Statistics - Roadmap

Road Map for a Statistical Investigation- Draft

OProject Maths Development Team

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,
- 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

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of the above summary techniques used to compare sets of data

Relationship between Variables (bivariate)

tterplots relation Coefficient of Best Fit

Interpretation of the results to answer the question posed

ng a generalisation about the sample data or when the sample data is the same as the

ng the summary statistics to answer the question posed.

omparison between summary statistics: differences/similarities

ule: Interpreting a Normal Distribution (for a normal almost all data will fall within three standard deviations of the wise known as the 68 - 95 - 99.7 Rule.



z-score gives us an indication of how unusual a value is because it tells us how far it seasone gives us an indication or now unusual a value is because it tens us riow has ean on a Standardised Distribution Curve. If the data value sits right at the mean, e at all and its z-score is 0. A z-score of 1 tells us the data value is one standard the mean, while a z-score of -1 tells us that the value is one standard deviation

en a step further to make a generalisation about the population from which the

deterministic (definite/absolute) statement about the population because the s just our best attempt to represent the population. There will be some

must not be deterministic - use: "tends to", "estimation", "inference"

Correlation and Association

n between the two variables? Causation: Does one variable change because

setween the two variables? What does the correlation suggest about the mable "tends to" increase as the other variable increases.

Margin of Error

the same size as the population there is a margin of error that se smaller the margin of error.



http://www.getstats.org.uk/ http://www.open.ac.uk/openlearn/whats-on/the-joy-stats

Data Handling Cycle

Pose a question



Collect Data



Interpret the Results



Analyse the Data



"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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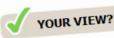


search.



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Should mobile phones be banned in schools?

- O Yes
- O No
- Only during class time

Vote

Results

Home

Welcome to CensusAtSchool

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 🛴 🚔 🔤

POSTER COMPETITION WINNERS ANNOUNCED! The Central Statistics Office has announced a new John Hooper Medal for Statistics 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 >> 📙 🖶 🞫

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.



Read more...

📙 🖶 🞫

Phase 10 (2010/2011)

The Phase 10 questionnaire is now live! A National Census of Population will be held in ConsusAtSchool Phase 10 questionnaire, there are















