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SCUOLA Liceo Scientifico IA

CLASSE

MATERIA MATEMATICA 

ANNO SCOLASTICO 2023/2024

INSIEMI E LOGICA

P. 150 n. 13

" $\frac{1}{2}$ non appartiene all'insieme dei numeri naturali"

"-2 appartiene all'insieme dei numeri interi"

" $\sqrt{3}$ non appartiene all'insieme dei numeri razionali"

" $\sqrt{2}$ appartiene all'insieme dei numeri reali"

n. 17

$$A = \{r, n, c, t\}$$

n. 19

$$B = \{0, 2, 4, 6, 8, 10, 12, 14\}$$

n. 21

$$A = \{-2, -1, 0, 1, 2\}$$

n. 23

$$A = \{x \in \mathbb{N} \mid x \text{ divide } 30\}$$

n. 25

$$C = \{x \in \mathbb{Q} \mid x^2 < x\}$$

n. 27

$$B = \{x \mid x \text{ è pari e } 1 < x < 20\}$$

n. 29

$$A = \{x \mid x = n^2 \text{ con } n \in \mathbb{N} \text{ e } 1 \leq n \leq 5\}$$

P. 152 n. 55

$$A = \{\text{nord, sud, est, ovest}\} \quad \text{ELEMENTI/NOE}$$

$$A = \{x \mid x \text{ è un punto cardinale}\} \quad \text{P. CARATTERISTICA}$$

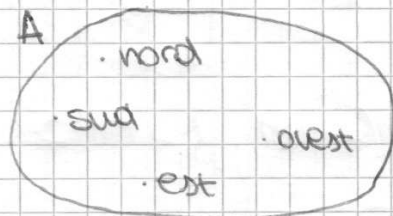


DIAGRAMMA LENN

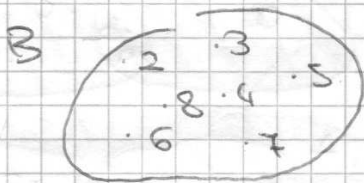
n. 60

$$B = \{2, 3, 4, 5, 6, 7, 8\}$$

ELENCAZIONE

$$B = \{x \in \mathbb{N} \mid 2 \leq x \leq 8\}$$

PROP. CARATTERISTICA



n. 65

$$x = \{2, -1, \text{rosso}, \text{Milano}\}$$

n. 80

$$X = \{x \in \mathbb{N} \mid x \geq 11\}$$

$$X = \{11, 12, 13, \dots\}$$

$$\bullet A = \{x \in \mathbb{N} \mid x > 10\}$$

$$A = \{11, 12, 13, \dots\} \text{ IMPROPRIO } A \Rightarrow x =$$

$$\bullet B = \{x \in \mathbb{N} \mid x \leq 10\} \text{ - non \u00e9 un sottoinsieme - } B = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$$

$$\bullet C = \{x \in \mathbb{N} \mid x^2 = -1\} \quad C = \{ \} \quad \text{IMPROPRIO}$$

n. 85

$$X = \{0, e\}$$

$$A = \{0\} \text{ SOTTOINSIEME PROPRIO}$$

$$B = \{e\} \quad \text{=} \quad \text{}$$

$$C = \{0, e\} \quad \text{IMPROPRIO}$$

$$D = \{ \} \quad \text{IMPROPRIO}$$

n. 95

$$X = \{3, 6, 9, 12, 15, 18, 21, \dots\}$$

RICORDA: elemento \in insieme
insieme \subset insieme

n. 105 p. 156

$$A = \{a, b, d\}$$

$$B = \{b, c, d, e\}$$

RAPPRESENTAZIONE ENUC.

$$C = \{a, e, f\}$$

RAPPRESEN. DIAGRAMMA

$$A \cup B$$

$$A \cup B = \{a, b, c, d, e\}$$



$$A - B$$

$$A - B = \{a\}$$



$$A \cap B$$

$$A \cap B = \{b, d\}$$

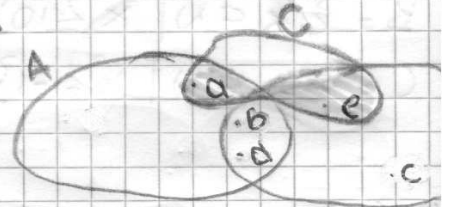


$$(A \cup B) \cap C$$

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

$$= \{a, b, c, d, e\} \cap \{a, e, f\}$$

$$= \{a, e\}$$



n. 110

$$A = \{x \in \mathbb{N} \mid 2 < x \leq 4\}$$

$$A = \{3, 4\}$$

$$B = \{x \in \mathbb{N} \mid x \text{ divide } 12\}$$

$$B = \{1, 2, 3, 4, 6, 12\}$$

$$C = \{x \in \mathbb{N} \mid x \text{ è pari e } x \leq 8\}$$

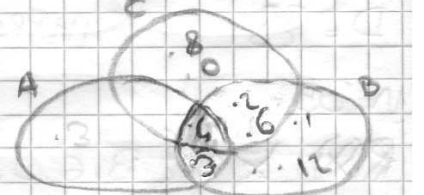
$$C = \{0, 2, 4, 6, 8\}$$

$$A \cap B \cap C$$

rappresentazione
per enumerazione

$$A \cap B \cap C = \{4\}$$

diagramma Venn

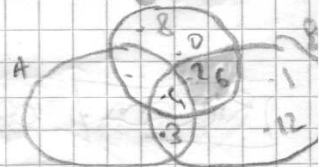


$$(B - A) \cap C$$

$$(B - A) \cap C =$$

$$= \{1, 2, 6, 12\} \cap \{0, 2, 4, 6, 8\}$$

$$= \{2, 6\}$$

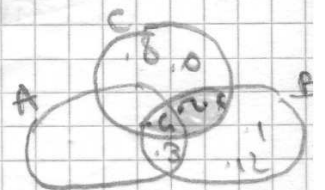


$$(A \cup B) \cap C$$

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

$$= \{1, 2, 3, 4, 6, 12\} \cap \{0, 2, 4, 6, 8\}$$

$$= \{2, 4, 6\}$$

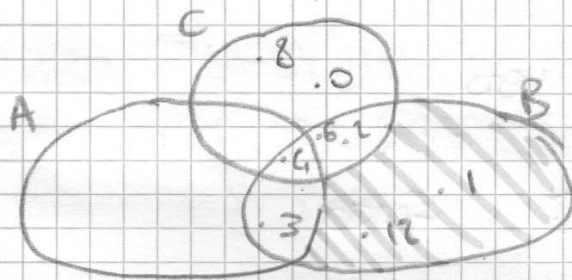


$$B - (A \cup C)$$

$$B - (A \cup C) =$$

$$= \{1, 2, 3, 4, 6, 12\} - \{0, 2, 3, 4, 6, 8\}$$

$$= \{1, 12\}$$



n. 125

Insieme universo U

alfabeto

Insieme A

insieme consonanti

Complementare di A (A rispetto ad U)

insieme vocali

$$\bar{A}^U = \{x \mid x \in U, x \notin A\}$$

$$\bar{A}^U = \{a, e, i, o, u\}$$

n. 135

$$U = \{x \in \mathbb{N} \mid 10 \leq x \leq 19\}$$

$$U = \{10, 11, 12, 13, 14, 15, 16, 17, 18, 19\}$$

$$A = \{x \in \mathbb{N} \mid x = 2n+1, \text{ con } n \in \mathbb{N} \text{ e } 6 < n < 10\}$$

$$A = \{15, 17, 19\}$$

$$B = \{x \in \mathbb{N} \mid x = 2n, \text{ con } n \in \mathbb{N} \text{ e } 6 < n < 10\}$$

