CBSE CLASS XII · MATHEMATICS (041)

Chapter 8
Application of Integrals

Chapter-wise Previous Year Questions with Marking Scheme

INFINITY
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AN EDUCATIONAL INSTITUTE

Board Examinations 2022 – 2026 (including Compartment / Supplementary)

Reviewed by **Deepika Bhati**
Maths Mentor Since 2009 | Maths Passionate..

Objective Questions (MCQ)

Multiple Choice Questions (1 mark)

Q1. **2024** : 65/5/1 [1 Mark]

Area of the region bounded by curve $y^2 = 4x$ and the X-axis between $x = 0$ and $x = 1$ is :

(A) $\frac{2}{3}$ (B) $\frac{8}{3}$

(C) 3 (D) $\frac{4}{3}$

Ans. (D) $\frac{4}{3}$ **1**

Q2. **2024** : 65/5/2 [1 Mark]

The area of the region bounded by the curve $y^2 = 4x$ and $x = 1$ is :

(A) $\frac{4}{3}$ (B) $\frac{8}{3}$

(C) $\frac{64}{3}$ (D) $\frac{32}{3}$

Ans. (B) $\frac{8}{3}$ **1**

Q3. **2024** : 65/5/3 [1 Mark]

The area bounded by the curve $y = \sqrt{x}$, Y-axis and between the lines $y = 0$ and $y = 3$ is :

(A) $2\sqrt{3}$ (B) 27

(C) 9 (D) 3

Ans. (C) 9 **1**

Q4. **2024 Comptt** : 65/S/1, 65/S/2, 65/S/3 [1 Mark]

The area (in sq. units) of the region bounded by the curve $y = x$, x-axis, $x = 0$ and $x = 2$ is :

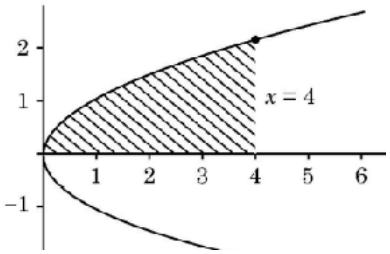
(A) $\frac{3}{2}$ (B) $\frac{1}{2}\log 2$

(C) 2 (D) 4

Ans. (C) 2 **1**

Q5. **2025** : 65/1/1, 65/1/2, 65/1/3 [1 Mark]

The area of the shaded region bounded by the curves $y^2 = x$, $x = 4$ and the x-axis is given by



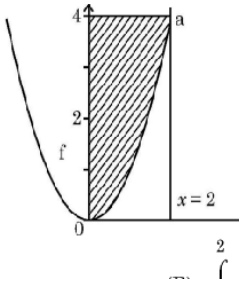
(A) $\int_0^4 x\,dx$ (B) $\int_0^2 y^2\,dy$

(C) $2\int_0^4 \sqrt{x}\,dx$ (D) $\int_0^4 \sqrt{x}\,dx$

Ans. (D) $\int_0^4 \sqrt{x}\,dx$ **1**

Q6. **2025** : 65/2/1, 65/2/2, 65/2/3 **[1 Mark]**

The area of the shaded region (figure) represented by the curves $y = x^2$, $0 \le x \le 2$ and y-axis is given by



(A) $\int_0^2 x^2\,dx$ (B) $\int_0^2 \sqrt{y}\,dy$

(C) $\int_0^4 x^2\,dx$ (D) $\int_0^4 \sqrt{y}\,dy$

Ans. (D) $\int_0^4 \sqrt{y}\,dy$ **1**

Q7. **2025** : 65/4/1, 65/4/2, 65/4/3 **[1 Mark]**

The area of the region enclosed by the curve $y = \sqrt{x}$ and the lines $x = 0$ and $x = 4$ and x-axis is :

(A) $\frac{16}{9}$ sq. units (B) $\frac{32}{9}$ sq. units

(C) $\frac{16}{3}$ sq. units (D) $\frac{32}{3}$ sq. units

Ans. (C) $\frac{16}{3}$ sq. units **1**

Q8. **2025** : 65/5/1, 65/5/2, 65/5/3 **[1 Mark]**

The area of the region enclosed between the curve $y = x|x|$, x-axis, $x = -2$ and $x = 2$ is :

(A) $\frac{8}{3}$ (B) $\frac{16}{3}$

(C) 0 (D) 8

Ans. (B) $\frac{16}{3}$ **1**

Q9. **2025** : 65/6/1, 65/6/2, 65/6/3 **[1 Mark]**

The area of the region bounded by the curve $y^2 = x$ between $x = 0$ and $x = 1$ is :

(A) $\frac{3}{2}$ sq units (B) $\frac{2}{3}$ sq units

(C) 3 sq units (D) $\frac{4}{3}$ sq units

Ans. (D) $\frac{4}{3}$ sq units **1**

Q10. **2025 Supp** : 65/S/1 **[1 Mark]**

The area bounded by the parabola $x^2 = y$ and the line $y = 1$ is :

(A) $\frac{2}{3}$ sq unit (B) $\frac{1}{3}$ sq unit

(C) $\frac{4}{3}$ sq units (D) 2 sq units

Ans. (C) $\frac{4}{3}$ sq units **1**

Q11. **2025 Supp** : 65/S/2, 65/S/3 **[1 Mark]**

The area bounded by the curve $x = y^2$, y-axis and the lines $y = 3$ and $y = 4$ is :

(A) $\frac{74}{3}$ sq units (B) $\frac{37}{3}$ sq units

(C) 74 sq units (D) 37 sq units

Ans. (B) $\frac{37}{3}$ sq units **1**

Q12. **2026** : 65/1/1, 65/1/2, 65/1/3 **[1 Mark]**

The area bounded by the curve $y = x|x|$, x-axis and the ordinates $x = -1$ and $x = 1$ is given by

(A) 0 (B) $\frac{1}{3}$

(C) $\frac{2}{3}$ (D) $\frac{4}{3}$

Ans. (C) $\frac{2}{3}$ **1**

Q13. **2026** : 65/2/1, 65/2/2, 65/2/3 **[1 Mark]**

Which of the following expressions will give the area of region bounded by the curve $y = x^2$ and line $y = 16$?

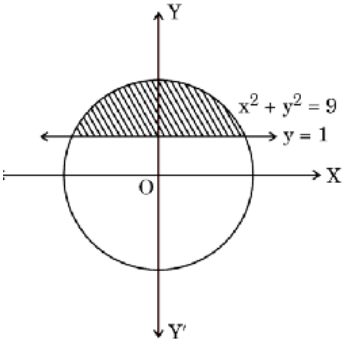
(A) $\int_0^4 x^2\,dx$ (B) $2\int_0^4 x^2\,dx$

(C) $\int_0^{16} \sqrt{y}\,dy$ (D) $2\int_0^{16} \sqrt{y}\,dy$

Ans. (D) $2\int_0^{16} \sqrt{y}\,dy$ **1**

Q14. **2026** : 65/3/1, 65/3/2, 65/3/3 **[1 Mark]**

The area of the shaded region of the circle given below is equal to :



(A) $\int_1^3 \sqrt{9 - y^2}\,dy$ (B) $2\int_1^3 \sqrt{9 - y^2}\,dy$

(C) $\int_0^3 \sqrt{9 - x^2}\,dx$ (D) $2\int_0^3 \sqrt{9 - x^2}\,dx$

Ans. (B) $2\int_1^3 \sqrt{9 - y^2}\,dy$ **1**

Q15. **2026** : 65/4/1, 65/4/2, 65/4/3 **[1 Mark]**

The area of the region bounded by the curve $y = x$ and x-axis, between $x = 0$ and $x = 2$ is :

(A) 2 sq. units (B) $\frac{1}{2}$ sq. unit

(C) 1 sq. unit (D) 4 sq. units

Ans. (A) 2 sq. units **1**

Q16. **2026** : 65/5/1, 65/5/2, 65/5/3 **[1 Mark]**

An ant is observed crawling on a sheet of paper along a straight line given by equation y = 2x − 4. Area of the surface covered by the ant bounded by y-axis, x-axis and x = 1 is :

(A) 1 sq. unit (B) 3 sq. units

(C) 2 sq. units (D) 4 sq. units

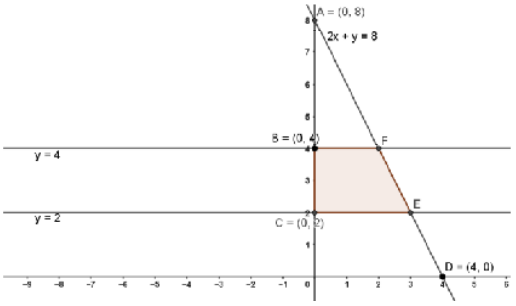
Ans. (B) 3 sq. units **1**

Area of Bounded Regions – Subjective Questions

Very Short Answer Questions (2 marks)

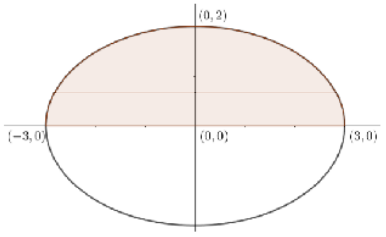
Q17. **2023** : 65/5/1, 65/5/2, 65/5/3 **[2 Marks]**

Question & answer as per CBSE Marking Scheme

23.	Sketch the region bounded by the lines $2x + y = 8$, $y = 2$, $y = 4$ and the y-axis. Hence, obtain its area using integration.	
Sol.		½ for correct figure
	Required area $= \int_2^4 \frac{1}{2}(8-y)dy$	$\frac{1}{2}$ 1
	$= 5$	$\frac{1}{2}$

Q18. **2025** : 65/4/1, 65/4/2, 65/4/3 **[2 Marks]**

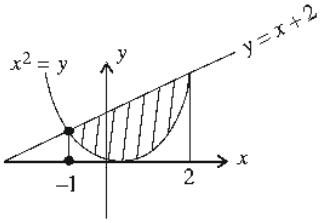
Question & answer as per CBSE Marking Scheme

Q24.	Calculate the area of the region bounded by the curve $\frac{x^2}{9} + \frac{y^2}{4} = 1$ and the x-axis using integration.	
A24.		(½ for correct figure)
	$A = 2\times\frac{2}{3}\int_0^3 \sqrt{9-x^2}\,dx$	½
	$= \frac{4}{3}\left[\frac{x}{2}\sqrt{9-x^2} + \frac{9}{2}\sin^{-1}\left(\frac{x}{3}\right)\right]_0^3$	½
	$= \frac{4}{3}\left[\left(0 + \frac{9}{2}\sin^{-1}1\right) - 0\right]$	
	$= 3\pi$	½

Short Answer Questions (3 marks)

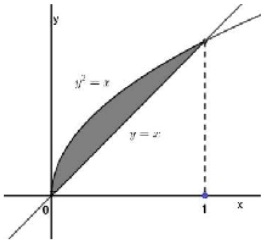
Q19. 2022 T-II : 65/4/1 [3 Marks]

Question & answer as per CBSE Marking Scheme

Q7.	Find the area of the region $\{(x, y) : x^2 \le y \le x + 2\}$, using integration.	**3**
A7.	 *(for correct figure)*	1
	x-coordinates of points of intersection are $-1, 2$.	½
	Required area $= \int_{-1}^{2}[(x+2)-x^2]dx$	½
	$= \frac{(x+2)^2}{2} - \frac{x^3}{3}\Big\|_{-1}^{2}$	½
	$= \frac{16}{3} - \frac{5}{6} = \frac{9}{2}$	½

Q20. 2022 T-II : 65/4/2 [3 Marks]

Question & answer as per CBSE Marking Scheme

Q7.	Using integration, find the area of the region $\{(x, y) : y^2 \le x \le y\}$.	
A7.	 *(for correct figure)*	1
	Clearly x coordinates of point of intersection are $0, 1$	½
	Required area $= \int_0^1 (\sqrt{x} - x)dx$	½
	$= \left[\frac{2x^{\frac{3}{2}}}{3} - \frac{x^2}{2}\right]_0^1$	½
	$= \frac{1}{6}$	½

Q21. 2022 T-II Comptt : 65/6/1, 65/6/2, 65/6/3 [3 Marks]

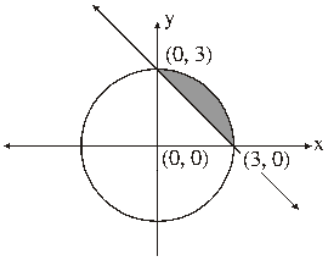
Question & answer as per CBSE Marking Scheme

7. (a) Find the area of the region $\{(x, y) : x^2 + y^2 \le 9, x + y \ge 3\}$, using integration.

