1. A man is known to speak truth 3 out of 4 times. He throws die and reports that it is a 6. The probability that it is actually a 6 is

Sol: If 6 actually appeared, he can report it with the probability of 3/4. If 6 has not appeared, still he can report it wrongly with the probability of 1/4

So the probability that it is actually a 6 = (Probability to appear 6 x His truthfulness to report + Probability to appear any other number x His lieing probability) = $16\times34+56\times14=13$

The probability that it is actually 6 = $\text{Probability that he reports 6}\text{Total probability to appear 6}=34\times1634\times16+14\times56=38$

2. In how many ways can we distribute 10 pencils to 4 children so each child gets atleast one pencil?

Number of ways of distributing r identical objects to n distinct objects so that each get atleast one = $(n-1)C(r-1) = (10-1)C(4-1)=9C3$

3. A drawer holds 4 red hats and 4 blue hats. what is probability of getting exactly 3 red hats or 3 blue hats when taking out 4 hats randomly out of drawer and immediately returning every hat to drawer before taking out next??

As the objects are replaced, the probability of drawing red or blue is equal.

Probability to draw 3 red hats consecutively = $12\times12\times12=18$

Similarly probability to draw 3 blue hats consecutively = $12\times12\times12=18$

Total probability = $12\times12\times12=18+12\times12\times12=18 = 14$

4. A father purchased dress for his 3 daughters. The dresses are of same color but diff size and they are kept in dark room. what is probability that all the 3 will not choose their own dress?

This is a case of de-arrangements = $Dn=n!(12!-13!+14!-....)$

So number of ways that none of them chooses their own dress = $D3=3!(12!-13!)=2$

So probability = $23!=13$

5. 60% of male in a town and 70% of female in a town are eligible to vote. out of which 70% of male and 60% of female who are eligible to vote voted for candidate A. what is the value of votes in % did A get?

Let the ratio of men and women are 100 : k

Male eligible votes = 60 and female eligible votes = 70% (k)

Number of males who voted for A = 70% (60) = 42

Number of females who voted for A = 60%(70% (K) = 42% (k)

Percentage of votes got by A = $42+42100(K)60+70100(K)\times100=4200+42K6000+70K\times100$

So this value cannot be determined as the value of K is not known

6. George and Mark can paint 720 boxes in 20 days. Mark and Harry in 24 days and Harry and George in 15 days. George works for 4 days, Mark for 8 days and Harry for 8 days. The total number of boxes painted by them is

Capacity of G + M = 720 / 20 = 36

M + H = 720 / 24 = 30

H + G = 720 / 15 = 48

Combined capacity = 2 (G + H + M) = 114

G + H + M = 114 / 2 = 57

Now capacity of G = (G+H+M) - (H + M) = 57 - 30 = 27

M = (G+H+M) - (H + G) = 57 - 48 = 9

H = (G+H+M) - (G + M) = 57 - 36 = 21

Given that G worked for 4 days, and mark for 8 and harry for 8 days

So total work by them = 4 x 27 + 8 x 9 + 8 x 21 = 348

7. Two equilateral triangle of side 12cm are placed one on top another, such a 6 pionted star is formed if the six vertices lie on a circle what is the area of the circle not enclosed by the Star?

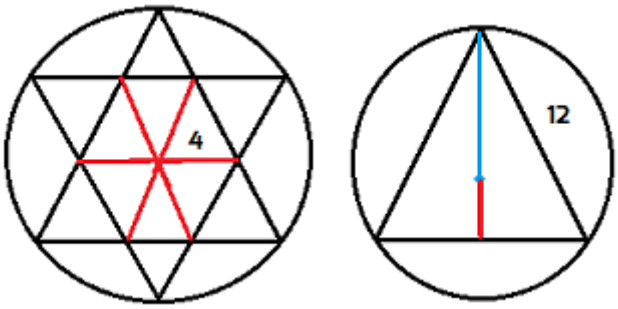
a)61

b)57

c)68

d)83

Sol: Given that two equilateral triangles of length 12 has inscribed in a circle.



