SHUKLA INSTITUTE

B-BLOCK NEW DELHI MOTI NAGAR 9999863306

205-206, Progressive House, near MM Public School, Rohit Kunj, Market, Pitam Pura,

SAMPLE PAPER-1

Class 12 - Mathematics

Time Allowed: 2 hours **Maximum Marks: 40**

General Instructions:

1. This question paper contains three sections – A, B and C. Each part is compulsory.
2. Section - A has 6 short answer type (SA1) questions of 2 marks each.
3. Section – B has 4 short answer type (SA2) questions of 3 marks each.
4. Section - C has 4 long answer-type questions (LA) of 4 marks each.
5. There is an internal choice in some of the questions.
6. Q 14 is a case-based problem having 2 sub-parts of 2 marks each.

Section A

1. Evaluate: $\int \frac{\sec x}{\sec 2x} dx$ **[2]**

OR

Evaluate: $\int x^2 \cos 2x\, dx$

2. Solve the differential equation: $\frac{dy}{dx} = xe^x - \frac{5}{2} + \cos^2 x$ **[2]**
3. Find the area of the parallelogram determined by the vector $\hat{i} - 3\hat{j} + \hat{k}$ and $\hat{i} + \hat{j} + \hat{k}$ **[2]**
4. Find the cartesian form of the equation of the planes: **[2]**
$\vec{r} = (\hat{i} - \hat{j}) + s(-\hat{i} + \hat{j} + 2\hat{k}) + t(\hat{i} + 2\hat{j} + \hat{k})$.
5. A coin is tossed three times, determine P(E|F), **[2]**
where E: at least two heads, F: at most two heads.
6. A Box of oranges is inspected by examining three randomly selected oranges drown without replacement. If all the three oranges are good, the box is approved for sale, other wise, it is rejected. Find the probability that a box containing 15 oranges out of which 12 are good and 3 are bad ones will be approve for sale? **[2]**

Section B

7. Find the integral: $\int \frac{x+3}{\sqrt{5-4x-x^2}} dx$ **[3]**
8. Solve the initial value problem: $\sqrt{1-y^2}\, dx = (\sin^{-1} y - x)\, dy$, $y(0) = 0$ **[3]**

OR

Find the particular solution of the differential equation $\frac{dy}{dx} = 1 + x + y + xy$, given that y = 0 when x = 1.

9. If $\vec{a}$ and $\vec{b}$ are two vectors, such that $|\vec{a}| = 2|\vec{b}| = 1$ and $\vec{a} \cdot \vec{b} = 1$, then find $(3\vec{a} - 5\vec{b}) \cdot (2\vec{a} + 7\vec{b})$. **[3]**
10. Show that the lines $\frac{x-1}{2} = \frac{y+1}{3} = z$ and $\frac{x+1}{5} = \frac{y-2}{1} = z - 2$ do not intersect each other. **[3]**

OR

Find the shortest distance between the following lines :

$\vec{r}=2\hat{i}-5\hat{j}+\hat{k}+\lambda(3\hat{i}+2\hat{j}+6\hat{k})$ and $\vec{r}=7\hat{i}-6\hat{k}+\mu(\hat{i}+2\hat{j}+2\hat{k})$

Section C

11. Evaluate the integral as limit of sum: $\int_0^1 |3x-1|dx$. **[4]**

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

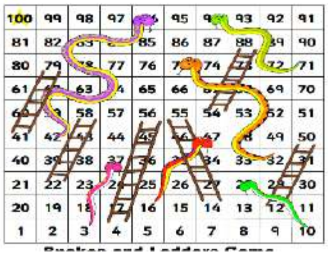
OR

Using integration, find the area of region bounded by the triangle whose vertices are (-2, 1), (0, 4) and (2, 3).

13. Find the vector and cartesian equations of a line passing through (1, 2,-4) and perpendicular to the two lines $\frac{x-8}{3}=\frac{y+19}{-16}=\frac{z-10}{7}$ and $\frac{x-15}{3}=\frac{y-29}{8}=\frac{z-5}{-5}$. **[4]**

CASE-BASED/DATA-BASED

14. Akshat and his friend Aditya were playing the snake and ladder game. They had their own dice to play the game. Akshat was having red dice whereas Aditya had black dice. In the beginning, they were using their own dice to play the game. But then they decided to make it faster and started playing with two dice together. **[4]**

Aditya rolled down both black and red die together.

i. Find the conditional probability of obtaining a sum greater than 9, given that the black die resulted in a 5.
ii. Find the conditional probability of obtaining the sum 8, given that the red die resulted in a number less than 4.

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205-206, Progressive House, near MM Public School, Rohit Kunj, Market, Pitam Pura,

SAMPLE PAPER-2

Class 12 - Mathematics

Time Allowed: 2 hours **Maximum Marks: 40**

General Instructions:

1. This question paper contains three sections – A, B and C. Each part is compulsory.
2. Section - A has 6 short answer type (SA1) questions of 2 marks each.
3. Section – B has 4 short answer type (SA2) questions of 3 marks each.
4. Section - C has 4 long answer-type questions (LA) of 4 marks each.
5. There is an internal choice in some of the questions.
6. Q 14 is a case-based problem having 2 sub-parts of 2 marks each.