OR

(b) Using integration, find the area of the region bounded by the parabola $y^2 = 4x$, the lines $x = 0$ and $x = 3$ and the x-axis.

Ans. Point of intersection $(3, 0)$ and $(0, 3)$



Correct figure $\frac{1}{2}$

Required Area

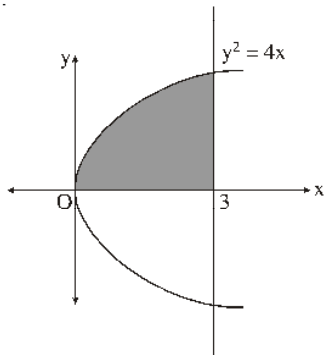
$= \int_0^3 \sqrt{9-x^2}\,dx - \int_0^3 (3-x)dx$ 1

$= \left[\frac{x}{2}\sqrt{9-x^2} + \frac{9}{2}\sin^{-1}\left(\frac{x}{3}\right)\right]_0^3 - \left[\frac{(3-x)^2}{-2}\right]_0^3$ 1

$= \frac{9}{2}\sin^{-1}1 - \frac{9}{2} = \frac{9}{2}\left(\frac{\pi}{2}-1\right)$ $\frac{1}{2}$

OR

Required Area



Correct Figure 1

$= \int_0^3 2\sqrt{x}\,dx$ 1

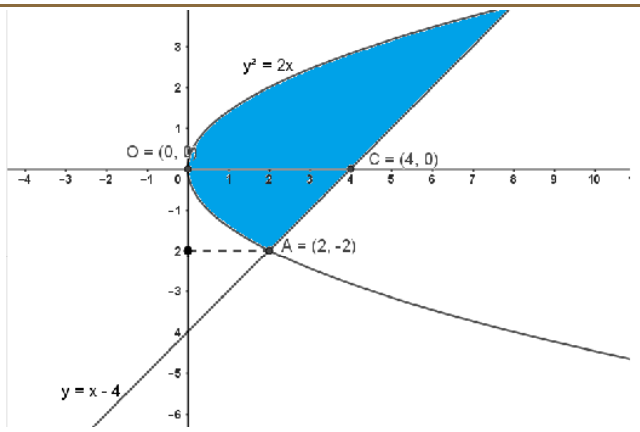
$= 2 \times \frac{2}{3}[x^{3/2}]_0^3$ $\frac{1}{2}$

$= \frac{4}{3} \times 3^{3/2} = 4\sqrt{3}$ $\frac{1}{2}$

Q22. 2023 : 65/5/1 [3 Marks]

Question & answer as per CBSE Marking Scheme

29.	Find the area of the following region using integration : $\{(x, y) : y^2 \le 2x \text{ and } y \ge x - 4\}$	
Sol.		**1 mark**



for correct figure

Solving $y^2 = 2x$ and $y = x - 4$, we get $\frac{1}{2}$

$y = 4$ or -2

Required area $= \int_{-2}^{4} \left[(y + 4) - \frac{y^2}{2}\right] dy$ 1

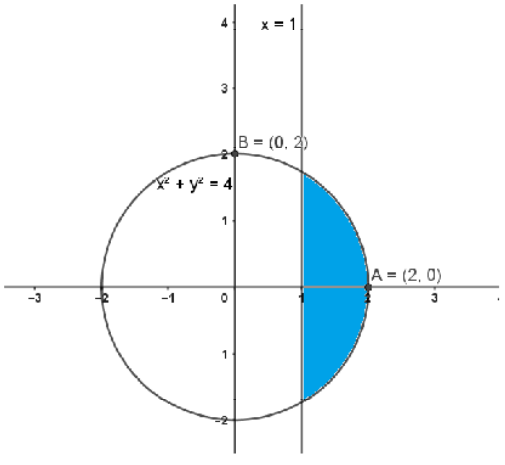
$= 18$ $\frac{1}{2}$

Q23. **2023** : 65/5/2 **[3 Marks]**

Question & answer as per CBSE Marking Scheme

29. Find the area of the minor segment of the circle $x^2 + y^2 = 4$ cut off by the line $x = 1$, using integration.

Sol.



1 for correct figure

Required area $= 2\int_{1}^{2} \sqrt{4 - x^2}\, dx$ $\frac{1}{2}$

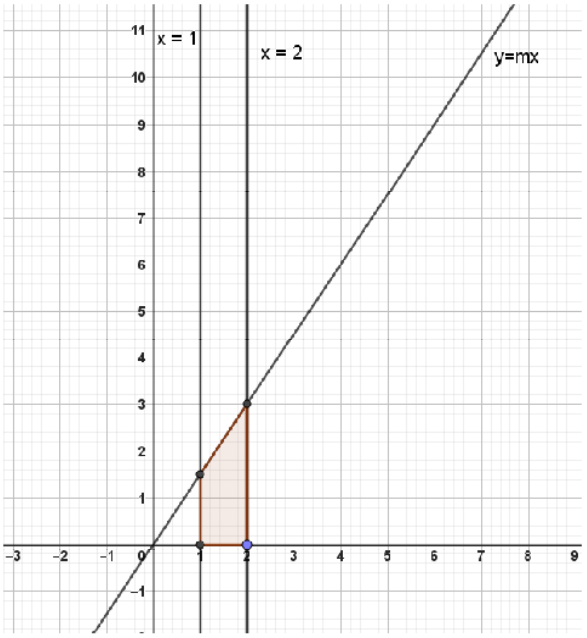
$= 2\left[\frac{x}{2}\sqrt{4 - x^2} + \frac{4}{2}\sin^{-1}\left(\frac{x}{2}\right)\right]_1^2$ $\frac{1}{2}$

$= 2\left[\left\{0 + 2\left(\frac{\pi}{2}\right)\right\} - \left\{\frac{1}{2}\sqrt{3} + 2 \cdot \frac{\pi}{6}\right\}\right]$ $\frac{1}{2}$

	$= 2\left(\pi - \frac{\sqrt{3}}{2} - \frac{\pi}{3}\right)$ $= \left(\frac{4\pi}{3} - \sqrt{3}\right)$	$\frac{1}{2}$

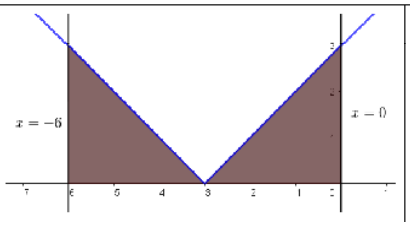
Q24. 2023 : 65/5/3 [3 Marks]

Question & answer as per CBSE Marking Scheme

27.	Using integration, find the area of the region bounded by y = mx (m > 0), $x = 1$, $x = 2$ and the x-axis.	
Sol.		**1 mark for correct figure**
	Required area $= \int_1^2 (mx)dx$	**1**
	$= m\left[\frac{x^2}{2}\right]_1^2$	$\frac{1}{2}$
	$= \frac{3}{2}m$	$\frac{1}{2}$

Q25. 2025 : 65/1/1, 65/1/2 [3 Marks]

Question & answer as per CBSE Marking Scheme

Q31.	Sketch the graph of y = | $x + 3$ | and find the area of the region enclosed by the curve, x-axis, between $x = -6$ and $x = 0$, using integration.	
Ans	**Required Area** $= \int_{-6}^{0} y\,dx$ 	**For correct graph: 1 mark** ½

$$= 2\int_{-3}^{0} (x+3)\,dx \qquad \text{½}$$

$$= 2\left[\frac{(x+3)^2}{2}\right]_{-3}^{0} \qquad \text{½}$$

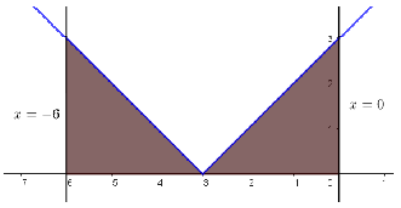
$$= 9 \qquad \text{½}$$

Q26. 2025 : 65/1/3 [3 Marks]

Question & answer as per CBSE Marking Scheme

Q29. Sketch the graph of y = | x + 3 | and find the area of the region enclosed by the curve, x-axis, between $x = -6$ and $x = 0$, using integration.

Ans



For correct graph: 1 mark

Required Area

$$= \int_{-6}^{0} y\,dx \qquad \text{½}$$

$$= 2\int_{-3}^{0} (x+3)\,dx \qquad \text{½}$$

$$= 2\left[\frac{(x+3)^2}{2}\right]_{-3}^{0} \qquad \text{½}$$

$$= 9 \qquad \text{½}$$

Long Answer Questions (5 marks)

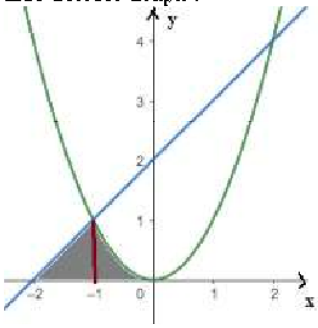
Q27. 2023 : 65/1/1 [5 Marks]

Question & answer as per CBSE Marking Scheme

35. Find the area of the region bounded by the curves $x^2 = y$, $y = x + 2$ and x-axis, using integration.

Ans

Let Correct Graph :



1 ½

x coordinates of point of intersection are – 1, 2 ½

$$\text{Required area} = \int_{-2}^{-1} (x+2)\,dx + \int_{-1}^{0} x^2\,dx \qquad 1\text{½}$$

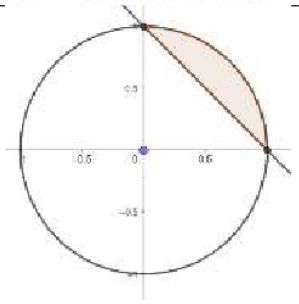
$$= \frac{(x+2)^2}{2}\Big|_{-2}^{-1} + \frac{x^3}{3}\Big|_{-1}^{0} \qquad 1$$

$$= \frac{1}{2} + \frac{1}{3} = \frac{5}{6} \qquad \text{½}$$

Q28. 2023 : 65/1/2 [5 Marks]

