

Maharashtra State Board
Class X Mathematics - Algebra
Board Paper – 2015 Solution

Note: (1) All questions are compulsory.
(2) Use of calculator is not allowed.

1.

i. Given,

$$t_1 = 1, t_2 = 3, t_3 = 5, t_4 = 7$$

To find: t_5 and t_6

The difference between two consecutive terms is 2.

$$t_5 = t_4 + 2 = 7 + 2 = 9$$

$$t_6 = t_5 + 2 = 9 + 2 = 11.$$

The next two terms are 9 and 11.

ii. $t_n = 4n$

$$\Rightarrow t_1 = 4(1) = 4$$

iii. Here, $a = 1$ and $b = 3$.

iv. The equation: $2x + 3y = 15$

v. Given, Selling Price = Rs. 23 and Marked Price = 25

Selling Price = Marked Price – Discount

$$\therefore \text{Discount} = \text{Marked Price} - \text{Selling Price} = \text{Rs. } 25 - \text{Rs. } 23 = \text{Rs. } 2$$

Thus, discount is Rs. 2.

vi. Amount of tax paid by Mohan = Rs. 1000

Amount of tax recovered by Mohan = Rs. 1200

Thus, the M-VAT payable by Mohan = Rs. 1200 - Rs. 1000 = Rs. 200

2.

i. Deshpande's annual income = Rs. 2,60,000

Period of financial year = 2012 - 2013

Observe the following table for the financial year 2012 - 2013.

Income Range	General (non-senior citizens) Category	Women (Below 60 years of age) (This category is <u>abolished</u> from this year and is thus is same as that of General Category)	Senior Citizens (Men and Women above 60 years of age), but below 80 years	Very Senior Citizens (Men and Women above 80 years of age)
Upto Rs. 2,00,000	Nil	Nil	Nil	Nil
Rs. 2,00,001 to Rs. 2,50,000	10%	10%	Nil	Nil
Rs. 2,50,001 to Rs. 5,00,000	10%	10%	10%	Nil
Rs. 5,00,001 to Rs. 10,00,000	20%	20%	20%	20%
Above Rs. 10,00,000	30%	30%	30%	30%

Since the range of income in the above table shows that there is no interest for the amount up to Rs. 2, 00, 000,

$$\begin{aligned}\text{Taxable income} &= \text{Annual income} - \text{Upper limit of slab} \\ &= \text{Rs. } 2, 60, 000 - \text{Rs. } 2, 00, 000 \\ &= \text{Rs. } 60, 000\end{aligned}$$

ii. Price of shirt and trouser together = Rs. 500

Rebate = 11%

$$\text{Amount of rebate} = \frac{11}{100} \times 500 = \text{Rs. } 55$$

iii. Given A.P. is 2, 5, 8, 11,

$$a = t_1 = 2, t_2 = 5, t_3 = 8, \dots\dots$$

$$\text{Common difference, } d = t_2 - t_1 = 5 - 2 = 3$$

$$\text{Now, } t_n = a + (n - 1)d$$

Thus, 9th term,

$$t_9 = 2 + (9 - 1)3$$

$$= 2 + 8 \times 3$$

$$= 2 + 24$$

$$= 26$$

iv. Equation is $m^2 + 4m + 3 = 0$
 Substituting $m = 2$ in the given equation, we get
 $(2)^2 + 4 \times 2 + 3$
 $= 4 + 8 + 3$
 $= 15$
 $\neq 0$
 Hence, $m = 2$ is not a root of quadratic equation.

v. $3m + 4n = 7$ (1)
 $4m + 3n = 14$ (2)
 Adding (1) and (2), we get

$$\begin{aligned} 3m + 4n &= 7 \\ \underline{4m + 3n} &= \underline{14} \\ 7m + 7n &= 21 \\ \therefore 7(m + n) &= 21 \\ \therefore m + n &= \frac{21}{7} \\ \therefore m + n &= 3 \end{aligned}$$

vi. Given: $p \propto q$, $p = 14$ and $q = 7$
 Thus, $p = kq$

$$\begin{aligned} \therefore k &= \frac{p}{q} \\ \therefore k &= \frac{14}{7} \\ \therefore k &= 2 \end{aligned}$$

