Statistics

The rules

Booklet Exams

Third Sec

منتدى توجيه الرياضيات

أ عادل إدوار

1- $-1 \le r \le 1$

-1	0	1
Perfect inverse Correlation	No Correlation	Perfect direct Correlation

2- $r = \dfrac{n\sum xy - \sum x \sum y}{\left(\sqrt{n\sum x^2 - (\sum x)^2}\right)\left(\sqrt{n\sum y^2 - (\sum y)^2}\right)}$ (pearso's cor.)

3- $r = 1 - \dfrac{6\sum D^2}{n(n^2-1)}$ $(Spearman's\ rank\ corr.)$

4- $y = a + bx$ (The regression line of y on x)

$$b(reg.coeff.) = \frac{n\sum xy - \sum x \sum y}{n\sum x^2 - (x)^2}, \quad a = \frac{\sum y - b\sum x}{n}$$

$$Error = \left| \begin{array}{r} Table\ value - the\ value\ satisf. \\ the\ regr.\ equation \end{array} \right|$$

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

$ii) P(A^{\backslash}) = 1 - P(A)$

$iii) P(A - B) = P(A \cap B^{\backslash}) = P(A) - P(A \cap B)$

6- $P(A/B) = \dfrac{P(A \cap B)}{P(B)}$ $(Prob.\ Of\ A\ in\ condition\ of\ B)$

7- $P(A \cap B) = P(A) \times P(B)$ $(A, B\ are\ independent)$

8- The mutually exclusive events $(A \cap B) = \varphi$

9- $\mu = \sum x_r \quad f(x_r)$ (mean)

10- $\sigma^2 = \sum {x_r}^2 f(x_r) - \mu^2$ (Variance)

11- $\sigma = \sqrt{varince}$ (Standard diviation)

12- $Coeff.\,of\ variation = \frac{\sigma}{\mu} \times 100\%$

13- $Z = \frac{x-\mu}{\sigma}$ (z is the standard value, x is normal value)

Z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.0000	0.0040	0.0080	0.0120	0.0160	0.0199	0.0239	0.0279	0.0319	0.0359
0.1	0.0398	0.0438	0.0478	0.0517	0.0557	0.0596	0.0636	0.0675	0.0714	0.0753
0.2	0.0793	0.0832	0.0871	0.0910	0.0948	0.0987	0.1026	0.1064	0.1103	0.1141
0.3	0.1179	0.1217	0.1255	0.1293	0.1331	0.1368	0.1406	0.1443	0.1480	0.1517
0.4	0.1554	0.1591	0.1628	0.1664	0.1700	0.1736	0.1772	0.1808	0.1844	0.1879
0.5	0.1915	0.1950	0. 1985	0.2019	0.2054	0.2088	0.2123	0.2157	0.2190	0.2224
0.6	0.2257	0.2291	0.2324	0.2357	0.2389	0.2422	0.2454	0.2486	0.2517	0.2549
0.7	0.2580	0.2611	0.2642	0.2673	0.2704	0.2734	0.2764	0.2794	0.2823	0.2852
0.8	2881	0.2910	0.2939	0.2967	0.2995	0.3023	0.3051	0.3078	0.3106	0.3133
0.9	0.3159	0.3186	0.3212	0.3238	0.3264	0.3289	0.3315	0.3340	0.3365	0.3389
1.0	0.3413	0.3438	0.3461	0.3485	0.3508	0.3531	0.3554	0.3577	0.3599	0.3621
1.1	0.3643	0.3665	0.3686	0.3708	0.3729	0.3749	0.3770	0.3790	0.3810	0.3830
1.2	0.3849	0.3869	0.3888	0.3907	0.3925	0.3944	0.3962	0.3980	0.3997	0.4015
1.3	0.4032	0.4049	0.4066	0.4082	0.4099	0.4115	0.4131	0.4147	0.4162	0.4177
1.4	0.4192	0.4207	0.4222	0.4236	0.4251	0.4265	0.4279	0.4292	0.4306	0.4319
1.5	0.4332	0.4345	0.4357	0.4370	0.4382	0.4394	0.4406	0.4418	0.4429	0.4441
1.6	0.4452	0.4463	0.4474	0.4484	0.4495	0.4505	0.4515	0.4525	0.4535	0.4545
1.7	0.4554	0.4564	0.4573	0.4582	0.4591	0.4599	0.4608	0.4616	0.4625	0.4633
1.8	0.4641	0.4649	0.4656	0.4664	0.4671	0.4678	0.4686	0.4693	0.4699	0.4706
1.9	0.4713	0.4719	0.4726	0.4732	0.4738	0.4744	0.4750	0.4756	0.4761	0.4767
2.0	0.4772	0.4778	0.4783	0.4788	0.4793	0.4798	0.4803	0.4808	0.4812	0.4817
2.1	0.4821	0.4826	0.4830	0.4834	0.4838	0.4842	0.4846	0.4850	0.4854	0.4857
2.2	0.4861	0.4864	0.4868	0.4871	0.4875	0.4878	0.4881	0.4884	0.4887	0.4890
2.3	0.4893	0.4896	0.4898	0.4901	0.4904	0.4906	0.4909	0.4911	0.4913	0.4916
2.4	0.4918	0.4920	0.4922	0.4925	0.4927	0.4929	0.4931	0.4932	0.4934	0.4936
2.5	0.4938	0.4940	0.4941	0.4943	0.4945	0.4946	0.4948	0.4949	0.4951	0.4952
2.6	0.4953	0.4955	0.4956	0.4957	0.4959	0.4960	0.4961	0.4962	0.4963	0.4964
2.7	0.4965	0.4966	0.4967	0.4968	0.4969	0.4970	0.4971	0.4972	0.4973	0.4974
2.8	0.4974	0.4975	0.4976	0.4977	0.4977	0.4978	0.4979	0.4979	0.4980	0.4981
2.9	0.4981	0.4982	0.4982	0.4983	0.4984	0.4984	0.4985	0.4985	0.4986	0.4986
3.0	0.4987	0.4987	0.4987	0.4988	0.4988	0.4989	0.4989	0.4989	0.4990	0.4990
3.1	0.4990	0.4991	0.4991	0.4991	0.4992	0.4992	0.4992	0.4992	0.4993	0.4993
3.2	0.4993	0.4993	0.4994	0.4994	0.4994	0.4994	0.4994	0.4995	0.4995	0.4995
3.3	0.4995	0.4995	0.4995	0.4996	0.4996	0.4996	0.4996	0.4996	0.4996	0.4997
3.4	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4998
3.5	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998

