STA 2e: Sect. 3.2   Worksheet #1   Name _____
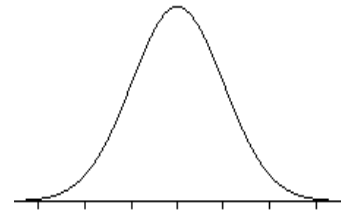**68%-95%-99.7% RULE   INTERPRETING Z-SCORES**

1.   If a person has a negative z-score, did the person score higher or lower than the mean? ……………

2.   If a person has a negative z-score, it does not always mean that the person did not do well. Name a sport
      where having the lowest z-score would be the most desirable.
                                                                    ………………………

*For #3 – 9: The mean weight of adult American men is 180 pounds with standard deviation of 25 pounds.
The weights are approximately normally distributed. Use the 68%-95%-99.7% Rule to approximate each
of the following.*

3.   Using the values given above, label the normal curve at the right with the numerical values for μ, μ ± σ, μ ±
      2σ and μ ± 3σ.

 4. What percent of all adult American men have a weight less than
      130 pounds?
                                        ……………

 5. What percent of all adult American men have a weight between
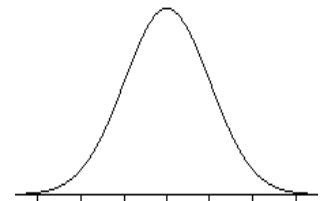   130 and 205 pounds?
                                        ……………
 6. What percent of all adult American men have a weight less than 230 pounds?   ……………

 7. What percent of all adult American men have a weight less than 105 pounds?   ……………

 8. The heaviest 16% of all men in weight weigh more than how many pounds?   ……………

 9. What weight separates the lowest 2.5% of all American men in weight from the remaining weights? ………

*For #10 –17: Elephants have the longest pregnancy of all mammals. One species of elephant has a
mean gestation period of 525 days and standard deviation of 32 days.   Pregnancy length follows an
approximately normally distribution. Use the 68%-95%-99.7% Rule to approximate each of the following.*

10.   Using the values given above, label the normal curve at the right with the numerical values for μ, μ ± σ, μ ±
      2σ and μ ± 3σ.

11. The longest 16% of all elephant pregnancies last at least how many days?
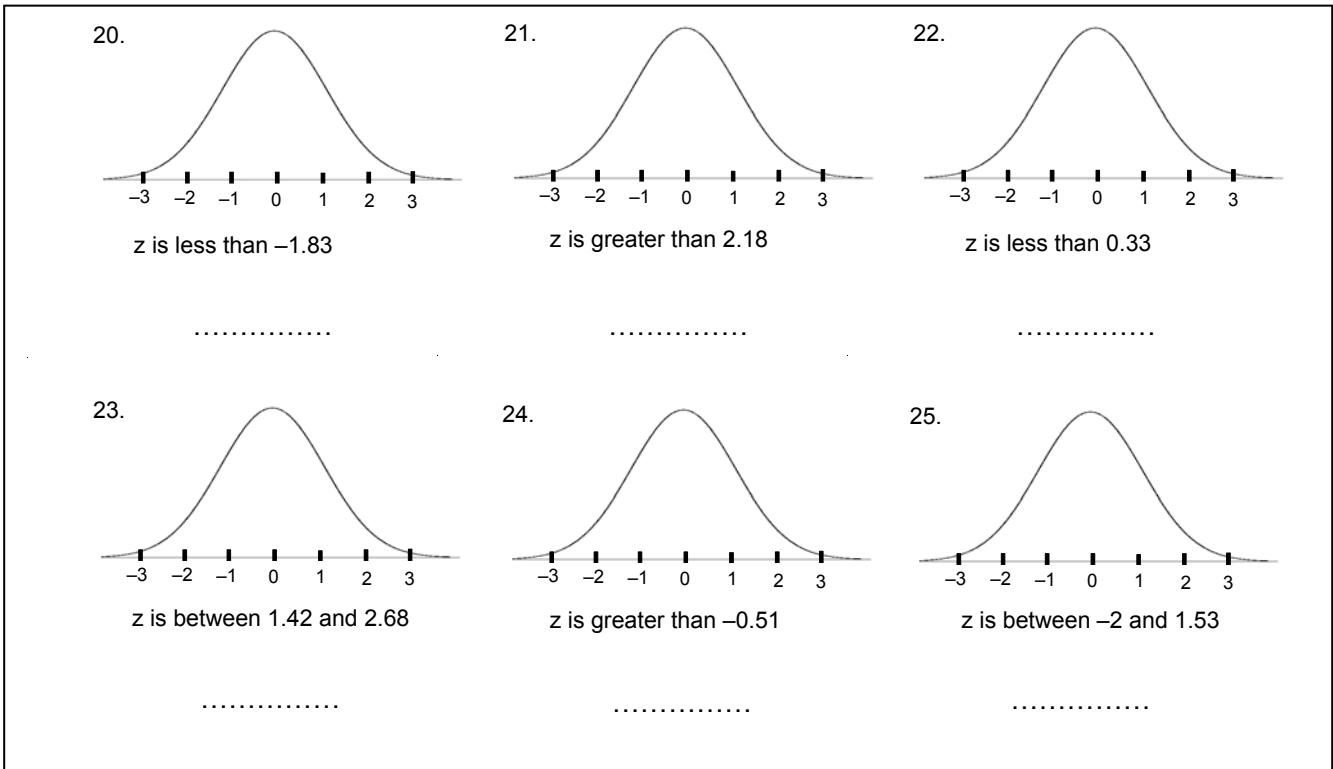   …………

