LONDON SCHOOL

+1

MATHS Q-BANK

VOLUME 1

CHAPTER 1
SETS, RELATIONS AND FUNCTIONS

2 Marks

1. Find the number of subsets of A if $A = \{x: x = 4n + 1, 2 \leq n \leq 5, n \in N\}$. **(EG 1.1)**
2. If $\wp(A)$ denotes the power set of A, then find $n(\wp(\wp(\wp(\emptyset))))$.**(EG 1.9)**
3. Write the in roster form. $\{x \in \mathbb{N}: x^2 < 121$ and x is a prime$\}$. **(EX 1.1 - 1)**
4. Write the set $\{-1, 1\}$ in set builder form. **(EX 1.1 - 2)**
5. Justify the trueness of the statement:
   "*An element of a set can never be a subset of itself*." **(EX 1.1 - 5)**
6. If $n(\wp(A)) = 1024$, $n(A \cup B) = 15$ and $n(\wp(B)) = 32$, then find $n(A \cap B)$. **(EX 1.1 - 6)**
7. If $n(A \cap B) = 3$ and $n(A \cup B) = 10$, then find $n(\wp(A\Delta B))$. **(EX 1.1 - 7)**
8. If $A \times A$ has 16 elements, $S = \{(a, b) \in A \times A: a < b\}$, $(-1,2)$ and $(0,1)$ are two elements of S, then find the remaining elements of S. **(EX 1.1 - 10)**
9. Prove that the relation "$friendship$" is not an equivalence relation on the set of all people in Chennai. **(EX 1.2 – 6)**
10. The function for exchanging American dollars for Singapore Dollar on a given day is $f(x) = 1.23x$, where x represents the number of American dollars. On the same day the function for exchanging Singapore Dollar to Indian Rupee is $g(y) = 50.50y$, where y represents the number of Singapore dollars. Write a function which will give the exchange rate of American dollars in terms of Indian rupee. **(EX 1.3 - 17)**

3 Marks

1. In a survey of 5000 persons in a town, it was found that 45% of the persons know Language A, 25% know Language B, 10% know Language C, 5% know Languages A and B, 4% know Languages B and C, and 4% know Languages A and C. If 3% of the persons know all the three Languages, find the number of persons who knows only Language A. **(EG 1.2)**
2. Prove that $\left((A \cup B' \cup C) \cap (A \cap B' \cap C')\right) \cup \left((A \cup B \cup C') \cap (B' \cap C')\right) = B' \cap C'$. **(EG 1.3)**
3. If $X = \{1,2,3, \ldots\ldots,10\}$ and $A = \{1,2,3,4,5\}$, find the number of sets $B \subseteq X$ such that $A - B = \{4\}$. **(EG 1.4)**
4. If A and B are two sets so that $n(B - A) = 2n(A - B) = 4n(A \cap B)$ and if $n(A \cup B) = 14$, then find $n(\wp(A))$. **(EG 1.5)**
5. Two sets have m and k elements. If the total number of subsets of the first set is 112 more than that of the second set, find the values of m and k. **(EG 1.6)**
6. If $n(A) = 10$ and $n(A \cap B) = 3$, find $n((A \cap B)' \cap A)$. **(EG 1.7)**
7. Check the relation $R = \{(1,1), (2,2), (3,3), \ldots\ldots, (n, n)\}$ defined on the set $S = \{1,2,3, \ldots\ldots, n\}$ for the three basic relations. **(EG 1.10)**
8. Discuss the relations for reflexivity, symmetricity and transitivity: On the set of natural numbers the relation R defined by "xRy if x+2y=1". (EX 1.2 - 1)

9. Let $X = \{a, b, c, d\}$ and $R = \{(a, a), (b, b), (a, c)\}$. Write down the minimum number of ordered pairs to be included to R to make it (i) reflexive (ii) symmetric (iii) transitive (iv) equivalence **(EX 1.2 - 2)**
10. On the set of natural numbers let R be the relation defined by aRb if $a + b \leq 6$. Write down the relation by listing all the pairs. Check whether it is $i)$ reflexive (ii) symmetric (iii) transitive (iv) equivalence **(EX 1.2 - 7)**
11. Let $A = \{a, b, c\}$. What is the equivalence relation of smallest cardinality on A? What is the equivalence relation of largest cardinality on A? **(EX 1.2 - 8)**
12. Write the values of f at $-3, 5, 2, -1, 0$ if $f(x) = \begin{cases} x^2 + x - 5 & if\ x \in (-\infty, 0) \\ x^2 + 3x - 2 & if\ x \in (3, \infty) \\ x^2 & if\ x \in (0, 2) \\ x^2 - 3 & otherwise \end{cases}$.

(EX 1.3 - 3)

5 Marks

1. By taking suitable sets A, B, C, verify the results:$(B - A) \cup C = (B \cup C) - (A - C)$. **(EX 1.1 - 4)**
2. In the set $\mathbb{Z}$ of integers, define mRn if $m - n$ is a $multiple$ of 12. Prove that R is an equivalence relation. **(EG 1.13)**
3. In the set Z of integers, define mRn if $m - n$ is $divisible$ by 7. Prove that R is an equivalence relation. **(EX 1.2 - 9)**
4. If $f: \mathbb{R} \to \mathbb{R}$ is defined by $f(x) = 2x - 3$ prove that f is a bijection and find its inverse. **(EG 1.30)**
5. If $f: \mathbb{R} \to \mathbb{R}$ is defined by $f(x) = 3x - 5$, prove that f is a bijection and find its inverse. **(EX 1.3 - 12)**
6. The formula for converting from Fahrenheit to Celsius temperatures is $y = \frac{5x}{9} - \frac{160}{9}$. Find the inverse of this function and determine whether the inverse is also a function. **(EX 1.3 - 19)**
7. A simple cipher takes a number and codes it, using the function $f(x) = 3x - 4$. Find the inverse of this function, determine whether the inverse is also a function and verify the symmetrical property about the line $y = x$. (by drawing the lines). **(EX 1.3 - 20)**

CHAPTER 2 BASIC ALGEBRA

2 Marks

SET 1

1. Solve $3|x - 2| + 7 = 19$ for x. **(EG 2.2)**
2. Solve $\left|\frac{2}{x-4}\right| > 1, x \neq 4$. **(EG 2.15)**
3. Solve $23x < 100$ when (i) x is a natural number, (ii) x is an integer. **(EX 2.3 - 2)**
4. Solve -2x≥9 when (i) x is a real number, (ii) x is an integer, (iii) x is a natural number. (EX 2.3 - 3)

