

Mastering Pitch with Max the Mathematician

Learning objective: To understand, identify, and describe how pitch varies in musical instruments and the voice, and to explore how frequency affects the sound we hear.

Read each question carefully and use your knowledge of musical pitch to provide detailed, scientific explanations. Max needs your help to solve these sound-based puzzles!

Max the monkey is investigating how sound works. He knows that pitch is how 'high' or 'low' a note sounds, and it depends on how fast an object vibrates. A faster vibration creates a higher pitch, while a slower vibration creates a lower pitch. Whether it is a string instrument, a wind instrument, or the human voice, the rules of physics remain the same.

Word bank: Frequency · Vibration · High pitch · Low pitch · Tension · Interval · Octave · Amplitude

1. Max is plucking two guitar strings. One string is thick and loose, and the other is thin and tight. Explain which string will produce the higher pitch and justify your answer using the concept of vibration. (2 marks)

2. If you were to blow across the top of two glass bottles, one filled with water and one empty, which would produce a lower pitch? Explain why the volume of air inside the bottle affects the pitch. (2 marks)

3. Compare and contrast the sound of a double bass to the sound of a piccolo. Use the terms 'frequency' and 'vibration' in your answer. (2 marks)

4. What might happen to the pitch of a violin string if the player increases the tension? Explain the relationship between tension and frequency. (2 marks)

5. If a singer moves from a low note to a much higher note, describe what is physically happening to their vocal cords to change the pitch. (2 marks)

Draw: Draw a diagram showing two sound waves: one representing a high-pitched note with waves very close together, and one representing a low-pitched note with waves far apart. Label these 'High Frequency' and 'Low Frequency'.



Extension challenge: Design an experiment using everyday household objects (such as jars of water, rubber bands, or rulers) to create a scale of at least five different pitches. Write a short report explaining why each object produces a different pitch and which variables you changed to alter the sound.