Review P480-485

1a) $t_n = 2n + 1$

$t_1 = 2(1)+1$ $\boxed{t_1 = 3}$ $t_2 = 2(2)+1$ $\boxed{t_2 = 5}$ $t_3 = 2(3)+1$ $\boxed{t_3 = 7}$ $t_4 = 2(4)+1$ $\boxed{t_4 = 9}$ $t_5 = 2(5)+1$ $\boxed{t_5 = 11}$

1b) $t_n = n^2 - 3$

$t_1 = 1^2 - 3$, $\boxed{t_1 = -2}$, $t_2 = 2^2 - 3$, $\boxed{t_2 = 1}$, $t_3 = 3^2 - 3$, $\boxed{t_3 = 6}$, $t_4 = 4^2 - 3$, $\boxed{t_4 = 13}$, $t_5 = 5^2 - 3$ $\boxed{t_5 = 22}$

1c) $f(n) = 7 - 2n$

$f(1) = 7 - 2(1)$, $f(1) = 5$, $f(2) = 7 - 2(2)$, $\boxed{f(2) = 3}$, $f(3) = 7 - 2(3)$, $\boxed{f(3) = 1}$, $f(4) = 7 - 2(4)$ $\boxed{f(4) = -1}$ $f(5) = 7 - 2($ $\boxed{f(5) = -3}$

1d) $t_n = 3^n - 1$

$t_1 = 3^1 - 1$ $\boxed{t_1 = 2}$, $t_2 = 3^2 - 1$ $\boxed{t_2 = 8}$, $t_3 = 3^3 - 1$ $\boxed{t_3 = 26}$, $t_4 = 3^4 - 1$ $\boxed{t_4 = 80}$, $t_5 = 3^5 - 1$ $\boxed{t_5 = 242}$

2a) $t_n = \frac{3n+2}{n-2} \Rightarrow t_{10} = \frac{3(10)+2}{10-2}$

$t_{10} = \frac{32}{8}$

$\boxed{t_{10} = 4}$

3a) $t_n = 5n - 4$; t_6 and t_{14}

$t_6 = 5(4) - 4$
$\boxed{t_6 = 16}$

$t_{14} = 5(14) - 4$
$= 70 - 4$
$\boxed{t_{14} = 66}$

3b) $f(n) = 7 - 4n$; t_5 and t_9

$f(5) = 7 - 4(5)$
$\boxed{f(5) = -13}$

$f(9) = 7 - 4(9)$
$f(9) = 7 - 36$
$\boxed{f(9) = -29}$

3c) $t_n = n^2 - 5$; t_7 and t_{10}

$t_7 = 7^2 - 5$
$t_7 = 49 - 5$
$\boxed{t_7 = 44}$

$t_{10} = 10^2 - 5$
$t_{10} = 100 - 5$
$\boxed{t_{10} = 95}$

3d) $f(n) = \frac{n+2}{2}$; t_8 and t_{30}

$f(8) = \frac{8+2}{2}$
$f(8) = \frac{10}{2}$
$\boxed{f(8) = 5}$

$f(30) = \frac{30+2}{2}$
$f(30) = \frac{32}{2}$
$\boxed{f(30) = 16}$

4a) $4, 8, 12, 16, \ldots$

$t_n = 4 + (n-1)4$
$t_{12} = 4 + (12-1)4$
$t_{12} = 4 + (11)4$
$t_{12} = 4 + 44$
$\boxed{t_{12} = 48}$

4b) $1, 3, 5, 7, \ldots$

$t_n = 1 + (n-1)2$
$t_{12} = 1 + (12-1)2$
$t_{12} = 1 + (11)2$
$t_{12} = 1 + 22$
$\boxed{t_{12} = 23}$

