

# MT

2017 \_\_\_\_\_ 1100

Seat No. 

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## MT GENERAL MATHEMATICS (71) ALGEBRA - SEMI PRELIM - I - PAPER - 2 (E)

Time : 2½ Hours

Model Answer Paper

Max. Marks : 40

<b>A.1.</b>	<b>Solve the following : (Any 5)</b>	
(i)	<p>Here,</p> $t_1 = 2^1 = 2$ $t_2 = 2^2 = 4$ $t_3 = 2^3 = 8$ $t_4 = 2^4 = 16$ $t_5 = 2^5 = 32$ $t_6 = 2^6 = 64$ $t_7 = 2^7 = 128$ <div style="border: 1px solid black; padding: 2px; display: inline-block; margin-top: 10px;">The next three terms are 32, 64, 128.</div>	1
(ii)	<p>∴ <math>x = 2</math> and <math>y = 5</math> is the solution of <math>7x + by = 54</math>  It satisfies the equation  m Substituting <math>x = 2</math> and <math>y = 5</math> in the equation we get,  m <math>7(2) + b(5) = 54</math>  m <math>14 + 5b = 54</math>  m <math>5b = 54 - 14</math>  m <math>5b = 40</math>  m <div style="border: 1px solid black; padding: 2px; display: inline-block;">b = 8</div></p>	½       ½
(iii)	<p>1, 3, 5, 7, .....</p> <p>In the given sequence,  <math>t_1 = 1, t_2 = 3, t_3 = 5, t_4 = 7</math>  <math>t_2 - t_1 = 3 - 1 = 2</math>  <math>t_3 - t_2 = 5 - 3 = 2</math>  <math>t_4 - t_3 = 7 - 5 = 2</math>  The difference between any two consecutive terms is same.  m The given sequence is an A.P.</p>	½       ½
(iv)	<p>Amount paid by Younus = ₹ 120  Amount of rebate = ₹ 15</p>	

	m	MRP of flower pot = Amount paid + rebate = 120 + 15 = 135	$\frac{1}{2}$
	m	The Marked Price of the flower pot is ₹ 135.	$\frac{1}{2}$
(v)		Let the rate of one dozen oranges be ₹ x The rate of one dozen banana be ₹ y As per the first condition, $2x + 3y = 210$	1
(vi)		Sale price (S.P.) = ₹ 600000 Rate of commission = 2%	
		Commission = $\frac{\text{S.P.} \times \text{Rate of commission}}{100}$ = $\frac{600000 \times 2}{100}$ = ₹ 12000	$\frac{1}{2}$
	m	The commission of estate agent is ₹12000.	$\frac{1}{2}$
<b>A.2.</b>		<b>Solve the following : (Any 4)</b>	
(i)		$2x + 3y = 19$ .....(i)	
	m	$2x - 3y = -11$ .....(ii)	
		Adding (i) and (ii) we get, $2x + 3y = 19$ $2x - 3y = -11$ <hr/> $7x = 8$	
	m	$x = 2$	$\frac{1}{2}$
		Substituting $x = 2$ in (i), $2(2) + 3y = 19$	
	m	$4 + 3y = 19$	
	m	$3y = 19 - 4$	
	m	$y = 5$	$\frac{1}{2}$
	m	$x = 2$ and $y = 5$ is the solution of given equations.	1
(ii)		For $n = 1$ , $S_1 = (1)^2 (1 + 1)$	
	m	$S_1 = 1 (2)$	
	m	$S_1 = 2$	$\frac{1}{2}$
		For $n = 2$ , $S_2 = (2)^2 (2 + 1)$	
	m	$S_2 = 4 (3)$	
	m	$S_2 = 12$	

