Hw 2 - Permutations Hw

(1) 1 2 3 4 5 6 7 8

(a) no repetition

$8 \cdot 7 \cdot 6 \cdot 5 = 1680$

(b) repetition is allowed

$8 \cdot 8 \cdot 8 \cdot 8 = 4096$

(c) no repetition, must be greater than 5000

must be 5, 6, 7, or 8 → $4 \cdot 7 \cdot 6 \cdot 5 = 840$

can't be 1st #

(d) repetition is allowed, must be even

$8 \cdot 8 \cdot 8 \cdot 4$ ← must be even 2, 4, 6, or 8

$= 2048$

(e) no repetion, must be less than 3000

must be 1 or 2 → $2 \cdot 7 \cdot 6 \cdot 5 = 420$

(2) $8 \cdot 7 \cdot 6$ or $P(8,3) = \frac{8!}{5!} = \frac{8 \cdot 7 \cdot 6 \cdot 5!}{5!} = 336$

(3) $100 \cdot 99 \cdot 98$ or $P(100,3) = \frac{100!}{97!} = \frac{100 \cdot 99 \cdot 98 \cdot 97!}{97!} = 970,200$

(4) (a) $12 \cdot 11 \cdot 10 \cdot 9 \cdot 8$ or $P(12,5) = \frac{12!}{7!} = \frac{12 \cdot 11 \cdot 10 \cdot 9 \cdot 8 \cdot 7!}{7!} = 95040$

(b) $12 \cdot 11 \cdot$ Grandma Ling $\cdot 10 \cdot 9$ or $P(12,4) = \frac{12!}{8!}$

$= 11,880$

(5) (a) $20 \cdot 19 \cdot 18$

or $P(20,3) = \frac{20!}{17!}$

$= 6840$

(b) $20 \cdot 20 \cdot 20$

20^3

$= 8000$

(6) MATCHING 8 total letters

(a) $8! = 40320$

(b) $\underline{M} \cdot \underline{7} \cdot \underline{6} \cdot \underline{5} \cdot \underline{4} \cdot \underline{3} \cdot \underline{2} \cdot \underline{1}$

$7! = 5040$

(c) $\frac{M}{1} \cdot \underline{4} \cdot \frac{T}{3} \cdot \underline{3} \cdot \frac{H}{5} \cdot \underline{2} \cdot \frac{N}{7} \cdot \underline{1}$

$4! = 24$

(d) $\underline{6} \cdot \underline{5} \cdot \underline{4} \cdot \underline{3} \cdot \underline{2} \cdot \underline{1}$ NG

$6! = 720$

(7) (a) MAXIMUM

7 total M→3

$\frac{7!}{3!} = 840$

(b) CANADA

6 total A→3

$\frac{6!}{3!} = 120$

(c) BOOKKEEPER

10 total O→2 E→3 K→2

$\frac{10!}{2!2!3!} = 151,200$

(d) ~~MATHEMATICS~~

11 total M→2

A→2 T→2

$\frac{11!}{2!2!2!} = 4,989,600$

(8) 4 4 6 6 6 5 total #s $\frac{5!}{2!3!} = 10$

(9) 2 vanilla 3 chocolate 4 strawberry 1 pistachio

$\frac{10!}{2!3!4!} = 12,600$

(10) 4 different books, 3 copies of each *like copies must stay together*

$$\frac{4!3!3!3!3!}{3!3!3!3!} = 4! = 24$$

(11) BASKETBALL 10 total letters B→2 A→2 L→2

# of permutations: $\frac{10!}{2!2!2!} = 453,600$

(a) begin with K: $\frac{9!}{2!2!2!}$

45,360

(b) begin with B: $\frac{9!}{2!2!}$

90,720

(c) two L's together → treat them as 1 letter

$$\frac{9!}{2!2!} = 90,720$$

(12) $\underline{6}\cdot\underline{5}\cdot\underline{4}\cdot\underline{3}\cdot\underline{2}\cdot\underline{1} = 720$

$6!$

$P(6,6) = 6!/0!$

(13) $\underline{10}\cdot\underline{5}\cdot\underline{4}\cdot\underline{4}\cdot\underline{3}\cdot\underline{3}\cdot\underline{2}\cdot\underline{1}\cdot\underline{1}\_\_\_$

↑ either Boy or Girl could be first in line!

$10\cdot 5!\cdot 4!$

28,800