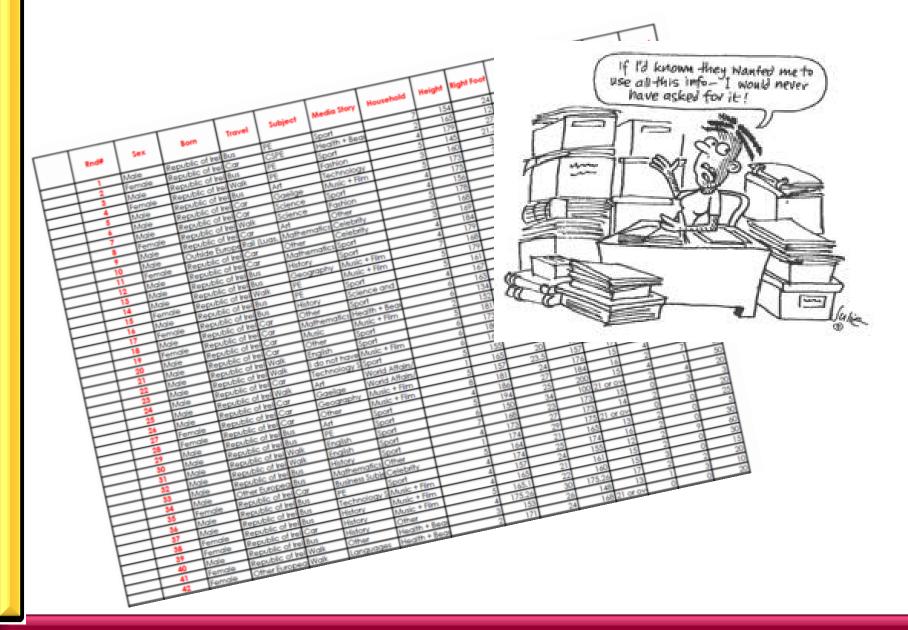


200 Students, 13 Data Records

	Rnd#	Sex	Born	Travel	Subject	Media Story	Household	Height	Right Foot	Arm Span	Age	Cons	Soft Drinks	Travel
	1	Male	Republic of Irei	Bus	PE	Sport	7	154	24	154	12	2	3	45
\vdash	2	Female Male	Republic of Itel Republic of Itel		CSPE	Health + Bear Sport	2	165 179	12	90 178	12	2	2	20
	4	Female	Republic of Irel	Walk	PE	Fashion	5	145	21.2	141	13	î	3	10
	- 5	Male	Republic of Irel	Bus	Art .	Technology	3	160	35	100	13	- 4	5	100
-	4	Male Male	Republic of Itel Republic of Itel	Car	Goelige Science	Music + Film Sport	5	173 175	30 19	170	17	2	1	10 45
-	- 6	Female	Republic of Irei		Science	Fashion	4	156	20	150	17		ő	5
	9	Male	Republic of Irel	Car	Art	Other	5	178	28	193	16	2	1	5
	10	Male	Outside Europe	Rail (Luas,	Mathematics	Celebrity	3	168 169	23	167	16	- 1	0	20
-	12	Female Male	Republic of Itel Republic of Itel	Car	Other Mathematics	Celebrity	3	184	24.9	173	16	2	0	5
	13	Male	Republic of Irel	Bus	History	Sport	4	179	26	180	15	2	Ö	25
	14	Male	Republic of Irel		Geography	Music + Film	7	168	24	168 179	16	4	2	15
-	15 16	Female Male	Republic of hel Republic of hel	Walk	PE PE	Music + Film Sport	5	179 161	25	179	15	2	9	15
	17	Female	Republic of Irel	Bus	History	Science and	4	167	25	100	12	3	4	70
	18	Male	Republic of Irel		Other	Sport	6	163	26	166	13	3	0	30
	19	Female Male	Republic of Ire		Mathematics Music	Health + Bear Music + Film	6	134 152	29	145 152	15	- 2	0	15
	21	Male	Republic of Itel Republic of Itel	Car	Other	Sport	5	181	25		15		8	20
	22	Male	Republic of irei	Walk	English	Sport	6	181 173	27	125 170	16	2	3	20 35
	23	Male	Republic of Irel	Walk	I do not have		6	180	18	180	16	2	2	10
	24 25	Male Male	Republic of Itel Republic of Itel		Technology S Art	Sport World Affairs/	6	165 155	25	170 90	13 12	2	1	30
	26	Male	Republic of rei	Car	Goeige	World Affairs/	1	165	20		16	1	ő	15
	27	Female	Republic of Irel	Car	Geography	Music + Film	5	165 157	23.5	102 157	17	3	3	5
	28	Female	Republic of Irel	Car	Other	Music + Film	8	181	24	176	15	4	1	12
	30	Male Male	Republic of Itel Republic of Itel		Art PE	Sport Sport	4	186 194	27	184	16 15	2	7	30 50
	31	Male	Republic of Irel	Walk	English	Sport	6	150	34	100	21 or ov	2	4	20
	32	Male	Republic of Irel	Walk	English	Sport	7	168	23	173	15	0	3	3
	33 34	Male Male	Republic of Itel Other Europea	Bus Bus	History Mathematics	Sport Other	4	173 174	27	173	21 or ov	0	1	20 25
	35	Female	Republic of Irel		Mathematics Business Subis		5	164	29	165	21 or ov 13	2	0	5
	36	Male	Republic of Irel	Bus	PE	Sport	4	174	25	174	16	2	o o	30
	37	Male	Republic of Irel	Bus	Technology S	Music + Film	4	157	24	155	12	2	9	60
\vdash	38	Female Female	Republic of Itel Republic of Itel	Cor	History	Music + Film Music + Film	4	165 165.1	21	161	15	2	0	30 15
	40	Male	Republic of Irel		History	Other	4	175.26	30	175.26	17	2	2	20
	41	Female	Republic of Irel	Walk	Other	Health + Bear	3	153	26	148	13	1	3	10
	42 43	Female Female	Other Europea Republic of Itel	Walk	Languages	Health + Bear Celebrity	2	171 173	24 20	168	21 or ov	0	0	20 10
	44	Male	Republic of re	Bus	Languages Other	Sport	4	183	30	189	15	2	3	15
	45	Female	Republic of Irel	Car	PE	Fashion	5	150	25	152	12	2	4	5
	46	Female	Republic of Irel		PE	Sport	4	167.5	22.7	160.5	15	2	0	15
	47 48	Male Male	Republic of Irel Outside Europe	Car	Business Subje I do not have	Technology Sport	4	185 170	25.6	195	16 15	2	3	- 5
	49	Female	Outside Europe	Bus	Art	Celebrity		157	20	160	12	2	o	20 30
	50	Male	Republic of Irel	Bus	History	Sport	4	178	27	181 172	16	2	0	65
-	51 52	Female	Republic of Itel Republic of Itel		History Laborat house	Health + Bear	8	163 165	26	172	15	3	4	65 20 15
	53	Female Female	Republic of re		I do not have Other	Celebrity	6	1.59	24	159	13	f	ő	20
	54	Male	Republic of Irel	Walk	Mathematics	Technology	8	146	27	147	12	2	0	2
	55	Female	England	Car	I do not have	Sport	5	164	25	164	13	2	0	20
	56	Female Female	Republic of Irel Republic of Irel		Art Art	Celebrity Music + Film	3	165	21	165	13	- 2	9	20
	58	Female	Republic of irei		Other	Music + Film	4	179.832	21	150	17	2	o o	10
	59	Female	Republic of Irel	Car	Technology S	Celebrity	5	164	22	163	14	2	5	5
	41	Male Female	Republic of Itel Republic of Itel	Bus	Other Science	Sport Music + Film	6	155	25 21.6	165	15 16	3	4	20
	62	Male	Republic of Irel			Sport	5	155	23	157	12	2	2	10
	63	Male	Republic of Irel	8us	Science	Sport	6	170	17	174	13	3	0	20 30
	64 65	Male Male	Republic of Irel Republic of Irel	Car	Mathematics PF	Music + Film Other	4	175 140	27	179	21 or ov 13	2	0	30
	66	Female	Republic of rei	Walk	Science	Cither Fashion	6	140	22	157	13	2	1	30 25
	67	Male	Republic of Irel	Walk	Science	Music + Film	4	165 179	23	157	17	2	2	15
	48	Male	Republic of Irel	Walk	Mathematics	Sport	5	179	23	145	16	2	9	15
—	69 70	Female Male	Republic of Itel Republic of Itel	Bus Car	Mathematics I do not have	Sport Other	5	150	24 35	150 158	12	2	20	20
	71	Male	Republic of he	Car	PE	Sport	5	152 188.976	29	150	15	3	5	20 15
	72	Male	Republic of Irel	Bus	PE	Sport	5	185	28	186 172	16		0	30 20
	73 74	Female Female	Republic of Itel Republic of Itel	Walk	Languages I do not have	Fashion Fashion	4	170 167	26 25	172	15 13	2	2	20
	75	Male	Republic of re		PE PE	Sport	4	148	23		12	0	0	20
	76	Male	Other Europea	Cycle	History	Sport	4	177	28	148 177	14	2	3	7
	77	Female	Republic of he		Other	Celebrity	4	161	25	159	15	2	0	3
	78 79	Female Female	Republic of Irel Republic of Irel		Science Goelige	Celebrity	3	181 167.5	24 23.6	166	16 19	-	2	20
	80	Male	Republic of Irel	Bus	Geography	Music + Film	5	176	23.0	176	15		ő	30
	81	Female	Republic of Irel	Walk	Music	Fashion	9	149	22	146	16	2	7	10
	82 83	Male	Republic of Irel Outside Europe	Cor	Foodsh	Sport Music + Film	5	170	25.5 20	170	16 12	1	1	40
	84	Female Male	England	Car	English PE	Sport	4	161	20	158	12	2		10
	85	Male	Republic of Irel	Bus	English	Music + Film	4	168	25	160	15	1	2	25
	84 87	Female	Republic of itel	Car	Music	Music + Film	4	167.5 174	21 25.2	120 182	15	2		2
	88	Male Male	Other Europea Republic of Irel	Cor	History	Sport World Affairs/	5	174	25.2	182	17	-	2	20
	89	Female	Republic of Irel	Walk		Fashion	5	150	15	144	12	2	15	7
	90	Male	Republic of Irei	Bus	Other	Sport	5	174	27	175	15	2	0	25
	91 92	Female	Republic of he	Bus	I do not have	Fashion	5	158 190	22 32	162	15	3	0	20
	93	Male Female	Republic of hel Republic of hel	Bus .	Science	Sport Health + Bear	4	190	23	186	18	1	0	30
	94	Female	Republic of Irei	Bus	Business Subje	Celebrity	5	152	24	150	12	3	Ĭ	30
	95	Male	England	8us	PE	Sport	7	164	22	164	16	3	1	45
	97	Male Female	Republic of Irei Republic of Irei	Car	Science Art	Music + Film Celebrity	4	147 158	22.5	147	12	1	0	50 15
	98	Female	Republic of he	8us	I do not have	Eachion	6	200	26	99	12	6	5	15
	99	Male	Republic of Irel	Car	Mathematics	Science dMi	6	192	28.5	189	15	4	10	10
	100	Male	Republic of Itel Republic of Itel	Car	PE Art	Sport Music + Film	6	163 165	34 24	163	13	4	3	20
	101	TWITTEN.	republic of Fe	to GE	PRINT .	THE Y SHAPE	3	163	24	128	13	2	0	2

