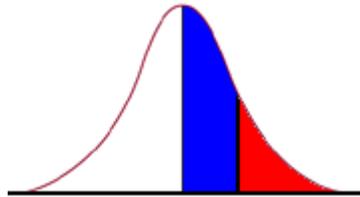


Problems

Questions from 1 through 11 depend on the following situation

"820 8th grade students in a school district took a standardized social studies test that is normally distributed and has a mean of 340 and a variance of 256. Here are the scores for four of the students: Salam scored 364, Magdy scored 356, Safaa scored 344, and Hanan scored 332. "

1. In this sample, how many students would be expected to score above Magdy?



First, compute the standard deviation: $s = \text{SQRT}(\text{variance}) = \text{SQRT}(256) = 16$

Convert Magdy's raw score to a Z-score: $Z = (356 - 340)/16 = +1.0$

Find area from the mean to a Z-score of +1.0: .3413

Find area above: $.5000 - .3413 = .1587$

Find number of people: $.1587 * 820 = 130.134$ or 130 people

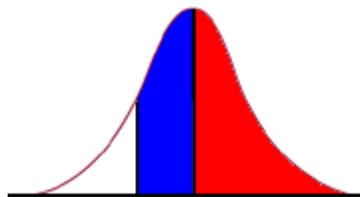
2. What proportion of the students would be expected to score above Salam?

Convert Salam's raw score to a Z-score: $Z = (364 - 340)/16 = +1.5$

Find area from the mean to a Z-score of +1.5: .4332

Find area above: $.5000 - .4332 = .0668$

3. What percent of students would be expected to score above Hanan?



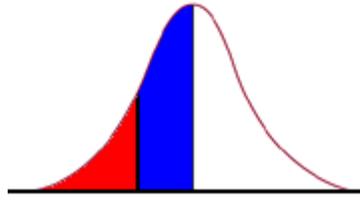
Convert Hanan's raw score to a Z-score: $Z = (332 - 340)/16 = -0.5$

Find area from the mean to a Z-score of -0.5: .1915

Find area above: $.5000 + .1915 = .6915$

Convert to percent: 69.15%

4. How many students would be expected to score below Hanan?



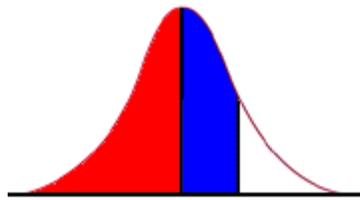
Hanan's Z-score: $Z = -0.5$

Find area from the mean to a Z-score of -0.5 : .1915

Find area below: $.5000 - .1915 = .3085$ or using information from #3: $1.0 - .6915 = .3085$

Find number of people: $.3085 * 820 = 252.97$ or 253 people

5. What percentage of students would be expected to score below Safaa?



Convert Safaa's raw score to a Z-score: $Z = (344 - 340)/16 = +0.25$

Find area from the mean to a Z-score of $+0.25$: .0987

Find area below: $.5000 + .0987 = .5987$

Convert to percent: 59.87%

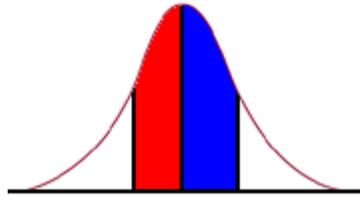
6. What proportion of students would be expected to score below Salam?

Salam's Z-score: $Z = +1.5$

Find area from the mean to a Z-score of $+1.5$: .4332

Find area below: $.5000 + .4332 = .9332$

7. How many students would be expected to score between Safaa and Hanan?



Safaa's Z-score: $Z = +0.25$

Hanan's Z-score: $Z = -0.5$

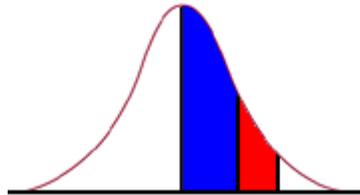
Find area from the mean to a Z-score of +0.25: .0987

Find area from the mean to a Z-score of -0.5: .1915

Find area between: $.0987 + .1915 = .2902$

Find number of people: $.2902 * 820 = 237.964$ or 238 people

8. What proportion of students would be expected to score between Salam and Magdy?



Salam's Z-score: $Z = +1.5$

Magdy's Z-score: $Z = +1.0$

Find area from the mean to a Z-score of +1.5: .4332

Find area from the mean to a Z-score of +1.0: .3413

Find area between: $.4332 - .3413 = .0919$

9. What percentage of students would be expected to score between Safaa and Magdy?

Safaa's Z-score: $Z = +0.25$

Magdy's Z-score: $Z = +1.0$

Find area from the mean to a Z-score of +0.25: .0987

Find area from the mean to a Z-score of +1.0: .3413

Find area between: $.3413 - .0987 = .2426$

Convert to percent: 24.26%

10. 225 students score above Laith, what is his test score?

Proportion above Laith is: $225/820 = .2744$

Proportion from mean to Laith: $.5000 - .2744 = .2256$

Z-score for Laith: +0.6

Find the raw test score: $+0.6 = (X-340)/16$, $X = 0.6*16 + 340 = 349.6$

11. What are the approximate test scores for Q1 and Q3?

Find area from the mean to Q1: .25

Find area from the mean to Q3: .25

Z-score for Q1: -0.67

Z-score for Q3: +0.67

Find the raw test score: $-0.67 = (X-340)/16$, $X = -0.67*16 + 340 = 329.28$

Find the raw test score: $+0.67 = (X-340)/16$, $X = +0.67*16 + 340 = 350.72$

12. A middle-school student took two standardized tests. On the Language Proficiency test she scored 114.4 (mean = 100, sd = 16) and on Mathematical Reasoning she scored 61.7 (mean = 50, sd = 9). On which test did she do better?

Compute Z-score for test 1: $Z = (114.4 - 100)/16 = .9$

Compute Z-score for test 2: $Z = (61.7 - 50)/9 = 1.3$

Relatively speaking, the student did better on the Mathematical Reasoning test.