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## MATHS

## BOOKS - KC SINHA MATHS (HINGLISH)

## 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 $\frac{x^{2}}{a^{2}}+\frac{y^{2}}{b^{2}}=1$ and the ordinates $x=0$ and $x=a e$,
where, $b^{2}=a^{2}\left(1-e^{2}\right)$ 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 between the $x$-axis and the curve

$$
y=\sin x \text { from } x=0 \text { to } x=2 \pi
$$

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

$$
y=x+1,3 y=x+5 \quad \text { and } \quad y=-x+7 \quad \text { by }
$$

method of integration.

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

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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 of $y=|x+3|$. Evaluate $\int_{-6}^{0}|x+3| d x$. What does the value of this integral represent?
16. Using integration, find the area of the region bounded by the following curves, after curves, after

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

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17. Find the area included between the line $y=x$ and the parabola $x^{2}=4 y$.
18. Find the area bounded by the curve $x^{2}=4 y$ and the line $x=4 y 2$.

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19. Find the area cut off from the parabola $2 y=3 x^{2}$ by the line $2 y=3 x+12$.

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20. Using integration, find the area of the triangle

ABC whose vertices are $A(-1,1), B(0,5)$ and
$C(3,2)$.

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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 $C(6,3)$.

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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 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 $y=x$.

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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

$$
y=x^{2}+1, y=x, x=0 \text { and } y=2 .
$$

26. Find the area enclosed between the parabola $y^{2}=4 a x$ and the line $y=m x$.

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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.

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29. Find the area of the region bounded by the two
parabolas $y=x^{2}$ and $y^{2}=x$.

## - Watch Video Solution

30. Find the area included between the curves $x^{2}=4 y$ and $y^{2}=4 x$.

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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. Using integration, find the area of the region common to the circle $x^{2}+y^{2}=16$ and the parabola $y^{2}=6 x$.
34. Find the area of the circle $x^{2}+y^{2}=16$ which is exterior to the parabolay ${ }^{2}=6 x$ by using integration.

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

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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 $x^{2}+y^{2}=1 \quad$ and $(x-1)^{2}+y^{2}=1$

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39. Find the area of the 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. Find the area of the region in the first quadrant enclosed by $x$-axis, line $x=\sqrt{3} y$ and the circle
$x^{2}+y^{2}=4$.

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Exercise

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

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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 $x=1$

## - Watch Video Solution

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

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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.

## - Watch Video Solution

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

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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. Examples: Find the area bounded by the parabola $y^{2}=4 a x$ and its latus rectum.

## - Watch Video Solution

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 the area of the region bounded by the ellipse $\frac{x^{2}}{16}+\frac{y^{2}}{9}=1$.

## - Watch Video Solution

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 $(3,1)$.
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 the portion of an ellipse
$4 x^{2}+9 y^{2}=36$, which is surrounding by the positive direction of $x$ and $y$-axes.
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

$$
y=\sin x, \text { from } x=0 \text { to } x=\pi
$$

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25. Find the area bounded by the curve $y=x e^{x^{2}}$, x -axis and the ordinates $\mathrm{x}=0$ and $\mathrm{x}=\mathrm{h}$.

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26. 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,$x=\pi$.
27. Find the area between the curve $y=x \sin x$ and x -axis from $x=0$ to $x=2 \pi$.

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28. Find the area bounded by the curve $y=x|x|, \mathrm{x}-$ axis and ordinates $x=-1$ and $x=1$.

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

## - Watch Video Solution

30. Find by integration the area of the region bounded by the curve $y=2 x-x^{2}$ and the $x$-axis.

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31. Find the area of the region enclosed by the parabola $x^{2}=y$, the line $y=x+2$ and the $x$-axis.
32. 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

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

## - Watch Video Solution

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

## - Watch Video Solution

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

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

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37. Find the area enclosed between the circle $x^{2}+y^{2}=25$ and the straight line $x+y=5$.

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

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

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40. Find the area of the circle $4 x^{2}+4 y^{2}=9$ which is interior to parabola $y^{2}=4 x$.
41. Find the area of the region bounded by the curves $x^{2}+y^{2}=4$ and $(x-2)^{2}+y^{2}=4$.

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

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43. 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?

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44. Using the method of integration find the area bounded by the curve $|x|+|y|=1$.
45. Find the area of the region $\left\{(x, y): x^{2}+y^{2} \leq 1 \leq x+y\right\}$

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46. Find the area of the region
$\left\{x, y: x^{2}+y^{2} \leq 2 a x, y^{2} \geq a x, x \geq 0, y \geq 0\right\}$

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47. Find the area bounded by curves
$\left\{(x, y): y \geq x^{2}\right.$ and $\left.y=|x|\right\}$