Question & answer as per CBSE Marking Scheme

33. Find the area of the region $\{(x, y) : x^2 + y^2 \le 1 \le x + y\}$, using integration.



Correct figure — 1 ½

x coordinates of point of intersection are 1, 0 — ½

Required area $= \int_0^1 \sqrt{1-x^2}\,dx - \int_0^1 (1-x)dx$ — 1 ½

$= \frac{x}{2}\sqrt{1-x^2} + \frac{1}{2}\sin^{-1}x\Big|_0^1 + \frac{(1-x)^2}{2}\Big|_0^1$ — 1

$= \frac{\pi}{4} - \frac{1}{2}$ — ½

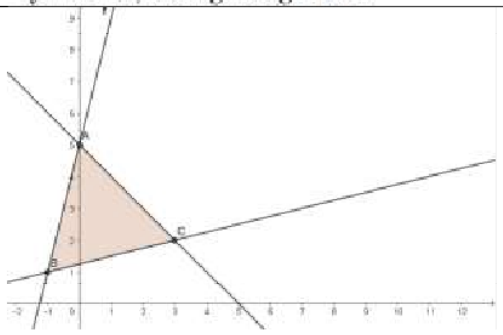
A relation R is defined on a set of real numbers $\mathbb{R}$ as

Q29. 2023 : 65/1/3 [5 Marks]

Question & answer as per CBSE Marking Scheme

34. Find the area of the region bounded by the lines $y = 4x + 5$, $x + y = 5$ and $4y = x + 5$, using integration.

Ans



Correct Figure — 1

Vertices are A(0, 5), B(−1, 1), C(3, 2), — 1 ½

Required area $= \int_{-1}^{0} (4x+5)\,dx + \int_0^3 (5-x)\,dx - \int_{-1}^{3} \frac{x+5}{4}\,dx$ — 1

$= \frac{(4x+5)^2}{8}\Big|_{-1}^{0} + \frac{(5-x)^2}{-2}\Big|_0^3 - \frac{(x+5)^2}{8}\Big|_{-1}^{3}$ — 1

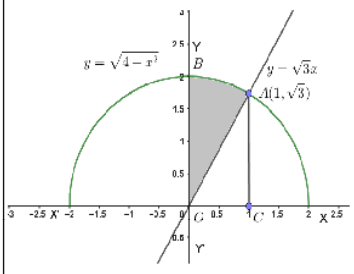
$= 3 + \frac{21}{2} - 6 = \frac{15}{2}$ — ½

A relation R is defined on a set of real numbers $\mathbb{R}$ as

Q30. 2023 : 65/2/1 [5 Marks]

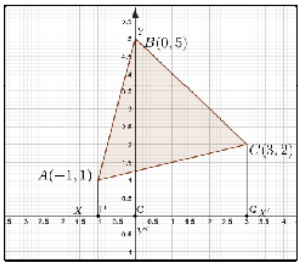
Question & answer as per CBSE Marking Scheme

34. Using integration, find the area of region bounded by line $y = \sqrt{3}x$, the curve $y = \sqrt{4 - x^2}$ and y–axis in first quadrant.

Ans	 Correct Figure	1
	Shaded region	½
	Point of intersection at $x=1$	½
	$\text{ar}(OAB)=\int_0^1\sqrt{4-x^2}dx-\int_0^1\sqrt{3}xdx$	1½
	$=\left(\frac{x\sqrt{4-x^2}}{2}+2\sin^{-1}\left(\frac{x}{2}\right)\right)\Big]_0^1-\frac{\sqrt{3}}{2}x^2\Big]_0^1$	1
	$=\frac{\sqrt{3}}{2}+2\times\frac{\pi}{6}-\frac{\sqrt{3}}{2}=\frac{\pi}{3}$	½

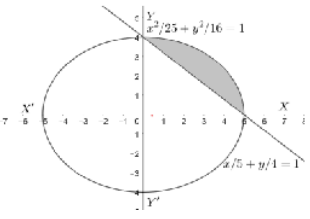
Q31. 2023 : 65/2/2 [5 Marks]

Question & answer as per CBSE Marking Scheme

33.	Using Integration, find the area of triangle whose vertices are (–1, 1), (0, 5) and (3, 2).	
Ans	 Correct Figure	1
	Equation of the lines AB, BC and AC are:	
	$y=4x+5\ ;\ y=5-x\ ;\ y=\frac{x}{4}+\frac{5}{4}$ respectively,	1½
	$\text{ar}(\Delta ABC)=\int_{-1}^{0}(4x+5)dx+\int_0^3(5-x)dx-\frac{1}{4}\int_{-1}^{3}(5+x)dx$	1
	$=\frac{1}{8}(4x+5)^2\Big]_{-1}^{0}-\frac{1}{2}(5-x)^2\Big]_0^3-\frac{1}{8}(5+x)^2\Big]_{-1}^{3}$	1
	$=3+\frac{21}{2}-6=\frac{15}{2}$	½

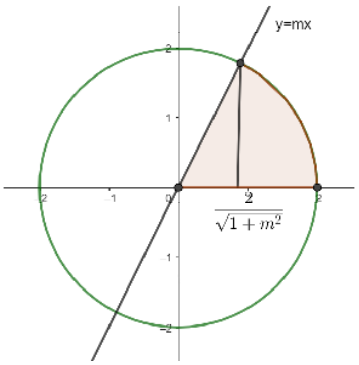
Q32. 2023 : 65/2/3 [5 Marks]

Question & answer as per CBSE Marking Scheme

35.	Find the area of the smaller region bounded by the curves $\frac{x^2}{25}+\frac{y^2}{16}=1$ and $\frac{x}{5}+\frac{y}{4}=1$, using integration.	
Ans	 Correct Figure	1½
	Required Area $=\frac{4}{5}\int_0^5\sqrt{25-x^2}dx-\frac{4}{5}\int_0^5(5-x)dx$	1½
	$=\frac{4}{5}\left(\frac{x}{2}\sqrt{25-x^2}+\frac{25}{2}\sin^{-1}\frac{x}{5}\right)\Big]_0^5+\frac{2}{5}(5-x)^2\Big]_0^5$	1+½
	$=\frac{4}{5}\left(\frac{25\pi}{4}\right)-10=5\pi-10$	½

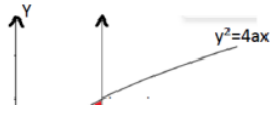
Q33. 2023 : 65/3/1, 65/3/2, 65/3/3 [5 Marks]

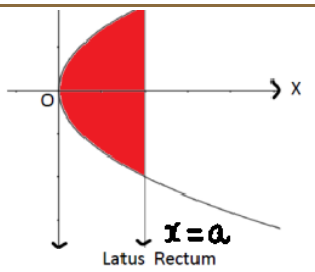
Question & answer as per CBSE Marking Scheme

Q33	The area of the region bounded by the line $y = mx$ $(m > 0)$, the curve $x^2 + y^2 = 4$ and the x-axis in the first quadrant is $\frac{\pi}{2}$ units. Using integration, find the value of m.	
Ans		1 for correct figure
	$x^2 + y^2 = 4$ and $y = mx$	
	$\Rightarrow x^2 + m^2x^2 = 4 \Rightarrow x = \frac{2}{\sqrt{1+m^2}}$	
	x- coordinate of the required point of intersection is $\frac{2}{\sqrt{1+m^2}}$.	1
	According to question,	
	$\int_0^{\frac{2}{\sqrt{1+m^2}}} mx\,dx + \int_{\frac{2}{\sqrt{1+m^2}}}^{2} \sqrt{4-x^2}\,dx = \frac{\pi}{2}$	1+1
	$\Rightarrow \frac{2m}{1+m^2} + \pi - \frac{2m}{1+m^2} - 2\sin^{-1}\frac{1}{\sqrt{1+m^2}} = \frac{\pi}{2}$	
	$\Rightarrow \frac{\pi}{4} = \sin^{-1}\frac{1}{\sqrt{1+m^2}}$	
	$\Rightarrow \frac{1}{\sqrt{2}} = \frac{1}{\sqrt{1+m^2}} \Rightarrow m^2 + 1 = 2$	
	$\Rightarrow m = 1$ (as $m > 0$)	½

Q34. 2023 : 65/4/1, 65/4/3 [5 Marks]

Question & answer as per CBSE Marking Scheme

33.	Using integration, find the area of the region bounded by the parabola $y^2 = 4ax$ and its latus rectum.	
Sol.		



1

Required area $= 2\int_0^a 2\sqrt{ax}\ dx$ $1\frac{1}{2}$

$= 4\sqrt{a}\int_0^a \sqrt{x}\ dx$ $\frac{1}{2}$

$= 4\sqrt{a}\left|\frac{2x^{3/2}}{3}\right|_0^a$ 1

$= \frac{8}{3}a\sqrt{a}\sqrt{a}$

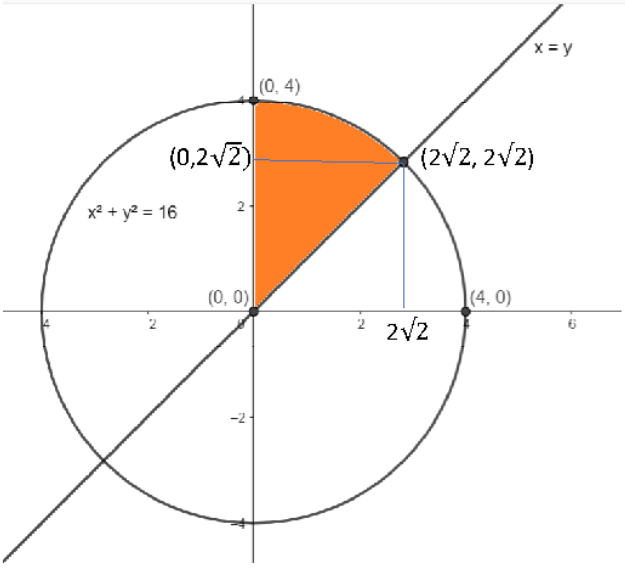
$= \frac{8}{3}a^2$ 1

Q35. 2023 : 65/4/2 [5 Marks]

Question & answer as per CBSE Marking Scheme

32. Using integration, find the area of the region bounded by the circle $x^2 + y^2 = 16$, line $y = x$ and y-axis, but lying in the 1st quadrant.

Sol.



