6. (*a*) Show that

$$\sqrt{2+\sqrt{3}}-\sqrt{2-\sqrt{3}}=\sqrt{2}\,.$$

(3)

(*b*) Hence prove that

$$\log_{\frac{1}{8}}\left(\sqrt{2+\sqrt{3}}-\sqrt{2-\sqrt{3}}\right)=-\tfrac{1}{6}\,.$$

(3)

(*c*) Find all possible pairs of integers a and n such that

$$\log_{\frac{1}{n}}\left(\sqrt{a+\sqrt{15}}-\sqrt{a-\sqrt{15}}\right)=-\tfrac{1}{2}\,.$$

(13)