

Statistics – Roadmap

Pose a question & Collect Data

Road Map for a Statistical Investigation- Draft

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Come up with a specific question to answer

- Summary Question: (one variable) Ex: Find the typical height of the students in the class.
- Comparison Question: (one variable) Ex: Do boys or girls spend more time on the internet?
- Relationship Question: (two variables) Ex: Do students who study more do better in exams?

Collect Data

- What data do I need? Categorical (Qualitative): Nominal, Ordered
Numerical (Quantitative): Discrete, Continuous
- What sampling method will I use? Simple Random, Stratified, Cluster, Quota
- How will I eliminate bias? random selection, careful questioning, who, when & where
- What will the source of data be? Primary/Secondary, questionnaire, C@S, official records

Analyse the Data

Descriptive Statistics

Statistics on the sample data

Distribution

Statistical distribution describes the number of times each possible outcome occurs in a sample.

- Distribution Table / Frequency Distribution Table / Grouped Frequency Distribution Table

Choose the appropriate visual representation

Nominal (male/female): Bar Chart, Line Plot (Dot Plot), Pie Chart
Ordinal (never/sometimes): Bar Chart, Dot Plot (Line Plot), Pie Chart
Discrete (no. of cars/age in years): Bar Chart, Pie Chart, Dot Plot, Stem and Leaf Plot
Continuous (height/foot length): Histogram, Stem and Leaf Plot

- Bar Charts good for comparing frequencies
- Pie Charts good for showing proportion of the total sample
- Dot plots useful for representing a small sample. Particularly good for showing central tendency, dispersion and shape.
- Stem and Leaf Plots useful for representing a sample of discrete or continuous data. Particularly good for showing central tendency, dispersion and shape.

Summary of the data (univariate)

- Central Tendency
 - Mean
 - Median

The Five-Number Summary

Analyse the data

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Comparison of Data (univariate)
of the above summary techniques used to compare sets of data

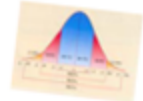
Relationship between Variables (bivariate)
Scatterplots
Correlation Coefficient
Coefficient of Best Fit

Interpretation of the results to answer the question posed

Non-Inferential Statistics
Drawing a generalisation about the sample data or when the sample data is the same as the population

Using the summary statistics to answer the question posed.
Comparison between summary statistics: differences/similarities

Interpreting a Normal Distribution (for a normal distribution almost all data will fall within three standard deviations of the mean, otherwise known as the 68 – 95 – 99.7 Rule.



A z-score gives us an indication of how unusual a value is because it tells us how far it is from the mean on a Standardised Distribution Curve. If the data value sits right at the mean, its z-score is 0. A z-score of 1 tells us the data value is one standard deviation above the mean, while a z-score of -1 tells us that the value is one standard deviation below the mean.

Inferential Statistics
Drawing a step further to make a generalisation about the population from which the sample is taken

No absolute statements
A deterministic (definite/absolute) statement about the population because there is just our best attempt to represent the population. There will be some uncertainty. It must not be deterministic – use: "tends to", "estimation", "inference"

Correlation and Association
What is the relationship between the two variables? Causation: Does one variable change because of the other?
What is the relationship between the two variables? What does the correlation suggest about the relationship? Does one variable "tends to" increase as the other variable increases.

Margin of Error
The size of the sample is the same size as the population there is a margin of error that is a measure of the uncertainty of the statistic about the population. The smaller the margin of error, the more precise the estimate.

THE JOY OF STATS

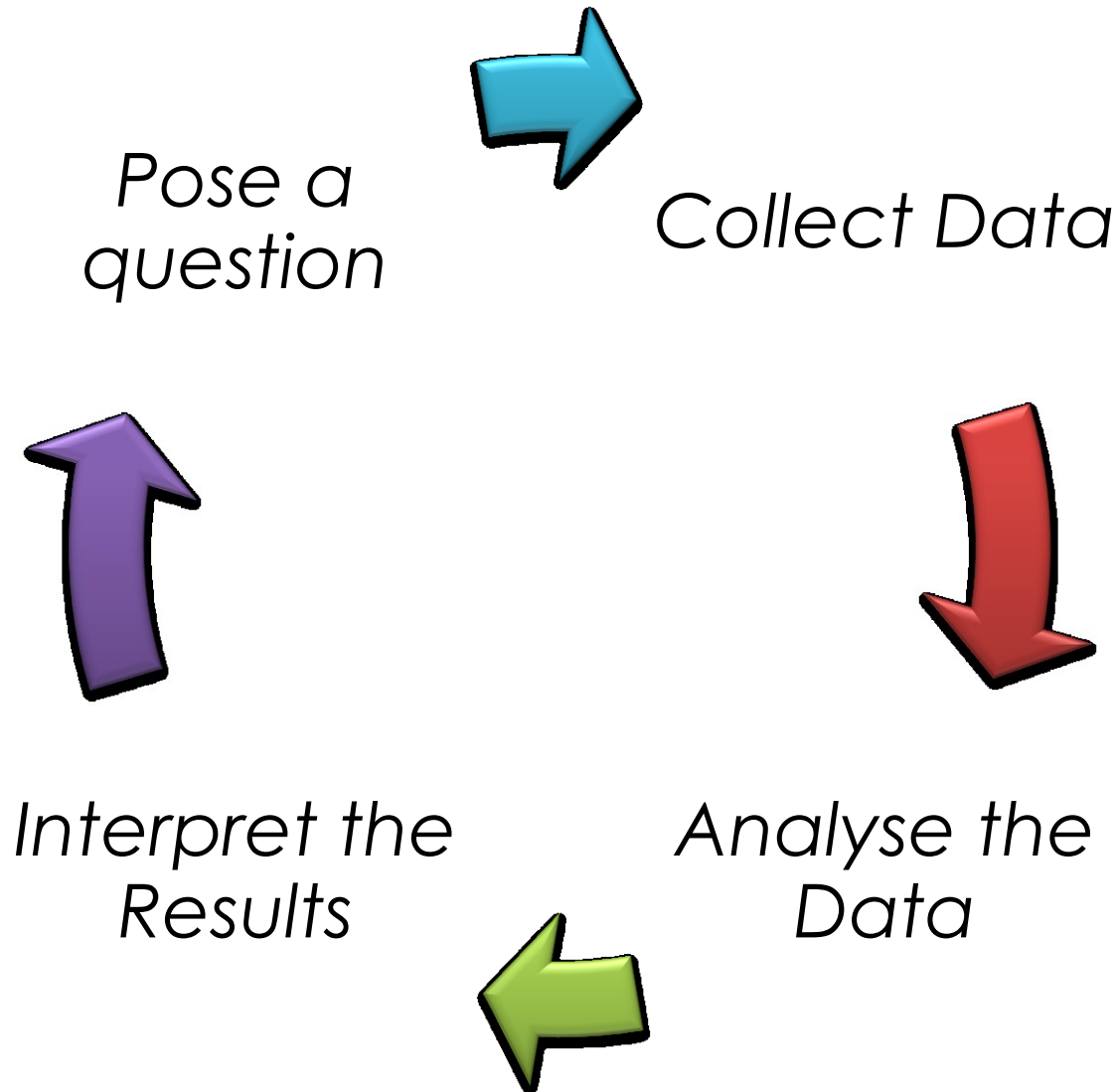
with Professor **Hans Rosling**



<http://www.getstats.org.uk/>

<http://www.open.ac.uk/openlearn/whats-on/the-joy-stats>

Data Handling Cycle



“The ability to take data, understand it, process it, extract value from it, visualise and communicate it will be a hugely important skill in the next decades”

Hal Varian*, 2009

***Hal Varian:** Professor of Business and Economics at Berkeley University
Also Google’s Chief Economist.

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YOUR VIEW?

Should mobile phones be banned in schools?

- Yes
- No
- Only during class time

 [Home](#)

Welcome to CensusAtSchool



Census 2011 Schools Resources

The census is a key source of information for everyone in our country. It provides information in relation to who we are, what we do and how we live our daily lives. Have a look at the resources for primary and secondary schools the Census website at <http://www.census.ie/-and-Communities/Census-in-Schools.138.1.aspx>

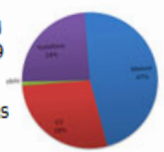
John Hooper Medal for Statistics

POSTER COMPETITION WINNERS ANNOUNCED! The Central Statistics Office has announced a new award for second-level students -- the John Hooper Medal for Statistics. This competition requires students to create a poster that uses statistics to describe or make sense of daily life. Students can win money for their school and represent Ireland in the International Statistical Literacy Project competition. [More details >>](#)



Phase 9 Results

Results from last year's survey are now available and they're fascinating. 863 young people in Irish schools completed the Phase 9 questionnaire between September 2009 and May 2010. Here are some things we found by having a look at their data. Over half (54%) of those completing the survey were female and the age range was between 12 and 20 inclusive.



Phase 10 (2010/2011)

The Phase 10 questionnaire is now live! A National Census of Population will be held in 2011. As part of the CensusAtSchool Phase 10 questionnaire, there are questions about the national census. Phase



What to do with the data?

End#	Sex	Born	Travel	Subject	Media Story	Household	Height	Right Foot
1	Male	Republic of Ireland	Bus	PE	Sport	7	154	24
2	Female	Republic of Ireland	Car	CSPE	Health + Bead	2	165	12
3	Male	Republic of Ireland	Bus	PE	Sport	4	179	27
4	Female	Republic of Ireland	Walk	Art	Fashion	5	145	21
5	Male	Republic of Ireland	Bus	Gaelige	Music + Film	3	160	3
6	Male	Republic of Ireland	Car	Science	Fashion	5	173	3
7	Female	Republic of Ireland	Car	Science	Other	4	175	3
8	Male	Republic of Ireland	Walk	Art	Celebrity	4	156	3
9	Female	Republic of Ireland	Car	Mathematics	Celebrity	4	178	3
10	Male	Outside Europe	Rail (Luas)	Other	Celebrity	3	168	3
11	Female	Republic of Ireland	Car	Mathematics	Sport	4	184	3
12	Male	Republic of Ireland	Car	History	Sport	7	179	3
13	Male	Republic of Ireland	Bus	Geography	Music + Film	5	161	3
14	Male	Republic of Ireland	Bus	PE	Sport	4	167	3
15	Male	Republic of Ireland	Walk	PE	Science and	6	163	3
16	Female	Republic of Ireland	Bus	History	Sport	2	152	3
17	Male	Republic of Ireland	Bus	Other	Health + Bead	3	181	3
18	Female	Republic of Ireland	Car	Mathematics	Music + Film	3	173	3
19	Male	Republic of Ireland	Car	Music	Sport	6	18	3
20	Female	Republic of Ireland	Car	Other	Sport	6	14	3
21	Male	Republic of Ireland	Car	English	Music + Film	5	155	20
22	Male	Republic of Ireland	Walk	I do not have	Sport	1	165	23.5
23	Male	Republic of Ireland	Walk	Technology	World Affairs	5	157	24
24	Male	Republic of Ireland	Car	Art	World Affairs	8	181	27
25	Male	Republic of Ireland	Walk	Gaelige	Music + Film	4	186	25
26	Male	Republic of Ireland	Car	Geography	Music + Film	5	194	34
27	Male	Republic of Ireland	Car	Other	Sport	6	150	23
28	Female	Republic of Ireland	Car	Art	Sport	2	168	27
29	Female	Republic of Ireland	Bus	PE	Sport	4	173	29
30	Male	Republic of Ireland	Walk	English	Sport	1	174	21
31	Male	Republic of Ireland	Walk	English	Sport	5	164	25
32	Male	Republic of Ireland	Walk	History	Other	4	174	24
33	Male	Republic of Ireland	Bus	Mathematics	Celebrity	4	157	21
34	Male	Other Europe	Bus	Business Subject	Sport	4	165	22
35	Female	Republic of Ireland	Bus	PE	Music + Film	5	165.1	30
36	Male	Republic of Ireland	Bus	History	Music + Film	4	175.26	26
37	Male	Republic of Ireland	Bus	History	Other	3	153	24
38	Female	Republic of Ireland	Bus	History	Other	2	171	24
39	Female	Republic of Ireland	Bus	History	Health + Bead	3	171	24
40	Male	Republic of Ireland	Walk	Other	Health + Bead	2	171	24
41	Female	Other Europe	Walk	Languages	Health + Bead	2	171	24
42	Female	Other Europe	Walk	Languages	Health + Bead	2	171	24



Discrete

ORDINAL

Nominal

Continuous

Numerical

Categorical

Types of Data

2. Please state your age in completed years.

.....years

12. How many cars belong to people in your household?

..... cars

20. How long does it usually take you to travel to school?

.....minutes

18. What is your favourite subject at school?

.....

8. What is your favourite Olympic sport?

.....

1. Are you:

female? male?

19. How do you usually travel to school?(Select one answer)

- Walk Bus
 Car Cycle
 Luas/Train/Dart
 Other (pls specify)

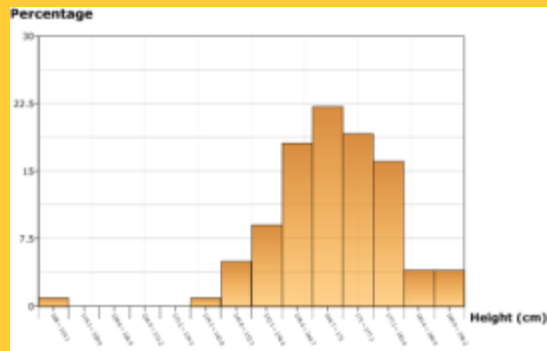
11. Have you moved house in the last year?

