

MT

2017 _____ 1100

Seat No.

MT GENERAL MATHEMATICS (71) ALGEBRA - SEMI PRELIM - I - PAPER - 1 (E)

Time : 2½ Hours

Model Answer Paper

Max. Marks : 40

A.1. Solve the following : (Any 5)	
(i) Here, $t_1 = 0^2 = 0$ $t_2 = 1^2 = 1$ $t_3 = 2^2 = 4$ $t_4 = 3^2 = 9$ $t_5 = 4^2 = 16$ $t_6 = 5^2 = 25$ $t_7 = 7^2 = 49$ $t_8 = 8^2 = 64$ <div style="border: 1px solid black; padding: 2px; display: inline-block;">The next three terms are 25, 49 and 64.</div>	1
(ii) Substituting $x = 5$ and $y = 3$ in L.H.S. of equation, L.H.S. = $2x + 5y$ = $2(5) + 5(3)$ = $10 + 15$ = 25 = R.H.S. m L.H.S. = R.H.S. m <div style="border: 1px solid black; padding: 2px; display: inline-block;">$x = 5$ and $y = 3$ is the solution of the equation $2x + 5y = 25$.</div>	$\frac{1}{2}$ $\frac{1}{2}$
(iii) 1, 3, 5, 7, In the given sequence, $t_1 = 1, t_2 = 3, t_3 = 5, t_4 = 7$ $t_2 - t_1 = 3 - 1 = 2$ $t_3 - t_2 = 5 - 3 = 2$ $t_4 - t_3 = 7 - 5 = 2$ The difference between any two consecutive terms is same. m The given sequence is an A.P.	 $\frac{1}{2}$ $\frac{1}{2}$
(iv) MRP of towel = ₹ 90 Selling Price (SP) = ₹ 80	

	<p>m Rebate = MRP - SP = 90 - 80 = 10</p>	½
	<p>m Amount of rebate on towel is ₹ 10.</p>	½
(v)	<p>Let the cost of bucket be x and cost of a mug be y As per the condition,</p>	
m	<p>2x + y = 215</p>	1
(vi)	<p>Total Sales = ₹ 17000 Commission = 8% of total sales = 8% of 17000 = $\frac{8}{100} \times 17000$ = ₹ 1360</p>	½
m	<p>The commission earned by the agent is ₹ 1360.</p>	½
A.2.	Solve the following : (Any 4)	
(i)	<p>2x - y = 0(i) 5x + y = - 14(ii) Adding equation (i) and (ii) we get, $\begin{array}{r} 2x - y = 0 \\ 5x + y = -14 \\ \hline 7x = -14 \end{array}$ </p>	
m	<p>x = - 2 Substituting x = - 2 in (i), 2(- 2) - y = 0</p>	½
m	- 4 - y = 0	
m	- 4 = y	
m	y = - 4	½
m	<p>x = - 2 and y = - 4 is the solution of given equations.</p>	1
(ii)	<p>For n = 1, S_n = n³ (n + 1) S₁ = (1)³ (1 + 1) S₁ = 1 × 2 = 2 For n = 2, S₂ = 2³ (2 + 1) = 8 × 3 = 24 For n = 3 S₃ = (3)³ (3 + 1) S₃ = 27 (4) S₃ = 108</p>	1

