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

If sets are called S and T:

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

$n(S \cup T) = 5 + 4 - 2$

$n(S \cup T) = 7$

3. $n(S \cup T) = n(S) + n(T) - n(S \cap T)$

$15 = 7 + 8 - n(S \cap T)$

$0 = -n(S \cap T)$

$-n(S \cap T) = 0$

$n(S \cap T) = 0$

5. $n(S \cup T) = n(S) + n(T) - n(S \cap T)$

$13 = n(S) + 7 - 5$

$13 = n(S) + 2$

$11 = n(S)$

$n(S) = 11$

(9) Let $P = \{$adults in South America fluent in Portuguese$\}$

Let $S = \{$adults in South America fluent in Spanish$\}$

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

$$293 \text{ million} = 160 \text{ million} + 155 \text{ million} - n(P \cap S)$$

$$-22 \text{ million} = -n(P \cap S)$$

$$-n(P \cap S) = -22 \text{ million}$$

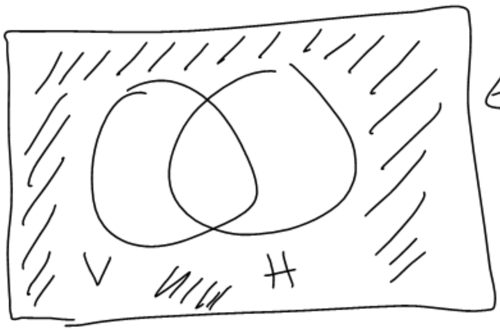
$$n(P \cap S) = 22 \text{ million}$$

(11) Let $V = \{\text{letters with vertical symmetry}\}$
Let $H = \{\text{letters with horizontal symmetry}\}$

$$n(V \cup H) = n(V) + n(H) - n(V \cap H)$$

$$n(V \cup H) = 11 + 9 - 4$$

$$n(V \cup H) = 16$$



We want the number in the outer region.

The outer region is $(V \cup H)'$

$$n((V \cup H)') = 26 - 16$$

$$n((V \cup H)') = 10.$$

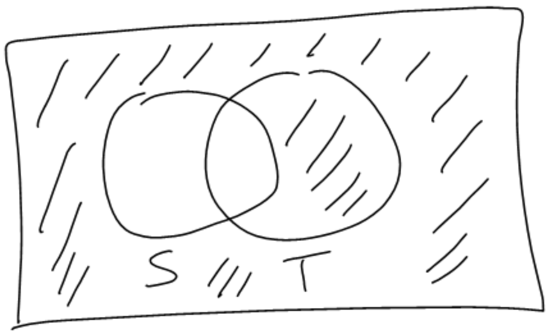
(13) Let $A = \{\text{cars with automatic transmission}\}$
Let $P = \{\text{cars with power steering}\}$

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

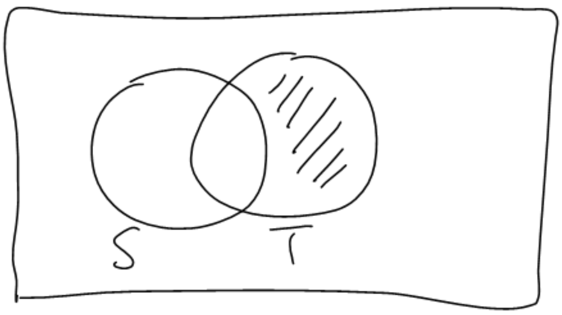
$$n(A \cup P) = 325 + 216 - 89$$

$$n(A \cup P) = 452$$

(15)

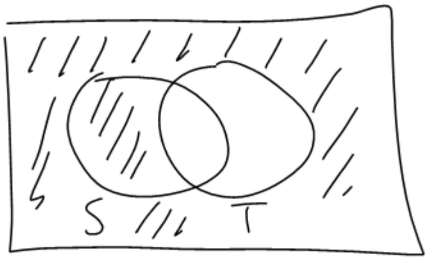


S'

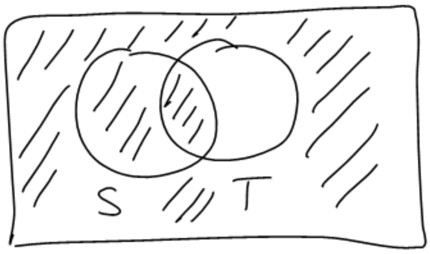


$S' \cap T$

(17)