Altitude of the triangle = $3\sqrt{2}a = 3\sqrt{2}(12) = 63\sqrt{}$
We know that centroid divides the altitude in the ratio 2 : 1 and 23(Altitude) = Circum radius
Circum radius = $23(63\sqrt{})=43\sqrt{}$
Area of the circle = $\pi r^2=3.14\times(43\sqrt{})^2$
Now the two triangles in the circle forms 12 small equilateral triangles with side 4. So their total area = $12\times3\sqrt{4a^2} = 12\times3\sqrt{44^2}$
Area which is not covered by the equilateral triangles = $3.14\times(43\sqrt{})^2 - 12\times3\sqrt{44^2} = 67.65 \simeq 68$

8. There are 4 different letters and 4 addressed envelopes.In how many ways can the letters be put in the envelopes so that atleast one letter goes to the correct address ?
a)15 b)16 c)18 d)12
Total ways of putting r letters to r covers = r! = 4! = 24
Number of ways that none of them goes into the right envelope = $D_4=4!(12!-13!+14!) = 9$
So atleast one envolope goes into the right one = 24 - 9 = 15

9.There are 250men and 150 women in a committee, if all will work they will complete 12 units per day, if all men work they will complete 15 units per day, how many units will women complete per day?
I think there is a mistake in this question. If all men and women together complete 12 units, how only men can do 15 Units of work a day?
Forgetting about the reality, Women can do -3 units a day.

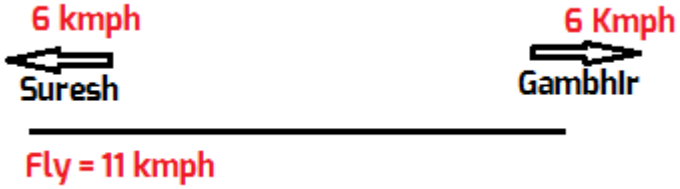
10. How many odd and even numbers are there between 42 and 400?? Find the sum of odd numbers and the sum of even numbers!
Sol: Odd numbers are from 43 to 399. Number of odd numbers = $l-ad+1=399-432+1=179$
Their sum = $n2(l+a)$ = 39559

Even numbers are from 44 to 398. Number of even numbers = $l-ad+1=398-442+1=178$
Their sum = $1782(398+44)=39338$

11. The famous church in the city of Kumbakonnam has a big clock tower and is said to be over 300 years old. Every Monday 10.00 A M the clock is set by Antony, doing service in the church. The Clock loses 6 mins every hour. What will be the actual time when the faulty clock shows 3 P.M on Friday?
a. 4 AM
b.3.16 PM
c. 4.54 AM
d. 3 AM
Total time passed in the faulty clock = Monday 10 am to Friday 3 pm = 24 x 4 + 5 hours = 96 and 5 hours = 101 hrs
54 min in the faulty clock = 60 minutes of the correct clock
101 hrs in the faulcty clock = ?
10154×60 = 112.2 Hrs.
96 Hrs + 16.2 Hrs
Friday 10 am + 16 hrs = Saturday 2am
0.2 x 60 min = 12 min

So Saturday 2.12 min AM

12. Suresh Raina and Gautam Gambhir after a scintillating IPL match decide to travel by cycle to their respective villages. Both of them start their journey travelling in opposite directions. Each of their speeds is 6 miles per hour. When they are at a distance of 50 miles, a housefly starts flying from Suresh Raina's cycle towards Gautam Gambhir at a relative speed of 17 miles per hour with respect to Raina's speed. What will be the time taken by housefly to reach Gambhir?
a. 10 hrs
b. 15 hrs
c. 20 hrs
d. 25 hrs
Sol:



Fly speed is 17 kmph w.r.t to suresh as fly is moving in opposite direction to suresh, its actual speed is 17 - 6 = 11.
Now relative speed of fly and gambhir = 11 - 6 = 5 kmph
So fly takes = $5011-6$ = 10 Hrs