	<p>Now, $t_1 = S_1 = 2$ $t_2 = S_2 - S_1 = 24 - 2 = 22$ $t_3 = S_3 - S_2 = 108 - 24 = 84$</p> <p>The three terms are 2, 22, 84.</p>	1
(iii)	<p>Goods sold by agent = ₹ 13000 Amount given to principal = ₹ 12350</p> <p>m Commission = ₹ 13000 - ₹ 12350 = ₹ 650</p> <p>m Rate of commission = $\frac{\text{commission}}{\text{Total sales}} \times 36000$ = $\frac{650}{13000} \times 36000$ = 5%</p> <p>m The rate of commission is 5%.</p>	<p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>1</p>
(iv)	<p>Here, $t_n = 5n - 2$ For n = 1, $t_1 = 5(1) - 2$ $t_1 = 5 - 2$ $t_1 = 3$ For n = 2, $t_2 = 5(2) - 2$ $t_2 = 10 - 2$ $t_2 = 8$ For n = 3, $t_3 = 5(3) - 2$ $t_3 = 15 - 2$ $t_3 = 13$ For n = 4, $t_4 = 5(4) - 2$ $t_4 = 20 - 2$ $t_4 = 18$</p> <p>m The required A.P. is 3, 8, 13, 18,</p>	<p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>1</p>
(v)	<p>$x + 4y = 15$(i) $5x - 3y = 6$(ii) Consider (i), $x + 4y = 15$ $x = 15 - 4y$(iii)</p>	<p>$\frac{1}{2}$</p>

	$x - 3y = 12$ m $x = 12 + 3y$(iii)	$\frac{1}{2}$
	Substituting (iii) in (ii), $3(12 + 3y) - 2y = 1$	$\frac{1}{2}$
	m $36 + 9y - 2y = 1$	
	m $9y - 2y = 1 - 36$	
	m $7y = - 35$	
	m $y = - 5$	$\frac{1}{2}$
	Substitute $y = - 5$ in (iii), $x = 12 + 3(- 5)$	
	m $x = 12 - 15$	
	m $x = - 3$	
	m $x = - 3$ and $y = - 5$ is the solution of given equations.	1
(v)	Cash price of dinner set = ₹ 1500 Cash down payment = ₹ 1000 Balance payment = $1500 - 100 = ₹ 500$	$\frac{1}{2}$
	Here, the one instalment to be paid at the end of 6 months = ₹ 545	
	m Interest charged = $545 - 500 = ₹ 45$	$\frac{1}{2}$
	Time period = 6 months = $\frac{1}{2}$ years Rate of interest = R	
	m Interest = $\frac{P \times N \times R}{100}$	
	m $45 = \frac{500 \times \frac{1}{2} \times R}{100}$	$\frac{1}{2}$
	m $45 = \frac{250}{100} \times R$	
	m $\frac{45 \times 100}{250} = R$	$\frac{1}{2}$
	m $R = 18\%$	
	m The rate of interest charged under the instalment scheme is 18% per annum.	

A.4. Solve the following : (Any 2)		
(i)	Deepak saved ₹ 36000 in ten years	
m	$S_{10} = 36000$	
	where, $n = 10$, $d = 600$	
	We know that,	
	$S_n = \frac{n}{2} [2a + (n - 1) d]$	1
m	$S_{10} = \frac{10}{2} [2a + (10 - 1) 600]$	1
m	$36000 = 5 [2a + 9 (600)]$	
m	$\frac{36000}{5} = 2a + 5400$	1
m	$7200 - 5400 = 2a$	
m	$1800 = 2a$	
m	$a = 900$	
m	<div style="border: 1px solid black; padding: 2px;">He saved ₹ 900 in the first year.</div>	1
(ii)	Let length of the base of an isosceles triangle be x cm and length of its congruent side be y cm	
	We know that,	
	Perimeter of a triangle = sum of all sides	
	As per the first condition,	
	$x + y + y = 13$	
m	$x + 2y = 13$(i)	1
	As per the second condition,	
	$y = x - 1$(ii)	1
	Substituting (ii) in (i),	
	$x + 2(x - 1) = 13$	
m	$x + 2x - 2 = 13$	
m	$3x = 13 + 2$	
m	$3x = 15$	
m	$x = 5$	1
	Substituting $x = 5$ in (ii),	
	$y = 5 - 1$	
m	$y = 4$	
m	<div style="border: 1px solid black; padding: 2px;">Length of base of an isosceles triangle is 5 cm and length of its congruent side is 4 cm.</div>	1
(iii)	Monthly sales of Dinkar = ₹ 36000	
	Commission = 6% of total sales	
	= 6% of 36000	
	= $\frac{6}{100} \times 36000$	
	= ₹ 2160	1

