MATH 227: TEST # 3

[redacted]

(Form A)

Name : ____________________

Student ID number: ___________

Please show all work on the test.

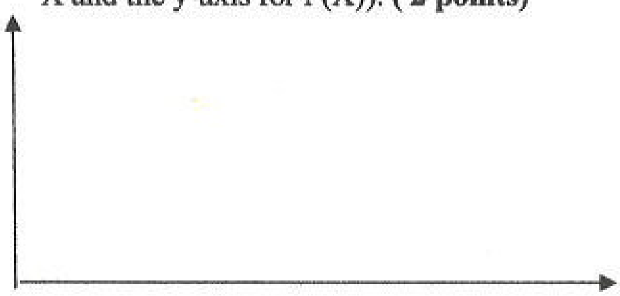
Problem # 1: A coin is tossed 3 times. Suppose that the random variable X is defined as **the number of tails**. **(5 points)**

a) Construct a probability distribution of X.

Outcomes	HHH	HHT	HTH	HTT	THH	THT	TTH	TTT
X								

X	0	1	2	3
Probability P(X)				

b) Represent this probability distribution graphically. (Use the x-axis for values of X and the y-axis for P(X)). **(2 points)**



c) Find the **mean, variance, and the standard deviation** for the number of **tails.** **(5 points)**

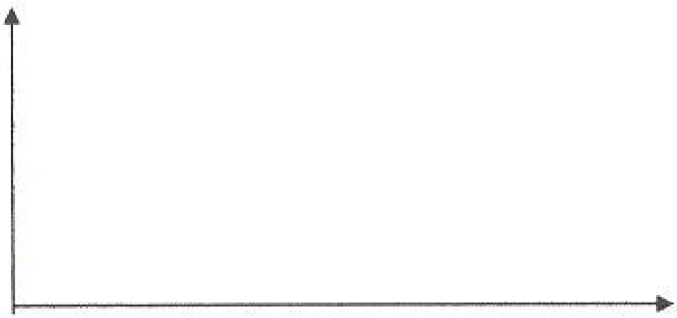
Mean =

Variance =

Standard deviation =

Problem # 2: A box contains **four** \$1 bills, **two** \$5 bills, **three** \$10 bill, and **one** \$20 bills. Construct a probability distribution for the data if X represents the value of a single bill drawn at random and replaced. Represent this probability distribution graphically. (Use the x-axis for values of X and the y-axis for P(X)). **(6 points)**

X				
P(X)				



Value	# of bills
\$1	
\$5	
\$10	
\$20	
Total:	

Problem # 3: The number of students using the Math Lab per day is found in the distribution below. Find the mean, variance, and the standard deviation for this probability distribution. **(5 points)**

X	7	9	12	17
P(X)	0.2	0.4	0.3	0.1

Mean =

Variance =

Standard deviation =

Problem # 4: **Three thousands** tickets are sold for **$2 each**. The prize is $700. What is the expected value of the gain if you purchase one ticket? **(5 points)**

	Win	Lose
Gain X		
P(X)		

E =

Problem # 5: It is reported that 78% of workers aged 16 and over drive to work alone. Choose **5** workers at random. Find the probability that

a) All drive to work alone. **(4 points)**

b) **At most 4** drive to work alone. **(2 points)**

Problem # 6: If 8% of calculators are defective, find the **mean, variance, and the standard deviation** of a lot of 5000 calculators. **(4 points)**

Mean =

Variance =

Standard deviation =

Problem # 7: A students takes a **5 – question**, multiple-choice exam with **four** choices for each question and guesses on each question.

n =   p =   q =

a) Find the probability of guessing exactly 2 out of 5 correctly. **(5 points)**

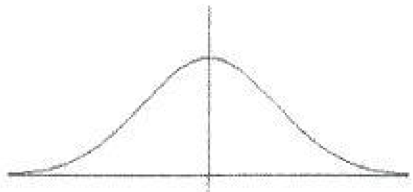
P (X = 2) =

b) Find the probability of guessing at most 2 out of 5 correctly. **(8 points)**

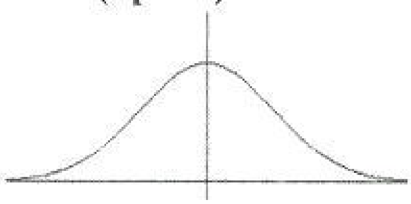
P (at most 2) =

Problem # 12: A salaries at the corporation are normally distributed with an average salary of $18,000 and a standard deviation of $4,000.