13. The value of diamond varies directly as the square of its weight. If a diamond falls and breaks into two pieces with weights in the ratio 2:3. what is the loss percentage in the value?
Sol: Let weight be "x"
the cost of diamond in the original state is proportional to x^2

when it is fallen it breaks into two pieces 2y and the 3y
x = 5y
Original value of diamond = $(5y)^2 = 25y^2$
Value of diamond after breakage = $(2y)^2+(3y)^2=13y^2$

so the percentage loss will be = $25y^2-13y^225y^2\times100=48\%$

14. Five college students met at a party and exchanged gossips. Uma said, "Only one of us is lying". David said, "Exactly two of us are lying". Thara said, "Exactly 3 of us are lying". Querishi said, "Exactly 4 of us are lying". Chitra said "All of us are lying". Which one was telling the truth?
a)David
b)Querishi
c)Chitra
d)Thara
Sol: As all are contradictory statements, it is clear that ONLY one of them is telling the truth. So remaining 4 of them are lying. Querishi mentioned that exactly 4 are lying. So, he is telling the truth.
Explanation: Let us 1st assume that Uma is telling the truth. Then according to her only one is lying. But if only one is lying then all the others' statements are contradicting the possibility. In the same way all the other statements should be checked. If we assume the Querishi is telling the truth, according to him exactly 4 members are lying. So all the others are telling lies and he is the one who is telling the truth. This case fits perfectly.

15. Cara, a blue whale participated in a weight loss program at the biggest office. At the end of every month, the decrease in weight from original weight was measured and noted as 1, 2, 6, 21, 86, 445, 2676. While Cara made a steadfast effort, the weighing machine showed an erroneous weight once. What was that.
a) 2676
b) 2
c) 445
d) 86

SOL: This is a number series problem nothing to do with the data given.
1x 1+1=2
2 x 2+2=6
6 x 3+3=21
21 x 4+4=88 and not 86
88 x 5+5 = 445
445*6+6 = 2676

16. The letters in the word ADOPTS are permuted in all possible ways and arranged in alphabetical order then find the word at position 42 in the permuted alphabetical order?
a) AOTDSP
b) AOTPDS
c) AOTDPS
d) AOSTPD
SOL:
In alphabetical order : A D O P S T
A _ _ _ _ _ : the places filled in 5! ways = 120, But we need a rank less than 120. So the word starts with A.
A D _ _ _ _ : empty places can be filled in 4!=24
A O _ _ _ _ : the places filled with 4! ways = 24. If we add 24 + 24 this total crosses 42. So We should not consider all the words starting with AO.
A O D _ _ _ : 3!= 6
A O P _ _ _ : 3!=6
Till this 36 words are obtained, we need the 42nd word.
AOS _ _ _ : 3!= 6
Exactly we are getting the sum 42. So last 3 letters in the descending order are TPD.
So given word is AOSTPD

17. A man who goes to work long before sunrise every morning gets dressed in the dark. In his sock drawer he has 6 black and 8 blue socks. What is the probability that his first pick was a black sock, but his second pick was a blue sock?
SOL: This is a case of without replacement. We have to multiply two probabilities. 1. Probability of picking up a black sock, and probability of picking a blue sock, given that first sock is black.
$^{6}C_{1}{}^{14}C_{1}\times{}^{8}C_{1}{}^{13}C_{1}=2491$

18. There are 6 red balls,8 blue balls and 7 green balls in a bag. If 5 are drawn with replacement, what is the probability at least three are red?
Sol: At least 3 reds means we get either : 3 red or 4 red or 5 red. And this is a case of replacement.
case 1 : 3 red balls : 6/21 x 6/21 x 6/21 x 15/21 x 15/21
case 2 : 4 red balls : 6/21 x 6/21 x 6/21 x 6/21 x 15/21
case 3 : 5 red balls : 6/21 x 6/21 x 6/21 x 6/21 x 6/21

Total probability = = (6/21 x 6/21 x 6/21 x 15/21 x 15/21)+(6/21 x 6/21 x 6/21 x 6/21 x (15)/21)+ (6/21 x 6/21 x 6/21 x 6/21 x 6/21)
= 312/16807

19. Total number of 4 digit number do not having the digit 3 or 6.
Sol:
consider 4 digits _ _ _ _
1st blank can be filled in $^{7}C_{1}$ ways (0,3,6 are neglected as the first digit should not be 0)
2st blank can be filled in $^{8}C_{1}$ ways (0 considered along with 1,2,4,5,7,8,9)
3st blank can be filled in $^{8}C_{1}$ ways
4st blank can be filled in $^{8}C_{1}$ ways
Therefore total 4 digit number without 3 and 6 is 7 x 8 x 8 x 8=3584

