

Problems with explanations:

1. In Rwanda, the chance for rain on any given day is 50%. What is the probability that it rains on 4 out of 7 consecutive days in Rwanda?

- a) $4/7$
- b) $3/7$
- c) $35/128$
- d) $4/28$
- e) $28/135$

2. A Four digit safe code does not contain the digits 1 and 4 at all. What is the probability that it has at least one even digit?

- a) $1/4$
- b) $1/2$
- c) $3/4$
- d) $15/16$
- e) $1/16$

3. John wrote a phone number on a note that was later lost. John can remember that the number had 7 digits, the digit 1 appeared in the last three places and 0 did not appear at all. What is the probability that the phone number contains at least two prime digits?

- a) $15/16$
- b) $11/16$
- c) $11/12$
- d) $1/2$
- e) $5/8$

4. The probability of Sam passing the exam is $1/4$. The probability of Sam passing the exam and Michael passing the driving test is $1/6$. What is the probability of Michael passing his driving test?

- a) $1/24$.
- b) $1/2$.
- c) $1/3$.
- d) $2/3$.
- e) $2/5$

5. In a blue jar there are red, white and green balls. The probability of drawing a red ball is $1/5$. The probability of drawing a red ball, returning it, and then drawing a white ball is $1/10$. What is the probability of drawing a white ball?

- a) $1/5$.
- b) $1/2$.
- c) $1/3$.
- d) $3/10$.
- e) $1/4$.

6. Out of a classroom of 6 boys and 4 girls the teacher picks a president for the student board, a vice president and a secretary. What is the probability that only girls will be elected?

- a) $8/125$.
- b) $2/5$.
- c) $1/30$.
- d) $1/720$.
- e) $13/48$.

7. Two dice are rolled. What is the probability the sum will be greater than 10?

- a) $1/9$.
- b) $1/12$.
- c) $5/36$.
- d) $1/6$.
- e) $1/5$.

8. The probability of having a girl is identical to the probability of having a boy. In a family with three children, what is the probability that all the children are of the same gender?

- a) $1/8$.
- b) $1/6$.
- c) $1/3$.
- d) $1/5$.
- e) $1/4$.

9. On one side of a coin there is the number 0 and on the other side the number 1. What is the probability that the sum of three coin tosses will be 2?

- a) $1/8$.
- b) $1/2$.
- c) $1/5$.
- d) $3/8$.
- e) $1/3$.

10. In a flower shop, there are 5 different types of flowers. Two of the flowers are blue, two are red and one is yellow. In how many different combinations of different colors can a 3-flower garland be made?

- a) 4.
- b) 20.
- c) 3.
- d) 5.
- e) 6.

11. In a deck of cards there are 52 cards numbered from 1 to 13. There are 4 cards of each number in the deck. If you insert 12 more cards with the number 10 on them and

you shuffle the deck really good, what is the probability to pull out a card with a number 10 on it?

- a) $1/4$.
- b) $4/17$.
- c) $5/29$.
- d) $4/13$.
- e) $1/3$.

12. There are 18 balls in a jar. You take out 3 blue balls without putting them back inside, and now the probability of pulling out a blue ball is $1/5$. How many blue balls were there in the beginning?

- a) 9.
- b) 8.
- c) 7.
- d) 12.
- e) 6.

13. In a box there are A green balls, $3A + 6$ red balls and 2 yellow ones. If there are no other colors, what is the probability of taking out a green or a yellow ball?

- a) $1/5$.
- b) $1/2$.
- c) $1/3$.
- d) $1/4$.
- e) $2/3$.

14. In a jar there are balls in different colors: blue, red, green and yellow. The probability of drawing a blue ball is $1/8$. The probability of drawing a red ball is $1/5$. The probability of drawing a green ball is $1/10$.

If a jar cannot contain more than 50 balls, how many yellow balls are in the Jar?

- a) 23.
- b) 20.
- c) 24.
- d) 17.
- e) 25.

15. In a jar there are 3 red balls and 2 blue balls. What is the probability of drawing at least one red ball when drawing two consecutive balls randomly?

- a) $9/10$
- b) $16/20$
- c) $2/5$
- d) $3/5$
- e) $1/2$

Explanations:

1. The best answer is C.

We have $7!/(4!*3!) = 35$ different possibilities for 4 days of rain out of 7 consecutive days (choosing 4 out of seven). Every one of these 35 possibilities has the following probability: every day has the chance of $\frac{1}{2}$ to rain so we have 4 days of $\frac{1}{2}$ that it will rain and 3 days of $\frac{1}{2}$ that it will not rain. We have $\frac{1}{2}$ to the power of 7 = $1/128$ as the probability of every single event. The total is $35 \times 1/128 = 35/128$.