GOOD LUCK

MR/GEORGE ADEL

(01225923424)

Experimental Exam(2018) (1)

① If A and B are two independent events of a sample space S for a random experiment where : $P(A) = 0.6$, $P(B) = 0.3$, then $P(B - A) = \dots\dots$

ⓐ 0.9 ⓑ 0.3
ⓒ 0.18 ⓓ 0.12

② If A and B are two events of a sample space S for a random experiment ,then $P(A \cap B) - P(A) \times P(B|A) = \dots\dots$

ⓐ $P(\emptyset)$ ⓑ $P(S)$
ⓒ $P(A')$ ⓓ $P(B)$

③ If the regression line equation Y on X is: $2\hat{Y} = 3 + X$, then the correlation between the values of X and the values of Y is ....

ⓐ nihilistic ⓑ direct
ⓒ inverse ⓓ Perfect

④ **Answer only one item from the items of this question:**
If $\sum x = 41$, $\sum y = 55$, $\sum xy = 362$, $\sum x^2 = 256$, $\sum y^2 = 523$ and $n = 8$

Find :

(a) Pearson's linear correlation coefficient between x and y and determine its type.

(b) The regression line equation of y on x .

⑤ If x is a normal variable whose mean $\mu = 5$ and its standard deviation $\sigma = 4$,then the variable subjected to a standard normal distribution is:

ⓐ $\frac{5-x}{4}$ ⓑ $\frac{5-x}{2}$
ⓒ $\frac{x-5}{4}$ ⓓ $\frac{x-4}{5}$

⑥ If Z is a standard normal variable and $P(Z \ge -k) = 0.9834$, then $k = \dots\dots$

ⓐ 2.17 ⓑ 2.13
ⓒ 2.03 ⓓ 2.3

⑦ If x is a discrete random variable whose probability distribution is as follows:

x_r	1	2	4	a
$f(x_r)$	0.2	b	0.4	0.1

Find :

First : The value for each of a and b if the mean $\mu = 3$

Second : The standard deviation of the random variable x

⑧ If x is a continuous random variable, its probability density function is :

$$f(x) = \begin{cases} \frac{1}{24}(2x+1) & \text{when } 2 \le x \le 5 \\ \text{zero} & \text{otherwise} \end{cases}$$

Find :

First : $P(3 < x < 5)$

Second : $P(x > 4)$

⑨ If the mean for a random variable equals 47 and its variance equals 100 ,then the coefficient of variation of it equals .... % (approximately)

ⓐ 21.3 ⓑ 212.8
ⓒ 47 ⓓ 470

⑩ If $P(A') = \frac{2}{5}$, $P(B|A) = \frac{1}{2}$, then $P(A \cap B) = \dots\dots\dots$

ⓐ $\frac{1}{5}$ ⓑ $\frac{3}{10}$
ⓒ $\frac{5}{6}$ ⓓ $\frac{3}{5}$

(11) From the data of the following table:

X	3	1	6	4	3	8
Y	7	4	5	8	6	7

Calculate spearman's rank correlation coefficient between x and y ,then show its type.