12. The middle 68% of all elephant pregnancies last between …………
      and ………… days.

13. Only 2.5% of all elephant pregnancies last longer than ………… days.

14. What percent of elephant pregnancies last less than 461 days? …………

15. What percent of elephant pregnancies last between 525 and 557 days?   …………

16. What percent of elephant pregnancies last between 493 and 589 days?   …………

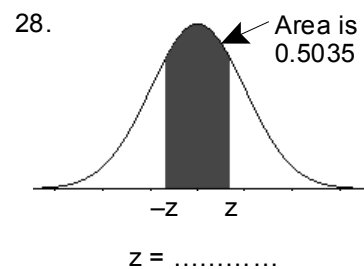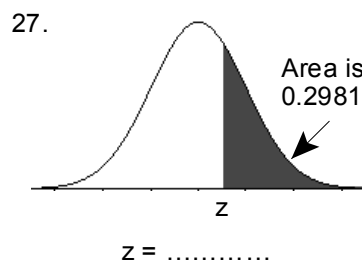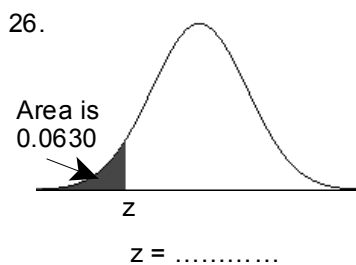17. What percent of elephant pregnancies last less than 557 days?   …………

18. Maria made 75% on her Government test and 83% on her Algebra 2 test. The mean grade on the Government test was 72% with a standard deviation of 5%. The average grade on the Algebra 2 test was 81% with a standard deviation of 4%. On which test did Maria do better? *Justify your answer.*

19. For a standard normal distribution, the mean μ is always ……… and the standard deviation σ is always ……….

For #20 – 25: Use Table A (Standard Normal Distribution) to find the proportion of observations that satisfies each of the following statements. In each case, shade the area under the curve that is the answer to the question.

20.

−3 −2 −1 0 1 2 3

z is less than −1.83

……………

21.

−3 −2 −1 0 1 2 3

z is greater than 2.18

……………

22.

−3 −2 −1 0 1 2 3

z is less than 0.33

……………

23.

