Part II
Practice Problems

A. The table below shows 200 shirts in terms of colors and size. **(All answers in percentage and round in 2 decimal)**

	Blue	**R**ed	**W**hite
Large	50 40 20		
Small	40 20 30		

If one shirt is randomly selected then find the following probability that

1) It is red or small **2)** It is white or large **3)** It is white or blue **4)** It is red or white or large

5) If two shirts are randomly selected then find the probability that both shirts are small.

6) If two shirts are randomly selected then find the probability that both shirts are non white. **All answers. on page 6.**

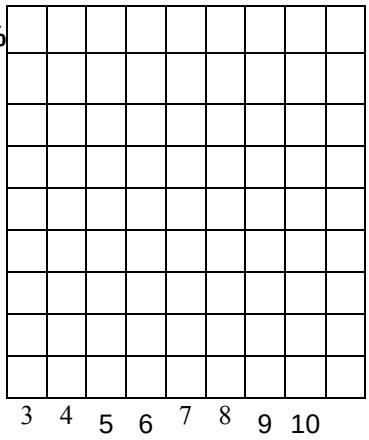
Practice: It is cold and dark and way out there, there are two rooms, in the first room we have 4 men and 3 women, and in the second room 4 men and 5 women. If one person left the first room and went into the second room and then one left the second room, then

a) List all possibilities of the person who have left the second room by drawing a tree diagram. **Ans**:
b) Find the probability that the person who left the second room is man. **Ans**: 16 / 35
c) Find the probability that the person who left the second room is woman. **Ans**: 19 / 35

B. Let **Random Variable X** = the number of digital **camcorders sold** in a given day at an electronic store.

B			
x	**f**		
3	8		
4	11		
5	14		
6	19		
7	20		
8	12		
9	9		
10	7		
		1.00 = ?	
Mean = 6.39			

P(x)%



- Complete the table, draw probability distribution (**Answers/P.16**) and find the probability that,

1. At **least** there will be 7 **camcorders sold** in a given day. **Ans: 48 %**
2. At **most** there will be 8 **camcorders sold** in a given day. **Ans: 84 %**
3. Find the **mean** of number of camcorders sold in a given day. ***Mean = 6.39***

C. A $.5 slot machine in a casino has a winning prize of $10 for each play with winning probability 1 / 100 . What are the expected results for the players and the house each time the game is played. How much will be the expected to generate revenue if a typical casino has 100 slot machines and each slot machine is played 1000 times a day and 360 days **Ans: $142,200 per year**.

Counting

1) If a password should consist of 2 letters first and 3 digits after, then how many different passwords are possible? L L D D D — 1) ***676,000***

2) If a password should consist of non-repeating of 2 letters first and non-repeating 3 digits after, then how many different passwords are possible? — 2) ***468,000***

L L D D D

3) How many different 3-letter words can be written ending with vowels (a,e,i,o,u)? — 3) ***3,380***

_____ , _____ , _____

4) How many different 3-letter words can be written not ending with vowels (a,e,i,o,u)? — 4) ***14,196***

_____ , _____ , _____

5) How many different 3-digits odd number can be written by using 0,2,1,3,7,8 digits? — 5) ***90***

_____ , _____ , _____

6) How many different 3-letter words can be written ending with letters (e, n, d)? — 6) ***2,028***

_____ , _____ , _____

7) How many different 3-digits even number can be written by using 0,2,1,3,7,8 digits? — 7) ***90***

_____ , _____ , _____

8) In how many ways Joe can dress up, if he has 6 shirts, 7, pants, and 5 pair of shoes? — 8) ***210***

_____ , _____ , _____

9) If a password should consist of non-repeating of 3 letters first and non-repeating 2 digits after, then how many different passwords are possible? — 9) ***1,404,000***

_____ , _____ , _____, _____ , _____

10) If a password should consist of 2 letters first and 2 digits after, then how many different passwords are possible? — 10) ***67,600***

11) How many different 3-letter words can be written ending with letters (a,c,e,t,o,p)? — 11) ***4,056***

_____ , _____ , _____

12) How many different 3-digits even number divisible by 5 can be written by using 0,2,1,3,7,5,8 digits? — 12) ***42***

_____ , _____ , _____

13) How many different 3-digits number divisible by 5 can be written by using 0,2,1,3,7,5,8 digits? — 13) ***84***

