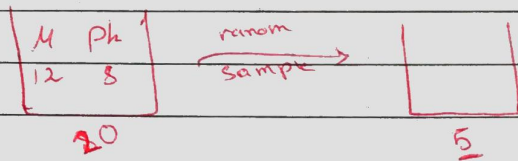


Test bank

Q: A class consists of 12^{math} students and 8 physics students if a random sample of 5 students is chosen from this class then the probability of getting exactly 3 math students is:

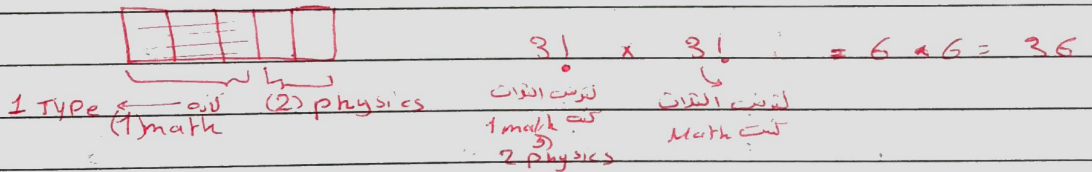
- a) $\frac{21^3 8^2}{20^5}$ b) $\frac{12(11)(10)(8)(7)}{(20)(19)(18)(17)(16)}$ c) $\frac{\binom{12}{5}}{\binom{20}{5}}$ d) $\frac{\binom{12}{3} \binom{8}{2}}{\binom{20}{5}}$



prob. $P(3M) = P(3M, 2Ph) = \frac{\binom{12}{3} \binom{8}{2}}{\binom{20}{5}} \dots \rightarrow \text{d}$

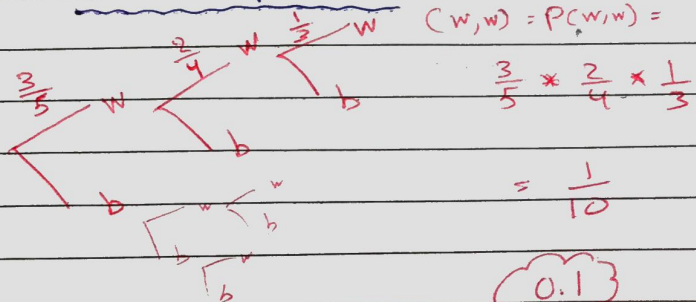
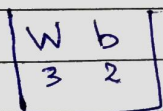
Q₂ The number of ways for arranging 5 books (2 math and 2 physics) on a shelf such that all math books are beside each other:

a) 36 b) 144 c) 98 d) 12 e) 72

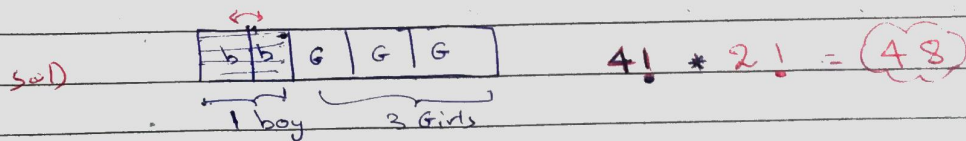


Q₃

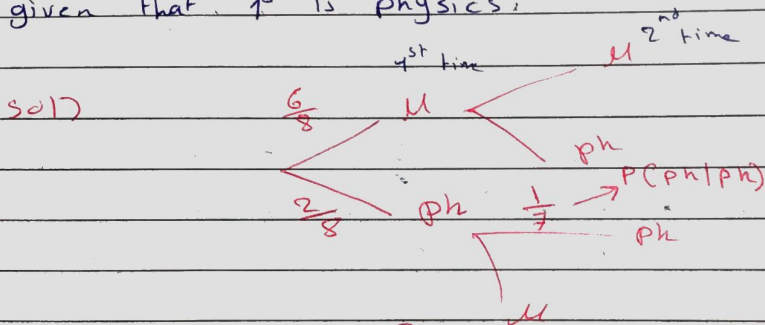
If a box contains five balls three of them white and two are black, what's the probability of drawing three white balls without replacement:



Q4: The number of ways 2 boys and 3 girls can stand on a line such that all boys are next each other.

