

TASK 1a

calculate the retardation required to stop train before it reaches the level crossing.

To calculate the retardation required to stop the train before it reaches the level crossing, we can use the

$$v^2 = u^2 + 2as$$

However, the final velocity (v) is 0 ms^{-1} , and the initial velocity (u) is 21 ms^{-1} . The displacement (s) required is 441m.

$$0^2 = 21^2 + 2a(100)$$

$$441 = 200a$$

$$a = 441/200$$

$$a = 2.205 \text{ ms}^{-2}$$

Since the acceleration is in the opposite direction of motion when stopping, it is referred to as retardation. The required retardation to stop the train before it reaches the level crossing is approximately 2.205 ms^{-2} .

Multiply the answer with last 3 digit of your student number (2230889)

$$2.205 \times 889 = 1960.245 \text{ ms}^{-2}$$

determine the time taken for the train to come to rest.

To determine the time taken for the train to come to rest, we can use the equation of motion:

$$v = u + at$$

Since the final velocity (v) is 0 m/s and the initial velocity (u) is 21 m/s , and we have already calculated the acceleration (a) as -2.205 ms^{-2} , we can solve for time (t):

$$0 = 21 + 2.205t$$

$$2.205t = -21$$

$$t = -21 / 2.205$$

$$t = -9.523 \text{ s}$$

The negative sign indicates that the time is in the opposite direction to the motion. However, in this case, we are interested in the magnitude of the time.

$$|t| = 9.523 \text{ s}$$

Therefore, it takes approximately 9.523 seconds for the train to come to rest.

Multiply the answer with first 3 digit of your student number (2230889)

$$9.523 \times 223 = 2123.629 \text{ s}$$

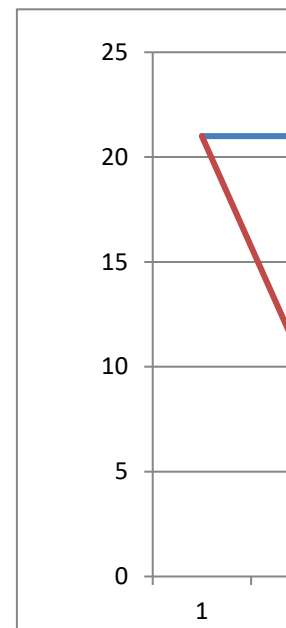
TASK 1b

final	initial	acceleration	distance (m)	time (s)	train will
0	21	1	220.5	21	not in time
0	21	2	441	10.5	not in time
0	21	3	661.5	7	not in time
0	21	4	882	5.25	not in time
0	21	5	1102.5	4.2	not in time
0	21	6	1323	3.5	not in time
0	21	7	1543.5	3	not in time

0	21	8	1764	2.625	not in time
0	21	9	1984.5	2.333333333	not in time
0	21	10	2205	2.1	not in time

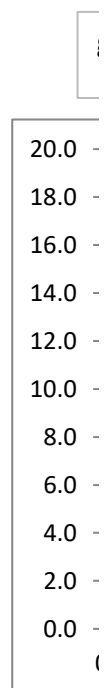
Task 1c

velocity ms	initial velocity	acceleration	time (s)
0	21	1	21
0	21	2	10.5
0	21	3	7
0	21	4	5.25
0	21	5	4.2
0	21	6	3.5
0	21	7	3
0	21	8	2.625
0	21	9	2.333333333
0	21	10	2.1



Task 2a

sample	actual size	Technician 1	Technician 2	Technician 3
1	1.7	3.6	2.4	3.3
2	5.0	4.3	4.7	5.9
3	2.6	4.7	4.7	3.8
4	3.8	1.9	4.7	3.8
5	6.4	7.1	8.3	7.1
6	1.3	2.8	2.4	2.4
7	0.6	2.8	2.4	1.7
8	0.9	1.2	2.4	2.1
9	14.2	13.0	15.4	14.7
10	2.7	1.2	3.6	3.3
11	3.1	5.0	3.6	4.0
12	2.3	2.4	2.4	3.1
13	2.7	4.3	3.6	3.8
14	1.2	3.6	2.4	2.4
15	4.3	4.7	5.9	5.0
16	17.8	14.2	19.0	16.6
17	0.7	2.4	2.4	1.9
18	1.2	2.1	2.8	1.9
19	11.6	10.7	13.0	11.6
20	0.6	1.2	2.4	1.2
Total values	84.7	93.2	108.5	99.6
Means	4.24	4.66	5.43	4.98