_____ , _____ , _____

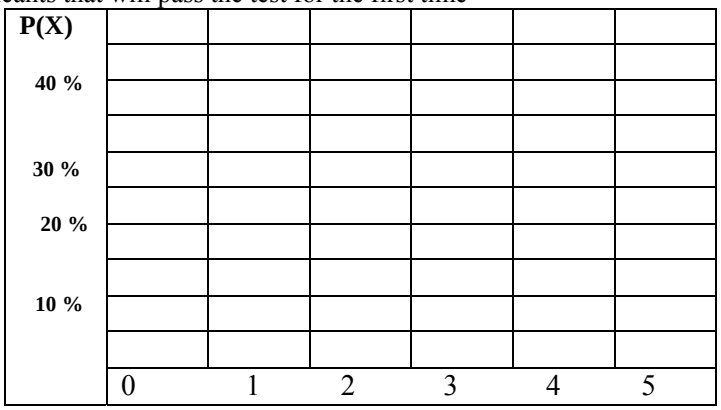
14) How many different area codes can we have? — 14) ***1000***

_____ , _____ , _____

D. In general there is 64% chance to pass DMV test for the first time, and if there are 5 applicants taking the test for the first time, complete the below table and then answer the question, X = the number of applicants passing DMV test

X	P(x)		
0 1 2 3 4 5			

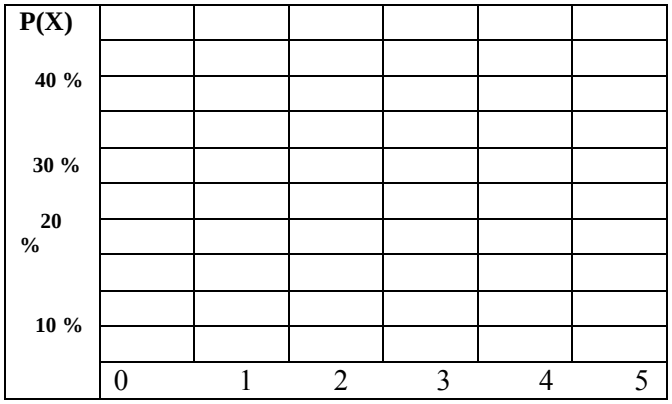
Draw the probability distribution of number of applicants that will pass the test for the first time



(All answers in percentage and round in 2 decimal)

1. Find the probability that only 2 applicants will pass the test for the first time.
2. Find the probability that only 4 applicants will pass the test for the first time
3. Find the probability that at least 2 applicant will pass the test for the first time.
4. Find the probability that at a at most 3 applicant will pass the test for the first time.
5. Find the expected number of applicants that will pass the test for the first time.

E. If only 40% of university students graduate in 4 years, and we know 6 of friends who are going to university, then complete a probability distribution table based on X= number of our friends who will graduate in 4 years from university.
Draw the probability distribution of number of applicants that will pass the test for the first time. Also answer question at the end of the table



(All answers in percentage and round in 2 decimal)

1. Find the probability that at least 3 will graduate in 4 years.
2. Find the probability that at most 4 will graduate in 4 years.
3. Find the probability that none will graduate in 4 years
4. Find the probability that all lucky six will graduate in 4 years.
5. Expected number of students that will graduate in 4 years.
6. Standard deviation of number of students that will graduate in 4 years.

Finding Area under SNPD:

Be sure to **shade the proper region.** Use the table and find the area that corresponds to the given probability.

1	P(-1.75 < Z) =	**2**	P(Z < 1.08) =	**3**	P(.5 < Z < 1.5) =	**4**	P(-2.11 < Z < 1.55) =
5	P(-1.8 < Z < 2.08) =	**6**	P(1.57 > Z) =	**7**	P(-1.17< Z < 1.34) =	**8**	P(-2.0 < Z < -.5) =
9	P(3.884 < Z) =	**10**	P(Z > -1.4) =	**11**	P(-1.8 < Z < -.8) =	**12**	P(1.2 < Z < 1.6) =

Answers on page 7

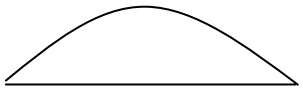
F. If the average life of "Die Easy" batteries is 60 months with st. dev. of 10 months. Assuming that data are normally distributed then what percentage of batteries last

1. Between 48 and 46 months
2. Between 55 and 65 months
3. Between 66 and 75 months
4. Less than 54 months
5. More than 52 months
6. Less than 68 months
7. More than 85 months
8. Within 10 months of the mean

9 Find the time that separates the top 20% of batteries that last longer than the rest.

10. Find the time that separates the bottom 5% of batteries that last less than the rest.

1.



