Most Important Questions(Mathematics)

Class 12 CBSE Board 2021-22(Term II)

1. Vertices B and C of $\triangle ABC$ lie along the line $\frac{x+2}{2}=\frac{y-1}{1}=\frac{z-0}{4}$. Find the area of the triangle given that A has coordinates $(1,-1,2)$ and line segment BC has length 5.

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2. Find the shortest distance between lines l_1 and l_2 whose vector equations are given below:
$l_1: \vec{r}=\hat{i}+\hat{j}+\lambda(2\hat{i}-\hat{j}+\hat{k}) \quad l_2: \vec{r}=2\hat{i}+\hat{j}-\hat{k}+\mu(3\hat{i}-5\hat{j}+2\hat{k})$

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3. Find the value of λ, so that the lines $\frac{1-x}{3}=\frac{7y-14}{2\lambda}=\frac{5z-10}{11}$ and $\frac{7-7x}{3\lambda}=\frac{y-5}{1}=\frac{6-z}{5}$ are perpendicular to each other.

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4. Two systems of rectangular axis have the same origin. If a plane cuts them at distances a,b,c and a',b',c', respectively from the origin, then prove that $\frac{1}{a^2}+\frac{1}{b^2}+\frac{1}{c^2}=\frac{1}{a'^2}+\frac{1}{b'^2}+\frac{1}{c'^2}$

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5. Find the distance of the point $(2,3,4)$ from the line $\frac{x+3}{3}=\frac{y-2}{6}=\frac{z}{2}$ measured parallel to the plane $3x+2y+2z-5=0$.

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6. Find the equation of plane passing through the line of intersection of planes $2x+y-z=3$ and $5x-3y+4z+9=0$ and parallel to line $\frac{x-1}{2}=\frac{y-3}{4}=\frac{z-5}{5}$.

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7. Find the equation of plane passing through point $(1,1,-1)$ and perpendicular to planes $x+2y+3z-7=0$ and $2x-3y+4z=0$.

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8. Find the vector and Cartesian equations of line passing through point $(1,2,-4)$ and perpendicular to the lines
$\frac{x-8}{3}=\frac{y-19}{-16}=\frac{z-10}{7}$ and $\frac{x-15}{3}=\frac{y-29}{8}=\frac{z-5}{-5}$.

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9. Find the angle between the lines whose direction cosines are given by the equations: $3l+m+5n=0$ and $6mn-2nl+5lm=0$.

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10. Sketch the curves and identify the region bounded by $x=\frac{1}{2}, x=2, y=\log_e x$ and $y=2^x$. Find the area of this region.

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11. Using integration, find the area bounded by the curve $x^2=4y$ and the line $x=4y-2$

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12. Find the area of the region bounded by the $y=x^2+1, y=x, x=0$ and $y=2$.

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13. Find the area of the region bounded by the curves $x=2y-y^2$ and $y=2+x$.

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

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15. Find the area bounded by the lines $y=4x+5, y=5-x$ and $4y=x+5$

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16. Determine the order and degree of the following differential equation.
$\frac{d^2 y}{dx^2}=1+\sqrt{\frac{dy}{dx}}$

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17. Determine the order and degree of the following differential equation.
$y+\frac{dy}{dx}=\frac{1}{4}\int y dx$

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18. Solve the following differential equation:
$\frac{dy}{dx}=(4x+y+1)^2$

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19. Solve the following differential equation:
$\frac{dy}{dx}=\cos(x+y)$

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20. Solve:
$\frac{dy}{dx}=e^{x-y}+x^2 e^{-y}$

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21. Find the particular solution of the differential equation $\left(\tan^{-1} y-x\right) dy=\left(1+y^2\right) dx$, given that when $x=0, y=0$

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22. Solve the differential equation $\frac{dy}{dx}=1+x+y^2+xy^2$, when $y=0$ and $x=0$

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23. Find the particular solution of the differential equation $\frac{dx}{dy}+x\cot y=2y+y^2\cot y,(y\neq 0)$, given that $x=0$ when $y=\frac{\pi}{2}$.

