2. $\bar{X}$ is a sample statistic, so

- it varies with the sample collected, and
- it has a sampling distribution.

While it will not, generally, equal μ, it has μ as its mean.

$\Rightarrow$ (b)

3. This is (c).

4. (a) is similar to a binomial setting, but for the fact there is no set number of trials.

(b) is not binomial – you're not counting "successes" out of n (fixed) trials.

(c) is binomial.

(d) is arguably not binomial because sampling is without replacement here, and that means with each new student drawn, the chance of "success" is slightly altered. But $n = 75$ is well less than 10% of the (student) population, so it will be indistinguishable from binomial.

5. (a) The probabilities should sum to 1, so the missing value is

$$1 - (0.05 + 0.1 + 0.15 + 0.26 + 0.18) = 0.26.$$

(b) $\Pr(X \leq 3) = \Pr(X=1) + \Pr(X=2) + \Pr(X=3) = 0.05 + 0.1 + 0.15 = 0.3$

(c) The event, A = "3 or less," has probability 0.3. That success rate is the same for all $n = 60$ trials, so this is a binomial setting. That is,

$$Y \sim \text{Binom}(60, 0.3) \quad \Rightarrow \quad \Pr(Y \leq 10) = \text{pbinom}(10, 60, 0.3).$$

(d) With the original probability table/function,

$$\mu_X = (1)(0.05) + (2)(0.1) + (3)(0.15) + (4)(0.26) + (5)(0.18) + (6)(0.26) = 4.2.$$

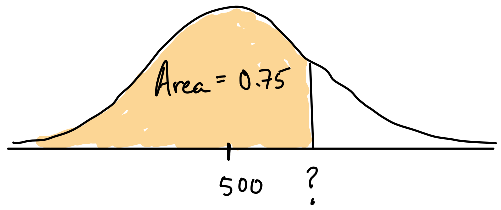
$$\text{Var}(X) = (1-4.2)^2(0.05) + (2-4.2)^2(0.1) + (3-4.2)^2(0.15) + (4-4.2)^2(0.26)$$
$$+ (5-4.2)^2(0.18) + (6-4.2)^2(0.26) = 2.18.$$

With the substitute table,

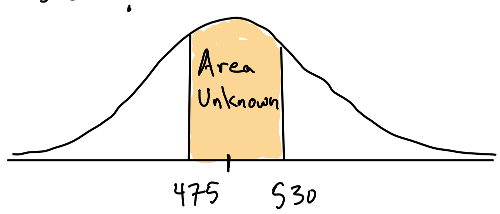
$$\mu_X = (1)/9 + (2)/6 + (3)/3 + (4)/6 + (5)/9 + (6)/9 = 3.333, \text{ or } \frac{10}{3}.$$

$$\text{Var}(X) = \left(1-\tfrac{10}{3}\right)^2(1/9) + \left(2-\tfrac{10}{3}\right)^2(1/6) + \left(3-\tfrac{10}{3}\right)^2(1/3) + \left(4-\tfrac{10}{3}\right)^2(1/6)$$
$$+ \left(5-\tfrac{10}{3}\right)^2(1/9) + \left(6-\tfrac{10}{3}\right)^2(1/9) = 2.111.$$

6. (a) qnorm(0.75, 500, 100)



(b) pnorm(530, 500, 100) − pnorm(475, 500, 100)



7. Define $X_1, X_2, \dots, X_{16}$ to be weights of 16 random riders. Each $X_i \sim \text{Norm}(192, 26.3)$, so, the population mean and standard deviation are $\mu = 192$, $\sigma = 26.3$.

(a) $S = X_1 + X_2 + \cdots + X_{16}$. We want $\Pr(S > 3300)$.

(b) $S \sim \text{Norm}(16\mu, \sigma\sqrt{16}) = \text{Norm}(3072, 105.2)$

(c) 1 − pnorm(3300, 3072, 105.2).