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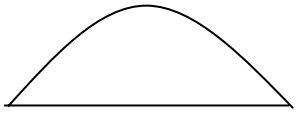

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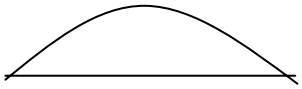

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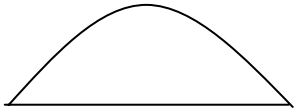

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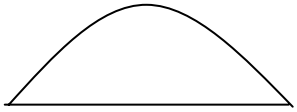

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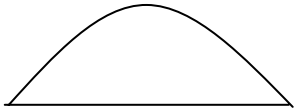

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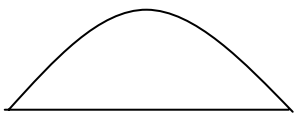
10.



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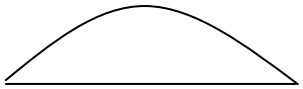
Answers on page 8

G. If the average price for textbooks in a college university is $75 with st. dev. of 20. Assuming that data are normally distributed then what percentage of college books is,

1. Between 60 and 80 dollars
2. Between 65 and 67 dollars
3. Between 80 and 110 dollars
4. Less than 70 dollars
5. More than 50 dollars
6. Less than 90 dollars
7. More than 100 dollars
8. Within 25 dollars of the mean
9. Find the dollar value that separates the top most 8% of expensive of textbooks.
10. Find the dollar value that separates the lowest 25% inexpensive of textbooks.

1.



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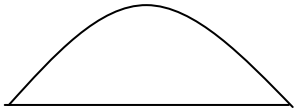

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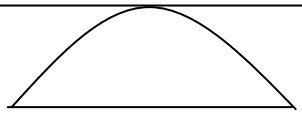

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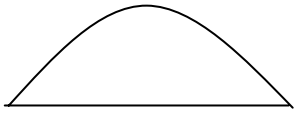

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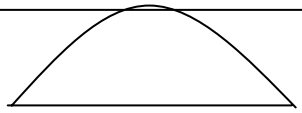

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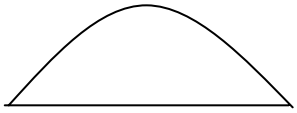

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Answers on page 8

Answers

A. **1)** 65% **2)** 70% **3)** 70% **4)** 80% **5)** 20.13% **6)** 56.16%

$$a)\begin{cases}\frac{4/7}{m}\times\frac{5/10}{m}=\frac{20}{70}=\frac{10}{35}\\ \\ \frac{4/7}{m}\times\frac{5/10}{w}=\frac{20}{70}=\frac{10}{35}\end{cases}\quad or\quad \begin{cases}\frac{3/7}{w}\times\frac{4/10}{m}=\frac{12}{70}=\frac{6}{35}\\ \\ \frac{3/7}{w}\times\frac{6/10}{w}=\frac{18}{70}=\frac{9}{35}\end{cases}\quad\begin{matrix}\Rightarrow\\ \\ \Rightarrow\end{matrix}\quad\begin{cases}b)\ \frac{10}{35}+\frac{6}{35}=\frac{16}{35}\\ \\ c)\ \frac{10}{35}+\frac{9}{35}=\frac{19}{35}\end{cases}$$

B				
x	**f**	**P(x)%**	**x P(x)**	**$X^2P(x)$**
3	8	0.08	0.24	0.72
4	11	0.11	0.44	1.76
5	14	0.14	0.70	3.50
6	19	0.19	1.14	6.84
7	20	0.20	1.40	9.80
8	12	0.12	0.96	7.68
9	9	0.09	0.81	7.29
10	7	0.07	0.70	7.00
	100	1.00	***6.39***	44.59
Mean = 6.39			***St. Dev = 1.94***	

Outcome	x	$p(x)$	$x\,p(x)$
Win	\$10	1/100	\$.10
Lose \$	-.5	99/100	\$-.495
		$\sum p(x)=1$?	$\sum xp(x)=\$$ **-.395**
(.395)(1000)(100)(360) = \$14,220,000			

Counting

1) If a password should consist of 2 letters first and 3 digits after, then how many different passwords are possible? 2) ***676,000***