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24. Find the particular solution of the differential equation $\left(\tan^{-1} y-x\right) dy=\left(1+y^2\right) dx$, given that when $x=0, y=0$

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25. Solve the following differential equation
$\left(x\cos\frac{y}{x}+y\sin\frac{y}{x}\right) y-\left(y\sin\frac{y}{x}-x\cos\frac{y}{x}\right)\cdot x\frac{dy}{dx}=0$

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26. Solve the following differential equation
$\left(1+x^2\right)\frac{dy}{dx}+2xy=\frac{1}{1+x^2}$, given $y=0$ when $x=1$.

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27. Find the equation of a curve passing through $\left(1,\frac{\pi}{4}\right)$ if the slope of the tangent to the curve at any point $P(x,y)$ is $\frac{y}{x}-\cos^2\frac{y}{x}$.

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28. Evaluate $\int\frac{2}{1+\cos 2x}dx$

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29. Evaluate $\int\left[\frac{1}{\log x}-\frac{1}{(\log x)^2}\right] dx$

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30. Evaluate $\int\frac{\sec x}{\log(\sec x+\tan x)}dx$

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31. Evaluate $\int\left(x^4+x^2+1\right) d\left(x^2\right)$

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32. Evaluate $\int\frac{dx}{\cos x(\sin x+2\cos x)}$

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33. Evaluate $\int\frac{2\sin x\cos x}{\sin^4 x+\cos^4 x}dx$

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34. Evaluate $\int\frac{\sin^8 x-\cos^8 x}{1-2\sin^2 x\cos^2 x}dx$

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35. Evaluate $\int \tan(x-\theta)\tan(x+\theta)\tan 2x dx$ Ask Filo

36. Evaluate $\int \frac{1}{\sin(x-a)\sin(x-b)} dx$ Ask Filo

37. Evaluate $\int \frac{dx}{x^{2/3}\sqrt{x^{2/3}-4}}$ Ask Filo

38. Evaluate $\int \sqrt{\frac{x}{a^3-x^3}} dx$ Ask Filo

39. Evaluate $\int \frac{x^2}{(x\sin x+\cos x)^2} dx$ Ask Filo

40. Evaluate $\int (\sqrt{\tan x}+\sqrt{\cot x}) dx$ Ask Filo

41. Evaluate $\int \frac{dx}{(\sin^2 x-2\cos^2 x)(2\sin^2 x+\cos^2 x)}$ Ask Filo

42. Evaluate $\int \left[\log(\log x)+\frac{1}{(\log x)^2}\right] dx$ Ask Filo

43. Evaluate $\int \sin^{-1}\sqrt{\frac{x}{x+a}} dx$ Ask Filo

44. Evaluate $\int_0^1 \frac{\log(1+x)}{1+x^2} dx$ Ask Filo

45. Prove that $\int_0^\pi x f(\sin x) dx=\frac{\pi}{2}\int_0^\pi f(\sin x) dx$ Ask Filo

46. Evaluate Ask Filo
$\int_0^{\frac{\pi}{2}} \frac{\sin 2x}{\sin^4 x+\cos^4 x} dx.$

47. Evaluate $\int \frac{\cos x}{\sin x+\sqrt{\sin x}} dx$ Ask Filo

48. Evaluate $\int_0^a \sin^{-1}\sqrt{\frac{x}{a+x}} dx$ Ask Filo

49. Evaluate $\int \frac{\cos x}{(1-\sin x)^3(2+\sin x)} dx$ Ask Filo

50. Evaluate $\int (2x-5)\sqrt{2+3x-x^2} dx$ Ask Filo

51. Evaluate $\int \frac{dx}{\sin^4 x+\cos^4 x}$ Ask Filo

52. Evaluate $\int \sqrt{\cot\theta} d\theta$ Ask Filo

53. Evaluate $\int_1^3 (2x^2+5x) dx$ as a limit of sum. Ask Filo

54. Evaluate $\int_0^1 \cot^{-1}[1-x+x^2] dx$ Ask Filo

55. Evaluate Ask Filo
$\int_{-1}^{\frac{3}{2}} |x\sin\pi x| dx.$

56. Evaluate: $\int_0^{\pi/2} \frac{dx}{(a^2\cos^2 x+b^2\sin^2 x)^2}$ Ask Filo

57. The probability of a man hitting a target is $1/4$. How many times must he fire so that the Ask Filo

probability of his hitting the target at least once is greater than $2/3$?

