

64.  $5 \cos 90^\circ - 3 \cos 0^\circ + 2 \cos 180^\circ - \cos 270^\circ + 4 \cos 360^\circ.$  [-1]
65.  $\sin 180^\circ + 2 \cos 90^\circ + 2 \cos 180^\circ + 3 \sin 90^\circ + \cos 360^\circ.$  [2]
66.  $2 \cos 90^\circ + 3 \sin 90^\circ - 2 \cos 270^\circ + \sin 360^\circ - \operatorname{tg} 180^\circ.$  [3]
67.  $5(\sin 90^\circ - \cos 180^\circ + 2 \sin 270^\circ) - \operatorname{tg} 360^\circ.$  [0]
68.  $\sin 90^\circ - \cos 360^\circ + \frac{3}{2}(\operatorname{tg} 180^\circ + \cos 90^\circ - \sin 270^\circ).$   $[\frac{3}{2}]$
69.  $3 \sin 360^\circ - \cos 270^\circ + \frac{1}{2} \operatorname{tg} 360^\circ - 5 \sin 180^\circ + \cos^2 0^\circ.$  [1]
70.  $2 \cos 0^\circ - 2 \sin 270^\circ - \cos 180^\circ - 2 \cos 270^\circ.$  [5]
71.  $\sin 90^\circ - 2 \cos 180^\circ + 3 \operatorname{tg} 180^\circ - \operatorname{ctg} 90^\circ - \sin 270^\circ.$  [4]
72.  $5 \cos \frac{\pi}{2} - 3 \cos 2\pi + 2 \cos \pi - \cos \frac{3}{2}\pi + 4 \cos 0^\circ.$  [-1]
73.  $\frac{2}{3} \sin \frac{\pi}{2} + 3 \sin \pi - 4 \sin \frac{3}{2}\pi - \frac{5}{3} \cos 0^\circ.$  [3]
74.  $5 \operatorname{ctg} \frac{\pi}{2} + 3 \cos \frac{\pi}{2} - 2 \operatorname{tg} 0^\circ + \sin \frac{3}{2}\pi - 2 \sin 2\pi.$  [-1]
75.  $-\sin \frac{3}{2}\pi - \cos \pi + \operatorname{tg} 2\pi + \operatorname{ctg} \frac{\pi}{2}.$  [2]
76.  $\cos 2\pi + \sin \frac{\pi}{2} + 3 \cos 0^\circ - 3 \cos \pi.$  [8]
77.  $\sin 3\pi + \cos 4\pi - \sin \pi - \cos 6\pi + \sin \frac{5}{2}\pi.$  [1]
78.  $\cos \frac{7}{2}\pi + \sin 4\pi - \sin 6\pi - \operatorname{tg} 3\pi - \cos 3\pi.$  [1]
79.  $2(\cos 180^\circ \sin 270^\circ - \cos 270^\circ \sin 90^\circ) - \cos^2 180^\circ - \sin 270^\circ.$  [2]
80.  $\frac{1 - 2 \sin 270^\circ}{4 \sin 90^\circ - 7 \cos 0^\circ - 3 \cos 270^\circ - 6 \cos 180^\circ}$  [1]
81.  $a^2 \cos 0^\circ - 2ab \sin 270^\circ - b^2 \cos 180^\circ - a \cos 270^\circ.$   $[(a+b)^2]$
82.  $7 \sin 0^\circ - 2 \cos 180^\circ - 5 \sin 270^\circ + 4 \cos 0^\circ - 11 \cos 360^\circ.$  [0]
83.  $5 \operatorname{ctg} 90^\circ + 3 \cos 90^\circ - 2 \operatorname{tg} 0^\circ + \sin 270^\circ - 2 \sin 360^\circ.$  [-1]
84.  $2 \cos \frac{3}{2}\pi - \frac{3}{4} \sin 2\pi + 2 \sin \frac{3}{2}\pi - \frac{3}{2} \operatorname{tg} 0 + 2 \sin \frac{\pi}{2}.$  [0]
85.  $3 \sin \pi - 5 \cos \pi + 2 \operatorname{tg} \frac{3}{2}\pi - \operatorname{ctg} \pi + 2 \sin \frac{3}{2}\pi.$  [Impossibile. Perché?]
86.  $\cos 0 - 2 \sin \frac{3}{2}\pi + 3 \operatorname{tg} \pi - \operatorname{ctg} \frac{\pi}{2} + \frac{2}{3} \operatorname{tg} 2\pi - \cos \pi.$  [+]

## Esercizio svolto

Semplificare la seguente espressione:  $\frac{(a+b)^2}{\cos 2\pi} + \frac{4ab}{\cos \pi} - 2ab \operatorname{sen} \frac{3}{2}\pi$ .

