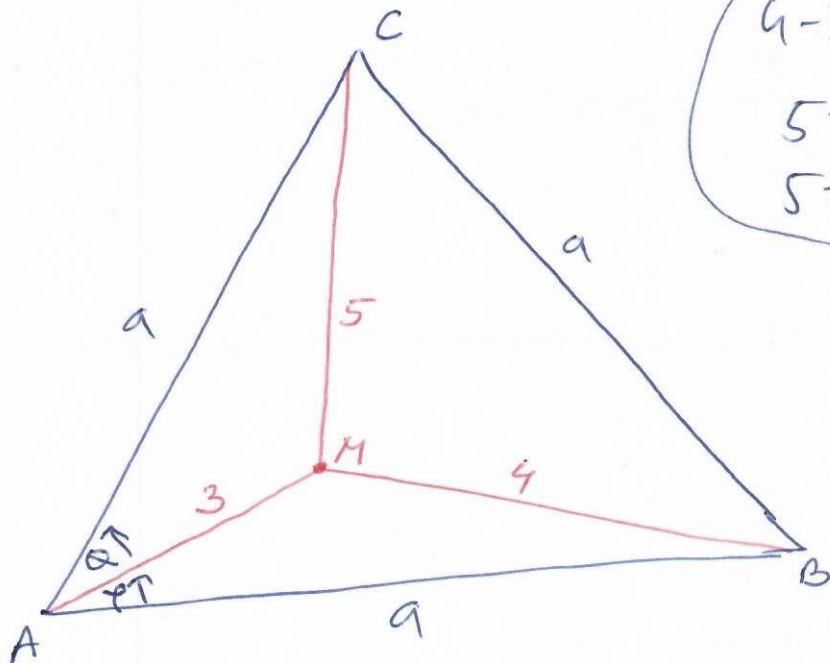




$$\begin{aligned} 4-3 &< a < 4+3 \\ 5-3 &< a < 5+3 \\ 5-4 &< a < 5+4 \end{aligned}$$



$$\boxed{2 < a < 7}$$

$$4 < a^2 < 49$$

$$P+Q = 60^\circ \Rightarrow \cos(P+Q) = \frac{1}{2} \Rightarrow$$

$$\Rightarrow \boxed{\cos(P) \cdot \cos(Q) - \sin(P) \cdot \sin(Q) = \frac{1}{2}} \quad \#$$

$$\Delta AMB \Rightarrow 4^2 = 3^2 + a^2 - 2 \cdot 3 \cdot a \cdot \cos(P) \Rightarrow \boxed{\cos(P) = \frac{a^2 - 7}{6 \cdot a}}$$

$$\sin^2(P) = 1 - \frac{a^4 - 14a^2 + 49}{36a^2} \Rightarrow \boxed{\sin(P) = \frac{\sqrt{50a^2 - a^4 - 49}}{6a}}$$

$$\Delta AMC \Rightarrow 5^2 = 3^2 + a^2 - 2 \cdot 3 \cdot a \cdot \cos(Q) \Rightarrow \boxed{\cos(Q) = \frac{a^2 - 16}{6a}}$$

$$\sin^2(Q) = 1 - \frac{a^4 - 32a^2 + 256}{36a^2} \Rightarrow \boxed{\sin(Q) = \frac{\sqrt{68a^2 - a^4 - 256}}{6a}}$$

$\Rightarrow$

$$\frac{(a^2 - 7) \cdot (a^2 - 16)}{36a^2} - \frac{\sqrt{50a^2 - a^4 - 49} \cdot \sqrt{68a^2 - a^4 - 256}}{36a^2} = \frac{1}{2}$$

(2)

$$a^2 = x$$

$$4 < x < 49$$

$$\frac{(x-7) \cdot (x-16)}{36x} = \frac{\sqrt{(50x-x^2-49) \cdot (68x-x^2-256)}}{36x} = \frac{1}{2} \quad | \cdot 36x$$

$$(x-7) \cdot (x-16) - \sqrt{(50x-x^2-49) \cdot (68x-x^2-256)} = 18x$$

$$x^2 - 23x + 7 \cdot 16 - 18x = \sqrt{(50x-x^2-49) \cdot (68x-x^2-256)}$$

$$(x^2 - 41x + 7 \cdot 16)^2 = (-x^2 + 50x - 49) \cdot (-x^2 + 68x - 256)$$

$$\cancel{x^4} + 41^2 x^2 + \cancel{7^2 \cdot 16^2} - 82x^3 + 14 \cdot 16 x^2 - 14 \cdot 16 \cdot 41x =$$

$$= \cancel{x^4} + x^3(-50-68) + x^2(+49+256+50 \cdot 68) + x \cdot (-49 \cdot 68 - 50 \cdot 256) + \cancel{7^2 \cdot 16^2}$$

$$-82x^3 + x^2 \cdot (14 \cdot 16 + 41^2) - 14 \cdot 16 \cdot 41x =$$

$$= -118x^3 + x^2 \cdot (+305 + 68 \cdot 50) + x \cdot (-49 \cdot 68 - 50 \cdot 256) \quad | : x$$

$$36x^2 + (14 \cdot 16 + 41^2 + 305 - 68 \cdot 50)x + 49 \cdot 68 + 50 \cdot 256 - 14 \cdot 16 \cdot 41 = 0$$

$$36x^2 - 1800x + 6948 = 0 \quad | : 36$$

$$x^2 - 50x + 193 = 0 \Rightarrow x = \frac{50 \pm \sqrt{1728}}{2}$$

$$x = \frac{50 \pm 24\sqrt{3}}{2} = 25 \pm 12\sqrt{3}$$

$$x > 4 \Rightarrow \boxed{x = 25 + 12\sqrt{3}} \Rightarrow \boxed{a = \sqrt{25 + 12\sqrt{3}}}$$