

Student: Rebecca Wilson
Date: 1/29/13
Time: 1:36 PM

Instructor: David Blodgett
Course: Applied Managerial Statistics (3) Problems
Book: DeVry GM533: Applied
Managerial Statistics

Assignment: Week 3 Homework

1. The ages of a group of 50 women are approximately normally distributed with a mean of 50 years and a standard deviation of 6 years. One woman is randomly selected from the group, and her age is observed.
- Find the probability that her age will fall between 54 and 61 years.
 - Find the probability that her age will fall between 49 and 51 years.
 - Find the probability that her age will be less than 34 years.
 - Find the probability that her age will exceed 40 years.
- a. The probability that her age will fall between 54 and 61 years is .
(Round to four decimal places as needed.)
- b. The probability that her age will fall between 49 and 51 years is .
(Round to four decimal places as needed.)
- c. The probability that her age will be less than 34 years is .
(Round to four decimal places as needed.)
- d. The probability that her age will exceed 40 years is .
(Round to four decimal places as needed.)
-
2. The mean gas mileage for a hybrid car is 57 miles per gallon. Suppose that the gasoline mileage is approximately normally distributed with a standard deviation of 3.5 miles per gallon. a. What is the probability that a randomly selected hybrid gets more than 60 miles per gallon? b. What is the probability that a randomly selected hybrid gets 52 miles per gallon or less? c. What is the probability that a randomly selected hybrid gets between 58 and 61 miles per gallon? d. What is the probability that a randomly selected hybrid gets less than 46 miles per gallon?
- The probability that a randomly selected hybrid gets more than 60 miles per gallon is .
(Round to four decimal places as needed.)
 - The probability that a randomly selected hybrid gets 52 miles per gallon or less is . (Round to four decimal places as needed.)
 - The probability that a randomly selected hybrid gets between 58 and 61 miles per gallon is .
(Round to four decimal places as needed.)
 - The probability that a randomly selected hybrid gets less than 46 miles per gallon is . (Round to four decimal places as needed.)

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3. Resource Reservation Protocol (RSVP) was originally designed to establish signaling links for stationary networks. RSVP was applied to mobile wireless technology. A simulation study revealed that the transmission delay (measured in milliseconds) of an RSVP linked wireless device has an approximate normal distribution with mean $\mu = 48.5$ milliseconds and $\sigma = 8.5$ milliseconds. Complete parts **a** and **b**.

- a.** What is the probability that the transmission delay is less than 57 milliseconds?

$$P(x < 57) = \square \text{ (Round to four decimal places as needed.)}$$

- b.** What is the probability that the transmission delay is between 40 and 60 milliseconds?

$$P(40 \leq x \leq 60) = \square \text{ (Round to four decimal places as needed.)}$$

4. Almost all companies utilize some type of year-end performance review for their employees. Human Resources (HR) at a university's Health Science Center provides guidelines for supervisors rating their subordinates. For example, raters are advised to examine their ratings for a tendency to be either too lenient or too harsh. According to HR, "if you have this tendency, consider using a normal distribution—10% of employees (rated) exemplary, 20% distinguished, 40% competent, 20% marginal, and 10% unacceptable." Suppose you are rating an employee's performance on a scale of 1 (lowest) to 100 (highest). Also, assume the ratings follow a normal distribution with a mean of 45 and a standard deviation of 14. Complete parts **a** and **b**.

- a.** What is the lowest rating you should give to an "exemplary" employee if you follow the university's HR guidelines?

$$\square \text{ (Round to two decimal places as needed.)}$$

- b.** What is the lowest rating you should give to a "competent" employee if you follow the university's guidelines?

