The University of Queensland
Australia
CREATE CHANGE

ECON1310
Introductory Statistics for Social Sciences

Tutorial 5: NORMAL DISTRIBUTION

Tutor: Francisco Tavares Garcia

LBRT 01 is available now

LBRT #1 (First Attempt) now available

Posted on: Tuesday, 3 January 2023 09:00:00 o'clock AEST

Dear Students,

A reminder that **LBRT #1 (First Attempt)** is now available and will be open until **4pm Wednesday 4 January (tomorrow).** This LBRT can be accessed via Blackboard under Assessment > LBRTs (Lecture Block Review Tasks) > LBRT #1.

Please note that you will have **90 minutes (1.5 hrs)** to complete the quiz. The quiz will **automatically submit** once the 90 minutes have elapsed. It should also be noted that **no access will be available after 4pm Wednesday (tomorrow)**. Therefore, please give yourself enough time to complete the quiz (i.e. start at 2:30pm Wednesday at the latest to give yourself a full 90 minutes).

You will be able to **view your score** (but not feedback) **4pm Wednesday 4 January** (i.e. once the LBRT closes for all students), and able to view both your **score and feedback** at **9am Monday 9 January**.

Note there is an **optional second attempt** for LBRT #1, which will be available from 9am Thursday 5 January until 4pm Friday 6 January. As with the CMLs, only your best score from the 2 attempts will contribute towards your final grade.

In preparation for LBRT #1, if you have not already done so, please familiarise yourself with the **Practice LBRT test**, (which shows you how the questions will appear) and the **General Information for Completing LBRTs** document. Details can be found under Assessment > LBRTs (Lecture Block Review Tasks).

Best of luck!

Dominic

ECON1310

Tutorial 5 for Week 6

NORMAL DISTRIBUTION

At the end of this tutorial you should be able to

- Describe the characteristics of the normal distribution and standardised normal distribution
- Interpret and use the standardised normal distribution tables
- Compute Z scores and associated probabilities

Q1. A large city transit association has reported that the average revenue per passenger trip during a given year was $3.38. If we assume a normal distribution and a standard deviation of $0.42, what is the probability that the revenue per trip is

a. less than $3.00

b. between $2 and $3

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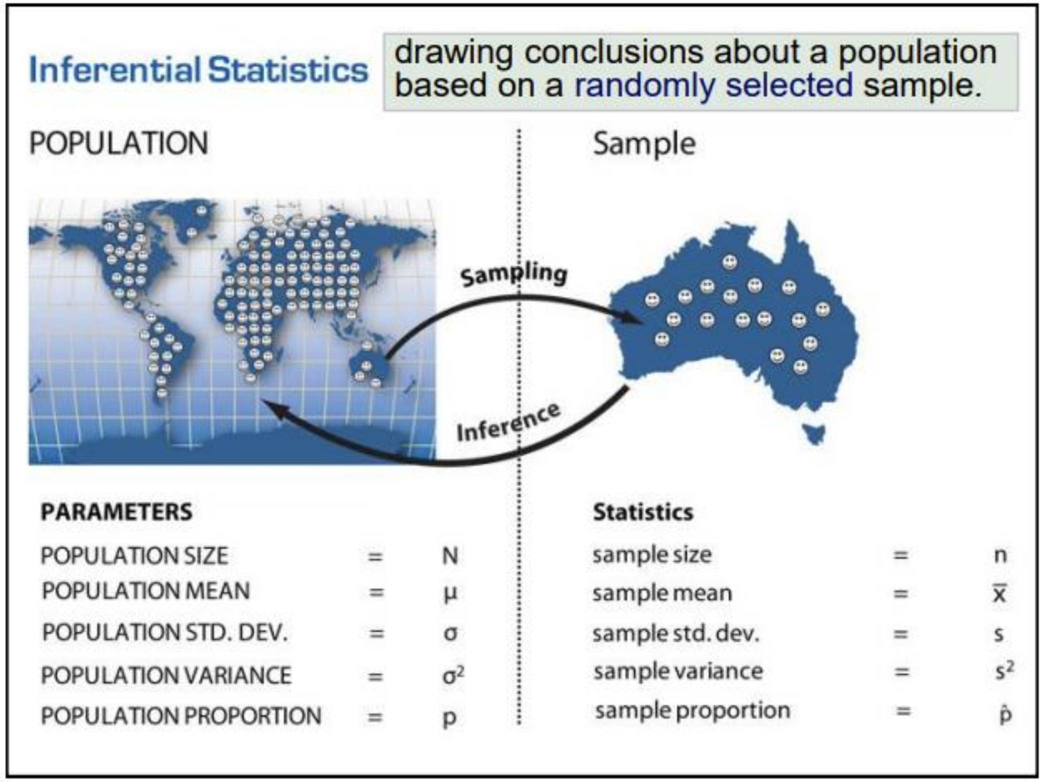
(Pool)



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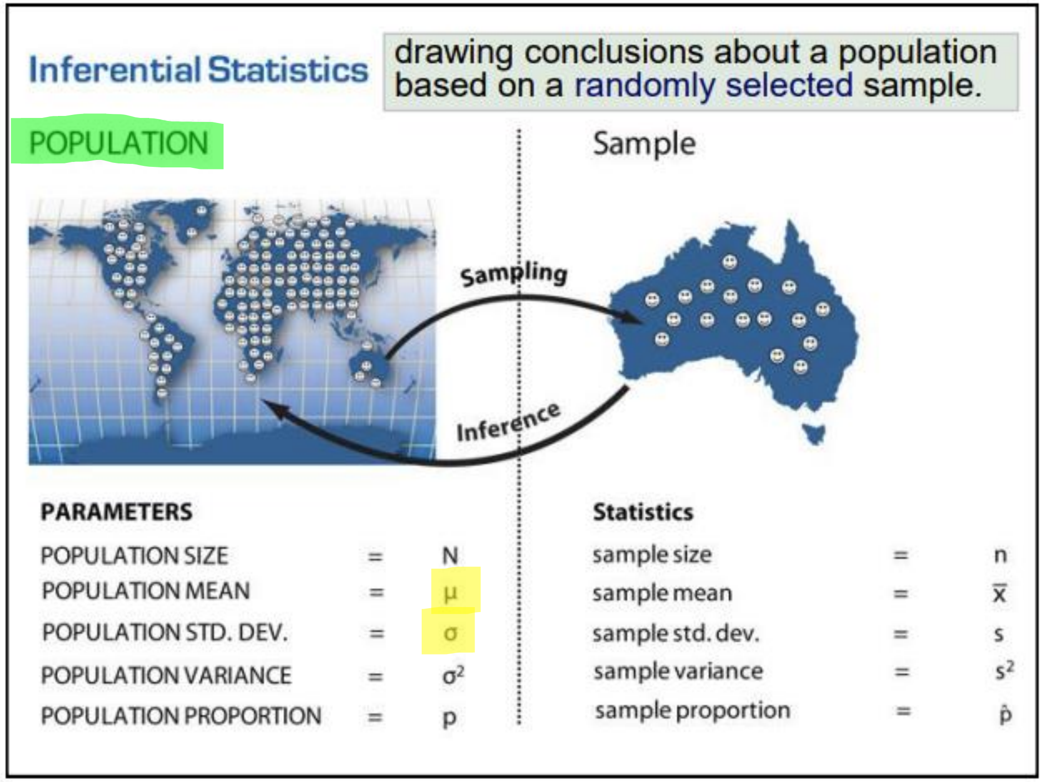
$\sigma = 0.42$
$P(X < 3) = ?$



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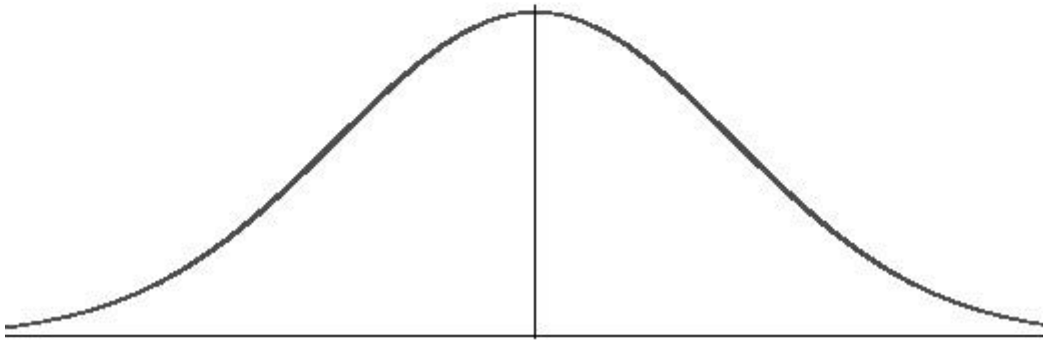

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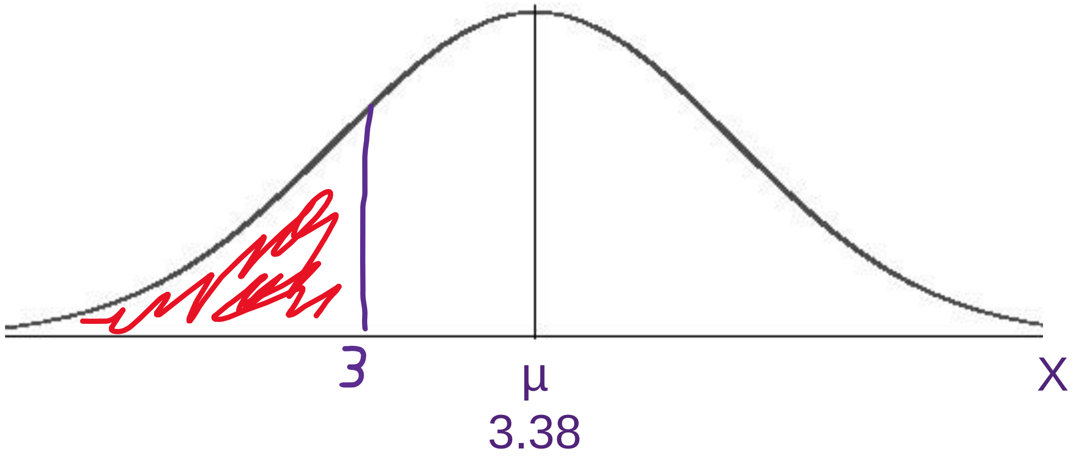

adm T05 Q1 Q2 Q3 (a) (b) Q4

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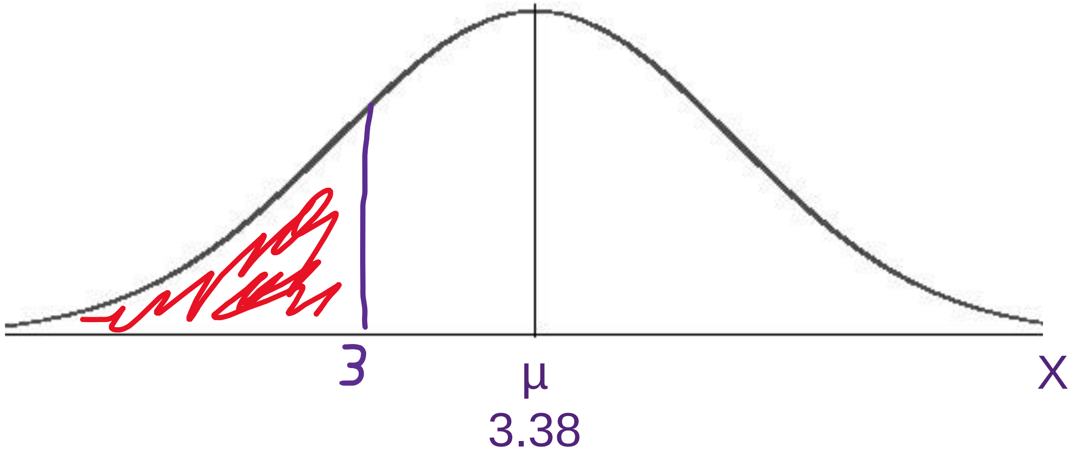
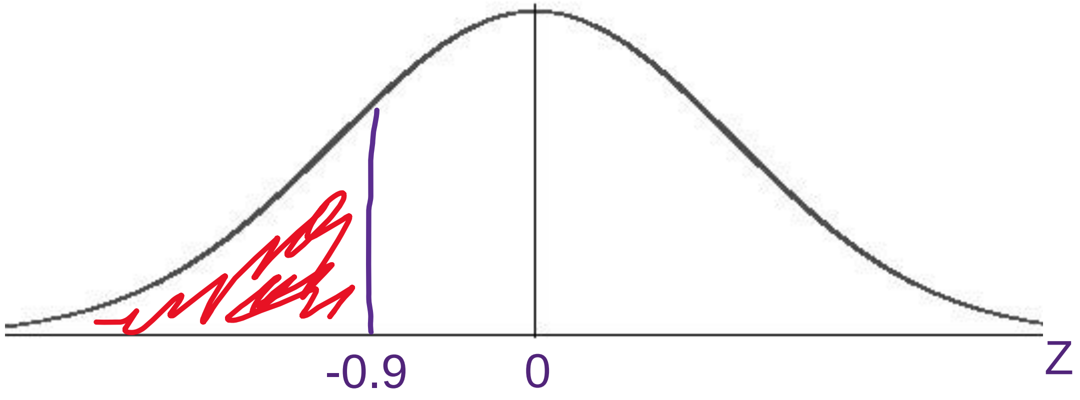


Z transformation

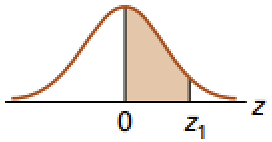
$P(Z < \dfrac{X - \mu}{\sigma}) =$
$P(Z < \dfrac{3 - 3.38}{0.42}) =$
$P(Z < -0.90) = ?$



adm T05 Q1 Q2 Q3 (a) (b) Q4

TABLE A.5 Areas of the standard normal distribution $\mu = 0, \sigma = 1$

The entries in this table are the probabilities that a standard normal random variable is between 0 and z_1 (the shaded area).



z_1	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359
0.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0753
0.2	.0793	.0832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141
0.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517
0.4	.1554	.1591	.1628	.1664	.1700	.1736	.1772	.1808	.1844	.1879
0.5	.1915	.1950	.1985	.2019	.2054	.2088	.2123	.2157	.2190	.2224
0.6	.2257	.2291	.2324	.2357	.2389	.2422	.2454	.2486	.2517	.2549
0.7	.2580	.2611	.2642	.2673	.2704	.2734	.2764	.2794	.2823	.2852
0.8	.2881	.2910	.2939	.2967	.2995	.3023	.3051	.3078	.3106	.3133
0.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389
1.0	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621
1.1	.3643	.3665	.3686	.3708	.3729	.3749	.3770	.3790	.3810	.3830
1.2	.3849	.3869	.3888	.3907	.3925	.3944	.3962	.3980	.3997	.4015
1.3	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147	.4162	.4177
1.4	.4192	.4207	.4222	.4236	.4251	.4265	.4279	.4292	.4306	.4319

adm T05 Q1 Q2 Q3 (a) (b) Q4

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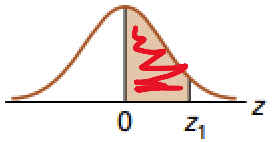
The entries in this table are the probabilities that a standard normal random variable is between 0 and z_1 (the shaded area).



z_1	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359
0.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0753
0.2	.0793	.0832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141
0.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517
0.4	.1554	.1591	.1628	.1664	.1700	.1736	.1772	.1808	.1844	.1879
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0.8	.2881	.2910	.2939	.2967	.2995	.3023	.3051	.3078	.3106	.3133
0.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389
1.0	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621
1.1	.3643	.3665	.3686	.3708	.3729	.3749	.3770	.3790	.3810	.3830
1.2	.3849	.3869	.3888	.3907	.3925	.3944	.3962	.3980	.3997	.4015
1.3	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147	.4162	.4177
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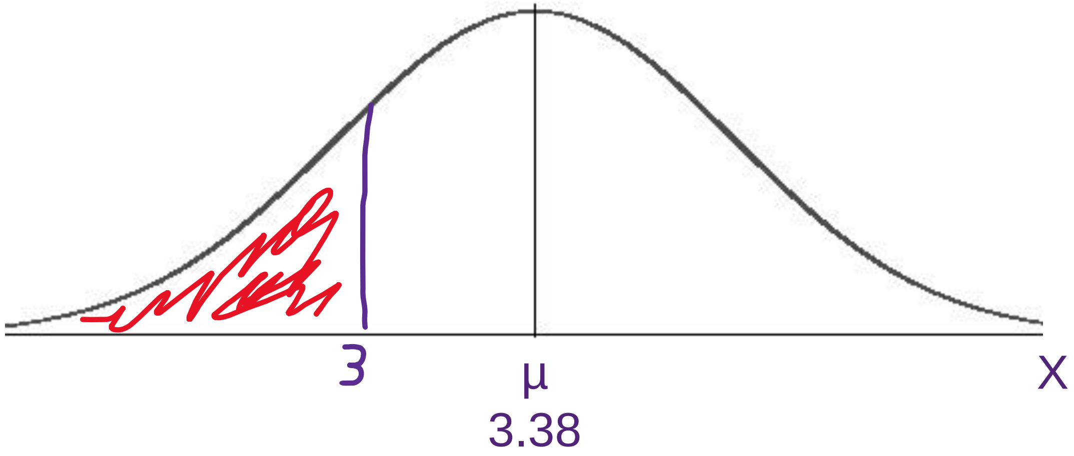
$\sigma = 0.42$

$P(X < 3) =$



Z transformation

$P(Z < \frac{X - \mu}{\sigma}) =$

$P(Z < \frac{3 - 3.38}{0.42}) =$

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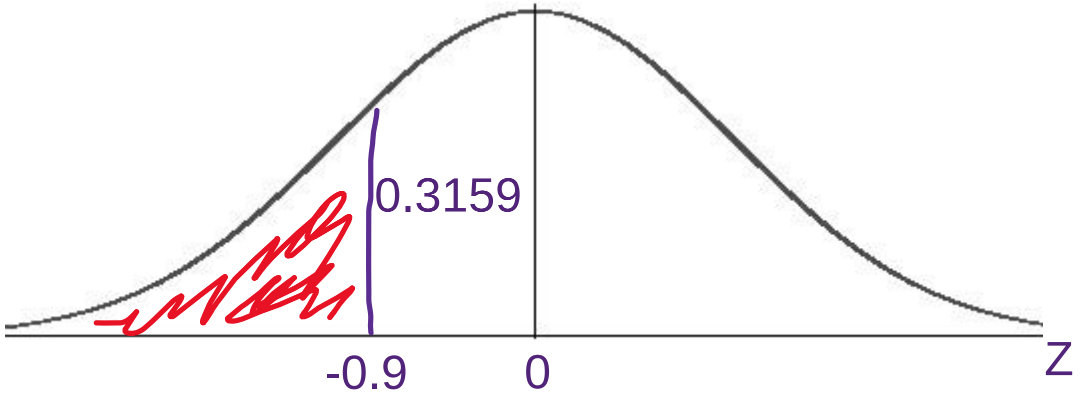

