

VIDEO SUMMARIES: PROBABILITY

NORMAL DISTRIBUTION

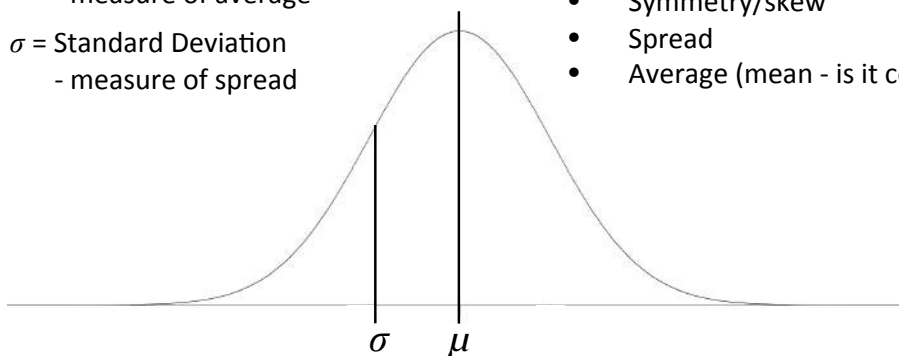
What you need to know:

μ = Mean

- measure of average

σ = Standard Deviation

- measure of spread



Comment on:

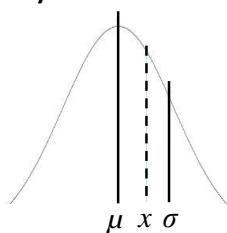
- Symmetry/skew
- Spread
- Average (mean - is it centred)

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NORMAL DISTRIBUTION - Z CHARTS

What you need to know:



x = No. of interest

μ = Mean

σ = Standard Deviation

Z = No. of standard deviations

$$Z = \frac{x - \mu}{\sigma}$$

Standard Normal Distribution
 $(z = \frac{x - \mu}{\sigma})$
 Each entry gives the probability that the standardized normal random variable Z lies between 0 and z .

