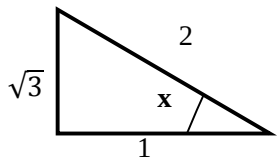
First Year Higher Secondary Examination –September – 2021

Mathematics-Science -FY -227-Answer Key

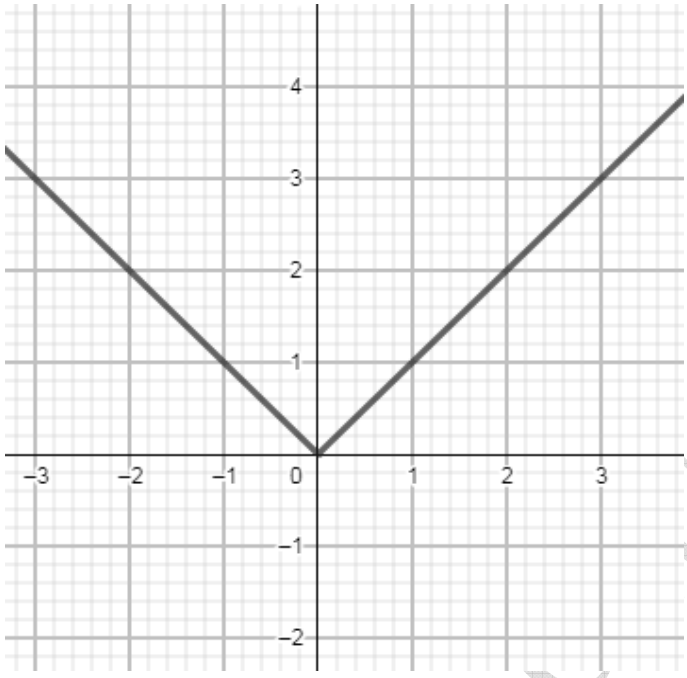
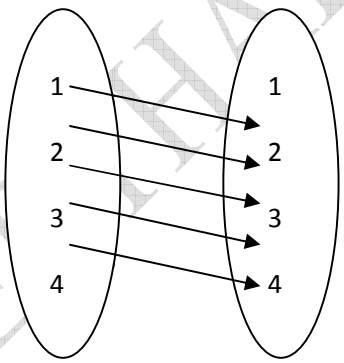
Qn No	Scoring Indicators	Split Score	Total Score
1	**(i)** A = { 1,2,3,4,5} **(ii)** A∩B = {1,2} **(iii)** A-B = {3,4,5}	**1** **1** **1**	**3**
2	Sequence is 105,110,……. 995 Number of terms = $\frac{995-105}{5}$ +1 = 179 Sum = $\frac{179}{2}$ (105 + 995) = 98450	**1** **1** **1**	**3**
3	$(2x+3)^5 = {}^5C_0 (2x)^5 + {}^5C_1 (2x)^4.3 + {}^5C_2 (2x)^3.3^2 + {}^5C_3 (2x)^2 3^3$ $+ {}^5C_4 (2x). 3^4 + {}^5C_5 3^5$ $= 32x^5 + 240x^4 + 720x^3 + 1080x^2 + 810x + 243$	**2** **1**	**3**
4	LHL = 2. 0 + 3 = 3 RHL = 3(0+1) = 3 LHL = RHL $\Rightarrow$ $\lim_{x\to 0} f(x)$ =3	**1** **1** **1**	**3**
5	n(H) = 250, n(E) = 200 and n(EUH) = 400 n(E∩H) = n(E) + n(H) – n(EUH) = 250+200- 400 = 50	**1** **1** **1**	**3**