26× 26× 10 × 10 × 10= **676,000**

2) If a password should consist of non-repeating of 2 letters first and non-repeating 3 digits after, then how many different passwords are possible? 1) ***468,000***

26 × 25 × 10× 9 × 8 = **468,000**

3) How many different 3-letter words can be written ending with vowels (a,e,i,o,u)? 3) ***3,380***

26 × 26 × 5 = **3,380**

4) How many different 3-letter words can be written not ending with vowels (a,e,i,o,u)? 4) ***14,196***

26 × 26× 21 =**14,196**

5) How many different 3-digits odd number can be written by using 0,2,1,3,7,8 digits? 5) ***90***

5 × 6 × 3 = **90**

6) How many different 3-letter words can be written ending with letters (e, n, d)? 6) ***2,028***

26 × 26 × 3 = **2,028**

7) How many different 3-digits even number can be written by using 0,2,1,3,7,8 digits? 7) ***60***

5 × 6 × 3 = **90**

8) In how many ways Joe can dress up, if he has 6 shirts, 7, pants, and 5 pair of shoes? 8) ***210***

$6 \times 7 \times 5 =$ **210**

9) If a password should consist of non-repeating of 3 letters first and non-repeating 2 digits after, then how many different passwords are possible? 9) ***1,404,000***

$26 \times 25 \times 24 \times 10 \times 9 = 1{,}404{,}006$

10) If a password should consist of 2 letters first and 2 digits after, then how many different passwords are possible? 10) ***67,600***

$26 \times 26 \times 10 \times 10 =$ **67,600**

11) How many different 3-letter words can be written ending with letters (a,c,e,t,o,p)? 11) ***4,056***

$26 \times 26 \times 6 =$ **4,056**

12) How many different 3-digits even number divisible by 5 can be written by using 0,2,1,3,7,5,8 digits? 12) ***42***

$6 \times 7 \times 1 =$ **42**

13) How many different 3-digits number divisible by 5 can be written by using 0,2,1,3,7,5,8 digits? 13) ***84***

$6 \times 7 \times 2 =$ **82**

14) How many different area codes can we have? 14) ***1000***

$10 \times 10 \times 10 =$ **1000**

D

X	P(X)
0	.0061
1	.053 7
2	.191 1
3	.339 7
4	.301 9
5	.107 4

1. **P(2) = .1911 = 19.11%**
2. **P(4) = .3019 = 30.19%**
3. **P(at least 2)=.1911 + .3397 + .3019 + .1074 = .9401 = 94.01%**
4. **P(at most 3)=.0061 + .0537 + .1911 + .3397 = .5906**
5. $\mu = 3.2$.
6. $\sigma = 1.07$

E

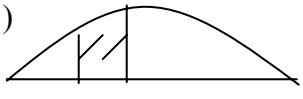
X	P(X)
0	.0467
1	.186 6
2	.311 0
3	.276 5
4	.138 2
5	.036 9
6	.004 1

1. **P(at least 3) =.2765+.1382+.0369+.0041= .4557 = 45.57%**
2. **P(at most 4) =1382+.2765+.3110+.1866+.0467 =.9590 =95.90%**
3. **P(0) =.0467=4.67%**
4. **P(6) =.0041=.41%**
5. $\mu = 2.4$
6. $\sigma = 1.2$

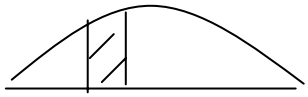
1	.9599	**2**	.8599	**3**	.2417	**4**	.9220
5	.9453	**6**	.9418	**7**	.7889	**8**	.2857
9	.0001	**10**	.9192	**11**	.1760	**12**	.0603

F.

1)



46 48

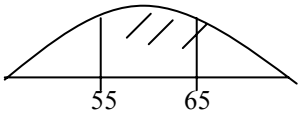


-1.4 -.12

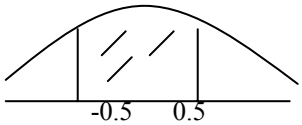
$$z = \frac{46-60}{10} = -1.4 \qquad z = \frac{48-60}{10} = -1.2$$

$p(-1.4 < z < -1.2) = .1151 - .0808 = .0343 = 3.43\%$

2)