z		0	1	2	3	4	5	6	7	8	9
0.0	0.00	0.5000	0.5039	0.5078	0.5117	0.5156	0.5195	0.5234	0.5273	0.5311	0.5350
0.1	0.01	0.5040	0.5079	0.5118	0.5157	0.5196	0.5235	0.5274	0.5313	0.5352	0.5391
0.2	0.02	0.5080	0.5119	0.5158	0.5197	0.5236	0.5275	0.5314	0.5353	0.5392	0.5431
0.3	0.03	0.5120	0.5159	0.5198	0.5237	0.5276	0.5315	0.5354	0.5393	0.5432	0.5471
0.4	0.04	0.5160	0.5199	0.5238	0.5277	0.5316	0.5355	0.5394	0.5433	0.5472	0.5511
0.5	0.05	0.5200	0.5239	0.5278	0.5317	0.5356	0.5395	0.5434	0.5473	0.5512	0.5551
0.6	0.06	0.5240	0.5279	0.5318	0.5357	0.5396	0.5435	0.5474	0.5513	0.5552	0.5591
0.7	0.07	0.5280	0.5319	0.5358	0.5397	0.5436	0.5475	0.5514	0.5553	0.5592	0.5631
0.8	0.08	0.5320	0.5359	0.5398	0.5437	0.5476	0.5515	0.5554	0.5593	0.5632	0.5671
0.9	0.09	0.5360	0.5399	0.5438	0.5477	0.5516	0.5555	0.5594	0.5633	0.5672	0.5711
1.0	0.10	0.5400	0.5439	0.5478	0.5517	0.5556	0.5595	0.5634	0.5673	0.5712	0.5751
1.1	0.11	0.5440	0.5479	0.5518	0.5557	0.5596	0.5635	0.5674	0.5713	0.5752	0.5791
1.2	0.12	0.5480	0.5519	0.5558	0.5597	0.5636	0.5675	0.5714	0.5753	0.5792	0.5831
1.3	0.13	0.5520	0.5559	0.5598	0.5637	0.5676	0.5715	0.5754	0.5793	0.5832	0.5871
1.4	0.14	0.5560	0.5599	0.5638	0.5677	0.5716	0.5755	0.5794	0.5833	0.5872	0.5911
1.5	0.15	0.5600	0.5639	0.5678	0.5717	0.5756	0.5795	0.5834	0.5873	0.5912	0.5951
1.6	0.16	0.5640	0.5679	0.5718	0.5757	0.5796	0.5835	0.5874	0.5913	0.5952	0.5991
1.7	0.17	0.5680	0.5719	0.5758	0.5797	0.5836	0.5875	0.5914	0.5953	0.5992	0.6031
1.8	0.18	0.5720	0.5759	0.5798	0.5837	0.5876	0.5915	0.5954	0.5993	0.6032	0.6071
1.9	0.19	0.5760	0.5799	0.5838	0.5877	0.5916	0.5955	0.5994	0.6033	0.6072	0.6111
2.0	0.20	0.5800	0.5839	0.5878	0.5917	0.5956	0.5995	0.6034	0.6073	0.6112	0.6151
2.1	0.21	0.5840	0.5879	0.5918	0.5957	0.5996	0.6035	0.6074	0.6113	0.6152	0.6191
2.2	0.22	0.5880	0.5919	0.5958	0.5997	0.6036	0.6075	0.6114	0.6153	0.6192	0.6231
2.3	0.23	0.5920	0.5959	0.5998	0.6037	0.6076	0.6115	0.6154	0.6193	0.6232	0.6271
2.4	0.24	0.5960	0.5999	0.6038	0.6077	0.6116	0.6155	0.6194	0.6233	0.6272	0.6311
