Problem 1. Solution

	Time Period	1 Sec	1 min	1 hour	1 month	1yr	1 century
f(n)	**microsec (t)**	1.00E+06	6.00E+07	3.60E+09	2.59E+12	3.15E+13	3.15E+15
lg n	n = 2^(t)	2^1.00E+06	2^6.00E+07	2^3.60E+09	2^2.59E+12	2^3.15E+13	2^3.15E+15
√n	n = (t)^2	1.00E+12	3.60E+15	1.30E+19	6.72E+24	9.95E+26	9.95E+30
n	n = (t)	1.00E+06	6.00E+07	3.60E+09	2.59E+12	3.15E+13	3.15E+15
n lg n	n = e^(W(ln(2	5.15E+04	2.37E+06	1.15E+08	6.37E+10	7.12E+11	6.19E+13
n^2	n = √(t)	1000	7745	60000	1609968	5615692	56156922
n^3	n = 3√(t)	100	391	1532	13736	31593	146645
2^n	lg (t)	19	25	31	41	44	51
n!		9	11	12	15	16	17

Solving algorithm
Since the time required to solve for n data points is f(n) microsecs
Therefore number of data points that can be solved in t microsec = f^-1(t) rounded down to whole number
Table shows Possible data set of size n that can be solved for the given Time

n lg n can be solved using Lamber W Function
converting log to the base 2 to natural log
n (ln (n))/ln(2)
n ln(n) = ln(2).t
n = e^(W(ln(2).t)
W0(x) = ln x - ln ln x + 0(1)
W0 = ln (.6931472*t) - ln ln (.6931472*t) +0(1)

n! can be solved using an iterative method with below steps
n=1
t

```
while(t/n>=(n+1){
   t=t/n;
   n++
}
```

Problem 2. Solution

	A	B	O	o	Ω	ω	ϴ
a	lgkn	n^E	Yes	Yes	Yes	Yes	Yes
b	n^k	c^n	Yes	Yes	No	No	No
c	√n	n^ sin n	No	No	No	No	No
d	2^n	2^n/2	No	No	Yes	Yes	No
e	nlg c	clg n	No	No	Yes	Yes	No
f	lg(n!)	nlg(n)	Yes	No	Yes	No	Yes

Function Definations

Function (A) belongs to the set of Big O of function B if A <= C.B for some value of C

Function (A) belongs to the set of Small o of function B if A < C.B for all values of C

Function (A) belongs to the set of of Ω function B if C. A>=B for some value of C

Function (A) belongs to the set of of ω function B if A>C.B for all values of C

Function (A) belongs to the set of of Ө function B if C2.B >= A >=C.B

a lgkn n^E

For k = 1 and E = 2; A < B hence A is Big (0) of B

For k = 1 and E =.1; A >B hence A is Big (Omega) of B

Since the curve of the funtion is highly dependent on the K and e terms

The function will behave differently based on K and E hence all are true

b n^k c^n

n^k is smaller than c^n hence it's a Big O of c^n

This will stand true for all values of C after a certain n hence its also small 0 of C^n

c √n n^ sin n

Sin n is a cyclic function (-1 to 1) so function A is not a part of any function

as B will fluctuate between 1 and n

d 2^n 2^n/2

2^n will always be bigger than 2^n/2 hence its Big Omega of B

Its true for all values of C so its also w of B

e nlg c clg n

lgc^n lg n^c

since c^n will always be bigger than n^c it's a Big Omega of B

it will be true for all values of C its also w of the B

	A	B
1.f	lg(n!)	nlg(n)

lg(n!) = log(n) + log(n-1) ….. Log(1)

nlg(n) = log(n) + log(n) ….. log(n)

so B > A

but since its alog function it grows much slower and if we use

a very large constant B<A hence it can be big omeaga, big theta and big O

Since its dependent on C its neither small 0 small w