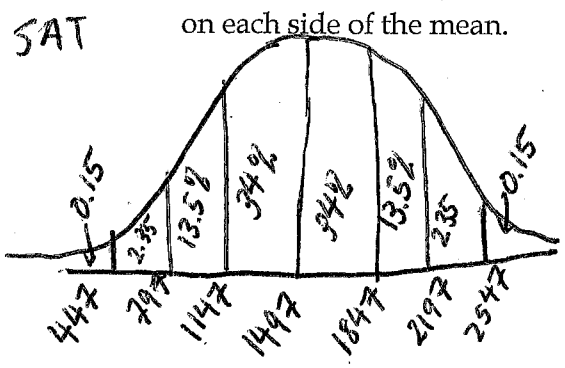
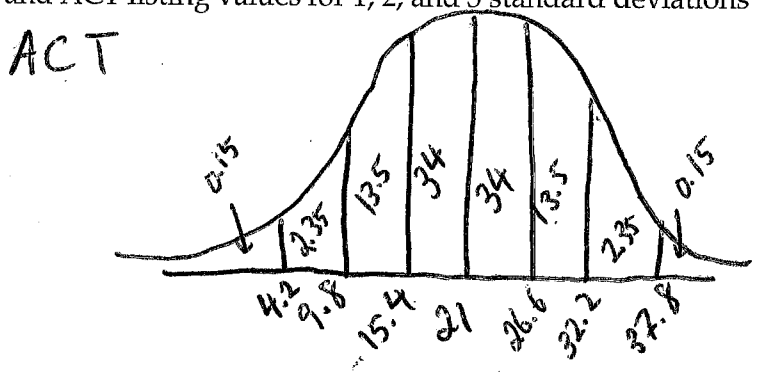
9.05 Applications of the Empirical Rule Date: _____

A) Comparing the SAT and ACT: college admissions offices need to compare scores of students who take the Scholastic Aptitude Test (SAT) with those who take the American College Test (ACT). Suppose that for recent college applicants who took the SAT, scores have a mean of 1497 (out of 2400) and a standard deviation of 350. Further, suppose that for recent college applicants who took the ACT, scores have a mean of 21 (out of 36) and a standard deviation of 5.6.

1. Sketch normal curves for both the SAT and ACT listing values for 1, 2, and 3 standard deviations on each side of the mean.





Apply the empirical rule to approximate the following: Empirical Rule (68-95-99.7 Rule)

2. About 95% of SAT takers score between what two values?

within $(\pm 2\sigma) \rightarrow (797, 2197)$

3. About 95% of ACT takers score between what two values?

within $(\pm 2\sigma)$ $(9.8, 32.2)$

4. What is the proportion of students who score between 1147 and 1847 on the SAT?

68%

5. What is the proportion of students who score between 15.4 and 32.2 on the ACT?

$68 + 13.5 =$ **81.5%**

6. If John scored at the 84th percentile on the ACT, what score did he achieve?

7. College Board reports that 1,672,395 students took the SAT in 2014. About how many students achieved a score of at least 2197?

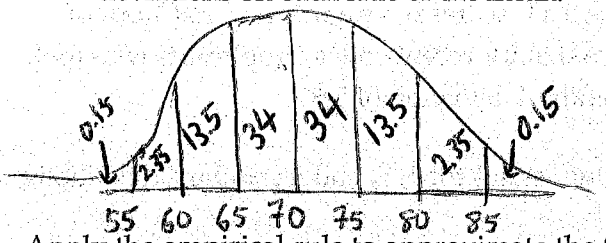
$1{,}672{,}395(0.025) = 41{,}810$ students

8. ACT, Inc. reports that 1,845,787 students took the ACT in 2014. About how many students achieved a score of at most 21?

$1{,}845{,}787(0.5) = 922{,}894$ students

B) Last spring, 250 students took the Algebra 2 final exam. The scores were distributed normally with a mean of 70 and a standard deviation of 5.

9. Sketch the normal curve for the final exam scores, listing values for 1, 2, and 3 standard deviations on each side of the mean.



Apply the empirical rule to approximate the following:

10. What percentage of scores is between scores 65 and 75?

$34 + 34 = 68\%$

11. What percentage of scores is between scores 60 and 70?

$13.5 + 34 = 47.5\%$

12. What percentage of scores is between scores 60 and 85?

$13.5 + 34 + 34 + 13.5 + 2.35 = 97.35\%$

13. What percentage of scores is less than a score of 55?

0.15%

14. What percentage of scores is at least a score of 80?

$2.35 + 0.15 = 2.5\%$

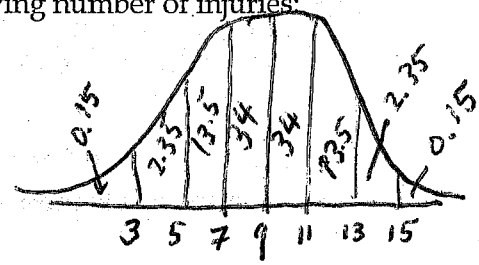
15. How many Algebra 2 students achieved a score between 70 and 80? (out of 250 total students)

$0.34 + 0.135 = 0.475$ (47.5%) | $250(0.475) =$ 119 students

16. How many Algebra students achieved a score of at most 75? (75 and less)

$0.0015 + 0.0235 + 0.135 + 0.34 + 0.34 = 0.84$ (84%) | $250(0.84) =$ 210 students

C) Statistics kept for NFL football teams regarding the number of injuries suffered by NFL players during their careers showed the distribution is approximately normal with the mean number of injuries per player to be 9 with a standard deviation of 2. If there are 1696 NFL players in the current season, determine how many players will have the following number of injuries:



17. Less than 9 injuries in their career. (50%)

$1696(0.5) = 848$ players

18. At least 7 injuries in their career. (7 or more)

$50 + 34 = 84\%$

$1696(0.84) = 1425$ players

19. More than 5 but less than 11 injuries in their career.

$13.5 + 34 + 34 \rightarrow 81.5\%$ | $1696(0.815) = 1382$ players