20. Find the missing in the series: 70, 54, 45, 41,____.
Sol: 40
70-54 = 16 = 4^{2}
54-45 = 9 = 3^{2}

45-41 = 4 = 2^2
41-40 = 1 = 1^2

21. A school has 120, 192 and 144 students enrolled for its science, arts and commerce courses. All students have to be seated in rooms for an exam such that each room has students of only the same course and also all rooms have equal number of students. What is the least number of rooms needed?
Sol: We have to find the maximum number which divides all the given numbers so that number of roots get minimized. HCF of 120,192 & 144 is 24. Each room have 24 students of the same course.
Then rooms needed $\frac{120}{24}+\frac{192}{24}+\frac{144}{24}$ = 5 +8 + 6 = 19

22. A farmer has a rose garden. Every day he picks either 7,6,24 or 23 roses. When he plucks these number of flowers the next day 37,36,9 or 18 new flowers bloom. On Monday he counts 189 roses. If he continues on his plan each day, after some days what can be the number of roses left behind? (Hint : Consider number of roses remaining every day)
a)7
b)4
c)30
d)37
SOL:
let us consider the case of 23. when he picks up 23 roses the next day there will be 18 new, so in this case., 5 flowers will be less every day. So when he counts 189, the next day 184, 179,174,169,.....
finally the no. of roses left behind will be 4.

23. What is the 32nd word of "WAITING" in a dictionary?
Sol: Arranging the words of waiting in Alphabetical Order : A,G,I,I,N,T,W

Start with A_ _ _ _ _ _ This can be arranged in 6!/2! ways=720/2=360 ways
so can't be arranged starting with A alone as it is asking for 32nd word so it is out of range

AG_ _ _ _ _then the remaining letters can be arranged in 5!/2! ways so,120/2=60 ways. Out of range as it has to be within 32 words.
AGI_ _ _ _ Now the remaining letters can be arranged in 4! ways =24
AGN _ _ _ _ can be arranged in 4!/2! ways or 12 ways
so,24+12 =36th word so out of range. So we should not consider all the words start with AGN
now AGNI_ _ _can be arranged in 3! ways =6 ways
so 24+6=30 within range
Now only two word left so, arrange in alphabetical order.
AGNTIIW - 31st word
AGNTIWI - 32nd word

24. A manufacturer of chocolates makes 6 different flavors of chocolates. The chocolates are sold in boxes of 10. How many "different" boxes of chocolates can be made?
Sol:
If n similar articles are to be distributed to r persons, $x_1+x_2+x_3.....x_r=n$ each person is eligible to take any number of articles then the total ways are ${}^{n+r-1}C_{r-1}$
In this case $x_1+x_2+x_3.....x_6=10$
in such a case the formula for non negative integral solutions is ${}^{n+r-1}C_{r-1}$
Here n =6 and r=10. So total ways are ${}^{10+6-1}C_{6-1}$ = 3003

25. In a single throw with two dice, find the probability that their sum is a multiple either of 3 or 4.
a. 1/3
b. 1/2

c. 5/9
d. 17/36
Sol: Their sum can be 3,4,6,8,9,12
For two dice, any number from 2 to 7 can be get in (n-1) ways and any number from 8 to 12 can be get in (13 - n) ways.
Then possible ways are 2 + 3 + 5 + 5 + 4 + 1 = 20 possible cases.
So probability is (20/36)=(5/9)

26. B alone can do piece of work in 10 days. A alone can do it in 15 days. If the total wages for the work is Rs 5000, how much should B be paid if they work together for the entire duration of the work?
a. 2000
b. 4000
c. 5000
d. 3000
Sol:
Time taken by A and B is in the ratio of = 3:2
Ratio of the Work = 2 : 3 (since, time and work are inversely proportional)
Total money is divided in the ratio of 2 : 3 and B gets Rs.3000

27. On a 26 question test, 5 points were deducted for each wrong answer and 8 points were added for right answers. If all the questions were answered how many were correct if the score was zero.
a. 10
b. 11
c. 13
d. 12
Sol:
Let x ques were correct. Therefore, (26- x) were wrong
$8x-5(26-x)=0$
Solving we get x=10

