

UNIVERSITI SAINS MALAYSIA

Peperiksaan Semester Kedua  
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MKT362 - Statistik Gunaan I

Masa: [3 jam]

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Jawab LIMA soalan. Semua soalan mesti dijawab dalam Bahasa Malaysia.  
Satu set lampiran dikepulkan.

1. (a) (i) Apakah tujuh alat utama kawalan kualiti itu?  
Apakah fungsi-fungsi utamanya?
- (ii) Huraikan secara ringkas bagaimana setiap yang berikut  
digunakan di dalam bidang kawalan kualiti:
- (1) histogram
  - (2) gambarajah sebaran dan korelasi
  - (3) gambarajah pareto.

(50/100)

- (b) Sebuah kilang mempunyai 4 buah mesin yang menghasilkan sejenis  
butir. Pada suatu pemeriksaan, sampel yang tak bersandar diambil  
daripada setiap mesin dan yang berikut adalah datanya:

<u>Sampel</u>	<u>Ukuran</u>
I	4.25, 4.50, 4.25, 4.40
II	4.15, 4.00, 4.10, 4.15
III	3.95, 4.00, 4.05, 4.40
IV	4.35, 4.40, 4.45, 4.60, 4.50

- (i) Berdasarkan maklumat sampel-sampel ini, bolehkah pihak  
pengurusan menyatakan min keempat-empat mesin itu sama?  
Gunakan  $\alpha = 0.05$ .
- (ii) Apakah anggapan yang digunakan di dalam analisis anda?

(50/100)

.../2

2. (a) Huraikan setiap yang berikut:

- (i) Risiko pengeluar, risiko pengguna
- (ii) LQL, paras kualiti penghad
- (iii) AOQ, kualiti keluar secara purata
- (iv) AOQL, had kualiti keluar secara purata
- (v) AQL, paras kualiti yang boleh diterima

(30/100)

(b) Data awal telah diambil untuk membina carta kawalan  $\bar{X}$ -R bagi suatu ciri ukuran daripada suatu proses penghasilan. Yang berikut ialah ringkasannya, saiz subsampel  $n = 5$ ):

Nombor subsampel	$\bar{X}$	R	Nombor subsampel	$\bar{X}$	R
1	136.6	9.2	12	139.8	4.7
2	138.4	4.2	13	136.3	4.5
3	136.0	6.3	14	138.4	6.2
4	134.2	2.1	15	138.1	2.4
5	133.5	1.6	16	138.0	1.5
6	136.4	7.3	17	137.9	1.7
7	138.6	3.4	18	135.7	3.3
8	137.4	3.3	19	137.5	3.8
9	137.2	4.2	20	140.1	6.8
10	137.8	2.9	21	132.4	5.2
11	137.4	3.8	22	137.8	5.4

- (i) Tentukan garis tengah dan had-had kawalan percubaan.
- (ii) Jika terdapat titik di luar had-had kawalan percubaan dan dengan menganggapkan sebab-sebab terumpukkan, periksa semula garis tengah dan had-had kawalan untuk kegunaan kelak.

(30/100)

(c) Sampel sebanyak 50 cerapan diambil daripada suatu populasi dan didapati fungsi taburan longgokan sampelnya  $S(x)$  seperti yang berikut:

$$S(x) = \begin{cases} 0, & x < 153 \\ 0.07, & 153 \leq x < 157 \\ 0.25, & 157 \leq x < 161 \\ 0.47, & 161 \leq x < 165 \\ 0.69, & 165 \leq x < 169 \\ 0.89, & 169 \leq x < 173 \\ 0.95, & 173 \leq x < 177 \\ 1, & 177 \leq x \end{cases}$$

Gunakan ujian Kolmogorov-Smirnov untuk menguji hipotesis bahawa populasinya ialah normal dengan  $\mu = 165.20$  dan sisihan piawai  $\sigma = 5.86$ . Gunakan  $\alpha = 0.05$ . ( $n = 50$ , daripada sifar Kolmogorov-Smirnov, nilai genting ialah 0.188 untuk  $\alpha = 0.05$ .)

