

# MT

2018 \_\_\_\_ 1100

Seat No.

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## MT - MATHEMATICS (71) Algebra - SEMI PRELIM - I - PAPER - III

Time : 2 Hours

(Answer Paper)

Max. Marks : 40

<b>A.1.</b>	<b>(A) Solve the following : (Any 4)</b>																
1.	Let $a = 2$ , $b = 4$ and $c = 8$ $b^2 = 4^2 = 16$ $ac = 2 \times 8 = 16$ $\therefore b^2 = ac$ If $b^2 = ac$ then $a, b, c$ are in continued proportion. $\therefore 2, 4, 8$ are in continued proportion.	<b>1</b>															
2.	Here, maximum frequency is 09 which is for 35 and 37 $\therefore$ mode = 35 marks and 37 marks. $\therefore$ Mode of marks is 35 and 37	<b>1</b>															
3.	<table border="1"><thead><tr><th>Sr. No.</th><th>Individuals</th><th>Age</th><th>Taxable income (₹)</th><th>Will have to pay income tax or not</th></tr></thead><tbody><tr><td>1.</td><td>Miss. Nikita</td><td>27</td><td>₹ 2,34,000</td><td>NO</td></tr><tr><td>2.</td><td>Mr. Desilva</td><td>81</td><td>₹ 4,50,000</td><td>NO</td></tr></tbody></table>	Sr. No.	Individuals	Age	Taxable income (₹)	Will have to pay income tax or not	1.	Miss. Nikita	27	₹ 2,34,000	NO	2.	Mr. Desilva	81	₹ 4,50,000	NO	<b>1</b>
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1.	Miss. Nikita	27	₹ 2,34,000	NO													
2.	Mr. Desilva	81	₹ 4,50,000	NO													
4.	Annual income of an individual = ₹ 5,50,000 Deduction under section 80C = ₹ 1,80,000. But deduction to be considered under section 80C = ₹ 1,50,000. Taxable Income = ₹ 5,50,000 – ₹ 1,50,000 = ₹ 4,00,000. <b><math>\therefore</math> Amount of taxable income is ₹ 4,00,000</b>	<b>1</b>															
5.	20 is the lower class limit and 25 is the upper class limit.	<b>1</b>															

6.	Individuals who are above 80 years of age are considered as super senior citizens.	1
<b>A.1.</b>	<b>(B) Solve the following : (Any 2)</b>	
1.	$\sqrt{7} \times \sqrt{5} = \sqrt{35}$ and $3 \times 3 = 9 = \sqrt{81}$ Now, $\sqrt{35} < \sqrt{81}$ $\therefore \sqrt{7} \times \sqrt{5} < 3 \times 3$ $\therefore \frac{\sqrt{5}}{3} < \frac{3}{\sqrt{7}}$	1 1
2.	Data in ascending order : 59, 68, 70, 74, 75, 80 Here $n = 7$ (odd number) $\therefore$ Median = $\frac{n+1}{2}$ th term $= \left(\frac{7+1}{2}\right)$ term = $\left(\frac{8}{2}\right)$ 4th term = 4th term $\therefore$ 4th term is 74. $\therefore$ Median = 74	1 1
3.	Let the total amount received by Alka each month be ₹ x. Alka's expenditure = 90% of the total amount $\therefore$ Alka's saving $= (100 - 90)\%$ $= 10\%$ of the total amount But she saves ₹120 per month ..... [Given] $\therefore 10\%$ of x = 120 $\therefore \frac{10}{100} \times x = 120$ $\therefore x = \frac{120 \times 100}{10}$ $\therefore x = 1200$ $\therefore$ Amount received by Alka each month is ₹1200.	1 1

