February 13, 2020

1) Notes
2) Calculator
3) Homework
4) Normal Table

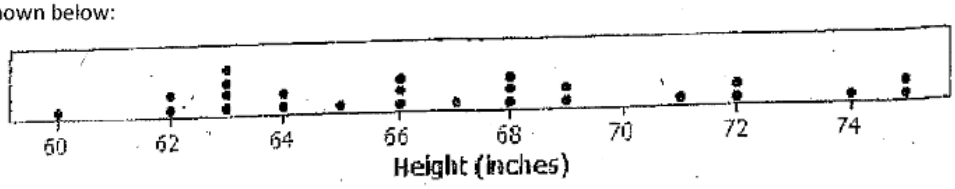
0:04:21

When you check your bank account after "living your best life" this weekend..

Statistical Reasoning
Percentiles and Z-Scores – Practice

Name: _____
Date: _____

Mrs. Navard's statistic class has just completed the human dot plot activity we did in class. Their data is shown below:



1. Give the summary statistics below:

Number of students in class: Mean: 67 Std. Dev: 4.3

Min: 60 Q_1: 63 Med: 66 Q_3: 70 Max: 75

2. Lynette, who is a student in the class, is 65in tall. What is Lynette's percentile in the class's height distribution?

$\frac{10}{25} = 0.4$ 40th percentile - 40% of the class is 65 in or shorter

3. Where does Lynette "stand" relative to the mean of the distribution (z-score)? What does it mean? (In other words, is she tall or short relative to her classmates?)

$Z = \frac{65-67}{4.3} = -0.5$ negative z-score thats close to zero means that she is shorter than average, but close to average

4. Find the z-score of the following and explain what this number means in terms of the standard deviation.

a. 71 inches

$Z = \frac{71-67}{4.3} = 0.93$ (a) 0.93 St. dev above the mean

b. 68 inches

$Z = \frac{68-67}{4.3} = 0.23$ (b) 0.23 St. dev above the mean

c. 63 inches

$Z = \frac{63-67}{4.3} = -0.93$ (c) 0.93 St. dev below the mean

d. 75 inches

$Z = \frac{75-67}{4.3} = 1.86$ (d) 1.86 St. dev above the mean

5. Sofia scores 600 on the SAT Math test. The distribution of SAT scores in the population is roughly symmetric and single-peaked with mean 500 and standard deviation 100. Jim takes the ACT Math test and scores 26. ACT scores follow a symmetric, single-peaked distribution with mean 18 and standard deviation 6. Assuming that both tests measure the same kind of ability, who did better? (Show work and summarize your findings using a few sentences.

Sofia

$z = \frac{600-500}{100} = 1.00$

Jim

$z = \frac{26-18}{6} = 1.30$

* Jim did better. He has a higher z-score which means his score is bigger than average

6. Complete the following book problems on this paper.

PG. 105 #3.1, 3.5, 3.6

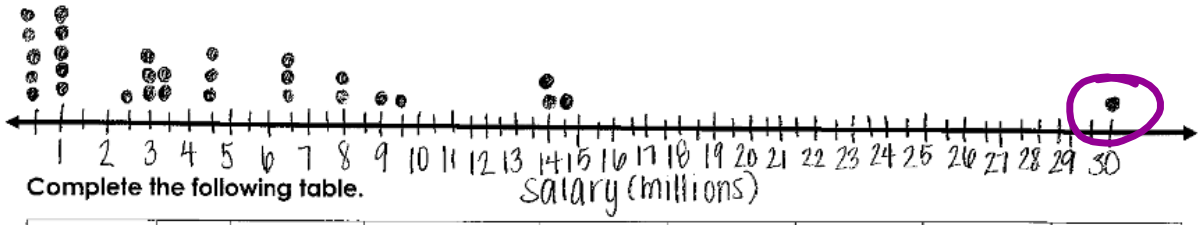
Statistical Reasoning
Practice: Percentiles and Z-Scores in Salaries