(40/100)

3. (a)  $\mu$  ialah min suatu populasi normal yang variansnya  $\sigma^2 = 1$ .  
 Di dalam ujian kaedah berjujukan (ujian nisbah kebolehjadian maksimum) tentang

$$H_0 : \mu = 0$$

$$H_1 : \mu = 2, \alpha = 0.05, \beta = 0.10,$$

(i) tunjukkan rantau penerimaan, rantau penolakan dan rantau berterusan pensampelan di dalam satah- $m$ ,  $m$  ialah bilangan cerapan yang digunakan dan  $y = \sum_{i=1}^m X_i, X_1, X_2, \dots, X_m, \dots$  ialah cerapan.

(ii) Jika yang berikut ialah suatu sampel mengikut susunan pengambilan:

2.1, 1.9, 1.4, 1.8, 1.9, 1.9, 2.0, 1.8, 1.7,  
 1.6, 1.9, 2.0, 1.9, 1.8, 2.0,

sudahkah keputusan dicapai untuk menerima  $H_0$  atau menolak  $H_0$ ?

(40/100)

(b) Terangkan erti indeks keupayaan dan perhubungannya dengan had-had kawalan, had-had spesifikasi. Gunakan satu contoh yang jelas di dalam penerangan anda.

(30/100)

(c) Syarikat Warna Malaysia mengeluarkan gulungan filem negatif untuk menghasilkan gambar berwarna. Jurutera pengawalan kualiti syarikat itu ingin menggunakan carta-C untuk mengawal bilangan kecacatan di dalam setiap gulung filem negatifnya. Data awal 25 gulung filem negatif diperiksa dan didapati yang berikut:

<u>Gulung</u>	<u>Bilangan kecacatan</u>	<u>Gulung</u>	<u>Bilangan kecacatan</u>
1	15	14	0
2	12	15	7
3	10	16	9
4	11	17	6
5	16	18	5
6	8	19	3
7	6	20	4
8	5	21	10
9	7	22	12
10	4	23	14
11	8	24	15
12	6	25	6
13	10		

- (i) Tentukan garis tengah dan had-had kawalan percubaan.
- (ii) Jika terdapat titik-titik yang di luar had-had kawalan percubaan dan dengan menganggapkan sebab-sebab terumpukkan, periksa semula garis tengah dan had-had kawalan untuk kegunaan kelak.

(30/100)

4. (a) Sebuah kilang elektronik mengeluarkan sejenis "chip". Pihak pengurusan ingin menggunakan carta-p untuk mengawal proses penghasilannya. Yang berikut ialah maklumat 25 sampel awal. (Saiz setiap sampel ialah 1000.)

<u>Sampel</u>	<u>Bilangan butir yang cacat</u>	<u>Sampel</u>	<u>Bilangan butir yang cacat</u>
1	14	14	40
2	23	15	21
3	12	16	14
4	10	17	16
5	6	18	12
6	16	19	22
7	15	20	21
8	18	21	16
9	8	22	28
10	27	23	10
11	30	24	9
12	18	25	3
13	15		

- (i) Tentukan garis tengah dan had-had kawalan percubaan untuk carta-p bagi data awal ini.
- (ii) Jika terdapat titik-titik di luar had-had kawalan percubaan dan dengan menganggapkan sebab-sebab terumpukkan, periksa semula garis tengah dan had-had kawalan untuk kegunaan kelak.

(40/100)

(b) Anggapkan sistem berpemberat 5 : 4 : 1 digunakan di dalam suatu carta-demerit per unit.

- (i) Tentukan carta-demerit per unitnya jika  $n = 80$ ,

$$u_{oc} = 0.10, u_{oma} = 0.15 \text{ dan } u_{omi} = 4.10 .$$

- (ii) Pada suatu ketika, pemeriksaan sampel 80 butir memberikan

bilangan kecacatan genting = 2  
 bilangan kecacatan major = 25  
 bilangan kecacatan minor = 200

Dapatkan bilangan demerit per unit untuk sampel ini. Berdasarkan maklumat sampel ini, proses di dalam kawalan atau di luar kawalan?