<p><b>A.2. (A) Solve the following :</b></p>		
1.	(B) 465	1
2.	(B) 9%	1
3.	(A) 2,16,000	1
4.	(C) 0%	1
<p><b>A.2. (B) Solve the following : (Any 2)</b></p>		
1.	<p>The A.P. is 7, 13, 19, 25, ...            Here <math>a = 7, d = 13 - 7 = 6, t_{19} = ?</math>  <math>t_n = a + (n - 1) d</math>  <math>t_{19} = 7 + (19 - 1) 6</math> <span style="float: right;">(<math>\because n = 19</math>)</span>  <math>= 7 + 18 \times 6</math>  <math>= 7 + 108</math>  <math>t_{19} = 115</math></p>	1
	<p><b>Thus 19<sup>th</sup> term of the A.P. is 115</b></p>	1
2.	<p>FV of share = ₹ 100            Discount = ₹ 30  <math>\therefore MV = FV - \text{discount}</math>  <math>= 100 - 30</math>  <math>= ₹ 70</math>  <math>\therefore</math> Market value of 1 share = ₹ 70  <math>\therefore</math> Total amount obtained by selling 300 shares  <math>= 300 \times 70 = ₹ 21000</math></p>	1
	<p><math>\therefore</math> <b>The amount obtained by selling 300 shares is ₹ 21,000.</b></p>	1

3.	<p>(i)</p> <table border="1" data-bbox="363 376 1109 900"> <thead> <tr> <th data-bbox="363 376 630 454">Mode of transport</th> <th data-bbox="630 376 746 454">%</th> <th data-bbox="746 376 1109 454">Measure of Central angle</th> </tr> </thead> <tbody> <tr> <td data-bbox="363 454 630 544">Two wheelers</td> <td data-bbox="630 454 746 544">40%</td> <td data-bbox="746 454 1109 544"><math>\frac{40}{100} \times 360 = 144^\circ</math></td> </tr> <tr> <td data-bbox="363 544 630 622">Rickshaws</td> <td data-bbox="630 544 746 622">10%</td> <td data-bbox="746 544 1109 622"><math>\frac{10}{100} \times 360 = 36^\circ</math></td> </tr> <tr> <td data-bbox="363 622 630 701">Buses</td> <td data-bbox="630 622 746 701">8%</td> <td data-bbox="746 622 1109 701"><math>\frac{8}{100} \times 360 = 28.8 \rightarrow 29^\circ</math></td> </tr> <tr> <td data-bbox="363 701 630 779">Tempos</td> <td data-bbox="630 701 746 779">12%</td> <td data-bbox="746 701 1109 779"><math>\frac{12}{100} \times 360 = 43.2 \rightarrow 43^\circ</math></td> </tr> <tr> <td data-bbox="363 779 630 846">Cars</td> <td data-bbox="630 779 746 846">30%</td> <td data-bbox="746 779 1109 846"><math>\frac{30}{100} \times 360 = 108^\circ</math></td> </tr> <tr> <td data-bbox="363 846 630 900"><b>Total</b></td> <td data-bbox="630 846 746 900"><b>100%</b></td> <td data-bbox="746 846 1109 900"><b>360°</b></td> </tr> </tbody> </table> <p>(ii) Total no. of two wheelers = 1200  Central angle of two wheeler = <math>\frac{\text{No. of two wheelers}}{\text{Total no. of vehicles}} \times 360</math>  <math display="block">144 = \frac{1200}{\text{Total no. of vehicles}} \times 360</math>  Total no. of vehicles = <math>\frac{1200 \times 360}{144}</math>  = 3000  ∴ <b>Total number of vehicles is 3000.</b></p>	Mode of transport	%	Measure of Central angle	Two wheelers	40%	$\frac{40}{100} \times 360 = 144^\circ$	Rickshaws	10%	$\frac{10}{100} \times 360 = 36^\circ$	Buses	8%	$\frac{8}{100} \times 360 = 28.8 \rightarrow 29^\circ$	Tempos	12%	$\frac{12}{100} \times 360 = 43.2 \rightarrow 43^\circ$	Cars	30%	$\frac{30}{100} \times 360 = 108^\circ$	<b>Total</b>	<b>100%</b>	<b>360°</b>	1
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**A.3. (A) Solve the following activity : (Any 2)**

1.