$$\square \text{ (Round to two decimal places as needed.)}$$

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5. Personnel tests are designed to test a job applicant's cognitive and/or physical abilities. A particular dexterity test is administered nationwide by a private testing service. It is known that for all tests administered last year, the distribution of scores was approximately normal with mean 74 and standard deviation 7.1.
- a. A particular employer requires job candidates to score at least 79 on the dexterity test. Approximately what percentage of the test scores during the past year exceeded 79?
- b. The testing service reported to a particular employer that one of its job candidate's scores fell at the 95th percentile of the distribution (i.e., approximately 95% of the scores were lower than the candidate's, and only 5% were higher). What was the candidate's score?
- a. Approximately % of the test scores during the past year exceeded 79.
(Round to two decimal places as needed.)
- b. The candidate's score was .
(Round to the nearest whole number as needed.)
6. Before negotiating a long-term construction contract, building contractors must carefully estimate the total cost of completing the project. At a certain university, a contractor proposed a model for total cost of a long-term contract based on the normal distribution. For one particular construction contract, the university assumed total cost, x , to be normally distributed with mean \$870,000 and standard deviation \$160,000. The revenue, R , promised to the contractor is \$1,010,000.
- a. The contract will be profitable if revenue exceeds total cost. What is the probability that the contract will be profitable for the contractor?
- b. What is the probability that the project will result in a loss for the contractor?
- c. Suppose the contractor has the opportunity to renegotiate the contract. What value of R should the contractor strive for in order to have a 0.95 probability of making a profit?
- a. The probability that the contract will be profitable for the contractor is .
(Round to four decimal places as needed.)
- b. The probability that the project will result in a loss for the contractor is .
(Round to four decimal places as needed.)
- c. What value of R should the contractor strive for in order to have a 0.95 probability of making a profit?
- $R = \$$ (Round to the nearest dollar as needed.)

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7. The characteristics of an industrial filling process in which an expensive liquid is injected into a container was investigated. The quantity injected per container is approximately normally distributed with mean 10 units and standard deviation 0.02 units. Each unit of fill costs \$10 per unit. If a container contains less than 10 units (that is, is underfilled), it must be reprocessed at a cost of \$14. A properly filled container sells for \$135. Complete parts **a** through **c**.

a. Find the probability that a container is underfilled.

(Round to four decimal places as needed.)

Find the probability that a container is not underfilled.

(Round to four decimal places as needed.)

b. A container is initially underfilled and must be reprocessed. Upon refilling, it contains 10.60 units. How much profit will the company make on this container?

\$

c. The operations manager adjusts the mean of the filling process upward to 10.10 units in order to make the probability of underfilling approximately zero. Under these conditions, what is the expected profit per container?

\$

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8. A random sample of $n = 100$ observations is drawn from a population with a mean equal to 23 and a standard deviation equal to 20.

- a. Give the mean and standard deviation of the (repeated) sampling distribution \bar{x} .
- b. Describe the shape of the sampling distribution of \bar{x} . Does your answer depend on the sample size?
- c. Calculate the standard normal z-score corresponding to a value of $\bar{x} = 19.5$.
- d. Calculate the standard normal z-score corresponding to a value of $\bar{x} = 27$.

a. $\mu_{\bar{x}} = \square$ $\sigma_{\bar{x}} = \square$

b. Choose the correct answer below.

- A. The shape is that of a uniform distribution and doesn't depend on the sample size.
- B. The shape is that of a normal distribution and doesn't depend on the sample size.
- C. The shape is that of a uniform distribution and depends on the sample size.
- D. The shape is that of a normal distribution and depends on the sample size.

c. $z = \square$

d. $z = \square$

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9. A random sample of $n = 81$ observations is drawn from a population with a mean equal to 51 and a standard deviation equal to 36.

a. Find the probability that \bar{x} is less than 47.

b. Find the probability that \bar{x} is greater than 61.

c. Find the probability that \bar{x} falls between 47 and 59.

 Click the icon to view the table of normal curve areas.

a. The probability that \bar{x} is less than 47 is .

(Round to four decimal places as needed.)

b. The probability that \bar{x} is greater than 61 is .

(Round to four decimal places as needed.)

c. The probability that \bar{x} falls between 47 and 59 is .

(Round to four decimal places as needed.)

