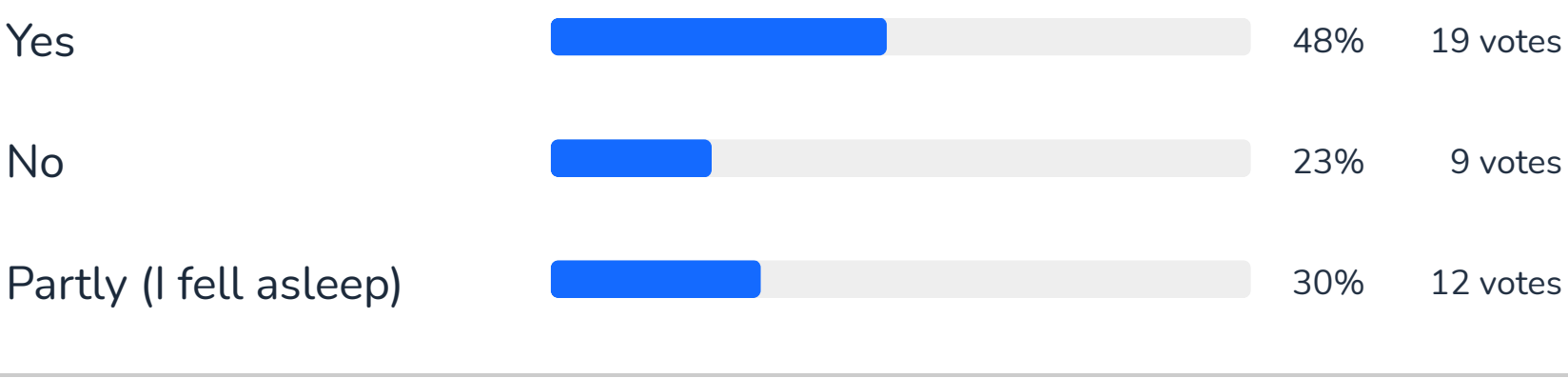
VIB2021 : Vibration sources and Fourier Analysis