Si tratta di sostituire semplicemente i valori delle funzioni degli angoli noti che compaiono nell'espressione; poiché:  $\cos 2\pi = 1$ ,  $\cos \pi = -1$  e  $\operatorname{sen} \frac{3}{2}\pi = -1$ , si ottiene:

$$\frac{(a+b)^2}{1} + \frac{4ab}{-1} - 2ab(-1) = (a+b)^2 - 4ab + 2ab = a^2 + b^2 + 2ab - 4ab + 2ab = a^2 + b^2.$$

Semplificare le seguenti espressioni.

$$87. -a \operatorname{sen} 270^\circ - b \cos 180^\circ + (a+b) \operatorname{tg} 360^\circ. \quad [a+b]$$

$$88. a^3 \cos 360^\circ + b^3 \operatorname{sen} 90^\circ + 3a^2b \cos 0^\circ - 3ab^2 \cos 180^\circ. \quad [(a+b)^3]$$

$$89. (a-b)^2 \cos 180^\circ + (a+b)^2 \cos 360^\circ - 2ab \operatorname{tg} 180^\circ. \quad [4ab]$$

$$90. (a+b)^2 \operatorname{sen}^2 \frac{3}{2}\pi - 4ab \cos^2 \pi + a \operatorname{tg}^2 2\pi. \quad [(a-b)^2]$$

$$91. p \operatorname{sen} 270^\circ + q \operatorname{tg} 180^\circ - (p-q) \sec 0^\circ. \quad [q-2p]$$

$$92. \frac{(m-n)^2 \operatorname{sen}^2 \frac{\pi}{2} - 3mn \cos \pi + mn \operatorname{sen}^2 \frac{3}{2}\pi}{m \cos 0 - n \cos \pi}. \quad [m+n]$$

$$93. \frac{a^3 + b^3}{a+b} \cos 180^\circ - \frac{a^3 - b^3}{a-b} \operatorname{sen} 270^\circ. \quad [2ab]$$

$$94. \cos 720^\circ + \operatorname{sen} 540^\circ - \operatorname{sen} 180^\circ - \cos 1080^\circ + \operatorname{sen} 450^\circ - \cos 630^\circ - \operatorname{sen} 720^\circ. \quad [1]$$

$$95. (a+b)^3 \cos 360^\circ - \frac{a^4 - b^4}{a-b} \operatorname{sen} 90^\circ + 2ab(a+b) \sec 540^\circ. \quad [0]$$

$$96. \frac{a^4 - b^4}{a-b} \operatorname{sen} 90^\circ + ab(a+b) \cos 540^\circ - a^4 \operatorname{tg} 360^\circ. \quad [a^3 + b^3]$$

Determinare il valore delle seguenti espressioni.

$$97. \frac{\operatorname{tg} 45^\circ - 2 \operatorname{ctg} 90^\circ + \operatorname{tg}^2 30^\circ}{\operatorname{tg} 180^\circ + 2 \operatorname{ctg} 45^\circ + \operatorname{ctg}^2 30^\circ}. \quad \left[ \frac{4}{15} \right]$$

$$98. 2 \cos^2 \frac{\pi}{10} + 2\sqrt{5} \operatorname{sen}^2 \frac{\pi}{10} - \sqrt{5} \operatorname{sen} \frac{\pi}{2}. \quad [0]$$

$$99. \frac{2}{\sqrt{3}} \cos \frac{\pi}{6} - \sqrt{3} \cos \frac{\pi}{6} + 2\sqrt{2} \operatorname{sen} \frac{\pi}{4} - \operatorname{ctg} \frac{3}{2}\pi. \quad \left[ \frac{3}{2} \right]$$

$$100. (\operatorname{sen} 30^\circ + \cos 45^\circ)^2 + (\cos 30^\circ + \operatorname{sen} 45^\circ)^2 - 2 \operatorname{tg} 45^\circ. \quad \left[ \frac{\sqrt{2} + \sqrt{6}}{2} \right]$$

$$101. \frac{1}{\cos 60^\circ} + \operatorname{ctg} 45^\circ \cdot \operatorname{sen} 30^\circ + \cos 30^\circ \cdot \frac{1}{\operatorname{tg} 60^\circ}. \quad [3]$$

$$102. 2 \cos^2 60^\circ + 2\sqrt{5} \operatorname{sen}^2 60^\circ - \sqrt{5} \operatorname{sen} 30^\circ. \quad \left[ \frac{1 + 2\sqrt{5}}{2} \right]$$

$$103. \cos 60^\circ \cdot \operatorname{sen} 60^\circ - 2(\operatorname{tg} 30^\circ - \operatorname{tg} 45^\circ). \quad \left[ \frac{24 - 5\sqrt{3}}{12} \right]$$

$$104. (\operatorname{sen} 30^\circ + \cos 45^\circ)^2 + (\cos 60^\circ + \operatorname{sen} 45^\circ)^2 - 3 \operatorname{tg} 45^\circ. \quad \left[ \frac{2\sqrt{2} - 3}{2} \right]$$