10
9
8
7
6
5
4
3
2
1

Range	17.2	13.00	16.60	15.40
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Measurement Accuracy: We can compare the absolute differences between each technician's measurements and the actual measurement total of 84.7m.

The technician with the smallest difference would be considered more accurate.

Mean Value Accuracy: We can compare the absolute differences between each technician's mean value and the actual mean value of 4.24.

The technician with the smallest difference would be considered more accurate in terms of mean value estimation.

Measurement Accuracy:

Technician 1: Absolute difference = $|93.2 - 84.7| = 8.5\text{m}$

Technician 2: Absolute difference = $|108.5 - 84.7| = 23.8\text{m}$

Technician 3: Absolute difference = $|99.6 - 84.7| = 14.9\text{m}$

In terms of measurement accuracy, Technician 1 has the smallest difference from the actual measurement total, which tell us his better performance in terms of measurement accuracy.

Mean Value Accuracy:

Technician 1: Absolute difference = $|4.66 - 4.24| = 0.42$

Technician 2: Absolute difference = $|5.43 - 4.24| = 1.19$

Technician 3: Absolute difference = $|4.98 - 4.24| = 0.74$

In terms of mean value accuracy, Technician A has the smallest difference from the actual mean value, showing us his better performance in terms of mean value estimation.

after having both measurement accuracy and mean value accuracy, Technician 1 appears to have performed better as compaired to other two technicians.

There may be verious reasons why Technician 1 performed better compared to Technicians 2 and 3. Here are a few possibilities:

Measurement Skill, Experience, Calibration, Consistency, Method of work.

Similarities:

All technicians are involved in taking measurements.

They all have a certain level of competence to be entrusted with performing the measurements.

They all contribute to the overall understanding of the measured quantity.

Differences:

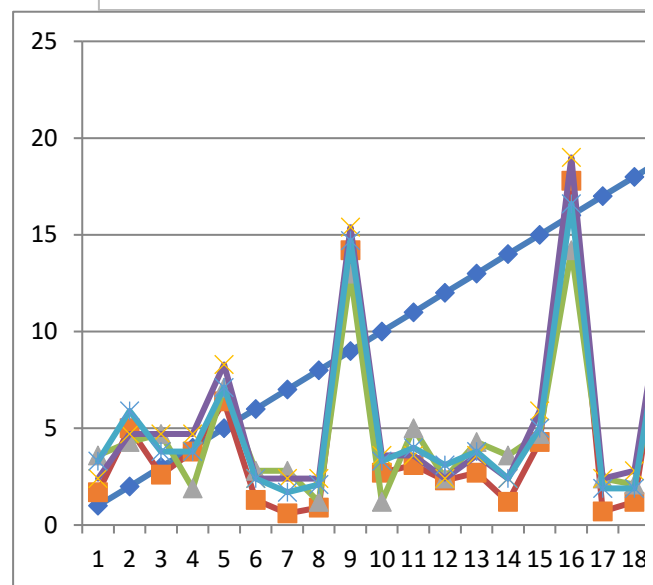
measurement

20.
18.
16.
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0.

Measurement Accuracy, Mean Value Accuracy, Performance, Personal Characteristics.

TASK 2b

frequency distribution cha



Analysis to further demonstrate

There could be several reasons why Technician 1 performed better compared to Technicians 2 and 3. Here are some potential factors:

Measurement Skill: Technician 1 may have better measurement skills, such as being more precise in taking measurements or having a better understanding of the measurement equipment being used. This could result in more accurate measurements.