28. Arun makes a popular brand of ice cream in a rectangular shaped bar 6cm long, 5cm wide and 2cm thick. To cut costs, the company had decided to reduce the volume of the bar by 19%. The thickness will remain same, but the length and width will be decreased by some percentage. The new width will be,
a. 5.5
b. 4.5
c. 7.5
d. 6.5
Sol:
Volume $=l\times b\times h = 6\times5\times2 = 60\ cm^3$
Now volume is reduced by 19%.
Therefore, new volume = $(100-19)100\times60=48.6$
Now, thickness remains same and let length and breadth be reduced to x%
so, new volume: $(x100\times6)(x100\times5)2=48.6$
Solving we get x =90
thus length and width is reduced by 10%
New width = 5-(10% of 5)=4.5

29. If all the numbers between 11 and 100 are written on a piece of paper. How many times will the number 4 be used?
Sol: We have to consider the number of 4's in two digit numbers. _ _
If we fix 4 in the 10th place, unit place be filled with 10 ways. If we fix 4 in units place, 10th place be filled with 9 ways (0 is not allowed)
So total 19 ways.
Alternatively:
There are total 9 4's in 14, 24, 34...,94
& total 10 4's in 40,41,42....49
thus, 9+10=19.

30. If twenty four men and sixteen women work on a day, the total wages to be paid is 11,600. If twelve men and thirty seven women work on a day, the total wages to be paid remains the same.

What is the wages paid to a man for a day's work?
Sol: Let man daily wages and woman daily wages be M and W respectively
24M+16W=11600
12M+37W=11600
solving the above equations gives M=350 and W=200

31. The cost price of a cow and a horse is Rs 3 lakhs. The cow is sold at 20% profit and the horse is sold at 10% loss. Overall gain is Rs 4200. What is the cost price of the cow?
Sol:
Profit = 4200
Profit =SP - CP
4200=SP - 300000 therefore SP=304200
x+y = 300000
1.2x + 0.9y = 304200
Solving for x = 114000 = CP of cow.

32. 1, 2, 2, 3, 3, 3, 4, 4, 4, 4, 1, 1, 2, 2, 2, 2, 3, 3, 3, 3, 3, 3, 4, 4, 4, 4, 4, 4, 4, 4, 1, 1, 1, 2, 2, 2, 2, 2, 2, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 4.....
In the above sequence what is the number of the position 2888 of the sequence.
a) 1
b) 4
c) 3
d) 2
Sol: First if we count 1223334444. they are 10
In the next term they are 20
Next they are 30 and so on
So Using $n(n+1)2\times10\leq2888$

For n = 23 we get LHS as 2760. Remaining terms 128.

Now in the 24th term, we have 24 1's, and next 48 terms are 2's. So next 72 terms are 3's.
The 2888 term will be "3".

33. How many 4-digit numbers contain no.2?
Sol: Total number of four digit numbers =9000 (i.e 1000 to 9999)
We try to find the number of numbers not having digit 2 in them.
Now consider the units place it can be selected in 9 ways (i.e 0,1,3,4,5,6,7,8,9)
Tens place it can be selected in 9 ways (i.e 0,1,3,4,5,6,7,8,9)
Hundreds place it can be selected in 9 ways (i.e 0,1,3,4,5,6,7,8,9)
Thousands place can be selected in 8 ways (i.e 1,3,4,5,6,7,8,9) here '0' cannot be taken
Total number of numbers not having digit 2 in it =9 x 9 x 9 x 8 =5832
Total number of numbers having digit 2 in it = 9000-5832 =3168

34. 2ab5 is a four digit number divisible by 25. If a number formed from the two digits ab is a multiple of 13, then ab is

a. 52

b. 45

c.10

d.25

Sol: For a number to be divisible by 25, last two digits of that number should be divisible by 25.

So b must be either 2 or 7

it is given that ab must be divisible by 13 and in the options only 52 is divisible by 13.

36. The average temperature of Tuesday Wednesday and Thursday was 37 C. The average temperature of Wednesday and Thursday and Friday was 38 C. if the temperature on Friday was 39 C.