1

Required area $= \int_0^{2\sqrt{2}} y\ dy + \int_{2\sqrt{2}}^{4} \sqrt{16 - y^2}\ dy$ 1

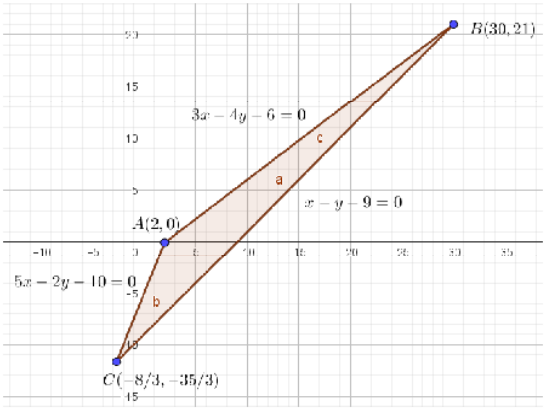
$= 4 + \left\{8\sin^{-1}(1) - \sqrt{2}\,.\,\sqrt{8} - 8\sin^{-1}\left(\frac{1}{\sqrt{2}}\right)\right\}$ $\frac{1}{2}$

$= 4 + 8\left(\frac{\pi}{2}\right) - 4 - 8\left(\frac{\pi}{4}\right)$

$= 8\left(\frac{\pi}{4}\right)$ or 2π 1

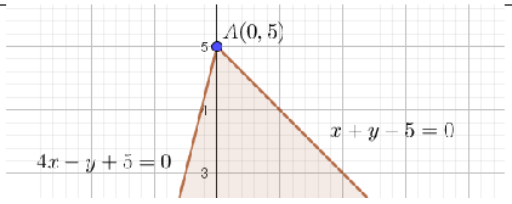
Q36. 2023 Supp : 65/C/1 [5 Marks]

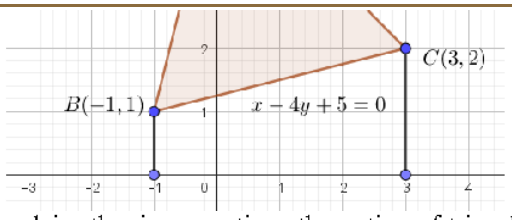
Question & answer as per CBSE Marking Scheme

34.	Find the area of the triangle ABC bounded by the lines represented by the equations $5x - 2y - 10 = 0$, $x - y - 9 = 0$ and $3x - 4y - 6 = 0$, using integration method.	
Sol.		**Correct figure 1 mark**
	solving the given equations, the vertices of triangle are $A(2,0), B(30,21)$ and $C\left(-\frac{8}{3},-\frac{35}{3}\right)$	**3**
	$\text{ar}(\triangle ABC)=\frac{3}{4}\int_2^{30}(x-2)dx-\int_9^{30}(x-9)dx+\left\lvert\int_{-\frac{8}{3}}^{9}(x-9)dx\right\rvert-\left\lvert\frac{5}{2}\int_{-\frac{8}{3}}^{2}(x-2)dx\right\rvert$ $=\frac{3}{8}(x-2)^2\Big]_2^{30}-\frac{1}{2}(x-9)^2\Big]_9^{30}+\left\lvert\frac{1}{2}(x-9)^2\Big]_{-\frac{8}{3}}^{9}\right\rvert-\left\lvert\frac{5}{4}(x-2)^2\Big]_{-\frac{8}{3}}^{2}\right\rvert$ $=294-\frac{441}{2}+\frac{1225}{18}-\frac{245}{9}=\frac{343}{3}$	**1**

Q37. 2023 Supp : 65/C/2 [5 Marks]

Question & answer as per CBSE Marking Scheme

35.	Using integration, find the area of the region bounded by the triangle ABC when its sides are given by the lines $4x - y + 5 = 0$, $x + y - 5 = 0$ and $x - 4y + 5 = 0$.	
Sol.		
		Correct figure 1 mark



solving the given equations, the vertices of triangle are

$A(0,5), B(-1,1)$ and $C(3,2)$ — 1

$$\text{ar}(\triangle ABC)=\int_{-1}^{0}(4x+5)dx+\int_{0}^{3}(-x+5)dx-\int_{-1}^{3}\frac{5+x}{4}dx$$ — 2

$$=\left[\frac{4x^2}{2}+5x\right]_{-1}^{0}+\left[\frac{-x^2}{2}+5x\right]_{0}^{3}-\left[\frac{5x}{4}+\frac{x^2}{8}\right]_{-1}^{3}$$ — ½

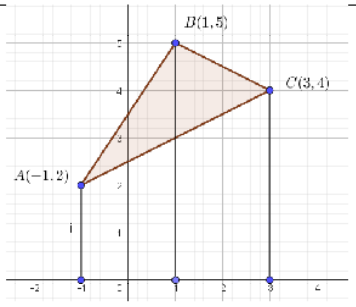
$$=\frac{15}{2}$$ — ½

Q38. 2023 Supp : 65/C/3 [5 Marks]

Question & answer as per CBSE Marking Scheme

32. Using integration, find the area of the region bounded by the triangle whose vertices are (– 1, 2), (1, 5) and (3, 4).

Sol.



Correct figure 1 mark

$$ar(ABC)=\int_{-1}^{1}y_{AB}\,dx+\int_{1}^{3}y_{BC}\,dx-\int_{-1}^{3}y_{AC}\,dx$$ — 1

$$=\int_{-1}^{1}\left(\frac{7+3x}{2}\right)dx+\int_{1}^{3}\left(\frac{11-x}{2}\right)dx-\int_{-1}^{3}\left(\frac{5+x}{2}\right)dx$$ — 1

$$=\frac{1}{2}\times\left(7x+\frac{3x^2}{2}\right)\Big]_{-1}^{1}+\frac{1}{2}\times\left(11x-\frac{x^2}{2}\right)\Big]_{1}^{3}-\frac{1}{2}\times\left(5x+\frac{x^2}{2}\right)\Big]_{-1}^{3}$$ — 1

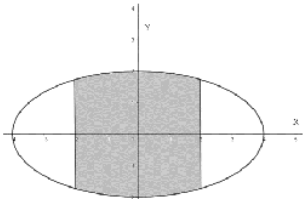
$=7+9-12=4$ — 1

Q39. 2024 : 65/1/1, 65/1/2, 65/1/3 [5 Marks]

Question & answer as per CBSE Marking Scheme

34. Using integration, find the area of the ellipse $\frac{x^2}{16}+\frac{y^2}{1}=1$, included between the lines x = – 2 and x = 2.

Sol.

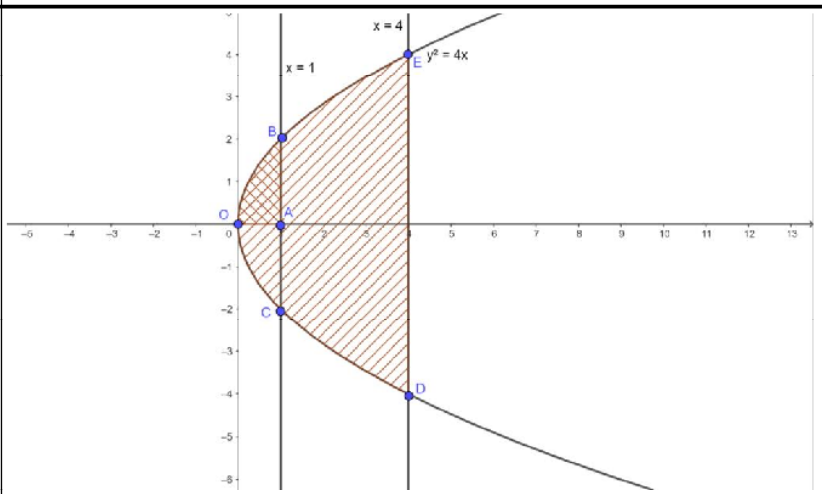


Correct graph-1

	$\text{Area} = 4\int_0^2 y\,dx$	1
	$= 4\left[\frac{1}{2}\int_0^2 \sqrt{4^2 - x^2}\,dx\right]$	
	$= 2\left[\frac{x}{2}\sqrt{4^2 - x^2} + 8\sin^{-1}\left(\frac{x}{4}\right)\right]_0^2$	2
	$= 2\left[\sqrt{12} + \frac{8\pi}{6}\right] = 4\sqrt{3} + \frac{8\pi}{3}$	1

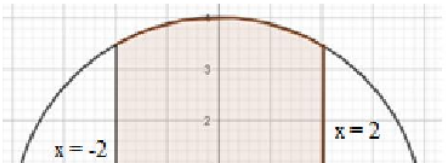
Q40. 2024 : 65/2/1, 65/2/2, 65/2/3 [5 Marks]

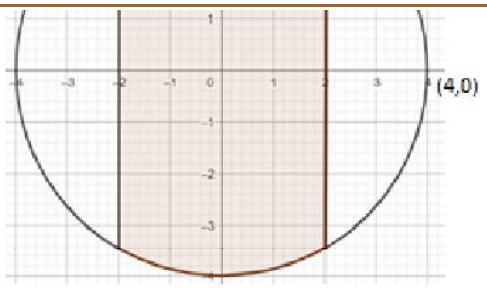
Question & answer as per CBSE Marking Scheme

35.	If A_1 denotes the area of region bounded by $y^2 = 4x$, $x = 1$ and x-axis in the first quadrant and A_2 denotes the area of region bounded by $y^2 = 4x$, $x = 4$, find $A_1 : A_2$.	
Sol.		2
	$A_1 = \text{Area (region OABO)} = \int_0^1 2\sqrt{x}\,dx = 2\left[\frac{x^{\frac{3}{2}}}{\frac{3}{2}}\right]_0^1 = \frac{4}{3}$	1
	$A_2 = \text{Area (region ODEO)} = 2\int_0^4 2\sqrt{x}\,dx = 4 \times \frac{2}{3}[2^3] = \frac{64}{3}$	1
	$A_1 : A_2 = \frac{4}{3} : \frac{64}{3} = 1 : 16$	1

Q41. 2024 : 65/3/1 [5 Marks]

Question & answer as per CBSE Marking Scheme

Q34	Using integration, find the area of the region enclosed between the circle $x^2 + y^2 = 16$ and the lines $x = -2$ and $x = 2$.
Ans	



For correct figure 1 mark

$$\text{Required area} = 4\int_0^2 \sqrt{16-x^2}\,dx \qquad 1$$

$$= 4\left[\frac{x}{2}\sqrt{16-x^2} + 8\sin^{-1}\left(\frac{x}{4}\right)\right]_0^2 \qquad 2$$

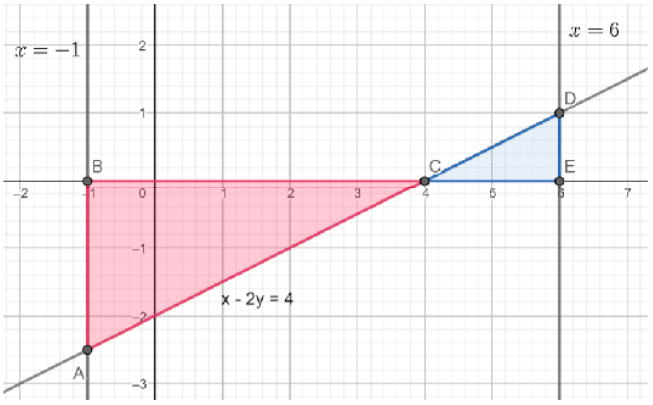
$$= 8\sqrt{3} + \frac{16\pi}{3} \qquad 1$$

Q42. 2024 : 65/3/2 [5 Marks]

Question & answer as per CBSE Marking Scheme

Q33 Find the area of the region bounded by the lines x – 2y = 4, x = –1, x = 6 and x-axis, using integration.

Ans



For correct figure 1 mark

$$\text{Required area} = \left|\int_{-1}^{4}\left(\frac{x-4}{2}\right)dx\right| + \int_4^6 \left(\frac{x-4}{2}\right)dx \qquad 2$$

$$= \left|\left[\frac{(x-4)^2}{4}\right]_{-1}^{4}\right| + \left[\frac{(x-4)^2}{4}\right]_4^6 \qquad 1$$

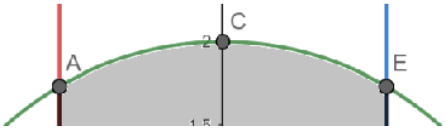
$$= \frac{25}{4} + 1 = \frac{29}{4} \qquad 1$$

Q43. 2024 : 65/3/3 [5 Marks]

Question & answer as per CBSE Marking Scheme

Q35 Using integration, find the area of the region enclosed between the curve $y = \sqrt{4-x^2}$ and the lines x = –1, x = 1 and the x-axis.

