sum rule \[ \sum_j \langle 0 | H | X_i \rangle^2 = \langle 0 | H^2 | 0 \rangle \]

only the collective state contributes to the sum rule

11). Level density

Nuclei have a very large number of levels. This is why it is useful to summarize them by a level density

\[ p(E) = \sum \delta(E - E_i) \]

Integrated level density

\[ N(E) = \int_p p(E) \, dE = \int E \, dE \]

11a) Level density of a billiard with area \( A \)

we have one level per unit \( h^2 \) of phase space. \( d^6 q = h^6 \)

phase space volume

\[ \int_{H \leq E} \, d^6 p \]

\[ N(E) = \frac{1}{h^2} \int_{H \leq E} d^6 p \, d^2 x \]

\[ H = \frac{p^2}{2m}, \quad J = \oint \]