Production (in thousand rupees)	Class Mark ( $x_i$ )	No. of families ( $f_i$ )	$f_i x_i$
20 - 30	25	10	250
30 - 40	35	11	385
40 - 50	45	15	675
50 - 60	55	16	880
60 - 70	65	18	1170
70 - 80	75	14	1050
<b>Total</b>		$N = \sum f_i = 84$	$\sum f_i x_i = 4410$

$$\text{Mean } (\bar{x}) = \frac{\sum f_i x_i}{\sum f_i}$$

$$= \frac{4410}{84}$$

$$= 52.5$$

$$\text{Mean of production} = 52.5 \times 1000$$

$$= 52,500$$

**∴ Mean of production in rupees is ₹ 52,500.**

2. Fill in the blanks given in the contract note of sale-purchase of shares.  
(B - buy S - sell)

No. of shares	MV of shares	Total value	Brokerage 0.2%	9% CGST on brokerage	9% SGST on brokerage	Total Value of shares
100 B	₹ 45	₹ 4500	₹ 9	₹ 0.81	₹ 0.81	₹ 4510.62
75 S	₹ 200	₹ 15000	₹ 30	₹ 2.70	₹ 2.70	₹ 14964.60

<p>3.</p>	<p>First term and common difference of an A.P. are 6 and 3 respectively: Find <math>S_{27}</math> Solution: <math>a = 6, d = 3, S_{27} = ?</math> <math display="block">S_n = \frac{n}{2} [2a + (n-1)d]</math><math display="block">\therefore S_{27} = \frac{27}{2} [12 + (27-1)3]</math><math display="block">= \frac{27}{2} \times 90 = 27 \times 45</math><math display="block">\therefore S_{27} = 1215</math></p>	<p>1</p> <p>1</p>
<p><b>A.3. (B) Solve the following activity : (Any 2)</b></p>		
<p>1.</p>	<p>The first <math>n</math> even natural numbers are: 2, 4, 6, 8,..... They form an A.P. with <math>a = 2,</math> <math>d = t_2 - t_1 = 4 - 2 = 2</math> We know, <math>S_n = \frac{n}{2} [2a + (n-1)d]</math> <math display="block">\therefore S_{123} = \frac{123}{2} [2(2) + (123-1)2]</math><math display="block">= \frac{123}{2} [4 + 122(2)]</math><math display="block">= \frac{123}{2} [4 + 244]</math><math display="block">= \frac{123}{2} [248]</math><math display="block">= 123 [124]</math><math display="block">= 15252</math> <math display="block">\therefore \text{The sum of first 123 even natural numbers in 15252.}</math></p>	<p>1</p> <p>1</p>
<p>2.</p>	<p>MV = ₹ 1000 Brokerage = 0.1% Brokerage per share = 0.1% of ₹ 1000 <math display="block">= \frac{0.1}{100} \times 1000</math><math display="block">= ₹ 1</math> <math display="block">\therefore \text{Selling price per share} = \text{MV} - \text{Brokerage}</math></p>	<p>1</p>

... 7 ...

