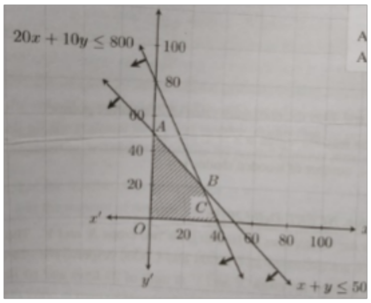
KENDRIYA VIDYALAYA SANGATHAN, MUMBAI REGION
FIRST PREBOARD EXAMINATION 2019-2020
CLASS XII : MATHEMATICS-041

ANSWERS

1	b) 320	1
2	d) 2	1
3	C) 2	1
4	a) 1/3	1
5	C) (2,3)	1
6	a) $\frac{2\pi}{5}$	1
7	b) 32/95	1
8	(d) $\frac{1}{7}\sin^{-1}\frac{7x}{4} + c$	1
9	b) 5/2	1
10	C) (0,3,-1)	1
11	2	1
12	t^2	1
13	A	1
14	6cm or decreasing at rate of 72 units/sec.	1
15	$\frac{j}{\sqrt{2}} + \frac{k}{\sqrt{2}}$ Or $\lambda = 5$	1
16	X+y dy/dx =0 Or 6	1
17	2	1

18	a = -2/3, b=3/2	½ + ½
19	O	1
20	e^x/x +C	1
21	Getting P(B)=7/8 and P(A∩ B)=6/8 Getting P(A/B) = 6/7	1 1
22	Subsituting in the formula and getting angle as $\pi/3$	1+1
23	Writing $\left(\vec{a}+\lambda\vec{b}\right).\vec{c}=0$ Getting the value as 8	1 1
	Expanding using scalar triple product For proving	1 1
24	Finding C=0 Finding the point as (0,0)	1 1`
25	Finding LHL and RHL Arriving at the conclusion that f is continuous	1 1
26	Writing $\tan^{-1}x + \tan^{-1}y=\pi- \tan^{-1}z$ and using correct formula and proving Or For proving not reflexive And not transitive	1 1 1 1
27	For proving one one For proving onto For finding inverse, $g(y)=\frac{\sqrt{y-6}-3}{2}$	1 ½ 1 ½ 1
28	For correct LPP	

	Max z=10500x+9000y s.t $x+y \le 50, 20x + 10y \le 800, x \ge 0, y \ge 0$ For graph  Solution, x=30, y=20 and max profit =Rs. 495000	2 1 1
29	Cosine formula, limits,getting a=± 2 OR Proper substitution,calculation,correct form of answer	1+2+1 1+2+1
30	Writing in the form $\frac{dy}{dx} + Py = Q$ Getting I.F as $cosec^3x$ Getting the solution as y= $-2sin^2x+Csin^3x$	1 1 2
31	Putting $x^{2=}$y and rewriting the integrand Applying partial fractions and getting the constants as -4/5 And 9/5 Getting final answer as $-2/5 \tan^{-1}x/2 + 3/5 \tan^{-1}x/3 + C$	1 2 1

<table>
<tr><td></td><td></td><td></td></tr>
<tr><td>32</td><td>Writing values of X as 0,1,2,3

Getting the table as follows:
<table>
<tr><td>X</td><td>0</td><td>1</td><td>2</td><td>3</td></tr>
<tr><td>P(X)</td><td>27/64</td><td>27/64</td><td>9/64</td><td>1/64</td></tr>
</table>
Getting mean as ¾

OR

Defining E1: guesses the answer, E2: copies, E3: knows the answer, A: answered correctly

P(E1)=1/3, P(E2)=1/6, P(E3)= ½

P(A/E1)=1/4, P(A/E2)=1/8, P(A/E3)= 1

Applying Bayes theorem and getting the answer,

P(E2/A)=1/29</td><td>½

2 ½

1

1

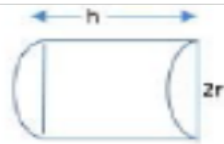
½

1

1 ½</td></tr>
<tr><td>33</td><td>Dividing R1,R2,R3 BY x,y,z res.</td><td>1</td></tr>
<tr><td></td><td>Multiplying C1,C2,C3 BY x, y, z respectively</td><td>1</td></tr>
<tr><td></td><td>$\Rightarrow xyz\begin{vmatrix}\frac{(x+y)^2}{x} & y & z\\ x & \frac{(x+z)^2}{y} & z\\ x & y & \frac{(x+y)^2}{z}\end{vmatrix}\Rightarrow\begin{vmatrix}(x+y)^2 & y^2 & z^2\\ x^2 & (x+z)^2 & z^2\\ x^2 & y^2 & (x+y)^2\end{vmatrix} R_1\to R_1-R_3,\ R_2\to R_2-R_3$

