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| <b>A.P. SET CODE</b> |
| <b>A</b>             |

# MT - W

2017 \_\_\_ 1100 - **MT - W** - GENERAL MATHEMATICS (71)ALGEBRA- SET - A (E)

**Time : 2 Hours**

**Preliminary Model Answer Paper**

**Max. Marks : 40**

|              |  |               |
|--------------|--|---------------|
| <b>A.1.</b>  | <b>Solve ANY FIVE of the following :</b>   |               |
| (i)          | (a) 6, 9, 12, 15, .....<br>(b) 2, 5, 8, 11, .....<br>(c) 7, 10, 13, 16, .....<br>(d) 100, 103, 106, 109, .....   | <b>1</b>      |
| (ii)         | $\frac{1}{x^2} + x = 10$<br>i.e. $1 + x^3 = 10x^2$ [Multiplying throughout by $x^2$ ]<br>m $x^3 - 10x^2 + 1 = 0$<br>This is not a quadratic<br>$\therefore$ <span style="border: 1px solid black; padding: 2px;">Highest power (Degree) is not 2.</span> | <b>1</b>      |
| (iii)        | $7y = 3x + 23$<br>m $-3x + 7y = 23.$   | <b>1</b>      |
| (iv)         | Selling price (SP) = ₹ 1920<br>Discount = ₹ 48<br>m Marked Price (MP) = Selling price (SP) + Discount<br>= 1920 + 48<br>= 1968   | $\frac{1}{2}$ |
| m            | <span style="border: 1px solid black; padding: 2px;">Selling price = ₹ 1968</span>   | $\frac{1}{2}$ |
| (v)          | Sale Price = ₹ 1800<br>Rate of CST = 2%<br>CST = Sale Price $\times$ Rate of CST<br>= $1800 \times \frac{2}{100}$<br>= $18 \times 2$   |               |
| $\therefore$ | CST = ₹ 36   | $\frac{1}{2}$ |

|             |   |               |
|-------------|---|---------------|
|             | $\begin{aligned} \text{Selling Price} &= \text{Sale Price} + \text{CST} \\ &= 1800 + 36 \\ &= ₹ 1836 \end{aligned}$   |               |
|             | m Selling Price is ₹ 1836   | $\frac{1}{2}$ |
| (vi)        | <p>1, 3, 5, 7, .....</p> <p>In the given sequence,<br/> <math>t_1 = 1, t_2 = 3, t_3 = 5, t_4 = 7</math><br/> <math>t_2 - t_1 = 3 - 1 = 2</math><br/> <math>t_3 - t_2 = 5 - 3 = 2</math><br/> <math>t_4 - t_3 = 7 - 5 = 2</math></p> <p>The difference between any two consecutive terms is same.</p>  | $\frac{1}{2}$ |
|             | m The given sequence is an A.P.   | $\frac{1}{2}$ |
| <b>A.2.</b> | <b>Solve ANY FOUR of the following :</b>  |               |
| (i)         | $t_n = n(n + 1)$<br>For n = 1,<br>$t_1 = 1(1 + 1)$<br>m $t_1 = 1$ (2)<br>m $t_1 = 2$<br>For n = 2,<br>$t_2 = 2(2 + 1)$<br>m $t_2 = 2$ (3)<br>m $t_2 = 6$<br>For n = 3,<br>$t_3 = 3(3 + 1)$<br>m $t_3 = 3$ (4)<br>m $t_3 = 12$<br>For n = 4,<br>$t_4 = 4(4 + 1)$<br>m $t_4 = 4$ (5)<br>m $t_4 = 20$<br>For n = 5,<br>$t_5 = 5(5 + 1)$<br>m $t_5 = 5$ (6)<br>m $t_5 = 30$ | $\frac{1}{2}$ |
|             | m The first five terms of the sequence are 2, 6, 12, 20, 30.  | <b>1</b>      |
| (ii)        | $x^2 + 5x - 14 = 0$<br>Substituting x = 2 in L.H.S. of the given equation<br>L.H.S. = $x^2 + 5x - 14$<br>= $(2)^2 + 5(2) - 14$<br>= $4 + 10 - 14$<br>= $14 - 14$<br>= 0<br>= R.H.S.   | $\frac{1}{2}$ |
|             | m 2 is the root of the given given equation.  | <b>1</b>      |

