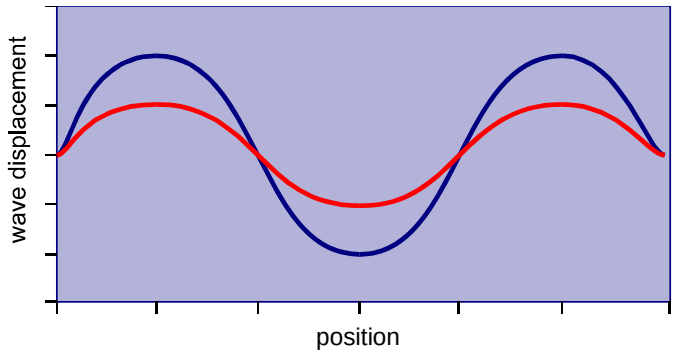
TAP 320 - 2: Phase difference and superposition

This question helps you check your understanding of phase difference and gives you further practice in superposing waves.

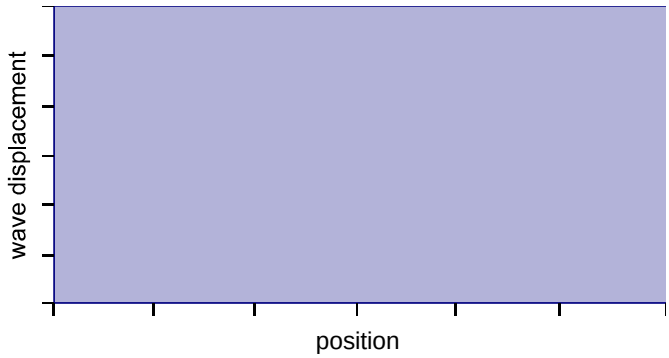
Graphs of waves

A graph of wave displacement against position shows a wave 'frozen' in space at an instant of time. Really, the waves are travelling along. The graph shows 'snapshots' of two waves, A and B.

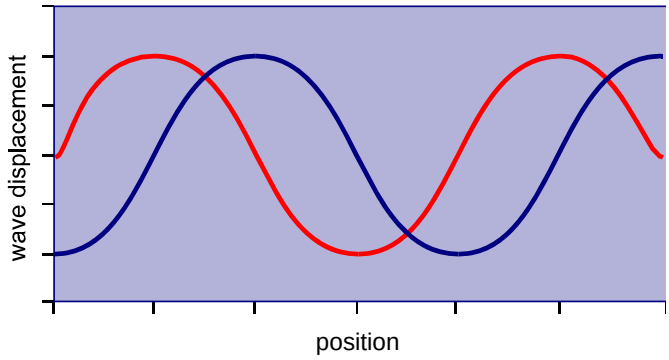


1. What is the phase difference between A and B? Give your answers in fractions of a wavelength and degrees. There are at least two correct answers to this question!

2. Sketch the superposition pattern of A and B.

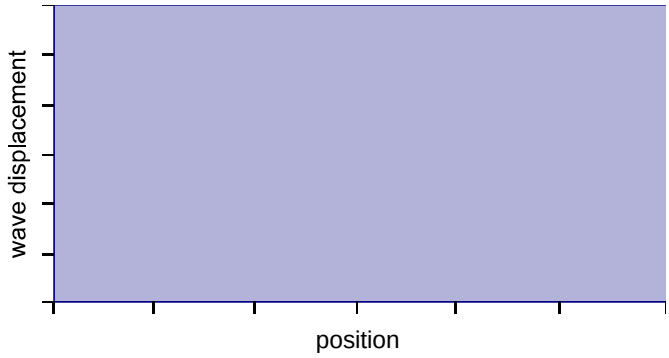


The next diagram shows two more waves, C and D.



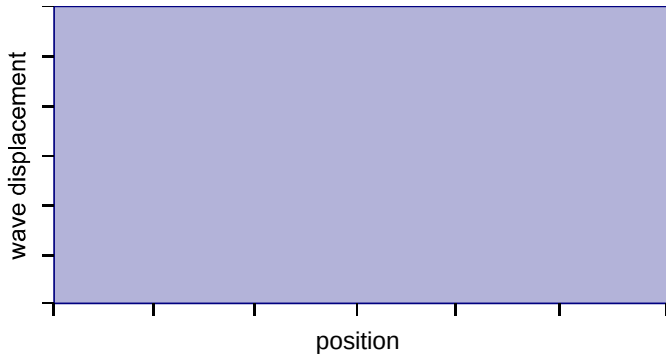
3. What is the phase difference between C and D?

4. Sketch the superposition pattern of C and D.



5. What phase angle corresponds to a phase difference of 1/3 of a wavelength?

6. Sketch a diagram showing two waves of equal amplitude with a phase difference equal to 1/3 of a wavelength.



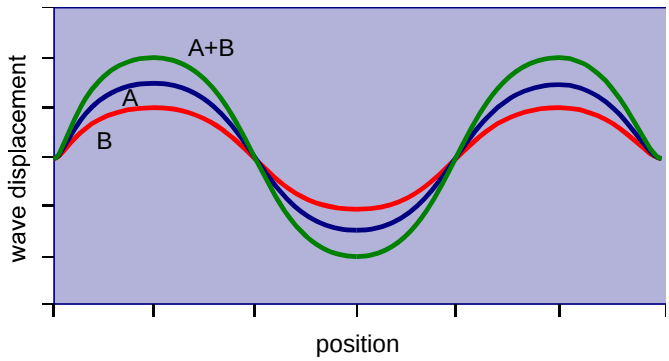
Practical advice

A suitable question to support demonstrations of superposition, phase and path difference.

Answers and worked solutions

1. Zero phase difference

2.

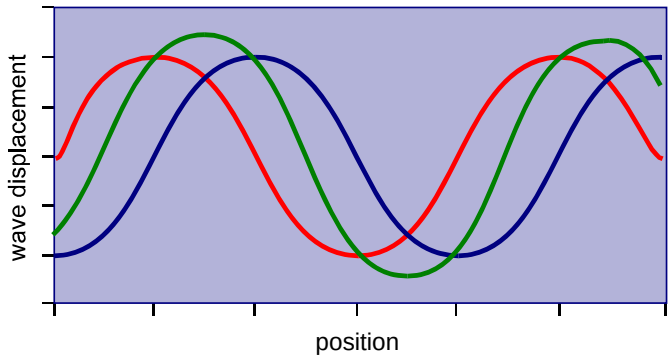


3. One oscillation (or wavelength for a displacement amplitude graph) is equivalent to 360º. Therefore:

$1/4$ wavelength $= 1/4 \times 360° = 90°$

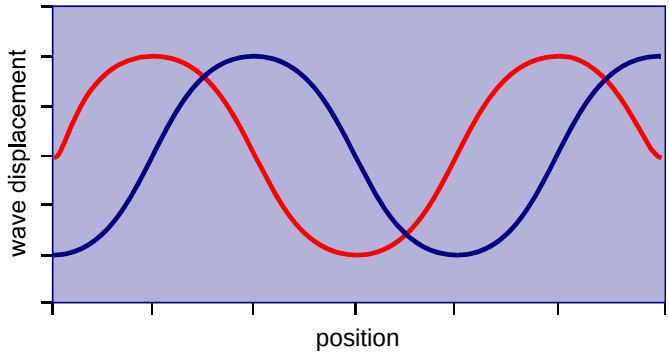
$3/4$ wavelength $= 3/4 \times 360° = 270°$.

4.



5. $1/3 \times 360° = 120°$

6.



External reference

This activity is taken from Advancing Physics chapter 6, 10W