Number of participants: 57

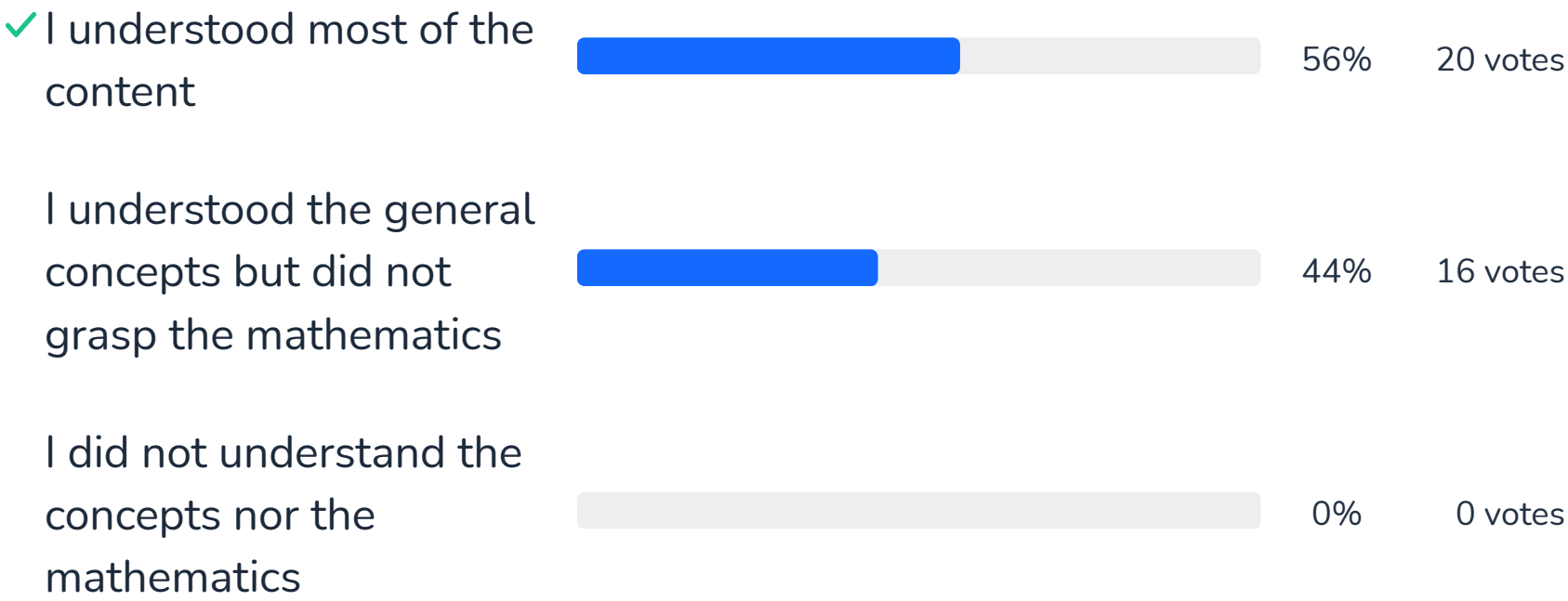
1

I have watched the video on vibration sources before coming to the class



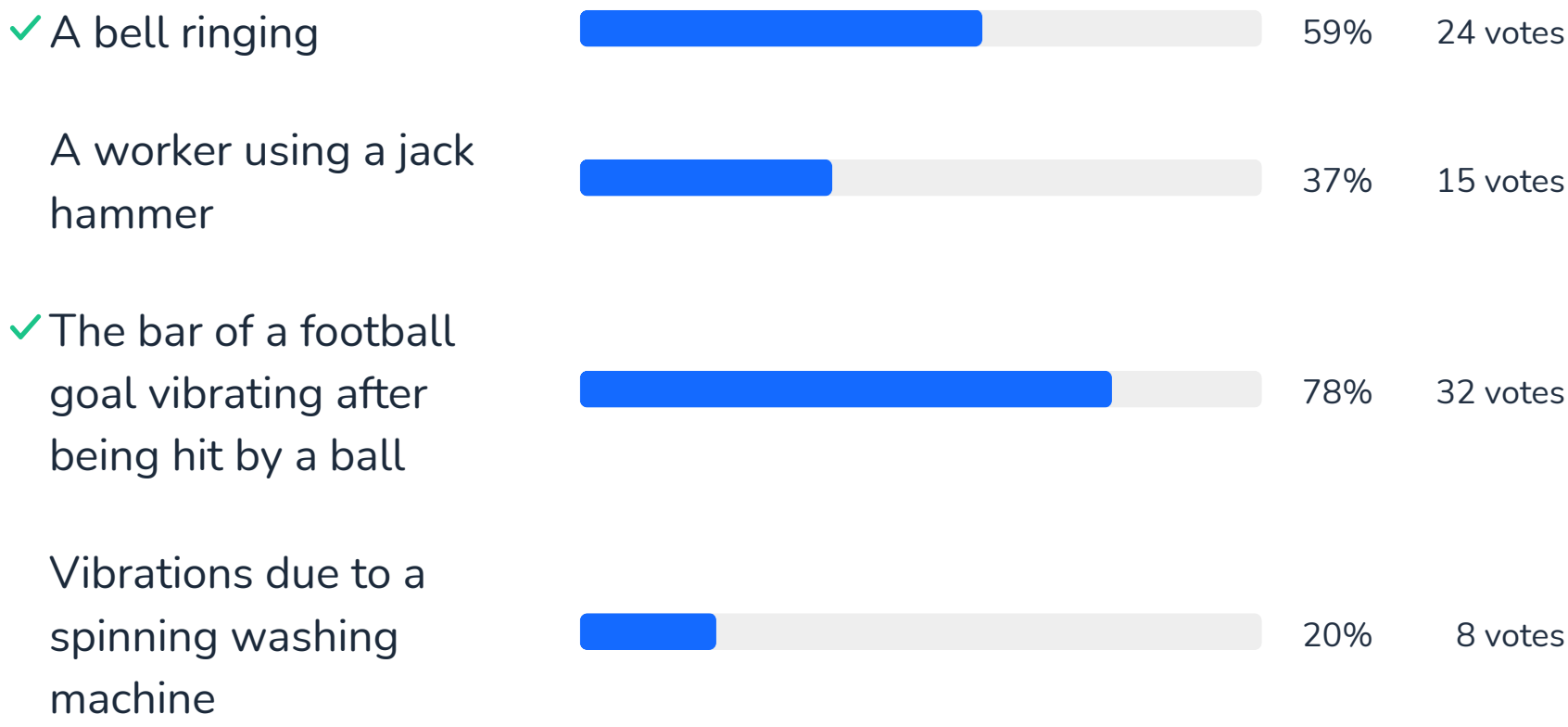
2

After watching the video I think that



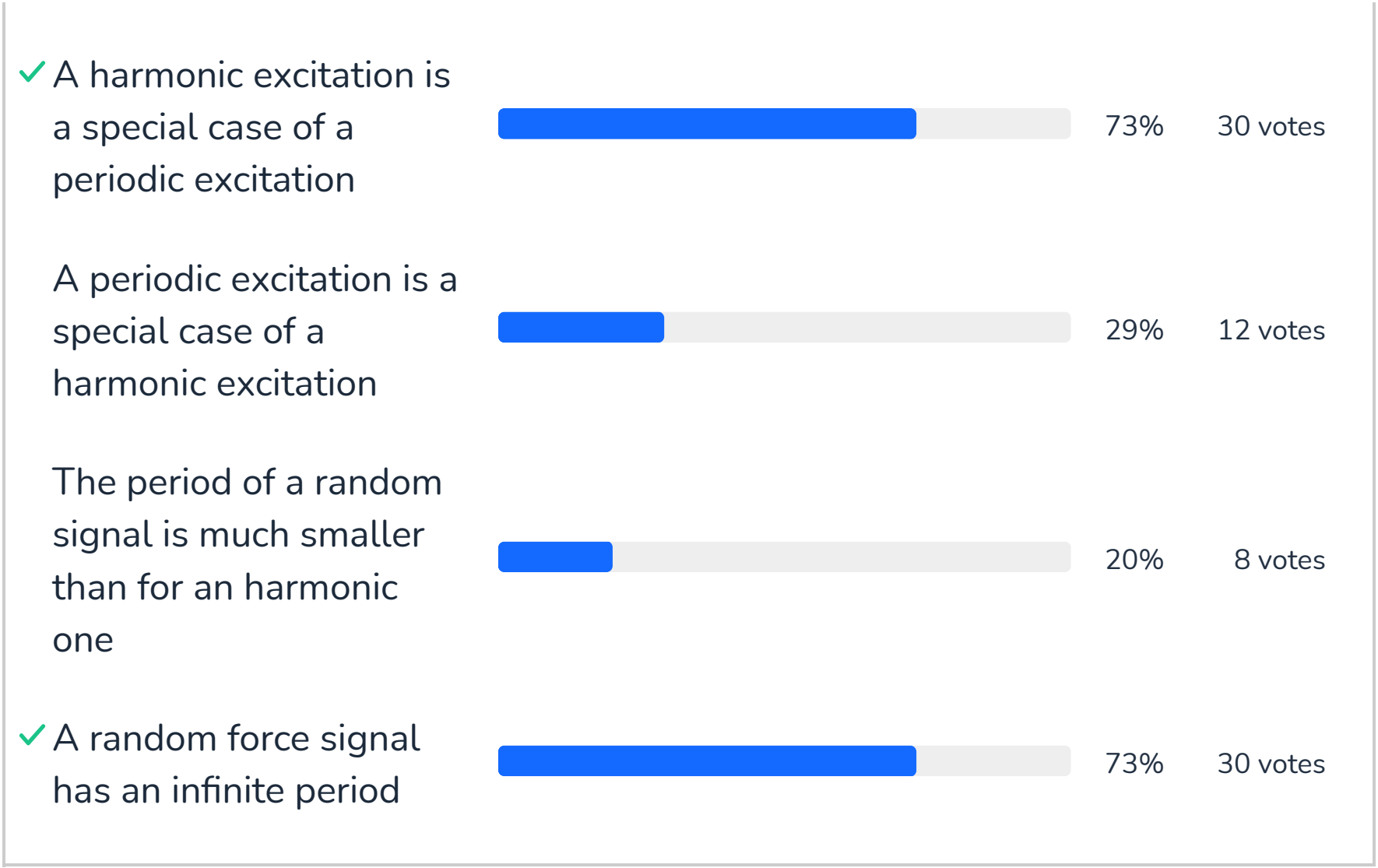
3

The following are examples of free mechanical vibrations



4

Which of the following statements are true ?


✓ A harmonic excitation is a special case of a periodic excitation
73% 30 votes
A periodic excitation is a special case of a harmonic excitation
29% 12 votes
The period of a random signal is much smaller than for an harmonic one
20% 8 votes
✓ A random force signal has an infinite period
73% 30 votes

