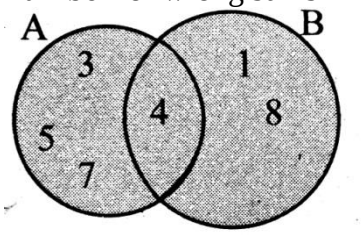
	Subject – Algebra	Model Answer Set – 1

Q.1 A) Solve the following questions. (Any four)

1. Number of questions attempted = x + y
   Number of sums correct = + y – 2z
   Number of wrong sums = − +
   x + 2z
   Number of wrong sums = x + 2z

2. 

3. Classmark = $\frac{\text{Lower class limit+Upper class limit}}{2}$
   $= \frac{35+40}{2} = \frac{75}{2}$
   = 37.2

4. Adding the given equations,
   2x – 5y = 1
   5x + 5y = 20
   7x = 21
   ∴ x = $\frac{21}{7}$ ...[Dividing both sides by 7]
   ∴ x = 3

5. $\sqrt{52} = \sqrt{4 \times 13} = 2\sqrt{13}$
   ∴ $\sqrt{52}$ and $5\sqrt{13}$ are like surds.

6. $p(y) = 2y^3 - 6y^2 - 5y + 7$
   ∴ $p(2) = 2(2)^3 - 6(2)^2 - 5(2) + 7$
   = 2 × 8 – 6 × 4 – 10 + 7
   = 16 – 24 – 10 + 7
   ∴ p(2) = −11

B) Solve the following questions. (Any two)

1. $\frac{1}{\sqrt{7}+\sqrt{2}} = \frac{1}{(\sqrt{7}+\sqrt{2})} \times \frac{(\sqrt{7}-\sqrt{2})}{(\sqrt{7}-\sqrt{2})}$
   ...[Multiplying the numerator and denominator by $\sqrt{7} - \sqrt{2}$]
   $= \frac{\sqrt{7}-\sqrt{2}}{(\sqrt{7})^2-(\sqrt{7})^2}$ ..[∵ $(a - b)(a + b) = a^2 - b^2$
   $= \frac{\sqrt{7}-\sqrt{2}}{7-2}$
   $= \frac{\sqrt{7}-\sqrt{2}}{5}$

2. Let the persons required to build a house in 6 days be x.
   Days required to build a house and number of persons are in inverse proportion.
   ∴ 6 × x = 8 × 3
   ∴ 6x = 24
   ∴ x = 4
   ∴ 4 persons are required to build the house in 6 days.

3. Let 'x' be the amount Alka receives every month. 90% she spends. Means if 100/- Alka gets every month, 90/- She spends and saves 100 – 90 = Rs. 10
   Thus
   $\frac{\text{10 Rs. saving}}{\text{100 Rs.monthly}} = \frac{\text{120 Rs.total saving}}{x}$
   ∴ x = $\frac{100 \times 120}{10}$ = Rs. 1200
   Alka gets Rs. 1200 per month.

Q.2 A) Choose the correct alternative.

1. b 2. b 3. b 4. b

B) Solve the following questions. (Any two)

1.

Class Time (hrs.)	Class mark x_i	Frequency (No. of students) f_i	Frequency × Class mark $f_i x_i$
0 – 2	1	7	7
2 – 4	3	18	54
4 – 6	5	12	60
6 – 8	7	10	70
8 – 10	9	3	27
Total	-	$\Sigma f_i = 50$	$\Sigma f_i x_i$ = 218

Mean = $\bar{X} = \frac{\Sigma f_i x_i}{\Sigma f_i} = \frac{218}{50} = 4.36$
∴ The mean of the time spent by the students for their studies is 4.36 hours.

2. $m^2 - 11 = 0$
   ∴ $m^2 - (\sqrt{11})^2 = 0$
   ∴ $(m + \sqrt{11})(m - \sqrt{11}) = 0$
   ∴ $m + \sqrt{11} = 0$ or $m - \sqrt{11} = 0$
   ∴ $m = -\sqrt{11}$ or $m = \sqrt{11}$

3. The number of seats arranged row-wise are as follows : 20, 22, 24, ...
   The above sequence is an A.P.
   ∴ a = 20, d = 22 – 20 = 2, n = 27
   $t_n = a + (n - 1)d$

$\therefore t_{15} = 20 + (15 - 1)2$

$= 20 + 14 \times 2$

$= 20 + 28 = 48$

$\therefore t_{15} = 48$

$\therefore$ the number of seats in the 15th row is 48.

Q.3 A) Complete the following activities. (Any two)

1. $5x + 3y = 9$ ...(i)

$2x - 3y = 12$ ...(ii)

Add equations (i) and (ii).

$5x + 3y = 9$

$2x - 3y = 12$

$\boxed{7}x = \boxed{21}$

$\therefore x = \frac{\boxed{21}}{\boxed{7}}$

$\therefore x = \boxed{3}$

Put $x = 3$ in equation (i).