(12) Answer only two items from the items of this question :

A 50- student classroom has 15 study Chemistry, 25 study Biology and 10 study both subjects. A student is randomly chosen, Calculate the probability the student chosen studies:

(a) Chemistry if He (She) is already studying Biology.

(b) Biology if He (She) is already studying Chemistry.

(13) If x is a normal variable whose mean $\mu = 17$ and its standard deviation $\sigma = 2$

Find :

First : $P(16 \leq x \leq 20)$

Second : $P(x > 15)$

Experimental Exam(2018) (2)

(1) If A and B are two independent events of a sample space S for a random experiment where : $P(A) = 0.5$, $P(B) = 0.6$, then $P(A' \cup B') = \dots\dots\dots$

(a) 0.3 (b) 0.7

(c) 0.8 (d) 0.2

(2) If $P(A) = \frac{1}{2}$, $P(A - B) = \frac{3}{8}$, then $P(B'|A) = \dots\dots\dots\dots$

(a) $\frac{3}{8}$ (b) $\frac{3}{16}$

(c) $\frac{3}{4}$ (d) $\frac{9}{32}$

(3) The variable that can be estimated from the regression line equation is called .... variable.

(a) independent (b) dependent

(c) direct (d) inverse

(4) If x is a discrete random variable whose probability distribution is defined by the function : $f(x) = \frac{a}{x+1}$ where $x = 0,1,2$ and 3

Find :

First : The value a

Second : The expectation and the variance of the random variable x

(5) If the expectation for a random variable is μ and its standard deviation equals 8 and its coefficient of variation equals 8.3 %, then $\mu \simeq$......

ⓐ 64 ⓑ 16
ⓒ 96 ⓓ 103.75

(6) If $P(A|B) = \frac{5}{8}$, $P(B') = \frac{4}{5}$ then, $P(A' \cup B') =$..........

ⓐ $\frac{1}{8}$ ⓑ $\frac{7}{8}$
ⓒ $\frac{1}{5}$ ⓓ $\frac{3}{8}$

(7) **Answer only two items from the items of this question :**
If a die has been rolled once, Calculate :

(a) The probability that the appearing number is a prime number on condition that the appearing number is an odd number.

(b) The probability that the appearing number is an odd number given that the appearing number is divisible by 5 .

(c) The probability that the appearing number is an even number on condition that the appearing number is a multiple of 3.

(8) If x is a continuous random variable, its probability density function is :

$$f(x) = \begin{cases} \frac{1}{16}(x+2) & when\ 0 \le x \le 4 \\ zero & otherwise \end{cases}$$

Find :

First : $P(x \ge 3)$

Second : $P(2 \le x \le 4)$

(9) **Answer only one item from the items of this question:**

If $\sum x = 60, \sum y = 70, \sum xy = 374$

$\sum x^2 = 406, \sum y^2 = 536$ and $n = 10$

Find :

(a) Pearson's linear correlation coefficient between x and y and determine its type.

(b) The regression line equation of y on x .

(10) If Z is a standard normal variable, $P(Z \le k) = 0.9147$, then k= ....

ⓐ 1.37 ⓑ 0.97
ⓒ 2.13 ⓓ 1.2

(11) If x is a normal variable whose mean $\mu = 9$ and its variance equals 16 ,then the variable subjected to a standard normal distribution is:

ⓐ $\frac{9-x}{4}$ ⓑ $\frac{x-9}{16}$
ⓒ $\frac{x-4}{9}$ ⓓ $\frac{x-9}{4}$

(12) If x is a normal variable whose mean $\mu = 8$ and its standard deviation $\sigma = 2$

Find :

First : $P(x \le 10)$

Second : $P(5.8 \le x \le 10.2)$

(13) The following table shows the marks of six students in mathematics (x) and statistics (y):

Mathematics (X)	22	25	19	24	25	13
Statistics (Y)	45	35	40	28	40	25

Calculate the value of the spearman's rank correlation coefficient between the marks of mathematics (x) and the marks of statistics (y) and show its type.