55 65

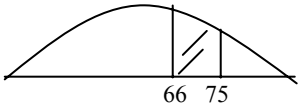


-0.5 0.5

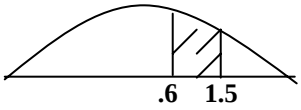
$$z = \frac{55-60}{10} = -0.5 \qquad z = \frac{65-60}{10} = 0.5$$

$p(-0.5 < z < 0.5) = .6915 - .3085 = .3830 = 38.3\%$

3)



66 75

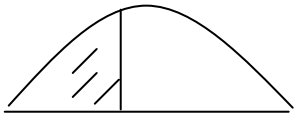


.6 1.5

$$z = \frac{66-60}{10} = 0.6 \qquad z = \frac{75-60}{10} = 1.5$$

$p(.6 < z < 1.5) = .9332 - .7257 = .2075 = 20.75\%$

4)

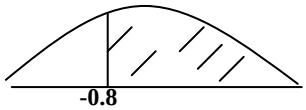


-0.6

$$z = \frac{54-60}{10} = -0.6$$

$p(z < 0.6) = .2743 = 27.43\%$

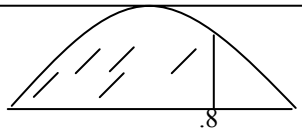
5) $z = \frac{52-60}{10} = -0.8$



-0.8

$p(z > -0.8) = 1 - 0.2119 = .7881 = 78.81\%$

6) $z = \frac{68-60}{10} = 0.8$



.8

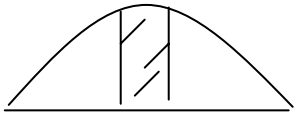
$p(z < 0.8) = 0.7881 = 78.81\%$

7) $z = \frac{85-60}{10} = 2.5$

2.5

$p(2.5 < z) = 1 - .9938 = .0062 = .62\%$

8) $z = \frac{-10}{10} = -1$

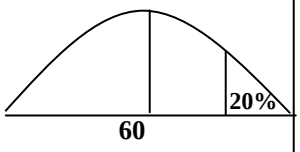


-1 1

$z = \frac{10}{10} = 1$

$p(-1 < z < 1) = .8413 - .1587 = .6826 = 68.26\%$

9)

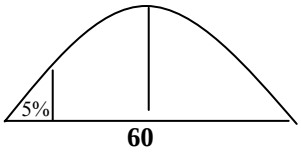


20%

60

$x = \bar{x} + s\,z \quad \Rightarrow \quad x = 60 + 10(.84) = 68.4$

10)



5%

60

$x = \bar{x} + s\,z \quad \Rightarrow \quad x = 60 + 10(-1.645) = 43.55$

	1 2 3			4 5 6			7	8	9	10
F	**3.43 %**	38.30	**20.75**	27.43	**78.81**	78.81	**0.62**	68.26	**X = 68.40**	X = 43.55
G	**37.21 %**	3.61	**36.12**	40.13	**89.44**	77.34	**10.56**	78.88	**X = 103.20**	X =61.40

Expected Value Problems

Hint: To find the expected value use the formula $\sum x \bullet p(x)$

1) In a game, you have a 1 probability of winning \$116 and a 44 probability of losing \$7. What is your expected value? **1) _____**

A) −\$4.42 **B)** \$2.58 **C)** −\$6.84 **D)** \$9.42

2) A contractor is considering a sale that promises a profit of \$38,000 with a probability of 0.7 or a loss (due to bad weather, strikes, and such) of \$18,000 with a probability of 0.3. What is the expected profit? **2) _____**

A) \$21,200 **B)** \$20,000 **C)** \$26,600 **D)** \$39,200

3) Suppose you pay \$3.00 to roll a fair die with the understanding that you will get back \$5.00 for rolling a 5 or a 4, nothing otherwise. What is your expected value of your gain or loss? **3) _____**

A) −\$3.00 **B)** \$5.00 **C)** \$3.00 **D)** −\$1.33

4) Suppose you buy 1 ticket for \$1 out of a lottery of 1000 tickets where the prize for the one winning ticket is to be \$5000. What is your expected value? **4) _____**

A) \$40.00 **B)** \$4.00 **C)** \$0.40 **D)** −\$0.40

5) A 28-year-old man pays \$159 for a one-year life insurance policy with coverage of \$140,000. If the probability that he will live through the year is 0.9994, what is the expected value for the insurance policy? **5) ____**