$\therefore 5 \times \boxed{3} + 3y = 9$

$\therefore 3y = 9 - \boxed{15}$

$\therefore 3y = \boxed{-6}$

$\therefore y = \frac{\boxed{-6}}{3}$

$\therefore y = \boxed{-2}$

$\therefore$ Solution is $(x, y) = (\boxed{3}, \boxed{-2})$

2.

No.	Services	SAC	GST rate
(a)	Railway transport services	996511	**5%**
(b)	Airways services (economy)	996411	**5%**
(c)	Currency exchange services	997157	**18%**
(d)	Brokerage services	997152	**18%**

3. a) $t_1 = 192$, $t_2 = \frac{196}{-2} = \frac{t_1}{-2}$,

$t_3 = 48 = \frac{-96}{-2} = \frac{t_2}{-2}$

$\therefore t_n = \frac{t_{n-1}}{-2}$

$\therefore t_5 = \frac{t_4}{-2} = \frac{-24}{-1} = \underline{\mathbf{12}}$

$t_6 = \frac{t_5}{-2} = \frac{12}{-2} = \underline{\mathbf{-6}}$

$\therefore 192, -96, 48, -24, \underline{\mathbf{12}}, \underline{\mathbf{-6}}$

b) $t_1 = \frac{1}{2}$, $t_2 = \frac{1}{6} = \frac{1}{3\times 2} = \frac{1}{3\times t_2}$

$t_3 = \frac{1}{18} = \frac{1}{3\times 6} = \frac{1}{3\times t_2}$

$\therefore t_n = \frac{1}{3(t_n - 1)}$

$\therefore t_5 = \frac{1}{3t_4} = \frac{1}{3\times 54} = \mathbf{\frac{1}{162}}$

$t_6 = \frac{1}{3t_5} = \frac{1}{3\times 162} = \mathbf{\frac{1}{486}}$

$\therefore \frac{1}{2}, \frac{1}{6}, \frac{1}{18}, \frac{1}{54}, \mathbf{\frac{1}{162}}, \mathbf{\frac{1}{486}}$

B) Solve the following questions. (Any two)

1.

2. Here, MV = Rs. 200, Brokerage = 0.3%

Brokerage = 0.3 % of MV

$= \frac{0.3}{100} \times 200$ = Rs. 0.6

$\therefore$ Purchase value of the share = MV + Brokerage

= 200 + 0.6 = Rs. 200.60

$\therefore$ Purchase value of the share is Rs. 200.60

3. Let the first term of the A.P. be a and the common difference be d.

According to the given condition,

$t_{17} = t_{10} + 7$

$\therefore a + (17 - 1)d = a + (10 - 1)d + 7$

....[$\because t_n = a + (n - 1)d$]

$\therefore a + 16d = a + 9d + 7$

$\therefore a + 16d - a - 9d = 7$

$\therefore 7d = 7$

$\therefore d = \frac{7}{7} = 1$

$\therefore$ The common difference is 1.

Q.4 Solve the following questions. (Any three)

1. Sample space (S) = [0, 1, 2, 3, 4, 5}

$\therefore n(S) = 6$

i. Let A be the event that the card drawn shows a natural number.

$\therefore A = \{1, 2, 3, 4, 5\}$

$\therefore n(A) = 5$

$\therefore P(A) = \frac{n(A)}{n(S)}$

$\therefore P(A) = \frac{5}{6}$

ii. Let B be the event that the card drawn shows a number less than 1.

$\therefore B = \{0\}$

$\therefore$ n(B) = 1

$\therefore$ P(B) = $\frac{n(B)}{n(S)}$

$\therefore$ P(B) = $\frac{1}{6}$

iii. Let C be the event that the card drawn shows a whole number.

$\therefore$ C = {0, 1, 2, 3, 4, 5}

$\therefore$ n(C) = 6

$\therefore$ P(C) = $\frac{n(C)}{n(S)} = \frac{6}{6}$

$\therefore$ P(C) = 1

2. Here, FV = Rs. 100, MV = Rs. 120

Dividend = 7%, Number of shares = 150

$\therefore$ Sum invested = Number of shares $\times$ MV

= 150 $\times$ 120 = Rs. 18000

Dividend per share = 7% of FV

= $\frac{7}{100} \times 100$ = Rs. 7

$\therefore$ Total dividend of 150 shares = 150 $\times$ 7

= Rs. 1050

Now, rate of return = $\frac{\text{Total dividend}}{\text{Sum invested}} \times 100$

= $\frac{1050}{18000} \times 100$ = 5.83%

$\therefore$ Rate of return on investment is 5.83%

3. i. Class 60 – 70 ii. 20 – 30 and 90 – 100

iii. Class mark 55 iv. Lower class limit 80 and upper class limit 90 v) 15

vi) Class 80 – 90

4. The given simultaneous equations are

$\frac{2}{x} + \frac{2}{3y} = \frac{1}{6}$ ...(i)

$\frac{3}{x} + \frac{2}{y} = 0$ .....(ii)

Let $\frac{1}{x} = p$ and $\frac{1}{y} = q$

$\therefore$ Equations (i) and (ii) become

$2p + \frac{2}{3}q = \frac{1}{6}$

$\therefore$ $6p + 2q = \frac{1}{2}$ ....(iii) [Multiplying both sides by 3]