- no moved within Ireland
 moved from abroad

Types of Investigative Questions

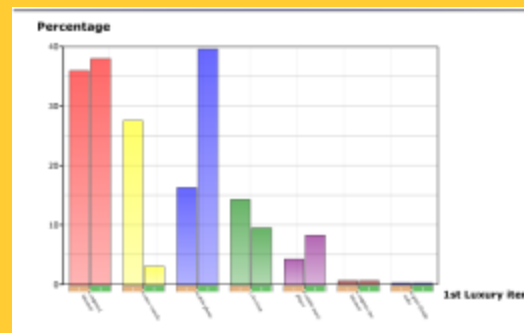
Summary

about a single variable for the whole group



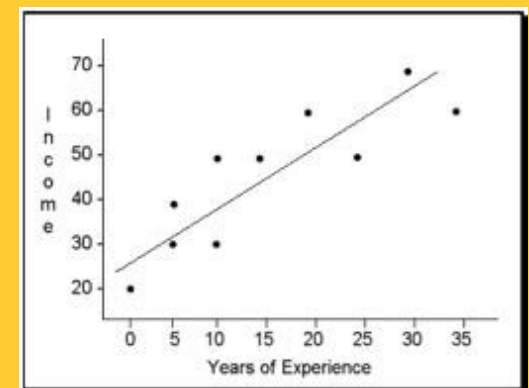
Comparison

Questions that compare a single variable between two categories

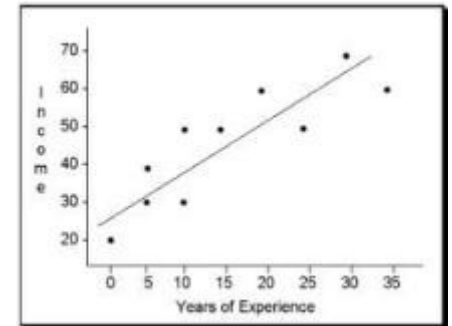
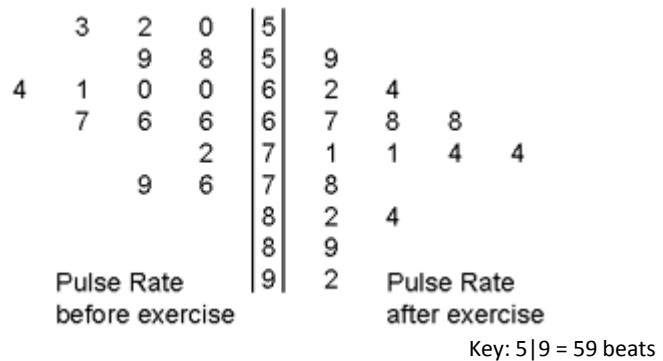
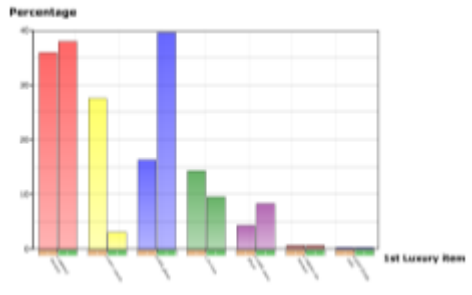
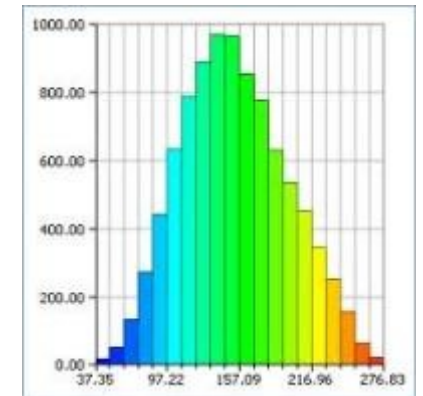
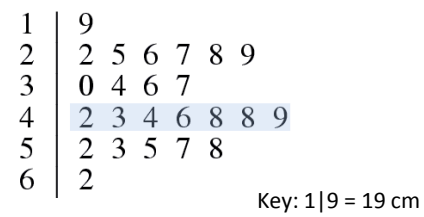
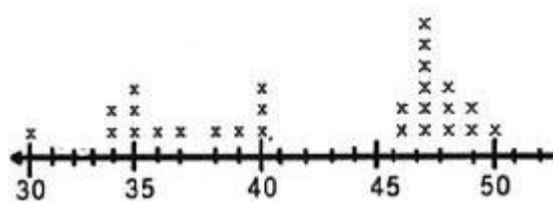
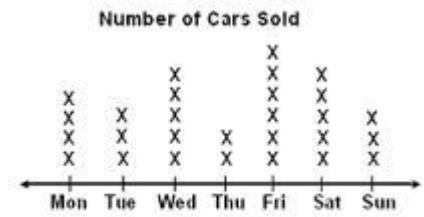
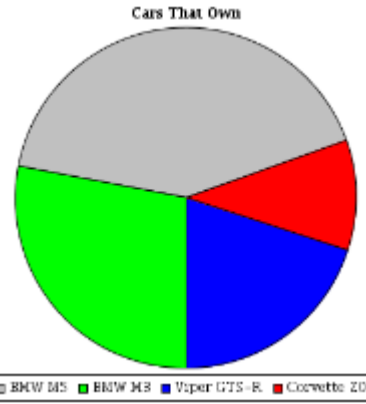
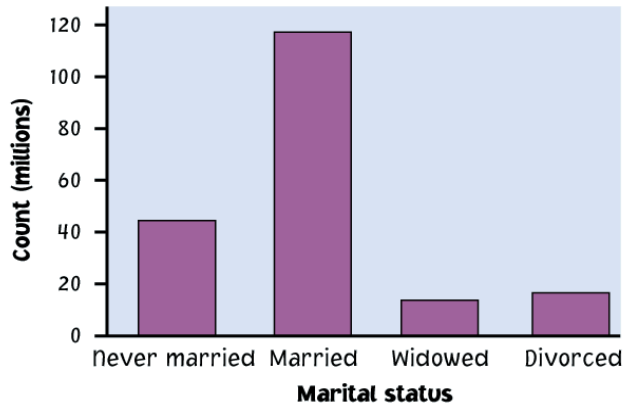


Relationship

Look for a relationship between two variables



Which Graphical Representation?



What determines our choice?




	YES	NO
Are you concerned about job losses in your local area?	<input type="checkbox"/>	<input type="checkbox"/>
Do you agree that the building of large supermarkets generates local employment?	<input type="checkbox"/>	<input type="checkbox"/>
Are small grocery stores competitive with pricing in comparison to large supermarkets?	<input type="checkbox"/>	<input type="checkbox"/>
Do you think we should reduce the number of large supermarkets in our towns?	<input type="checkbox"/>	<input type="checkbox"/>

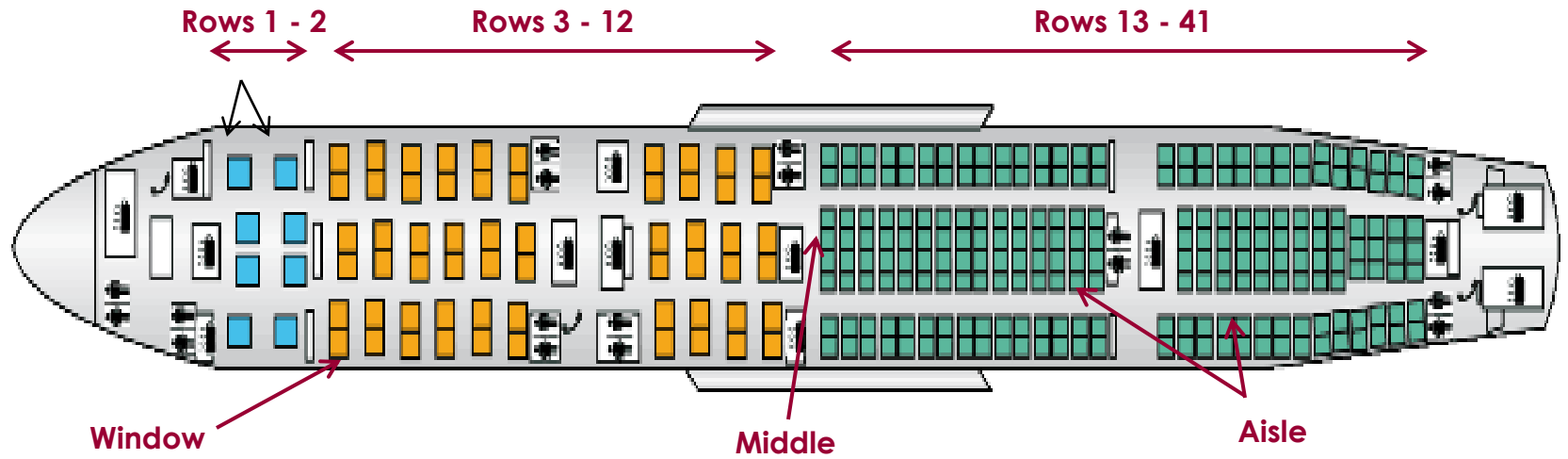
	YES	NO
Are you concerned about the impact of large supermarkets on small businesses in your local area?	<input type="checkbox"/>	<input type="checkbox"/>
Do you agree that the location of large supermarkets is causing erosion of town centres?	<input type="checkbox"/>	<input type="checkbox"/>
Do you believe that large supermarkets have too much power over local suppliers?	<input type="checkbox"/>	<input type="checkbox"/>
Do you think we should reduce the number of large supermarkets in our towns?	<input type="checkbox"/>	<input type="checkbox"/>

Dis





-  *First class:* 8 seats
-  *Business class:* 60 seats
-  *Economy class:* 224 seats



We want to survey 30 passengers on this flight. How would you sample this group?

Choose from 1st class, Business and Economy.

Stratified

Randomly generate 30 numbers and survey passengers who sit there.

Simple

Split the passengers into groups of 15 based on where they are sitting. Randomly pick two groups and survey everybody in the 2 groups.

Cluster

Choose 15 male, 15 female in the 40 – 50 age bracket.

Quota

Cluster

Quota

Simple

Stratified

M

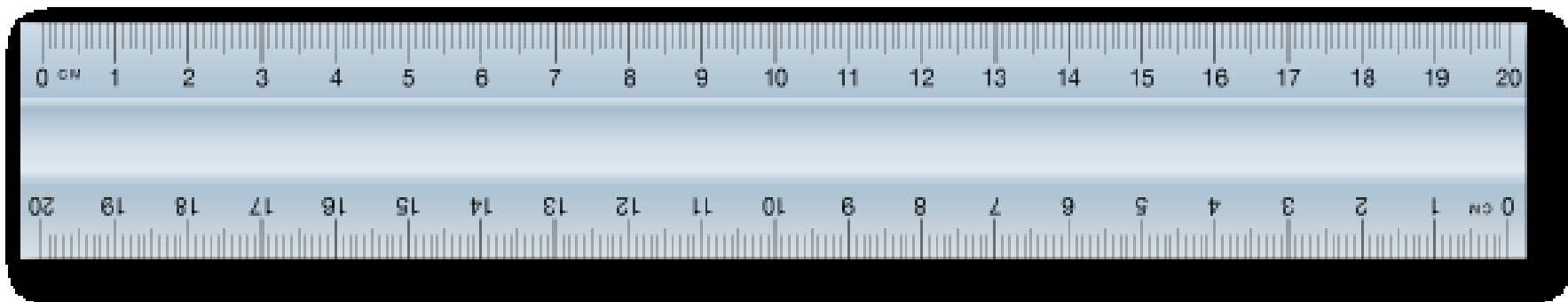
ean

edian

ode

Sample 30 of Household

	Rnd#	Sex	Born	Travel	Subject	Media Story	Household	Height	Right Foot	Arm Span
	1	Male	Republic of Ire	Bus	PE	Sport	7	154	24	154
	2	Female	Republic of Ire	Car	CSPE	Health + Beau	2	165	12	90
	3	Male	Republic of Ire	Bus	PE	Sport	4	179	27	178
	4	Female	Republic of Ire	Walk	PE	Fashion	5	145	21.2	141
	5	Male	Republic of Ire	Bus	Art	Technology	3	160	35	100
	6	Male	Republic of Ire	Car	Gaeilge	Music + Film	5	173	30	170
	7	Male	Republic of Ire	Car	Science	Sport	4	175	19	178
	8	Female	Republic of Ire	Walk	Science	Fashion	4	156	20	150
	9	Male	Republic of Ire	Car	Art	Other	5	178	28	193
23	10	Male	Outside Europe	Rail (Luas,	Mathematics	Celebrity	3	168	23	167
	11	Female	Republic of Ire	Car	Other	Celebrity	3	169	27	150
	12	Male	Republic of Ire	Car	Mathematics	Sport	4	184	24.9	173
	13	Male	Republic of Ire	Bus	History	Sport	4	179	26	180
	14	Male	Republic of Ire	Bus	Geography	Music + Film	7	168	24	168
	15	Female	Republic of Ire	Walk	PE	Music + Film	5	179	25	179
	16	Male	Republic of Ire	Bus	PE	Sport	5	161	25	166
	17	Female	Republic of Ire	Bus	History	Science and	4	167	25	100
	18	Male	Republic of Ire	Car	Other	Sport	6	163	26	166
	19	Female	Republic of Ire	Car	Mathematics	Health + Beau	6	134	29	145