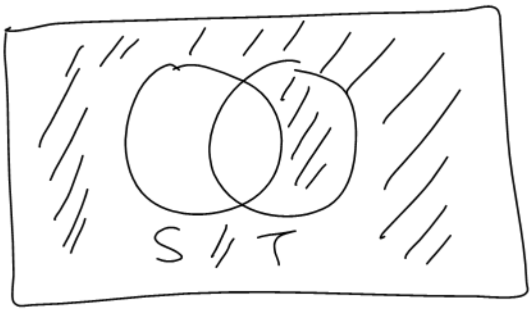


T'

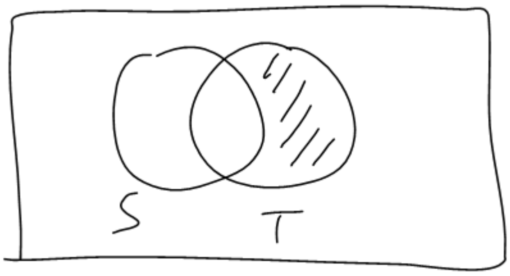


$S \cup T'$

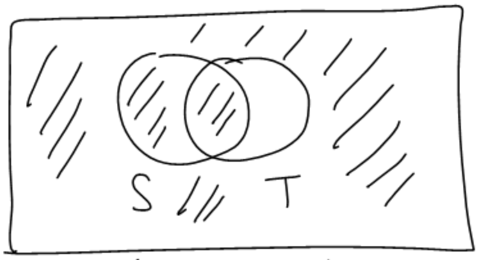
(19)



S'

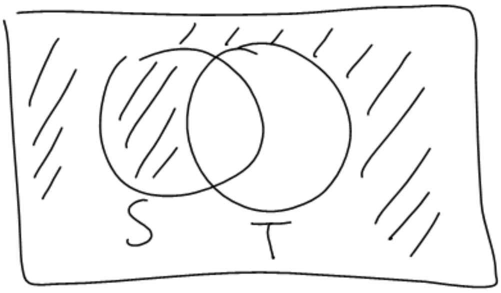


$S' \cap T$

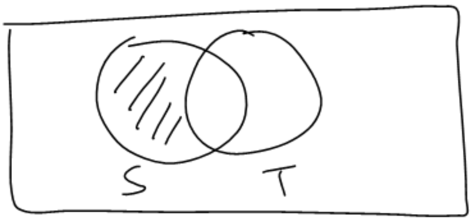


$(S' \cap T)'$

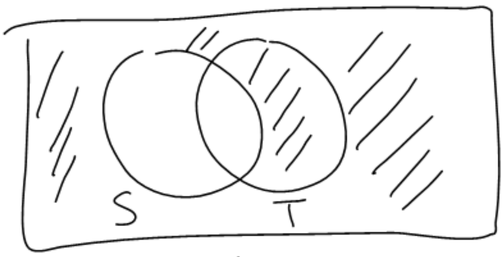
21



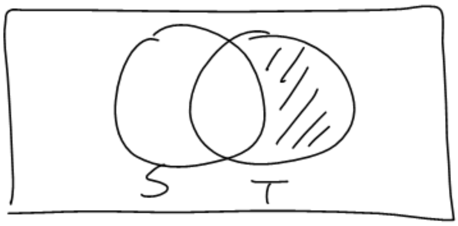
T'



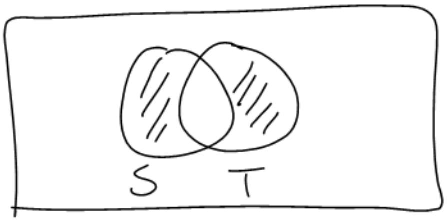
$S \cap T'$



S'

