Advanced Algebra
Unit 6 Statistics
Normal Distribution & Z-Score Worksheet

Name_______________________

Date_______________Block_____

Use the Empirical Rule:

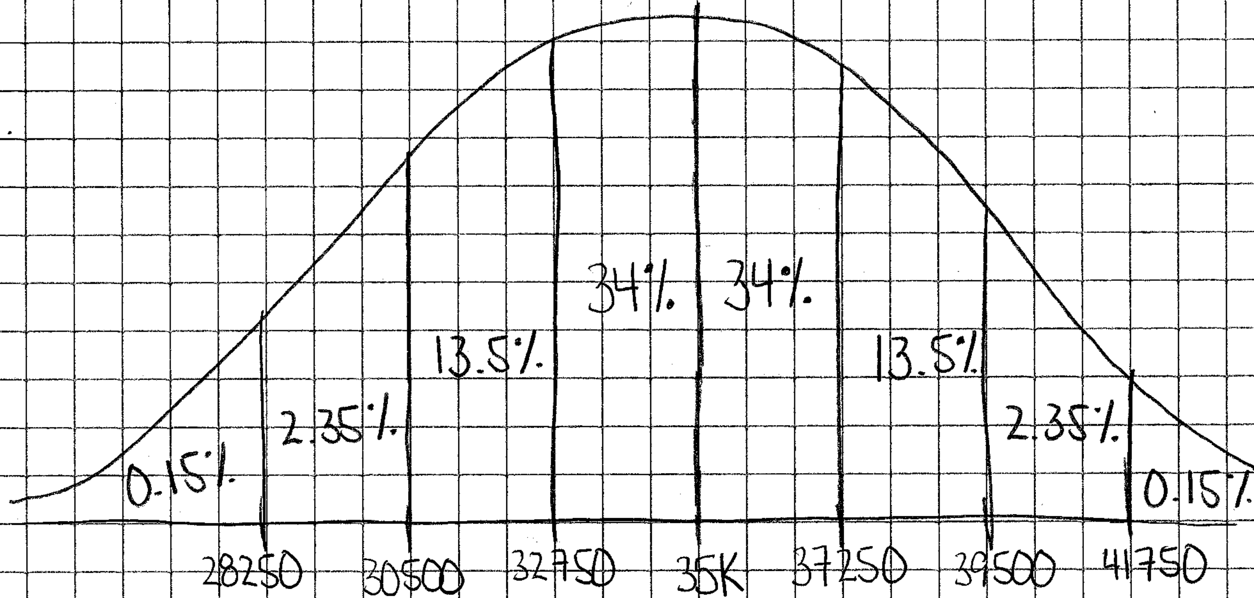
1. A certain brand of automobile tire has a mean life span of 35,000 miles and a standard deviation of 2250 miles. Assume the life spans of the tires have a bell-shaped distribution.
   a. Draw a normal distribution that clearly shows the empirical rule.
   b. The life spans of the three randomly selected tires are 34,000 miles, 37,000 miles, and 31,000 miles. Find the z-score that corresponds to each life span. According to the z-scores, would the life spans of any of these tires be considered unusual?
   c. The life spans of three randomly selected tires are 30,500 miles, 37,250 miles and 35,000 miles. Using the Empirical Rule, find the percentile that corresponds to each life span.
   d. What percentage of tires has life spans between 30,500 and 37,250 miles?
   e. What percentage of tires has life spans greater than 37,250 miles?

2. The life spans of a species of fruit fly have a bell shaped distribution, with a mean of 33 days and a standard deviation of 4 days.
   a. Draw a normal distribution that clearly shows the empirical rule.
   b. The life spans of three randomly selected fruit flies are 34 days, 30 days and 42 days. Find the z-score that corresponds to each life span and determine if any of these life spans are unusual.
   c. The life spans of three randomly selected fruit flies are 29 days, 41 days and 25 days. Use the Empirical Rule, find the percentile that corresponds to each life span.
   d. What percentage of fruit flies lives at most 21 days?
   e. What percentage of fruit flies lives longer than 37 days?

3. Intelligence Quotient (IQ) is normally distributed with a mean of 100 and a standard deviation of 15.
   a. Sketch a normal distribution curve to reflect this information.
   b. Find the probability a person picked at random out of the general population has an IQ in the given interval:
      i. Between 100 and 115.
      ii. Between 85 and 130.
      ii. Between 130 and 145.
      iv. Over 130.
      v. Less than 55.