4b) $2, 5, 10, 17$

$t_n =$
$t_{12} = 12^2 + 1$
$t_{12} = 144 + 1$
$\boxed{t_{12} = 145}$

n	t_n	1st diff	2nd diff
1	2		
		3	
2	5		2
		5	
3	10		2
		7	
4	17		

← q

4c) $1, 3, 5, 7$

$t_n = 1 + (n-1)2$

$t_{12} = 1 + (12-1)2$
$= 1 + 11(2)$
$\boxed{t_{12} = 23}$

n	t_n	
1	1	
		2
2	3	
		2
3	5	
		2
4	7	

} linear
arithmetic

4d) $-6, -11, -16, -21$
$\quad -5 \quad -5 \quad -5$ ← arithmetic

$t_n = -6 + (n-1)(-5)$

5. Let $f(n)$ represent the growth of a nail after 1 week

$$f(n) = 15 + (n\ \ )(0,6)$$

a) $f(1) = 15 + (1)0.6$

$\boxed{f(1) = 15.6\text{mm}}$

b) $f(2) = 15 + (2)(0.6)$

$f(2) = 15 + 1.2$

$\boxed{f(2) = 16.2\text{mm}}$

c) $f(4) = 15 + (4)(0.6)$

$= 15 + 2.4$

$\boxed{f(4) = 17.4\text{mm}}$

6a) $9, 15, 21, 27, 33, 39$

b) $6, 1, -4, -9, -14, -19, -24$

c) $-3.5, -1, 1.5, 4.0, 6.5, 9.0$

d) $1, \frac{1}{2}, 0, -\frac{1}{2}, -1, -\frac{3}{2}$

7a) $t_n = 5n+2$

$t_1 = 5(1)+2$, $t_2 = 5(2)+2$, $t_3 = 5(3)+2$, $t_4 = 5(4)+2$

7c) $f(n) = 6 - 3n$

$f(1) = 6-3(1)$, $f(2) = 6-3(2)$, $f(3) = 6-3(3)$, $f(4) = 6-3(4)$

$\boxed{f(1) = 3}$ $\boxed{f(2) = 0}$ $\boxed{f(3) = -3}$ $\boxed{f(4) = -6}$

7d) $f(n) = -5n + 3$

$f(1) = -5(1)+3$, $f(2) = -5(2)+3$, $f(3) = -5(3)+3$, $f(\cancel{4}) = -5(4)+3$

$\boxed{f(1) = -2}$ $\boxed{f(2) = -7}$ $\boxed{f(3) = -12}$ $\boxed{f(4) = -17}$

7e) $t_n = \frac{2n-1}{3}$

$t_1 = \frac{2(1)-1}{3}$, $t_2 = \frac{2(2)-1}{3}$, $t_3 = \frac{2(3)-1}{3}$, $t_4 = \frac{2(4)-1}{3}$

$\boxed{t_1 = \frac{1}{3}}$ $\boxed{t_2 = 1}$ $\boxed{t_3 = \frac{5}{3}}$ $\boxed{t_4 = \frac{7}{3}}$

7f) $f(n) = 0.2n + 4$

$f(1) = 0.2(1)+4$, $f(2) = 0.2(2)+4$, $f(3) = 0.2(3)+4$, $f(4) = 0.2(4)+4$

$\boxed{f(1) = 4.2}$ $\boxed{f(2) = 4.4}$ $\boxed{f(3) = 4.6}$ $\boxed{f(4) = 4.8}$