Final (2017)

1 If A and B are two events of a sample space S for a random experiment where $A \subset B$, then $P(B|A) = \dots\dots$

(a) $P(A)$ (b) $P(B)$
(c) $P(A-B)$ (d) $P(\emptyset)$

2 If A, B are two independent events of sample space for a random experiment, $P(A) = 0.5$, $P(B) = 0.6$, then $P(A \cup B) = \dots\dots$

(a) 0.3 (b) 0.4
(c) 0.8 (d) 0.2

3 Answer only two items from the items of this question:
A box contains 10 white balls, 15 red balls. Two balls are drawn respectively without replacing.
Calculate the probability:
(a) The two balls are red.
(b) The second ball is red if the first is white.
(c) The second ball is white if the first is red.

4 If the regression line equation Y on X is $\hat{Y} = bX + a$, if the coefficient of X is [illegible], then the correlation between the two variables X and Y is [illegible]

(a) [illegible] (b) perfect
(c) direct (d) inverse

5 If the mean for a random variable equals 75 and its coefficient of variation equals 2.5%, then the variance of the random variable equals .... (approximately)

(a) 3.75 (b) 14.1
(c) 375 (d) [illegible]

6 If X is a normal variable whose mean μ and its standard deviation σ
Find:
First: $P(X > \mu - 1.5\,\sigma)$
Second: $P(\mu - 1.96\,\sigma < X < \mu + 1.96\,\sigma)$

7 The following table shows the number of product units (X) from a certain product and the cost of the production of a unit (Y) in Egyptian pound in seven factories produce this product

Number of units (X)	500	1500	1400	700	2000	2500	1500
Cost of one unit (Y)	20	24	24	25	20	30	23

Calculate the spearman's rank correlation coefficient between the number of product units and the cost of the production of a unit in these factories.

8 If A and B are two events of a sample space S for a random experiment where:
$P(A) = 0.45$, $P(B) = 0.6$,
$P(B|A) = 0.8$, then $P(A|B) = \dots\dots$

(a) 0.6 (b) 0.036
(c) 0.48 (d) 0.06

9 If Z is a standard normal variable, $P(-k \le Z \le k) = 0.8664$, then $K = \dots$

(a) 1.2 (b) 1.4
(c) 1.5 (d) 1.7

10 If the marks of the students in an exam follow a normal distribution whose mean is 75 and its standards deviation is 5 ,if the mark of a student equals 80 marks, then the standard normal value for the mark of this student in this exam equals ......

ⓐ -1 ⓑ 1

ⓒ 1.07 ⓓ -1.07

11 If x is a discrete random variable whose probability distribution is as follows

x_r	0	1	2	3	4
$f(x_r)$	0.4	a	0.1	0.1	0.1

Find :

First : The value of a

Second : The expectation and the standard deviation of the random variable x

12 If x is a continuous random variable, its probability density function is ;

$$f(x) = \begin{cases} \frac{1}{4}(x+a) & \text{when } 0 \le x \le 2 \\ \text{zero} & \text{otherwise} \end{cases}$$

Find :

First : The value of a

Second : $P(\frac{1}{2} \le x \le \frac{3}{2})$

13 Answer only one item from the items of this question:

If $\sum x = 56, \sum y = 40, \sum xy = 364$

$\sum x^2 = 524, \sum y^2 = 256$ and $n = 8$

Find :

(a) Pearson's linear correlation coefficient between x and y and determine its type.

(b) The regression line equation of y on x .

Good Luck

Prepared by the Expert in Math/

Mr George Adel

(* Model answer *)

1 d

$$P(B-A)$$
$$= P(B) - P(A\cap B)$$
$$= P(B) - [P(A)\times P(B)]$$
$$= 0.3 - [0.6\times 0.3]$$
$$= 0.3 - 0.18$$
$$= \boxed{0.12}$$

2 c

$$P(A\cap B) - P(A)\times\frac{P(A\cap B)}{P(A)}$$
$$= P(A\cap B) - P(A\cap B)$$
$$= \boxed{\text{Zero}}$$
$$= P(\phi)$$

3 b $\boxed{\text{Direct}}$

$$2y = 3 + x$$
$$y = \frac{3}{2} + \frac{1}{2}x$$

(+ve)

4

$$r = \frac{n\sum xy - (\sum x)(\sum y)}{\sqrt{n\sum x^2 - (\sum x)^2}\sqrt{n\sum y^2 - (\sum y)^2}}$$
$$= \frac{8(362) - (41)(55)}{\sqrt{8(256) - (41)^2}\sqrt{8(523) - (55)^2}}$$
$$\simeq \boxed{0.52}\ \boxed{\text{Direct}}$$