(c) Carta kawalan  $\bar{X}$  - R sedang digunakan dan yang berikut adalah maklumatnya:

Carta  $\bar{X}$

garis tengah = 300.2  
UCL $\bar{X}$  = 303.2  
LCL $\bar{X}$  = 297.2

Carta R

garis tengah = 10.1  
UCL $R$  = 17.4  
LCL $R$  = 2.8

Saiz subsampel ialah  $n = 8$ . Kedua-dua carta menunjukkan proses penghasilan itu adalah terkawal.

- (i) Spesifikasi bagi cirian kualiti ini ialah  $298 \pm 6$ . Apakah kesimpulan anda tentang keupayaan proses penghasilan ini?
- (ii) Jika min proses penghasilan beralih ke 297, berapakah kebarangkalian bahawa proses ini mengeluarkan butir yang memenuhi spesifikasi? Andaikan varians bagi proses penghasilan tidak berubah.

(30/100)

5. (a) Untuk saiz lot  $N = 4000$ ,  $AQL = 0.40\%$ , gunakan MIL-STD-105D paras inspeksi II, tentukan rancangan pensampelan penerimaan tunggal untuk inspeksi normal, ketat dan longgar. Terangkan makna nombor-nombor yang anda berikan itu.

(30/100)

(b) Untuk saiz lot  $N = 40,000$ ,  $AQL = 1.5\%$ , gunakan MIL-STD-105D pada paras inspeksi II, tentukan rancangan pensampelan penerimaan berganda dua untuk inspeksi normal, ketat dan longgar. Terangkan makna nombor-nombor yang anda berikan itu.

(30/100)

(c) Yang berikut ialah rancangan pensampelan penerimaan berganda tiga untuk satu penghantaran:

saiz lot,  $N = 4000$

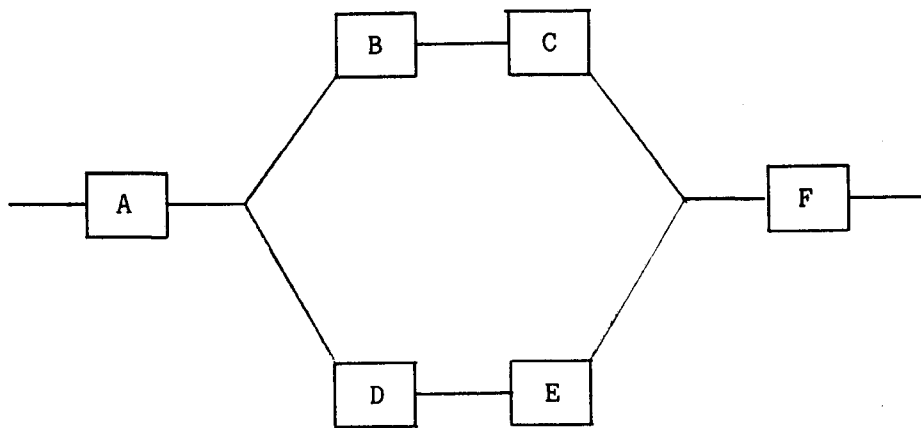
$n_1 = 40,$	$c_1 = 1,$	$r_1 = 4$
$n_2 = 40,$	$c_2 = 4,$	$r_2 = 6$
$n_3 = 40,$	$c_3 = 6,$	$r_3 = 8$

Katakan  $X_1, X_2, X_3$  masing-masing menandakan bilangan butir yang cacat di dalam sampel yang pertama, sampel yang kedua, dan sampel yang ketiga.

- (i) Dapatkan lengkung-lengkung cirian pengoperasian selepas sampel yang pertama dan sampel yang kedua.
- (ii) Dapatkan persamaan untuk lengkung cirian pengoperasian pada sampel yang ketiga.

