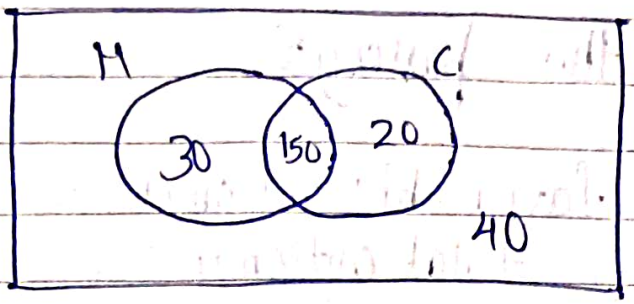
1.1.2

1.



ε = {240 passengers arriving in Cyprus}
H = {passengers who are on a holiday}
C = {passengers who hire a car}

(a) Write down the number of passengers who

(i) are on holiday

$n(H) = 30 + 150 = 180$

(ii) hire a car but are not on holiday

$= 20$

(b) $n(H \cup C') = 30 + 150 + 40 = 220$

(c) One of the 240 passengers is chosen at random

Probability that this passenger

(i) P(hires a car) = $\frac{\text{favourable outcomes}}{\text{total outcomes}} = \frac{30+150}{240}$

$= \frac{180}{240} = 0.75$

(ii) P(is on a holiday and hires a car) = $\frac{150}{240} = 0.625$

(d) Two of the passengers are chosen at random.

(i) P(they are both on holiday) = $\frac{(30+150)}{(240)} \cdot \frac{(179)}{(239)}$

$= \underbrace{\frac{180}{240}}_{\text{Person 1}} \cdot \underbrace{\frac{179}{239}}_{\text{Person 2}}$

$= 0.75 \times 0.74 = 0.555$

OR

If events are independent

$= \frac{180}{240} \cdot \frac{180}{240} = 0.5$

(ii) exactly one of the two passengers is on holiday
(exactly one of two passengers is on holiday)

$$= \underbrace{\left(\frac{180}{240}\right)}_{\text{on holiday}} \cdot \underbrace{\left(\frac{60}{240}\right)}_{\text{not on holiday}} = 0.375$$

(e) two passengers are chosen at random from those on holiday.

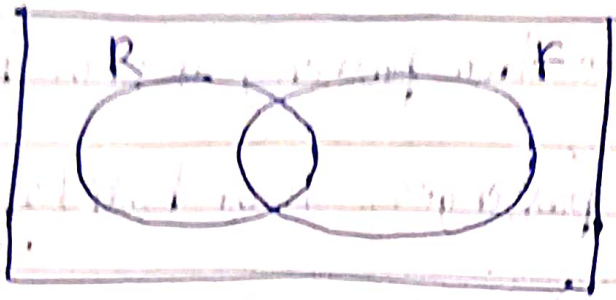
F = Find the probability that they both hire a car.

$$P(F) = \frac{\text{favourable outcomes}}{\text{total outcomes}} = \frac{150}{30+150} \cdot \frac{150}{30+150}$$

$$= \left(\frac{150}{180}\right)\left(\frac{150}{180}\right)$$

$$= 0.6889$$

2.



ξ = { students in a survey }
R = { students who lik rugby }
F = { students who like football }

$n(\xi) = 20$

$n(R \cup F) = 17$

$n(R) = 13$

$n(F) = 11$

$\Rightarrow n(R \cup F) = n(R) + n(F) - n(R \cap F)$

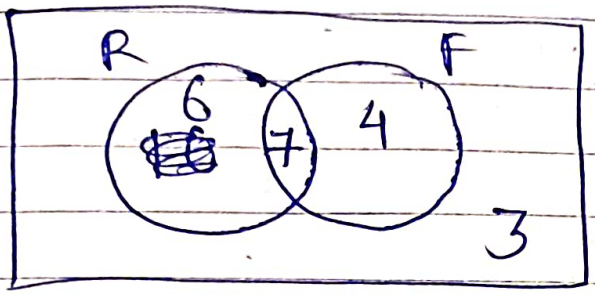
$\Rightarrow 17 = 13 + 11 - n(R \cap F)$