$=\begin{vmatrix}(y+Z)^2-x^2 & 0 & z^2-(x+y)^2\\ 0 & (x+z)^2-y^2 & z^2-(x+y)^2\\ x^2 & y^2 & (x+y)^2\end{vmatrix}\Rightarrow(x+y+z)^2\begin{vmatrix}y+z-x & 0 & z-x-y\\ 0 & x+z-y & z-x-y\\ x^2 & y^2 & (x+y)^2\end{vmatrix}$</td><td>2</td></tr>
</table>

	after applying the operation $= 2(x+y+z)^2[\{(y+x-x)(0+xy^2)\} - 0 + x(y+z)\{0+y(x+z-y)\}], = 2xyz(x+y+z)^3$	2
34	Drawing the figure and getting point of intersection $(\frac{1}{2}, \frac{\sqrt{3}}{2})$, Area = $2(\int_0^{\frac{1}{2}} \sqrt{1-(x-1)^2}dx + \int_{\frac{1}{2}}^{1} \sqrt{1-x^2}\ dx)$ $=2(\left\{\frac{x-1}{2}\sqrt{1-(x-1)^2}+\frac{1}{2}\sin^{-1}\frac{x-1}{1}\right\} + \left\{\frac{x}{2}\sqrt{1-x^2}+\frac{1}{2}\sin^{-1}\frac{x}{1}\right\})$ $= 2(\frac{-1}{4}\frac{\sqrt{3}}{2} - \frac{1}{2}\sin^{-1}\frac{1}{2}+\frac{1}{2}\sin^{-1} 1+\frac{1}{2}\sin^{-1} 1-\frac{1}{4}\frac{\sqrt{3}}{2} - \frac{1}{2}\sin^{-1}\frac{1}{2})$ $= \frac{2\pi}{3} - \frac{\sqrt{3}}{2}$ sq units	2 2 2
35	Let V denotes the volume of the cone of radius r and Height h inscribed in a sphere of radius R $\Rightarrow V=\frac{1}{3}\pi r^2 h$ ……… (1) For correct figure Clearly $R^2=r^2+(h-R)^2$ $r^2=2hR-h^2$ substituting in eq(1) we get $V=1/3\ \pi\ (2h^2R-h^3)$…………………………(2) $\frac{dv}{dh} = 1/3\ \pi\ (4hR-3h^2)$ from $\frac{dv}{dh} = 0\ \ h=\frac{4R}{3}$ also $\frac{d^2v}{dh^2} = 1/3\ \pi\ (4R-6h)$ $\frac{d^2v}{dh^2}\}$ at $h = \frac{4R}{3} = -4\pi R/3 < 0$	½ 1 1/2 1 1+1

	Therefore V has maximum when $h = \frac{4R}{3}$ in Eqn(2)	
	We get V=8/27 Volume of a sphere	1
	Or	
		
	Total surface area of half cylinder is	$1\frac{1}{2}$
	S=$2\left(\frac{1}{2}\pi r^2\right) + \pi rh + 2rh$……………………(2)	
	From (1) put the value of h in (2)	1
	S=$(\pi r^2) + \pi r\left(\frac{2V}{\pi r^2}\right) + 2r\left(\frac{2V}{\pi r^2}\right)$	
	S=$(\pi r^2) + \left(\frac{1}{r}\right)\left[\frac{4V}{\pi} + 2V\right]$	
	$\frac{ds}{dr} = (2\pi r) + \left(\frac{-1}{r^2}\right)\left[\frac{4V}{\pi} + 2V\right]$ ……………….(3)	
	For maxima/minima $\frac{ds}{dr} = 0$	
	$\Rightarrow (2\pi r) + \left(\frac{-1}{r^2}\right)\left[\frac{4V}{\pi} + 2V\right] = 0$	1
	$\Rightarrow (2\pi r) = \left(\frac{1}{r^2}\right)\left[\frac{4V + 2V\pi}{\pi}\right]$	
	$\Rightarrow \pi r^3 = V\left[\frac{2+\pi}{\pi}\right]$	1
	$\Rightarrow$ V=$\frac{\pi^2 r^3}{\pi+2}$…………………..(4)	
	From (1) and (4)	
	$\Rightarrow \frac{1}{2}\pi r^2 h = \frac{\pi^2 r^3}{\pi + 2}$	1
	$\Rightarrow \frac{h}{2r} = \frac{\pi}{\pi + 2}$	
	$\Rightarrow height{:}diameter = \pi{:}\pi + 2$	
	Differentiating (3) with respect to r	
	$\frac{d^2s}{dr^2} = (2\pi) + \left(\frac{2}{r^3}\right)\left[\frac{4V}{\pi} + 2V\right]$=positive (as all quantities are +ve)	
	so S is minimum when	
	$height{:}diameter = \pi{:}\pi + 2$	
36	Writing eqn. of plane,	1
	using condition of perpendicularity,getting $\lambda=\frac{-1}{3}$,	1
	getting eqn. of plane by putting value of λ	1
	x-z+2=0 ,	2
	finding distance = $\sqrt{2}$ units	1