Find the temperature on Tuesday.

a. 37.33

b. 38.33

c. 36

d. None of the above

Sol:

(tues + wed + thurs)/3=37

tues + wed + thurs=111...(1)

(wed + thurs + fri)/3=38

(wed + thurs + fri) =114...(2)

Given friday is 39.

then, (2) - (1) Fri - Tues = 3

So 39 - Tues = 3

Tuesday =36

37. There are 5 boxes in a cargo. The weight of the 1st box is 200 KG, the weight of the 2nd box is 20% higher than the third box, whose weight is 25% higher than the 1st box weight. The 4th box which weighs 350 KG is 30% lighter than the 5th box. Find the difference in average weight of the 4 heaviest boxes and the four lightest boxes.

Sol: weight of 1st box=200

weight of 3rd box=(125/100)*200=250

weight of 2nd box=(120/100)*250=300

weight of 4th box =350

weight of 5th box=(10/7)*350=500

average of 4 highest weighted boxes=(500+350+300+250)/4=350

average of 4 lightest boxes=(350+300+250+200)/4=275

therefore difference=350-275=75

38. The length, breadth and height of a room are in the ratio 3:2:1. If the breadth and height are halved, while the length is doubled. Then the total area of the 4 walls of the room will be decreased by

a. 30%

b. 18.75%

c. 15%

d. 13.6%

Sol: Given l:b:h=3:2:1

let h=10, b = 20, and l = 30

area = $2(l+b)h$

area= 2*(3x+2x)*x = $2(30+20)10=1000$

Now after those adjustments in the measurements,

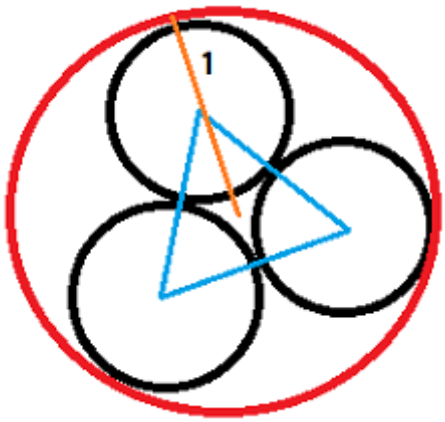
l=60, b=10, h=5

area= $2(l+b)h = 2(60+10)5=700$

Percentage decrease= $1000-7001000\times1000=30\%$

39. A circle circumscribes three unit circles that touch each other. What is the area of the larger circle? Note that p is the ratio of the circumference to the diameter of a circle (3.14159265).

Sol:



By joining centres of 3 unit circles we will get an equilateral triangle of length 2 unit. We have to find the length of the orange line.

And center of the equilateral triangle will be the center of the big circle.

So radius of the big circle will be = (1 + Circum radius of the equilateral triagle)

Circum radius of equilateral triangle = $23\times3\sqrt{2}\times2=23\sqrt{}$

Area of big circle will be = $\pi r2=3.14\times(1+23\sqrt{})2=3.14\times(1+43\sqrt{}+43)$

$=3.14\times(1+43\sqrt{}+43)=3.14\times(73+43\sqrt{})=3.14\times(7+43\sqrt{}3)$

40. Rajesh calculated his average over the last 24 tests and found it to be 76. He finds out that the marks for three tests have been inverted by mistake. The correct marks for these tests are 87, 79 and 98. What is the approximate percentage difference between his actual average and his incorrect average?

Sol: No Change

Incorrect value is: 78, 97, 89

correct values are: 87, 79, 98

difference between correct and incorrect value is= 9 + 9 -18=0

41. Joke is faster than Paul, Joke and Paul each walk 24 KM. The sum of their speed is 7 Km per hour. And the sum of times taken by them is 14 hours. Then, Joke speed is

a. 3 KM/Hr

b. 4 KM/Hr

c. 5 KM/Hr

d.7 KM/Hr

Sol:

$\text{Speed}=\text{Timedistance}$

let the speed of joke x then speed of paul will be 7-x

$24x+247-x=14$

Try to plugin the values from the options. If Joke speed is 4 the paul is 3.