$$B = \{12, 14, 16, 18\}$$

a. $A \cup B$

$$A \cup B = \{12, 14, 15, 16, 17, 18, 19\}$$

b. \bar{A}

$$\bar{A} = \{10, 11, 12, 13, 14, 16, 18\}$$

c. $\bar{A} \cap B$

$$\bar{A} \cap B = \{12, 14, 16, 18\}$$

quindi $\bar{A} \cap B = B$

P. 155

n. 101

$$A = \{1, 3, 5, 6, 7\} \quad B = \{1, 2, 3, 5, 6\}$$

1. $A \cap B = \{1, 3, 5, 6\}$ vero

2. $A \cup B = \{1, 2, 3, 5, 6, 7\}$ vero

3. $A - B = \{7\}$

4. $A - B = \{7\}$ $B - A = \{2\}$ falso

n. 106

$$A = \{-1, 1, 3, 4\}$$

$$B = \{1, 2, 3, 4\}$$

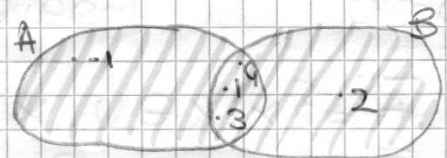
insieme

rappr. elementare

rappr. Diagramma Venn

$$A \cup B$$

$$A \cup B = \{-1, 1, 2, 3, 4\}$$



$$A \cap B$$

$$A \cap B = \{1, 3, 4\}$$



$$A - B$$

$$A - B = \{-1\}$$



$$B - A$$

$$B - A = \{2\}$$



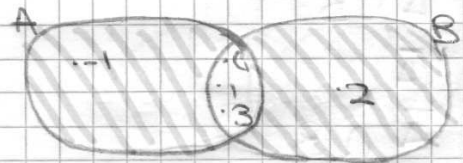
$$(A - B) \cup (B - A)$$

$$(A - B) \cup (B - A) =$$

↓
differenza
simmetrica

$$= \{-1\} \cup \{2\} =$$

$$= \{-1, 2\}$$



n. 111

$$A = \{1, 2, 3, 5\}$$

$$B = \{2, 4, 5\}$$

$$C = \{1, 3, 4, 5\}$$

insieme

rappr. elementare

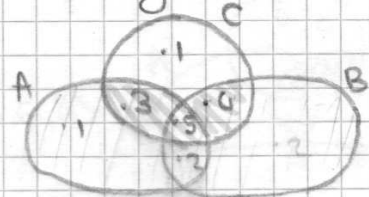
rappr. Diagramma Venn

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

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

$$= \{1, 2, 3, 4, 5\} \cap C =$$

$$= \{1, 3, 4, 5\} = C$$

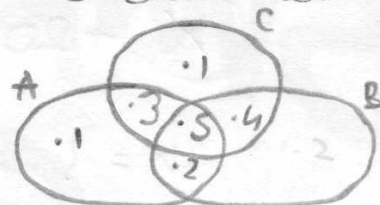


$$A - (B \cup C)$$

calcolativa

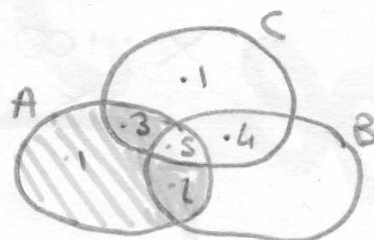
$$\begin{aligned} A - (B \cup C) &= \\ &= A - \{1, 2, 3, 4, 5\} = \\ &= \emptyset \end{aligned}$$

diagramma ven



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

$$\begin{aligned} (A - B) \cup (B - C) &= \\ &= \{1, 3\} \cup \{2\} = \\ &= \{1, 2, 3\} \end{aligned}$$



n. 116

$$A = \left\{ \frac{1}{3}, \frac{5}{4}, \frac{11}{2}, \frac{7}{8}, \frac{25}{3} \right\}$$

$$B = \left\{ \frac{1}{4}, \frac{3}{10}, \frac{15}{12}, \frac{11}{3}, \frac{25}{4} \right\}$$

$$C = \{x \in \mathbb{Q} \mid x < 1\}$$

$$D = \{x \in \mathbb{Q} \mid x > 2\}$$

$$A \cap B = \left\{ \frac{7}{8}, \frac{25}{4} \right\}$$

$$A \cup B = \left\{ \frac{1}{3}, \frac{5}{4}, \frac{11}{2}, \frac{7}{8}, \frac{25}{3}, \frac{1}{4}, \frac{11}{3}, \frac{25}{4} \right\}$$

$$A - B = \left\{ \frac{1}{3}, \frac{11}{2}, \frac{25}{3} \right\}$$

$$\begin{aligned} (A \cup B) \cap C &= \left\{ \frac{1}{3}, \frac{5}{4}, \frac{11}{2}, \frac{7}{8}, \frac{25}{3}, \frac{1}{4}, \frac{11}{3}, \frac{25}{4} \right\} \cap \left\{ \frac{1}{3}, \frac{7}{8}, \frac{1}{4} \right\} \\ &= \left\{ \frac{1}{3}, \frac{7}{8}, \frac{1}{4} \right\} = C \end{aligned}$$

$$\begin{aligned} (A \cup B) \cap D &= \left\{ \frac{1}{3}, \frac{5}{4}, \frac{11}{2}, \frac{7}{8}, \frac{25}{3}, \frac{1}{4}, \frac{11}{3}, \frac{25}{4} \right\} \cap \left\{ \frac{11}{2}, \frac{25}{3}, \frac{11}{3}, \frac{25}{4} \right\} \\ &= \left\{ \frac{11}{2}, \frac{25}{3}, \frac{11}{3}, \frac{25}{4} \right\} = D \end{aligned}$$

n. 126

$$\bar{A}^U = \{x \in \mathbb{N} \mid x \neq 2n, \text{ con } n \in \mathbb{N}\}$$

$$\bar{A}^U = \{x \in \mathbb{N} \mid x \text{ non è un multiplo di } 2\}$$

n. 136

$$U = \{x \in \mathbb{N} \mid 12 \leq x \leq 23\}$$

$$U = \{12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23\}$$

$$A = \{x \in \mathbb{N} \mid x = 2n^2 \text{ con } n \in \mathbb{N} \text{ e } 7 \leq n < 11\}$$

$$A = \{15, 17, 19, 21\}$$

$$B = \{x \in \mathbb{N} \mid x = 2n, \text{ con } n \in \mathbb{N} \text{ e } 5 \leq n \leq 9\}$$

$$B = \{10, 12, 14, 16, 18\}$$

$$A \cap B = \emptyset$$

$$\bar{B} = \{13, 15, 17, 19, 20, 21, 22, 23\}$$

$$A \cup \bar{B} = \{13, 15, 17, 19, 20, 21, 22, 23\}$$

esercizi p. 156

n. 107

$$A = \{i, e\}$$

$$B = \{e, a, i, o\}$$

$$C = \{u, i, o, e\}$$

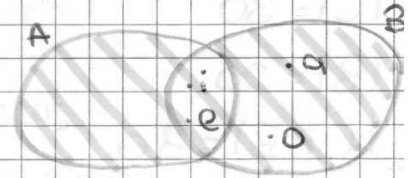
insieme

rapp. per elevazione

rapp. Diagrammi Venn

$$A \cup B$$

$$A \cup B = \{i, e, a, o\}$$



$$A \cap B$$

$$A \cap B = \{i, e\}$$



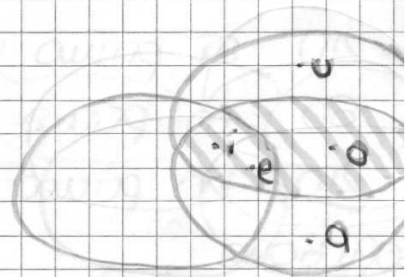
$$A - B$$

$$A - B = \emptyset$$



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

$$\begin{aligned} (A \cup B) \cap C &= \\ &= \{i, e, a, o\} \cap \{u, i, o, e\} = \\ &= \{i, e, o\} \end{aligned}$$



n. 127

$$A^u = \{x \in \mathbb{Z} \mid x = n \text{ con } |n| \leq 3\}$$

n. 132

$$V = \{13, 17\} \quad V^u = \{1, 15, 23\}$$

n. 117

$$A = \left\{ x \in \mathbb{Q} \mid x = n + \frac{1}{n}, \text{ con } n \in \mathbb{N} \text{ e } n \neq 0 \right\}$$

$$A = \left\{ 2, \frac{5}{2}, \frac{10}{3}, \frac{17}{4}, \frac{26}{5}, \frac{37}{6}, \frac{50}{7} \right\}$$

$$B = \{x \in \mathbb{R} \mid 1 \leq x \leq 5\}$$

$$B = \left\{ 1, 2, \frac{5}{2}, \frac{10}{3}, \frac{17}{4}, 5 \right\}$$

$$C = \left\{ x \in \mathbb{R} \mid \frac{9}{2} \leq x \leq \frac{11}{2} \right\}$$

$$C = \left\{ \frac{5}{2}, \frac{10}{3}, \frac{17}{4}, \frac{26}{5}, \frac{11}{2} \right\}$$

$$A \cap B = \left\{ 2, \frac{5}{2}, \frac{10}{3}, \frac{17}{4} \right\}$$

$$A \cap C = \left\{ \frac{5}{2}, \frac{10}{3}, \frac{17}{4}, \frac{26}{5} \right\}$$

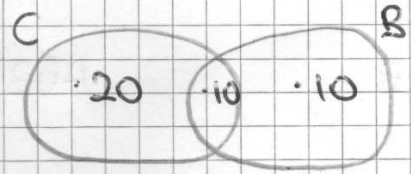
$$(A \cap B) \cup (A \cap C) = \left\{ 2, \frac{5}{2}, \frac{10}{3}, \frac{17}{4} \right\}$$

$$A \cap B \cap C = \left\{ \frac{5}{2}, \frac{10}{3}, \frac{17}{4} \right\}$$

In un gruppo di ragazzi 30 giocano a calcio e 20 giocano a basket. Sapendo che quelli che giocano sia a calcio sia a basket sono 10, determinare il numero dei ragazzi che giocano solo a calcio solo a basket

$$\begin{cases} D \\ A \\ I \end{cases} \begin{cases} |C| = 30 \\ |B| = 20 \\ |C \cap B| = 10 \end{cases}$$

