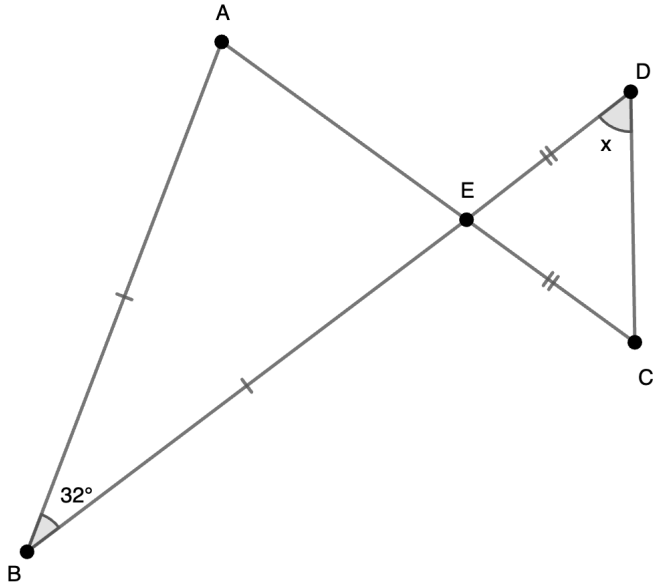
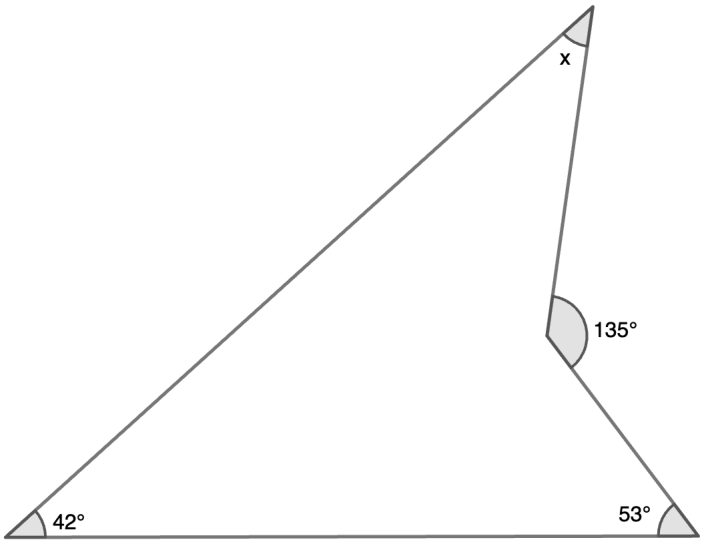
Find the measure of $\angle x$.[1]

(1) $AB = AE$, $CE = DE$

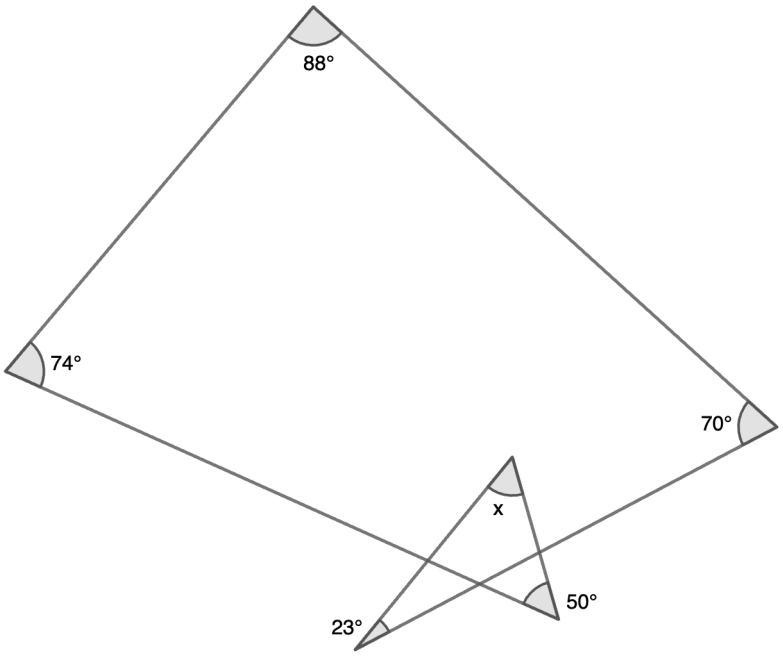


(2)

