100 Most Important Questions In Mathematics For Class 12 Board Exams

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#Guess Paper for Class 12 Maths # Sample Paper For Class 12 Math # Practice Paper for Class 12 Maths # Important Questions for Class 12 Maths # Must Do questions for Class 12 Maths # Expected Questions in Class 12 Maths.

1. Prove that the relation on the set $A = \{1, 2, 3, 4, 5\}$ given by $R = \{(a, b) : |a - b| \text{ is even}\}$ is an equivalence relation . Find all the elements related to element 3 i.e. Find the Equivalence Class [3]. ($\{1,3,5\}$)

2. Consider $f : R_+ \to [-5, \infty)$ given by $f(x) = 9x^2 + 6x - 5$. Show that f is an invertible function. Also prove that $f^{-1}(x) = \frac{\sqrt{x+6} - 1}{3}$

3. Show that $f : A \to B$ defined by $f(x) = \frac{x-2}{x-3}$ is bijective, where $A = R - \{3\}$ and $B = R - \{1\}$.

4. Let $A = N \times N$ and $*$ be binary operation on A defined by $(a,b)*(c,d) = (a+c, b+d)$.. Show that $*$ is commutative and associative. Also find identity element for $*$ if it exists. (e does not exist)

5. Consider the be binary operation $* : R \times R \to R$ and $o : R \times R \to R$ defined as $a*b = |a-b|$. and $aob = a$ for all $a, b, c \in R$. Show that $*$ is commutative but not associative. 'o' is associative but not commutative.

6. Define a binary operation $*$ on the set {0, 1, 2, 3, 4, 5} as $a*b = \begin{cases} a+b; & \text{if } a+b<6 \\ a+b-6; & \text{if } a+b \geq 6 \end{cases}$. Write the operation table of $*$ and show that 0 is the identity element for $*$ and each element a of the set is invertible with $6-a$ being the inverse of a.

7. Prove that $\tan^{-1}\left(\frac{1}{5}\right) + \tan^{-1}\left(\frac{1}{7}\right) + \tan^{-1}\left(\frac{1}{3}\right) + \tan^{-1}\left(\frac{1}{8}\right) = \frac{\pi}{4}$

8. Prove that $\cot^{-1}\left[\frac{\sqrt{1+\sin x} + \sqrt{1-\sin x}}{\sqrt{1+\sin x} - \sqrt{1-\sin x}}\right] = \frac{x}{2}$; $x \in \left(0, \frac{\pi}{4}\right)$

9. Prove that $\tan^{-1}\left(\frac{\sqrt{1+x} - \sqrt{1-x}}{\sqrt{1+x} + \sqrt{1-x}}\right) = \frac{\pi}{4} - \frac{1}{2}\cos^{-1} x$; $-\frac{1}{\sqrt{2}} \leq x \leq 1$

10. Solve the following: $\tan^{-1}\left(\frac{1-x}{1+x}\right) = \frac{1}{2}\tan^{-1} x$; x > 0 ($\frac{1}{\sqrt{3}}$)

11. Using properties of determinants prove that: $\begin{vmatrix} x^2+1 & xy & xz \\ xy & y^2+1 & yz \\ zx & zy & z^2+1 \end{vmatrix} = 1+x^2+y^2+z^2$

12. Using properties of determinants prove that: $\begin{vmatrix} 1+a^2-b^2 & 2ab & -2b \\ 2ab & 1-a^2+b^2 & 2a \\ 2b & -2a & 1-a^2-b^2 \end{vmatrix} = \left(1+a^2+b^2\right)^3$

13. Express follwing matrices as the sum of symmetric and skew-symmetric matrix:

$\begin{bmatrix} 3 & -2 & -4 \\ 3 & -2 & -5 \\ -3 & 1 & 2 \end{bmatrix}$ ($\begin{bmatrix} 3 & \frac{1}{2} & \frac{-5}{2} \\ \frac{1}{2} & -2 & -2 \\ \frac{-5}{2} & -2 & 2 \end{bmatrix} + \begin{bmatrix} 0 & \frac{-5}{2} & \frac{-3}{2} \\ \frac{5}{2} & 0 & -3 \\ \frac{3}{2} & 3 & 0 \end{bmatrix}$)

