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First Exam Math 131 Fall 13-14

20 Excellent

Name [redacted] Student Number 0126965 Section (L) Serial number 42

(Q1) Given the following table

Class	Frequency	X	X·F	C.F	upper
3-5	5	4	20	5	5.5
6-8	2	7	14	7	8.5
9-11	2	10	20	9	11.5
12-14	1	13	13	10	14.5
	10		67		

(a) Find the mode
A) 13 B)7 C)4 D)2

(b) Find the mean
A)6.5 B)6.7 C)9.7 D)7.6

$\bar{X} = \frac{\Sigma X \cdot f}{n} = \frac{67}{10} = 6.7$

(c) What is the percentage of observations that are greater than 5.5 and smaller than 11.5
A)40% B)30% C)70% D)90%

0.475 0.095 0.375 = 40%

(Q2) Consider the following information about a sample

Median=6	Standard Deviation=2	First Quartile=5	Third Quartile=7

Assume that all values of X are transformed to $Y = 4 - 2X$, find

(a) The standard deviation of Y
A)2 B)4 C)6 D)3

$S^2_{(Y)} = a^2 \cdot S^2_X = (-2)^2 \cdot (4) = 16 = \sqrt{16} = 4$

(b) The first quartile of Y
A) − 10 B) − 2 C)0 D) − 6

$Q_{1(Y)} = 4 - 2\,Q_{3(X)} = 4 - 2(7) = 4 - 14$

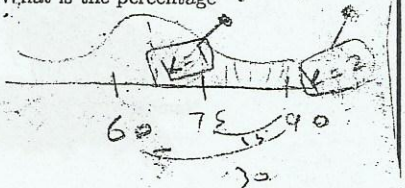
(Q3) Let A and B be two events in the same sample space such that $P(A) = 0.3$, $P(B) = 0.4$, A and B are independent Find $P(\bar{A} \cup \bar{B})$?
A)0.92 B)0.8 C)1.0 D)0.88

	A	$\bar{A}$	
B	0.12	0.28	0.4
$\bar{B}$	0.18	0.42	0.6
	0.3	0.7	

$P(\bar{A} \cup \bar{B}) = P(\bar{A}) + P(\bar{B}) - P(\bar{A} \cap \bar{B})$
$= 0.7 + 0.6 - 0.42$
$= 0.88$

(Q4) A bell shaped sample data has mean $\bar{X} = 60$ and standard deviation $S = 15$. What is the percentage of observations in this sample data that are between 75 and 90.

A)13.5% B)15.5% C)2% D)2.5%



(Q5) Consider a collection of observations (measured to the nearest integer) with minimum observation= 9 and maximum observation 67. If we wish to organizd these observations using frequency table of 8 classes of equal width (length). Find the the width of each class.

A)10 B)9 C)8 D)7

$k = 8$

$w = \frac{67-9}{8} = \frac{\max - \min}{k}$

$7.25 \uparrow := 8$

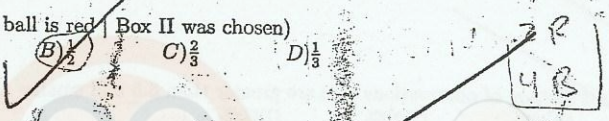
(Q6) Given the following information:

Box I: contains 2 Red and 4 Black balls.
Box II: contains 3 Red and 3 Black balls.

One box is chosen randomly with probability (1/2) and then one ball is drawn. Find

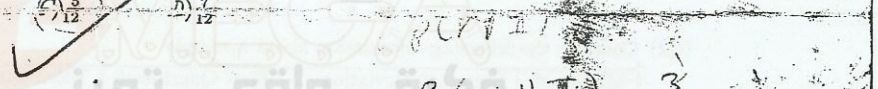
(a) P(drawn ball is red | Box II was chosen)

A)$\frac{3}{4}$ B)$\frac{1}{2}$ C)$\frac{2}{3}$ D)$\frac{1}{3}$



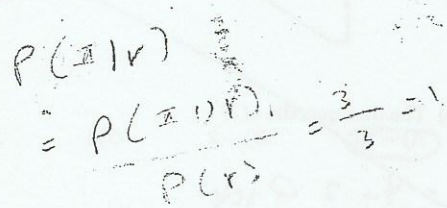
(b) P(drawn ball is red)

