5 **(a)** Fig. 5.1 shows the variation with time *t* of the displacement *y* of a wave W as it passes a point P. The wave has intensity *I*.

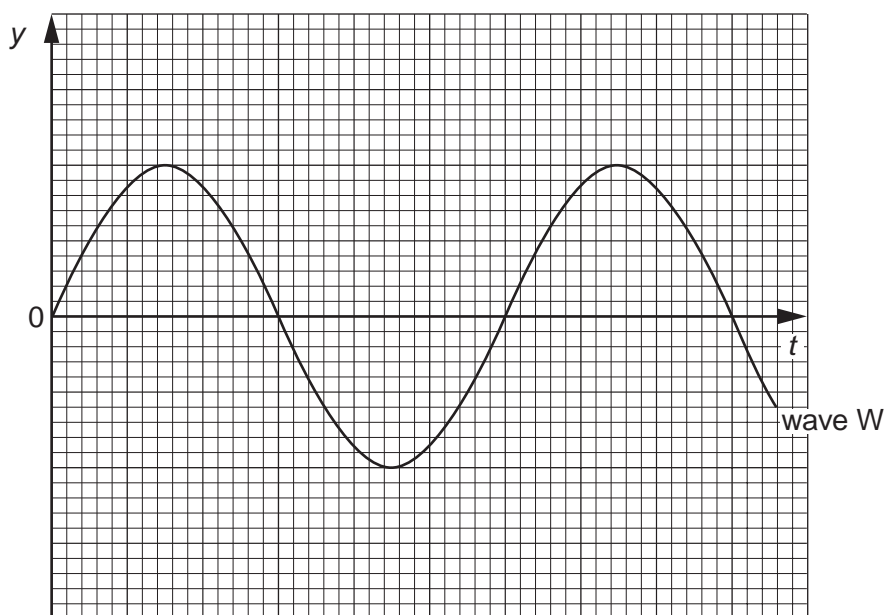**Fig. 5.1**

A second wave X of the same frequency as wave W also passes point P.
This wave has intensity $\frac{1}{2}I$. The phase difference between the two waves is 60°.
On Fig. 5.1, sketch the variation with time *t* of the displacement *y* of wave X. [3]

(b) In a double-slit interference experiment using light of wavelength 540 nm, the separation of the slits is 0.700 mm. The fringes are viewed on a screen at a distance of 2.75 m from the double slit, as illustrated in Fig. 5.2 (not to scale).
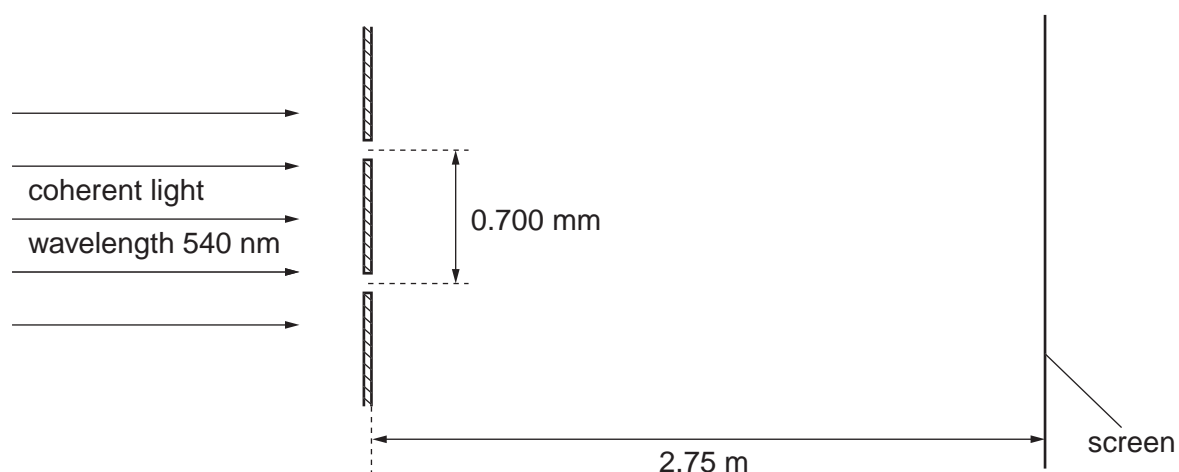

coherent light

wavelength 540 nm

0.700 mm

2.75 m

screen

Fig. 5.2

Calculate the separation of the fringes observed on the screen.

separation = ... mm [3]

(c) State the effect, if any, on the appearance of the fringes observed on the screen when the following changes are made, separately, to the double-slit arrangement in **(b).**

(i) The width of each slit is increased but the separation remains constant.

....

....

....

.... [3]

(ii) The separation of the slits is increased.

....

....

.... [2]