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	102	Male Male	Other Europea Republic of Irel		Music	Music + Film	3	173	24	175	15	2	2	20
_	104	Female	Republic of ire	Bus	Music	Sport Music + Film	- 4	175	24.5	174	17	-	- 2	20
	105	Female	Republic of Ire	Car	Art .	Music + Film	4	174	35	166	15	2	0	10
	106	Female	Republic of Irei		Art .	Science and		169	24	167	16	3	0	20
	107	Male	Republic of Irei	Walk	Ar1	Music + Film	4	168	12	170	16	1	0	20 25 20
	108	Male	Republic of Irel	Bus	English	none	7	181	28	175	16	2	5	20
	109	Male	Republic of Irel	Cycle	History	Other	4	182	28	185	15	2	5	20
	110	Female	Outside Europe		Ar1	Music + Film	6	165	21 29	156 176	16	2	0	36 30 10
$\overline{}$	111	Male	Republic of Ire		Geography	Music + Film Music + Film	6	181	29		16	2	0	30
_	112	Female	Republic of Ire				4	167 165	23 24	162	15 16	- 2	/	30
-	114	Female Male	Republic of Irei Republic of Irei		Mathematics oc	Celebrity Sport	4	160	24	158	13	2	2	35
-	115	Mole	Republic of ite		English	Sport	- 5	155	26	155	17	1	9	10
	116	Male	Republic of ire	Walk	CT	Technology	5	162	25	165	16	- 2	5	15
$\overline{}$	117	Female	Republic of Irei		Business Subje	Business		1.55	20	154	12	2	ō	30
	118	Male	Republic of Irei	Bus	I do not have	Fashion	4	172	23	171	1.5	0	3	20
	119	Male	Republic of Irel		PE	Sport	4	150	28	120 172	12	3	6	20
	120	Female	Republic of Irel	Car	Languages	Celebrity	4	175	20	172	16	2	0	15
	121	Female	Republic of Irei	Car	Gaeige	Music + Film	6	150 179	24	148	12	2	0	
	122	Male	Republic of Irel		Art .	Music + Film	4		30.2	179	16	- 1	0	10
$\overline{}$	123	Male	Republic of Irel	Cycle	Mathematics	Sport		188	28.2	185	15	1	20	8
	124	Male	Republic of Ire		PE	Sport	4	165	24	156	13	- 2	2	10
	125	Male	Republic of Ire		Science	Sport		176	26	173	16	2	0	
_	126	Male	Republic of Ire	Bus		Celebrity	4	164	25	160	16	- 2	5	25
$\overline{}$	127	Female Male	Republic of Irei Republic of Irei	Bus Car	Business Subje PE	Sport	- 4	173 178	24.5 27	176	15 16	- 4	0	25 20 15 20
	128 129	Male	Republic of rei	Bus	Art .	Sport Sport	4	150	23.5	159	13	3	0	15
-	130	Female	Republic of ite		PE	Music + Film		168	22.2	158	15		1	20
$\overline{}$	131	Female	Republic of Ire	Bus	History	none	5	161	23.5	165	15	2	1	40
	132	Female	Republic of Ire	Walk	Art	Music + Film	7	153	20	150	16	3	2	
\neg	133	Male	Republic of Ire			Music + Film	4	184	30	180	19	2	2	10
	134	Female	Republic of Irei		PE	Sport		153		152	12	3	2	20
	135	Male	Republic of Irei		Science	Sport	7	183	21 25	183	15	2	2	15
	136	Male	England	Car	Art	Sport	5	155	23	154	12	1	7	10
	137	Male	Republic of Irei	Bus	PE	Sport	6	188	29	180	16	6	0	20
	138	Female	Republic of Ire	Bus	Mathematics	Health + Bear	6	150	20	150	17	2	0	30
	139	Male	Republic of Ire	Car	Technology S PE	Music + Film	3	186	35.2	189	16	1 5	3	
$\overline{}$	140	Male	England	Car	PE	Sport		106.6	22	163	18	. 5	5	15
_	141	Male	Republic of Ire	wak	Art Enoteb	Sport Celebrity	3	182 190	26	181	17		3	
$\overline{}$		Female	Republic of he Republic of he	William	English PE	Celebrity Sport	- 1	167		168	16	- 2	0	10
	143	Female Female	Outside Europe	Cor	Art	Sport		160	29 20	154	13		1	15
-	145	Female	Republic of Ire		Music	World Affairs/		160	27.5	165	13	3	-	12
	146	Male	Republic of Ire		Art .	Sport	4	185	20		14	1	11	15
	147	Male	Republic of Ire		Business Subje	Music + Film	6	155	24	120 155	19	2	0	15
	148	Female	Republic of Irei		English	Music + Film	3	163	23	160	16		1	40
	149	Male	Republic of Irel	Walk	Technology S	Sport		180	26	186	15	2	1	3
	150	Male	Republic of Irel	Car	Music	Music + Film	3	168	24	166	15	2	1	25 10
	151	Female	Republic of Irel	Walk	Art .	Music + Film	6	147	13	149	15		4	10
	152	Male	Republic of Irel	Walk	PE	Sport	6	174	26	174	1.5	_	2	20
	153	Female	Republic of Irei		Music	Music + Film	4	170	23	120	16	3	0	45
$\overline{}$	154	Female	Republic of Irel		Art	Music + Film	4	156 153	22.6	156	14	0	1	40
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$\overline{}$	154 157	Male	Republic of Ire		Other PE	Music + Film	4	180	27	176	16 13	- 1	2	10
-	157	Male	Republic of Ire			Other Music + Film	4	162	26	162	16	4	0	2.5 30
_	158 159	Male Male	Outside Europe Republic of Irei		Science History	Music + Film	3	169 180	23	169	15	- 2	- 2	10
$\overline{}$	140	Female	Republic of Ire		Business Subje	Sport		168	20	164	16		+	10
-	161	Male	Republic of ite	Car	PE SOLD	Music + Film		157	29	177	15	- 4	- 0	5
	162	rename.		Wak	English	Sport	4	153	22	100	12	2		2
			England		en rigginal i	Mind AM - No. 8							- 5	i
-	163	Male Male	England	Car	Mathematics			120	35	90 150	16	2	2	
	164	Male Male	England Republic of Ire Republic of Ire	Car	Mathematics Technology S	World Affairs/ Technology	5	120 161	35 24.5	90 150 156	16 12	2	0 3	20
	164	Male Male	England Republic of Ire Republic of Ire	Car	Mathematics Technology S Music		5	120 161 168		150	16	2 4 2		7
	164 165 166	Male	England Republic of Irei	Car Car Car	Technology S	Technology	5 4 5	161 168 165	24.5 23.1 24	150 156	16 12	2 4 2		7 8
	164	Male Male Female	England Republic of Ire Republic of Ire England	Car Car Car Walk	Technology S Music PE Art	Technology Celebrity Sport Fashion	5 4 5	161 168 165	24.5 23.1 24	150 156 167	16 12 16 16	2	3 2 4	7 8
	164 165 166 167 168	Male Male Female Male Female Male	England Republic of Ire Republic of Ire England Republic of Ire Republic of Ire Republic of Ire	Car Car Car Walk Bus Car	Technology S Music PE Art Business Subje	Technology Celebrity Sport Fashion Music + Film	5 4 5 5	161 168 165 175.26	24.5 23.1 24	150 156 167 162 165 142	16 12 16 16 16	2	3	7 8
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	164 165 166 167 168 169	Male Female Male Female Male Female Female Female Female	England Republic of ite Republic of ite England Republic of ite England	Car Car Car Walk Bus Car Car	Technology S Music PE Art Business Subje Science I do not have	Technology Celebrity Sport Fashion Music + Film Sport Celebrity	5 4 5 5 7	161 168 165 175.26 174 170	24.5 23.1 24 26 21 20 22	150 156 167 162 165 142 164	16 12 16 16 16 16 13	2	3 2 4	7 8
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	164 165 164 167 168 169 170	Male Male Female Male Female Male Female Male Female Female Male	England Republic of ite Republic of ite England Republic of ite England	Car Car Car Walk Bus Car Car Car Car Car	Technology S Music PE Art Business Subje Science I do not have Business Subje RE Science	Technology Celebrity Sport Fashion Music + Film Sport Celebrity Sport	4 41 44 45 45 45 45 45 45 45 45 45 45 45 45	161 168 165 175.26 174 170	24.5 23.1 24 26 21 20 22 30 25 28	150 156 167 162 165 142 164	16 12 16 16 16 13 17	2	3 2 4	7 8 45 36 20 10 12 20 15
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What to do with the data?



Pircrete

ORDINAL

Nominal

Continuous

Numerical

Categorical

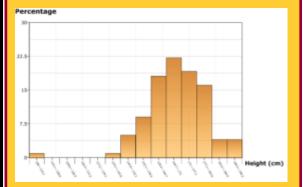
Types of Data

	18. What is your favourite subject 15. What is your favourite subject
Please state your age in completed years.	8. What is your favourite Olympic sport?
years	
12. How many cars belong to people in your household?	1. Are you:
cars	□ female? □ male?
20. How long does it usually take you to travel to school?	19. How do you usually travel to school?(Select one answer)
minutes	□ Walk □ Bus □ Cycle □ Luas/Train/Dart □ Other (pls specify)
	_ morea from abroad

Types of Investigative Questions

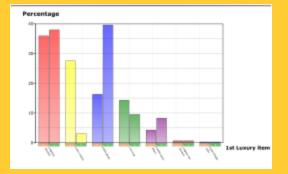
Summary

about a single variable for the whole group



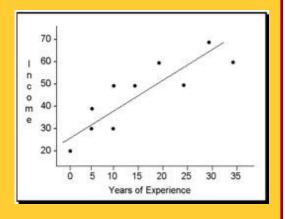
Comparison

Questions that compare a single variable between two categories

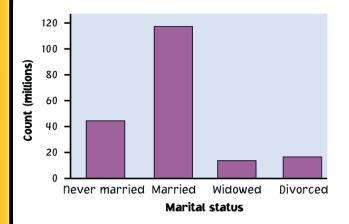


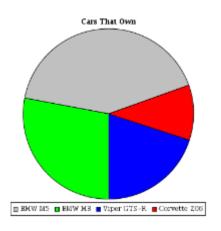
Relationship

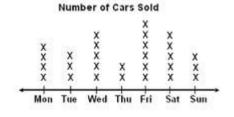
Look for a relationship between two variables

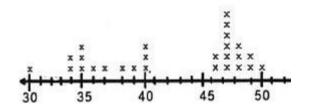


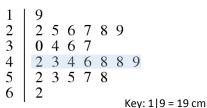
Which Graphical Representation?

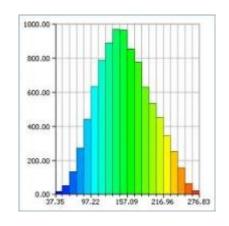


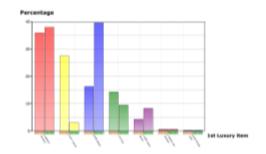


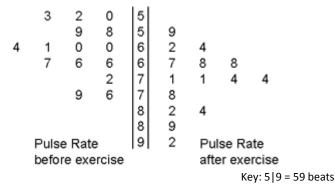


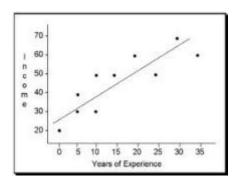












What determines our choice?