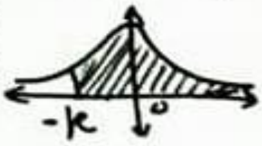
$$y = a + bx$$
$$b = \frac{n\sum xy - (\sum x)(\sum y)}{n\sum x^2 - (\sum x)^2}$$
$$= \frac{8(362) - (41)(55)}{8(256) - (41)^2}$$
$$= \boxed{\frac{641}{367}}$$
$$a = \frac{\sum y - a\sum x}{n}$$
$$= \frac{(55) - \left(\frac{641}{367}\right)(41)}{8}$$
$$= -\frac{762}{367}$$
$$\therefore y = -\frac{762}{367} + \frac{641}{367}x$$

5 c

$$Z = \frac{x-\mu}{\sigma}$$
$$= \boxed{\frac{x-5}{4}}$$

6 b

$$P(Z \geq -k) = 0.9834$$
$$0.5 + P(Z \geq -k) = 0.9834$$



$$P(k \geq Z \geq 0) = 0.9834 - 0.5$$
$$P(k \geq Z \geq 0) = 0.4834 \downarrow$$

$P(0 \le Z \le k) = 0.4834$

$\therefore \boxed{k = 2.13}$

7 $0.2 + b + 0.4 + 0.1 = 1$

$\boxed{b = 0.3}$

$\mu = 3$

$\sum x_r \cdot f(x_r) = 3$

$1(0.2) + 2(0.3) + 4(0.4) + a(0.1) = 3$

$\boxed{a = 6}$

x_i	$f(x_i)$	$x \cdot f(x_i)$	$x_i^2 \cdot f(x_i)$
1	0.2	0.2	0.2
2	0.3	0.6	1.2
4	0.4	1.6	6.4
6	0.1	0.6	3.6
	1	3	11.4

$\sigma^2 = \sum x_i^2 \cdot f(x_i) - \mu^2$

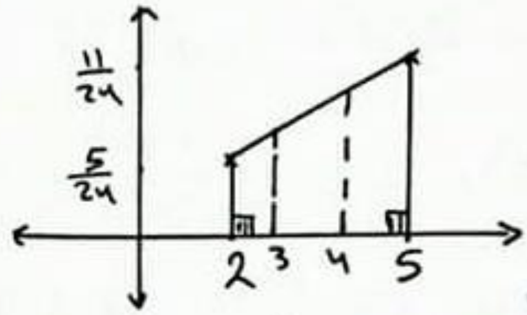
$\sigma^2 = 11.4 - (3)^2$

$\sigma^2 = 2.4$

$\sigma \simeq \boxed{1.55}$

8

x	2	5
y	5/24	11/24



$P(3 < x < 5) = \frac{b_1 + b_2}{2} \times h$

$= \frac{7/24 + 11/24}{2} \times 2$

$= \frac{18}{24} = \frac{3}{4}$

$P(x > 4) = \frac{9/24 + 11/24}{2} \times 1$

$= \frac{20}{48} = \frac{5}{12}$

9 $\sigma^2 = 100$

$\sigma = 10$, $\mu = 47$

Coeff. of Variation

$= \frac{\sigma}{\mu} \times 100\%$

$= \frac{10}{47} \times 100\%$

$= 21.3\%$

10 **b**

$P(\bar{A}) = 1 - \frac{2}{5} = \frac{3}{5}$

$P(B|\bar{A}) = \frac{P(\bar{A} \cap B)}{P(\bar{A})}$ ↓

$$\frac{1}{2} = \frac{P(A\cap B)}{3/5}$$

$$P(A\cap B) = \frac{3}{10}$$

11)

X	R(x)	y	R(y)	D	D^2
3	4.5	7	2.5	2	4
1	6	4	6	0	0
6	2	5	5	-3	9
4	3	8	1	2	4
3	4.5	6	4	0.5	0.25
8	1	7	2.5	-1.5	6.25
					23.5

$$r = 1 - \frac{6\sum D^2}{n(n^2-1)}$$

$$= 1 - \frac{6(23.5)}{6(36-1)}$$

$$= \boxed{0.329}$$

12) $P(A) = \frac{15}{50} = \frac{3}{10}$

$P(B) = \frac{25}{50} = \frac{1}{2}$

$P(A\cap B) = \frac{10}{50} = \frac{1}{5}$

i) $P(A|B) = \frac{P(A\cap B)}{P(B)}$

$= \frac{1/5}{1/2} = \frac{2}{5}$

ii) $P(B|A) = \frac{P(A\cap B)}{P(A)}$

$= \frac{1/5}{3/10} = \frac{2}{3}$

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

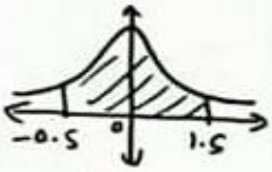
$= \frac{3}{10} + \frac{1}{2} - \frac{1}{5}$