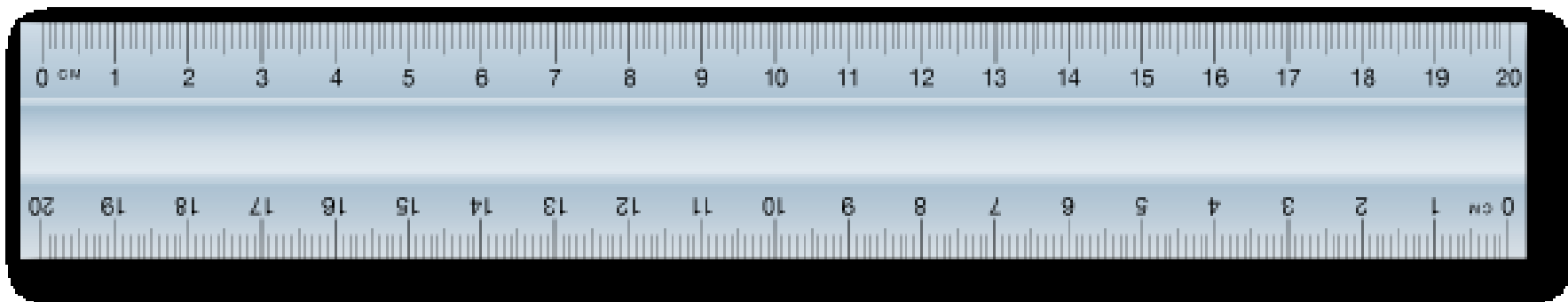
	4	30	Male	Republic of Ire	Bus	PE	Sport	5	194	25	200
			Male	Republic of Ire	Walk	PE	Sport	4	160	24	160

Sample 30 of Household

	Rnd#	Sex	Born	Travel	Subject	Media Story	Household	Height	Right Foot	Arm Span
	1	Male	Republic of Ire	Bus	PE	Sport	7	154	24	154
									12	90
									27	178
									12	141
									35	100
									30	170
									19	178
									20	150
									28	193
23									23	167
									27	150
									49	173
									26	180
									24	168
									25	179
	16	Male	Republic of Ire	Bus	PE	Sport	5	161	25	166
	17	Female	Republic of Ire	Bus	History	Science and	4	167	25	100
	18	Male	Republic of Ire	Car	Other	Sport	6	163	26	166
	19	Female	Republic of Ire	Car	Mathematics	Health + Beau	6	134	29	145

10. How many people live in your household? (Include yourself)

..... people



	30	Male	Republic of Ire	Bus	PE	Sport	5	194	25	200
	31	Male	Republic of Ire	Bus	PE	Sport	5	160	24	160

Random Sampling using Calculator

Calculators generate a pseudo 3 – digit random number that is less than 1. i.e. it generates a random number in the range **[0, 1]**

Note: The result is displayed as a fraction when Natural Display/WriteView is selected.

Example: To generate random numbers between 1 and 200
 $199 \times [0, 1] = [0, 199]$
 $199 \times [0, 1] + 1 = [1, 200]$



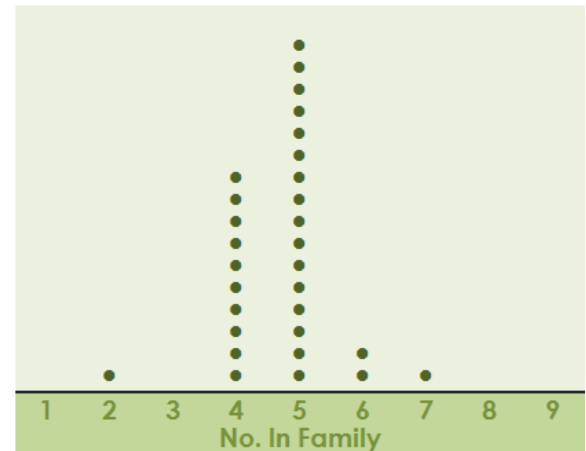
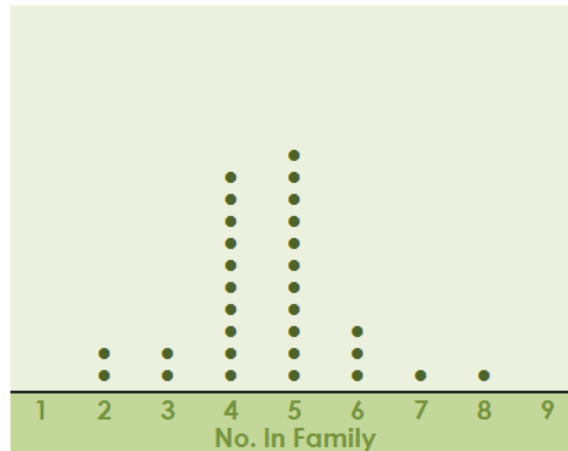
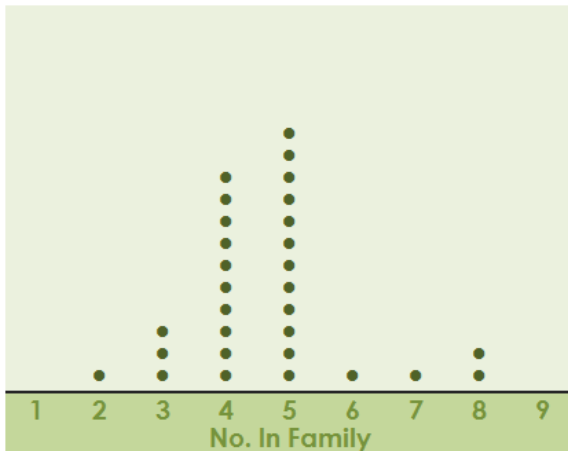
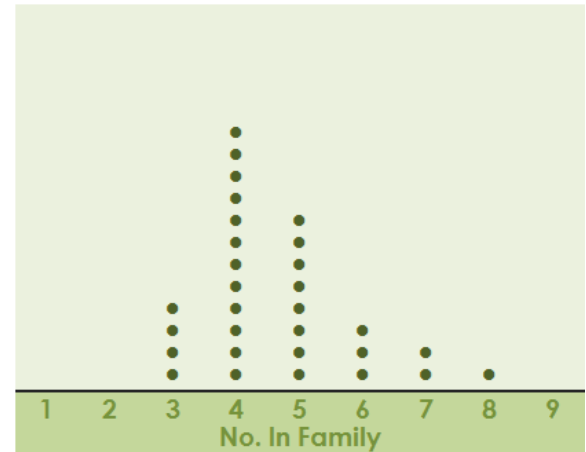
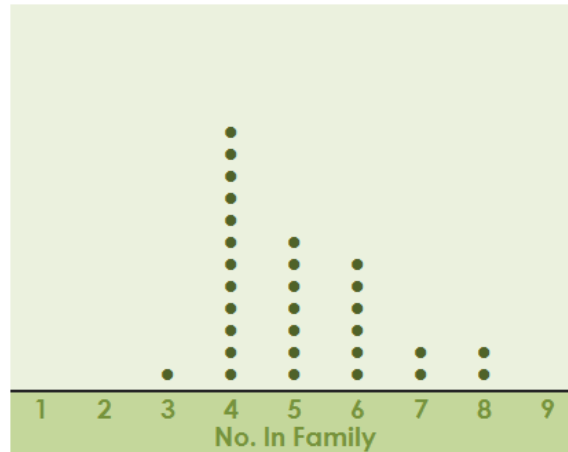


Question 12

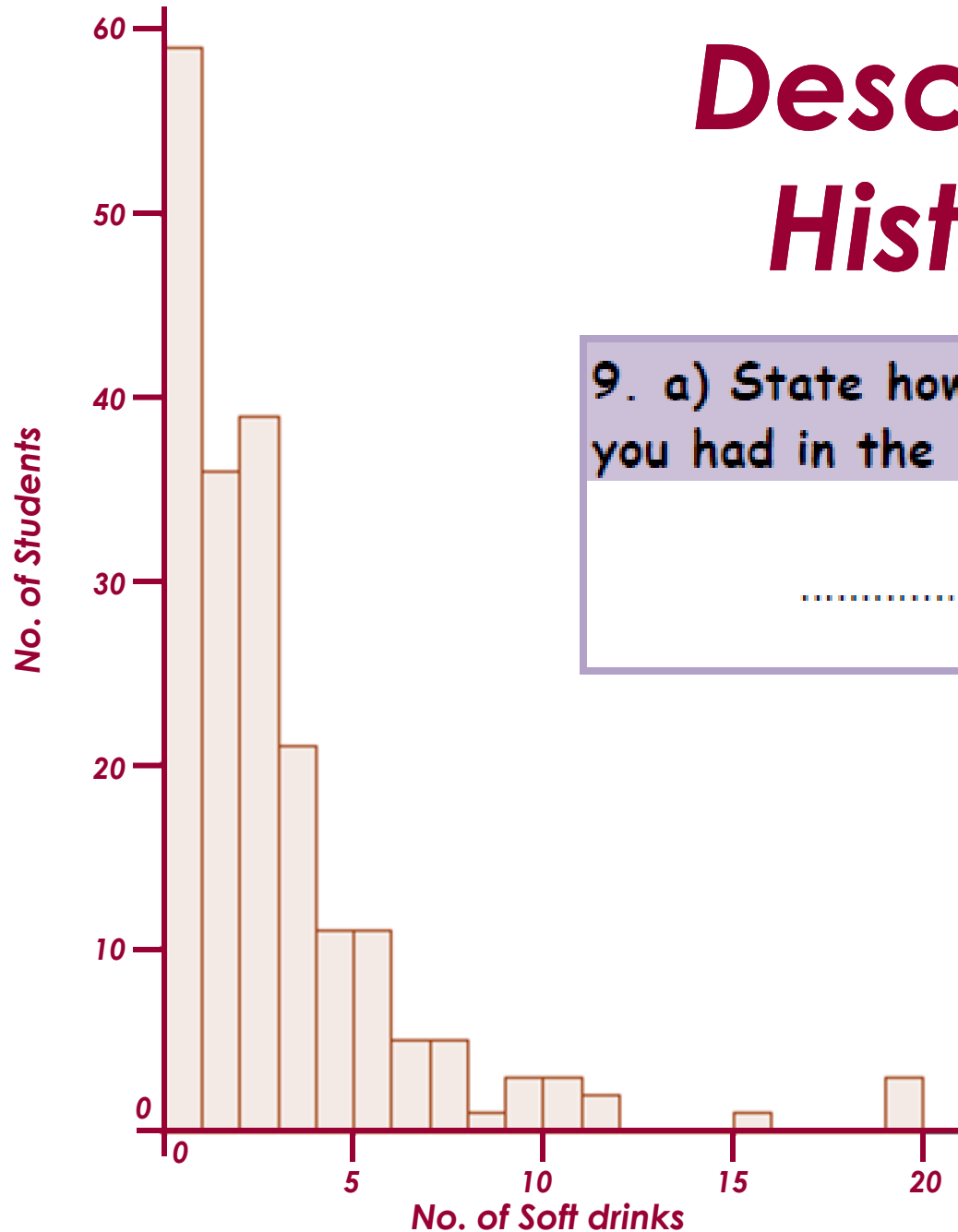
Describe the data in as many ways as you can using numerical and shape descriptions (Fractions and Decimals permitted and words of course!).

Note: *Variation should be taken into account.*

Sample Variation



Describe this Histogram



9. a) State how many soft drinks you had in the last 2 days.

.....

DO YOU HAVE
GOUT?Gout can attack silently,
EVEN BETWEEN FLARES.LEARN MORE
AT GOUT.COM →

USATODAY Salaries Databases

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2009

Go

Team

Go

Player

Go

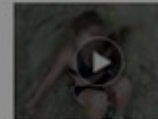
Position

Go

National Football League Salaries
2009-10 NFL Salaries by Team

TEAM	TOTAL PAYROLL			
New York Giants	\$ 138,354,866			
Miami Dolphins	\$ 126,383,421			
Houston Texans	\$ 122,258,610			
New Orleans Saints	\$ 121,552,424	\$ 1,992,000	\$ 2,580,010	
Chicago Bears	\$ 120,672,110	\$ 2,154,859	\$ 820,616	\$ 3,353,848
New York Jets	\$ 120,634,420	\$ 2,079,903	\$ 762,750	\$ 2,776,685
Pittsburgh Steelers	\$ 119,292,960	\$ 2,056,775	\$ 792,500	\$ 2,761,268
San Diego Chargers	\$ 117,458,935	\$ 2,025,154	\$ 927,880	\$ 3,540,888
Green Bay Packers	\$ 113,959,603	\$ 1,931,518	\$ 812,500	\$ 2,647,804
Tennessee Titans	\$ 113,494,050	\$ 2,141,397	\$ 1,010,000	\$ 2,099,092
Carolina Panthers	\$ 112,963,398	\$ 1,947,644	\$ 823,700	\$ 3,120,365
Oakland Raiders	\$ 111,527,250	\$ 2,065,319	\$ 830,000	\$ 2,634,432
Buffalo Bills	\$ 111,253,126	\$ 1,765,922	\$ 771,000	\$ 2,014,947
Arizona Cardinals	\$ 111,138,646	\$ 1,984,618	\$ 812,440	\$ 3,074,368
Baltimore Ravens	\$ 109,503,397	\$ 1,795,137	\$ 735,760	\$ 2,667,159
Jacksonville Jaguars	\$ 106,879,214	\$ 1,875,073	\$ 817,450	\$ 2,596,032
Philadelphia Eagles	\$ 106,493,095	\$ 1,804,967	\$ 1,017,280	\$ 2,412,917
San Francisco 49ers	\$ 103,738,952	\$ 1,957,338	\$ 1,177,280	\$ 2,259,187
Indianapolis Colts	\$ 103,360,985	\$ 1,782,085	\$ 542,280	\$ 3,159,957
Denver Broncos	\$ 101,658,735	\$ 1,918,089	\$ 1,016,370	\$ 2,125,478
Washington Redskins	\$ 99,953,611	\$ 1,784,885	\$ 901,500	\$ 2,098,759
Detroit Lions	\$ 99,910,434	\$ 1,693,397	\$ 896,040	\$ 1,783,126
Minnesota Vikings	\$ 99,802,010	\$ 1,919,269	\$ 952,665	\$ 2,309,590
St. Louis Rams	\$ 99,707,892	\$ 1,661,798	\$ 537,990	\$ 3,016,850

Videos you may be interested in

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er rescued from
faceMexican motorists
witness gruesome
body dump

DO YOU HAVE GOUT?