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Q1. A large city transit association has reported that the average revenue per passenger trip during a given year was \$3.38. If we assume a normal distribution and a standard deviation of \$0.42, what is the probability that the revenue per trip is

a. less than \$3.00 0.1841

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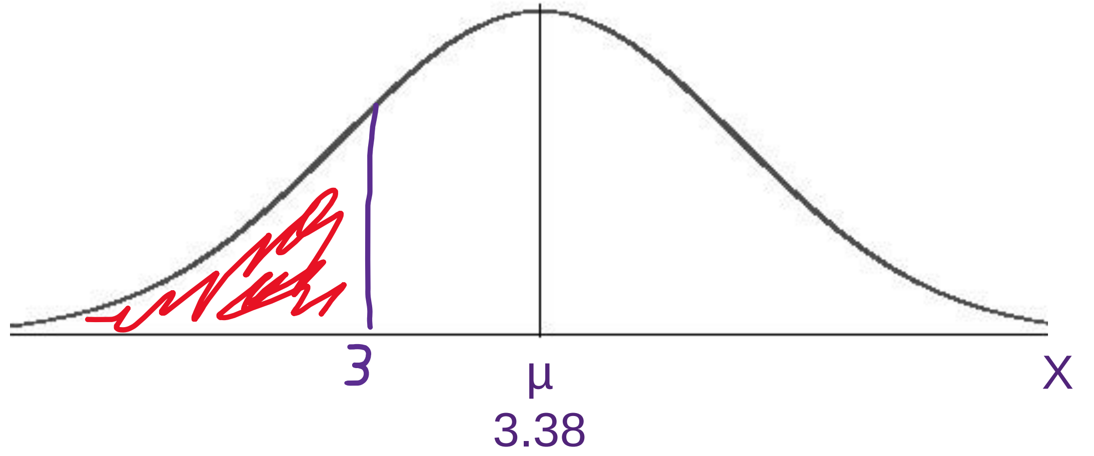

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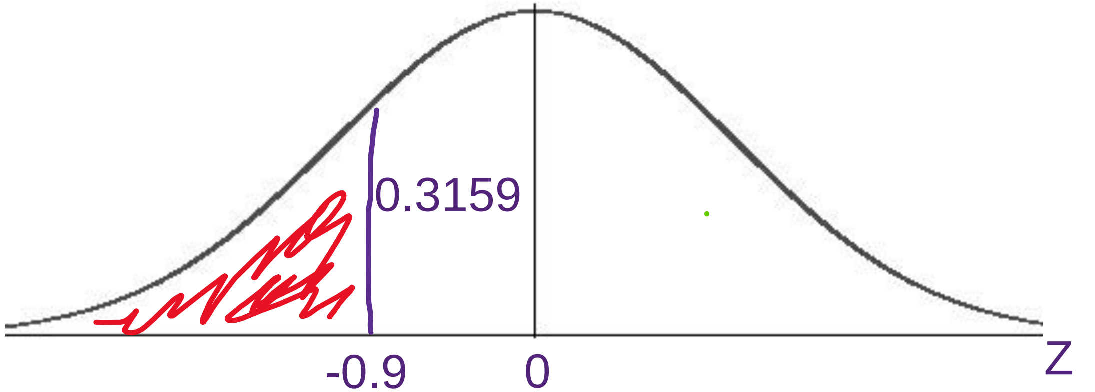
$$0.5 - 0.3159 = 0.1841$$



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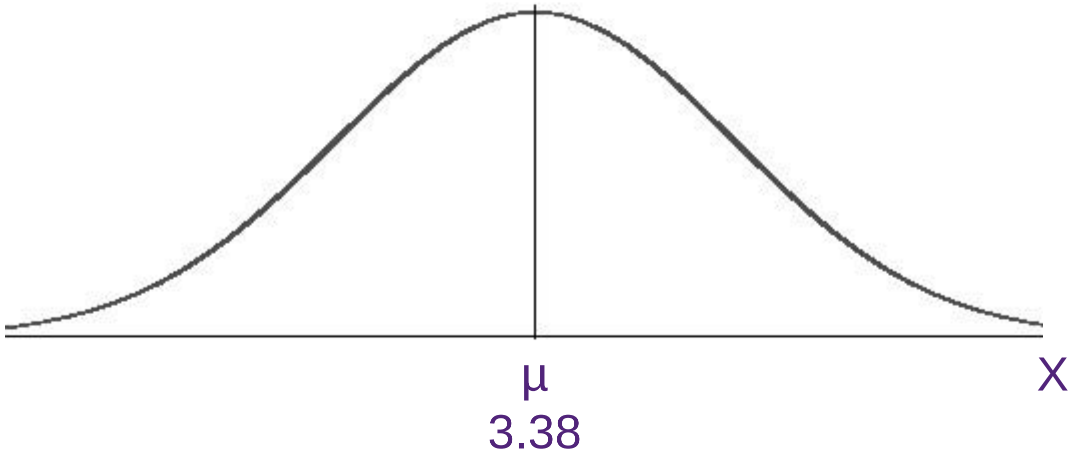

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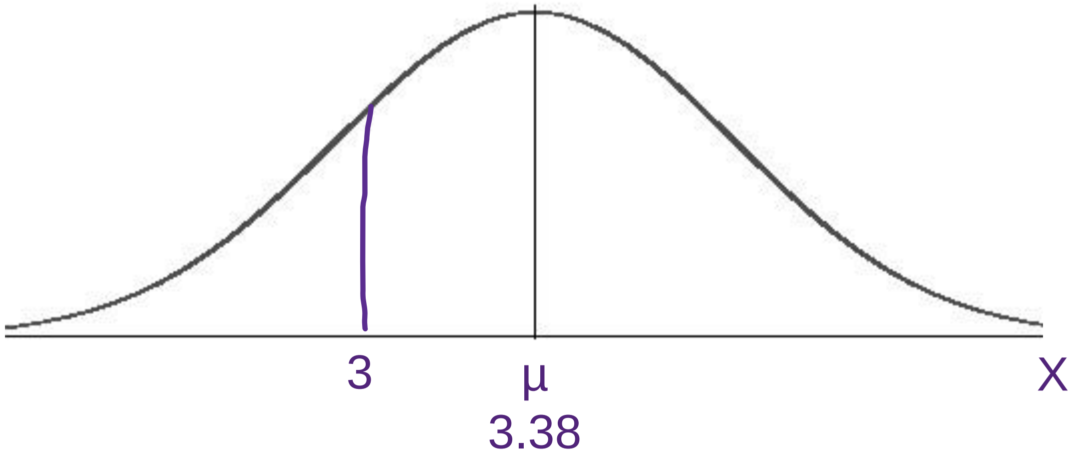

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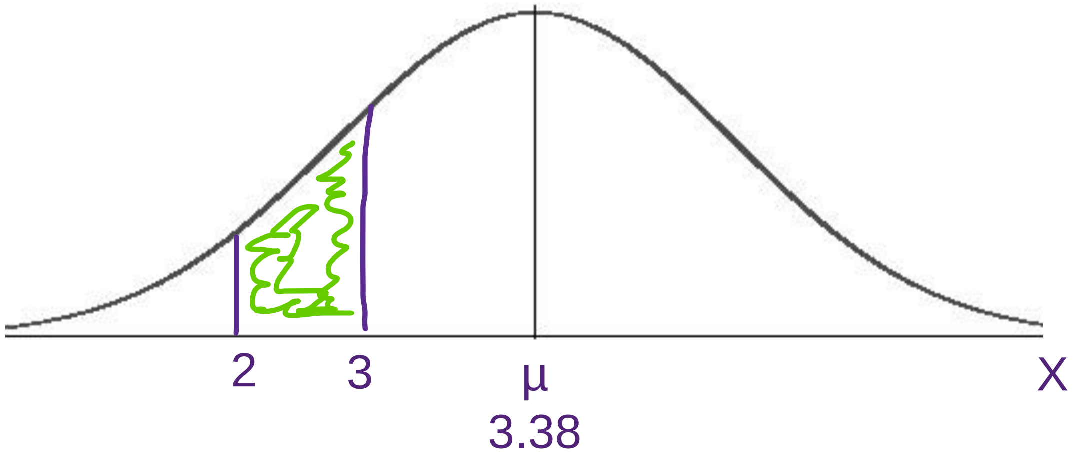

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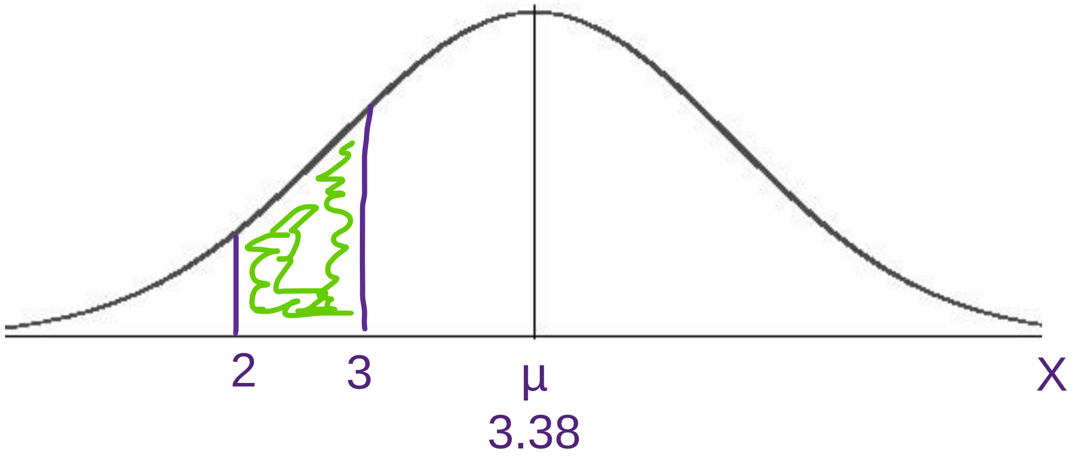

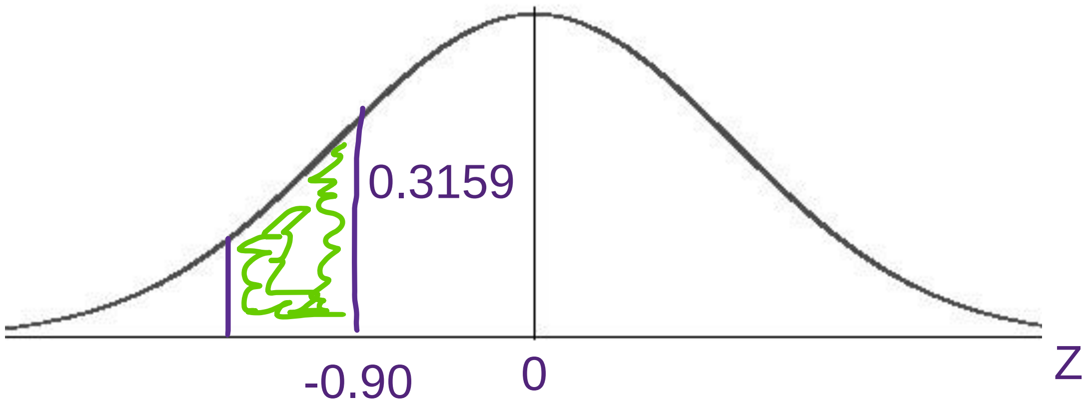

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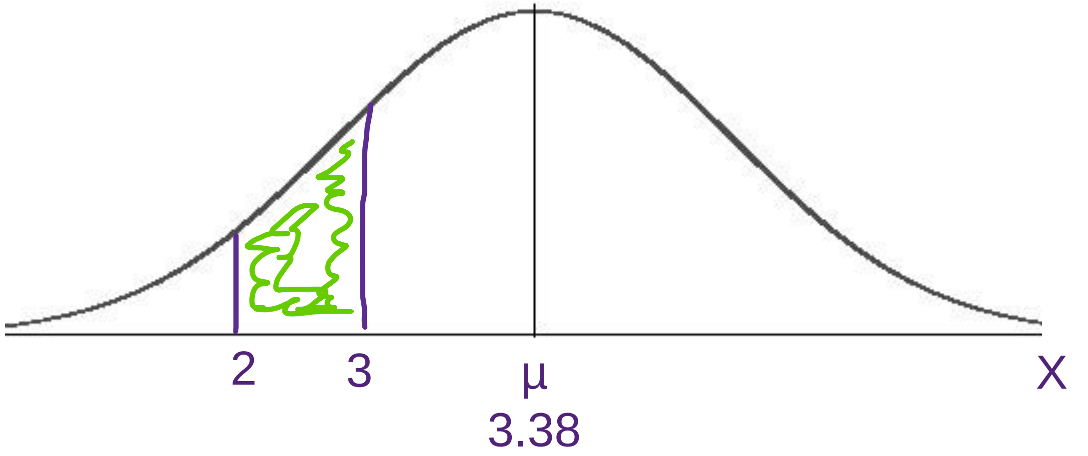
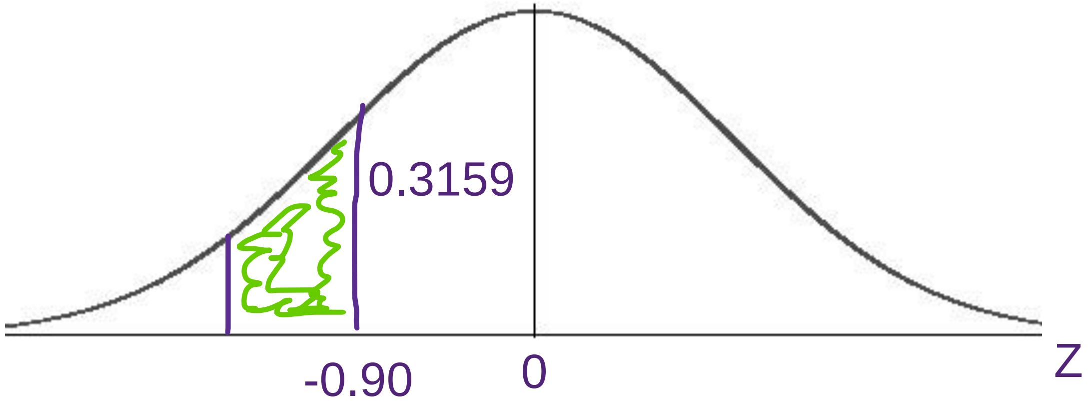


Z transformation

$$P\left(\frac{X-\mu}{\sigma} < Z < \frac{X-\mu}{\sigma}\right) =$$
$$P\left(\frac{2-3.38}{0.42} < Z < \frac{3-3.38}{0.42}\right) = ?$$



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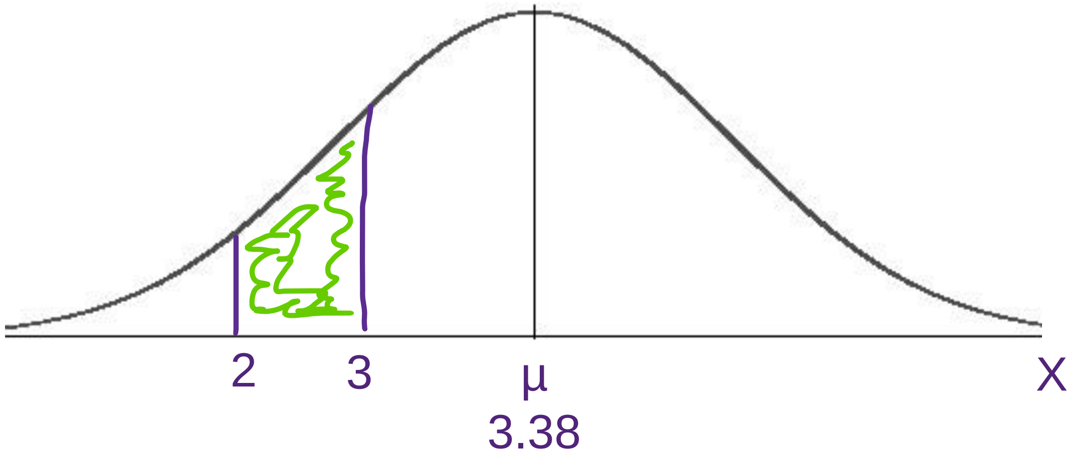

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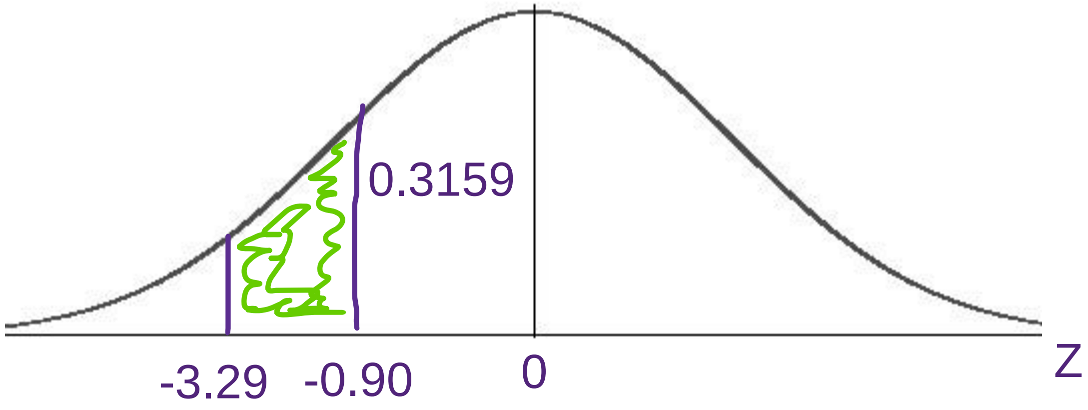
$$P(-3.29 < Z < -0.90) = ?$$



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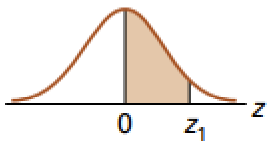

z_1	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
2.0	.4772	.4778	.4783	.4788	.4793	.4798	.4803	.4808	.4812	.4817
2.1	.4821	.4826	.4830	.4834	.4838	.4842	.4846	.4850	.4854	.4857
2.2	.4861	.4864	.4868	.4871	.4875	.4878	.4881	.4884	.4887	.4890
2.3	.4893	.4896	.4898	.4901	.4904	.4906	.4909	.4911	.4913	.4916
2.4	.4918	.4920	.4922	.4925	.4927	.4929	.4931	.4932	.4934	.4936
2.5	.4938	.4940	.4941	.4943	.4945	.4946	.4948	.4949	.4951	.4952
2.6	.4953	.4955	.4956	.4957	.4959	.4960	.4961	.4962	.4963	.4964
2.7	.4965	.4966	.4967	.4968	.4969	.4970	.4971	.4972	.4973	.4974
2.8	.4974	.4975	.4976	.4977	.4977	.4978	.4979	.4979	.4980	.4981
2.9	.4981	.4982	.4982	.4983	.4984	.4984	.4985	.4985	.4986	.4986
3.0	.4987	.4987	.4987	.4988	.4988	.4989	.4989	.4989	.4990	.4990
3.1	.4990	.4991	.4991	.4991	.4992	.4992	.4992	.4992	.4993	.4993
3.2	.4993	.4993	.4994	.4994	.4994	.4994	.4994	.4995	.4995	.4995
3.3	.4995	.4995	.4995	.4996	.4996	.4996	.4996	.4996	.4996	.4997
3.4	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4998
3.5	.4998									
4.0	.49997									
4.5	.499997									
5.0	.4999997									
6.0	.499999999									