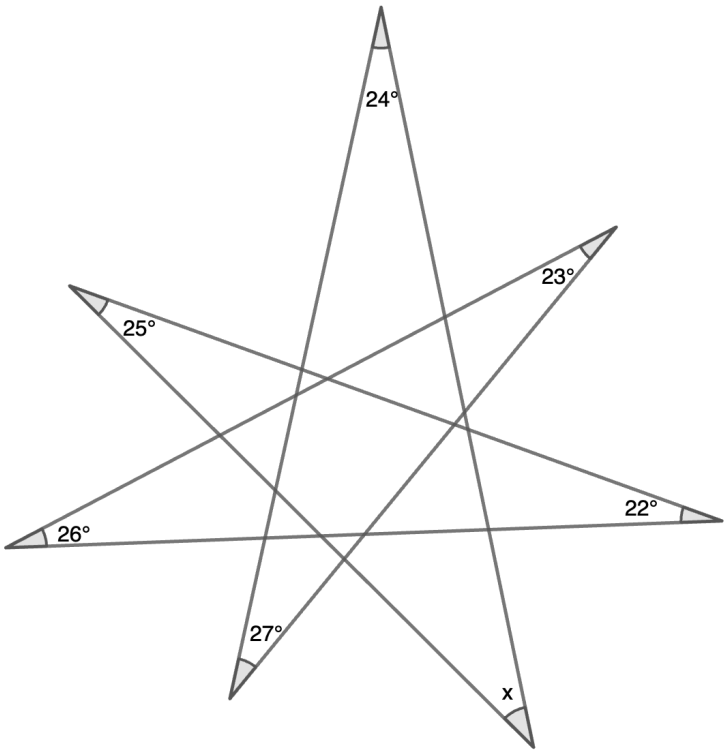


[1](1) Osaka Toin High School, Osaka, (2) Meiji Gakuin Senior High School, Tokyo, (3) Rakunan High School, Kyoto, (4) Nihon University Narashino High School, Chiba

(3)



(4)



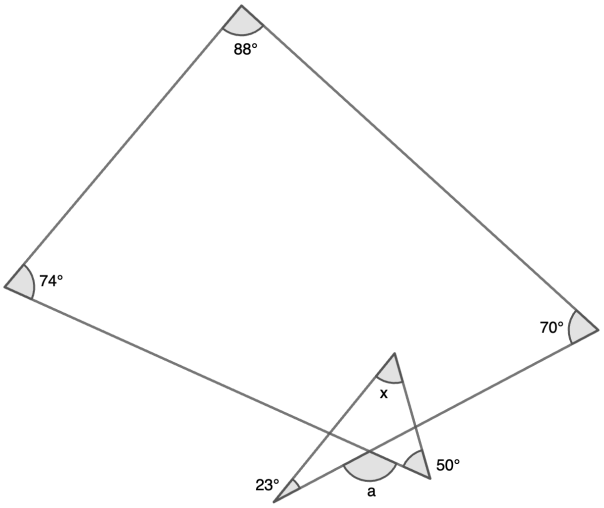
Solution

Answer : (1) : $53°$, (2) : $40°$, (3) : $55°$, (4) : $33°$

Proof (1): Since $BA = BE$, $\angle AEB = (180° - 32°) \div 2 = 74°$. Also, since $EC = ED$, $\angle x = (180° - \angle CED) \div 2$, which equals $(180° - \angle AEB) \div 2$, giving us: $\angle \mathbf{x} = (\mathbf{180}° - \mathbf{74}°) \div \mathbf{2} = \mathbf{106}° \div \mathbf{2} = \mathbf{53}°$.

Proof (2): $\angle x + 42° + 53° = 135°$, so $\angle \mathbf{x} = \mathbf{40}°$.

Proof (3): *Refer to the diagram below.* Since we know that the angles of a quadrilateral add up to $360°$, $\angle a + 74° + 88° + 70° = 360°$, giving us $\angle a = 128°$.$\angle x + 23° + 50° = 128°$, so $\angle \mathbf{x} = \mathbf{55}°$.



Proof (4): *Refer to the diagram below.* $\angle a = 26° + 23° + 22° = 71°$. $\angle b = \angle a + 25° + 27° = 123°$. Given this information, $\angle x + \angle b + 24° = 180°$, so $\angle \mathbf{x} = \mathbf{33}°$.