MATHS

BOOKS - S CHAND MATHS (ENGLISH)

THE STRAIGHT LINE

Examples

1. Find the angle between the lines whose slopes are -3 and $-\frac{1}{2}$.

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2. Determine the slope and y- intercept of the following lines:

$y = x + 5$

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3. Determine the slope and y- intercept of the following lines:

$y = \sqrt{3}x - 7$

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4. State the equation of the line which has the y-intercept equal to $\frac{4}{3}$ and is perpendicular to $3x - 4y + 11 = 0$

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5. Find the equation of the straight line through the given point P(-1, -5) and having its slope equal to $\frac{9}{5}$.

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6. Find the equation of the line through the point (4, -5) and (a) parallel to (b) perpendicular to the line $3x + 4y + 5 = 0$.

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7. Find the equation of the two straight lines through the point (2, -1)making an angle of 45° with the line $6x + 5y - 1 = 0$

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8. Find the equation of the straight line passing through the point (2, 3) and cutting off (a) equal intercepts along the positive directions of both the axes, (b) intercepts equal in magnitude and opposite in sign.

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9. write down the equation of the line for which p=3, alpha=120 degree

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10. Sketch roughly the lines satisfying the given conditions and write their equations:

inclination $\theta = 150^\circ$, and distance from the origin = 3.

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11. Sketch roughly the lines satisfying the given conditions and write their equations:

x intercept = 7, and distance from the origin = 2.

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12. The equation of a tangent to the parabola $y^2 = 8xisy = x + 2$. The point on this line from which the other tangent to the parabola is perpendicular to the given tangent is (1) $(-1, 1)$ (2) $(0, 2)$ (3) $(2, 4)$ (4) $(-2, 0)$

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13. Reduce the equation $x + y + \sqrt{2} = 0$ to the normal form and find the value of p and α.

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14. Are the points (2, 3) and (1, 3) on the same side or on opposite sides of the line $x - 2y = -3$.

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15. Find the equation of the straight line joining the origin to the point of intersection of $y - x + 7 = 0$ and $y + 2x - 2 = 0$.

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16. Prove that the three lines

$2x - y - 5 = 0, 3x - y - 6 = 0$ and $4x - y - 7 = 0$ meet in a point.

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17. For what value of 'a' the three straight lines $3x + y + 2 = 0, x - y + 2 = 0, x + 2ay + 5 = 0$ are concurrent.

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18. To find the condition that the three straight lines $A_1x + B_1y + C_1 = 0$, $A_2x + B_2y + C_2 = 0$ and $A_3x + B_3y + C_3 = 0$ are concurrent.

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19. Find the distancce of the point P(-2, 3) from the line AB which is $x - y = 5$.

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20. Find the perpendicular distance between the lines.

$3x + 4y - 5 = 0 \ldots (1)$ and $6x + 8y - 45 = 0 \ldots (2)$

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21. Find the equation of the st. line, with a positive gradient, which passes through the point (-5, 0) and is at a perpendicular distance of 3 units from the origin.

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22. Find all points on the line $x + y = 4$ that lie at a unit distance from the line $4x + 3y = 10$.

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23. Find the equations of the bisectors of the angles between the lines $12x + 5y - 4 = 0$ and $3x + 4y + 7 = 0$.

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24. Find the equations of the bisectors of the angles between the lines $12x + 5y - 4 = 0$ and $3x + 4y + 7 = 0$. Distinguish the one which bisects the acute angle between the lines.

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25. A triangle is formed by the lines whose equations are $3x + 4y - 6 = 0, 12x - 5y - 3 = 0$ and $4x - 3y + 10 = 0$. Find the internal bisector of the angle opposite to the side $3x + 4y - 6 = 0$.

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26. Find the equation of the line which passes through the point (4, -5)and is

parallel to the line joining the points A(3,7) and B(-2,4) .

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27. Find the equation of the line which passes through the point (4, -5) and is

perpendicular to the line $3x + 4y + 5 = 0$

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28. Find the equation of the line joining the origin to the point of intersection of $4x + 3y = 8$ and $x + y = 1$.

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29. Find the locus of a point which moves so that its distance from the x-axis is twice its distance from the y-axis.

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30. Find the locus of the point of intersection of the lines $x + y = 3 + \lambda$ and $5x - y = 7 + 3\lambda$, where λ is a variable.

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31. Find the locus of the foot of the perpendicular from the origin to the line which always passes through a fixed point(h, k).

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32. A is (-2, 0) and P is any point on the curve given by $y^2 = 16x$. If Q bisect AP, find the equation of the locus of Q.