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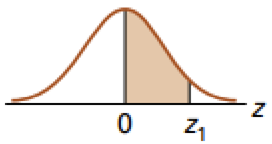

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2.3	.4893	.4896	.4898	.4901	.4904	.4906	.4909	.4911	.4913	.4916
2.4	.4918	.4920	.4922	.4925	.4927	.4929	.4931	.4932	.4934	.4936
2.5	.4938	.4940	.4941	.4943	.4945	.4946	.4948	.4949	.4951	.4952
2.6	.4953	.4955	.4956	.4957	.4959	.4960	.4961	.4962	.4963	.4964
2.7	.4965	.4966	.4967	.4968	.4969	.4970	.4971	.4972	.4973	.4974
2.8	.4974	.4975	.4976	.4977	.4977	.4978	.4979	.4979	.4980	.4981
2.9	.4981	.4982	.4982	.4983	.4984	.4984	.4985	.4985	.4986	.4986
3.0	.4987	.4987	.4987	.4988	.4988	.4989	.4989	.4989	.4990	.4990
3.1	.4990	.4991	.4991	.4991	.4992	.4992	.4992	.4992	.4993	.4993
3.2	.4993	.4993	.4994	.4994	.4994	.4994	.4994	.4995	.4995	.4995
3.3	.4995	.4995	.4995	.4996	.4996	.4996	.4996	.4996	.4996	.4997
3.4	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4998
3.5	.4998									
4.0	.49997									
4.5	.499997									
5.0	.4999997									
6.0	.499999999									

Q1. A large city transit association has reported that the average revenue per passenger trip during a given year was \$3.38. If we assume a normal distribution and a standard deviation of \$0.42, what is the probability that the revenue per trip is

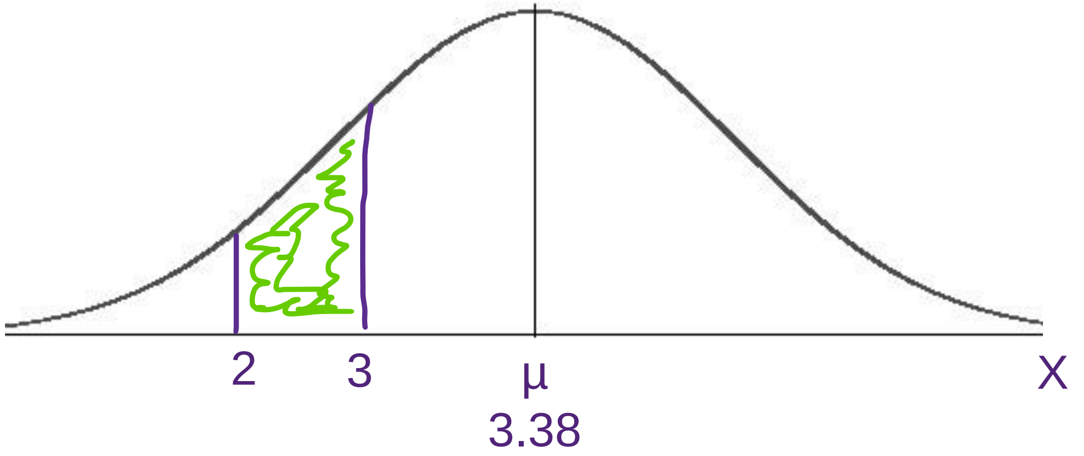
a. less than \$3.00 0.1841

b. between \$2 and \$3 0.1836

c. between \$3 and \$4

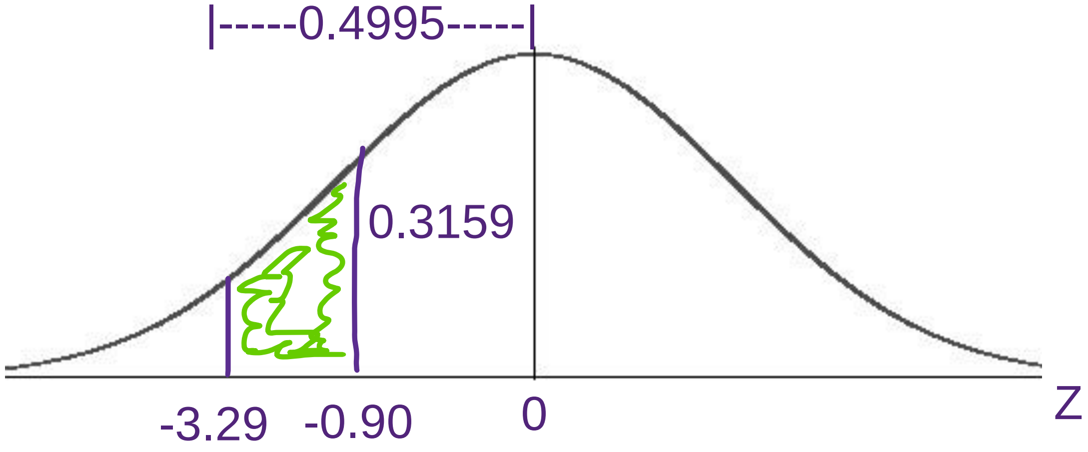
d. more than \$3.50

$\mu = 3.38$
$\sigma = 0.42$
$P(2 < X < 3) =$



Z transformation

$$P\left(\frac{X-\mu}{\sigma} < Z < \frac{X-\mu}{\sigma}\right) =$$
$$P\left(\frac{2-3.38}{0.42} < Z < \frac{3-3.38}{0.42}\right) =$$
$$P(-3.29 < Z < -0.90) = ?$$



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c. between \$3 and \$4

d. more than \$3.50

$\mu = 3.38$
$\sigma = 0.42$
$P(2 < X < 3) =$

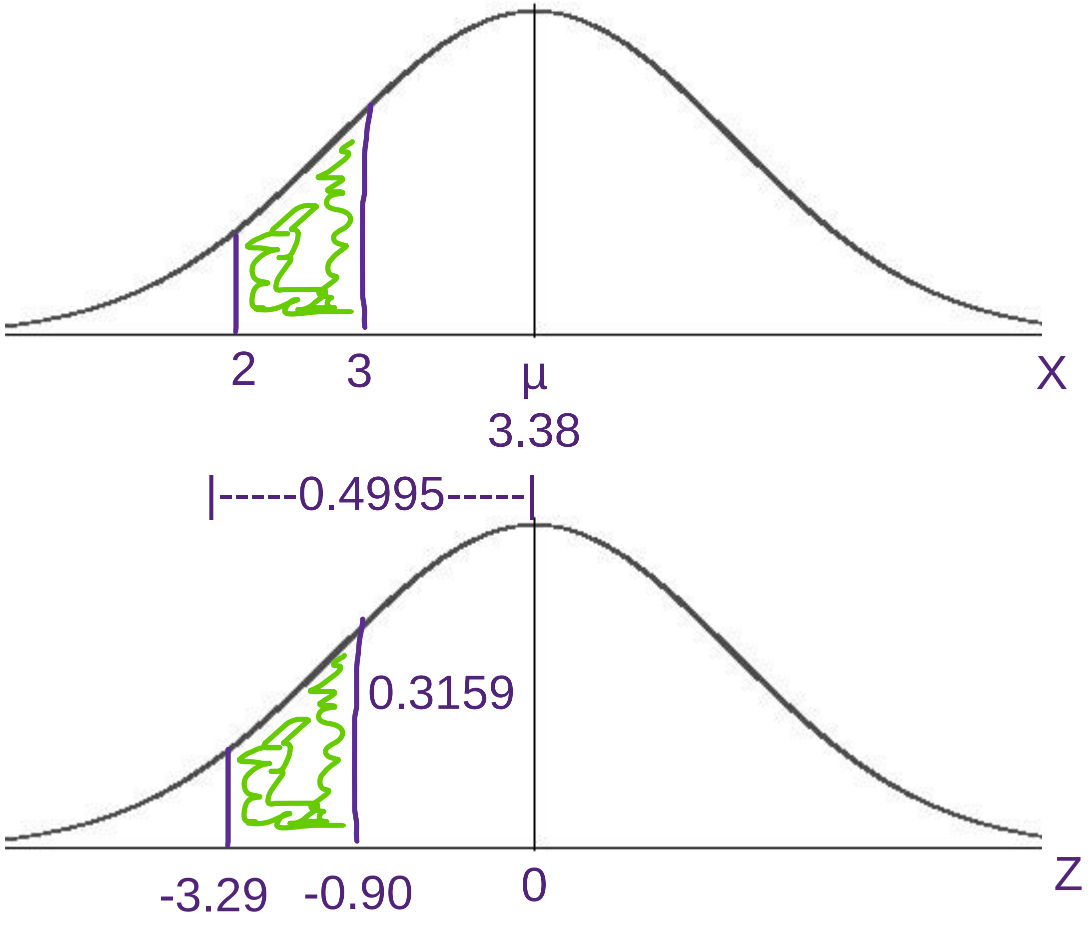
Z transformation

$P(\frac{X-\mu}{\sigma} < Z < \frac{X-\mu}{\sigma}) =$

$P(\frac{2-3.38}{0.42} < Z < \frac{3-3.38}{0.42}) =$

$P(-3.29 < Z < -0.90) =$

$0.4995 – 0.3159 = 0.1836$



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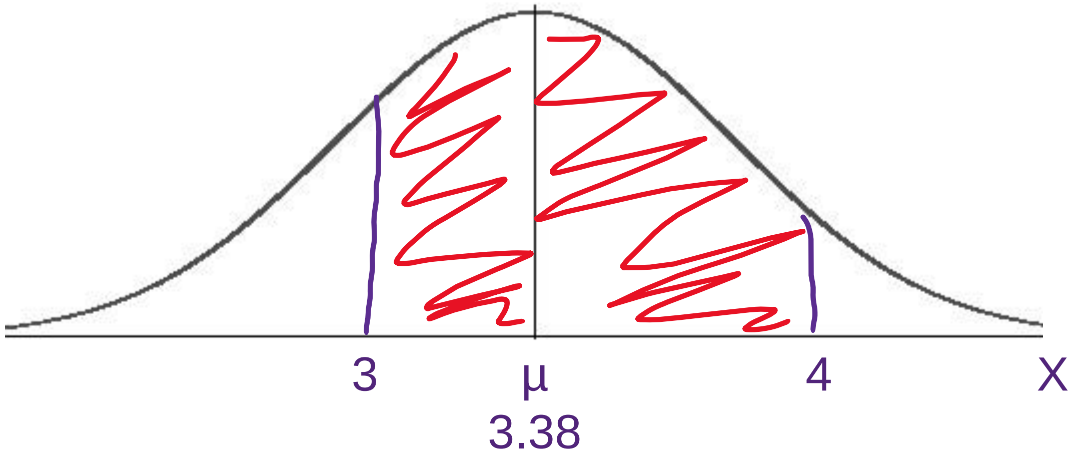
c. between \$3 and \$4

d. more than \$3.50

$\mu = 3.38$
$\sigma = 0.42$
$P(3 < X < 4) = ?$



adm T05 Q1 Q2 Q3 (a) (b) Q4

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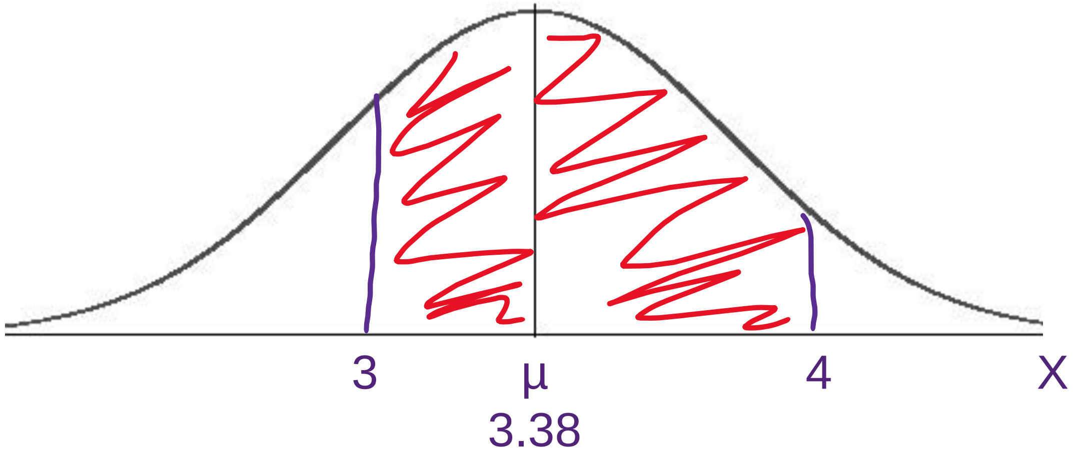
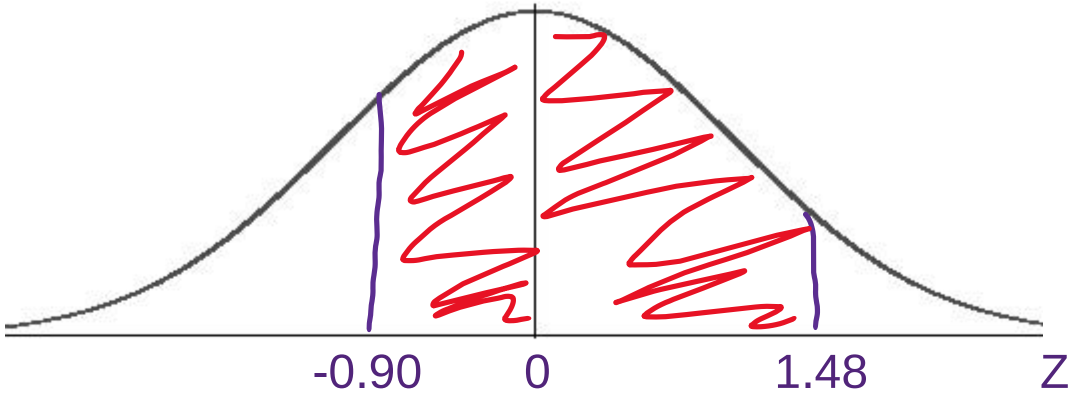


Z transformation

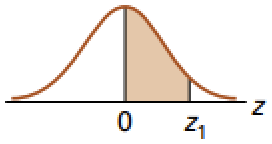
$$P\left(\frac{X-\mu}{\sigma} < Z < \frac{X-\mu}{\sigma}\right) =$$
$$P\left(\frac{3-3.38}{0.42} < Z < \frac{4-3.38}{0.42}\right) =$$
$$P(-0.90 < Z < 1.48) = ?$$



adm T05 Q1 Q2 Q3 (a) (b) Q4

TABLE A.5 Areas of the standard normal distribution $\mu = 0, \sigma = 1$

The entries in this table are the probabilities that a standard normal random variable is between 0 and z_1 (the shaded area).



z_1	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359
0.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0753
0.2	.0793	.0832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141
0.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517
0.4	.1554	.1591	.1628	.1664	.1700	.1736	.1772	.1808	.1844	.1879
0.5	.1915	.1950	.1985	.2019	.2054	.2088	.2123	.2157	.2190	.2224
0.6	.2257	.2291	.2324	.2357	.2389	.2422	.2454	.2486	.2517	.2549
0.7	.2580	.2611	.2642	.2673	.2704	.2734	.2764	.2794	.2823	.2852
0.8	.2881	.2910	.2939	.2967	.2995	.3023	.3051	.3078	.3106	.3133
0.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389
1.0	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621
1.1	.3643	.3665	.3686	.3708	.3729	.3749	.3770	.3790	.3810	.3830
1.2	.3849	.3869	.3888	.3907	.3925	.3944	.3962	.3980	.3997	.4015
1.3	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147	.4162	.4177
1.4	.4192	.4207	.4222	.4236	.4251	.4265	.4279	.4292	.4306	.4319

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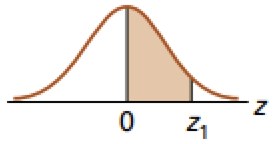

z_1	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359
0.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0753
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0.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517
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0.5	.1915	.1950	.1985	.2019	.2054	.2088	.2123	.2157	.2190	.2224
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0.7	.2580	.2611	.2642	.2673	.2704	.2734	.2764	.2794	.2823	.2852
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1.0	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621
1.1	.3643	.3665	.3686	.3708	.3729	.3749	.3770	.3790	.3810	.3830
1.2	.3849	.3869	.3888	.3907	.3925	.3944	.3962	.3980	.3997	.4015
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a. less than \$3.00 0.1841

b. between \$2 and \$3 0.1836

c. between \$3 and \$4 0.7465

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$\mu = 3.38$
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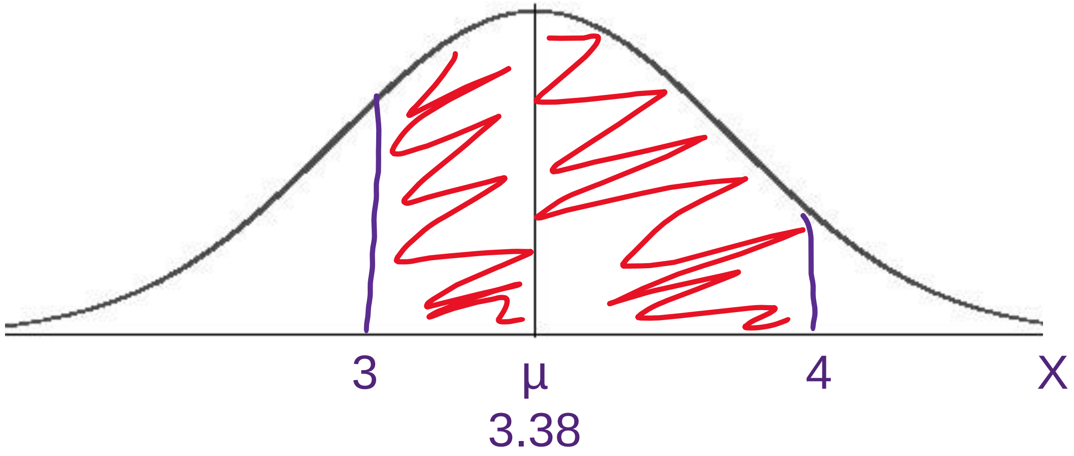
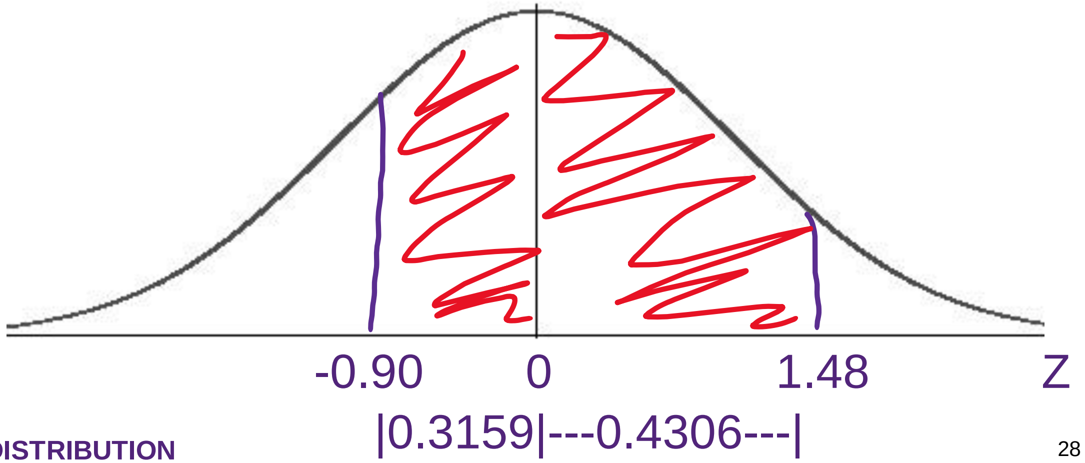
$P(3 < X < 4) =$



