Delivery 3 | 3 | 8 | .2 | 1 | .6 | 6 | .3 | 18 |
| Total | | 40 | 1 | Expected | 1.9 | 20 | 1 | 40 |
| Random Number 1 | | | | | | | Average | 2 |

**Individual Runs**

(untitled) Solution

| Number | Random Number | Category | Value |
|---|---|---|---|
| 1 | .19 | Lead Time for Delivery 1 | 1 |
| 2 | .3 | Lead Time for Delivery 2 | 2 |
| 3 | .33 | Lead Time for Delivery 2 | 2 |
| 4 | .34 | Lead Time for Delivery 2 | 2 |
| 5 | .8 | Lead Time for Delivery 3 | 3 |
| 6 | .28 | Lead Time for Delivery 1 | 1 |
| 7 | .08 | Lead Time for Delivery 1 | 1 |
| 8 | .18 | Lead Time for Delivery 1 | 1 |
| 9 | .82 | Lead Time for Delivery 3 | 3 |
| 10 | .35 | Lead Time for Delivery 2 | 2 |
| 11 | .06 | Lead Time for Delivery 1 | 1 |
| 12 | .59 | Lead Time for Delivery 2 | 2 |
| 13 | .65 | Lead Time for Delivery 2 | 2 |
| 14 | .91 | Lead Time for Delivery 3 | 3 |
| 15 | .18 | Lead Time for Delivery 1 | 1 |
| 16 | .51 | Lead Time for Delivery 2 | 2 |
| 17 | .73 | Lead Time for Delivery 2 | 2 |
| 18 | .94 | Lead Time for Delivery 3 | 3 |
| 19 | .87 | Lead Time for Delivery 3 | 3 |
| 20 | 1 | Lead Time for Delivery 3 | 3 |

# Monte Carlo Simulation

This the Testing for a Reorder Policy with Information from Shuzworld

| Day | Units Received | Beginning Inventory | RandomNumber | Demand | Ending Inventory | Lost Sales | Order ? | Random Number | Lead Time |
|---|---|---|---|---|---|---|---|---|---|
| 1 | | 30 | 0.72 | 10 | 20 | 0 | no | | |
| 2 | | 20 | 0.28 | 8 | 12 | 0 | yes | 0.19 | 1 |
| 3 | 30 | 42 | 0.74 | 10 | 32 | 0 | no | | |
| 4 | | 32 | 0.13 | 7 | 25 | 0 | no | | |
| 5 | | 25 | 0.66 | 10 | 15 | 0 | no | | |
| 6 | | 15 | 0.27 | 8 | 7 | 0 | yes | 0.3 | 2 |
| 7 | | 7 | 0.37 | 9 | 0 | 2 | no | | |
| 8 | 30 | 30 | 0.34 | 8 | 22 | 0 | no | | |
| 9 | | 22 | 0.29 | 8 | 14 | 0 | no | | |
| 10 | | 14 | 0.86 | 11 | 3 | 0 | yes | 0.33 | 2 |
| 11 | | 3 | 0.76 | 11 | 0 | 8 | no | | |
| 12 | 30 | 30 | 0.41 | 9 | 21 | 0 | no | | |
| 13 | | 21 | 0.43 | 9 | 12 | 0 | yes | 0.34 | 2 |
| 14 | | 12 | 0.72 | 10 | 2 | 0 | no | | |
| 15 | 30 | 32 | 0.14 | 7 | 25 | 0 | no | | |
| 16 | | 25 | 0.14 | 7 | 18 | 0 | no | | |
| 17 | | 18 | 0.47 | 9 | 9 | 0 | yes | 0.8 | 3 |
| 18 | | 9 | 0.6 | 10 | 0 | 1 | no | | |
| 19 | | 0 | 0.81 | 11 | 0 | 11 | no | | |
| 20 | 30 | 30 | 0.27 | 8 | 22 | 0 | no | | |