$= \boxed{\frac{3}{5}}$

13) $P(16 \le x \le 20)$

$= P\left(\frac{16-17}{2} \le Z \le \frac{20-17}{2}\right)$

$= P(-0.5 \le Z \le 1.5)$



$= P(-0.5 \le Z \le 0) + P(0 \le Z \le 1.5)$

$= 0.1915 + 0.4332$

$= \boxed{0.6247}$

ii) $P(x > 15)$

$= P\left(Z > \frac{15-17}{2}\right)$

$= P(Z > -1)$

$= P(-1 < Z < 0) + 0.5$

$= 0.3413 + 0.5$

$= \boxed{0.8413}$

Model answer of exp. exam (2018)

1] b)

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

$= 0.5 \times 0.6$

$= \boxed{0.3}$

$\therefore P(A' \cup B') = P(A\cap B)'$

$= 1 - P(A\cap B)$

$= 1 - 0.3$

$= \boxed{0.7}$

2] c)

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

$\frac{3}{8} = 0.5 - P(A\cap B)$

$P(A\cap B) = 0.5 - \frac{3}{8}$

$= \boxed{\frac{1}{8}}$

$\therefore P(B'|A) = 1 - P(B|A)$

$= 1 - \frac{P(A\cap B)}{P(A)}$

$= 1 - \frac{1/8}{1/2}$

$= \boxed{\frac{3}{4}}$

3] b)

dependent

4] $f(0) + f(1) + f(2) + f(3) = 1$

$a + \frac{a}{2} + \frac{a}{3} + \frac{a}{4} = 1$

$\frac{25}{12} a = 1 \Rightarrow a = \frac{12}{25}$

x_i	$f(x_i)$	$x_i f(x_i)$	$x_i^2 f(x_i)$
0	12/25	0	0
1	6/25	6/25	6/25
2	4/25	8/25	16/25
3	3/25	9/25	27/25
	1	23/25	49/25

$\mu = \sum x_i \cdot f(x_i)$

$= \boxed{23/25}$

$\sigma^2 = \sum x_i^2 \cdot f(x_i) - \mu^2$

$= 49/25 - \left(\frac{23}{25}\right)^2$

$= \frac{696}{625}$

5 c)

$$\text{Coeff of variation} = \frac{\sigma}{\mu} \times 100\%$$

$$8.3\% = \frac{8}{\mu} \times 100\%$$

$$\mu \simeq \boxed{96}$$

6 b)

$$P(B) = 1 - \frac{4}{5} = \frac{1}{5}$$

$$P(A|B) = \frac{5}{8}$$

$$\frac{P(A\cap B)}{P(B)} = \frac{5}{8}$$

$$\frac{P(A\cap B)}{1/5} = \frac{5}{8}$$

$$P(A\cap B) = \boxed{\frac{1}{8}}$$

$$P(A' \cup B') = P(A\cap B)'$$

$$= 1 - P(A\cap B)$$

$$= 1 - \frac{1}{8}$$

$$= \boxed{\frac{7}{8}}$$

7 a) $S = \{1, 2, 3, 4, 5, 6\}$

$A = \{2, 3, 5\}$

$B = \{1, 3, 5\}$

$$P(A|B) = \frac{P(A\cap B)}{P(B)} \nearrow$$

$$= \frac{2/6}{3/6} = \frac{2}{3}$$

b) $A = \{1, 3, 5\}$

$B = \{5\}$

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

$$= \frac{1/6}{1/6} = 1$$

c) $A = \{2, 4, 6\}$

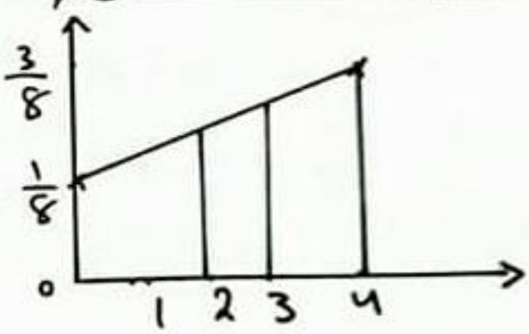
$B = \{3, 6\}$

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

$$= \frac{1/6}{2/6} = \frac{1}{2}$$

8

x	0	4	2	3
y	1/8	3/8	1/4	5/16



i) $P(X \geq 3) = P(3 \leq X \leq 4)$

$$= \frac{1}{2}\left(\frac{5}{16} + \frac{3}{8}\right) \times 1$$

$\downarrow$

$$= \boxed{\frac{11}{32}}$$

ii) $P(2 \le X \le 4)$

$$= \frac{1}{2}\left(\frac{1}{4} + \frac{3}{8}\right) \times 2$$

$$= \boxed{\frac{5}{8}}$$

9 a)