5. If a and b are the roots of the equation $x^2 - px + q = 0$, find the value of $\frac{1}{a} + \frac{1}{b}$. **(EG 2.10)**
6. If α and β are the roots of the quadratic equation $x^2 + \sqrt{2}x + 3 = 0$, form00 a quadratic polynomial with zeroes $\frac{1}{\alpha}, \frac{1}{\beta}$. **(EX 2.4 - 3)**
7. Discuss the nature of roots of $(i) - x^2 + 3x + 1 = 0$, (EX 2.4 - 8)
8. Write $f(x) = x^2 + 5x + 4$ in completed square form. **(EX 2.4 - 10)**
9. Simplify: $\left(x^{\frac{1}{2}}y^{-3}\right)^{\frac{1}{2}}$, where $x, y \geq 0$.
10. Find the square root of 7-4$\sqrt{3}$. (EG 2.33)

SET 2

11. Evaluate $\left(\left((256)^{\frac{-1}{2}}\right)^{\frac{-1}{4}}\right)^3$. **(EX 2.11 - 2)**
12. Simplify and hence find the value of n: $\frac{3^{2n}9^2 3^{-n}}{3^{3n}} = 27$. **(EX 2.11 - 4)**
13. Find the radius of the spherical tank whose volume is $\frac{32\pi}{3}$ units. **(EX 2.11 - 5)**
14. Simplify by rationalising the denominator. $\frac{7+\sqrt{6}}{3-\sqrt{2}}$ **(EX 2.11 - 6)**
15. Find the logarithm of 1728 to the base $2\sqrt{3}$. **(EG 2.34)**
16. If the logarithm of 324 to base a is 4, then find a. **(EG 2.35)**
17. Compute $\log_3 5 \log_{25} 27$. **(EG 2.39)**
18. Compute $\log_9 27 - \log_{27} 9$. **(EX 2.12 - 2)**
19. Prove $\log_{a^2} a \log_{b^2} b \log_{c^2} c = \frac{1}{8}$. **(EX 2.12 - 8)**
20. Solve $\log_{5-x}(x^2 - 6x + 65) = 2$. **(EX 2.12 - 12)**

3 Marks

SET 1

1. Solve $-3|x| + 5 \leq -2$ and graph the solution set in a number line. **(EX 2.2 - 3)**
2. Solve $\frac{1}{5}|10x - 2| < 1$. **(EX 2.2 - 5)**
3. To secure A grade one must obtain an average of 90 marks or more in 5 subjects each of maximum 100 marks. If one scored 84,87,95,91 in first four subjects, what is the minimum mark one scored in the fifth subject to get A grade in the course? **(EX 2.3 - 5)**
4. Find all pairs of consecutive odd natural numbers both of which are larger than 10 and their sum is less than 40. **(EX 2.3 - 7)**
5. A model rocket is launched from the ground. The height h reached by the rocket after t seconds from lift off is given by $h(t) = -5t^2 + 100t, 0 \leq t \leq 20$. At what times the rocket is 495 feet above the ground? **(EX 2.3 - 8)**
6. A quadratic polynomial has one of its zeros $1 + \sqrt{5}$ and it satisfies $p(1) = 2$. Find the quadratic polynomial. **(EX 2.4 - 2)**
7. If the difference of the roots of the equation $2x^2 - (a + 1)x + a - 1 = 0$ is equal to their product, then prove that $a = 2$. **(EX 2.4 - 5)**

8. Solve $\frac{x^2-4}{x^2-2x-15} \leq 0$. **(EX 2.8 - 3)**
9. Resolve into partial fractions: $\frac{1}{x^2-a^2}$ **(EX 2.9 - 1)**
10. Resolve into partial fractions: $\frac{x}{(x+3)(x-4)}$. **(EG 2.25)**

SET 2

11. Resolve into partial fractions: $\frac{x+1}{x^2(x-1)}$. **(EG 2.27)**
12. Simplify $\frac{1}{3-\sqrt{8}} - \frac{1}{\sqrt{8}-\sqrt{7}} + \frac{1}{\sqrt{7}-\sqrt{6}} - \frac{1}{\sqrt{6}-\sqrt{5}} + \frac{1}{\sqrt{5}-2}$ **(EX 2.11 - 7)**
13. Prove $\log\frac{75}{16} - 2\log\frac{5}{9} + \log\frac{32}{243} = \log 2$. **(EG 2.36)**
14. If $\log_2 x + \log_4 x + \log_{16} x = \frac{7}{2}$, find the value of x. **(EG 2.37)**
15. Given that $\log_{10} 2 = 0.30103, \log_{10} 3 = 0.47712$ (approximately), find the number of digits in $2^8 3^{12}$. **(EG 2.40)**
16. Solve $\log_8 x + \log_4 x + \log_2 x = 11$. **(EX 2.12 - 3)**
17. If $a^2 + b^2 = 7ab$, show that $\log\frac{a+b}{3} = \frac{1}{2}(\log a + \log b)$. **(EX 2.12 - 5)**
18. Prove $\log a + \log a^2 + \log a^3 + \ldots\ldots + \log a^n = \frac{n(n+1)}{2}\log a$. **(EX 2.12 - 9)**
19. If $\frac{\log x}{y-z} = \frac{\log y}{z-x} = \frac{\log z}{x-y}$, then prove that $xyz = 1$. **(EX 2.12 - 10)**
20. Solve $\log_2 x - 3\log_{\frac{1}{2}} x = 6$. **(EX 2.12 - 11)**