Experience: Technician 1 might have more experience in taking measurements, which could contribute to better performance. Experience can enhance a technician's ability to handle different measurement scenarios and make accurate measurements.

Calibration: It's possible that Technician 1's measuring equipment was calibrated more accurately than the equipment used by Technicians 2 and 3. Properly calibrated equipment can lead to more accurate measurements.

Consistency: Technician 1 may have demonstrated more consistency in their measurements. Consistency is important for accurate results. If Technicians 2 and 3 had inconsistencies in their measurements, it could result in less accurate overall results.

Methodology: Technician 1 might have followed a more rigorous or standardized methodology while taking measurements. A consistent methodology can help ensure accurate and reliable results.

similarities and differences of technicians

Similarities:

All technicians are involved in taking measurements.

All technicians are involved in taking measurements.

They all have mean values associated with their measurements.

They all have a certain level of competence to be entrusted with performing the measurements.

They all contribute to the overall understanding of the measured quantity.

Differences:

Measurement Accuracy: Each technician's individual measurements differ from one another. Technician 1 measured 99.6m, Technician 2 measured 99.7m, and Technician 3 measured 99.6m. These differences indicate variations in their measurement skills or techniques.

Mean Value Accuracy: The mean values associated with their measurements also differ. Technician 1 has a mean value of 4.98, Technician 2 has a mean value of 4.99, and Technician 3 has a mean value of 4.98. These differences suggest variations in their ability to estimate the true value.

Performance: Technician 1 appears to have performed better in terms of both measurement accuracy and mean value accuracy, as discussed in the previous responses.

Personal Characteristics: There may be differences in the personal characteristics, skills, experience, or training of the technicians, leading to variations in their performance.

ie equation of motion:

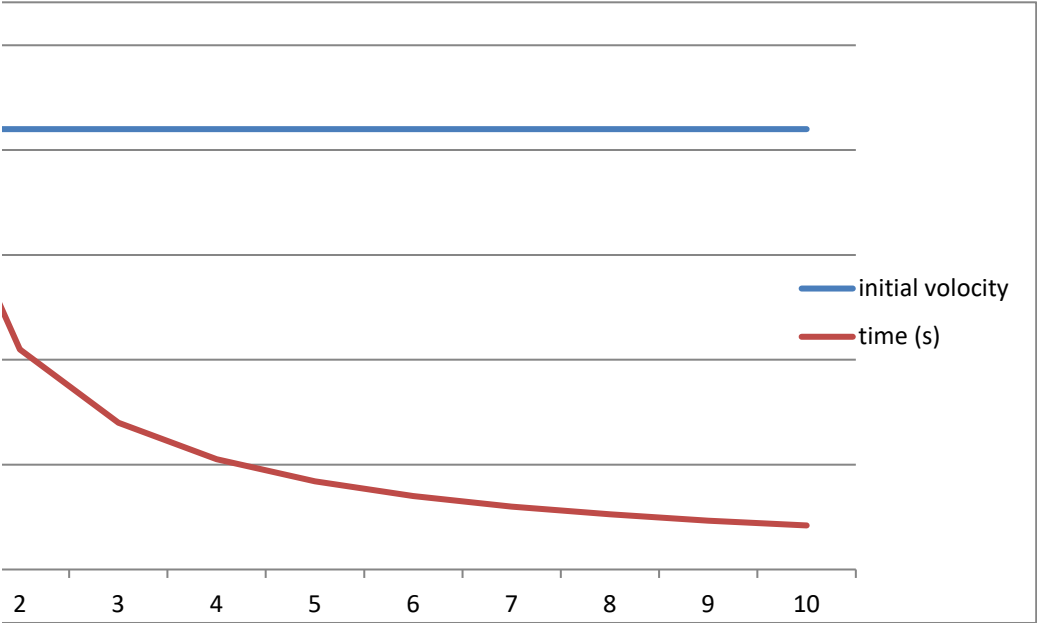
mains the same at 100 m. Rearranging the equation, we have:

