Roll 3 dice and count ⚀s.

X = number of ⚀'s

$X \sim B(3, 1/6)$ $\qquad$ $\left(\frac{1}{6} + \frac{5}{6}\right)^3$

$E(X) = \frac{1}{6}(3) = \frac{1}{2}$

X	0	1	2	3
$P(X)$	$\frac{125}{216}$	$\frac{75}{216}$	$\frac{15}{216}$	$\frac{1}{216}$

$$P(X=0) = \binom{3}{0}\left(\frac{1}{6}\right)^0\left(\frac{5}{6}\right)^3 = \frac{125}{216}$$

$$P(X=1) = \binom{3}{1}\left(\frac{1}{6}\right)^1\left(\frac{5}{6}\right)^2 = \frac{75}{216}$$

$$P(X=2) = \binom{3}{2}\left(\frac{1}{6}\right)^2\left(\frac{5}{6}\right)^1 = \frac{15}{216}$$

$$P(X=3) = \binom{3}{3}\left(\frac{1}{6}\right)^3\left(\frac{5}{6}\right)^0 = \frac{1}{216}$$

(2) $P(X=10) = \binom{20}{10}\left(\frac{1}{2}\right)^{10}\left(\frac{1}{2}\right)^{10} = 0.176$

$X \sim B(20, 1/2)$

(d) $P(X < 15) = P(X \leq 14)$

$= \text{binomialcdf}(20, 1/2, 14)$

$= 0.979$

(e) $P(X > 10) = 1 - P(X \leq 10) = 0.412$

$1 - \text{binomialcdf}(20, 1/2, 10)$

(f) $P(X \geq 7) = 1 - P(X \leq 6)$

$= 0.942$

(g) $P(8 \leq x \leq 12) = P(X \leq 12) - P(x \leq 7)$

$= 0.737$

Ex. A machine makes widgets. 3% of them are faulty. You select a sample of 15 widgets.

$X \sim B(15, 0.03)$

↖ number of duds

(a) $P(\text{no faulty widgets})$

$= P(X=0) = \text{binomialpdf}(15, 0.03, 0)$

$= 0.633$

(b) $P(X \geq 1) = 1 - P(X=0)$

$= 0.367$

(c) $P(X<3) = P(X \leq 2) = 0.991$