8a) $a=3, d=5$

Sequence is $3, 8, 13, 18, 23, \ldots$

8b) $a=-5, d=2$

Sequence is $-5, -3, -1, 1, 3, \ldots$

8c) $a=4, d=-3$

Sequence is $4, 1, -2, -5, -8, \ldots$

8d) $a=0, d=-2.3$

Sequence is: $0, -2.3, -4.6, -6.9, -9.2$

9a) $3, 5, 7, \ldots; t_{30}$

$a=3 \quad d=2$

$t_n = 3+(n-1)(2)$

$t_{30} = 3+(30-1)(2)$

$t_{30} = 3+(29)(2)$

$t_{30} = 3+58$

$\boxed{t_{30} = 61}$

9b) $-2, -6, -10, \ldots; t_{25}$

$a=-2, d=-4$

$t_n = -2+(n-1)(-4)$

$t_{25} = -2+(25-1)(-4)$

$t_{25} = -2+(24)(-4)$

$t_{25} = -2-96$

$\boxed{t_{25} = -98}$

9c) $-4, 3, 10, \ldots; t_{18}$

$a=-4, d=7$

$t_n = -4+(n-1)(7)$

$t_{18} = -4+(18-1)(7)$

$t_{18} = -4+(17)(7)$

$t_{18} = -4+119$

10a) $4, 9, 14, \ldots 169$

$a = 4, d = 5$

$t_n = 4 + (n-1)5$ Let $t_n = 169$ find n.

$169 = 4 + (n-1)5$

$169 = 4 + 5n - 5$

$169 = -1 + 5n$

$170 = 5n$

$\frac{170}{5} = \frac{5n}{5}$

$\boxed{34 = n}$ ∴ There are 34 terms.

10b) $19, 11, 3, \ldots, -229$

$a = 19, d = 8$

$t_n = 19 + (n-1)(-8)$ Let $t_n = -229$

$-229 = 19 + (n-1)(-8)$

$-229 = 19 - 8n + 8$

$-229 = 27 - 8n$

$-2 \quad = -8n$

$+32 = n$

∴ There are 32 terms.

11a) $t_7 = 9$ and $t_{12} = 29$

Arithmetic sequence: $t_n = a + (n-1)d$

note $t_7 = a + (7-1)d$

$$9 = a + 6d$$

$$\Rightarrow ① \; a = 9 - 6d$$

note: $t_{12} = 29$

$$a + (12-1)d = 29$$

$$② \; a + 11d = 29$$

Sub ① into ②

$$(9 - 6d) + 11d = 29$$

$$9 + 5d = 29$$

$$5d = 20$$

$$\boxed{d = 4}$$

Sub $d = 4$ into ①

$$a = 9 - 6(4)$$

$$= 9 - 24$$

$$\boxed{a = -15}$$

$\therefore$ General term is $t_n = -15 + (n-1)(4)$

$$t_n = -15 + 4n - 4$$

$$\boxed{t_n = 4n - 19}$$

11b) $t_4 = 12$ and $t_{11} = -2$

Arithmetic sequence: $t_n = a + (n-1)d$

note: $t_4 = 12$

$$t_4 = a + (4-1)d$$
$$12 = a + 3d$$
$$\Rightarrow ① \; a = 12 - 3d$$

$$t_{11} = -2$$

$$t_{11} = a + (11-1)d$$
$$② \; -2 = a + 10d$$

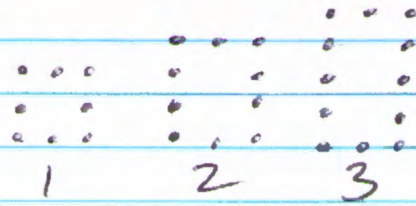
Sub ① into ②

$$-2 = (12 - 3d) + 10d$$
$$-2 = 12 + 7d$$
$$-14 = 7d$$
$$\boxed{-2 = d}$$

Sub $d = -2$ into ①

$$a = 12 - 3(-2)$$
$$a = 12 + 6$$
$$\boxed{a = 18}$$

12a)



There are 14 dots in the 4th rectangle.

12b) $t_n = 8 + (n-1)(2)$

$t_n = 8 + 2n - 2$

$t_n = 6 + 2n$

12c) $t_{25} = 6 + 2(25)$

$t_{25} = 6 + 50$

$t_{25} = 56$

$\therefore$ There are 56 dots in the 25th rectangle

12d Let $t_n = 92$ find n.

$92 = 6 + 2n$

$86 = 2n$

$43 = n$

$\therefore$ The 43rd rectangle has 92 asterisks

13a) Let Y_n be the Year of the n'th soccer tounament.

