

**Table 3.** A survey of a sample of business students resulted in the following information regarding the genders of the individuals and their selected major.

Gender	Selected Major			Total
	Management	Marketing	Economics	
Male	40	10	30	80
Female	30	20	70	120
Total	70	30	100	200

(9) Refer to Table 3. What is the percentage of female students?

- a. 0.25
- b. 0.40
- c. 0.43
- d. 0.60

(10) Refer to Table 3. What is the percentage of the students who are majoring in Marketing?

- a. 0.35
- b. 0.15
- c. 0.50
- d. 0.57

(11) Refer to Table 3. What is the probability of selecting a student who is a male and majoring in Management?

- a. 0.20
- b. 0.40
- c. 0.50
- d. 0.57

$$\frac{\text{management} \cap \text{male}}{P(\text{male})} = \frac{0.2}{0.4}$$

(12) Refer to Table 3. What is the probability of selecting a student who is a female or majoring in Management?

- a. 0.60
- b. 0.35
- c. 0.80
- d. 0.15

$$P(F \cup M) = 0.6 + 0.35 - 0.15 = 0.8$$

(13) Refer to Table 3. If we select a male student, what is the probability that he is majoring in Marketing?

- a. 0.05
- b. 0.333
- c. 0.125
- d. 0.50

$$M | \text{male} = \frac{\text{Market} \cap \text{male}}{P(M)}$$

$$\frac{0.05}{0.4} = 0.125$$

$$Q_1 = P - \frac{25}{100}$$

Question 4 (3 points). A survey of a sample resulted in the following statistics.

Mean	Variance	First Quartile	Median	Third Quartile
250	900	230	250	270

$$s.d = 30$$

(1) Find the coefficient of variation.

$$\frac{\text{Standard dev}}{\text{mean}} \times 100\% = \frac{30}{250} \times 100\% = 12\%$$

(2) Find the interquartile range.

$$Q_3 - Q_1 = 270 - 230 = 40$$

(3) Check if the value 335 can be detected as an outlier or not?

$$U.L = 270 + 1.5(40) = 330$$

$$L.L = 230 - 1.5(40) = 170$$

335 can not be detected as outlier because it must be higher than U.L and lower than L.L

Question 5 (2 points). Consider the following frequency distribution.

Class	Frequency	Midpoints
4-6	5	5
7-9	7	8
10-12	8	11

(1) Find the sample mean.

$$8.45$$

(2) Find the sample variance.

$$5.94$$

Question 6 (3 points). You are given the following sample of two variables.

x	1	9	6	7
y	12	10	13	6

(1) Find the sample correlation coefficient  $r_{xy}$ .

$$-0.47$$

(2) Using the estimated regression equation  $\hat{y} = b_0 + b_1x$ , estimate y when  $x = 1$ .

$$b_0 = 12.52 \quad \hat{y} = 12.52 - 0.39x$$

$$b_1 = -0.39$$

$$\hat{y} = 12.52 - 0.39(1) = 12.13$$

(20) In how many ways can we select 4 students from a class of 20 students?

- a. 4845  
 b. 116280  
 c. 160000

(21) In how many ways can we arrange 4 letters to form a password from a set of 52 letters?

- a. 13  
 b. 270725  
 c. 6497400  
 d. 7311616

Question 2 (4 points). You are given the following salaries for a sample of employees.

1500	2100	3500	3500	2450
------	------	------	------	------

(1) Find the sample mean.

..... 2610

(2) Find the sample standard deviation.

..... 880,62

(3) Find the mode.

..... 3500

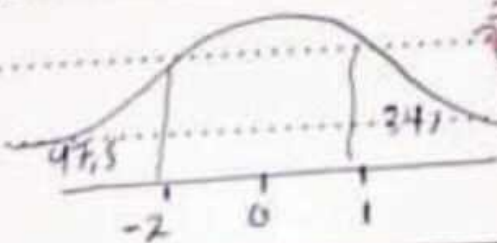
(4) Find the 70<sup>th</sup> percentile.

.....  $\frac{70}{100} \times 5 = 3.5$  \* round up \* 4  
 ..... 7 = 3500

Question 3 (2 points). Assume that a sample is taken from a bell-shaped population with mean  $\mu = 900$  and standard deviation  $\sigma = 150$ . Find the percentage of data which is between the values 600 and 1050.