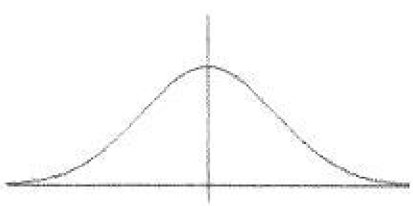
a) What is the probability that an employee will have a salary more than $25,000? **(5 points)**



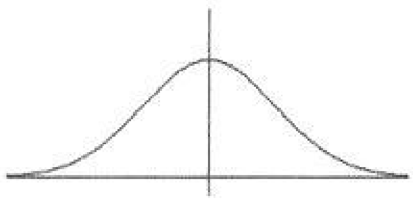
b) What is the probability that an employee will have a salary less than $16,800 ? **(4 points)**



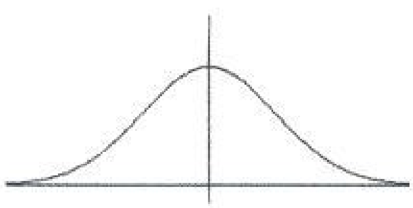
c) What is the probability that an employee will have a salary between $12,520 and $13,480? **(6 points)**



Problem # 13: A placement test for state university freshmen has a normal distribution with a mean of 700 and a standard deviation of 30.
The bottom 4% of students must take a summer session. What is the minimum score you would need to stay out of this group? **(6 points)**

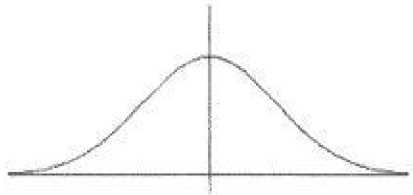


Problem # 14: The average person uses 130 gallons of water daily. If the standard deviation is 35 gallons, find the probability that the mean of a randomly selected sample of 25 people will be between 110 and 135 gallons. Assume the variable is normally distributed. **(7 points)**

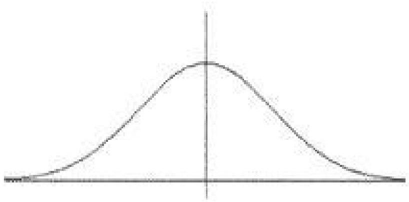


Problem # 15: In the University High school the average score on a physical fitness exam is 172 with a standard deviation of 30. The scores are normally distributed.

a) If 1 score is randomly selected, find the probability that is score is above 183. **(5 points)**



b) If 36 scores are randomly selected, find the probability that the mean for this sample is above 183. **(6 points)**



FORMULAS:

Discrete Probability Distribution:

Mean: $\mu = \sum X \cdot P(X)$

Variance: $\sigma^2 = \sum\left[X^2 \cdot P(X)\right] - \mu^2$

Standard Deviation: $\sigma = \sqrt{\sigma^2}$

Expectation: $E = \sum X \cdot P(X)$

Binomial Distribution:

Binomial Probability:

$$P(X) = \frac{n!}{(n-X)!\,X!} p^X q^{n-X}$$

$$q = 1 - p$$

Mean for Binomial Distribution: $\mu = n \cdot p$

Variance for Binomial Distribution: $\sigma^2 = n \cdot p \cdot q$

Standard Deviation for Binomial Distribution: $\sigma = \sqrt{n \cdot p \cdot q}$

Normal Distribution:

z – score: $z = \dfrac{X - \mu}{\sigma}$ $\qquad X = \mu + z \cdot \sigma$

The Central Limit Theorem:

Mean of the sample means: $\mu_{\overline{X}} = \mu$

Standard error (standard deviation) of the mean: $\sigma_{\overline{X}} = \dfrac{\sigma}{\sqrt{n}}$

Z - value for the central limit theorem: $z = \dfrac{\overline{X} - \mu}{\left(\dfrac{\sigma}{\sqrt{n}}\right)}$