5 Marks

1. A manufacturer has 600 litres of a 12 percent solution of acid. How many litres of a 30 percent acid solution must be added to it so that the acid content in resulting mixture will be more than 15 percent but less than 18 percent? **(EX 2.3 - 6)**
2. If one root of $k(x-1)^2 = 5x - 7$ is double the other root, show that $k = 2, -25$. **(EX.4 - 4)**
3. If the equations $x^2 - ax + b = 0$ and $x^2 - ex + f = 0$ have one root in common and if the second equation has equal roots, then P T $ae = 2(b+f)$. **(EX 2.4 - 7)**
4. Resolve into partial fractions: $\frac{x}{(x^2+1)(x-1)(x+2)}$ **(EX 2.9 - 3)**
5. Resolve into partial fractions: $\frac{1}{x^4-1}$ **(EX 2.9 - 5)**
6. Resolve into partial fractions: $\frac{x^3+2x+1}{x^2+5x+6}$ **(EX 2.9 - 8)**
7. Resolve into partial fractions: $\frac{6x^2-x+1}{x^3+x^2+x+1}$ **(EX 2.9 - 10)**
8. Resolve into partial fractions: $\frac{2x^2+5x-11}{x^2+2x-3}$ **(EX 2.9 - 11)**
9. Resolve into partial fractions: $\frac{7+x}{(1+x)(1+x^2)}$ **(EX 2.9 - 12)**
10. Prove that $\log 2 + 16\log\frac{16}{15} + 12\log\frac{25}{24} + 7\log\frac{81}{80} = 1$. **(EX 2.12 - 7)**

CHAPTER 3 TRIGONOMETRY

2 Marks

SET 1

1. For each given angle, find a coterminal angle with measure of θ such that $0° \le \theta < 360°$ (iii) 1150° (iv) -270° (EX 3.1 - 2)
2. Find the length of an arc of a circle of radius 5 cm subtending a central angle measuring 15°. **(EG 3.6)**
3. If the arcs of same lengths in two circles subtend central angles 30° and 80° find the ratio of their radii. **(EG 3.7)**
4. Express each of the angles in radian measure: $(ii)\ 135°$ $(iii)\ -205°$ (**EX 3.2 – 1**)
5. Find the degree measure to the radian measures $(iv)\ \frac{7\pi}{3}$ $(v)\ \frac{10\pi}{9}$. **(EX 3.2 - 2)**
6. Find the degree measure of the angle subtended at the centre of circle of radius $100\ cm$ by an arc of length $22\ cm$. **(EX 3.2 - 5)**
7. What is the length of the arc intercepted by a central angle of measure 41° in a circle of radius $10\ ft$? **(EX 3.2 - 6)**

SET 2

8. An airplane propeller rotates 1000 times per minute. Find the number of degrees that a point on the edge of the propeller will rotate in 1 second. **(EX 3.2 - 9)**
9. Determine whether the following functions are even, odd or neither. $(i)\ \sin^2 x - 2\cos^2 x - \cos x$ **(EG 3.14)**
10. Find the values of $(i)\ \cos 15°$ and $(ii)\ \tan 165°$. **(EG 3.15)**
11. Prove that $(i)\ \cos(30° + x) = \frac{\sqrt{3}\cos x - \sin x}{2}$ **(EX 3.4 - 6)**
12. Prove that $\sin 4A = 4\sin A\cos^3 A - 4\cos A\sin^3 A$. **(EG 3.24)**
13. Find x such that $-\pi \le x \le \pi$ and $\cos 2x = \sin x$. **(EG 3.28)**
14. Find the value of $\sqrt{3}\ cosec\ 20° - \sec 20°$. **(EG 3.31)**
15.

3 Marks

SET 1

1. In a circle of diameter $40\ cm$, a chord is of length $20\ cm$. Find the length of the minor arc of the chord. **(EX 3.2 - 4)**
2. Find the degree measure of the angle subtended at the centre of circle of radius $100\ cm$ by an arc of length $22\ cm$. **(EX 3.2 - 5)**
3. A train is moving on a circular track of $1500\ m$ radius at the rate of $66\ km/hr$. What angle will it turn in 20 seconds? **(EX 3.2 - 10)**
4. A circular metallic plate of radius $8\ cm$ and thickness $6\ mm$ is melted and molded into a pie (a sector of the circle with thickness) of radius $16\ cm$ and thickness $4\ mm$. Find the angle of the sector. **(EX 3.2 - 11)**
5. $\left(\frac{5}{7}, \frac{2\sqrt{6}}{7}\right)$ is a point on the terminal side of an angle θ in standard position. Determine the trigonometric function values of angle θ. **(EX 3.3 - 2)**

6. Prove that $\tan 315° \cot(-405°) + \cot 495° \tan(-585°) = 2$. **(EG 3.13)**
7. Prove that $\frac{\cot(180°+\theta)\sin(90°-\theta)\cos(-\theta)}{\sin(270°+\theta)\tan(-\theta)cosec(360°+\theta)} = \cos^2\theta\tan\theta$. **(EX 3.3 - 4)**
8. Find all the angles between 0° and 360° which satisfy the equation $\sin^2\theta = \frac{3}{4}$. **(EX 3.3 - 5)**
9. Show that $\sin^2\frac{\pi}{18} + \sin^2\frac{\pi}{9} + \sin^2\frac{7\pi}{18} + \sin^2\frac{4\pi}{9} = 2$. **(EX 3.3 - 6)**
10. If $\sin x = \frac{4}{5}$ (in I quadrant) and $\cos y = \frac{-12}{13}$ (in II quadrant), then find $(i)\ \sin(x-y)$, $(ii)\ \cos(x-y)$. **(EG 3.16)**

SET 2

11. Prove that $\cos\left(\frac{3\pi}{4}+x\right) - \cos\left(\frac{3\pi}{4}-x\right) = -\sqrt{2}\sin x$. **(EG 3.17)**
12. Find $\cos(x-y)$, given that $\cos x = \frac{-4}{5}$ with $\pi < x < \frac{3\pi}{2}$ and $\sin y = \frac{-24}{25}$ with $\pi < y < \frac{3\pi}{2}$. **(EX 3.4 - 3)**
13. Find a quadratic equation whose roots are $\sin 15°$ and $\cos 15°$. **(EX 3.4 - 7)**
14. Prove that $\sin(n+1)\theta\sin(n-1)\theta + \cos(n+1)\theta\cos(n-1)\theta = \cos 2\theta, n \in Z$. **(EX 3.4 - 15)**
15. If $\tan x = \frac{n}{n+1}$ and $\tan y = \frac{1}{2n+1}$, find $\tan(x+y)$. **(EX 3.4 - 22)**
16. Prove that $\tan\left(\frac{\pi}{4}+\theta\right)\tan\left(\frac{3\pi}{4}+\theta\right) = -1$. **(EX 3.4 - 23)**
17. Find the value of $\sin\left(22\frac{1}{2}^{\circ}\right)$. **(EG 3.22)**
18. Find the values of $(i)\ \sin 18°$ **(EG 3.29)**
19. If $\tan\frac{\theta}{2} = \sqrt{\frac{1-a}{1+a}}\tan\frac{\phi}{2}$, then prove that $\cos\phi = \frac{\cos\theta - a}{1-a\cos\theta}$. **(EG 3.30)**
20. Prove that $\cos A\cos 2A\cos 2^2A\ \cos 2^3A\ \ldots\cos 2^{n-1}A = \frac{\sin 2^nA}{2^n\sin A}$.