$$r = \frac{n\sum xy - (\sum x)(\sum y)}{\sqrt{n\sum x^2 - (\sum x)^2}\sqrt{n\sum y^2 - (\sum y)^2}}$$

$$= \frac{10(374) - (60)(70)}{\sqrt{10(406) - (60)^2}\sqrt{10(536) - (70)^2}}$$

$$= \boxed{-1}$$ inverse Perfect

b)

$$b = \frac{n\sum xy - \sum x \sum y}{n(\sum x^2) - (\sum x)^2}$$

$$= \frac{10(374) - (60)(70)}{10(406) - (60)^2}$$

$$= -1$$

$$a = \frac{\sum y - b\sum x}{n}$$

$$= \frac{70 - (-1)(60)}{10} = 13$$

$$\boxed{y = 13 - x}$$

10 a)

$$P(Z \le k) = 0.9147$$

$$0.5 + P(0 \le Z \le k) = 0.9147$$

$$P(0 \le Z \le k) = 0.4147$$

$$k = \boxed{1.37}$$

11 d)

$$Z = \frac{x - 9}{16}$$

12 i)

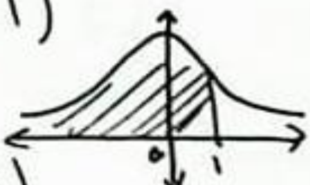
$$P(x \le 10)$$

$$= P\left(Z \le \frac{10 - 8}{2}\right)$$

$$= P\left(Z \le \frac{2}{2}\right)$$

$$= P(Z \le 1)$$

$$= 0.5 + P(0 \le Z \le 1)$$



$$= 0.5 + 3413$$

$$= \boxed{0.8413}$$

ii) $P(5.8 \le X \le 10.2)$

$= P\left(\frac{5.8-8}{2} \le Z \le \frac{10.2-8}{2}\right)$

$= P(-1.1 \le Z \le 1.1)$

$= 2P(0 \le Z \le 1.1)$

$= 2(.3643)$

$= \boxed{0.7286}$

13

X	R(x)	Y	R(y)	D	D^2
22	4	45	1	3	9
25	1.5	35	4	-2.5	6.25
19	5	40	2.5	2.5	6.25
24	3	28	5	-2	4
25	1.5	40	2.5	-1	1
13	6	25	6	0	0
					26.5

$r = 1 - \frac{6\sum D^2}{n(n^2-1)}$

$= 1 - \frac{6(26.5)}{6(36-1)}$

$\simeq \boxed{0.24}$

inverse weak

Mr/George Adel

Model answer (* (* of final exam (2017) *) *)

1 d

$A \subset B$

$\Rightarrow A \cap B = A$

$\therefore P(B|A) = \frac{P(A \cap B)}{P(A)}$

$= \frac{\cancel{P(A)}}{\cancel{P(A)}} = 1 = \boxed{P(S)}$

2 c

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

$= (0.5)(0.6)$

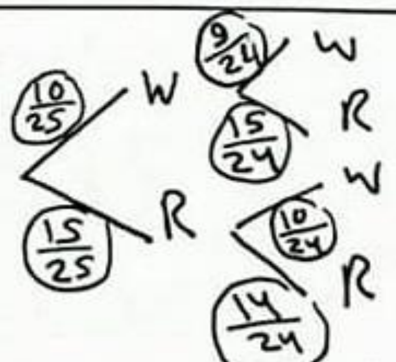
$= \boxed{0.3}$

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

$= 0.5 + 0.6 - 0.3$

$= \boxed{0.8}$

3



a) $= \frac{15}{25} \times \frac{14}{25} = \frac{7}{20}$

ii) $= \frac{15}{24}$

$= \frac{5}{8}$

iii) $= \frac{10}{24}$

$= \frac{5}{12}$

4) d)

Inverse

5) b)

Coeff. of Var. $= \frac{\sigma}{\mu} \times 100\%$

$2.5\% = \frac{\sigma}{150} \times 100\%$

$\boxed{\sigma^2 = 14.1}$

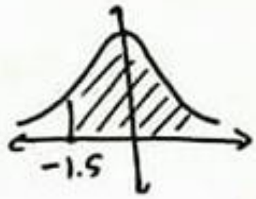
6) i)

$P(x > \mu - 1.5\sigma)$

$= P\left(Z > \frac{\mu - 1.5\sigma - \mu}{\sigma}\right)$

$= P(Z > -1.5)$

$= P(-1.5 < Z < 0) + 0.5$



$= 0.5 + 0.4332$

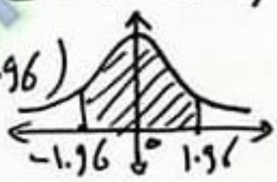
$= \boxed{0.9332}$

ii) $P(\mu - 1.96\sigma < x < \mu + 1.96\sigma)$

$= P\left(\frac{\mu - 1.96\sigma - \mu}{\sigma} < Z < \frac{\mu + 1.96\sigma - \mu}{\sigma}\right)$