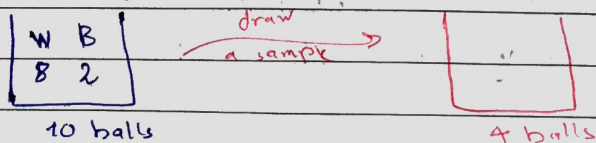


Q5: a class contains 8 students, 6 are math and two are physics. If we choose two students from this class, then the probability that the 2nd is physics given that 1st is physics.



$$P(ph | ph) = \frac{1}{7}$$

Q6: a box contains 10 balls, 8 are white and two are black. If we draw 4 balls together, the probability of getting 3 white is: سؤال 8 في 10



$$P(3W, 1B)$$

$$\frac{\binom{8}{3} \binom{2}{1}}{\binom{10}{4}}$$

الجواب 6

Q7: a group of four friends with different ages, what is the probability that they will have different birthdays. (If the year is 365 days):

- a) 0.5 b) 0.358 **c) 0.983** d) 0.11

$$\frac{365 \times 364 \times 363 \times 362}{(365)^4} = \frac{{}^3 P_4}{(365)^4} = 0.9836$$

Q8: The number of ways we can perform 3-digit

سؤال: **even** number using (1, 2, 3, 4, 5, 6) is (no restriction):

- a) 60 b) 125 c) 50 d) 40 e) 45

--- even

Q9: The number of ways of selecting 2 red and 2 white balls out of box contain 5 red and 4 white ball is:

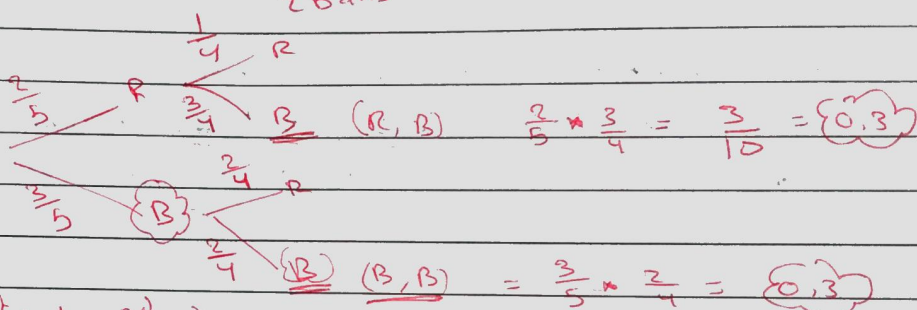
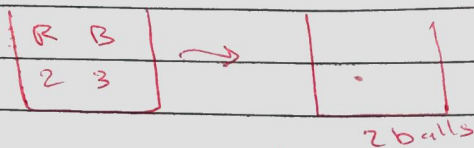
$$\begin{array}{|c|c|} \hline R & W \\ \hline 5 & 4 \\ \hline \end{array} \xrightarrow{\text{selecting}} \begin{array}{|c|c|} \hline R & W \\ \hline 3 & 2 \\ \hline \end{array} = \binom{5}{3} * \binom{4}{2}$$

$${}^5 C_2 * {}^4 C_2 = \boxed{60}$$

Q10: If 4 students are selected, then how many ways can we have exactly 2 smokers?

$$\binom{4}{2} = {}^4 C_2 = 6 \text{ ways}$$

Q₁₁: A box contains 2 red and 3 black distinct balls. Two balls are randomly selected from this box without replacement. If the second ball is black, then the probability that the first ball was black is ?



$$P(1^{st} B | 2^{nd} B) =$$

$$= \frac{P(B, B \rightarrow \text{دعوى})}{P(B \rightarrow \text{دعوى})} = \frac{0.3}{0.3 + 0.3} = \frac{1}{2} = 0.5$$

$$P(1^{st} B | 2^{nd} B) = \frac{P(B \cap B)}{P(B)} = \frac{1}{2}$$

Q₁₂: A class contains of 5 students, in how many ways can we register their birthdays if three of them have the same birthday:

- A) $365 * 364 * 363 * 362 * 20$ B) $365 * 364 * 363 * 100$
 C) $5 * 8$ D) $3 * 4 * 4$ E) $365 * 364 * 363 * 10$

$$\frac{365 * 1 * 1 * 364 * 363 * \binom{5}{3}}$$

$$\binom{5}{3} = 10$$

(E) is Answer

Q13: A class consists of 8 males and 12 females, where 5 males and 8 females passed the exam. If a student is selected randomly from the class, then the probability that this student passed the exam is:

- A) 0.6 B) 0.55 C) 0.75 D) 0.7 E) 0.65

M	F
8	12
5P	8P

$n = 20$

P	P'
5+8	4+3
13	7

$n = 20$

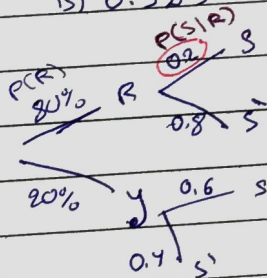
selected student (13) = 13
Gender = 7

الحاج :- $Prob(\text{Pass}) = \frac{\binom{13}{1} \times \binom{7}{0}}{\binom{20}{1}}$

Calculator result :- $\frac{13C1 \times 7C0}{20C1} = \frac{13}{20} = 0.65$

Q14: We want to plant a bag that contains 80% red seeds and 20% yellow seeds, the probability of success for red seeds is 0.2 and for yellow is 0.6, then the probability that they will success if they are red =

- A) 0.2 B) 0.523 C) 0.45 D) 1 E) 0.98



$P(S|R) = 0.2$ ✓

Q15: How many 3-digit even number can we form using {1, 2, 3, 4, 5} if repetition is not allowed?

- A) 60 B) 125 C) 50 D) 40 E) 24

$4 * 3 * 2 = 24$ (even 2, 4)

Q16: Three numbers are selected randomly from the number $\{1, 2, 3, 4, 5, 6\}$ without replacement. The probability that two of them is odd -

odd ev.
3 3

$$P(\text{odd, odd}) \rightarrow P(2\text{ odd}) = \frac{\binom{3}{2} \binom{3}{1}}{\binom{6}{3}} = \frac{3C2 * 3C1}{6C3} = \frac{9}{20} = 0.45$$

Q17: Three children wearing T-shirt numbered 1, 2 and 3 asked to sit on three chairs numbered 1, 2 and 3 at random. The probability that each T-shirt number matches the chair number is:

عدد طواف الخيوس: حروف 3 صفة
 (لكل صفة رقم واحد من نفس رقمه)
 $1 \times 1 \times 1 = 1$
 عدد طواف الخيوس: لكل صفة 3!
 $3 \times 2 \times 1 = 3!$
 عدد طواف الخيوس: الثلاثة اطفال من ثوبه كترسي
 $3 \leftarrow 2 \leftarrow 1$
 عدد طواف الخيوس: 3!
 $P = \frac{1}{6} = \frac{1}{3!}$

Q18: A box contains 11 balls numbered from 1-11. If three balls are chosen with replacement, then the probability that the three balls are different numbered is:

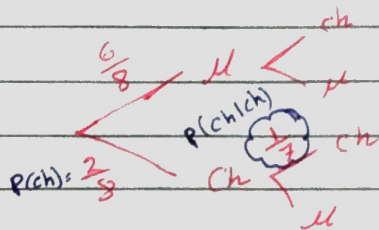
- (A) 0.744 (B) 0.325 (C) 0.425 (D) 0.480 (E) 0.556

كلان وصفه 9 من 1 الى 11 نفس صفة
 حجم الترتيب عليه 6 ارقام
 $n \Omega = 11^k$
 وعدد مرات الترتيب 3
 $n \Omega = 11^3$

$$\frac{11 \times 10 \times 9}{(11)^3} = \frac{90}{121} = 0.7438 \approx 0.744$$

Q19: A class consists of 8 students, 6 are math students and 2 are chemistry, if we choose two students from this class then the probability that the second is chemistry given that the first is chemistry:

- A) 0.88 B) 0.78 C) 0.143 D) 6/7 E) 1/28



$$P(\text{ch}|\text{ch}) = \frac{1}{7} = 0.1428$$

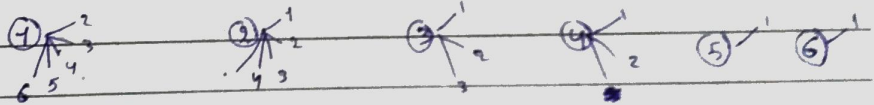
R 0.143

Q20: Method of counting outcomes in which number of outcomes determined without taking care of arrangement order is: A) permutation B) factorial C) combination D) A+B E) None of the above