Name: _____
Date: _____ Period: _____

Average Salaries for 30 Atlanta Falcons, 2018

Player	Avg Salary (millions)	Player	Avg Salary (millions)	Player	Avg Salary (millions)
Matt Ryan	30	Jake Matthews	14.5	Julio Jones	14
Desmond Trufant	14	Robert Alford	9.5	Alex Mack	9
Devonta Freeman	8	Andy Levitre	8	Mohamed Sanu	6.5
Ricardo Allen	6.5	Ryan Schraeder	6.5	Matt Schaub	4.5
Brooks Reed	4.5	Brandon Fusco	4.5	Vic Beasley	3.5
Matt Bryant	3.5	Jack Crawford	3	Ben Garland	3
Calvin Ridley	3	Keanu Neal	2.5	Tevin Coleman	1
Austin Hooper	1	Justin Hardy	0.5	Grady Jarrett	0.5
Richard Jarvis	0.5	Brian Poole	0.5	Justin Zimmer	0.5
Russell Gage	1	Ito Smith	1	Deion Jones	1

1. Create a dotplot of the salary.



Complete the following table.

Variable	n	Mean	St. dev	Min	Q1	M	Q3	Max
Average Salary	30	5.5	6.3	0.5	1	3.5	8	30

2. Find the percentile for Brooks Reed's salary. Explain what this means.

$\frac{19}{30} = 0.63$ 63rd percentile - 63% of the team makes 4.5 million or below.

3. Find the z-score corresponding to Reed's salary. Explain what this means.

$Z = \frac{4.5-5.5}{6.3} = -0.161$ Reed's salary is 0.16 standard deviations below the mean.

4. Find the percentile for Tevin Coleman salary. Explain what this means.

$\frac{10}{30} = 0.33$ 33rd percentile - 33% of the team makes 1 million or less.

5. Find the z-score corresponding to Tevin Coleman's salary. Explain what this means.

$Z = \frac{1-5.5}{6.3} = -0.71$ Coleman's salary is 0.71 standard deviations below the mean.

6. Find the percentile for Matt Ryan's salary. Explain what this means.

$\frac{30}{30} = 1$ 100% – 99th percentile – 99% of the team makes 30 million or less.

7. Find the z-score corresponding to Ryan's salary. Explain what this means.

$Z = \frac{30-5.5}{6.3} = \boxed{3.89}$ Ryan's salary is 3.89 standard deviations above the mean.

8. Based on his z-score, would you consider Matt Ryan's salary to be unusual? Why or why not?

Ryan's salary is unusual because z-scores are rarely above 3 or below -3.

9. Prove whether or not Matt Ryan's salary is an outlier. Make sure to use the formula.

Above = $Q_3 + 1.5(IQR)$
$= 8 + 1.5(7)$
$= 18.5 \leftarrow$ yes

30 is outside of the fence (18.5)
30 is an outlier

10. Which player has a z-score close to 2.5? (Hint: z = 2.5, Solve for x)

$6.3 \quad 2.5 = \frac{X-5.5}{6.3} \cdot 6.3$

Jake Matthen's z-score is the closest to 2.5.

$15.75 = X - 5.5 \rightarrow \boxed{X = 21.25}$
$+5.5 \quad +5.5$

11. Which player has a z-score close to -0.5?

$6.3 \quad -0.5 = \frac{X-5.5}{6.3} \cdot 6.3$

Keanu Neal's salary is the closest to -0.5.

$-3.15 = X - 5.5 \rightarrow \boxed{X = 2.35}$
$+5.5 \quad +5.5$

12. Describe using vocabulary and calculations, the distribution of the 30 Atlanta Falcon average salaries.

a. Center

mean = 5.5
median = 3.5

b. ~~Shape~~ Spread

range = 30 – 0.5 = 29.5
IQR = 8 – 1 = 7
Standard deviation = 6.3

c. Shape

Skewed right – Outlier is on the right

Topic: Using the Normal Table (Medium) **Date:** _____

What am I learning today?