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Exercise 16 A

1. Find the slope of a line whose inclination is

30°

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2. Find the slope of a line whose inclination is

45°

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3. Find the slope of a line whose inclination is

60°

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4. Find the slope of a line whose inclination is

15°

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5. Find the slope of a line whose inclination is

135°

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6. Find the slope and inclination of the line through each pair of the following points:

(1, 2) and (5, 6)

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7. Find the slope and inclination of the line through each pair of the following points:

(0, 0) and $\left(-\sqrt{3}, 3\right)$

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8. Find the slope and inclination of the line through each pair of the following points:

(10, 4) and (-2, -2)

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9. Find the slope and inclination of the line through each pair of the following points:

(-1, -8) and (5, 7)

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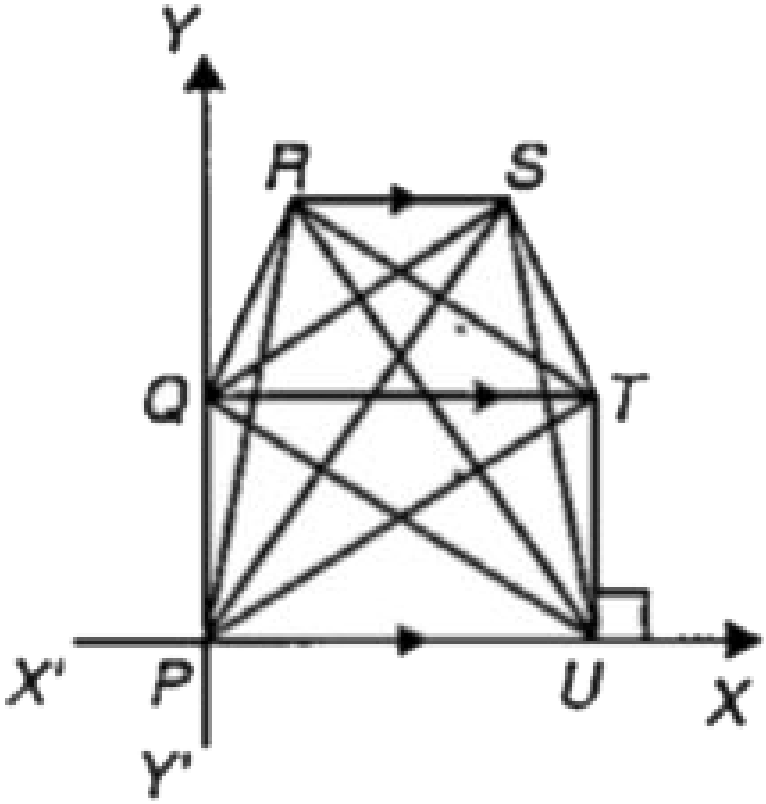
10. In the hexagon PQRSTU, RS||PU||QT. Which sides or diagonals have



positive slope

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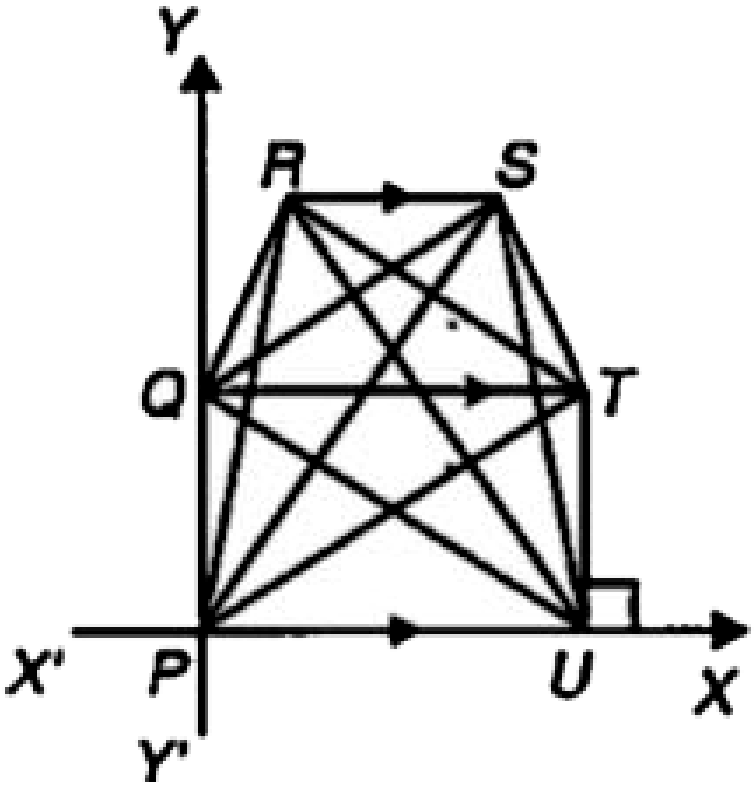
11. In the hexagon PQRSTU, PS||PU||QT. Which sides or diagonals have



