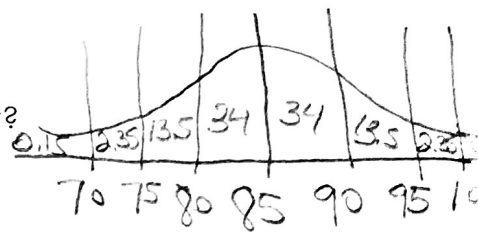


Key

2.1 Normal Distribution, Standard Normal Distribution and Z scores REVIEW 2

Remember, you should only apply the Empirical Rule (68% - 95% - 99.7%) for data that is **normally distributed**.

8. On a recent test showed a normal distribution with a mean of 85 and a standard deviation of 5. Draw and label the normal curve for this data.



A. What percent of the students scored higher than 90 on the test?

16%

B. What is the probability that a student will score less than 70?

0.15%

C. What is an interval of test scores that represent 95% of the data?

75 to 95

D. If 650 students were tested, approximately how many made an A?

104 students = 650(.16)

E. Find the probability that a student made a passing grade of 90 or less

84%

Using the Standard Normal Curve and Z scores

9. In a normal distribution, the $\bar{x} = 88$ and $\sigma = 12$. Convert the following into z-scores and then use the Standard Normal Distribution chart to calculate the probability.

A. $P(x \leq 85)$

$z = -0.25$
40.13%

B. $P(x \leq 122)$

$z = 2.83$
99.77%

C. $P(74 \leq x \leq 80)$

$z = -1.17$
 $z = -0.67$
13.04%

D. $P(x \geq 75)$

$z = -1.08$
 $1 - .1421 =$ 85.79%

E. $P(x \geq 59)$

$z = -2.42$
 $1 - .0078 =$ 99.22%

F. $P(66 \leq x \leq 99)$

$z = -1.83$
 $z = 0.92$
78.76%

Working backwards with the Z Score Table

10. Find the z score associated with the following probability (you will have to find the closest estimate on the table).

A. $P = 20\%$, $Z =$

-0.84

B. $P = 74.5\%$, $Z =$

0.66

C. $P = 0.42$, $Z =$

-0.20

Understanding Percentiles

11. One component of standardized tests is an individual's comparison to their peers' performances. If, after taking the SATs, for example, you are reported to be in the 84th percentile, what does that mean?

you scored better than 84% of students taking the SAT.

12. The intelligence quotients (IQ) of 7000 college freshmen were normally distributed with a mean of 100 and a standard deviation of 15. Convert to z-scores and use the Standard Normal Distribution chart to answer the following:

A. What percentage of these college students has IQs greater than 120?

9.12%

B. Find the probability that a randomly chosen college student has an IQ less than 80

9.12%

C. How many of these college freshmen have an IQ 80 or less?

638.5 students $7000(.0912)$

D. What IQ would qualify one of these college freshmen for the 90th percentile?

119.2

E. What IQ would qualify one of these college freshmen for the 50th percentile?

100

Using Z Scores to Compare Data Sets

13. Last semester, the mean and standard deviation of GPAs for 11th graders at three local high schools were as follows:

Madison High School: $\bar{x} = 2.89$ and $\sigma = 0.32$

Jefferson High School: $\bar{x} = 2.95$ and $\sigma = 0.34$

Washington High School: $\bar{x} = 2.61$ and $\sigma = 0.64$

Whitney, a junior at Madison High School had a 4.12 GPA. Alan, a junior at Jefferson High School had a 4.16 GPA. Ian, a junior at Washington High School had a 4.23 GPA.

Which of these students had the best academic performance relative to their peers?
w $z = 3.84$ A $z = 3.56$ I $z = 2.53$ → Whitney was best.

14. On Interstate I-75, the average speed is 68.6 with a standard deviation of 4.3. On Old Highway 41, the average speed is 39.1 with a standard deviation of 2.9.

Bubba is speeding down I-75 at 84 mph, trying to beat the crowds to the beach. Georgina is hurrying down Old Highway 41, trying not to be late to school. She reaches a speed of 50 mph. Which of these two is driving at a rate more likely to raise eyebrows?

Bubba $z = \frac{84 - 68.6}{4.3}$
 $z = 3.58$

Georgina $z = \frac{50 - 39}{2.9}$
 $z = 3.79$