on. Therefore, the retardation required to stop the train before it reaches the

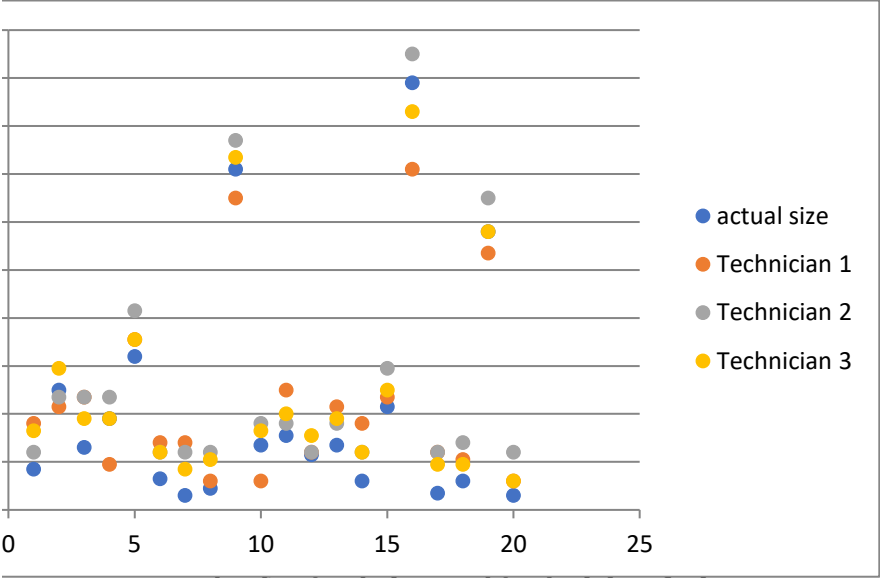
he acceleration (a) to be approximately 2.205 ms^{-2} , we can rearrange the equation

e, we are interested in the magnitude of time, so we take the absolute value:

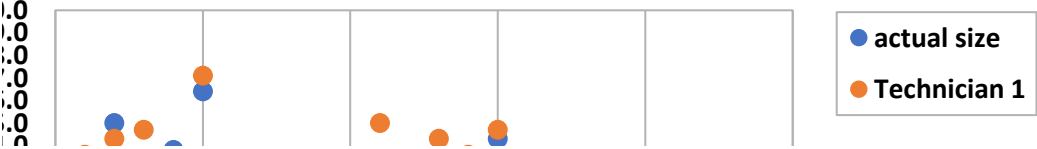


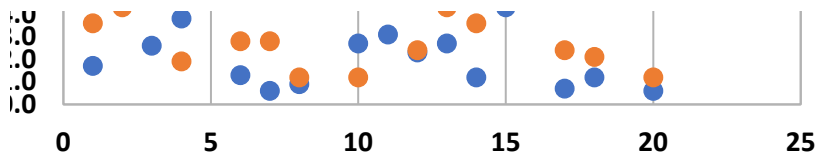


graph of actual size and technician 1,2,3

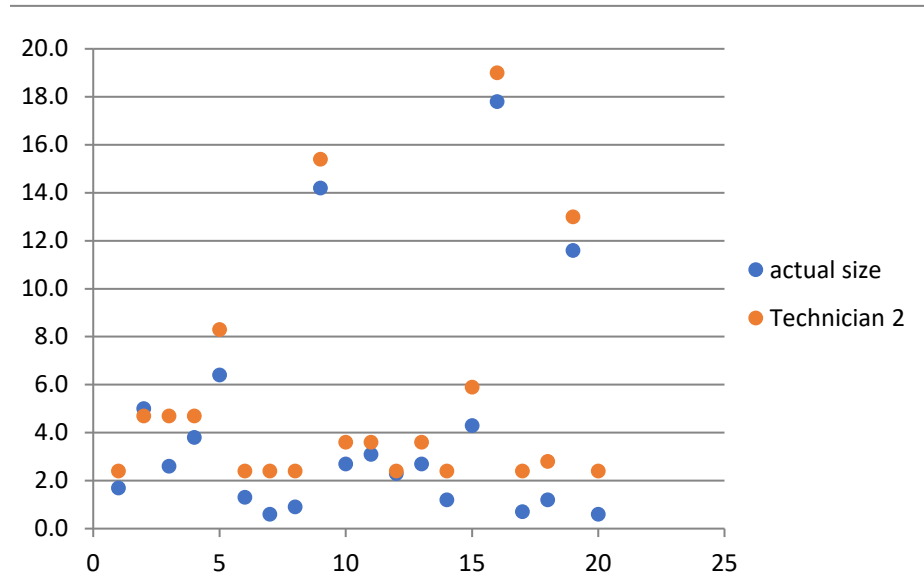


graph of actual size and technician 1 size

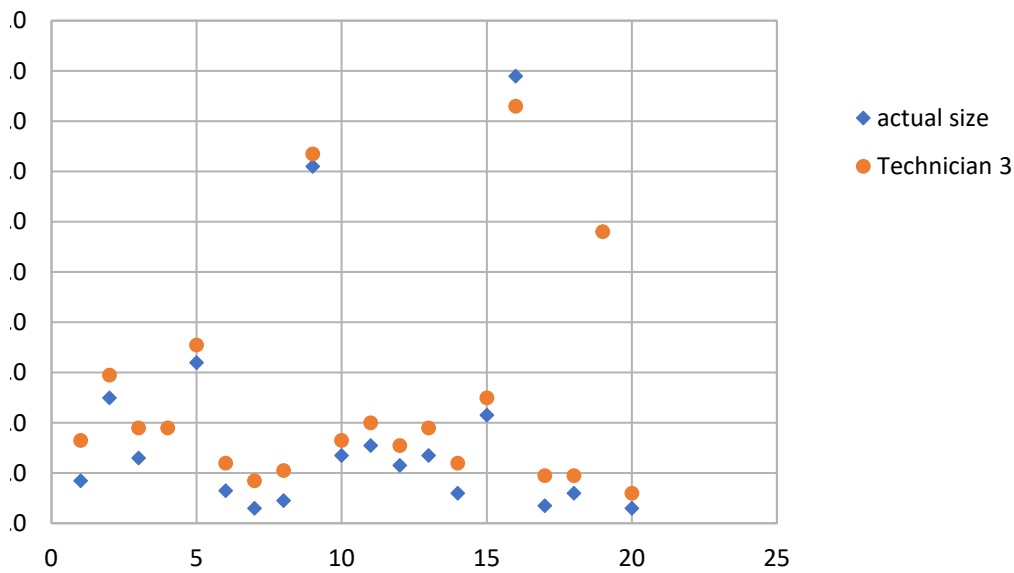


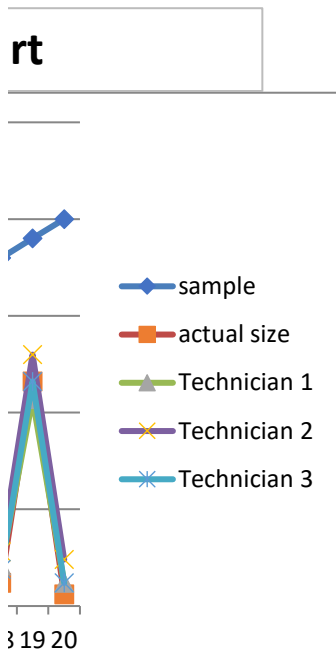


graph of actual size and technician 3



graph of actual size and technician 3 size





There are a few possibilities:

Improving measurements or having a better understanding of the data.

Improving their better performance. More accurate judgments.

Improving the equipment used by Technicians 2 and 3.

It is important to ensure reliability in the data collected. Consistent results.

Improving measurements, minimizing potential errors or biases that

1 measured 93.2m, Technician 2 measured 108.5m, techniques.

a mean value of 4.66, Technician 2 has a mean value of 5.43, the true mean value.

d mean value accuracy compared to Technicians 2 and 3,

aining of each technician, which could contribute to

