Let $A = \{\text{Dirk, Johan, Frans, Sarie}\}$

$B = \{\text{Frans, Sarie, Tina, Klaas, Henrika}\}$

$C = \{\text{Hans, Frans}\}$

1. $n(A) + n(B) = |A| + |B| = 4 + 5 = 9$

2. $n(A) + n(C) = 4 + 2 = 6$

3. $n(A \cup B) = n(A) + n(B) - n(A \cap B)$

$= 4 + 5 - 2 = 7.$

or count the number of elements in

$A \cup B = \{\text{Dirk, Johan, Frans, Sarie, Tina, Klaas, Henrika}\}.$

4. $n(A \cup C) = n(A) + n(C) - n(A \cap C)$

$= 4 + 2 - 1$

$= 5.$

$\cancel{S \setminus A = A'}$

$S = \{\cancel{1}, \cancel{2}, \cancel{3}, \cancel{4}, \cancel{5}, \cancel{6}, 7, \cancel{8}, 9, \cancel{10}, 11, \cancel{12}\}$

$A = \{2, 4, 6, 8, 10, 12\}$

$A' = S \setminus A = \{1, 3, 5, 7, 9, 11\}$

$B = \{1, 3, 5\}$

$(A \cup B)' = S \setminus (A \cup B) = \{7, 9, 11\}$

$A \cup B = \{1, 2, 3, 4, 5, 6, 8, 10, 12\}$

How many 5-letter sequences are possible that use the letters b, o, g, e, y once each?

The sequences are ordered lists.

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$$P(5,5) = \frac{5!}{(5-5)!} = \frac{5!}{0!} = \frac{5!}{1} = \underset{\substack{\parallel \\ 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1}}{5!} = 120.$$

6 letter sequences

60

A A A

u u

K

_ _ _ _ _ _

6 places to put the K

$\binom{5}{2} = \frac{5!}{3!\,2!} = \frac{5\cdot 4}{2} = 10,$

$\binom{n}{r} = C(n,r) = \frac{n!}{(n-r)!\,r!}$

$\binom{5}{2} = \frac{5!}{(5-2)!\,2!} = \frac{5!}{3!\,2!} = \frac{5\cdot 4\cdot \cancel{3!}}{\cancel{3!}\,2} = \frac{20}{2} = 10$

10 ways to select a location for the two Us, and then the location of the A's are fixed. There are
$6\cdot 10 = 60$ ways.

K u u _ _ _

K u _ u _ _

K u _ _ u _

K u _ _ _ u

K _ u u _ _

K _ u _ u _

K _ u _ _ u

K _ _ u u _

K _ _ u _ u

K _ _ _ u u