$Y_n = 1991 + (n-1)4$ or $Y_n = 1987 + 4n$

14a) 1, 8, 27, 64 → neither
no d value
no r value

14b) 1, 3, 9, 27 $r = 3$ $a = 1$

~~t_n~~ Next terms, 81, 243

14c) 6, 12, 18, 24 $r = 2$ $a = 6$ or $d = 6$

$t_n = 6(2)^{n-1}$ $t_n = 6 + (n-1)(2)$
$t_n = 4 + 2n$

Next terms: 30, 36

14d) 64, −32, 16, −8, ...

$r = -\frac{1}{2}$ $a = 64$

$t_n = 64\left(-\frac{1}{2}\right)^{n-1}$

Next terms: 4, −2

14e) 15, 14, 12, 9, 5 → neither geometric or quadratic

~~$t_n = 15 + \left(-\frac{1}{2}\right)(n-$~~

Next terms: 0, −6

n	t_n	1st	2nd
1	15		
		−1	
2	14		−1
		−2	
3	12		−1
		−3	
4	9		−1
		−4	
5	5		
		−5	
6	0		

this is quadratic

14f) 3.2, 7.2, 4.2, 1 .....

15a) $a=6$, $r=4$

Sequence: 6, 24, 96, 384, 1536, ...

15b) $a=5$ $r=-2$

Sequence: 5, −10, 20, −40, 80, ...

15c) $a=-3$, $r=-5$

Sequence: −3, 15, −75, 375, −1875

15d) $a=10$, $r=0.1$

Sequence: 10, 1, 0.1, 0.01, 0.001

16a) $t_n = 3(2)^{n-1}$

Sequence: 3, 6, 12, , 48, ...

16b) $t_n = 2(-3)^{n-1}$

Sequence: 2, −6, 18, −54, 162, ...

16c) $f(n) = 4(-2)^{n-1}$

Sequence: 4, −8, 16, −32, 64, ...