Section A

1. Evaluate the Integral: $\int \frac{\tan x \sec^2 x}{(1-\tan^2 x)} dx$ **[2]**

OR

Integrate the function $\frac{x^3}{\sqrt{1-x^8}}$

2. Solve: $\frac{dy}{dx}$ = e^{x+y} **[2]**

3. Find the magnitude of two vectors $\vec{a}$ and $\vec{b}$, having the same magnitude and such that the angle between them is 60° and their scalar product is $\frac{1}{2}$. **[2]**

4. Find the angle between the pair of line given by **[2]**
$\vec{r} = 3\hat{i} + 2\hat{j} - 4\hat{k} + \lambda(\hat{i} + 2\hat{j} + 2\hat{k})$
$\vec{r} = 5\hat{i} - 2\hat{j} + \mu(3\hat{i} + 2\hat{j} + 6\hat{k})$

5. A and B appear for an interview for two vacancies in the same post. The probability of A's selection is 1/6 and that of B's selection is 1/4. Find the probability that none is selected. **[2]**

6. 10% of the bulbs produced in a factory are of red colour and 2% are red and defective. If one bulb is picked up at random, determine the probability of its being defective if it is red. **[2]**

Section B

7. Prove that **[3]**
$\int_0^{\pi/2} \frac{\sin^2 x}{\sin x+\cos x} dx = \frac{1}{\sqrt{2}} \log(\sqrt{2}+1).$

8. Find the general solution of $x \log x \frac{dy}{dx} + y = \frac{2}{x} \log x$ **[3]**

OR

Solve the differential equation: (sin x) $\frac{dy}{dx}$ + y cos x = 2 $\sin^2$ x cos x

9. If $\vec{a}, \vec{b}$ are two non-collinear vectors, prove that the points with position vector $\vec{a} + \vec{b}, \vec{a} - \vec{b}$ and $\vec{a} + \lambda\vec{b}$ are collinear for all real values of λ. **[3]**

10. Find the vector equation of a line passing through the point (2, 3, 2) and parallel to the line $\overrightarrow{\mathbf{r}} = (-2\hat{\mathbf{i}} + 3\hat{\mathbf{j}}) + \lambda(2\hat{\mathbf{i}} - 3\hat{\mathbf{j}} + 6\hat{\mathbf{k}})$. Also, find the distance between these two lines. **[3]**

Hint: The given line is $L_1 : \vec{r} = (-2\hat{i} + 3\hat{j}) + \lambda(2\hat{i} - 3\hat{j} + 6\hat{k})$

The required line is $L_2 : \vec{r} = (2\hat{i} + 3\hat{j} + 2\hat{k}) + \mu(2\hat{i} - 3\hat{j} + 6\hat{k})$

Now, find the distance between the parallel lines L_1 and L_2.

OR

Find the vector equation of a line which is parallel to the vector $2\hat{i} - \hat{j} + 3\hat{k}$ and which passes through the point (5, - 2, 4). Also, reduce it to cartesian form.

Section C

11. Evaluate: $\int \frac{dx}{(\sin x + \sin 2x)}$. **[4]**

12. Using method of integration find the area of the triangle ABC, co-ordinates of whose vertices are A(1, -2), B(3, 5) and C(5,2). **[4]**

OR

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

13. Find the shortest distance between the pairs of lines whose Cartesian equations are: **[4]**

$\frac{x-3}{1} = \frac{y-5}{-2} = \frac{z-7}{1}$ and $\frac{x+1}{7} = \frac{y+1}{-6} = \frac{z+1}{1}$

CASE-BASED/DATA-BASED

14. The probability that a certain person will buy a shirt is 0.2, the probability that he will buy a trouser is 0.3, and the probability that he will buy a shirt given that he buys a trouser is 0.4. **[4]**


i. Find the probability that he will buy both a shirt and a trouser.
ii. Find also the probability that he will buy a trouser given that he buys a shirt.

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SAMPLE PAPER-3 FINAL

Class 12 - Mathematics

Time Allowed: 2 hours **Maximum Marks: 40**

General Instructions:

1. This question paper contains three sections – A, B and C. Each part is compulsory.
2. Section - A has 6 short answer type (SA1) questions of 2 marks each.
3. Section – B has 4 short answer type (SA2) questions of 3 marks each.
4. Section - C has 4 long answer-type questions (LA) of 4 marks each.
5. There is an internal choice in some of the questions.
6. Q 14 is a case-based problem having 2 sub-parts of 2 marks each.

Section A

1. Evaluate: $\int \frac{\log\left(1+x^2\right)}{x^3} dx$ **[2]**

OR

Evaluate: $\int \frac{dx}{(x^2+2)(x^2+4)}$.

