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| | Given Gardasil Vaccine | Given Placebo |
|-------------------------------|------------------------|---------------|
| Developed HPV infection | 1 | 36 |
| Did not develop HPV infection | 275 | 240 |
| | 276 | 276 |

- Find the value of the absolute risk (of being infected) reduction between the treatment and placebo groups. $\left| \frac{1}{276} - \frac{36}{276} \right| = \frac{35}{276} \approx .127$ 3
- What is the number needed to treat that must be given the Gardasil vaccine to prevent one HPV infection. $\frac{1}{a.r.r} = \frac{1}{35/276} \approx 7.9 \approx 8$ 8 women 3
- The odds of being infected were many times higher for those in the placebo group than for those in the Gardasil group. How many times higher? (what factor?) $\frac{36/240}{1/275} = 41.25$ 41.25 times higher 3

Write "binomial" or "Poisson" to indicate which distribution should be used to model each of the following:

- Poisson A typist makes an average of 2 mistakes per page. What is the probability of a particular page having no errors on it? (
- Poisson A computer crashes once every 2 days on average. What is the probability of there being 2 crashes in one week? (
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- Poisson The mean number of faults in a new house is 8. What is the probability of buying a house with exactly 1 fault? |

An allergist determined the average number of fire ants per square centimeter of a mound is six. Use this for the next two questions. $\mu = 6$ Poisson

- Find the probability of eight fire ants in a square centimeter of a mound. $P(X=8) = \frac{\mu^x e^{-\mu}}{x!} = \frac{6^8 e^{-6}}{8!} = \text{poisson pdf}(6,8) = .103$ 3
- Find the probability that there are at least four fire ants in a square centimeter of the mound. $P(X \geq 4) = 1 - P(X \leq 3) = 1 - \text{poisson cdf}(6,3) = 1 - .151$ 3

On a multiple choice test each question has 4 possible answers. Suppose a student guesses on each question.

11. What is the probability that a question selected at random is answered correctly? $p = .25$ 2
12. If there are three questions, what is the probability that a student gets exactly 1 of the questions correct? $X = \# \text{ correct} = \text{binomial}, n = 3, p = .25$
 $P(X=1) = 3^C_1 (.25)^1 (.75)^2 =$.422 3
13. If there are three questions, what is the probability that a student gets at least two of the three questions correct? $P(X > 2) = 1 - P(X \leq 1)$
 $= 1 - \text{binomcdf}(3, .25, 1) =$.156 3

A child peeled some of the pips (the little dots) off a die. What was left was cube that had a '3' on two sides, a '4' on two sides, a '1' on one side and a '0' (no pips) on one side. Let X be the number that comes up on a single roll (assume all cubes are equally likely).

14. What is the probability distribution for X ?

| X | P | X · P |
|---|-----|-------|
| 0 | 1/6 | 0 |
| 1 | 1/6 | 1/6 |
| 3 | 2/6 | 6/6 |
| 4 | 2/6 | 8/6 |
| | 1 | |

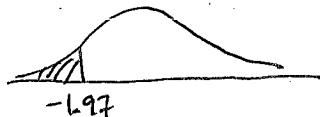
15. What is $P(X \leq 3)$? $4/6$ 2
16. What is the mean value of X ? 2.5 pips 3
- $\mu = \sum X P(X) = \frac{1}{6} + 1 + \frac{4}{3} \approx$

Find the value of the test statistic using the following information.

17. An environmental non-profit group collected a sample of 200 juvenile salmon from a created wetland to test whether the population of fish is eating less than 40% Chironomids, a type of fly. After flushing the contents of the stomachs, they find that the sample of juvenile salmon is eating 38% Chironomids. $Z = \frac{\hat{p} - p_0}{\sqrt{\frac{p_0(1-p_0)}{n}}} = \frac{.38 - .4}{\sqrt{\frac{.4(.4)}{200}}} =$ $Z = -.58$ 4

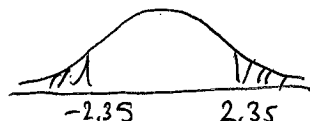
For the next two questions, find the p -value using the given information.

18. With $H_1: p < .2$, the test statistic is $z = -1.97$.



$p = .0244$ 3

19. With $H_1: p \neq .2$, the test statistic is $z = 2.35$.



$p \approx 2 * .0094$

$\approx .0188$ 3

20. Write a one-sentence interpretation of this confidence interval in the context of this problem.

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