BLC150 Name: _____

HW-11- Statistics, Dice, and Probability

Average vs. Median

Average: Add up the numbers and divide by the number of numbers.
E.g. 4, 5, 2, 8, 10. The average is $\frac{2+5+4+8+10}{5} = \frac{29}{5} = 5.8$

Median: Put the numbers in order, find the middle number in the list, that's the median.
If your list has an odd number of numbers, the middle number is the median.
E.g. 4, 5, 2, 8, 10. Puth them in order: 2, 4, **5**, 8, 10. Pick out the middle number: 5
If your list has an even number of numbers, put them in order again and average the two numbers in the middle.
E.g. 3, 1, 7, 5, 10, 18 → 1, 3, **5, 7**, 10, 18 → $\frac{5+7}{2} = 6$

Political decisions are often based on annual income statistics. If you want to look at a population and determine how the majority are doing economically the median is often more representative than the average. Here's a problem to show why.
From the following list of incomes from a group of people,
find the **average** income and the **median** income.

$15,000	$1,232,000	$34,000	$41,000	$38,000	$53,000	$48,000
$15,000	$34,000	$38,000	$41,000	$48,000	$53,000	$1,232,000

1. The Average income from this set:

2. The Median income from this set:

Find the average and the median from the following sets of numbers.

3)	2	76	25	67	55	75	4

Average:

Median:

4)	84	917	39	414	18	66	931

Average:

Median:

5)	400	23	36	900	1,232,200	810

Average:

Median:

Tetrahedral Dice

What are all the possibilities when rolling 2 tetra-dice

1	**2**	**3**	**4**
1+1	2+1	3+1	4+1
1+2	2+2	3+2	4+2
1+3	2+3	3+3	4+3
1+4	2+4	3+4	4+4

There are 16 possibilities.

Each roll on the first die can be partnered with 4 possible rolls on the second die. $4 \times 4 = 4^2$

What are all the possible sums when rolling 2 tetra-dice.

Possible Sums	**Possible rolls**				**Probability**	**Probability (simplified)**	**Probability Percentage**
2	1+1				1/16	1/16	6.25%
3	1+2	2+1			2/16	1/8	12.5%
4	1+3	2+2	3+1		3/16	3/16	18.75%
5	1+4	2+3	3+2	4+1	4/16	1/4	**25.0%**
6		2+4	3+3	4+2	3/16	3/16	18.75%
7			3+4	4+3	2/16	1/8	12.5%
8				4+4	1/16	1/16	6.25%

What are all the possibilities when rolling 3 tetra-dice.

1+1	**1+2**	**1+3**	**1+4**	**2+1**	**2+2**	**2+3**	**2+4**	**3+1**	**3+2**	**3+3**	**3+4**	**4+1**	**4+2**	**4+3**	**4+4**
1+1+1	1+2+1	1+3+1	1+4+1	2+1+1	2+2+1	2+3+1	2+4+1	3+1+1	3+2+1	3+3+1	3+4+1	4+1+1	4+2+1	4+3+1	4+4+1
1+1+2	1+2+2	1+3+2	1+4+2	2+1+2	2+2+2	2+3+2	2+4+2	3+1+2	3+2+2	3+3+2	3+4+2	4+1+2	4+2+2	4+3+2	4+4+2
1+1+3	1+2+3	1+3+3	1+4+3	2+1+3	2+2+3	2+3+3	2+4+3	3+1+3	3+2+3	3+3+3	3+4+3	4+1+3	4+2+3	4+3+3	4+4+3
1+1+4	1+2+4	1+3+4	1+4+4	2+1+4	2+2+4	2+3+4	2+4+4	3+1+4	3+2+4	3+3+4	3+4+4	4+1+4	4+2+4	4+3+4	4+4+4

There are 64 possibilities.