| (iii)   | <p><math>\therefore x = 2</math> and <math>y = 5</math> is the solution of <math>7x + by = 54</math><br/>It satisfies the equation</p> <p>m Substituting <math>x = 2</math> and <math>y = 5</math> in the equation we get,<br/>m <math>7(2) + b(5) = 54</math><br/>m <math>14 + 5b = 54</math><br/>m <math>5b = 54 - 14</math><br/>m <math>5b = 40</math><br/>m <math>b = 8</math></p>  | <p><math>\frac{1}{2}</math></p> <p><math>\frac{1}{2}</math></p> <p><b>1</b></p>   |                  |               |         |           |         |                 |
|---|---|---|------------------|---------------|---------|-----------|---------|-----------------|
| (iv)  | <p>(a) <math>x \propto y</math><br/><math>\therefore x = Ky</math> .....(i) [Where K is constant of variation]<br/><math>\therefore</math> When <math>x = 20, y = 5</math><br/><math>\therefore 20 = K \times 5</math><br/><math>\therefore K = \frac{20}{5}</math><br/><math>\therefore K = 4</math><br/><math>\therefore</math> The constant of variation.</p> <p>(b) Substituting <math>k = 4</math> in (i),<br/><math>x = 4y</math> [Equation of variation]</p> | <p><math>\frac{1}{2}</math></p> <p><math>\frac{1}{2}</math></p> <p><math>\frac{1}{2}</math></p> <p><math>\frac{1}{2}</math></p> |                  |               |         |           |         |                 |
| (v)   | <p>Discount = M.P. - S.P.<br/>= 25000 - 23500<br/>= 1500</p> <p>m Rate of discount = <math>\frac{\text{Discount}}{\text{M.P.}} \times 100</math><br/>= <math>\frac{1500}{25000} \times 100</math><br/>= 6%</p>  | <p><b>1</b></p>   |                  |               |         |           |         |                 |
| <table border="1"> <thead> <tr> <th>Marked Price (M.P)</th> <th>Rate of Discount</th> <th>Selling Price</th> </tr> </thead> <tbody> <tr> <td>₹ 25000</td> <td><b>6%</b></td> <td>₹ 23500</td> </tr> </tbody> </table> |   | Marked Price (M.P)  | Rate of Discount | Selling Price | ₹ 25000 | <b>6%</b> | ₹ 23500 | <p><b>1</b></p> |
| Marked Price (M.P)  | Rate of Discount  | Selling Price   |                  |               |         |           |         |                 |
| ₹ 25000   | <b>6%</b>   | ₹ 23500   |                  |               |         |           |         |                 |
| (vi)  | <p>Income tax is ₹ 2000<br/>Education cess rate is 3%<br/>Education cess = Income tax <math>\times</math> Rate of education cess<br/>= <math>2000 \times \frac{3}{100}</math><br/>= <math>20 \times 3</math><br/>= ₹ 60</p>   | <p><b>1</b></p> <p><b>1</b></p>   |                  |               |         |           |         |                 |

**A.3. Solve ANY THREE of the following :**

(i) We know that,  
 10, 14, 18, 22, .....