Q21: Rolling a die two times, the probability of getting a product less than 10 is:

(Skip the last)

Soln:



$$n \Omega = 6^2 = 36$$

$$\frac{17}{36} = 0.4722$$

Q22: Three numbers are randomly selected from the numbers {1, 2, 3, 4, 5, 6, 7, 8} without replacement, the probability that they are odd:

odd	even
4	4

$$\frac{\binom{4}{3} \binom{4}{0}}{\binom{8}{3}}$$

$$= \frac{{}^4P_3 \cdot {}^4C_0}{{}^8C_3} = \frac{4}{56}$$

$$= \frac{1}{14}$$

Q23: ~~34~~ There are 8 students in the class, what is the probability that no two of them have the same birthday?

$$365 \times 364 \times 363 \times 362 \times 361 \times 360 \times 359 \times 358$$

$$(365)^8$$

$$= 0.9256 \approx 0.926$$



Q24: Arwa, Ala'a, Alaram and 7 other friends are lining up for a picture. How many ways can all of them line up to take the picture if Arwa has to be directly between Ala'a and Alaram?

Sol) Ala'a, Arwa, Alaram

①

⑦

2!

Arwa

$$8! \times 2! = 80640$$

Q25: In a class of 5 students, the probability that no two students in the class have the same birthday is:

A) 0.973

B) 0.983

C) 0.88

D) 0.68

E) 0.1

$$\frac{{}^365P_5}{n \cdot 2} = \frac{365 \times 364 \times 363 \times 362 \times 361}{(365)^5} = \frac{{}^365P_5}{(365)^5}$$

$$\approx 0.97286 \approx 0.973$$

Q26: In how many ways we can make a 4-digit number from the set $\{0, 1, 2, 3, 4, 5\}$ if repetition isn't allowed:

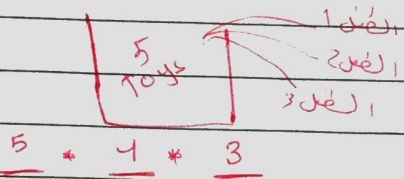
cannot be 0

$$5 \times 5 \times 4 \times 3$$

$$= 300 \text{ ways}$$

Q27) In how many ways can 3 children select toys, one toy for each child, from a box that contains 5 different toys?

- A) 10 ways **B) 60 ways** C) 6 way D) 120 ways E) 3 ways



permutation not combination
 ${}^5P_3 = 60 \text{ ways}$

Q28) A coin is flipped, and a die is rolled. Find the probability of getting a head on the coin and 4 on the die?

- A) $1/24$ B) $5/12$ C) $9/12$ D) $5/12$ E) $1/12$

Multiplication Rule

$$P = P(4) * P(H) = \frac{1}{6} * \frac{1}{2} = \frac{1}{12}$$

Q29) A box contains 40 balls numbered from 1 to 40. Three balls are drawn from this box one at a time without replacement. The probability that the numbers on the first and on the third draws (trials) are the same equals?

- A) $1/100$ B) $1/10$ C) $1/9$ **D) 0** E) $1/1000$

Impossible $\Rightarrow P=0$

Q30) The following is the frequency table of the blood groups of a sample of 100 people. One person is randomly selected from this sample. Then the prob. that this person's blood group is A or O is: (Disjoint) $P(A \text{ or } O) = P(A \cup O)$

sol)

A	15
B	30
AB	50
O	5

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

$$= \frac{15}{100} + \frac{5}{100} = \frac{20}{100} = 0.2$$

Q31) Let A, B be two mutually exclusive (disjoint) events. If $P(A) = 0.4$ and $P(B) = 0.3$, then the probability that not A and not B will occur equals

A) 0.3 B) 0.4 C) 0.7 D) 0.5 E) 1

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

$$= 1 - (P(A) + P(B) - 0)$$

$$= 1 - (0.4 + 0.3) = 1 - 0.7 = 0.3$$

Q32) Let A, B and C be events such that $P(A) = 0.2$, $P(B) = 0.5$, $P(C) = 0.4$, $P(A \cup B) = 0.7$, $P(A \cup C) = 0.6$ and $P(B \cup C) = 0.7$, which of the events A, B, and C are independent?