5 Marks

SET 1

1. Point $A(9,12)$ rotates around the origin O in a plane through 60° in the anticlockwise direction to a new position B. Find the coordinates of the point B. **(EG 3.18)**
2. If $\sin x = \frac{15}{17}$ and $\cos y = \frac{12}{13}, 0 < x < \frac{\pi}{2}, 0 < y < \frac{\pi}{2}$, find the value of $(i)\ \sin(x+y)$ $(ii)\ \cos(x-y)$ $(iii)\ \tan(x+y)$. **(EX 3.4 - 1)**
3. If $\sin A = \frac{3}{5}$ and $\cos B = \frac{9}{41}, 0 < A < \frac{\pi}{2}, 0 < B < \frac{\pi}{2}$, find the value of $(i)\ \sin(A+B)$ $(ii)\ \cos(A-B)$. **(EX 3.4 - 2)**
4. Expand $\cos(A+B+C)$. Hence prove that $\cos A\cos B\cos C = \sin A\sin B\cos C + \sin B\sin C\cos A + \sin C\sin A\cos B$, if $A+B+C = \frac{\pi}{2}$. **(EX 3.4 - 8)**
5. If $a\cos(x+y) = b\cos(x-y)$, show that $(a+b)\tan x = (a-b)\cot y$. **(EX 3.4 - 10)**
6. Prove that $\sin 75° - \sin 15° = \cos 105° + \cos 15°$. **(EX 3.4 - 12)**
7. Prove that $\cos(A+B)\cos C - \cos(B+C)\cos A = \sin B\sin(C-A)$. **(EX 3.4 - 14)**

SET 2

8. If $\cos(\alpha-\beta)+\cos(\beta-\gamma)+\cos(\gamma-\alpha)=\frac{-3}{2}$, then prove that $\cos\alpha+\cos\beta+\cos\gamma=\sin\alpha+\sin\beta+\sin\gamma=0$. **(EX 3.4 - 19)**
9. If $\theta+\phi=\alpha$ and $\tan\theta=k\tan\phi$, then prove that $\sin(\theta-\phi)=\frac{k-1}{k+1}\sin\alpha$. **(EX 3.4 - 25)**
10. Show that $\cot\left(7\frac{1}{2}^{\circ}\right)=\sqrt{2}+\sqrt{3}+\sqrt{4}+\sqrt{6}$. **(EX 3.5 - 9)**
11. Prove that $32(\sqrt{3})\ \sin\frac{\pi}{48}\cos\frac{\pi}{48}\cos\frac{\pi}{24}\cos\frac{\pi}{12}\cos\frac{\pi}{6}=3$. **(EX 3.5 - 11)**
12. Show that $\sin 12^\circ \sin 48^\circ \sin 54^\circ=\frac{1}{8}$. **(EX 3.6 - 3)**
13. Show that $\cot(A+15^\circ)-\tan(A-15^\circ)=\frac{4\cos 2A}{1+2\sin 2A}$. **(EX 3.6 - 14)**

CHAPTER 4 COMBINATORICS AND MATHEMATICAL INDUCTION

2 Marks

SET 1

1. In how many ways (i) 5 different balls be distributed among 3 boxes? (ii) 3 different balls be distributed among 5 boxes? **(EG 4.14)**
2. There are 10 bulbs in a room. Each one of them can be operated independently. Find the number of ways in which the room can be illuminated. **(EG 4.15)**
3. Let N denote the number of days. If the value of $N!$ is equal to the total number of hours in N days then find the value of N? **(EG 4.19)**
4. If $\frac{6!}{n!}=6$, then find the value of n. **(EG 4.20)**
5. If $n!+(n-1)!=30$, then find the value of n. **(EG 4.21)**
6. What is the unit digit of the sum $2!+3!+4!+\ldots\ldots\ldots+22!$? **(EG 4.22)**
7. A mobile phone has a pass code of 6 distinct digits. What is the maximum number of attempts one makes to retrieve the pass code? **(EX 4.1 - 2)**
8. Given four flags of different colours, how many different signals can be generated if each signal requires the use of three flags, one below the other? (EX 4.1 - 2)
9. Three persons enter in to a conference hall in which there are 10 seats. In how many ways they can take their seats? **(EX 4.1 - 1)**
10. In how many ways 5 boys and 4 girls can be seated in a row so that no two girls are together. **(EG 4.32)**

SET 2

11. Find the number of ways of arranging the letters of the word ***BANANA***. **(EG 4.36)**
12. Find the number of ways of arranging the letters of the word ***RAMANUJAN*** so that the relative positions of vowels and consonants are not changed. **(EG 4.37)**
13. If ${}^{n}P_{r}=11880$ and ${}^{n}C_{r}=495$, Find n and r. **(EG 4.47)**
14. A salad at a certain restaurant consists of 4 of the following fruits: apple, banana, guava, pomegranate, grapes, papaya and pineapple. Find the total possible number of fruit salads. **(EG 4.51)**

15. A Mathematics club has 15 members. In that 8 are girls. 6 of the members are to be selected for a competition and half of them should be girls. How many ways of these selections are possible? **(EG 4.52)**
16. If a set of m parallel lines intersect another set of n parallel lines (not parallel to the lines in the first set), then find the number of parallelograms formed in this lattice structure. **(EG 4.59)**
17. If ${}^{n}C_{12} = {}^{n}C_{9}$ find ${}^{21}C_{n}$. **(EX 4.3 - 1)**
18. If ${}^{15}C_{2r-1} = {}^{15}C_{2r+4}$ find r. **(EX 4.3 - 2)**
19. A Kabaddi coach has 14 players ready to play. How many different teams of 7 players could the coach put on the court? **(EX 4.3 - 9)**
20. In an examination a student has to answer 5 questions, out of 9 questions in which 2 are compulsory. In how many ways a student can answer the questions? (EX 4.3 - 15)

