Quiz Simulation Inventory Problem

In preparing for the upcoming holiday season, Marshall Toy Co. designed a new doll called Freddy.

- The fixed cost to produce the doll is $1,000.
- The variable cost, which includes material, labor, and shipping cost, follows the probability distribution as in the Table 2 below from $1 to $3.
- The sell price per doll is uniformly distributed between $4 and $6.
- If Marshall overproduces the dolls, the excess dolls will be sold in January through a distributer who has agreed to pay Marshall a discounted price of only $1 per doll.
- Demand for new toys during the holiday selling season is extremely uncertain. Forecasts are expected a demand of 600 dolls with a standard deviation of 150. Assume the demand follows the normal distribution and we know P(Z < 0.1383) = 0.555 for standardized normal distribution.
- If Marshall has shortages of dolls, they would pay a stiff shortage penalty cost of $5 per doll.

You are asked to do a simulation study to analyze the mean net profit and probability of losses for the sales of the dolls. A spreadsheet is set up for you as given in the Table 2 above. You are required to use the information in Table 1 below to answer the following questions.

The Total revenue is the summation of the revenue through the dolls sold during the holiday and the excess revenue after the holiday season. The Total cost is the summation of the Fixed cost, Variable cost and Shortage cost. The Net profit is the difference between the Total revenue and the Total cost.

	A	B	C	D	E	F	G	H	I	J	K	L
1	Test 2 Simulation									Sell price low limit		4
2			Production Quantity	600						Sell price high limit		6
3			Fixed Cost	1000								
4										shortage penalty cost		5
5			Variable Cost	Probability						Excess discount price		1
6			1	0.3								
7			2	0.5						Mean of demand		600
8			3	0.2						Standard devision of demand		150
9												
10		Random number										
11		0.0682	0.7669	0.555			Shortage		Excess	Total		
12	Trial No	Var Cost	Sell price	Demand	Sold	Shortage	Cost	Excess	Revenue	Revenue	Total cost	Net profit
13	1				No need to compute any other values for Trial No. 1							
14	2	2	5.637	458.056								
15	3	3	4.797	737.705								
16	4											-12.856

Use the following information to answer questions 1 to 6.

For Trial No. 1 in Row 13 in Table 1, you are to use the random numbers given above each variable in Row 11 to answer the corresponding questions. You should use the random number 0.0682, 0.7669, and 0.555 to derive Var Cost, Sell Price, and Demand, respectively. Assume the lower limit of probability for variable cost is from Cells F6 to F8, the upper limit is from G6 to G8, and the values of the variable cost from H6 to H8.

1. What is the value of the variable cost to be used?
   a. 1 b. 2 c. 3 d. 0.0682

2. What is the Excel formula to be used in Cell B13 to obtain the value of the variable cost?
   a. =$C$6 + B11*($C$8 - $C$6)
   b. =NORMINV(B11,$C$7, $C$8 - $C$6)
   c. =$C$7 + NORMSINV(B11)* ($C$8 - $C$6)
   d. =VLOOKUP(B11,$F$6:$H$8,3)

3. What is the value of the Sell price to be used?
   a. 0.7669 b. 5.534 c. 4 d. 2

4. What is the Excel formula to be used in Cell C13 to obtain the value of the sell price?
   a. =$C$6 + C11*($C$8 - $C$6)
   b. =NORMINV(C11,$C$7, $C$8 - $C$6)
   c. =$L$1 + C11* ($L$2 - $L$1)
   d. =VLOOKUP(C11,$F$6:$H$8,3)

5. What is the value of the Demand to be used?
   a. 600.00 b. 620.75 c. 683.25 d. 750.00

6. What is NOT the Excel formula to be used in Cell D13 to obtain the value of the Demand?
   a. =$L$7 + D11*($L$7 - $L$8)
   b. =NORMINV(D11,$L$7, $L$8)
   c. =$L$7 + NORMSINV(D11)* $L$8

Use the following information to answer questions 7 to 10:

For Trial No. 2 in Row 14 in Table 1, you are to use the values of the given variable cost, sell price and demand in Row 14 to answer the following questions:

7. What is the number of dolls sold?
   a. 600.00 b. 0.00 c. 458.06 d. 141.94

8. What is the number of Shortages?
   a. 600.00 b. 0.00 c. 458.06 d. 141.94

9. Which is the Excess revenue?
   a. 2724.19 b. 0.00 c. 458.06 d. 141.94

10. What is the Net profit?
    a. 2724.19 b. 2200.00 c. 524.19 d. 666.13

Use the following information to answer questions 11 to 12:
For Trial No. 3 in Row 15 in Table 1, you are to use the values of given variable cost, sell price and demand in Row 15 to answer the following questions:

11. Which is the Shortage cost?
    a. 600.00 b. 688.53 c. 3488.53 d. 137.71

12. What is the Total cost?
    a. 600 b. 688.53 c. 3488.53 d. -610.57

Use the following information to answer questions 13 to 15:
Use Trial No. 3 in Row 15 in Table 1, you are to provide Excel formulas to be used to simulate the doll sales 1100 times. You need to be sure the Excel formulas will be correct when they are used for all of the 1100 trials. One way to check them is to verify the formulas with your computations for Trials 2 and 3 above.

