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Problem 1

Events that are complementary must also be mutually exclusive.

- A. True
- B. False

Solution:

The statement is true, since events that are complementary must be mutually exclusive. For example, if rolling a single die and recording the score, the events {even score} and {odd score} are complementary and cannot both occur on a given roll.

Correct Answers:

- A

+6pc-1pc
Problem 2

A bag contains four pieces of paper, each labelled withone of the digits 1, 2, 3, 4.
You draw three pieces of paper (without replacement) to form a 3 digit number (first piece of paper is first digit,etc).

The probability that your 3 digit numbe is a muliple of 3 is ___.

Solution:

Solution

First we must figure out how many different 3 digit numbers we can make.
We can choose the first digit in 4 ways, then we can choose the second digit
in three ways (because one of the sheets of paper is no longer in the bag),
then we can choose the third
digit in 2 ways, so there are $4 \times 3 \times 2 = 24$ possible numbers.

Next we must figure out which of these work. One way to do that is to go down
the list and pick those that work. They are:
$123 = 3 \times 41$
$132 = 3 \times 44$
$213 = 3 \times 71$
$231 = 3 \times 77$
$234 = 3 \times 78$
$243 = 3 \times 81$
$312 = 3 \times 104$
$321 = 3 \times 107$
$324 = 3 \times 108$
$342 = 3 \times 114$

$423 = 3 \times 141$
$432 = 3 \times 144$

So we have a total of 12 that work and so the probability is one half.
A faster, way that you might have thought of, is to notice that a number is a muliple of 3 if the sum of its digits is a multiple of 3.
There are two sets of numbers that add to a multiple of 3, 1,2,3 and 2,3,4 and each of these can be ordered in 6 ways.

Correct Answers:

- 0.5

+6pc-1pc
Problem 3

Events A and B are independent. $P(A) = 0.1$ and $P(B) = 0.2$. Find $P(A \cup B)$ to two decimal places.

$P(A \cup B) =$ _____
Solution: Solution

Recall that $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

Since the events are independent, $P(A \cap B) = P(A)P(B)$. Hence $P(A \cup B) = P(A) + P(B) - P(A)P(B) = 0.1 + 0.2 - 0.02 = 0.28$.

Correct Answers:

- 0.28

+6pc-1pc
Problem 6

Harry tosses a nickel 4 times.

The probability that he gets at least as many heads as tails is __.
Solution:

Solution

Notice that he can get 4 heads in just one way: namely HHHH.
He can get 3 heads in four ways:
HHHT (that is, a tail on his last toss), HHTH (a tail on his next to last toss), HTHH, and THHH ;
He can get 2 heads in 6 ways: HHTT, HTHT, HTTH, THHT, THTH, THHT, TTHH.
Since there are $2^4 = 16$ ordered ways that the nickel can land, the probability of at least two heads (which guarantees that he gets at least as many heads as tails) is $\frac{6+4+1}{16} = \frac{11}{16}$.

Another way of thinking of it is that after computing the number of ways of getting 4, 3, 2 heads, we know there are 5 ways that heads exceed tail
and that means that there must be 5 ways that tails exceed heads so we don't really need to do anything more to know the denominator.

Correct Answers:

- $\frac{11}{16}$

+6pc-1pc
Problem 7

A palindrome is a number (like 535) that is the same if the digits are written in reverse order. If a number is a three digit multiple of eleven then the probability that it is a palindrome is __

Solution:

Solution

In this sort of problem a little bit of experimenting goes a long way so lets try. A three digit multiple of 11 must be 11 times a 2 digit number (since $11 \times 9 = 99$ and 99 is a 2 digit number). So first lets find the largest 2 digit number which, when multiplied by 11 gives a 3 digit number. A few experiments will show you that $0 \times 11 = 990$ while $91 \times 11 = 1001$. we know that there are 81 three digit number starting with 110 and ending with 990 that are multiples of 11. (The reason for the 81 is that these are 11 times each of the numbers from 10 to 90.)

Now we experiment a few times. $10 \times 11 = 110$, $11 \times 11 = 121$, $12 \times 11 = 132$.
What have we learned do far?
When we increase the number we muliply by 1 the last digit if the product increases by 1.
That means that for every first digit there cannot be more than one palindrome and if we use all possible second digits there will be exactly one palindrome (since a 3 digit number is a palindrome when the third digit is the same as the first.

Now we know that we have a palindrome for the two digit numbers with first digit 1, 2, ..., 8.
The only number with first digit 9 is 90 and $90 \times 11 = 990$ is not a palindrome.
Thus 8 of the 81 three digit multiples of 11 is a palindrome.

Correct Answers:

- $\frac{8}{81}$

+6pc-1pc
Problem 8

A bag contains only red marbles and blue marbles.

There are 6 marbles in the bag.