5

A rigid rotating machine induces a force that is

✓ periodic		71%	29 votes
✓ harmonic		54%	22 votes
random		2%	1 vote

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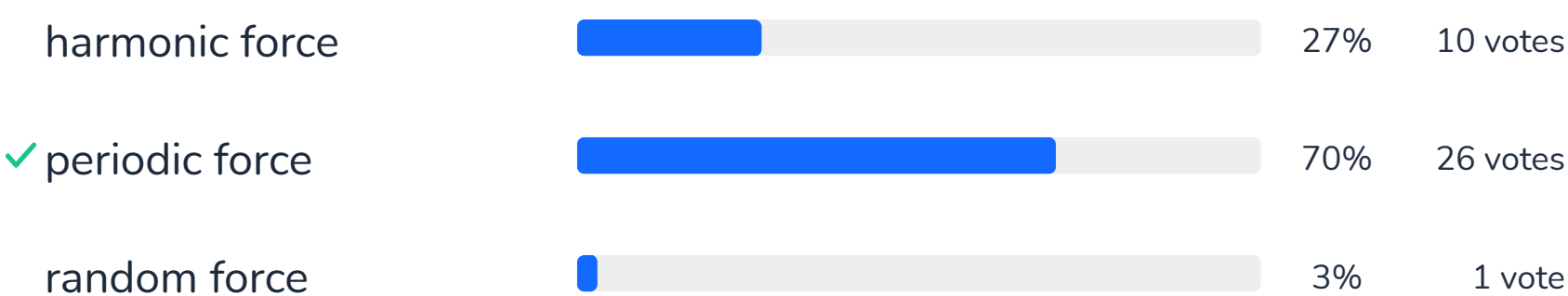
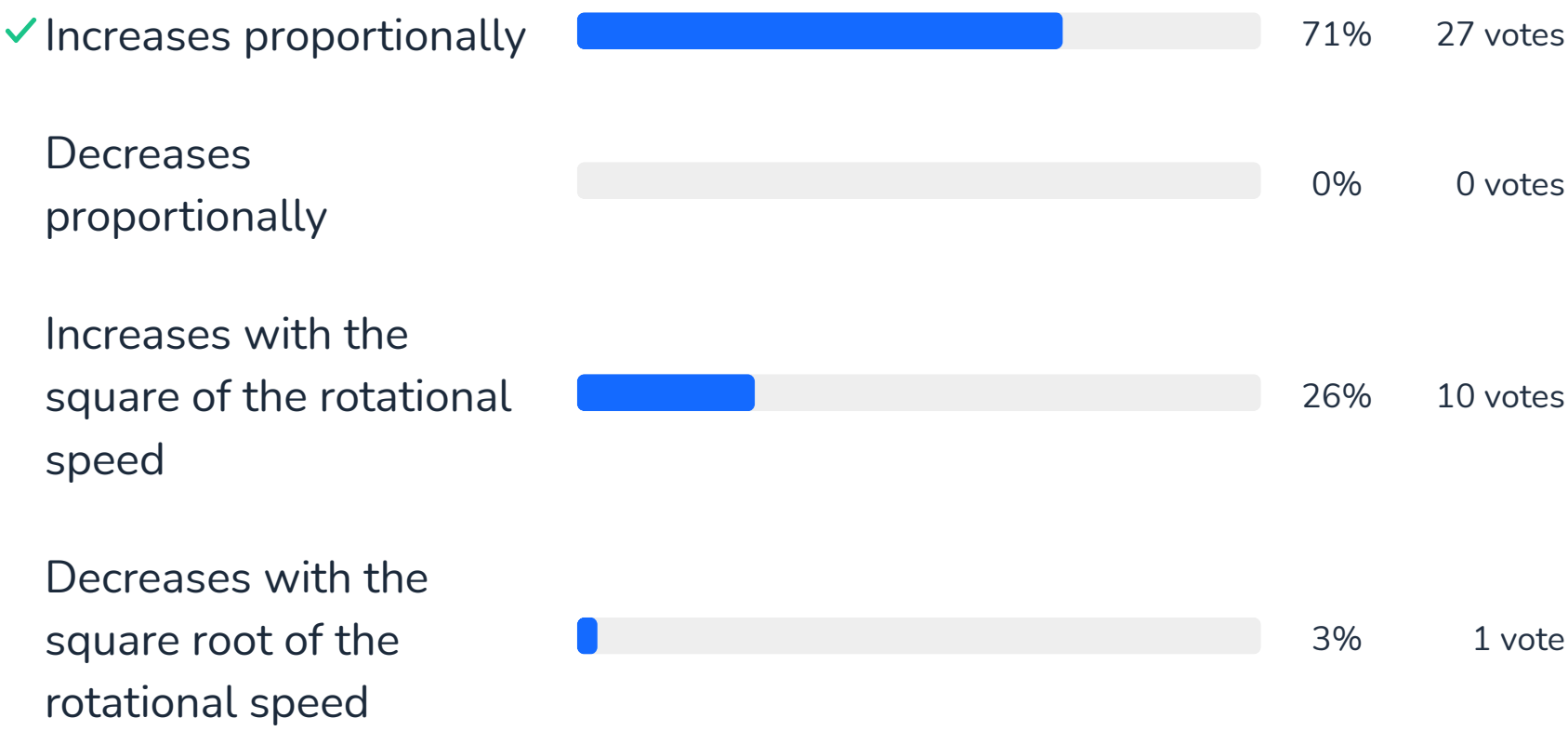
Any rotating machine produces a



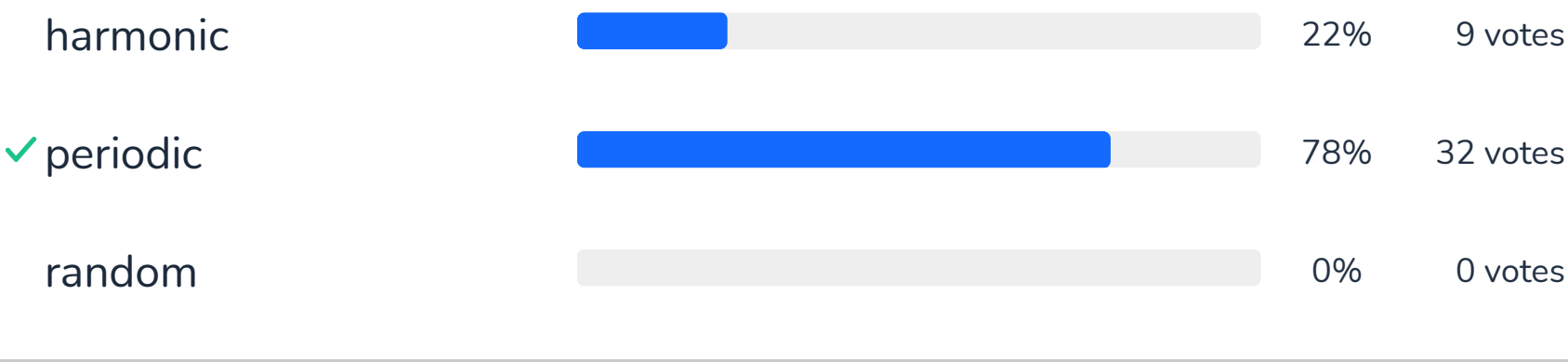
7

When the rotational speed of a machine increases, the frequency of the forces produced