Gout can attack silently,
EVEN BETWEEN
FLARES.

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Videos

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DO YOU HAVE

Gout can attack silently.

ALL	AVG SALARY	MEDIAN	STD DEV
66	\$ 2,470,622	\$ 890,000	\$ 3,718,306
21	\$ 2,256,846	\$ 978,290	\$ 3,206,135
10	\$ 2,037,643	\$ 848,640	\$ 3,159,274
24	\$ 1,992,662	\$ 870,000	\$ 2,580,010
10	\$ 2,154,859	\$ 820,616	\$ 3,353,848
20	\$ 2,079,903	\$ 762,750	\$ 2,776,685

New York Jets	\$ 120,634,420	\$ 2,079,903	\$ 762,750	\$ 2,776,685
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Washington Redskins	\$ 99,953,611	\$ 1,784,885	\$ 901,500	\$ 2,098,759
Detroit Lions	\$ 99,910,434	\$ 1,693,397	\$ 896,040	\$ 1,783,126
Minnesota Vikings	\$ 99,802,010	\$ 1,919,269	\$ 952,665	\$ 2,309,590
St. Louis Rams	\$ 99,707,892	\$ 1,661,798	\$ 537,990	\$ 3,016,850

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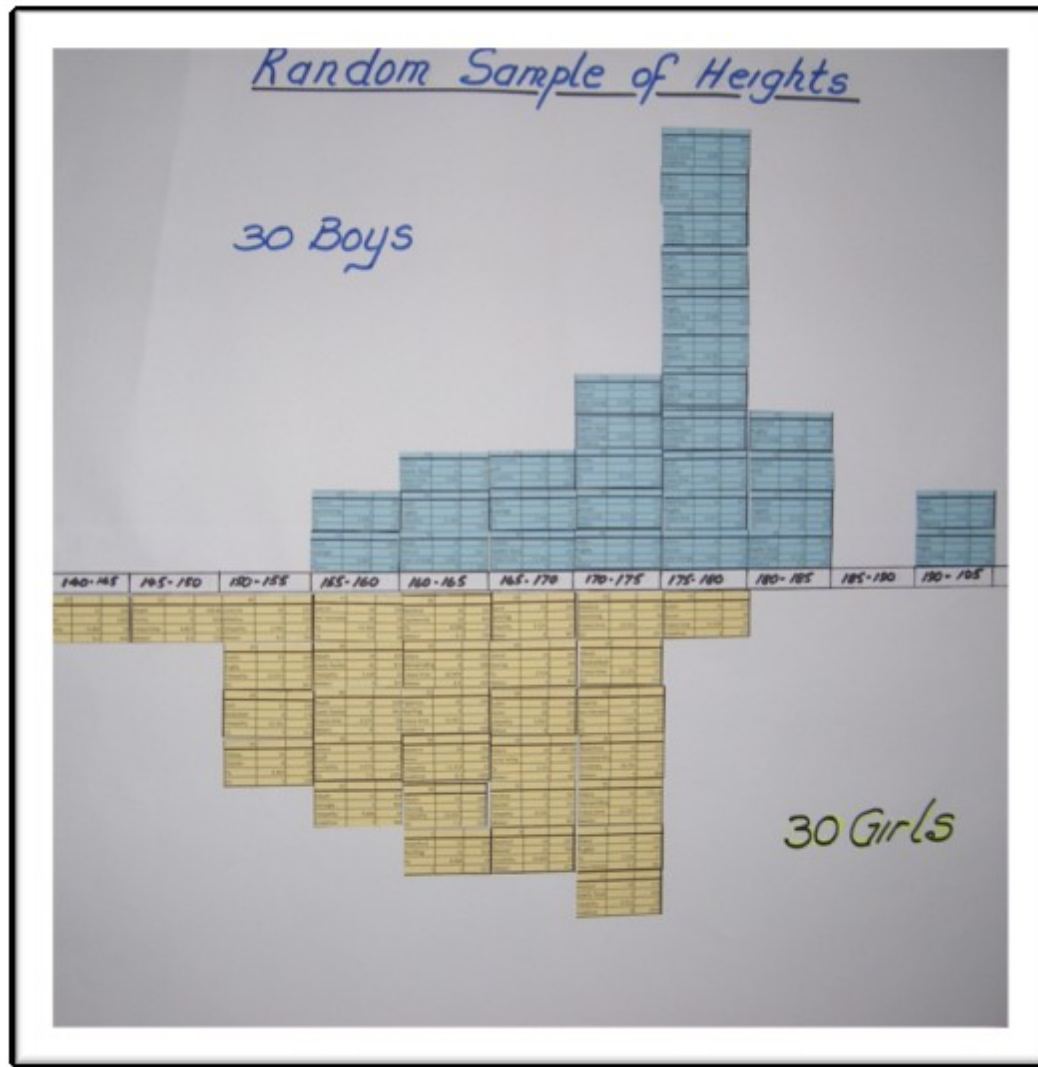
Stories

- Reeling Red Sox lose to Yankees
- Live: Updates as No. 3 LSU visits No. 16 W
- No. 6 Oklahoma State overcomes slow sta

Videos

Facebook to integrate Twitter, MyWu

A Project Using c@s



Comparing Distributions

1. Are you:

- female? male?

6. a) How tall are you without shoes? (Answer in centimetres)

..... centimetres

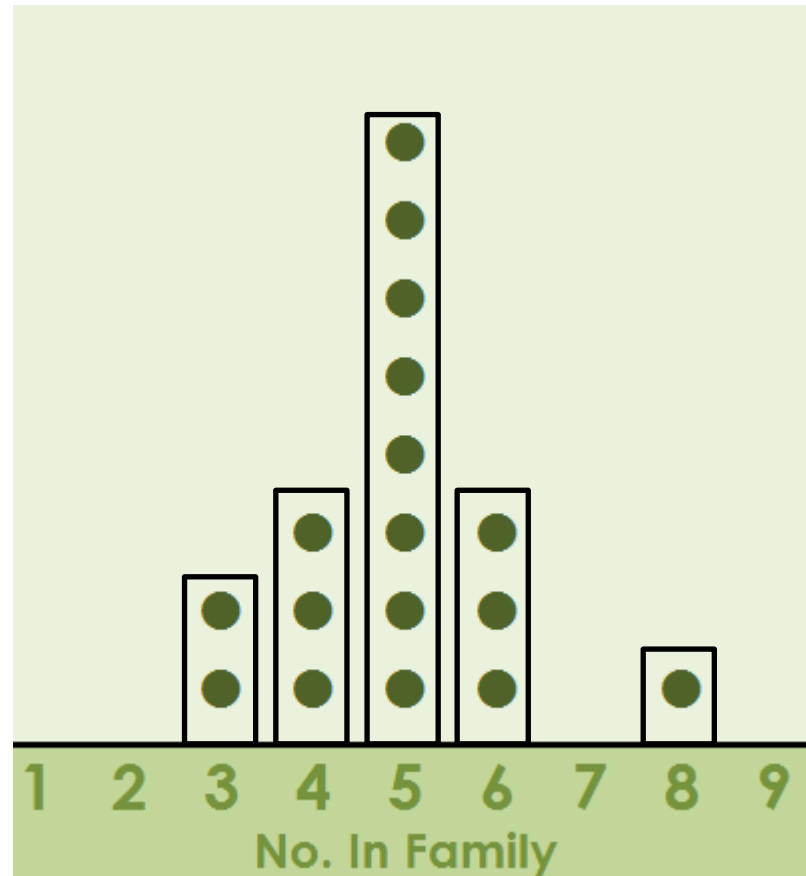
Males

Females

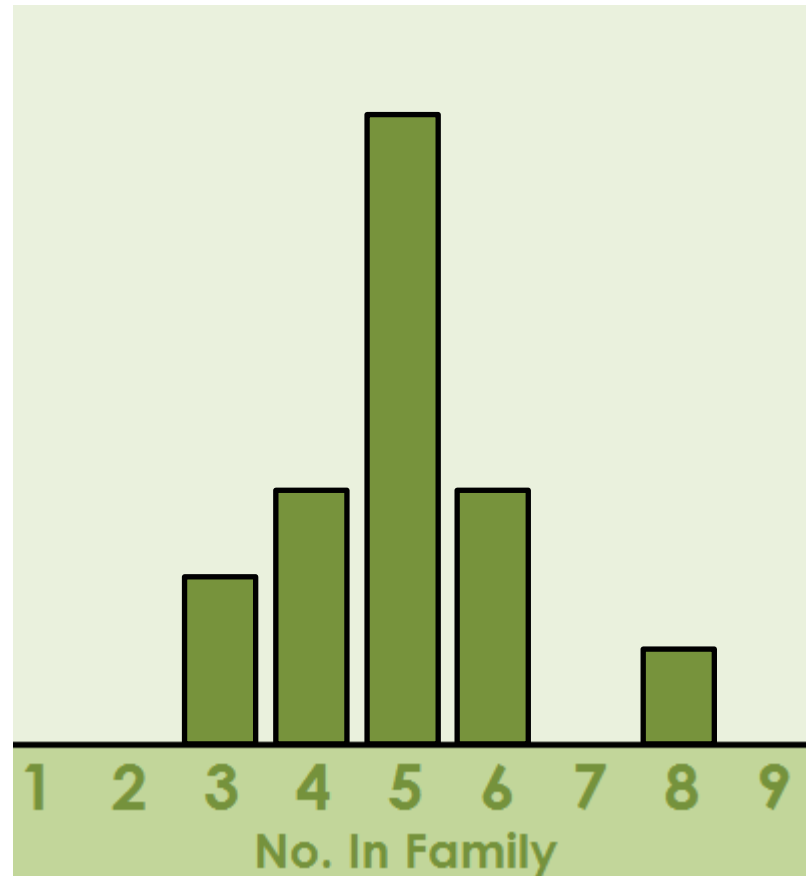
	0	12	
		13	4
		14	5
	4 2 0	15	0 0 3 4 5 6 7 7 9
	8 8 5 0	16	3 3 4 4 4 5 5 5 5 5 7 8 9
9 9 9 8 8 5 5 3 3 2		17	0 1 3 9
6 6 6 6 5 4 3 2 2 0		18	0 1
	9 0	19	