16e) $t_n = -2(-2)^{n-1}$

Sequence: $-2, 4, -8, 16, -32, \ldots$

16f) $t_n = -1000(0.5)^{n-1}$

Sequence: $-1000, -500, -250, -125, -62.5, \ldots$

17a) $3, 6, 12, \ldots \quad a=3, \; r=\frac{6}{2}=3$

$t_n = 3(3)^{n-1}$

$t_{10} = 3(3)^{10-1}$

$t_{10} = 3^{10}$

$\boxed{t_{10} = 59\,049}$

17b) $2, 8, 32, \ldots ; \; t_8 \quad a=2, \; r=\frac{8}{2}=4$

$t_n = 2(4)^{n-1}$

$t_8 = 2(4)^{8-1}$

$t_8 = 2(4)^7$

$\boxed{t_8 = 32\,768}$

17c) $27, 9, 3, \ldots ; \; t_6 \quad a=27 \quad r=\frac{9}{27}=\frac{1}{3}$

$t_n = 27\left(\frac{1}{3}\right)^{n-1}$

$t_6 = 27\left(\frac{1}{3}\right)^{6-1}$

$t_6 = 27\left(\frac{1}{3}\right)^5$

23b) $t_1=0$; $t_n=3t_{n-1}+(n-1)$

$\boxed{t_1=0}$

$t_2=3t_1+(2-1)$
$t_2=3(0)+1$
$\boxed{t_2=1}$

$t_3=3t_2+(3-1)$
$t_3=3(1)+2$
$\boxed{t_3=5}$

$t_4=3t_3+(4-1)$
$t_4=3(5)+3$
$t_4=15+3$
$\boxed{t_4=18}$

$t_5=3t_4+(5-1)$
$t_5=3(18)+4$
$\boxed{t_5=58}$

23c) $t_1=-3$; $t_n=t_{n-1}-4$

$\boxed{t_1=-3}$

$t_2=t_1-4$
$t_2=-3-4$
$\boxed{t_2=-7}$

$t_3=t_2-4$
$t_3=-7-4$
$\boxed{t_3=-11}$

$t_4=t_3-4$
$t_4=-11-4$
$\boxed{t_4=-15}$

$t_5=t_4-4$
$=-15-4$
$\boxed{t_5=-19}$

24.a) $t_1=-5$; $t_n=t_{n-1}+3$

$t_1=-5$

$t_2=t_1+3$
$t_2=-5+3$
$\boxed{t_2=-2}$

$t_3=t_2+3$
$t_3=(-2)+3$
$\boxed{t_3=1}$

$t_4=t_3+3$
$t_4=(1)+3$
$\boxed{t_4=4}$

$t_5=t_4+3$
$t_5=4+3$
$\boxed{t_5=7}$

Explicit formula

$t_n=-5+(n-1)(3)$

17d) $1, -3, 9, \ldots; t_7$ $\quad a = 1,\ r = \left(\frac{-3}{1}\right) = -3$

$t_n = 1(-3)^{n-1}$

$t_7 = 1(-3)^{7-1}$

$t_7 = 1(-3)^6$

$\boxed{t_7 = 729}$

18a) $1, 2, 4, \ldots\ldots 1024$ $\quad a = 1 \quad r = \frac{2}{1} = 2$

$t_n = 1(2)^{n-1}$

Let $t_n = 1024$

$1024 = 1(2)^{n-1}$

$1024 = (2)^{n-1}$

$2^{10} = 2^{n-1}$

$10 = n-1$

$10+1 = n$

$\boxed{11 = n}$ $\quad \therefore$ There are 11 terms.

18b) $16384, 4096, \ldots\ldots 1$ $\quad a = 16384,\ r = \frac{4096}{16384} = \frac{1}{4}$