	<p>For <math>n = 3</math>,</p> $S_3 = (3)^2 (3 + 1)$ <p>m <math>S_3 = 9 \times 4</math></p> <p>m <math>S_3 = 36</math></p> <p>Now,</p> $t_1 = S_1 = 2$ $t_2 = S_2 - S_1 = 12 - 2 = 10$ $S_3 = S_3 - S_2 = 36 - 12 = 24$	
	<p>The first terms are 2, 10 and 24.</p>	<b>1</b>
(iii)	<p>Printed price = ₹ 100</p> <p>Sale price (S.P.) of 4 dolls = ₹ 360</p> <p>Percentage discount = ?</p> <p>S.P. of 4 dolls = ₹ 360</p>	
	<p>m S.P. of 1 doll = <math>\frac{360}{4} = ₹ 90</math></p> <p>Discount = Printed price - S.P.</p> <p style="padding-left: 40px;">= 100 - 90</p> <p style="padding-left: 40px;">= ₹ 10</p>	$\frac{1}{2}$
	<p>The percentage discount is ₹ 10.</p>	<b>1</b>
(iv)	<p>Here,</p> $t_n = 3n + 5$ <p>For <math>n = 1</math>,</p> $t_1 = 3(1) + 5$	
	<p>m <math>t_1 = 3 + 5</math></p> <p>m <math>t_1 = 8</math></p> <p>For <math>n = 2</math>,</p> $t_2 = 3(2) + 5$	
	<p>m <math>t_2 = 6 + 5</math></p> <p>m <math>t_2 = 11</math></p> <p>For <math>n = 3</math>,</p> $t_3 = 3(3) + 5$	
	<p>m <math>t_3 = 9 + 5</math></p> <p>m <math>t_3 = 14</math></p> <p>For <math>n = 4</math>,</p> $t_4 = 3(4) + 5$	
	<p>m <math>t_4 = 12 + 5</math></p> <p>m <math>t_4 = 17</math></p>	<b>1</b>
	<p>The required A.P. is 8, 11, 14, 17, .....</p>	<b>1</b>

(v)	$4x + y = 5$ .....(i)	$\frac{1}{2}$
	$7x - 2y = 20$ .....(ii)	
	Consider (i),	
	$4x + y = 5$	
m	$y = 5 - 4x$ .....(iii)	
	Substituting (iii) in (ii),	
	$7x - 2(5 - 4x) = 20$	
m	$7x - 10 + 8x = 20$	
m	$7x + 8x = 20 + 10$	
m	$15x = 30$	
m	$x = 2$	$\frac{1}{2}$
	Substituting $x = 2$ in (iii),	
	$y = 5 - 4(2)$	
m	$y = 5 - 8$	
m	$y = -3$	
m	$x = 2$ and $y = -3$ is the solution of given equations.	<b>1</b>
(vi)	Sale price (S.P.) = ₹ 650000	
	Rate of commission = 2%	
	Commission = $\frac{\text{S.P.} \times \text{Rate of commission}}{100}$	<b>1</b>
	= $\frac{650000 \times 2}{100}$	
	= ₹ 13000	
m	The commission of estate agent is ₹ 13000.	<b>1</b>
<b>A.3.</b>	<b>Solve the following : (Any 3)</b>	
(i)	Given A.P. is 4, 8, 12, 16, .....	
	In the sequence $t_1 = a = 4$	
	$d = t_2 - t_1 = 8 - 4 = 4$	$\frac{1}{2}$
	We know that,	
	$S_n = \frac{n}{2} [2a + (n - 1) d]$	$\frac{1}{2}$
m	$S_{25} = \frac{25}{2} [2(4) + (25 - 1) 4]$	$\frac{1}{2}$
m	$S_{25} = \frac{25}{2} [8 + 96]$	
m	$S_{25} = \frac{25}{2} \times 104$	$\frac{1}{2}$
m	$S_{25} = 25 \times 52$	
m	$S_{25} = 1300$	
m	The sum of first 25 terms is 1300.	<b>1</b>

(ii)	<p><math>5x + 15 = 20 - 5y</math></p> <p>m <math>5x + 5y = 20 - 15</math></p> <p>m <math>5x + 5y = 5</math></p> <p>Dividing throughout by 5,</p> <p>m <math>x + y = 1</math> .....(i)</p> <p><math>2x - 6y = 10</math></p> <p>Dividing throughout by 2,</p> <p>m <math>x - 3y = 5</math> .....(ii)</p> <p>Subtracting (i) from (ii),</p> $\begin{array}{r} x - 3y = 5 \\ x + y = 1 \\ (-) \quad (-) \quad (-) \\ \hline -4y = 4 \end{array}$ <p>m <math>y = -1</math></p> <p>Substituting <math>y = -1</math> in (ii),</p> <p><math>x - 1 = 1</math></p> <p>m <math>x = 1 + 1</math></p> <p>m <math>x = 2</math></p> <p>m <span style="border: 1px solid black; padding: 2px;"><math>x = 2</math> and <math>y = -1</math> is the solution of given equations.</span></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> <p><b>1</b></p>
(iii)	<p>Total price for 2 bed sheets = <math>2 \times 160</math></p> <p>= ₹ 320</p> <p>Rebate % on bed sheet = 20%</p> <p>m Rebate on bed sheet = 20% of 320</p> <p>= <math>\frac{20}{100} \times 320</math></p> <p>= ₹ 64</p> <p>m Amount paid for bed sheet = ₹ 320 - ₹ 64</p> <p>= ₹ 256</p> <p>Total price for a silk saree = ₹ 600</p> <p>Rebate % on silk saree = ₹ 12%</p> <p>m Rebate on silk saree = 12% of 600</p> <p>= <math>\frac{12}{100} \times 600</math></p> <p>= ₹ 72</p> <p>m Amount paid for silk saree = ₹ 600 - 72</p> <p>= ₹ 528</p> <p>Total price paid for 2 bottles of honey = <math>2 \times 300</math></p> <p>= ₹ 600</p> <p>Rebate % = 15%</p> <p>m Rebate amount = 15% of 600</p> <p>= <math>\frac{15}{100} \times 600</math></p> <p>= ₹ 90</p>	<p><math>\frac{1}{2}</math></p> <p><math>\frac{1}{2}</math></p> <p><math>\frac{1}{2}</math></p>