- A) The events A and B and the events A only C only
 B) Any two of A, B, and C are independent.
 C) The events B and C only
 D) The events A and C only
 E) = = . A and B only.

$P(B \cap C) \Rightarrow P(A \cap C) \Rightarrow P(A \cap B)$ 0.15 0.5

$\Rightarrow P(A \cap B) \Rightarrow P(A \cup B) = P(A) + P(B) - P(A \cap B)$
 $0.7 = 0.2 + 0.5 - P(A \cap B)$
 $\Rightarrow P(A \cap B) = 0$ (disjoint)

$\Rightarrow P(A \cap C) \Rightarrow P(A \cup C) = P(A) + P(C) - P(A \cap C)$
 $0.6 = 0.2 + 0.4 - P(A \cap C)$
 $\Rightarrow P(A \cap C) = 0$

$\Rightarrow P(B \cap C) \Rightarrow P(B \cup C) = P(B) + P(C) - P(B \cap C)$
 $0.7 = 0.5 + 0.4 - P(B \cap C)$
 $\Rightarrow P(B \cap C) = 0.2$

Independent C & B $\Rightarrow P(B \cap C) = P(B) * P(C)$ 0.15

Q33) Let A and B be two events in a random experiment such that $P(A) = 0.7$, $P(A' \cup B') = 0.5$ and $P(B) = 0.4$, then $P(A|B') =$

- A) $\frac{1}{3}$ B) 0.5 C) 0.2 D) 0.7 E) None

$$* P(A|B') = \frac{P(A \cap B')}{P(B')} = \frac{P(A) - P(A \cap B)}{P(B')} = \frac{0.7 - 0.5}{0.4}$$

$$* P(A' \cup B') = P(A \cap B)' = 1 - P(A \cap B) = 0.5$$

$$P(A \cap B) = 0.5$$

$$\rightarrow P(A|B') = \frac{0.2}{0.4} = \frac{2}{4} = 0.5 \dots \text{Answer is } \boxed{B}$$

Q34) Let A, B be independent events. Assume that $P(A) = P(B) = 0.3$. Then $P(A \cup B)$ equals?

- A) 0.51 B) 0.60 C) 0.30 D) 0.39 E) 0.69

$$A, B \rightarrow \text{independent} \Rightarrow P(A \cap B) = P(A) * P(B)$$

$$P(A \cap B) = 0.3 * 0.3 = 0.09$$

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

$$0.3 + 0.3 - 0.09 = 0.51 \dots \boxed{A}$$

Q35) If A and B are independent events such that $P(A) = P(B)$, if $P(A \cap B) = 0.81$, then $P(A' \cap B)$

$$\text{Sol)} P(A' \cap B) = P(B) - P(A \cap B) = 0.9 - 0.81 = 0.09$$

$$\begin{aligned} \frac{P(A \cap B)}{P(A)P(B)} &= P(A) * P(B) = \sqrt{P(B)}^2 = \sqrt{0.81} \rightarrow P(B) = 0.9 \\ \rightarrow P(B) &= 0.9 \dots \text{Answer is } \boxed{C} \end{aligned}$$

Q 35) Let A & B be two independent events in a sample space of a random experiment if $P(B) = 0.4$ & $P(A \cap B) = 0.1$, then $P(A \cup B) =$
 A) 0.65 B) 0.4 C) 0.55 D) 0.7 E) 0.5

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

$$0.1 = P(A) * 0.4$$

$$\rightarrow P(A) = 0.25$$

$$\begin{aligned} \rightarrow P(A \cup B) &= P(A) + P(B) - P(A \cap B) \\ &= 0.25 + 0.4 - 0.1 \\ &= 0.55 \end{aligned}$$

Q 37) Let A & B be two independent events in the sample space such that $P(A) = 0.3$ & $P(B) = 0.4$ find $P(A' \cup B') =$

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

$$= 0.3 * 0.4 = 0.12$$

$$\begin{aligned} \rightarrow P(A' \cup B') &= P(A \cap B)' = 1 - P(A \cap B) \\ &= 1 - 0.12 \\ &= 0.88 \quad \dots \text{Answer D} \end{aligned}$$

Q 38) Let A & B be two independent events, if $P(A) = 0.1$ & $P(B) = 0.2$, then $P(A \cup B)' =$