2. Solve the differential equation: $x\frac{dy}{dx}$ = x + y **[2]**

3. For any two vectors $\vec{a}$ and $\vec{b}$ prove that: $|\vec{a}-\vec{b}|^2 = |\vec{a}|^2 + |\vec{b}|^2 - 2\vec{a}\cdot\vec{b}$ **[2]**

4. The Cartesian equation of a line is $\frac{x-5}{3} = \frac{y+4}{7} = \frac{z-6}{2}$ Write its vector form. **[2]**

5. A bag contains 19 tickets, numbered from 1 to 19. A ticket is drawn and then another ticket is drawn without replacement. Find the probability that both tickets will show even numbers. **[2]**

6. A bag contains 7 red, 5 white and 8 black balls. If four balls are drawn one by one with replacement, what is the probability that any two are white? **[2]**

Section B

7. Evaluate $\int_0^{3/2} |x\cos \pi x| dx$ **[3]**

8. Find the general solution: e^xtanydx + (1 - e^x)$\sec^2$ydy = 0 **[3]**

OR

Find the solution of diff . equation. (1 + x^2)dy + 2xy dx = cot x dx

9. Simplify: $[\vec{a}-\vec{b}\ \vec{b}-\vec{c}\ \vec{c}-\vec{a}]$ **[3]**

10. Show that the point (1,2,1) is equidistant from the planes $\vec{r}\cdot(\hat{i}+2\hat{j}-2\hat{k}) = 5$ and $\vec{r}\cdot(2\hat{i}-2\hat{j}+\hat{k})+3=0$ **[3]**

OR

Show that the lines x = -y = 2z and x + 2 = 2y - 1 = -z + 1 are perpendicular to each other.

HINT: The given lines are $\frac{x}{2} = \frac{y}{-2} = \frac{z}{1}$ and $\frac{x+2}{2} = \frac{y-1/2}{1} = \frac{z-1}{-2}$

Section C

11. Evaluate: $\int \frac{\sin x\cos x}{(\cos^2 x - \cos x - 2)} dx$. **[4]**

12. Find the area of the region in the first quadrant enclosed by x-axis, line $x = \sqrt{3}y$ and the given curve $x^2 + y^2 = 4$ **[4]**

OR

Using integration, find the area of the triangular region whose sides have the equations y = 2x + 1, y = 3x + 1 and x = 4.

13. Find the perpendicular distance of the point (1, 0, 0) from the line $\frac{x-1}{2} = \frac{y+1}{-3} = \frac{z+10}{8}$. Also, find the coordinates of the foot of the perpendicular and the equation of the perpendicular. **[4]**

CASE-BASED/DATA-BASED

14. Three bags contain a number of red and white balls as follows: **[4]**

Bag 1 : 3 red balls, Bag 2 : 2 red balls and 1 white ball and Bag 3 : 3 white balls.

The probability that bag a will be chosen and a ball is selected from it is $\frac{1}{6}$. What is the probability that

i. a red ball will be selected?

ii. a white ball is selected?

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SAMPLE PAPER-4

Time Allowed: 2 hours **Class 12 - Mathematics** **Maximum Marks: 40**

General Instructions:

1. This question paper contains three sections – A, B and C. Each part is compulsory.
2. Section - A has 6 short answer type (SA1) questions of 2 marks each.
3. Section – B has 4 short answer type (SA2) questions of 3 marks each.
4. Section - C has 4 long answer-type questions (LA) of 4 marks each.
5. There is an internal choice in some of the questions.
6. Q 14 is a case-based problem having 2 sub-parts of 2 marks each.

Section A

1. Find: $\int \frac{x^2+x}{x^3-x^2+x-1} dx$ **[2]**

OR

Find the integral of the function $\sin^4 x$

2. Find the general solution: $\frac{dy}{dx} = \sqrt{4-y^2}\ (-2 < y < 2)$ **[2]**

3. Let $\vec{a}, \vec{b}$ and $\vec{c}$ be three vectors such that $|\vec{a}| = 3, |\vec{b}| = 4, |\vec{c}| = 5$ and each one of them being $\perp$ to the sum of the other two, find $|\vec{a} + \vec{b} + \vec{c}|$ **[2]**

4. Find the angle between the pairs of lines: **[2]**
$\frac{x-5}{1} = \frac{2y+6}{-2} = \frac{z-3}{1}$ and $\frac{x-2}{3} = \frac{y+1}{4} = \frac{z-6}{5}$

5. Two cards are drawn successively without replacement from a well-shuffled deck of 52 cards. Find the probability of exactly one ace. **[2]**

6. There are three urns containing 3 white and 2 black balls; 2 white and 3 black; 1 black and 4 white balls respectively. There is equal probability of each urn being chosen. One ball is drawn from an urn chosen at random. What is the probability that a white ball is drawn? **[2]**

Section B

7. Evaluate: $\int_0^1 \sin^{-1} \sqrt{x}dx$ **[3]**

8. Solve the following differential equation, given that y = 0, when x = $\frac{\pi}{4}$: $\sin 2x\frac{dy}{dx} - y = \tan x$ **[3]**

OR

Find a particular solution of $x\frac{dy}{dx} - y = \log x$, given that y = 0 when x = 1.

9. Show that the points $(2\hat{i} - \hat{j} + \hat{k},), (\hat{i} - 3\hat{j} - 5\hat{k}), (3\hat{i} - 4\hat{j} - 4\hat{k})$ from the vertices of a right-angled triangle. **[3]**

10. Find the angle between the lines $\vec{r} = 2\hat{i} - 5\hat{j} + \hat{k} + \lambda(3\hat{i} + 2\hat{j} + 6\hat{k})$ and $\vec{r} = 7\hat{i} - 6\hat{j} - 6\hat{k} + \mu(\hat{i} + 2\hat{j} + 2\hat{k})$. **[3]**

OR

By computing the shortest distance determine whether the pairs of lines intersect or not:

$\frac{x-5}{4}=\frac{y-7}{-5}=\frac{z+3}{-5}$ and $\frac{x-8}{7}=\frac{y-7}{1}=\frac{z-5}{3}$

Section C

11. Evaluate: $\int \frac{(5x+8)}{x^2(3x+8)} dx$. **[4]**

12. Sketch the graph of y = |x + 3| and evaluate $\int_{-6}^{0}|x+3|dx$ **[4]**

OR

Find the area bounded by the circle $x^2 + y^2 = 16$ and the line $\sqrt{3}y = x$ in the first quadrant, using integration.