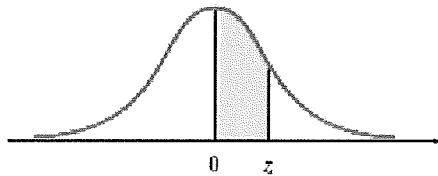
Normal Curve Areas

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Assignment: Week 3 Homework

9.
 (cont.)



z	.00	.01	.02	.03	.04	.05	.06	.07
.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279
.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675
.2	.0793	.0832	.0871	.0910	.0948	.0987	.1026	.1064
.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443
.4	.1554	.1591	.1628	.1664	.1700	.1736	.1772	.1808
.5	.1915	.1950	.1985	.2019	.2054	.2088	.2123	.2157
.6	.2257	.2291	.2324	.2357	.2389	.2422	.2454	.2486
.7	.2580	.2611	.2642	.2673	.2704	.2734	.2764	.2794
.8	.2881	.2910	.2939	.2967	.2995	.3023	.3051	.3078
.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340
1.0	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577
1.1	.3643	.3665	.3686	.3708	.3729	.3749	.3770	.3790
1.2	.3849	.3869	.3888	.3907	.3925	.3944	.3962	.3980
1.3	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147
1.4	.4192	.4207	.4222	.4236	.4251	.4265	.4279	.4292
1.5	.4332	.4345	.4357	.4370	.4382	.4394	.4406	.4418
1.6	.4452	.4463	.4474	.4484	.4495	.4505	.4515	.4525
1.7	.4554	.4564	.4573	.4582	.4591	.4599	.4608	.4616
1.8	.4641	.4649	.4656	.4664	.4671	.4678	.4686	.4693
1.9	.4713	.4719	.4726	.4732	.4738	.4744	.4750	.4756
2.0	.4772	.4778	.4783	.4788	.4793	.4798	.4803	.4808
2.1	.4821	.4826	.4830	.4834	.4838	.4842	.4846	.4850
2.2	.4861	.4864	.4868	.4871	.4875	.4878	.4881	.4884
2.3	.4893	.4896	.4898	.4901	.4904	.4906	.4909	.4911
2.4	.4918	.4920	.4922	.4925	.4927	.4929	.4931	.4932
2.5	.4938	.4940	.4941	.4943	.4945	.4946	.4948	.4949
2.6	.4953	.4955	.4956	.4957	.4959	.4960	.4961	.4962
2.7	.4965	.4966	.4967	.4968	.4969	.4970	.4971	.4972
2.8	.4974	.4975	.4976	.4977	.4977	.4978	.4979	.4979
2.9	.4981	.4982	.4982	.4983	.4984	.4984	.4985	.4985
3.0	.4987	.4987	.4987	.4988	.4988	.4989	.4989	.4989
z	.00	.01	.02	.03	.04	.05	.06	.07

10. The average salary for a certain profession is \$69,500. Assume that the standard deviation of such salaries is \$38,500. Consider a random sample of 55 people in this profession and let \bar{x} represent the mean salary for the sample.

 Click the icon to view the table of normal curve areas.

- a. What is $\mu_{\bar{x}}$?

$$\mu_{\bar{x}} = \square$$

- b. What is $\sigma_{\bar{x}}$?

$$\sigma_{\bar{x}} = \square \text{ (Round to two decimal places as needed.)}$$

- c. Describe the shape of the sampling distribution of \bar{x} .

- A. The shape is that of a binomial distribution.
 B. The shape is that of a normal distribution.
 C. The shape is that of a uniform distribution.
 D. The shape is that of a poisson distribution.

- d. Find the z-score for the value $\bar{x} = 62,000$.

$$z = \square \text{ (Round to two decimal places as needed.)}$$

- e. Find $P(\bar{x} > 62,000)$.

$$P(\bar{x} > 62,000) = \square \text{ (Round to four decimal places as needed.)}$$

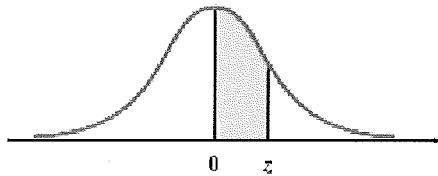
Normal Curve Areas

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10.
 (cont.)