3.

i. $x^2 + 9x + 8 = 0$
 $\Rightarrow x^2 + 8x + x + 8 = 0$
 $\Rightarrow x(x + 8) + 1(x + 8) = 0$
 $\Rightarrow (x + 8)(x + 1) = 0$
 $\therefore x + 8 = 0 \Rightarrow x = -8$
 $\therefore x + 1 = 0 \Rightarrow x = -1$

ii.

$$(a) x \propto \frac{1}{y}$$

$$\Rightarrow x = \frac{k}{y}$$

$$\Rightarrow 7 = \frac{k}{9}$$

$$\Rightarrow k = 7 \times 9$$

$$\therefore k = 63$$

$$(b) \text{ The equation of variation is } x = \frac{63}{y}$$

$$\therefore xy = 63$$

$$(c) \text{ Given } x = 9$$

$$x = \frac{63}{y}$$

$$\Rightarrow y = \frac{63}{x}$$

$$\Rightarrow y = \frac{63}{9}$$

$$\therefore y = 7$$

iii. List price of the oven = Rs. 25,000

Discount = 5% of Rs.25000

$$= \frac{5}{100} \times 25000$$

$$= \text{Rs.}1250$$

CST Paid

= 2% of Rs. 25,000

$$= \frac{2}{100} \times 25000$$

$$= \text{Rs.}500$$

Amount paid by Vimla

$$= 25000 - 1250 + 500$$

$$= \text{Rs. } 24,250$$

iv. Cost of 2 towels = $2 \times 90 = \text{Rs } 180$

Cost of 2 shirts = $2 \times 220 = \text{Rs } 440$

Cost of 4 trousers = $2 \times 290 = \text{Rs } 580$

Total amount = $180 + 440 + 580 = \text{Rs } 1200$

Rebate offered by Swarajya Khadi Bhandar

= 30% of total amount

$$= \frac{30}{100} \times 1200$$

$$= \text{Rs. } 360$$

Amount paid by Mr. Kamath = $1200 - 360$

$$= \text{Rs. } 840$$

v. $a = 4,$

$d = t_2 - t_1 = 8 - 4 = 4,$ where t_2, t_1 are the 1st and 2nd term of the A.P.

$$S_{15} = \frac{n}{2}[2a + (n-1)d]$$

$$= \frac{15}{2}[2 \times 4 + (15-1) \times 4]$$

$$= \frac{15}{2} \times [8 + 56]$$

$$= \frac{15}{2} \times 64$$

$$= 480$$

4.

i. Let x and $x+2$ be the two consecutive odd natural numbers.

It is given that the product of these two consecutive odd natural numbers is 99.

$$\therefore (x) \times (x+2) = 99$$

$$x^2 + 2x = 99$$

$$x^2 + 2x - 99 = 0$$

$$x^2 + 11x - 9x - 99 = 0$$

$$x(x+11) - 9(x+11) = 0$$

$$(x+11)(x-9) = 0$$

$$\therefore x = -11 \text{ or } x = 9$$

But x is a natural number, so it can not be negative.

$$\therefore x = 9$$

another number is $= x + 2 = 9 + 2 = 11.$

\therefore The numbers are 9 and 11.

ii.

