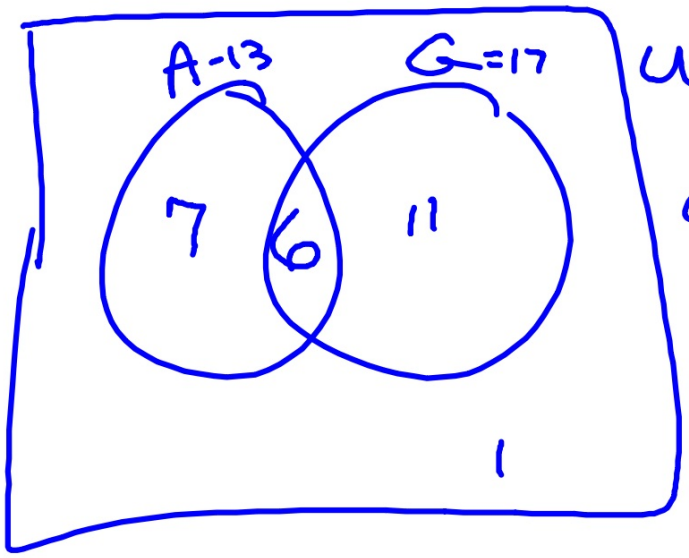
3. 25 girls in PE. 13 took aerobics
17 gymnastics. 1 has done neither
How many both

