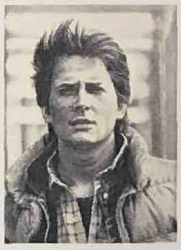
Lesson 2.2: Will Marty Make it Back to the Future?



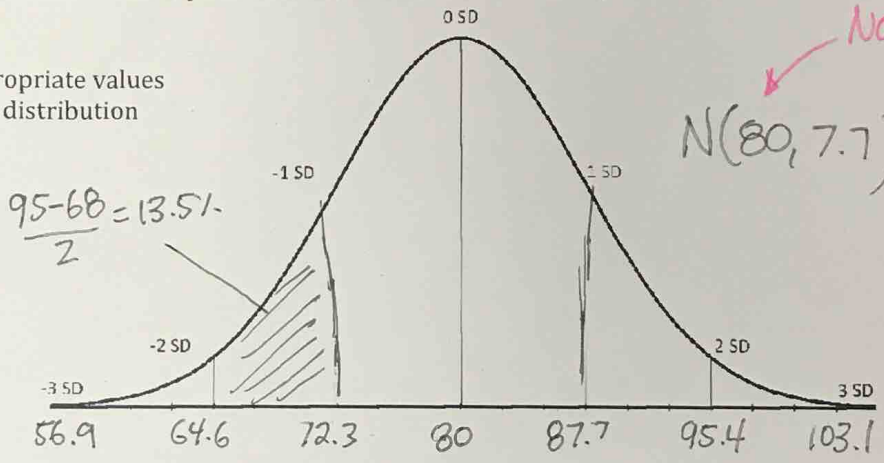
Assign #1-5. Have students stop at #5.

After accelerating for 20 seconds, a DeLorean sports car has a wide range of speeds that it can achieve, depending on traction. The distribution of speed follows an approximately Normal distribution with a mean of 80 mph and a standard deviation of 7.7 mph.

1. Label the appropriate values on the normal distribution

Notation!

$N(80, 7.7)$



2. What percentage of the runs will give the Delorean a speed greater than 87.7 mph?

68-95-99.7 RULE → $100 - 68 = 32$ $\quad 32/2 = \boxed{16\%}$

3. What percentage of the runs will give the Delorean a speed between 64.6 mph and 87.7 mph?

$13.5 + 68 = \boxed{81.5\%}$

4. What percentage of the runs will give the Delorean a speed less than 64.6 mph?

$100 - 95 = 5$ $\quad 5/2 = \boxed{2.5\%}$

5. What percentage of the runs will give the Delorean a speed less than 68.45 mph?

68-95-99.7 RULE doesn't work!

Need Table A

$$z = \frac{\text{value} - \text{mean}}{SD} = \frac{68.45 - 80}{7.7} = -1.5$$

"A speed of 68.45 is 1.5 standard deviations below the mean"

TABLE A → Area = 0.0668

$\boxed{6.68\%}$

STOP!

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MODEL #6 for students. Then let them try #7, 8.

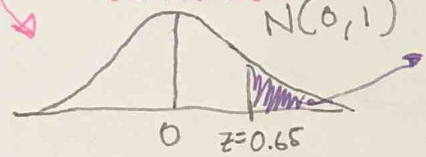
6. What percentage of the runs will give the Delorean a speed greater than 85 mph? Show work.

unstandardized

standardizing

why? So we can use Table A

standardized



CALCULATOR: normalcdf(85, 9999, 80, 7.7)

$z = \frac{\text{value} - \text{mean}}{SD} = \frac{85 - 5}{7.7} = 0.65$

Table A

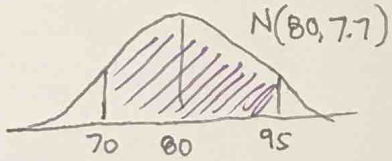
AREA = 1 - 0.7422

= 0.2478 **24.78%**

For full credit

1. unstandardize picture with N(80, 7.7) and shading
2. standardized picture with N(0, 1) & shading.
3. z-score formula & calculator
4. final answer

7. What percentage of the runs will give the Delorean a speed between 70 and 95 mph? Show work.



CALCULATOR: normalcdf(70, 95, 80, 7.7)