$$\left. \begin{matrix} |B - C| \\ |C - B| \end{matrix} \right\} ?$$



SOLUZIONE

$$|B - C| = |B| - |C \cap B| = 10$$

$$|C - B| = |C| - |C \cap B| = 20$$

Problema P.163 n. 200

$$150 \text{ candidati} = |U|$$

$$40 \text{ si primo no secondo} = |A - B| \quad |A \cap B| = ?$$

$$60 \text{ no primo si secondo} = |B - A| \quad |S - P|$$

$$40 \text{ no primo no secondo} = |P \cup S|$$

Soluzione

$$|U| = 150$$

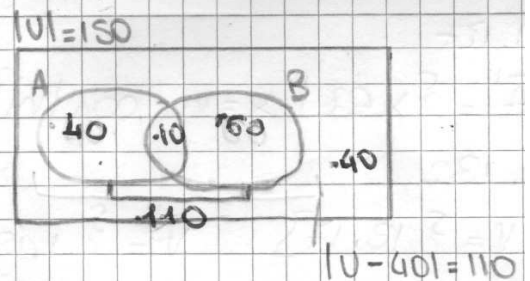
$$|A \cup B| = 110$$

$$|A \cap B| = 110 - 60 = 50 \begin{cases} \text{si primo no} \\ \text{secondo} \\ \text{si primo si} \\ \text{secondo} \end{cases}$$

$$|B \cap A| = 110 - 40 = 70 \begin{cases} \text{no primo si} \\ \text{secondo} \\ \text{si primo si} \\ \text{secondo} \end{cases}$$

$$50 - 40 = 10$$

$$70 - 60 = 10$$



PROBLEMA P. 163 n. 201

$$\begin{array}{l}
 D \\
 A \\
 T \\
 I
 \end{array}
 \left\{
 \begin{array}{l}
 300 \text{ studenti} = |U| \\
 30\% \text{ nuoto} = |N| \\
 60\% \text{ calcio} = |C| \\
 20\% \text{ n\`e nuoto n\`e calcio} = |N \cup C|
 \end{array}
 \right.
 \quad |N \cap C| = ?$$

Soluzione

$$\frac{30}{100} \cdot 300 = 90 \text{ nuoto}$$

$$\frac{60}{100} \cdot 300 = 180 \text{ calcio}$$

$$\frac{20}{100} \cdot 300 = 60 \text{ n\`e nuoto n\`e calcio}$$

$$|U| = 300 \text{ e } |U - (N \cup C)| = 60$$

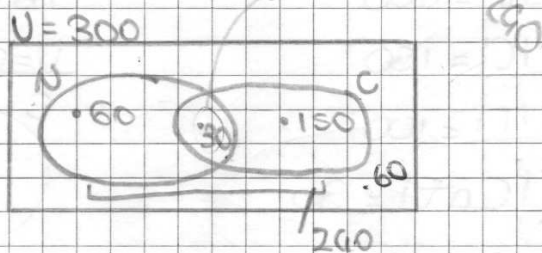
$$|N \cup C| = 240$$

$$|N - C| = 240 - 180 = 60$$

$$|C - N| = 240 - 90 = 150$$

$$|C \cap N| = 180 - 150 = 30$$

$$\rightarrow |N| + |C| - |A \cup B|$$



Problema P. 163 n. 202

$$100 \text{ italiani} = |U|$$

$$21 \text{ DVD} = |A|$$

$$56 \text{ VHS} = |B|$$

$$10 \text{ sia DVD sia VHS} = |A \cap B|$$

$$|U - (A \cup B)| = ?$$

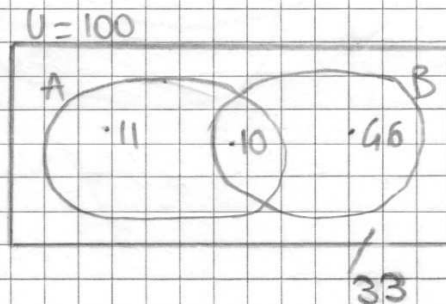
Soluzione

$$|U - (A \cup B)| =$$

$$|A - B| = |A| - |A \cap B| = 21 - 10 = 11$$

$$|B - A| = |B| - |A \cap B| = 56 - 10 = 46$$

$$= 100 - (11 + 10 + 46) = 33$$



PROBLEMA P. 164 n. 203

$$\begin{array}{l}
 D \\
 A \\
 T \\
 i
 \end{array}
 \left\{
 \begin{array}{l}
 200 \text{ commercio} = |A| \\
 150 \text{ industria} = |B| \\
 80 \text{ sia commercio sia industria} = |A \cap B| \\
 160 \text{ nè commercio nè industria} = |\overline{A \cup B}|
 \end{array}
 \right.
 \quad |U| = ?$$

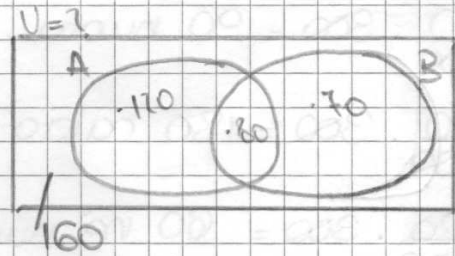
SOLUZIONE

$$|U| = ?$$

$$|A - B| = |A| - |A \cap B| = 120$$

$$|B - A| = |B| - |A \cap B| = 70$$

$$|U| = 120 + 80 + 70 + 160 = 430$$

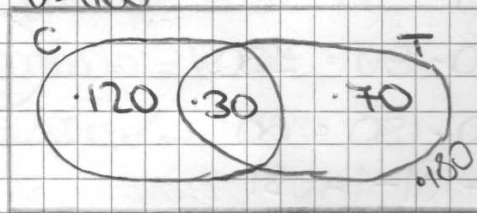


P. 164 n. 204

$$\begin{array}{l}
 D \\
 A \\
 T \\
 i
 \end{array}
 \left\{
 \begin{array}{l}
 |U| = 400 \\
 |C| = 150 \\
 |T| = 100 \\
 |C \cap T| = 30
 \end{array}
 \right.$$

$$|\overline{C \cup T}| = ?$$

$$U = 400$$



SOLUZIONE

$$|C - T| = |C| - |C \cap T| = 150 - 30 = 120$$

$$|T - C| = |T| - |C \cap T| = 100 - 30 = 70$$

$$|\overline{C \cup T}| = |U| - (|C - T| + |T - C| + |C \cap T|) = 400 - 220 = 180$$

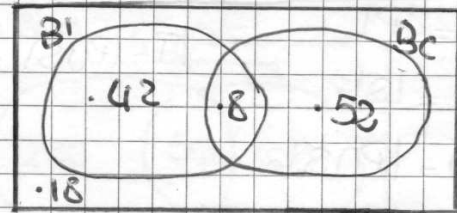
P. 160 n. 205

$$|I| = 50$$

$$|C| = 60$$

$$|\overline{I \cup C}| = 18$$

$$|U| = ?$$



Soluzioni

$$|I \cap C| = |I| - |I - C| = 50 - 42 = 8$$

$$|C - I| = |C| - |I \cap C| = 60 - 8 = 52$$

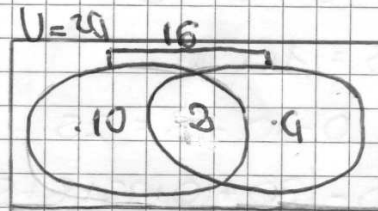
$$|U| = |I - C| + |C - I| + |I \cap C| + |\overline{I \cup C}| = 42 + 52 + 8 + 18 = 120$$

n. 206 $|U| = 20$

$$|C \cap T| = \frac{1}{2} \cdot 20^2 = 20$$

$$|C \cup T| = \frac{2}{3} \cdot 20^2 = 26$$

$$|T - C| = \frac{|C \cup T|}{2}$$



Soluzioni

$$|C \cup T| = |U| - |C \cap T| = 20 - 2 = 18$$

$$|T - C| = \frac{18}{2} = 9$$

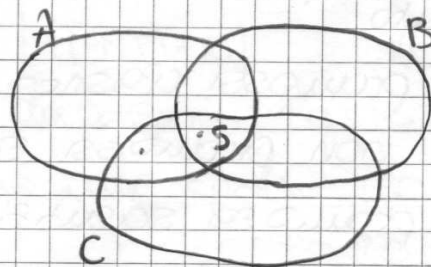
$$|C| = |C \cup T| - |T - C| = 18 - 9 = 9$$

$$|C - T| = |C \cup T| - |T| = 18 - 9 = 9$$

$$A = \{1, 3, 5, 7, 9\}$$

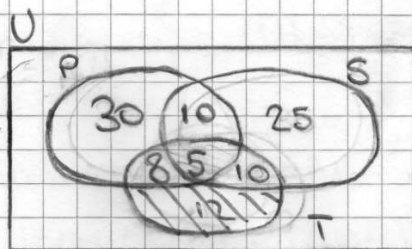
$$B = \{2, 4, 5, 6, 8\}$$

$$C = \{1, 5, 6, 7\}$$



P. 165 n. 209

$$\begin{cases}
 53 = |P| \\
 50 = |S| \\
 10 = |P \cap S| \\
 8 = |P \cap T| - |S| \\
 15 = |S \cap T| \\
 30 = |P - (S \cup T)| \\
 100 = |P \cup S \cup T|
 \end{cases}$$