	YES	NO
Are you concerned about job losses in your local area?		
Do you agree that the building of large supermarkets generates local employment?		
Are small grocery stores competitive with pricing in comparison to large supermarkets?		
Do you think we should reduce the number of large supermarkets in our towns?		
	YES	NO
Are you concerned about the impact of large supermarkets on small businesses in your local area?	YES	NO
,	YES	NO O
supermarkets on small businesses in your local area? Do you agree that the location of large supermarkets is	YES	NO NO



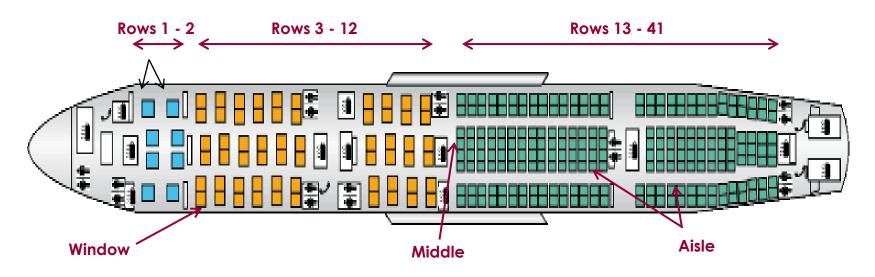


First class: 8 seats

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

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Sample 30 of Household

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

1		ШІШ															ЩЩ					5
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Sample 30 of Household

	Rnd#	Sex	Born	Travel	Subject	Media Story	Household	Height	Right Foot	Arm Span
	1	Male	Republic of Irel	Rus	PF	Sport	7	154	24	154
	10						þ.		12	90
	LIU.	. Ho	w man	IV DE	20DIE	live i	n vou	r	27	178
		_		., .			,	•	1.2	141
	— 1 — — —		1.40 /	P I.			LEN		35	100
	⊥nou	ısen	old? (:	Lncii	iae v	ourse	IT)		30	170
	_								19	178
	- ⊢								20	150
23	- ⊢								28	193
	+-								23 27	167
\vdash	+-						aaanla		1.9	150 173
\vdash	+						people	•	26	180
\vdash	+-					•	-		24	168
\vdash	+								24 25	179
	16	Male	Republic of Irel	Bus	PE	Sport	5	161	25	166
$\overline{}$	17	Female	Republic of Irel		History	Science and	4	167	25	100
				Car	Other	Sport	6	163	26	-
	18	Male	Republic of Irel	- COL				100	20	166
	18 19	Male Female	Republic of Irel Republic of Irel	Car	Mathematics	Health + Beau	6	134	29	166 145
		-	Republic of Irel			0 0011	6			145
		-				0 0011	6			145
0 cn 1		-	Republic of Irel		Mathematics	0 0011	6	134		145
0 cm 1		-	Republic of Irel	Car	Mathematics	Health + Beau	6	134	29	145
0 on 1		-	Republic of Irel	Car	Mathematics	Health + Beau	6	134	29	145
0 cm 1		-	Republic of Irel	Car	Mathematics	Health + Beau	6	134	29	145
		-	Republic of Irel	Car	Mathematics	Health + Beau	6	134 17 1	29 	145
	19 	Female	Republic of Irel		Mathematics	Health + Beau	6 	134 17 1	29 	145
0 cw 1	19 	Female	Republic of Irel		Mathematics	Health + Beau	6 	134 17 1	29 	145
	19 	Female	Republic of Irel	Car 8 9 3L LL	Mathematics 10 11 1	Health + Beau	6 	134 17 1	29 	145 2 25 20 0 0

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

 $199 \times [0, 1] = [0, 199]$

 $199 \times [0, 1] + 1 = [1, 200]$

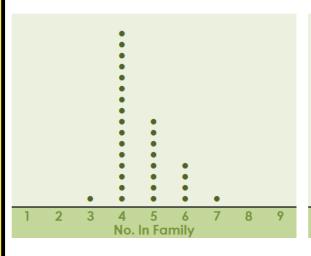


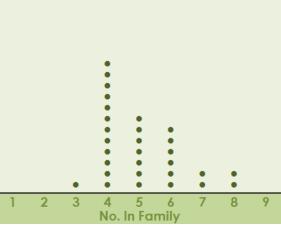
Question 12

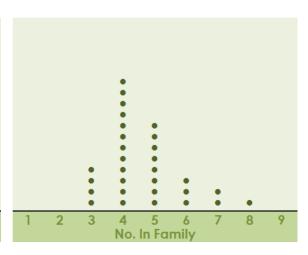
Describe the data in as many ways as you can using numerical and shape descriptions (Fractions and Decimals permitted and words of course!).

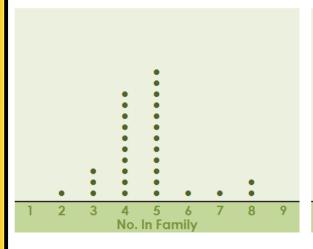
Note: Variation should be taken into account.

