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## MATHS

## BOOKS - ARIHANT PUBLICATION

## QUESTION PAPER 2018

## Very Short Answer Type Questions Answer All The Questions

1. If $p$ and $q$ are respectively degree and order of
the differential equation $y=e^{d y / d x}$, then write the relation between p and q .

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2. If $(\vec{a} \times \vec{b})^{2}+(\vec{a} \cdot \vec{b})^{2}=144$, write the value of $a b$.

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3. Write the equations of the line $2 x+z-4=0=2 y+z$ in the symmetrical form.
4. Sets $A$ and $B$ have respectively $m$ and $n$ elements. The total number of relations from $A$ to B is 64. If $m<n$ and $m \neq 1$, write the values of m and n respectively.

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5. Write the principal value of
$\sin ^{-1}\left(-\frac{1}{2}\right)+\cos ^{-1} \cos \left(-\frac{\pi}{2}\right)$
6. If every element of a third order determinant of value 8 is multiplied by 2 , then write the value of the new determinant.

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7. In a Davis Cup tie between India and South Korea, write the probability that India is ahead 2-1 after 3 matches assuming that both the teams are equally likely to win each match.
8. Write the interval in which the function $f(x)=\sin ^{-1}(2-x)$ is differentiable.

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9. A balloon is pumped at the rate of $2 \mathrm{~cm}^{3} /$ minute. Write the rate of increase of the surface area, when the radius is 0.5 cm .

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10. Write the definite integral which is equal to
$\lim _{n \rightarrow \infty} \frac{1}{n} \sum_{r=1}^{n} \frac{r}{\sqrt{n^{2}+r^{2}}}$

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Short Answer Type Questions Answer Any Three Questions

1. Prove the $\sin ^{-1} \sqrt{\frac{x-q}{p-q}}=\cos ^{-1} \operatorname{sqrt}((\mathrm{p}-\mathrm{x}) /(\mathrm{p}-$
$q))=" \cot ^{\prime \wedge}(-1) \operatorname{sqrt}((p-x) /(x-q))^{\prime}$

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2. Sole the following LPP graphically

Minimize $Z=4 x+3 y$
subject to $2 x+5 y \geq 10$ and $x, y \geq 0$.

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3. Let $\sim$ be defined by $(m, n) \sim(p, q)$ if $m q=n p$ where $\mathrm{m}, \mathrm{n}, \mathrm{p}, q \in Z-\{0\}$. Show that it is an equivalence relation.
4. Let $f(x)=\sqrt{x} \operatorname{and} g(x)=1-x^{2}$. Compute fog and gof and find their natural domains.

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5. Show that $\sin ^{-1} \frac{4}{5}+2 \tan ^{-1} \frac{1}{3}=\frac{\pi}{2}$.

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6. A bag $A$ contains 2 white and 3 red balls and another bag $B$ contains 4 white and 5 red balls.

One ball is drawn at random from a bag chosen at
random and it is found to be red. Find the probability that it was drawn from bag $B$.

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7. If $P(A)=0.6, P\left(\frac{B}{A}\right)=0.5$, find $P(A \cup B)$
when $A$ and $B$ are independent.

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8. If $A, B, C$ are matrices of order $2 \times 2$ each and
$2 A+B+C=\left[\begin{array}{ll}1 & 2 \\ 3 & 0\end{array}\right]$
$A+B+C=\left[\begin{array}{ll}0 & 1 \\ 2 & 1\end{array}\right]$
$A+B-C=\left[\begin{array}{ll}1 & 2 \\ 1 & 0\end{array}\right]$ find $\mathrm{A}, \mathrm{B}$ and C .
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9. Find the inverse of the following matrix $\left[\begin{array}{lll}1 & 1 & 2 \\ 0 & 1 & 2 \\ 1 & 2 & 1\end{array}\right]$.

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10. Prove that the following.

$$
\left[\begin{array}{ccc}
a-b-c & 2 a & 2 a \\
2 b & b-c-a & 2 b \\
2 c & 2 c & c-a-b
\end{array}\right]=(a+b+c)^{3}
$$

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11. Show that the sum of the intercepts on the
coordinate axes of any tangent to the curve
$\sqrt{x}+\sqrt{y}=\sqrt{a}$ is constant.

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12. Show that $2 \sin \mathrm{x}+\tan \mathrm{x} \geq 3 \mathrm{x}$ for all $\mathrm{x} \varepsilon\left(0, \frac{\pi}{2}\right)$.

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13. 