negative slope

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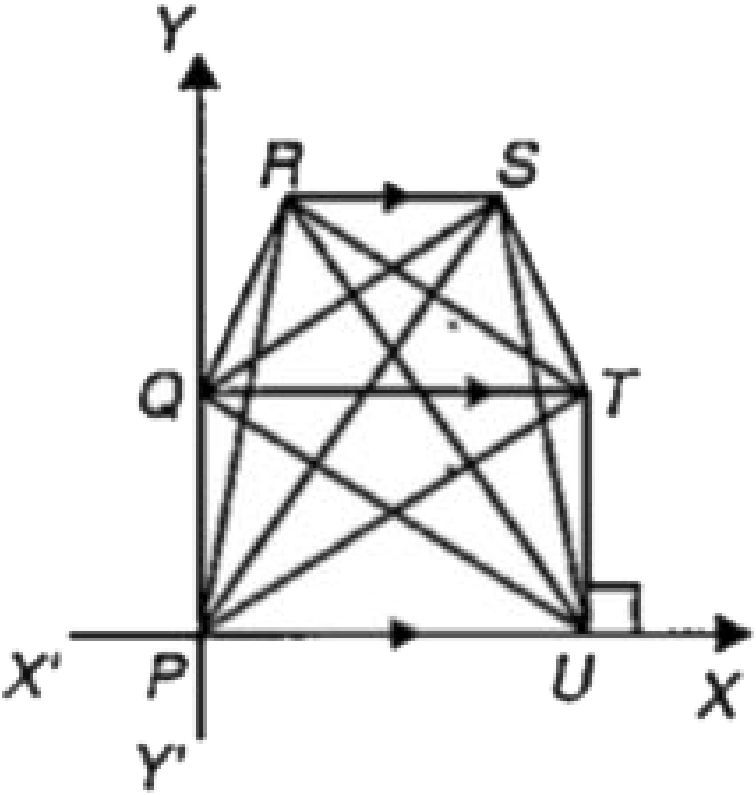
12. In the hexagon PQRSTU, RS||PU||QT. Which sides or diagonals have



zero slope

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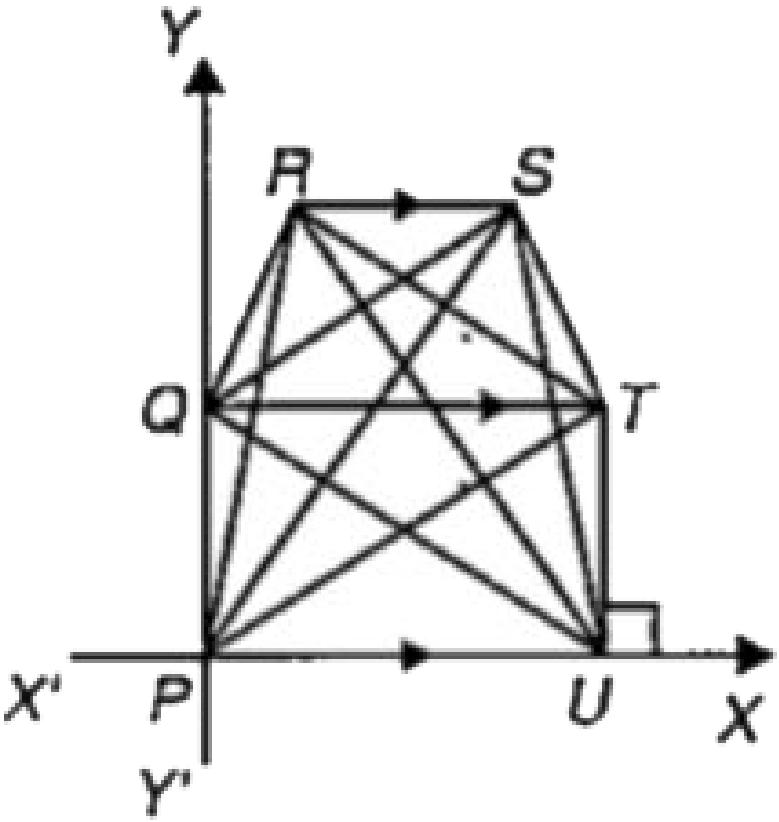
13. In the hexagon PQRSTU, RS||PU||QT. Which sides or diagonals have



infinite slope?

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14. The side BC of an equilateral $\angle ABC$ is parallel to the x-axis. What are the slope of its sides?

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15. In a regular hexagon ABCDEF, AB||ED|| x-axis. What are the slopes of its sides?

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16. Using slopes determine which of the following sets of three points are collinear. (i) (5, -2), (7, 6), (0, -2) (ii) (-2, 3), (8, -5), (5 4)

A. (5, -2), (7, 6), (0, -2)

B. (-2, 3), (8, -5), (5 4)

C. (6, -1), (5, 0), (2, 3)

D.

Answer:

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17. Find y if the slope of the line joining (-8, 11), (2, y) is $-\frac{4}{3}$.

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18. Find the angle between the line whose slope are 2 and -1 .

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19. Find the slope of the line which makes an angle of 45° with a line of slope $-\frac{6}{5}$.