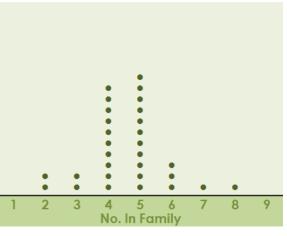
Sample Variation

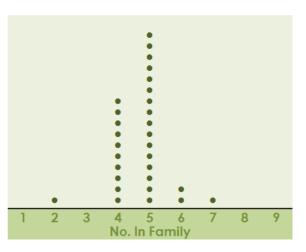


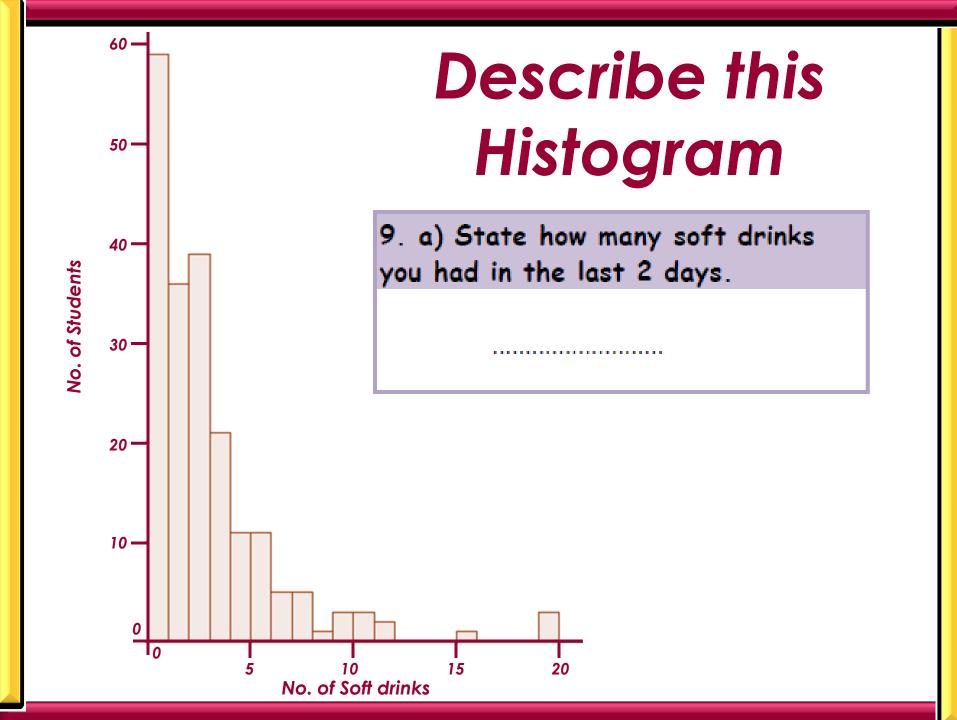


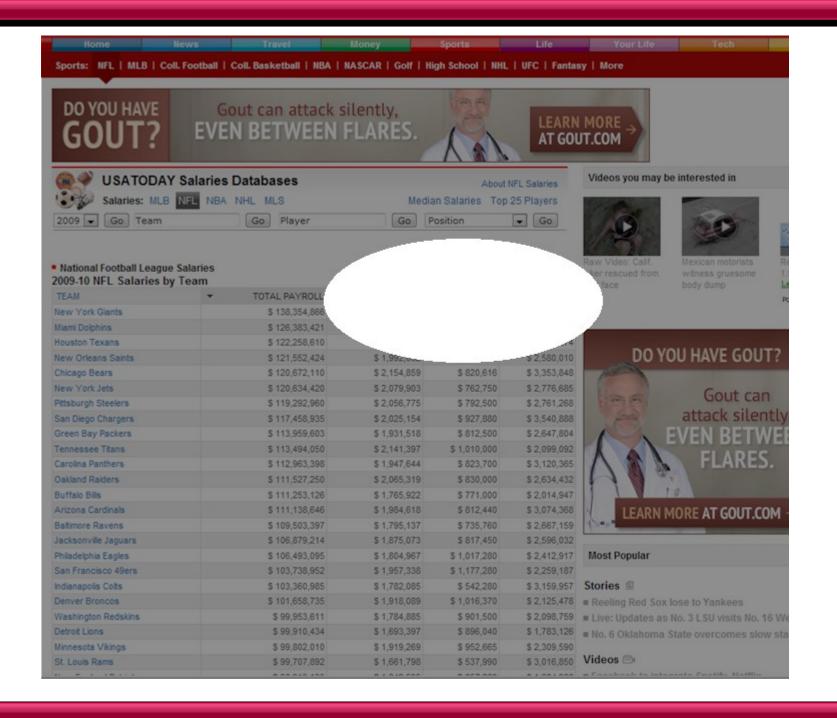


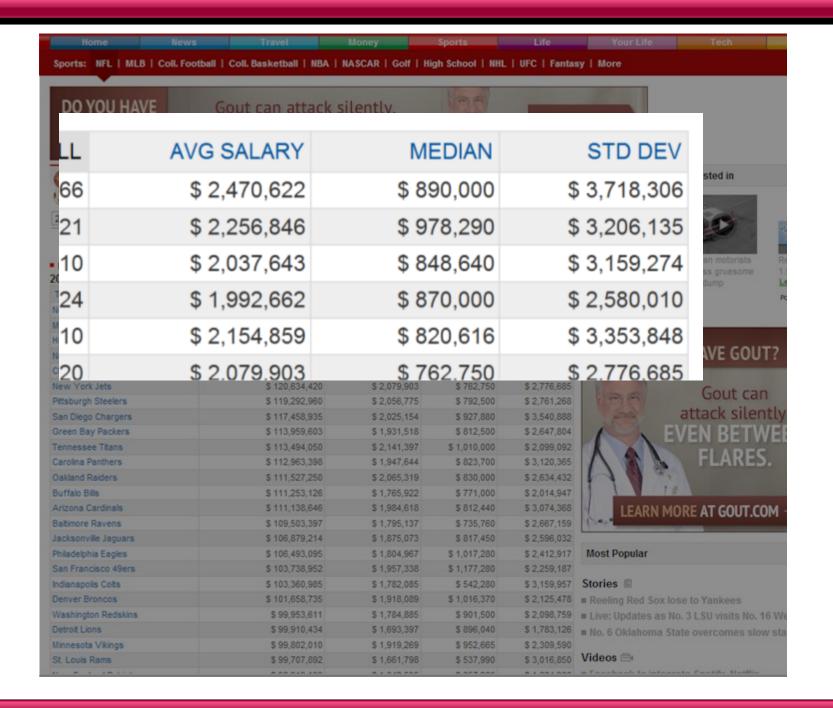




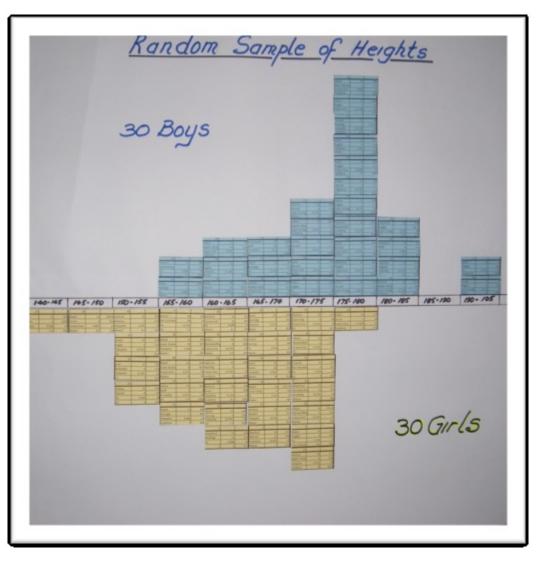








A Project Using c@s



Comparing Distributions

```
1. Are you:

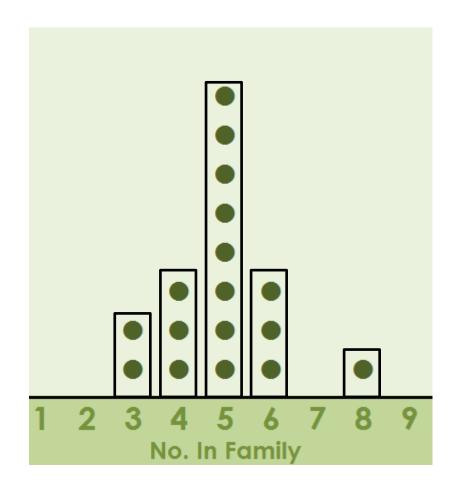
□ female? □ male?
```