14. Using elementary transformations find the inverse of following matrix: $\begin{bmatrix} -1 & 1 & 2 \\ 1 & 2 & 3 \\ 3 & 1 & 1 \end{bmatrix}$ ($\begin{bmatrix} 1 & -1 & 1 \\ -8 & 7 & -5 \\ 5 & -4 & 3 \end{bmatrix}$)

15. A school wants to award its students for the values of Honesty , Regularity and Hard Work with a total cash award of Rs. 6000. three times the award money for hard work added to that given for Honesty amounts to Rs. 11000. The award money given for Honesty and Hard Work together is double the one given for Regularity . Represent the above situation algebraically and find the award money for each value, using matrix method . Apart from these values namely Honesty Regularity and Hard Work suggest one more value which the school must include for awards. ($500, 2000$ *and* 3500)

16. 10 students were selectedfrom a school on the basis of values for giving awards into three groups 1st were hard workers . 2nd for honesty and 3rd for obedient students. Double the number of students of the 1st group added to the no in the 2nd group gives 13 while the combined strength of 1st and 2nd group is four times that of 3rd group .Using matrix method find the no of students in each group. Apart from these values suggest one more value which the school must include for aawards. (3, 4, and 5)

17. Two school A and B wants to award their selected students on the values of sincerity , truthfulness and helpfulness. The school A wants to award Rs x each, Rs y each nad Rs z each for the three respective values to 3, 2 and 1 students respectively with a total award money of Rs 1,600. School B wants to spend Rs, 2,300 to award its 4,1 and 3 students on the respective values (by giving the same award money to the three values as before). If the total amount for one prize on each value is Rs 900, Using matrices , find the award money for each value . Apart from these three values , suggest one more value which should be considered for award . ($200, 300$ *and* 400 *Value based award for Punctuality*)

18. Find k, *If* $f(x)$ is continuous at $x=\frac{\pi}{2}$ $f(x)=\begin{cases} \frac{k\cos x}{\pi-2x} & ; x\neq\frac{\pi}{2} \\ 3 & ; x=\frac{\pi}{2} \end{cases}$ (k = 6)

19. Find a and b if the following function is continuous at x=1, $f(x)=\begin{cases} 3ax+b & ; x>1 \\ 11 & ; x=1 \\ 5ax \quad 2b & ; x<1 \end{cases}$ (a = 3 , b = 2)

20. Find a, b and c if $f(x)=\begin{cases} \frac{\sin(a+1)x+\sin x}{x} & ; x<0 \\ c & ; x=0 \\ \frac{\sqrt{x+bx^2}-\sqrt{x}}{bx^{\frac{3}{2}}} & x>0 \end{cases}$ *is continuous at* $x=0$ ($a=\frac{-3}{2}, c=\frac{1}{2}, b\in R$)

21. Examine the Differentiability of the function $f(x)=\begin{cases} 2x+3 \text{ , if } -3\le x<-2 \\ x+1 \text{ , if } -2\le x<0 \\ x+2 \text{ , if } 0\le x\le 1 \end{cases}$ (Not differentiable at x=-2 and x=0)

22. If $y=\left(\tan^{-1}x\right)^2$ show that : $\left(1+x^2\right)^2\frac{d^2y}{dx^2}+2x\left(1+x^2\right)\frac{dy}{dx}=2$

23. If $x=a(\cos t+t\sin t), y=a(\sin t-t\cos t)$. Find $\frac{d^2x}{dt^2},\frac{d^2y}{dt^2}$ and $\frac{d^2y}{dx^2}$

($\frac{d^2x}{dt^2}=a(-t\sin t+\cos t),\frac{d^2y}{dt^2}=a(t\cos t+\sin t),\frac{d^2y}{dt^2}=\frac{1}{at\cos^3 t}$)

24. If $x=a\left(\cos t+\log\tan\frac{t}{2}\right), y=a(1+\sin t)$. Find $\frac{d^2y}{dx^2}$ ($\frac{1}{a}\sec^4 t\sin t$)

25. Differentiate w.r.t. x : $(\sin x)^x+(\cos x)^{\tan x}$ ($(\sin x)^x[\log\sin x+x\cot x]+(\cos x)^{\tan x}\left[\sec^2 x\log\cos x-\tan^2 x\right]$)