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20. Find the interior angle of the triangle whose vertics are A(4, 3), B(-2, 2) and C(2, -8)

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21. Find the slope of a line parallel to a line whose slope is

(i) -3 (ii) $\frac{1}{2}$ (iii) 2.3 (iv) 0

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22. Find the slope of a line parallel to the which passes through each pair of the following points:

(0, 0) and (5, 6)

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23. Find the slope of a line parallel to the which passes through the following points:

(-1, 3) and (4, 7)

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24. Find the slope of a line parallel to the which passes through the following points:

(-5, -8) and (3, 0)

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25. Find the slope of a line parallel to the line which passes through the points:

(-a, 0) and (0, b)

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26. Find the slope of a line perpendicular to the line whose slope is $\frac{1}{3}$

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27. Find the slope of a line perpendicular to the line whose slope is $-\frac{5}{6}$

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28. Find the slope of a line perpendicular to the line whose slope is 5.

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29. Find the slope of a line perpendicular to the line whose slope is

-5(1)/(7)`

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30. Find the slope of a line perpendicular to the line whose slope is 0

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31. Find the slope of a line perpendicular to the line whose slope is Infinite .

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32. Find the slope of a line perpendicular to the line which passes through each pair of the following points:

(0, 8) and (-5, 2)

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33. Find the slope of a line perpendicular to the line which passes through each pair of the following points: (1, -11) and (5, 2)

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34. Find the slope of a line perpendicular to the line which passes through each pair of the following points (-k, h) and (b, -f)

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35. Find the slope of a line perpendicular to the line which passes through each pair of the following points:

$$(x_1, y_1) \text{ and } (x_2, y_2).$$

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36. In rectangle ABCD, slope of $AB = \frac{5}{6}$. State the slope of BC .

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37. In rectangle ABCD, slope of $AB = \frac{5}{6}$. State the slope of

CD

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38. In rect. ABCD, slope of $AB = \frac{5}{6}$. State the slope of DA

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39. In parallelogram ABCD, slope of AB = -2, slope of BC = $\frac{3}{5}$. State the slope of

AD

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40. In parallelogram ABCD, slope of AB = -2, slope of BC = $\frac{3}{5}$. State the slope of

CD

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41. In parallelogram ABCD, slope of AB = -2, slope of BC = $\frac{3}{5}$. State the slope of

the altitude to AD

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42. In parallelogram ABCD, slope of AB = -2, slope of BC = $\frac{3}{5}$. State the slope of

the altitude to CD

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43. The vertices of a ΔABC are A(1, 1), B(7, 3) and C(3, 6). State the slopr of the altitude to AB

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44. The vertices of a ΔABC are A(1, 1), B(7, 3) and C(3, 6). State the slope of the altitude to BC

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45. The vertices of a ΔABC are A(1, 1), B(7, 3) and C(3, 6). State the slope of the altitude to AC

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46. The line joining (-5, 7) and (0, -2) is perpendicular to the line joining (1, -3) and (4, x). Find x.

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Exercise 16 B

1. State the equation of the line which has the y-intercept 2 and slope 7

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2. State the equation of the line which has the y-intercept -3 and slope -4

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3. State the equation of the line which has the y-intercept

-1 and is parallel to $y = 5x + 7$

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4. State the equation of the line which has the y-intercept

2 and is inclined at 45° to the x-axis

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5. State the equation of the line which has the y-intercept

-5 and is equally inclined to the axes

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6. What will be the value of m and c if the straight line $y = mx + c$

passes through the points (3, -4) and (-1, 2) ?

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7. Find the equation of t he straight line through the given point P and having the given slope m if

$P(-4, 7), m = -\sqrt{3}$

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8. Find the equation of t he straight line through the given point P and having the given slope m if

$P(-1, -5), m = \frac{-6}{11}$

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9. Find the equation of the line through the point (1, -2) making an angle of 135° with the x-axis.

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10. Find the equation to the straight line passing through the origin and perpendicular to $x + 2y = 4$

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11. Find the equation to the straight line passing through the point (4, 3) and parallel to $3x + 4y = 12$

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12. Find the equation to the straight line passing through the point (4, 5) and (a)parallel to, (b) perpendicular to $3x - 2y + 5 = 0$

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13. Find the equation to the line which is perpendicular to the line $\frac{x}{a} - \frac{y}{b} = 1$ at the point where it meets the x-axis.

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14. Find the equation of the two lines throgh the point (4, 5) which make an acute angle of 45° with the line $2x - y + 7 = 0$.

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15. The line through A(4, 7) with gradient m meets the x-axis at P and the y-axis at R. The line through B(8, 3) with gradient $\frac{-1}{m}$ meets the x-axis at Q and the y-axis at S. Find in term of m, the co-ordinates of P, Q, R and S. Obtain expressions for OP. OQ and OR. OS, where O is the point (0, 0).