2.5	0.25	0.6000	0.6039	0.6078	0.6117	0.6156	0.6195	0.6234	0.6273	0.6312	0.6351
2.6	0.26	0.6040	0.6079	0.6118	0.6157	0.6196	0.6235	0.6274	0.6313	0.6352	0.6391
2.7	0.27	0.6080	0.6119	0.6158	0.6197	0.6236	0.6275	0.6314	0.6353	0.6392	0.6431
2.8	0.28	0.6120	0.6159	0.6198	0.6237	0.6276	0.6315	0.6354	0.6393	0.6432	0.6471
2.9	0.29	0.6160	0.6199	0.6238	0.6277	0.6316	0.6355	0.6394	0.6433	0.6472	0.6511
3.0	0.30	0.6200	0.6239	0.6278	0.6317	0.6356	0.6395	0.6434	0.6473	0.6512	0.6551
3.1	0.31	0.6240	0.6279	0.6318	0.6357	0.6396	0.6435	0.6474	0.6513	0.6552	0.6591
3.2	0.32	0.6280	0.6319	0.6358	0.6397	0.6436	0.6475	0.6514	0.6553	0.6592	0.6631
3.3	0.33	0.6320	0.6359	0.6398	0.6437	0.6476	0.6515	0.6554	0.6593	0.6632	0.6671
3.4	0.34	0.6360	0.6399	0.6438	0.6477	0.6516	0.6555	0.6594	0.6633	0.6672	0.6711
3.5	0.35	0.6400	0.6439	0.6478	0.6517	0.6556	0.6595	0.6634	0.6673	0.6712	0.6751
3.6	0.36	0.6440	0.6479	0.6518	0.6557	0.6596	0.6635	0.6674	0.6713	0.6752	0.6791
3.7	0.37	0.6480	0.6519	0.6558	0.6597	0.6636	0.6675	0.6714	0.6753	0.6792	0.6831
3.8	0.38	0.6520	0.6559	0.6598	0.6637	0.6676	0.6715	0.6754	0.6793	0.6832	0.6871
3.9	0.39	0.6560	0.6599	0.6638	0.6677	0.6716	0.6755	0.6794	0.6833	0.6872	0.6911
4.0	0.40	0.6600	0.6639	0.6678	0.6717	0.6756	0.6795	0.6834	0.6873	0.6912	0.6951
4.1	0.41	0.6640	0.6679	0.6718	0.6757	0.6796	0.6835	0.6874	0.6913	0.6952	0.6991
4.2	0.42	0.6680	0.6719	0.6758	0.6797	0.6836	0.6875	0.6914	0.6953	0.6992	0.7031
4.3	0.43	0.6720	0.6759	0.6798	0.6837	0.6876	0.6915	0.6954	0.6993	0.7032	0.7071
4.4	0.44	0.6760	0.6799	0.6838	0.6877	0.6916	0.6955	0.6994	0.7033	0.7072	0.7111
4.5	0.45	0.6800	0.6839	0.6878	0.6917	0.6956	0.6995	0.7034	0.7073	0.7112	0.7151
4.6	0.46	0.6840	0.6879	0.6918	0.6957	0.6996	0.7035	0.7074	0.7113	0.7152	0.7191
4.7	0.47	0.6880	0.6919	0.6958	0.6997	0.7036	0.7075	0.7114	0.7153	0.7192	0.7231
4.8	0.48	0.6920	0.6959	0.6998	0.7037	0.7076	0.7115	0.7154	0.7193	0.7232	0.7271
4.9	0.49	0.6960	0.6999	0.7038	0.7077	0.7116	0.7155	0.7194	0.7233	0.7272	0.7311
5.0	0.50	0.7000	0.7039	0.7078	0.7117	0.7156	0.7195	0.7234	0.7273	0.7312	0.7351