26. Differentiate w.r.t. x : x^{x^x} ($x^{x^x}x^x\log x\left[1+\log x+\frac{1}{x\log x}\right]$)

27. Differentiate w.r.t. x : $\tan^{-1}\left(\frac{\sqrt{1+x}-\sqrt{1-x}}{\sqrt{1+x}+\sqrt{1-x}}\right)$ ($\frac{1}{2\sqrt{1-x^2}}$)

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28. If $x=\tan\left(\frac{1}{a}\log y\right)$, show that $\left(1+x^2\right)\frac{d^2y}{dx^2}+(2x-a)\frac{dy}{dx}=0$.

29. Find the intervals in which the following function is strictly (i) increasing (ii) decreasing

$f(x)=\sin x+\cos x \quad ;0\le x\le 2\pi$ ((i) $\left[0,\frac{\pi}{4}\right)\cup\left(\frac{5\pi}{4},2\pi\right]$ (ii) $\left(\frac{\pi}{4},\frac{5\pi}{4}\right)$)

30. Find the points of the curve $x^2+y^2-2x-3=0$ at which the tangents are parallel to x - axis . ($(1,2),(1,-2)$)

31. Find the points on the curve $y=x^3-11x+5$ at which the equation of the tangent is $y=x-11$ ($(2,-9)$)

32. Prove that following function is an increasing function throughout its domain: $y=\log(1+x)-\frac{2x}{2+x} \quad ;x>-1$

33. Using differentials , Find the approximate value of $\sqrt{0.037}$ (0.192)

34. A tank with rectangular base and rectangular sides, open at the top is to be constructed so that its depth is 2 m and volume is 8 *m3.* If building of tank costs Rs 70 per sq metres for the base and Rs 45 per square metres for the base and Rs 45 per square metre for sides. What is the cost of least expensive tank? ($Rs\,1000$)

35. Show that the height of the cylinder of maximum volume that can be inscribed in a sphere of radius R is $\frac{2R}{\sqrt{3}}$ Also show the maximum volume is $\frac{1}{\sqrt{3}}$ times the volume of sphere.

36. Show that the right circular cylinder, open at the top, and of given surface area and maximum volume is such that its height is equal to the radius of the base.

37. Show that the altitude of the right circular cone of maximum volume that can be inscribed in a sphere of radius R is $\frac{4R}{3}$. Also show that the maximum volume of the cone is $\frac{8}{27}$ of the volume of the sphere.

38. Show that the volume of the greatest cylinder which can be inscribed in a cone of height *h* and semi vertical angle α is $\frac{4}{27}\pi h^3\tan^2\alpha$

39. Show that semi- vertical angle of right circular cone of given surface area and maximum Volume is $\sin^{-1}\left(\frac{1}{3}\right)$

40. Show that Semi- vertical angle of the cone of the maximum volume and of given slant height is $\tan^{-1}\left(\sqrt{2}\right)$

41. $\int \frac{x+2}{\sqrt{(x-2)(x-3)}}\,dx$ $\left(\sqrt{x^2-5x+6}+\frac{9}{2}\log\left|\left(x-\frac{5}{2}\right)+\sqrt{x^2-5x+6}\right|+c\right)$

42. $\int e^x\left(\frac{\sin 4x-4}{1-\cos 4x}\right)dx$ $\left(e^x\cot 2x+c\right)$

43. $\int \frac{\sin x}{\sin(x-a)}\,dx$ $\left(x\cos a+\sin a\log\left|\sin(x-a)\right|+c\right)$

44. $\int \frac{x^4}{(x^2+1)(x-1)}\,dx$ $\left(\frac{x^2}{2}+x+\frac{1}{2}\log|x-1|-\frac{1}{4}\log\left|x^2+1\right|-\frac{1}{2}\tan^{-1}x+c\right)$

45. $\int \frac{1}{\sin(x-a)\cos(x-b)}\,dx$ $\left(\frac{1}{\cos(b-a)}\log\left|\frac{\cos(x-b)}{\sin(x-a)}\right|+c\right)$

46. $\int \frac{1}{\sin(x-a)\sin(x-b)}\,dx$ $\left(\frac{1}{\sin(b-a)}\log\left|\frac{\sin(x-b)}{\sin(x-a)}\right|+c\right)$