$z = \frac{\text{value} - \text{mean}}{SD} = \frac{70 - 80}{7.7} = -1.30$

$= \frac{95 - 80}{7.7} = 1.95$

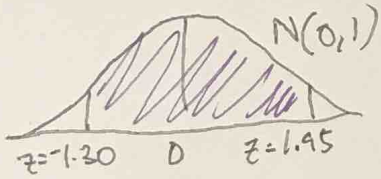


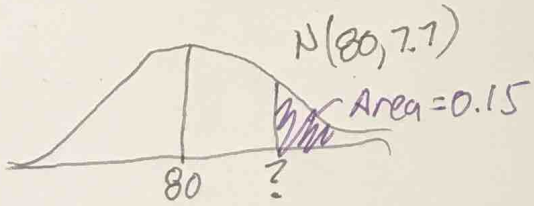
Table A

Area = 0.9744 - 0.0968

= 0.8776 **87.76%**

8. Marty wants his last run to be in the top 15% of all the possible speeds. What speed does he need to achieve to be in the top 15%?

CALCULATOR: invNorm(.85, 80, 7.7) = 88

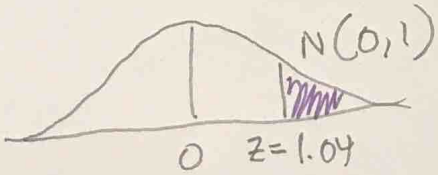


$z = \frac{\text{value} - \text{mean}}{SD}$

$1.04 = \frac{x - 80}{7.9}$

$x = 88.2$

88.2 mph



Lesson 2.2 – Density Curves and Normal Distributions

Big Ideas:

Use Table A to find area under any normal curve.

$z = \frac{\text{value} - \text{mean}}{SD}$

normalcdf(left, right, mean, SD)

invNorm(area to left, mean, SD)

Reminders!

Draw picture

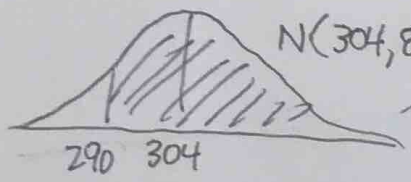
Label N(,)

Show work

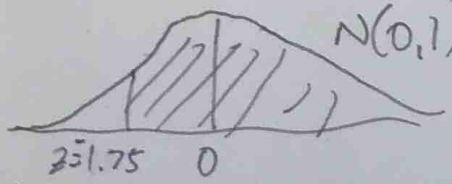
Check Your Understanding:

When professional golfer Jordan Spieth hits his driver, the distance the ball travels can be modeled by a Normal distribution with mean 304 yards and standard deviation 8 yards.

1. On a specific hole, Jordan would need to hit the ball at least 290 yards to have a clear second shot that avoids a large group of trees. What percent of Spieth's drives travel at least 290 yards?



$z = \frac{\text{value} - \text{mean}}{SD} = \frac{290 - 304}{8} = -1.75$

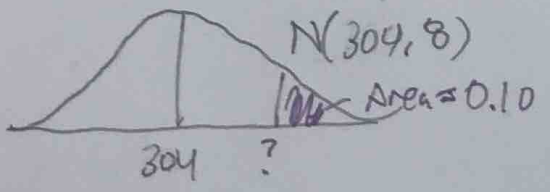


Area = 1 − 0.0400

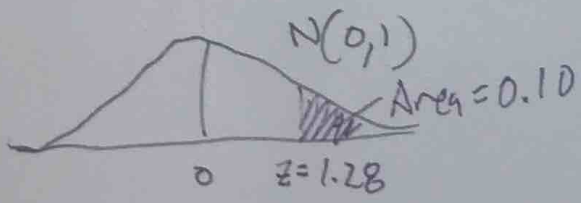
= 0.96

96%

2. On another golf hole, Spieth has the opportunity to drive the ball onto the green if he hits the ball a distance in the top 10% of all his drives. How far does the ball have to go?



$z = \frac{\text{value} - \text{mean}}{SD}$



$1.28 = \frac{x - 304}{8}$

$x = 314.24$

314.24 yards

Homework: Pg 139 – 153, 55, 57, 59, 61, 63

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