DUE DATE: MONDAY, OCTOBER 26, 2020 by 11:59 PM on Gradescope

1. (Binomial Distribution) The probability that a patient recovers from a delicate heart operation is 0.9 .7 patients have this operation. Of these 7, $n = 7$, $P = 0.9$, $q = 1 - P = 0.1$

    (a) What is the probability that exactly 5 recover? $P(x=5) = \binom{7}{5}(0.9)^5(0.1)^2 = \boxed{0.124}$

    (b) What is the probability that anywhere from 4 to 6 recover? $P(4 \le x \le 6) =$
    $P(x=4) + P(x=5) + P(x=6)$
    $1 = \sum_{r=4}^{6} P(x=r) = \sum_{r=4}^{6} \binom{7}{r}(0.9)^r (0.1)^{7-r}$
    $= \boxed{0.5190}$

    (c) what is the probability that not less than 2 recover?
    $P(x \not< 5) = P(x \ge 5) = P(x=5) + P(x=6) + P(x=7)$
    $= \sum_{r=5}^{7} P(x=r) = \sum_{r=5}^{7} \binom{7}{r}(0.9)^r (0.1)^{7-r} = \boxed{0.9743}$

2. Suppose we have the following probability distribution for X:

x	0	1	2	3	4
$f(x)$	0.1	0.2	0.1	0.3	0.3

   $P(x \le 2) = P(x=0) + P(x=1) + P(x=2)$
   $= 0.1 + 0.2 + 0.1$
   $= \boxed{0.4}$

    (a) Find P($X \le 2$).

    (b) Find P($X > 3$). $\quad P(x > 3) = P(x=4) = \boxed{0.3}$

    (c) Find P($2 \le X \le 4$). $\quad P(2 \le x \le 4) = P(x=2) + P(x=3) + P(x=4)$
    $= 0.1 + 0.3 + 0.3 = \boxed{0.7}$

    (d) What is E(X)? $\quad E(x) = 0.2 + 0.2 + 0.9 + 1.2 = \boxed{2.5}$

    (e) What is V(X)?
    $E(x^2) = 0^2 \times 0.1 + 1^2 \cdot 0.2 + 2^2 \times 0.1 + 3^2 \times 0.3 + 4^2 \times 0.3$
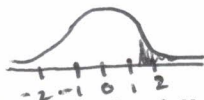 $= 8.1 \implies V(x) = 8.1 - (2.5)^2 = \boxed{1.85}$

3. Given a standard normal distribution, find the area between $z = -1.84$ and $z = 0.68$.
    $Z = -1.84$ and $Z = 0.68$
    $= P(-1.84 < Z < 0.68)$
    $= P(Z < 0.68) - P(Z < -1.84) = 0.7517 - 0.0329 = \boxed{0.7188}$ ARFA

4. Find the area to the right of $z = 1.53$.

   $1 - 0.9370 = \boxed{0.0630}$

5. Convert the following Z scores to X values:

    - $z = -0.23, \mu = 10, \sigma^2 = 9.$

      Mean $= \mu = 10$
      SD $= \sigma^2 = 9$
      $X = Z \times \sigma + \mu$
      $X = -0.23 \times 3 + 10$
      $\boxed{X = 9.31}$

    - $z = 1.13, \mu = 2, \sigma = 2.$

      Mean $= \mu = 2$
      SD $= \sigma = 2$
      $X = Z \times \sigma + \mu$
      $X = 1.13 \times 2 + 2$
      $\boxed{X = 4.26}$