Test 5 Study Guide

Name: ______________________

(ISN pgs. 51 – 60)

Vocabulary—*Know your vocab!*

Percentile	*Ranks*	*68-95-99.8*	*Type 1*
Z-Score	*Normal*	*Area*	*Type 2*
Percentages	*Empirical Rule*	*Table A*	

Work Problems—*answer each question fully.*

Z-SCORES

1. The change in scales makes it hard to compare scores on the 1994 math SAT (mean 480, standard deviation 100) and the 1996 math SAT (mean 510, standard deviation 120). Jane took the SAT in 1994 and scored 500. Her sister Colleen took the SAT in 1996 and scored 520. Who did better on the exam?

Colleen $z = \frac{520-510}{120}$ $z = .08$

Jane $z = \frac{500-480}{100}$ $z = .20$

$\boxed{\text{Jane}}$

2. The change in scales makes it hard to compare scores on the 1994 math SAT (mean 480, standard deviation 120) and the 1996 math SAT (mean 510, standard deviation 110). Tim took the SAT in 1994 and scored 520. What is an equivalent score on the 1996 SAT?

Tim SAT 1994 $z = \frac{520-480}{120}$ $z = .33$ → $.33 = \frac{x-510}{110}$ $\boxed{x = 546.7}$

The weight of the wrestlers on the wrestling team is normally distributed with a mean of 154 and a standard deviation of 3. Find the z-scores for each of the following.

3. 164 lbs. $z = \frac{164-154}{3} = \boxed{3.33}$

4. 136 lbs. $z = \frac{136-154}{3} = \boxed{-6}$

The following set of data represents the shoe size of randomly selected male students. {13, 11.5, 9, 10.5, 13, 11, 10.5, 12.5, 13, 9, 9, 8, 10}. Find the z-scores for the following. $\bar{x} = 10.8$ $s = 1.74$

5. Size 10.5 $z = \frac{10.5-10.8}{1.74} = \boxed{-.17}$

6. Size 12 $z = \frac{12-10.8}{1.74} = \boxed{.69}$

The z-scores of four students on an algebra test are given. If the mean of the test was 89 and the standard deviation was 5.5, find each students test grade.

7. Samantha's z-score is −1.25

$-1.25 = \frac{x-89}{5.5}$ $\boxed{x = 82.1}$

8. Kendall's z-score is 2.15

$2.15 = \frac{x-89}{5.5}$ $\boxed{x = 100.8}$

PERCENTILES

Below is a list of test grades for a class of 24 GMC students.

~~90~~ ~~93~~ ~~93~~ ~~93~~ ~~100~~ ~~93~~ ~~83~~ ~~80~~ ~~90~~ ~~65~~ ~~68~~ ~~85~~

~~95~~ ~~98~~ ~~85~~ ~~95~~ ~~93~~ ~~100~~ ~~95~~ ~~85~~ ~~93~~ ~~95~~ ~~55~~ ~~90~~ ~~90~~

55 65 68 80 83 85 90 90 90 90 93 93 93 93 93 93 95 95 95 95 98 100 100

Determine the percentile of the following students.

9. If Ben scored an 95 on the test.

$\frac{21}{24} = .875 = \boxed{88^{th}}$

10. If Jacob scored a 80 on the test

$\frac{4}{24} = .167 = \boxed{17^{th}}$

11. If Spencer scored an 65 on the test.

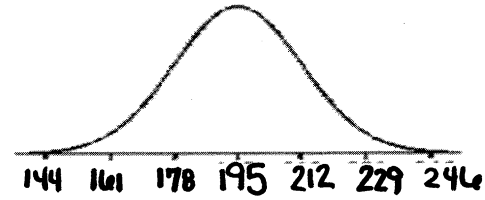
$\frac{2}{24} = .083 = \boxed{8^{th}}$

12. Jessica scored an 90 on the test.

$\frac{10}{24} = .417 = \boxed{42^{nd}}$

EMPIRICAL RULE

The mean weight of adult American men is 195 pounds with standard deviation of 17 pounds. Use the <u>Empirical Rule</u> to answer the following.



13. What percent of adult men are less than 195 lbs.?

    $34 + 13.5 + 2.4 + 0.1 = \boxed{50\%}$

14. What percent of adult men are between 178 and 229?

    $34 + 34 + 13.5 = \boxed{81.5\%}$

15. What percent of adult men are greater than 161 lbs?

    $13.5 + 34 + 50 = \boxed{97.5\%}$

16. The middle 95% of the data is between what two weights?

    $\boxed{161 \text{ and } 229}$

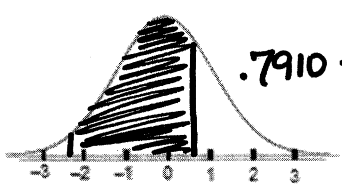
17. 178 is how many standard devations away from the mean? And in which direction?

    $\boxed{1 \text{ negative}}$

AREA UNDER THE CURVE

Use Table A to find the area under the curve. Shade the area and answer to the question.

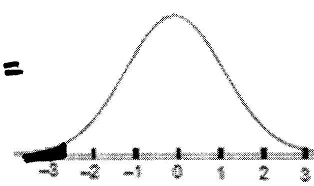
18. Between $z = -2.11$ and 0.81



$.7910 - .0174 =$

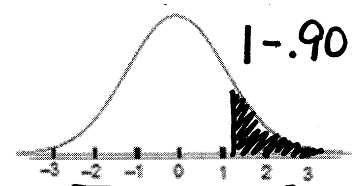
$\boxed{.7736}$

19. Less than $z = -2.75$



$\boxed{.0030}$

20. Greater than $z = 1.29$



$1 - .9015$

$\boxed{.0985}$

CALCULATIONS WITH NORMAL CURVES—TYPE 1 or TYPE 2

Adult woman in America have pregnancies lengths that are roughly Normal with a mean of 265 days and a standard deviation of 10 days.

21. If the length of a women's pregnancy is in the 13th percentile, how many days was she pregnant?

    $13^{th} \rightarrow$ area $.1300 \rightarrow$ Closest $.1292 \rightarrow z = -1.13 \rightarrow -1.13 = \frac{x - 265}{10}$ $\boxed{x = 253.7}$

22. Determine the percent of women whose pregnancies are between 240 and 260 days.

    $x = 240 \rightarrow z = \frac{240 - 265}{10}$ $z = -2.50 \rightarrow$ area: $.0062$

    $x = 260 \rightarrow z = \frac{260 - 265}{10} = z = -0.50 \rightarrow$ area: $.3085$

    $.3085 - .0062 = .3023$

    $\boxed{30.23\%}$

23. Determine the percent of women whose pregnancies are greater than 286 days.

    $x = 286 \rightarrow z = \frac{286 - 265}{10}$ $z = 2.1 \rightarrow$ area: $.9821 \rightarrow$ GREATER: $1 - .9821 = .0179 \rightarrow \boxed{1.79\%}$

24. What would the length of a women's pregnancy have to be to be considered in the top 10% of pregnancy lengths?

    Top 10% $\rightarrow$ Bottom 90% $\rightarrow$ area $.9000 \rightarrow$ Closest $.8997 \rightarrow z = 1.28 \rightarrow 1.28 = \frac{x - 265}{10}$

    $\boxed{x = 277.8}$

25. Determine the percent of women whose pregnancies are less than 256 days.

    $x = 256 \rightarrow z = \frac{256 - 265}{10}$ $z = -0.90 \rightarrow$ area: $.1841 \rightarrow \boxed{18.41\%}$