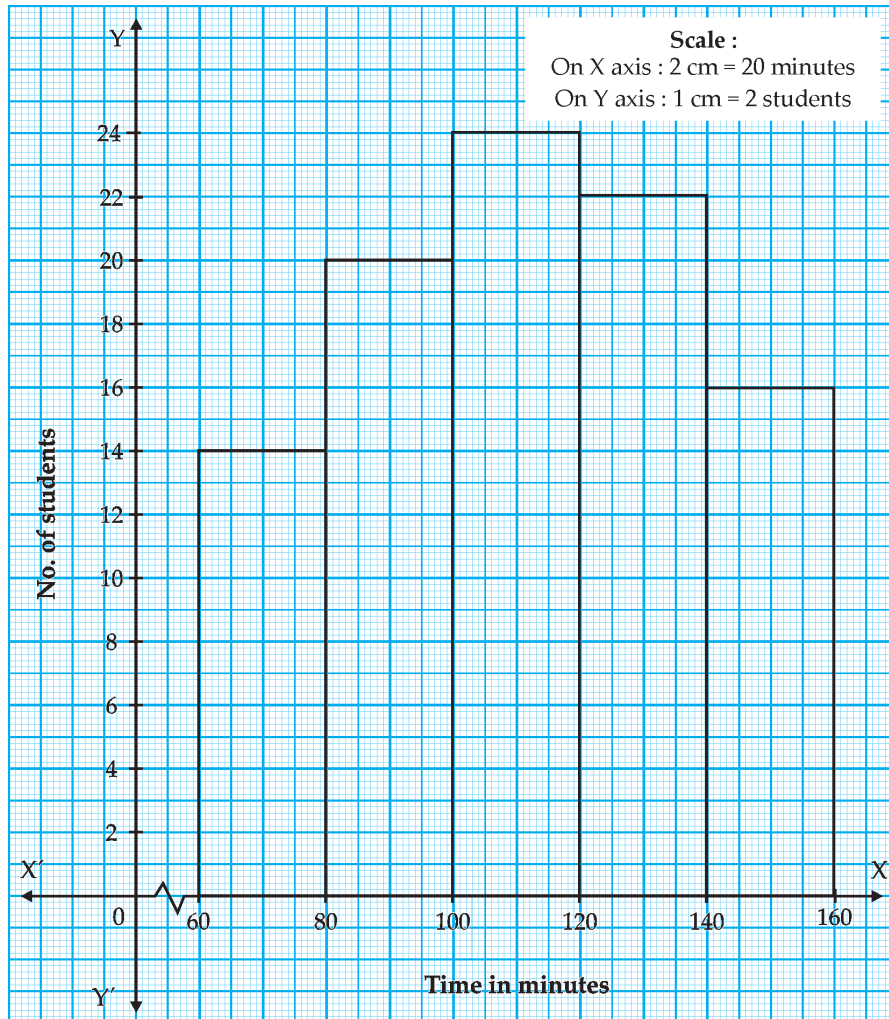
$$= 1000 - 1$$
$$= ₹ 999$$

∴

The amount obtained on selling the share is ₹ 999.

1

3.



2

**A.4. Solve the following : (Any 3)**

**9**

1.

Class interval (Milk in litres)	Frequency (No. of Hotels)
1 - 3	7
3 - 5	5
5 - 7	15
7 - 9	20 $\rightarrow f_0$
<b>9 - 11</b>	35 $\rightarrow f_1$
11 - 13	18 $\rightarrow f_2$

$f_1 =$  Maximum frequency = 35.

The corresponding class 9 - 11 is the modal class.

$f_0 = 20, f_2 = 18, L = 9$  and  $h = 2$

$$\begin{aligned} \text{Mode} &= L + \left[ \frac{f_1 - f_0}{2f_1 - f_0 - f_2} \right] \times h \\ &= 9 + \left[ \frac{35 - 20}{2 \times 35 - 20 - 18} \right] \times 2 \\ &= 9 + \frac{15}{32} \times 2 \\ &= 9 + 0.94 = 9.94 \end{aligned}$$

$\therefore$  **Modal of quantity of milk consumed by hotels is 9.94 litres.**

**1**

**1**

**1**

2. The first A.P. is 9, 7, 5, ...

Here,  $a = 9, d = 7 - 9 = -2$

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

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

$$\therefore t_n = 9 + (n - 1) (-2)$$

$$\therefore t_n = 9 - 2n + 2$$

$$\therefore t_n = 11 - 2n$$

... (i)

The second A.P. is 24, 21, 18....

Here,  $a = 24, d = 21 - 24 = -3$

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

$$\therefore t_n = 24 + (n - 1) (-3)$$

$$\therefore t_n = 24 - 3n + 3$$

$$\therefore t_n = 27 - 3n$$

... (ii)

Now,  $n$ th term of first A.P. =  $n$ th term of second A.P.

