Stat Practice # 7 Date:_________ Section: _______ Name: ___________________________

Help can be found in class lecture, topics review or related PowerPoints

a) What are the properties of a normal distribution?
b) Where mean, median and mode are located in a normal distribution?
c) What is the total area under normal probability distribution curve?
d) Can we interchangeably use the total area under normal probability distribution curve as probability?
e) What is the mean and standard deviation for standard normal probability distribution?
f) What is the name of horizontal axis used in standard normal probability distribution?
g) In computing the area or probability, if the upper boundary is missing, then what formula needs to be used?
h) In computing the area or probability, if the lower boundary is missing, then what formula needs to be used?
i) What is the formula to find the cut-off point value, and where can we look up the z-value?
j) How to use **TI calculator** to compute the probability (**normalcdf**) and find **the cut-off point(invNorm)**?

Online Calculator: http://onlinestatbook.com/2/calculators/normal_dist.html
Online Calculator: http://onlinestatbook.com/2/calculators/normal_dist.html
YouTube TI Calculator: https://www.youtube.com/watch?v=SERkAlt1Wuk Finding the area under a SNPD curve
YouTube TI Calculator: https://www.youtube.com/watch?v=5-AsqGuhdm0 Normalcdf and Invnorm
YouTube TI Calculator: https://www.youtube.com/watch?v=QaNWTl78Ods To find cut-off point for a given percentile

A) Finding Area under SNPD:

Be sure to **shade the proper region** and find the area that corresponds to the given probability.
Hint: To create **missing** lower or upper limit, use the formula (lower limit = $\mu - 5\sigma$, upper limit = $\mu + 5\sigma$)

1	P(-5 < Z <5) =	**2**	P(-1.8 < Z < -.8) =	**3**	P(.5 < Z < 1.5) =	**4**	P(-2.11 < Z < 1.55) =
5	P(-1.17< Z < 1.34) =	**6**	P(1.2 < Z < 1.6) =	**7**	P(-2.0 < Z < -.5) =	**8**	P(Z > -1.75)
9	P(Z > 3.04) =	**10**	P(Z < 1.08) =	**11**	P(Z > -1.4) =	**12**	P(Z< 1.57) =

Answers:

1	1	**2**	.1760	**3**	.2417	**4**	.9220
5	.7889	**6**	.0603	**7**	.2857	**8**	.9599
9	.0012	**10**	.8599	**11**	.9192	**12**	.9418

B) Cut-off point practices: Use TI calculator (**invNorm)** and/or **page 3 of table** (under part two course materials) to find the Z-value that separates

a) the bottom 5% **TI Instruction** 2nd, Dist, InvNorm $(0.05, 0, 1) = \mathbf{-1.645}$
b) the top 5% **TI Instruction** 2nd, Dist, InvNorm $(0.95, 0, 1) = \mathbf{1.645}$
c) the bottom 10% ***Ans:*** **−1.28** d) the top 10% ***Ans:*** **1.28** e) the middle 80% = ±1.28

C) If the average price for textbooks in a college university is $75 with standard deviation of 20. Assuming that data are normally distributed then what percentage of college books is,

Hint: To create **missing** lower or upper limit, use the formula (lower limit = $\mu - 5\sigma$, upper limit = $\mu + 5\sigma$)

1. Between 60 and 80 dollars **TI** 2nd, Dist, Normalcdf $(60, 80, 75, 20) =$ **37.21 %**
2. Less than 70 dollars **TI** 2nd, Dist, Normalcdf $(0, 70, 75, 20) =$ **40.13 %**
3. More than 50 dollars **TI** 2nd, Dist, Normalcdf $(50, 175, 75, 20) =$ **89.44 %**
4. Within 25 dollars of the mean = **75 ± 25** **TI** 2nd, Dist, Normalcdf $(50, 100, 75, 20) =$ **78.88%**
5. Find the price for the top 8% of expensive of textbooks. **TI** 2nd, Dist, InvNorm $(0.92, 75, 20) =$ $ **103.20**
6. Find the price for the lowest 25% (Q1) of inexpensive of textbooks. **TI** 2nd, Dist, InvNorm $(0.25, 75, 20) =$ **$61.40**
7. Find the price for the top 25% (Q3) of expensive of textbooks. **TI** 2nd, Dist, InvNorm $(0.75, 75, 20) =$ **$88.05**
8. Find the 45th percentile (P_{45}) price for the textbooks. **TI** 2nd, Dist, InvNorm $(0.45, 75, 20) =$ **$72.49**

Hint: To create **missing** lower or upper limit, use the formula (lower limit $= \mu - 5\sigma$, upper limit $= \mu + 5\sigma$)

1. The mean life of a tire is 30 000 km. The standard deviation is 2000 km.

a) 68% of all tires will have a life between ______km and ______km. **You try!**

b) 95% of all tires will have a life between ______km and ______km. **You try!**

c) What percent of the tires will have a life that exceeds 26 000 km? **97.72%**

d) If a company purchased 2000 tires, how many tires would you expect to last more than 28 000 km? **1683**