The Z chart is used to change between Z scores and probabilities

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VIDEO SUMMARIES: PROBABILITY

NORMAL DISTRIBUTION – FINDING A PROBABILITY

Nutty Snack Bars are produced on machines operated by shift workers. The weights of the bars are normally distributed, with a mean of 41 grams and standard deviation of 0.8 grams. What percentage of Nutty Snack Bars weigh more than 42 grams?

Calculator:

- MENU** STAT
- F5** DIST
- F2** NORM
- F1** NcD
- L.List – 42
- U.List – 9999999
- $\sigma - 0.8$
- $\mu - 41$ Prob = 0.10564
- EXE** =10.564%

Hand:

- Write out formula
- List what you know
 $x = 42, \sigma = 0.8, \mu = 41$
- Substitute and solve
- Find probabilities from table

a variable Z lies between 0 and

		Differences				
Z	0	1	2	3	4	
0.0	0.2420	0.2445	0.2470	0.2495	0.2520	
0.1	0.2549	0.2574	0.2599	0.2625	0.2650	
0.2	0.2675	0.2700	0.2725	0.2750	0.2774	
0.3	0.2809	0.2834	0.2859	0.2884	0.2909	
0.4	0.2943	0.2968	0.2993	0.3018	0.3043	
0.5	0.3078	0.3103	0.3128	0.3153	0.3178	
0.6	0.3213	0.3238	0.3263	0.3288	0.3313	
0.7	0.3348	0.3373	0.3398	0.3423	0.3448	
0.8	0.3483	0.3508	0.3533	0.3558	0.3583	
0.9	0.3618	0.3643	0.3668	0.3693	0.3718	
1.0	0.3753	0.3778	0.3803	0.3828	0.3853	
1.1	0.3888	0.3913	0.3938	0.3963	0.3988	
1.2	0.4023	0.4048	0.4073	0.4098	0.4123	
1.3	0.4158	0.4183	0.4208	0.4233	0.4258	
1.4	0.4293	0.4318	0.4343	0.4368	0.4393	
1.5	0.4428	0.4453	0.4478	0.4503	0.4528	
1.6	0.4563	0.4588	0.4613	0.4638	0.4663	
1.7	0.4688	0.4713	0.4738	0.4763	0.4788	
1.8	0.4813	0.4838	0.4863	0.4888	0.4913	
1.9	0.4938	0.4963	0.4988	0.5013	0.5038	
2.0	0.5063	0.5088	0.5113	0.5138	0.5163	
2.1	0.5188	0.5213	0.5238	0.5263	0.5288	
2.2	0.5313	0.5338	0.5363	0.5388	0.5413	
2.3	0.5438	0.5463	0.5488	0.5513	0.5538	
2.4	0.5563	0.5588	0.5613	0.5638	0.5663	
2.5	0.5688	0.5713	0.5738	0.5763	0.5788	
2.6	0.5813	0.5838	0.5863	0.5888	0.5913	
2.7	0.5938	0.5963	0.5988	0.6013	0.6038	
2.8	0.6063	0.6088	0.6113	0.6138	0.6163	
2.9	0.6188	0.6213	0.6238	0.6263	0.6288	
3.0	0.6313	0.6338	0.6363	0.6388	0.6413	
3.1	0.6438	0.6463	0.6488	0.6513	0.6538	
3.2	0.6563	0.6588	0.6613	0.6638	0.6663	
3.3	0.6688	0.6713	0.6738	0.6763	0.6788	
3.4	0.6813	0.6838	0.6863	0.6888	0.6913	
3.5	0.6938	0.6963	0.6988	0.7013	0.7038	
3.6	0.7063	0.7088	0.7113	0.7138	0.7163	
3.7	0.7188	0.7213	0.7238	0.7263	0.7288	
3.8	0.7313	0.7338	0.7363	0.7388	0.7413	
3.9	0.7438	0.7463	0.7488	0.7513	0.7538	
4.0	0.7563	0.7588	0.7613	0.7638	0.7663	

$z = \frac{x - \mu}{\sigma}$

$z = \frac{42 - 41}{0.8} = 1.25$

The percentage that weighs more than 42g is 10.56%

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NORMAL DISTRIBUTION

Nutty Snack Bars are produced on machines operated by shift workers. The weights of the bars are normally distributed, with a mean of 41 grams and standard deviation of 0.8 grams. Above what weight do 10% of Nutty Snack Bars lie?

Calculator:

- MENU** STAT
- ||** DIST
- ||** NORM
- F3** InvN
- Area – 0.9
- $\sigma - 0.8$
- $\mu - 41$
- $x = 42.0245$ g

Hand:

- Write out formula
- List what you know
- Calculate Z value
- Calculate x values