	m	Total amount paid for bottles of honey = ₹ 600 – ₹ 90 = ₹ 510	
	m	Total rebate given = ₹ 64 + ₹ 72 + ₹ 90 = ₹ 226	½
		Total amount paid = ₹ 256 + ₹ 528 + ₹ 510 = ₹ 1294	
	m	The total amount of rebate and the amount he paid is ₹ 1294.	1
(iv)		– 7a = 14 – 28b Dividing throughout by 7, – a = 2 – 4b	
	m	4b – 2 = a	
	m	a = 4b – 2 .....(i)	1
		5b = 15a – 25 .....(ii)	
		Substituting (i) in (ii), 5b = 15 (4b – 2) – 25	
	m	5b = 60b – 30 – 25	½
	m	5b – 60b = – 55	
	m	– 55b = – 55	
	m	$b = \frac{-55}{-55}$	
	m	b = 1	½
		Substituting b = 1 in (iii), a = 4 (1) – 2	
	m	a = 4 – 2	
	m	a = 2	
	m	a = 2 and b = 1 is the solution of given equations.	1
(v)		Printed price = ₹ 2700 Sale price = ₹ 2376 Percentage discount = ?	
		Discount = Printed price – sale price = 2700 – 2376 = ₹ 324	½
		Percentage Discount = $\frac{\text{Discount}}{\text{Printed price}} \times 100$	1
		= $\frac{324}{2700} \times 100$	½
		= 12	
	m	The percentage discount is 12.	1

<b>A.4. Solve the following : (Any 2)</b>		
(i)	Since she save ₹ 33000 in ten years $S_{10} = 33000, d = 200, n = 10$ We know that,	$\frac{1}{2}$
	$S_n = \frac{n}{2} [2a + (n - 1) d]$	<b>1</b>
m	$S_{10} = \frac{10}{2} [2a + (10 - 1) d]$	
m	$33000 = 5 [2a + 9 (200)]$	<b>1</b>
m	$\frac{33000}{5} = 2a + 1800$	
m	$6600 = 2a + 1800$	
m	$6600 - 1800 = 2a$	$\frac{1}{2}$
m	$a = 2400$	
m	She saved ₹ 2400 in the first year.	<b>1</b>
(ii)	Let length of the playground be x m and breadth of the playground be y m As per the first condition, $x = 2y$ .....(i) We know that, Perimeter of rectangle = $2(l + b)$ $2(x + y) = 600$	<b>1</b>
m	$x + y = 300$ .....(ii)	<b>1</b>
	Substituting (i) in (ii), $2y + y = 300$	
m	$3y = 300$	
m	$y = 100$	<b>1</b>
	Substituting $y = 100$ in (i), $x = 2(100)$	
m	$x = 200$	
m	Length of the playground is 200 m and breadth of the playground is 100 m.	<b>1</b>
(iii)	Monthly salary of sales man = ₹ 6000 Incentives = 4% for sales over 48000 Sales for the month = ₹ 50000	$\frac{1}{2}$
m	Incentives = 4% of (50000 - 48000) $= \frac{4}{100} \times 2000$ $= ₹ 80$	<b>1</b>
		<b>1</b>