Z transformation

$$P\left(\frac{X-\mu}{\sigma} < Z < \frac{X-\mu}{\sigma}\right) =$$
$$P\left(\frac{3-3.38}{0.42} < Z < \frac{4-3.38}{0.42}\right) =$$
$$P(-0.90 < Z < 1.48) =$$
$$0.3159 + 0.4306 = 0.7465$$



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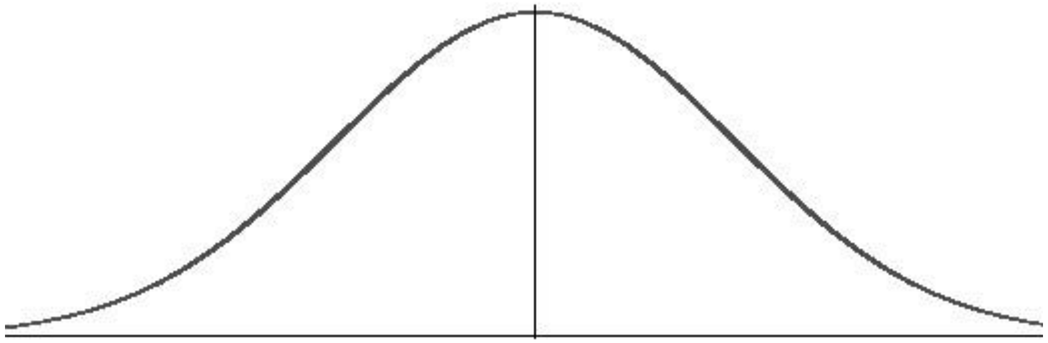

$\mu = 3.38$
$\sigma = 0.42$
$P(X > 3.5) = ?$

Q1. A large city transit association has reported that the average revenue per passenger trip during a given year was \$3.38. If we assume a normal distribution and a standard deviation of \$0.42, what is the probability that the revenue per trip is

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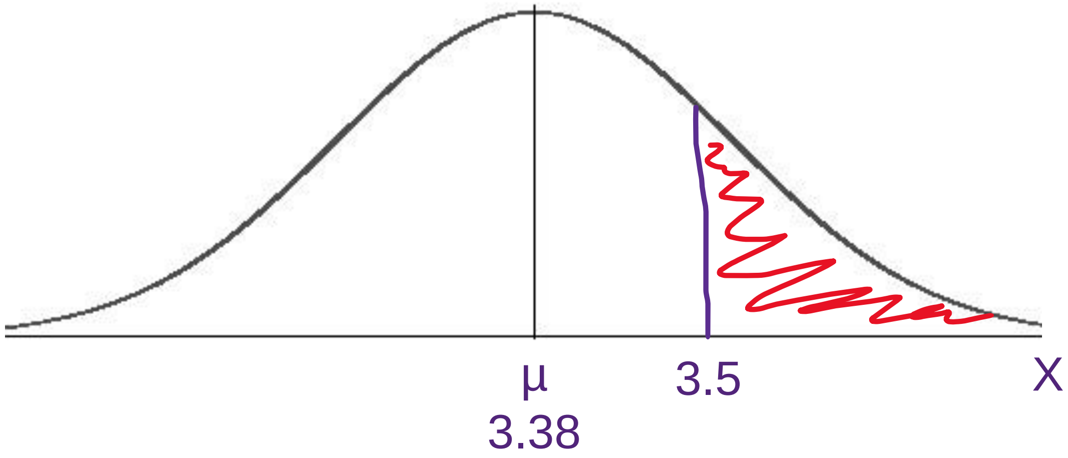
$P(X > 3.5) = ?$



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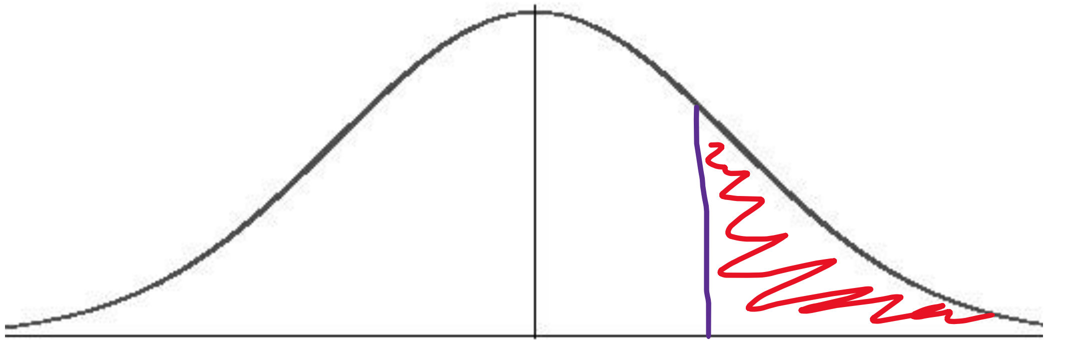
$\sigma = 0.42$
$P(X > 3.5) =$



Z transformation

$$P\left(Z > \frac{X-\mu}{\sigma}\right) =$$
$$P\left(Z > \frac{3.5-3.38}{0.42}\right) =$$
$$P(Z > 0.29) = ?$$

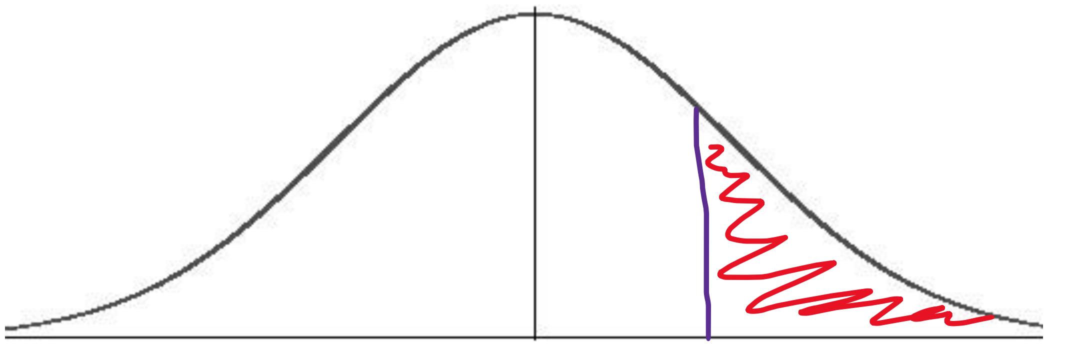


TABLE A.5 Areas of the standard normal distribution $\mu = 0, \sigma = 1$

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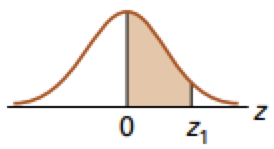

z_1	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359
0.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0753
0.2	.0793	.0832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141
0.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517
0.4	.1554	.1591	.1628	.1664	.1700	.1736	.1772	.1808	.1844	.1879
0.5	.1915	.1950	.1985	.2019	.2054	.2088	.2123	.2157	.2190	.2224
0.6	.2257	.2291	.2324	.2357	.2389	.2422	.2454	.2486	.2517	.2549
0.7	.2580	.2611	.2642	.2673	.2704	.2734	.2764	.2794	.2823	.2852
0.8	.2881	.2910	.2939	.2967	.2995	.3023	.3051	.3078	.3106	.3133
0.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389
1.0	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621
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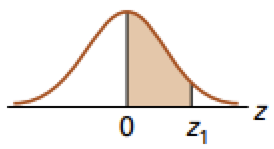

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0.7	.2580	.2611	.2642	.2673	.2704	.2734	.2764	.2794	.2823	.2852
0.8	.2881	.2910	.2939	.2967	.2995	.3023	.3051	.3078	.3106	.3133
0.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389
1.0	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621
1.1	.3643	.3665	.3686	.3708	.3729	.3749	.3770	.3790	.3810	.3830
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1.3	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147	.4162	.4177
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adm T05 Q1 Q2 Q3 (a) (b) Q4

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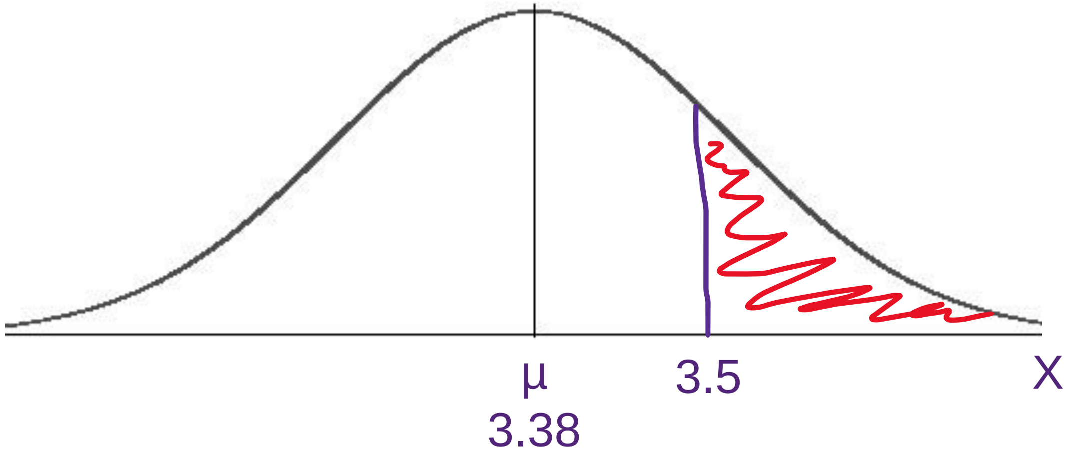
c. between \$3 and \$4 0.7465

d. more than \$3.50

$\mu = 3.38$

$\sigma = 0.42$

$P(X > 3.5) =$

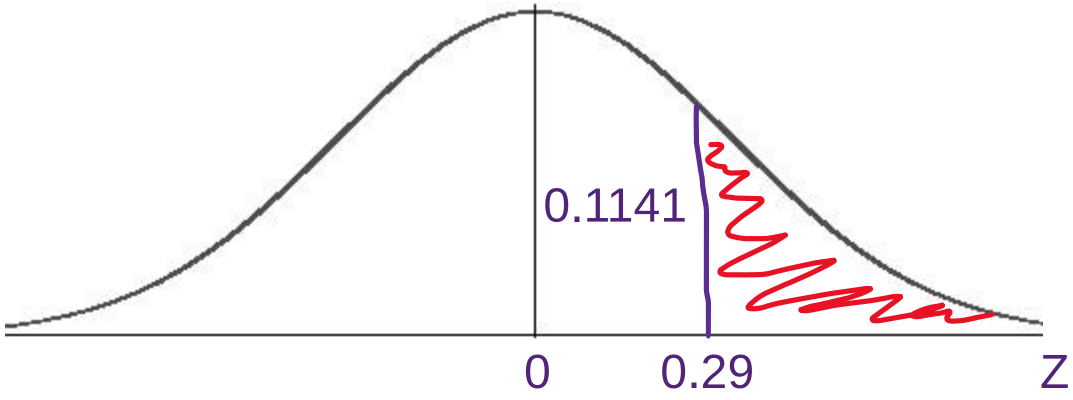


Z transformation

$$P\left(Z > \frac{X - \mu}{\sigma}\right) =$$

$$P\left(Z > \frac{3.5 - 3.38}{0.42}\right) =$$

$$P(Z > 0.29) = ?$$



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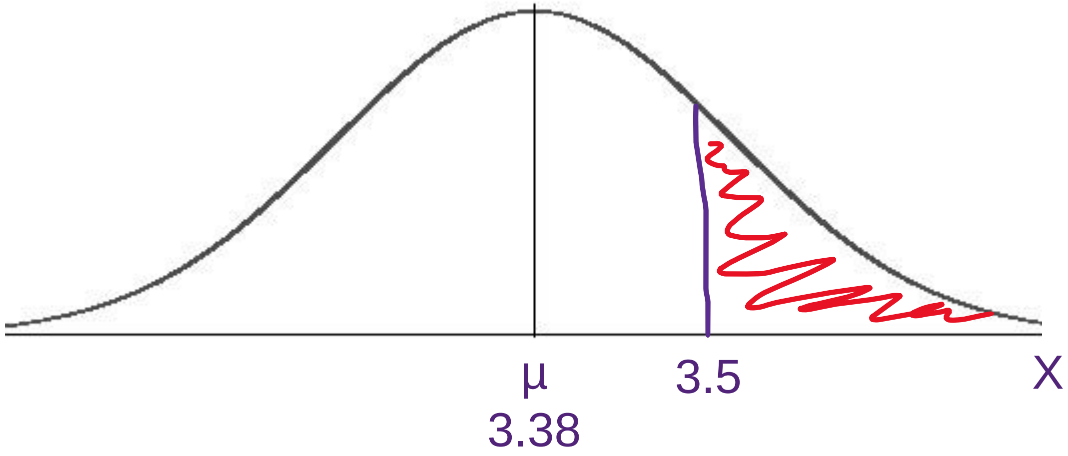
b. between \$2 and \$3 0.1836

c. between \$3 and \$4 0.7465

d. more than \$3.50 0.3859

$\mu = 3.38$
$\sigma = 0.42$
$P(X > 3.5) =$



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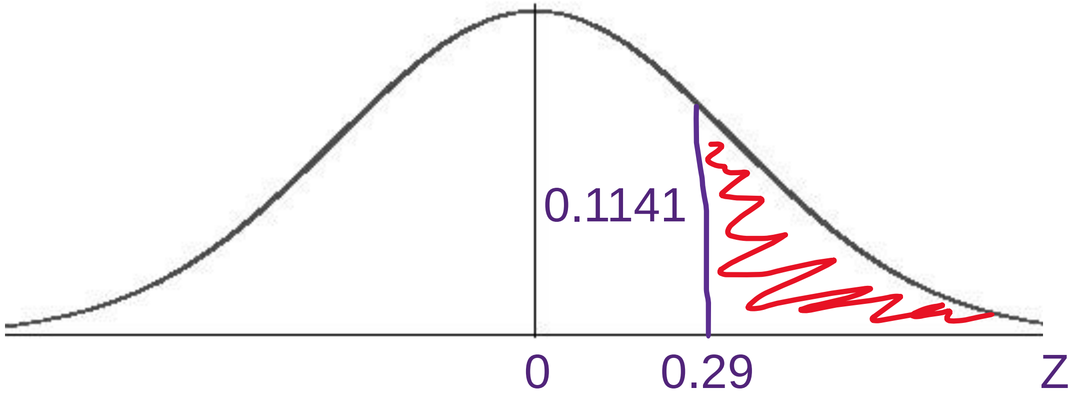
$$P(Z > 0.29) =$$
$$0.5 - 0.1141 = 0.3859$$



Q2. A bank manager knows, from past experience, home loan application requests follow a normal distribution. History has shown the home loan application mean is $70,000 and standard deviation is $20,000. A home loan application has just been received by the bank managers.

a) What is the probability the amount requested is $80,000 or more? What is the probability the amount requested is more than $80,000?

b) What is the probability the amount requested is between $65,000 and $80,000? Are these values inclusive?

c) What is the probability that the loan application is within $30,000 either side of the mean?

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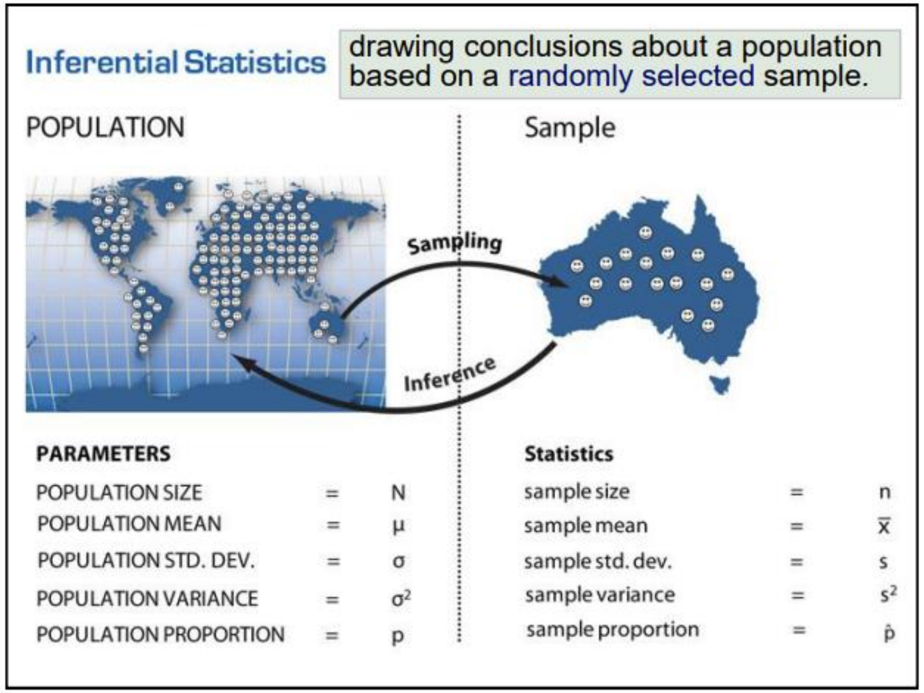

(Pool)

adm T05 Q1 Q2 Q3 (a) (b) Q4

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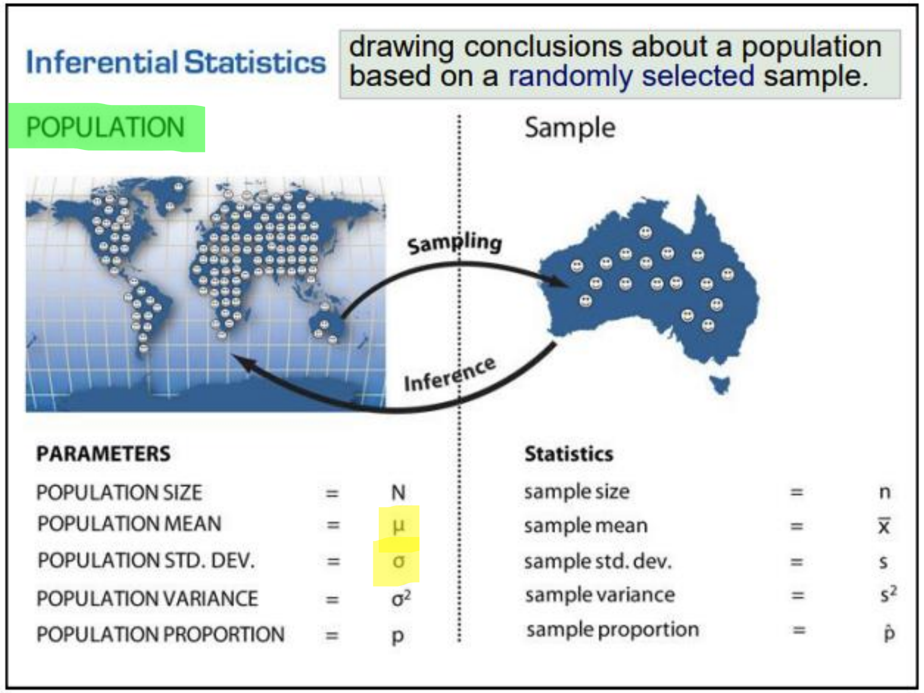
$\mu = 3.38$

$\sigma = 0.42$



Q2. A bank manager knows, from past experience, home loan application requests follow a normal distribution. History has shown the home loan application mean is \$70,000 and standard deviation is \$20,000. A home loan application has just been received by the bank managers.