$$105. 4 \cos^2 45^\circ - \frac{1}{2} \operatorname{sen}^2 60^\circ - \frac{3}{4} \operatorname{tg}^2 30^\circ. \quad \left[ \frac{11}{8} \right]$$

$$106. (\operatorname{sen} 30^\circ + \operatorname{sen} 45^\circ)(\cos 45^\circ - \cos 60^\circ) - \frac{1}{4}(\cos 180^\circ - \cos 90^\circ) + \sqrt{2} \cdot \operatorname{sen} 45^\circ. \quad \left[ \frac{3}{2} \right]$$

$$107. \cos 60^\circ \cdot (\operatorname{sen} 60^\circ + \operatorname{sen} 45^\circ) - \cos 30^\circ \cdot (\operatorname{sen} 90^\circ - \cos 60^\circ). \quad \left[ \frac{\sqrt{2}}{4} \right]$$

$$108. (\cos 180^\circ + \operatorname{sen} 270^\circ)^2 \cdot (\cos 0^\circ + \operatorname{sen} 90^\circ)^2 - 4 \operatorname{tg}^2 60^\circ. \quad [4]$$

$$109. \left( \frac{\sqrt{3}}{2} \cos 2\pi + \operatorname{tg} \frac{\pi}{4} \right)^2 \left( \cos \frac{\pi}{6} - \operatorname{ctg} \frac{\pi}{4} \right)^2 \cdot 16 \left( \operatorname{ctg} \frac{\pi}{4} \right)^3. \quad [1]$$

$$110. \operatorname{sen} \frac{\pi}{10} + \operatorname{sen} 2\pi - \frac{\sqrt{5}}{4} \operatorname{tg} \frac{\pi}{4} - \cos \frac{3}{2}\pi + \frac{1}{4} \operatorname{ctg} \frac{\pi}{4}. \quad [0]$$

$$111. \frac{\operatorname{sen}^3 45^\circ + \cos^3 45^\circ}{\operatorname{tg} 45^\circ \cos 45^\circ + \operatorname{ctg} 45^\circ \operatorname{sen} 45^\circ} - \operatorname{sen} 45^\circ \cos 45^\circ. \quad [0]$$

$$112. \sqrt{2} b^2 \operatorname{sen} \frac{\pi}{4} - 4ab \operatorname{sen} \frac{\pi}{6} + a^2 \cos 0. \quad [(a-b)^2]$$

$$113. 16 \cos^2 30^\circ + 48 \operatorname{sen}^2 45^\circ + 11 \operatorname{tg}^3 45^\circ - 36 \cos^2 180^\circ. \quad [11]$$

$$114. \left( \operatorname{sen} \frac{\pi}{6} + \cos \frac{\pi}{4} \right)^2 + \left( \cos \frac{\pi}{6} + \operatorname{sen} \frac{\pi}{4} \right)^2 - 2 \operatorname{tg} \frac{\pi}{4}. \quad \left[ \frac{\sqrt{2}}{2} (1 + \sqrt{3}) \right]$$

$$115. \sqrt{2} \operatorname{tg} \frac{\pi}{4} - \frac{1}{2} \cos \frac{\pi}{4} + 2 \operatorname{sen} \frac{\pi}{4} - 2 \operatorname{ctg} \frac{\pi}{4} + 2 \operatorname{tg} \frac{\pi}{4}. \quad \left[ \frac{7}{4} \sqrt{2} \right]$$

$$116. \frac{\operatorname{sen}^2 \frac{\pi}{4} + \cos^2 \frac{\pi}{4}}{\operatorname{tg} \frac{\pi}{4} \cdot \cos \frac{\pi}{4} + \operatorname{sen} \frac{\pi}{4} \cdot \operatorname{ctg} \frac{\pi}{4}}. \quad \left[ \frac{\sqrt{2}}{2} \right]$$

$$117. 2 \cos \frac{\pi}{6} + \operatorname{ctg} \frac{\pi}{3} - \operatorname{tg} \frac{\pi}{6} + 5 \operatorname{sen} \frac{\pi}{4} - \frac{\sqrt{2}}{2} \operatorname{tg} \frac{\pi}{4} - \operatorname{tg} \frac{\pi}{3}. \quad [2\sqrt{2}]$$

$$118. \frac{\operatorname{tg} \frac{\pi}{4} - 2 \operatorname{ctg} \frac{\pi}{2} + \operatorname{tg}^2 \frac{\pi}{3}}{\operatorname{ctg}^2 \frac{\pi}{6} + 2 \operatorname{tg} \frac{\pi}{4}}; \quad 8 \cos^2 \frac{\pi}{6} + 12 \operatorname{sen}^2 \frac{\pi}{4} + 7 \operatorname{tg}^3 \frac{\pi}{4} - 12 \cos^2 \pi. \quad \left[ \frac{4}{5}; 7 \right]$$