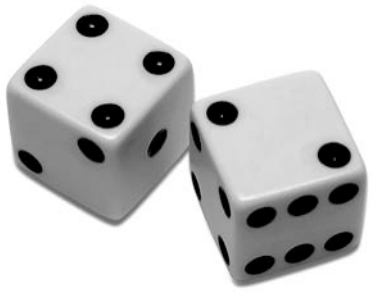
Each roll on the first die can be partnered with 4 possible rolls on the second die. $4 \times 4 \times 4 = 4^3 = 64$

What are all the possible sums when rolling 2 tetra-dice.

Possible Sums	**Possible rolls**												**approx. Prob.**
3	1+1+1												1.6%
4	1+1+2	1+2+1	2+1+1										4.7%
5	1+1+3	1+2+2	1+3+1	2+1+2	2+2+1	3+1+1							9.4%
6	1+1+4	1+2+3	1+3+2	1+4+1	2+1+3	2+2+2	2+3+1	3+1+2	3+2+1				14.1%
7	1+2+4	1+3+3	1+4+2	2+1+4	2+2+3	2+3+2	2+4+1	3+1+3	3+2+2	3+3+1	4+1+2	4+2+1	**18.8%**
8	1+3+4	1+4+3	2+2+4	2+3+3	2+4+2	3+1+4	3+2+3	3+3+2	3+4+1	4+1+3	4+2+2	4+3+1	**18.8%**
9	etc.	etc.	etc.	etc.	etc.	etc.	etc.	etc.	etc.				14.1%
10	etc.	etc.	etc.	etc.	etc.	etc.							9.4%
11	3+4+4	4+3+4	4+4+3										4.7%
12	4+4+4												1.6%

What are all the possibilities when rolling 2 hexa-dice (6-sided dice). Fill in the missing boxes.

1	2	3	4	5	6
1+1	2+1	3+1			6+1
1+2		3+2			
					6+3
					6+4
			4+5		
1+6			4+6		



There are 36 possibilities.

Each roll on the first die can be partnered with 6 possible rolls on the second die. $6 \times 6 = 6^2$

What are all the possible sums when rolling 2 hexa-dice?

Fill in the missing boxes under the heading, "Possible rolls," in the table below. Also fill in the missing "Probability Percentages." Then add up all the fractions in the "Probability column" and put the total in the box at the bottom of that column.

Possible Sums	Possible rolls						Probability	Probability (simplified)	Probability Percentage
2	1+1						1/36	1/36	~2.78%
3	1+2						2/36	1/18	~
4	1+3		3+1				3/36	1/12	~8.33%
5	1+4	2+3	3+2	4+1			4/36	1/9	~
6	1+5						5/36	5/36	~
7	1+6	2+5					6/36	1/6	~
8		2+6	3+5				5/36	5/36	~13.89%
9			3+6		5+4		4/36	1/9	~11.11%
10							3/36	1/12	~
11					5+6	6+5	2/36	1/18	~5.56%
12							1/36	1/36	~
							Total:		

TSA agent pulls a guy off a plane.
TSA Agent: *Why do you have a bomb in your carry-on suitcase.*
Guy: *What are the odds of there being two bombs on this airplane? Come on!*

This joke points out that some things are totally independent of one another. Like rolling dice. Each roll is a brand new situation. It doesn't matter if you just rolled 5 sixes in a row. The odds of rolling another 6 will again be 1 in 6.

A physicist, an engineer, and a statistician go on a hunting trip. They spot a deer in a clearing. The physicist calculates the distance of the target, the velocity of his bullet and the effects of gravity, adjusts his rifle, fires, and misses the deer 3 feet to the left.
The engineer rolls his eyes. 'You forgot to account for wind resistance!' He snatches the rifle, licks his finger, estimates the wind speed, and fires, missing the deer 3 feet to the right.
Immediately after the engineer's shot the statistician pumps his fist in the air and exclaims, "Got him!"

This joke points out that statistics chop up the world in unnatural and often unrealistic ways. Do Americans really have 2.3 children? Do I make $56,515 per year? Did I really drink 57 gallons of soda-pop in 1997?

