

INDIAN SCHOOL MUSCAT

ANNUAL EXAMINATION

FEBRUARY 2020

SET A

CLASS XI

Marking Scheme – MATHEMATICS

Q.NO.	SECTION:A	Marks (with split up)
1.	d) $2^{mn}$	1
2.	b) $e=2, f=-3$	1
3.	c) $\frac{\sqrt{3}}{2}$	1
4.	c) $4^5$	1
5.	a) 20	1
6.	c) 12	1
7.	c) $\sqrt{13}$	1
8.	d) $x^2 = -12y$	1
9.	b) Seventh octant	1
10.	b) $\frac{m}{n}$	1
11.	100	1
12.	$\sqrt{3}$	1
13.	0.2	1
14.	$x = 0$	1
15.	1:32 OR 55	1
16.	$\frac{3}{8}$	1
17.	$P(A) = \{\phi, \{1\}, \{2\}, \{1,2\}\}$	1
18.	$-1+i0$ OR $\frac{\sqrt{5}}{14} - \frac{3}{14}i$	1
19.	$\sqrt{7}$ is irrational.	1
20.	11 cm	1
	<b>SECTION:B</b>	
21.	$D_f = [-4,4]$ & $R_f = [0,4]$ OR $f(x) = ax^2 + bx + c$ $c = 6, a = \frac{1}{2}$ and $b = \frac{3}{2}$ $\therefore f(x) = \frac{1}{2}x^2 + \frac{3}{2}x + 6$	1+1  $\frac{1}{2} + \frac{1}{2} + \frac{1}{2}$ $\frac{1}{2}$

22.	$\frac{-16}{1+i\sqrt{3}} = -4 + i4\sqrt{3}$ $r = 8, \cos\theta = \frac{-1}{2}, \sin\theta = \frac{\sqrt{3}}{2}$ $\theta = \frac{2\pi}{3}; \text{ Polar form: } 8\left(\cos\frac{2\pi}{3} + i\sin\frac{2\pi}{3}\right)$	1  1
23.	$PA = PB$ $\Rightarrow PA^2 = PB^2$ $(x-3)^2 + (y-4)^2 + (z+5)^2 = (x+2)^2 + (y-1)^2 + (z-4)^2$ $\Rightarrow 10x + 6y - 18z - 29 = 0$	$\frac{1}{2} + \frac{1}{2}$ 1
24.	$a = 3, r = \frac{1}{2}, S_n = \frac{3069}{512}$ $\frac{a(1-r^n)}{1-r} = \frac{3069}{512}$ $\frac{1}{2^n} = \frac{1}{1024} \Rightarrow n = 10$ <p style="text-align: center;">OR</p> <p>Let <math>a^{\frac{1}{x}} = b^{\frac{1}{y}} = c^{\frac{1}{z}} = k</math></p> $\Rightarrow a = k^x, b = k^y, c = k^z \text{ _____ (i)}$ <p><math>\therefore a, b, c</math> are in G.P</p> $\therefore b^2 = ac \text{ _____ (ii)}$ <p>Using (i) &amp; (ii) <math>k^{2y} = k^{x+z}</math></p> $\Rightarrow 2y = x + z$ $\Rightarrow x, y, z \text{ are in A.P.}$	1  1          1
25.	$a_k = 5k + 1 \text{ (given)}$ $a_1 = 6 \text{ and } a_n = 5n + 1$ $S_n = \frac{n}{2}(5n + 7)$	1  1
26.	<p>(i) <math>\frac{12!}{3!4!2!} = 1663200</math></p> <p>(ii) <math>\frac{10!}{3!2!4!} = 12600</math></p>	1  1
<b>SECTION:C</b>		