Ans



For correct

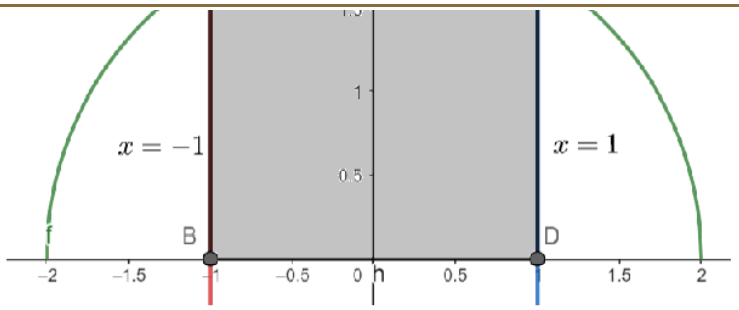


figure
1 mark

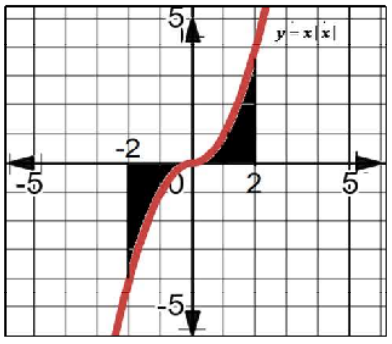
Required area $= 2\int_0^1 \sqrt{4 - x^2}\, dx$ — **1**

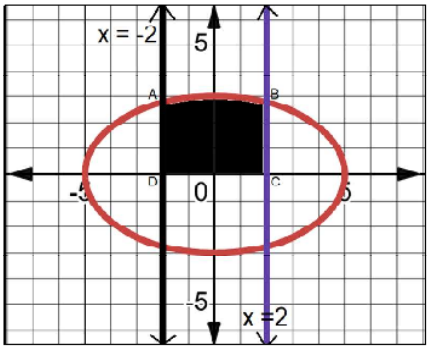
$= 2\left[\frac{x}{2}\sqrt{4 - x^2} + 2\sin^{-1}\frac{x}{2}\right]_0^1$ — **2**

$= \sqrt{3} + \frac{2\pi}{3}$ — **1**

Q44. 2024 : 65/4/1, 65/4/2, 65/4/3 [5 Marks]

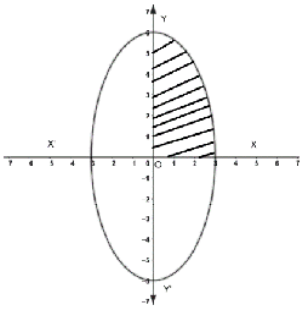
Question & answer as per CBSE Marking Scheme

32(a).	Sketch the graph of $y = x\|x\|$ and hence find the area bounded by this curve, X-axis and the ordinates $x = -2$ and $x = 2$, using integration.	
Sol.	 As, $y = x\|x\| = \begin{cases} -x^2, x < 0 \\ x^2, x \geq 0 \end{cases}$	**For correct figure 1 ½**
	Area of the shaded region $= \int_{-2}^{2} y\, dx = 2\int_0^2 y\, dx = 2\int_0^2 x^2\, dx$	**1 ½**
	$= 2\left(\frac{x^3}{3}\right)_0^2$	**1**
	$= 2\left(\frac{8}{3}\right) = \frac{16}{3}$	**1**

	OR	
32(b).	Using integration, find the area bounded by the ellipse $9x^2 + 25y^2 - 225$, the lines $x = -2$, $x = 2$, and the X-axis.	
Sol.		**For correct figure 1 ½**
	As, $9x^2 + 25y^2 = 225 \Rightarrow \boxed{y = \pm\frac{3}{5}\sqrt{5^2 - x^2}}$	
	Required Area $= \int_{-2}^{2} \frac{3}{5}\sqrt{5^2 - x^2}\, dx = \frac{6}{5}\int_{0}^{2} \sqrt{5^2 - x^2}\, dx$	**1 ½**
	$= \frac{6}{5}\left(\frac{x\sqrt{5^2 - x^2}}{2} + \frac{25}{2}\sin^{-1}\left(\frac{x}{5}\right)\right)_0^2$	**1**
	$= \frac{6}{5}\left(\frac{2\sqrt{21}}{2} + \frac{25}{2}\sin^{-1}\left(\frac{2}{5}\right)\right)$	
	$= \left(\frac{6\sqrt{21}}{5} + 15\sin^{-1}\left(\frac{2}{5}\right)\right)$	**1**

Q45. **2024** : 65/5/1, 65/5/2, 65/5/3 **[5 Marks]**

Question & answer as per CBSE Marking Scheme

33.	Find the area of the region bounded by the curve $4x^2 + y^2 = 36$ using integration.	
Ans	**The given equation can be written as:** $\frac{x^2}{9} + \frac{y^2}{36} = 1$**, which is an ellipse.**	
	 **Correct Graph**	**1**
	Area of the region bounded by the curve	
	$= 4 \times \frac{6}{3}\int_0^3 \sqrt{9 - x^2}\, dx$	**1½**
	$= 8\left[\frac{x}{2}\sqrt{9 - x^2} + \frac{9}{2}\sin^{-1}\frac{x}{3}\right]_0^3$	**1½**
	$= 18\pi$	**1**

Q46. **2024 Comptt** : 65/S/1, 65/S/2, 65/S/3 **[5 Marks]**

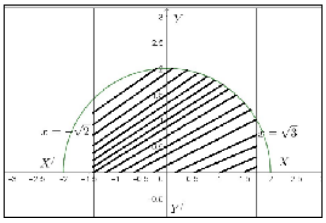
Question & answer as per CBSE Marking Scheme

33. (a) Using integration, find the area of the region bounded by the curve $y = \sqrt{4 - x^2}$, the lines $x = -\sqrt{2}$ and $x = \sqrt{3}$ and the x-axis.

OR

(b) Using integration, evaluate the area of the region bounded by the curve $y = x^2$, the lines $y = 1$ and $y = 3$ and the y-axis.

Ans



Correct Graph 1

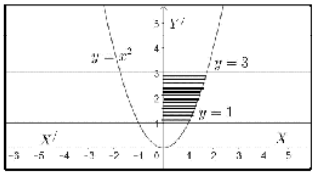
Area of the region bounded by the curve

$$= \int_{-\sqrt{2}}^{\sqrt{3}} \sqrt{4-x^2}\,dx \quad 1\frac{1}{2}$$

$$= \left[\frac{x}{2}\sqrt{4-x^2} + 2\sin^{-1}\frac{x}{2}\right]_{-\sqrt{2}}^{\sqrt{3}} \quad 1\frac{1}{2}$$

$$= \frac{\sqrt{3}}{2} + 2\cdot\frac{\pi}{3} + 1 + 2\cdot\frac{\pi}{4} = \frac{\sqrt{3}}{2} + 1 + \frac{7\pi}{6} \quad 1$$

Or



Correct Graph 1

Area of the region bounded by the curve

$$= \int_{1}^{3} \sqrt{y}\,dy \quad 2$$

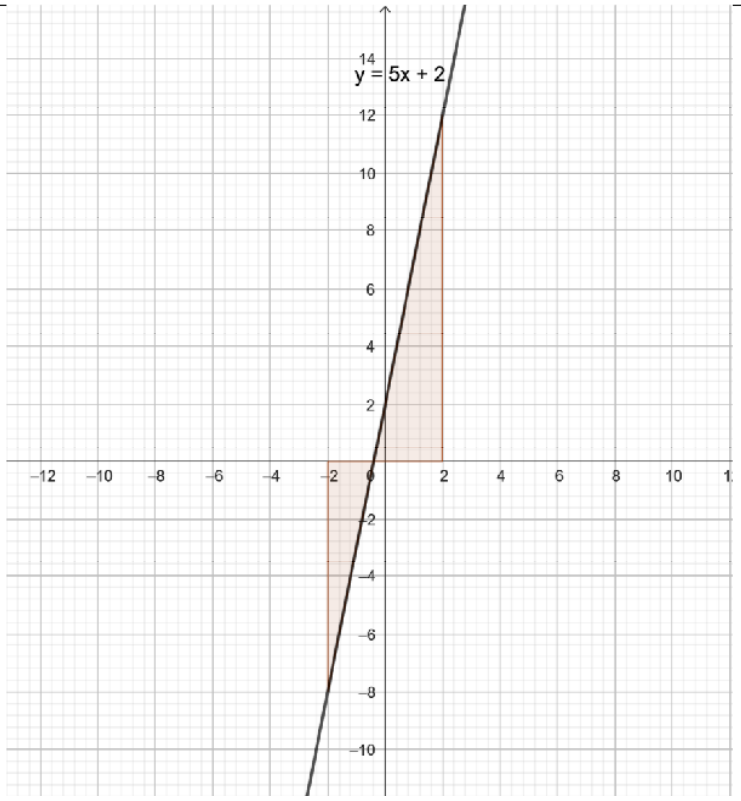
$$= \left[\frac{2y^{3/2}}{3}\right]_{1}^{3} = \frac{2}{3}\left(3\sqrt{3} - 1\right) \quad 2$$

Q47. **2025** : 65/2/1, 65/2/2, 65/2/3 **[5 Marks]**

Question & answer as per CBSE Marking Scheme

2. Using integration, find the area of the region bounded by the line $y = 5x + 2$, the x – axis and the ordinates $x = -2$ and $x = 2$.

Ans



Correc sketch and shadin

2

The required area

$$= \left| \int_{-2}^{-\frac{2}{5}} (5x+2)dx \right| + \int_{-\frac{2}{5}}^{2} (5x+2)dx$$ 1

$$= \left| \left[\frac{(5x+2)^2}{10} \right]_{-2}^{-\frac{2}{5}} \right| + \left[\frac{(5x+2)^2}{10} \right]_{-\frac{2}{5}}^{2}$$ 1

$$= \frac{64}{10} + \frac{144}{10} = \frac{104}{5}$$ 1

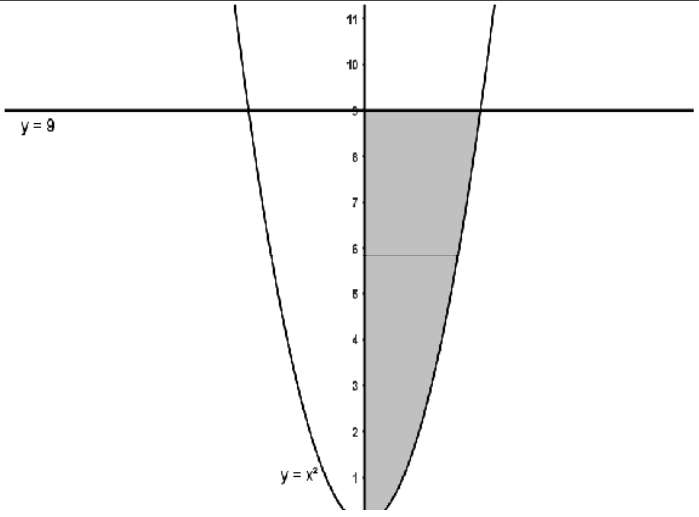
Find : $\int \frac{x^2+x+1}{\quad} dx$

Q48. **2025** : 65/5/1 **[5 Marks]**

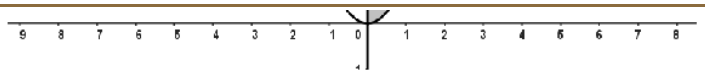
Question & answer as per CBSE Marking Scheme

32. Sketch a graph of $y = x^2$. Using integration, find the area of the region bounded by $y = 9$, $x = 0$ and $y = x^2$.