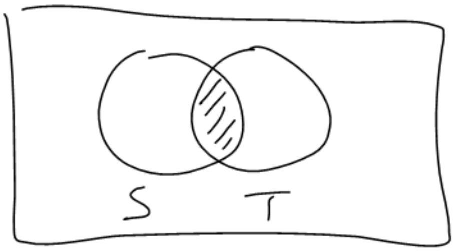


$S' \cap T$

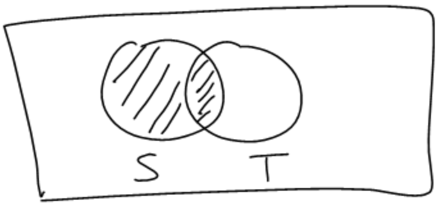


$(S \cap T') \cup (S' \cap T)$

23

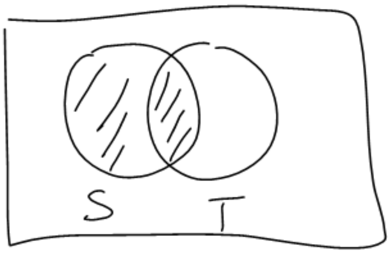


$S \cap T$

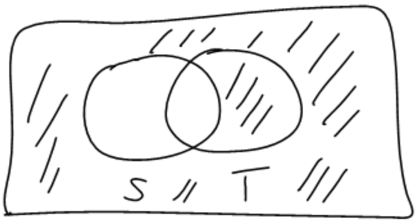


$S \cup (S \cap T)$

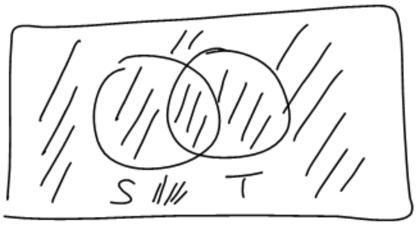
25



S

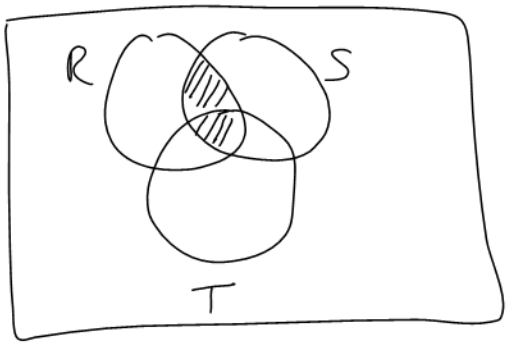


S'

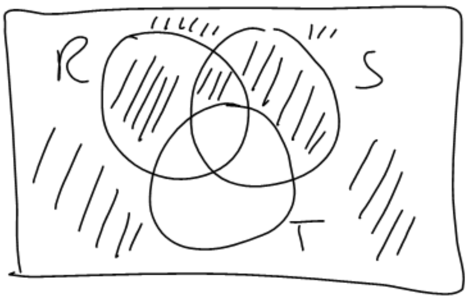


$S \cup S'$

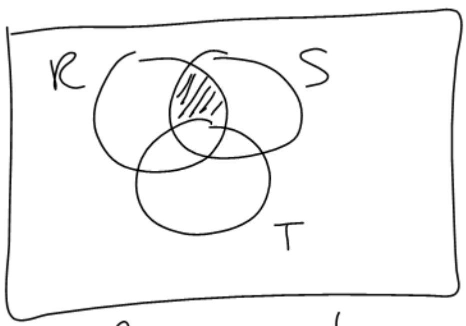
(27)



$R \cap S$



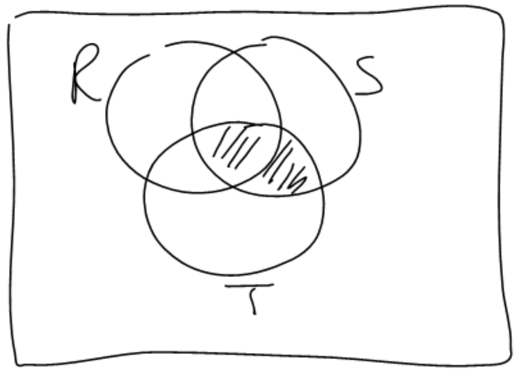
T'