Main Ideas/ Questions

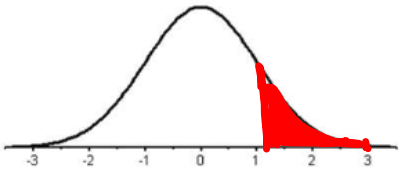
Area under the Normal Curve BETWEEN standard deviations

Notes

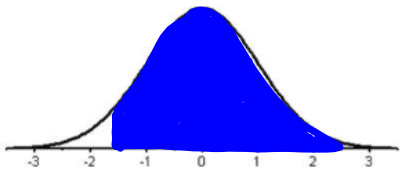
Shade the area under the curve that would satisfy each scenario.

Area between -1 and 1.5 standard deviations

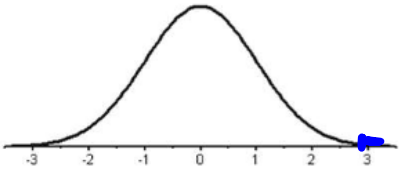
Area between 1.25 and 3 standard deviations



Z-score more than -1.5



Z-score more than 3



Using the Norm Table and Z-Scores

Types of Problems Using the Standard Normal Table

1) **Less than**: Z ≤ #	2) **Greater than**: Z > #	3) **Between**: # < Z < #
a. Find Z-score	a. Find Z-score	a. Find Z-score #1
b. Use NORMAL TABLE	b. Use NORMAL TABLE	b. Find Z-score #2
	c. Subtract from 1 (100%)	c. Use NORMAL TABLE
		d. Subtract from eachother (probability)

Find the probability using the z-score and the Normal Table above.

Example 7: Z-score more than 1.05

Z

Z = 1.05

TBL = .8531

P = 1 - .8531

P = .1469

Example 8: Z-score more than 0.83

Z

Z = 0.83

TBL = .7967

P = 1 - .7967

P = .2033

Example 9: Z-score > 0.5

Z = 0.50

TBL = .6915

P = 1 - .6915

P = .3085

Topic: Area/Probability under the Normal Curve **Date:** _____

Main Ideas/ Questions

Examples

Notes

Find the probability using the z-score and the Normal Table above.

Example 4:
Z-score is between -2.25 and 0.01

Z = -2.25 Z = 0.01

TBL = .0122 TBL = .5040

P = .5040 - .0122

P = .4918

Example 5:
Z-score is between 0.25 and 0.47

Z = 0.25 Z = 0.47

TBL = .5987 TBL = .6808

P = .6808 - .5987

P = .0821

Example 6:
-1.27 < Z < 0.14

Z = -1.27 Z = 0.14

TBL = .1020 TBL = .5557

P = .5557 - .1020

P = .4537

BE CAREFUL!

1.37 | 5

1.38

Example 3.10:
When Tiger Woods hits a golf ball down a course, the distance the ball travels follows a normal distribution with a mean of 304 years and a standard deviation of 8 yards.

$\bar{x}$ s_x

Shade the area under the curve that would satisfy each scenario.

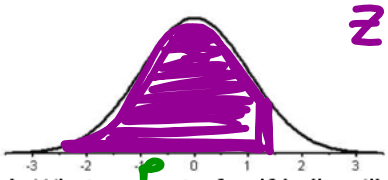
P x

a) What percent of golf balls will travel less than 315 yards?

$Z = \frac{315-304}{8}$

Z = 1.38 → TBL = .9162

P = .9162



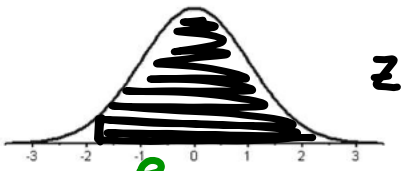
P x

b) What percent of golf balls will travel more than 290 yards?