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16. Write down the slopes of the lines

joining P(1, 1) and Q(2, 3)

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17. Write down the slopes of the lines

joining L(-p, q) and M(r, s)

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18. Write down the slopes of the lines parallel to the line joining A(-1, 5) and B(-6, -7)

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19. Write down the slope of the line

perpendicular to the line joining B(2, -3) and S(-4, 1).

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20. Find the equations of the lines joining the points

(i) A(1, 1) and B(2, 3) (ii) L(a, b) and M(b, a) (iii) P(3, 3) and Q(7, 6)

What is the length of the portion of the line in (c) intercepted between the axes of co-ordinates?

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21. Given the vertices A(10, 4), B(-4, 9) and C(-2, -1) of ΔABC, find the equation of the side AB

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22. Given the vertices A(10, 4), B(-4, 9) and C(-2, -1) of ΔABC, find the equation of the median through A

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23. Given the vertices A(10, 4), B(-4, 9) and C(-2, -1) of ΔABC, find the equation of the altitude through B

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24. Given the vertices A(10, 4), B(-4, 9) and C(-2, -1) of ΔABC, find the equation of the perpendicular bisector of the side AB.

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25. The points A, B and C are (4, 0), (2, 2) and (0, 6) respectively. AB produced cuts the y-axis at P and CB produced cuts the x-axis at Q.

Find the co-ordinates of the points P and Q. Find the equation of the straight line joining the mid-points of Ac and OB (where O is the origin), and verify that this line passes through the mid- point of PQ.

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26. A line through the point (3, 0) meets the variable line $y = tx$ at right angle at the point P. Find, in terms of t, the co-ordinates of P. Find the value of k for which Plies on the curve $x^2 + y^2 = kx$.

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27. The point P is the foot of the perpendicular from A(0, t) to the line whose equation is $y = tx$. Determine

the equation of the line AP

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28. The point P is the foot of the perpendicular from A(0, t) to the line whose equation is $y = tx$. Determine the co-ordinates of P

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29. The point P is the foot of the perpendicular from A(0, t) to the line whose equation is $y = tx$. Determine the area of ΔOAP, where O is the origin.

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30. Find the equation of line joining the origin to the point of intersection of $4x + 3y = 8 \text{ and } x + y = 1$.

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31. Find the equation of the straight line which passes through the point of intersection of the lines $3x + 4y - 1 = 0$ and $5x + 8y - 3 = 0$ and is perpendicular to the line $4x - 2y + 3 = 0$.

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Exercise 16 C

1. Write down the equation of the straight line cuttting off intercepts a and b from the axes where

a = -2, b = 3

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2. Write down the equation of the straight line cuttting off intercepts a and b from the axes where

a = 5, b = -6

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3. Write down the equation of the straight line cuttting off intercepts a and b from the axes where

$$a = -\frac{k}{m}, b = k$$

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4. Determine the x- intercept 'a' and the y-intercept 'b' of the following lines. Sketch each.

$$3x + 5y - 15 = 0,$$

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5. Determine the x- intercept 'a' and the y-intercept 'b' of the following lines. Sketch each.

$x - y - 7 = 0$

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6. Find the equation of the line which makes equal intercepts on the axes and passes through the point (2, 3).

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7. Write down the euqation of the line which makes an intercepts of 2a on the x-axis and 3a on the y-axis. Given that the line passes through the point (14, -9), find the numerical value of a.

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8. Find the equation of the straight line which passes through the point (5, 6) and has intercept on the axes euqal in magnitude but opposite in sign.

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9. A straight line passes through (2, 3) and the portion of the line intercepted between the axes is bisected at this point. Find its equation.

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10. Show that the three points (5, 1), (1, -1) and (11, 4) lie on a straight line. Further find

its intercepts on the axes

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11. Show that the three points (5, 1), (1, -1) and (11, 4) lie on a straight line. Further find

the length of the portion of the line interceptes between the axes.

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12. Show that the three points (5, 1), (1, -1) and (11, 4) lie on a straight line. Further find

the slope of the line.

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13. Find the equation of the striaght line which passes through the point (3, -2) and cuts off positive intercepts on the x and y-axes which are in the ratio $4:3$.

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14. Find the equation of the straight line at a distance of 3 units from the origin such that the perpendicular from the origin to the line makes an angle α, given by the equation $\tan\alpha = \frac{5}{12}$, with the positive direction of the axis of x.

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15. Show on a diagram the position of the straight line $x\cos 30^\circ + y\sin 30^\circ = 2$ in relation to the co-ordinate axes, indicating clearly which angle is 30° and which length is 2 units. Find

(i) the equation of the straight line parallel to that given line and passing through the point (4, 3) and

(ii) the distance between the two parallel straight lines.

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(i) the equation of the straight line parallel to that given line and passing through the point (4, 3) and

(ii) the length of the perpendicular from the origin on to this line

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17. Show on a diagram the position of the straight line $x\cos 30^\circ + y\sin 30^\circ = 2$ in relation to the co-ordinate axes, indicating clearly which angle is 30° and which length is 2 units. Find

(i) the equation of the straight line parallel to that given line and passing through the point (4, 3) and

(ii) the distance between the two parallel straight lines.