47. $\int \frac{1}{1+\tan x}dx$ $\left(\frac{1}{2}x+\frac{1}{2}\log\left|\cos x+\sin x\right|+c\right)$

48. $\int e^{ax}\cos bx\,dx$ $\left(\frac{e^{ax}}{a^2+b^2}\left[a\cos bx+b\sin bx\right]+c\right)$

49. $\int \frac{x^2+4}{x^4+16}dx$ $\left(\frac{1}{2\sqrt{2}}\tan^{-1}\left(\frac{x^2-4}{2\sqrt{2}x}\right)+c\right)$

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

51. $\int \sqrt{\tan\theta}-\sqrt{\cot\theta}\;d\theta$ $\left(\sqrt{2}\tan^{-1}\left(\frac{\tan\theta-1}{\sqrt{2\tan\theta}}\right)+c\right)$

52. $\int (x+3)\sqrt{3-4x-x^2}\;dx$ $\left(\frac{-1}{3}\left(3-4x-x^2\right)^{\frac{3}{2}}+\frac{(x+2)}{2}\sqrt{3-4x-x^2}+\frac{7}{2}\sin^{-1}\left(\frac{x+2}{\sqrt{7}}\right)+c\right)$

53. $\int_0^{\pi}\frac{dx}{5+4\cos x}$ $\left(\frac{\pi}{3}\right)$

54. $\int_0^{\frac{\pi}{2}}\frac{x\sin x\cos x}{\sin^4 x+\cos^4 x}dx$ $\left(\frac{\pi^2}{16}\right)$

55. $\int_0^{\pi}\frac{x\,dx}{a^2\cos^2 x+b^2\sin^2 x}dx$ $\left(\frac{\pi^2}{2ab}\right)$

56. Prove that $\int_0^{\frac{\pi}{2}}\log\sin x\,dx=\frac{-\pi}{2}\log 2$

57. $\int_0^{\frac{\pi}{2}}\sqrt{\tan x}+\sqrt{\cot x}\;dx=\sqrt{2}\pi$

58. Evaluate following as limit of sum $\int_0^3 2x^2+3x+5\,dx$ $\left(\frac{93}{2}\right)$

59. Evaluate following as limit of sum $\int_0^4 x+e^{2x}\,dx$ $\left(\frac{15+e^8}{2}\right)$

60. $\int_{-1}^{2}\left|x^3-x\right|dx$ $\left(\frac{11}{4}\right)$

61. $\int_1^4\left(|x-1|+|x-2|+|x-3|\right)dx$ $\left(\frac{19}{2}\right)$

62. $\int_{-1}^{\frac{3}{2}}\left|x\sin(\pi x)\right|dx$ $\left(\frac{3}{\pi}+\frac{1}{\pi^2}\right)$

63. $\int_{\frac{\pi}{6}}^{\frac{\pi}{3}}\frac{1}{1+\sqrt{\tan x}}dx$ $\left(\frac{\pi}{12}\right)$

64. Find the area of the region enclosed between the two circle $x^2+y^2=4$ *and* $(x-2)^2+y^2=4$ $\left(\frac{8\pi}{3}-2\sqrt{3}\right)$

65. Find the area of the circle $4x^2+4y^2=9$ which is interior to the parabola $y^2=4x$ $\left(\frac{\sqrt{2}}{6}+\frac{9}{4}\sin^{-1}\left(\frac{2\sqrt{2}}{3}\right)\right)$

66. Find the area of the region encluded between the parabolas $y = \frac{3x^2}{4}$ *and line* $3x - 2y + 12 = 0$ (27)

67. Using Integration , find the area of the triangle ABC where $A(-3,5), B(4,2)$ *and* $C(-1,-6)$ ($35.5\ sq.units$)

68. Using Integration , find the area of the Region: $\{(x, y) : 0 \le y \le x^2 + 1 , 0 \le y \le x + 1, 0 \le x \le 2\}$ ($\frac{23}{6}$)

69. Form the differential equation of the family of ellipse having foci on x-axis and centre at origin. ($xyy'' + x(y')^2 - yy' = 0$)