$Z = \frac{290-304}{8}$

Z = -1.75 → TBL = .0401

P = 1 - .0401 P = .9599



P x x

c) What percent of golf balls will travel between 300 and 321 yards?

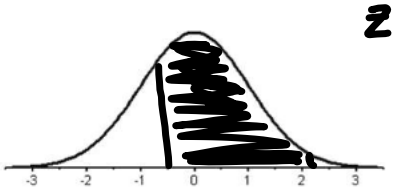
$Z = \frac{300-304}{8}$ $Z = \frac{321-304}{8}$

Z = -0.50 Z = 2.13

TBL = .3085 TBL = .9834

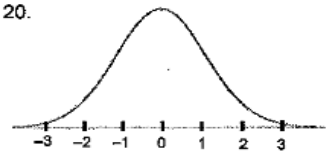
P = .9834 - .3085

P = .6749



***For #20 – 25:** Use Table A (Standard Normal Distribution) to find the proportion of observations that satisfies each of the following statements. In each case, shade the area under the curve that is the answer to the question.*

20.



z is less than –1.83

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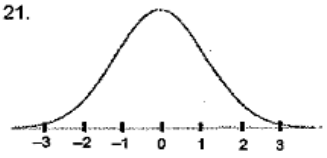
21.



z is greater than 2.18

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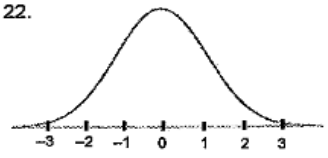
22.



z is less than 0.33

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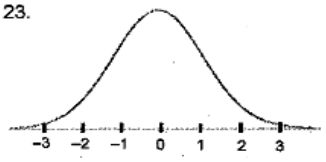
23.



z is between 1.42 and 2.68

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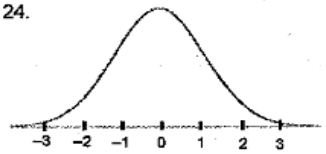
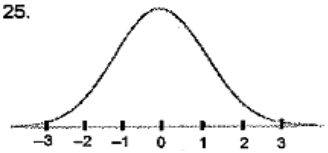
24.



z is greater than –0.51

.....

25.

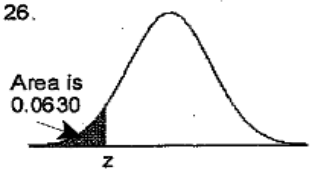


z is between –2 and 1.53

.....

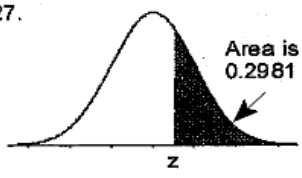
***For #26 – 28:** Find the value of z from the standard normal distribution that satisfies each of the following conditions. (Use the value of z from Table A that comes closest to satisfying the condition.)*

26.



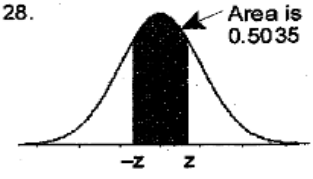
z = ...

27.



z = ...

28.



z = ...

Practice

PG. 127 #3.27, 3.29 (Sketch curves)

PG. 132 #3.37

HW: QUIZ REVIEW

Standard Normal Probabilities

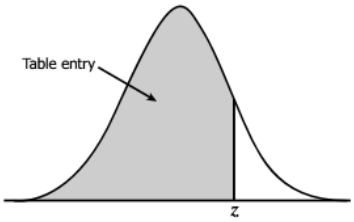


Table entry for z is the area under the standard normal curve to the left of z.