$\Rightarrow -n(R \cap F) = 17 - (24)$

$\Rightarrow n(R \cap F) = 7$

(a)

(i) $n(R \cap F) = 7$

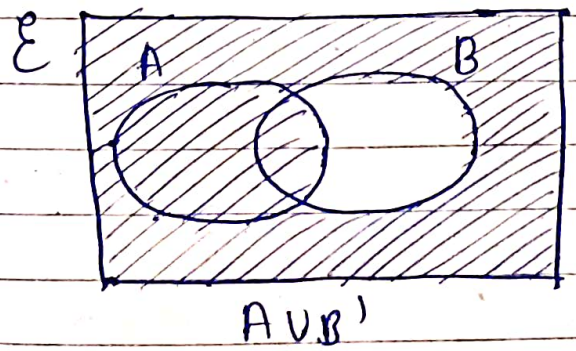


(ii) $n(R' \cap F) = (4+3) - 3 = 4$

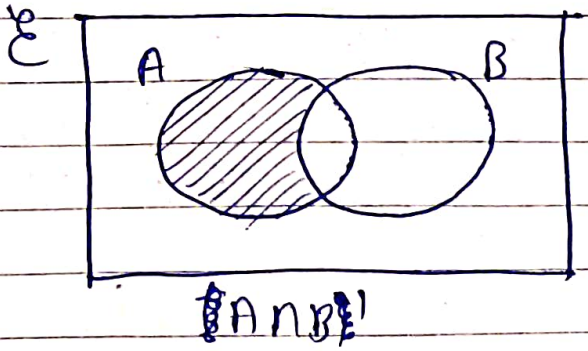
(b) A student who likes rugby is chosen at random. find probability that he also likes football

$$P(E) = \frac{7}{6+7} = 0.4615$$

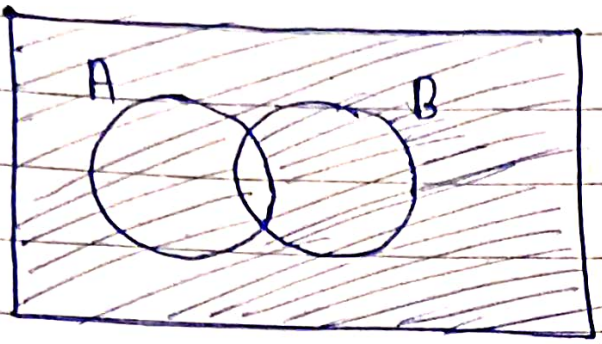
(3.)



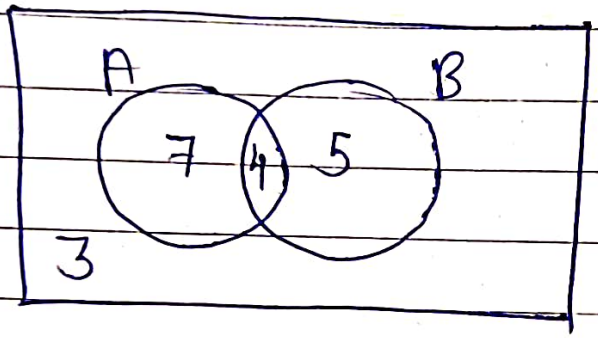
$A \cup B'$



$A \cap B'$

4. (a) 

$(A \cap B')'$

(b) 