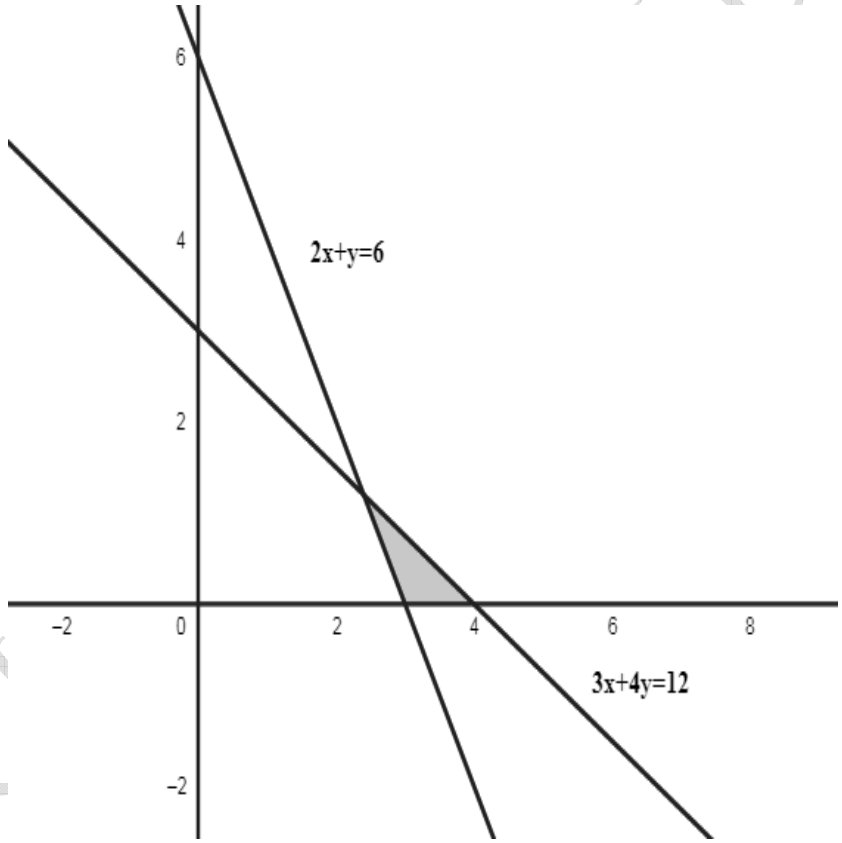
6	Here A = 2, B = 3 and C = -6 **(i)** Slope = $\frac{-A}{B}$ = $\frac{-2}{3}$ **(ii)** Y intercept = $\frac{-C}{B}$ = $\frac{6}{3}$ = 2	**1** **1** **1**	**3**
7	**(i)** Focus = (a,0) =(3,0) **(ii)** Eq. of directrix is x +3 =0 **(iii)** Length of LR = 4a = 12	**1** **1** **1**	**3**
8	**(i)** Option (b) =YZ plane **(ii)** PQ = $\sqrt{25+9+9}$ = $\sqrt{43}$	**1** **1** **1**	**3**
9	P(1) : $7^1 - 3^1 = 4$ is divisible by 4 P(k) : Let $7^k - 3^k$ is divisible by 4 $\Rightarrow 7^k - 3^k = 4\lambda \Rightarrow 7^k = 3^k + 4\lambda$ P(k+1) : $7^{k+1} - 3^{k+1} = 7^k .7 - 3^k .3$ $= 7(3^k + 4\lambda) - 3.3^k = 28\lambda + 4.3^k = M(4)$	**1** **1** **1**	**3**
10	**(i)** $T_{r+1} = {}^nC_r\, a^{n-r}\, b^r$ $= {}^{12}C_r\, x^{12-r}\, (-2y)^r$ **(ii)** $T_4 = {}^{12}C_3\, x^9\, (-2y)^3$	**1** **1** **1**	**3**

11	Here z = 0 $\frac{-8m+10n}{m+n} = 0 \Rightarrow$ -8m+10n = 0 $\Rightarrow$ m:n = 10 : 8 or 5:4	**1** **1** **1**	**3**
12	**(i)** It is false that every natural number is greater than zero. **(ii)** Converse: If n is even then n^2 is even Contrapositive: If n is not even then n^2 is not even.	**1** **1** **1**	**3**
13	**(i)** Option (c) = 8 **(ii)** Subsets are {1,2}, {2,3} and {1,3} **(iii)** A' = { 4,5,6}	**1** **2** **1**	**4**
14	**(i)** x+1 = 3 and y-2 =1 $\Rightarrow$ x = 2 and y = 3 **(ii)** Ax B = { (1,3), (1,4), (2,3) ,(2,4), (3,3),(3,4) }	**1** **1** **2**	**4**
15	**(i)** Cos x = $\frac{-1}{2}$ Sin x = $\frac{-\sqrt{3}}{2}$ Tan x = $\sqrt{3}$  **(ii)** $\text{Sin}^2\frac{\pi}{6} + \cos^2\frac{\pi}{3} = \left(\frac{1}{2}\right)^2 + \left(\frac{1}{2}\right)^2$ $= \frac{1}{4} + \frac{1}{4} = \frac{1}{2}$	**1** **1** **1** **1**	**4**

16	**(i)** P(1) : $1 = \frac{3^1-1}{2} \Rightarrow 1=1$ **(ii)** P(k): $1+ 3+ 3^2 + \ldots + 3^{k-1} = \frac{3^k-1}{2}$ P(k+1) : $1 + 3+ 3^2 + \ldots + 3^{k-1} + 3^k$ $= \frac{3^k-1}{2} + 3^k$ $= \frac{3^k-1+2.3^k}{2} = \frac{3.3^k-1}{2}$ $= \frac{3^{k+1}-1}{2}$	**1** **1** **1** **1**	**4**
17.	**(i)** Option (b) = i **(ii)** $3(7+i7)+i(7+i7) = 21 +21i +7i+7i^2$ $= 21+ 28i -7$ $= 14 +28i$	**1** **1** **1** **1**	**4**
18	$z = 1+ i\sqrt{3}$ $r = \sqrt{1+3} = 2$ $\tan\Theta = \sqrt{3} \Rightarrow \Theta = 60^0$ Polar form is $r(\cos\Theta + i\sin\Theta)$ $= 2(\cos 60^0 + i \sin 60^0)$	**1** **1** **1** **1**	**4**
19	**(i)** Option (d) =10 **(ii)** Number of chords = $^{21}C_2 = 210$	**1** **3**	**4**
20	(i) Three digit numbers formed are 5.4.3 $= 60$ (ii) Number of permutations = $\frac{9!}{4!2!}$ $= 7560$	**1** **1** **1** **1**	**4**