4. A city's annual rainfall is approximately normally distributed with a mean of 40 inches and a standard deviation of 6 inches. Use the Empirical Rule to find the probability for each annual rainfall in the city:
   a. less than 34 inches
   b. greater than 46 inches
   c. greater than 52 inches
   d. less than 28 inches
   e. between 34 and 40 inches
   f. between 34 and 46 inches.

1a.



1b. $z\text{-score} = \dfrac{34000-35000}{2250} = -0.44$

$= \dfrac{37000-35000}{2250} = 0.89$

$= \dfrac{31000-35000}{2250} = -1.78$

None are unusual b/c none are more than 3 standard deviations from the mean.

1c. 30500 ⇒ 2.35% + 0.15% = 2.5% ⇒ 2nd percentile

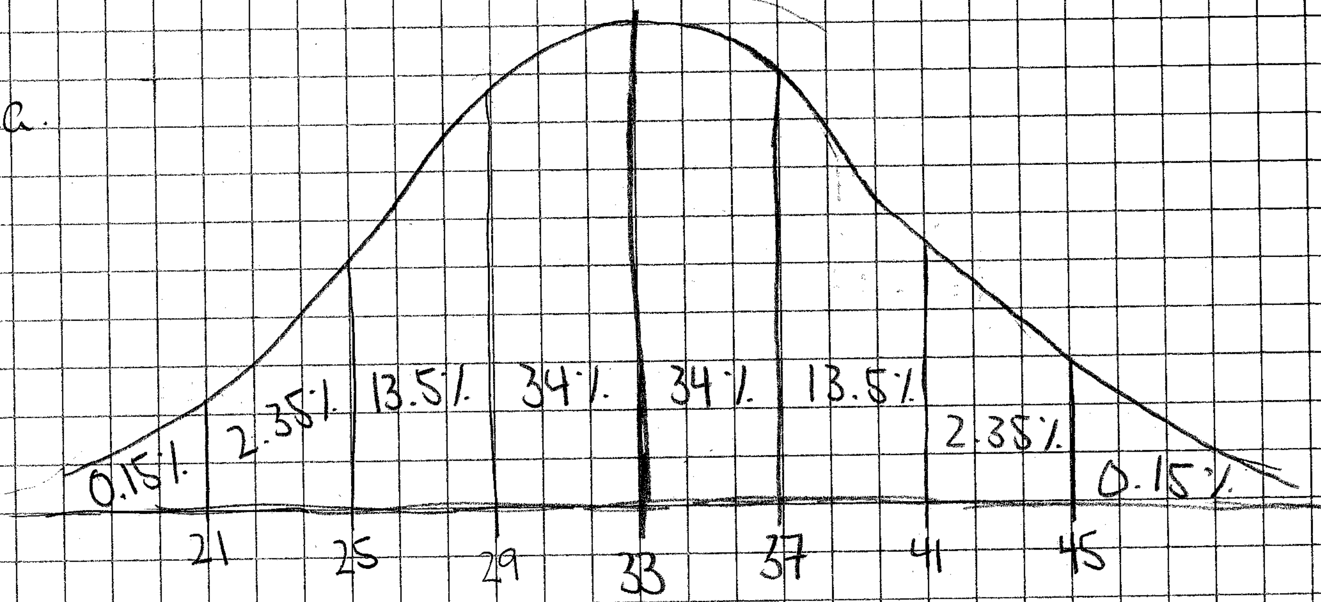
37250 ⇒ 2.5% + 13.5% = 16% ⇒ 16th percentile

35000 ⇒ 50th percentile

1d. 13.5% + 34% + 34% = 81.5%

1e. 13.5 + 2.35 + .15 = 16%

2a.



2b. $\frac{34-33}{4} = 0.25$

$\frac{30-33}{4} = -0.75$

$\frac{42-33}{4} = 2.25$

None are unusual b/c none are more than 3 standard deviations from the mean.