$$\begin{array}{r} 13 \\ +17 \\ \hline 30 \\ -24 \\ \hline \end{array}$$



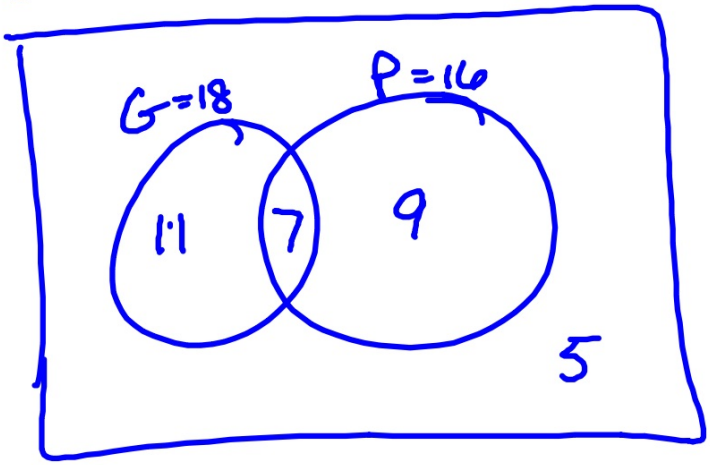
$U = 25$

a) $P(\text{Both}) = P(A \cap G) = \frac{6}{25}$

b) $P(G \cap A') = \frac{11}{25}$

4) 32 students
18 golf
16 piano
7 play both

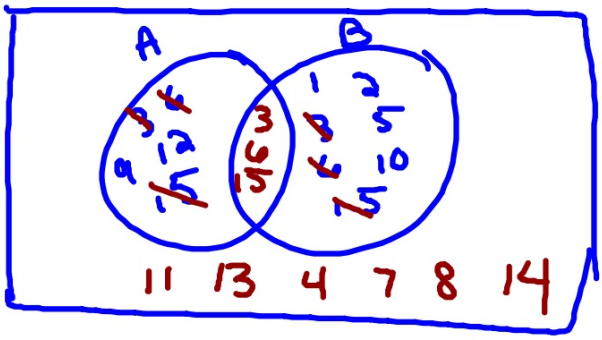
neither = 5



5) $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15\}$

$A = \{$ Z multiples of $3\} = \{3, 6, 9, 12, 15\}$ ai

$B = \{$ Z factors of $30\} = \{1, 2, 3, 5, 6, 10, 15\}$ aii

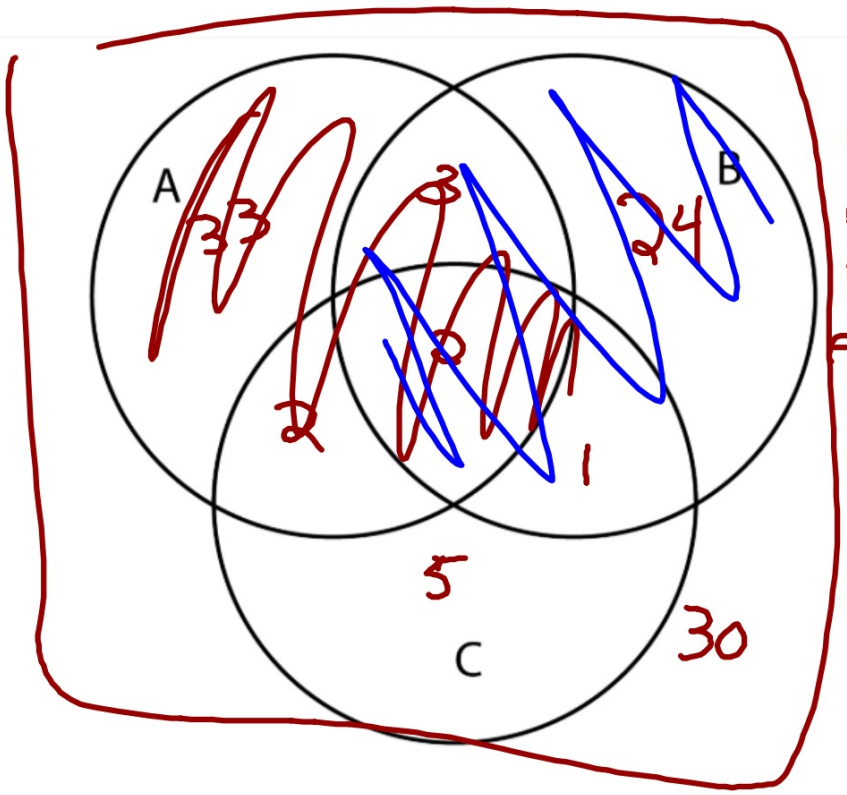


c): P (both mult of 3 and fact. 30)

$= P(A \cap B) = \frac{3}{15} = \frac{1}{5}$

ii P (neither) $= \frac{6}{15} = \frac{2}{5}$

6) In a town 40% of the population read newspaper 'A', 30% read newspaper 'B', 10% read newspaper 'C'. It is found that 5% read both 'A' and 'B'; 4% read A and C, and 3% read B and C. 2% read all three.



$A = .4,\ B = .3,\ C = .10$

$A \cap B = 0.05$

$A \cap C = 0.04$

$B \cap C = 0.03$

$A \cap B \cap C = 0.02$

a) $P(\text{only } A) = \frac{33}{100}$

b) $P(\text{only } B) = \frac{24}{100}$

c) $P(\text{none}) = \frac{30}{100}$

The Addition Rule

- if we count the total in each circle, we have overcounted the middle (intersection) amount.

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

Ex If two events A and B have probabilities $P(A) = \frac{9}{20}$ and $P(B) = \frac{3}{10}$, and $P(A \cup B) = 2\,P(A \cap B)$

find a) $P(A \cup B)$

b) $P(A \cup B)'$

c) $P(A \cap B')$

a) $P(A \cup B)$ $\qquad P(A \cup B) = 2P(A \cap B)$

$P(A \cup B) = P(A) + P(B) - P(A \cap B)$

let $P(A \cap B) = x$

$2x = P(A) + P(B) - x$

$3x = \frac{9}{20} + \frac{6}{20}$

$\frac{1}{3} \cdot 3x = \frac{5 \times 5}{20} \cdot \frac{1}{3}$

$x = \frac{5}{20} = \frac{1}{4} = P(A \cap B)$

$P(A \cup B) = 2P(A \cap B) = 2\left(\frac{1}{4}\right) = \frac{1}{2}$

b) $P(A \cup B)'$

if $P(A \cup B) = \frac{1}{2}$

then $P(A \cup B)' = 1 - \frac{1}{2} = \frac{1}{2}$

c) $P(A \cap B')$

if $P(A \cap B) = \frac{1}{4}$, then

$P(A \cap B') = P(A) - P(A \cap B)$

$= \frac{9}{20} - \frac{1}{4} = \frac{1}{5}$

HW 3C

p. 74

#1, 3, 4, 5, 7