Key: 13 | 4 = 134 cm

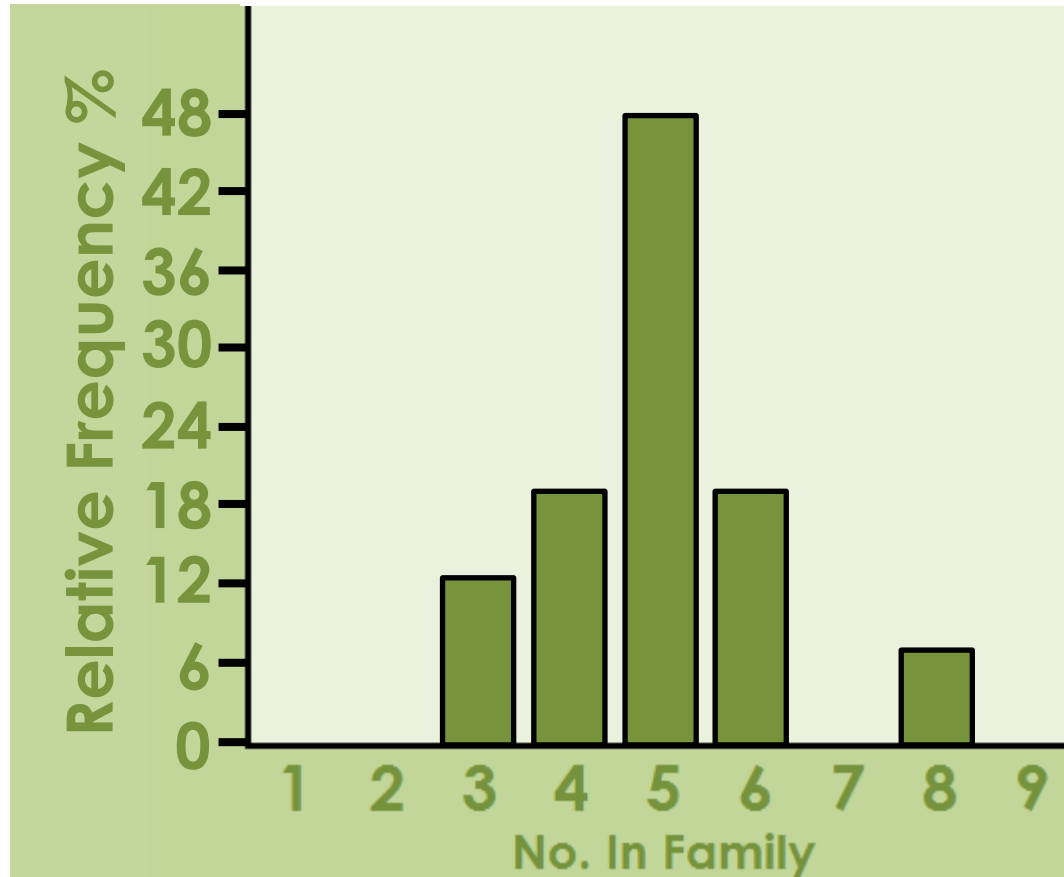
Line Plot to Frequency Bar Chart



Line Plot to Frequency Bar Chart

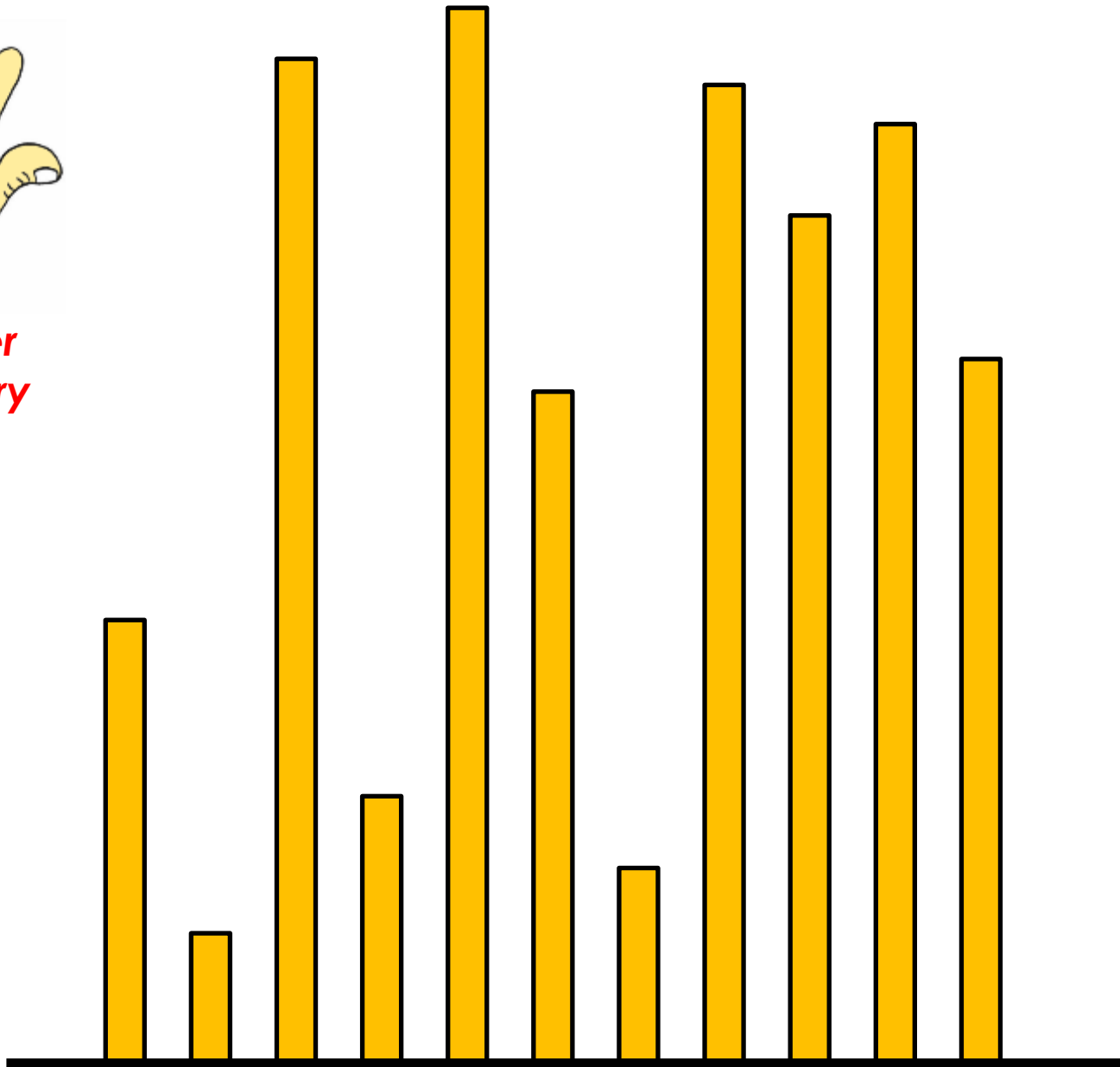


Bar Chart to Relative Frequency Bar Chart



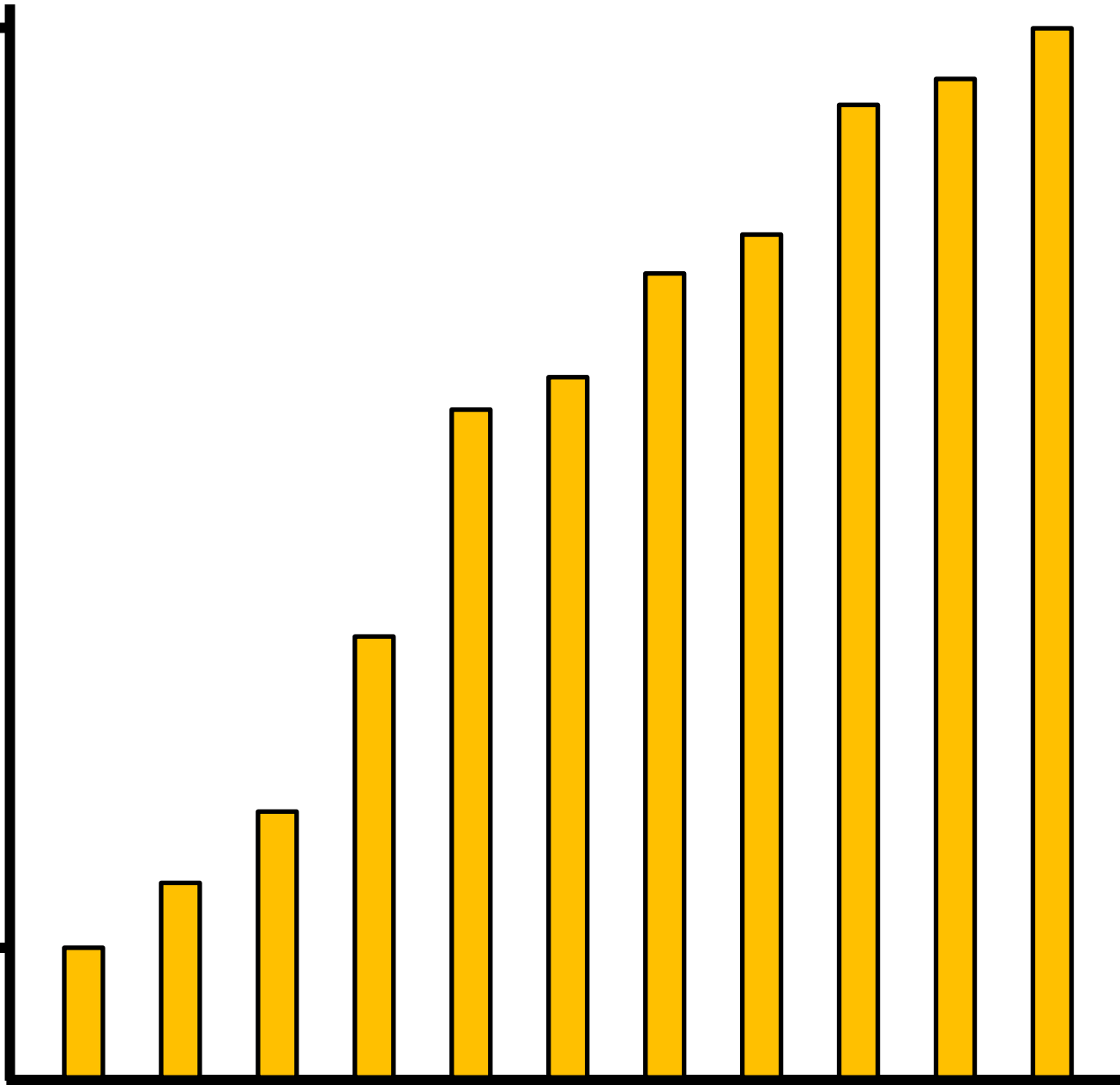