3 Marks

SET 1

1. If $\frac{1}{7!} + \frac{1}{8!} = \frac{A}{9!}$ then find the value of A. **(EG 4.23)**
2. Count the number of three-digit numbers which can be formed from the digits 2,4,6,8 if (i) repetitions of digits is allowed. (ii) Repetitions of digits is not allowed **(EX 4.1 - 4)**
3. How many numbers are there between 100 and 500 with the digits $0, 1, 2, 3, 4, 5$? if (i) repetition of digits allowed (ii) the repetition of digits is not allowed. **(EX 4.1 - 6)**
4. Count the numbers between 999 and 10000 subject to the condition that there are (i) no restriction. (ii) no digit is repeated. (iii) at least one of the digits is repeated. **(EX 4.1 - 8)**
5. How many words can be formed using the letters of the word $\boldsymbol{LOTUS}$ if the word (i) either starts with L or ends with S? (ii) neither starts with L nor ends with S? **(EX 4.1 - 12)**
6. . Evaluate $\frac{n!}{r!(n-r)!}$ when $(i)\ n = 6, r = 2 \quad (ii)\ n = 10, r = 3\ (iii)$ For any n with $r = 2$. **(EX 4.1 - 15)**
7. Find the value of n if $(i)\ (n+1)! = 20(n-1)!\ \ (ii)\ \frac{1}{8!} + \frac{1}{9!} = \frac{n}{10!}$ **(EX 4.1 - 16)**
8. If ${}^{n+2}P_{4} = 42 \times {}^{n}P_{2}$, find n. **(EG 4.26)**
9. If $10P_{r} = 7P_{r+2}$ find r. **(EG 4.27)**
10. How many different strings can be formed together using the letters of the word $\boldsymbol{EQUATION}$ so that (i) the vowels always come together?
11. 4 boys and 4 girls form a line with the boys and girls alternating. Find the number of ways of making this line. **(EG 4.33)**
12. If the letters of the word $\boldsymbol{IITJEE}$ are permuted in all possible ways and the strings thus formed are arranged in the lexicographic order, find the rank of the word $\boldsymbol{IITJEE}$ **(EG 4.42)**
13. If ${}^{n-1}P_{3} : {}^{n}P_{4} = 1 : 10$ find n. **(EX 4.2 - 1)**

SET 2

14. A test consists of 10 multiple choice questions. In how many ways can the test be answered if (i) Each question has four choices? (ii) The first four questions have three choices and the remaining have five choices? (iii) Question number n has n choices? **(EX 4.2 - 5)**
15. How many strings can be formed from the letters of the word $\boldsymbol{ARTICLE}$, so that vowels occupy the even places? **(EX 4.2 - 7)**
16. Find the distinct permutations of the letters of the word $\boldsymbol{MISSISSIPPI}$? **(EX 4.2 - 9)**
17. Find the number of strings that can be made using all letters of the word $\boldsymbol{THING}$. If these words are written as in a dictionary, what will be the 85th string? **(EX 4.2 - 17)**
18. If ${}^{n}P_r = 720$, and ${}^{n}C_r = 120$ find n, r. **(EX 4.3 - 3)**
19. Prove that ${}^{15}C_3 + 2 \times {}^{15}C_4 + {}^{15}C_5 = {}^{17}C_5$. **(EX 4.3 - 4)**
20. Prove that ${}^{35}C_5 + \sum_{r=0}^{4} {}^{39-r}C_4 = {}^{40}C_5$. **(EX 4.3 - 5)**
21. Find the number of strings of 4 letters that can be formed with the letters of the word $\boldsymbol{EXAMINATION}$. **(EX 4.3 - 21)**
22. A polygon has 90 diagonals. Find the number of its sides? **(EX 4.3 - 25)**
23. Prove that the sum of first n positive odd numbers is n^2. **(EG 4.62)**
24. Prove that for any natural number $n, a^n - b^n$ is divisible by $a - b$, where $a > b$. **(EG 4.65)**
25. By the principle of Mathematical induction, prove that
26. Prove that the sum of the first n non-zero even numbers is $n^2 + n$. **(EX 4.4 - 3)**, for $n \geq 1$

5 Marks

SET 1

1. If ${}^{10}P_{r-1} = 2 \times {}^{6}P_r$ find r. **(EX 4.2 - 2)**
2. How many strings are there using the letters of the word $\boldsymbol{INTERMEDIATE}$, if (i) The vowels and consonants are alternative (ii) All the vowels are together(iii) Vowels are never together (iv) No two vowels are together. **(EX 4.2 - 14)**
3. If the letters of the word $\boldsymbol{GARDEN}$ are permuted in all possible ways and the strings thus formed are arranged in the dictionary order, then find the ranks of the words $(\boldsymbol{i})$ $\boldsymbol{GARDEN}$ $(\boldsymbol{ii})$ $\boldsymbol{DANGER}$. **(EX 4.2 - 16)**
4. Find the sum of all 4 −digit numbers that can be formed using the digits 1, 2, 4, 6, 8. **(EG 4.43)**
5. If ${}^{n+2}C_7 : {}^{n-1}P_4 = 13 : 24$ find n. **(EG 4.50)**
6. If ${}^{n+1}C_8 : {}^{n-3}P_4 = 57 : 16$, find the value of n. **(EX 4.3 - 6)**
7. Prove that ${}^{2n}C_n = \frac{2^n \times 1 \times 3 \times \ldots\ldots (2n-1)}{n!}$ **(EX 4.3 - 7)**
8. Prove that if $1 \leq r \leq n$ then $n \times {}^{n-1}C_{r-1} = (n - r + 1) \times {}^{n}C_{r-1}$. **(EX 4.3 - 8)**
9. A committee of 7 peoples has to be formed from 8 men and 4 women. In how many ways can this be done when the committee consists of (i) exactly 3 women? (ii) at least 3 women? (iii) at most 3 women? **(EX 4.3 - 18)**

