3 **(a)** State the *principle of superposition*.

……..

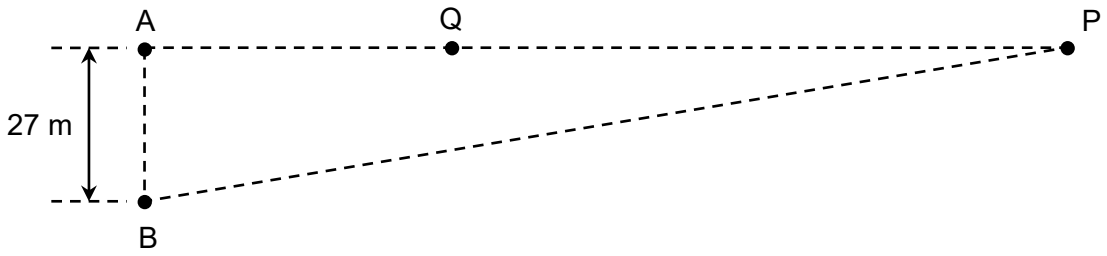
……..

……..

……..[2]

(b) Two microwave transmitters are positioned 27 m apart at points A and B as shown in Fig. 3.1. Operating at different power, they each transmit a microwave of wavelength 4.0 m uniformly in all directions. The two waves emitted are in phase at the transmitters.

Line AB and AP are perpendicular to each other.



(not drawn to scale)

Fig. 3.1

The variation with time *t* of the displacement *x* of the microwave arriving at point P is shown in Fig. 3.2.

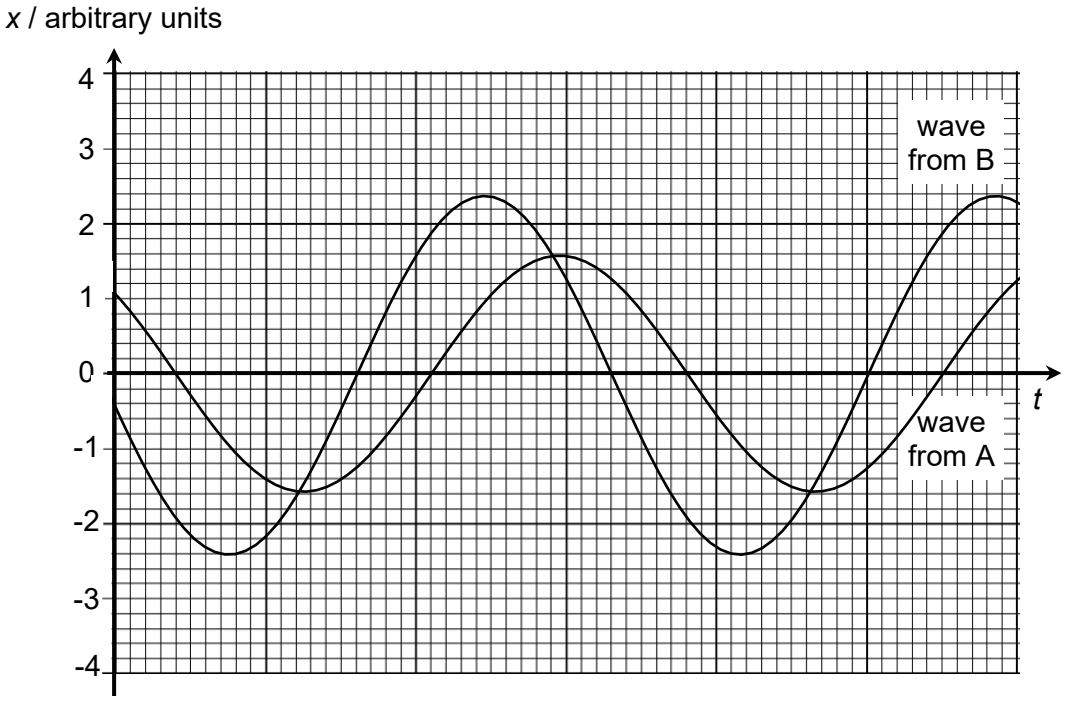


Fig. 3.2

(i) Determine the phase difference between the waves from transmitter A and from transmitter B that arrive at point P.

phase difference = …… rad [2]

(ii) The waves from the two transmitters interfere to form positions of maximum intensity and minimum intensity.

Use Fig. 3.2 to determine, for points of maximum and minimum intensity closest to point P, the ratio

$$\frac{\text{maximum wave intensity}}{\text{minimum wave intensity}}$$

ratio = …….. [3]

(c) The path difference between the waves arriving from A and B at Q is 6.5 m.

Determine the number of maxima found along the line between A and Q.

number of maxima = …….. [2]

(d) A student thinks that a stationary wave is formed along the line joining A and B. Comment on the student's thought.

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……..……..……

…...……...…..……[2]