42. The crew of a rowing team of 8 members is to be chosen from 12 men (M1, M2, …., M12) and 8 women (W1, W2,…., W8), such that there are two rows, each row occupying one the two sides of the boat and that each side must have 4 members including at least one women. Further it is also known W1 and M7 must be selected for one of its sides while M2, M3 and M10 must be selected for other side. What is the number of ways in which rowing team can be arranged.

SoL:

We need two person for one side and 1 women for the another side. We select that women in 7 ways. Now that second side people can sit in 7x4! ways.

Now for the first side we need two people from the remaining 14. So this can be done in $^{14}C_2$ ways and this side people can sit in $^{4}C_2 \times 4!$ ways.

Again the first group may take any of the two sides. So total ways are $2 \times 7 \times 4! \times {}^{14}C_2 \times 4!$

43. In a certain city, 60% of the registered voters are congress supporters and the rest are BJP supporters. In an assembly election, if 75% of the registered congress supporters and 20% of the registered BJP supporters are expected to vote for candidate A, what percent of the registered voters are expected to vote for candidate A?

Sol: let the people in the city be 100

Congress supporters = 60% of 100 = 60

40% are BJP=40% of 100 = 40

out of 60,75% voted for congress=75%(60)=45

out of 40%,20% voted for congress=20%(40)=8

Total=45 + 8 = 53

Total percent= 53%

44. Anusha, Banu and Esha run a running race of 100 meters. Anusha is the fastest followed by Banu and then Esha. Anusha, Banu and Esha maintain constant speeds during the entire race. When Anusha reached the goal post, Banu was 10m behind. When Banu reached the goal post Esha was 10m behind. How far was behind Anusha when the latter reached the goal post.

option

a) 70

b) 81

c) 90

d) 80

Sol:

By that time Anusha covered 100m, Bhanu covered 90m. So ratio of their speeds = 10 : 9

By that time Bhanu reached 100m, Esha covered 90m. So ratio of their speeds = 10 : 9

Ratio of the speed of all the three = 100 : 90 : 81

By that time Anusha covered 100m, Esha Covers only 81.

45. Seven different objects must be divided among three persons. In how many ways this can be done if at least one of them gets exactly one object.

Sol: Division of m+n+p objects into three groups is given by $(m+n+p)!m!\times n!\times p!$

But 7 = 1 + 3 + 3 or 1 + 2 + 4 or 1 + 1 + 5

So The number of ways are $(7)!1!\times 3!\times 3!\times 12!+(7)!1!\times 2!\times 4!+(7)!1!\times 1!\times 5!\times 12!$ = 70 + 105 + 21 = 196

46. George while driving along the highway saw road markers which are at equal distances from each other. He crosses the markers every 20 seconds. If he increases his speed by x meters per second, he crosses the markers at every 15 seconds. But if he increases his speed by y meters per second, he crosses the marker at every 10th second. If y-x = 40 meters per second, then what is the distance between two markers.

Sol: Let speed be =z m/s then Distance= 20z m

(z+x)15=20z; (z+y)10=20z

Also given that y - x = 40

solving we get 20z=1200

47. How many different 9 digit numbers can be formed from the number 223355888 by re-arranging its digits so that the odd digits occupy even position?

Sol: Odd places are 4 and these are occupied by 3355. So this can be done in 4!/ (2! 2!) = 6

There are 5 even numbers which have to be placed at 5 odd places. So 5!/(2!3!) = 10 ways

so total number of ways of arranging all these numbers are 10 * 6 = 60 ways

48. In a vessel, there are 10 litres of alcohol. An operation is defined as taking out five litres of what is present in the vessel and adding 10 litres of pure water to it. What is the ratio of alcohol to water after two operations?

a) 1 : 5

b) 2 : 3

c) 1 : 6

d) 3 : 2

Sol: $\text{Final concentration} = \text{Initial concentration}(1-\frac{\text{replacement quantity}}{\text{Final volume}})$

$\text{Final concentration} = 1\times(1-\frac{10}{15})=\frac{1}{3}$

$\text{Final concentration} = \frac{1}{3}\times(1-\frac{10}{20})=\frac{1}{6}$

So ratio of alcohol : water = 1 : 5