$n(A \cup B') = 7+4+3 = 14$

5. 60 cars

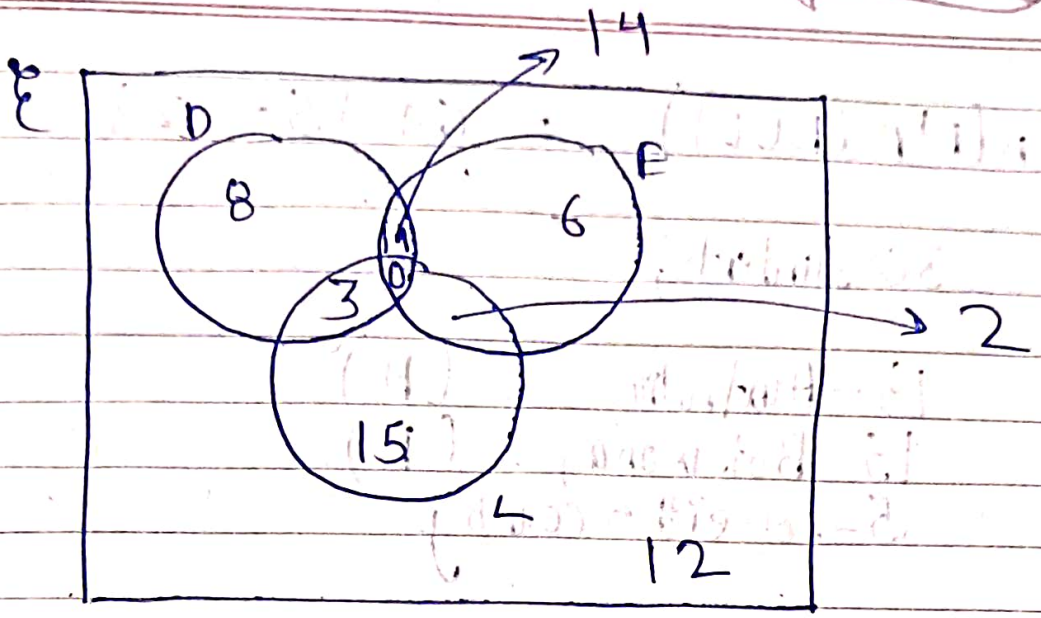
25 use diesel
20 use hydrogen
22 use electricity

D = Diesel
H = hydrogen
E = electricity

No cars use all 3 fuels

14 diesel and electricity
8 diesel only
15 hydrogen only
6 electricity only

(a)



~~n(D ∩ L) = (8 + 14 + 15)~~

$n(D \cap L) = 25 - (8 + 14) = 25 - (22) = 3$

$n(E \cap L) = 22 - (6 + 14) = 22 - (20) = 2$

$\varepsilon = 60 - (8 + 14 + 6 + 2 + 3 + 15) = 12$

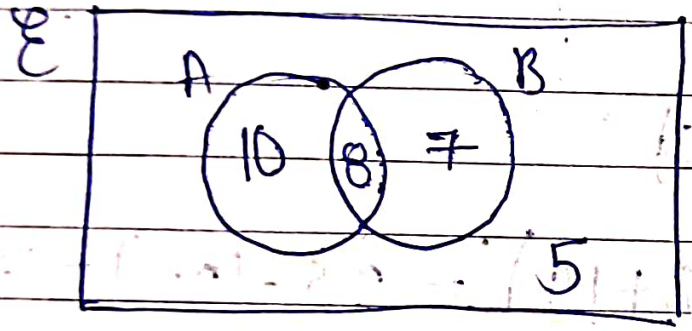
(b) Find the number of cars which use diesel but not electricity.

$= 8 + 3 = 11$

(c) $n(D' \cap (E \cup L)) = 6 + 15 = 21$

(6.) 30 students,

18 - Australia, (A)
15 - Botswana, (B)
5 - not either country



$n(A \cup B) = \mathcal{E}\text{-total} - \mathcal{E} = 30 - 5 = 25$

$n(A) = 18$
$n(B) = 15$

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

$\Rightarrow 25 = 18 + 15 - n(A \cap B)$

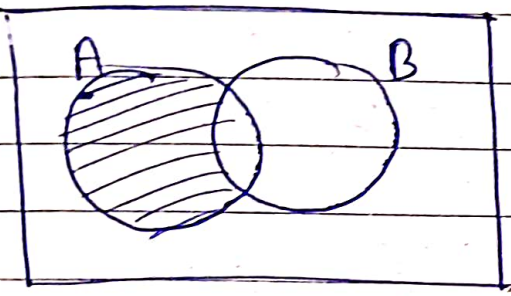
$\Rightarrow -8 = -n(A \cap B)$
$\Rightarrow n(A \cap B) = 8$

n(students who have visited australia but not Botswana)