A recent finding by statisticians...
...shows that the average human has one breast and one testicle.

This stupid joke points out that you need to be careful what you ask of statistics. If I sample a collection of 500 bunches of spinach and 500 people, can I honestly say that on average people are half green?

An anthropologist, a mathematician, and a biologist are standing outside a house.
They watch two people walk in. A couple hours later, they watch three people walk out.

The anthropologist considers the problem for a moment, then thinks to himself:
"Oh, we must have miscounted."

The biologist, naturally, goes through a similar moment of introspection before deciding,
"Ah, they must have reproduced!"

Meanwhile, the mathematician arrived at the solution almost immediately:
"If one person goes back into the house, it will be completely empty!"

This stupid joke points out that mathematicians are oblivious to reality.

Two statisticians were traveling in an airplane from LA to New York.
About an hour into the flight, the pilot announced that they had lost an engine, but don't worry, there are three left. However, instead of 5 hours it would take 7 hours to get to New York.
A little later, he announced that a second engine failed, and they still had two left, but it would take 10 hours to get to New York.
Somewhat later, the pilot again came on the intercom and announced that a third engine had died. Never fear, he announced, because the plane could fly on a single engine. However, it would now take 18 hours to get to New York.
At this point, one statistician turned to the other and said, "Gee, I hope we don't lose that last engine, or we'll be up here forever!"

Rank	Cause	Century	Death toll	Death toll: mid-20th-century equivalent	Adjusted Rank
1	Second World War	20th	55,000,000	55,000,000	9
2	Mao Zedong (mostly government-caused famine)	20th	40,000,000	40,000,000	11
3	Mongol Conquests	13th	40,000,000	278,000,000	2
4	An Lushan Revolt	8th	36,000,000	429,000,000	1
5	Fall of the Ming Dynasty	17th	25,000,000	112,000,000	4
6	Taiping Rebellion	19th	20,000,000	40,000,000	10
7	Annihilation of the American Indians	15th–19th	20,000,000	92,000,000	7
8	Josef Stalin	20th	20,000,000	20,000,000	15
9	Mideast Slave Trade	7th–19th	19,000,000	132,000,000	3
10	Atlantic Slave Trade	15th–19th	18,000,000	83,000,000	8
11	Timur Lenk (Tamerlane)	14th–15th	17,000,000	100,000,000	6
12	British India (mostly preventable famine)	19th	17,000,000	35,000,000	12
13	First World War	20th	15,000,000	15,000,000	16
14	Russian Civil War	20th	9,000,000	9,000,000	20
15	Fall of Rome	3rd–5th	8,000,000	105,000,000	5
16	Congo Free State	19th–20th	8,000,000	12,000,000	18
17	Thirty Years' War	17th	7,000,000	32,000,000	13
18	Russia's Time of Troubles	16th–17th	5,000,000	23,000,000	14
19	Napoleonic Wars	19th	4,000,000	11,000,000	19
20	Chinese Civil War	20th	3,000,000	3,000,000	21
21	French Wars of Religion	16th	3,000,000	14,000,000	17

The column titled, "Death-toll: mid-20th-century equivalent," shows deaths adjusted as a percentage of the entire world population as it stood in 1945, which was about 2.5 billion. You'll notice that the Crusades don't even rank. [From Steven Pinker's book, *The Better Angels of Our Nature: Why violence has declined.*

E.g. When Cain killed Abel, there were exactly 4 humans on earth: Adam, Eve, Cain, and Abel. So, Cain killed exactly 25% of the population. In 1945 terms that works out to 625,000,000 deaths. This is the number that would show up in the column called "Death-toll: mid-20th-century equivalent" if Cain's war on the world were included. Cain's world war would easily rank as the #1 causer of violent death (unless you include the Great Flood). In today's terms, with a world population of 7.6 billion, Cain's war would be 25% of the 7.6 billion people on earth… or 1,900,000,000 people. About 2 billion deaths.
What do you think of this methodology?