2c. 29 ⇒ 0.15% + 2.35% + 13.5% = 16% ⇒ 16^{th} percentile

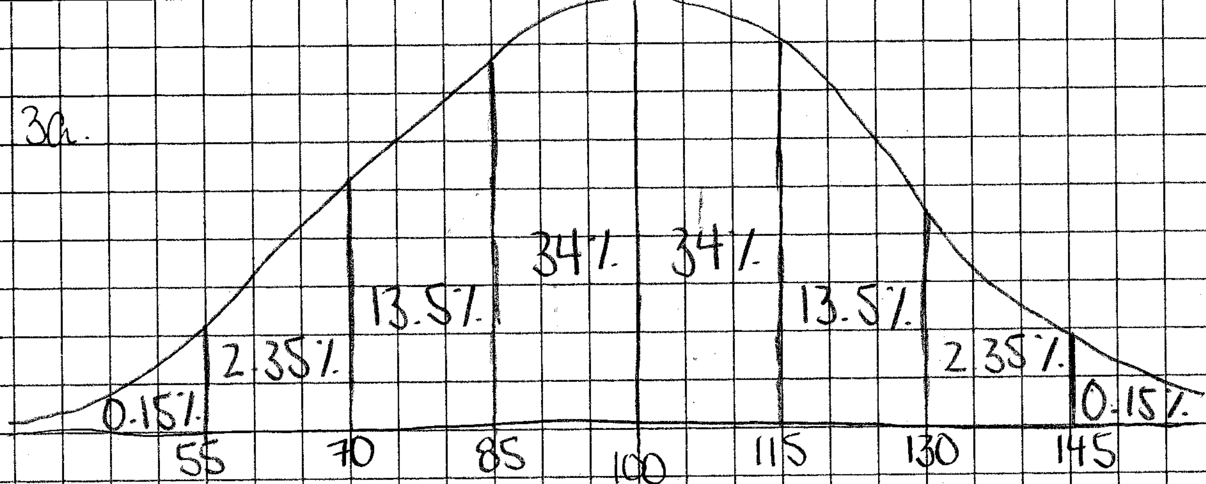
41 ⇒ 50% + 34% + 13.5% = 97.5% ⇒ 97^{th} percentile

25 ⇒ 0.15% + 2.35% = 2.5% ⇒ 2^{nd} percentile

2d. 0.15%

2e. 13.5% + 2.35% + 0.15% = 16%

3a.



i. B/t 100 + 115 – 34% or 0.34

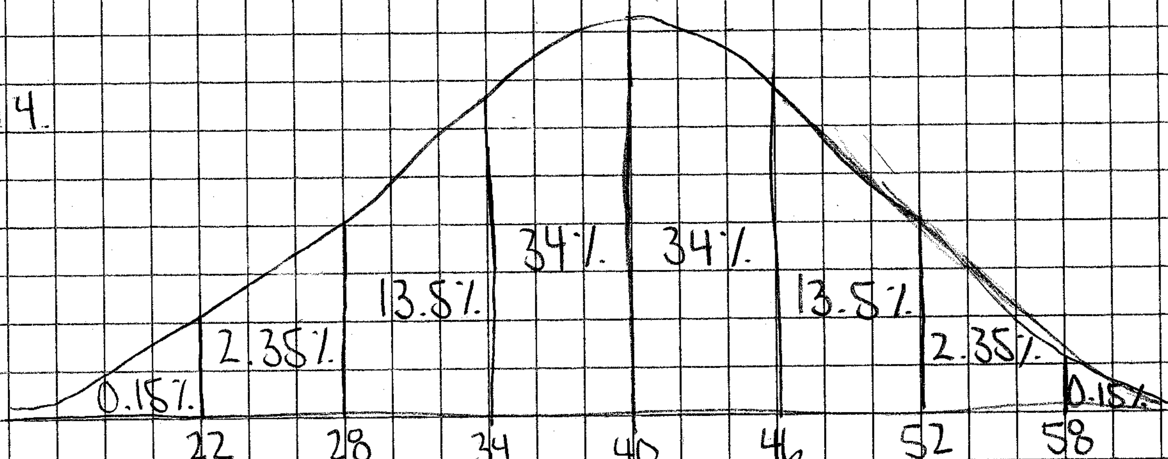
ii. B/t 85 + 130 – 81.5% or 0.815

iii. B/t 130 + 145 – 2.35% or 0.0235

iv. Over 130 – 2.5% or 0.025

v. Less than 55 – 0.15% or 0.0015

4.



a. less than 34 in – 16% or 0.16

b. greater than 46 in – 16% or 0.16

c. greater than 52 in – 2.5% or 0.025

d. less than 28 in – 2.5% or 0.025

e. b/t 34 in and 40 in – 34% or 0.34

f. b/t 34 in and 46 in – 68% or 0.68