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18. A staright line $\frac{x}{a} - \frac{y}{b} = 1$ passes through the point (8, 6) and cuts off a triangle of area 12 units from the axes of co-ordinates. Find the equations of the straight line.

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19. A straight line passes through the points (a, 0) and (0, b). The length of the line segment contained between the axes is 13 and the product of their intercepts on the axes is 60. Calculate the values of a and b and find the equation of the straight line.

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Exercise 16 D

1. Write down the slopes of the following lines:

$2x + 3y + 1 = 0$

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2. Write down the slopes of the following lines:

$7x - 5y + 8 = 0$

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3. Write down the slopes of the following lines:

$-6y - 11x = 0$

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4. Write down the slopes of the following lines:

$xx_1 + yy_1 = a^2$

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5. Write down the slopes of the following lines:

$3x + 4y - 2(x + x_1) - 5(y + y_1) + 2 = 0$

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6. Find the value of k such that the line

$(k - 2)x + (k + 3)y - 5 = 0$ is

parallel to the line $2x - y + 7 = 0$

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7. Find the value of k such that the line

$(k - 2)x + (k + 3)y - 5 = 0$

perpendicualr to $2x - y + 7 = 0.$

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8. Prove that the lines

(i) $3x + 4y - 7 = 0$ and $28x - 21y + 50 = 0$ are mutually perpendicualr

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9. Prove that the lines

(ii) $px + qy - r = 0$ and $-4px - 4qy + 5s = 0$ are parallel.

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10. Find the slope of the line which is perpendicular to the line $7x + 11y - 2 = 0$.

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11. Determine the angle between the lines whose equation are

$3x + y - 7 = 0$ and $x + 2y + 9 = 0$,

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12. Determine the angle between the lines whose equation are

$2x - y + 3 = 0$ and $x + y - 2 = 0$.

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13. Use tables to find the acute angle between the lines $2y + x = 0$ and $\frac{x}{1} + \frac{y}{2} = 2$.

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14. Reduce the following equations to the normal form and find the values of p and α.

$\sqrt{3}x - y + 2 = 0$

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15. Reduce the following equations to the normal form and find the values of p and α.

$3x + 4y + 10 = 0$ (use tables).

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16. Put the equation $12y = 5x + 65$ in the form $x\cos\theta + y\sin\theta = p$ and indicate clearly, in a rough diagram the position of the straight line and the meaning of the constant θ and p.

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17. If $Ax + By = C$ and $x\cos\alpha + y\sin\alpha = p$ represent the same line, find p in terms of A, B, C.

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18. Show that (2, -1) and (1, 1) are an opposite sides of $3x + 4y = 6$.

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19. The sides of a triangle are given by the equations $3x + 4y = 10, 4x - 3y = 5,$ and $7x + y + 10 = 0,$ show that the origin lies within the triangle.

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20. Find the calculation whether the points (13, 8), (26, -4) lie in the same, adjacent, or opposite angles formed by the straight lines $5x + 6y - 112 = 0, \text{ and } 10x + 11y - 217 = 0.$

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Exercise 16 E

1. Find the co-ordinates of the point of intersection of the straight lines

$3x - 5y + 5 = 0, 2x + 3y - 22 = 0$

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2. Find the co-ordinates of the point of intersection of the straight lines

$2x - 3y - 7 = 0, 3x - 4y - 13 = 0$

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3. Find the area of the triangle formed by the lines $y + x - 6 = 0, 3y - x + 2 = 0$ and $3y = 5x + 2$.

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4. Find the orthocentre of the triangle whose angular points are (0, 0), (2, -1), (-1, 3).

[Note. Orthocentre is the point of intersection of the altitudes]

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5. The vertices of a triangle are A (0, 5), B (-1, -2) and C (11, 7). Write down the equations of BC and the perpendicular from A to BC and hence find the co-ordinates of the foot of the perpendicular.

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6. Find the equation of the straight line passing through the point of intersection of the two line $x + 2y + 3 = 0$ and $3x + 4y + 7 = 0$ and parallel to the straight line $y - x = 8$

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7. Find the equation of the line through the intersection of $y + x = 9$ and $2x - 3y + 7 = 0,$ and perpendicular to the line $2y - 3x - 5 = 0$

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8. Prove that the three lines $5x + 3y - 7 = 0, 3x - 4y = 10,$ and $x + 2y = 0$ meet in a point.

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9. For what value of m are the three lines $y = x + 1, y = 2(x + 1)$ and $y = mx + 3$ concurrent ?

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10. The co-ordinates of A, B and C are (3, 1), (1, 5) and (4, 2) respectively. P is the mid-pt. of BC and Q lies on AC and is such that $CQ : QA = 3 : 1$, R lies on AB and is such that $AR : RB = 1 : 3$. Find the equation of the lines AP, BQ and CR.