1. z-score =  $\frac{x - \mu}{\sigma} = \frac{600 - 900}{150} = -2$

2.  $\frac{1050 - 900}{150} = 1$



.....  $47.5 + 24 = 71.5$   
 ..... 71.5% Percent

7

**Table 4.** Let  $S = \{E_1, E_2, E_3, E_4\}$  be the sample space of an experiment and let  $A = \{E_1, E_2\}$ ,  $B = \{E_3\}$ , and  $C = \{E_2, E_4\}$  be events from  $S$ . The probabilities of the sample points are assigned as follows:

Sample point	$E_1$	$E_2$	$E_3$	$E_4$
Probability	0.15	0.25	0.30	0.30

(14) Refer to Table 4. Find  $P(A)$ .

- a. 0.15  
 b. 0.25  
 c. 0.40  
 d. 0.70

$$P(A) = 0,15 + 0,25$$

(15) Refer to Table 4. Find  $P(B^c)$ .

- a. 0.70  
 b. 0.30  
 c. 0.55  
 d. 0.45

$$1 - P(B)$$

$$P(B) = 0,30$$

$$1 - 0,30$$

(16) Refer to Table 4. Find  $P(A \cap B)$ .

- a. 0.15  
 b. 0.25  
 c. 0.30  
 d. 0

(17) Refer to Table 4. Find  $P(B \cup C)$ .

- a. 0.30  
 b. 0.60  
 c. 0.25  
 d. 0.15

$$P(B) + P(C) - P(B \cap C)$$

$$0,30 + 0,6 - 0,30$$

(18) Refer to Table 4. We can say that

- a.  $A$  and  $B$  are exclusive events.  
 b.  $A$  and  $C$  are exclusive events.  
 c.  $B$  and  $C$  are exclusive events.  
 d. a. and b. are correct.

$$0,3$$

$$A \cap B$$

$$A \cap B = P(A) \times P(B)$$

$$0,3 \times 0,3 = 0,09$$

incl

(19) Refer to Table 4. We can say that

- a.  $A$  and  $B$  are independent events.  
 b.  $A$  and  $C$  are independent events.  
 c.  $B$  and  $C$  are independent events.  
 d. None of the above.

$$B \cup C = 0,30 + 0,30 - 0,18 = 0,42$$

Table 1. Part of the data bank of a corporation is shown below.

Employee Number	Gender	Department	Years of Experience	Employee Rank (1 - 10)	Yearly Salary
23450	Male	Accounting	15	10	\$ 52,443.00
34568	Female	IT	24	7	\$111,239.00
23123	Female	Personnel	20	4	\$ 84,473.00
23007	Male	Finance	9	1	\$ 47,519.00

(4) Refer to Table 1. Employee number is an example of

- a. nominal data
- b. ordinal data
- c. interval data
- d. ratio data

(5) Refer to Table 1. Yearly Salary is an example of

- a. nominal data
- b. ordinal data
- c. interval data
- d. ratio data

Table 2. The numbers of hours worked (per week) by 400 statistics students are shown below.

Number of hours	Frequency
0 - 9	20
10 - 19	80
20 - 29	200
30 - 39	100

(6) Refer to Table 2. The relative frequency of students working 0 - 9 hours is

- a. 20
- b. 100
- c. 0.95
- d. 0.05

(7) Refer to Table 2. The percent frequency of students working 19 hours or less is

- a. 20 %
- b. 25 %
- c. 75 %
- d. 80 %

$$80 + 20 = \frac{100}{400} = 0,25$$

(8) Refer to Table 2. The number of elements is

- a. 4
- b. 9
- c. 10
- d. 400

Circle your section number!

Section	Instructor	Days	Times	Rooms
1	Duha Sharhah	S	10:00 - 11:15	Aggad303
		M	10:00 - 11:15	Al-Juraysi321
2	Areej Awawdah	S	14:15 - 15:30	SCI213
		W	14:15 - 15:30	Aggad415
3	Areej Awawdah	S, W	12:50 - 14:05	Aggad407
4	Maher Abdallatif	S	10:00 - 11:15	Al-Juraysi002
		W	10:00 - 11:15	Al-Juraysi027
5	Mohammad Madiah	T, R	10:00 - 11:15	SCI215
6	Hani Kabajah	T, R	11:25 - 12:40	SCI113
7	Hani Kabajah	T, R	14:15 - 15:30	SCI116
8	We'am Abu Arqoub	T, R	08:30 - 09:45	SCI113

Question 1 (21 points). Circle the most correct answer.