$$a = t_1 = 10$$

$$d = t_2 - t_1 = 14 - 10 = 4$$

$$t_n = a + (n - 1) d$$

m  $t_{15} = a + (15 - 1) d$  1

m  $t_{15} = 10 + (14) 4$

m  $t_{15} = 10 + 56$

m  $t_{15} = 66$

m The 15th term of an A.P. is 66. 1

(ii)  $p^2 + 9p + 18 = 0$

m  $p^2 + 6p + 3p + 18 = 0$  1

m  $p(p + 6) + 3(p + 6) = 0$

m  $(p + 6)(p + 3) = 0$  1

m  $p + 6 = 0$  or  $p + 3 = 0$

m  $p = -6$  or  $p = -3$

m  $p = -6$  and  $p = -3$  are the solution of given quadratic equation. 1

(iii)  $n \propto m$

$\therefore n = Km$  [Where K is constant]  $\frac{1}{2}$

When  $m = 4$  and  $n = 16$

$\therefore 16 = K \times 4$

$\therefore K = \frac{16}{4}$

$\therefore K = 4$

$\therefore n = 4m$  .....(i) [Equation of variation]  $\frac{1}{2}$

$\therefore$  Substituting  $m = 12$  in (i),

$n = 4 \times 12$

$\therefore n = 48$   $\frac{1}{2}$

Substituting  $n = 28$  in (i),

$\therefore 28 = 4 \times m$

$\therefore m = \frac{28}{4}$

$\therefore m = 7$   $\frac{1}{2}$

Substituting  $m = 3.5$  in (i),

$\therefore n = 4 \times 3.5$

$\therefore n = 14$

|          |    |    |           |          |           |
|----------|----|----|-----------|----------|-----------|
| <b>m</b> | 4  | 5  | 12        | <b>7</b> | 3.5       |
| <b>n</b> | 16 | 20 | <b>48</b> | 28       | <b>14</b> |

**1**

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|-------------|--|--|
| (iv)        | <p>MP of the article = ₹ 250<br/>Rate of discount = 10%</p> <p>m Discount = <math>\frac{10}{100} \times 250</math><br/>= ₹ 25</p> <p>m Selling Price of article = MP - discount<br/>= 250 - 25<br/>= 225</p> <p>Now,<br/>Profit = 25%<br/>If CP of the article is 100 the SP is 125 i.e.<br/>when CP = 100, SP = 125<br/>when CP = x, SP = 225</p> <p>m <math>\frac{10}{x} = \frac{125}{225}</math></p> <p>m <math>x = \frac{100 \times 225}{125}</math></p> <p>m <math>x = 180</math></p> <p>m <span style="border: 1px solid black; padding: 2px;">Cost price of an article is ₹ 180.</span></p> | <p>1</p> <p>1</p> <p>1</p>               |
| (v)         | <p>(a) No income tax<br/>(b) Income tax is to be paid<br/>(c) No income tax</p>  | <p>1</p> <p>1</p> <p>1</p>               |
| <b>A.4.</b> | <b>Solve ANY TWO of the following :</b>  |  |
| (i)         | <p><math>4x^2 + 7 - 12x = 0</math><br/><math>4x^2 - 12x + 7 = 0</math><br/>Divide throughout by 4,</p> <p>m <math>x^2 - 3x + \frac{7}{4} = 0</math></p> <p>m <math>x^2 - 3x = \frac{-7}{4}</math> .....(i)</p> <p>m Third term = <math>\left[ \frac{1}{2} \times \text{coefficient of } x \right]^2</math><br/>= <math>\left[ \frac{1}{2} \times (-3) \right]^2</math><br/>= <math>\frac{9}{4}</math></p>  | <p><math>\frac{1}{2}</math></p> <p>1</p> |