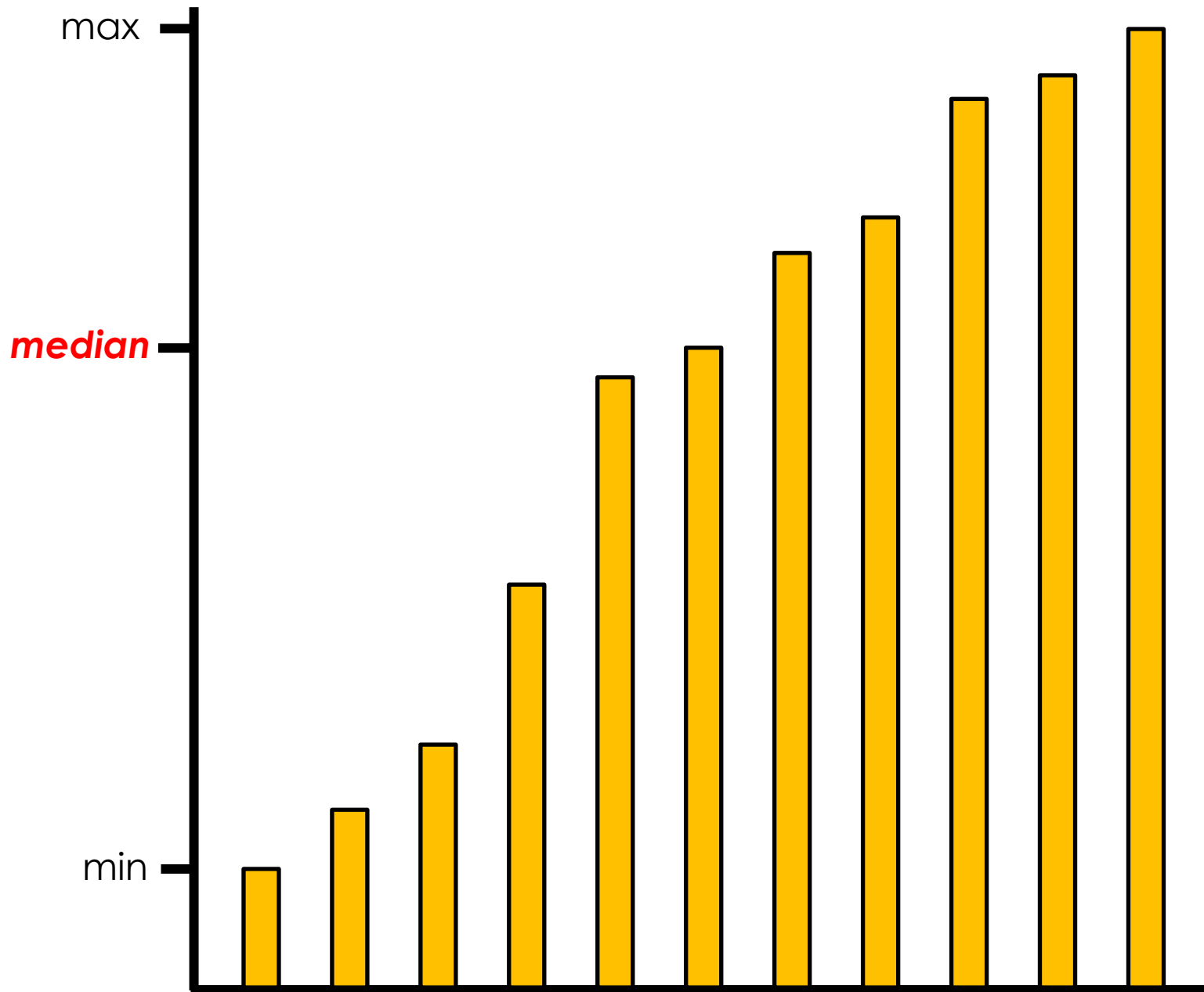
**Number
Summary**

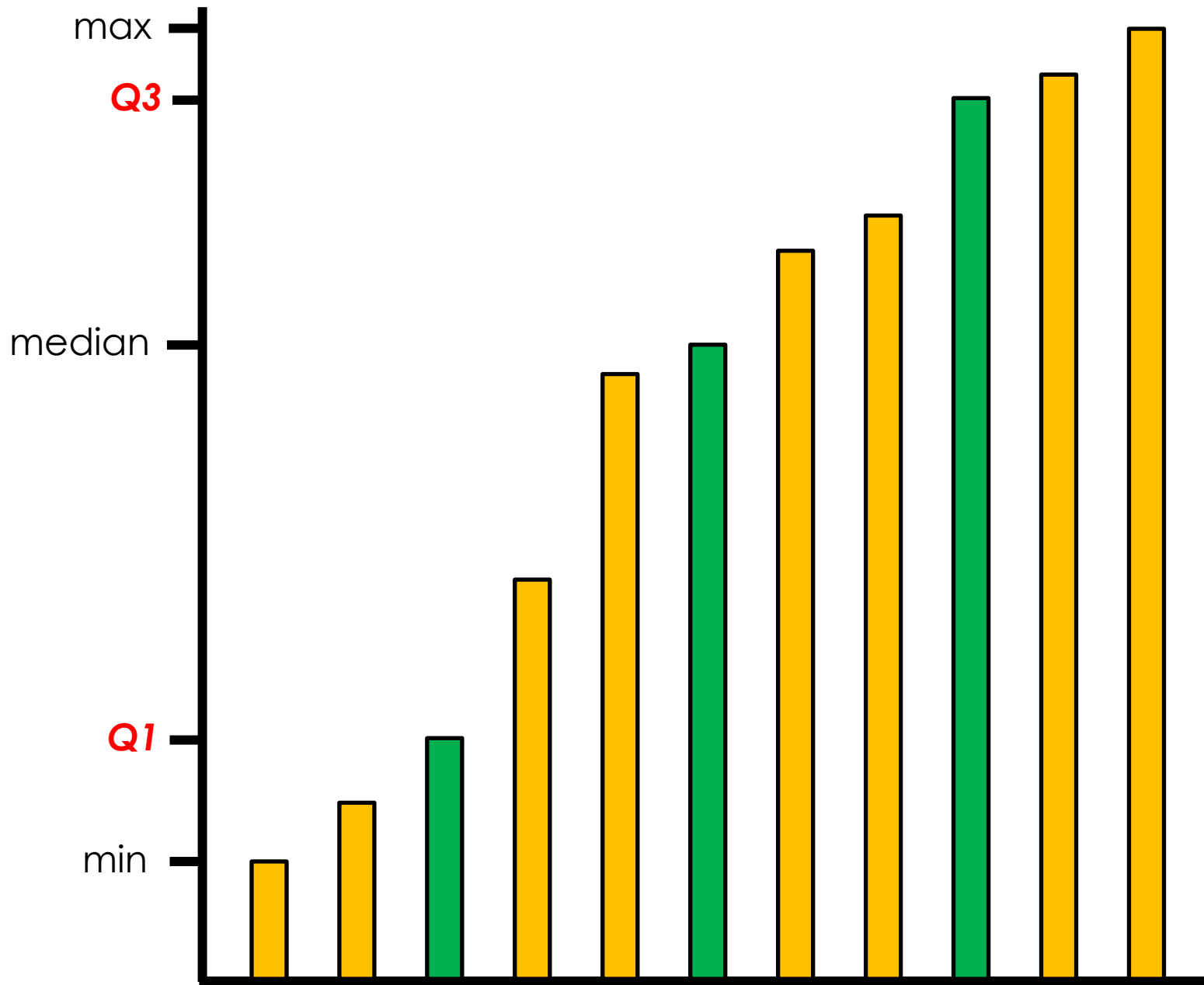


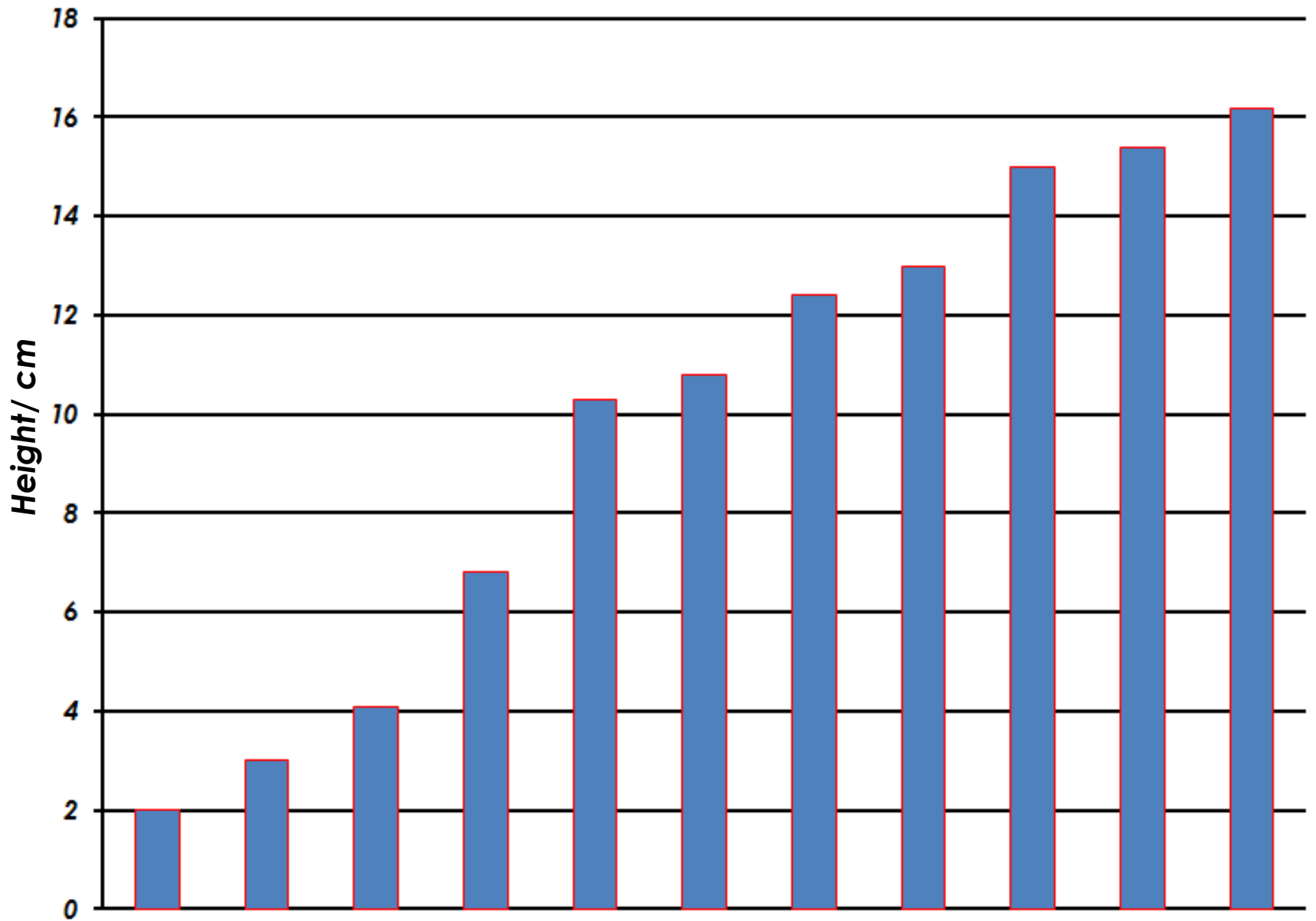
max

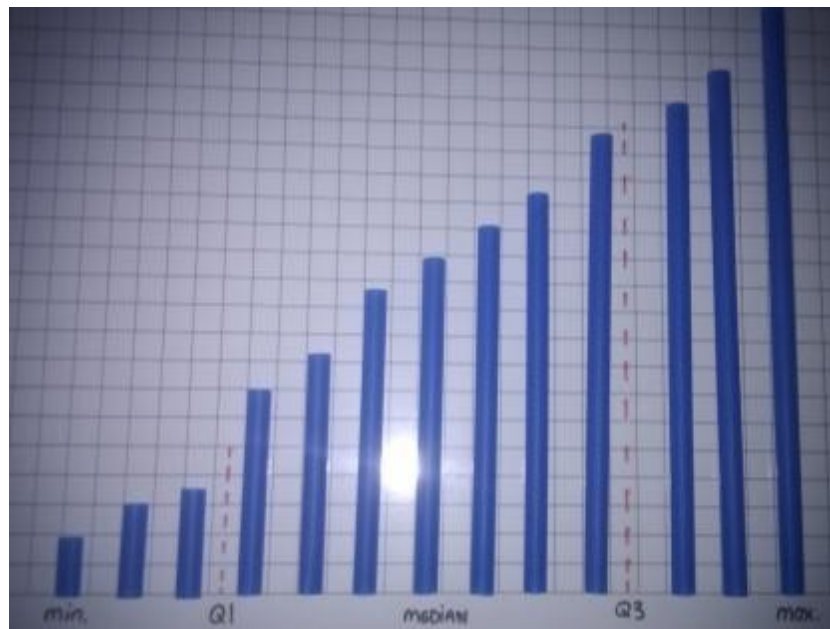
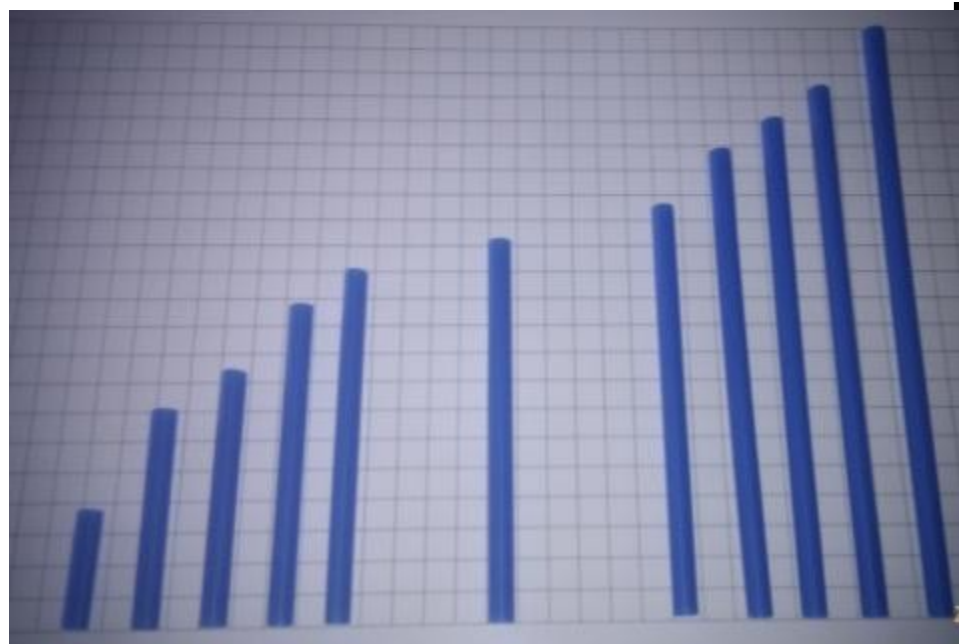
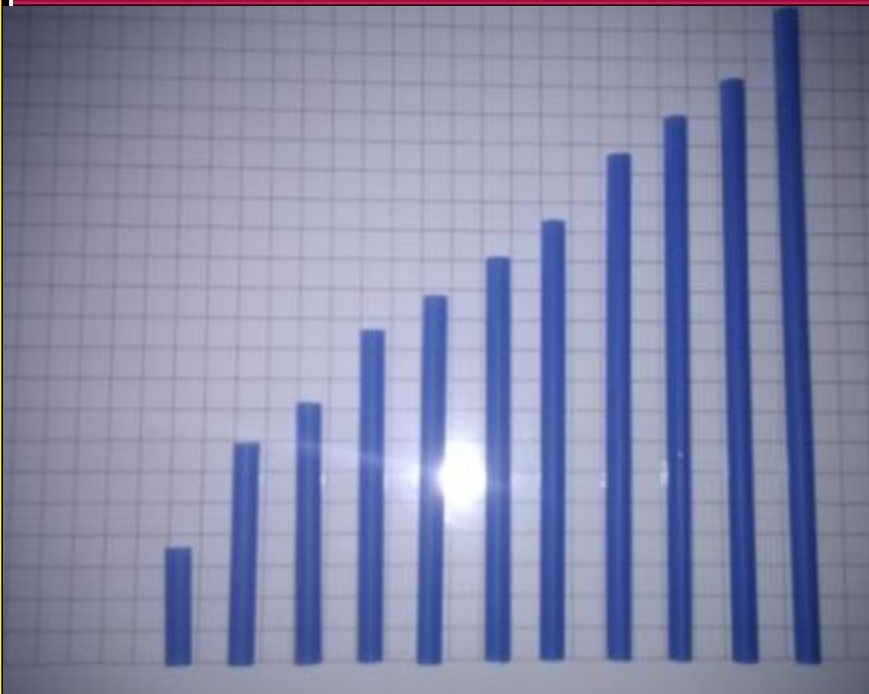
min