Ans



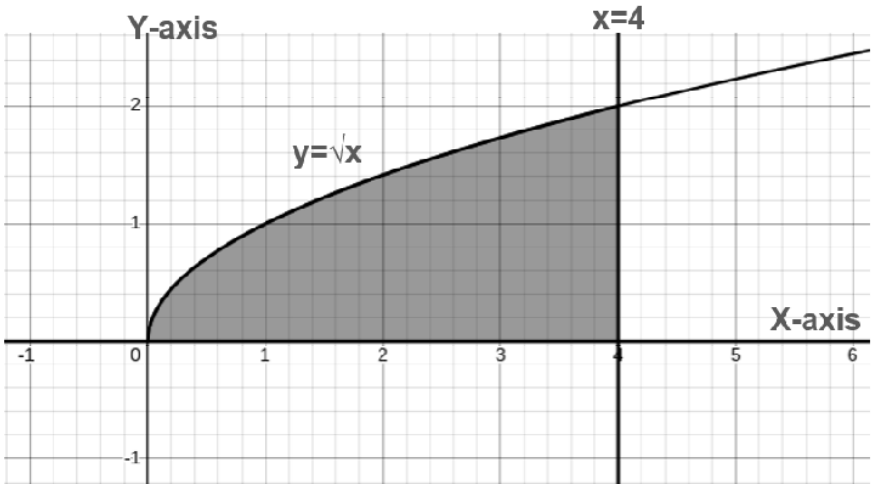
1½ for correct figure and shading



	Required area $= \int_0^9 \sqrt{y}\, dy$	1½
	$= \frac{2}{3}\left[y^{3/2}\right]_0^9$	1
	$= 18$	1
	Note: If area is found in second quadrant, may be considered.	

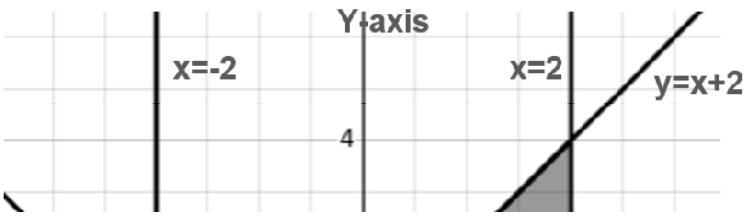
Q49. 2025 : 65/5/2 [5 Marks]

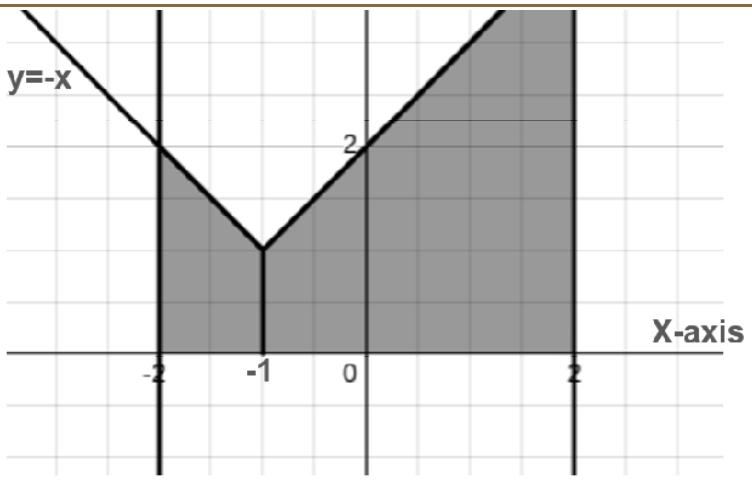
Question & answer as per CBSE Marking Scheme

32.	Draw a rough sketch of the curve $y = \sqrt{x}$. Using integration, find the area of the region bounded by the curve $y = \sqrt{x}$, $x = 4$ and x-axis, in the first quadrant.	
Ans		**2 marks for correct figure and shading**
	Required area $= \int_0^4 \sqrt{x}\, dx$	1
	$= \frac{2}{3}\left[x^{3/2}\right]_0^4$	1
	$= \frac{2}{3} \times 8 = \frac{16}{3}$	1

Q50. 2025 : 65/5/3 [5 Marks]

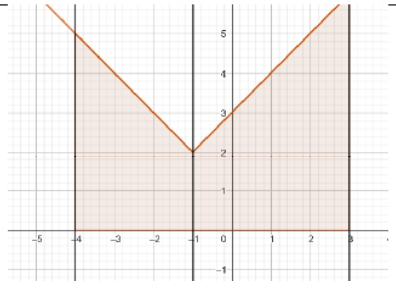
Question & answer as per CBSE Marking Scheme

32.	In a rough sketch, mark the region bounded by $y = 1 + \lvert x + 1 \rvert$, $x = -2$, $x = 2$ and $y = 0$. Using integration, find the area of the marked region.	
Ans		**2 marks**

	 s	for correct graph and shading
	Required area $= \int_{-2}^{-1}(-x)\ dx + \int_{-1}^{2}(x+2)\,dx$	1½
	$= -\frac{1}{2}[x^2]_{-2}^{-1} + \left[\frac{1}{2}x^2 + 2x\right]_{-1}^{2}$	1
	$= 9$	½

Q51. **2025** : 65/6/1 **[5 Marks]**

Question & answer as per CBSE Marking Scheme

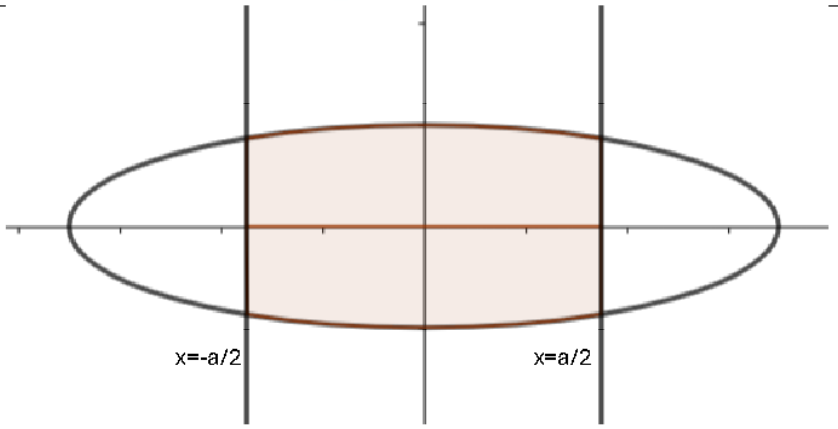
33.	Draw a rough sketch for the curve $y = 2 + \|x+1\|$. Using integration, find the area of the region bounded by the curve $y = 2 + \|x+1\|$, $x = -4$, $x = 3$ and $y = 0$.	
Ans		
	Correct Graph:	1
	Required area $= \int_{-4}^{-1}(2+\|x+1\|)\,dx + \int_{-1}^{3}(2+\|x+1\|)\,dx$	1
	$= \int_{-4}^{-1}(1-x)\,dx + \int_{-1}^{3}(3+x)\,dx$	1
	$= -\frac{(1-x)^2}{2}\Big\|_{-4}^{-1} + \frac{(3+x)^2}{2}\Big\|_{-1}^{3}$	1
	$= \frac{21}{2} + 16 = \frac{53}{2}$	1

Q52. **2025** : 65/6/3 **[5 Marks]**

Question & answer as per CBSE Marking Scheme

33.	Using integration, find the area of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ bounded between the lines $x = -\frac{a}{2}$ to $x = \frac{a}{2}$.

Ans



Correct Graph: 1

$$\text{Required area} = \frac{4b}{a}\int_0^{\frac{a}{2}}\sqrt{a^2 - x^2}\,dx$$ 2

$$= \frac{4b}{a}\left[\frac{x}{2}\sqrt{a^2 - x^2} + \frac{a^2}{2}\sin^{-1}\frac{x}{a}\right]_0^{\frac{a}{2}}$$ 1

$$= \frac{4b}{a}\left[\frac{a}{4}\cdot\frac{\sqrt{3}a}{2} + \frac{a^2}{2}\cdot\frac{\pi}{6}\right]$$

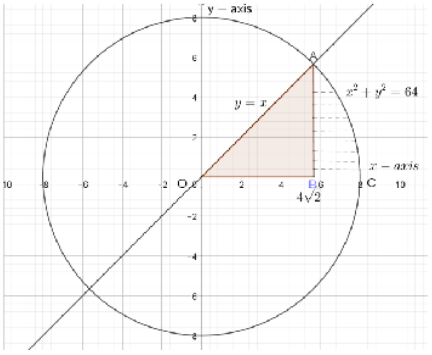
$$= ab\left[\frac{\sqrt{3}}{2} + \frac{\pi}{3}\right]$$ 1

Q53. **2025** : 65/7/1, 65/7/2, 65/7/3 **[5 Marks]**

Question & answer as per CBSE Marking Scheme

33. A woman discovered a scratch along a straight line on a circular table top of radius 8 cm. She divided the table top into 4 equal quadrants and discovered the scratch passing through the origin inclined at an angle $\frac{\pi}{4}$ anticlockwise along the positive direction of x-axis. Find the area of the region enclosed by the x-axis, the scratch and the circular table top in the first quadrant, using integration.

Ans



Correct graph 1

Equation of the circular tabletop: $x^2 + y^2 = 64$ ½

Equation of line (scratch): $x = y$ ½

The line and circle intersect at $x = 4\sqrt{2}$ ½

Area of the shaded region

$$= \int_0^{4\sqrt{2}} x\,dx + \int_{4\sqrt{2}}^{8}\sqrt{64 - x^2}\,dx$$ 1

$$= \frac{x^2}{2}\Big]_0^{4\sqrt{2}} + \left[\frac{x}{2}\sqrt{64 - x^2} + 32\sin^{-1}\frac{x}{8}\right]_{4\sqrt{2}}^{8}$$ 1

$$= \frac{32}{2} + 32\sin^{-1}1 - 2\sqrt{2}\cdot 4\sqrt{2} - 32\sin^{-1}\frac{1}{\sqrt{2}}$$
$$= 16 + 16\pi - 16 - 8\pi = 8\pi \text{ cm}^2$$

½

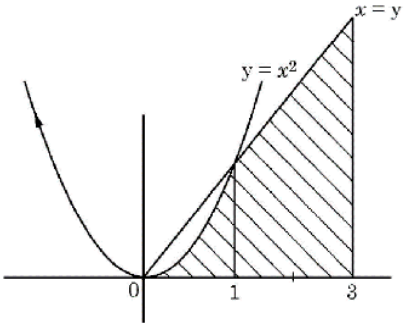
Q54. 2025 Supp : 65/S/1, 65/S/2, 65/S/3 [5 Marks]

Question & answer as per CBSE Marking Scheme

Q34.	Using integration, find the area of the region $\{(x, y): 0 \le y \le x^2,\ 0 \le y \le x,\ 0 \le x \le 3\}$.

