3.54 (a) For any y^*, since $Y^* = n - Y$

$$P(Y^* = y^*) = P(n - Y = y^*)$$
$$= P(Y = n - y^*)$$

because $\{Y^* = y^*\} = \{n - Y = y^*\} = \{Y = n - y^*\}$ are the same event.

(b). $$\binom{n}{n-y^*} = \frac{n!}{(n-y^*)!\,[n-(n-y^*)]!}$$
$$= \frac{n!}{(n-y^*)!\; y^*!} = \binom{n}{y^*}$$

(c) Because one can define Y^* as the number of "failures", it follow a Binomial (n, q)

3.31. (a)

It depends: if $\mu > 0$, then $\mathbb{E}W > \mu$
if $\mu = 0$, then $\mathbb{E}W = \mu$
if $\mu < 0$, then $\mathbb{E}W < \mu$

(b) $\mathbb{E}W = \mathbb{E}(2Y) = 2\mathbb{E}Y = 2\mu$

(c) Larger.

(d) $$\mathrm{Var}(W) = \mathbb{E}[W - \mathbb{E}W]^2 = \mathbb{E}[2Y - 2\mathbb{E}Y]^2$$
$$= \mathbb{E}4(Y-\mu)^2 = 4\sigma^2.$$