A)$\frac{1}{2}$ B)$\frac{1}{12}$ C)$\frac{5}{12}$ D)$\frac{7}{12}$



(c) P(Box II is drawn | ball drawn is red)

A)$\frac{4}{7}$ B)$\frac{3}{5}$ C)$\frac{1}{3}$ D)1



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THE UNIVERSITY OF JORDAN

0301131 Principles of Statistics 2nd test Dec. 7, 2013

Name: [redacted] Number: [redacted] Serial No.

Instructor's name: اسامة علقم Section (day and time): 1:00 – 12:00

Mark with an × the symbol that represents the correct answer.

Q1	Q2	Q3	Q4	Q5 i	Q5 ii	Q5 iii	Q6 i	Q6 ii	Q6 iii	Q6 iv	Q7	Q8	Q9 i	Q9 ii
a	a	a	a	a	a	a	a	a	a	a	a	a	a	a
b	b	b	b	b	b	b	b	b	b	b	b	b	b	b
c	c	c	c	c	c	c	c	c	c	c	c	c	c	c
d	d	d	d	d	d	d	d	d	d	d	d	d	d	d

Q1) Let X have a Poisson distribution with variance 4. Then, $E(X^2)$ equals

a) 30 b) 6 c) 12 d) 20

Q2) Suppose that 20% of all Jordanian adults are smokers. Let X be the number of smokers in a randomly selected sample of 10 Jordanian adults. Then, $P(X < 5)$ equals

a) 0.850 b) 0.967 c) 0.953 d) 0.994

Q3) Let $X \sim Binomial(10, p)$. If $E(X) = 4$, then $Var(X)$ equals

a) 2.4 b) 1.6 c) 2.5 d) 2.1

Q4) The probability of success of each trial of a binomial experiment is 0.2. If this binomial experiment is repeated so many times, then the probability that the first success occurs at the third trial equals

a) 0.096 b) 0.147 c) 0.128 d) 0.144

Q5) Consider the following bivariate distribution

X \ Y	0	1	Total x
−1	0.30	0.10	0.40
0	0.10	0.20	0.30
1	0.10	0.20	0.30
	0.50	0.50	1

i) $E(XY)$ equals

a) 0 b) 0.05 c) − 0.20 d) 0.10

ii) $P(X^2 + Y^2 = 1)$ equals

a) 0.55 b) 0.60 c) 0.30 d) 0.40

iii) $Var(Y)$ equals

a) 0.16 b) 0.24 c) 0.25 d) 0.21

Q6) The grades of a Math. test are normally distributed with mean 55 and variance 100.

i) the proportion of Math. Grades that are greater than 75 equals

a) 0.0228 b) 0.0062 c) 0.1587 d) 0.0668

ii) the 90^{th} percentile P_{90} of the grades equals

a) 77.8 b) 82.8 c) 72.8 d) 67.8

iii) If 50% of the grades are between 45 and a, then the proportion of grades that are greater than a equals

a) 0.4332 b) 0.3413 c) 0.1915 d) 0.4772

iv) Let $\bar{X}$ be the mean of a sample with size 35 randomly selected from Math. grades, then the distribution of $\bar{X}$ is

a) $N(65, 25/9)$ b) $N(70, 5/2)$ c) $N(60, 25/9)$ d) $N(55, 20/7)$

Q7) Let X and Y be random variables such that $Var(X) = Var(Y) = 4$ and $Cov(X, 3Y) = 6$, then $Corr(X, Y)$ equals

a) 0.60 b) 0.75 c) 0.50 d) 0.80

Q8) If X and Y are independent random variables such that $Var(X) = Var(Y) = 5$, then $Var(X - 3Y)$ equals

a) 50 b) 30 c) 40 d) 25

Q9) Let $X \sim Binomial(60, 0.20)$. We wish to use normal approximation to this binomial distribution.