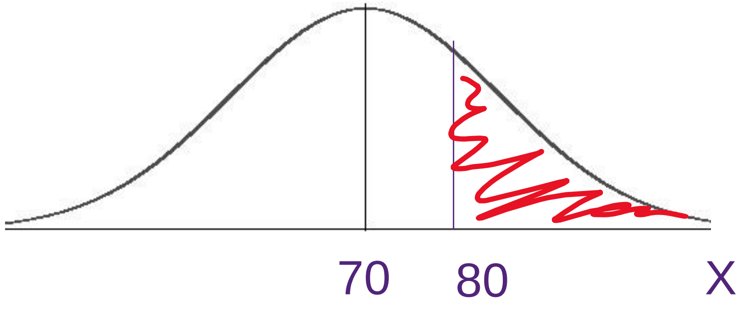
a) What is the probability the amount requested is \$80,000 or more? What is the probability the amount requested is more than \$80,000?

b) What is the probability the amount requested is between \$65,000 and \$80,000? Are these values inclusive?

c) What is the probability that the loan application is within \$30,000 either side of the mean?

$\mu = 3.38$
$\sigma = 0.42$

$P(X \geq 80{,}000) = ?$



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Q2. A bank manager knows, from past experience, home loan application requests follow a normal distribution. History has shown the home loan application mean is $70,000 and standard deviation is $20,000. A home loan application has just been received by the bank managers.

a) What is the probability the amount requested is $80,000 or more? What is the probability the amount requested is more than $80,000?

b) What is the probability the amount requested is between $65,000 and $80,000? Are these values inclusive?

c) What is the probability that the loan application is within $30,000 either side of the mean?

μ = 3.38
σ = 0.42

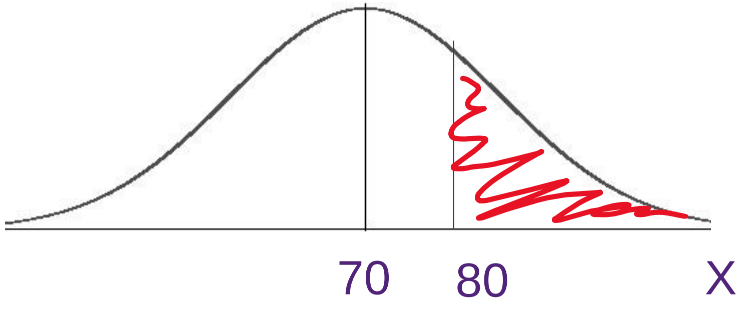
P(X ≥ 80,000) =

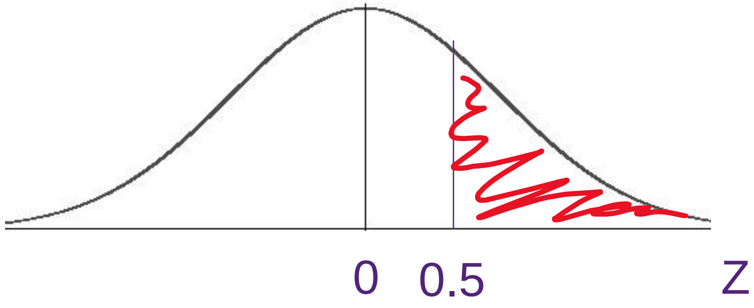
Z transformation

$$P(\ Z \geq \frac{X-\mu}{\sigma}\ ) =$$

$$P(\ Z \geq \frac{80{,}000-70{,}000}{20{,}000}\ ) =$$

P(Z ≥ 0.5) = ?

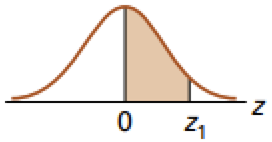




adm T05 Q1 Q2 Q3 (a) (b) Q4

TABLE A.5 Areas of the standard normal distribution $\mu = 0, \sigma = 1$

The entries in this table are the probabilities that a standard normal random variable is between 0 and z_1 (the shaded area).



z_1	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359
0.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0753
0.2	.0793	.0832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141
0.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517
0.4	.1554	.1591	.1628	.1664	.1700	.1736	.1772	.1808	.1844	.1879
0.5	.1915	.1950	.1985	.2019	.2054	.2088	.2123	.2157	.2190	.2224
0.6	.2257	.2291	.2324	.2357	.2389	.2422	.2454	.2486	.2517	.2549
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0.8	.2881	.2910	.2939	.2967	.2995	.3023	.3051	.3078	.3106	.3133
0.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389
1.0	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621
1.1	.3643	.3665	.3686	.3708	.3729	.3749	.3770	.3790	.3810	.3830
1.2	.3849	.3869	.3888	.3907	.3925	.3944	.3962	.3980	.3997	.4015
1.3	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147	.4162	.4177
1.4	.4192	.4207	.4222	.4236	.4251	.4265	.4279	.4292	.4306	.4319

adm T05 Q1 Q2 Q3 (a) (b) Q4

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TABLE A.5 Areas of the standard normal distribution $\mu = 0, \sigma = 1$

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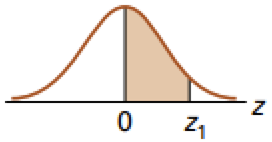

z_1	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
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0.8	.2881	.2910	.2939	.2967	.2995	.3023	.3051	.3078	.3106	.3133
0.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389
1.0	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621
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c) What is the probability that the loan application is within $30,000 either side of the mean?

$\mu = 3.38$
$\sigma = 0.42$

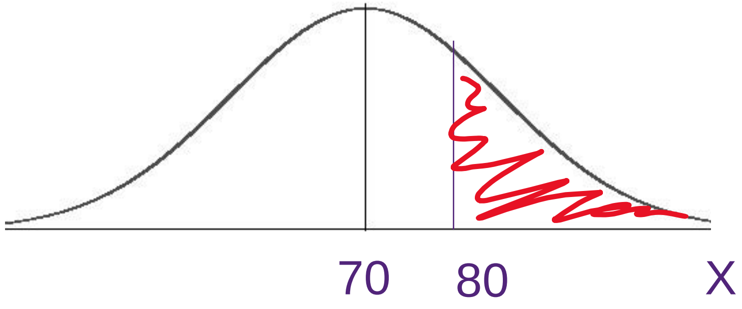
$P(X \geq 80{,}000) =$

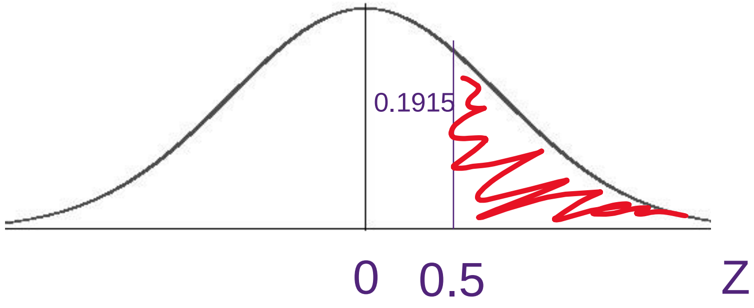
Z transformation

$P\left(Z \geq \dfrac{X-\mu}{\sigma}\right) =$

$P\left(Z \geq \dfrac{80{,}000-70{,}000}{20{,}000}\right) =$

$P(Z \geq 0.5) = ?$





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0.3085

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P(X ≥ 80,000) =

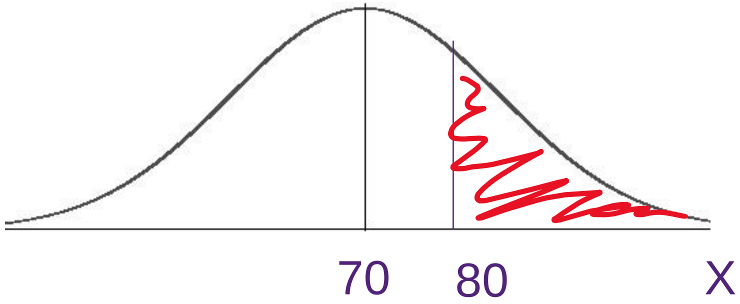
Z transformation

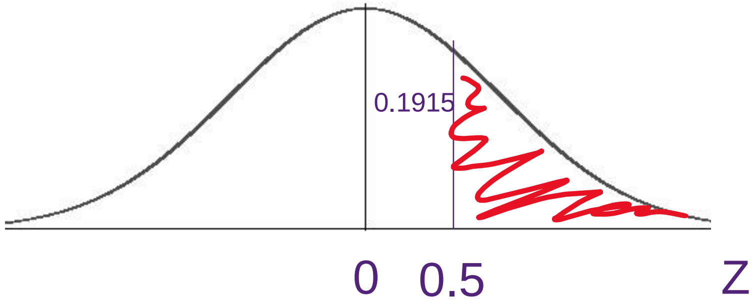
$P(Z \geq \frac{X - \mu}{\sigma}) =$

$P(Z \geq \frac{80{,}000 - 70{,}000}{20{,}000}) =$

P(Z ≥ 0.5) =

0.5 – 0.1915 = 0.3085





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c) What is the probability that the loan application is within \$30,000 either side of the mean?

$P(X \geq 80{,}000) =$

Z transformation

$P\left(Z \geq \dfrac{X - \mu}{\sigma}\right) =$

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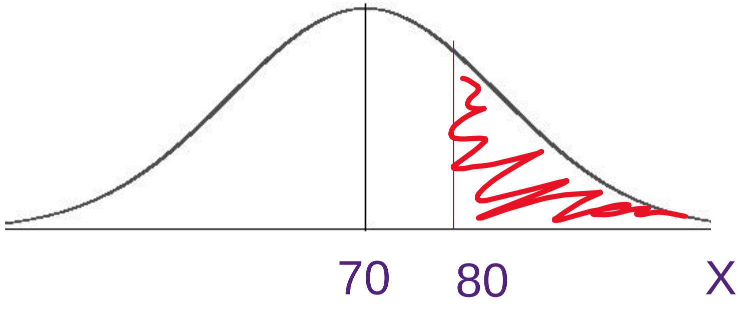
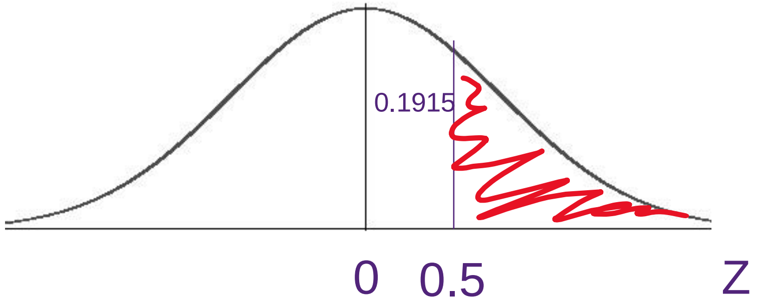
$P(Z \geq 0.5) =$

$0.5 - 0.1915 = 0.3085$





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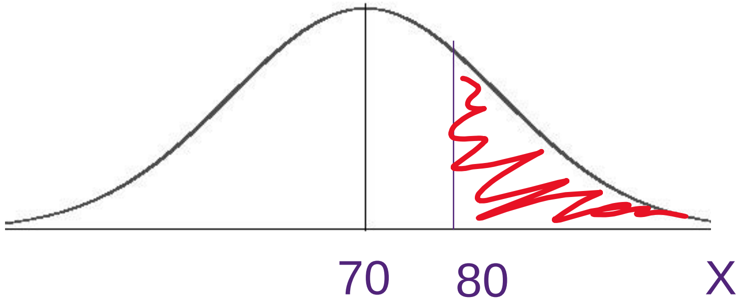
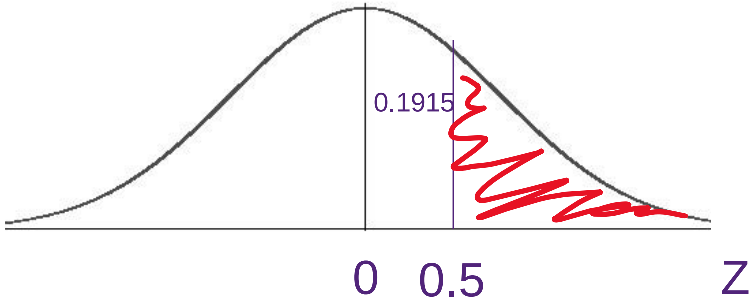
P(X ≥ 80,000) = P(X > 80,000) ?
(inclusive) (exclusive)





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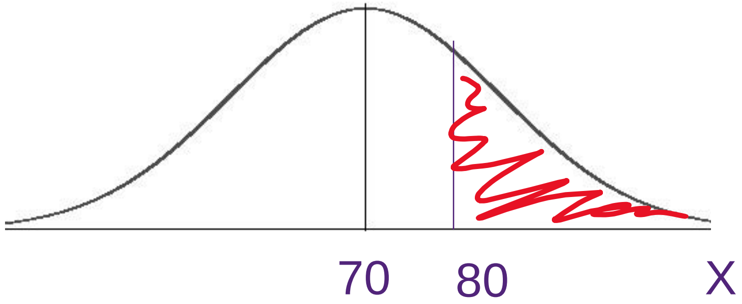
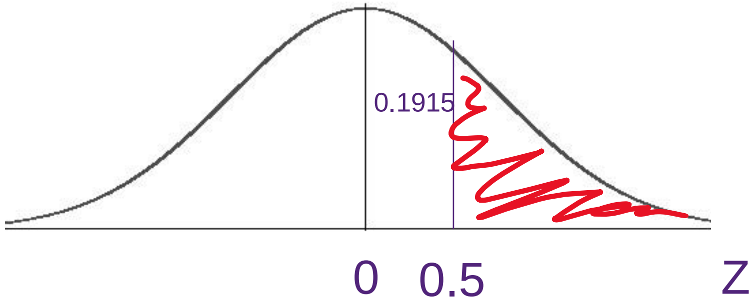
$P(X \geq 80{,}000) = P(X > 80{,}000)$?
(inclusive) (exclusive)

$P(X \geq 80{,}000) - P(X > 80{,}000) = P(X = 80{,}000)$

$P(X = 80{,}000) = ?$





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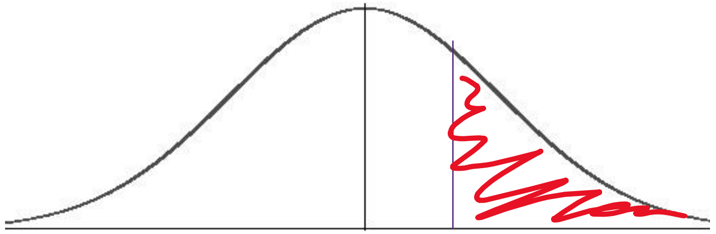
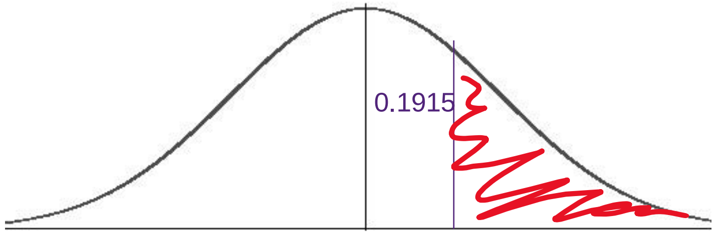
$P(X \geq 80{,}000) = P(X > 80{,}000)$?
(inclusive) (exclusive)

$P(X \geq 80{,}000) - P(X > 80{,}000) = P(X = 80{,}000)$

$P(X = 80{,}000) = 0$
because the Normal distribution is continuous.





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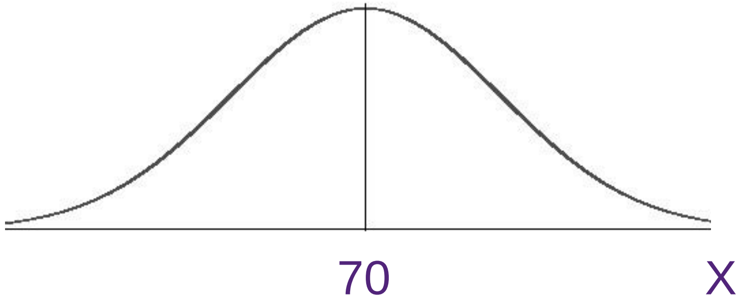
b) What is the probability the amount requested is between \$65,000 and \$80,000? Are these values inclusive?

c) What is the probability that the loan application is within \$30,000 either side of the mean?

P(65,000 > X > 80,000) = ?