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11. The sides of a triangle are OA, OB, AB and have equations $2x - y = 0, 3x + y = 0, x - 3y + 10 = 0,$ respectively. Find the equation of the three medians of the triangle and verify that they are concurrent.

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12. Show that the lines $lx + my + n = 0, mx + ny + l = 0$ and $nx + ly + m = 0$ are concurrent if $l + m + n = 0$

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13. Prove that the lines $(b - c)x + (c - a)y + (a - b) = 0, (c - a)x + (a - b)y + (b - c) = 0$ and $(a - b)x + (b - c)y + (c - a) = 0$ are concurrent.

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14. Prove that the medians of a triangle are concurrent.

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Exercise 16 F

1. Find the distance of the point P from the lines AB in the following cases :

P(4, 2), AB is $5x - 12y - 9 = 0$

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2. Find the distance of the point P from the lines AB in the following cases :

P(0, 0), AB is $h(x + h) + k(y + k) = 0$

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3. Calculate the length of the perpendicular from (7, 0) to the straight line $5x + 12y - 9 = 0$ and show that it is twice the length of the perpendicular from (2, 1).

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4. The point A(0, 0), B(1, 7), C(5, 1) are the vertices of a triangle. Find the length of the perpendicular from A to BC and hence the area of the ΔABC.

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5. Find the lengths of altitudes of the triangle whose sides are given by

$3x - 4y = 5, 4x + 3y = 5 \text{ and } x + y = 1$

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6. If p is the perpendicualr distance of the origin from the line whose intercepts on the axes are a and b, show that

$$\frac{1}{p^2} = \frac{1}{a^2} + \frac{1}{b^2}$$

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7. Find the perpendicular distance between the lines

$3x + 4y + 5 = 0, 3x + 4y + 17 = 0$

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8. Find the perpendicular distance between the lines

$9x + 40y - 20 = 0, 9x + 40y + 21 = 0$

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9. Find the perpendicular distance between the lines

$y = mx + c, y = mx + d$

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10. Find the equation of two straight lines which are parallel to the straight line $x + 7y + 2 = 0$, and at a unit distance from the point (2, -1).

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11. Find the equations of the two straight lines drawn through the point (0, 1) on which the perpendiculars dropped from the point (2, 2) are each of unit length.

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12. A straight line is parallel to the lines $3x - y - 3 = 0$ and $3x - y + 5 = 0$, and lies between them. Find its equation if its distances from these lines are in the ratio $3:5$.

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13. Find the equation of the locus of a point P which is equidistance from the st. line $3x - 4y + 2 = 0$ and the origin.

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14. A point P is such that the sum of the squares of its distances from the two axes of co-ordinates is equal to the square of its distance from the line $x - y = 1$. Find the equation of the locus of P.

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15. Show that the equation to the parallel line mid-way between the parallel lines

$ax + by + c_1 = 0$ and $ax + by + c_2 = 0$ is $ax + by + \frac{c_1 + c_2}{2} = 0$

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16. Prove that the line $12x - 5y - 3 = 0$ is mid-parallel to the lines $12x - 5y + 7 = 0$ and $12x - 5y - 13 = 0$.

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Exercise 16 G

1. Find the equations of the lines bisecting the angles between the following pairs of straight lines writing first the bisector of the angle in which the origin lies :

$3x - 4y + 10 = 0, 5x - 12y - 10 = 0$

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2. Find the equations of the lines bisecting the angles between the following pairs of straight lines writing first the bisector of the angle

in which the origin lies :

$12x - 5y + 3 = 0, 4x + 3y - 2 = 0.$

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3. Find the equations of the bisectrors of the angles between $4x + 3y - 4 = 0$ and $12x + 5y - 3 = 0$. Show that these bisectors are at right angles to each other.

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4. Find the locus of a point which moves so that the perpendiculars drawn from it to the two straight lines $3x + 4y = 5, 12x - 5y = 13$ are equal.

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5. Find the equations of the lines bisecting the angles between the lines $4x - 3y + 12 = 0$ and $12x + 5y = 20$.

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6. Find the bisector of the acute angle between the lines :

$3x + 4y = 11$ and $12x - 5y = 2$

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7. Find the bisector of the acute angle between the lines :

$5x = 12y + 24$ and $12x = 5y + 10$

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8. Prove that the perpendiculars drawn from any point of the line $2x + 11y = 5$ to the lines $24x + 7y = 20$ and $4x - 3y = 2$ are equal in length.

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9. A triangle is formed by the lines whose equations are $AB: x + y - 5 = 0, BC: x + 7y - 7 = 0,$ and $CA: 7x + y + 14 = 0$. Find the bisector of the interior angle at B

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10. A triangle is formed by the lines whose equations are $AB: x + y - 5 = 0, BC: x + 7y - 7 = 0,$ and $CA: 7x + y + 14 = 0$. Find

the bisector of the exterior angle at C.