i) The normal distribution that we use to approximate this binomial distribution is

a) $N(12, 9.6)$ b) $N(18, 12.6)$ c) $N(24, 14.4)$ d) $N(15, 10.5)$

ii) $P(16 \leq X < 23)$ is approximated by the following normal distribution probability

a) $P(15.5 < X < 22.5)$ b) $P(16.5 < X < 22.5)$ c) $P(15.5 < X < 20.5)$ d) $P(15.5 < X < 21.5)$

$P(16 \leq X < 23)$

15.5, 16.5

$P(22.5$

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THE UNIVERSITY OF JORDAN Department of Mathematics 103131 First Test

Name (in Arabic): [redacted] Number: [redacted]

Instructor's name: Class time:

Part A: fill in the blanks with answers only. Each question is worth 2 marks.

Q1) Consider the following grouped sample data :

Class	2 to 4	5 to 7	8 to10	11 to 13
Cumulative Frequency	3	13	17	20

3 10 4 3

The proportion of observations that are greater than 7 equals 7/20

Q2) The variance of the sample data 0,1,1,3,5 equals 4

Q3) The mean of a sample data of 180 observations is 60 and the standard deviation is 5. An interval that contains at least 160 of these observations is (49, 71)

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Q4) The mean of 10 observations is 40. The mean of these observations after changing an observation from 20 to 10 is 39

Q5) Let A, B be two mutually exclusive (disjoint) events such that $P(B) = 0.1$. Then $P(\bar{A}|B)$ equals 1

Q6) Let A, B be two independent events such that $P(A) = P(B) = 0.3$. Then $P(A \cup \bar{B})$ equals 0.79

Q7) A box contains 5 red and 2 white balls. **Three** balls are drawn **without replacement** from this box. The probability that all drawn balls are red equals 0.28

Q8) Let $Y = 2 - 3X$. If the interquartile range (IQR) of Y equals 30 and Q_1 of X equals 25, then Q_3 of X equals 35

Q9) A box contains **seven** balls with different colors. **Three** balls are drawn from this box **with replacement**. The probability that the drawn balls have different colors equals 1.63

Q10) The 80th percentile P_{80} for the following sample equals 8.5

x	6	7	8	9
Frequency	5	8	7	5

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Part B: Write down the steps of your work.

Q11) Consider the following grouped sample data.

Class	4 to 8	9 to 13	14 to 18	19 to 23
Frequency	2	3	5	2

a) (2 marks) Find the mean of this sample data

(x_i) mid point	f_i	$x_i f_i$
6	2	12
11	3	33
16	5	80
21	2	42
Total	12	167

$$\text{mean} = \frac{\sum x_i f_i}{\sum f_i} = \frac{167}{12} = 13.9$$

b) (3 marks) Find the third quartile Q_3 of this sample data.

$Q_3 = P_{75}$

$p = 75 \times 100 = .75$

$n \times p = 0.75 \times 12 = 9$

Upper	Cumulative frequency
8.5	2
13.5	5
P_{75}	9
18.5	10
23.5	12

$$\Rightarrow \frac{P_{75} - 13.5}{18.5 - 13.5} = \frac{9-5}{10-5}$$

$$P_{75} = 17.5$$

THE UNIVERSITY OF JORDAN — Department of Mathematics — 103131 First Test

Name (in Arabic): ..... Number: .....

Instructor's name: ..... Class days and time: .....

Part A: fill in the blanks with answers only. Each question is worth 2 marks.

Q1) Consider the following grouped sample data of 10 observations:

Class	2 to 4	5 to 7	8 to10	11 to 13
Frequency	4	3	2	1

a) the mean of this sample data equals $= \frac{\sum xf}{n} = \frac{60}{10} = 6$

b) if one observation is selected from this sample and found to be greater than or equal to 5, then the probability that it is in the 3rd class (8 to 10) equals $\frac{2}{6} = \frac{1}{3}$

c) the proportion of observations that are less than or equal to 9 equals 0.9

Q2) Three numbers are randomly selected from the numbers 1,2,3,4,5,6,7,8,9 without replacement. The probability that two numbers of them are odd equals 0.0333

Q3) A sample data contains 10 observations and has mean $\bar{X} = 4$. The observation 10 in the sample is changed to 5. The mean of the new sample equals 3.5

Q4) Consider the following sample data of 24 observations

x	1	2	3	4	5	6	7	8
Frequency	5	5	5	3	2	2	1	1

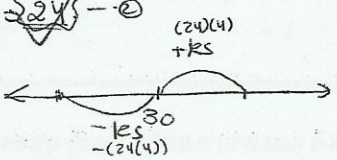
The third quartile Q_3 of this sample data equals 4.5

Part B: Write down every step of your work. Each question is worth 4 marks.