(40/100)

6. (a) Yang berikut ialah satu sistem campuran:



Setiap komponen di dalam sistem ini mempunyai masahayat yang taburannya mengikut f.k.k. yang berikut:

$$f(x) = \frac{3}{5} (x-500)^2 \exp\left\{-\left(\frac{x-500}{5}\right)^3\right\}, \quad x > 500 .$$

Cari kebolehpercayaan sistem ini pada masa  $t = 510$ .

(30/100)

(b) Huraikan:

- (i) kebolehpercayaan suatu komponen dan kebolehpercayaan suatu sistem dan faktor-faktor yang berkaitan dengannya.
- (ii) kadar kegagalan dan kadar bahaya tentang sesuatu ciri kualiti penghasilan.

(30/100)

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- (c) X ialah pembolehubah rawak masahayat suatu komponen elektronik. Jika kadar bahayanya ialah  $h(x)$ ,

$$h(x) = \frac{1}{\sigma} \exp \left\{ \frac{x-\mu}{\sigma} \right\}, \quad x \geq 0,$$

$\mu$  dan  $\sigma$  ialah pemalar,  $\sigma > 0$ ,

- (i) tentukan f.k.k. untuk pembolehubah rawak X.  
(ii) Jika  $\sigma = 1$ ,  $\mu = 0$ , carikan kebolehpercayaan komponen itu pada masa  $x = \ln 50$ .

(40/100)

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**TABLE B Factors for Computing Central Lines and 3σ Control Limits for  $\bar{X}$ , s, and R, Charts**

Observations in Sample, n	Chart for Standard Deviations										Chart for Ranges									
	Factors for Central Line					Factors for Control Limits					Factors for Central Line					Factors for Control Limits				
	A	A <sub>2</sub>	A <sub>3</sub>	c <sub>4</sub>	1/c <sub>4</sub>	B <sub>3</sub>	B <sub>4</sub>	B <sub>5</sub>	B <sub>6</sub>	d <sub>2</sub>	1/d <sub>2</sub>	d <sub>1</sub>	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	D <sub>4</sub>				
2	2.121	1.880	2.659	0.7979	1.2533	0	3.267	0	2.606	1.128	0.8865	0.853	0	3.686	0	3.267				
3	1.732	1.023	1.954	0.8862	1.1284	0	2.568	0	2.276	1.693	0.5907	0.888	0	4.358	0	2.574				
4	1.500	0.729	1.628	0.9213	1.0854	0	2.266	0	2.088	2.059	0.4857	0.880	0	4.698	0	2.282				
5	1.342	0.577	1.427	0.9400	1.0638	0	2.089	0	1.964	2.326	0.4299	0.864	0	4.918	0	2.114				
6	1.225	0.483	1.287	0.9515	1.0510	0.030	1.970	0.029	1.874	2.534	0.3946	0.848	0	5.078	0	2.004				
7	1.134	0.419	1.182	0.9594	1.0423	0.118	1.882	0.113	1.806	2.704	0.3698	0.833	0.204	5.204	0.076	1.924				
8	1.061	0.373	1.099	0.9650	1.0363	0.185	1.815	0.179	1.751	2.847	0.3512	0.820	0.388	5.306	0.136	1.864				
9	1.000	0.337	1.032	0.9693	1.0317	0.239	1.761	0.232	1.707	2.970	0.3367	0.808	0.547	5.393	0.184	1.816				
10	0.949	0.308	0.975	0.9727	1.0281	0.284	1.716	0.276	1.669	3.078	0.3249	0.797	0.687	5.469	0.223	1.777				
11	0.905	0.285	0.927	0.9754	1.0252	0.321	1.679	0.313	1.637	3.173	0.3152	0.787	0.811	5.535	0.256	1.744				
12	0.866	0.266	0.886	0.9776	1.0229	0.354	1.646	0.346	1.610	3.258	0.3069	0.778	0.922	5.594	0.283	1.717				
13	0.832	0.249	0.850	0.9794	1.0210	0.382	1.618	0.374	1.585	3.336	0.2998	0.770	1.025	5.647	0.307	1.693				
14	0.802	0.235	0.817	0.9810	1.0194	0.406	1.594	0.399	1.563	3.407	0.2935	0.763	1.118	5.696	0.328	1.672				
15	0.775	0.223	0.789	0.9823	1.0180	0.428	1.572	0.421	1.544	3.472	0.2880	0.756	1.203	5.741	0.347	1.653				
16	0.750	0.212	0.763	0.9835	1.0168	0.448	1.552	0.440	1.526	3.532	0.2831	0.750	1.282	5.782	0.363	1.637				
17	0.728	0.203	0.739	0.9845	1.0157	0.466	1.534	0.458	1.511	3.588	0.2787	0.744	1.356	5.820	0.378	1.622				
18	0.707	0.194	0.718	0.9854	1.0148	0.482	1.518	0.475	1.496	3.640	0.2747	0.739	1.424	5.856	0.391	1.608				
19	0.688	0.187	0.698	0.9862	1.0140	0.497	1.503	0.490	1.483	3.689	0.2711	0.734	1.487	5.891	0.403	1.597				
20	0.671	0.180	0.680	0.9869	1.0133	0.510	1.490	0.504	1.470	3.735	0.2677	0.729	1.549	5.921	0.415	1.585				
21	0.655	0.173	0.663	0.9876	1.0126	0.523	1.477	0.516	1.459	3.778	0.2647	0.724	1.605	5.951	0.425	1.575				
22	0.640	0.167	0.647	0.9882	1.0119	0.534	1.466	0.528	1.448	3.819	0.2618	0.720	1.659	5.979	0.434	1.566				
23	0.626	0.162	0.633	0.9887	1.0114	0.545	1.455	0.539	1.438	3.858	0.2592	0.716	1.710	6.006	0.443	1.557				
24	0.612	0.157	0.619	0.9892	1.0109	0.555	1.445	0.549	1.429	3.895	0.2567	0.712	1.759	6.031	0.451	1.548				
25	0.600	0.155	0.606	0.9896	1.0105	0.565	1.435	0.559	1.420	3.931	0.2544	0.708	1.806	6.056	0.459	1.541				