16

Ans



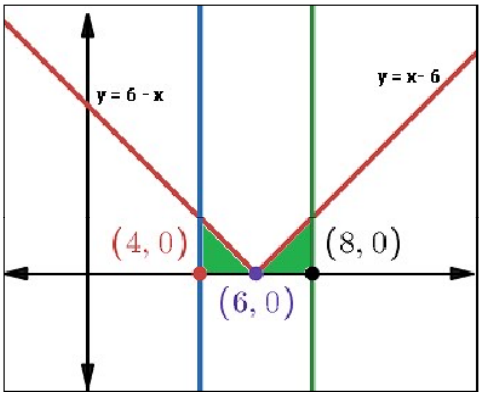
Required Area

$$= \int_0^1 x^2\,dx + \int_1^3 x\,dx$$
$$-\frac{x^3}{3}\Big]_0^1 + \frac{x^2}{2}\Big]_1^3$$
$$-\frac{1}{3} + 4 - \frac{13}{3}$$

1 mark for correct figure — 1 1 — 1 — 1

Q55. 2026 : 65/4/1 [5 Marks]

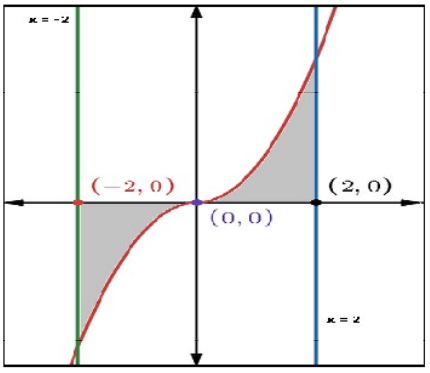
Question & answer as per CBSE Marking Scheme

33.	Using integration, find the area of the region enclosed by the curve $y = \lvert x - 6 \rvert$, the x-axis, and between $x = 4$ and $x = 8$.		
Sol.		I	1 (For correct graph)

	Required Area $= \int_4^8 y\,dx = \int_4^8 \lvert x-6 \rvert\,dx$	II	1
	Area $= -\int_4^6 (x-6)\,dx + \int_6^8 (x-6)\,dx$	III	1
	Area $= -\left(\frac{(x-6)^2}{2}\right)_4^6 + \left(\frac{(x-6)^2}{2}\right)_6^8 = 2+2 = 4$ or 4 sq. units	IV	2

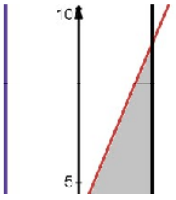
Q56. **2026** : 65/4/2 **[5 Marks]**

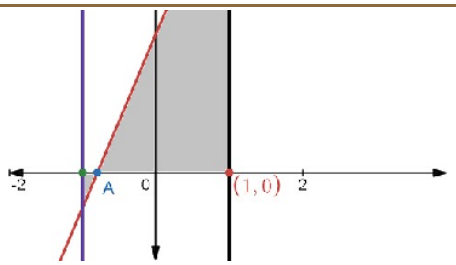
Question & answer as per CBSE Marking Scheme

33.	Using integration, find the area of the region bounded by the curve $y = x\lvert x \rvert$, $x-$axis, $x=-2$ and $x=2$.		
Sol.		I	1 (For correct graph)
	Required Area $= -\int_{-2}^{0} x\lvert x \rvert\,dx + \int_0^2 x\lvert x \rvert\,dx$	II	1
	Area $= \int_{-2}^{0} -x^2\,dx + \int_0^2 x^2\,dx$	III	1
	Area $= -\left(\frac{x^3}{3}\right)_{-2}^{0} + \left(\frac{x^3}{3}\right)_0^2 = \frac{8}{3}+\frac{8}{3} = \frac{16}{3}$ or $\frac{16}{3}$ sq. units Alternative Approach: Area $= 2\times\int_0^2 x^2\,dx$ & proceed accordingly	IV	2

Q57. **2026** : 65/4/3 **[5 Marks]**

Question & answer as per CBSE Marking Scheme

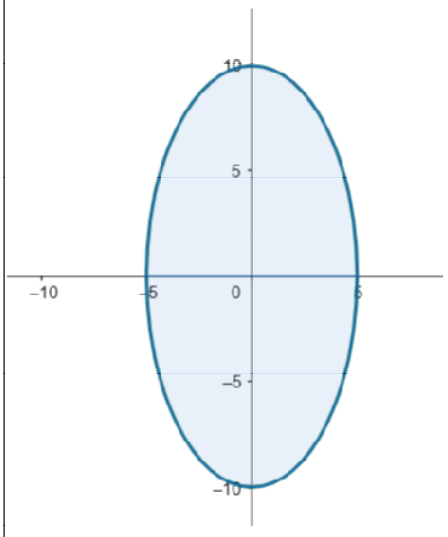
33.	Using integration, find the area of the region bounded by $y = 5x+4$, $y=0$, $x=-1$ and $x=1$.		
Sol.		I	1 (For correct graph)



	Required Area $= \left\lvert \int_{-1}^{\frac{-4}{5}} y\,dx \right\rvert + \int_{\frac{-4}{5}}^{1} y\,dx$	II	1
	Area $= -\int_{-1}^{\frac{-4}{5}} (5x+4)\,dx + \int_{\frac{-4}{5}}^{1} (5x+4)\,dx$	III	1
	Area $= -\left(\frac{(5x+4)^2}{10}\right)_{-1}^{\frac{-4}{5}} + \left(\frac{(5x+4)^2}{10}\right)_{\frac{-4}{5}}^{1} = \frac{1}{10}+\frac{81}{10} = \frac{41}{5}$ or $\frac{41}{5}$ sq. units	IV	2

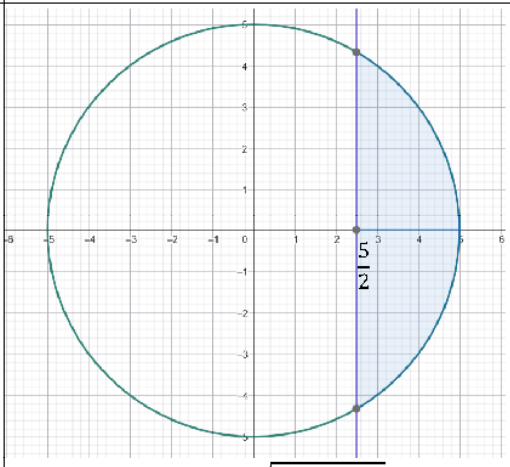
Q58. **2026** : 65/5/1, 65/5/2 **[5 Marks]**

Question & answer as per CBSE Marking Scheme

34.	Sketch the curve $\{(x, y) : 100x^2 + 25y^2 = 2500\}$ and find the area of the region enclosed by it, using integration.		
Sol.		I	1½
	Required area $= 4\int_0^5 \frac{10}{5}\sqrt{25-x^2}\,dx$	II	1½
	$= 8\left[\frac{x}{2}\sqrt{25-x^2} + \frac{25}{2}\sin^{-1}\frac{x}{5}\right]_0^5$	III	1
	$= 50\pi$	IV	1

Q59. **2026** : 65/5/3 **[5 Marks]**

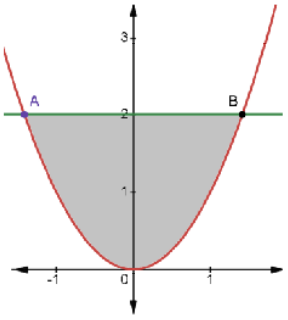
Question & answer as per CBSE Marking Scheme

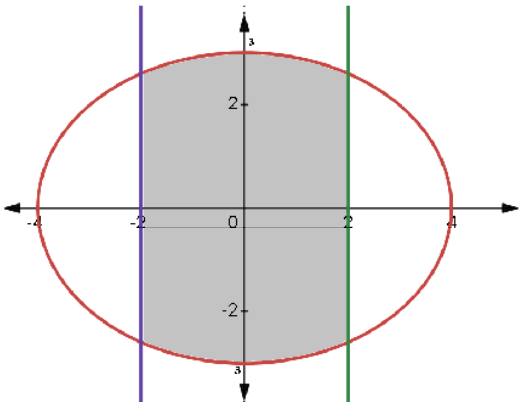
34.	Sketch the graph defined by $\left\{(x, y) : \frac{x^2}{25} + \frac{y^2}{25} = 1\right\}$. Find the area of the region of minor segment cut off by the line $x = \frac{5}{2}$, using integration.		
Sol.		I	1½
	Required area $= 2\int_{\frac{5}{2}}^{5}\sqrt{25-x^2}\,dx$	II	1½
	$= 2\left[\frac{x}{2}\sqrt{25-x^2} + \frac{25}{2}\sin^{-1}\frac{x}{5}\right]_{\frac{5}{2}}^{5}$	III	1
	$= 25\left(\frac{\pi}{3} - \frac{\sqrt{3}}{4}\right)$	IV	1

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Q60. **2026 Supp** : 65/7/1, 65/7/2, 65/7/3 **[5 Marks]**

Question & answer as per CBSE Marking Scheme

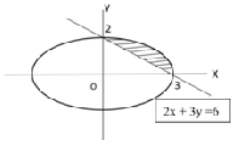
33.	(a) Using integration, find the area bounded by the curve $y = x^2$ and the line $y = 2$. **OR** (b) Using integration, find the area bounded by the curve $9x^2 + 16y^2 = 144$ and the lines $x = 2$, $x = -2$.		
Sol (a)		I	1 (For correct graph)
	Required Area $= 2\int_0^2 x\,dy = 2\int_0^2 \sqrt{y}\,dy$	II	2
	$= 2\left(\frac{y^{\frac{3}{2}}}{\frac{3}{2}}\right)_0^2$	III	1

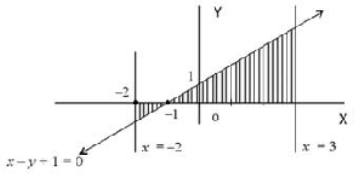
	$=\frac{4}{3}\left(2\sqrt{2}\right)=\frac{8\sqrt{2}}{3}$	IV	1
	OR		
Sol(b)		I	1 (For correct graph)
	Required Area $= 4\int_0^2 y\,dx = 4\times\frac{3}{4}\int_0^2\sqrt{4^2-x^2}\,dx$	II	2
	$=3\times\left(\frac{x\sqrt{4^2-x^2}}{2}+8sin^{-1}\frac{x}{4}\right)_0^2$	III	1
	$=3\left(2\sqrt{3}+\frac{8\times\pi}{6}\right)=\left(6\sqrt{3}+4\pi\right)$	IV	1

Case Study Based Questions (4 marks)

Q61. **2022 T-II** : 65/1/1, 65/1/2 **[4 Marks]**

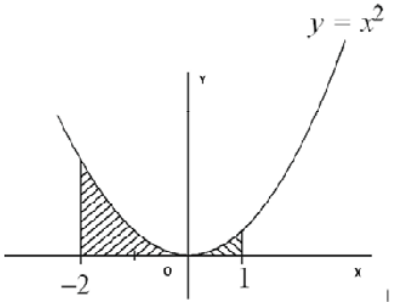
Question & answer as per CBSE Marking Scheme