13. Show that the lines: **[4]**

$\overrightarrow{r_1}=\hat{i}+\hat{j}+\hat{k}+\lambda(\hat{i}-\hat{j}+\hat{k})$

$\overrightarrow{r_2}=4\hat{j}+2\hat{\mathrm{k}}+\mu(2\hat{\mathrm{i}}-\hat{\mathrm{j}}+3\hat{\mathrm{k}})$ are coplanar.

Also, find the equation of the plane containing these lines.

CASE-BASED/DATA-BASED

14. In pre-board examination of class XII, commerce stream with Economics and Mathematics of a particular school, 50% of the students failed in Economics, 35% failed in Mathematics and 25% failed in both Economics and Mathematics. A student is selected at random from the class. **[4]**

Based on the above information, answer the following questions.

i. The probability that the selected student has failed in Economics, if it is known that he has failed in Mathematics?

ii. The probability that the selected student has failed in Mathematics, if it is known that he has failed in Economics?

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SAMPLE PAPER-5

Time Allowed: 2 hours **Class 12 - Mathematics** **Maximum Marks: 40**

General Instructions:

1. This question paper contains three sections – A, B and C. Each part is compulsory.
2. Section - A has 6 short answer type (SA1) questions of 2 marks each.
3. Section – B has 4 short answer type (SA2) questions of 3 marks each.
4. Section - C has 4 long answer-type questions (LA) of 4 marks each.
5. There is an internal choice in some of the questions.
6. Q 14 is a case-based problem having 2 sub-parts of 2 marks each.

Section A

1. Evaluate: $\int \frac{\cos 2x}{\cos x} dx$. **[2]**

OR

Evaluate: $\frac{\cos 2x}{(\cos x+\sin x)^2}$

2. Find the general solution of the differential equation $\frac{dy}{dx} + 2y = e^{3x}$ **[2]**

3. If $\vec{a} = \hat{i} + \hat{j} + \hat{k}, \vec{b} = \hat{j} - \hat{k}$ find vector $\vec{c}$ such that $\vec{a} \times \vec{c} = \vec{b}$ and $\vec{a}.\vec{c} = 3$ **[2]**

4. Find the Cartesian equations of the line passing through the point (-1, 3, - 2) and perpendicular to the lines $\frac{x}{1} = \frac{y}{2} = \frac{z}{3}$ and $\frac{x+2}{-3} = \frac{y-1}{2} = \frac{z+1}{5}$ **[2]**

5. Let E_1 and E_2 are the two independent events such that $P(E_1) = 0.35$ and $P(E_1 \cup E_2) = 0.60$, find $P(E_2)$ **[2]**

6. A bag contains 4 white and 2 black balls. Another contains 3 white and 5 black balls. If one ball is drawn from each bag, find the probability that both are black. **[2]**

Section B

7. Evaluate the integral: $\int \frac{e^{m \tan^{-1} x}}{(1+x^2)^{3/2}} dx$ **[3]**

8. In the differential equation show that it is homogeneous and solve it: $x^2 \frac{dy}{dx} + y^2 = xy$. **[3]**

OR

Solve the differential equation: $\frac{dy}{dx} = \sec (x + y)$

9. Find the angle between the vectors $\vec{a}$ *and* $\vec{b}$, where $\vec{a} = 2\hat{i} - \hat{j} + 2\hat{k}$ and $\vec{b} = 4\hat{i} + 4\hat{j} - 2\hat{k}$ **[3]**

10. Find the distance between the lines l_1 and l_2 given by. **[3]**

$$\overrightarrow{r} = \hat{i} + 2\hat{j} - 4\hat{k} + \lambda(2\hat{i} + 3\hat{j} + 6\hat{k})$$
$$\overrightarrow{r} = 3\hat{i} + 3\hat{j} - 5\hat{k} + \mu(2\hat{i} + 3\hat{j} + 6\hat{k})$$

OR

Find the shortest distance between the pairs of lines whose vector equations are:
$\vec{r} = (\hat{i} + 2\hat{j} + 3\hat{k}) + \lambda(2\hat{i} + 3\hat{j} + 4\hat{k})$ and $\vec{r} = (2\hat{i} + 4\hat{j} + 5\hat{k}) + \mu(3\hat{i} + 4\hat{j} + 5\hat{k})$

Section C

11. Evaluate $\int \frac{2x-1}{(x-1)(x+2)(x-3)} dx$ **[4]**

12. Find the area of region bounded by the triangle whose vertices are (-1, 1), (0, 5) and (3, 2) using integration. **[4]**

OR

Find the area enclosed by the parabola $4y = 3x^2$ and the line $2y = 3x + 12$.