	m Monthly earning of salesman = Salary + incentives = 6000 + 80 = ₹ 6080	½
	m <span style="border: 1px solid black; padding: 2px;">The monthly income of the salesman is ₹ 6080.</span>	1
<b>A.5. Solve the following : (Any 2)</b>		
(i)	Let the digit in tens place be x and let digit in unit place be y	
m	The original number is $10x + y$	
m	The number obtained by interchanging the digits is $10y + x$	
	As per the first condition, $y = x - 4$ .....(i)	1
	As per the second condition, $10x + y + 10y + x$	
m	$11x + 11y = 154$	
	Dividing throughout by 11,	
m	$x + y = 14$ .....(ii)	1
	Substituting (i) in (ii), $x + x - 4 = 14$	
m	$2x - 4 = 14$	
m	$2x = 18$	
m	$x = 9$	1
	Substituting $x = 9$ in (i), $y = 9 - 4$	
m	$y = 5$	1
m	$10x + y = 10(9) + 5 = 90 + 5 = 95$	
m	$10y + x = 10(5) + 9 = 50 + 9 = 59$	
m	<span style="border: 1px solid black; padding: 2px;">The original number is 95 and number obtained by interchanging the digits is 59.</span>	1
(ii)	Cash price of equipment = ₹ 8000 Cash down payment = ₹ 2000	
m	Balance payment = $8000 - 2000 = ₹ 6000$	½
	Let the amount of each instalment be ₹ x Number of instalment = 6	
m	Amount to be paid in 6 instalments = ₹ 6x	
m	Interest charged (I) = $6x - 6000$	½
	Now, Principal for first month = ₹ 6000 Principal for second month = ₹ $(6000 - x)$ Principal for third month = ₹ $(6000 - 2x)$ Principal for fourth month = ₹ $(6000 - 3x)$ Principal for fifth month = ₹ $(6000 - 4x)$ Principal for sixth month = ₹ $(6000 - 5x)$	1



	<p>m Total principal for 1 month            = [6000 + (6000 - x) + (6000 - 2x) + (6000 - 3x) + (6000 - 4x) + (6000 - 5x)]            = ₹ (36000 - 15x)</p> <p>Period (N) = <math>\frac{1}{2}</math> years            Rate of interest = 8%</p>	$\frac{1}{2}$
	<p>m Interest = <math>\frac{P \times N \times R}{100}</math></p>	$\frac{1}{2}$
	<p>m <math>6x - 6000 = \frac{(36000 - 15x) \times \frac{1}{2} \times 8}{100}</math></p>	
	<p>m <math>100 (6x - 6000) = (36000 - 15x) \times \frac{2}{3}</math></p>	$\frac{1}{2}$
	<p>m <math>300 (6x - 6000) = 72000 - 30x</math>            m <math>1800x - 1800000 = 72000 - 30x</math>            m <math>1800x + 30x = 72000 + 1800000</math>            m <math>1830x = 1872000</math></p>	$\frac{1}{2}$
	<p>m <math>x = \frac{1872000}{1830}</math>            m <math>x = 1022.95</math></p>	
	<p>m <span style="border: 1px solid black; padding: 2px;">Amount of each instalment is ₹ 1022.95.</span></p>	<b>1</b>
(iii)	<p>Here, <math>S_n = 6500</math>, <math>a = 610</math>, <math>d = -30</math>            We know that,</p>	$\frac{1}{2}$
	$S_n = \frac{n}{2} [2a + (n - 1) d]$	<b>1</b>
	<p>m <math>6500 = \frac{n}{2} [2 (610) + (n - 1) - (30)]</math></p>	
	<p>m <math>6500 = \frac{n}{2} [1220 - 30n + 30]</math></p>	$\frac{1}{2}$
	<p>m <math>6500 = \frac{n}{2} [1250 - 30n]</math></p>	
	<p>m <math>6500 \times 2 = 1250n - 30n^2</math>            m <math>13000 = 1250n - 30n^2</math></p>	$\frac{1}{2}$
	<p>m <math>30n^2 - 1250n + 13000 = 0</math>            m <math>6n^2 - 250n + 2600 = 0</math>            m <math>3n^2 - 125n + 1300 = 0</math></p>	
	<p>m <math>3n^2 - 65n - 60n + 1300 = 0</math></p>	$\frac{1}{2}$

$$m \quad n \quad (3n - 65) - 20(3n - 65) = 0$$

$$m \quad (n - 20) (3n - 65) = 0$$

$$m \quad n = 20 \text{ or } n = \frac{65}{3}$$

But,  $n$  is a term number, it has to be a natural number.

$$m \quad n \neq \frac{65}{3}$$

m No. of years required to repay the loan is 20.

 $\frac{1}{2}$  $\frac{1}{2}$ **1**