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|------|---|---|
|      | <p>m Add <math>\frac{9}{4}</math> on both side of equation (i),</p> <p>m <math>x^2 - 3x + \frac{9}{4} = \frac{-7}{4} + \frac{9}{4}</math></p> <p>m <math>\left(x - \frac{3}{2}\right)^2 = \frac{2}{4}</math></p> <p>Taking square root on both side,</p> <p>m <math>\left(x - \frac{3}{2}\right) = \pm \frac{\sqrt{2}}{2}</math></p> <p>m <math>x = \frac{3}{2} \pm \frac{\sqrt{2}}{2}</math></p> <p>m <math>x = \frac{3 \pm \sqrt{2}}{2}</math></p> <p>m <math>x = \frac{3 + \sqrt{2}}{2}</math> or <math>x = \frac{3 - \sqrt{2}}{2}</math></p> <div style="border: 1px solid black; padding: 5px; display: inline-block;"> <p>m <math>x = \frac{3 + \sqrt{2}}{2}</math> and <math>x = \frac{3 - \sqrt{2}}{2}</math> are solutions of given quadratic equation.</p> </div>   | <p>1</p> <p><math>\frac{1}{2}</math></p> <p>1</p> |
| (ii) | <p>Let the wavelength be } and frequency be y</p> <p><math>\therefore \lambda \propto \frac{1}{\eta}</math></p> <p><math>\lambda = \frac{K}{\eta}</math> [Where K is constant]</p> <p>When <math>\lambda = 60</math> cm; <math>\eta = 280</math> Hz.</p> <p><math>\therefore 60 = \frac{K}{280}</math></p> <p><math>\therefore K = 60 \times 280</math></p> <p><math>\therefore \lambda = \frac{60 \times 280}{\eta}</math> .....(i) [Equation of variation]</p> <p>Substituting <math>\lambda = 100</math> cm</p> <p><math>\therefore 100 = \frac{60 \times 280}{\eta}</math></p> <p><math>\therefore \eta = \frac{60 \times 280}{100}</math></p> <p><math>\therefore \eta = 6 \times 28 = 168</math></p> <div style="border: 1px solid black; padding: 5px; display: inline-block;"> <p><math>\therefore</math> The frequency of sound is 168 Hertz. When the wave length is 100 cm.</p> </div> | <p>1</p> <p>1</p> <p>1</p>                        |

|             |   |  |
|-------------|---|--|
| (iii)       | <p>Monthly income of Mr. Deshpande is ₹ 23700</p> <p>(A) Gross Annual income = <math>23700 \times 12</math><br/>= ₹ 284400</p> <p>(B) Deductions :</p> <p>(i) Under 80C</p> <p>(a) PF = ₹ <math>2300 \times 12</math><br/>= ₹ 27600</p> <p>(b) NSC = ₹ 10000</p> <p>(ii) Under 80G Donations ₹ 6000 (cm relief fund)</p> <p>Total Deductions ₹ 43600</p> <p>(C) Taxable income = [A] - [B]<br/>= <math>284400 - 43600</math><br/>= ₹ 240800</p> <p>(D) Total tax to be paid :</p> <p>(i) For first 200000 at 0% is Nil<br/>(<math>240800 - 200000 = ₹ 40800</math>)</p> <p>(ii) For next ₹ 40800 at 10% is</p> $= \frac{10}{100} \times 40800$ $= 10 \times 408$ $= ₹ 4080$ <p>(E) Education cess is 3% on income tax</p> $= \frac{3}{100} \times 4080$ $= ₹ 122.4$ <p>(F) Net tax payable = [D] + [E]<br/>= <math>4080 + 122.4</math><br/>= ₹ 4202.4</p> <p>∴ Rounded off to the nearest multiple of 10 = ₹ 4200</p> <p>∴ Net income tax payable is ₹ 4200</p> | <p>½</p> <p>1</p> <p>½</p> <p>1</p> <p>1</p> |
| <b>A.5.</b> | <b>Solve ANY TWO of the following :</b>   |  |
| (i)         | <p>The farmer repays</p> $₹ 8000 + ₹ 1360 = ₹ 9360$ <p>Number of instalments = 12</p> <p>m n = 12 and <math>S_{12} = 9360</math></p> <p>Each installment is ₹ 40 less than the preceding one</p> <p>m d = - 40</p> <p>We have,</p>  | <p>½</p>                                     |