Differentiate
$y=\tan ^{-1} \cdot \frac{\sqrt{1+x^{2}}+\sqrt{1-x^{2}}}{\sqrt{1+x^{2}}-\sqrt{1-x^{2}}}$

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14. Differentiate $y=(\sin y)^{\sin 2 x}$
15. Test the continuity of the following function at
$x=0$
$f(x)= \begin{cases}\frac{1-e^{-x}}{x}, & x \neq 0 \\ 1, & x=0\end{cases}$

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16. From the differential equation whose general solution is $y=a \sin t+b e^{t}$.
17. Solve the following differential equations
$\left(1+y^{2}\right) d x+\left(x-e^{-\tan ^{-1} y}\right) d y=0$

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18. Evaluate $\int \frac{d x}{(x+1) \sqrt{1-x^{2}}}$

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19. $\int_{0}^{\frac{1}{2}} \frac{1}{\sqrt{1-x^{2}}} d x$.
20. Find the area enclosed bt the two paraboles $y^{2}=4$ ax and $x^{2}=4$ ay.

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21. Prove that the measure of the angle between
two main diagonals of a cube is $\cos ^{-1} \frac{1}{3}$.
22. The position vectors of two points $A$ and $B$ are
$3 \hat{i}+\hat{j}+2 \hat{k}$ and $\hat{i}-2 \hat{j}-4 \hat{k}$, respectively. Find the equation of the plane passing through $B$ and prependicular to $A B$.

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23. Find the area of the triangle $A B C$ with vertices
$A(1,2,4), B(3,1,-2)$ and $C(4,3,1)$ by vector method.
24. 

Prove
$\left[\begin{array}{lll}\vec{a}+\vec{b} & \vec{b}+\vec{c} & \vec{c}+\vec{a}\end{array}\right]=2\left[\begin{array}{lll}\vec{a} & \vec{b} & \vec{c}\end{array}\right]$

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25. If the sum of two unit vectors is a unit vector, show that the magnitude of their difference is $\sqrt{3}$
26. 

$a=2 \hat{i}+\hat{k}, b=\hat{i}+\hat{j}+\hat{k}$ and $c=4 \hat{i}-3 \hat{j}+7 \hat{k}$
, then find the vector $\vec{r}$ which satisfies $r \times b=c \times b$ and $r . a=0$.

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27. Find the shortest distance between the lines
$\frac{x-3}{3}=\frac{y-8}{-1}=\frac{z-3}{1}$
$\frac{x+3}{-3}=\frac{y-7}{2}=\frac{z-6}{4}$
Find also the
equation of the line of shortest distance.
28. $\int_{0}^{1} \frac{1}{1-x^{2}} d x$.

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29. Let $f: X \rightarrow Y$ and $g: Y \rightarrow Z$. Prove that gof is bijective if both $f$ and $g$ are bijective. Also prove that $(g o f)^{-1}=f^{-1} o g^{-1}$.
30. In a $\triangle A B C$, if $m \angle A=90^{\circ}$, prove that $\tan ^{-1} \frac{b}{a+c}+\tan ^{-1} \frac{c}{a+b}=\frac{\pi}{4}$, where $\mathrm{a}, \mathrm{b}, \mathrm{c}$ are sides of the triangle.

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31. By elementary operations, find $A^{-1}$ for the
following: $A=\left[\begin{array}{ccc}1 & 1 & 0 \\ 1 & -1 & 1 \\ 1 & -1 & 2\end{array}\right]$
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32. Solve the following system of equations by the matrix inversion method.
$x+y+z=4$
$2 x-y+3 z=1$
and $3 x+2 y-z=1$

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33. Two cards are drawn successively with replacement from a well-shuffled deck of 52 cards.

Find the probability distribution of the number of aces.
34. Find the coordinates of the point on the curve
$x^{2} y-x+y=0$
where the slope of the tangent is maximum.

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35. If $x=\frac{1-\cos ^{2} \theta}{\cos \theta}, y=\frac{1-\cos ^{2 n} \theta}{\cos ^{n} \theta}$ then
show that $\left(\frac{d y}{d x}\right)^{2}=n^{2}\left(\frac{y^{2}+4}{x^{2}+4}\right)$

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36. Find the solution of the following differential equations:
$(4 x+6 y+5) d x-(2 x+3 y+4) d y=0$

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37. Evaluate $\int \frac{2 \cos x+7}{4-\sin x} d x$

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38. Find the area enclosed by $y=4 x-1$ and
$y^{2}=2 x$.
