# Probability and Statistics for Final Year Engineering Students 

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## Starred Exercises 0: <br> Mathematical Review

## Starred Exercises:

1) Find a formula for the number of ways to distribute $k$ identical balls into $n$ distinct boxes. Example, if $\mathrm{k}=3$ and $\mathrm{n}=2$ the number of ways is 4 .
2) Assume the sets $A_{1}, \ldots, A_{M}$ have each a finite number of elements, $\left|A_{i}\right|=n_{i}$. Find a formula based on $n_{1}, \ldots, n_{M}$ for the number of elements in the set $B=A_{1} \cup \ldots \cup A_{M}$. Note that the formula should take into account that the sets are not necessarily disjoint.
3) Let $f(x)=e^{-\frac{x^{2}}{2}}$. Show that $\int_{-\infty}^{\infty} f(x) d x=\sqrt{2 \pi}$. Hint: Look at the function $g(x, y)=$ $f(x) f(y)$ and integrate it over the plane after making a change to polar coordinates.