= 10

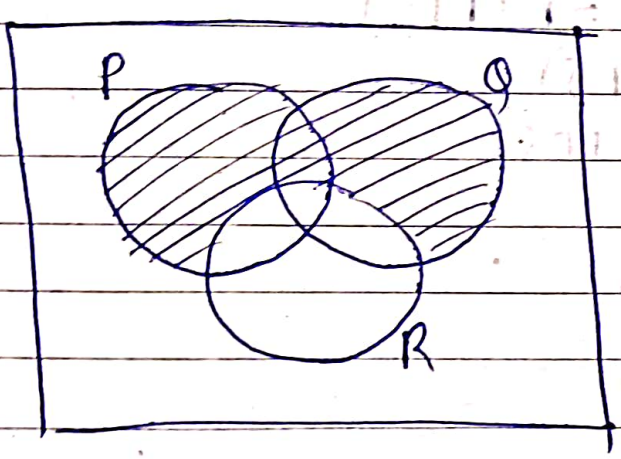
X ——— o ——— X

7. ε



$A \cap B'$

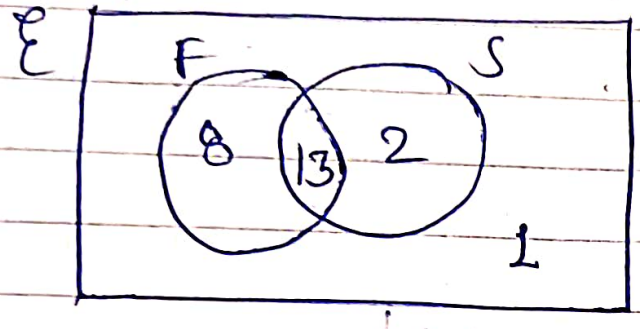
ε



$(P \cup Q) \cap R'$

8. 24 students, 21 = football (F)
15 = swimming (S)

