Standard: Use theoretical and experimental probability to model and solve problems. Find expected values and determine fairness.

Group A

1. Players A and B play a game in which a pair of dice are rolled and A wins 2 dollars from B if a sum of 8 or 9 appears. Otherwise, B wins 3 dollars from A if a total of seven is rolled. Is this game fair? If not, what does B have to earn from A to make it fair?
2. A lottery has two $1000 prize, five $100 prizes, and ten $50 prizes. What is the expected value from buying one of the 5000 tickets sold for $2 each?

Standard: Use theoretical and experimental probability to model and solve problems. Identify and use discrete random variables to solve problems

Group B

1. Each member of the group will roll the pair of die five times and record the total in the

chart below. <https://appzaza.com/dice-roller>

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Group | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| A |  |  |  |  |  |  |  |  |  |  |  |
| B |  |  |  |  |  |  |  |  |  |  |  |
| C |  |  |  |  |  |  |  |  |  |  |  |
| D |  |  |  |  |  |  |  |  |  |  |  |
| E |  |  |  |  |  |  |  |  |  |  |  |
| F |  |  |  |  |  |  |  |  |  |  |  |
| G |  |  |  |  |  |  |  |  |  |  |  |
| H |  |  |  |  |  |  |  |  |  |  |  |
| I |  |  |  |  |  |  |  |  |  |  |  |
| J |  |  |  |  |  |  |  |  |  |  |  |
| K |  |  |  |  |  |  |  |  |  |  |  |
| L |  |  |  |  |  |  |  |  |  |  |  |

Standard: Use theoretical and experimental probability to model and solve problems. Apply the Binomial Theorem.

Group C

1. Each member is going to shoot five shots in the basket. Please record the number made

and the number missed for each group member in the chart below:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Group | Made | Missed | Made | Missed | Made | Missed | Made | Missed |
| A |  |  |  |  |  |  |  |  |
| B |  |  |  |  |  |  |  |  |
| C |  |  |  |  |  |  |  |  |
| D |  |  |  |  |  |  |  |  |
| E |  |  |  |  |  |  |  |  |
| F |  |  |  |  |  |  |  |  |
| G |  |  |  |  |  |  |  |  |
| H |  |  |  |  |  |  |  |  |
| I |  |  |  |  |  |  |  |  |
| J |  |  |  |  |  |  |  |  |
| K |  |  |  |  |  |  |  |  |
| L |  |  |  |  |  |  |  |  |

Standard: Use theoretical and experimental probability to model and solve problems. Calculate and apply permutations and combinations.

Group D

1. Twenty people report for jury duty. How many different twelve person jurors can be

chosen?

2. In Cougar Class, each student is asked to choose the male Prom Court (King, Prince,

and Jester). There are fifteen boys to choose from. How many different members can be

chosen?

3. There are 15 books on your summer reading list. Three of them are plays, one is poetry,

and the rest novels. What is the probability that you will choose three novels?

4. In a diving competition, the order in which competitors dive is randomly drawn. If

there are eight divers in the finals, how many orders are possible?

Standard: Use theoretical and experimental probability to model and solve problems. Calculate and apply permutations and combinations.

Group E

1. You bought a box of marbles. You select two of them randomly and note the color. The

marbles are no replaced. What is the probability of each of the following?

Your box contains 3 Blue, 2 Yellow, 6 red, and 1 green.

1. P(2 Yellow)
2. P(Red and Blue)
3. P(2 Green)
4. P(at least one blue)

Standard: Use theoretical and experimental probability to model and solve problems. Calculate and apply permutations and combinations.

Group F

1. In a certain state the license plates consist of two letters followed by four digits. How

many license plates contain no K and the digits can not repeat?

2. A combination lock will open if the right choice of three numbers (from 1 to 30) is

selected. How many different lock combinations are possible? (Numbers can’t repeat)

3. In how many ways can five girls and three boys walk into class if the girls must walk

through the door first?

4. How many different arrangements can be made out of the word “Advanced Math”?

Standard: Use theoretical and experimental probability to model and solve problems. Calculate probability.

Group G

1. In a standard deck of cards, five cards are drawn, what is the probability of each of the

following?

1. P(all hearts)
2. P(2 spades and 3 diamonds)
3. P(all face cards)

One card is drawn:

1. P(Diamond or a Queen)

Two cards are drawn without replacement:

1. P(Club or a face card)

Standard: Use theoretical and experimental probability to model and solve problems. Calculate and apply permutations and combinations.

Group H

1. 8 people are sitting at a table, how many ways can they be seated?

2. 10 keys are on a key ring with no reference, how many ways can they be arranged?

3. 4 charms on a bracelet with a clasp, how many ways can they be arranged?

4. 6 people are sitting at a table. Two of them are married. How many ways can they be s

seated if the married couple must sit together?

Standard: Use theoretical and experimental probability to model and solve problems. Calculate geometric probability.

Group I

1. What is the probability of the landing in the



shaded region?

5 cm.

2. A stop light at an intersection stays red for 45 second, changes to green for 60 seconds, and then yellow for 10 seconds. If you arrive at the intersection at a random time, what is the probability that you will have to wait at a red light for more than 5 seconds?

3. The probability of me winning a baseball game is 2/3. What is the probabilty that I

will win three out of my first five games?

4. In the above example, what is the probability of me winning at least 4 out of the first

five?

Answers:

Group A Answers:

1. Fair Game 2. -.4034

Group D Answers:

1. 125, 970 2. 2,730 3. 33/91 4. 40,320

20 choose 12 15 \* 14 \* 13 11 choose 3/ 15 choose 3 8!