8

The force applied by a pedestrian walking or running at constant speed on a bridge is



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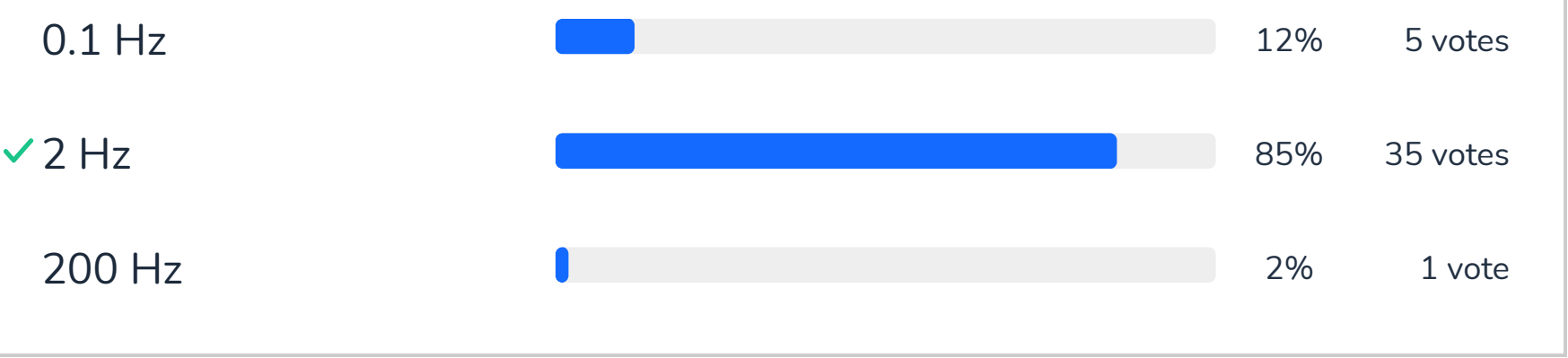
The main frequency of excitation for walking pedestrians is around



10

The discrete Fourier transform applies to

any type of signal		26%	10 votes
only random signals		3%	1 vote
✓ only periodic signals		72%	28 votes

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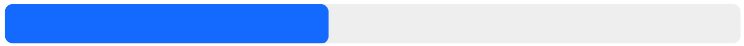
The discrete Fourier transform computes amplitudes of sine and cosine functions at frequencies which are

✓ multiples of the fundamental angular frequency = 2pi/T		44%	16 votes
odd multiples of the fundamental frequency = 2pi/T		14%	5 votes
✓ multiples of the fundamental frequency = 1/T		64%	23 votes

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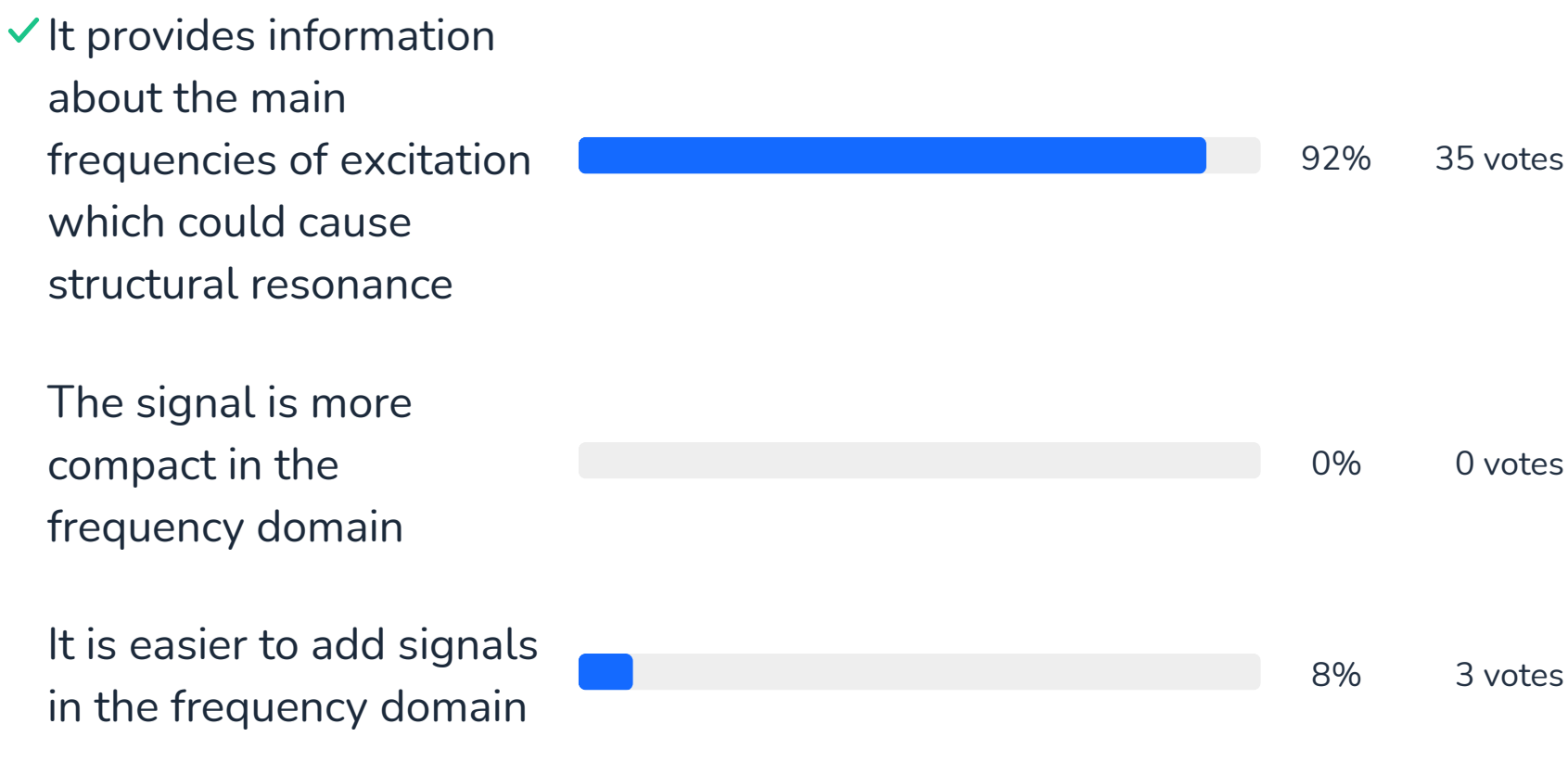
It is interesting to transform an excitation signal from the time domain to the frequency domain because