13. Find the coordinates of the foot of the perpendicular from the point (1, 1, 2) to the plane $2x - 2y + 4z + 5 = 0$. Also, find the length of the perpendicular. **[4]**

CASE-BASED/DATA-BASED

14. Three machines E_1, E_2, E_3 in a certain factory produced 50%, 25% and 25%, respectively, of the total daily output of electric tubes. It is known that 4% of the tubes produced one each of machines E_1 and E_2 are defective, and that 5% of those produced on E_3 are defective. **[4]**

i. If one tube is picked up at random from a day's production, calculate the probability that it is defective.
ii. Calculate the probability that the defective tube was produced on machine E_1.

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SAMPLE PAPER-6

Class 12 - Mathematics

Time Allowed: 2 hours **Maximum Marks: 40**

General Instructions:

1. This question paper contains three sections – A, B and C. Each part is compulsory.
2. Section - A has 6 short answer type (SA1) questions of 2 marks each.
3. Section – B has 4 short answer type (SA2) questions of 3 marks each.
4. Section - C has 4 long answer-type questions (LA) of 4 marks each.
5. There is an internal choice in some of the questions.
6. Q 14 is a case-based problem having 2 sub-parts of 2 marks each.

Section A

1. Prove that: $\int_0^{\pi/2} \frac{\sqrt{\cot x}}{(1+\sqrt{\cot x})} dx = \frac{\pi}{4}$ **[2]**

OR

Evaluate the integrals: $\int \sqrt{x^2+5}dx$

2. Solve the differential equation: $\frac{dy}{dx} = x^2 + x - \frac{1}{x}, x \neq 0$ **[2]**
3. If $\vec{a} = \hat{i} + \hat{j}, \vec{b} = \hat{j} + \hat{k}$ and $\vec{c} = \hat{k} + \hat{i}$, write unit vectors parallel to $\vec{a} + \vec{b} - 2\vec{c}$. **[2]**
4. Find the shortest distance between the pairs of parallel lines whose equations are: **[2]**
$\vec{r} = (\hat{i} + \hat{j}) + \lambda(2\hat{i} - \hat{j} + \hat{k})$ and $\vec{r} = (2\hat{i} + \hat{j} - \hat{k}) + \mu(4\hat{i} - 2\hat{j} + 2\hat{k})$
5. If A and B be two events such that P (A) = $\frac{1}{4}$, P (B) = $\frac{1}{3}$ and P(A ∪ B) = $\frac{1}{2}$, show that A and B are independent events. **[2]**
6. Two dice are thrown and it is known that the first die shows 6. Find the probability that the sum of the numbers showing on two dice is 7. **[2]**

Section B

7. Evaluate: $\int \frac{1}{\sin x(3+2\cos x)} dx$. **[3]**
8. Show that it is homogeneous and solve it: (x cos $\frac{y}{x}$)$\frac{dy}{dx}$ = (x cos $\frac{y}{x}$) + x **[3]**

OR

Solve the differential equation: (sin x) $\frac{dy}{dx}$ + y cos x = 2 $\sin^2$ x cos x

9. Show that the points $\left(2\hat{i} - \hat{j} + \hat{k},\right), \left(\hat{i} - 3\hat{j} - 5\hat{k}\right), \left(3\hat{i} - 4\hat{j} - 4\hat{k}\right)$ from the vertices of a right-angled triangle. **[3]**
10. Find the shortest distance between the lines given below: $\frac{x-12}{-9} = \frac{y-1}{4} = \frac{z-5}{2}$ and $\frac{x-23}{-6} = \frac{y-19}{-4} = \frac{z-25}{3}$ **[3]**
Hint: Change the given equation in vector form.

OR

Find the angle between the vectors with direction ratios proportional to 1, -2, 1 and 4, 3, 2.

Section C

11. Evaluate $\int_0^{\frac{1}{2}} \frac{dx}{(1+x^2)\sqrt{1-x^2}}$ (Hint: let x = sin θ) **[4]**

12. Find the area of region bounded by the triangle whose vertices are (-1, 1), (0, 5) and (3, 2) using integration. **[4]**

OR

Find the area of the region enclosed by the parabola $y^2 = x$ and the line x + y = 2.

13. Find the length and the foot of perpendicular from the point $\left(1, \frac{3}{2}, 2\right)$ to the plane 2x - 2y + 4z + 5 = 0. **[4]**

CASE-BASED/DATA-BASED

14. In a hostel 60% of the students read Hindi news paper, 40% read English news paper and 20% read both Hindi and English news papers. **[4]**

A student is selected at random.

a. Find the probability that she read neither Hindi nor English news papers.
b. If she reads Hindi news paper, find the probability that she reads English news paper.

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SAMPLE PAPER-7
Class 12 - Mathematics

Time Allowed: 2 hours **Maximum Marks: 40**

General Instructions:

1. This question paper contains three sections – A, B and C. Each part is compulsory.
2. Section - A has 6 short answer type (SA1) questions of 2 marks each.
3. Section – B has 4 short answer type (SA2) questions of 3 marks each.
4. Section - C has 4 long answer-type questions (LA) of 4 marks each.
5. There is an internal choice in some of the questions.
6. Q 14 is a case-based problem having 2 sub-parts of 2 marks each.