27.	<p>P(1) is true          Assume that P(k) is true.          Prove that P(k+1) is true.          Conclusion</p>	$\frac{1}{2} + 1 + 2$  $\frac{1}{2}$
28.	$9x^2 + 16y^2 = 144$ $\Rightarrow \frac{x^2}{16} + \frac{y^2}{9} = 1$ $a = 4, b = 3, c = \sqrt{7}$ <p>Coordinates of foci <math>(\pm \sqrt{7}, 0)</math>          Coordinates of vertices are <math>(\pm 4, 0)</math>          Length of major axis = 8          Length of minor axis = 6          Eccentricity = <math>\frac{\sqrt{7}}{4}</math>          Length of latus rectum = <math>\frac{9}{2}</math></p>	
29.	<p>Total number of ways = <math>7! = 5040</math>          No. of ways in which 3 vowels come together = <math>5!3! = 720</math>          Probability = <math>\frac{720}{5040} = \frac{1}{7}</math>          OR  <math>n(S) = 20</math>          (i) P(number on the card is a multiple of 4) = <math>\frac{1}{4}</math>          (ii) P(number on the card is a multiple of 6) = <math>\frac{3}{20}</math>          (iii) P(number on the card is not a multiple of 6) = <math>\frac{17}{20}</math></p>	
30.	<p>Draw the graph of each straight line          Find the solution region</p>	$1 + 1 + 1$ $1$
31.	<p><math>{}^nC_{r-2} : {}^nC_{r-1} : {}^nC_r + 1 : 3 : 5</math>  <math>3n - 8r + 3 = 0</math> _____ (i)  <math>n - 4r + 5 = 0</math> _____ (ii)          Solving (i) &amp; (ii) <math>n = 7</math> &amp; <math>r = 3</math></p> <p style="text-align: center;">OR</p> <p>Apply Leibnitz Product rule</p> $(x + \cos x)'(x - \tan x) + (x + \cos x)(x - \tan x)'$ $(1 - \sin x)(x - \tan x) + (x + \cos x)(1 - \sec^2 x)$	$1 + 1 + 1$ $\frac{1}{2} + \frac{1}{2}$         $2 + 2$

32.	<p>Let <math>f(x) = \tan x</math>. Then</p> $\frac{df(x)}{dx} = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h} = \lim_{h \rightarrow 0} \frac{\tan(x+h) - \tan(x)}{h}$ $= \lim_{h \rightarrow 0} \frac{1}{h} \left[ \frac{\sin(x+h)}{\cos(x+h)} - \frac{\sin x}{\cos x} \right]$ $= \lim_{h \rightarrow 0} \left[ \frac{\sin(x+h)\cos x - \cos(x+h)\sin x}{h \cos(x+h)\cos x} \right]$ $= \lim_{h \rightarrow 0} \frac{\sin(x+h-x)}{h \cos(x+h)\cos x} \text{ (using formula for } \sin(A+B)\text{)}$ $= \lim_{h \rightarrow 0} \frac{\sin h}{h} \cdot \lim_{h \rightarrow 0} \frac{1}{\cos(x+h)\cos x}$ $= 1 \cdot \frac{1}{\cos^2 x} = \sec^2 x.$	$\frac{1}{2}$  1  1  1  $\frac{1}{2}$
	<b>SECTION:D</b>	
33.	<p>Show that: <math>p = k \cos 2\theta</math></p> <p>Show that: <math>q = \frac{k}{2} \sin 2\theta</math></p> $p^2 + 4q^2 = (k \cos 2\theta)^2 + 4\left(\frac{k}{2} \sin 2\theta\right)^2$ $= k^2$	2 2  2
34.	<p>Venn diagram with correct entries</p> <p>(i) 30</p> <p>(ii) 80</p> <p>(iii) 20</p>	3 1+1+1

35.	$\text{L.H.S.} = \frac{1}{2} \left[ 2\cos 2x \cos \frac{x}{2} - 2\cos \frac{9x}{2} \cos 3x \right]$ $= \frac{1}{2} \left[ \cos \left( 2x + \frac{x}{2} \right) + \cos \left( 2x - \frac{x}{2} \right) - \cos \left( \frac{9x}{2} + 3x \right) - \cos \left( \frac{9x}{2} - 3x \right) \right]$ $= \frac{1}{2} \left[ \cos \frac{5x}{2} + \cos \frac{3x}{2} - \cos \frac{15x}{2} - \cos \frac{3x}{2} \right] = \frac{1}{2} \left[ \cos \frac{5x}{2} - \cos \frac{15x}{2} \right]$ $= \frac{1}{2} \left[ -2\sin \left\{ \frac{\frac{5x}{2} + \frac{15x}{2}}{2} \right\} \sin \left\{ \frac{\frac{5x}{2} - \frac{15x}{2}}{2} \right\} \right]$ $= -\sin 5x \sin \left( -\frac{5x}{2} \right) = \sin 5x \sin \frac{5x}{2} = \text{R.H.S.}$	$\frac{1}{2}$  2  $\frac{1}{2}$  $1\frac{1}{2}$  $\frac{1}{2}$
	<p>The equation can be written as</p> $\sin 6x + \sin 2x - \sin 4x = 0$ <p>or</p> $2 \sin 4x \cos 2x - \sin 4x = 0$ <p>i.e.</p> $\sin 4x(2 \cos 2x - 1) = 0$ <p>Therefore</p> $\sin 4x = 0 \quad \text{or} \quad \cos 2x = \frac{1}{2}$ <p>i.e.</p> $\sin 4x = 0 \quad \text{or} \quad \cos 2x = \cos \frac{\pi}{3}$ <p>Hence</p> $4x = n\pi \quad \text{or} \quad 2x = 2n\pi \pm \frac{\pi}{3}, \text{ where } n \in \mathbf{Z}$ <p>i.e.</p> $x = \frac{n\pi}{4} \quad \text{or} \quad x = n\pi \pm \frac{\pi}{6}, \text{ where } n \in \mathbf{Z}.$	$1 + \frac{1}{2}$  2+2  $\frac{1}{2}$
36.	Let the other two observations be $x$ and $y$ .	

