**Math Analysis Honors**

**Unit 14 Stats WS 3**

**1. Suppose the test scores of 600 students are normally distributed with a mean of 76 and standard deviation of 8. What is the number of students scoring between 70 and 82?**

**2. Refer to the preceding question. What is the approximate 90th percentile of the score distribution?**

**3. The height of an adult male is known to be normally distributed with mean of 175 cm and standard deviation 6 cm. What is the 20th percentile of the distribution of male heights?**

**4. Suppose the distribution of GPAs at Jefferson High School has a mean of 2.7 and a standard deviation of 0.37. The GPAs at Washington High School has a mean of 2.8 and a standard deviation of 0.33.**

**a. Ted, a student at Washington High School, has a GPA of 3.25, and Frank, at Jefferson High**

**School, has a GPA of 3.17. Calculate the z-score for Ted and Frank and comment on which of them has the higher GPA relative to his peers.**

**b. What GPA would Ted need to have the same z-score as Frank?**

**c. Torsten, another student at Jefferson High School, has a GPA of 3.07. Assuming that these GPAs follow a mound-shaped distribution, approximately what proportion of Jefferson High School students have a larger GPA? (Use the empirical rule to answer this question.)**

**d. What GPA would you need to have to be in the top 10% of the class at each high school?**

**5. Suppose that the IQ scores of students at a certain college follow a normal distribution with mean 115 and standard deviation 12.**

**a. Draw a sketch of this distribution. Be sure to label the horizontal axis.**

**b. Shade in the area corresponding to the proportion of students with an IQ below 100. Based on this shaded region, make an educated guess as to this proportion.**

**c. Use the normal model to determine the proportion of students with an IQ score below 100. d. Find the proportion of these undergraduates having IQs greater than 130.**

**e. Find the proportion of these undergraduates having IQs between 110 and 130.**

**f. With his IQ of 75, what would the percentile of Forrest Gump’s IQ be?**

**g. Determine how high one’s IQ must be in order to be in the top 1% of all IQs at this college.**

**6. One of the side effects of flooding a lake in northern boreal forest areas (e.g. for a hydro-electric project) is that mercury is leached from the soil, enters the food chain, and eventually contaminates the fish. The concentration in fish will vary among individual fish because of differences in eating patterns, movements around the lake, etc. Suppose that the concentration of mercury in individual fish follows an approximate normal distribution with a mean of 0.25 ppm and a standard deviation of 0.08 ppm. Fish are safe to eat if the mercury level is below 0.30 ppm. What proportion of fish is safe to eat?**

**7. Refer to the previous question. The Department of Fisheries and Oceans wishes to know the mercury level of the top 20% of the fish. What is the appropriate percentile and mercury level for this lake?**

**8. The heights of students at a college are normally distributed with a mean of 175 cm and a standard deviation of 6 cm. what is the expected number of students in a sample of 1000 students that are shorter than 163 cm is?**

**9. The height of an adult male is known to be normally distributed with a mean of 69 inches and a standard deviation of 2.5 inches. Calculate the height of the doorway such that 96 percent of the adult males can pass through it without having to bend.**

**10. The weights in pounds of children in a certain fourth grade class are given:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **64** | **69** | **63** | **60** | **69** |
| **72** | **57** | **90** | **77** | **76** |
| **69** | **60** | **74** | **79** | **68** |
| **88** | **69** | **72** | **59** | **75** |
| **60** | **78** | **59** | **55** | **67** |
| **71** | **74** | **74** | **70** | **71** |
| **84** | **67** | **63** | **62** | **62** |
| **71** | **68** | **65** | **66** | **63** |
| **57** | **75** | **91** | **62** | **93** |

**a. Find the mean and median. Is the data symmetric?**

**b. Find Q1 and Q3. What is the significance of these two weights? What percent of the data lies between them?**

**c. Assume the data is normally distributed. Find the standard deviation.**

**Use the mean and standard deviation to find answers to the following:**

**d. What percent of the students are below 80 lbs?**

**e. What percent of the students are above 72 lbs?**

**f. What percent of the students are between 70 lbs and 82 lbs?**

**g. What weight would put a student at the 85th percentile?**

**h. Between what two weights do the middle 60% lie?**

**11. The IQ’s of a random sample of 100 people are given**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **84** | **120** | **78** | **89** | **107** | **116** | **73** | **88** | **106** | **117** |
| **144** | **92** | **100** | **124** | **84** | **100** | **115** | **76** | **93** | **112** |
| **89** | **109** | **110** | **128** | **101** | **109** | **135** | **100** | **112** | **81** |
| **99** | **119** | **88** | **117** | **110** | **81** | **103** | **127** | **97** | **120** |
| **93** | **115** | **92** | **116** | **68** | **97** | **66** | **102** | **84** | **108** |
| **95** | **72** | **104** | **95** | **80** | **85** | **106** | **99** | **87** | **115** |
| **104** | **100** | **95** | **85** | **121** | **112** | **97** | **106** | **113** | **82** |
| **104** | **102** | **111** | **103** | **125** | **95** | **102** | **88** | **102** | **97** |
| **99** | **100** | **103** | **78** | **99** | **99** | **91** | **97** | **99** | **103** |
| **102** | **110** | **88** | **100** | **90** | **100** | **103** | **92** | **103** | **110** |

**a. Find the mean and median. Is the data symmetric?**

**b. Assume the data is normally distributed. Find the standard deviation.**

**c. What percent of the people are below 110?**

**d. What percent of the people are above 92?**

**e. What percent of the people are between 95 and 105?**

**f. What IQ would put a person at the 73rd percentile?**

**g. Between what two IQs do the middle 40% lie?**

**Answer Key:**

1. **328**
2. **86.2**
3. **170cm**
4. **A) Ted has 1.364, Frank has 1.27**

**B) 3.22**

**C) 16%**

**D) Jefferson is 3.17, Washington is 3.22**

 **5) A)-B) sketch**

 **C) 10.6%**

 **D) 10.6%**

 **E) 55.67%**

 **F) 0.043%**

 **6) 73.4%**

 **7) 0.317ppm**

 **8) 23 students**

 **9) 73.4 inches**

 **10) A) mean= 69.7, median=69**

 **B) Q1 =62.5, Q3=74.5, 50%**

 **C) 9.16**

 **D) 87%**

 **E) 40.1%**

 **F) 39.7%**

 **G) 79.2%**

 **H) 62 to 77**

 **11) A) mean=100.42, median=100**

 **B) 14.34**

 **C) 74.8%**

 **D) 72.1 %**

 **E) 27.3%**

 **F) 109.2**

 **G) 93 and 108**