SOLUZIONE

$$|P \cap S \cap T| = 53 - 30 - 8 - 10 = 5$$

$$|S \cap T| - P = 15 - 5 = 10$$

$$S - (P \cup T) = 50 - 10 - 10 - 5 = 25$$

$$T - (P \cup S) = 100 - (30 + 10 + 25 + 8 + 5 + 10) = 12$$

P. 169 n. 204

$$|U| = 600$$

$$|P^c| = |S^c|$$

600 studenti $\begin{cases} \text{LC} \\ \text{LS} \end{cases}$

$$|P| = 80\% \cdot 600$$

$$|P^c| = ?$$

$$|P^c| = 20$$

$$\text{Studenti promossi istituto} = 80\% = \frac{80}{100} \cdot 600 = 480$$

$$\text{Studenti non promossi LC} = 20$$

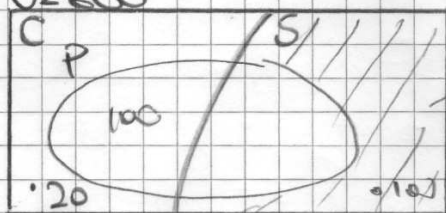
$$\text{Studenti non promossi istituto} = 600 - 480 = 120$$

$$\text{Studenti promossi classico} = 120 - 20 = 100$$

$$\text{Studenti non promossi scientifico} = 100$$

$$\text{Studenti promossi scientifico} = 480 - 100 = 380$$

$$U = 600$$

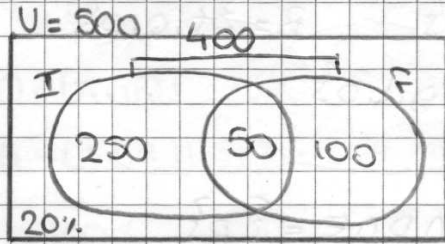


$$600 - 480 - 20$$

$$100$$

P. 139 n. 1

		?
D	$ U = 500$	
A	$ I = 60\% \cdot 500$	$ F \cap I $
F	$ F = 30\% \cdot 500$	$ I - F $
I	$ \overline{F \cap I} = 20\% \cdot 500$	$ F - I $



Soluzione

$$|I| = \frac{60}{100} \cdot 500 = 300$$

$$|F| = \frac{30}{100} \cdot 500 = 150$$

$$|\overline{F \cap I}| = \frac{20}{100} \cdot 500 = 100$$

$$|F \cup I| = |U| - |\overline{F \cap I}| = 500 - 100 = 400$$

$$|I - F| = 400 - 150 = 250$$

$$|F - I| = 400 - 300 = 100$$

$$|F \cap I| = 400 - 250 - 100 = 50$$

P. 164 n. 208

$$|C| = 200$$

$$|N| = 140$$

$$|T| = 110$$

$$|N \cap T| = 30$$

$$|C - (N \cup T)| = 150$$

$$|(C \cap N) - T| = 20$$

$$|(C \cap N \cap T)| = 10$$

$$|(C \cup N \cup T)| = 40$$

SOLUZIONE

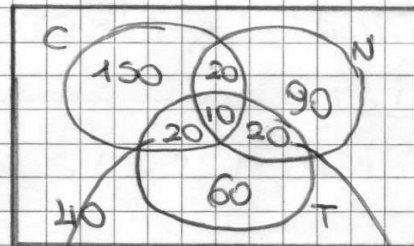
$$|(C \cap T) - N| = |C| - |C - (N \cup T)| - |(C \cap N) - T| - |(C \cap N \cap T)| = 200 - 150 - 20 - 10 = 20$$

$$|T - (C \cup N)| = |T| - |N \cap T| - |(C \cap N) - T| = 110 - 30 - 20 = 60$$

$$|(N \cap T) - C| = |N \cap T| - |(C \cap N \cap T)| = 30 - 10 = 20$$

$$|N - (C \cup T)| = |N| - |(C \cap N) - T| - |N \cap T| = 140 - 20 - 30 = 90$$

$$|U| = ?$$



$$|(C \cap T) - N|$$

$$|(N \cap T) - C|$$

almeno due sport: $20 + 20 + 10 + 20$

massimo due sport: $150 + 90 + 60 +$

$$20 + 20 + 40$$

Q. 15 & n. 18

$$A = \{a, b, c\}$$

$$B = \{p, q, b, c, m, n\}$$

$$A \cap B = \{b, c\}$$

$$A \cup B = \{a, b, c, p, q, m, n\}$$

n. 210

$$|M| = 40$$

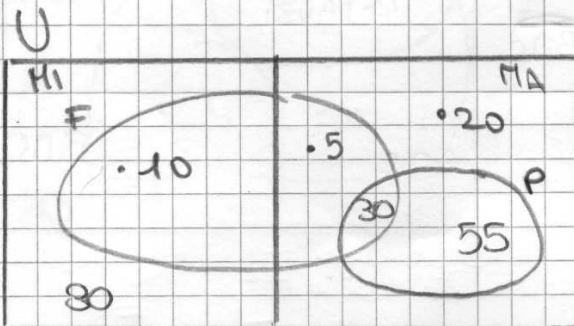
$$|P| = 85$$

$$|F| = 45$$

$$|M \cap F| = 10$$

$$|(F \cap M) - P| = 5$$

$$|M - (F \cup P)| = 20$$



SOLUTION

$$|F \cap P| = |F| - |M \cap F| - |(F \cap M) - P| = 45 - 10 - 5 = 30$$

$$|P - (F \cap P)| = |P| - |F \cap P| = 85 - 30 = 55$$

$$|M - F| = |M| - |M \cap F| = 40 - 10 = 30$$

$$|U| = |M| + |P| + |(F \cap M) - P| + |M - (F \cup P)| = 40 + 85 + 5 + 20 = 150$$

n. 211

$$|A| = 26$$

$$|R| = 30$$

$$|A \cap B| = 17$$

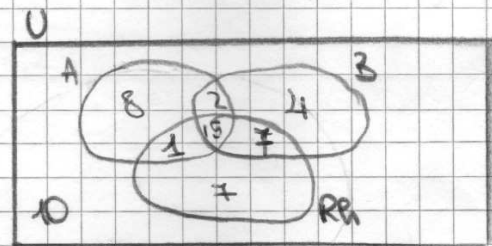
$$|A \cup B \cap R| = 10$$

$$|B| = 28$$

$$|A \cap R| = 16$$

$$|B \cap R| = 22$$

$$|A \cap B \cap R| = 15$$



SOLUTION

$$|(A \cap B) - R| = |A \cap B| - |A \cap B \cap R| = 17 - 15 = 2 = AB^-$$

$$|(A \cap R) - B| = |A \cap R| - |A \cap B \cap R| = 16 - 15 = 1 = A^+ B^-$$

$$|A - (B \cup R)| = |A| - |(A \cap B) - R| - |A \cap R| = 26 - 2 - 16 = 8 = A^+$$

$$|(B \cap R) - A| = |B \cap R| - |A \cap B \cap R| = 22 - 15 = 7 = B^+ R^-$$

$$|B - (A \cup R)| = |B| - |A \cap B| - |(B \cap R) - A| = 28 - 17 - 7 = 4 = B^+$$

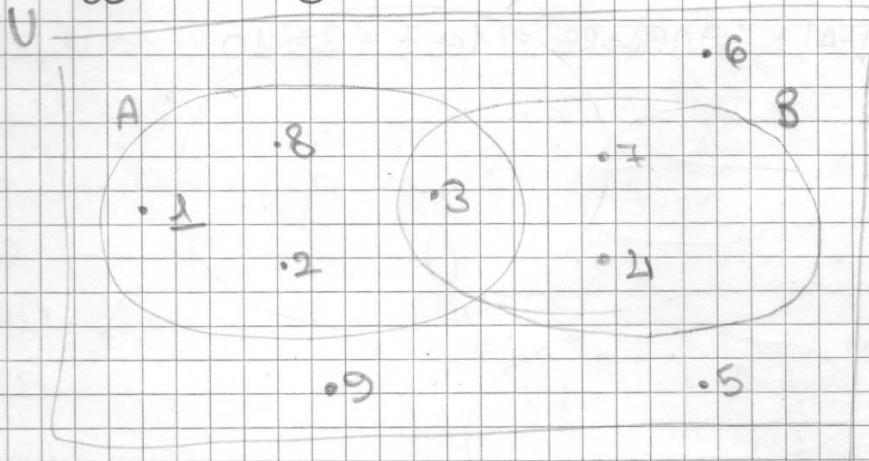
$$|R - (A \cup B)| = |R| - |A \cap R| - |(B \cap R) - A| = 30 - 16 - 7 = 7 = R^+$$

$$|U| = |A| + |B - (A \cup R)| + |(B \cap R) - A| + |R - (A \cup B)| + |A \cup B \cap R| = 26 + 4 + 7 + 7 + 10 = 54$$

$$|A - (B \cup R)| + |B - (A \cup R)| + |R - (B \cup A)| = 8 + 9 + 1 = 19$$

$$|(A \cap R) - B| + |(B \cap R) - A| + |(A \cap B) - R| = 1 + 7 + 2 = 10$$

I legge de Morgan



$$A \cup B = \{1, 2, 3, 4, 7, 8\}$$

$$\overline{A \cup B} = \{5, 6, 9\}$$

=

$$\overline{A} = \{4, 5, 6, 7, 9\}$$

$$\overline{B} = \{1, 2, 5, 6, 8, 9\}$$

$$\overline{A} \cap \overline{B} = \{5, 6, 9\}$$

Proprietà generale

$$A \cap B = \{3\}$$

=

$$\overline{A \cap B} = \{1, 2, 4, 5, 6, 7, 8, 9\}$$

$$\overline{A} \cup \overline{B} = \{1, 2, 4, 5, 6, 7, 8, 9\}$$

COMPITI P. 156

n. 113

$$A = \{p, m, n\}$$

$$B = \{m, n, o\}$$

$$A \cup B = \{p, m, n, o\}$$

$$A \cap B = \{m, n\}$$

$$A - B = \{p\}$$

$$B - A = \{o\}$$

~~~~~

$$A \cap B = \{m, o\}$$

$$A - B = \{p\}$$

$$B - A = \{n, q\}$$

$$A = \{p, m, o\}$$

$$B = \{n, q, m, o\}$$

$$A \cup B = \{p, m, o, n, q\}$$

