

1. Subject	Enrollment	Quota Initial	Final
Math.	355	8.4	8
Eng.	230	5.4	5
Chem.	120	2.8	2
Bio.	55	1.3	1
Total	760		16

$$\frac{760}{18} = 42.22$$

$$\text{Quota Initial } \frac{355}{42.22} = 8.408 \quad (\text{math})$$

Modified divisor be 40.

Math	355	$\frac{355}{40} = 8.875$	8
Eng	230	$\frac{230}{40} = 5.75$	5
Chem.	120	$\frac{120}{40} = 3$	3
Bio	55	$\frac{55}{40} = 1.3$	1
			17

divisor is 39

Math	$\frac{355}{39} = 9.1$	≈ 9
Eng	$\frac{230}{39} = 5.9$	≈ 5
Chem	$\frac{120}{39} = 3.07$	≈ 3
Bio	$\frac{55}{39} = 1.41$	≈ 1
		18

7. Counsellors = 13.

$$1715 + 7364 =$$

a) 13

School enrollment Counsellor Assign

Lowell 1715 3

Fairview 7364 10

$$\text{Total } \frac{9079}{13} = 698.4$$

$$\text{Lowell: } \frac{1715}{698.4} = 2.456 \approx 2$$

$$\text{Fairview: } \frac{7364}{698.4} = 10.544 \approx 10$$

The remaining 1 counsellor goes to fairview.

$$\text{New school: } \frac{2989}{698.4} = 4.2798$$

≈ 4 counsellors

$$\text{Total Counsellors} = 2 + 11 + 4 = 17$$

$$\frac{9079 + 2989}{17} = 709.88$$

$$\text{Lowell} = \frac{1715}{709.88} = 2.42 \approx 2$$

$$\text{Fairview} = \frac{7364}{709.88} = 10.37 \approx 10$$

$$\text{New school} = \frac{2989}{709.88} = 4.21 \approx 4$$

d) The above situation do not represent the apportionment issue. Hence none of these is the choice.

6. $F_0 = 1, F_1 = 1$

$F_n = F_{n-2} + F_{n-1} \quad n \geq 2$

$1+1=2, 1+2=3, 2+3=5, 3+5=8,$
 $5+8=13, 21+34=55, 89+144=$
 $233, 377.$

$\therefore$ the next 3 terms.

$144, 233, 377.$

9. At every octave lowered the frequency ~~2~~ is halved so the frequency 2 octaves lowered will be.

$\frac{330}{4} = 82.5 \text{ cps.}$

10. Hamilton's method.

Subject	Student	Standard Quota	Dec.	Extra
Math.	330	6.23	6	6
Eng.	265	5	5	5
Chem.	130	2.45	2+1	3
Bio.	70	1.32	1	1
Total	795		14	15

$795 \div 15 = 53.$

11. Perfect E exists at 660 Hz

$E = \frac{3}{2} \times 440 = 660.$

Tempering is the process of changing the interval size by increasing or reducing it.

Similar note is at $E = 659.26 \text{ Hz}$

This note is known as tempered frequency of E. The difference lies in the pitch.

The equal tempered system exhibits a constant frequency multiple between the notes of the chromatic scale.

Any key sounds can well be played.

State	Pop.	Standard Quota	Standard Quota
A	6000	4.29 4	4.71 4+1 5
B	6000	4.29 4	4.71 4+1 5
C	2000	1.43 1+1	1.57 1
Total		9	10

$14000 \div 10 = 1400$

a)

$\frac{14000}{11} = 1272.73$

b)

c) C lost a representative and both A and B gained a representative.

6. $F_0 = 1, F_1 = 1$

$F_n = F_{n-2} + F_{n-1} \quad n \geq 2$

$1+1=2, 1+2=3, 2+3=5, 3+5=8, 5+8=13, 21+34=55, 89+144=233, 377$

∴ the next 3 terms.

