```
In[43]:= (* Uniform Distribution *)

In[1]:= Integrate[(1 / (b - a)) * (x - (a + b) / 2)^2, {x, a, b}]

Out[1]= a^2/12 - a b/6 + b^2/12

In[2]:= Simplify[%]

Out[2]= 1/12 (a - b)^2

In[7]:= Integrate[(1 / (b - a)) * (x), {x, a, b}]

Out[7]= -a^2/(2 (-a + b)) + b^2/(2 (-a + b))

In[8]:= Simplify[%]

Out[8]= (a + b)/2

In[10]:= (* note triangular is 1/24 (b-a)^2 *)

In[11]:= (* normal *)

In[25]:= normpdf[x_] := (1 / (Sqrt[2 * Pi] * sig)) * Exp[(-1 / 2) * ((x - mu) / sig)^2]

In[26]:= Assuming[sig > 0, Integrate[x * normpdf[x], {x, -Infinity, Infinity}]]

Out[26]= mu

In[27]:= Assuming[sig > 0, Integrate[(x - mu)^2 * normpdf[x], {x, -Infinity, Infinity}]]

Out[27]= sig^2

In[44]:= (* Discrete, Binomial *)

In[28]:= binompdf[y_] := Binomial[n, y] * pi^y * (1 - pi)^(n - y)

In[32]:= Sum[y * binompdf[y], {y, 0, n}]

Out[32]= n (1 - pi)^n (-1/(-1 + pi))^n pi

In[34]:= Sum[(y - n * pi)^2 * binompdf[y], {y, 0, n}]

Out[34]= -n (1 - pi)^n pi (n (-1/(-1 + pi))^n pi - (1 + pi/(1 - pi))^n + pi (1 + pi/(1 - pi))^n - n pi (1 + pi/(1 - pi))^n)

In[36]:= Assuming[pi < 1, Simplify[%32]]

Out[36]= n pi

In[37]:= Assuming[pi < 1, Simplify[%34]]

Out[37]= -n (-1 + pi) pi
```

```
In[45]:= Limit[%32, pi → 1]

Out[45]= (-1)^(2 n) n

In[47]:= Limit[%34, pi → 1]

Out[47]= 0

In[38]:= (* Poisson *)

In[39]:= poipdf[y_] := Exp[-lam] * lam^y / y!

In[41]:= Sum[y * poipdf[y], {y, 0, Infinity}]

Out[41]= lam

In[42]:= Sum[(y - lam)^2 * poipdf[y], {y, 0, Infinity}]

Out[42]= lam
```