WARMUP

1) The serial number on a new $20 bill consists of a letter followed by 8 digits and then a letter. How many different serial numbers are possible if:

a) Letters and digits cannot be repeated.

b) Letters and digits can be repeated.

c) The letters are nonrepeated consonants and the digits can be repeated.

a) $26 \cdot \underbrace{10 \cdot 9 \cdot 8 \cdot 7 \cdot 6 \cdot 5 \cdot 4 \cdot 3}_{\text{8 digits}} \cdot 25 = 1{,}179{,}360{,}000$

(26: letter; 25: letter)

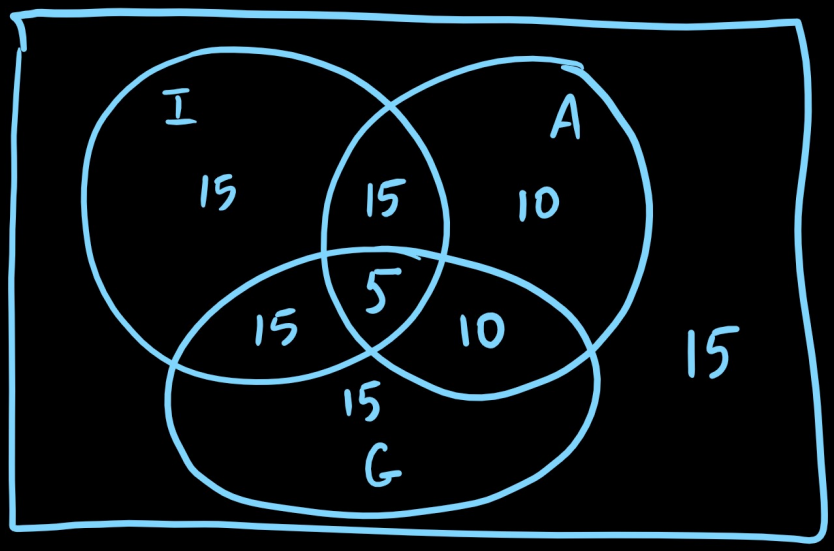
b) $26 \cdot 10^8 \cdot 26 = 6.76 \times 10^{10}$

c) $21 \cdot 10^8 \cdot 20 = 4.2 \times 10^{10}$

37 p 907

Cardinal Numbers

- $n(U) = 100$
- $n(I) = 50$
- $n(A) = 40$
- $n(G) = 45$
- $n(I \cap G) = 20$
- $n(A \cap G) = 15$
- $n(I \cap A) = 20$
- $n(I \cap A \cap G) = 5$



a) 15

b) 15

c) 15

d) 25

e) 40

60) 4 games $\left.\begin{matrix} NNNN \\ AAAA \end{matrix}\right\}$ 2 — 2

5 games $\left.\begin{matrix} NNNAN \\ NNANN \\ NANNN \\ ANNNN \end{matrix}\right\}$ 4 national + 4 American — 8

6 games $\underline{A}\ \underline{A}\ \underline{N}\ \underline{N}\ \underline{N} \cdot \boxed{N}$ — 20

$\frac{5!}{3!2!} = \frac{5 \cdot 4 \cdot 3 \cdot 2 \cdot 1}{3 \cdot 2 \cdot 1 \cdot 2 \cdot 1} = 10$ ways nationals

so 10 American

7 games

$\underline{N}\ \underline{N}\ \underline{N}\ \underline{A}\ \underline{A}\ \underline{A}\ \boxed{N}$

$\frac{6!}{3!\,3!} = \frac{6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1}{3 \cdot 2 \cdot 1 \cdot 3 \cdot 2 \cdot 1} = 20$

20 ways national
20 ways American

40

70

54) a) ${}_{15}C_5 = 3003$

b) ${}_{15}C_3 \cdot {}_{10}C_2 = 20475$

c) ${}_{15}C_4 \cdot {}_{10}C_1 + {}_{15}C_5 = 13650 + 3003 = 16653$