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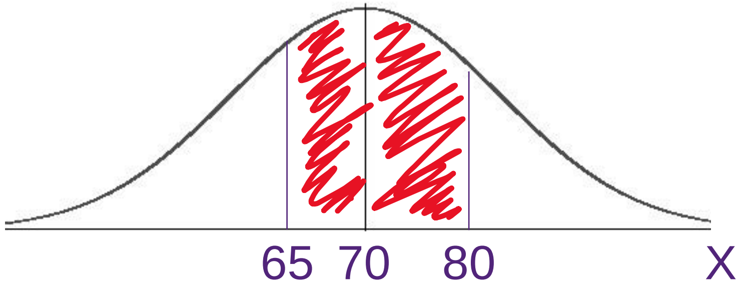
P(65,000 > X > 80,000) =



adm T05 Q1 Q2 Q3 (a) (b) Q4

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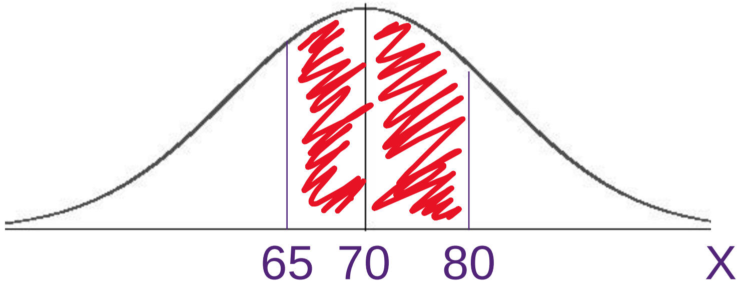
P(65,000 > X > 80,000) =

Z transformation

$$P\left(\frac{X-\mu}{\sigma} < Z < \frac{X-\mu}{\sigma}\right) =$$

$$P\left(\frac{65{,}000-70{,}000}{20{,}000} < Z < \frac{80{,}000-70{,}000}{20{,}000}\right) =$$

P(-0.25 < Z < 0.50) = ?



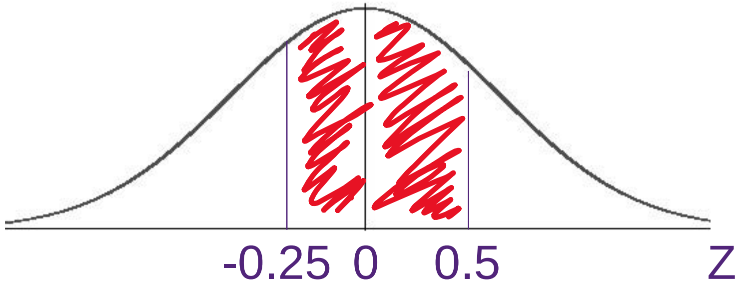
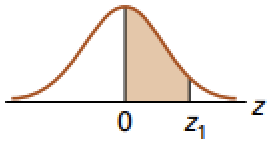


TABLE A.5 Areas of the standard normal distribution $\mu = 0, \sigma = 1$

The entries in this table are the probabilities that a standard normal random variable is between 0 and z_1 (the shaded area).



z_1	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
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0.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389
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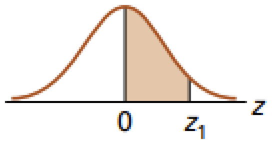

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1.1	.3643	.3665	.3686	.3708	.3729	.3749	.3770	.3790	.3810	.3830
1.2	.3849	.3869	.3888	.3907	.3925	.3944	.3962	.3980	.3997	.4015
1.3	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147	.4162	.4177
1.4	.4192	.4207	.4222	.4236	.4251	.4265	.4279	.4292	.4306	.4319

Q2. A bank manager knows, from past experience, home loan application requests follow a normal distribution. History has shown the home loan application mean is \$70,000 and standard deviation is \$20,000. A home loan application has just been received by the bank managers.

a) What is the probability the amount requested is \$80,000 or more? What is the probability the amount requested is more than \$80,000?

0.3085

$\mu = 3.38$
$\sigma = 0.42$

b) What is the probability the amount requested is between \$65,000 and \$80,000? Are these values inclusive?

0.2902

c) What is the probability that the loan application is within \$30,000 either side of the mean?

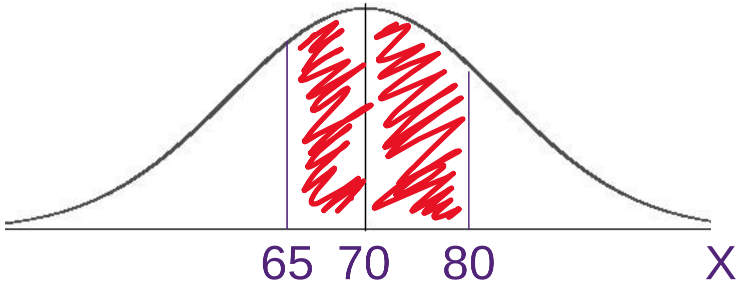
P(65,000 > X > 80,000) =

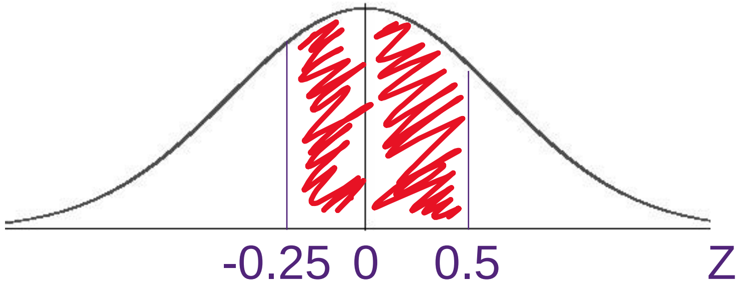
Z transformation

$$P\left(\frac{X-\mu}{\sigma} < Z < \frac{X-\mu}{\sigma}\right) =$$

$$P\left(\frac{65{,}000-70{,}000}{20{,}000} < Z < \frac{80{,}000-70{,}000}{20{,}000}\right) =$$

P(-0.25 < Z < 0.50) = 0.0987 + 0.1915 = 0.2902





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Q2. A bank manager knows, from past experience, home loan application requests follow a normal distribution. History has shown the home loan application mean is \$70,000 and standard deviation is \$20,000. A home loan application has just been received by the bank managers.

a) What is the probability the amount requested is \$80,000 or more? What is the probability the amount requested is more than \$80,000?

0.3085

$\mu = 3.38$

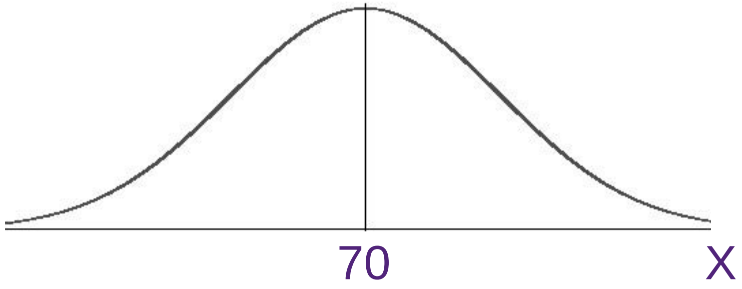
$\sigma = 0.42$

b) What is the probability the amount requested is between \$65,000 and \$80,000? Are these values inclusive?

0.2902

c) What is the probability that the loan application is within \$30,000 either side of the mean?

P(> X >) = ?



Q2. A bank manager knows, from past experience, home loan application requests follow a normal distribution. History has shown the home loan application mean is \$70,000 and standard deviation is \$20,000. A home loan application has just been received by the bank managers.

a) What is the probability the amount requested is \$80,000 or more? What is the probability the amount requested is more than \$80,000?

0.3085

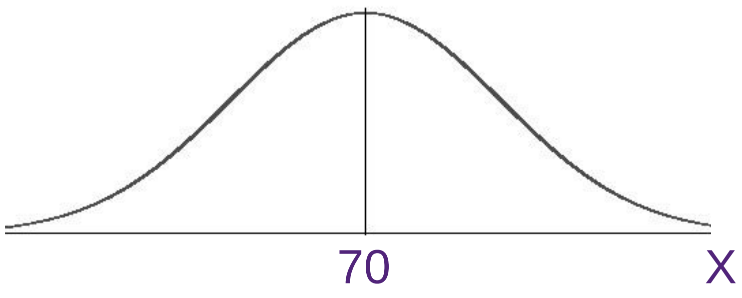
$\mu = 3.38$
$\sigma = 0.42$

b) What is the probability the amount requested is between \$65,000 and \$80,000? Are these values inclusive?

0.2902

c) What is the probability that the loan application is within \$30,000 either side of the mean?

P(70,000 – 30,0000 > X > 70,000 + 30,0000) = ?



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Q2. A bank manager knows, from past experience, home loan application requests follow a normal distribution. History has shown the home loan application mean is \$70,000 and standard deviation is \$20,000. A home loan application has just been received by the bank managers.

a) What is the probability the amount requested is \$80,000 or more? What is the probability the amount requested is more than \$80,000?

0.3085

$\mu = 3.38$
$\sigma = 0.42$

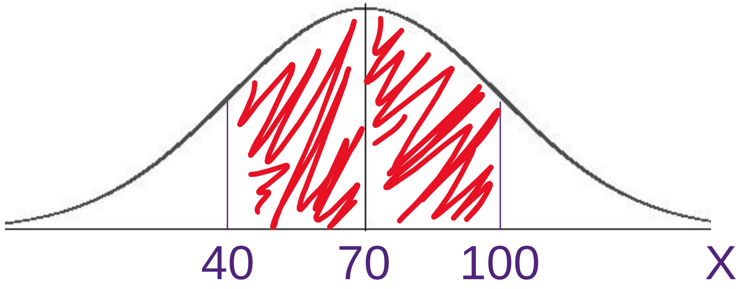
b) What is the probability the amount requested is between \$65,000 and \$80,000? Are these values inclusive?

0.2902

c) What is the probability that the loan application is within \$30,000 either side of the mean?

P(70,000 – 30,0000 > X > 70,000 + 30,0000) =

P(40,000 > X > 100,000) = ?



Q2. A bank manager knows, from past experience, home loan application requests follow a normal distribution. History has shown the home loan application mean is \$70,000 and standard deviation is \$20,000. A home loan application has just been received by the bank managers.

a) What is the probability the amount requested is \$80,000 or more? What is the probability the amount requested is more than \$80,000? 0.3085

b) What is the probability the amount requested is between \$65,000 and \$80,000? Are these values inclusive? 0.2902

$\mu = 3.38$
$\sigma = 0.42$

c) What is the probability that the loan application is within \$30,000 either side of the mean?

P(70,000 – 30,0000 > X > 70,000 + 30,0000) =

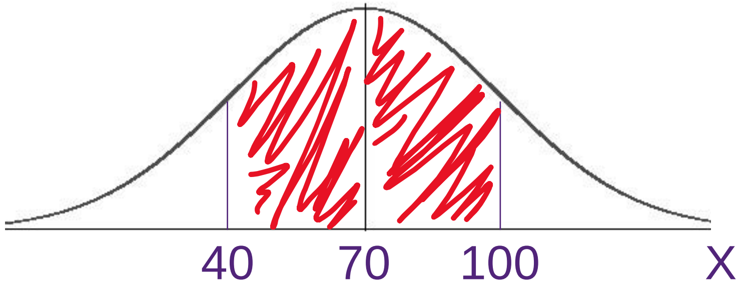
P(40,000 > X > 100,000) = ?

Z transformation

$$P\left(\frac{X-\mu}{\sigma} < Z < \frac{X-\mu}{\sigma}\right) =$$

$$P\left(\frac{40{,}000-70{,}000}{20{,}000} < Z < \frac{100{,}000-70{,}000}{20{,}000}\right) =$$

P(-1.50 < Z < 1.50) = ?



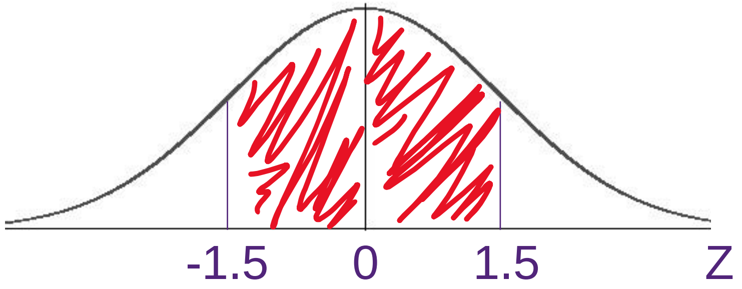
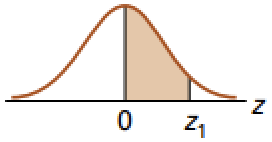


TABLE A.5 Areas of the standard normal distribution $\mu = 0, \sigma = 1$

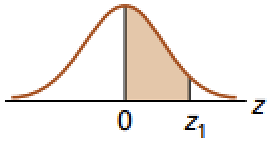
The entries in this table are the probabilities that a standard normal random variable is between 0 and z_1 (the shaded area).



z_1	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359
0.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0753
0.2	.0793	.0832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141
0.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517
0.4	.1554	.1591	.1628	.1664	.1700	.1736	.1772	.1808	.1844	.1879
0.5	.1915	.1950	.1985	.2019	.2054	.2088	.2123	.2157	.2190	.2224
0.6	.2257	.2291	.2324	.2357	.2389	.2422	.2454	.2486	.2517	.2549
0.7	.2580	.2611	.2642	.2673	.2704	.2734	.2764	.2794	.2823	.2852
0.8	.2881	.2910	.2939	.2967	.2995	.3023	.3051	.3078	.3106	.3133
0.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389
1.0	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621
1.1	.3643	.3665	.3686	.3708	.3729	.3749	.3770	.3790	.3810	.3830
1.2	.3849	.3869	.3888	.3907	.3925	.3944	.3962	.3980	.3997	.4015
1.3	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147	.4162	.4177
1.4	.4192	.4207	.4222	.4236	.4251	.4265	.4279	.4292	.4306	.4319
1.5	.4332	.4345	.4357	.4370	.4382	.4394	.4406	.4418	.4429	.4441
1.6	.4452	.4463	.4474	.4484	.4495	.4505	.4515	.4525	.4535	.4545
1.7	.4554	.4564	.4573	.4582	.4591	.4599	.4608	.4616	.4625	.4633
1.8	.4641	.4649	.4656	.4664	.4671	.4678	.4686	.4693	.4699	.4706
1.9	.4713	.4719	.4726	.4732	.4738	.4744	.4750	.4756	.4761	.4767

TABLE A.5 Areas of the standard normal distribution $\mu = 0, \sigma = 1$

The entries in this table are the probabilities that a standard normal random variable is between 0 and z_1 (the shaded area).



z_1	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359
0.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0753
0.2	.0793	.0832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141
0.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517
0.4	.1554	.1591	.1628	.1664	.1700	.1736	.1772	.1808	.1844	.1879
0.5	.1915	.1950	.1985	.2019	.2054	.2088	.2123	.2157	.2190	.2224
0.6	.2257	.2291	.2324	.2357	.2389	.2422	.2454	.2486	.2517	.2549
0.7	.2580	.2611	.2642	.2673	.2704	.2734	.2764	.2794	.2823	.2852
0.8	.2881	.2910	.2939	.2967	.2995	.3023	.3051	.3078	.3106	.3133
0.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389
1.0	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621
1.1	.3643	.3665	.3686	.3708	.3729	.3749	.3770	.3790	.3810	.3830
1.2	.3849	.3869	.3888	.3907	.3925	.3944	.3962	.3980	.3997	.4015
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1.6	.4452	.4463	.4474	.4484	.4495	.4505	.4515	.4525	.4535	.4545
1.7	.4554	.4564	.4573	.4582	.4591	.4599	.4608	.4616	.4625	.4633
1.8	.4641	.4649	.4656	.4664	.4671	.4678	.4686	.4693	.4699	.4706
1.9	.4713	.4719	.4726	.4732	.4738	.4744	.4750	.4756	.4761	.4767

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Q2. A bank manager knows, from past experience, home loan application requests follow a normal distribution. History has shown the home loan application mean is \$70,000 and standard deviation is \$20,000. A home loan application has just been received by the bank managers.

a) What is the probability the amount requested is \$80,000 or more? What is the probability the amount requested is more than \$80,000? 0.3085

b) What is the probability the amount requested is between \$65,000 and \$80,000? Are these values inclusive? 0.2902

$\mu = 3.38$
$\sigma = 0.42$

c) What is the probability that the loan application is within \$30,000 either side of the mean? 0.8664

P(70,000 – 30,0000 > X > 70,000 + 30,0000) =

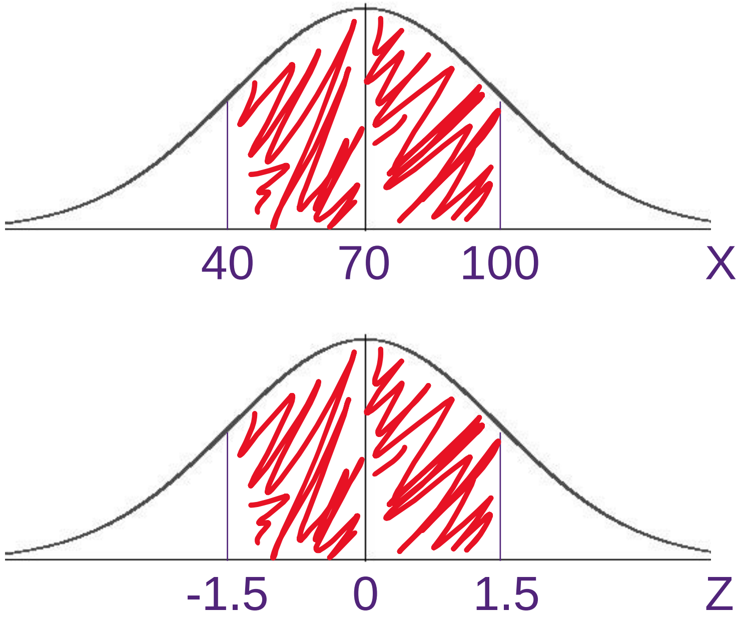
P(40,000 > X > 100,000) = ?

Z transformation

$$P\left(\frac{X-\mu}{\sigma} < Z < \frac{X-\mu}{\sigma}\right) =$$

$$P\left(\frac{40{,}000-70{,}000}{20{,}000} < Z < \frac{100{,}000-70{,}000}{20{,}000}\right) =$$

P(-1.50 < Z < 1.50) = 0.4332 + 0.4332 = 0.8664



Q3. a) Toolworkers are subject to work-related injuries. One disorder, caused by strains to the hands and wrists, is called carpal tunnel syndrome and is estimated to cost employers and insurers an average of $30,000 per injured worker. Suppose these costs are normally distributed.

(i) State the variable and its units.

(ii) If 90.8% of costs are more than $7,000 find the value of the standard deviation (to the nearest dollar). (more challenging)

a) Suppose the mean value of the carpal tunnel injuries is unknown but the standard deviation is $9,000.

(i) Find the probability that costs are within $3,000 of the mean.

(ii) How much would the average cost be if 87.8% of the costs were less than $33,000?