$$Z = \frac{x - \mu}{\sigma}$$

$$1.281 = \frac{x - 41}{0.8}$$

$$x = 42.0245 \text{ g}$$

a variable Z lies between 0 and

		Differences				
Z	0	1	2	3	4	
0.0	0.2420	0.2445	0.2470	0.2495	0.2520	
0.1	0.2549	0.2574	0.2599	0.2625	0.2650	
0.2	0.2675	0.2700	0.2725	0.2750	0.2774	
0.3	0.2809	0.2834	0.2859	0.2884	0.2909	
0.4	0.2943	0.2968	0.2993	0.3018	0.3043	
0.5	0.3078	0.3103	0.3128	0.3153	0.3178	
0.6	0.3213	0.3238	0.3263	0.3288	0.3313	
0.7	0.3348	0.3373	0.3398	0.3423	0.3448	
0.8	0.3483	0.3508	0.3533	0.3558	0.3583	
0.9	0.3618	0.3643	0.3668	0.3693	0.3718	
1.0	0.3753	0.3778	0.3803	0.3828	0.3853	
1.1	0.3888	0.3913	0.3938	0.3963	0.3988	
1.2	0.4023	0.4048	0.4073	0.4098	0.4123	
1.3	0.4158	0.4183	0.4208	0.4233	0.4258	
1.4	0.4293	0.4318	0.4343	0.4368	0.4393	
1.5	0.4428	0.4453	0.4478	0.4503	0.4528	
1.6	0.4563	0.4588	0.4613	0.4638	0.4663	
1.7	0.4688	0.4713	0.4738	0.4763	0.4788	
1.8	0.4813	0.4838	0.4863	0.4888	0.4913	
1.9	0.4938	0.4963	0.4988	0.5013	0.5038	
2.0	0.5063	0.5088	0.5113	0.5138	0.5163	
2.1	0.5188	0.5213	0.5238	0.5263	0.5288	
2.2	0.5313	0.5338	0.5363	0.5388	0.5413	
2.3	0.5438	0.5463	0.5488	0.5513	0.5538	
2.4	0.5563	0.5588	0.5613	0.5638	0.5663	
2.5	0.5688	0.5713	0.5738	0.5763	0.5788	
2.6	0.5813	0.5838	0.5863	0.5888	0.5913	
2.7	0.5938	0.5963	0.5988	0.6013	0.6038	
2.8	0.6063	0.6088	0.6113	0.6138	0.6163	
2.9	0.6188	0.6213	0.6238	0.6263	0.6288	
3.0	0.6313	0.6338	0.6363	0.6388	0.6413	
3.1	0.6438	0.6463	0.6488	0.6513	0.6538	
3.2	0.6563	0.6588	0.6613	0.6638	0.6663	
3.3	0.6688	0.6713	0.6738	0.6763	0.6788	
3.4	0.6813	0.6838	0.6863	0.6888	0.6913	
3.5	0.6938	0.6963	0.6988	0.7013	0.7038	
3.6	0.7063	0.7088	0.7113	0.7138	0.7163	
3.7	0.7188	0.7213	0.7238	0.7263	0.7288	
3.8	0.7313	0.7338	0.7363	0.7388	0.7413	
3.9	0.7438	0.7463	0.7488	0.7513	0.7538	
4.0	0.7563	0.7588	0.7613	0.7638	0.7663	

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VIDEO SUMMARIES: PROBABILITY

PROBABILITY TABLES

Tables, Proportions and Relative Risk

a) What proportion of people in the trial, aged under 40 years, showed symptoms of arthritis?

	No symptoms of arthritis shown	Some symptoms of arthritis shown	Total
Under 40	394	107	501
40 and over	178	121	299
Total	572	228	800

$$\text{Proportion} = \frac{\text{No. of interest}}{\text{Total}}$$

$$\text{Proportion} = \frac{107}{501} = 0.2135 = 21.4\%$$

$$\text{Relative Risk} = \frac{\text{Proportion 1}}{\text{Proportion 2}}$$

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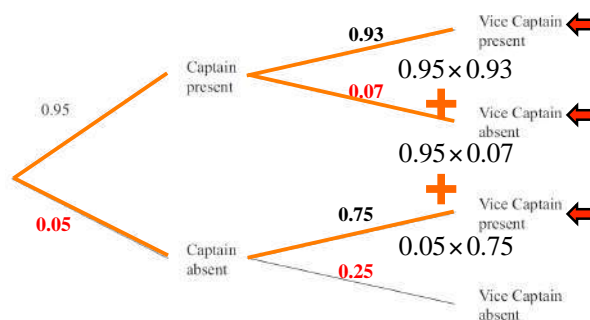
PROBABILITY TREES

- Always show probabilities as a decimal
- Each set of branches add to one
- Always look at end result
- x down braches + end results

There is a special team's award presented at a school assembly. There is no prior warning about the award. The hockey team is to receive the award.

The award must be accepted by the Captain or, if the Captain is absent, by the Vice Captain.

The Captain of the hockey team is present at assembly 95% of the time. The Vice Captain of the team is present at assembly 93% of the time that the Captain is present and 75% of the time the Captain is absent. Calculate the probability that the award will be presented to the hockey team at the assembly (i.e. at least the Captain or the Vice Captain is present at the assembly).



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