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Table 6-5 Sample-Size Code Letters (Table I of MIL-STD 105D)

Lot or batch size		Special inspection levels				General inspection levels		
		S-1	S-2	S-3	S-4	I	II	III
		A	A	A	A	A	A	A
8	A	A	A	A	A	A	B	
to	A	A	A	A	A	A	C	
15	A	A	A	A	A	A	C	
to	A	A	A	A	A	A	D	
25	A	A	A	A	A	A	D	
to	A	A	A	A	A	A	E	
50	A	B	B	B	B	C	E	
to	B	B	B	B	B	C	F	
90	B	B	B	B	B	C	F	
to	B	B	B	B	B	C	G	
150	B	B	B	B	B	C	G	
to	B	B	B	B	B	C	H	
280	B	C	C	C	C	D	H	
to	B	C	C	C	C	D	J	
500	B	C	C	C	C	D	J	
to	C	C	C	C	C	D	K	
1200	C	C	C	C	C	D	K	
to	C	C	C	C	C	D	L	
3200	C	D	D	D	D	E	L	
to	C	D	D	D	D	E	M	
10000	C	D	D	D	D	E	M	
to	C	D	D	D	D	E	N	
35000	C	D	D	D	D	E	N	
to	C	D	D	D	D	E	P	
150000	D	E	E	E	E	F	P	
to	D	E	E	E	E	F	Q	
500000	D	E	E	E	E	F	Q	
to	D	E	E	E	E	F	R	
500001 and over	D	E	E	E	E	F	R	

Convert to the  
 special  
 inspection level

Small sample inspection levels of MIL-STD-90C

L-1 and L-2 ..... S-1  
 L-3 and L-4 ..... S-2  
 L-5 and L-6 ..... S-3  
 L-7 and L-8 ..... S-4

Note.