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

$$0.1 * 0.2 = 0.02$$

$$P(A \cup B)' = 1 - P(A \cup B)$$

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

$$= 1 - (0.1 + 0.2 - 0.02) = 0.72$$

Q39: Let A & B be two events in a given sample space, $P(B) = 0.8$, $P(A \cup B) = 0.7$, $P(A' \cap B) = 0.5$. Then $P(A) =$

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

$$0.5 = 0.8 - P(A \cap B)$$

$$* P(A \cap B) = 0.3$$

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

$$0.7 = P(A) + 0.8 - 0.3$$

$$P(A) = \boxed{0.2}$$

Q40) If A & B are disjoint (mutually exclusive) events in a sample space, $P(B) = 0.3$, $P(A \cap B') = 0.4$, then $P(A \cup B) =$

$$P(A \cap B) = 0$$

$$\rightarrow P(A \cup B) = P(A) + P(B) - 0 = 0.4 + 0.3 = \boxed{0.7}$$

$$P(A) > P(B) \Rightarrow P(A \cap B') = P(A) - P(A \cap B)$$

$$\boxed{0.4 = P(A) - 0}$$

Q41) Suppose that $P(A) = 0.3$, $P(B|A') = 0.6$ & $P(B|A) = 0.4$, then $P(B) =$

$$\rightarrow P(B|A') = \frac{P(B \cap A')}{P(A')} = \frac{P(B) - P(A \cap B)}{1 - P(A)} = 0.6$$

$$P(A \cap B) > 0 \Rightarrow P(B|A) = \frac{P(A \cap B)}{P(A)} \rightarrow 0.4 = \frac{P(A \cap B)}{0.3}$$

$$\rightarrow P(A \cap B) = \frac{P(A \cap B)}{0.3} = 0.3 * 0.4 = 0.12$$

$$\rightarrow \frac{P(B) - (P(A) * 0.4)}{0.7} = 0.6 \rightarrow \cancel{P(B)} = \cancel{0.6} * (0.7)$$

$$P(B) = 0.7 + 0.12$$

$$0.42 + 0.12 = \boxed{0.54}$$

Q42: Let $\frac{(n+1)!}{(n-1)!} = 20$, then the value of n is:

- A) -5 & 4 B) -4 & 5 C) 4 only D) 5 only E) 0

$$\frac{(n+1)(n)(n-1)!}{(n-1)!} = 20$$

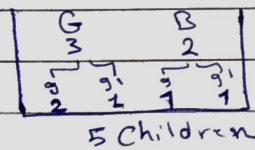
$$n(n+1) = 20$$

$$n = 4$$

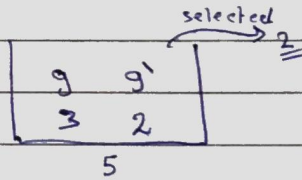
Q43: A family has 5 children's (3 Girls and 2 boys). Two of the girls and one boy wear glasses. The probability that two of them wearing glasses if two of them are selected is:

- A) 1 B) 5/3 C) 6/5 D) 0.30 E) 0

Sol)



⇒ Gender



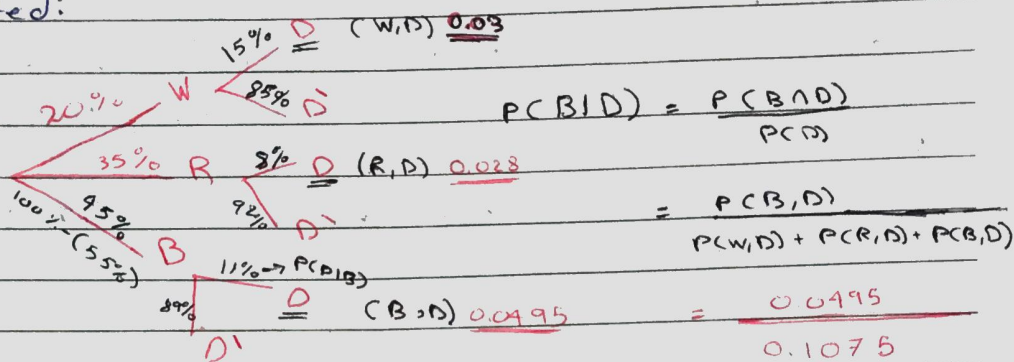
$$P(2g, 0g') = \frac{\binom{3}{2} \binom{2}{0}}{\binom{5}{2}} = \frac{3}{10} = 0.3$$

