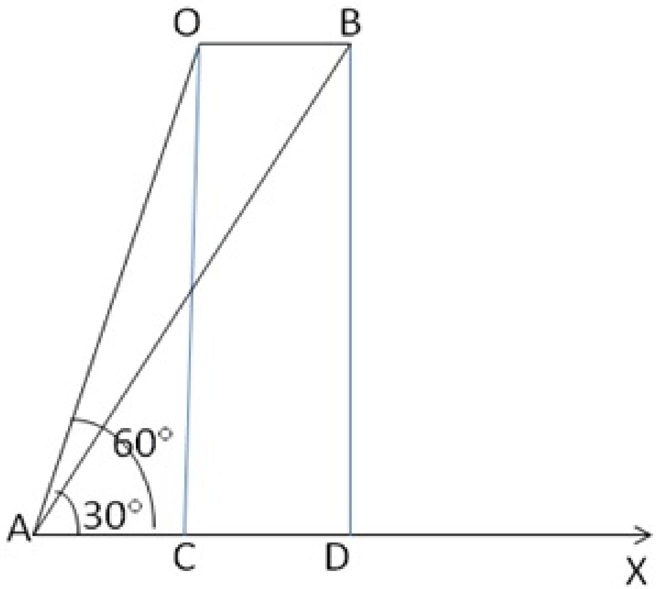
Question 17:
Let O and B the two positions of the jet plane and let A be the point of observation.
Let AX be the horizontal ground.
Draw OC ⊥ AX and BD ⊥ AX.
Then, ∠CAO = 60°, ∠DAB = 30° and OC = BD = 1500√3 m



From right Δ OCA, we have

$$\frac{AC}{OC} = \cot 60° = \frac{1}{\sqrt{3}}$$

$$\frac{AC}{1500\sqrt{3}} = \frac{1}{\sqrt{3}} \Rightarrow AC = 1500\,m \;---(1)$$

From right Δ ADB, we have

$$\frac{AD}{BD} = \cot 30° = \sqrt{3}$$

$$\Rightarrow \frac{AD}{1500\sqrt{3}} = \sqrt{3} \Rightarrow AD = \left(1500\sqrt{3} \times \sqrt{3}\right) = 4500\,m$$

$$\therefore CD = (AD - AC) = (4500 - 1500)\,m = 3000\ m$$

$$\therefore \quad OB = CD = 3000\,m$$

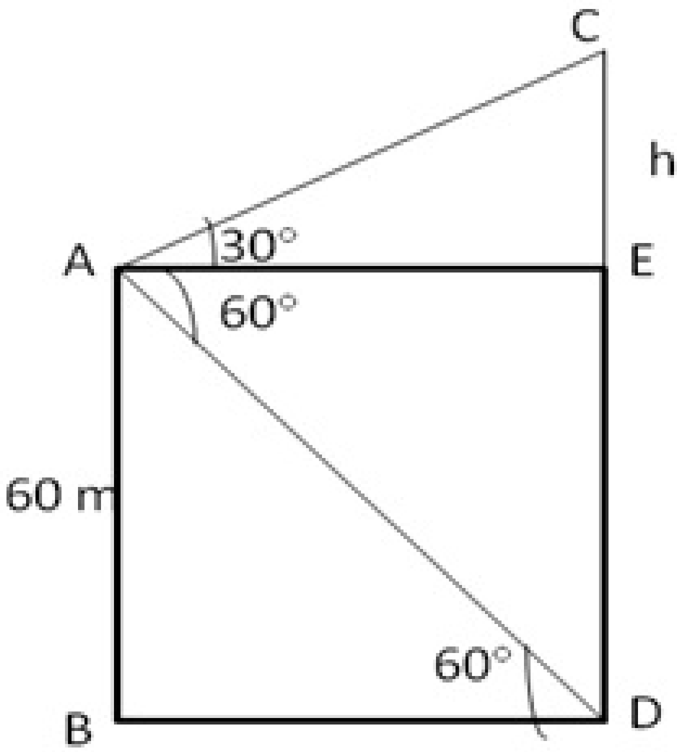
Thus, the aeroplane covers 3000 m in 15 seconds
Hence the speed of the aeroplane is

$$= \left(\frac{3000}{15} \times \frac{60 \times 60}{1000}\right) kmph$$

$$= 720\,kmph$$

Question 18:
Let AB be the building and CD be the light house.

AE is drawn perpendicular to CD.
Now AB = 60 m
∠ADB = 60°, ∠CAE = 30°
Let BD = x m
AE = BD = x m



In right Δ ACE, let CE = h

$$\therefore \frac{CE}{AE} = \tan 30^\circ$$

$$\frac{h}{x} = \frac{1}{\sqrt{3}}$$

$$\therefore x = \sqrt{3}h \quad ----(1)$$

In right ΔABD,

$$\frac{AB}{BD} = \tan 60^\circ \Rightarrow \frac{60}{x} = \sqrt{3}$$

$$\therefore x = \frac{60}{\sqrt{3}} = \frac{60\sqrt{3}}{3} = 20\sqrt{3}$$

$$= 20 \times 1.732 = 34.64\text{m} \quad --(2)$$

From (1) and (2),
$20\sqrt{3} = \sqrt{3}h$
h = 20 m
Hence,
(i) Difference of heights of light house and building = 20m
(ii) The distance between light house and building = 34.64m

*********** END **********