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

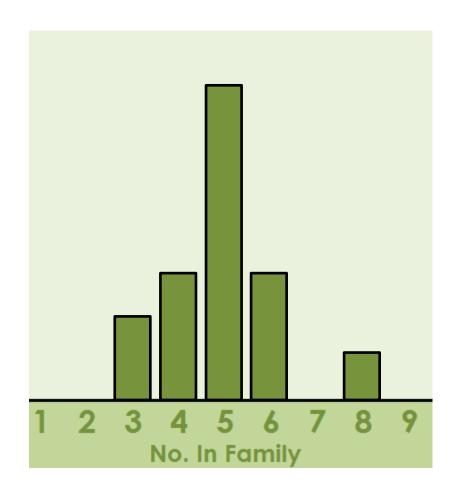
Males Females

Key: 13 | 4 = 134 cm

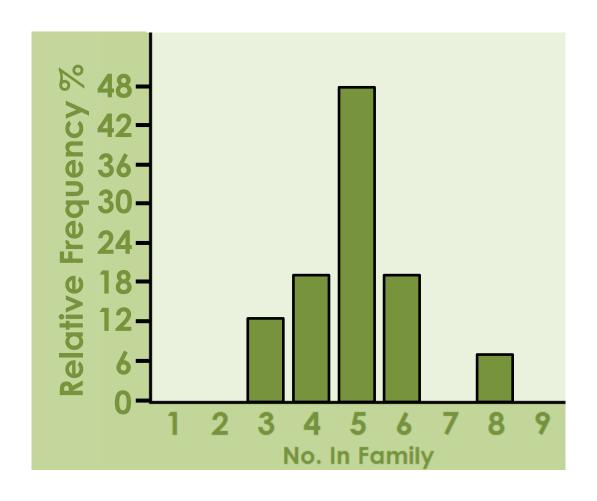
Line Plot to Frequency Bar Chart

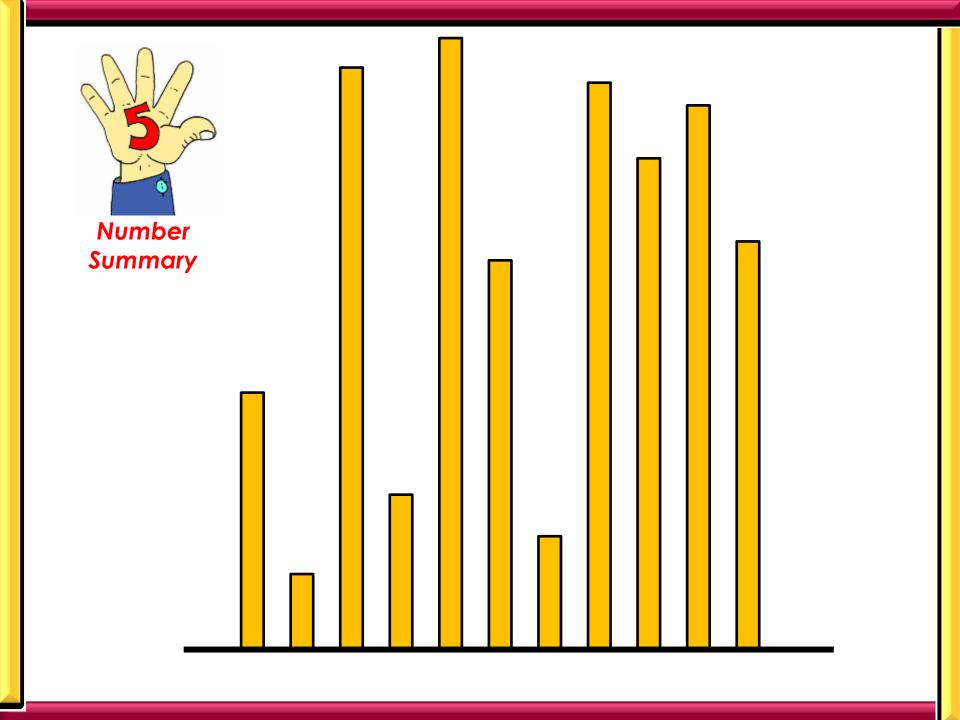


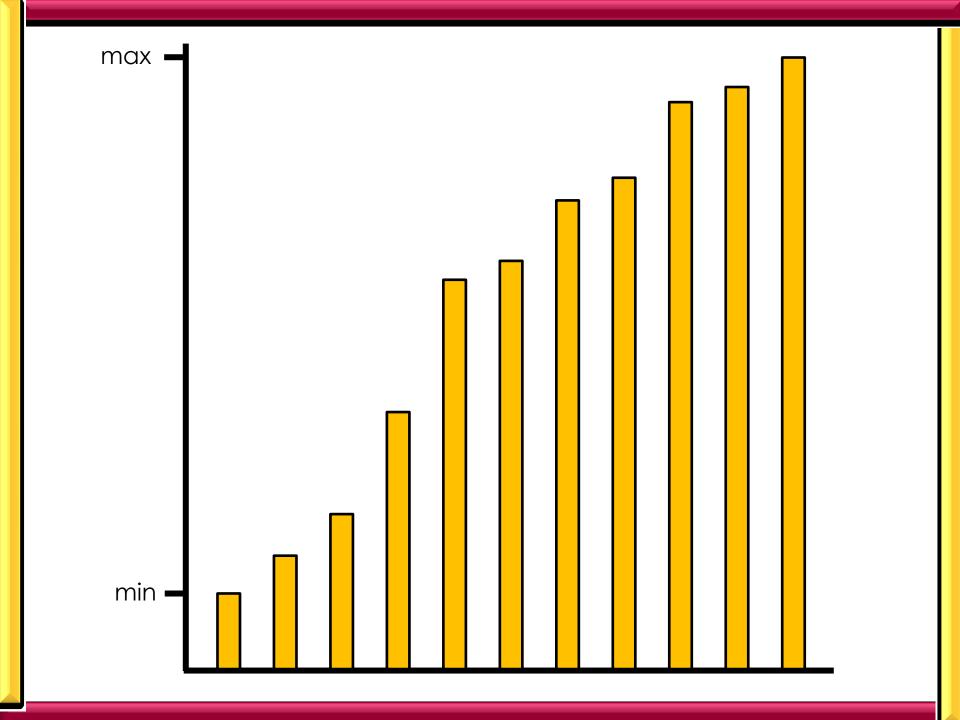
Line Plot to Frequency Bar Chart

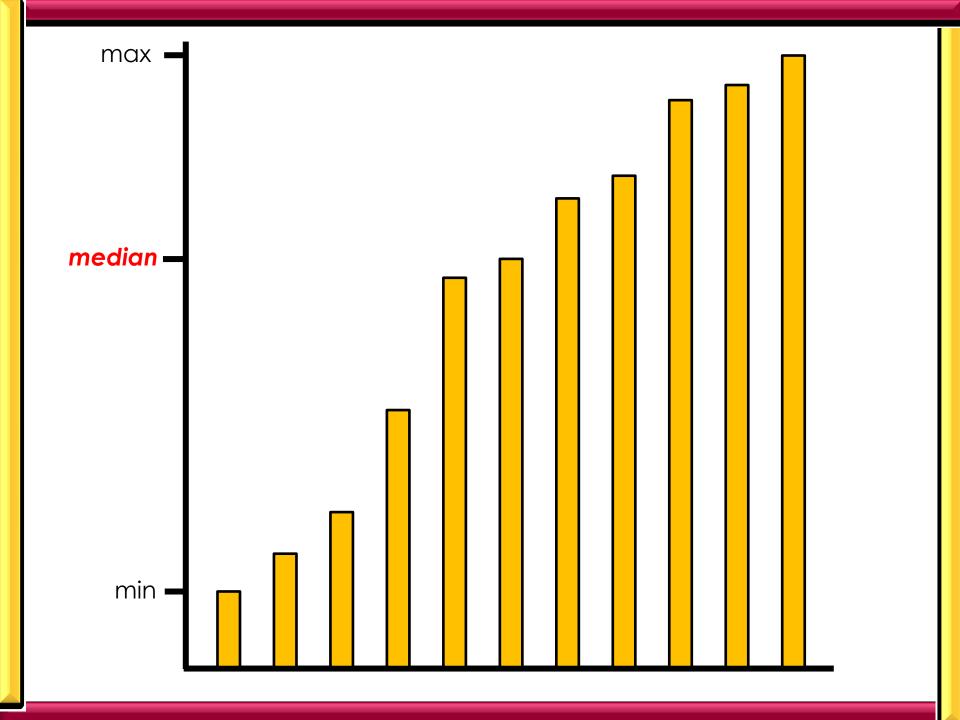


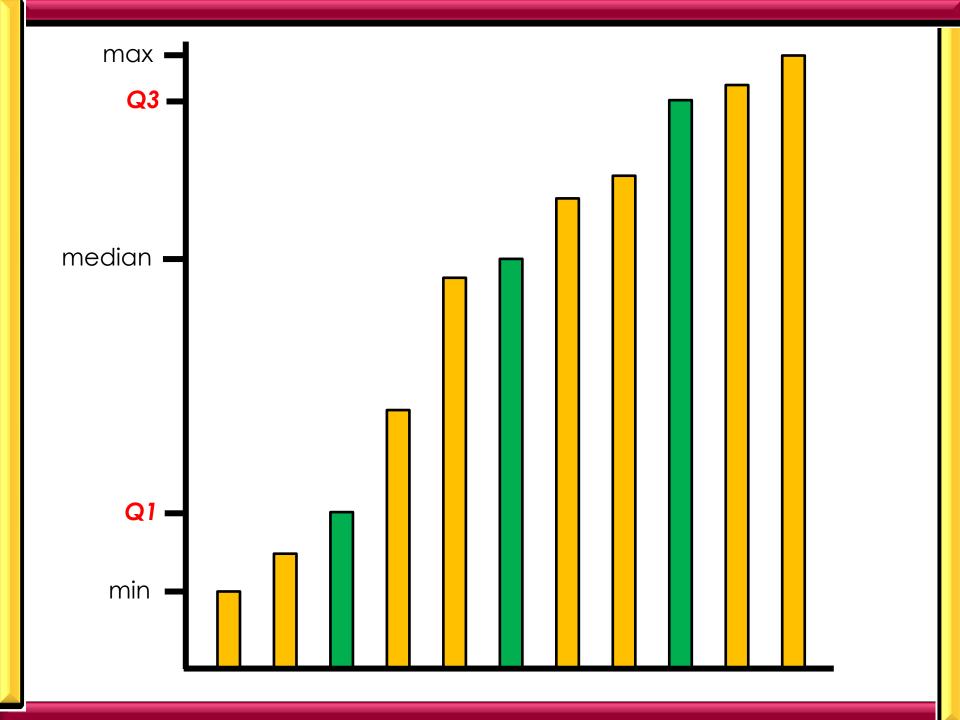
Bar Chart to Relative Frequency Bar Chart