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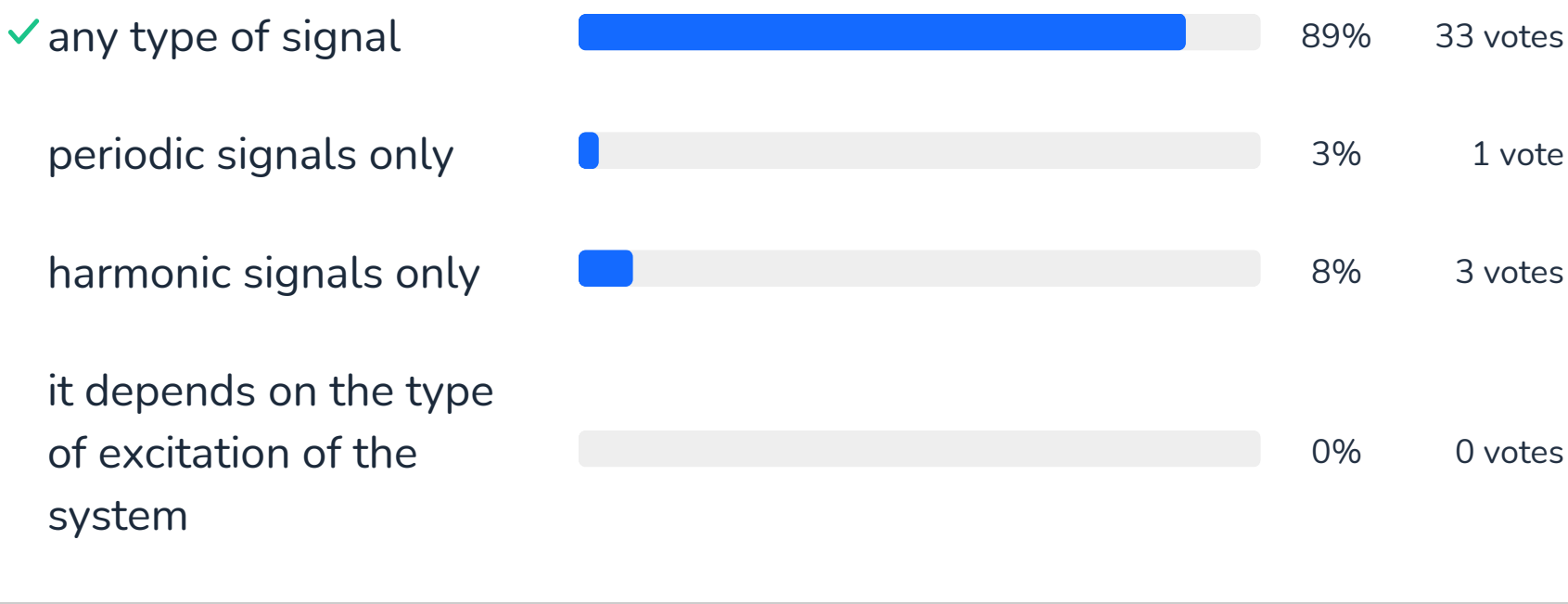
The continuous Fourier transform applies to



