Permutations Sheet Oct. 18

1. ${}_9P_4 = 3024$
2. ${}_4P_2 = 12$
3. $12 \cdot 11 \cdot 10$ or ${}_{12}P_3 = 1320$
4. $\frac{7!}{2!2!3!} = 210$
5. MKS ___ $= 3!4! = 144$

   $3!$ $4!$

$${}_nP_r = \frac{n!}{(n-r)!}$$

6. ${}_nP_2 = 30$

$$\frac{n!}{(n-2)!} = 30$$

$$\frac{n \cdot (n-1)(n-2)!}{(n-2)!}$$

$$n(n-1) = 30$$

$$n^2 - n - 30 = 0$$

$$(n-6)(n+5) = 0$$

$n = 6$ $n \neq -5$

b) ${}_{n-1}P_2 = 12$ $n+2$, $r=3$

$$\frac{(n-1)!}{(n-3)!} = 12$$

$$\frac{(n-1)(n-2)(n-3)!}{(n-3)!} = 12$$

$$(n-1)(n-2) = 12$$

$$n^2 - 2n - n + 2 = 12$$

$$n^2 - 3n - 10 = 0$$

$$(n-5)(n+2) = 0$$

$n = 5$ $n \neq -2$

7. FUNNY PEANUTS $= 7!$

$$\frac{5!}{2!} = \frac{120}{2} = 60$$

8. BBB GGGGG

$3!$ $6!$ $= 3! \cdot 6! = 4320$

9. SSSSSEEEEEE

$$\frac{11!}{5!\,6!} = 462$$

10. ${}_{12}P_4 = 11880$ or $12 \cdot 11 \cdot 10 \cdot 9$

11. $\underline{12} \cdot \underline{12} \cdot \underline{12} \cdot \underline{12} = 20736$

omit #12

13. MATHEMATICS

$$\frac{11!}{2!2!2!} = 4989600$$

14. INTERMISSION

$$\frac{12!}{3!2!2!}$$

PATHS

1. FFFDDDDDRRRR

$$\frac{12!}{3!5!4!}$$

Permutations with Cases

Cases occur when there's more than one situation, usually using the word "OR".

Oct. 19 Sheet PENCIL

One letter or two letter or three letter

$$6 + 6 \cdot 5 + 6 \cdot 5 \cdot 4 = 156$$

or

$${}_6P_1 + {}_6P_2 + {}_6P_3$$

2. 46723819

3 Digit or 4 digit or 5 digit

$${}_8P_3 + {}_8P_4 + {}_8P_5 = 8736$$

3. 13 Hearts

4 hand or 5 hand

$${}_{13}P_4 + {}_{13}P_5 = 171600$$

4. 8 people

3 person or 4 person committee

$${}_8P_3 + {}_8P_4 = 2016$$