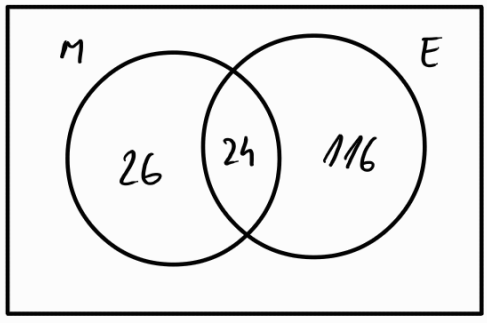
# INCLUSION + EXCLUSION

200 students
- 50 take M
- 140 take E
- 24 take both




How many students take neither course?

$200-(26+24+116) = 34$

$$|A \cup B| = |A| + |B| - |A \cap B|$$

$$|A \cup B \cup C| = |A| + |B| + |C| - |A \cap B| - |A \cap C| - |B \cap C| + |A \cap B \cap C|$$

60 women
- 20 do at least M
- 45 do at least E
- 16 do both

How many male students take neither course?

$$|E \cup M \cup W| = |E| + |M| + |W| - |E \cap M| - |E \cap W| - |M \cap W| + |E \cap M \cap W|$$

$$140 + 50 + 60 - 24 - 45 - 20 + 16$$

$$= 177$$

$$|U \setminus (E \cup M \cup W)| = 200 - 177 = 23$$

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- 40 students DM exam (3 questions)
- every student could do at least 1 question
- 10 students couldn't do Q1
- 15 — " — Q2
- 20 — " — Q3

- 5 students did all the questions

How many students could do exactly 2 questions?

$$|Q_1 \cup Q_2 \cup Q_3| = \overset{40}{|Q_1|} + \overset{30}{|Q_2|} + \overset{25}{|Q_3|} - \overset{20}{|Q_1 \cap Q_2|} - |Q_1 \cap Q_3| - |Q_2 \cap Q_3| + \overset{5}{|Q_1 \cap Q_2 \cap Q_3|}$$

$$|Q_1 \cap Q_2| + |Q_1 \cap Q_3| + |Q_2 \cap Q_3| = 30 + 25 \quad 20 + 5 - 40 = 40$$

$$\text{answer} = 40 - 3 \cdot |Q_1 \cap Q_2 \cap Q_3| = 40 - 3 \cdot 5 = \underline{25}$$