Table 6-6 Single Sampling Plans for Normal Inspection (Table II-A of MIL-STD 105D)\*

Sample size code letter	Acceptable Quality Levels (normal inspection)																										
	0.010	0.015	0.025	0.040	0.065	0.10	0.15	0.25	0.40	0.65	1.0	1.5	2.5	4.0	6.5	10	15	25	40	65	100	150	250	400	650	1000	
A	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
B	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
C	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
D	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
E	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
F	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
G	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
H	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
J	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
K	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
L	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
M	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
N	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
P	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
Q	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
R	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓



 Use first sampling plan below arrow. If sample size equals, or exceeds, lot or batch size, do 100 percent inspection.  
 Use first sampling plan above arrow.  
 Ac = Acceptance number.  
 Re = Rejection number.

Table 6-7 Single Sampling Plans for Tightened Inspection (Table II-B of MIL-STD 105D)\*

Sample size code letter	Sample size	Acceptable Quality Levels (tightened inspection)																									
		0.010	0.015	0.025	0.040	0.065	0.10	0.15	0.25	0.40	0.65	1.0	1.5	2.5	4.0	6.5	10	15	25	40	65	100	150	250	400	650	1000
A	2	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
B	3	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
C	5	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
D	8	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
E	13	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
F	20	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
G	32	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
H	50	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
J	80	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
K	125	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
L	200	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
M	315	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
N	500	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
P	800	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Q	1250	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
R	2000	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
S	3150	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

 Use first sampling plan below arrow. If sample size equals or exceeds lot or batch size, do 100 percent inspection.  
 Use first sampling plan above arrow.  
 Ac = Acceptance number.  
 Re = Rejection number.

Table 6-8 Single Sampling Plans for Reduced Inspection (Table II-C of MIL-STD 105D)<sup>a</sup>

Sample size code letter	Sample size	Acceptable Quality Levels (reduced inspection) <sup>b</sup>																					
		0.010	0.015	0.025	0.040	0.065	1.0	1.5	2.5	4.0	6.5	10	15	25	40	65	100	150	250	400	650	1000	
A	2	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re
B	2	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re
C	2	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re
D	3	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re
E	5	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re
F	8	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re
G	13	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re
H	20	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re
I	32	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re
K	50	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re
L	80	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re
M	125	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re
N	200	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re
P	315	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re
Q	500	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re
R	800	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re

= Use first sampling plan below arrow. If sample size equals or exceeds lot or batch size, do 100 percent inspection.  
 = Use first sampling plan above arrow.  
 Ac = Acceptance number.  
 Re = Rejection number.  
 ↑ = If the acceptance number has been exceeded, but the rejection number has not been reached, accept the lot, but reinstate normal inspection (see 10.1.6).

Table 6-9 Double Sampling Plans for Normal Inspection (Table III-A of MIL-STD 105D)\*

Sample size code letter	Sample size	Cumulative sample size	Acceptable Quality Levels (Normal inspection)																				
			0.010	0.015	0.025	0.040	0.065	1.0	1.5	2.5	4.0	6.5	10	15	25	40	65	100	150	250	400	650	1000
A			→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
B	First Second	2 4	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
C	First Second	3 6	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
D	First Second	5 10	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
E	First Second	8 16	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
F	First Second	13 26	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
G	First Second	20 40	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
H	First Second	32 64	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
J	First Second	50 100	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
K	First Second	80 160	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
L	First Second	125 250	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
M	First Second	200 400	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
N	First Second	315 630	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
P	First Second	500 1000	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Q	First Second	800 1600	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
R	First Second	1250 2500	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→

→ = Use first sampling plan below arrow. If sample size equals or exceeds lot or batch size do 100 percent inspection.  
 \* = Use first sampling plan above arrow.  
 Ac = Acceptance number.  
 Re = Rejection number.  
 • = Use corresponding single sample plan for alternately, use double sampling plan below, where available.

