

1.4 Applications of Set Theory

Ex: 40 members of a sports club were surveyed

23 play ball hockey

24 play tennis

18 play golf

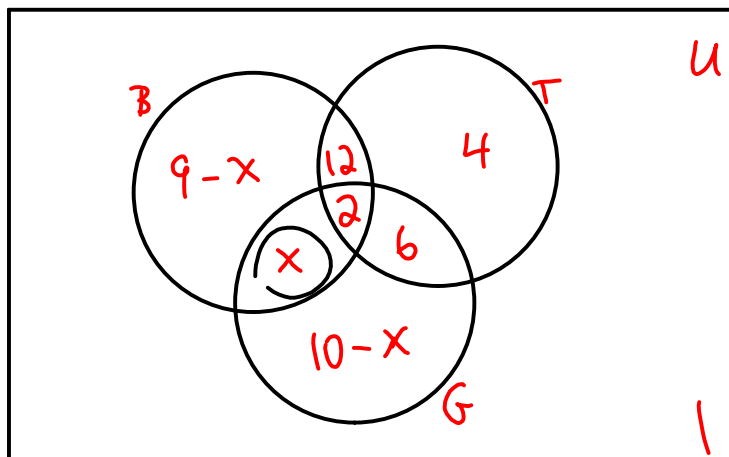
2 play all three

14 play tennis and ball hockey

8 play tennis and golf

1 does not play any sports.

How many play ball hockey and golf?



$$9 - x + x + 10 - x = 15$$

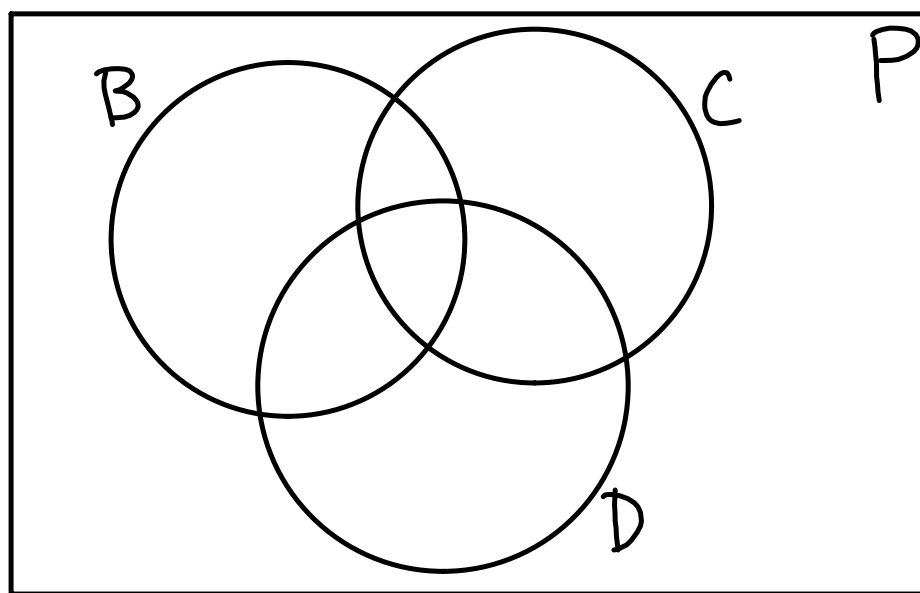
$$19 - x = 15$$

$$19 - 15 = x$$

$$4 = x$$

So 6 members play ball hockey and golf

Principle of Inclusion and Exclusion

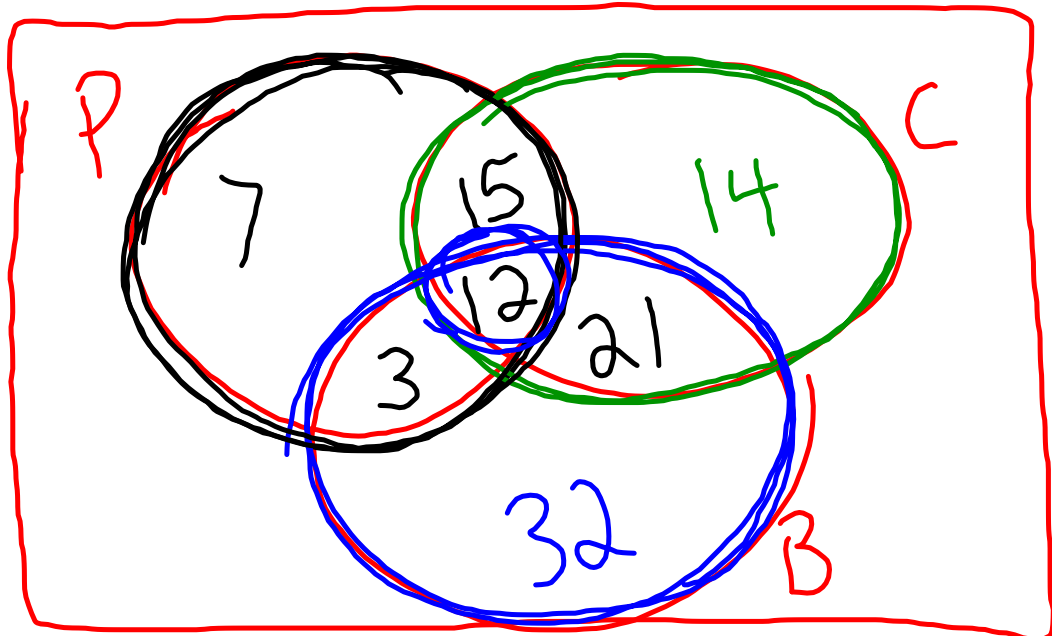


$$n(B \cup C) = n(B) + n(C) - n(B \cap C)$$

$$n(B \cup C \cup D) = n(B) + n(C) + n(D) - n(B \cap C) - n(C \cap D) - n(B \cap D) + n(B \cap C \cap D)$$

Ex: # taking Physics = 37
 " " Chem = 62
 " " Bio = 68

taking Phys and chem = 27
 " " " and Bio = 15
 " " chem and Bio = 33
taking all 3 = 12



$$7 + 3 + 12 + 21 + 32 + 15 + 14 = 104$$

$$\begin{array}{r}
 n(P) \\
 37 \\
 \hline
 7 + \underline{3} + \underline{15} + \underline{12}
 \end{array}
 +
 \begin{array}{r}
 n(C) \\
 62 \\
 \hline
 14 + \underline{21} + \underline{15} + \underline{12}
 \end{array}
 +
 \begin{array}{r}
 n(B) \\
 68 \\
 \hline
 32 + \underline{21} + \underline{3} \\
 \underline{+ 12}
 \end{array}$$

$$\begin{array}{r}
 n(P \cap C) \\
 - (15 + 12) \\
 \underline{27}
 \end{array}
 -
 \begin{array}{r}
 n(C \cap B) \\
 (21 + 12) \\
 \underline{33}
 \end{array}
 -
 \begin{array}{r}
 n(P \cap B) \\
 (3 + 12) \\
 \underline{15}
 \end{array}$$

$$\begin{array}{r}
 n(P \cap C \cap B) \\
 + (12)
 \end{array}$$

$$37 + 62 + 68 - 27 - 33 - 15 + 12 = 104$$

$$a) n((F \cup M) \setminus A) = 9 + 15 + 8 = 32$$

$$b) n((A \cup F) \setminus M) = 9 + 11 + 7 = 27$$

$$c) n(((F \cup A) \cup (F \cup M))) = 63$$

$$d) n(A \setminus F \setminus M) = 7$$

page 51

#4, 6, 9, 13