(1) All the data collected in a particular study are referred to as the

- a. inference
- b. variable
- c. data set
- d. None of the above

(2) In a sample of 400 students in a university, 80, or 20%, are Business majors. Based on above information, the school's paper reported that "20% of all the students at university are Business majors." This report is an example of

- a. a sample
- b. a population
- c. statistical inference
- d. descriptive statistics

(3) A sample is a subset of the population. But, the sample mean

- a. is always smaller than the mean of the population
- b. is always larger than the mean of the population
- c. must be equal to the mean of the population
- d. can be larger, smaller, or equal to the mean of the population

(الامتحان الثاني) ~~الامتحان الثاني~~ 19

OK	Birzeit University Mathematics Department Second Semester 2016/2017 STAT 2361 - Midterm Exam	$\frac{27}{30}$
----	---	-----------------

Name (in Arabic):	لينا عسان ابوري	Student No.:	1153251
Section No.:	#6	Time:	75 minutes

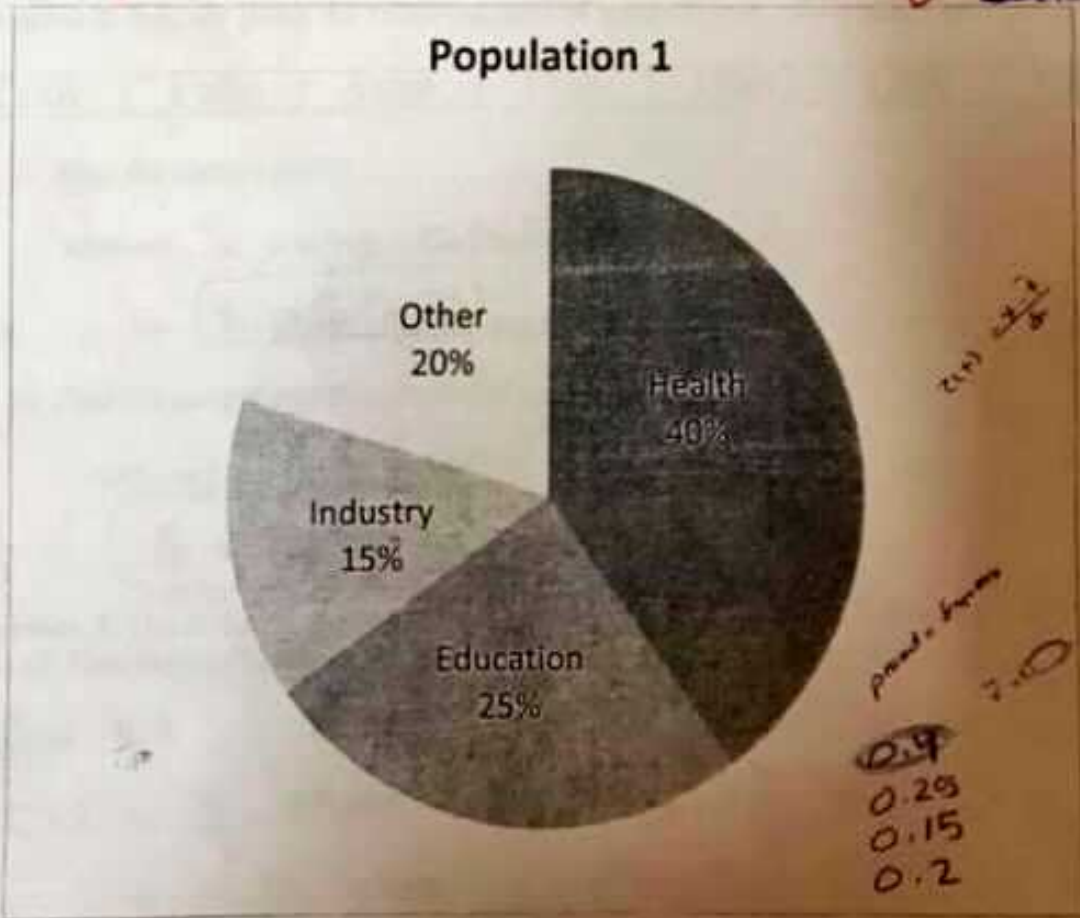
**Question 1.** You are given below the pie charts of two populations. The pie charts show the share of the health, education, and industry sectors from the government budget. The other parts of both budgets were combined in one sector.

a) In which population is the share of the industry sector more: Population 1 or 2? How much is the share?