	Incentives is earned @ 4% on any amount exceeding ₹20000 Amount exceeding ₹20000 = 36000 - 20000 = ₹ 16000	$\frac{1}{2}$
m	Incentive = 4% of 16000 = $\frac{4}{100} \times 16000$ = ₹ 640	1
m	Total monthly earning of Dinkar = commission + incentive = 2160 + 640 = ₹ 2800	$\frac{1}{2}$
m	<div style="border: 1px solid black; padding: 2px;">The monthly earning of Dinakar is ₹ 2800.</div>	1
A.5.	Solve the following : (Any 2)	
(i)	Let the digit at ten's place be x and the digit at units place be y	$\frac{1}{2}$
m	the original number is $10x + y$ number obtained by interchanging the digit is $10y + x$	$\frac{1}{2}$
	As per the first condition, $x = y + 3$(i)	1
	As per the second condition, $10x + y + 10y + x = 143$	
m	$11x + 11y = 143$	
m	$x + y = 13$(ii) [Dividing throughout by 11]	1
	Substituting (i) in (ii), $y + 3 + y = 13$	
m	$2y = 13 - 3$	
m	$2y = 10$	
m	$y = 5$	$\frac{1}{2}$
	Substituting $y = 5$ in (i), $x = 5 + 3$	
m	$x = 8$	$\frac{1}{2}$
	The original number = $10x + y = 10(8) + 5 = 80 + 5 = 85$	
m	<div style="border: 1px solid black; padding: 2px;">The original number is 85.</div>	1
(ii)	Cash price of equipment = ₹ 8000 Cash down payment = ₹ 2000	
m	Balance payment = $8000 - 2000 = ₹ 6000$	$\frac{1}{2}$
	Let the amount of each instalment be ₹ x Number of instalment = 6	
m	Amount to be paid in 6 instalments = ₹ 6x	$\frac{1}{2}$
m	Interest charged (I) = $6x - 6000$	
	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
m	Total principal for 1 month = [6000 + (6000 - x) + (6000 - 2x) + (6000 - 3x) + (6000 - 4x) + (6000 - 5x)] = ₹ (36000 - 15x)	1
	Period (N) = $\frac{1}{2}$ years Rate of interest = 8%	
m	Interest = $\frac{P \times N \times R}{100}$	
m	$6x - 6000 = \frac{(36000 - 15x) \times \frac{1}{12} \times 8}{100}$	
m	$100 (6x - 6000) = (36000 - 15x) \times \frac{2}{3}$	1
m	$300 (6x - 6000) = 72000 - 30x$	
m	$1800x - 1800000 = 72000 - 30x$	
m	$1800x + 30x = 72000 + 1800000$	
m	$1830x = 1872000$	
m	$x = \frac{1872000}{1830}$	
m	$x = 1022.95$	
m	Amount of each instalment is ₹ 1022.95.	1
(iii)	The farmer repays ₹ 8000 + ₹ 1360 = ₹ 9360 Number of instalments = 12	
m	$n = 12$ and $S_{12} = 9360$ Each installment is ₹ 40 less than the preceding one	
m	$d = -40$ We have,	1
m	$S_n = \frac{n}{2} [2a + (n - 1) d]$	
m	$S_{12} = \frac{12}{2} [2a + (12 - 1) (-40)]$	
m	$S_{12} = 6 [2a + 11 (-40)]$	1
m	$\frac{9360}{6} = 2a - 440$	
m	$1560 + 440 = 2a$	

m	$2000 = 2a$	
m	$a = 1000$	
	i.e., $t_1 = 1000$	
	Now,	
m	$S_n = \frac{n}{2} [t_1 + t_n]$	1
m	$9360 = \frac{12}{2} [1000 + t_n]$	1
m	$\frac{9360 \times 2}{12} = 1000 + t_n$	
m	$1560 = 1000 + t_n$	
m	$1560 - 1000 = t_n$	
	i.e. $t_n = 560$	
m	First instalment is ₹ 1000 and last instalment is ₹ 560.	1
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