13. Which is NOT Excel formula for the number of dolls sold in Cell E15?
    a. =MIN(D15, $D$2)
    b. = IF(D15>$D$2, $D$2,d15)
    c. =IF(D15<$D$2,D15,$D$2)
    d. =MAX(D15, $D$2)

14. Which is NOT Excel formulas for the number of Shortages in Cell F15?
    a. F15*$L$4
    b. =MAX(D15 - $D$2, 0)
    c. =D15 – E15
    d. =IF(D15>$D$2,D15-$D$2,0)

15. Which is NOT Excel formulas for the number of Excess in Cell H15?
    a. =IF($D$2>D15,$D$2-D15,0)
    b. =MAX($D$2 – D15,0)
    c. =MIN($D$2 – D15,0)
    d. =IF($D$2<=D15,,0,$D$2-D15)

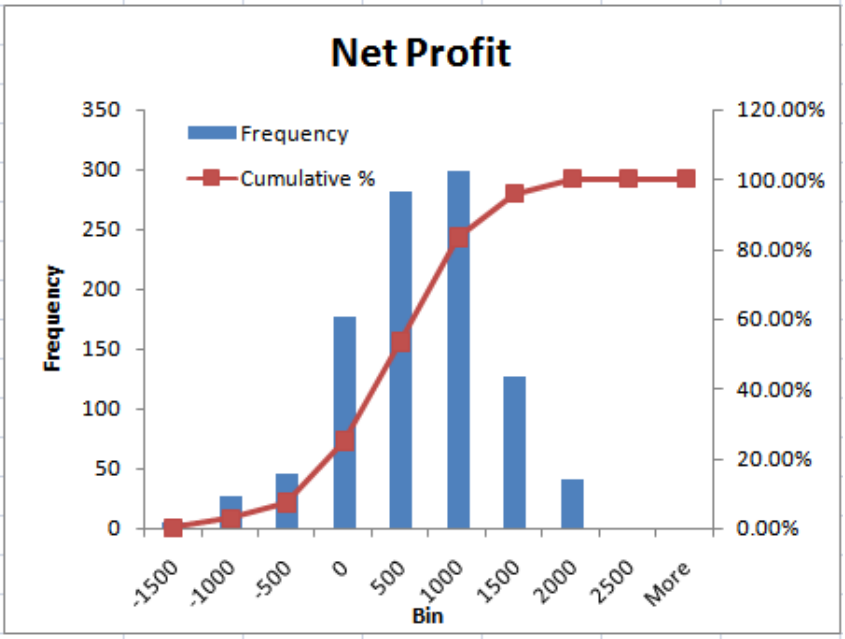
Use the following information to answer questions 16 to 17:
Assume the 1100 trials starts in the Row 13 and ends in the Row 1112 in Table 1. You could use Trials 1, through 4 in Table 1 to verify your answers.

16. What is the Excel formula to be used for the number of losses from the last 1000 trials?
    a. =COUNT(L13:L1112)
    b. =COUNTIF(L113:L1112,"<0")
    b. =COUNTIF(L13,L1112)
    d. =SUM(L113:L1112,"<0")

17. What is the Excel formula to be used for the percentage of losses from the last 1,000 trials?
    a. =COUNT(L13:L1112)/COUNTIF(L13:L1112)
    b. =COUNTIF(L113:L1112,"<0")
    b. =COUNTIF(L13,L1112)/COUNT(L13:L1112)
    d. =COUNTIF(L113:L1112,"<0")/COUNT(L113:L1112)

Use the following information and Table 2 below to answer questions 18 to 21:
Now, you run the simulation for 1,100 trials. You discard the first 100 trials and use only the last 1,000 trials. As in Table 2 and Figure 1 below, you obtain a frequency table, a histogram and the estimate of the mean net profit of $362.73, the standard error of the mean net profit of $46.78, and the average number of losses of 200.69 from the last 1,000 trials.

Net Profit	*Frequency*	*Cumulative %*
-1500	4	0.40%
-1000	26	3.00%
-500	45	7.50%
0	177	25.20%
500	282	53.40%
1000	298	83.20%
1500	127	95.90%
2000	41	100.00%
2500	0	100.00%
More	0	100.00%
	Net profit	No of loss
100		
Mean	362.73	200.69
Standard error	46.78	



18. Which one is NEITHER the margin of error, NOR the lower limit, NOR the upper limit of the 95% confidence interval for the mean net profit?
    a. 93.56 b. 46.78 c. 456.29 d. 269.17

19. What is the meaning of the 95% confidence interval for the mean net profit?
    a. We are 95% confident that the true mean net profit is correct
    b. We are 95% sure that the unknown true population mean net profit is within the confidence interval
    c. There is a 95% chance that the mean net profit will fall within the region
    d. There is a 95% chance that the sample mean net profit will fall within the region

20. What is the probability for the mean net profit to be more than $1,500?
    a. 16.80% b. 83.20% c. 95.90% d. 4.10%

21. Which is NEITHER the margin of error, NOR the lower or upper limits of the 95% confidence interval for the proportion of losses? (n = 100)
    a. 0.1222 b. 0.0785 c. 0.040 d. 0.2792