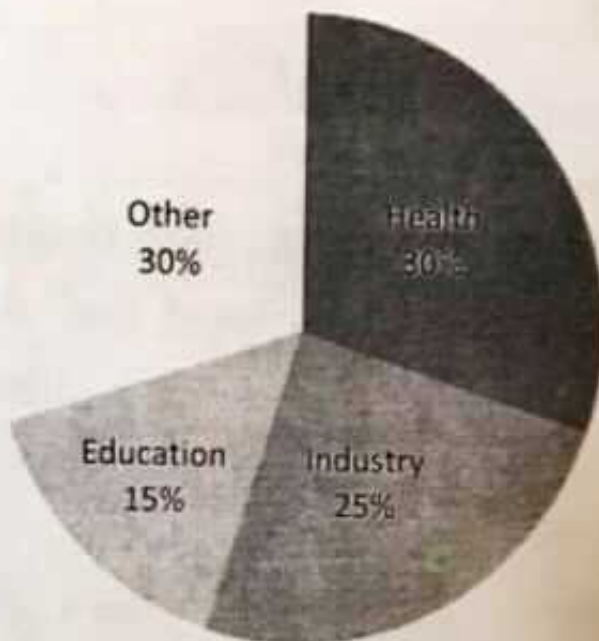
1) population 2 ... the share is 12.5%

b) What sector has the highest share in population 1: Health, education, or industry sector? How much is the share?

1) health has the highest share ... it has 40% of total sector



## Population 2



Question 2. You are given the following sales of some company for a period of 7 days.

\$ 2900	\$ 2920	\$ 2300	\$ 1700	\$ 5500	\$ 2890	\$ 3040
---------	---------	---------	---------	---------	---------	---------

a) Find the sample mean.

mean... = using calculator

$$= 3,035.71$$

b) Find the sample standard deviation.

using calculator

$$s = 1,186.81$$

Question 3. The mean price of a certain stock over the last week was \$ 27 and the variance was 68. Find the coefficient of variation?

$$\bar{x} = 27 \quad s^2 = 68$$

$$CV = \frac{s}{\bar{x}} \times 100 \quad s = 8.25$$

$$= \frac{8.25}{27} \times 100 = 30.59$$



**Question 4.** The means and the standard deviations of two stocks for a period of 5 days are shown below. Which stock is more stable? Explain.

	Mean	Standard Deviation
Stock 1	\$ 3.7	\$ 0.9
Stock 2	\$ 2.8	\$ 0.8

~~But~~ we should find coefficient of variation for two stock, and which has highest CV then it will be less stable

$$CV_{stock_1} = \frac{\sigma}{x} \times 100$$

$$= \frac{0.9}{3.7} \times 100 = 24.32$$

$$CV_{stock_2} = \frac{0.8}{2.8} \times 100 = 28.57$$

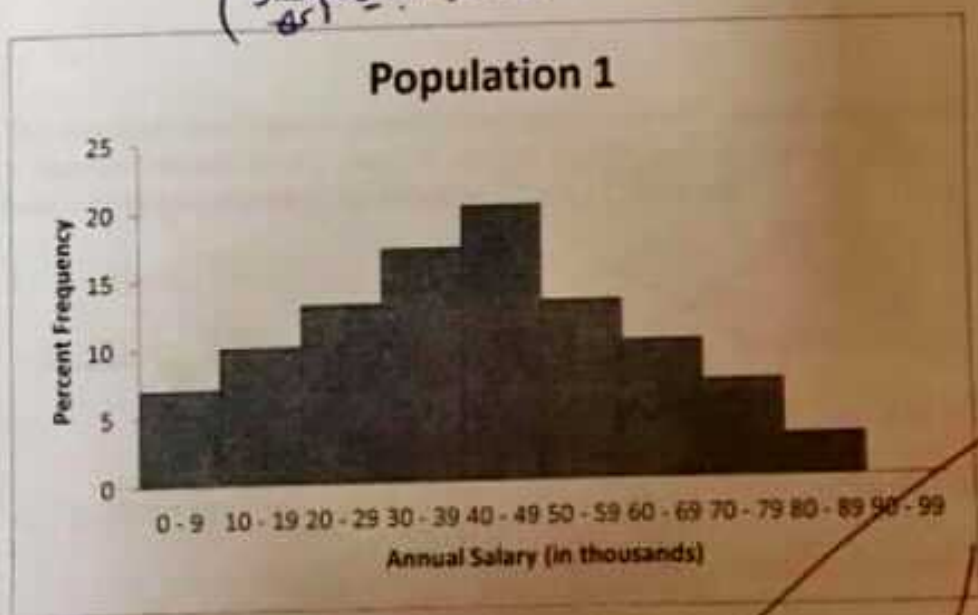
**Question 5.** You are given below the histograms of populations 1, 2, and 3.