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.5000	.5040	.5080	.5120	.5160	.5199	.5239	.5279	.5319	.5359
0.1	.5398	.5438	.5478	.5517	.5557	.5596	.5636	.5675	.5714	.5753
0.2	.5793	.5832	.5871	.5910	.5948	.5987	.6026	.6064	.6103	.6141
0.3	.6179	.6217	.6255	.6293	.6331	.6368	.6406	.6443	.6480	.6517
0.4	.6554	.6591	.6628	.6664	.6700	.6736	.6772	.6808	.6844	.6879
0.5	.6915	.6950	.6985	.7019	.7054	.7088	.7123	.7157	.7190	.7224
0.6	.7257	.7291	.7324	.7357	.7389	.7422	.7454	.7486	.7517	.7549
0.7	.7580	.7611	.7642	.7673	.7704	.7734	.7764	.7794	.7823	.7852
0.8	.7881	.7910	.7939	.7967	.7995	.8023	.8051	.8078	.8106	.8133
0.9	.8159	.8186	.8212	.8238	.8264	.8289	.8315	.8340	.8365	.8389
1.0	.8413	.8438	.8461	.8485	.8508	.8531	.8554	.8577	.8599	.8621
1.1	.8643	.8665	.8686	.8708	.8729	.8749	.8770	.8790	.8810	.8830
1.2	.8849	.8869	.8888	.8907	.8925	.8944	.8962	.8980	.8997	.9015
1.3	.9032	.9049	.9066	.9082	.9099	.9115	.9131	.9147	.9162	.9177
1.4	.9192	.9207	.9222	.9236	.9251	.9265	.9279	.9292	.9306	.9319
1.5	.9332	.9345	.9357	.9370	.9382	.9394	.9406	.9418	.9429	.9441
1.6	.9452	.9463	.9474	.9484	.9495	.9505	.9515	.9525	.9535	.9545
1.7	.9554	.9564	.9573	.9582	.9591	.9599	.9608	.9616	.9625	.9633
1.8	.9641	.9649	.9656	.9664	.9671	.9678	.9686	.9693	.9699	.9706
1.9	.9713	.9719	.9726	.9732	.9738	.9744	.9750	.9756	.9761	.9767
2.0	.9772	.9778	.9783	.9788	.9793	.9798	.9803	.9808	.9812	.9817
2.1	.9821	.9826	.9830	.9834	.9838	.9842	.9846	.9850	.9854	.9857
2.2	.9861	.9864	.9868	.9871	.9875	.9878	.9881	.9884	.9887	.9890
2.3	.9893	.9896	.9898	.9901	.9904	.9906	.9909	.9911	.9913	.9916
2.4	.9918	.9920	.9922	.9925	.9927	.9929	.9931	.9932	.9934	.9936
2.5	.9938	.9940	.9941	.9943	.9945	.9946	.9948	.9949	.9951	.9952
2.6	.9953	.9955	.9956	.9957	.9959	.9960	.9961	.9962	.9963	.9964
2.7	.9965	.9966	.9967	.9968	.9969	.9970	.9971	.9972	.9973	.9974
2.8	.9974	.9975	.9976	.9977	.9977	.9978	.9979	.9979	.9980	.9981
2.9	.9981	.9982	.9982	.9983	.9984	.9984	.9985	.9985	.9986	.9986
3.0	.9987	.9987	.9987	.9988	.9988	.9989	.9989	.9989	.9990	.9990
3.1	.9990	.9991	.9991	.9991	.9992	.9992	.9992	.9992	.9993	.9993
3.2	.9993	.9993	.9994	.9994	.9994	.9994	.9994	.9995	.9995	.9995
3.3	.9995	.9995	.9995	.9996	.9996	.9996	.9996	.9996	.9996	.9997
3.4	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9998

Standard Normal Probabilities

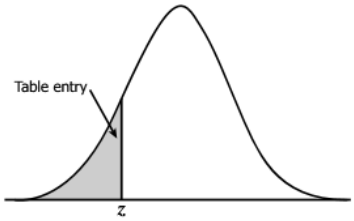


Table entry for z is the area under the standard normal curve to the left of z.

