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## MATHS

## BOOKS - KC SINHA ENGLISH

## APPLICATIONS OF INTEGRALS - FOR <br> BOARDS

Solved Examples

1. Find the area enclosed by the circle of radius a.

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2. Find the area of the region bounded by the parabola $y^{2}=4 a x$, its axis and two ordinates $x=4$ and $x=9$

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3. Using integration, find the area of the region bounded by the parabola $y^{2}=16 x$ and the line $x=4$
4. Find the area of the region bounded by the
ellipse $\frac{x^{2}}{a^{2}}+\frac{y^{2}}{b^{2}}=1$.

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5. Find the area of the smaller portion of the circle $x^{2}+y^{2}=4$ cut off by the line $x^{2}=1$

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6. Find the area bounded by the ellipse $\frac{x^{2}}{a^{2}}+\frac{y^{2}}{b^{2}}=1$
$x=a e$ and $x=0$,
$b^{2}=a^{2}\left(1-e^{2}\right)$ and $e<1$.

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7. Find the area included between the curve $y=\cos x$, the $x$ - axis and ordinates $x=-\frac{\pi}{2}$ and $x=\frac{\pi}{2}$

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8. Find the area bounded by the curve $y=\sin x$ between $x=0$ and $x=2 \pi$.

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9. Find the area of the quadrilateral formed by the lines $y=2 x+3, y=0, x=2$ and $x=4$ using integration.

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10. Using integration, find the area of the region bounded by the line $2 y+x=8$, the x -axis and the lines $x=2$ and $x=4$.
11. Find the area of the triangle formed by the lines
$y=x+1,3 y=x+5 \quad$ and $\quad y=-x+7 \quad$ by
method of integration.

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12. Find the area of the region bounded by the curve $y=x^{2}$ and the line $y=4$.
13. Find the area bounded by the curve $|x|+y=1$ and axis of x .

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14. Find the area of the region bounded by
$y^{2}=4 x, x=1, x=4$ and the $x$-axis in the first quadrant.

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15. Sketch the graph $y=|x+3|$. Evaluate $\int_{-6}^{0}|x+3| d x$. What does the value of this integral represent on the graph?

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16. Using integration, find the area of the region bounded by the following curves after making a

$$
\begin{aligned}
& \text { rough } \\
& y=1+|x+1|, x=-2, x=3, y=0
\end{aligned}
$$

sketch:
17. Find the area included between the line $y=x$ and the parabola $x^{2}=4 y$.

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18. Find the area bounded by the curve $x^{2}=4 y$ and the straight line $x=4 y-2$.

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19. Find the area enclosed by the parabola
$4 y=3 x^{2}$ and the line $2 y=3 x+12$.
20. Using integration, find the area of the region bounded by the triangle $A B C$ whose vertices $A, B, C$ are $(-1,1),(0,5)$ and ( 3,2 ) respectively.

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21. Using the method of integration find the area of the triangle $A B C$, coordinates of whose vertices are $A(2,0), B(4,5)$ and $C(6,3)$.
22. Find the area of the smaller region bounded by the ellipse $\frac{x^{2}}{a^{2}}+\frac{y^{2}}{b^{2}}=1$ and the straight line $\frac{x}{a}+\frac{y}{b}=1$.

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23. Find the area enclosed between first quadrant of a circle $x^{2}+y^{2}=16$ and line $y=x$.
24. Find the area of the region bounded by the curves $x=2 y-y^{2}$ and $y=2+x$.

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25. Find the area of the region bounded by $y$
$=x^{2}+1, \mathrm{y}=\mathrm{x}, \mathrm{x}=0$ and $\mathrm{y}=2$

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26. Find the area of the region enclosed by the parabola $y^{2}=4 a x$ and the line $y=m x$.
27. Find the area bounded by the parabola $y^{2}=4 x$ and the straight line $x+y=3$.

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28. Draw a rough sketch of the curves $y=\sin x$ and $y=\cos x$ as $x$ varies from 0 to $\frac{\pi}{2}$. Find the area of the region enclosed by the curves and the $y$-axis.
29. Find the area of the region bounded by the two parabolas $y=x^{2}$ and $y^{2}=x$.