Q6) A sample data has mean $\bar{X} = 30$ and standard deviation $S_x = 12$. Each observation X in this sample is multiplied by -2 to produce a new sample. Find an interval that contains at least $\frac{15}{16}$ of the observations in the new sample.

$y = -2x$ ...①

$* S_y = |-2| S_x = 2(12) = 24$ ...②



$* \frac{15}{16} = 1 - \frac{1}{k^2} \Rightarrow \frac{1}{k^2} = 1 - \frac{15}{16} \Rightarrow \frac{1}{k^2} = \frac{16-15}{16} \Rightarrow k^2 = 16 \Rightarrow k = 4$ ...③

$* ks = (24)(4) = 96$

$* By ② and ③ the interval is$

$(30 - (24)(4), 30 + (24)(4))$

$= (-66, 126)$

$= C$

$\bar{y} = -2 \times \bar{x}$

$= -2 \times 30$

$= -120$

-60

Q7) Let A, B be events. Suppose that $P(A|B) = 0.2$, $P(A \cup B) = 0.6$ and $P(\bar{B}) = 0.5$. Find $P(A)$.

① $P(A|B) = \frac{P(A \cap B)}{P(B)} \Rightarrow 0.2 = \frac{P(A \cap B)}{0.5} \Rightarrow \boxed{P(A \cap B) = 0.1}$

$P(\bar{B}) = 1 - P(B)$

$0.5 = 1 - P(B)$

$\boxed{P(B) = 0.5}$

② $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$0.6 = P(A) + 0.5 - 0.1$

$0.6 - 0.5 + 0.1 = P(A)$

$\Rightarrow P(A) = 0.2$

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THE UNIVERSITY OF JORDAN Department of Mathematics 103131 2nd Test

Name (in Arabic): [redacted] Number: [redacted]

Instructor's name: Class time: 11:20 - 12:20

Part A: fill in the blanks with answers only. Each question is worth 2 marks.

Q1) Consider the following bivariate distribution

X \ Y	0	2
−2	0.20	0.20
−1	0.20	0.10
0	a	0.15

, then

a) $a =$ .15

b) $E(X) =$ -0.1

c) $P(X + Y > 0) =$ .25

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Q2) If $Cov(1 + 2x, 2 + 3y) = 120$, then $Cov(X, Y)$ equals 20

Q3) Let $Z \sim N(0,1)$. If $P(-1 < Z < c) = 0.7745$, then $c =$ 1.50

Q4) The weights of newborns are normally distributed with mean 4.5 kg and standard deviation 1 kg. Then,

a) the proportion of newborns that have weights more than 4 kg equals .6915

b) the 95th percentile P_{95} of the weights of newborns equals 6.15

Q5) A sample with size 100 is randomly selected from a population with mean $\mu = 30$ and variance $\sigma^2 = 400$. Let $\bar{X}$ denote the mean of this sample. Then, $P(29 < \bar{X} < 32)$ equals .2359

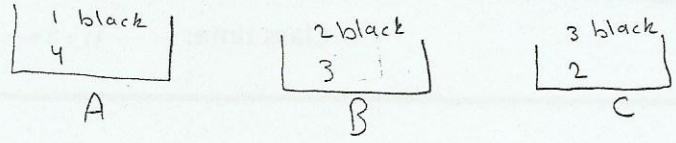
Q6) If a fair coin is tossed 10 times, then the probability of having at most 5 heads equals .623.

Q7) Let $X \sim Poisson(4)$. Then, $E(2X^2 + 5) =$ 45

Part B: Write down the steps of your work.