$144, 233, 377$

9. At every octave lowered the frequency ~~200~~ is halved so the frequency 2 octaves lowered will be.

$\frac{330}{4} = 82.5 \text{ cps.}$

10. Hamilton's method.

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Math.	330	6.23	6	6
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$795 \div 15 = 53.$

11. Perfect E exact at 660 Hz

$E = \frac{3}{2} \times 440 = 660.$

Tempering is the process of changing the interval size by increasing or reducing it.

Similar note is at $E = 659.26$

This note is known as tempered frequency of E. The difference lies in the pitch.

9. State Pop. Standard Quota

State	Pop.	Standard Quota	Standard Quota
A	6000	4.29	4
B	6000	4.29	4
C	2000	1.43	1
Total		9	10

$14000 \div 10 = 1400$

a)

$\frac{14000}{11} = 1272.73$

b)

The equal tempered system exhibits a constant frequency multiple between the notes of the chromatic scale.

11. Any key sounds can well played.

c) C lost a representative and both A and B gained a representative.

1. a).

b) let number of tulips be x
and number of years be y

$$x = 20 + 5y$$

3. a). $P_0 = 40$ $P_N = P_{N-1} + 15$

$$P_1 = P_0 + 15 = 40 + 15 = 55$$

$$P_2 = P_1 + 15 = 55 + 15 = 70$$

b) $P_N = 40 + 15N$

c) $P_{10} = 40 + (15 \times 10) = 190$

d) $P_N = 100,000$

$$40 + 15N = 100,000$$

$$15N = 100,000 - 40$$

$$15N = 99,960$$

$$N = 6664$$

5. a) $y = mx + c$

$$p = mw + c$$

$$p(w) = mw + c$$

$$p_0 = 3$$

$$p(0) = m(0) + c$$

$$p(0) = c \quad p(0) = 3$$

$$\Rightarrow c = 3$$

$$p(w) = mw + 3$$

$$w = 8, \quad p = 67$$

$$p(8) = 8m + 3$$

$$p(8) = 67$$

$$67 = 8m + 3$$

$$8m = 67 - 3$$

$$8m = 64$$

$$m = 8, \quad w = n$$

$$p(n) = 8n + 3$$

b) $p(n) = 187$

$$187 = 8n + 3$$

$$8n = 187 - 3$$

$$8n = 184$$

$$n = 23$$

$$n \approx 23, \text{ weeks}$$

7. $P = P_0 (1.09)^y$

a) $P = 200,000 + y \cdot 0.09P$

b) $P = P_0 (1.09)^y$

c) $P = P_0 (1.09)^y$

$$P = 200,000 (1.09)^y$$

$$P = 794,061.2$$

$$P \approx 794,061$$

d) $400,000 = 200,000 (1.09)^y$

$$(1.09)^y = \frac{400,000}{200,000}$$

$$(1.09)^y = 2$$

$$y \log 1.09 = \log 2$$

$$y = \frac{\log 2}{\log 1.09} = 8.043$$

$$2000 + 8$$

$$\approx 2008$$

$$9. P = P_0 (1.9)^y$$

$$P = 1700 (1.9)^{22}$$

$$P = \frac{2005}{1983} \cdot \frac{022}{022}$$

$$9. P(t) = P_0 e^{kt}$$

$$P(t) = 1700 e^{1.9 \times 22}$$

$$P(t) = 1700 e^{41.8}$$

$$P(t) = 2.4208 \times 10^{21} \text{ people.}$$

$$17. P_n = 4000 (1.04)^n$$

$$1.04 = 1 + 0.04$$

$$\therefore r = 0.04 \times 100 = 4\%$$

$\therefore$ It can be concluded that the population of the small town grows at a rate, of 4% per year (years after 2005).

$$19. V = 100 (1 - 0.05)^{20}$$

$$V = 100 (0.95)^{20}$$

$$V = .3585$$

$$V = \$35.85$$

35. The amount of energy radiated by an earthquake is a measure of the ability to cause damage to structures made by man. Each time the magnitude increases by 1, there is a tenfold increase in amplitude, representing 32 times amount of energy released.