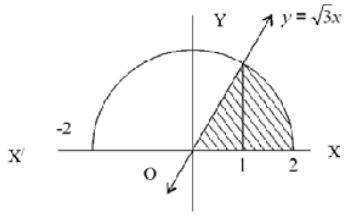
11.	(a) Using integration, find the area of the region $\{(x, y) : 4x^2 + 9y^2 \le 36, 2x + 3y \ge 6\}$. **OR** (b) Using integration, find the area of the region bounded by lines $x - y + 1 = 0$, $x = -2$, $x = 3$ and x-axis.	4
Sol.	 Correct figure	1
	Clearly points of intersection are (3, 0) and (0, 2)	½
	Required area $=\frac{2}{3}\int_0^3\sqrt{9-x^2}\,dx-\frac{2}{3}\int_0^3(3-x)\,dx$	1
	$=\frac{2}{3}\left[\frac{x}{2}\sqrt{9-x^2}+\frac{9}{2}\sin^{-1}\frac{x}{3}+\frac{(3-x)^2}{2}\right]_0^3$	1
	$=\frac{2}{3}\left[\frac{9\pi}{4}-\frac{9}{2}\right]$ *or* $\frac{3\pi}{2}-3$	½
		4

	Or  Correct figure Required area $= -\int_{-2}^{-1}(x+1)\,dx + \int_{-1}^{3}(x+1)\,dx$	 1 1
	$= -\frac{(x+1)^2}{2}\Big\|_{-2}^{-1} + \frac{(x+1)^2}{2}\Big\|_{-1}^{3}$ $= \frac{1}{2} + 8$ $= \frac{17}{2}$	1 1 4

Q62. **2022 T-II** : 65/1/3 **[4 Marks]**

Question & answer as per CBSE Marking Scheme

13.	Using integration, find the area of the region enclosed by the curve $y = x^2$, the x-axis and the ordinates $x = 2$ and $x = 1$. **OR** Using integration, find the area of the region enclosed by line $y = \sqrt{3}x$, semi-circle $y = \sqrt{4-x^2}$ and x-axis in first quadrant.	4
Sol.	 Correct figure $A = \int_{-2}^{1} x^2\,dx$ $= \frac{x^3}{3}\Big]_{-2}^{1}$ $= \frac{1}{3} - \left(\frac{-8}{3}\right) = 3$	1 1 1 1

		4
	Or	
	 Correct figure x coordinate of point of intersection is 1 Required area $= \int_0^1 \sqrt{3}\,x\,dx + \int_1^2 \sqrt{4-x^2}\,dx$ $= \sqrt{3}\frac{x^2}{2}\Big\|_0^1 + \frac{x}{2}\sqrt{4-x^2} + 2\sin^{-1}\frac{x}{2}\Big\|_1^2$ $= \frac{\sqrt{3}}{2} + \pi - \frac{\sqrt{3}}{2} - \frac{\pi}{3}$ $= \frac{2\pi}{3}$	1 ½ 1 1 ½

Q63. 2022 T-II : 65/2/1 [4 Marks]

Question & answer as per CBSE Marking Scheme

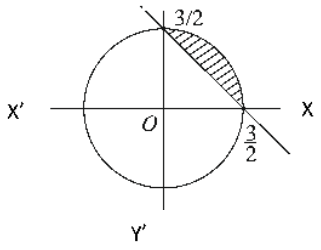
12.	Evaluate : $\int_0^1 x\,(1-x)^n\,dx$	4
Sol.	$I = \int_0^1 x(1-x)^n dx$ $= \int_0^1 (1-x)[1-(1-x)]^n dx$ [using property] $= \int_0^1 x^n(1-x)\,dx$ $= \int_0^1 x^n dx - \int_0^1 x^{n+1} dx$ $= \left[\frac{x^{n+1}}{n+1}\right]_0^1 - \left[\frac{x^{n+2}}{n+2}\right]_0^1$ $= \frac{1}{n+1} - \frac{1}{n+2}$ Or $\frac{1}{(n+1)(n+2)}$	1 1 1 1 4

Q64. 2022 T-II : 65/2/2, 65/2/3 [4 Marks]

Question & answer as per CBSE Marking Scheme

11.(a)	Using integration, find the area of the smaller region enclosed by the curve $4x^2 + 4y^2 = 9$ and the line $2x + 2y = 3$.	4
Sol.	Clearly point of intersection are Y	

$\left(\frac{3}{2}, 0\right)$ & $\left(0, \frac{3}{2}\right)$



Correct Figure — 1

Required area $= \int_0^{3/2} \sqrt{\frac{9}{4} - x^2}\, dx - \int_0^{3/2} \left(\frac{3}{2} - x\right) dx$ — 1

$= \frac{x}{2}\sqrt{\frac{9}{4} - x^2} + \frac{9}{8}\sin^{-1}\frac{2x}{3}\Big|_0^{3/2} + \frac{\left(\frac{3}{2} - x\right)^2}{2}\Big|_0^{3/2}$ — 1

$= \frac{9\pi}{16} - \frac{9}{8}$ — ½

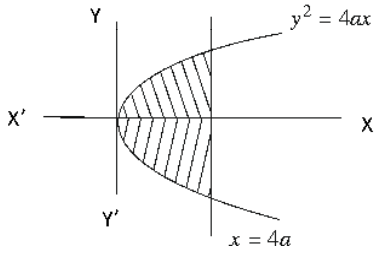
4

Or

11.(b) If the area of the region bounded by the curve $y^2 = 4ax$ and the line $x = 4a$ is $\frac{256}{3}$ sq. units, then using integration, find the value of a, where $a > 0$. — 4

Sol.

Given area $= \frac{256}{3}$



Correct Figure — 1

Area of Shaded region $= 2\int_0^{4a} \sqrt{4ax}\, dx$ — 1

$= 8\sqrt{a}\, \frac{x^{3/2}}{3}\Big|_0^{4a}$ — 1

$= \frac{64a^2}{3}$ — ½

$\frac{64a^2}{3} = \frac{256}{3}$

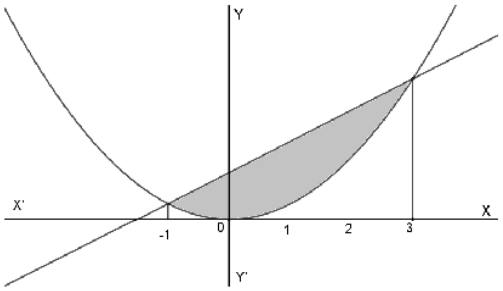
$\Rightarrow a^2 = 4$ gives $a = 2$ (as $a > 0$) — ½

4

Q65. **2022 T-II** : 65/3/1 **[4 Marks]**

Question & answer as per CBSE Marking Scheme

11.	Find the area of the region bounded by curve $4x^2 = y$ and the line $y = 8x + 12$, using integration.	4
Sol.		



Correct Figure 1

Point of intersection

$4x^2 = 8x + 12$

$x^2 - 2x - 3 = 0$

$(x-3)(x+1) = 0$ ½

$x = 3, -1$

Area $= \int_{-1}^{3}[(8x+12) - 4x^2]dx$ 1

$= 4x^2 + 12x - \frac{4}{3}x^3\Big]_{-1}^{3}$ 1

$= 36 + 36 - 36 - \left(4 - 12 + \frac{4}{3}\right)$

$= 44 - \frac{4}{3} = \frac{128}{3}$ ½

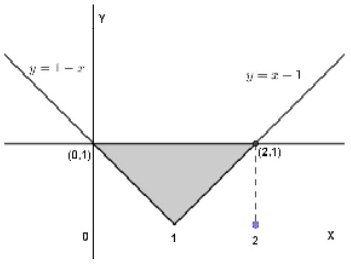
4

Q66. 2022 T-II : 65/5/1, 65/5/2, 65/5/3 [4 Marks]

Question & answer as per CBSE Marking Scheme

Q12.	Find the area bounded by the curves $y = \|x-1\|$ and $y = 1$, using integration.	4

A12.



(for correct figure) 1

Area of the bounded region is

$\int_0^1[1-(1-x)]dx + \int_1^2[1-(x-1)]dx$ 1

$\int_0^1 x\,dx + \int_1^2 (2-x)\,dx$

$= \frac{x^2}{2}\Big]_0^1 + \left[2x - \frac{x^2}{2}\right]_1^2$ 1

$= \frac{1}{2} + \left[4 - \frac{4}{2} - 2 + \frac{1}{2}\right]$

$= -1 + 2 = 1$ 1

Case Study Based Questions

Q67. **2026** : 65/1/1, 65/1/2, 65/1/3 **[4 Marks]**

Question & answer as per CBSE Marking Scheme

38. Roundabouts are often made on busy roads to ease the traffic and avoid red lights.



One such round-about is made such that equation representing its boundary is given by C_1 ; $x^2 + y^2 = 64$.

There is a circular pond with a fountain in the middle of the roundabout whose equation is given by C_2 : $x^2 + y^2 = 4$.

Based on the given information, answer the following questions :

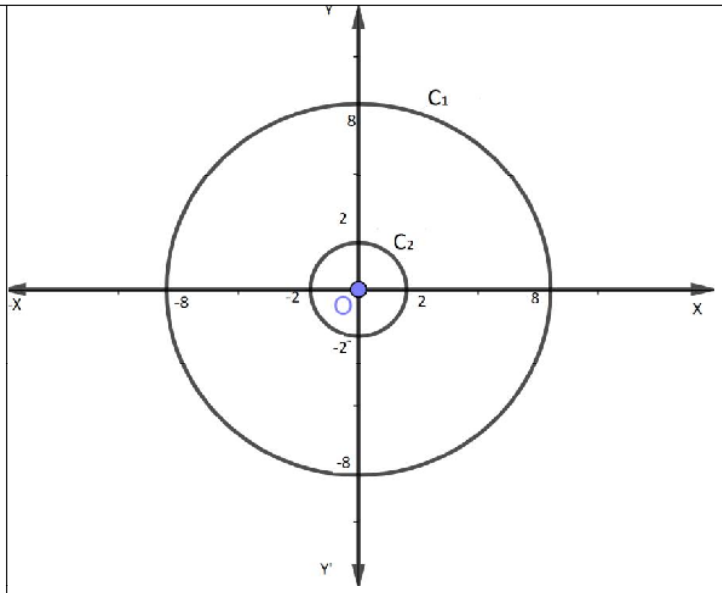
(i) Represent the given equations C_1 and C_2 with the help of a diagram.

(ii) Express y as a function of x, $(y = f(x))$, for both C_1 an C_2.

(iii) (a) Using integration find the area of region covered by the roundabout.

OR

(iii) (b) Using integration, find the area of region covered by circular pond.

Sol.(i)		I	1
Sol.(ii)	Circle C_1: $y = \sqrt{64 - x^2}$ *or* $y = -\sqrt{64 - x^2}$	I	½
	Circle C_2: $y = \sqrt{4 - x^2}$ *or* $y = -\sqrt{4 - x^2}$	II	½

Sol.(iii) (a)	Required area $= 4 \times \int_0^8 \sqrt{64 - x^2}\, dx$ $= 2[x\sqrt{64 - x^2} + 64sin^{-1}\frac{x}{8}]_0^8 = 64\pi$	I II	1 1
	OR		
Sol.(iii) (b)	Required area $= 4 \times \int_0^2 \sqrt{4 - x^2}\, dx$ $= 2[x\sqrt{4 - x^2} + 4sin^{-1}\frac{x}{2}]_0^2 = 4\pi$	I II	1 1

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References	CBSE Question Papers: https://www.cbse.gov.in/cbsenew/question-paper.html CBSE Marking Schemes: https://www.cbse.gov.in/cbsenew/marking-scheme.html

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