~~~~~

$$B = \{m, n, q\}$$

$$A - B = \{l, p\}$$

$$B - A = \{q\}$$

$$A \cap B = \{m, n\}$$

$$A \cup B = \{l, p, m, n, q\}$$

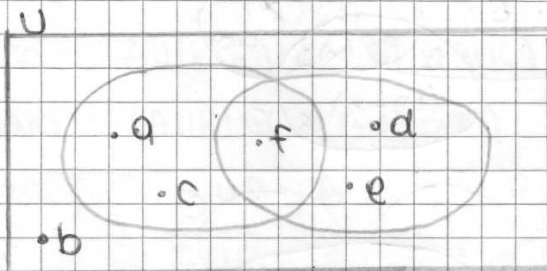
$$A = \{l, p, m, n\}$$

N. 139

$$U = \{a, b, c, d, e, f\}$$

$$A = \{a, c, f\}$$

$$B = \{d, e, f\}$$



a. $A \cup B = \{a, c, d, e, f\}$

b. $A \cap B = \{f\}$

c. $B - A = \{d, e\}$

d. $A - B = \{a, c\}$

e. $\bar{A} = \{d, e, b\}$

f. $A \cap \bar{B} = \{a, c, f\} \cap \{a, c, b\} = \{a, c\}$

g. $\bar{A} \cup B = \{b, d, e\} \cup \{d, e, f\} = \{b, d, e, f\}$

h. $\overline{A \cap B} = \{a, c, d, e, b\}$

i. $\overline{A \cap B} = \{b\}$

j. $\overline{A \cup B} = \{b\}$

k. $\overline{B - A} = \{a, b, c\} - \{b, d, e\} = \{a, c\}$

l. $\overline{B - A} = \{a, b, c, f\}$

P. 165 n. 212

$$|U| = 30$$

$$|C| = 10$$

$$|G| = 14$$

$$|S| = 12$$

$$|G \cap C| = \emptyset$$

$$|C \cap S| = 2$$

Soluzioni

$$|C - (G \cup S)| = |C| - |C \cap S| = 10 - 2 = 8$$

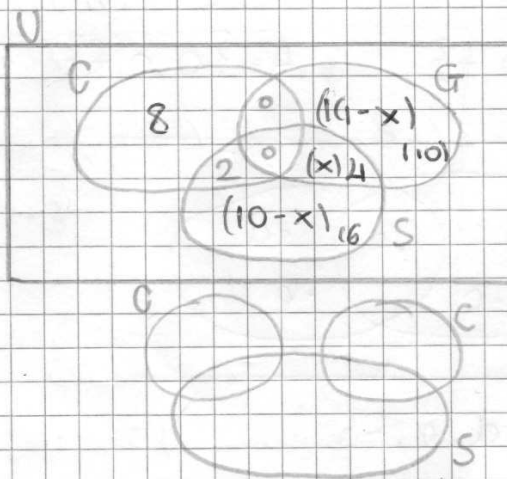
$$2 + 8 + 10 - x + x + 10 - x = 30$$

$$30 - x = 30$$

$$x = 4$$

$$|G - (S \cup C)| = |G| - |G \cap S| - |C| = 14 - 4 = 10$$

$$|S - (G \cup C)| = |S| - |C \cap S| - |G \cap S| - |C| = 12 - 2 - 4 = 6$$



n. 213

$$|(P \cap N) - C| = 4$$

$$|(P \cap C) - N| = 6$$

$$|(C \cap N) - P| = 5$$

$$|P - (C \cup N)| = 2$$

$$|C - (N \cup P)| = 4$$

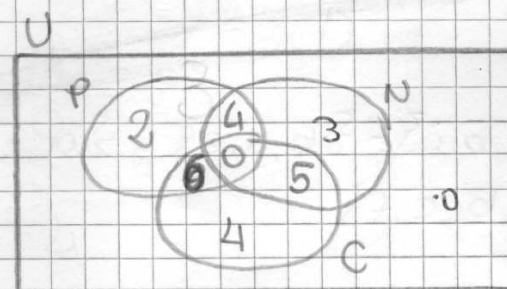
$$|C \cap N \cap P| = \emptyset$$

Soluzioni

$$|N| = 12$$

$$|N - (P \cup S)| = |N| - |(C \cap N) - P| - |(P \cap N) - C| = 12 - 5 - 4 = 3$$

$$|U| = |P| + |N - (P \cup S)| + |(C \cap N) - P| + |(P \cap N) - C| = 12 + 3 + 5 + 4 = 24$$



Prodotto cartesiano

$$A = \{a, b, c\} \quad B = \{1, 2\}$$

$$A \times B = \{(a, 1), (a, 2), (b, 1), (b, 2), (c, 1), (c, 2)\}$$

$$B \times A = \{(1, a), (1, b), (1, c), (2, a), (2, b), (2, c)\}$$

COMPITI VAGABONDI NATALE

p. 166

n. 215

$$4 \text{ antipasti} = A$$

$$3 \text{ primi} = B$$

$$3 \text{ secondi} = C$$

Un cliente può consumare un pranzo in 36 modi distinti.

SOLUZIONE

$$|A \cdot B \cdot C| = 4 \cdot 3 \cdot 3 = 36$$

n. 216

$$A = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9\}$$

4 caratteri

SOLUZIONE

$$|A| = 10$$

$$A \cdot A \cdot A \cdot A = 10 \cdot 10 \cdot 10 \cdot 10 = 10^4$$

n. 217

$$A = \{26 \text{ lettere} + 10 \text{ numeri}\}$$

4 caratteri

$$|A| = 36$$

SOLUZIONE

$$A \cdot A \cdot A \cdot A = 36 \cdot 36 \cdot 36 \cdot 36 = 36^4$$

n. 218

$$A = \{\text{testa}, \text{croce}\}$$

5 tiri

$$|A| = 2$$

SOLUZIONE

$$A \cdot A \cdot A \cdot A \cdot A = 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 = 2^5$$

n. 219

$$A = \{11 \text{ squadre}\}$$

SOLUZIONE

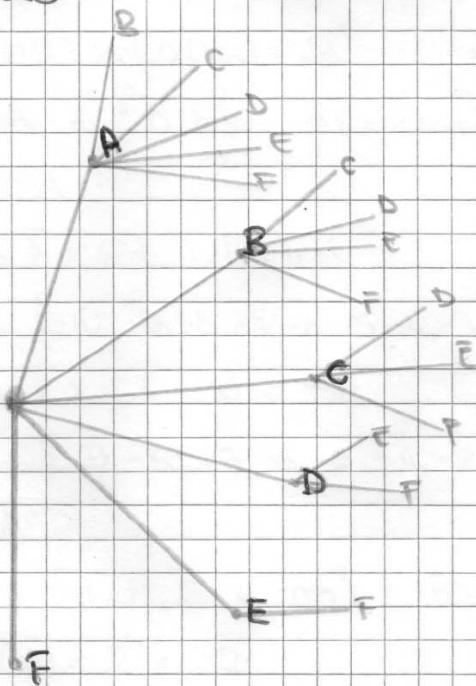
$$A^2 - A = 11^2 - 11 = 121 - 11 = 110$$

110 doppio turno (andata, ritorno)

$$110 : 2 = 55$$

55 turno semplice

n. 220



$$\frac{6^2 - 6}{2} = 15$$

n. 221

$$A = \{1, 2, 5, 6, 0\}$$

$$|A| = 5$$

SOLUZIONE

$$5 \cdot 4 = 20$$

n. 222

M O N T E
5 4 3 2 1

Gli anagrammi che si possono formare sono 120
($5 \cdot 4 \cdot 3 \cdot 2 \cdot 1$).

n. 223

R A M O
4 3 2 1

Gli anagrammi che si possono formare sono 24
($4 \cdot 3 \cdot 2 \cdot 1$)

n. 224

$$|A| = 3$$

Soluzione

$$S_A = 2^3 = 8$$

l'insieme A ha 8 sottoinsiemi

n. 225

$$X = \{x \in \mathbb{N} \mid 1 \leq x \leq 6\}$$

$$X = \{1, 2, 3, 4, 5, 6\}$$

$$|X| = 6$$

$$P(X) = 2^6 = 64$$

n. 227

targa = 2 lettere alfabeto -
3 cifre numeri -
2 lettere alfabeto.

$$|A| = 26$$

$$|C| = 26$$

$$|B| = 10$$

$$26^2 \cdot 10^3 \cdot 26^2 = 456976000$$

n. 226

DATI

$$|A| = 6$$

$$|E| = 1$$

$$|B| = 4$$

no carne - bianco
perce - rosso

$$|C| = 7$$

$$|D| = 5$$

SOLUZIONE

$$|A \cdot C| + |B \cdot D| + |A \cdot E| + |B \cdot E|$$

$$42 + 20 + 6 + 4 = 72$$

101	396	385	386	346	345
-----	-----	-----	-----	-----	-----

V	132	131	112	82	81
---	-----	-----	-----	----	----

P	0	1	10	50	51
---	---	---	----	----	----

n. 228

12 squadre

$$n. partite = 12 - 12 = 132$$

345 punti

$$\text{se tutte le partite fossero finite in parità oppure tutte unite} = 132 \cdot 2 = 264$$