58. Three bags contain a number of red and white balls as follows Bag I : 3 red balls, Bag II : 2 red balls and 1 white ball and Bag III : 3 white balls. The probability that bag I will be chosen and a ball is selected from it is $\frac{i}{6}$, where $i = 1, 2, 3$. If a white ball is selected, what is the probability that it came from (i) Bag II? (ii) Bag III?

59. A family has 2 children. Find the probability that both are boys, if it is known that (i) at least one of children is a boy. (ii) elder child is a boy.

60. Two cards are drawn at random and without replacement from a pack of 52 playing cards. Find the probability that both the cards are black.

61. A speak truth in 60% of the cases, while B in 90% of the cases. In what percent of cases are they likely to contradict each other in stating the same fact? In the cases of contradiction do you think, the statement of B will carry more weight as he speaks truth in more number of cases than A ?

62. If two natural numbers r and s are drawn one at a time, without replacement from the set $S = \{1, 2, 3, \ldots, n\}$, then find $P(r \leq p/s \leq p)$, where $p \in S$.

63. Suppose a girl throws a die. If she gets 5 or 6 , she tosses a coin 3 times and notes the number of heads. If she gets $1, 2, 3$ or 4 she tosses a coin once and notes whether a head or tail is obtained. If she obtained exactly one head, what is the probability that she throw $1, 2, 3$ or 4 with the die.

64. A letter is known to have come either from TATANAGAR or CALCUTTA. On the envelope just two consecutive letters TA are visible. What is the probability that the letter has come from (i) CALCUTTA (ii) TATANAGAR?

65. Suppose that the reliability of a HIV test is specified as follows:
Of people having HIV, 90% of the test detect the disease but 10% go undetected. Of people free of HIV, 99% of the test are judged HIV -ve but 1% are diagnosed as showing HIV + ve. From a large population of which only 0.1% have HIV, one person is selected at random, given the HIV test, and the pathologist reports him/her as HIV +ve. What is the probability that the person actually has HIV?

66. The random variable X has a probability distribution $P(x)$ to the following form, where k is some number:

$$P(X = x) = \begin{cases} k, & \text{if } x = 0 \\ 2k, & \text{if } x = 1 \\ 3k, & \text{if } x = 2 \\ 0, & \text{otherwise} \end{cases}$$

(i) Determine the value of k
(ii) Find $P(X < 2), P(X \leq 2), P(X \geq 2)$

67. Four bad oranges are mixed accidently with 16 good oranges. Find the probability distribution

of the number of bad oranges in a draw of two oranges.

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68. One card is drawn at random from a well shuffled deck of 52 cards. In which of the following cases are the events E and F independent?
(i) E : the card drawn is a spade, F : the card drawn in an ace.
(ii) E : the card drawn is black, F : the card drawn is a king.
(iii) E : the card drawn is a king or queen, F : the card drawn is a queen or jack.

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69. There are two bags, one of which contains 3 black and 4 white balls while the other contains 4 black and 3 white balls. A die is thrown. If it shows up 1 or 3 , a ball is taken from the I^{st} bag but it shows up any other number, a ball is chosen from the II $^{\text{nd}}$ bag. Find the probability of choosing a black ball.

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70. There are two bags. The first bag contains 5 white and 3 black balls the second bag contains 3 white and 5 black balls. Two balls are drawn at random from the first bag and are put into the second bag without noticing their colours. Then two balls are drawn from the second bag. Find the probability that the balls are white and black.

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71. If $\hat{a}$ and $\hat{b}$ are unit vectors inclined at an angle θ, then prove that $\sin \frac{\theta}{2}=\frac{1}{2}|\hat{a}-\hat{b}|$

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72. Find value of following
$\hat{\boldsymbol{i}} \cdot(\hat{\boldsymbol{j}} \times \hat{\boldsymbol{k}})+\hat{\boldsymbol{j}} \cdot(\hat{\boldsymbol{i}} \times \hat{\boldsymbol{k}})+\hat{\boldsymbol{k}} \cdot(\hat{\boldsymbol{i}} \times \hat{\boldsymbol{j}})$

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73. If $\vec{a}$ and $\vec{b}$ are two vectors such that $|\vec{a}+\vec{b}|=|\vec{a}|$, then prove that vector $2 \vec{a}+\vec{b}$ is perpendicular to vector $\vec{b}$.

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74. Write all unit vectors of XY-plane.

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

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