Unit 5: Statistics

5.5 Z-Scores

Instead of changing the scale on your graph for every question, you can keep the same by just using the normal distribution with a mean of 0 and standard deviation of 1, and then talking about "z-scores" instead of real numbers.

If I am 1.5 standard deviations above the mean, then my z-score is _____

If I am 0.6 standard deviations below the mean, then my z-score is _____

Formula:

$$Z = \frac{x - \mu}{\sigma}$$

Example: If the driving learners' test has an average of 80% with a standard deviation of 5%, and you got 72%... what is your z-score?

Example: If the average weight of a 16 year old male is 170 lbs. with a standard deviation of 12 and you weigh 190 lbs… what is your z-score?

Z-Scores are used to find probabilities under the bell curve (same as we did on the calculator). Instead of using the calculator, we use a statistics chart. (back of the textbook)

Example: What is the probability of getting a z-score of…

Less than 1.61?

Less than -0.55?

Example: An IQ test has a mean of 100 with a standard deviation of 15. What is the probability of getting less than 80 on the test?

Example: An IQ test has a mean of 100 with a standard deviation of 15. What score would have to get in order to be in the top 10%?

Assignment

1) Determine the z-score for each example:

a) $\mu = 112, \sigma = 15.5, x = 174$

b) $\mu = 53.46, \sigma = 8.24, x = 47.28$

c) $\mu = 82, \sigma = 12.5, x = 58$

d) $\mu = 245, \sigma = 22.4, x = 300$

2) Using a z-score table, determine the percent of the data to the left of each z-score.

a) z = 1.24

b) z = -2.35

c) z = 2.17

d) z = -0.64

3) Determine the percent of data **between** each pair of z-scores

a) z = -2.88 to z = -1.47

b) z = -0.85 to z = 1.64

4) What z-score is required for each situation?

a) 10% of the data is to the left of the z-score

b) 10% of the data is to the right of the z-score

c) 60% of the data is below the z-score

d) 60% of the data is above the z-score

5) Meg wonders if she should consider a career in the sciences, because she does well in mathematics. However, she also does well in English and has thought about becoming a journalist.

Subject	Standard Test Results		Meg's Mark (%)
	μ	σ	
English	77	6.8	93
Math	74	5.4	91

a) Determine the z-score of Meg's marks

b) Which subject is Meg better in, relative to her peers?

c) What other factors should Meg consider?

6) A manufacturer of plasma televisions has determines that the televisions require servicing after a mean of 67 months, with a standard deviation of 7.2 months. What length of warranty should be offered, if the manufacturer wants to repair less than 1% of the televisions under the warranty?

7) a) A club accepts members only if they have an IQ score that is greater than the scores for 98% of the population. What IQ score would you need to be accepted into this club? ($\mu = 100 \; and \; \sigma = 15$)

b) Only 0.38% of the population are considered to be geniuses, as measured by IQ score. What is the minium IQ score that is required to be considered a genius?

c) Jarrod was told that his IQ score is in the top 30% of the population. What is his IQ score?

Answer Key

1) a) 4 b) -0.75 c) -1.92 d) 2.455…

2) a) 89.25% b) 0.94% c) 98.50% d) 26.11%

3) a) 6.88% b) 75.18%

4) a) -1.28 b) 1.28 c) 0.25 d) -0.25

5) a) English: 2.352… Math: 3.148… b) Math

c) eg. The job market, her preferences, whether absolute or relative marks are more important for university applications, etc.

6) 50 months, or round down to 4 years

7) a) 131 b) 140 c) at least 108