$= P(-1.96 < Z < 1.96)$

$= 2P(0 \le Z \le 1.96)$



$= 2 \times 0.4750$

$= \boxed{0.9500}$

7)

x	R(x)	y	R(y)	D	D^2
600	7	30	1	6	36
1500	3.5	24	3.5	0	0
1400	5	24	3.5	1.5	2.25
700	6	25	2	4	16
2000	2	20	6.5	-4.5	20.25
2500	1	20	6.5	-5.5	30.25
1500	3.5	23	5	-1.5	2.25
					107

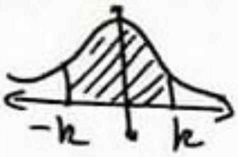
$r = 1 - \frac{6(107)}{7(49-1)}$

$= \boxed{-0.91}$ Inverse Corr.

9

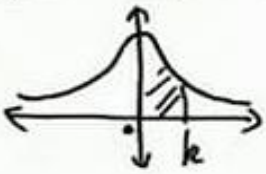
$P(-k \le Z \le k) = 0.8664$

$2P(0 \le Z \le k) = 0.8664$



$P(0 \le Z \le k) = 0.4332$

$\therefore k = 1.5$



8

$P(B|A) = 0.8$

$\frac{P(A \cap B)}{P(A)} = 0.8$

$\frac{P(A \cap B)}{0.45} = 0.8$

$P(A \cap B) = \boxed{0.36}$

$\therefore P(A|B) = \frac{P(A \cap B)}{P(B)}$

$= \frac{0.36}{0.6}$

$= \boxed{0.6}$

9

10

b)

$Z = \frac{X - \mu}{\sigma}$

$= \frac{80 - 75}{5}$

$= 1$

11

$0.4 + a + 0.1 + 0.1 + 0.1 = 1$

$\boxed{a = 0.3}$

x_i	$f(x_i)$	$x_i \cdot f(x_i)$	$x_i^2 \cdot f(x_i)$
0	0.4	0	0
1	0.3	0.3	0.3
2	0.1	0.2	0.4
3	0.1	0.3	0.9
4	0.1	0.4	1.6
		1.2	3.2

$\mu = 1.2$

$\sigma^2 = \sum x_i^2 \cdot f(x_i) - \mu^2$

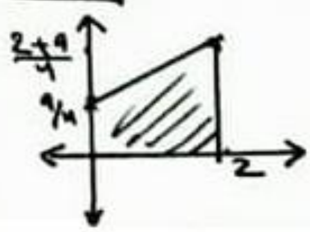
$= 3.2 - (1.2)^2$

$= \boxed{1.76}$

$\sigma = \boxed{1.33}$

12

x	0	2
y	$a/4$	$\frac{2+a}{4}$



$P(0 \le x \le 2) = 1$

$\frac{1}{2}\left(\frac{a}{4} + \frac{2+a}{4}\right) \times 2 = 1$

$\frac{2a+2}{4} = 1$

$2a + 2 = 4$

$2a = 2$

$\boxed{a = 1}$

$f(x) = \begin{cases} \frac{1}{4}(x+1), & 0 \le x \le 2 \\ 0 & \text{other.} \end{cases}$

x	1/2	3/2
y	3/8	5/8

$P\left(\frac{1}{2} \le x \le \frac{3}{2}\right)$

$= \left(\frac{3}{8} + \frac{5}{8}\right) \times \frac{1}{2} \times 1$

$= \boxed{\frac{1}{2}}$

13

$r = \frac{n\sum xy - (\sum x)(\sum y)}{\sqrt{n\sum x^2 - (\sum x)^2}\sqrt{n\sum y^2 - (\sum y)^2}}$

$r = \frac{8(364) - (56)(40)}{\sqrt{8(524) - (56)^2}\sqrt{8(256) - (40)^2}}$

$\boxed{r = 0.98}$

Direct

$b = \frac{n\sum xy - (\sum x)(\sum y)}{n\sum x^2 - (\sum x)^2}$

$= \frac{8(364) - 56 \times 40}{8 \times 524 - (56)^2}$

$= \boxed{\frac{7}{11}}$

$a = \frac{\sum y - b\sum x}{n}$

$= \frac{40 - \left(\frac{7}{11}\right)(56)}{8}$

$= \frac{6}{11}$

$\boxed{y = \frac{6}{11} + \frac{7}{11}x}$

Good luck

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