$$36. a) \log_{10} 1000 = x$$

$$10^x = 1000$$

$$10^x = 10^3$$

$$x = 3$$

$$\therefore \log 1000 = 3$$

$$b) \log_{10} 10 = x$$

$$10^x = 10^1$$

$$x = 1$$

$$\log 10 = 1$$

$$c) \log_{10} 10,000,000 = x$$

$$10^x = 10^7$$

$$x = 7$$

$$\therefore \log 10,000,000 = 7$$

37.

53. Total votes = $11 + 5 + 10 + 3 = 29$
 Votes needed = $\frac{29}{2} = 14.5$

≈ 15 votes

Plurality: the number of votes cast for a candidate who receives more than any other but does not receive an absolute majority.

b) Atkins votes = $11 + 3 = 14$
 Cortez votes = 5
 Burke votes = 10

Winner: Atkins.

Voters	11	5	10	3
1st	A	C	B	A
2nd	C	B	C	B
3rd	B	A	A	C

Voters	11	5	10	3
1st (3 points)	A: 33	C: 15	B: 30	A: 9
2nd (2 points)	C: 22	B: 10	C: 20	B: 6
3rd (1 point)	B: 11	A: 5	A: 10	C: 3

Atkins: $33 + 9 + 5 + 10 = 57$

Burke: $30 + 10 + 6 + 11 = 57$

Cortez: $15 + 22 + 20 + 3 = 60$

Winner: Cortez.

d) Majority = $\frac{29}{2} = 14.5 \approx 15$
 Atkins votes = $11 + 3 = 14$
 Cortez votes = 5
 Burke votes = 10

Eliminating Cortez

Voters	11	5	10	3
1st	Atkins	Burke	Burke	Atkins
2nd	Burke	Atkins	Atkins	Burke

Atkins votes = $11 + 3 = 14$
 Burke votes = $5 + 10 = 15$

Winner: Burke.

57. a) votes = 953

Candidates = 7

$\frac{953}{7} = 136.143 \approx 137$

Smallest number of votes that that a plurality candidate have = 137

b) Candidates = 8

$\frac{953}{8} = 119.125 \approx 120$

Smallest number of votes that a plurality candidate have = 120.

55.

	Preference 1	Preference 2	Preference 3
A	2	5	5
B	4	5	3
C	6	2	4

Winner B (high score)

a) No. of voters = $8 + 9 + 11 + 7 + 7 + 9$
 $= 47$

b) Majority votes = $\frac{47}{2}$ (round up)
 $= \text{round up}(23.5)$
 $= 24 \text{ votes.}$

c) A $\rightarrow 9 + 7 = 16 \text{ votes}$

B $\rightarrow 8 + 7 = 15 \text{ votes}$

C $\rightarrow 5 \text{ votes}$

D $\rightarrow 11 \text{ votes}$

$\therefore$ Maximum = A (16 votes)

d)

No. of votes	8	9	11	7
1 st choice	B	A	D	A
2 nd choice	C	D	B	B
3 rd choice	A	C	C	D
4 th choice	D	B	A	C

Relative points	8	9	11	7
1-000	8-0	9-0	11-0	7-0
0-750	6-0	6-8	8-3	5-3
0-500	4-0	4-5	5-5	3-5
0-250	2-0	2-3	2-8	1-8

Score A $4-0 + 9-0 + 2-8 + 7-0$

Score B $8-0 + 2-3 + 8-3 + 5-3$

Score C $6-0 + 4-5 + 5-5 + 1-8$

Score D $2-0 + 6-8 + 11-0 + 3-5$

51.

	Preference 1	Preference 2	Preference 3
A	2	5	5
B	4	5	3
C	6	2	4

59. No. of voters 8 7 6

1st choice A C B

2nd choice B B C

3rd choice C A A

Total = $8 + 7 + 6 = 21$

A vs B

Ignore candidate. Compare number of votes for best choice between A and B.