3 punti vittoria

$$132 \cdot 3 = 396$$

1 punto pareggio

$$345 - 264 = 81 \text{ unite}$$

$$132 - 81 = 51 \text{ pareggio}$$

p. 176

n. 450

$$A = \{a, b, m\}$$

$$A \cap B = \{b, m\}$$

$$A \cup B = \{a, b, m, c, d\}$$

$$B = \{b, c, d, m\}$$

$$B - A = \{c, d\}$$

$$A - B = \{a\}$$

$$(B - A) \times (A - B) = \{(c, a), (d, a)\}$$

$$\bar{A} = \{c, d\}$$

$$\bar{B} = \{a\}$$

$$(A \cup B) \times (A \cap B) = \{(a, b), (a, m), (b, b), (b, m), (m, b), (m, m), (c, b), (c, m), (d, b), (d, m)\}$$

$$A_1 = \{a, b\} \quad A_2 = \{m\}$$

n. 451

$$A = \{x \in \mathbb{Z} : |x| \leq 10\}$$

$$A = \{-10, -9, -8, -7, -6, -5, -4, -3, -2, -1, 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10\} \quad |A| = 21$$

$$B = \{x \in \mathbb{Z} : |x| < 10\}$$

$$B = \{-9, -8, -7, -6, -5, -4, -3, -2, -1, 0, 1, 2, 3, 4, 5, 6, 7, 8, 9\} \quad |B| = 19$$

n. 452

$$A = \{i, n, s, e, m\}$$

$$B = \{i, e\}$$

$$C = \{n, s, m\}$$

$$P(A) = 2^5 = 32$$

$$P(B) = 2^2 = 4$$

$$P(B) = \{\emptyset, \{i\}, \{e\}, \{i, e\}\}$$

$$P(C) = 2^3 = 8$$

$$4 \cdot 8 = 32$$

prodotta corrispondono delle parti di B e C

n. 254

$$A = \{1, 2, 3\} \quad B = \{4, 5\}$$

$$P(A) = \{\emptyset, \{1\}, \{2\}, \{3\}, \{1, 2\}, \{1, 3\}, \{2, 3\}, \{1, 2, 3\}\}$$

$$P(B) = \{\emptyset, \{4\}, \{5\}, \{4, 5\}\}$$

$$A \times B = \{\{1, 4\}, \{1, 5\}, \{2, 4\}, \{2, 5\}, \{3, 4\}, \{3, 5\}\}$$

$$B \times A = \{\{4, 1\}, \{4, 2\}, \{4, 3\}, \{5, 1\}, \{5, 2\}, \{5, 3\}\}$$

$$P(A) \times P(B) = 32 = 8 \cdot 4$$

n. 455

a. $A = \{b\}$

$$P(A) = \{\emptyset, \{b\}\}$$

$$A = \{b, m\}$$

$$P(A) = \{\emptyset, \{b\}, \{m\}, \{m, b\}\}$$

$$|A| = 4 \quad P(A) = 2^4 = 16$$

$$B = 4 \quad P(B) = 2^4 = 16$$

$$U = \{1, 2, 3, 4, 5\}$$

$$A = \{1, 2\}$$

$$B = \{3\}$$

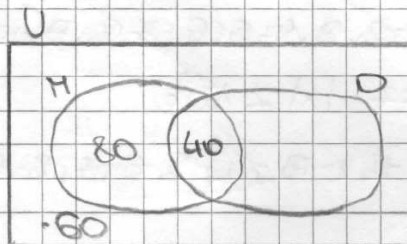
$$A \times B = 2 \cdot 1 = 3$$

$$\bar{A} \times \bar{B} = 3 \cdot 4 = 12$$

$$3 \neq 12$$

n. 459

$$\begin{array}{l}
 D \\
 A \\
 T \\
 I
 \end{array}
 \left\{
 \begin{array}{l}
 |U| = 200 \\
 |M| = 60\% = \frac{60}{100} \cdot 200 = 120 \\
 |M \cap O| = 20\% = \frac{20}{100} \cdot 200 = 40 \\
 |\overline{M \cup O}| = 30\% = \frac{30}{100} \cdot 200 = 60
 \end{array}
 \right.$$



SOLUZIONE

$$|M - O| = |M| - |M \cap O| = 120 - 40 = 80$$

$$|O - M| = |U| - |M| - |\overline{M \cup O}| = 200 - 120 - 60 = 20$$

n. 457

con un insieme contenere un elemento

a. Perché è possibile costruire 2 sottoinsiemi impropri e nessun sottoinsieme proprio

b. $A = \{a, b, c\}$

$$B = \{c, d\}$$

$$(A \cup B) - B =$$

$$\{a, b, c, d\} - \{c, d\} = \{a, b\}$$

c. Perché avendo entrambi gli insiemi A e B cardinalità > 1 è impossibile che il loro prodotto contenga sia 17 perché sia 1 moltiplicato per 17 da 17 (numero primo)

$$|P| = 30$$

$$|T| = 50$$

$$|C| = 150$$

$$|P \cap T| - C = 8$$

$$|P \cap C| - T = 12$$

$$|P - (C \cup T)| = 5$$

$$|T - (P \cup C)| = 17$$

$$|\overline{T \cup C \cup P}| = 70$$

SOLUZIONE

$$|P \cap T \cap C| = |P| - |P - (C \cup T)| - |P \cap T| - |P \cap C| = 30 - 5 - 8 - 12 = 5$$

$$|T \cap C| - P = |T| - |P \cap T| - |T - (P \cup C)| = 50 - 13 - 17 = 20$$

$$|C - (P \cup T)| = |C| - |T \cap C| - |P \cap C| - |P \cap T| = 150 - 25 - 12 = 113$$

n. 258

$$|L| = 40$$

$$|U| = ?$$

$$|I| = 8$$

$$|E| = 15$$

$$|E| = 214$$

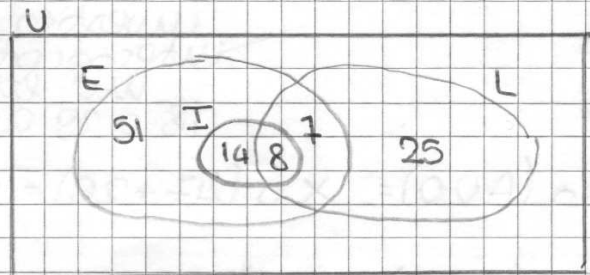
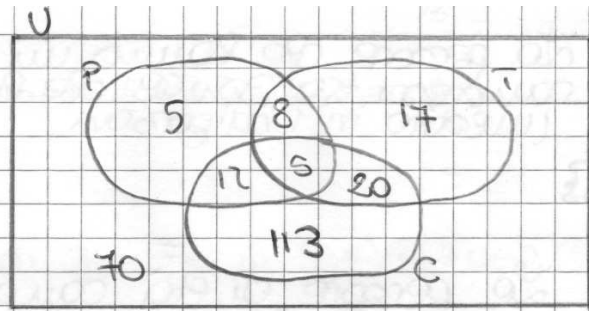
SOLUZIONE

$$|E \cap L| = |E \cap L| - |I \cap L| = 15 - 8 = 7$$

$$|I \cap L| = 2|E \cap L| = 2 \cdot 7 = 14$$

$$|L - E| = |L| - |L \cap E| = 40 - 15 = 25$$

$$|E - (I \cup L)| = 2|E| - |I \cap L| - |L \cap E| = 80 - 14 - 15 = 51$$



COMPITI P. 17 n. 261

Y_{NO} Le persone che hanno un'età compresa tra 30 e 49 che hanno investito in obbligazioni

$$Y_{NO} = 66$$

Y_{UZ} Le persone di età compresa tra 30-49 e quelle di età tra 50+

↓

$$Y_{UZ} = 91 = 33 + 58$$

X_{UA} Le persone che hanno un'età compresa tra 18-29 uniti a quelli che hanno investito in azioni