$\mathcal{E} = 1$



$n(F \cup S) = 24 - 1 = 23$

$n(F \cup S) = n(F) + n(S) - n(F \cap S)$

$\Rightarrow 23 = 21 + 15 - n(F \cap S)$

$\Rightarrow 23 - (21+15) = -n(F \cap S)$

$\Rightarrow 23 - 36 = -n(F \cap S)$

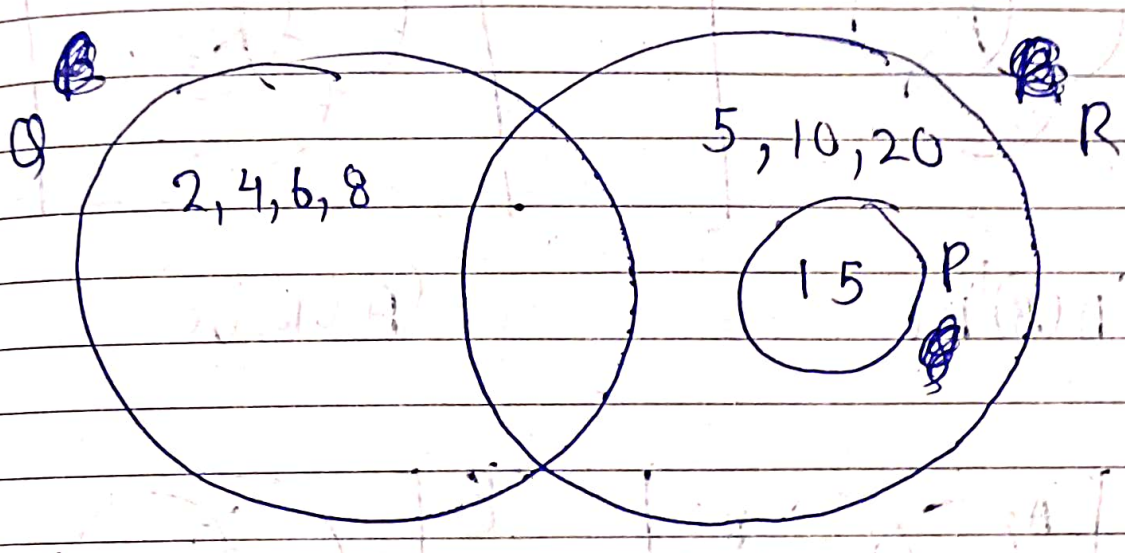
$\Rightarrow -13 = -n(F \cap S)$

$\Rightarrow n(F \cap S) = 13$

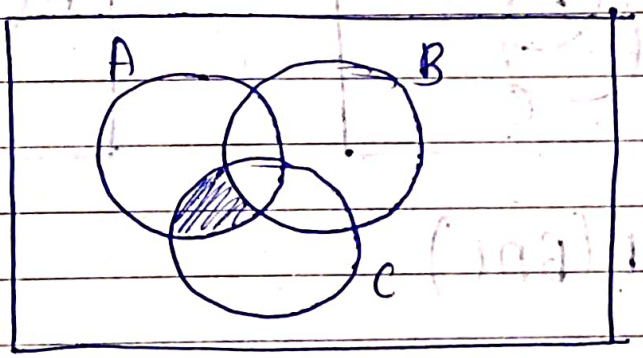
no. of students who like both football and swimming is 13.

9. $Q = \{2, 4, 6, 8, 10\}$, $R = \{5, 10, 15, 20\}$,

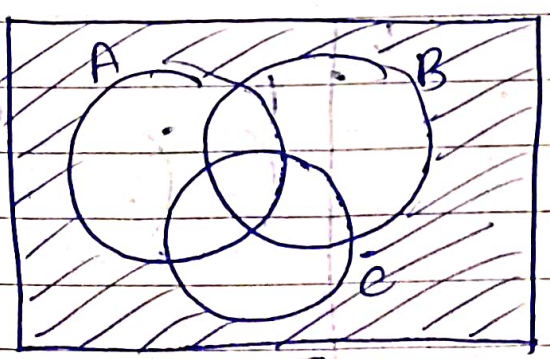
$15 \in P$, $n(P) = 1$ and $P \cap Q = \phi$



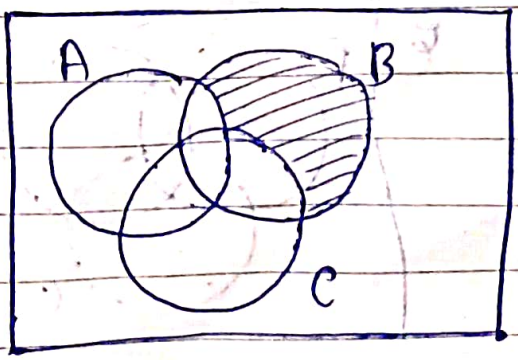
10.