70. Solve the following differential equation: $e^x \tan y\, dx + (1 - e^x)\sec^2 y\, dy = 0$ ($1 - e^x = c\tan y$)

71. Solve the following differential equation: $xdy - ydx = \sqrt{x^2 + y^2}dx$ ($y + \sqrt{x^2 + y^2} = cx^2$)

72. Solve the following differential equation: $(xdy - ydx)\, y.\sin\left(\frac{y}{x}\right) = (ydx + xdy)\, x\cos\left(\frac{y}{x}\right)$ *given that* $y = \pi$ *when* $x = 3$

($xy\cos\left(\frac{y}{x}\right) = \frac{3\pi}{2}$)

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73. Solve the following differential equation: $ye^{\frac{x}{y}}dx = \left(xe^{\frac{x}{y}} + y^2\right)dy; (y \ne 0)$ ($e^{\frac{x}{y}} = y + C$)

74. Find a particular solution of the differential equation (*x* – *y*) (*dx* + *dy*) = *dx* – *dy*, given that *y* = –1, when *x* = 0
(log |x-y|=x+y+1)

75. Solve the following differential equation: $\frac{dy}{dx} + y\cot x = 4x\,\mathrm{cosec}\, x ; y = 0, x = \frac{\pi}{2}$ ($y\sin x = 2x^2 - \frac{\pi^2}{2}$)

76. Verify that the function $y = c_1 e^{ax}\cos bx + c_2 e^{ax}\sin bx$, where c_1, c_2 are arbitrary constants is a solution of the differential equation $\frac{d^2y}{dx^2} - 2a\frac{dy}{dx} + (a^2 + b^2)y = 0$.

78. The scalar product of the vector $\hat{i} + \hat{j} + \hat{k}$ with a unit vector along the sum of the vectors $2\hat{i} + 4\hat{j} - 5\hat{k}$ *and* $\lambda\hat{i} + 2\hat{j} + 3\hat{k}$ is equal to one . Find the Value of λ . ($\lambda = 1$)

79. Let $\vec{a} = \hat{i} + 4\hat{j} + 2\hat{k}, \vec{b} = 3\hat{i} - 2\hat{j} + 7\hat{k}$ *and* $\vec{c} = 2\hat{i} - \hat{j} + 4\hat{k}$ Find a vector $\vec{d}$ which is perpendicular to both $\vec{a}$ *and* $\vec{b}$ *and* $\vec{c}.\vec{d} = 18$ ($64\hat{i} - 2\hat{j} - 28\hat{k}$)

80. If $\vec{a} = 3\hat{i} - \hat{j}, \vec{b} = 2\hat{i} + \hat{j} - 3\hat{k}$ then express $\vec{b}$ in the form $\vec{b} = \vec{b}_1 + \vec{b}_2$ such that $\vec{b}_1 \parallel \vec{a}$ *and* $\vec{b}_2 \perp \vec{a}$
($\vec{b} = \frac{1}{2}(3\hat{i} - \hat{j}) + \frac{1}{2}(\hat{i} + 3\hat{j} - 6\hat{k})$)

81. 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 perpendicular to sum of the other two vectors. Find $|\vec{a} + \vec{b} + \vec{c}|$ ($5\sqrt{2}$)

82. Show that the four points whose position vectors are $6\hat{i} - 7\hat{j}, 16\hat{i} - 19\hat{j} - 4\hat{k}, 3\hat{j} - 6\hat{k}$ *and* $2\hat{i} - 5\hat{j} + 10\hat{k}$ are coplanar .

83. Prove that $\left[\vec{a} + \vec{b},\ \vec{b} + \vec{c},\ \vec{c} + \vec{a}\right] = 2\left[\vec{a},\ \vec{b},\ \vec{c}\right]$

84. Find the coordinates foot of perpendicular, mirror image and perpendicular distance from (0, 2, 7) on the line $\frac{x+2}{-1} = \frac{y-1}{3} = \frac{z-3}{-2}$ ($\left(\frac{-3}{2}, \frac{-1}{2}, 4\right), (-3, -3, 1), \frac{\sqrt{70}}{2}$)

85. Find the shortest distance between the two lines: $\vec{r} = (2 + 2\mu)\hat{i} + (\mu - 1)\hat{j} - (1 - 2\mu)\hat{k}$ *and* $\vec{r} = (1 + \lambda)\hat{i} - (\lambda - 2)\hat{j} + (1 + \lambda)\hat{k}$
($\frac{3\sqrt{2}}{2}$)

86. Find the equation of the plane passing through the point (1, -1, 2) and perpendicular to each of planes

$2x+3y-2z=5$ and $x+2y-3z=8$ $(5x-4y-z=7)$

87. Find the distance of the point (3, -2, 1) from the plane $3x+y-z+2=0$ measured parallel to the line $\frac{x-1}{2}=\frac{y+2}{-3}=\frac{z-1}{1}$.