SET 2

10. By the principle of mathematical induction, prove that, for all integers $n \geq 1, 1 + 2 + 3 + \ldots\ldots + n = \frac{n(n+1)}{2}$. **(EG 4.61)**
11. By the principle of mathematical induction, prove that, for all integers $n \geq 1, 1^2 + 2^2 + 3^2 + \ldots\ldots + n^2 = \frac{n(n+1)(2n+1)}{6}$. **(EG 4.63)**
12. Using the Mathematical induction, show that for any natural number $n, \frac{1}{1.2} + \frac{1}{2.3} + \frac{1}{3.4} + \ldots\ldots + \frac{1}{n(n+1)} = \frac{n}{n+1}$. **(EG 4.64)**
13. Prove that $3^{2n+2} - 8n - 9$ is divisible by 8 for all $n > 1$. **(EG 4.66)**
14. Using the Mathematical induction, show that for any integer $n \geq 2, 3n^2 > (n+1)^2$. **(EG 4.67)**
15. Using the Mathematical induction, show that for any integer $n \geq 2, 3^n > n^2$. **(EG 4.68)**
16. By the principle of mathematical induction, prove that, for $n \geq 1$,
17. $1^3 + 2^3 + 3^3 + \ldots\ldots + n^3 = \left(\frac{n(n+1)}{2}\right)^2$. **(EX 4.4 - 1)**
18. By the principle of mathematical induction, prove that, for $n \geq 1, 1^2 + 3^2 + 5^2 + \ldots\ldots + (2n-1)^2 = \frac{n(2n-1)(2n+1)}{3}$. **(EX 4.4 - 2)**
19. $1.2 + 2.3 + 3.4 + \ldots\ldots + n.(n+1) = \frac{n(n+1)(n+2)}{3}$. **(EX 4.4 - 4)**

SET -3

20. Using the Mathematical induction, show that for any natural number $n \geq 2$, $\left(1 - \frac{1}{2^2}\right)\left(1 - \frac{1}{3^2}\right)\left(1 - \frac{1}{4^2}\right)\ldots\ldots\left(1 - \frac{1}{n^2}\right) = \frac{n+1}{2n}$. **(EX 4.4 - 5)**
21. 6. Using the Mathematical induction, show that for any natural number $n \geq 2$, $\frac{1}{1+2} + \frac{1}{1+2+3} + \frac{1}{1+2+3+4} + \ldots\ldots + \frac{1}{1+2+3+\ldots+n} = \frac{n-1}{n+1}$. **(EX 4.4 - 6)**
22. 7. Using the Mathematical induction, show that for any natural number n; $\frac{1}{1.2.3} + \frac{1}{2.3.4} + \frac{1}{3.4.5} + \ldots\ldots + \frac{1}{n.(n+1).(n+2)} = \frac{n(n+3)}{4(n+1)(n+2)}$. **(EX 4.4 - 7)**
23. 8. Using the Mathematical induction, show that for any natural number n, $\frac{1}{2.5} + \frac{1}{5.8} + \frac{1}{8.11} + \ldots\ldots + \ldots. + \frac{1}{(3n-1)(3n+2)} = \frac{n}{6n+4}$. **(EX 4.4 - 8)**
24. Prove by Mathematical Induction that $1! + (2 \times 2!) + (3 \times 3!) + \ldots\ldots + (n \times n!) = (n+1)! - 1$. **(EX 4.4 - 9)**
25. Using the Mathematical induction, show that for any natural number $n, x^{2n} - y^{2n}$ is divisible by $x + y$. **(EX 4.4 - 10)**
26. By the principle of mathematical induction, prove that, for $n \geq 1, 1^2 + 2^2 + 3^2 + \ldots\ldots + n^2 > \frac{n^3}{3}$. **(EX 4.4 - 11)**
27. Use induction to prove that $n^3 - 7n + 3$ is divisible by 3, for all natural numbers n. **(EX 4.4 - 12)**
28. Use induction to prove that $5^{n+1} + 4 \times 6^n$ when divided by 20 leaves a remainder 9, for all natural numbers n. **(EX 4.4 - 13)**
29. 14. Use induction to prove that $10^n + 3 \times 4^{n+2} + 5$ is divisible by 9, for all natural numbers n. **(EX 4.4 - 14)**

CHAPTER 5 BINOMIAL THEOREM, SEQUENCES AND SERIES

2 Marks

1. Write the first 6 terms of the sequences whose n^{th} term a_n is given below. (ii) $a_n = \begin{cases} 1 & if\ n=1 \\ 2 & if\ n=2 \\ a_{n-1}+a_{n-2} & if\ n>2 \end{cases}$. **(EX 5.2 - 2)**
2. Write the n^{th} term of the sequence $\frac{3}{1^2 2^2}, \frac{5}{2^2 3^2}, \frac{7}{3^2 4^2}, \dots \dots \dots$ as a difference of two terms. **(EX 5.2 - 5)**
3. If t_k is the k^{th} term of a GP, then show that t_{n-k}, t_k, t_{n+k} also form a GP for any positive integer k. **(EX 5.2 - 6)**
4. If a, b, c are in geometric progression, and if $a^{\frac{1}{x}} = b^{\frac{1}{y}} = c^{\frac{1}{z}}$, then prove that x, y, z are in arithmetic progression. **(EX 5.2 - 7)**
5. Expand $(1+x)^{\frac{2}{3}}$ up to four terms for $|x| < 1$. **(EG 5.21)**
6. Expand $\frac{1}{(1+3x)^2}$ in powers of x. Find a condition on x for which the expansion is valid. **(EG 5.22)**
7. Expand $(x+2)^{\frac{-2}{3}}$ **(EX 5.4 - 1)**
8. If $p - q$ is small compared to either $p\ or\ q$, then show that $\sqrt[n]{\frac{p}{q}} \simeq \frac{(n+1)p+(n-1)q}{(n-1)p+(n+1)q}$. Hence find $\sqrt[8]{\frac{15}{16}}$. **(EX 5.4 - 8)**

3 Marks

1. Find seven numbers $A_1, A_2, A_3, \dots, A_7$ so that the sequence $4, A_1, A_2, A_3, \dots, A_7, 7$ is in arithmetic progression and also 4 numbers G_1, G_2, G_3, G_4 so that the sequence $12, G_1, G_2, G_3, G_4, \frac{3}{8}$ is in geometric progression. **(EG 5.14)**
2. If the product of the $4^{th}, 5^{th}$ and 6^{th} terms of a geometric progression is 4096 and if the product of the $5^{th}, 6^{th}$ and 7^{th} terms of it is 32768, find the sum of first 8 terms of the geometric progression. **(EG 5.15)**
3. The product of three increasing numbers in GP is 5832. If we add 6 to the second number and 9 to the third number, then resulting numbers form an AP. Find the numbers in GP. **(EX 5.2 - 4)**
4. Find $\sum_{n=1}^{\infty} \frac{1}{n^2+5n+6}$. **(EG 5.20)**
5. Expand $\frac{1}{(1+3x)^2}$ in powers of x. Find a condition on x for which the expansion is valid. **(EG 5.22)**
6. Expand $\frac{1}{(3+2x)^2}$ in powers of x. Find a condition on x for which the expansion is valid. **(EG 5.23)**
7. Find $\sqrt[3]{65}$. **(EG 5.24)**