The bag contains twice as many blue marbles as red marbles.

Nadia takes one marble from the bag without looking.

The probability that the marble is blue is __.

Solution:

Solution

Since there are twice as many blue marbles as red marbles, the probability that the probability that Nadia picked a blue marble is $\frac{2}{3}$.

IN THIS PROBLEM ON THE NEAP EXAM YOU WERE EXPECTED TO SHOW YOUR WORK. SOMETHING SIMILAR TO THE SOLUTION ABOVE WOULD BE APPROPRIATE.

Notice that you did not even need the information that there were 6 marbles in the bag.

Correct Answers:

- 0.666667

+6pc-1pc
Problem 9

Look at these tiles.

Haley puts these 12 tiles in a bag and shakes. Then she pulls out a tile at random.

What is the probability she picks a tile that is a multiple of 3?

- A. $\frac{8}{4}$
- B. $\frac{8}{12}$
- C. $\frac{4}{12}$
- D. $\frac{4}{8}$

Solution:

Solution

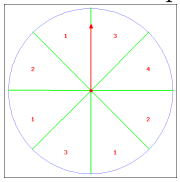
Of the 12 tiles, the following four are multiples of 3: 9,3,6,12.
So the probability that the chosen tile is a multiple of 3 is $\frac{4}{12}$.

Correct Answers:

- C

+6pc-1pc
Problem 10

Look at this spinner



On what number is the spinner least likely to land?

- A. 3

- B. 2
- C. 1
- D. 4

Solution:

Solution

There is one 4, there are two 3's, there are two 2's and there are three 1's.
Since the area of each sector is the same, the spinner is least likely to land on 4.

Correct Answers:

- D

+6pc-1pc
Problem 11

Which of the following is a requirement of the probabilities assigned to the outcomes O_i:

- A. $P(O_i) = 1 + P(O_i^C)$
- B. $P(O_i) \geq 1$
- C. $P(O_i) \leq 0$
- D. $0 \leq P(O_i) \leq 1$ for each i

Of the last 500 customers entering a supermarket, 50 have purchased a loaf of bread. If the relative frequency approach for assigning probabilities is used, the probability that the next customer will purchase a loaf of bread is:

- A. 0.90
- B. 0.10
- C. 0.50
- D. None of the above answers is correct

Correct Answers:

- D
- B

+6pc-1pc

Problem 12

A survey asks adults to report their marital status. Suppose that in the city which the survey is conducted, 51% of adults are married, 10% are single, 24% are divorced, and 15% are widowed. Find the probabilities of each of the following events:

The adult is single = _____

The adult is not divorced = _____

The adult is either widowed or divorced = _____

Correct Answers:

- 0.1
- 0.76
- 0.39

+6pc-1pc
Problem 13

The probability that a university graduate will be offered no jobs within a month of graduation is estimated to be 8%. The probability of receiving one, two, and three job offers has similarly been estimated to be 40%, 29%, and 23%, respectively. Determine the following probabilities:

A. P(A graduate is offered fewer than two jobs) = _____

B. P(A graduate is offered more than one job) = _____

Correct Answers:

- 0.48
- 0.52

+6pc-1pc
Problem 14

Using historical records, the personnel manager of a plant has determined the probability of X, the number of employees absent per day. It is

X	0	1	2	3	4	5	6	7
P(X)	0.0049	0.0249	0.3098	0.3399	0.2191	0.0795	0.0181	0.0038

Find the following probabilities.

A. $P(2 \leq X \leq 5)$

Probability = _____

B. $P(X > 5)$

Probability = _____

C.$P(X < 4)$

Probability = _____

Correct Answers:

- 0.9483
- 0.0219
- 0.6795

+6pc-1pc

Problem 15

Determine whether the following number can possibly be probability. Write "YES" for yes and "NO" for no. (without quotations)

(a) 3.9
answer: _____

(b) 1
answer: _____

(c) 0.9
answer: _____

(d) 0
answer: _____

(e) $\frac{1}{2}$
answer: _____

(f) -3
answer: _____

Correct Answers:

- NO
- YES
- YES
- YES
- YES
- No

+6pc-1pc

Problem 16

You flip a fair coin 10 times. What is the probability that it lands on heads exactly 7 times?

The probability of exactly 7 heads is _____.

What is the probability that it lands on heads at least 7 times?

The probability of at least 7 heads is _____.

