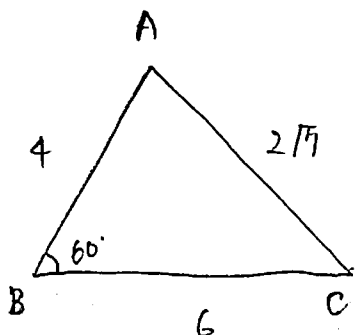


(1)



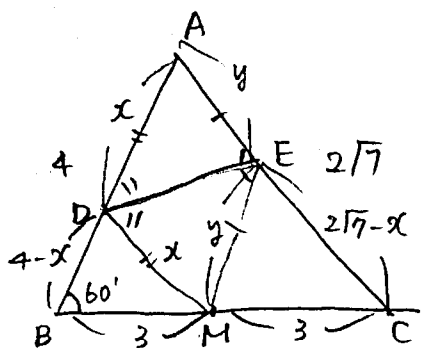
$$AC^2 = 4^2 + 6^2 - 2 \times 4 \times 6 \times \cos 60^\circ \quad \text{①}$$

$$\begin{aligned} AC^2 &= 16 + 36 - 2 \times 4 \times 6 \times \frac{1}{2} \\ &= 52 - 24 \\ &= 28 \end{aligned}$$

$$\therefore AC = 2\sqrt{7}$$

$$\cos \angle ACB = \frac{6^2 + (2\sqrt{7})^2 - 4^2}{2 \times 6 \times 2\sqrt{7}} = \frac{36 + 28 - 16}{24\sqrt{7}} = \frac{48}{24\sqrt{7}} = \frac{2}{\sqrt{7}} = \boxed{\frac{2\sqrt{7}}{7}}$$

(2) $AD = MD = x$, $AE = ME = y$ とおいた。



$$\cos 60^\circ = \frac{3^2 + (4-x)^2 - x^2}{2 \times 3 \times (4-x)} \quad \text{①}$$

$$\frac{1}{2} = \frac{9 + 16 - 8x}{6(4-x)} \quad \text{②から}$$

$$3(4-x) = 25 - 8x$$

$$5x = 13$$

$$x = \frac{13}{5}$$

$$\cos \angle ACB = \frac{3^2 + (2\sqrt{7}-y)^2 - y^2}{2 \times 3 \times (2\sqrt{7}-y)} \quad \text{①}$$

$$\frac{2}{\sqrt{7}} = \frac{9 + 28 - 4\sqrt{7}y}{6(2\sqrt{7}-y)} \quad \text{②から}$$

$$12(2\sqrt{7}-y) = 37\sqrt{7} - 28y$$

$$16y = 13\sqrt{7}$$

$$y = \frac{13}{16}\sqrt{7}$$

$$\therefore \boxed{MD = \frac{13}{5}, ME = \frac{13}{16}\sqrt{7}}$$