a) Which population distribution is skewed to the left: Population 2 or 3?

population 3, because the long tail extends to the left

b) Which population has higher skewness: Population 1 or 2?

population 2 (population 2 is skewed to the right)



min = 30  
max = 42

Question 11. In a certain university, the quartiles for the number of students per class were  $Q_1 = 30$  students per class,  $Q_2 = 38$  students per class, and  $Q_3 = 42$  students per class.

a) A certain class contained 58 students. Do you think that this class contains too many students according to the above information? Explain.

58  
average, superior

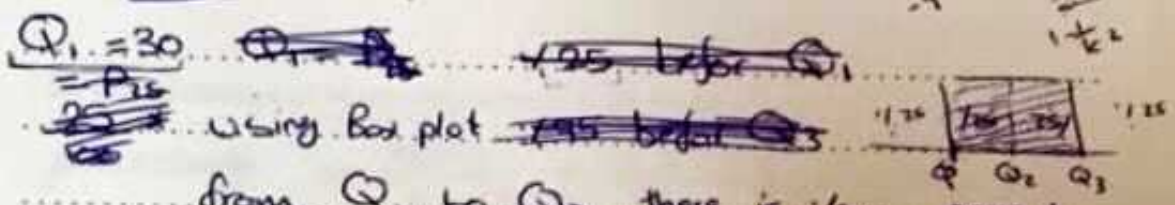
$IQR = Q_3 - Q_1 = 42 - 30 = 12$  using Box plot

$UP = Q_3 + 1.5 IQR = 60$

$LL = Q_1 - 1.5 IQR = 12$

this class have a normal number and not consider too high.

b) If this university had 1000 classes in some term, how many classes would you expect to have 30 to 42 students? Explain.



from  $Q_1$  to  $Q_3$  there is 1/50 percent of classes  $1/50 * 1000 = 20$  classes

Question 12. An experiment has 4 steps with 2 outcomes possible for the first step, 3 outcomes possible for the second step, 17 outcomes possible for the third step, and 8 outcomes possible for the fourth step. How many outcomes exist for the entire experiment?

outcomes =  $2 * 3 * 17 * 8$

= 816 outcomes

Question 13. Given 10 items you like the most, in how many ways can you select 3 items?

~~$10C3 = 120$~~   ${}_{10}P_3 = 720$

Question 14. Assume that you are given 25 equally qualified candidates for 2 positions; in how many ways can you fill the positions?

${}_{25}C_2 = 300$

X (comercial) 00  
 y (sales)

3.965

**Question 7.** A study was performed to seek a relationship between the number of commercials and sales. In the study, the variable  $x$  was the number of commercials per week, and the variable  $y$  was the sales (in \$ 100s) per week. Data were collected for 6 weeks, and the following results were given:  $\bar{x} = 10$ ,  $\bar{y} = 20$ ,  $s_x = 0.89$ ,  $s_y = 7.51$ ,  $\sum x_i y_i = 1221$ , and  $\sum (x_i - \bar{x})(y_i - \bar{y}) = 21$ . Find the estimated regression equation  $\hat{y} = b_0 + b_1 x$ ?

