

Midterm (75 minutes)

No calculators allowed. Just set up your answers, for example, $P = 49/52$. If you want extra time, you can buy time at a price of 1 point a minute; for example, if your test is handed in 10 minutes after the scheduled finish time, 10 points will be subtracted from your test score.

1. A 2001 study of four Philadelphia neighborhoods concluded that children who had access to more books in neighborhood libraries and public schools received better grades in school. A subsequent \$20 million grant from the William Penn Foundation funded a five-year project to improve 32 neighborhood libraries in order to “level the playing field” for all children and families in Philadelphia. As a statistician, why are you unpersuaded by this study?
2. A 1968 story in a Denver newspaper argued that women are better drivers than men. Among the evidence cited: “Of 101 drivers involved in an accident while passing on a curve, 15 were women.” In addition to automobile data, the newspaper cited these data: “3,000 men were injured on bicycles in the state in 1967 and 34 were killed, compared with 662 females injured and 11 killed.” Explain why these data are not sufficient to show that women are safer than men in passing on curves and riding bicycles.
3. A sports columnist recently wrote that, “Jon Gruden, left [Monday Night Football] to become Oakland’s head coach, a move that has been bad for both the broadcast and the team.” Is it possible for someone who goes from one organization to another to lower the average quality of both organizations?
4. Unanimous jury trials are guaranteed in federal criminal cases, but not in state trials. In 2019, the U.S. Supreme Court considered a challenge to the constitutionality of a Louisiana law that allows a conviction if at least 10 of 12 jurors vote guilty. A Stanford law school professor argued that a unanimous verdict of six jurors is more trustworthy than a majority decision of 12 or even 20 jurors.
Suppose that each juror is randomly selected from a large pool, of which 90 percent of the potential jurors would vote guilty and 10 percent would vote not guilty. Compare the probability that 6 randomly selected jurors would all vote guilty with the probability that a majority of 20 jurors would vote guilty.

8. The National Society of Professional Engineers used the following sample question to promote their national junior-high-school math contest:

According to the Elvis Institute, 45% of Elvis sightings are made west of the Mississippi, and 63% of sightings are made after 2 p.m. What are the odds of spotting Elvis east of the Mississippi before 2 p.m.?

The test answer was $(1 - 0.45)(1 - 0.63) = 0.2035$. Explain why this answer is incorrect.

9. Two fair coins are each labeled \$1 on one side and \$2 on the other side. The coins are flipped simultaneously and the payoff is equal to product of the numbers that land face up; for example, if one coin lands \$1 and the other coin lands \$2, the payoff is $(\$1)(\$2) = \$2$. What is the expected value of the payoff?

10. What is misleading about this graph of Affordable Care Act Enrollment created by a “trusted news source”?