↓

$$X_{UA} = (21 + 47) - 5 = 63$$

$X_{N(AUO)}$ Le persone che hanno investito in azioni unito a quelli che hanno investito in obbligazioni, intersecati a quelli che hanno un'età compresa tra 18 e 29 anni

$$X_{N(AUO)} = x_n(27 + 26) = 5 + 2 = 7$$

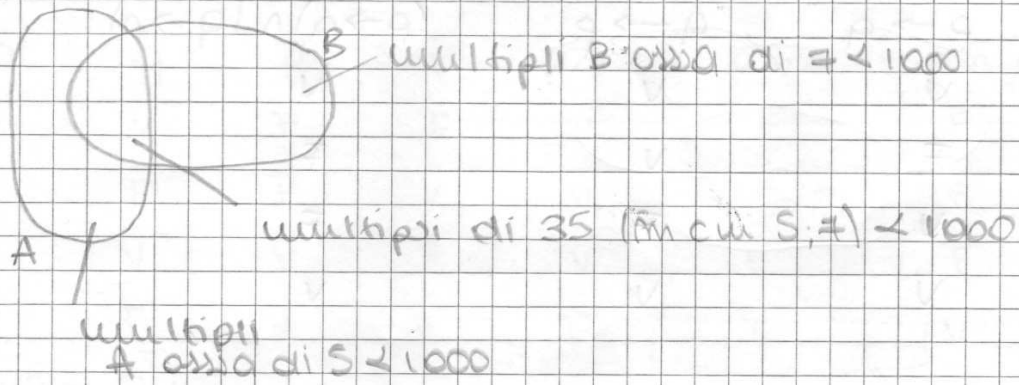
$X_{U(ZNF)}$ Le persone di età compresa tra 50 o più unito a quelle tra 18 e 29

$$X_{U(ZNF)} = 21 + 10 = 31$$

X_{UAUO} Le persone di età compresa tra 18-29 unito a quelle che hanno investito in azioni e obbligazioni

$$X_{UAUO} = (21 + 47 + 26) - 7 = 87$$

n. 171



$$|A| = 1000 : S = 200$$

$$1000 = 7 \cdot \underline{142} + 6$$

$$|B| = 142$$

$$1000 = 35 \cdot \underline{28} + 20$$

$$|A \cap B| = 28$$

$$|A \cup B| = 200 + 142 - 28 = 314$$

COMPLICAZIONE MATERIALE $p \leftrightarrow q = (p \rightarrow q) \wedge (q \rightarrow p)$

p	q	$p \rightarrow q$	$q \rightarrow p$	$(p \rightarrow q) \wedge (q \rightarrow p)$
V	V	V	V	V
V	F	F	V	F
F	V	V	F	F
F	F	V	V	V

ESPRESSIONI LOGICAMENTE EQUIVALENTI

$$p \leftrightarrow q = (p \wedge q) \vee (\bar{p} \wedge \bar{q})$$

p	q	$p \leftrightarrow q$
V	V	V
V	F	F
F	V	F
F	F	V

p	q	$p \wedge q$	$\bar{p} \wedge \bar{q}$	$(p \wedge q) \vee (\bar{p} \wedge \bar{q})$
F	F	F	V	V
F	V	F	F	F
V	F	F	F	F
V	V	V	F	V

Costruisci la tavola di verità di $\neg(p \wedge \bar{q})$

p	q	\bar{p}	\bar{q}	$p \wedge \bar{q}$	$\neg(p \wedge \bar{q})$
V	V	F	F	F	V
V	F	F	V	V	F
F	V	V	F	F	V
F	F	V	V	F	V

$(p \wedge \bar{q})$

F
F
V
F
F
F
F

$\neg(p \wedge \bar{q})$

F
F
V
F
F
F
F

se fosse una contraddizione è una proposizione sempre falsa

se fosse una tautologia è una proposizione sempre vera

$$\overline{p \vee q} = \overline{p} \wedge \overline{q}$$

p	q	\overline{p}	\overline{q}	$p \vee q$	$\overline{p \vee q}$	$\overline{p} \wedge \overline{q}$
V	V	F	F	V	F	F
V	F	F	V	V	F	F
F	V	V	F	V	F	F
F	F	V	V	F	V	V

COMPITI P. 167

n. 232 Il ladro è entrato dalla finestra e non aveva un complice

n. 234 Il ladro aveva un complice o il furto è avvenuto dopo mezzanotte

n. 236 se il furto è avvenuto dopo mezzanotte allora il ladro è entrato dalla finestra e aveva un complice

n. 238 Il furto è avvenuto dopo mezzanotte se e solo se il ladro non è entrato dalla finestra

n. 240 Il ladro non è entrato dalla finestra o aveva un complice

n. 242

$$p \vee \overline{q}$$

p	q	\overline{q}	$p \vee \overline{q}$
V	F	V	V

$$p \wedge \overline{q}$$

p	q	\overline{q}	$p \wedge \overline{q}$
V	F	V	V

$$\overline{p} \vee \overline{q}$$

p	q	\overline{p}	\overline{q}	$\overline{p} \vee \overline{q}$
V	F	F	V	V

n. 244

$$(p \vee q) \wedge r$$

p	q	r	$p \vee q$	$(p \vee q) \wedge r$
V	F	F	V	F

$$(p \wedge q) \vee r$$

p	q	r	$p \wedge q$	$(p \wedge q) \vee r$
V	F	F	F	F

n. 216

$$(p \wedge \bar{q}) \wedge r$$

p	q	r	\bar{q}	$p \wedge \bar{q}$	$(p \wedge \bar{q}) \wedge r$
V	F	F	V	V	F

$$(p \vee q) \vee \bar{r}$$

p	q	r	\bar{r}	$p \vee q$	$(p \vee q) \vee \bar{r}$
V	F	F	V	V	V

n. 266 - 245

$$(\overline{p \vee q}) \vee (p \wedge q)$$

p	q	$p \vee q$	$\overline{p \vee q}$	$p \wedge q$	$(\overline{p \vee q}) \vee (p \wedge q)$
V	V	V	F	V	V
V	F	V	F	F	F
F	V	V	F	F	F
F	F	F	V	F	V

$$(p \leftrightarrow q) \wedge r$$

p	q	r	$p \leftrightarrow q$	$(p \leftrightarrow q) \wedge r$
V	V	V	V	V
V	V	F	V	F
V	F	V	F	F
V	F	F	F	F
F	V	V	F	F
F	V	F	F	F
F	F	V	V	V
F	F	F	V	F

n. 247

$$P(x) = \{2, 3, 5, 7, 11, 13, \dots\}$$

$$D = \{2, 3, 4, 5, \dots, 10\}$$

$$P = \{2, 3, 5, 7, 11, 13\}$$

n. 280

$$Q = \{6, 12, 18\}$$

168. 277

$$P = \{1, 2, 3, 4, 6, 12\}$$

168. 279

$$P = \{6, 9, 12, 15, 18\}$$



168. 281

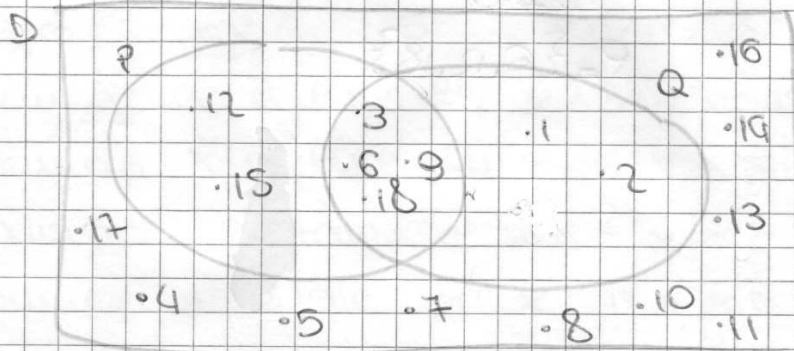
$$P = \{7, 21, 35, 49\}$$

168. 283

$$P = \{3, 6, 9, 12, 15, 18\}$$

$$Q = \{1, 2, 3, 6, 9, 18\}$$

$$D = \{1, 2, 3, \dots, 18\}$$



$$\overline{P \cap Q} = \overline{P \cap Q} = \{1, 2, 4, 5, 7, 8, 10, 11, 13, 14, 16, 17\}$$

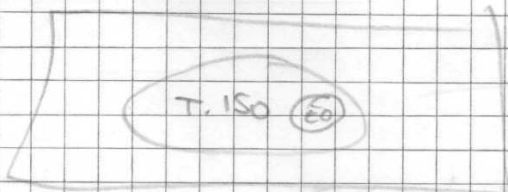
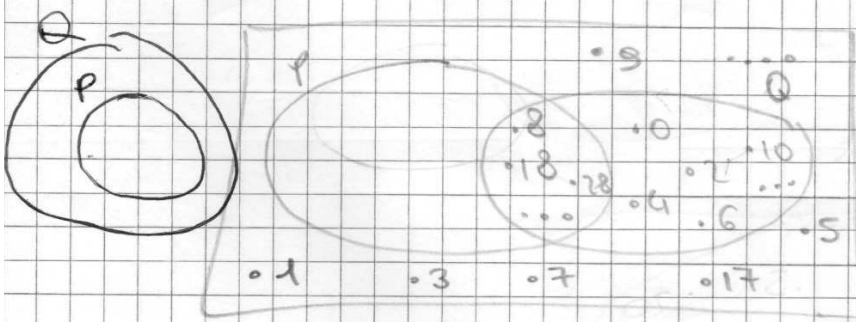
$$P \cap Q = P \cap Q = \{3, 6, 9, 18\}$$

$$P \cup Q = P \cup Q = \{3, 6, 9, 12, 15, 18\}$$

169. 315

$$P = \{8, 18, 28, 38, 48, 58, 68, \dots\}$$

$$Q = \{0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, \dots\}$$



170.330

Ogni numero naturale divisibile per 14 è divisibile per

$\forall x \in \mathbb{N}, x \text{ divide } 14 \mid \text{ divide } 7 \wedge 2$
7 e per 2, $\frac{m}{14} \in \mathbb{N} \quad \frac{m}{7} \in \mathbb{N} \wedge \frac{m}{2} \in \mathbb{N}$

Comunque scelti due numeri reali x e y tali che
 $x=y$ o $x=-y$, il quadrato di x è uguale al quadrato di y .