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30. The area included between the parabolas
$y^{2}=4 x$ and $x^{2}=4 y$ is (in square units) a. $4 / 3 \mathrm{~b}$.
1/3 c. 16/3 d. $8 / 3$

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31. Find the area of the region included between the parabolas
$y^{2}=4 a x a n d x^{2}=4 a y$, wherea $>0$.

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32. Draw a rough sketch of the curves
$y^{2}=x+1$ and $y^{2}=-x+1$ and find the area enclosed between them,

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33. find the area common to the circle $x^{2} y^{2}=16 a^{2}$ and the parabola $y^{2}=6 a x$. Or Find the area of the region
$\left\{(x, y): y^{2} \leq 6 a\right\}$ and $\left\{(x, y): x^{2}+y^{2} \geq 16 a^{2}\right\}$.

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34. Find the area of the circle $x^{2}+y^{2}=16$ exterior to the parabola $y^{2}=6 x$.
35. Find the area, lying above the $x=a x i s ~ a n d$ included between the circle $x^{2}+y^{2}=8 x$ and the parabola $y^{2}=4 x$.

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36. Prove that the curves $y^{2}=4 x$ and $x^{2}=4 y$ divide the area of square bounded by $x=0, x=4, y=4$ and $y=0$ into three equal parts.
37. Find the area bounded by the curves $y=x a n d y=x^{3}$.

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38. Find the area of the region enclosed between the two
circles
$x^{2}+y^{2}=1$ and $(x-1)^{2}+y^{2}=1$.

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39. Find the area of region :
$\left\{(x, y): 0 \leq y \leq x^{2}+1,0 \leq y \leq x+1,0 \leq x \leq 2\right\}$

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40. Find the area of the region $\left\{(x, y): x^{2} \leq y \leq|x|\right\}$.

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41. Find the area of the region

$$
\left\{(x, y): y^{2} \leq 4 x, 4 x^{2}+4 y^{2} \leq 9\right\}
$$

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42. Prove that the area in the first quadrant enclosed by the axis, the line $x=\sqrt{3} y$ and the circle $x^{2}+y^{2}=4$ is $\pi / 3$.

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Exercise

1. Find the area bounded by the curve $y=x^{2}, x=1, x=2$ and x -axis.
2. Find the area bounded by the line $y=x$, the $x$ axis and the ordinates $x=-1$ and $x=2$

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3. Find the area of the region bounded by the line $y=3 x+2$, the $x$-axis and the ordinates $x=-1$ and $x=1$.

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4. Using integration, find the area of the region
bounded by the line $y-1=x$, thex-a xi s
and theordinates $x=-2$ and $x=3$.'

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5. Find the area of the quadrilateral formed by the lines $y=2 x+3, \mathrm{y}=0, \mathrm{x}=4, \mathrm{x}=6$.

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6. Find the area of the region bounded by the parabola $y^{2}=4 a x$, its axis and two ordinates $x=a$ and $x=2 a$.
7. Find the area of the region bounded by the curve $y^{2}=x$ and the lines $x=1, x=4$ and the $x$-axis.

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8. Find the area of the region bouonded by
$y^{2}=4 x, x=1, x=4$ and $x$-axis in the first quadrant.
9. Find the area of the region bounded by $y^{2}=9 x, x=2, x=4$ and the $x$-axis in the first quadrant.

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10. Find the area of the region bounded by
$x^{2}=4 y, y=2, y=4$ and the $y$-axis in the first quadrant.
11. Find the area bounded by the parabola $y^{2}=4 a x$ and its latus rectum.

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12. Using integration, find the area of the region bounded by the parabola $y^{2}=16 x$ and the line $x=4$

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13. Find the area bounded by the curve $y^{2}=4 a x$ and the lines $y=2 a$ and $y$-axis.