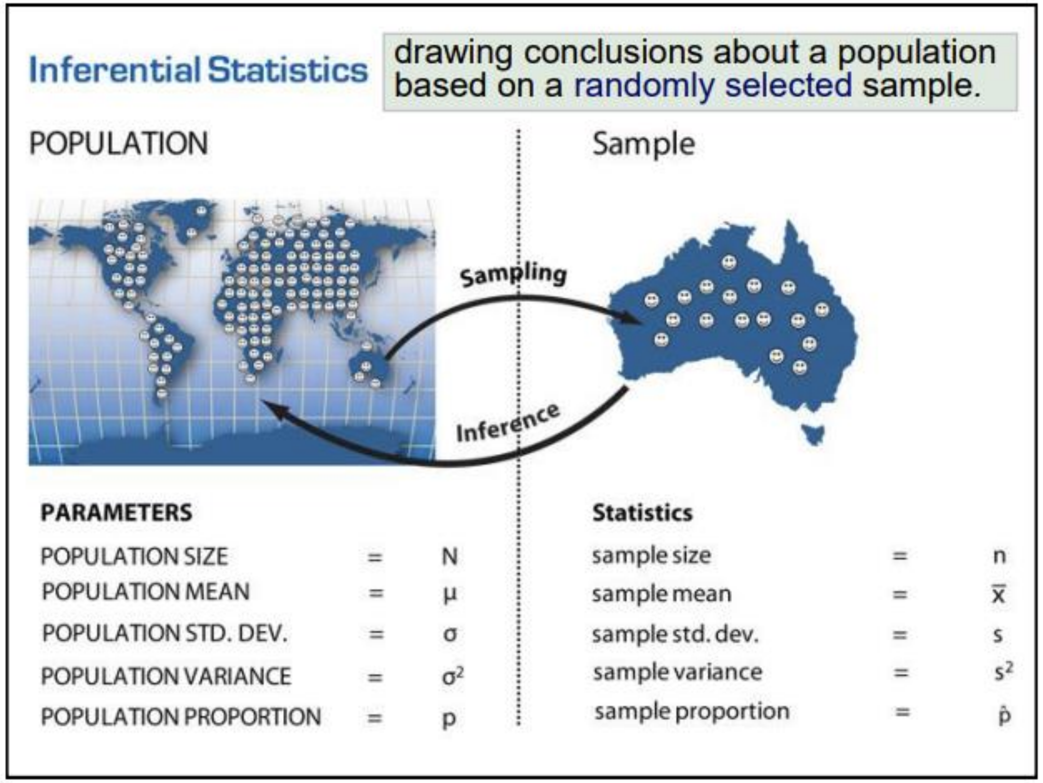
adm T05 Q1 Q2 Q3 (a) (b) Q4

Q3. a) Toolworkers are subject to work-related injuries. One disorder, caused by strains to the hands and wrists, is called carpal tunnel syndrome and is estimated to cost employers and insurers an average of $30,000 per injured worker. Suppose these costs are normally distributed.

(i) State the variable and its units.

(ii) If 90.8% of costs are more than $7,000 find the value of the standard deviation (to the nearest dollar). (more challenging)

(Pool)



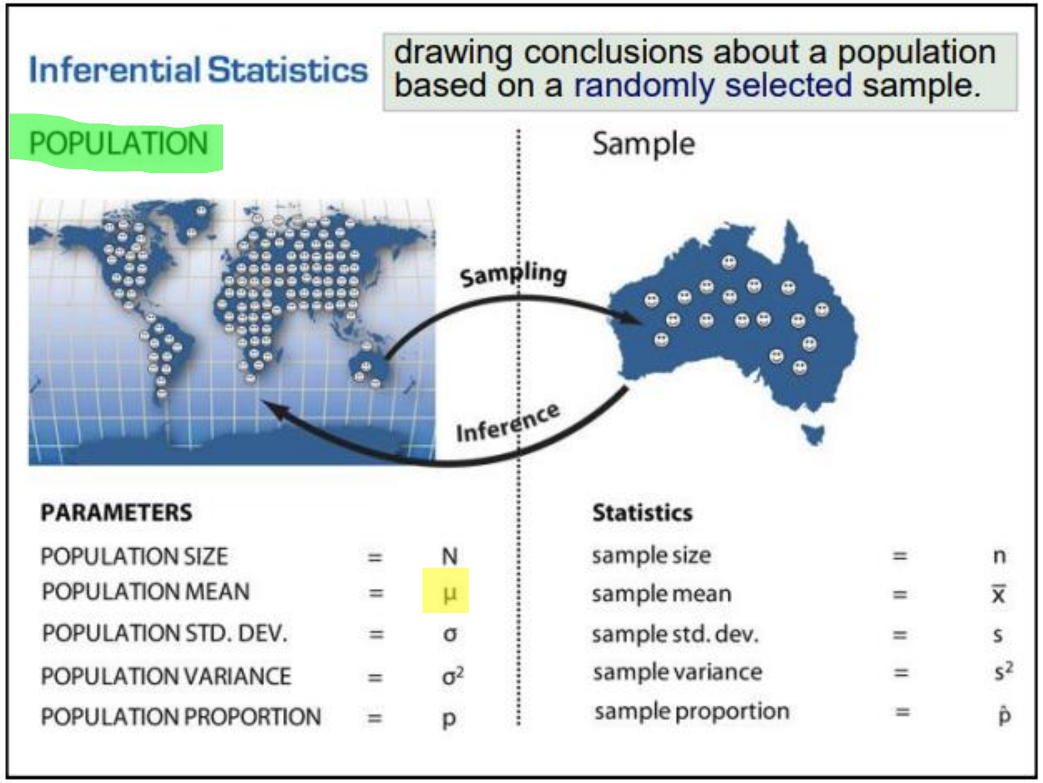
adm T05 Q1 Q2 Q3 (a) (b) Q4

Q3. a) Toolworkers are subject to work-related injuries. One disorder, caused by strains to the hands and wrists, is called carpal tunnel syndrome and is estimated to cost employers and insurers an average of \$30,000 per injured worker. Suppose these costs are normally distributed.

(i) State the variable and its units.

Cost to employers and insurers, dollars, μ = \$30,000.

(ii) If 90.8% of costs are more than \$7,000 find the value of the standard deviation (to the nearest dollar). (more challenging)



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Q3. a) Toolworkers are subject to work-related injuries. One disorder, caused by strains to the hands and wrists, is called carpal tunnel syndrome and is estimated to cost employers and insurers an average of \$30,000 per injured worker. Suppose these costs are normally distributed.

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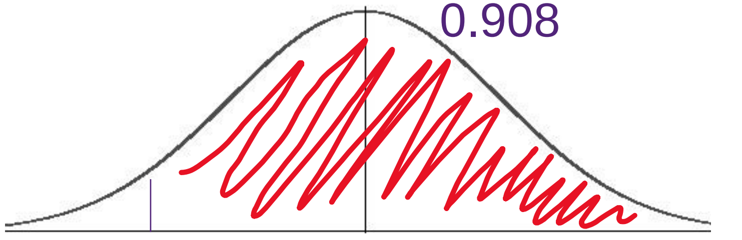
Cost to employers and insurers, dollars, μ = \$30,000.

(ii) If 90.8% of costs are more than \$7,000 find the value of the standard deviation (to the nearest dollar). (more challenging)

$P(X > 7{,}000) = 90.8\% = 0.908$, $\sigma = ?$



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Australia

Q3. a) Toolworkers are subject to work-related injuries. One disorder, caused by strains to the hands and wrists, is called carpal tunnel syndrome and is estimated to cost employers and insurers an average of \$30,000 per injured worker. Suppose these costs are normally distributed.

(i) State the variable and its units. Cost to employers and insurers, dollars, μ = \$30,000.

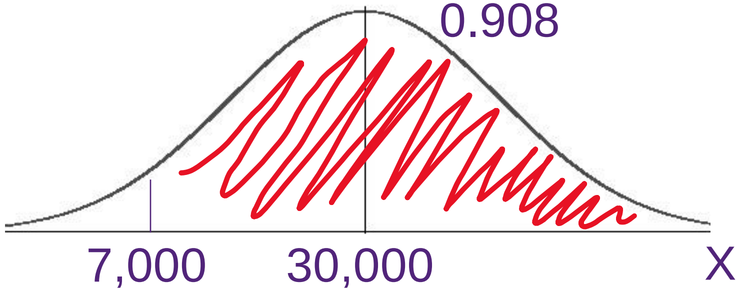
(ii) If 90.8% of costs are more than \$7,000 find the value of the standard deviation (to the nearest dollar). (more challenging)

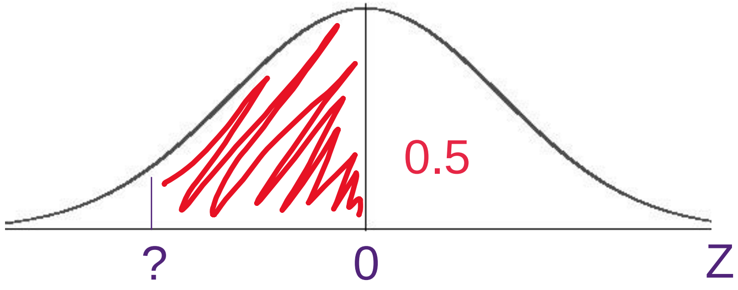
P(X > 7,000) = 90.8% = 0.908, σ = ?

Z transformation

$$P\left(Z > \frac{X - \mu}{\sigma} \right) =$$

$$P\left(Z > \frac{7{,}000 - 30{,}000}{\sigma} \right) = ?$$





Q3. a) Toolworkers are subject to work-related injuries. One disorder, caused by strains to the hands and wrists, is called carpal tunnel syndrome and is estimated to cost employers and insurers an average of $30,000 per injured worker. Suppose these costs are normally distributed.

(i) State the variable and its units. Cost to employers and insurers, dollars, μ = $30,000.

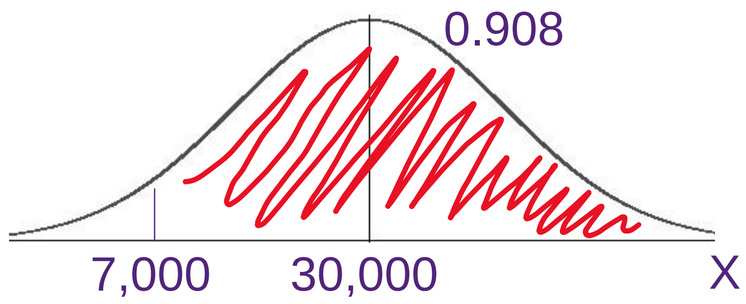
(ii) If 90.8% of costs are more than $7,000 find the value of the standard deviation (to the nearest dollar). (more challenging)

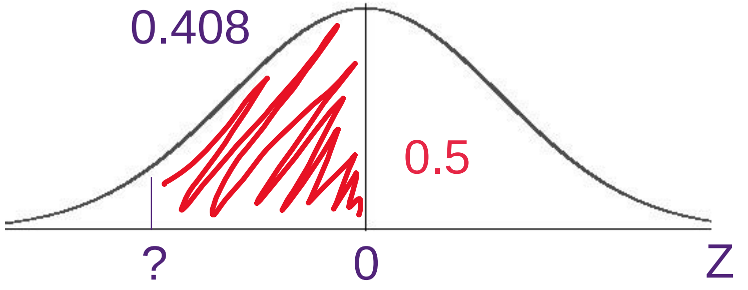
$P(X > 7{,}000) = 90.8\% = 0.908, \sigma = ?$

Z transformation

$$P\left(Z > \frac{X - \mu}{\sigma}\right) =$$

$$P\left(Z > \frac{7{,}000 - 30{,}000}{\sigma}\right) = 0.408$$

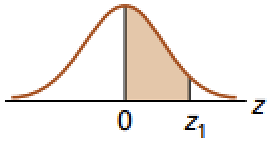




adm T05 Q1 Q2 Q3 (a) (b) Q4

TABLE A.5 Areas of the standard normal distribution $\mu = 0$, $\sigma = 1$

The entries in this table are the probabilities that a standard normal random variable is between 0 and z_1 (the shaded area).

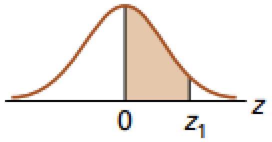


z_1	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359
0.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0753
0.2	.0793	.0832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141
0.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517
0.4	.1554	.1591	.1628	.1664	.1700	.1736	.1772	.1808	.1844	.1879
0.5	.1915	.1950	.1985	.2019	.2054	.2088	.2123	.2157	.2190	.2224
0.6	.2257	.2291	.2324	.2357	.2389	.2422	.2454	.2486	.2517	.2549
0.7	.2580	.2611	.2642	.2673	.2704	.2734	.2764	.2794	.2823	.2852
0.8	.2881	.2910	.2939	.2967	.2995	.3023	.3051	.3078	.3106	.3133
0.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389
1.0	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621
1.1	.3643	.3665	.3686	.3708	.3729	.3749	.3770	.3790	.3810	.3830
1.2	.3849	.3869	.3888	.3907	.3925	.3944	.3962	.3980	.3997	.4015
1.3	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147	.4162	.4177
1.4	.4192	.4207	.4222	.4236	.4251	.4265	.4279	.4292	.4306	.4319
1.5	.4332	.4345	.4357	.4370	.4382	.4394	.4406	.4418	.4429	.4441
1.6	.4452	.4463	.4474	.4484	.4495	.4505	.4515	.4525	.4535	.4545
1.7	.4554	.4564	.4573	.4582	.4591	.4599	.4608	.4616	.4625	.4633
1.8	.4641	.4649	.4656	.4664	.4671	.4678	.4686	.4693	.4699	.4706
1.9	.4713	.4719	.4726	.4732	.4738	.4744	.4750	.4756	.4761	.4767

adm T05 Q1 Q2 Q3 (a) (b) Q4

TABLE A.5 Areas of the standard normal distribution $\mu = 0, \sigma = 1$

The entries in this table are the probabilities that a standard normal random variable is between 0 and z_1 (the shaded area).



z_1	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359
0.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0753
0.2	.0793	.0832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141
0.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517
0.4	.1554	.1591	.1628	.1664	.1700	.1736	.1772	.1808	.1844	.1879
0.5	.1915	.1950	.1985	.2019	.2054	.2088	.2123	.2157	.2190	.2224
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0.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389
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Q3. a) Toolworkers are subject to work-related injuries. One disorder, caused by strains to the hands and wrists, is called carpal tunnel syndrome and is estimated to cost employers and insurers an average of $30,000 per injured worker. Suppose these costs are normally distributed.

(i) State the variable and its units.

Cost to employers and insurers, dollars, μ = $30,000.

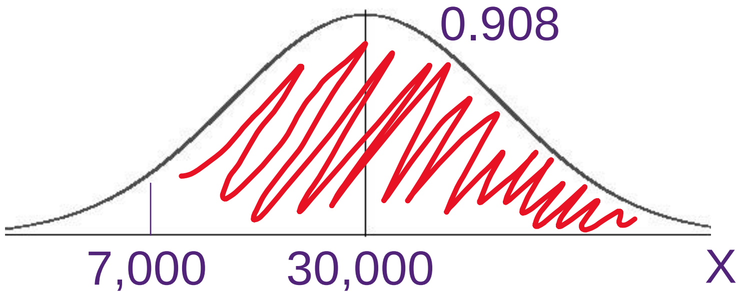
(ii) If 90.8% of costs are more than $7,000 find the value of the standard deviation (to the nearest dollar). (more challenging)

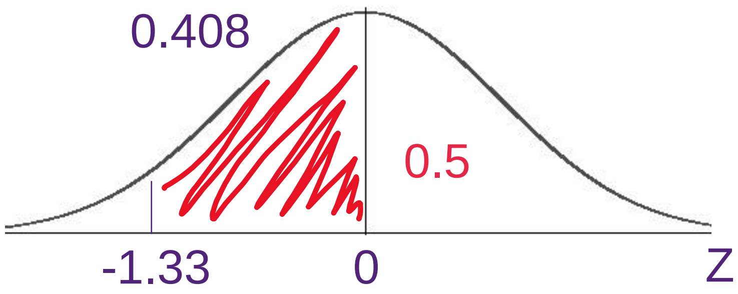
P(X > 7,000) = 90.8% = 0.908, σ = ?

Z transformation

$$P\left(Z > \frac{X - \mu}{\sigma} \right) =$$

$$P\left(Z > \frac{7{,}000 - 30{,}000}{\sigma} \right) = 0.408 = P(Z > -1.33)$$





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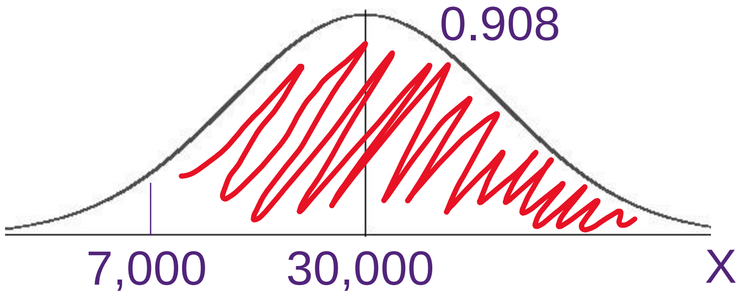
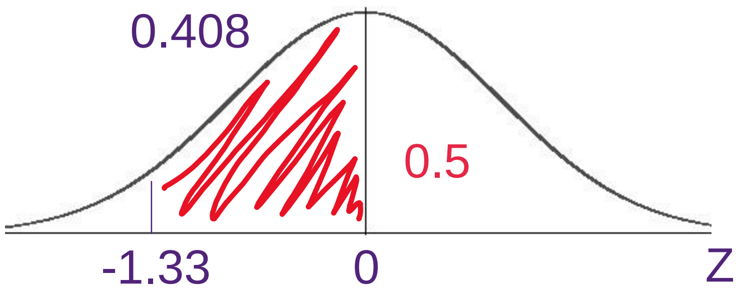
$$\frac{-23{,}000}{\sigma} = -1.33 \rightarrow \sigma = 17{,}293.23$$





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a) Suppose the mean value of the carpal tunnel injuries is unknown but the standard deviation is \$9,000.

(i) Find the probability that costs are within \$3,000 of the mean.

(ii) How much would the average cost be if 87.8% of the costs were less than \$33,000?

adm T05 Q1 Q2 Q3 (a) (b) Q4

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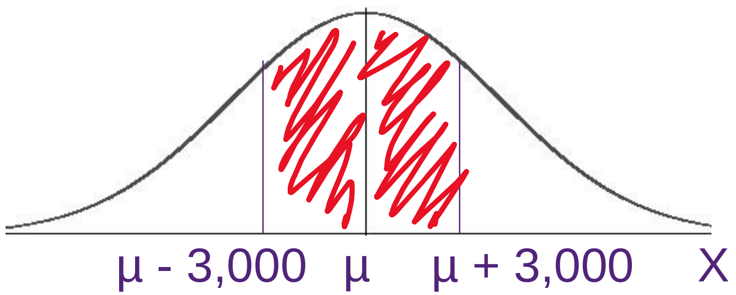
$\mu = ?$

$\sigma = \$9{,}000$

$P(\ \mu - 3{,}000 < X < \mu - 3{,}000\ )\ \ ?$



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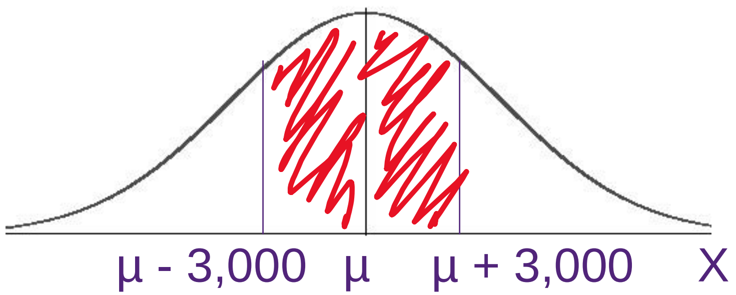
$\sigma = \$9{,}000$

$P(\ \mu - 3{,}000 < X < \mu - 3{,}000\ )$?