Order 30 cases when inventory drop below 12 cases

Lead Time of 1 is to be viewed as getting the shipment the very next day

# Monte Carlo Simulation

This the Testing for a Reorder Policy - this is the recommended reorder strategy

| Day | Units Received | Beginning Inventory | RandomNumber | Demand | Ending Inventory | Lost Sales | Order ? | Random Number | Lead Time |
|---|---|---|---|---|---|---|---|---|---|
| 1 | | 45 | 0.72 | 10 | 35 | 0 | no | | |
| 2 | | 35 | 0.28 | 8 | 27 | 0 | no | | |
| 3 | | 27 | 0.74 | 10 | 17 | 0 | no | | |
| 4 | | 17 | 0.13 | 7 | 10 | 0 | yes | 0.19 | 1 |
| 5 | 45 | 55 | 0.66 | 10 | 45 | 0 | no | | |
| 6 | | 45 | 0.27 | 8 | 37 | 0 | no | | |
| 7 | | 37 | 0.37 | 9 | 28 | 0 | no | | |
| 8 | | 28 | 0.34 | 8 | 20 | 0 | no | | |
| 9 | | 20 | 0.29 | 8 | 12 | 0 | yes | 0.3 | 2 |
| 10 | | 12 | 0.86 | 11 | 1 | 0 | no | | |
| 11 | 45 | 46 | 0.76 | 11 | 35 | 0 | no | | |
| 12 | | 35 | 0.41 | 9 | 26 | 0 | no | | |
| 13 | | 26 | 0.43 | 9 | 17 | 0 | no | | |
| 14 | | 17 | 0.72 | 10 | 7 | 0 | yes | 0.34 | 2 |
| 15 | | 7 | 0.14 | 7 | 0 | 0 | no | | |
| 16 | 45 | 45 | 0.14 | 7 | 38 | 0 | no | | |
| 17 | | 38 | 0.47 | 9 | 29 | 0 | no | | |
| 18 | | 29 | 0.6 | 10 | 19 | 0 | no | | |
| 19 | | 19 | 0.81 | 11 | 8 | 0 | no | | |
| 20 | | 8 | 0.27 | 8 | 0 | 0 | yes | 0.8 | 3 |

Order 45 cases when inventory drop below 12 cases

Lead Time of 1 is to be viewed as getting the shipment the very next day

D. Monte Carlo

# Human Resources Strategy

Managing of labor and design jobs so that employees are utilized in the most effective and efficient manner.

## Constraints for the Human Resource Strategy

**What Strategy**
Product strategy
- Materials needed and used
- Skills and talents that are needed
- Safety

**Where Strategy**
Location strategy
- Temperature and Climate/Noise/Light/Air quality

**When Strategy**
Schedule strategy
- Work days/weeks/seasonal
- Schedule types that are beneficial for everyone

**Who Strategy**
Individual strengths and weaknesses
- Optimum use of information processing

**Procedure Strategy**
- Use of machinery and technology
- Safety Strategy

**How Strategy**
- Use of work cells, assembly lines
- Fixed positions, process and product layout

## Strategy Factors

**Ethics & Environment**
- Equality, fairness, equity in the job design
- Safe working environment

**Time Standards**
- Definition of Time Study, work sampling and predetermined work times.

**Ergonomics**
- Employee comfort and safety
- Best Equipment designed for the workers
- Employee feedback on efficiencies

**Job Design**
- Incentives and motivation for employees
- Jobs for specialized employees and expansion
- Team that are self directed

**Work Schedules**
- Policies for working hours
- Work schedule strategies that increases employee morale and work commitment

**Employment policies regarding stability**
- Needed only on demand or constant operation
- Policies for constant oepration



E1. Human Resources Strategy

# Operations Management Philosophies

**Just-In-Time (JIT)**
Reducing Waste
Exposing Bad Inventory
Acquiring Quality Goods at Lower Cost

**Lean Operations**
Defining
**Value**
And what Customers are willing to pay

**Ohno's Seven Wastes**
Defective Products, Overprocessing, Motion, Inventory, Transportation, Queues (waiting lines) and Overproduction.

**TPS**
people and customer-oriented philosophy

**Kanban**
Produce and deliver as materials are consumed
Pulling System

# Sources

*Critical Path Analysis and PERT Charts*. (n.d.). Retrieved from www.mindtools.com: http://www.mindtools.com/critpath.htm

*expected monetary value*. (n.d.). Retrieved from http://www.businessdictionary.com/: http://www.businessdictionary.com/definition/expected-monetary-value.html

*Just In Time (JIT)*. (n.d.). Retrieved from about.com: http://logistics.about.com/od/supplychainglossary/g/JustInTime.htm

*Lean manufacturing*. (n.d.). Retrieved from http://en.wikipedia.org/: http://en.wikipedia.org/wiki/Lean_manufacturing

*Monte Carlo Simulation*. (n.d.). Retrieved from www.investopedia.com: http://www.investopedia.com/terms/m/montecarlosimulation.asp

*Project Crashing: What Options Do You Have?* (n.d.). Retrieved from www.brighthubpm.com: http://www.brighthubpm.com/resource-management/5055-project-crashing-what-options-do-you-have/