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14. The area between $x=y^{2}$ and $x=4$ is divided into two equal parts by the line $x=a$, find the value of $a$.
15. Find the area of the region bounded by the ellipse $\frac{x^{2}}{4}+\frac{y^{2}}{9}=1$

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16. Find area enclosed by ellipse $\frac{x^{2}}{16}+\frac{y^{2}}{9}=1$

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17. Draw a rough sketch of the graph of the curve $\frac{x^{2}}{4}+\frac{y^{2}}{9}=1$ and evaluate the area of the region under the curve and above the $x$-axis.

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18. Using integration, find the area of $\triangle A B C$, whose vertices are $A(2,3), B(4,7)$ and (6,2).

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19. Using integration find the area of region bounded by the triangle whose vertices are (1, 0),
$(2,2)$ and $(3,1)$.

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20. Using the method of integration find the area
of the region bounded by lines:
$2 x+y=4,3 x-2 y=6$ and $x-3 y+5=0$

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21. Find the area of that region of the ellipse
$4 x^{2}+9 y^{2}=36$ which lies in first quardrant.
22. Find the area of the smaller part of the circle $x^{2}+y^{2}=a^{2}$ cut off by the line $x=\frac{a}{\sqrt{2}}$.

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23. Find the area of the triangle formed by the
straight lines $y=2 x, x=0$ and $y=2$ by integration.

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24. Find the area between $x$-axis and the curve $y=\sin x$, from $x=0$ to $x=\pi$.

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25. Draw a rough sketch of the curve $y=\frac{x}{\pi}+2 \sin ^{2} x$ and find the area between the $x-$ axis, the curve and the ordinates $x=0$ and $x=\pi$.
26. The area bounded by the curve $y=x|x|, x$-axis and the ordinates $x=-1 \& x=1$ is:

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27. Find the area bounded by the curve $y=4 x-x^{2}$, the $x$-axis and the ordinates $x=1$ and $x=3$.

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28. Find the area of the region boounded by the curve $y=2 x-x^{2}$ and the X -axis.

## - Watch Video Solution

29. Find the area of the region enclosed by the parabola $x^{2}=y$, the line $y=x+2$ and the X -axis.

## - Watch Video Solution

30. Find the area of the region enclosed by the parabola $x^{2}=y$, the line $y=x+2$ and the X -axis.

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31. Find the area of the region bounded by the parabola $y=x^{2}$ and $y=|x|$.

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32. Find the area of the smaller region bounded by the ellipse $\frac{x^{2}}{9}+\frac{y^{2}}{4}=1$ and the line $\frac{x}{3}+\frac{y}{2}=1$.

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33. Find the area of the portion of the parabola $y^{2}=4 x$ cut off by the line $y=x$.

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34. Find the area between the curve $y=x$ and
$y=x^{2}$

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35. Find the area enclosed between the circle $x^{2}+y^{2}=25$ and the straight line $x+y=5$.
36. Find the area enclosed by the curves $y=4 x^{2}$ and $y^{2}=2 x$.

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37. Find the area of the region in the first quadrant enclosed by the $y$-axis, the line $y=x$ and the circle $x^{2}+y^{2}=32$, using integration.

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38. Find the area of circle $4 x^{2}+4 y^{2}=9$ which is interior to the parabola $x^{2}=4 y$

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39. Using integration, find the area of the region enclosed between the two circles $x^{2}+y^{2}=4$ and

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(x-2)^{2}+y^{2}=4
$$

- Watch Video Solution

40. Sketch the graph $y=|x-5|$. Evaluate $\int_{0}^{1}|x-5| d x$. what does this value f the integral represent on the graph.

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41. Sketch the graph $y=|x+1|$. Evaluate $\int_{0}^{1}|x+1| d x$. What does this value of the integral represent on the graph?
42. Using the metal of integration find the area bounded by the curve $|x|+|y|=1$.

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43. Find the area of the region
$\left\{(x, y): x^{2}+y^{2} \leq 1 \leq x+y\right\}$.

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44. Using integration find the area of the region
$\left\{(x, y): x^{2}+y^{2} \leq 2 a x, y^{2} \geq a x, x, y \geq 0\right\}$.
45. Find the area bounded by curves

$$
\left\{(x, y): y \geq x^{2} \text { and } y=|x|\right\}
$$

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