Table 6-10 Double Sampling Plans for Tightened Inspection (Table III-B of MIL-STD 105D)\*

Sample size code letter	Sample size	Number relative sample size	Acceptable Quality Levels (tightened inspection)																							
			0.010	0.015	0.025	0.040	0.065	0.10	0.15	0.25	0.40	0.65	1.0	1.5	2.5	4.0	6.5	100	150	250	400	650	1000			
			Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re		
A			→																							
B	2 First Second	2 4	→																							
C	3 First Second	3 6	→																							
D	5 First Second	5 10	→																							
E	8 First Second	8 16	→																							
F	13 First Second	13 26	→																							
G	20 First Second	20 40	→																							
H	32 First Second	32 64	→																							
J	50 First Second	50 100	→																							
K	80 First Second	80 160	→																							
L	125 First Second	125 250	→																							
M	200 First Second	200 400	→																							
N	315 First Second	315 630	→																							
P	500 First Second	500 1000	→																							
Q	800 First Second	800 1600	→																							
R	1250 First Second	1250 2500	→																							
S	2000 First Second	2000 4000	→																							

\* Use first sampling plan before arrow. If sample size equals or exceeds lot or batch size, do 100 percent inspection.  
 \* Use first sampling plan above arrow.  
 Ac - Acceptance number.  
 Re - Rejection number.  
 \* Use corresponding sample size for alternative, use double sampling plan below, where available.

Table 8-11 Double Sampling Plans for Reduced Inspection (Table III-C of MIL-STD 105D)\*

Sample use code letter	Sample size	Number of sample units	Acceptable Quality Level (reduced inspection) †																															
			0.010		0.015		0.025		0.040		0.065		0.10		0.15		0.25		0.40		0.65		1.00		1.50		2.50		4.00		6.50		10.00	
			Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re
A			→		→		→		→		→		→		→		→		→		→		→		→		→		→		→		→	
B			→		→		→		→		→		→		→		→		→		→		→		→		→		→		→		→	
C			→		→		→		→		→		→		→		→		→		→		→		→		→		→		→		→	
D	2 2	2 4	→		→		→		→		→		→		→		→		→		→		→		→		→		→		→		→	
E	3 3	3 6	→		→		→		→		→		→		→		→		→		→		→		→		→		→		→		→	
F	5 5	5 10	→		→		→		→		→		→		→		→		→		→		→		→		→		→		→		→	
G	8 8	8	→		→		→		→		→		→		→		→		→		→		→		→		→		→		→		→	
H	13 13	13 26	→		→		→		→		→		→		→		→		→		→		→		→		→		→		→		→	
I	20 20	20 40	→		→		→		→		→		→		→		→		→		→		→		→		→		→		→		→	
K	32 32	32 64	→		→		→		→		→		→		→		→		→		→		→		→		→		→		→		→	
L	50 50	50 100	→		→		→		→		→		→		→		→		→		→		→		→		→		→		→		→	
M	80 80	80 160	→		→		→		→		→		→		→		→		→		→		→		→		→		→		→		→	
N	125 125	125 250	→		→		→		→		→		→		→		→		→		→		→		→		→		→		→		→	
P	200 200	200 400	→		→		→		→		→		→		→		→		→		→		→		→		→		→		→		→	
Q	315 315	315 630	→		→		→		→		→		→		→		→		→		→		→		→		→		→		→		→	
R	500 500	500 1000	→		→		→		→		→		→		→		→		→		→		→		→		→		→		→		→	

\* Use first sampling plan below unless it sample size equals or exceeds lot or batch size, the 100 percent inspection.  
 † Use first sampling plan below unless, if sample size equals or exceeds lot or batch size, the 100 percent inspection.  
 ‡ Use first sampling plan above unless:  
 Ac = Acceptance number.  
 Re = Rejection number.  
 § Use corresponding sample size for alternative, use double sampling plan below, when available.  
 ¶ If, after the second sample, the acceptance number has been reached, but the rejection number has not been reached, accept the lot, but conduct normal inspection (see 10.1.4).