

Instructions: This quiz has 25 questions. The use of calculators is forbidden. Click on the box with the right answer. To initialise the quiz you must click on “BEGIN QUIZ.” When you finish the quiz you click on “END QUIZ” in order to see your score.

Begin Quiz Answer each of the following.

1. Let $A = \{1, 2, 3, 4, 5\}$, $B = \{4, 5, 6, 7, 8\}$. Find $(A \setminus B) \cup (B \setminus A)$.

$\{1, 2, 3, 4, 5, 6, 7, 9\}$

$\{1, 2, 3, 6, 7, 8\}$

$\{1, 2, 3\}$

$\{4, 5\}$

2. A bag contains tickets numbered 1 through 10. Two tickets are taken at random and without replacement. What is the probability that their product is 20?

$\frac{1}{15}$
 $\frac{1}{45}$
 $\frac{4}{45}$
 $\frac{2}{45}$

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3. A bag contains tickets numbered #1 through #10. A and B alternately draw tickets, **with replacement**, until #7 is drawn. If A plays first, what is the probability that he will eventually win?

$$\frac{\frac{10}{19} \frac{9}{19} \frac{1}{10}}{\frac{10}{19} \frac{9}{19} \frac{1}{10}}$$

4. A multiple-choice exam has 20 questions, each question having four choices, of which exactly one is the right answer. What is the probability that a student guessing on the exam will guess exactly half correctly?

$$\frac{1}{2} \quad \binom{20}{10} \left(\frac{1}{4}\right)^{10} \quad \frac{1}{4} \quad \binom{20}{10} \left(\frac{1}{4}\right)^{10} \left(\frac{3}{4}\right)^{10}$$

5. You take a number at random from the set $\{1, 2, \dots, 20\}$. You are paid \$3 if it is divisible by 3, you will pay \$1 if it leaves remainder 1 upon division by 3, and you will pay \$2 if it leaves remainder 2 upon division by 3. What will you earn, in average?

You will earn 15¢

You will lose 15¢

You will earn 20¢

You will lose 25¢

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Situation: There are 18 cards of which 5 are red, 6 are blue, 7 are white. The red cards are numbered 1 through 5, the blue cards are numbered 1 through 6, the white cards are numbered 1 through 7. **Three cards are taken at random and without replacement.** Questions 6 to 12 refer to this situation.

6. How many ways are there of selecting the three cards with no regards to order?

$$3 \qquad 18 \qquad \binom{18}{3} \qquad \binom{7}{3} \binom{6}{3} \binom{5}{3}$$

7. In how many ways can one select two red cards?

$$\binom{5}{2} \binom{6}{1} \qquad \binom{5}{2} \binom{6}{1} \binom{7}{1} \qquad \binom{5}{2} \binom{7}{1} \qquad \binom{5}{2} \binom{13}{1}$$

8. In how many ways can one select three odd-numbered cards?

$$10 \qquad \binom{10}{3} \qquad \binom{3}{1} \binom{3}{1} \binom{4}{1} \qquad \binom{9}{3}$$

9. In how many ways can one select three even-numbered cards?

$$8 \qquad \binom{9}{3} \qquad \binom{2}{1} \binom{2}{1} \binom{3}{1} \qquad \binom{8}{3}$$

10. What is the probability of choosing three even-numbered cards?

$$\frac{1}{2} \qquad \frac{3}{8} \qquad \frac{7}{102} \qquad \frac{5}{34}$$

11. In how many ways can one select three non-white-coloured cards?

$$11 \qquad \binom{5}{3} \binom{6}{3} \qquad \binom{11}{3} \qquad \binom{5}{1} \binom{6}{1}$$

12. What is the probability of choosing three cards one of each colour?

$$\frac{1}{210} \qquad \frac{1}{6} \qquad \frac{35}{136} \qquad \frac{1}{35}$$

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Situation: An urn contains 4 red marbles and 6 blue marbles. A marble is taken at random, **without replacement**, and its colour noted. If the marble is red, then one blue marble is put into the urn. If the marble is blue, then one red marble is put into the urn. Observe that after this operation you, once again, end up with ten marbles in the urn. A second marble is now taken from the urn. R_1, R_2 denote, respectively, the events that the first and second marble are red. Similarly, B_1, B_2 denote, respectively, the events that the first and second marble are blue. Questions 13 to 16 refer to this situation.