Also, find the foot of the perpendicular from the given point upon the given plane. $\left(4\sqrt{14}\ units, \left(\frac{9}{11}, -\frac{30}{11}, \frac{19}{11}\right)\right)$

88. Find distance of a point (-1, -5, -10) from the point of intersection of the line $\vec{r}=2\hat{i}-\hat{j}+2\hat{k}+\lambda\left(3\hat{i}+2\hat{j}+2\hat{k}\right)$ and the plane $\vec{r}.\left(\hat{i}-\hat{j}+\hat{k}\right)=5$. (13 units)

89. Find the coordinates of the point where the line through (3, -4, -5) and (2, -3, 1) crosses the plane determined by the points A (1, 2, 3), B (2, 2, 1) and C (-1, 3, 6). (1, -2, 7)

90. Find distance of a point (-1, -5, -10) from the point of intersection of the line $\vec{r}=2\hat{i}-\hat{j}+2\hat{k}+\lambda\left(3\hat{i}+2\hat{j}+2\hat{k}\right)$ and the plane $\vec{r}.\left(\hat{i}-\hat{j}+\hat{k}\right)=5$. (13 units)

91. Find the equation of the plane passing through the points (2, 1, -1), (-1, 3, 4) and perpendicular to the plane $x-2y+4z=10$. Also show that the plane thus obtained contains the line $\vec{r}=\left(-\hat{i}+3\hat{j}+4\hat{k}\right)+\lambda\left(3\hat{i}-2\hat{j}-5\hat{k}\right)$. $(18x+17y+4z=49)$

92. Find the equation of the passing through the line intersection of the planes $2x+y-z=3$ and $5x-3y+4z+9=0$ and parallel to the line $\frac{x-1}{2}=\frac{y-3}{4}=\frac{z-5}{5}$ $(7x+9y-10z=27)$

93. A pair dice is thrown 4 times. If getting a doublet is considered a success, find the probability distribution of number of successes. Also find the mean and variace of this distribution.

X	0	1	2	3	4
$P(X)$	$\frac{625}{1296}$	$\frac{500}{1296}$	$\frac{150}{1296}$	$\frac{20}{1296}$	$\frac{1}{1296}$

$Mean=\frac{2}{3}$ $Variance=\frac{5}{9}$

94. How many times must a man toss a fair coin so that the probability of having at least one head is more than 80%? $(n\geq 3)$

95. A man takes a step forward with probability 0.4 and backward with probability 0.6. Find the probability that at the end of 5 steps, he is one step away from the starting point. $(\frac{72}{125})$

96. A and B throw a die alternatively till one of them gets a number greater than four and wins the game. If A starts the game, what is the probability of B winning? $(\frac{2}{5})$

97. A man is known to speak the truth 3 out of 4 times. He throwns a die and reports that it is number greater than 6. Find the probability that it is actually a number greater than 6. $(\frac{3}{8})$

98. There are three coins. One is a two headed coin, another is a biased coin that comes up tails 25% of the time and third is an unbiased coin. One of the three coins is chosen at random and tossed, it shows heads, what is the probability that it was the two headed coin? $(\frac{4}{9})$

99. Bag I contains 3 red and 4 black balls and Bag II contains 4 red and 5 black balls. Two balls is transferred at random from Bag I to Bag II and then a ball is drawn from Bag II. The ball so drawn is found to be red in colour. Find the probability that the transferred balls were both black. $(\frac{4}{17})$

100. By examining the chest X ray, the probability that TB is detected when a person is actually suffering is 0.99. The probability of an healthy person diagnosed to have TB is 0.001. In a certain city, 1 in 1000 people suffers from TB. A person is selected at random and is diagnosed to have TB. What is the probability that he actually has TB? (110/221)

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