Section A

1. Evaluate: $\int e^x \frac{(x-1)}{(x+1)^3} dx$. **[2]**

OR

Evaluate $\int_0^{\pi/2} \cos^5 x dx$

2. Solve $\cos\left(\frac{dy}{dx}\right) = a$, y = 1, when x = 0 **[2]**

3. If $|\vec{a}| = 13, |\vec{b}| = 5$ and $\vec{a} \cdot \vec{b} = 60$, then find $|\vec{a} \times \vec{b}|$. **[2]**

4. Find the angle between the pair of lines **[2]**
$\vec{r} = (3\hat{i} + \hat{j} - 2\hat{k}) + \lambda(\hat{i} - \hat{j} - 2\hat{k})$
$\vec{r} = (2\hat{i} - \hat{j} - 56\hat{k}) + \mu(3\hat{i} - 5\hat{j} - 4\hat{k})$

5. A bag contains 3 white and 2 red balls, another bag contains 4 white and 3 red balls. One ball is drawn at random from each bag. Find the probability that the balls drawn are one white and one red. **[2]**

6. A bag contains 4 white and 2 black balls. Another contains 3 white and 5 black balls. If one ball is drawn from each bag, find the probability that both are black. **[2]**

Section B

7. Evaluate $\int_{-1}^{2} |x^3 - x| dx$. **[3]**

8. Solve the initial value problem $e^{(dy/dx)}$ = x + 1; y(0) = 5 **[3]**

OR

Solve the differential equation: $x\frac{dy}{dx}$ + y = xe^x

9. Find a unit vector perpendicular to each of the vectors $\vec{a} + \vec{b}$ and $\vec{a} - \vec{b}$, where $\vec{a} = 3\hat{i} + 2\hat{j} + 2\hat{k}$ and $\vec{b} = \hat{i} + 2\hat{j} - 2\hat{k}$. **[3]**

10. Find the distance between the point (-1, -5, -10) and the point of intersection of the line $\frac{x-2}{3} = \frac{y+1}{4} = \frac{z-2}{12}$ and the plane x - y + z = 5. **[3]**

OR

Find the vector equation of the plane passing through the point $(3\hat{i}+4\hat{j}+2\hat{k})$ and parallel to the vectors $(\hat{i}+2\hat{j}+3\hat{k})$ and $(\hat{i}-\hat{j}+\hat{k})$.

Section C

11. $\int \tan^{-1}\sqrt{\frac{1-x}{1+x}}dx$ **[4]**

12. Using integration, find the area of the region bounded by the triangle whose vertices are (2,1), (3, 4) and (5, 2). **[4]**

OR

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

13. Find the image of the point (5, 9, 3) in the line $\frac{x-1}{2}=\frac{y-2}{3}=\frac{z-3}{4}$ **[4]**

CASE-BASED/DATA-BASED

14. Elpis Limited is a company that produces electric bulbs. The quality of their bulbs is really very good. The customers are well satisfied and it has been as well recommended brand in the market. The probability that a bulb produced by Elpis Limited will fuse after 150 days of use is 0.05. **[4]**

Find the probability that out of 5 such bulbs

i. No bulb will fuse after 150 days of use.
ii. Not more than one will fuse after 150 days of use.

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B-BLOCK NEW DELHI MOTI NAGAR 9999863306

205-206, Progressive House, near MM Public School, Rohit Kunj, Market, Pitam Pura,

SAMPLE PAPER-8 FINAL

Time Allowed: 2 hours **Class 12 - Mathematics** **Maximum Marks: 40**

General Instructions:

1. This question paper contains three sections – A, B and C. Each part is compulsory.
2. Section - A has 6 short answer type (SA1) questions of 2 marks each.
3. Section – B has 4 short answer type (SA2) questions of 3 marks each.
4. Section - C has 4 long answer-type questions (LA) of 4 marks each.
5. There is an internal choice in some of the questions.
6. Q 14 is a case-based problem having 2 sub-parts of 2 marks each.

Section A

1. Evaluate: $\int(\tan^{-1} x^2)\, x\, dx$ **[2]**

OR

Evaluate: $\int \cot^2 x \operatorname{cosec}^4 x\, dx$

2. Determine the order and degree of the differential equation. State also whether it is linear or non-linear. $y = x\frac{dy}{dx} + a\sqrt{1 + \left(\frac{dy}{dx}\right)^2}$ **[2]**

3. Find $\left|\vec{a} - \vec{b}\right|$ if $|\vec{a}| = 2, \left|\vec{b}\right| = 3$ and $\vec{a}.\vec{b} = 4$ **[2]**

4. Write the direction cosines of the line $\frac{x-2}{2} = \frac{2y-5}{-3}, z = 2.$ **[2]**

5. Two balls are drawn from a urn containing 2 white, 3 red and 4 black balls one by one without replacement. What is the probability that at least one ball is red? **[2]**

6. A box contains 2 gold and 3 silver coins. Another box contains 3 gold and 3 silver coins. A box is chosen at random, and a coin is drawn from it. If the selected coin is a gold coin, find the probability that it was drawn from the second box. **[2]**

Section B

7. By using the properties of definite integrals, evaluate the integral $\int\limits_0^{\frac{\pi}{2}} \cos^2 x dx$ **[3]**

8. Solve the differential equation: $(1 + x^2) \frac{dy}{dx} - x = 2 \tan^{-1} x$ **[3]**

OR

In the differential equation show that it is homogeneous and solve it: $x\frac{dy}{dx} = y(\log y - \log x + 1)$.