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
−3.4	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0002
−3.3	.0005	.0005	.0005	.0004	.0004	.0004	.0004	.0004	.0004	.0003
−3.2	.0007	.0007	.0006	.0006	.0006	.0006	.0006	.0005	.0005	.0005
−3.1	.0010	.0009	.0009	.0009	.0008	.0008	.0008	.0008	.0007	.0007
−3.0	.0013	.0013	.0013	.0012	.0012	.0011	.0011	.0011	.0010	.0010
−2.9	.0019	.0018	.0018	.0017	.0016	.0016	.0015	.0015	.0014	.0014
−2.8	.0026	.0025	.0024	.0023	.0023	.0022	.0021	.0021	.0020	.0019
−2.7	.0035	.0034	.0033	.0032	.0031	.0030	.0029	.0028	.0027	.0026
−2.6	.0047	.0045	.0044	.0043	.0041	.0040	.0039	.0038	.0037	.0036
−2.5	.0062	.0060	.0059	.0057	.0055	.0054	.0052	.0051	.0049	.0048
−2.4	.0082	.0080	.0078	.0075	.0073	.0071	.0069	.0068	.0066	.0064
−2.3	.0107	.0104	.0102	.0099	.0096	.0094	.0091	.0089	.0087	.0084
−2.2	.0139	.0136	.0132	.0129	.0125	.0122	.0119	.0116	.0113	.0110
−2.1	.0179	.0174	.0170	.0166	.0162	.0158	.0154	.0150	.0146	.0143
−2.0	.0228	.0222	.0217	.0212	.0207	.0202	.0197	.0192	.0188	.0183
−1.9	.0287	.0281	.0274	.0268	.0262	.0256	.0250	.0244	.0239	.0233
−1.8	.0359	.0351	.0344	.0336	.0329	.0322	.0314	.0307	.0301	.0294
−1.7	.0446	.0436	.0427	.0418	.0409	.0401	.0392	.0384	.0375	.0367
−1.6	.0548	.0537	.0526	.0516	.0505	.0495	.0485	.0475	.0465	.0455
−1.5	.0668	.0655	.0643	.0630	.0618	.0606	.0594	.0582	.0571	.0559
−1.4	.0808	.0793	.0778	.0764	.0749	.0735	.0721	.0708	.0694	.0681
−1.3	.0968	.0951	.0934	.0918	.0901	.0885	.0869	.0853	.0838	.0823
−1.2	.1151	.1131	.1112	.1093	.1075	.1056	.1038	.1020	.1003	.0985
−1.1	.1357	.1335	.1314	.1292	.1271	.1251	.1230	.1210	.1190	.1170
−1.0	.1587	.1562	.1539	.1515	.1492	.1469	.1446	.1423	.1401	.1379
−0.9	.1841	.1814	.1788	.1762	.1736	.1711	.1685	.1660	.1635	.1611
−0.8	.2119	.2090	.2061	.2033	.2005	.1977	.1949	.1922	.1894	.1867
−0.7	.2420	.2389	.2358	.2327	.2296	.2266	.2236	.2206	.2177	.2148
−0.6	.2743	.2709	.2676	.2643	.2611	.2578	.2546	.2514	.2483	.2451
−0.5	.3085	.3050	.3015	.2981	.2946	.2912	.2877	.2843	.2810	.2776
−0.4	.3446	.3409	.3372	.3336	.3300	.3264	.3228	.3192	.3156	.3121
−0.3	.3821	.3783	.3745	.3707	.3669	.3632	.3594	.3557	.3520	.3483
−0.2	.4207	.4168	.4129	.4090	.4052	.4013	.3974	.3936	.3897	.3859
−0.1	.4602	.4562	.4522	.4483	.4443	.4404	.4364	.4325	.4286	.4247
−0.0	.5000	.4960	.4920	.4880	.4840	.4801	.4761	.4721	.4681	.4641