z	.00	.01	.02	.03	.04	.05	.06	.07
.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279
.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675
.2	.0793	.0832	.0871	.0910	.0948	.0987	.1026	.1064
.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443
.4	.1554	.1591	.1628	.1664	.1700	.1736	.1772	.1808
.5	.1915	.1950	.1985	.2019	.2054	.2088	.2123	.2157
.6	.2257	.2291	.2324	.2357	.2389	.2422	.2454	.2486
.7	.2580	.2611	.2642	.2673	.2704	.2734	.2764	.2794
.8	.2881	.2910	.2939	.2967	.2995	.3023	.3051	.3078
.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340
1.0	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577
1.1	.3643	.3665	.3686	.3708	.3729	.3749	.3770	.3790
1.2	.3849	.3869	.3888	.3907	.3925	.3944	.3962	.3980
1.3	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147
1.4	.4192	.4207	.4222	.4236	.4251	.4265	.4279	.4292
1.5	.4332	.4345	.4357	.4370	.4382	.4394	.4406	.4418
1.6	.4452	.4463	.4474	.4484	.4495	.4505	.4515	.4525
1.7	.4554	.4564	.4573	.4582	.4591	.4599	.4608	.4616
1.8	.4641	.4649	.4656	.4664	.4671	.4678	.4686	.4693
1.9	.4713	.4719	.4726	.4732	.4738	.4744	.4750	.4756
2.0	.4772	.4778	.4783	.4788	.4793	.4798	.4803	.4808
2.1	.4821	.4826	.4830	.4834	.4838	.4842	.4846	.4850
2.2	.4861	.4864	.4868	.4871	.4875	.4878	.4881	.4884
2.3	.4893	.4896	.4898	.4901	.4904	.4906	.4909	.4911
2.4	.4918	.4920	.4922	.4925	.4927	.4929	.4931	.4932
2.5	.4938	.4940	.4941	.4943	.4945	.4946	.4948	.4949
2.6	.4953	.4955	.4956	.4957	.4959	.4960	.4961	.4962
2.7	.4965	.4966	.4967	.4968	.4969	.4970	.4971	.4972
2.8	.4974	.4975	.4976	.4977	.4977	.4978	.4979	.4979
2.9	.4981	.4982	.4982	.4983	.4984	.4984	.4985	.4985
3.0	.4987	.4987	.4987	.4988	.4988	.4989	.4989	.4989
z	.00	.01	.02	.03	.04	.05	.06	.07

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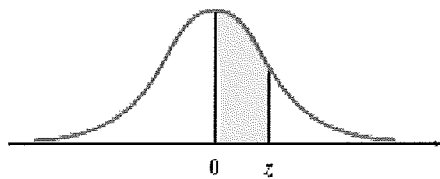
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11. Some students paid a private tutor to help them improve their results on a certain mathematical test. These students had a mean change in score of +20 points, with a standard deviation of 62 points. In a random sample of 100 students who pay a private tutor to help them improve their results, what is the likelihood that the change in the sample mean score is less than 10 points?

 Click the icon to view the table of normal curve areas.

$P(\bar{x} < 10) = \square$ (Round to four decimal places as needed.)

Normal Curve Areas



z	.00	.01	.02	.03	.04	.05	.06	.07
.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279
.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675
.2	.0793	.0832	.0871	.0910	.0948	.0987	.1026	.1064
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.5	.1915	.1950	.1985	.2019	.2054	.2088	.2123	.2157
.6	.2257	.2291	.2324	.2357	.2389	.2422	.2454	.2486
.7	.2580	.2611	.2642	.2673	.2704	.2734	.2764	.2794
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1.9	.4713	.4719	.4726	.4732	.4738	.4744	.4750	.4756
2.0	.4772	.4778	.4783	.4788	.4793	.4798	.4803	.4808
2.1	.4821	.4826	.4830	.4834	.4838	.4842	.4846	.4850
2.2	.4861	.4864	.4868	.4871	.4875	.4878	.4881	.4884
2.3	.4893	.4896	.4898	.4901	.4904	.4906	.4909	.4911
2.4	.4918	.4920	.4922	.4925	.4927	.4929	.4931	.4932
2.5	.4938	.4940	.4941	.4943	.4945	.4946	.4948	.4949
2.6	.4953	.4955	.4956	.4957	.4959	.4960	.4961	.4962
2.7	.4965	.4966	.4967	.4968	.4969	.4970	.4971	.4972
2.8	.4974	.4975	.4976	.4977	.4977	.4978	.4979	.4979
2.9	.4981	.4982	.4982	.4983	.4984	.4984	.4985	.4985
3.0	.4987	.4987	.4987	.4988	.4988	.4989	.4989	.4989
z	.00	.01	.02	.03	.04	.05	.06	.07

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