Group E Answers:

A. 1/66 B. 3/11 C. 0 D. 5/11

(2/12) \* (1/11) (6/12) \* (3/11) \* 2 2 \* (3/12) \* (9/11) + (3/12) \* (2/11)

Group F Answers:

1. 3,150,000 2. 24,360 3. 720 4. 39,916,800  
25 \* 25 \* 10 \* 9 \* 8 \* 7 30 \* 29 \* 28 5! \* 3! 12!/ (3! \* 2!)

Group G Answers:

A. 1,287/2,598,960 B. 22,308/2,598,960 C. 792/ 2,598,960

13 choose 5 / 52 choose 5 13 choose 2 \* 13 choose 3/ 52 choose 5 12 choose 5/ denom

D. 4/13 E. 77/442

(13/52) + (4/52) – (1/52) (22/52) \* (21/51)

Group H Answers:

1. 5,040 2. 181,440 3. 12 4. 48

7! 9! / 2 4! / 2 5! / (5) \* 2

Group I Answers:

1. 5/18 2. 8/23 3. 80/243 4. 112/243

((100/360) \* 25 \* pi)/ 25pi 40 / 115 5 choose 3 (2/3)3(1/3)2 5 choose 4 (2/3)4(1/3)1

+ 5 choose 5 (2/3)5(1/3)0

ENRICHMENT!

How many six digit numbers can be made using the numbers 1,2,3,4,5,6,7 if all of the odd numbers are in ascending order?

Standard: Use theoretical and experimental probability to model and solve problems. Identify and use discrete random variables to solve problems

2nd Period

1. Each member of the group will roll the pair of die five times and record the total in the

chart below.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Group | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| A |  |  | 2 | 2 | 4 | 1 | 3 | 1 | 2 |  |  |
| B |  | 1 |  | 2 | 2 | 3 | 1 | 3 | 2 | 1 | 1 |
| C |  | 2 | 2 |  | 1 | 1 |  | 1 | 1 | 2 |  |
| D |  |  |  |  | 3 | 1 |  | 1 |  |  |  |
| E | 1 |  |  | 2 | 1 | 10 | 3 | 1 |  |  |  |
| F | 1 | 1 | 1 | 1 | 1 | 4 | 3 |  | 2 | 1 |  |
| G | 1 |  |  | 3 |  | 2 | 3 | 2 | 1 | 3 |  |
| H | 1 | 1 | 1 | 3 | 3 | 1 | 2 | 2 | 5 | 1 |  |
| I |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |
| Totals | 4 | 5 | 6 | 13 | 15 | 23 | 15 | 11 | 13 | 8 | 1 |
|  |  |  |  |  |  |  |  |  |  |  |  |
| 114 |  |  |  |  |  |  |  |  |  |  |  |

Expected Value:

Standard: Use theoretical and experimental probability to model and solve problems. Apply the Binomial Theorem.

2nd Period

1. Each member is going to shoot five shots in the basket. Please record the number made

and the number missed for each group member in the chart below:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Group |  |  | Made | Missed |  |  |  |  |
| A |  |  | 8 | 15 |  |  |  |  |
| B |  |  | 12 | 20 |  |  |  |  |
| C |  |  | 12 | 15 |  |  |  |  |
| D |  |  | 8 | 15 |  |  |  |  |
| E |  |  | 8 | 15 |  |  |  |  |
| F |  |  | 7 | 15 |  |  |  |  |
| G |  |  | 11 | 15 |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |

Objective: Explain to the class the difference between theoretical probability and actual probability. Demonstrate the expected value for our class simulation yesterday.

Questions: Does probability always hold true? What would make our probabilities more accurate? Were we surprised with the expected value of our simulation? How does it compare to the theoretical one we discussed in class last week?

Using the highlighted groups demonstrate the binomial probability of a given circumstance. Then show the students how to use the binompdf function in their calculators to get a list of possible outcome probabilities.

Using the binompdf function discuss the paratroopers problem.

Show groups and begin group quiz with an hour to go in class.

Standard: Use theoretical and experimental probability to model and solve problems. Identify and use discrete random variables to solve problems

3rd Period

1. Each member of the group will roll the pair of die five times and record the total in the

chart below.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Group | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| A |  |  |  |  |  |  |  |  |  |  |  |
| B |  |  |  |  |  |  |  |  |  |  |  |
| C |  |  |  |  |  |  |  |  |  |  |  |
| D |  |  |  |  |  |  |  |  |  |  |  |
| E |  |  |  |  |  |  |  |  |  |  |  |
| F |  |  |  |  |  |  |  |  |  |  |  |
| G |  |  |  |  |  |  |  |  |  |  |  |
| H |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |
| Total |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |

Expected Value:

Standard: Use theoretical and experimental probability to model and solve problems. Apply the Binomial Theorem.

3rd Period

1. Each member is going to shoot five shots in the basket. Please record the number made

and the number missed for each group member in the chart below:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Group |  |  | Made | Missed |  |  |  |  |
| A |  |  |  |  |  |  |  |  |
| B |  |  |  |  |  |  |  |  |
| C |  |  |  |  |  |  |  |  |
| D |  |  |  |  |  |  |  |  |
| E |  |  |  |  |  |  |  |  |
| F |  |  |  |  |  |  |  |  |
| G |  |  |  |  |  |  |  |  |
| H |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |

Standard: Use theoretical and experimental probability to model and solve problems. Calculate probability.

1. What is the probability of getting four of a kind (the same type of

card) in a standard poker hand?

Standard: Use theoretical and experimental probability to model and solve problems. Calculate the probability using the binomial theorem.

2. Ten paratroopers are jumping out of a plane. The chance that they

hit their target is 48%. What is the probability that at most four hit

the target?