$t_n = 16384\left(\frac{1}{4}\right)^{n-1}$

Let $t_n = 1$

$1 = 16384\left(\frac{1}{4}\right)^{n-1}$

$\frac{1}{16384} = \left(\frac{1}{4}\right)^{n-1}$

19 a) $t_4 = 24$ and $t_6 = 96$ General term is $t_n = ar^{n-1}$

$t_4 = ar^{4-1}$

$t_6 = 96$

$t_4 = ar^3$

$t_6 = ar^{6-1}$

$24 = ar^3$

$t_6 = ar^5$

① $\frac{24}{r^3} = a$

② $96 = ar^5$

Sub ① into ②

$$96 = \left(\frac{24}{r^3}\right) r^5$$

$$96 = 24r^2$$

$$\frac{96}{24} = r^2$$

$$4 = r^2$$

$$\therefore r = \pm 2$$

If $r = -2$ sub in ①

$$a = \frac{24}{(-2)^3}$$

$$\boxed{a = -3}$$

If $r = 2$ sub in ①

$$a = \frac{24}{(2)^3}$$

$$\boxed{a = 3}$$

$\therefore t_n = -3(-2)^{n-1}$ or $t_n = 3(2)^{n-1}$

$a = -3, r = -2$ $\quad$ $a = 3, r = 2$

19b) $t_2 = -6$ and $t_5 = -162$

$t_2 = ar^{2-1}$ $t_5 = ar^{5-1}$

$t_2 = ar$ $t_5 = ar^4$

$-6 = ar$ ② $-162 = ar^4$

① $\frac{-6}{a} = r$

sub ① into ②

$$-162 = a\left(\frac{-6}{a}\right)^4$$

$$-162 = \frac{a1296}{a^4}$$

$$-162 = \frac{1296}{a^3}$$

$$a^3 = \frac{-1296}{162}$$

$$a^3 = -8$$

$$\boxed{a = -2}$$

Sub $a = -2$ into ①

$$r = \frac{-6}{a}$$

$$r = \frac{-6}{-2}$$

$$\boxed{r = 3}$$

20. Let P_n be the population in the nth year

$P_{1870} = 3.5$

$P_{1910} = 7.0$

$P_{1950} = 14$

$P_{1990} = 28$

$P_{2030} = 56$

$P_{2070} = 112$

$\therefore$ There will be 112 million

21. a) $A_n = A\left(\frac{1}{2}\right)^{n-1}$

b) Let $A = 200$

$A_n = 200\left(\frac{1}{2}\right)^{n-1}$

$n = \frac{32}{8} = 4$

remember breaks down every 8 days

$A_4 = 200\left(\frac{1}{2}\right)^{4-1}$

$A_4 = 200\left(\frac{1}{2}\right)^3$

$A_4 = 200\left(\frac{1}{8}\right)$

22. a) $t_1 = 19$; $t_n = t_{n-1} - 8$

$\boxed{t_1 = 19}$

$t_2 = t_{2-1} - 8$
$t_2 = 19 - 8$
$\boxed{t_2 = 11}$

$t_3 = t_{3-1} - 8$
$t_3 = t_2 - 8$
$t_3 = 11 - 8$
$\boxed{t_3 = 3}$

$t_4 = t_{4-1} - 8$
$t_4 = t_3 - 8$
$t_4 = 3 - 8$
$\boxed{t_4 = -5}$

$t_5 = t_{5-1} - 8$
$t_5 = t_4 - 8$
$t_5 = -5 - 8$
$\boxed{t_5 = -13}$

22b) $f(1) = -5$; $f(n) = f(n-1) + 3$

$\boxed{f(1) = -5}$

$f(2) = f(2-1) + 3$
$f(2) = f(1) + 3$
$f(2) = -5 + 3$
$\boxed{f(2) = -2}$

$f(3) = f(3-1) + 3$
$f(3) = f(2) + 3$
$f(3) = -2 + 3$
$\boxed{f(3) = 1}$

$f(4) = f(4-1) + 3$
$f(4) = f(3) + 3$
$f(4) = 1 + 3$
$\boxed{f(4) = 4}$

$f(5) = f(5-1) + 3$
$f(5) = f(4) + 3$
$f(5) = 4 + 3$
$\boxed{f(5) = 7}$

22c) $t_1 = -1$; $t_n = -2t_{n-1}$

$\boxed{t_1 = -1}$

$t_2 = -2t_{2-1}$
$t_2 = -2t_1$
$t_2 = -2(-1)$
$\boxed{t_2 = 2}$

$t_3 = -2t_2$
$= -2(2)$