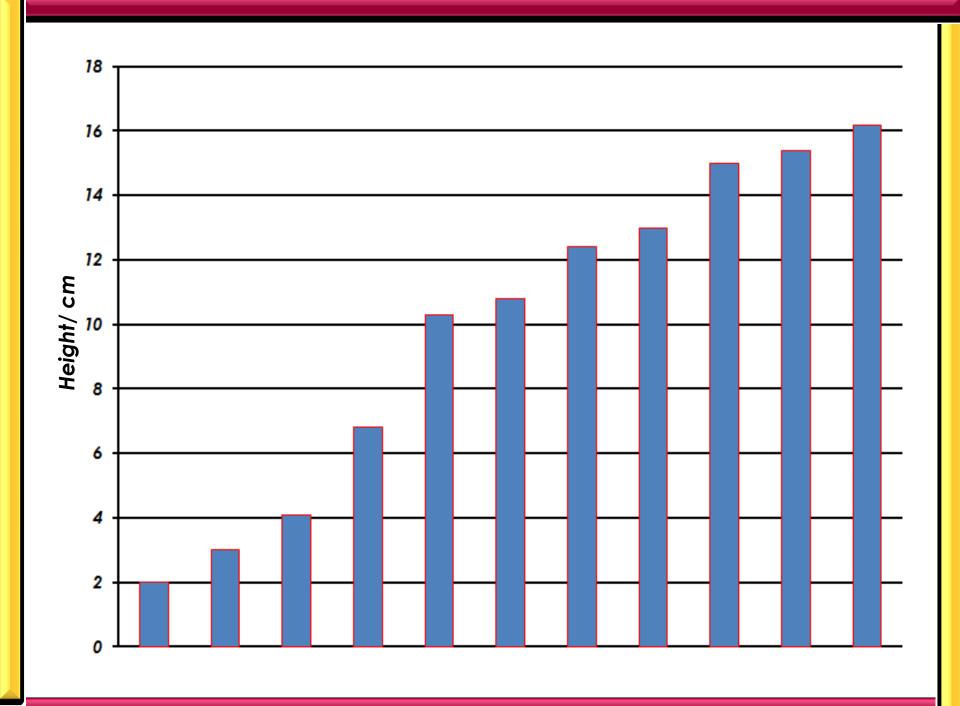


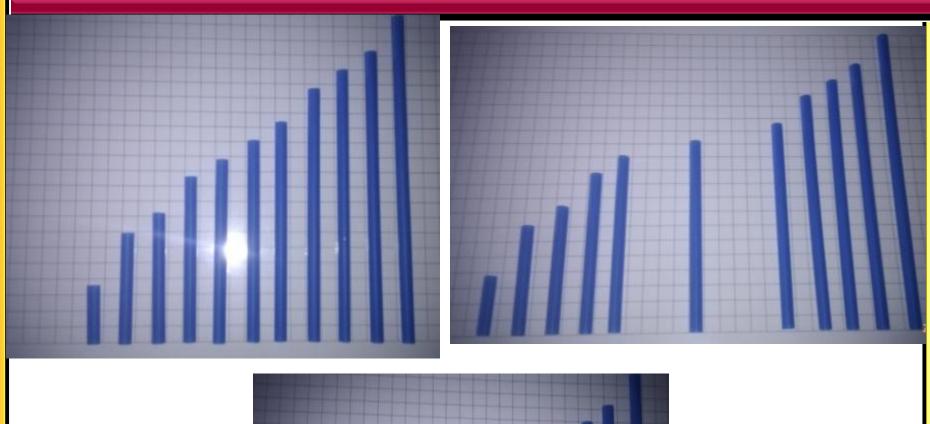


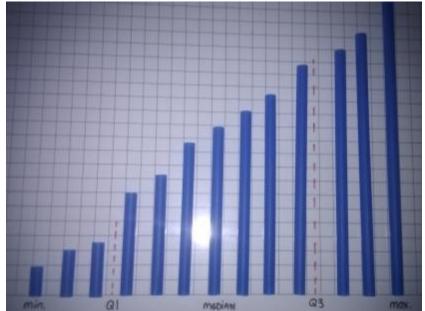




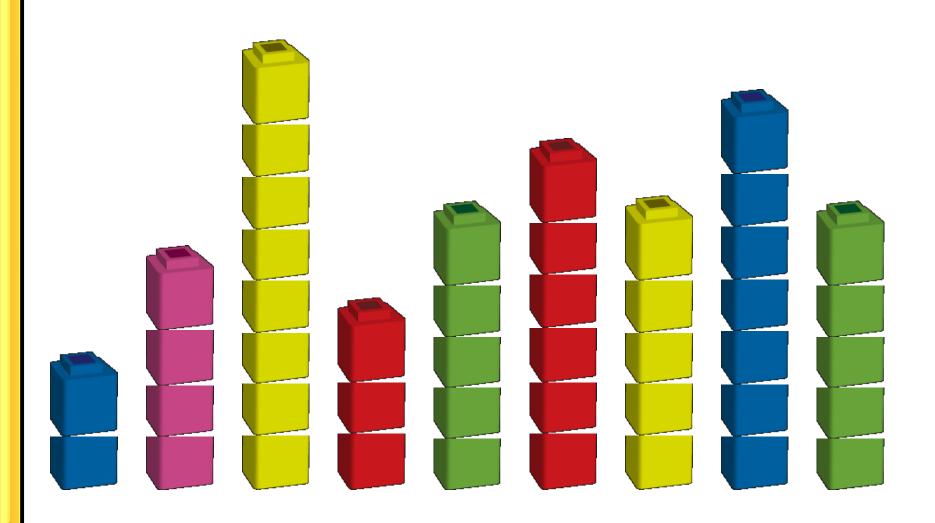




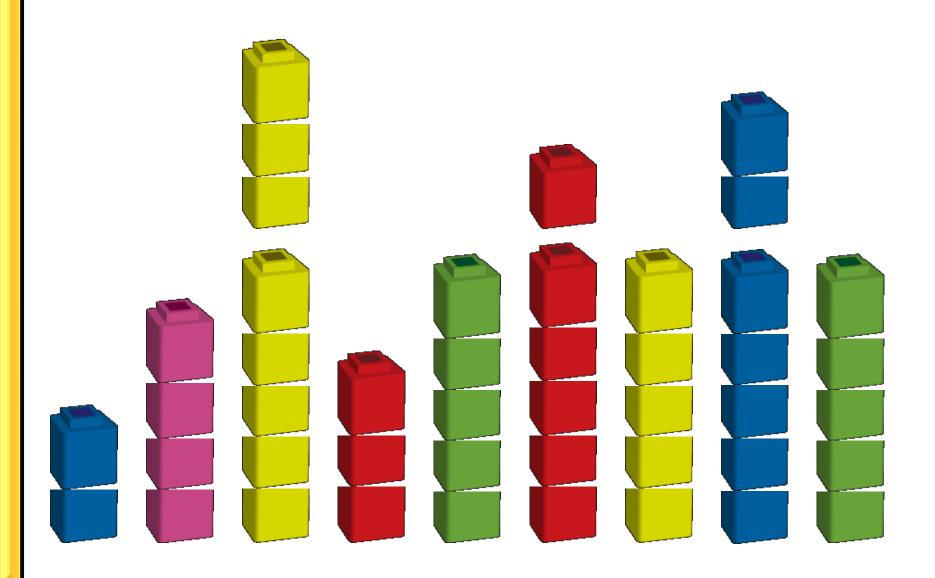




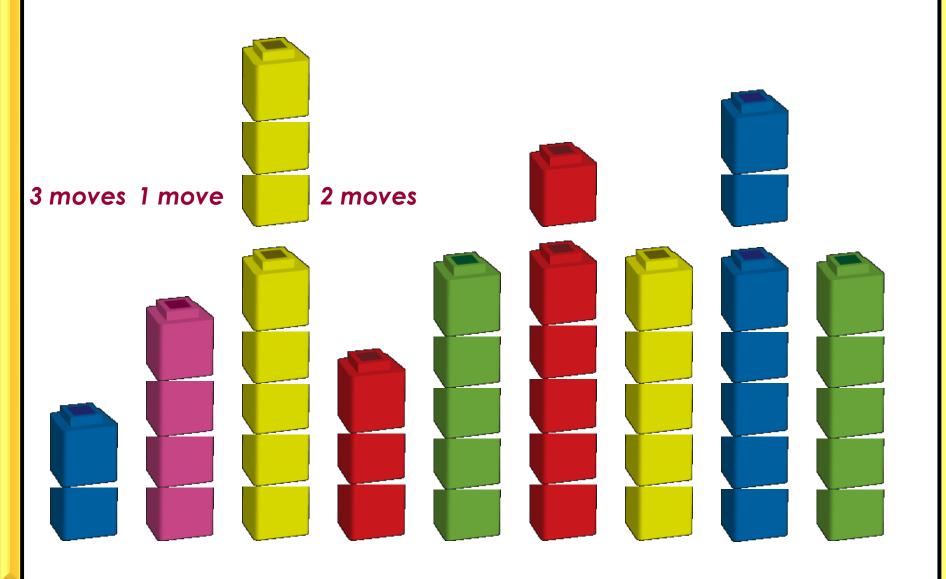
Fair & Unfair Allocations



Fair & Unfair Allocations



Fair & 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					
В	1	10	10	1	1	10	1	10	1					
С	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					

	1	2	3	4	5	6	7	8	9	Ranking	Median	Moves	Mean	
Α	6	5	5	4	5	5	6	5	4	1				
В	1	10	10	1	1	10	1	10	1	6				
С	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				

	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			
В	1	10	10	1	1	10	1	10	1	6	1			
С	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			

	1	2	3	4	5	6	7	8	9	Ranking	Median	Moves	Mean	
Α	6	5	5	4	5	5	6	5	4	1	5	2		
В	1	10	10	1	1	10	1	10	1	6	1	20		
С	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		

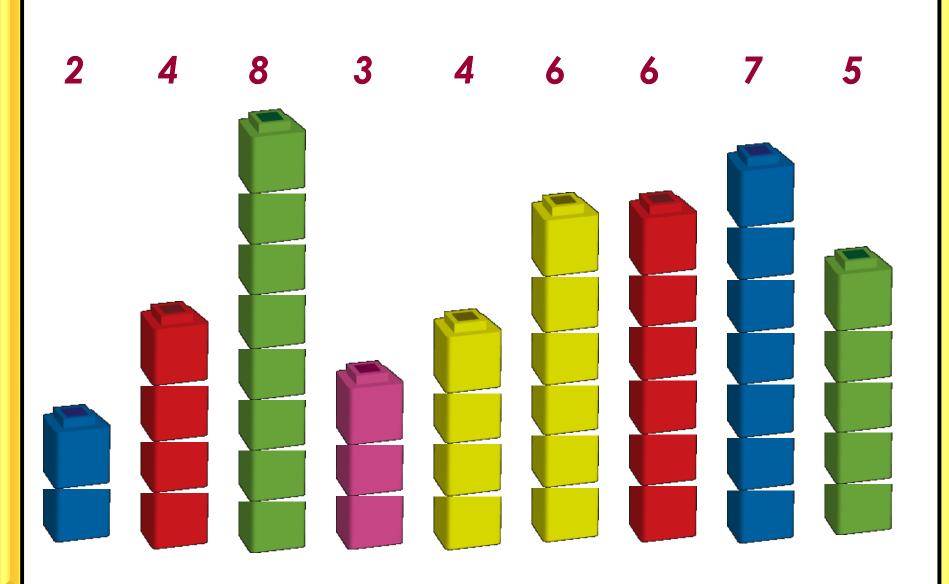
	1	2	3	4	5	6	7	8	9	Ranking	Median	Moves	Mean	
Α	6	5	5	4	5	5	6	5	4	1	5	2	5	
В	1	10	10	1	1	10	1	10	1	6	1	20	5	
С	2	4	8	3	4	6	6	7	5	3	5	7	5	
D	4	4	7	4	4	5	6	7	4	2	4	5	5	
Ε	1	4	8	4	4	6	6	8	4	4	4	8	5	
F	8	1	7	7	4	1	3	7	7	5	7	11	5	