Q8) (5 marks) One box from three boxes A, B and C is randomly selected then a ball from this box is drawn at random. **Each box contains 5 balls**, with **1 black** ball **in box A**, **2 black** balls **in box B** and **3 black** balls **in box C**. The probability of selecting **box A is 0.2**, **box B is 0.3** and **box C is 0.5**.

a) Find the probability that the drawn ball is black.



$P(A) = .2$
$P(B) = .3$
$P(C) = .5$

$P(\text{black}) = P(\text{black}/A)P(A) + P(\text{black}/B)P(B) + P(\text{black}/C)P(C)$

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

$= 0.04 + 0.12 + .3$

$= 0.46$

(5)

b) If the drawn ball is black, find the probability this ball was drawn from box A.

$P(A/\text{black}) = \frac{P(\text{black}/A)\,P(A)}{P(\text{black})}$

$= \frac{0.04}{0.46}$

$= 0.08$

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THE UNIVERSITY OF JORDAN Department of Mathematics 103131 2nd Test

Name (in Arabic): [redacted] Number: [redacted]

Instructor's name: د. [redacted] Class time: 11 - 12

Part A: fill in the blanks with answers only. Each question is worth 2 marks.

Q1) Consider the following bivariate distribution

X \ Y	0	2	
−2	0.10	0.10	0.2
−1	0.30	0.20	0.5
0	a	0.25	
	0.45	0.55	

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, then

a) $a =$ 0.05

b) $E(X) = (-2)(0.2)+(-1)(0.5) = -0.4-0.5 =$ -0.9

c) $P(X+Y>0) =$ 0.20 + 0.25 = 0.45

Q2) If $Cov(1+2x, 2+3y) = 180$, then $Cov(X,Y)$ equals $\frac{180}{6} =$ 30

Q3) Let $Z \sim N(0,1)$. If $P(-1 < Z < c) = 0.8186$, then $c =$ 0.9773

Q4) The weights of newborns are normally distributed with mean 5 kg and standard deviation 1 kg. Then,

a) the proportion of newborns that have weights more than 4 kg equals 0.8413

b) the 95th percentile P_{95} of the weights of newborns equals 6.65

Q5) A sample with size 100 is randomly selected from a population with mean $\mu = 30$ and variance $\sigma^2 = 400$. Let $\bar{X}$ denote the mean of this sample. Then, $P(29 < \bar{X} < 33)$ equals 0.6247

Q6) If a fair coin is tossed 10 times, then the probability of having at most 6 heads equals 1.00

$n=10$

$p = \frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}$

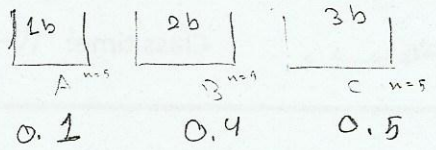
Q7) Let $X \sim Poisson(3)$. Then, $E(2X^2+5) =$ 29

μ

Part B: Write down the steps of your work.

Q8) (5 marks) One box from three boxes A, B and C is randomly selected then a ball from this box is drawn at random. **Each box contains 5 balls**, with **1 black** ball **in box A**, **2 black** balls **in box B** and **3 black** balls **in box C**. The probability of selecting **box A is 0.1**, **box B is 0.4** and **box C is 0.5**.

a) Find the probability that the drawn ball is black.



$$P(\text{black}) = P(\text{black}/A)P(A) + P(\text{black}/B)P(B) + P(\text{black}/C)P(C)$$

$$= \left(\frac{1}{5}\right)(0.1) + \left(\frac{2}{5}\right)(0.4) + \left(\frac{3}{5}\right)(0.5)$$

$$.02 + 0.16 + 0.3$$

$$= 0.48$$

5

b) If the drawn ball is black, find the probability this ball was drawn from box A.

$$P(A/\text{black}) = \frac{P(\text{black}/A)P(A)}{P(\text{black})} = \frac{(0.2)(0.1)}{0.48} = \frac{0.02}{0.48} = 0.0416$$

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THE UNIVERSITY OF **JORDAN** Department of Mathematics 103131 Second Test

Name (in Arabic): .... Number: 20 (Seat number)

Instructor's name: د. أمل حلو Class days and time: 9:30-11

Part A: fill in the blanks with answers only. Each question is worth 2 marks.