Q44: A businessman has 4 dress and 7 ties, the number of ways that he can wear different out files are:

Sol) ties and dress × dress wear response = (تربط) مع

$$4 \times 7 = 28$$

Ques: A box containing balls, 20% of them are white, 35% are red and the rest are black. 15% of white balls are detected, 8% of red ball are detected and 11% of black are detected. If a ball is selected randomly then find the prob. That is black given that is detected:



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

$$= \frac{P(B, D)}{P(W, D) + P(R, D) + P(B, D)}$$

$$= \frac{0.0495}{0.1075}$$

0.460 = 0.4609

Q46: The number of ways we can form a 5-digit odd number from the numbers $\{1, 2, 3, 4, 5, 6, 7, 8\}$ if repetition is not allowed.

sol) $7 \times 6 \times 5 \times 4 \times \overset{\text{odd } (1, 3, 5, 7)}{4}$

$$= 3360$$

Q47: The number of ways we can make a team consist of two people, if we have 6 men and 4 women such that the team has one man and one woman.

men	women
6	4

$P(1 \text{ man, } 1 \text{ woman}) = \frac{\binom{6}{1} \binom{4}{1}}{\binom{10}{2}}$

لكنه طلب عدد الجواب $\binom{6}{1} \binom{4}{1} = 24$

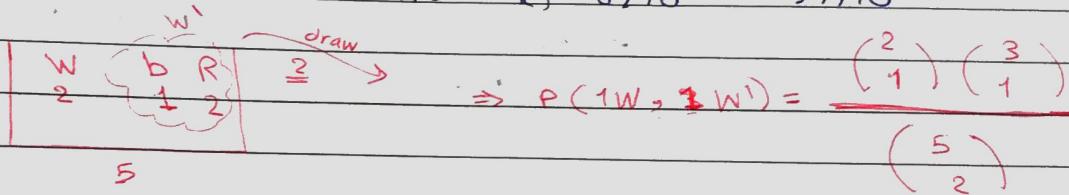
او من خلال multiplication ← عدد طرف احب، اراءه * عدد طرف احب، الرطل

(Q42) The number of ways we can award a 1st, 2nd and 3rd place prize among eight contestants is:

$${}^8P_3 = 8 \times 7 \times 6 = 336$$

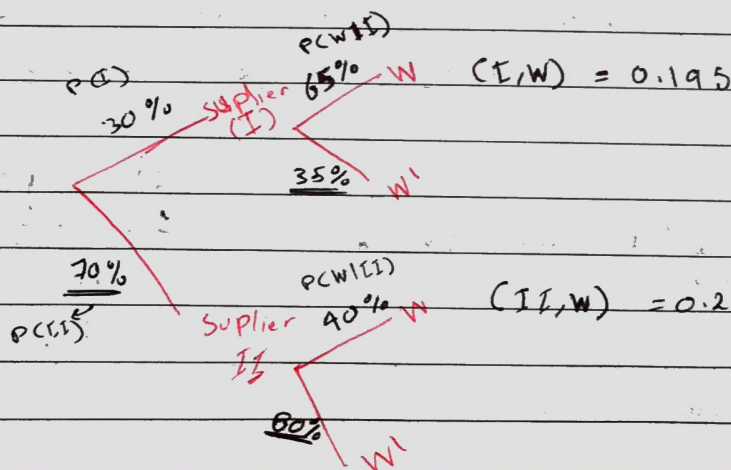
(Q44) A box contains 2 white balls, 1 black ball and 2 red balls. If we draw 2 balls without replacement, then the probability of getting 1 white ball is:

- A) 5/10 B) 4/10 C) 6/10 D) 7/10



$$= \frac{{}^2C_1 * {}^3C_1}{{}^5C_2} = \frac{2 * 3}{5 * 2} = \frac{3}{5} = \frac{6}{10}$$

(Q50) In a company 30% the papers form supplier I and the rest are form Supplier II. 65% of the papers supplied by I are white and 40% of the papers supplied by II are white. If we choose a paper randomly from this company, then the probability that it is white will be:



