① (a) $a=8$ $(u_{18}) = a + 17d$ ✓   (2)
$d=3$ $8 + 17(3) = 59$ ✓

(b) $n=20$ $S_n = \frac{n}{2}[2a+(n-1)d]$ $S_{20} = \frac{20}{2}(2(8)+(20-1)(3))$
✓ $= 10[16+19(3)] = 730$ ✓ (2)

② $a=6$ $(u_n) = a+(n-1)d$ (3)
$d=2$ $6+(n-1)(2) = 40 \Rightarrow (n-1)(2) = 34$ ✓
$L=u_n=40$ $n-1 = 17$
                                    ✓ $n = 18$

③ (a) $u_4 = 20 \Rightarrow a+3d = 20$ ✓   (2)
     $u_{16} = 92 \quad a+15d = 92$ ✓

(b) subtracting $\nearrow$: $12d = 72 \Rightarrow d=6$ $a=2$ ✓   (3)

(c) $(u_n) = a+(n-1)d = 2+(n-1)(6) = 6n-4$ (3)
          ✓   ✓   ✓

④ a) $6, 8, 10$ ✓
   b) $u_{42} = 6+41\times2 = 88$ ✓
   c) $u_n = 6+(n-1)2 = 2n+4$ ✓   (5)
   d) $S_{14} = \frac{14}{2}\{12+13\times2\} = 7\times38 = 266$ ✓

⑤ a) $9, 13, 17, 21$ ✓
   b) $u_n = 9+(n-1)4 = 4n+5$ ✓
   c) $S_{12} = \frac{12}{2}\{2\times9+11\times4\} = 6\times62 = 372$ ✓   (4)

⑥ $u_3 = 10$, $u_6 = -2$

   a) $a+2d = 10$ ✓
      $a+5d = -2$ ✓
      Subtracting
   b) $3d = -12 \Rightarrow d=-4$ ✓   (5)
      $a - 8 = 10$
      $a = 18$ ✓ $a = 18, d = -4$ ✓

(7.) $98 = 6 + (n-1)4 = 4n + 2$ ✓   (2)

$96 = 4n$ ✓

$n = 24$ ✓

(8.) a) $U_1 = 45 - 6 = 39$ ✓   (1)

$U_2 = 45 - 12 = 33$ ✓

b) $d = -6$ ✓   (1)

c) $S_n = 0 \Rightarrow \frac{n}{2}\{2 \times 39 + (n-1)(-6)\} = 0$ ✓   (1)

$\times 2 \Rightarrow n(78 - 6n + 6) = 0$

$n(84 - 6n) = 0$ ✓

$n = 0$ or $n = \frac{84}{6} = 14 \qquad \Rightarrow n = 14$ ✓   (2)

(9.) The proof:

$+ \begin{cases} S_n = a + (a+d) + \cdots + a+(n-2)d + a+(n-1)d \\ S_n = a+(n-1)d + a+(n-2)d + \cdots + (a+d) + a \end{cases}$ ✓

Adding the two sums!

$2S_n = 2a+(n-1)d + 2a+(n-1)d + \cdots + 2a+(n-1)d$ ✓

$2S_n = n[2a+(n-1)d]$ ✓ $\Rightarrow S_n = \frac{n}{2}[2a+(n-1)d]$ ✓

QED.   (5)

(10) $n = 11$

$a + (a+d) + \cdots + (a+10d)$

$- \begin{cases} a+10d = 9 ✓ \\ a+5d = 7 \\ \hline 5d = 2 ✓ \end{cases}$

$d = 0.4$ or $\frac{2}{5}$ ✓

$a = 5$ ✓

$S_n = \frac{n}{2}(a+L) = 77$ ✓

$S_n = \frac{11}{2}(a+a+10d) = 77$ ✓

$\frac{11}{2}(2a+10d) = 77$

$a+5d = 7$ ✓   (7)