A) -\$158.90 **B)** \$139,916.00 **C)** −\$75.00 **D)** \$84.00

6) The prizes that can be won in a sweepstakes are listed below together with the chances of winning each one:\$3500 (1 chance in 8100); \$1900 (1 chance in 5400); \$700 (1 chance in 3400); \$400 (1 chance in 2500). Find the expected value of the amount won for one entry if the cost of entering is 66 cents. **6) ____**

A) −\$0.49 **B)** \$0.49 **C)** 4.9 **D)** −\$4.9

7) On a multiple-choice test, a student is given five possible answers for each question. The student receives 1 point for a correct answer and loses ¼ point for an incorrect answer. If the student has no idea of the correct answer for a particular question and merely guesses, what is the student's expected gain or loss on the question? **7) _____**

A) 0 **B)** 0.25 **C)** 0.133 **D)** -0.33

8) Suppose also that on one of the questions you can eliminate two of the five answers as being wrong. If you guess at one of the remaining three answers, what is your expected gain or loss on the question? **8) ____**

A) 0 **B)** 0.167 **C)** 0.133 **D)** 0.63

9) A dairy farmer estimates for the next year the farm's cows will produce about 25,000 gallons of milk. Because of variation in the market price of milk and cost of feeding the cows, the profit per gallon may vary with the probabilities given in the table below. Estimate the profit on the 25,000 gallons. **9) ___**

Gain per gallon	$1.10	$0.90	$0.70	$0.40	$0.00	-$0.10
Probability	0.30	0.38	0.20	0.06	0.04	0.02

A) $21,850 **B)** $20,508 **C)** $20,580 **D)** $20,850

10) At many airports, a person can pay only $1.00 for a $100,000 life insurance policy covering the duration of the flight. In other words, the insurance company pays $100,000 if the insured person dies from a possible flight crash; otherwise the company gains $1.00 (before expenses). Suppose that past records indicate 0.45 deaths per million passengers. **10) ___**

How much can the company expect to gain on one policy?

A) $0.895 **B)** $0.955 **C)** $0.95 **D)** $0.855

On 100,000 policies?

A) $89,500 **B)** $95,500 **C)** $95,000 **D)** $85,500

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11) A construction company wants to submit a bid for remodeling a school. The estimated bid cost $4000 for construction company. If the bid were accepted, the company would have revenue of $26,000. Would you advise the company to spend the $4000 if the bid has only 20% probability of being accepted? Explain your reasoning. **11) ___**

A) $2,000 **B)** $1,500 **C)** $1,000 **D)** $1,200

Expected Values

1-Game

x	p(x)	x . P(x)
109	0.022	2.422
-7	0.978	-6.844
	1	-4.422

2- Contractor

x	p(x)	x . P(x)
38000	0.7	26600
-18000	0.3	-5400
		21200

3-Fair Die

x	p(x)	x . P(x)
2	0.333	0.667
-3	0.667	-2.000
	1.000	-1.333

4-Lottery

x	p(x)	x . P(x)
4999	0.001	4.999
-1	0.999	-0.999
	1	4

5- Life Insurance

	x	p(x)	x . P(x)
Die	139841	0.0006	83.9046
Survive	-159	0.9994	-158.9046
		1	-74.9046

6- Sweepstakes

x	p(x)	x . P(x)
3499.34	0.00012	0.43202
1899.34	0.00019	0.35173
699.34	0.00029	0.20569
399.34	0.0004	0.15974
-0.66	0.99900	-0.6593
	1	0.48983

7 - Multiple choice

	X	P(x)	X*P(X)
Correctly	1	0.2	0.2
Uncorrectly	-0.25	0.8	-0.2
		1	0

8 - Multiple choice

	X	P(x)	X*P(X)
Correctly	1.000	0.333	0.333
Uncorrectly	-0.250	0.667	-0.167
		1	0.167

9 - Gallon of Milk

X	P(x)	X*P(X)
1.1	0.3	0.33
0.9	0.38	0.342
0.7	0.2	0.14
0.4	0.06	0.024
0	0.04	0
-0.1	0.02	-0.002
	1	0.834

25000*.834=$20850

10 - Plane Crash

	X	P(x)	X*P(X)
No Crash	-1	0.9999996	-1
Crash	99999	0.00000045	0.045
		1	-0.955

Passenger'loss is Airline gain=$0.955

100000*.955=95,500

11 - Bidding on the Job

	X	P(x)	X*(P(X)
Miss	-4000	0.8	-3200
Hit	22000	0.2	4400
		1	1200