

⚠ Lagunita is retiring and will shut down at 12 noon Pacific Time on March 31, 2020. A few courses may be open for self-enrollment for a limited time. We will continue to offer courses on other online learning platforms; visit <http://online.stanford.edu>.

Course > EDA: Examining Distributions > One Quantitative Variable: Measures of Center > Learn By Doing Activity

🔖 Bookmark this page

Learn By Doing Activity

Scenario: Readability of Cancer Pamphlets

Background

A study was done in order to find out whether pamphlets containing information for cancer patients are written at a level that the cancer patients can understand. Tests were administered to measure the reading levels of 63 cancer patients, and the readability levels of 30 cancer pamphlets were evaluated based on such factors as the lengths of the sentences and the number of polysyllabic words. Both the reading and readability levels correspond to grade levels, but patients' reading levels of less than grade 3 and above grade 12 cannot be determined exactly. (**Source:** Short, Moriarty, and Cooley. (1995). "Readability of Educational Materials for Cancer Patients." *Journal of Statistics Education*, v.3, n.2)

The following tables indicate the number of patients at each reading level and the number of pamphlets at each readability level.

Patients' Reading Level	<3	3	4	5	6	7	8	9	10	11	12	>12
Count	6	4	4	3	3	2	6	5	4	7	2	17

Pamphlets' Readability Level	6	7	8	9	10	11	12	13	14	15	16
Count	3	3	8	4	1	1	4	2	1	2	1

Comment

Note: For both the reading level and readability level, the data are presented in a grouped form where the count represents the frequency of occurrence of that level. In the readability data, for example, the count of level 6 is 3 which means that the first three data points are 6 6 6; the count of level 7 is 3 which means that the next three data points are 7 7 7; the count of level 8 is 8 which means that the next eight data points are 8 8 8 8 8 8 8 8, and so on.

Answer the following questions:

Learn By Doing

1/1 point (graded)

Which of the following is the mode of the readability level for the pamphlets?

Note that the frequencies of each level have already been determined.

☒ 8 ✓

☐ 16

☐ 1

☐ 17

Answer

Correct:

Indeed the readability level that occurs with the highest frequency (8) corresponds to grade level 8

Submit

Learn By Doing (1/1 point)

Explain why you cannot calculate the mean (average) reading level of patients given the above data.

Your Answer:

Because of the <3 and >12

Our Answer:

In order to find the mean, we need the actual values of ALL the observations. Since not all the reading levels can be determined exactly, we have 23 observations (6 below level 3, and 17 above level 12) for which we do not know the actual values.

Resubmit

Reset

Learn By Doing

1/1 point (graded)

Now find the median reading level of the patients. Note that the data are already ordered—that's good!

How many observations (n) are there for the reading level of cancer patients?

☐ 12

☐ 30

☒ 63 ✓

☐ 93

Answer

Correct: Tests were administered to 63 cancer patients, which is the number of observations, or n.

Submit

Learn By Doing

1/1 point (graded)

Since n is odd, the median reading level for patients will be which observation in the ordered data?

☒ center observation ✓

☐ average of the two center observations

Answer

Correct:

When n (the number of observations) is odd, the median is the center observation in the ordered data.

Submit

Learn By Doing

1/1 point (graded)

What is the rank of the observation that represents the median reading level for patients?

☐ 31st☒ 32nd ✓☐ 63rd**Answer**

Correct:

Since n is odd (63), the value of the median is located at the $(n+1) / 2$ spot in the ordered data, or $(63+1) / 2 = 64 / 2 = 32$.

Submit

Learn By Doing

1/1 point (graded)

What is the median reading level for patients?

☐ 7☐ 7.5☐ 8☒ 9 ✓**Answer**

Correct:

$6 (< 3) + 4 (L3) + 4 (L4) + 3 (L5) + 3 (L6) + 2 (L7) + 6 (L8) + 5 (L9) = 32$ so the 32nd observation falls in patients' reading level 9.

Submit

Learn By Doing (1/1 point)

Find the median readability level of the pamphlets.

Your Answer:

9

Our Answer:

The median readability level of the cancer pamphlets is $M = 9$. We have 30 readability level data points, and therefore the median will be the mean of the observations located at the $(30 / 2) = 15$ th and $(30 / 2) + 1 = 16$ th spots in the ordered list. Taking the counts into consideration, we find that both the 15th and 16th ranked observations are 9, and therefore the median is $(9 + 9) / 2 = 9$.

[Resubmit](#)[Reset](#)

Learn By Doing (1/1 point)

Can you conclude that the pamphlets are well matched to the patients' reading levels? Look carefully at the data.

Your Answer:

No because of the mismatch of distributions. A lot of the students could read better or worse than what the pamphlets could provide.

Our Answer:

Even though the medians of the reading and readability levels are the same, the pamphlets are not well matched to patients' reading levels. Note that the pamphlets' readability level starts at grade level 6, while there are 17 ($6 + 4 + 4 + 3$) cancer patients whose reading level is below that. These 17 cancer patients therefore do not have any pamphlets that they can fully comprehend.

[Resubmit](#)[Reset](#)

Open Learning Initiative [↗](#)



[↗](#) Unless otherwise noted this work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License [↗](#).

© All Rights Reserved