|      |   |               |
|------|---|---------------|
|      | $m \quad S_n = \frac{n}{2} [2a + (n - 1) d]$  |               |
|      | $m \quad S_{12} = \frac{12}{2} [2a + (12 - 1) (- 40)]$  | 1             |
|      | $m \quad S_{12} = 6 [2a + 11 (- 40)]$   |               |
|      | $m \quad \frac{9360}{6} = 2a - 440$   |               |
|      | $m \quad 1560 + 440 = 2a$   |               |
|      | $m \quad 2000 = 2a$   | 1             |
|      | $m \quad a = 1000$  |               |
|      | $\text{i.e., } t_1 = 1000$  |               |
|      | Now,  |               |
|      | $m \quad S_n = \frac{n}{2} [t_1 + t_n]$   | 1             |
|      | $m \quad 9360 = \frac{12}{2} [1000 + t_n]$  |               |
|      | $m \quad \frac{9360 \times 2}{12} = 1000 + t_n$   | $\frac{1}{2}$ |
|      | $m \quad 1560 = 1000 + t_n$   |               |
|      | $m \quad 1560 - 1000 = t_n$   |               |
|      | $\text{i.e. } t_n = 560$  |               |
|      | $m \quad \boxed{\text{First instalment is ₹ 1000 and last instalment is ₹ 560.}}$   | 1             |
| (ii) | <p>Let present age of Reshma be x years and present age of her mother be y years.</p> <p>As per the first condition,</p> $x + y = 60 \quad \text{.....(i)}$ <p>Five years ago,</p> <p>Reshma's age = (x - 5) years</p> <p>Mother's age = (y - 5) years</p> <p>As per the second condition,</p> $y - 5 = 4(x - 5)$ |               |
|      | $m \quad y - 5 = 4x - 20$   |               |
|      | $m \quad y = 4x - 20 + 5$   |               |
|      | $m \quad y = 4x - 15 \quad \text{.....(ii)}$  | 1             |
|      | <p>Substituting (ii) from (i),</p> $x + 4x - 15 = 60$   |               |
|      | $m \quad 5x = 60 + 15$  |               |
|      | $m \quad 5x = 75$   |               |
|      | $m \quad x = 15$  | 1             |



|       |   |   |
|-------|---|---|
|       | Substituting $x = 15$ in (i),<br>$y = 4(15) - 15$<br>m $y = 60 - 15$<br>m $y = 45$  |   |
|       | m Present age of Reshma is 15 years and<br>present age of her mother is 45 years.   | 1 |
| (iii) | Total price for 2 sarees<br>= $2 \times ₹ 280$<br>= ₹ 560<br>Rebate % on saree<br>= 15%<br>m Rebate amount<br>= 15% of 560<br>= $\frac{15}{100} \times 560$<br>= ₹ 84       |   |
|       | m Total amount paid for 2 sarees<br>= ₹ 560 - ₹ 84<br>= ₹ 476   | 1 |
|       | Total price for 3 bed sheets<br>= $3 \times 120$<br>= ₹ 360<br>Rebate % on bed sheet<br>= 20%<br>m Rebate amount<br>= 20% of 360<br>= $\frac{20}{100} \times 360$<br>= ₹ 72 |   |
|       | m Total amount paid for 3 bedsheets<br>= ₹ 360 - ₹ 72<br>= ₹ 288  | 1 |
|       | Total price of 2 decorated brass vessels<br>= $2 \times ₹ 375$<br>= ₹ 750<br>Rebate %<br>= 15%  |   |
|       | m Amount of Rebate = 15% of 750<br>= $\frac{15}{100} \times 750$<br>= ₹ 112.5   |   |
|       | m Total amount for 2 decorated brass vessels<br>= ₹ 750 - ₹ 112.5<br>= ₹ 637.5  | 1 |
|       | m Total Rebate given<br>= ₹ 84 + ₹ 72 + ₹ 112.5<br>= ₹ 268.50   | 1 |
|       | m Total amount paid for the articles<br>= ₹ 476 + ₹ 288 + ₹ 637.5<br>= ₹ 1401.50  | 1 |
|       | ◆◆◆◆  |   |