

External assessment 2023

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Stimulus book

# General Mathematics SEE

SEE 1

## General instruction

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## Context

Billboard publishes lists of the most popular songs and albums. In the past, artists released new songs that could be heard on the radio, purchased as a single<sup>1</sup> or as part of an album. Artists' income from recorded music came from retail sales and royalties from radio plays.

### Stimulus 1

The table shows the average song length (seconds) of popular songs released between 1960 and 2000.

This content is redacted until copyright has been assessed and cleared.

### Stimulus 2

The table shows the average song length (seconds) of popular songs released between 2000 and 2020.

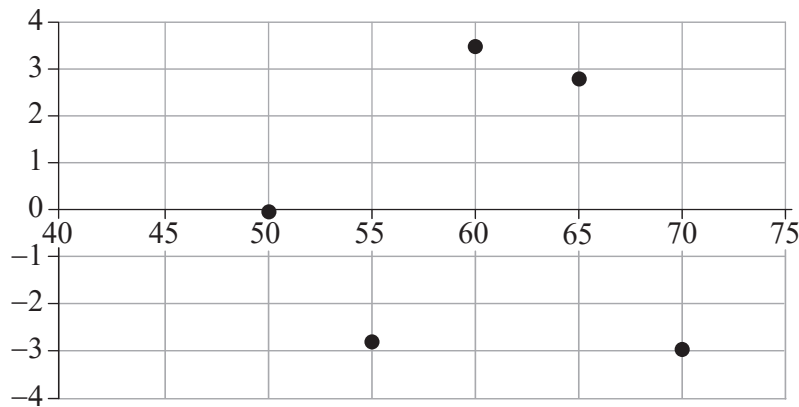
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<sup>1</sup> a song released separately from an album

### Stimulus 3

The graph shows the residual plot when model 3 from Question 5 ( $y = -1.46x + 315.2$ ) is compared to the data from Stimulus 2.



### Stimulus 4

Originally, the only way to enjoy music was to hear it performed live. Once it became possible to record music, a system for sharing music and paying artists was developed. Recordings were packaged as singles (normally one song) or albums (a combination of songs) and these physical items were available for purchase. Digital downloads and streaming became possible more recently due to the internet.

The table summarises some of the key changes in music sharing.

Medium	Details	Artist income
Physical albums / singles	<ul style="list-style-type: none"> <li>• Vinyl records were a popular medium for music reproduction from the 1940s to the early 1990s.</li> <li>• Typically, vinyl albums could play 22 minutes per side (44 minutes in total).</li> <li>• CDs were a popular medium for music reproduction from the 1980s to the 2000s.</li> <li>• Typically, CDs could play 74–80 minutes of music.</li> </ul>	<ul style="list-style-type: none"> <li>• Artists receive income from album and single sales.</li> <li>• Artists receive royalties from radio plays.</li> </ul>
Digital download	<ul style="list-style-type: none"> <li>• Digital downloads have been popular since the 2000s.</li> <li>• There are options to purchase an entire album or individual songs.</li> </ul>	
Streaming	<ul style="list-style-type: none"> <li>• Streaming was introduced in the 2010s and has steadily increased in popularity.</li> <li>• 1500 song streams from an album is equivalent to an album sale.</li> </ul>	<ul style="list-style-type: none"> <li>• Artists receive income from song plays (listening to 30 seconds counts as a play).</li> <li>• Artists receive royalties from radio plays.</li> </ul>

### **Stimulus 5**

What makes a song popular? Songs that become hits almost always share features that are sometimes called the 'pop-music formula'. These songs are easy to remember and sing along to and have:

- a good rhythm
- a catchy melody
- a chorus that is repeated several times
- two or more verses.

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## References

### Stimulus 1 and 2

Data sourced from:

Birch Okkels, C 2013, *A Data Analysis and Visualisation of Music Chart History*,  
[https://rstudio-pubs-static.s3.amazonaws.com/9904\\_8793c74e535344f2abbaf87779668873.html](https://rstudio-pubs-static.s3.amazonaws.com/9904_8793c74e535344f2abbaf87779668873.html).



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