13. $P(R_2|B_1) =$

$\frac{1}{2}$	$\frac{3}{10}$	$\frac{7}{10}$	$\frac{3}{5}$
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14. $P(R_2 \cap B_1) =$

$\frac{7}{25}$	$\frac{3}{25}$	$\frac{3}{10}$	$\frac{1}{10}$
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15. $P(R_2) =$

$\frac{21}{50}$	$\frac{29}{50}$	$\frac{1}{2}$	$\frac{7}{10}$
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16. $P(B_1|R_2) =$

$\frac{7}{10}$	$\frac{1}{2}$	$\frac{5}{7}$	$\frac{14}{29}$
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Situation: \mathbf{X} is a random variable with distribution table as shewn below. k is a real number constant that you must find.

\mathbf{X}	$\mathbf{P}(\mathbf{X})$
-1	k
0	k
1	$3k$

Questions 17 through 21 refer to this situation.

17. $k =$

$$\frac{1}{2} \qquad \frac{1}{5} \qquad \frac{2}{5} \qquad \frac{3}{5}$$

18. $\mathbf{P}(\mathbf{X} = 1) =$

$$\frac{1}{2} \qquad \frac{1}{5} \qquad \frac{2}{5} \qquad \frac{3}{5}$$

19. $\mathbf{E}\mathbf{X} =$

$$\frac{1}{5} \qquad \frac{2}{5} \qquad \frac{3}{5} \qquad -\frac{1}{5}$$

20. $\mathbf{E}\mathbf{X}^2 =$

$$\frac{1}{5} \qquad \frac{2}{5} \qquad \frac{3}{5} \qquad \frac{4}{5}$$

21. $\mathbf{var}\mathbf{X} =$

$$0 \qquad \frac{1}{25} \qquad \frac{23}{25} \qquad \frac{16}{25}$$

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22. What is the probability that the last names of three people chosen at random will each start with a different letter of the 26 of the English alphabet? Assume that last names have equal chances of starting with any given letter.

$$\frac{3}{26}$$

$$\frac{25}{169}$$

$$\frac{150}{169}$$

$$\frac{1}{2600}$$

23. A certain disease is known to afflict $\frac{10}{100}$ of a population. A test for this disease is devised and it is observed that it produces false positives $\frac{1}{100}$ of the time and false negatives $\frac{2}{100}$ of the time. Let A denote the event that a person taken from this population actually has the disease and X denote the event that a person tests positive on the test. Find $\mathbf{P}(A|X^c)$.

$$\frac{2}{893}$$

$$\frac{11}{891}$$

$$\frac{11}{893}$$

$$\frac{891}{893}$$

24. Seven married couples, the Adams, the Browns, the Castros, the Friedmans, the Goldbergs, the Santos, and the Jias, go to a desert island. Unbeknownst to them, a group of savages and cannibals awaits them. After an agonic week, five of the fourteen people survive. What is the average number of last names which are represented? (A last name is represented if either spouse, or possibly, both spouses, survived.)

$$\frac{10}{13}$$

$$\frac{55}{13}$$

$$\frac{45}{13}$$

$$\frac{13}{4}$$

25. An urn has 5 red, and 6 blue marbles. Marbles are drawn one by one, without replacement. What is the probability that exactly two red marbles are drawn before the third blue marble is drawn?

$$\frac{5}{66}$$

$$\frac{20}{77}$$

$$\frac{10}{33}$$

$$\frac{100}{231}$$

End Quiz

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