Therefore, the series is 1, 2, 6, x, y.

Now Mean  $\bar{x} = 4.4 = \frac{1+2+6+x+y}{5}$

or  $22 = 9 + x + y$

Therefore  $x + y = 13$  ... (1)

Also variance =  $8.24 = \frac{1}{n} \sum_{i=1}^5 (x_i - \bar{x})^2$

i.e.  $8.24 = \frac{1}{5} [(3.4)^2 + (2.4)^2 + (1.6)^2 + x^2 + y^2 - 2 \times 4.4(x+y) + 2 \times (4.4)^2]$  2

or  $41.20 = 11.56 + 5.76 + 2.56 + x^2 + y^2 - 8.8 \times 13 + 38.72$

Therefore  $x^2 + y^2 = 97$  ... (2)

But from (1), we have

$x^2 + y^2 + 2xy = 169$  ... (3)

From (2) and (3), we have

$2xy = 72$  ... (4) 2

Subtracting (4) from (2), we get

$x^2 + y^2 - 2xy = 97 - 72$  i.e.  $(x - y)^2 = 25$

or  $x - y = \pm 5$  ... (5)

So, from (1) and (5), we get

$x = 9, y = 4$  when  $x - y = 5$

or  $x = 4, y = 9$  when  $x - y = -5$

Thus, the remaining observations are 4 and 9.

Class	Frequency ( $f_i$ )	Mid-point ( $x_i$ )	$f_i x_i$	$(x_i - \bar{x})^2$	$f_i(x_i - \bar{x})^2$
30-40	3	35	105	729	2187
40-50	7	45	315	289	2023
50-60	12	55	660	49	588
60-70	15	65	975	9	135
70-80	8	75	600	169	1352
80-90	3	85	255	529	1587
90-100	2	95	190	1089	2178
	50		3100		10050

3

Mean=62  
Variance=201  
Standard deviation=14.18

1+1+1

**SET B**

12.

$$\frac{\sqrt{3}}{2}$$

1

14.

$$z=0$$

1

1+1

21.

Domain=R and Range= $[3, \infty)$

28.

$$9y^2 - 4x^2 = 36$$

$$\Rightarrow \frac{y^2}{4} - \frac{x^2}{9} = 1$$

 $\frac{1}{2}$  for  
each step

$$a = 2, b = 3, c = \sqrt{13}$$

Coordinates of foci  $(0, \pm\sqrt{13})$

Coordinates of vertices are  $(0, \pm 2)$

Length of transverse axis=4

Length of conjugate axis=6

$$\text{Eccentricity} = \frac{\sqrt{13}}{2}$$

Length of latus rectum= 9

**SET C**

12.

$$\frac{\sqrt{3}}{2}$$

 $\frac{1}{2}$

14.	$y=0$	1 1+1
21.	Domain = $[2, \infty)$ and Range = $[0, \infty)$	
28.	$9x^2 - 16y^2 = 144$ $\Rightarrow \frac{x^2}{16} - \frac{y^2}{9} = 1$ $a = 4, b = 3, c = 5$ <p>Coordinates of foci <math>(\pm 5, 0)</math>  Coordinates of vertices are <math>(\pm 4, 0)</math>  Length of transverse axis = 8  Length of conjugate axis = 6  Eccentricity = <math>\frac{5}{4}</math></p> <p>Length of latus rectum = <math>\frac{9}{2}</math></p>	$\frac{1}{2}$ for each step