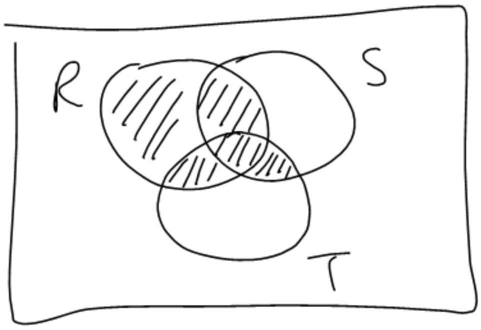
$R \cap S \cap T'$

Note: $R \cap S \cap T'$ could also be written $(R \cap S) \cap T'$ or $R \cap (S \cap T')$

29

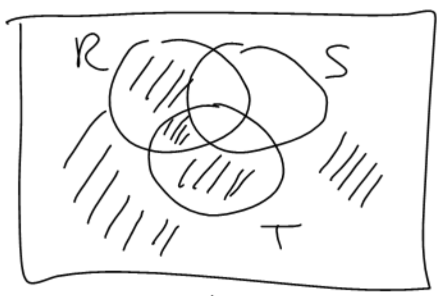


$S \cap T$

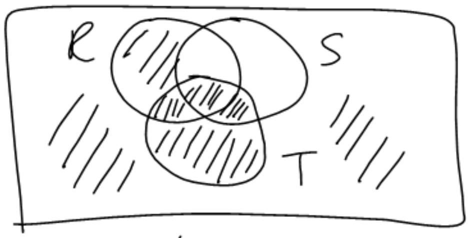


$R \cup (S \cap T)$

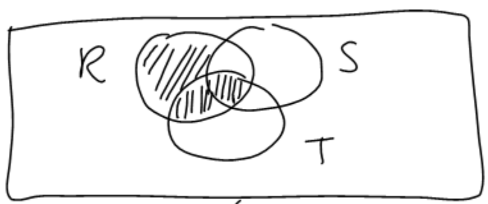
31



S'

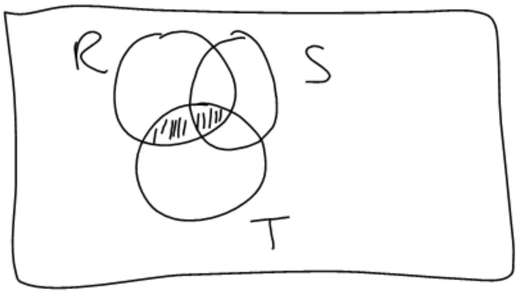


$S' \cup T$

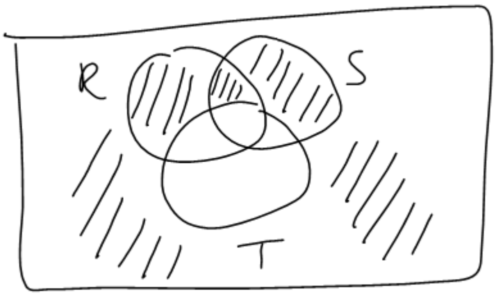


$R \cap (S' \cup T)$

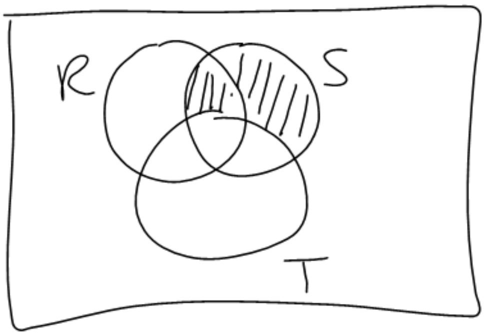
37



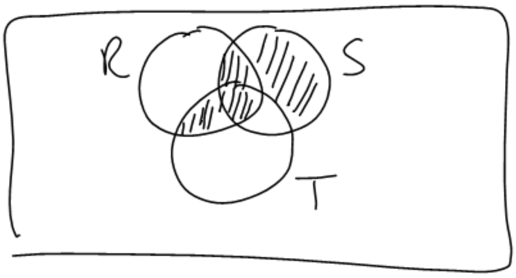
$R \cap T$



T'



$S \cap T'$



$(R \cap T) \cup (S \cap T')$

(45) S'

(47) $R \cap T$

(49) The shaded region is outside R and inside S and inside T.

$$R' \cap S \cap T$$

Could also be written as

$$(R' \cap S) \cap T \quad \text{or} \quad R' \cap (S \cap T)$$