$(A \cap C) \cap B'$

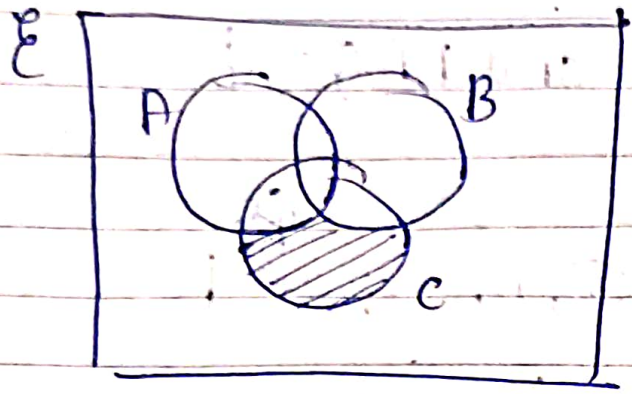


$(A \cup B \cup C)'$

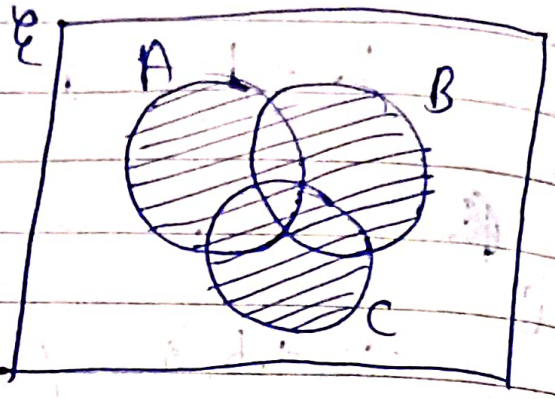


$(B \cap (A \cup C)')$

11. Shade required regions

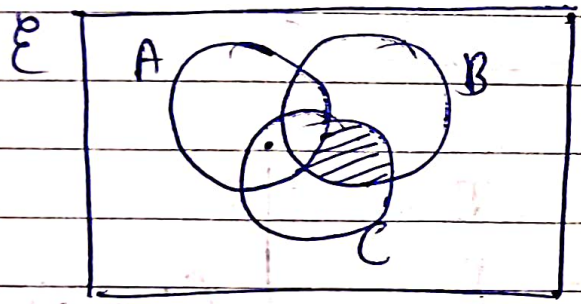


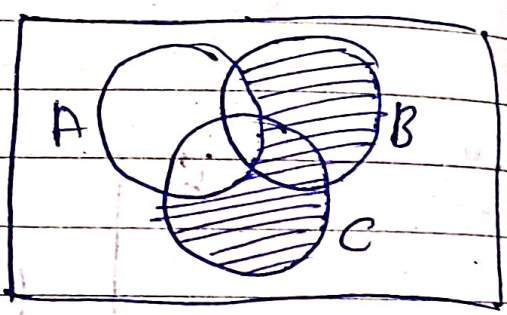
$(A \cup B)' \cap C$



$(A \cup B) \cup C$

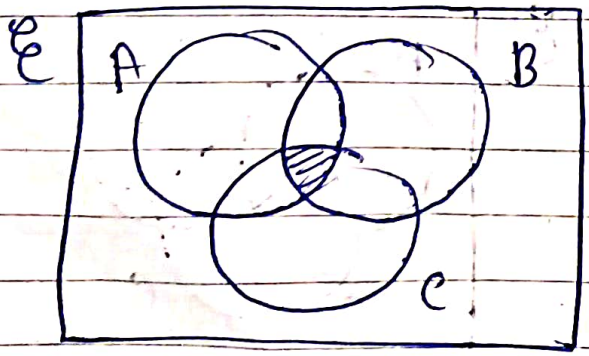
12.



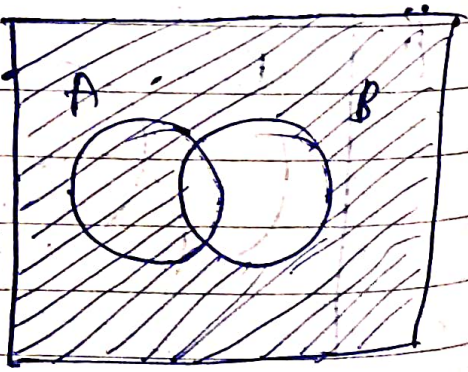


$A' \cap (B \cap C)$

13.



$A \cap B \cap C$



$A \cup B'$