$\boxed{t_3 = -}$

$t_4 = -2t_3$
$t_4 = -2(-4)$
$\boxed{t_4 = 8}$

$t_5 = -2t_4$
$t_5 = -2(8)$
$t_5 = -16$

22d) $f(1)=8;\ f(n)=0.5f(n-1)$

$\boxed{f(1)=8}$

$f(2)=0.5f(2-1)$
$f(2)=0.5f(1)$
$f(2)=0.5(8)$
$\boxed{f(2)=4}$

$f(3)=0.5f(3-1)$
$f(3)=0.5f(2)$
$f(3)=0.5(4)$
$\boxed{f(3)=2}$

$f(4)=0.5f(4-1)$
$f(4)=0.5f(3)$
$f(4)=0.5(2)$
$\boxed{f(4)=1}$

$f(5)=0.5f(5-1)$
$f(5)=0.5f(4)$
$f(5)=0.5(1)$
$\boxed{f(5)=0.5}$

22e) $t_1=3;\ t_2=3;\ t_n=t_{n-1}+t_{n-2}$

$\boxed{t_1=3}$

$\boxed{t_2=3}$

$t_3=t_2+t_1$
$t_3=(3)+(3)$
$\boxed{t_3=6}$

$t_4=t_3+t_2$
$t_4=(6)+(3)$
$\boxed{t_4=9}$

$t_5=t_4+t_3$
$t_5=(9)+(6)$
$\boxed{t_5=15}$

22f) $t_1=-12;\ t_n=t_{n-1}+3n$

$\boxed{t_1=-12}$

$t_2=t_1+3(2)$
$=-12+3(2)$
$\boxed{t_2=-6}$

$t_3=t_{3-1}+3(3)$
$t_3=t_2+9$
$t_3=-6+9$
$\boxed{t_3=3}$

$t_4=t_{4-1}+3(4)$
$t_4=t_3+12$
$t_4=3\ \ -12$
$\boxed{t_4=-9}$

$t_5=t_{5-1}+3(5)$

22g) $t_1 = 11$; $t_n = 2t_{n-1} - n^2$

$\boxed{t_1 = 11}$

$t_2 = 2t_{2-1} - (2)^2$
$t_2 = 2(11) - 4$
$t_2 = 22 - 4$
$\boxed{t_2 = 18}$

$t_3 = 2t_{3-1} - 3^2$
$t_3 = 2t_2 - 3^2$
$t_3 = 2(18) - 9$
$t_3 = 36 - 9$
$\boxed{t_3 = 27}$

$t_4 = 2t_{4-1} - 4^2$
$t_4 = 2t_3 - 16$
$t_4 = 2(27) - 16$
$t_4 = 38$

$t_5 = 2t_{5-1} - 5^2$
$t_5 = 2(38) - 5^2$
$t_5 = 76 - 25$
$\boxed{t_5 = 51}$

22h) $t_1 = -1$; $t_2 = 1$; $t_n = t_{n-1} \div t_{n-2}$

$\boxed{t_1 = 1}$
$\boxed{t_2 = 1}$

$t_3 = t_{3-1} \div t_{3-2}$
$t_3 = t_2 \div t_1$
$t_3 = 1 \div 1$
$\boxed{t_3 = 1}$

$t_4 = t_{4-1} \div t_{4-2}$
$t_4 = t_3 \div t_2$
$t_4 = 1 \div 1$
$\boxed{t_4 = 1}$

$t_5 = t_{5-1} \div t_{5-2}$
$t_5 = t_4 \div t_3$
$t_5 = 1 \div 1$
$\boxed{t_5 = 1}$

23.a) $t_1 = 2$; $t_n = 4t_{n-1}$

$\boxed{t_1 = 2}$

$t_2 = 4t_1$
$t_2 = 4(2)$
$\boxed{t_2 = 8}$

$t_3 = 4t_2$
$t_3 = 4(8)$
$\boxed{t_3 = 32}$

$t_4 = 4t_3$
$t_4 = 4(32)$
$\boxed{t_4 = 128}$

$t_5 = 4t_4$
$t_5 = 4(128)$
$\boxed{t_5 = 512}$

24b) $t_1 = 3$; $t_n = 4t_{n-1}$

$\boxed{t_1 = 3}$

$t_2 = 4t_1$
$t_2 = 4(3)$
$\boxed{t_2 = 12}$

$t_3 = 4t_2$
$t_3 = 4(12)$
$\boxed{t_3 = 48}$

$t_4 = 4t_3$
$t_4 = 4(48)$
$\boxed{t_4 = 192}$

$t_5 = 4t_4$
$t_5 = 4(192)$
$\boxed{t_5 = 768}$

24c) $t_1 = 40$; $t_n = 0.5t_{n-1} + n$

$\boxed{t_1 = 40}$

$t_2 = 0.5t_1 + 1$
$t_2 = 0.5(40) + 1$
$t_2 = 20 + 1$
$\boxed{t_2 = 21}$

$t_3 = 0.5t_2 + 1$
$t_3 = 0.5(21) + 1$
$t_3 = 10.5 + 1$
$\boxed{t_3 = 11.5}$

$t_4 = 0.5t_3 + 1$
$t_4 = 0.5(11.5) + 1$
$\boxed{t_4 = 6.75}$

$t_5 = 0.5t_4 + 1$
$t_5 = 0.5(6.75) + 1$
$\boxed{t_5 = 4.375}$

25a)