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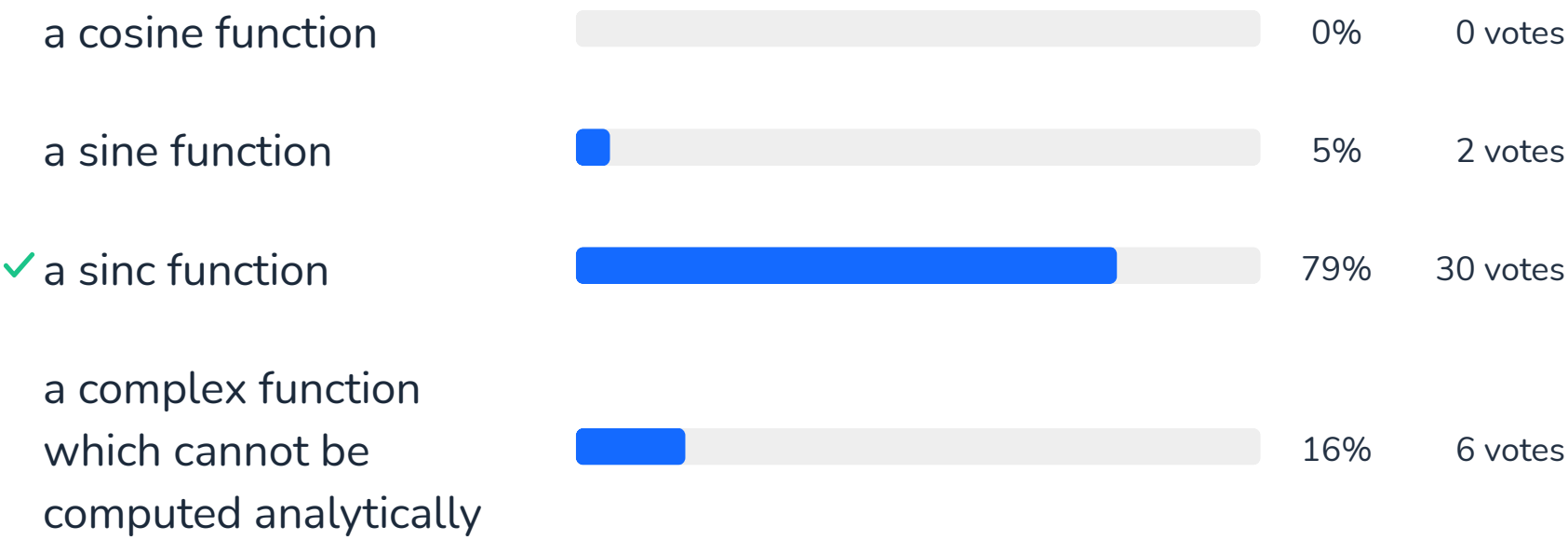
The continuous Fourier transform of a rectangle (pulse) is



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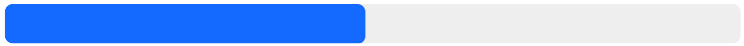
For a SDOF system (and MDOF), the Fourier transform of the impulse response h(t)

✓ allows to extract the information about the natural frequency		49%	17 votes
cannot be computed analytically		0%	0 votes
✓ is the transfer function X(w)/F(w)		71%	25 votes

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Convolution in the time domain corresponds to

✓ multiplication in the frequency domain	91%	32 votes
convolution in the frequency domain	9%	3 votes
deconvolution in the frequency domain	0%	0 votes
division in the frequency domain	0%	0 votes

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Aliasing happens when

The sampling frequency is too high with respect to the frequency content of the signal		10%	4 votes
✓ The sampling frequency is too low with respect to the frequency content of the signal		85%	33 votes
The sampling frequency is equal to the frequency content of the signal		5%	2 votes

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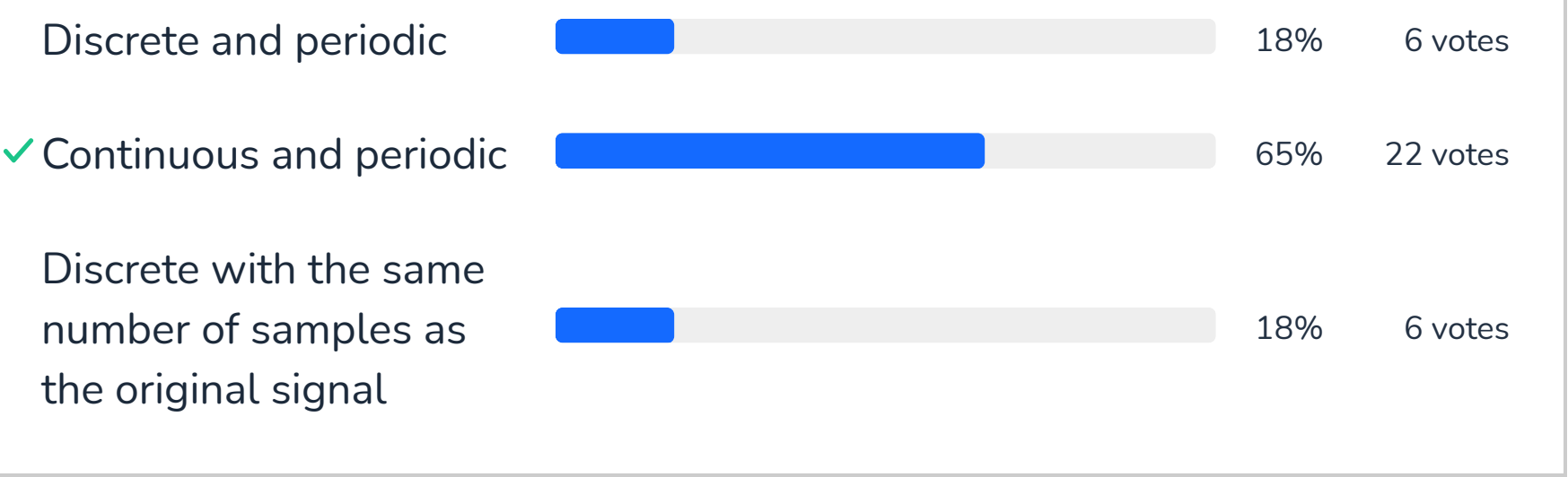
The continuous Fourier transform of a sampled signal is



