

Hints to Review Questions

1. Solve $0.5 = 1 - \frac{\binom{365}{n} \times n!}{365^n}$ or $0.5 = 1 - \left(\frac{364}{365}\right)^n$ for n .

2. Formulate as a conditional probability problem and get

$$\frac{\frac{1}{1000}}{\frac{1}{1000} + \frac{999}{1000} \times \left(\frac{1}{2}\right)^{10}}.$$

3. Formulate as a Wilcoxon rank test, the detail is standard and omitted here.

4. Observe that $\mathbb{P}(Y < y) = \mathbb{P}(F(X) < y) = \mathbb{P}(X < F^{-1}(y)) = F(F^{-1}(y)) = y$ hence Y follows a uniform distribution on $[0, 1]$. Thus $\mathbb{E}Y = \frac{1}{2}$ and $Var(Y) = \frac{1}{12}$.

5. Use $\hat{\mu}_- = \bar{X} - \bar{Y}$ as an estimate for the difference of means and then calculate $SE(\hat{\mu}_-)$, the rest is standard and omitted. For (3), there is a duality between CI and hypothesis testing.

6. Regress Y on e^X and simply replace X with e^X in the formulas for \hat{a} and \hat{b} in simple linear regression. Use F -test for the hypothesis $H_0 : a = b = 0$.

7. Use fact that density function $f(x, y)$ satisfies

$$\int f(x, y) dx dy = 1$$

and also $f(x, y) \geq 0$. X and Y independent $\Leftrightarrow f(x, y) = h(x).g(y)$.

8. This is the so-called regression effect and $q > p$ for $p < 0.5$ while $q \leq p$ for $p > 0.5$.

9. Standard and omitted. Please refer to textbook for basic concepts.

10. Standard and omitted.

11. Good luck to your final and have a nice winter break!

References

Omitted.