

$$\textcircled{1} \quad 121, 117, 113, \dots$$

$$a = 121$$

$$d = 117 - 121 \\ = -4$$

$$a_n < 0$$

$$a + (n-1)d < 0$$

$$121 + (n-1)(-4) < 0$$

$$\Rightarrow -4(n-1) < -121$$

$$\Rightarrow n-1 > \frac{-121}{-4}$$

$$\Rightarrow n-1 > 30.25$$

$$\Rightarrow n > 31.25$$

\therefore First negative term = 32

$$\textcircled{2} \quad a_3 + a_7 = 6$$

$$a + 2d + a + 6d = 6$$

$$\Rightarrow 2a + 8d = 6$$

$$\Rightarrow a + 4d = 3$$

$$\Rightarrow a = 3 - 4d \dots \textcircled{1}$$

$$a_3 \times a_7 = 8$$

$$(a + 2d)(a + 6d) = 8$$

$$(3 - 4d + 2d)(3 - 4d + 6d) = 8$$

$$\Rightarrow (3 - 2d)(3 + 2d) = 8$$

$$\Rightarrow 9 - 4d^2 = 8$$

$$\Rightarrow -4d^2 = -1$$

$$\Rightarrow d^2 = \frac{1}{4}$$

$$\Rightarrow d = \pm \frac{1}{2}$$