Q1) Consider the following bivariate distribution

X \ Y	0	1	2
1	0.1	0.3	0.1
2	0.2	0.2	0.1

a) P(X+Y=2) equals $= P(x=1, y=1) + P(x=2, y=0) = 0.3 + 0.2 = 0.5$

b) E(XY) equals $= 0(1)(0.1) + (1)(1)(0.3) + (1)(2)(0.1) + (2)(0)(0.2) + (2)(1)(0.2) + (2)(2)(0.1)$ $= 1.3$

Q2) Consider the following distribution

X	1	2
P(X)	c	d

$c + d = 1$ — ①

$\frac{4}{3} = c + 2d$ — ②

$\frac{4}{3} = c + 2d$, $-1 = -c - d$, $\frac{1}{3} = d$

If E(X) = 4/3, then P(X=2) equals $= \frac{1}{3}$

Q3) Let X, Y be random variables such that Corr(X,Y)=0.5, Var(X)=9, Var(Y)=4. Then Cov(1-2X,Y+1) equals $= Cov(-2x, y) = (-2)(1)\, Cov(x, y) = -2 \times -6 = 12$

Q4) The number of customers arriving in a fast-food restaurant is distributed according to a Poisson distribution with mean 2 customers every 3 minutes.

a) The variance of the number of customers arriving in this restaurant in a 6 minute period equals 4

b) The probability that at most 4 customers arrive in a 6 minute period is 0.629

Q5) A box contains 8 white and 2 black balls. One ball is drawn from this box with replacement 10 times. The probability that a black ball shows up at most 3 times equals $= 0.879$

Q6) Let X be the number of trials of a binomial experiment until the first success. If the probability of success in each trial is 0.3, then E(3X-1) equals $= 9$

Q7) Let X~N(40, 100). Then the 90th percentile P_{90} of X is $= 52.8$

Q8) The time students need to finish a particular test has the normal distribution with mean 60 minutes and standard deviation 10 minutes. The proportion of students who will need less than 75 minutes to finish the test equals 0.9332

Part B: Write down every step of your work. Each question is worth 5 marks.

Q9) Let X~B(100,0.5). Use normal approximation to approximate P(45<X≤ 60).

$x \sim B(100, 0.5)$

1. $n = 100$, $p = 0.5$

$\mu = np = 100 * 0.5 = 50$

$\sigma_x^2 = npq = 50 * 0.5 = 25$.

$\Rightarrow \sigma_x = 5$

2. $P(45 < x \leq 60) = P(46 \leq x \leq 60)$

$= P(45.5 \leq x \leq 60.5)$

$= P\left(\frac{45.5-50}{5} \leq \frac{x-\mu}{\sigma} \leq \frac{60.5-50}{5}\right)$

$= P(-0.9 < z < 2.1)$

$= F(2.1) - F(-0.9)$

$= 0.9821 - 0.1841$

$= 0.798$

+5

Q10) In a school, 60% of the students are females. 80% of the females and 30% of the males are IT students. Find the proportion of males within all IT students in this school.

$P(f) = 0.6$

$P(IT|f) = 0.8$

$P(m) = ??$

$P(IT|m) = 0.3$

$P(IT|f) = 0.8$

$P(all|f) = 0.2$

$P(f) = 0.6$

$P(IT|m) = 0.3$

$P(all|m) = 0.7$

$P(m) = ??$

all → all Student in the school within IT

$P(IT) = P(IT|f)P(f) + P(IT|m)P(m)$

$1 - P(all) = (0.8)(0.6) + 0.3\,P(m)$

$1 - [P(all|f)P(f) + P(all|m)P(m)] = 0.48 + 0.3P(m)$.

$1 - [(0.2 * 0.6) + (0.7)P(m)] = 0.48 + 0.3\,P(m)$

$1 - 0.12 - 0.7\,P(m) = 0.48 + 0.3\,P(m)$

$0.88 - 0.48 = P(m)$

$0.4 = P(m)$

$\Rightarrow P(m) = 40\%$

الجواب الصح 0.6 — Bayes's Rule.