HW 5B.1 (HL) #3, 6, 8df, 9, 10c, 14, 18 5B.2 #3
5B.1 (SL) #5, 9, 12df, 13c, 16, 17 5B.2 #3

3.) 87, 83, 79, 75, 71, ...

a.) $83 - 87 = 79 - 83$
$\Rightarrow -4 = -4$ ✓

b.) $u_n = d(n-1) + u_1$
$u_n = -4(n-1) + 87$
$u_n = -4n + 4 + 87$
$\boxed{u_n = -4n + 91}$

c.) $u_{40} = -4(40) + 91$
$= -160 + 91$
$= \boxed{-69}$

d.) $-297 = -4n + 91$
$\frac{-388}{-4} = \frac{-4n}{-4}$
$\boxed{n = 97^{th}}$

6.) 23, 36, 49, 62, ... 1st term to exceed 100,000...
$u_1 = 23$, $d = 13$ ∴ $u_n = 13(n-1) + 23$
$= 13n - 13 + 23$
$u_n = 13n + 10$

$13n + 10 > 100{,}000$
$\frac{13n}{13} > \frac{99{,}990}{13}$
$n > 7{,}691.53$
∴ $\boxed{n = 7{,}692}$

8d.) k, $2k+1$, $8-k$ If arithmetic $b-a = c-b$.
∴ $2k+1-(k) = 8-k-(2k+1)$
$k+1 = 8-k-2k-1$
$k+1 = 7-3k$
$\frac{4k}{4} = \frac{6}{4}$
$\boxed{k = \frac{3}{2}}$

check
$\frac{3}{2}$, 4, $\frac{13}{2}$
$\Rightarrow \frac{3}{2}, \frac{8}{2}, \frac{13}{2} \Rightarrow d = +\frac{5}{2}$ ✓

8f.) $2k+18$, $-2-k$, $2k+2$
∴ $(-2-k) - (2k+18) = (2k+2) - (-2-k)$
$\Rightarrow -2-k-2k-18 = 2k+2+2+k$
$-3k - 20 = 3k + 4$
$-6k = 24$
$\boxed{k = -4}$

check
$2(-4)+18$, $-2-(-4)$, $2(-4)+2$
$-8+18$, $-2+4$, $-8+2$
10, 2, $-6 \rightarrow d = -8$ ✓

9.) $10k+1,\ 2k,\ 4k^2-5$

a.) $2k-(10k+1) = 4k^2-5-2k$

$2k-10k-1 = 4k^2-2k-5$

$+8k+1 \qquad +8k+1$

$\Rightarrow 0 = 4k^2+6k-4$

$-16,\ 8,\ -2,\ 6$

$(4k^2+8k)(-2k-4)=0$

$4k(k+2)-2(k+2)=0$

$(4k-2)(k+2)=0$

$4k-2=0 \qquad k+2=0$

$\therefore \boxed{k=\frac{1}{2}} \qquad \boxed{k=-2}$

When $k=\frac{1}{2} \Rightarrow 10\left(\frac{1}{2}\right)+1,\ 2\left(\frac{1}{2}\right),\ 4\left(\frac{1}{2}\right)^2-5 \Rightarrow 6, 1, -4 \rightarrow \boxed{d=-5}$

when $k=-2 \Rightarrow 10(-2)+1,\ 2(-2),\ 4(-2)^2-5 \Rightarrow -19, -4, 11 \rightarrow \boxed{d=15}$

10c.) $u_7=1$ & $u_{15}=-39$

$1=d(6)+u_1 \rightarrow 1=6d+u_1$

$-39=d(14)+u_1 \rightarrow -39=14d+u_1$

$40=-8d$

$\therefore \boxed{d=-5}$

$1=6(-5)+u_1$

$1=-30+u_1$

$\boxed{u_1=31}$

$u_n=-5(n-1)+31$

$u_n=-5n+5+31$

$\boxed{u_n=-5n+36}$

14.) $50,\ \underline{50+d},\ \underline{50+2d},\ \underline{50+3d},\ 44$ ($44 = 50+4d$)

$44=50+4d$

$-50 \quad -50$

$\frac{-6}{4}=\frac{4d}{4} \qquad d=-\frac{3}{2}=-1.5$

$\therefore 50, 48.5, 47, 45.5, 44$

b.) Want to find n such that $u_n<0$

$\therefore 50+(n-1)(-1.5)<0$

$50-1.5n+1.5<0$

$-1.5n+51.5<0$

$\frac{-1.5n}{n} < \frac{-51.5}{n}$

$n>34.\overline{3}$

$\therefore \boxed{n=35}$ is the first negative term

check

$u_{35}=50+(34)(-1.5)$

$=50-51$

$u_{35}=-1$ ✓

18.) a.) 5, 18, 31, 44, 57, 70
1 2 3 4 5 6

b.) the number of cars made each month is constant

c.) $u_{12} = 5 + (12-1)(13) \rightarrow 5 + (11)(13) \rightarrow 5 + 143 = \boxed{148}$

d.) Want to know when $u_n = 250$ $\therefore 250 = 5 + (n-1)(13)$

$250 = 5 + 13n - 13$

$+8 \quad +8$

$\frac{258}{13} = \frac{13n}{13}$

$n \approx 19.85$

$\therefore n = 20$

20 months or
1 year and 8 months

5B.2 #3 : 580 square bales → total mass 9850 kg.

8 yards of animals → 2 bales to each yard

∴ 16 bales a day.

a.) $u_1 = 580 \quad d = -16$

$\therefore \boxed{u_n = 580 - 16n}$

If n represents the number of days, n must start at 0 instead of 1 since 580 bales is the total after 0 days have passed.

b.) $u_1 = 9850$ (for all 580)

mass of 1 bale $\approx \frac{9850}{580} \approx 17.0 kg$

$\therefore d = -17(16) = -272$

$\boxed{u_n = 9850 - 272n}$