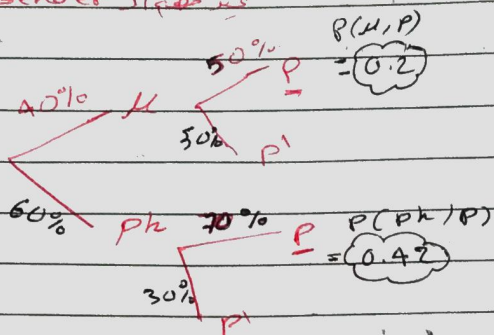
$$P(I, W) = 0.195$$

$$P(II, W) = 0.28$$

$$\Rightarrow P(W) = 0.195 + 0.28 = 0.475$$

Q51) In a class, 40% of the students are math and the rest are physics. 50% of the math students passed the test and 70% of the physics students passed the test. If we choose a student randomly, the probability that he/she passed the test is:

Gender \downarrow Pass vs



$$P(M, P) = 0.2$$

$$P(Ph, P) = 0.42$$

$$P(\text{Pass}) = 0.2 + 0.42 = 0.62$$

Q52) A box contains 3 white and 7 black balls. If two balls are drawn

i) The prob. that the drawn balls are RB is:

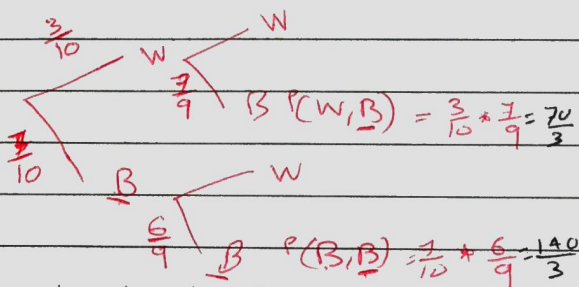
WB \rightarrow \leftarrow BW \rightarrow Tree-Diagram

$$P(RB) = \frac{\binom{7}{1} \binom{3}{1}}{\binom{10}{2}} = 0.4666 \approx 0.467$$

ii) Given that the 1st is black, find the prob. that two of the same color:

$P(B)$ new Ω (Black) \rightarrow (Black) \rightarrow (Black)

Tree-Diagram $P(B|B)$



$$P(B|B) = \frac{P(B \cap B)}{P(B)} = \frac{\frac{70}{3}}{\frac{70}{3} + \frac{140}{3}} = \frac{70}{210} = \frac{2}{3} \approx 0.667$$

Q53) A plastic bag contains 4 red and 2 black balls. A paper bag contains 3 red and 3 black balls. A fair die will be thrown. If the outcome of the thrown die is 6 then one ball is drawn from the plastic bag, while if the outcome of the thrown die is anything else then one ball is drawn from the paper bag. Find the probability that the drawn ball is red.

A) $12/19$

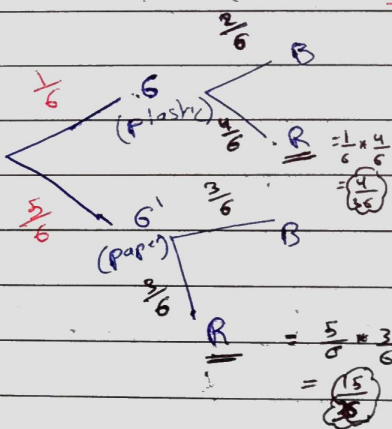
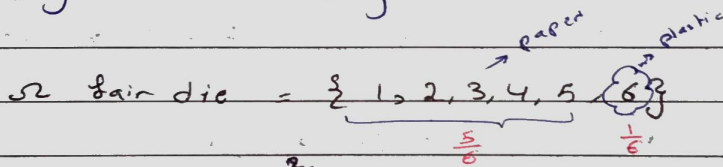
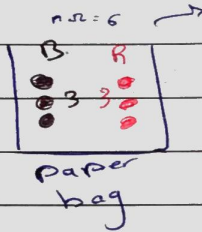
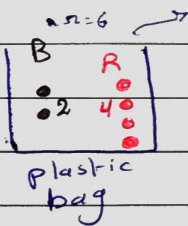
B) $7/36$

C) $7/12$

D) $5/12$

E) $19/36$ ✓

Sol)



$$P(R) = \frac{4}{36} + \frac{15}{36}$$

$$= \frac{19}{36}$$