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2. A line for tickets to a local concert had an average waiting time of 20 min. and a σ = 4 min. What percentage of the people in line waited for more than 28 minutes?**2.27%**

a) What is the Z-Score for people who waited 16 minutes? -1

b) If 2000 ticket buyers were in line, how many of them would expect to wait for less than 16 minutes? **317**

c) What is the Z –score for people who waited 15 minutes? **You try!**

d) What is the probability that a person waited at least 15 minutes? **89.43%**

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3. In an Oreo factory, the mean mass of a cookie is given as 40g. For quality control, the σ is 2 g.

a) If 10 000 cookies were produced, how many cookies are within 2 g of the mean? **(.68268)=6827**

b) Cookies are rejected if they weigh more than 44 g or less than 36 g. How many cookies would you expect to be rejected in a sample of 10 000 cookies? **455**

c) How many standard deviations away from the mean is an Oreo that weighs 49 g?**4.5**

d) What is the probability that a randomly selected cookie weighs between 36.3 g and the 50th percentile? **46.78%**

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4. A grading scale is set up for 1000 students' test scores. It is assumed that the scores are normally distributed with a mean score of 75 and a standard deviation of 15

a) If 60 is the lowest passing score, how many students are expected to pass the test? **(.7936)=794**

b) What score would a student have to score to be in the 64th percentile? **Score of 80.37**

c) What score would a student have to make to be in the top 25% of the class? **Score of 85**

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5. Women's heights are normally distributed with μ = 63.6 inches and σ = 2.5 inches. Suppose that a modeling agency will only accept the tallest 10% of women. What is the cutoff height that the agency uses (ie, how tall would a woman have to be to be hired by the agency**)? Minimum of 66.80 inch**

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6. At two years of age, sardines inhabiting Japanese waters have a length distribution that is approximately normal with mean 22.80 cm and standard deviation 0.65 cm.

a. How long are the longest 13% of all these sardines? **23.53 cm**
b. How short are the shortest 13% of all these sardines? **22.07 cm**
c. In what range do the middle 74% of all sardines fall? **You try!**

7. Porphyrin is a pigment in blood protoplasm and other body fluids that is significant in body energy and storage. In healthy Alaskan brown bears, the amount of porphyrin in the bloodstream (in mg/dL) has approximate normal distribution with mean 47.5 and standard deviation 10.2.

   a. What proportion of these bears have between 31.5 and 63.5 mg/dL porphyrin in their bloodstream? (That's within 16 of the mean amount of 47.5.) **88.33%**

   b. How low are the porphyrin levels for the lowest 5% of all the bears? **30.72 mg/Dl**

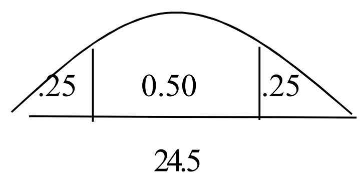
8. Healthy 10-week-old domesticated kittens have average weight 24.5 oz. with a standard deviation of 5.5 oz. The distribution is approximately normal.

   a. A kitten is designated as dangerously underweight when, at 10 weeks, it weighs less than 10.25 oz. What proportion of healthy kittens will be designated as dangerously underweight? **0.48%**

   b. What is the median weight of the kittens? **You try!**

   c. What are the first and third quartiles of the kitten weights? (25% of the kittens weigh less than Q_1; 75% weigh more. 75% of the kittens weigh less than Q_3; 25% weigh more.) What is the interquartile range (IQR) for the kitten weights? **Between 20.79 and 28.21**

$\mu = 24.5$ $\sigma = 5.5$



TI Instruction

Left Boundary 2nd, Dist, InvNorm $(.25, 24.5, 5.5) = 20.79$

Right Boundary 2nd, Dist, InvNorm $(.75, 24.5, 5.5) = 28.21$

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9. I.Q. scores are normally distributed with a mean of 100 and a standard deviation of 15.

a) People are considered "intellectually very superior" if their score is above 130. What *percentage* of people fall into that category? **2.27%**

b) If we redefine the category of "intellectually very superior" to be scores in the top 1%, what does the minimum score become? **135**

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10. The lengths of human pregnancies are approximately normally distributed with a mean of 266 days and a standard deviation of 16 days.

a) a wife claimed to have given birth 308 days after a brief visit from her husband, who was serving in the Navy. Find the probability of a pregnancy lasting more than 308 days. What does the result suggest? **0.43%**

b) If we stipulate that a baby is premature if the length of the pregnancy is in the lowest 4%, find the length (in days) that separates premature babies from those who are not premature. **238 days**

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11. Scores on the SAT form a normal distribution with $\mu = 500$ and $\sigma = 100$.

   a) What is the minimum score necessary to be in the top 15% of the SAT distribution? **604**

   b) Find the range of values that defines the middle 80% of the distribution of SAT scores (372 and 628). Find the z-scores ***-1.28, 1.28***

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12. For a normal distribution, find the z-score that separates the distribution as follows:

a. Separate the highest 30% from the rest of the distribution. **0.52**
b. Separate the lowest 40% from the rest of the distribution**. 0.25**
c. Separate the highest 75% from the rest of the distribution. **-0.67**

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13. A patient recently diagnosed with Alzheimer's disease takes a cognitive abilities test and scores a 45. The mean on this test is 52 and the standard deviation is 5. What is the patient's percentile rank? **8.1%**

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14. A fifth grader takes a standardized achievement test ($\mu = 125$, $\sigma = 15$) and scores a 148. What is the child's percentile rank? **94%**