1) Wave frequency, $f_{max} = \frac{1}{T}$

$= \frac{1}{2}$ Hz

a) Sampling rate, $f_s = 1$ Hz

$\therefore f_s = 2 f_{max}$

b) $f_s = \frac{1}{1.5}$ Hz

$= \frac{2}{3}$ Hz

$\therefore f_s = \frac{4}{3} f_{max}$

c) $8\Delta s = 3T$

$\Delta s = \frac{3T}{8}$

$= \frac{6}{8}$

$f_s = \frac{1}{\Delta s}$

$= \frac{8}{6}$ Hz

$\therefore f_s = \frac{16}{6} f_{max}$

1d) $f_s = \frac{1}{0.5}$

$= 2\,Hz$

$\therefore f_s = 4\, f_{max}$

e) $f_s = 4\,Hz$

$\therefore f_s = 8 f_{max}$

2) $\sum_{n=1} \frac{4}{(2n-1)\pi} \sin\left[\frac{2\pi(2n-1)t}{10}\right]$

$f_{max} = 2\,Hz$

$f_s > 2 f_{max}$

$f_s > 4\,Hz$

An appropriate sampling rate would be 5Hz.

$\therefore f_s = 5\,Hz$

2) Frequencies = 0.1, 0.3, 0.5, 0.7, 0.9, 1.1, 1.3, 1.5, 1.7, 1.9

Alias frequency, $f_a = |f_s \cdot i - f_n|$

f_s	f_a
0.1	$\|5(1) - 0.1\| = 4.9$
0.3	$\|5(1) - 0.3\| = 4.7$
0.5	$\|5(1) - 0.5\| = 4.5$
0.7	$\|5(1) - 0.7\| = 4.3$
0.9	$\|5(1) - 0.9\| = 4.1$
1.1	$\|5(1) - 1.1\| = 3.9$
1.3	$\|5(1) - 1.3\| = 3.7$
1.5	$\|5(1) - 1.5\| = 3.5$
1.7	$\|5(1) - 1.7\| = 3.3$
1.9	$\|5(1) - 1.9\| = 3.1$

3a) $\log_2 756 = \frac{\ln 756}{\ln 2}$

$= 9.562242424$

≈ 10

$\therefore$ 10 bits are required to represent 756.

b)

	Remainder
$2 \mid 756$	0
$2 \mid 378$	0
$2 \mid 189$	1
$2 \mid 94$	0
$2 \mid 47$	1
$2 \mid 23$	1
$2 \mid 11$	1
$2 \mid 5$	1
$2 \mid 2$	0
$2 \mid 1$	1
0	

$756 = (1011110100)_2$

3b) Resolution $= \frac{5-0}{2^8}$

$= \frac{5}{256}$

$\approx 0.0195V$

Voltage value $= 32\left(\frac{5}{256}\right)$

$= 0.625V$