Z transformation

$$P\left(\frac{X-\mu}{\sigma} < Z < \frac{X-\mu}{\sigma}\right) = P\left(\frac{(\mu - 3{,}000) - \mu}{9{,}000} < Z < \frac{(\mu + 3{,}000) - \mu}{9{,}000}\right) =$$

$$P(\ -0.33 < Z < 0.33\ ) = ?$$

adm T05 Q1 Q2 Q3 (a) (b) Q4

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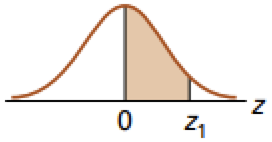
TABLE A.5 Areas of the standard normal distribution $\mu = 0, \sigma = 1$

The entries in this table are the probabilities that a standard normal random variable is between 0 and z_1 (the shaded area).



z_1	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359
0.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0753
0.2	.0793	.0832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141
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adm T05 Q1 Q2 Q3 (a) (b) Q4

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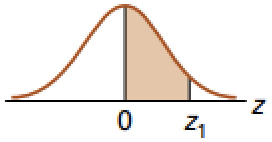

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a) Suppose the mean value of the carpal tunnel injuries is unknown but the standard deviation is \$9,000.

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(ii) How much would the average cost be if 87.8% of the costs were less than \$33,000?

$\mu = ?$

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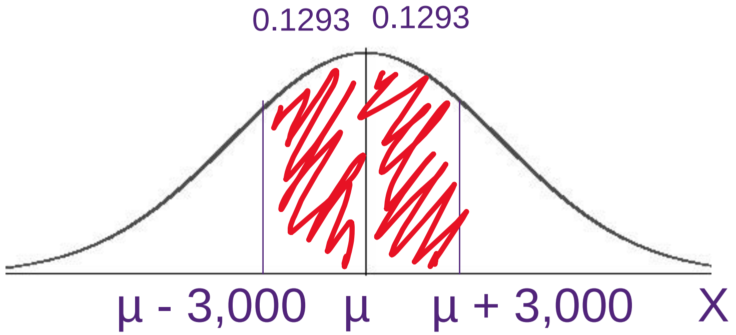
$P(\mu - 3{,}000 < X < \mu - 3{,}000)$?



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$$P(-0.33 < Z < 0.33) = 0.1293 + 0.1293 = 0.2586$$

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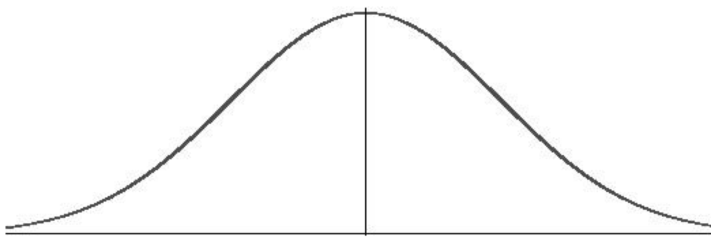
μ = ?

σ = \$9,000

P(X < 33,000) = 87.8% = 0.878



X

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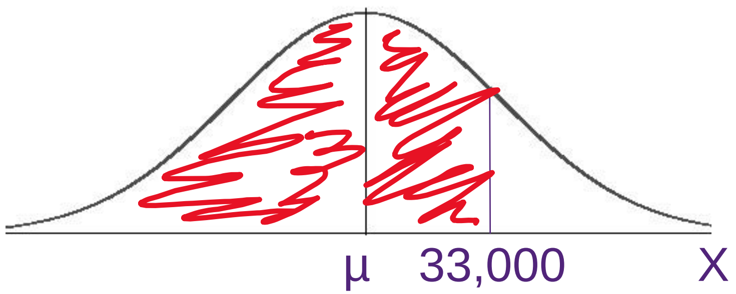

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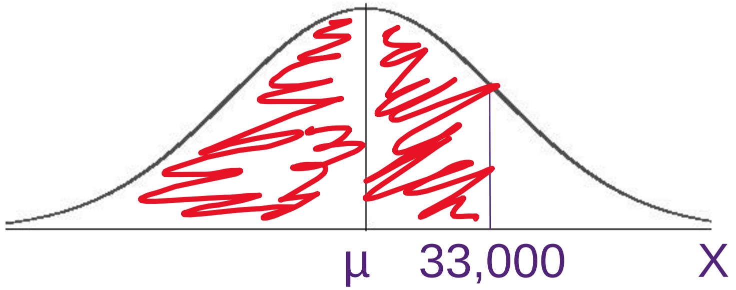
Z transformation

$$P\left(Z < \frac{X-\mu}{\sigma}\right) = P\left(Z < \frac{33{,}000-\mu}{9{,}000}\right) = 0.378$$



adm T05 Q1 Q2 Q3 (a) (b) Q4

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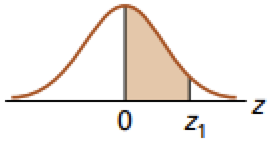

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0.2	.0793	.0832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141
0.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517
0.4	.1554	.1591	.1628	.1664	.1700	.1736	.1772	.1808	.1844	.1879
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0.8	.2881	.2910	.2939	.2967	.2995	.3023	.3051	.3078	.3106	.3133
0.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389
1.0	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621
1.1	.3643	.3665	.3686	.3708	.3729	.3749	.3770	.3790	.3810	.3830
1.2	.3849	.3869	.3888	.3907	.3925	.3944	.3962	.3980	.3997	.4015
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1.5	.4332	.4345	.4357	.4370	.4382	.4394	.4406	.4418	.4429	.4441
1.6	.4452	.4463	.4474	.4484	.4495	.4505	.4515	.4525	.4535	.4545
1.7	.4554	.4564	.4573	.4582	.4591	.4599	.4608	.4616	.4625	.4633
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adm T05 Q1 Q2 Q3 (a) (b) Q4

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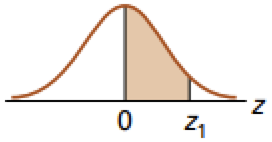

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0.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0753
0.2	.0793	.0832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141
0.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517
0.4	.1554	.1591	.1628	.1664	.1700	.1736	.1772	.1808	.1844	.1879
0.5	.1915	.1950	.1985	.2019	.2054	.2088	.2123	.2157	.2190	.2224
0.6	.2257	.2291	.2324	.2357	.2389	.2422	.2454	.2486	.2517	.2549
0.7	.2580	.2611	.2642	.2673	.2704	.2734	.2764	.2794	.2823	.2852
0.8	.2881	.2910	.2939	.2967	.2995	.3023	.3051	.3078	.3106	.3133
0.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389
1.0	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621
1.1	.3643	.3665	.3686	.3708	.3729	.3749	.3770	.3790	.3810	.3830
1.2	.3849	.3869	.3888	.3907	.3925	.3944	.3962	.3980	.3997	.4015
1.3	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147	.4162	.4177
1.4	.4192	.4207	.4222	.4236	.4251	.4265	.4279	.4292	.4306	.4319
1.5	.4332	.4345	.4357	.4370	.4382	.4394	.4406	.4418	.4429	.4441
1.6	.4452	.4463	.4474	.4484	.4495	.4505	.4515	.4525	.4535	.4545
1.7	.4554	.4564	.4573	.4582	.4591	.4599	.4608	.4616	.4625	.4633
1.8	.4641	.4649	.4656	.4664	.4671	.4678	.4686	.4693	.4699	.4706
1.9	.4713	.4719	.4726	.4732	.4738	.4744	.4750	.4756	.4761	.4767

Q3. a) Toolworkers are subject to work-related injuries. One disorder, caused by strains to the hands and wrists, is called carpal tunnel syndrome and is estimated to cost employers and insurers an average of \$30,000 per injured worker. Suppose these costs are normally distributed.

(i) State the variable and its units. Cost to employers and insurers, dollars, μ = \$30,000.

(ii) If 90.8% of costs are more than \$7,000 find the value of the standard deviation (to the nearest dollar). (more challenging) σ = \$17,293.23

a) Suppose the mean value of the carpal tunnel injuries is unknown but the standard deviation is \$9,000.

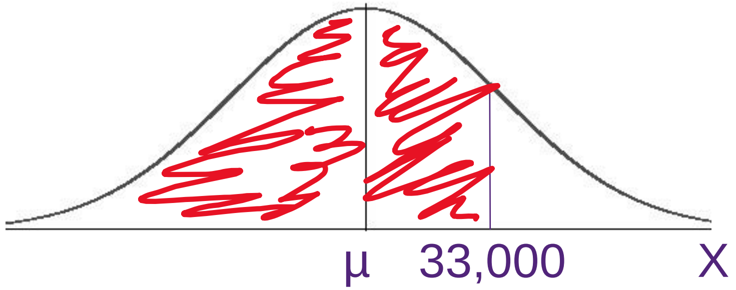
(i) Find the probability that costs are within \$3,000 of the mean. 0.2586

(ii) How much would the average cost be if 87.8% of the costs were less than \$33,000?

$\mu = ?$

$\sigma = \$9{,}000$

$P(X < 33{,}000) = 87.8\% = 0.878$



Z transformation

$$P\left(Z < \frac{X - \mu}{\sigma} \right) = P\left(Z < \frac{33{,}000 - \mu}{9{,}000} \right) = 0.378 = P(Z < 1.165)$$

$$\frac{33{,}000 - \mu}{9{,}000} = 1.165 \rightarrow ?$$

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Q3. a) Toolworkers are subject to work-related injuries. One disorder, caused by strains to the hands and wrists, is called carpal tunnel syndrome and is estimated to cost employers and insurers an average of \$30,000 per injured worker. Suppose these costs are normally distributed.

(i) State the variable and its units. Cost to employers and insurers, dollars, μ = \$30,000.

(ii) If 90.8% of costs are more than \$7,000 find the value of the standard deviation (to the nearest dollar). (more challenging) σ = \$17,293.23

a) Suppose the mean value of the carpal tunnel injuries is unknown but the standard deviation is \$9,000.

(i) Find the probability that costs are within \$3,000 of the mean. 0.2586

(ii) How much would the average cost be if 87.8% of the costs were less than \$33,000? \$22,515

$\mu = ?$

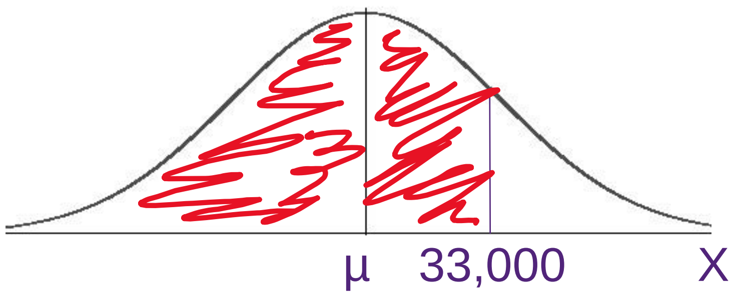
$\sigma = \$9{,}000$

$P(X < 33{,}000) = 87.8\% = 0.878$

Z transformation

$$P\left(Z < \frac{X-\mu}{\sigma}\right) = P\left(Z < \frac{33{,}000-\mu}{9{,}000}\right) = 0.378 = P(Z < 1.165)$$

$$\frac{33{,}000-\mu}{9{,}000} = 1.165 \rightarrow -\mu = -33{,}000 + 1.165*9{,}000 \rightarrow \mu = 22{,}515$$



Q4. The Kamp family has twins, Rob and Rachel who have graduated from university and are now each earning $50,000 per year. Rachel works in the retail industry where the mean salary for executives with less than 5 years' experience is $35,000 with a standard deviation of $8,000. Rob is an engineer. The mean salary for engineers with less than 5 years' experience is $60,000 with a standard deviation of $5,000. Compute the Z values for Rob and Rachel and comment on your findings.

Q4. The Kamp family has twins, Rob and Rachel who have graduated from university and are now each earning \$50,000 per year. Rachel works in the retail industry where the mean salary for executives with less than 5 years' experience is \$35,000 with a standard deviation of \$8,000. Rob is an engineer. The mean salary for engineers with less than 5 years' experience is \$60,000 with a standard deviation of \$5,000. Compute the Z values for Rob and Rachel and comment on your findings.

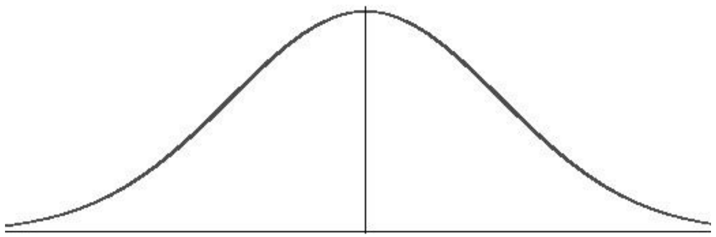
Rachel

$X = \$50{,}000$

$\mu = \$35{,}000$

$\sigma = \$8{,}000$

$$Z = \frac{X - \mu}{\sigma} = ?$$



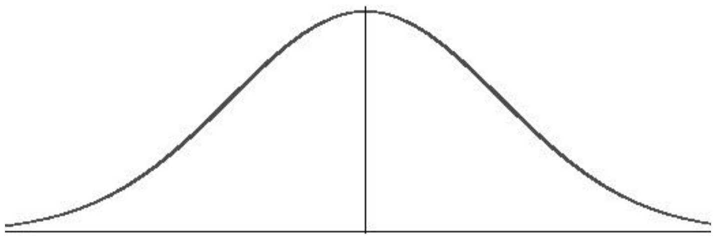
Rob

$X = \$50{,}000$

$\mu = \$60{,}000$

$\sigma = \$5{,}000$

$$Z = \frac{X - \mu}{\sigma} = ?$$



adm T05 Q1 Q2 Q3 (a) (b) Q4

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Q4. The Kamp family has twins, Rob and Rachel who have graduated from university and are now each earning \$50,000 per year. Rachel works in the retail industry where the mean salary for executives with less than 5 years' experience is \$35,000 with a standard deviation of \$8,000. Rob is an engineer. The mean salary for engineers with less than 5 years' experience is \$60,000 with a standard deviation of \$5,000. Compute the Z values for Rob and Rachel and comment on your findings.

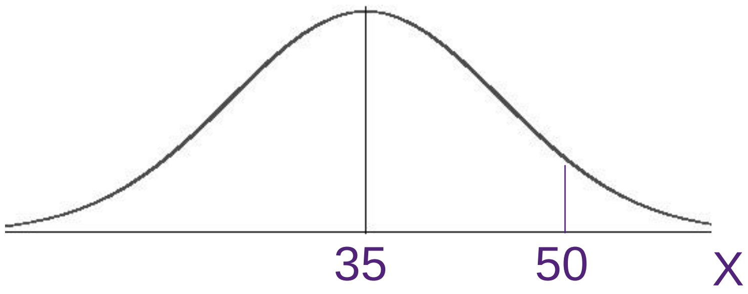
Rachel

$X = \$50,000$

$\mu = \$35,000$

$\sigma = \$8,000$

$$Z = \frac{X - \mu}{\sigma} = ?$$



(Pool)

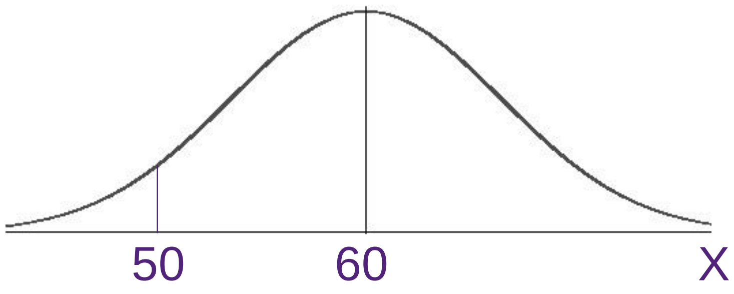
Rob

$X = \$50,000$

$\mu = \$60,000$

$\sigma = \$5,000$

$$Z = \frac{X - \mu}{\sigma} = ?$$



adm T05 Q1 Q2 Q3 (a) (b) Q4

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Q4. The Kamp family has twins, Rob and Rachel who have graduated from university and are now each earning \$50,000 per year. Rachel works in the retail industry where the mean salary for executives with less than 5 years' experience is \$35,000 with a standard deviation of \$8,000. Rob is an engineer. The mean salary for engineers with less than 5 years' experience is \$60,000 with a standard deviation of \$5,000. Compute the Z values for Rob and Rachel and comment on your findings.

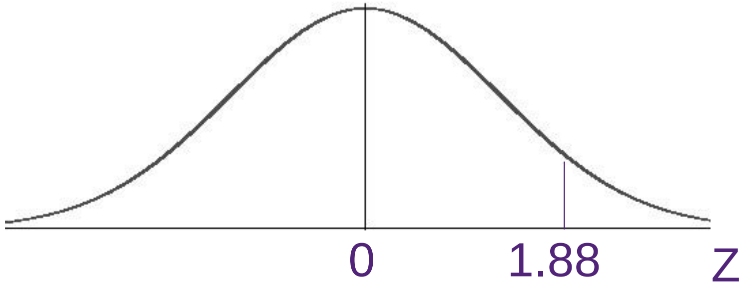
Rachel

$X = \$50{,}000$

$\mu = \$35{,}000$

$\sigma = \$8{,}000$

$$Z = \frac{X - \mu}{\sigma} = 1.88$$



Rachel is earning well in her field.

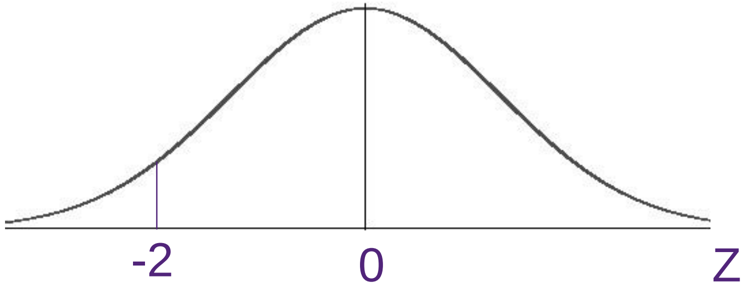
Rob

$X = \$50{,}000$

$\mu = \$60{,}000$

$\sigma = \$5{,}000$

$$Z = \frac{X - \mu}{\sigma} = -2$$



Rob is not earning well in his field.

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ECON1310
Tutorial 5 for Week 6
NORMAL DISTRIBUTION

At the end of this tutorial you should be able to

- Describe the characteristics of the normal distribution and standardised normal distribution
- Interpret and use the standardised normal distribution tables
- Compute Z scores and associated probabilities

Thank you

Francisco Tavares Garcia

Academic Tutor | School of Economics

tavaresgarcia.github.io

Reference

Black et al. (2016), Australasian Business Statistics, 4th Edition, Wiley Australia.