Chapter 3 Selected Homework Answers

1. $\Sigma X = 1 + 2 + 3 + 3 + 4 + 2 + 2 + 3 + 2 + 1 = 23$
$23 \times 3 = 69$
$\Sigma X^2 = 1 + 4 + 9 + 9 + 16 + 4 + 4 + 9 + 4 + 1 = 61$
$61/2 = 30.5$
$69 + 30.5 = 99.5$

3(a). $\Sigma X2 = 9 + 16 + 4 + 9 + 16 + 4 + 4 + 4 + 1 + 4 = 71$
$(71 \times 10)/5 = 710/5$
$710/5 = 142$

3(b). $\Sigma X = 3 + 4 + 2 + 3 + 4 + 2 + 2 + 2 + 1 + 2 = 25$
$(\Sigma X)2 = (25)2 = 625$
$\Sigma X/5 = 25/5$
$[(\Sigma X)2 – (\Sigma X)/5] = [625 – 25/5] = 625 – 5 = 620$
$620 \times 2 = 1240$

5.

Percentile	***T* score**	***z* score**	**Raw score**
64	53.7	.37	737
24	43	–.70	630
11	37.7	–1.23	577
21	41.8	–.82	618
17	40.5	–.95	605
96	68	1.80	880
68	54.7	.47	747
91	63.5	1.35	835
72	55.7	.57	757

7. The *z* score (from table 3-3) for 70th percentile is 0.52 (find 70 – 50 = 20 and look for the closest number to 20 in the body of the table [19.85]).
$T = 50 + 10(z)$
$T = 50 + 10(.52)$
$T = 50 + 5.2$
$T = 55.2$

9. *z* score = 1.28
$1.28 = (X–200)/40 = 251.2$

11. Find the *z* score for 85 and 115. For 85: *z* score = (85 – 100)/20 = –15/20 = –0.75. For 115: *z* score = (115 – 100)/20 = 15/20 = 0.75. Use table 3-3 to see that from the mean to *z*

score = 0.75 is 27.34% of observations. The *z* score is plus and minus 0.75 from the mean; thus, the answer is 27.34% + 27.34% = 54.68%.

13. *z* score = (54,000 – 50,000)/ 10,000 = 4,000/10,000 = 0.40
You want the percentage of tires that last longer than 54,000 miles:
50.00 – 15.54 = 34.46.

15. *z* score = (225 – 200)/20 = 1.25
50.00 – 39.44 = 10.56

17. Allison's *z* score of 1.25 includes 39.44% people between her and the mean. John's *z* score of 0.5 includes 19.15% people between him and the mean. 39.44 – 19.15 = 20.29.

19. *z* score = (38 – 35)/5 = 3/5 = 0.60. Look up *z* score of 0.60 in table 3-3: 50.00 – 22.57 = 27.43%.

21. Find the *z* score associated with each value.
The *z* score for 600 = (600 – 500)/100 = 100/100 = 1.0
z score for 550 = (550 – 500)/100 = 50/100 = 0.50
Determine the difference in these two percentages from the mean: 34.13 – 19.15 = 14.98.

23. Use table 3-3 to determine the *z* score for the 35th percentile. You must look up 15% in the body of the table. The percentage closest to 15 in the table is 15.17 (*z* score = 0.39). Since the 35th percentile is below the mean, the *z* score must be –0.39. Substitute into the *T* score equation to obtain the answer.
$T = 50 + 10(z)$
$T = 50 + 10(-.39)$
$T = 50 - 3.9$
$T = 46.1$

25. The *z* score = (185 – 200)/10; *z* score = –15/10 = –1.50. Go to table 3-3 and look up the percentage of observations between the mean and *z* score = –1.5. Since the value is below the mean, you must subtract it from 50 to determine the percentage below (i.e., the percentile): 50.00 – 43.32 = 6.68.

27. Order the topics by the size of the standard deviation. The larger the standard deviation, the greater weight that topic has in determining final grade. Ordered from *highest* to *lowest*: A, B, D, E, C.

29. *z* score = (41 – 50)/10 = –9/10 = –0.90. Use table 3-3 and determine the percentage of observations between the mean and –0.90. Since you are looking for the percentage below (i.e., the percentile), you must subtract this value from 50: 50.00 – 31.59 = 18.41%.

31. Find the *z* score associated with each value:
z score = (95 – 110)/20 = –15/20 = –0.75

z score = (90 – 110)/20 = –20/20 = –1.00.
Subtract 27.34 from 34.13 to determine the percentage between these two values.
34.13 – 27.34 = 6.79%.

33. Find the *z* score for a *T* score of 68. Subtract this value from 50 to see what percentage scored higher than a *T* score of 68. The *z* score = (68 – 50)/10 = 18/10 = 1.80. Look up 1.80 on table 3-3: 50.00–46.41 = 3.59%.

35. Go to the body of table 3-3 and find the number closest to 45 (i.e., 95 – 50 = 45). The closest number is either 44.95 or 45.05. You could choose either one. Typically, the number 45.05 is used. This is a *z* score of 1.65.
Solve the *z* score formula for *X*
$1.65 = (X – 30)/2$
$1.65 \times 2 = X – 30$
$3.3 = X – 30$
$30 + 3.3 = X$
$33.3 = X$

37. Determine the *z* score for each person and then use the *z* table.
John's *z* score = (56 – 50)/10 = .60.
John's percentile is 50.00 + 22.57 = 72.57.
Karen's *z* score = .57.
Karen's percentile is 50.00 + 21.57 = 71.57.

39. Determine the *z* score for $550.00 and $450.00 per month.
z score = (550 – 400)/50 = 3.0
z score = (450 – 400)/50 = 1.0
(49.87 – 34.13) = 15.74.

41. *z* score = (40 – 100)/50 = –60/50 = –1.20. Use table 3-3 to determine the percentage of people who scored below a z score of –1.20: 50.00 – 38.49 = 11.51.

43. *z* score = (39 – 42)/2 = –3/2 = –1.50. Use table 3-3 to determine the percentage between the mean and –1.50 standard deviations. Subtract this value from 50 to determine your percentile: 50.00 – 43.32 = 6.68.

45. Find the percentage associated with each *z* score from the *z* table and then subtract them. For *z* score = –1.5, the percentage between the mean and negative 1.5 is 43.32. For *z* score = –0.50, it is 19.15. The answer is 43.32 – 19.15 = 24.17.

47. Find the *z* score: *z* score = (40 – 45)/5 = –1.0. The answer is 50.00 – 34.13 = 15.87.

49. Find the *z* score for the vertical jump:
(28 – 25)/3 = 3/3 = 1.0
Find the *z* score for the 40-yard dash. Note that a faster speed (i.e., lower score) is a "better" value. So, the *z* score formula is reversed to

z = (M – X)/S
(4.8 – 4.6)/.2 = .2/.2 = 1
Finally, add the two *z* scores together for the answer:
1.0 + 1.0 = 2.0

51. Find the *z* score for the vertical jump:
(24 – 25)/3 = –1/3 = –.33
Find the *z* score for the 40-yard dash. Note that a faster speed (i.e., lower score) is a "better" value. So, the *z* score formula is reversed to
z = (M – X)/S
(4.8 – 5.2)/.2 = –.4/.2 = –2
Multiply the *z* score for the vertical jump by 2 (weighting it twice) and add it to the 40-yard dash *z* score
2 * –.33 = –.66 (for vertical jump)
1 * –2.00 = –2.00 (for 40-yard dash)
–.66 + (–2.00) = –2.66