

QUIZ 2: 60 Minutes

Last Name: _____

First Name: _____

RIN: _____

Section: _____

Answer **ALL** questions.

NO COLLABORATION or electronic devices. Any violations result in an F.
NO questions allowed during the test. Interpret and do the best you can.

GOOD LUCK!

Circle at most one answer per question.

10 points for each correct answer

You **MUST** show **CORRECT** work to get full credit.

When in doubt, **TINKER**.

Total
200

INSTRUCTIONS

1. This is a **closed book** test. No electronics, books, notes, internet, etc.
2. The test will become available in Submitty at 8am on the test date.
3. Your PDF is due in Submitty by 2pm.
4. By submitting the test you attest that:
 - the work is entirely your own.
 - you obeyed the time limits of the exam.
5. Your submission *must* be typed and submitted as a PDF file.
6. The first page should list your twenty answers, something like:

(1)	A
(2)	B
(3)	C
(4)	D
⋮	
(20)	A

7. The *second* page onward *must* show your work for *every* answer, e.g.:

(1)	Because x is even
(2)	Because $\sqrt{2}$ is irrational.
(3)	Number of links is $1 + 2 + \cdots + 10 = 55$
⋮	
(20)	Because we proved in class that $\ell = n - 1$

- Some problems may be “easy”, so give a one line justification.
 - Some problems may require a detailed reasoning.
8. **If you don’t show correct work, you won’t get credit.**
 9. Be careful. This is multiple choice.
 - Correct answers get 10 points.
 - Wrong answers or correct answers with no justification get 0.
 10. Submit with plenty of time to spare. A late test won’t be accepted.
 - We won’t accept submissions that are even 1 second late.

1. How many students would guarantee two students with the same first initial. (First initials are A, B, \dots, Z .)
- A 24.
 - B 25.
 - C 26.
 - D 27.
 - E None of the above.
2. How many numbers in $\{1, 2, \dots, 1000\}$ are divisible by 2 or 5.
- A 200.
 - B 500.
 - C 600.
 - D 700.
 - E None of the above.
3. In how many ways can you pick a cooking team of 4 students from 7 student-chefs?
- A 4×7 .
 - B $7!/4!$.
 - C 7^4 .
 - D $7!/(4! \times 3!)$.
 - E None of the above.
4. The only available majors at FOCS-University are CS and BIO. There are 70 students in total. There are 50 CS majors and 50 BIO majors. How many dual CS-BIO majors are there?
- A 10.
 - B 20.
 - C 30.
 - D 40.
 - E None of the above.
5. The sum of the probabilities for all possible outcomes is always:
- A 0
 - B $1/4$.
 - C $1/2$.
 - D 1.
 - E None of the above.

6. Randomly flip three independent fair coins. What are the chances of more H (heads)?
- A 0.
 - B $2/8$.
 - C $4/8$.
 - D $6/8$.
 - E 1.
7. Randomly flip three independent fair coins. What are the chances of more H if the first flip is H?
- A 0.
 - B $2/8$.
 - C $4/8$.
 - D $6/8$.
 - E 1.
8. Randomly flip three independent fair coins. What are the chances of more H if the first two flips are H?
- A 0.
 - B $2/8$.
 - C $4/8$.
 - D $6/8$.
 - E 1.
9. Random variable \mathbf{X} is a value in $\{1, 2, 3, 4\}$ with probabilities $\{x, 2x, 3x, 4x\}$ respectively. What is x ?
- A 0.1.
 - B 0.2.
 - C 0.3.
 - D 0.4.
 - E It cannot be determined or none of the above.
10. For the random variable \mathbf{X} in the previous problem, what is $\mathbb{E}[\mathbf{X}]$
- A 1.
 - B 2.
 - C 3.
 - D 4.
 - E It cannot be determined or none of the above.

11. What is the probability to get 4 or more heads in 5 independent flips of a biased coin with probability $1/3$ of heads.
- A $10/3^5$.
 - B $11/3^5$.
 - C $12/3^5$.
 - D $13/3^5$.
 - E None of the above.
12. You flip a fair coin 10 times. What is the expected number of heads?
- A 3.
 - B 4.
 - C 5.
 - D 6.
 - E None of the above.
13. Boys are 4 times as likely as girls. You have kids till you get a girl. What is the expected number of kids you will have?
- A 2.
 - B 3.
 - C 4.
 - D 5.
 - E None of the above.
14. Random variables $\mathbf{X}_1, \mathbf{X}_2, \mathbf{X}_3$ have expected values $\mu_1 = 1, \mu_2 = 2, \mu_3 = 3$. What is $\mathbb{E}[2\mathbf{X}_1 + \mathbf{X}_2 + 3\mathbf{X}_3]$?
- A 11.
 - B 12.
 - C 13.
 - D 14.
 - E Can't be determined or none of the above.
15. 60% of students are men and 40% are women. Men have average hair length 5in. Women have average hair length 10in. What is the average hair length for all students?
- A 6in.
 - B 7in.
 - C 8in.
 - D 9in.
 - E None of the above.

16. A box has 5 fair and 5 two-headed coins Pick a random coin and flip 5 times. What are the chances of exactly 2 heads?
- A $2/5$
 - B $1/32$
 - C $5/32$
 - D $10/32$
 - E None of the above.
17. A box has 5 fair and 5 two-headed coins Pick a random coin and flip 10 times. What is the expected number of heads?
- A 5.
 - B 6.
 - C 7.
 - D 8.
 - E None of the above.
18. A test for COVID gives the right answer 90% of the time and 10% of people have COVID. You tested positive. What are the chances you have COVID.
- A 9%.
 - B 10%.
 - C 50%.
 - D 90%.
 - E None of the above.
19. A test for COVID gives the right answer 90% of the time and 10% of people have COVID. You test 100 people. What is the expected number people that have a positive test.
- A 9.
 - B 10.
 - C 18.
 - D 90.
 - E None of the above.
20. Starburst comes in two-packs and there are two equally likely colors. You buy two-packs until you have at least one starburst of each color. What is the expected number of two-packs you buy?
- A $4/3$.
 - B $5/3$.
 - C $6/3$.
 - D $7/3$.
 - E None of the above.

SCRATCH