$$b_1 = \frac{\sum x_i y_i - n \bar{x} \bar{y}}{(n-1) s_x^2} = \frac{1221 - 6 \times 10 \times 20}{5 \times 0.7921} = 5.30$$

$$b_0 = \bar{y} - b_1 \bar{x} = 20 - 5.3 \times 10 = -33$$

$$\hat{y} = -33 + 5.30x$$

**Question 8.** You are given the following regression equation

$$\hat{y} = 0.3 - 2.1x, \quad r^2 = 0.7.$$

Estimate  $y$  when  $x = 4$ .

$$\hat{y} = 0.3 - 2.1x$$

$$\hat{y}(4) = 0.3 - (2.1 \times 4) = -8.1$$

**Question 9.** You are given the following estimated regression equations.

Equation 1:  $\hat{y} = 2.0 + 4.4x$  with  $r^2 = 0.9$

Equation 2:  $\hat{y} = 1.8 + 4.1x$  with  $r^2 = 0.8$

Which equation would you use to estimate  $y$ ? Explain.

I would use equation #1 because this equation can

interpret 90% of the value of  $y$ .

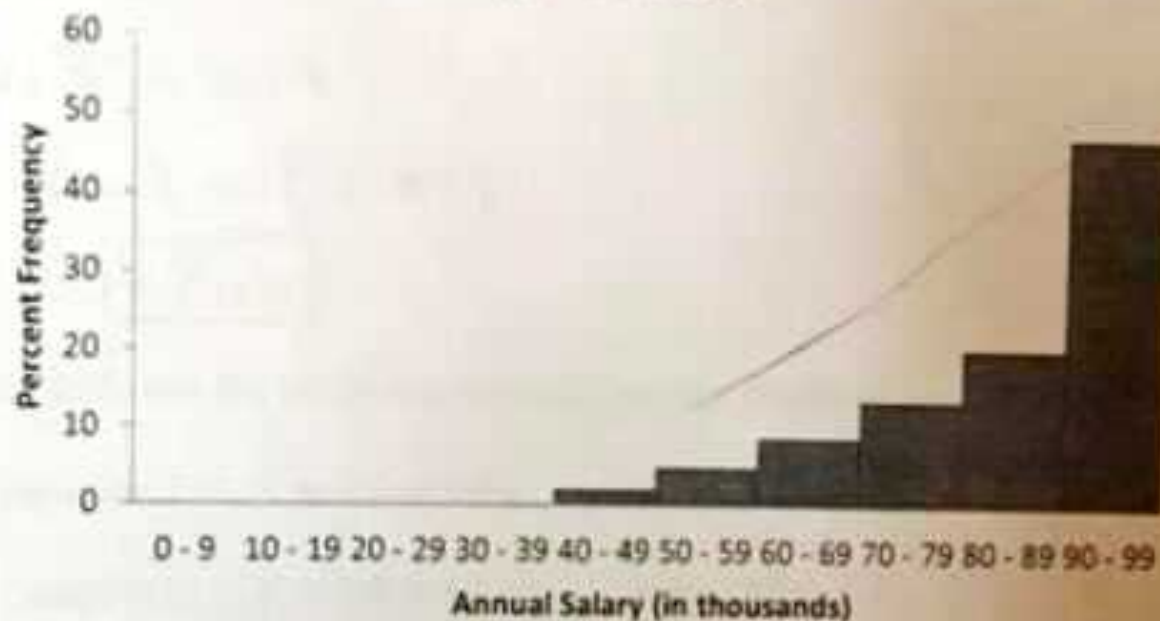
**Question 10.** A private hospital was hiring doctors with a planning mean salary of \$ 8000 per month and a standard deviation of \$ 500. The hospital was offering a certain doctor a salary of \$ 10 000 per month. Is this salary fine according to the planning strategy? Explain.

$$\bar{x} = 8,000 \quad s = 500$$

$$Z(10,000) = \frac{10,000 - 8,000}{500} = 4$$

this salary is fine because is above the average of all salaries.

### Population 3



The distribution of ages in a certain population was bell-shaped with a mean of  $\mu = 27$  and a standard deviation of 5 years. A sample of 2000 individuals was taken. How many individuals would you expect to be between 22 and 37 years old?

$$\sigma = 5$$

$$z = \frac{22 - 27}{5} = -1$$



$$\text{percentage} = 34.13\%$$

$$z = \frac{37 - 27}{5} = 2$$

$$= 97.72\%$$

# of individuals

$$= 0.6359 \times 2000 = \boxed{1272}$$

Question 15. The data given below were taken from a study about smoking. The table below indicates the numbers of people in the study according to their gender and smoking habits.

