Time Frame: 50 minutes

Subject Matter: Finding Data Values Given Specific Probabilities

TELL ME

Objective: TSWBAT find the probabilities for a normally distributed variable by transforming it into a standard normal variable

Standards: DA – 4.8

 Materials: PowerPoint Presentation and Worksheets

SHOW ME

Presentation of Information:

The teacher will discuss the following problems.

1. To qualify for a police academy, candidates must score in the top 10% on a general abilities test. The test has mean of 200 and a standard deviation of 20. Find the lowest possible score to qualify. Assume the test scores are normally distributed.

Solution

Since the test scores are normally distributed, the test value (X) that cuts off the upper 10% of the area under the normal distribution is desired.

Step 1:

Subtract 0.1000 from 0.5000 to get the area under the normal distribution between 200 and X : 0.5000 – 0.1000 = 0.4000.

Step 2:

Find the z value that corresponds to an area of 0.4000 by looking up 0.4000 in the area portion of Table E. If the specific value cannot be found, use the closest value – in this case, 0.3997. The corresponding z value is 1.28.

Step 3

Substitute in the formula $z= \frac{X- μ}{σ}$ and solve for X.

$$1.28= \frac{X- 200}{20}$$

$$1.28×20=X-200$$

$$1.28×20+200=X$$

$$225.60=X$$

$$226=X$$

 A score of 226 should be used as a cutoff. Anybody scoring 226 or higher qualifies.

Try these

1. To qualify for a letter sorting, applicants are given a speed-reading test. The scores are normally distributed, with a mean of 80 and a standard deviation of 8. If only the top 15% of the applicants are selected, find the cutoff score.
2. The scores on a test have a mean of 100 and a standard deviation of 15. If a personnel manager wishes to select from the top 75% of applicants who take the test, find the cutoff score. Assume the variable is normally distributed.

Classwork:

1. To help students improve their reading, a school district decides to implement a reading program. It is to be administered to the bottom 5% of the students in the district, based on the scores on a reading achievement exam. If the average score of the students in the district is 122.6, find the cutoff score that will make a student eligible for the program. The standard deviation is 18. Assume the variable is normally distributed.
2. A mandatory competency test for high school sophomores has a normal distribution with a mean of 400 and a standard deviation of 100.
3. The top 3% of students receive $500. What is the minimum score you would need to receive this award?
4. The bottom 1.5% of students must go to summer school. What is the minimum score you would need to stay out of this group?
5. The average length of a hospital stay is 5.9 days. If we assume a normal distribution and a standard deviation of 1.7 days, 15% of hospital stays are less than how many days? Twenty-five percent of hospital stays are longer than how many days?

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