

Sol. $t_{r+1} = {}^n C_r (2x)^r$

$$\Rightarrow \frac{{}^n C_{r-1} (2)^{r-1}}{{}^n C_r (2)^r} = \frac{2}{5}$$

$$\Rightarrow \frac{\frac{n!}{(r-1)!(n-r+1)!}}{\frac{n!}{r!(n-r)!}} = \frac{2}{5}$$

$$\Rightarrow \frac{r}{n-r+1} = \frac{4}{5} \Rightarrow 5r = 4n - 4r + 4$$

$$\Rightarrow 9r = 4(n+1) \quad \dots (1)$$

$$\Rightarrow \frac{{}^n C_r (2)^r}{{}^n C_{r+1} (2)^{r+1}} = \frac{5}{8}$$

$$\Rightarrow \frac{\frac{n!}{r!(n-r)!}}{\frac{n!}{(r+1)!(n-r-1)!}} = \frac{5}{4} \Rightarrow \frac{r+1}{n-r} = \frac{5}{4}$$

$$\Rightarrow 4r + 4 = 5n - 5r \Rightarrow 5n - 4 = 9r \quad \dots (2)$$

From (1) and (2)

$$\Rightarrow 4n + 4 = 5n - 4 \Rightarrow n = 8$$

$$(1) \Rightarrow r = 4$$

so, coefficient of middle term is

$${}^8 C_4 2^4 = 16 \times \frac{8 \times 7 \times 6 \times 5}{4 \times 3 \times 2 \times 1} = 16 \times 70 = 1120$$

90. Five digit numbers are formed using the digits 1, 2, 3, 5, 7 with repetitions and are written in descending order with serial numbers. For example, the number 77777 has serial number 1. Then the serial number of 35337 is _____.

Official Ans. by NTA (1436)

Ans. (1436)

Sol. No of 5 digit numbers starting with digit 1
 $= 5 \times 5 \times 5 \times 5 = 625$
 No of 5 digit numbers starting with digit 2
 $= 5 \times 5 \times 5 \times 5 = 625$
 No of 5 digit numbers starting with 31
 $= 5 \times 5 \times 5 = 125$
 No of 5 digit numbers starting with 32
 $= 5 \times 5 \times 5 = 125$
 No of 5 digit numbers starting with 33
 $= 5 \times 5 \times 5 = 125$
 No of 5 digit numbers starting with 351
 $= 5 \times 5 = 25$
 No of 5 digit numbers starting with 352
 $= 5 \times 5 = 25$
 No of 5 digit numbers starting with 3531
 $= 5$
 No of 5 digit numbers starting with 3532
 $= 5$
 Before 35337 will be 4 numbers,
 So rank of 35337 will be 1690

So, in descending order serial number will be
 $3125 - 1690 + 1 = 1436$