



## CBSE Maths Questions – 2016

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### Questions

14. Evaluate:

$$\int (3x + 5)\sqrt{5 + 4x - 2x^2} dx$$

15. Solve the differential equation:

$$x \frac{dy}{dx} + y - x + xy \cot x = 0, \quad x \neq 0$$

16. Solve the differential equation:

$$(x^2 + 3xy + y^2) dx - x^2 dy = 0$$

given that  $y = 0$  when  $x = 1$ .

17. Find the angle between the vectors  $(\mathbf{a} + \mathbf{b})$  and  $(\mathbf{a} - \mathbf{b})$  if

$$\mathbf{a} = 2\hat{i} - \hat{j} + 3\hat{k}, \quad \mathbf{b} = 3\hat{i} + \hat{j} - 2\hat{k}.$$

Also find a vector perpendicular to both.

18. Show that the lines

$$\frac{x-1}{3} = \frac{y-1}{-1} = \frac{z+1}{0} \quad \text{and} \quad \frac{x-4}{2} = \frac{y}{0} = \frac{z}{-3}$$

intersect. Find their point of intersection.

19. A committee of 4 students is selected from 7 boys and 4 girls. Find the probability that the committee contains exactly 2 girls, given that at least one girl is selected.

20. Show that the relation  $R$  defined by

$$(a, b)R(c, d) \Rightarrow a + d = b + c$$

on  $A \times A$ , where  $A = \{1, 2, 3, \dots, 10\}$ , is an equivalence relation. Hence write the equivalence class of  $(3, 4)$ .

21. Solve:

$$\begin{vmatrix} a+x & a-x & a \\ a-x & a+x & a-x \\ a & a-x & a+x \end{vmatrix} = 0$$

22. Show that the height of the cylinder of greatest volume inscribed in a right circular cone of height  $h$  and semi-vertical angle  $\alpha$  is  $\frac{h}{3}$ . Hence find the greatest volume:

$$\frac{4}{27}\pi h^3 \tan^2 \alpha$$

23. Using integration, find the area of the triangle formed by the negative  $x$ -axis and the tangent and normal to the circle

$$x^2 + y^2 = 9$$

at the point  $(-1, 2\sqrt{2})$ .

24. Find the foot of the perpendicular and the perpendicular distance from  $P(4, 3, 2)$  to the plane

$$x + 2y + 3z = 2$$

Also find the image of  $P$  in the plane.

25. A, B and C throw a pair of dice alternately until one gets a total of 9. Find the probability that A wins, if A starts first.
26. A company manufactures two types of cardigans. Formulate the LPP and find the maximum profit graphically.

## Task 1

### Problem 1

**Solution:**

$$x \frac{dy}{dx} + y - x + xy \cot x = 0$$

### Problem 2

**Solution:**

$$(x^2 + 3xy + y^2) dx - x^2 dy = 0, \quad y(1) = 0$$

### Problem 3

**Solution:** Angle between  $(\mathbf{a} + \mathbf{b})$  and  $(\mathbf{a} - \mathbf{b})$  is given by

$$\cos \theta = \frac{(\mathbf{a} + \mathbf{b}) \cdot (\mathbf{a} - \mathbf{b})}{\|\mathbf{a} + \mathbf{b}\| \|\mathbf{a} - \mathbf{b}\|}$$