	Smokers (S)	Nonsmokers (N)	total
Men (M)	300	100	400
Women (W)	100	500	600
	400	600	1,000

- a) Find the percentage of men in the study.

$$\text{percentage of men} = \frac{400}{1000} = 0.4$$

- b) Find the percentage of nonsmoker women in the study.

$$\text{percentage} = \frac{500}{600} = 83.3$$

- c) A randomly individual is selected, what is the probability that the individual is a man and a smoker?

$$P(M \cap S) = \frac{300}{1000} = 0.3$$

- d) A randomly individual is selected, what is the probability that the individual is a woman or a smoker?

$$\begin{aligned} P(W \cup S) &= P(W) + P(S) - P(W \cap S) \\ &= \frac{600}{1000} + \frac{400}{1000} - \frac{100}{1000} \\ &= 0.6 + 0.4 - 0.1 = 0.9 \end{aligned}$$

- e) If the randomly individual selected is a nonsmoker, what is the probability that the individual is a man?

$$P(M/N) = \frac{P(M \cap N)}{P(N)} = \frac{0.1}{0.6} = 0.16$$

Question 16. The probabilities of the events  $A$  and  $B$  are  $P(A) = 0.20$  and  $P(B) = 0.40$ . Find the probability  $P(A \cup B)$  if the events  $A$  and  $B$  are mutually exclusive.

$$P(A \cup B) = P(A) + P(B)$$

$$= 0.20 + 0.40$$

$$= 0.60$$

Question 17. The probabilities of the events  $A$  and  $B$  are  $P(A) = 0.60$  and  $P(B) = 0.30$ . The probability of the intersection is  $P(A \cap B) = 0.10$ . Are the events  $A$  and  $B$  independent? Explain.

$$P(A \cap B) \stackrel{??}{=} P(A) \cdot P(B)$$

$$0.1 \stackrel{??}{=} 0.6 \cdot 0.3$$

$0.1 \neq 0.18$  ✓ A and B are dependent not independent

Question 18. The events  $A$  and  $B$  are equally likely events in a sample space  $S$ . Assume that  $P(A) = 0.40$  and assume that the events  $A$  and  $B$  are independent. Find  $P(A \cap B)$ .

$$P(A \cap B) = P(A) \cdot P(B)$$

$$P(A \cap B) = 0.4 \cdot 0.4$$

$$P(A \cap B) = 0.16$$

Question 19. The probabilities of the events  $A$  and  $B$  are  $P(A) = 0.70$  and  $P(B) = 0.80$ . Are the events  $A$  and  $B$  mutually exclusive? Explain.

Exclusive  ~~$P(A \cap B) = 0$~~   $P(A \cap B) \stackrel{??}{=} 0$

If  $A$  and  $B$  exclusive  ~~$P(A \cup B) = P(A) + P(B)$~~   $P(A \cup B) = P(A) + P(B)$

~~$P(A \cup B) = P(A) + P(B) \stackrel{??}{=} 1$~~   $P(A \cup B) = P(A) + P(B) \stackrel{??}{=} 1$

~~A and B~~

~~there is an intersection between A and B~~

Question 20. Let  $A$  and  $B$  be events and let  $P$  denote the probability. If  $P(B|A) = 0.20$ ,  $P(A \cup B) = 0.80$ , and  $P(A) = 0.30$ . Find  $P(B)$ .

$$P(B|A) = \frac{P(B \cap A)}{P(A)} \quad 0.2 = \frac{P(B \cap A)}{0.3}$$

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

$$0.8 = 0.3 + P(B) - 0.06$$

$$0.8 = 0.24 + P(B)$$

$$P(B) = 0.56$$

Question 19

$$P(A) * P(B) = 0.56$$

If A and B independent

$$P(A \cap B) = \underbrace{P(A) * P(B)}_{0.56}$$

$$P(A \cup B) \leq 1$$

$$P(B) + P(A) = 1.5$$

So there is an intersection between A and B so ~~the~~ A and B not mutually exclusive.

~~P(A)~~ is not as mutually exclusive

$$P(A \cap B)$$

~~P(A \cup B)~~

~~P(A/B)~~