**1**

**1**





Subtracting (i) from (ii),

$$a + 20d = 29$$

$$a + 10d = 16$$

$$\begin{array}{r} (-) \quad (-) \quad \quad (-) \\ \hline 10d = 13 \end{array}$$

$$\therefore d = \frac{13}{10}$$

Substituting  $d = \frac{13}{10}$  in equation (i)

$$a + 10d = 16$$

$$\therefore a + 10 \times \frac{13}{10} = 16$$

$$\therefore a + 13 = 16$$

$$\therefore a = 16 - 13$$

$$\therefore a = 3$$

Here,  $a = 3$ ;  $d = \frac{13}{10}$ ,  $t_{41} = ?$

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

$$\therefore t_{41} = 3 + (41 - 1) \frac{13}{10} \quad [\because n = 41]$$

$$= 3 + 40 \times \frac{13}{10}$$

$$= 3 + 4 \times 13$$

$$= 3 + 52$$

$$\therefore t_{41} = 55$$

**Thus 41<sup>st</sup> term of the A.P. is 55.**

**A.5 Solve the following : (Any 1)**

1. (i) For wholesaler:

Taxable amount of Electric goods = ₹ 1,50,000

Rate of GST = 18%

$\therefore$  Tax paid at the time of purchase (ITC)

$$= 18\% \text{ of } ₹ 1,50,000$$

$$= \frac{18}{100} \times 150000$$

$$= ₹ 27,000$$

Tax collected at time of sale (Output tax)