$$\forall x, y \in \mathbb{R} \mid x=y \vee x=-y, x^2=y^2$$

P. 168 n. 278

$$P = \{2, 3, 5, 7, 11, 13\}$$

n. 282

$$2x - 9$$

$$P = \{1, 0\}$$

n. 289

$$P = \{0, 2, 4, 6, 8, 10, 12, \dots\}$$

$$Q = \{1, 2, 3, 6, 9, 18\}$$

a. $\bar{P} = \{x \mid x \text{ è dispari}\}$

b. $P \cap Q = \{2, 6, 18\}$

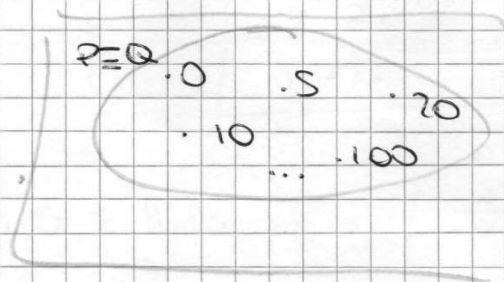
c. $P \cup Q = \{x \mid x \text{ è pari}\} \cup \{1, 3, 9\}$

d. $\bar{P} \cap Q = \{1, 3, 9\}$

n. 316

$$P = \{0, 5, 10, 15, 20, \dots\}$$

$$Q = \{0, 5, 10, 15, 20, \dots\}$$



P. 170 n. 332

$$\forall x \in \mathbb{N}, x \text{ è primo} \wedge x = 2n+1 \mid x \geq 3$$

n. 336

$$\exists x \in \mathbb{R} \mid \forall y \in \mathbb{R}, x < y$$

n. 380-397

$$\overline{p \vee q} = \bar{p} \wedge \bar{q}$$

$$\overline{p \wedge q} = \bar{p} \vee \bar{q} \quad a=1 \wedge b \neq 1$$

$$\overline{p \vee q} = \bar{p} \wedge \bar{q}$$

$$\overline{p \wedge q} = \bar{p} \vee \bar{q}$$

$$\overline{p \vee q} = \bar{p} \wedge \bar{q}$$

$$n \geq m$$

$$n \leq m$$

$$\bar{p}$$

$$p \wedge q \vee r \wedge s$$

il numero x è tale che $x < 5 \vee x > 15$

il numero x è tale che $x < 6 \vee x \geq 10$

il numero x è tale che $x \leq 7 \vee x \geq 9$

il numero x è tale che $x \leq 12 \vee x > 18$

$$5 \leq x < 20$$

$$9 < x \leq 18$$

$$3 < x < 6$$

$$4 \leq x \leq 8$$

p q

v

w

f

NEGATIVE IMPLICATIONE LOGICA

$$p \rightarrow q = \bar{p} \vee q$$

p	q	p	$p \rightarrow q$	$\bar{p} \vee q$
V	V	V	V	V
V	F	V	F	F
F	V	F	V	V
F	F	F	V	V

$$p \rightarrow q = \bar{p} \vee q = \overline{\overline{\bar{p} \vee q}} = \overline{p \wedge \bar{q}} = p \wedge \bar{q}$$

$$p \rightarrow q = p \wedge \bar{q}$$

DEDUZIONI LOGICHE

MODUS PONENS

$$\begin{array}{l} p \rightarrow q \\ \underline{p} \\ q \end{array}$$

MODUS TOLLENS

$$\begin{array}{l} p \rightarrow q \\ \underline{\bar{q}} \\ \bar{p} \end{array}$$

SILLOGISMO IPOTETICO

$$\begin{array}{l} p \rightarrow q \\ q \rightarrow r \\ \underline{p \rightarrow r} \end{array}$$

n. 418 MODUS PONENS

n. 419 MODUS TOLLENS

n. 620 SILLOGISMO IPOTETICO

n. 621 MODUS TOLLENS

n. 624

$$\begin{array}{l} p \rightarrow q \\ \underline{\bar{p}} \\ \bar{q} \end{array}$$

$$[(p \rightarrow q) \wedge (\bar{p})] \rightarrow \bar{q}$$

p	q	\bar{p}	\bar{q}	$p \rightarrow q$	$(p \rightarrow q) \wedge \bar{p}$	$[(p \rightarrow q) \wedge (\bar{p})] \rightarrow \bar{q}$
V	V	F	F	V	F	V
V	F	F	V	F	F	V
F	V	V	F	V	V	F
F	F	V	V	V	V	V

Deduzione non valida

n. 626

$$\begin{array}{l} p \rightarrow q \\ r \rightarrow \bar{q} \\ \underline{p} \\ \bar{r} \end{array}$$

$$[(p \rightarrow q) \wedge (r \rightarrow \bar{q}) \wedge p] \rightarrow \bar{r}$$

p	q	r	\bar{q}	\bar{r}	$p \rightarrow q$	$r \rightarrow \bar{q}$	$[(p \rightarrow q) \wedge (r \rightarrow \bar{q}) \wedge p]$	con
V	V	V	F	F	V	F	F	V
V	V	F	F	V	V	V	V	V
V	F	V	V	F	F	F	F	V
V	F	F	V	V	V	V	V	V
F	V	V	F	F	V	F	F	V
F	V	F	V	V	V	V	F	V
F	F	V	V	F	V	V	F	V
F	F	F	V	V	V	V	F	V

Deduzione valida

n. 277

$$p \rightarrow q$$

$$[(p \rightarrow q) \wedge (q \rightarrow r) \wedge r] \rightarrow p$$

$$q \rightarrow r$$

$$\frac{r}{p}$$

p	q	r	$p \rightarrow q$	$q \rightarrow r$	$(p \rightarrow q) \wedge (q \rightarrow r) \wedge r$	$[(p \rightarrow q) \wedge (q \rightarrow r) \wedge r] \rightarrow p$
V	V	V	V	V	V	V
V	V	F	V	F	F	V
V	F	V	F	V	F	V
V	F	F	F	V	F	V
F	V	V	V	V	V	V
F	V	F	V	V	F	V
F	F	V	V	V	F	V
F	F	F	V	V	F	V

Deduzione non valida

n. 228

$$p \rightarrow q$$

$$[(p \rightarrow q) \wedge (\bar{p} \rightarrow r) \wedge \bar{r}] \rightarrow q$$

$$\bar{p} \rightarrow r$$

$$\frac{\bar{r}}{q}$$

p	q	r	\bar{p}	\bar{r}	$p \rightarrow q$	$\bar{p} \rightarrow r$	$(p \rightarrow q) \wedge (\bar{p} \rightarrow r) \wedge \bar{r}$	$[(p \rightarrow q) \wedge (\bar{p} \rightarrow r) \wedge \bar{r}] \rightarrow q$
V	V	V	F	F	V	V	F	V
V	V	F	F	V	V	V	V	V
V	F	V	F	F	F	V	F	V
V	F	F	F	V	F	V	F	V
F	V	V	V	F	V	V	V	V
F	V	F	V	V	V	V	V	V
F	F	V	V	F	V	V	V	V
F	F	F	V	V	V	V	V	V

Deduzione valida

Validità di un ragionamento

Se mangio mi appesantisco

Se mi appesantisco non gioco a calcio

Se gioco a calcio non mangio

$$\begin{array}{l} p \rightarrow q \\ q \rightarrow \bar{r} \\ \hline r \rightarrow \bar{p} \end{array}$$

$$[(p \rightarrow q) \wedge (q \rightarrow \bar{r})] \rightarrow (r \rightarrow \bar{p})$$

p	q	r	\bar{p}	\bar{r}	$p \rightarrow q$	$q \rightarrow \bar{r}$	\neg	\rightarrow	Tutti
V	V	V	F	F	V	F	F	F	V
V	V	F	F	V	V	V	F	V	V
V	F	V	F	F	F	F	F	V	V
V	F	F	F	V	V	V	F	V	V
F	V	V	V	F	V	F	F	V	V
F	V	F	V	V	V	V	F	V	V
F	F	V	V	F	V	V	F	V	V
F	F	F	V	V	V	V	F	V	V

P. 171
n. 439

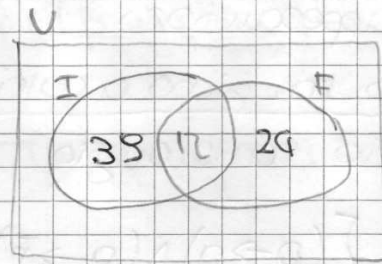
$$|U| = 100$$

$$|\overline{I \cup F}| = ?$$

$$|I| = 51$$

$$|F| = 36$$

$$|I \cap F| = 12$$



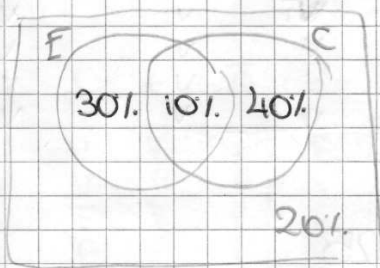
SOLUZIONE

$$|I - F| = |I| - |I \cap F| = 51 - 12 = 39$$

$$|F - I| = |F| - |I \cap F| = 36 - 12 = 24$$

$$|\overline{I \cup F}| = |U| - |I| - |F - I| = 100 - 51 - 24 = 25$$

n. 660



$$|E \cup C| = |U| - |\overline{E \cup C}| = 100\% - 20\% = 80\%$$

$$|E - C| = |E \cup C| - |C| = 80\% - 40\% = 40\%$$