5 Marks

1. If the roots of the equation $(q-r)x^2+(r-p)x+p-q=0$ are equal, then show that p, q and r are in AP. **(EX 5.2 – 9**
2. If a, b, c are respectively the p^{th}, q^{th} and r^{th} terms of a GP, show that $(q-r)\log a+(r-p)\log b+(p-q)\log c=0$. **(EX 5.2 - 10)**
3. Prove that $\sqrt[3]{x^3+7}-\sqrt[3]{x^3+4}$ is approximately equal to $\frac{1}{x^2}$ when x is large. **(EG 5.25)**
4. Find $\sqrt[3]{1001}$ approximately (two decimal places). **(EX 5.4 - 2)**
5. Prove that $\sqrt[3]{x^3+6}-\sqrt[3]{x^3+3}$ is approximately equal to $\frac{1}{x^2}$ when x is sufficiently large. **(EX 5.4 - 3)**
6. Prove that $\sqrt{\frac{1-x}{1+x}}$ is approximately equal to $1-x+\frac{x^2}{2}$ when x is very small. **(EX 5.4 - 4)**
7. Find the value of $\sum_{n=1}^{\infty}\frac{1}{2n-1}\left(\frac{1}{9^{n-1}}+\frac{1}{9^{2n-1}}\right)$. **(EX 5.4 - 10)**

CHAPTER 6 TWO DIMENSIONAL ANALYTICAL GEOMETRY

2 Marks

SET 1

1. Find the locus of a point which moves such that its distance from the x −axis is equal to the distance from the y −axis. **(EG 6.1)**
2. Find the path traced out by the point $\left(ct, \frac{c}{t}\right)$ here $t \neq 0$ is the parameter and c is a constant. **(EG 6.2**
3. If θ is a parameter, find the equation of the locus of a moving point, whose coordinates are $(a\sec\theta, b\tan\theta)$. **(EG 6.4)**
4. Find the locus of P, if for all values of α, the co-ordinates of a moving point P is (i) $(9\cos\alpha, 9\sin\alpha)$ (ii) $(9\cos\alpha, 6\sin\alpha)$ **(EX 6.1 - 1)**
5. Find the locus of a point P that moves at a constant distant of (i) two units from the x −axis (ii) three units from the y −axis. **(EX 6.1 - 2)**
6. If θ is a parameter, find the equation of the locus of a moving point, whose coordinates are $x=a\cos^3\theta, y=a\sin^3\theta$. **(EX 6.1 - 3)**
7. If O is origin and R is a variable point on $y^2=4x$, then find the equation of the locus of the midpoint of the line segment OR. **(EX 6.1 - 8)**
8. Find the slope of the straight line passing through the points $(5,7)$ and $(7,5)$. Also find the angle of inclination of the line with the x −axis. **(EG 6.7)**

SET 2

9. Find the points on the locus of points that are 3 units from x −axis and 5 units from the point $(5,1)$. **(EX 6.1 - 14)**
10. If $P(r, c)$ is midpoint of a line segment between the axes, then show that $\frac{x}{r} + \frac{y}{c} = 2$. **(EX 6.2 - 2)**
11. If p is length of perpendicular from origin to the line whose intercepts on the axes are a and b, then show that $\frac{1}{p^2} = \frac{1}{a^2} + \frac{1}{b^2}$. **(EX 6.2 - 4)**
12. Find the equation of the line, if the perpendicular drawn from the origin makes an angle $30°$ with x −axis and its length is 12. **(EX 6.2 - 8)**
13. Find the equations of a parallel line and a perpendicular line passing through the point $(1, 2)$ to the line $3x + 4y = 7$. **(EG 6.22)**
14. Find the distance between the line $4x + 3y + 4 = 0$ and a point (i) $(-2,4)$ (ii) $(7, -3)$ **(EX 6.3 - 3)**
15. Find the family of straight lines (i) Perpendicular (ii) Parallel to $3x + 4y - 12 = 0$. **(EX 6.3 - 13)**
16. Find the combined equation of the straight lines whose separate equations are $x - 2y - 3 = 0$ and $x + y + 5 = 0$. **(EX 6.4 - 1)**

3 Marks

SET 1

1. Find the locus of a point P moves such that its distances from two fixed points $A(1,0)$ and $B(5,0)$ are always equal. **(EG 6.3)**
2. A straight rod of the length 6 units, slides with its ends A and B always on the x and y axes respectively. If O is the origin, then find the locus of the centroid of ΔOAB . **(EG 6.5)**
3. If θ is a parameter, find the equation of the locus of a moving point, whose coordinates are $(a(\theta - \sin\theta), a(1 - \cos\theta))$. **(EG 6.6)**
4. Find the value of k and b, if the points $P(-3,1)$ and $Q(2, b)$ lie on the locus of $x^2 - 5x + ky = 0$. **(EX 6.1 - 4)**
5. A straight rod of length 8 units slides with its ends A and B always on the x and y axes respectively. Find the locus of the midpoint of the line segment AB. **(EX 6.1 - 5)**
6. Find the equation of the locus of a point such that the sum of the squares of the distance from the points $(3, 5), (1, -1)$ is equal to 20. **(EX 6.1 - 6)**
7. Find the equation of the locus of the point P such that the line segment AB, joining the points $A(1, -6)$ and $B(4, -2)$, subtends a right angle at P. **(EX 6.1 - 7)**

SET 2

8. If $P(2, -7)$ is a given point and Q is a point on $2x^2 + 9y^2 = 18$, then find the equations of the locus of the midpoint of PQ. **(EX 6.1 - 10)**
9. The sum of the distance of a moving point from the points $(4,0)$ and $(-4,0)$ is always 10 units. Find the equation of the locus of the moving point. **(EX 6.1 - 15)**
10. Find the equations of the straight lines, making the y − intercept of 7 and angle between the line and the y −axis is $30°$. **(EG 6.11)**