A vs B 8 vs 13

B vs C (ignore A) 14 vs 7

A vs C (ignore B) 8 vs 13

Hence B Condorcet candidate and winner.

Winner B (high score).

Q1. If x means rejection.

$$A = 6 + 3 + 2 = 11 \text{ votes.}$$

$$B = 7 + 4 + 2 = 13 \text{ votes}$$

$$C = 8 + 4 + 5 = 17 \text{ votes.}$$

$$D = 7 + 3 + 5 = 15 \text{ votes}$$

C Wins

If x means approval.

$$A = 8 + 7 + 4 + 5 = 24 \text{ votes}$$

$$B = 8 + 6 + 3 + 5 = 22 \text{ votes}$$

$$C = 7 + 6 + 3 + 2 = 18 \text{ votes}$$

$$D = 8 + 6 + 4 + 2 = 20 \text{ votes.}$$

A will win.

1a) $a_0 = 20$

every year 5 more.

Let a_n be the no. in n^{th} yr.

$$a_n = a_{n-1} + 5$$

5 more.

$$a_n = a_{n-1} + 5 \quad a_0 = 20$$

b) $a_1 = a_0 + 5 = 20 + 5 = 25$

$$a_2 = a_1 + 5 = 25 + 5 = 30$$

$$\therefore 20, 25, 30, 35, \dots \Rightarrow a_n = 20 + (n-1)5$$

$$\Rightarrow a_n = 5n + 15$$

$$\Rightarrow a_n = a_{n-1} + 5 \quad \text{A.P. } a_0, a_0 + 5, \dots$$

$$a_n - a_{n-1} = 5 \quad a_0 = 20$$

$$d = 25 - 20 = 5$$

$$n^{\text{th}} \text{ term } a_n = a + (n-1)d$$

$$a_n = 20 + (n-1)5$$

$$a_n = 5n + 15$$

$$a_n = 5(n+3)$$

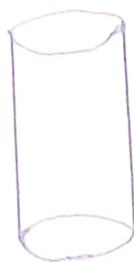
37.

Yes, these earthquakes have occurred with close proximity with the San Andreas Fault

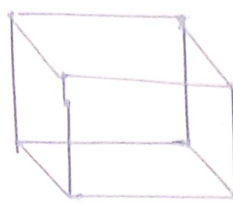
The 28/06/1994 Landers earthquake brought the San Andreas fault closure to failure near San Bernardino. Stress also increased on the San Jacinto fault near San Bernardino and on the southeast of Palm Spring at San Andreas.

However, there has been drop of stress on the San Andreas north of Los Angeles. This has led to the delay of a major earthquake for two to ten years

1.



Cylinder.



Rectangular box.



Triangular prism.

2.

In an octave there are 13 notes.

A scale is composed of 8 notes among them 3rd and 5th play a crucial role. They are foundation of basic chord. Now 5th note is dominant in musical theory, which is 8th note among the 13 notes.

$\frac{13}{8} = 1.625$, which is approximately the golden ratio.

Standard deviation used to make the greatest musical instrument ever

3. Musician Debussy used golden ratio and Fibonacci ~~members~~ numbers to the structure of the music.

The oratone series is based on the golden ratio.

Divide perfect 5th by an octave ($\frac{8}{13}$), perfect 4th by a major 6th ($\frac{6}{10}$), major 3rd by perfect 5th ($\frac{5}{8}$).

5. Golden rectangle is a rectangle whose side lengths are in a golden ratio, $1 : \frac{1+\sqrt{5}}{2}$, which is $1 : \phi$ where $\phi \approx 1.618$

Golden rectangle appears in nature and is used by humans in both art and architecture. The golden ratio can be noticed in the way trees grow, in proportions of both human and animal bodies and in frequency of rabbit births.