$$= 18\% \text{ of } ₹ 1,80,000$$

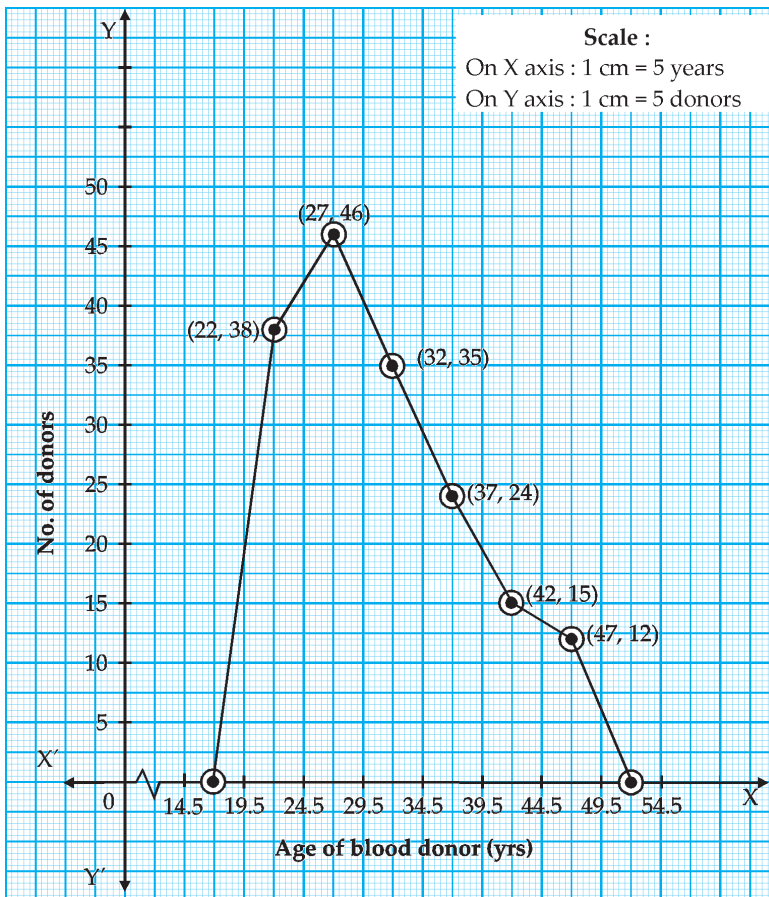
$$= \frac{18}{100} \times 180000$$

	<p>= ₹ 32,400</p> <p>∴ CGST and SGST shown in the tax invoice of wholesaler = <math>\frac{32400}{2}</math> = ₹ 16,200</p> <p>∴ GST payable by wholesaler = Output tax – ITC = ₹ 32,400 – ₹ 27,000</p> <p>GST payable by wholesaler = ₹ 5400</p> <p>∴ CGST to be paid by wholeseller = <math>\frac{5400}{2}</math></p> <p style="text-align: right;">= ₹ 2700</p> <p>∴ <b>CGST = SGST = ₹ 2700 is payable by wholeseller</b></p> <p>(ii) For retailer:</p> <p>Tax paid at the time of purchase (ITC) = ₹ 32,400</p> <p>Tax collected at the time of sale (Output tax) = 18% of ₹ 2,20,000</p> <p style="text-align: center;"><math>= \frac{18}{100} \times 220000</math></p> <p style="text-align: center;">= ₹ 39,600</p> <p>∴ CGST and SGST shown in the tax invoice of retailer = <math>\frac{39600}{2}</math></p> <p style="text-align: right;">= ₹ 19,800</p> <p>GST payable by retailer = Output tax – ITC = ₹ 39,600 – ₹ 32,400</p> <p>GST payable by retailer = ₹ 7200</p> <p>∴ CGST payable by wholeseller = <math>\frac{7200}{2}</math></p> <p style="text-align: right;">= ₹ 3600</p> <p>∴ <b>CGST = SGST = ₹ 3600 payable by retailer</b></p>	<p style="text-align: center;">1</p> <p style="text-align: center;">1</p> <p style="text-align: center;">1</p>
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2.

Class	Continuous class	Class mark	Frequency	Coordinate of points
15 - 19	14.5 - 19.5	17	0	(17, 0)
20 - 24	19.5 - 24.5	22	38	(22, 38)
25 - 29	24.5 - 29.5	27	46	(27, 46)
30 - 34	29.5 - 34.5	32	35	(32, 35)
35 - 39	34.5 - 39.5	37	24	(37, 24)
40 - 44	39.5 - 44.5	42	15	(42, 15)
45 - 49	44.5 - 49.5	47	12	(47, 12)
50 - 54	49.5 - 54.5	52	0	(52, 0)

1



3

**A.6 Solve the following : (Any 1)**

1. Class width (h) = 2

<b>Class intervals</b> (Daily working hours)	<b>Frequency</b> (No. of employees)	<b>Cumulative frequency</b> (less than type)
8 - 10	150	150 → c.f.
<b>10 - 12</b>	500 → f	150 + 500 = 650
12 - 14	300	650 + 300 = 950
14 - 16	50	950 + 50 = 1000
<b>Total</b>	<b>1000 ← N</b>	

Here, total frequency (N) = 1000.

$$\therefore \frac{N}{2} = \frac{1000}{2} = 500$$

Cumulative frequency (less than type) which is just greater than 500 is 650.

∴ Corresponding class 10 - 12 is the median class.

∴ f = 500, c. f. = 150, L = 10 and h = 2

$$\text{Median} = L + \left[ \frac{\frac{N}{2} - c.f.}{f} \right] \times h$$

$$= 10 + \left[ \frac{500 - 150}{500} \right] \times 2$$

$$= 10 + 1.4$$

$$= 11.4$$

∴ **Median of no. of hours worked is 11.4**

2. FV of share = ₹ 100

Dividend per share = 20% of ₹ 100

$$= \frac{20}{100} \times 100$$

∴ Dividend per share = ₹ 20

∴ Dividend on 50 shares = 50 × 20 = ₹ 1000

∴ MV of share = ₹ 80

∴ Total investment = 50 × 80 = ₹ 4000

∴ Rate of return =  $\frac{\text{Total dividend received}}{\text{Total investment}} \times 100$

$$= \frac{1000}{4000} \times 100$$

∴ **Rate of return = 25%**