11. Find the equation of the line passing through the point $(1,5)$ and also divides the co-ordinate axes in the ratio $3:10$. **(EX 6.2 - 3)**
12. A straight line is passing through the point $A(1,2)$ with slope $\frac{5}{12}$. Find points on the line which are 13 units away from A. **(EX 6.2 - 11)**
13. Find the equation of the bisector of the acute angle between the lines $3x + 4y + 2 = 0$ and $5x + 12y - 5 = 0$. **(EG 6.25)**
14. If $(-4,7)$ is one vertex of a rhombus and if the equation of one diagonal is $5x - y + 7 = 0$, then find the equation of another diagonal. **(EX 6.3 - 5)**

SET 3

15. Find the equation of the lines passing through the point of intersection lines $4x - y + 3 = 0$ and $5x + 2y + 7 = 0$, and (i) through the point $(-1,2)$ (ii) Parallel to $x - y + 5 = 0$ (iii) Perpendicular to $x - 2y + 1 = 0$ **(EX 6.3 - 6)**
16. Find the equations of straight lines which are perpendicular to the line $3x + 4y - 6 = 0$ and are at a distance of 4 units from $(2, 1)$. **(EX 6.3 - 8)**
17. If the line joining two points $A(2,0)$ and $B(3,1)$ is rotated about A in anticlockwise direction through an angle of $15°$, then find the equation of the line in new position. **(EX 6.3 - 14)**
18. A line is drawn perpendicular to $5x = y + 7$. Find the equation of the line if the area of the triangle formed by this line with co-ordinate axes is 10 sq. units. **(EX 6.3 - 16)**
19. Separate the equations $5x^2 + 6xy + y^2 = 0$. **(EG 6.33)**
20. Show that the straight lines $x^2 - 4xy + y^2 = 0$ and $x + y = 3$ form an equilateral triangle. **(EG 6.36)**
21. Show that $4x^2 + 4xy + y^2 - 6x - 3y - 4 = 0$ represents a pair of parallel lines. **(EX 6.4 – 2)**

SET 4

22. Show that $2x^2 + 3xy - 2y^2 + 3x + y + 1 = 0$ represents a pair of perpendicular lines. **(EX 6.4 - 3)**
23. Show that the equation $2x^2 - xy - 3y^2 - 6x + 19y - 20 = 0$ represents a pair of intersecting lines. Show further that the angle between them is $\tan^{-1}(5)$. **(EX 6.4 - 4)**
24. Find the separate equation of the pair of straight lines $6(x-1)^2 + 5(x-1)(y-2) - 4(y-2)^2 = 0$**EX 6.4 - 7)**
25. The slope of one of the straight lines $ax^2 + 2hxy + by^2 = 0$ is twice that of the other, show that $8h^2 = 9ab$. **(EX 6.4 - 8)**
26. The slope of one of the straight lines $ax^2 + 2hxy + by^2 = 0$ is three times the other, show that $3h^2 = 4ab$. **(EX 6.4 - 9)**
27. Prove that one of the straight lines given by $ax^2 + 2hxy + by^2 = 0$ will bisect the angle between the co-ordinate axes if $(a+b)^2 = 4h^2$. **(EX 6.4 - 16)**
28. Prove that the straight lines joining the origin to the points of intersection of $3x^2 + 5xy - 3y^2 + 2x + 3y = 0$ and $3x - 2y - 1 = 0$ are at right angles. **(EX 6.4 - 18)**

5 Marks

SET 1

1. The Pamban Sea Bridge is a railway bridge of length about 2065 m constructed on the PalkStrait, which connects the Island town of Rameswaram to Mandapam, the main land of India. The Bridge is restricted to a uniform speed of only 12.5 m/s. If a train of length $560m$ starts at the entry point of the bridge from Mandapam, then (i) Find an equation of the motion of the train. (ii) When does the engine touch island (iii) When does the last coach cross the entry point of the bridge? (iv) What is the time taken by a train to cross the bridge? **(EG 6.10)**
2. The quantity demanded of a certain type of Compact Disk is 22,000 units when a unit price is Rs. 8. The customer will not buy the disk, at a unit price of Rs. 30 or higher. On the other side the manufacturer will not market any disk if the price is Rs. 6 or lower. However, if the price Rs. 14 the manufacturer can supply 24,000 units. Assume that the quantity demanded and quantity supplied are linearly proportional to the price. Find (i) the demand equation (ii) supply equation (iii) the market equilibrium quantity and price. (iv) The quantity of demand and supply when the price is Rs. 10. **(EG 6.13)**
3. The normal boiling point of water is $100°C$ or $212°F$ and the freezing point of water is $0°C$ or $32°F$. (i) Find the linear relationship between C and FFind (ii) the value of C for $98.6°F$ and (iii) the value of F for $38°C$ **(EX 6.2 - 5)**
4. An object was launched from a place P in constant speed to hit a target. At the 15^{th} second it was $1400m$ away from the target and at the 18^{th} second $800m$ away. Find (i) the distance between the place and the target (ii) the distance covered by it in 15 seconds. (iii) time taken to hit the target. **(EX 6.2 - 6)**
5. Find the image of the point $(-2,3)$ about the line $x + 2y - 9 = 0$. **(EX 6.3 - 17)**
6. If the equation $\lambda x^2 - 10xy + 12y^2 + 5x - 16y - 3 = 0$ represents a pair of straight lines, find (i) the value of λ and the separate equations of the lines (ii) point of intersection of the lines (iii) angle between the lines **(EG 6.38)**

SET 2

7. Find p and q, if the following equation represents a pair of perpendicular lines $6x^2 + 5xy - py^2 + 7x + qy - 5 = 0$. **(EX 6.4 - 11)**
8. Find the value of k, if the following equation represents a pair of straight lines. Further, find whether these lines are parallel or intersecting, $12x^2 + 7xy - 12y^2 - x + 7y + k = 0$. **(EX 6.4 - 12)**
9. For what value of k does the equation $12x^2 + 2kxy + 2y^2 + 11x - 5y + 2 = 0$ represent two straight lines. **(EX 6.4 – 13)**
10. Show that the equation $9x^2 - 24xy + 16y^2 - 12x + 16y - 12 = 0$ represents a pair of parallel lines. Find the distance between them. **(EX 6.4 - 14)**
11. Show that the equation $4x^2 + 4xy + y^2 - 6x - 3y - 4 = 0$ represents a pair of parallel lines. Find the distance between them. **(EX 6.4 - 15)**
12. If the pair of straight lines $x^2 - 2kxy - y^2 = 0$ bisect the angle between the pair of straight lines $x^2 - 2lxy - y^2 = 0$, Show that the later pair also bisects the angle between the former. **(EX 6.4 - 17)**