−3 −2 −1 0 1 2 3

z is between 1.42 and 2.68

……………

24.

−3 −2 −1 0 1 2 3

z is greater than −0.51

……………

25.

−3 −2 −1 0 1 2 3

z is between −2 and 1.53

……………

For #26 – 28: Find the value of z from the standard normal distribution that satisfies each of the following conditions.   (Use the value of z from Table A that comes closest to satisfying the condition.)
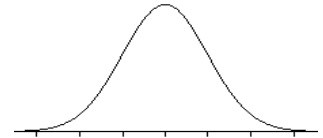
26.

Area is 0.0630

z

z = …………

27.

Area is 0.2981

z

z = …………

28.

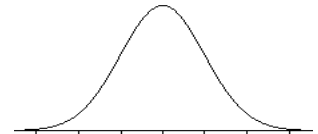Area is 0.5035

−z   z

z = …………

FINDING A PERCENT/PROPORTION given an x value	FINDING AN X VALUE given a percentage/proportion
Standardize x to restate the problem in terms of a standard Normal variable z. Draw a picture to show the area of interest under the standard Normal curve. Then find the required area under the standard Normal curve using Table A.	Look in the body of Table A for the entry closest to the given proportion or the proportion to the left of given proportion to find the corresponding z. *"Unstandardize"* to transform the solution from a z-score to a value of x using the equation $z = \dfrac{x - \mu}{\sigma}$.

Scores on the Wechsler Adult Intelligence Scale, a standard IQ test, are approximately normal for the 20 to 34 age group with μ = 110 and σ = 25.
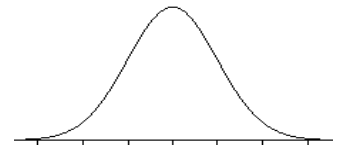
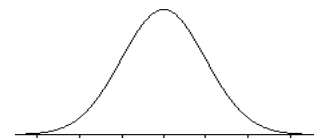1.   What percent of this age group have an IQ less than 100?

2.   What percent of this age group have an IQ between 90 and115?

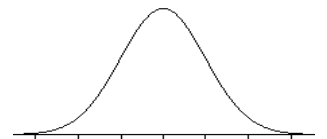3.   Find the 80th percentile of the IQ scores distribution of 20 to 34 year olds.

4.   Find the IQ score which separates the lowest 25% of all IQ scores for this age group from the highest 75%.
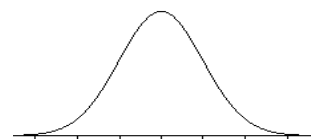
The adult men of the Dinaric Alps have the highest average height of all regions. The distribution of height is approximately normal with a mean height of 6 ft 1 in (73 inches) and standard deviation of 3 inches.

5.   Find the 40th percentile of the height of Dinaric Alps distribution for men.

6.   What percentage of men have a height greater than 74 inches?

7. What percentage of men have a height between 70 inches and 78 inches?

8. The average height of adult American men is 69 inches. What percent of the adult men in the Dinaric Alps are taller than the average American man?
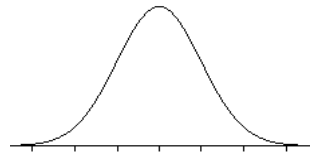
9. What would be the minimum height of man in the Dinaric Alps that would place him in the top 10% of all heights?

The length of pregnancy for the Asian elephant has an approximately normal distribution with an average length of 609 days and standard deviation of 31 days.
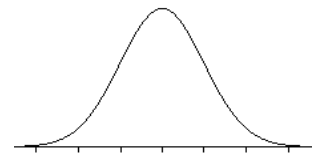
10. How long do the longest 5% of all elephant pregnancies last?

11. What percent of the elephant pregnancies last between 600 and 615 days?

12. The shortest 20% of all elephant pregnancies last fewer than how many days?

13. The middle 50% of all elephant pregnancies fall between how many days?