

سوال ۱

$$t_1 = \begin{cases} a+b=4 \\ a+b=31 \end{cases}$$

$$t_2 = \begin{cases} a+b=31 \\ 7a=21 \Rightarrow a=3, b=28 \Rightarrow a+b=31 \\ 7b+3a=21 \Rightarrow 7b=14 \Rightarrow b=2 \end{cases}$$

سوال ۲

$$n = 7x + 11$$

$$100 \leq n \leq 999 \Rightarrow 100 \leq 7x + 11 \leq 999$$

$$100 - 11 \leq 7x \leq 999 - 11$$

$$89 \leq 7x \leq 988$$

$$\Rightarrow \frac{89}{7} \leq x \leq \frac{988}{7} \Rightarrow 12 \leq x \leq 141$$

$$129 - (141 - 12) + 1 = 10$$

سوال ۳

$$+1 + n + 2 + n + 3 = 17 \Rightarrow 2n + 6 = 17 \Rightarrow 2n = 11 \Rightarrow n = \frac{11}{2} \Rightarrow -6 \times \frac{11}{2} + 12 = -10$$

$$+1 + n + 2 + n + 3 = 1 \Rightarrow 2n + 6 = 1 \Rightarrow 2n = -5 \Rightarrow n = -\frac{5}{2} \Rightarrow -6 \times \frac{-5}{2} + 12 = 1$$

$$-10 + 1 = -9$$

سوال ۴

$$t_1 - t_2 = t_3 - t_4$$

$$\Rightarrow \frac{2^{x+1}}{2^x + 1} - \frac{2^x}{2^x + 1} = \frac{2^x(2-1)+1}{2^x+1}$$

$$\frac{2^{x+1} - 2^x}{2^x + 1} = \frac{2^x(2-1)+1}{2^x+1}$$

$$2^{x+1} - 2^x = 2^x(2-1)+1$$

$$2^{x+1} - 2^x = 2^x + 1$$

$$2^{x+1} = 2^{x+1} + 1$$

$$\Rightarrow x = 2$$

سوال ۵

$$t_{12} - t_{10} = 8 \Rightarrow 2t_{12} = 30 \Rightarrow t_{12} = 15, t_{10} = 10$$

$$t_{12} + t_{10} = 25$$

$$12a + b = 15$$

$$10a + b = 10$$

$$2a = 5 \Rightarrow a = 2.5, b = -10$$

$$\Rightarrow 21a + b = 21 \times 2.5 - 10 = 37.5$$

سوال ۶

$$t_2 = 8a + 10d$$

$$t_{10} = 8a + 8d$$

$$(8a + 10d) - (8a + 8d) = 8d$$

$$2d = 8d$$

$$10a = 8d$$

$$\Rightarrow a = 1, d = 2$$

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سوال ۷

$$t_1 - t_0 = (t_1 - t_0) \frac{(t_1 + t_0)}{t_1 + t_0} = \frac{(t_1 - t_0)(t_1 + t_0)}{t_1 + t_0}$$

$$\frac{(t_1 - t_0)(t_1 + t_0)}{t_1 + t_0} = \frac{(-v_0)(vt_0)}{vt_0} = -v_0$$

$$d = \frac{b-a}{n+1} = \frac{2 + \sqrt{13} - (2 - 12\sqrt{13})}{13}$$

سوال ۸

$$\Rightarrow \frac{2 + \sqrt{13} - 2 + 12\sqrt{13}}{13} \Rightarrow d = \frac{12\sqrt{13}}{13} = \sqrt{13}$$

سوال ۹

$$\frac{r - r}{r_n - r} = \frac{r_0}{r_n - r} = d$$

$$a_{n+1} = a_1 + (n)d$$

$$\Rightarrow a_{n+1} = r + nd = 11$$

$$\Rightarrow nd = 9$$

$$\Rightarrow \frac{r_0 n}{r_n - r} = 9 \Rightarrow \frac{r_0 n}{r_n - r} = 9 \Rightarrow \frac{11}{-9n - 11} = 9 \Rightarrow n = \frac{11}{9} = 1$$

سوال ۱۰

$$a_n + a_{n+1} = a_r + a_{11} \Rightarrow a_1 + (n-1)d + a_1 + (n+1)d = (a_1 + 10d) + (a_1 + 11d)$$

$$\Rightarrow 2a_1 + (2n+2)d = 2a_1 + 21d \Rightarrow (2n+2)d = 21d \Rightarrow 2n+2=21 \Rightarrow n=9$$

$$\Rightarrow a + (n-1)d = 3 \times (a + (\frac{n}{3} - 1)d)$$

$$n=1 \Rightarrow a + 1d = 3 \times (a + 0d) \Rightarrow 0 = 2a + 1d = a + d = 0$$

$$\Rightarrow a = -d$$

$$a + (k-1)d = 0 \Rightarrow -d + (k-1)d = 0$$

$$\Rightarrow k = 2$$