9. If $\vec{a} = (4\hat{i} + 5\hat{j} - \hat{k}), \vec{b} = (\hat{i} - 4\hat{j} + 5\hat{k})$, and $\vec{c} = (3\hat{i} + \hat{j} - \hat{k})$, find a vector $\vec{d}$ which is perpendicular to both a and b and for which $\vec{c} \cdot \vec{d} =$ = 21. **[3]**

10. Find the shortest distance between the pairs of lines whose vector equations are: **[3]**
$\vec{r} = (3\hat{i} + 5\hat{j} + 7\hat{k}) + \lambda(\hat{i} - 2\hat{j} + 7\hat{k})$ and $\vec{r} = -\hat{i} - \hat{j} - \hat{k} + \mu(7\hat{i} - 6\hat{j} + \hat{k})$

OR

Find the vector equation of the line passing through (2, 1, -1) and parallel to the line $\vec{r} = (\hat{i} + \hat{j}) + \lambda(2\hat{i} - \hat{j} + \hat{k})$. Also, find the distance between these two lines.

Section C

11. Prove that: $\int_0^{\pi/2} \log(\tan x + \cot x) dx = \pi(\log 2)$. **[4]**

12. Using method of integration find the area of the triangle ABC, co-ordinates of whose vertices are A (2, 0), B (4, 5) and C (6, 3). **[4]**

OR

Find the area between the curves y = x and y = x^2

13. Find the shortest distance between the lines $\frac{x+1}{7} = \frac{y+1}{-6} = \frac{z+1}{1}$ and $\frac{x-3}{1} = \frac{y-5}{-2} = \frac{z-7}{1}$. **[4]**

CASE-BASED/DATA-BASED

14. Three bags contain a number of red and white balls as follows: **[4]**

Bag 1 : 3 red balls, Bag 2 : 2 red balls and 1 white ball and Bag 3 : 3 white balls.

The probability that bag a will be chosen and a ball is selected from it is $\frac{1}{6}$. What is the probability that

i. a red ball will be selected?

ii. a white ball is selected?

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205-206, Progressive House, near MM Public School, Rohit Kunj, Market, Pitam Pura,

SAMPLE PAPER-9

Time Allowed: 2 hours **Class 12 - Mathematics** **Maximum Marks: 40**

General Instructions:

1. This question paper contains three sections – A, B and C. Each part is compulsory.
2. Section - A has 6 short answer type (SA1) questions of 2 marks each.
3. Section – B has 4 short answer type (SA2) questions of 3 marks each.
4. Section - C has 4 long answer-type questions (LA) of 4 marks each.
5. There is an internal choice in some of the questions.
6. Q 14 is a case-based problem having 2 sub-parts of 2 marks each.

sample paper-9

1. Evaluate: $\int \frac{x^2}{(a^2-x^2)^{3/2}} dx$ **[2]**

OR

Evaluate the Integral: $\int \left(\frac{1+\sin 2x}{x+\sin^2 x}\right) dx$

2. Solve the differential equation: $\frac{dy}{dx}$ + y = e^{-2x} **[2]**

3. Find the angle between two vectors $\vec{a}$ and $\vec{b}$ with magnitude $\sqrt{3}$ and 2 respectively having $\vec{a}.\vec{b} = \sqrt{6}$ **[2]**

4. Find the angle between the pairs of lines: **[2]**
$\frac{x-2}{3} = \frac{y+3}{-2}, z = 5$ and $\frac{x+1}{1} = \frac{2y-3}{3} = \frac{z-5}{2}$

5. Two dice are thrown and it is known that the first die shows 6. Find the probability that the sum of the numbers showing on two dice is 7. **[2]**

6. Two cards are drawn from a well shuffled pack of 52 cards without replacement. What is the probability that one is a red queen and the other is a king of black colour? **[2]**

Section B

7. Evaluate the integral: $\int \sin^{-1} \sqrt{x} dx$ **[3]**

8. Solve: $\frac{dy}{dx} + \frac{y}{x}$ = cos x + $\frac{\sin x}{x}$ **[3]**

OR

Solve the differential equation: y (1 - x^2) $\frac{dy}{dx}$ = x (1 + y^2)

9. If $\vec{a}, \vec{b}$ and $\vec{c}$ be three vectors such that $\vec{a} + \vec{b} + \vec{c} = 0$ and $|\vec{a}| = 3, \left|\vec{b}\right| = 5, |\vec{c}| = 7$ find the angle between $\vec{a}$ and $\vec{b}$ **[3]**

10. Find the shortest distance between the skew-lines $l_1 : \frac{x-1}{2} = \frac{y+1}{1} = \frac{z-2}{4}$ and $l_2 : \frac{x+2}{4} = \frac{y-0}{-3} = \frac{z+1}{1}$. **[3]**

OR

Find the shortest distance between the lines whose vector equations are

$\vec{r} = \hat{i} + \hat{j} + \lambda(2\hat{i} - \hat{j} + \hat{k})$and $\vec{r} = 2\hat{i} + \hat{j} - \hat{k} + \mu(3\hat{i} - 5\hat{j} + 2\hat{k})$.