The electric current (I) flowing through the circuit is directly proportional to the potential difference (V) in it.

$$\therefore V \propto I$$

$$\therefore V = IR \dots\dots(1)$$

(Where R is the constant of proportionality, the resistance)

Substitute $V = 60$ and $I = 1.5$ in equation (1) we get

$$60 = (1.5)R$$

$$\therefore R = \frac{60}{1.5} = 40\Omega$$

Substitute $R = 40\Omega$ in equation (1) we get

$$V = 40I \dots\dots(2)$$

Substitute $V = 100$ in equation (2) we get

$$100 = 40I$$

$$\therefore I = \frac{100}{40} = 2.5 \text{ ampere}$$

When the potential difference is 100 volts then the electric current flowing through the circuit is 2.5 ampere.

iii. For wholesaler:

Purchase price = Rs. 1,50,000

Selling price = Rs. 1,80,000

Tax paid on purchase price

= 12.5% of Rs. 1,50,000

$$= \frac{12.5}{100} \times 150000 = \text{Rs. } 18,750$$

Tax charged on sale price

= 12.5% of Rs. 1,80,000

$$= \frac{12.5}{100} \times 180000 = \text{Rs. } 22,500$$

\therefore Vat paid by wholesaler

= Tax charged on sale price – Tax paid on purchase price

= Rs. 22,500 – Rs. 18,750 = Rs. 3,750

For retailer:

Purchase price = Rs. 1,80,000

Selling price = Rs. 2,20,000

Tax paid on purchase price

= 12.5% of Rs. 1,80,000

$$= \frac{12.5}{100} \times 180000 = \text{Rs. } 22,500$$

Tax charged on selling price

= 12.5% of Rs. 2,20,000

$$= \frac{12.5}{100} \times 220000 = \text{Rs. } 27,500$$

∴ Vat paid by retailer

= Tax charged on selling price – Tax paid on purchase price

= Rs. 27,500 – Rs. 22,500 = Rs. 5,000

5.

- i. Devendra invested Rs.1000 in the first year and Rs. 1400 in the second year.

Again in the fourth year he invested Rs.1800

Thus his investment in each year forms an A.P.

Consider the A.P., 1000, 1400, 1800, ...

Here $a = 1000$ and common difference = $1400 - 1000 = 1800 - 1400 = 400$

Sum of total amount Devendra invested = S_n

$$S_n = \frac{n}{2} [2a + (n-1)d]$$

$$\Rightarrow S_{12} = \frac{12}{2} [2 \times 1000 + (12-1) \times 400]$$

$$\Rightarrow S_{12} = 6 [2000 + 11 \times 400]$$

$$\Rightarrow S_{12} = 6 [2000 + 4400]$$

$$\Rightarrow S_{12} = \text{Rs. } 38400$$

Thus the total amount he invested in 12 years is Rs. 38400

- ii. Let 'x' be the present age of Reshma.

Given that the sum of the present ages of Reshma and her mother is 60 years.

Thus, Reshma's mother's present age is $60 - x$.

Five years ago, Reshma's age = $x - 5$

And her mother's age would be = $60 - x - 5$

Given that five years ago, her mother's age was 4 times age of Reshma.

Thus, we have,

$$60 - x - 5 = 4(x - 5)$$

$$\Rightarrow 55 - x = 4x - 20$$

$$\Rightarrow 55 + 20 = 4x + x$$

$$\Rightarrow 75 = 5x$$

$$\Rightarrow x = \frac{75}{5}$$

$$\Rightarrow x = 15$$

Thus, the present age of Reshma is 15 years and her mother's is $60 - 15 = 45$

iii. Cost of artificial jewellery = Rs. 850

Down payment = Rs. 600

Money paid in installment = Rs. 270

Total money paid in installment scheme = Rs. 600 + Rs. 270 = Rs. 870

Interest amount = Rs. 870 - Rs. 850 = Rs. 20

$$\text{Interest} = \frac{\text{Principal} \times \text{Time} \times \text{Rate of interest}}{100}$$

Substituting, Interest = Rs. 20, Time = $\frac{6}{12}$ year and

Principal = Rs. 850, we have,

$$\Rightarrow 20 = \frac{850 \times 6 \times R}{12 \times 100}$$

$$\Rightarrow 20 = \frac{850 \times R}{2 \times 100}$$

$$\Rightarrow 2 = \frac{85 \times R}{2 \times 100}$$

$$\Rightarrow 400 = 85 \times R$$

$$\Rightarrow R = \frac{400}{85} = 4.71\%$$