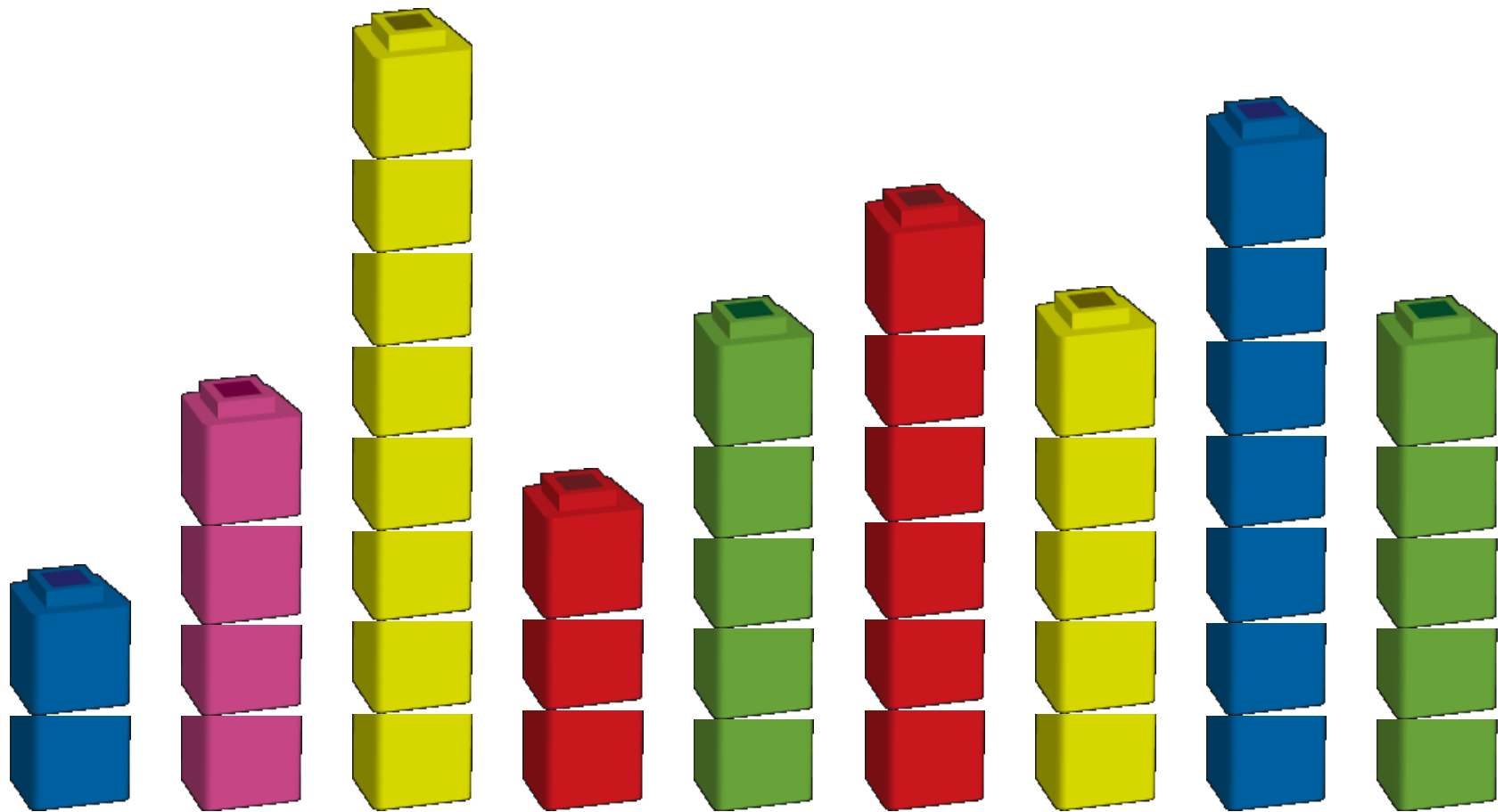




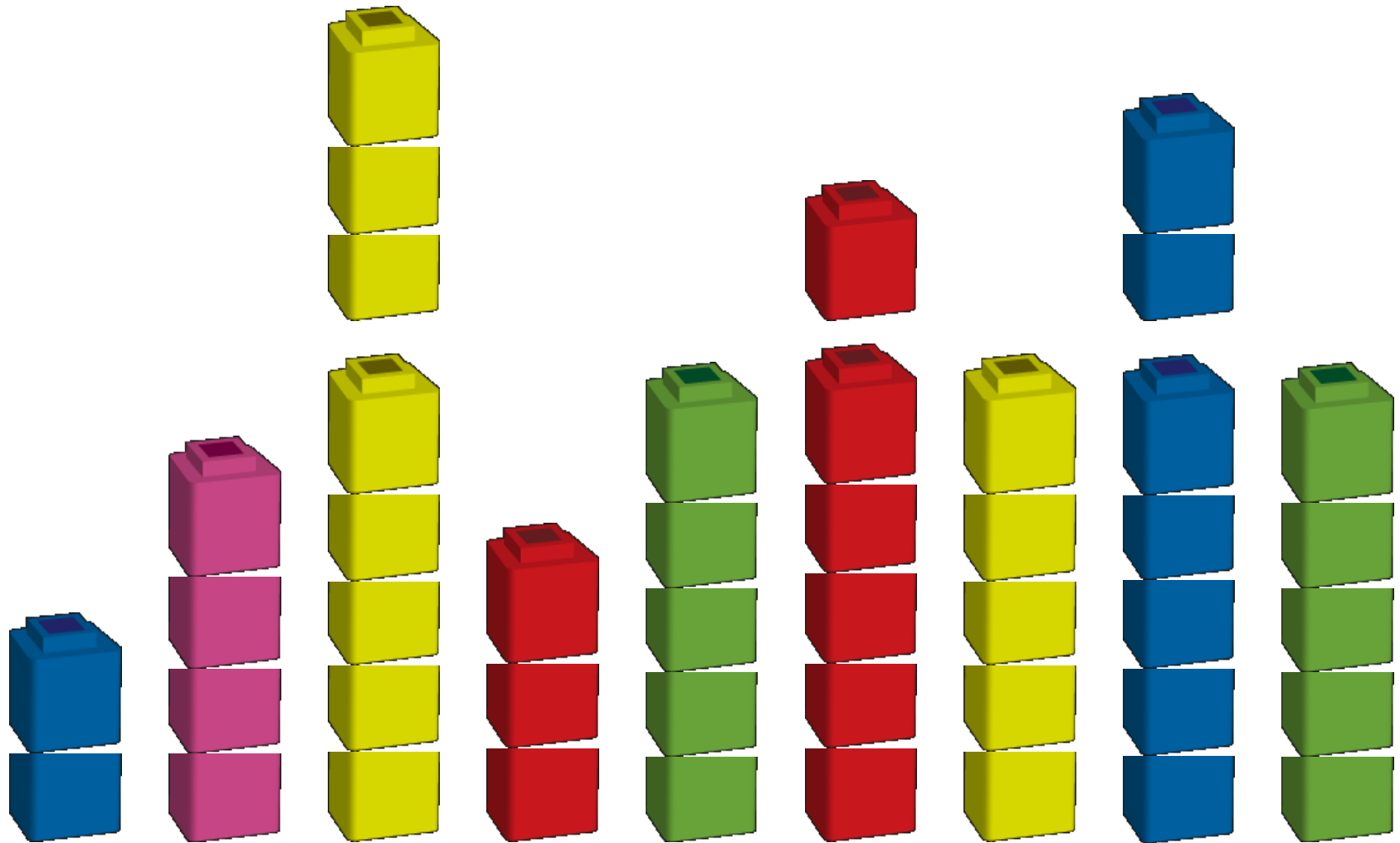




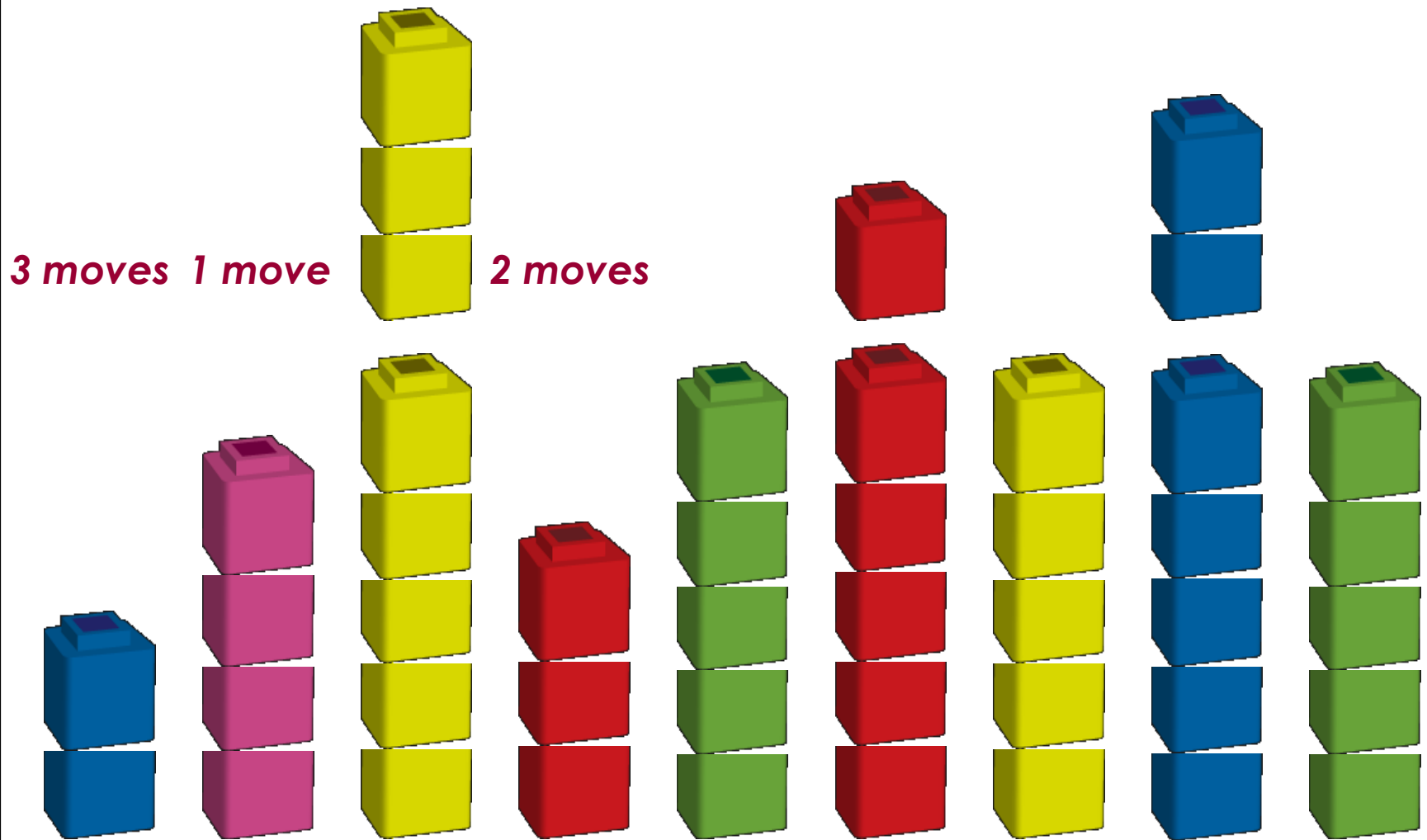
Fair & Unfair Allocations



Fair & Unfair Allocations



Fair & Unfair Allocations



Unfair Allocations

	1	2	3	4	5	6	7	8	9	Ranking	Median	Moves	Mean	
A	6	5	5	4	5	5	6	5	4					
B	1	10	10	1	1	10	1	10	1					
C	2	4	8	3	4	6	6	7	5					
D	4	4	7	4	4	5	6	7	4					
E	1	4	8	4	4	6	6	8	4					
F	8	1	7	7	4	1	3	7	7					

Each row totals 45

Unfair Allocations

	1	2	3	4	5	6	7	8	9	Ranking	Median	Moves	Mean	
A	6	5	5	4	5	5	6	5	4	1				
B	1	10	10	1	1	10	1	10	1	6				
C	2	4	8	3	4	6	6	7	5	3				
D	4	4	7	4	4	5	6	7	4	2				
E	1	4	8	4	4	6	6	8	4	4				
F	8	1	7	7	4	1	3	7	7	5				

Each row totals 45

Unfair Allocations

	1	2	3	4	5	6	7	8	9	Ranking	Median	Moves	Mean	
A	6	5	5	4	5	5	6	5	4	1	5			
B	1	10	10	1	1	10	1	10	1	6	1			
C	2	4	8	3	4	6	6	7	5	3	5			
D	4	4	7	4	4	5	6	7	4	2	4			
E	1	4	8	4	4	6	6	8	4	4	4			
F	8	1	7	7	4	1	3	7	7	5	7			

Each row totals 45

Unfair Allocations

	1	2	3	4	5	6	7	8	9	Ranking	Median	Moves	Mean	
A	6	5	5	4	5	5	6	5	4	1	5	2		
B	1	10	10	1	1	10	1	10	1	6	1	20		
C	2	4	8	3	4	6	6	7	5	3	5	7		
D	4	4	7	4	4	5	6	7	4	2	4	5		
E	1	4	8	4	4	6	6	8	4	4	4	8		
F	8	1	7	7	4	1	3	7	7	5	7	11		

Each row totals 45

Unfair Allocations

	1	2	3	4	5	6	7	8	9	Ranking	Median	Moves	Mean	
A	6	5	5	4	5	5	6	5	4	1	5	2	5	
B	1	10	10	1	1	10	1	10	1	6	1	20	5	
C	2	4	8	3	4	6	6	7	5	3	5	7	5	
D	4	4	7	4	4	5	6	7	4	2	4	5	5	
E	1	4	8	4	4	6	6	8	4	4	4	8	5	
F	8	1	7	7	4	1	3	7	7	5	7	11	5	

Each row totals 45

The Mean & The Median

Let's now contrast the mean and the median as summary measures.

Do you expect that the median stack size for the 9 stacks will always be the same for any allocation?
Why or why not?

The Mean & The Median

2



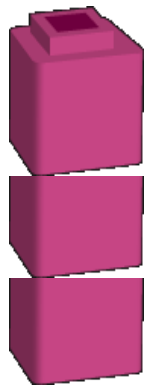
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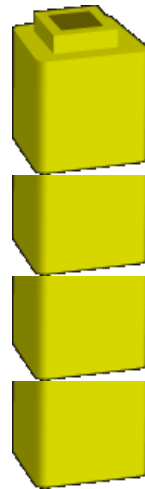
8



3



4



6



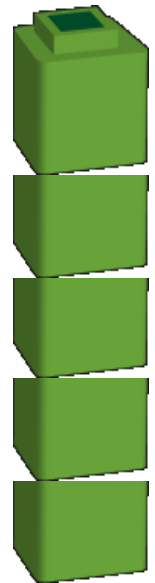
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7