Section C

11. Evaluate: $\int \frac{\sin x \cos x}{(\cos^2 x - \cos x - 2)} dx$. **[4]**

12. Find the area bounded by the lines y = 4x + 5, y = 5 - x and 4y = x + 5. **[4]**

OR

Using method of integration, find the area bounded by the curve |x| + |y| = 1.
[Hint: The required region is bounded by lines x + y = 1, x - y = 1, -x + y = 1 and -x - y = 1]

13. Find the coordinates of the point where the line through the points A (3, 4, 1) and B(5, 1, 6) crosses the XY-plane. **[4]**

CASE-BASED/DATA-BASED

14. Three machines E_1, E_2, E_3 in a certain factory produced 50%, 25% and 25%, respectively, of the total daily output of electric tubes. It is known that 4% of the tubes produced one each of machines E_1 and E_2 are defective, and that 5% of those produced on E_3 are defective. **[4]**

i. If one tube is picked up at random from a day's production, calculate the probability that it is defective.
ii. Calculate the probability that the defective tube was produced on machine E_1.

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SAMPLE PAPER-10

Class 12 - Mathematics

Time Allowed: 2 hours **Maximum Marks: 40**

General Instructions:

1. This question paper contains three sections – A, B and C. Each part is compulsory.
2. Section - A has 6 short answer type (SA1) questions of 2 marks each.
3. Section – B has 4 short answer type (SA2) questions of 3 marks each.
4. Section - C has 4 long answer-type questions (LA) of 4 marks each.
5. There is an internal choice in some of the questions.
6. Q 14 is a case-based problem having 2 sub-parts of 2 marks each.

Section A

1. Find: $\int e^{2x} \cdot \cos(3x+1) dx$ **[2]**

OR

Evaluate: $\int \frac{1}{(x^2+1)(x^2+4)} dx$

2. Solve the differential equation: $\frac{dy}{dx} + \frac{\cos x \sin y}{\cos y} = 0$ **[2]**

3. Find the unit vectors perpendicular to the plane of the vectors $\vec{a} = 2\hat{i} - 6\hat{j} - 3\hat{k}$ and $\vec{b} = 4\hat{i} + 3\hat{j} - \hat{k}$. **[2]**

4. Write the angle between the lines $\frac{x-5}{7} = \frac{y+2}{-5} = \frac{z-2}{1}$ and $\frac{x-1}{1} = \frac{y}{2} = \frac{z-1}{3}$. **[2]**

5. Two dice were thrown and it is known that the numbers which come up were different. Find the probability that the sum of the two numbers was 5. **[2]**

6. The probability of student A passing an examination is 2/9 and of student B passing is 5/9. Assuming the two events : 'A passes', 'B passes' as independent, find the probability of: only one of them passing the examination. **[2]**

Section B

7. Evaluate $\int \frac{x+2}{\sqrt{x^2+5x+6}} dx$. **[3]**

8. Find the general solution of the differential equation $\frac{dy}{dx} = \sin^{-1} x$ **[3]**

OR

In the differential equation show that it is homogeneous and solve it: $\frac{dy}{dx} = \frac{2xy}{(x^2-y^2)}$.

9. Find the components of a unit vector which is perpendicular to the vectors $\hat{i} + 2\hat{j} - \hat{k}$ and $3\hat{i} - \hat{j} + 2\hat{k}$ **[3]**

10. Find the angles between the lines $\vec{r} = 3\hat{i} - 2\hat{j} + 6\hat{k} + \lambda\left(2\hat{i} + \hat{j} + 2\hat{k}\right)$ and $\vec{r} = \left(2\hat{i} - 5\hat{k}\right) + \mu\left(6\hat{i} + 3\hat{j} + 2\hat{k}\right)$ **[3]**

OR

Find the distance between the line $\vec{r} = (-\hat{i} + 3\hat{k}) + \lambda(\hat{i} - 2\hat{j})$ and the line passing through (0,

-1, 2) and (1, -2, 3).

Section C

11. Evaluate: $\int \frac{\cos x}{(1+\sin x)(2+\sin x)} dx$. **[4]**

12. Find the area of the region bounded by the curve $y^2 = x$ and the lines $x = 1$, $x = 4$ and the x-axis in the first quadrant. **[4]**

OR

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

13. Find the vector and cartesian equations of the plane passing through the line of intersection of the planes **[4]**
$\vec{r} \cdot (2\hat{i} + 2\hat{j} - 3\hat{k}) = 7,\ \vec{r} \cdot (2\hat{i} + 5\hat{j} + 3\hat{k}) = 9$
such that the intercepts made by the plane on x-axis and z-axis are equal.

CASE-BASED/DATA-BASED

14. To teach the application of probability a maths teacher arranged a surprise game for 5 of his students namely Govind, Girish, Vinod, Abhishek and Ankit. He took a bowl containing tickets numbered 1 to 50 and told the students go one by one and draw two tickets simultaneously from the bowl and replace it after noting the numbers. **[4]**

Based on the above information, answer the following questions.

i. Teacher ask Govind, what is the probability that tickets are drawn by Abhishek, shows a prime number on one ticket and a multiple of 4 on other ticket?
ii. Teacher ask Girish, what is the probability that tickets drawn by Ankit, shows an even number on first ticket and an odd number on second ticket?