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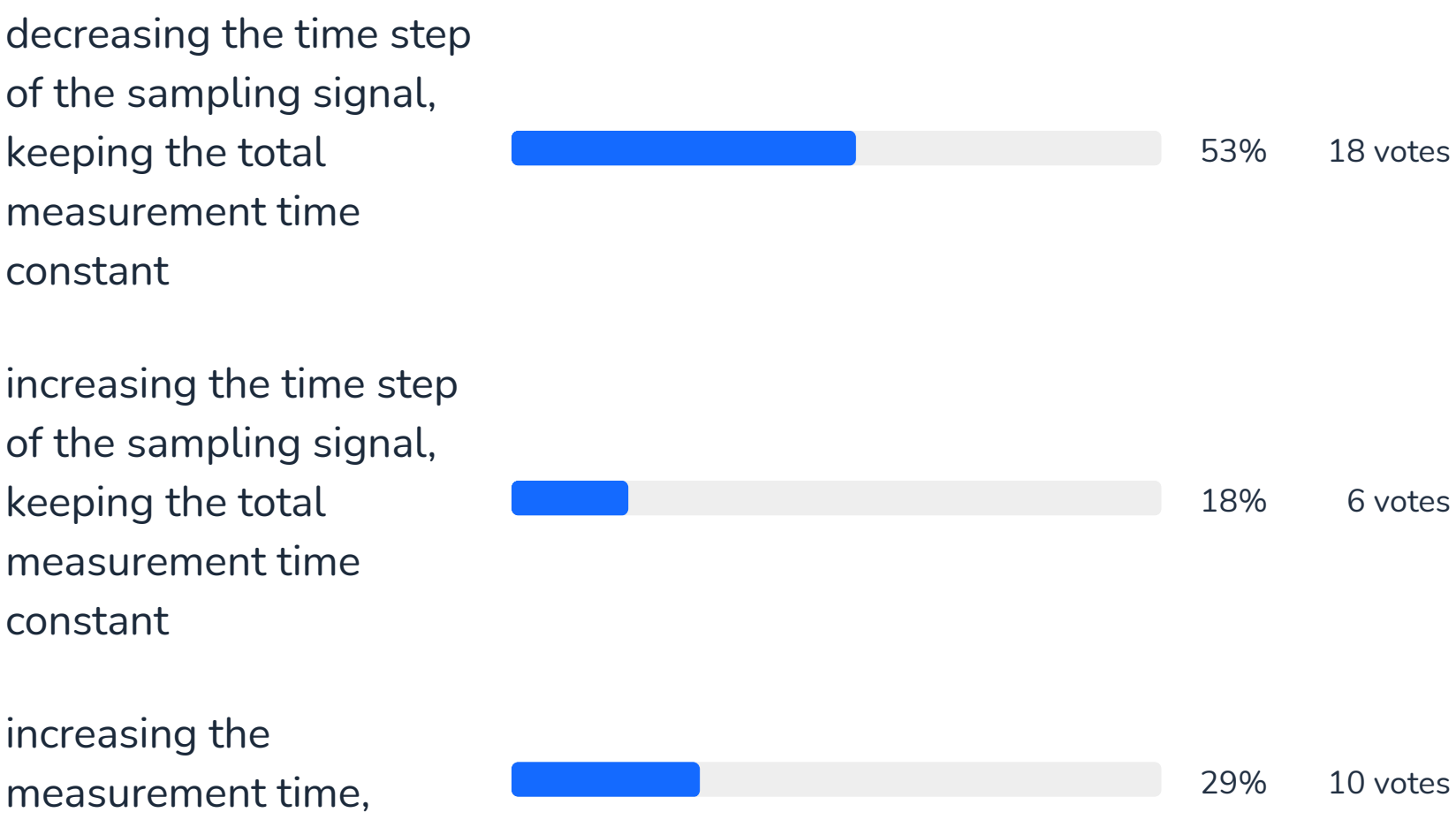
When using Fast Fourier Transform on sampled signals, you can increase the frequency resolution by



whatever the time step
of the sampling signal

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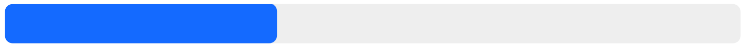
When using DFT, the time step of the sample signal has an influence on

The frequency resolution of the DFT		53%	16 votes
✓ The maximum frequency of the F-DFT		37%	11 votes
It has no influence on the DFT		10%	3 votes

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Suppose the sampling frequency of the accelerometer on your smartphone is 200 Hz. Up to what frequency can you measure acceleration signals ?