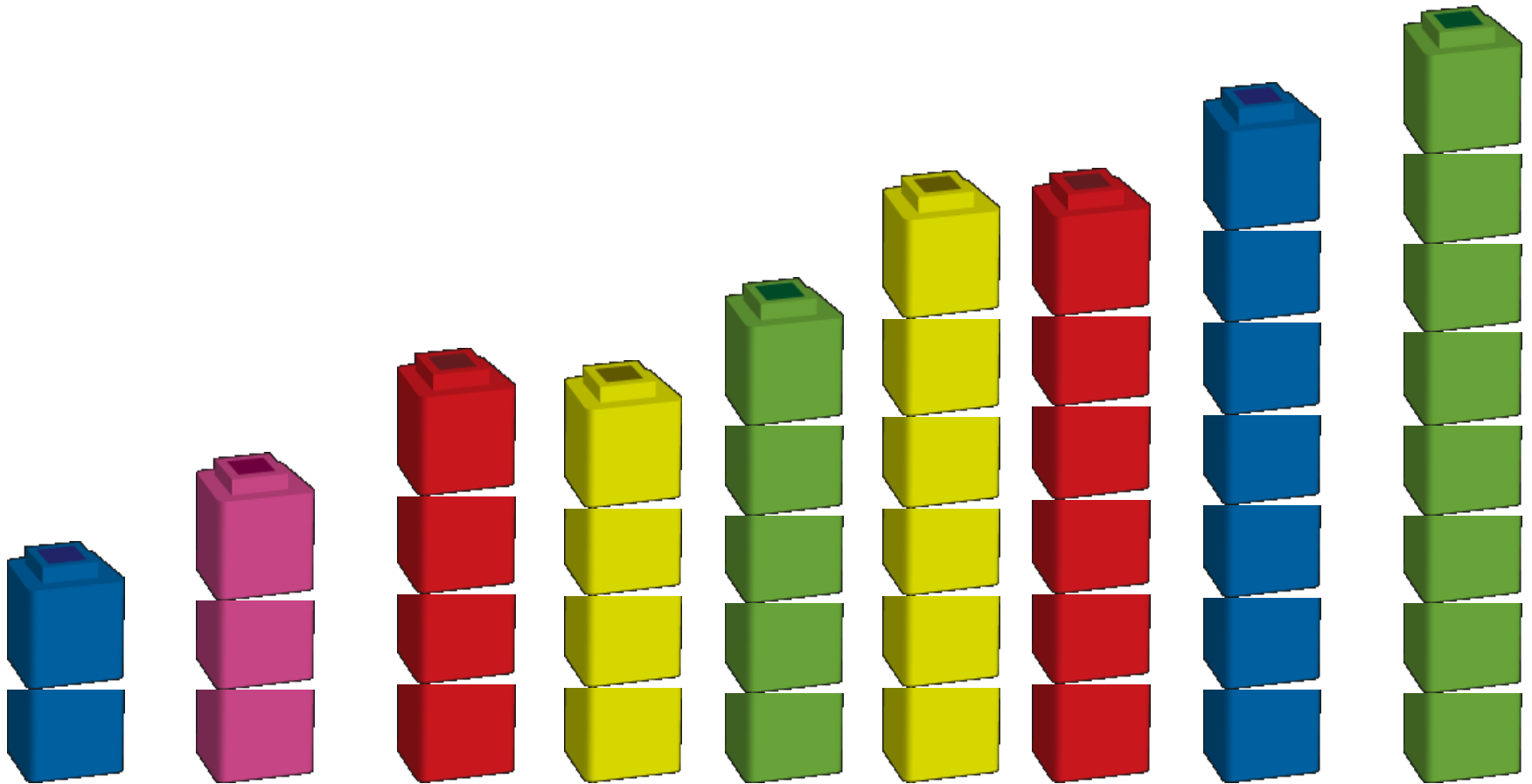


5

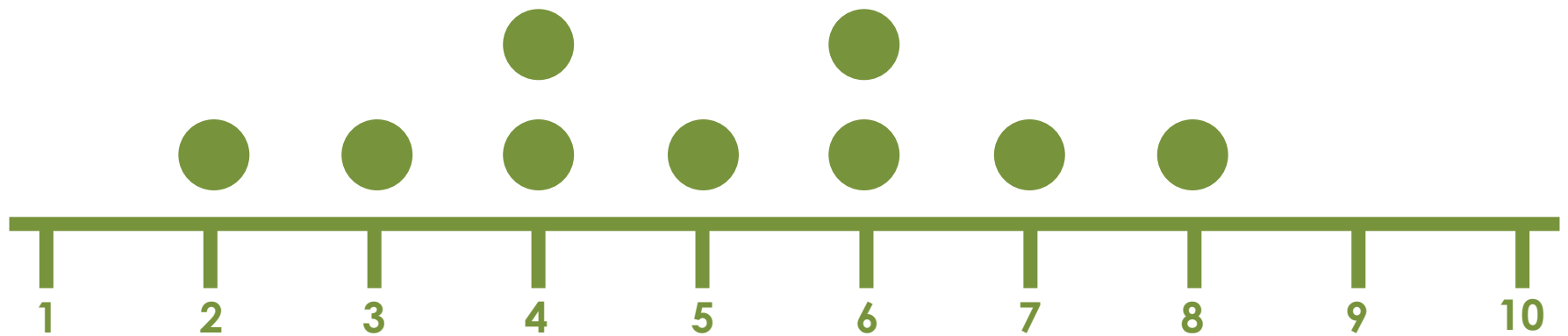
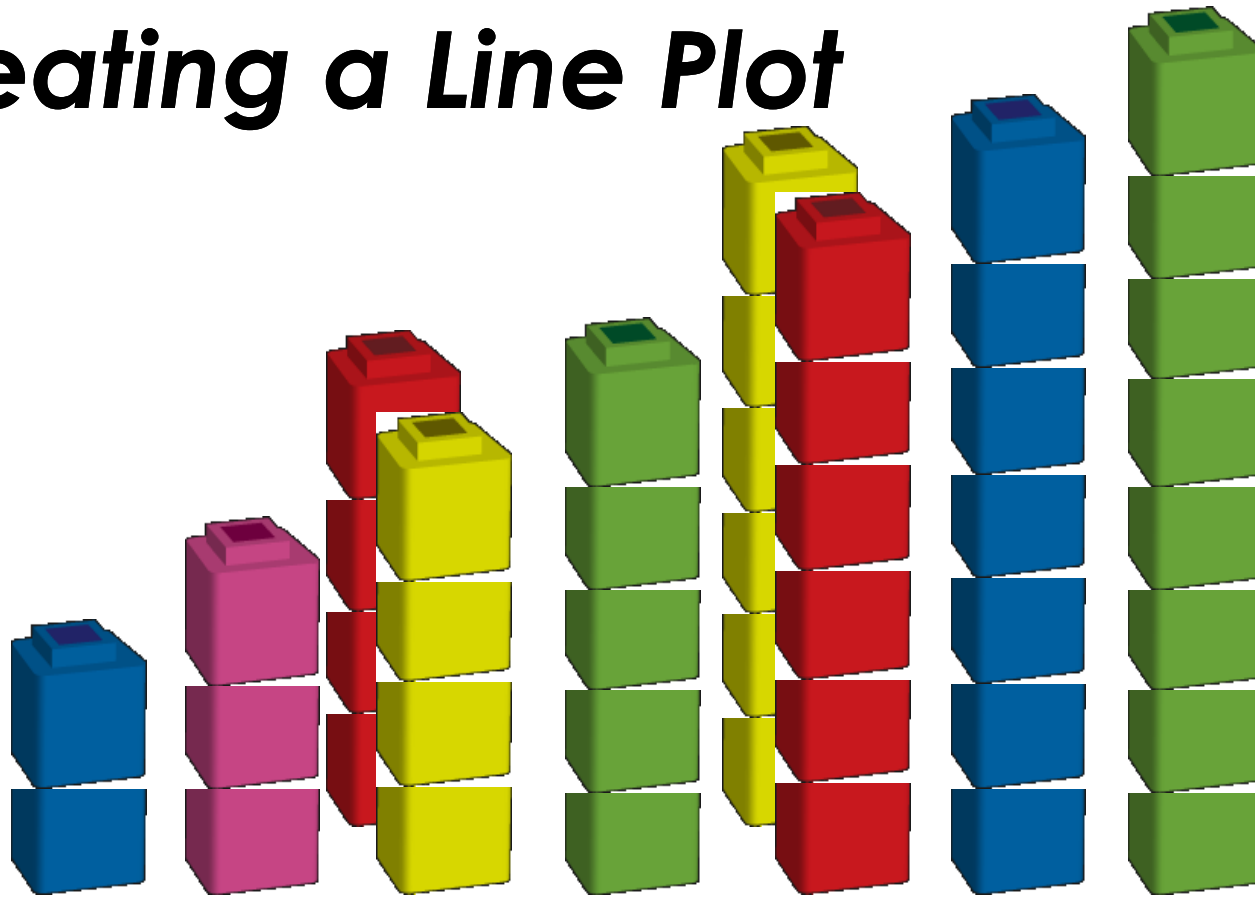


The Mean & The Median

2 3 4 4 5 6 6 7 8



Creating a Line Plot



Deviations from the Mean



Standard Deviation



Standard Deviation using Calculator

Use your calculator to calculate the standard deviation of the various sets given in the table.

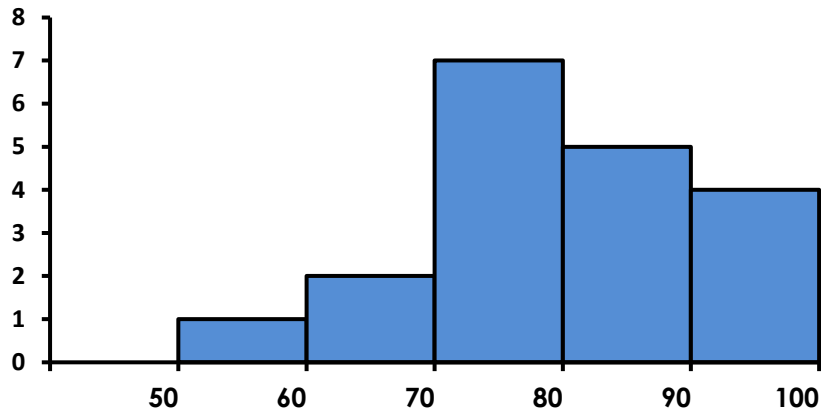


Unfair Allocations

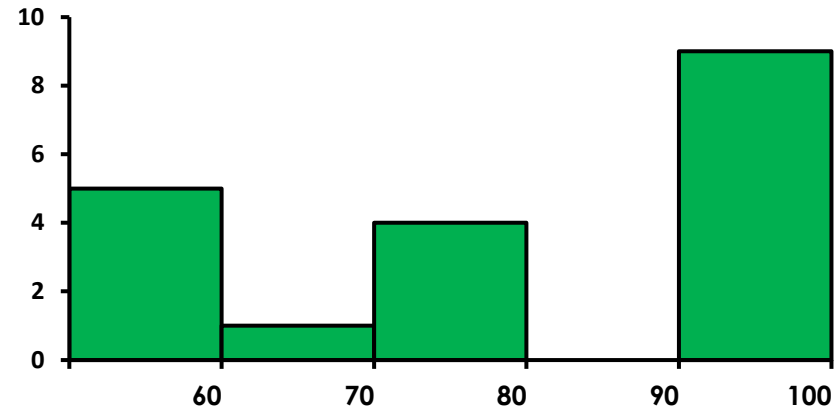
	1	2	3	4	5	6	7	8	9	Ranking	Median	Moves	Mean	S.D.
A	6	5	5	4	5	5	6	5	4	1	5	2	5	0.67
B	1	10	10	1	1	10	1	10	1	6	1	20	5	4.47
C	2	4	8	3	4	6	6	7	5	3	5	7	5	1.83
D	4	4	7	4	4	5	6	7	4	2	4	5	5	1.25
E	1	4	8	4	4	6	6	8	4	4	4	8	5	2.11
F	8	1	7	7	4	1	3	7	7	5	7	11	5	2.62

Each row totals 45

Which data set has the highest Standard Deviation?



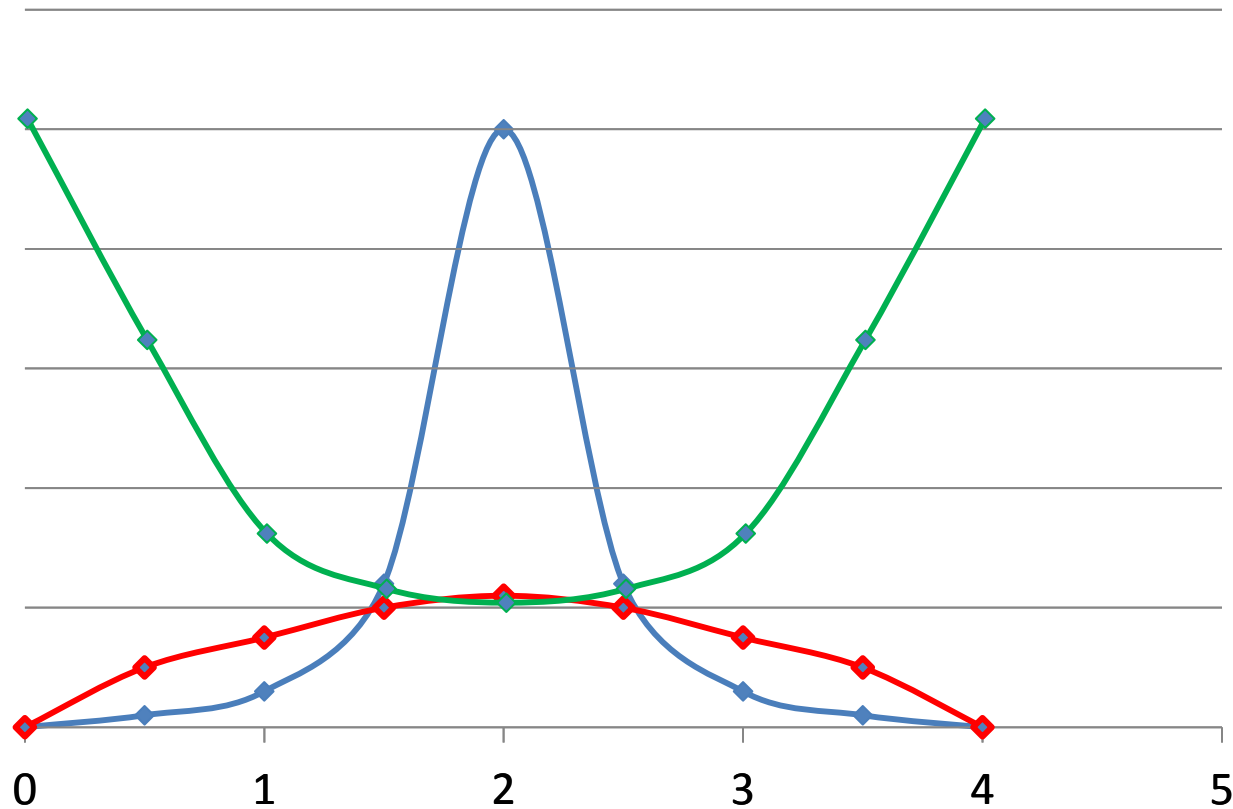
Dataset 1



Dataset 2

	Dataset 1	Dataset 2
Median	78.0	78.0
Mean	79.1	79.1
Mode	75.0	75.0
Maximum	99	99
Minimum	58	51
Range	41	48
Standard Deviation		

Observing Standard Deviation from a Graph



Low, High and Very High Standard Deviation