2. The best answer is D.

For every digit we can choose out of 8 digits (10 total minus 1 and 4). There are four different options:

1. No even digits
2. One even digit.
3. Two even digits.
4. Three even digits.
5. Four even digits.

The probability of choosing an odd (or an even) digit is $\frac{1}{2}$.

One minus the option of no even digits: $1 - (1/2)^4 = 15/16$.

You can also sum up all of the other options (2-5).

3. The best answer is B.

Since 1 appears exactly three times, we can solve for the other four digits only. For every digit we can choose out of 8 digits only (without 1 and 0). Since we have 4 prime digits (2, 3, 5, 7) and 4 non-prime digits (4, 6, 8, 9), the probability of choosing a prime digit is $\frac{1}{2}$.

We need at least two prime digits:

One minus (the probability of having no prime digits + having one prime digit):

There are 4 options of one prime digit, each with a probability of $(1/2)^4$.

There is only one option of no prime digit with a probability of $(1/2)^4$.

So: $[1 - ((1/2)^4 + (1/2)^4 * 4)] = 11/16$.

4. The best answer is D.

Indicate A as the probability of Michael passing the driving test.

The probability of Sam passing the test is $1/4$, the probability of both events happening together is $1/6$ so: $1/4 \times A = 1/6$ therefore $A = 2/3$.

5. The best answer is B.

Indicate A as the probability of drawing a white ball from the jar.

The probability of drawing a red ball is $1/5$.

The probability of drawing both events is $1/10$ so, $1/5 \times A = 1/10$.

Therefore $A = 1/2$.

6. The best answer is C.

The basic principle of this question is that one person can't be elected to more than one part, therefore when picking a person for a job the "inventory" of remaining people is growing smaller.

The probability of picking a girl for the first job is $4/10 = 2/5$.

The probability of picking a girl for the second job is $(4-1)/(10-1) = 3/9$.

The probability of picking a girl for the third job is $(3-1)/(9-1) = 1/4$.

The probability of all three events happening is: $\frac{2}{5} \times \frac{3}{9} \times \frac{1}{4} = \frac{1}{30}$.

7. The best answer is B.

When rolling two dice, there are 36 possible pairs of results (6×6).

A sum greater than 10 can only be achieved with the following combinations: (6,6), (5,6), (6,5).

Therefore the probability is $\frac{3}{36} = \frac{1}{12}$.

8. The best answer is E.

The gender of the first-born is insignificant since we want all children to be of the same gender no matter if they are all boys or girls.

The probability for the second child to be of the same gender as the first is: $\frac{1}{2}$. The same probability goes for the third child. Therefore the answer is $\frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$.

9. The best answer is D.

The coin is tossed three times therefore there are 8 possible outcomes ($2 \times 2 \times 2$). We are interested only in the three following outcomes: (0,1,1), (1,0,1), (1,1,0).

The probability requested is $\frac{3}{8}$.

10. The best answer is A.

We want to make a 3-flower garlands, each should have three colors of flowers in it.

There are two different types of blue and two different types of red.

The options are (2 blue) \times (2 red) \times (1 yellow) = 4 options.

11. The best answer is A.

The total number of cards in the new deck is $12 + 52 = 64$.

There are ($4 + 12 = 16$) cards with the number 10.

The probability of drawing a 10 numbered card is $\frac{16}{64} = \frac{1}{4}$.

12. The best answer is E.

After taking out 3 balls there are 15 left. $\frac{15}{5} = 3$ blue balls is the number of left after we took out 3 therefore there were 6 in the beginning.

13. The best answer is D.

The number of green and yellow balls in the box is $A+2$.

The total number of balls is $4A + 8$.

The probability of taking out a green or a yellow ball is $\frac{(A+2)}{(4A+8)} = \frac{1}{4}$.

14. The best answer is A.

If $\frac{1}{8}$ is the probability of drawing a blue ball then there are $\frac{40}{8} = 5$ blue balls in the jar. And with the same principle there are 8 red balls and 4 green ones. $40 - 5 - 8 - 4 = 23$ balls (yellow is the only color left).

15. The best answer is A.

Since we want to draw at least one red ball we have four different possibilities:

6. Drawing blue-blue.
7. Drawing blue-red.
8. Drawing red-blue.

9. Drawing red-red.

There are two ways to solve this question:

One minus the probability of getting no red ball (blue-blue):

$$1 - \frac{2}{5} \times \frac{1}{4} = 1 - \frac{2}{20} = \frac{18}{20} = \frac{9}{10}$$

Or summing up all three good options:

$$\text{Red-blue} \rightarrow \frac{3}{5} \times \frac{2}{4} = \frac{6}{20}$$

$$\text{Blue-red} \rightarrow \frac{2}{5} \times \frac{3}{4} = \frac{6}{20}$$

$$\text{Red-red} \rightarrow \frac{3}{5} \times \frac{2}{4} = \frac{6}{20}$$

$$\text{Together} = \frac{18}{20} = \frac{9}{10}$$

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