$3p + 2q = 0$ ...(iv)

Subtracting equation (iv) from (iii), we get

$6p + 2q = \frac{1}{2}$

$3p + 2q = 0$

$3p = \frac{1}{2}$

$\therefore$ $p = \frac{1}{6}$

Substituting $p = \frac{1}{6}$ in equation (iv), we get

$3\left(\frac{1}{6}\right) + 2q = 0$

$\therefore$ $\frac{1}{2} + 2q = 0$

$\therefore$ $2q = -\frac{1}{2}$ $\therefore$ $q = -\frac{1}{4}$

$\therefore$ $(p, q) = \left(\frac{1}{6}, \frac{1}{4}\right)$

Resubstituting the value of p and q, we get

$\frac{1}{6} = \frac{1}{x}$ and $-\frac{1}{4} = \frac{1}{y}$

$\therefore$ x = 6 and y = -4

$\therefore$ (x, y) = $(6, -4)$ is the solution of the given simultaneous equations.

Q.5 Solve the following questions. (Any one)

1. Total number of marbles = 24

$\therefore$ n(S) = 24

Let the number of blue marbles be x.

$\therefore$ The number of green marbles = 24 – x

Let A be the event of getting green marbles.

$\therefore$ n(A) = 24-x

$\therefore$ P(A) = $\frac{n(A)}{n(S)} = \frac{24-x}{24}$

According to the given condition,

P(A) = $\frac{2}{3}$

$\therefore$ $\frac{24-x}{24} = \frac{2}{3}$

$\therefore$ 24 – x = 16

$\therefore$ x = 8

$\therefore$ The number of blue marbles in the jar is 8.

2. Difference between the perimeters of two squares is 8 cm.

$\therefore$ Difference between their sides is 2 cm.

Let the side of the smaller square be x cm.

$\therefore$ The side of the bigger square is (x + 2) cm.

Area of square = $(\text{side})^2$

$\therefore$ Area of smaller square = x^2 cm^2

Area of bigger square = $(x + 2)^2$ cm^2

According to the given condition,

$x^2 + (x + 2)^2 = 244$

$\therefore$ $x^2 + x^2 + 4x + 4 = 244$

$\therefore$ $2x^2 + 4x - 240 = 0$

$\therefore$ $x^2 + 2x - 120 = 0$

$\therefore$ $x^2 + 12x - 10x - 120 = 0$

$\therefore$ x(x + 12) – 10(x + 12) = 0

$\therefore$ (x + 12) (x – 10) = 0

$\therefore$ x + 12 = 0 or x – 10 = 0

$\therefore$ x = -12 or x = 10

But, $x \neq -12$ as the side of a square cannot be negative.

$\therefore$ x = 10

$\therefore$ Side of smaller square is 10 cm and side of bigger square is 12 cm.

As diagonal of a square = $\sqrt{2} \times$ side

$\therefore$ Length of the diagonal of smaller square is $10\sqrt{2}$ cm and length of the diagonal of bigger square is 12 $\sqrt{2}$ cm.

Ratio of the diagonals = $10\sqrt{2} : 12\sqrt{2} = 5 : 6$

$\therefore$ Ratio of their diagonals is 5 : 6.

Q.6 Solve the following questions. (Any one)

1. Let the numerator of the fraction be x and the denominator be y.

$\therefore$ Fraction = $\frac{x}{y}$

According to the first condition,

$y = 2x + 4$

$\therefore 2x - y = -4$ .....(i)

According to the second condition,

$(y - 6) = 12(x - 6)$

$\therefore y - 6 = 12x - 72$

$\therefore 12x - y = 72 - 6$

$\therefore 12x - y = 66$ ....(ii)

Subtracting equation (i) from (ii), we get

$12x - y = 66$

$2x - y = -4$

$- \quad + \quad +$

$10x \quad = 70$

$\therefore x = \frac{70}{10} = 7$

Substituting x = 7 in equation (i), we get

$2(7) - y = -4$

$\therefore 14 - y = -4$

$\therefore 14 + 4 = y$

$\therefore y = 18$

$\therefore$ Fraction = $\frac{x}{y} = \frac{7}{18}$

$\therefore$ The required fraction is $\frac{7}{18}$

2. $kx(x - 2) + 6 = 0$

$\therefore kx^2 - 2kx + 6 = 0$

Comparing the above equation with $ax^2 + bx + c = 0$, we get

$a = k, b = -2k, c = 6$

$\therefore \Delta = b^2 - 4ac$

$= (-2k)^2 - 4 \times k \times 6$

$= 4k^2 - 24k$

$= \Delta\ 4k\ (k - 6)$

Since, the roots are real and equal.

$\therefore \Delta = 0$

$\therefore 4k\ (k - 6) = 0$

$\therefore k(k - 6) = 0$

$\therefore k = 0$ or $k - 6 = 0$

But, if k = 0 then quadratic coefficient becomes zero.

$\therefore k \neq 0$

$\therefore k = 6$