The Mean & The Median

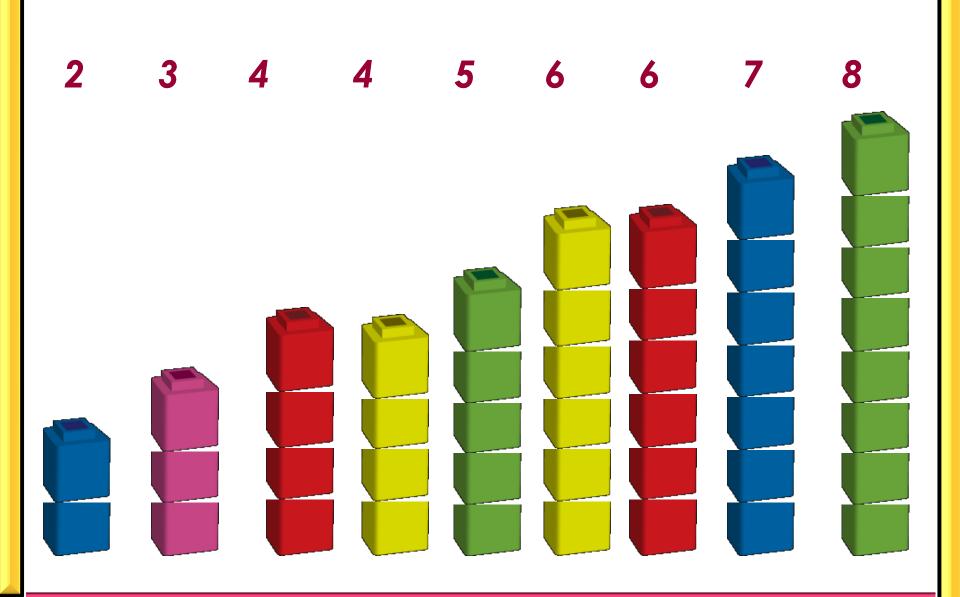
Let's now contrast the mean and the median as summary measures.

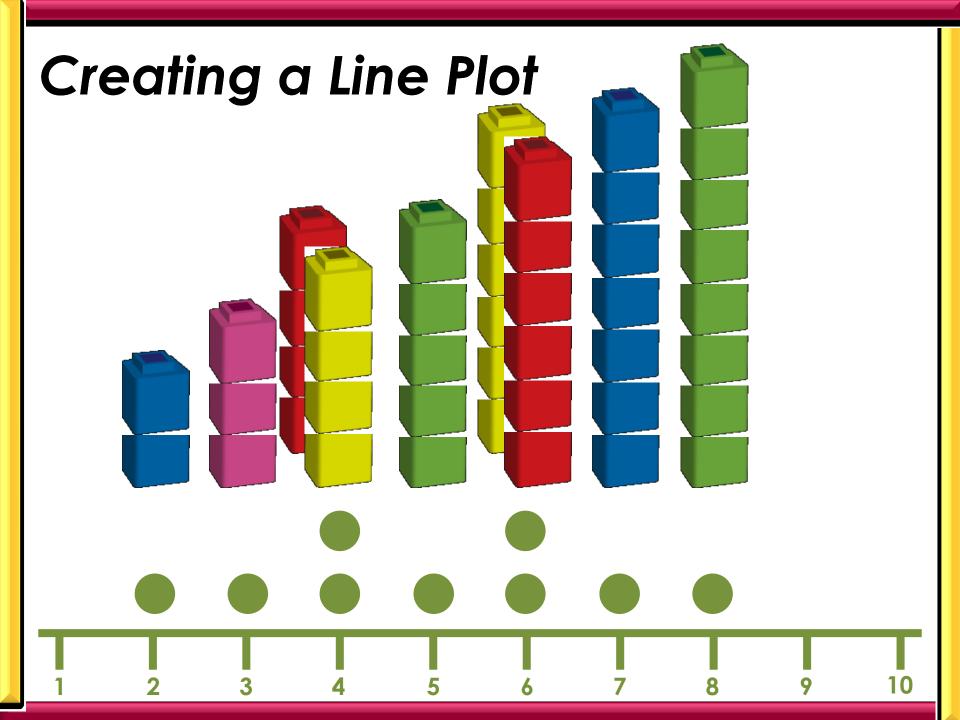
Do you expect that the median stack size for the 9 stacks will always be the same for any allocation? Why or why not?

The Mean & The Median

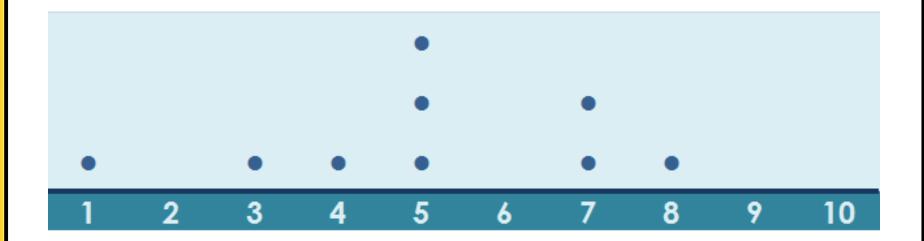


The Mean & The Median

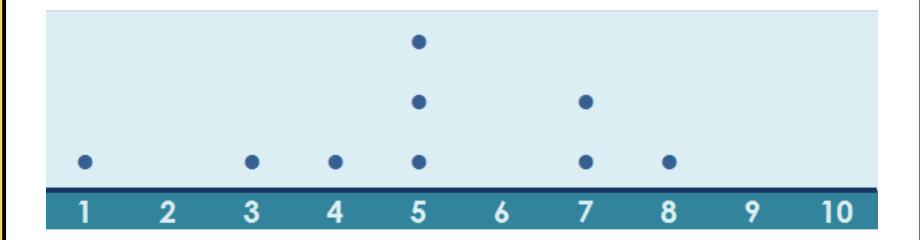




Deviations from the Mean



Standard Deviation



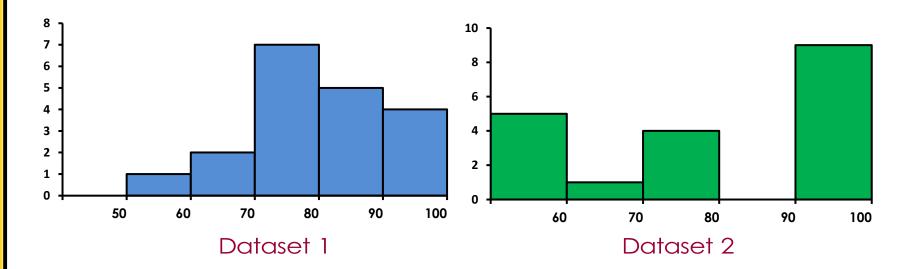
Standard Deviation using Calculator

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



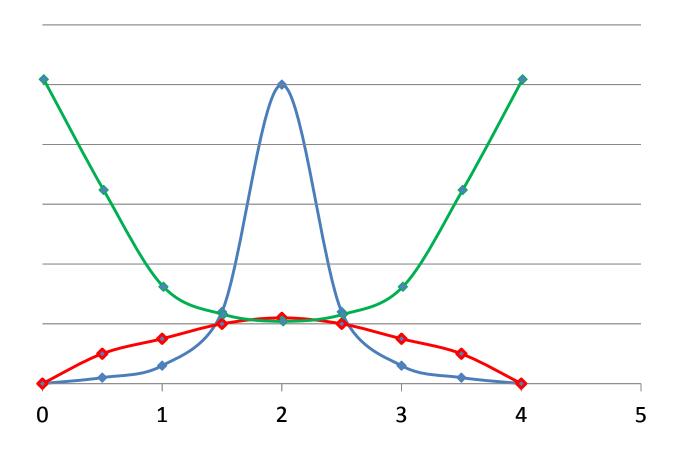
	1	2	3	4	5	6	7	8	9	Ranking	Median	Moves	Mean	S.D.
Α	6	5	5	4	5	5	6	5	4	1	5	2	5	0.67
В	1	10	10	1	1	10	1	10	1	6	1	20	5	4.47
С	2	4	8	3	4	6	6	7	5	3	5	7	5	1.83
D	4	4	7	4	4	5	6	7	4	2	4	5	5	1.25
E	1	4	8	4	4	6	6	8	4	4	4	8	5	2.11
F	8	1	7	7	4	1	3	7	7	5	7	11	5	2.62

Which data set has the highest Standard Deviation?



	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