Correct Answers:

- 0.1171875
- 0.171875

+6pc-1pc
Problem 17

A die is rolled. Find the probability of the given event.
(a) The number showing is a 5;
The probability is : ____
(b) The number showing is an even number;
The probability is : ____
(c) The number showing is greater than 5;
The probability is : ____

Correct Answers:

- 0.166666666666667
- 0.5
- 0.166666666666667

+6pc-1pc
Problem 18

A poker hand, consisting of 5 cards, is dealt from a standard deck of 52 cards. Find the probability that the hand contains an ace, king, queen, jack, and 10 of the same suit (royal flush).
Your answer is : _____

Correct Answers:

- $1.53907716932927 \times 10^{-6}$

+6pc-1pc
Problem 19

A ball is drawn randomly from a jar that contains 9 red balls, 6 white balls, and 2 yellow ball. Find the probability of the given event.
(a) A red ball is drawn;
The probability is : ____
(b) A white ball is drawn;
The probability is : ____

(c) A yellow ball is drawn;
The probability is : ____

Correct Answers:

- 0.529411764705882
- 0.352941176470588
- 0.117647058823529

+6pc-1pc
Problem 20

(a) Count the number of ways to arrange a sample of 5 elements from a population of 12 elements.

answer: ____

(b) If random sampling is to be employed, the probability that any particular sample will be selected is ____

Correct Answers:

- 792
- 0.00126262626262626

+6pc-1pc
Problem 21

A student is chosen at random from a class with 17 girls and 16 boys.

The probability of choosing a boy is __.

The odds in favor of choosing a boy is __

The probability of choosing either a girl or a boy is __

The odds that neither a girl nor a boy is chosen is __

Solution:

Correct Answers:

- $\frac{16}{33}$
- $\frac{16}{17}$
- 1
- $\frac{0}{1}$

+6pc-1pc

Problem 22

Suppose you select a letter at random from the word MISSISSIPPI.

The probability of selecting the letter P is ___

The probability of selecting the letter M is ___

The probability of selecting the letters I or S is ___

The probability of not selecting the letter S is ___

Solution: The probability of 'M's is 1/11.
The probability of 'I's is 4/11.
The probability of 'S's is 4/11.
The probability of 'P's is 2/11.

Correct Answers:

- $\frac{2}{11}$
- $\frac{1}{11}$
- $\frac{4}{11} + \frac{4}{11}$
- $1 - \frac{4}{11}$

+6pc-1pc
Problem 23

Suppose that a single die with 17 sides (numbered 1, 2, 3, ... , 17) is rolled once. What is the probability of getting an even number?

Answer = _____

Correct Answers:

- 0.471

+6pc-1pc
Problem 24

A committee of four is chosen at random from a group of 6 women and 3 men. Find the probability that the committee contains at least one man.

Answer: _____

Correct Answers:

- $1 - \frac{6}{9}\frac{6-1}{9-1}\frac{6-2}{9-2}\frac{6-3}{9-3}$

+6pc-1pc

Problem 25

Two dice are rolled and someone indicates that the two numbers that come up are different. Find the probability that the sum of the two numbers is 6.

Answer: _____
Correct Answers:

- $\frac{4}{30}$

+6pc-1pc
Problem 26

Two coins are tossed. Find the probability of tossing each of the following events:

---

1. One head and one tail.
Answer: _____

2. Two tails.
Answer: _____

3. At least one tail.
Answer: _____

4. No heads.
Answer: _____

Correct Answers:

- 0.5
- 0.25
- 0.75
- 0.25

+6pc-1pc
Problem 27

A jar contains 8 white, 9 blue, and 18 red marbles. If one marble is drawn at random from the jar, find the probability that:

---

1. the marble is white or blue.
Answer: _____

2. the marble is white or red.
Answer: _____

3. the marble is blue or red.
Answer: _____

Correct Answers:

- $\frac{8+9}{35}$
- $\frac{8+18}{35}$

- $\frac{18+9}{35}$

+6pc-1pc
Problem 28

Six coins are tossed. Find the probability of at least 3 heads.

Answer: _____
Correct Answers:
- $1-\frac{1}{64}-\frac{6}{64}-0.234375$

+6pc-1pc
Problem 29

Three coins are tossed. Find the probability of tossing each of the following events:

---

1. Three heads.
Answer: _____

2. Two heads and a tail.
Answer: _____

3. At least one tail.
Answer: _____

4. At least two heads.
Answer: _____

Correct Answers:
- 0.125
- 0.375
- 0.875
- 0.5

+6pc-1pc
Problem 30

Two cards are drawn at random from a pack without replacement. What is the probability that the first is an Ace but the second is not an Ace?

- A. 48/51
- B. 12/13
- C. 49/64
- D. 16/221
- E. 2/507

Solution:

In a pack of 52 cards, there are 4 Aces so
$P(\text{Ace}) = \frac{4}{52} = \frac{1}{13}$.
Having drawn an Ace, there are 51 cards left, three of which are Aces, so the probability of not drawing an Ace for the second card is $\frac{48}{51}$. Hence,
$P(\text{Ace then a card other than an Ace}) = \frac{1}{13} \times \frac{48}{51} = \frac{16}{221}$.;

Correct Answers:

- D