Math 145 **Quiz 4** **Name:** Solutions **Row:**

Show relavant work for credit. No work = little or no credit.

A certain medication produces undesirable side effects in 10% of patients. Assume the medication is given to 50 patients.

1. What is the mean number of patients with side effects?

$\mu = np = 50(.1) = 5$ 5 patients (1)

2. What is standard deviation of the number of patients with side effects?

$\sigma = \sqrt{np(1-p)} = \sqrt{50(.1)(.9)} \approx$ 2.1 patients (1)

3. If ten patients of the 50 have side effects, would this be unusual? Explain using the empirical rule.

By the empirical rule, about 95% of samples of size 50 should have between 5 - 4.2 = .8 patients & 5 + 4.2 = 9.2 patients w/ side effects. 10 would be considered unusual. (2)

4. Circle ALL that do not result in Poisson distributions: (2)

   (a) Researching the Northern Spotted Owl's number of feedings per month
   (b) Researching the Barred Owl's wing span in inches
   (c) Researching the number of Sooty Owls' deaths per year
   (d) Researching the number of Snowy Owl chicks that survive to one year from 20 hatchlings

For a science lab experiment 250,000 radioactive particles pass through the detector every minute (1 minute = 60 seconds, 1 second = 1000 milliseconds).

5. On average, to one decimal place, how many particles pass through the detector each millisecond?

$\mu = \frac{250{,}000 \text{ particles}}{\text{minute}} * \frac{1 \text{ minute}}{60 \text{ second}} * \frac{1 \text{ second}}{1000 \text{ millisecond}} \approx 4.2$ particles/millisecond (1)

6. What is the probability that six particles pass through the counter in a millisecond?

$P(6) = \frac{e^{-\mu}\mu^x}{x!} = \frac{e^{-4.2}4.2^6}{6!} = \text{poissonpdf}(4.2, 6) \approx$ .114 (2)

7. What is the probability that at least 3 particles pass through the counter in a millisecond?

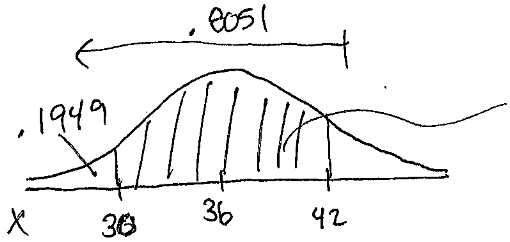
$P(x \geq 3) = 1 - P(x \leq 2) = 1 - \text{poissoncdf}(4.2, 2)$

$\approx 1 - .210 =$ .790 (2)

The maximum aerobic power (VO_{2MAX}) score for women ages 20 to 29 is normally distributed with mean 36 ml/min/kg and standard deviation 7/ml/min/kg.

8. Find the probability of a woman in this group having a VO_{2MAX} score between 30 ml/min/kg and 42 ml/min/kg.

$X \sim N(36, 7)$



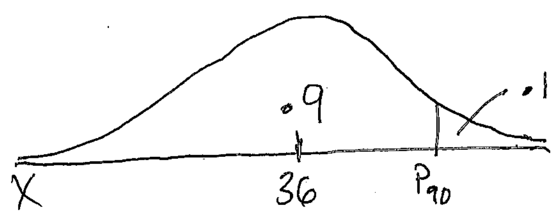
$P(30 \le X \le 42) \approx .8051 - .1949$

(exact ans is normalcdf$(30, 42, 36, 7) = .6086$)

$z \quad \frac{30-36}{7} = -.86 \qquad \frac{42-36}{7} = .86$

$= \underline{.6102}$ (2)

9. Determine the minimum VO_{2MAX} score for elite women in this group scoring in the top 10%.



$z \qquad 1.28$

(2)

$\underline{44.96 \text{ ml/min/kg}}$

$X = P_{90} = \sigma z + \mu$

$= 7(1.28) + 36 =$