21	Slope of the given line is $\frac{-A}{B} = \frac{1}{7}$ Slope of the perpendicular line is -7 Equation is $y-y_1 = m(x-x_1)$ $\Rightarrow$ $y+3 = -7(x-2)$ $\Rightarrow 7x + y - 11 = 0$	**1** **1** **1** **1**	**4**
22	Here $a = 5$ and $c = 4$ $\Rightarrow a^2 = 25$, $c^2 = 16$ and $b^2 = 25-16 = 9$ **(i)** Equation is $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ $\Rightarrow \frac{x^2}{25} + \frac{y^2}{9} = 1$ **(ii)** Eccentricity is $\frac{c}{a} = \frac{4}{5}$	**1** **1** **1** **1**	**4**
23.	**(i)** $(uv)' = u'v + uv'$ $= 1(x^2+2x+1) + x(2x+2)$ $= 3x^2 + 4x + 1$ **(ii)** $\left(\frac{u}{v}\right)' = \frac{u'v-uv'}{v^2}$ $= \frac{1.x-(x+1)1}{x^2}$ $= \frac{-1}{x^2}$	**1** **1** **1** **1**	**4**
24	Let $\sqrt{5}$ be rational $\Rightarrow \sqrt{5} = \frac{p}{q}$ where p and q have no common factor $\Rightarrow 5q^2 = p^2$ $\Rightarrow p^2$ and hence p is a multiple of 5 $\Rightarrow p = 5m$ for some integer m $\Rightarrow 25m^2 = 5q^2$ $\Rightarrow q^2$ and hence q is a multiple of 5 $\Rightarrow$ p and q are multiples of 5 which is a contradiction Thus $\sqrt{5}$ is irrational	**1** **1** **1** **1**	**4**

25	**(i)** Graph of f(x) = $\|x\|$  	**3**	**6**
	(ii) R = {(1,2), (2,3), (3,4), (4,5), (5,6) } **(a)** Arrow diagram  	**2** **1**	
	(b) Domain = {1,2,3,4,5}		

26	**(i)** Sin(x+y) = sin x. cos y + cos x. sin y Sin 75^0 = sin (45+30) = sin 45. Cos 30 + cos 45. Sin 30 $= \frac{1}{\sqrt{2}} \cdot \frac{\sqrt{3}}{2} + \frac{1}{\sqrt{2}} \cdot \frac{1}{2} = \frac{\sqrt{3}+1}{2\sqrt{2}}$ **(ii)** $\frac{\sin 5x+\sin 3x}{\cos 5x+\cos 3x}$ $= \frac{2 \sin 4x .\cos x}{2 \cos 4x.\cos x}$ = tan 4x	**1** **1** **1** **1** **1** **1**	**6**
27		**6**	**6**

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(i) Here a = 5 and r = 5

$a_{12} = ar^{11} = 5.5^{11}$ **1** **1**

(ii) $8+88+8888+\ldots. = 8\,(\ 1+11+111+\ldots\ldots)$ **1**

$= \frac{8}{9}\ (\ 9+99+999+\ldots\ldots.)$ **1**

$= \frac{8}{9}\ (\ 10-1+100-1+1000-1+\ldots\ldots.)$ **1**

$= \frac{8}{9}\ \left(\left(\frac{10(10^n-1)}{9}\right) - n\right)$ **1**

6

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x	**f**	**fx**	**fx^2**
35	3	105	3675
45	7	315	14175
55	12	660	36300
65	15	975	63375
75	8	600	45000
85	3	255	21675
95	2	190	18050
	50	3100	202250

(i) Mean $= \frac{\sum fx}{\sum f}$ **1**

$= \frac{3100}{50} = 62$ **1**

(ii) Variance $= \frac{\sum fx^2}{\sum f} - \left(\frac{\sum fx}{\sum f}\right)^2$ **1**

$= \frac{202250}{50} - (62)^2$ **1**

$= 201$ **1**

(iii) SD $= \sqrt{variance} = 14.18$ **1**

6

30	**(i)** S = {HH,HT,TH,TT} P(At least one tail = $\frac{3}{4}$ **(ii)** P(E) = $\frac{1}{4}$, P(F) = $\frac{1}{2}$ and P(E∩F) = $\frac{1}{8}$ (a) P(E or F) = P(EUF) = P(E) + P(F) – P(E∩F) = $\frac{1}{4}+\frac{1}{2}-\frac{1}{8}=\frac{5}{8}$ (b) P(not E and not F) = P(E'∩F') = 1-P(EUF) = 1-$\frac{5}{8}$ = $\frac{3}{8}$	**1** **1** **1** **1** **1** **1**	**6**