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11. Find the centre of the inscribed circle of the triangle the equations, of whose sides are $y - 15 = 0, 12y + 5x = 0 \text{ and } 4y - 3x = 0.$

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12. The co-ordinates of A, B, C are respectively (-4, 0), (0, 2) and (-3, 2). Check whether points are collinear.

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13. The co-ordinates of A, B, C are respectively (-4, 0), (0, 2) and (-3, 2). Find the co-ordinates of the point of intersection of the line which bisects the angle CAB internally and the line joining C to the middle point of AB is

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Exercise 16 H

1. Find the equation of the straight line which passes through the point (4, 5) and is parallel to 3x+ 4y = 5

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2. Find the equation of the straight line which passes through the point (4, 5) and is

perpendicular to the straight line $3x - 2y + 5 = 0$.

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3. Find the equation of the straight line which is such that

it passes through the point (4, 3) and is parallel to the line $3x - 4y + 5 = 0$.

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4. Find the equation of the straight line which is such that it passes through the point (4, 3) and is perpendicular to the line $3x - 4y + 5 = 0.$

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5. Find the equation of the straight line which passes through the origin and the point of intersection of the st. lines $y - x + 7 = 0, y + 2x - 2 = 0$

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6. Find the equation of the straight line which passes through the point (2, -9) and the intersection of the lines $2x + 5y - 8 = 0 \text{ and } 3x - 4y = 35$

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7. Find the equation of the straight line which passes through the origin and the point of intersection of the lines $ax + by + c = 0$ and $a'x + b'y + c' = 0$.

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8. Show that the equation $n(ax + by + c) = c(lx + my + n)$ represents the line joining the origin to the point of intersection of $ax + by + c = 0$ and $lx + my + n = 0$.

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9. Find the equation of the line through the intersection of $x - y = 1$ and $2x - 3y + 1 = 0$ and parallel to $3x + 4y = 12$.

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10. Find the equation of the line through the intersection o f $x + 2y + 3 = 0$ and $3x + 4y + 7 = 0$ and parallel to $y - x = 8$.

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11. Find the equation of the line through the intersection of $y + x = 9$ and $2x - 3y + 7 = 0$, and perpendicular to the line $2y - 3x - 5 = 0$.

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Exercise 16 I

1. Find locus of a point so that its distance from the axis of x is always one half its distance from the origin.

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2. Find the locus of point whose distance from the origin is 5.

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3. Find the locus of the point such that the sum of the squares of its distances from the points (2, 4) and (-3, -1) is 30.

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4. Find the locus of the point such that its distance from the x-axis is half its distance from the y-axis.

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5. Find the locus of the point such that its distance from the y-axis is equal to its distance from the point (1, 1).

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6. Find the locus of a point which is equidistance from the points (1, 0) and (-1, 0).

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7. A(2, 0) and B(4, 0) are two given points. A point P moves so that $PA^2 + PB^2 = 10$. Find the locus of P.

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8. Find the locus of a point such that the sum of its distances from the points (0, 2) and (0, -2) is 6.

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9. Find the locus of a point, so that the join of points (-5, 1) and (3, 2) subtends a right angle at the moving point.

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10. Two points A and B with co-ordinates (5, 3), (3, -2) are given. A point P moves so that the area of ΔPAB is constant and equal to 9 square units. Find the equation to the locus of the point P.

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11. Show that (1, 2) lies on the locus $x^2 + y^2 - 4x - 6y + 11 = 0$.

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12. Does the point (3, 0) lie on the curve $3x^2 + y^2 - 4x + 7 = 0$?

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13. Find the condition that the point (h, k) may lie on the curve $x^2 + y^2 + 5x + 11y - 2 = 0$.

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14. If the line $(2 + k)x - (2 - k)y + (4k + 14) = 0$ passes through the point (-1, 21), find k.

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15. A is the point (-1, 0) and B is the point (1, 1). Find a point on the line $4x + 5y = 4$, which is equidistant from A and B.

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16. The co-ordinates of the point S are (4, 0) and a point P has coordinates (x, y). Express PS^2 in terms of x and y. Given that M is the foot of the perpendicular from P to the y-axis and that the point P moves so that lengths PS and PM are equal, prove that the locus of P is $8x = y^2 + 16$. Find the co-ordinates of one of the two points on the curve whose distance from S is 20 units.

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17. Find the ratio in which the line joining the points (6, 12) and (4, 9) is divided by the curve $x^2 + y^2 = 4$.

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18. AB is a line of fixed length, 6 units, joining the points A (t, 0) and B which lies on the positive y-axis. P is a point on AB distant 2 units from A. Express the co-ordinates of B and P in terms of t. Find the locus of P as t varies.

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19. A rod of length / slides with its ends on two perpendicular lines. Find the locus of its mid-point.

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20. If O is the origin and Q is a variable, point on $x^2 = 4y$, find the locus of the mid-point of OQ.

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Exercise 16 J

1. The lines $x - 2y + 6 = 0$ and $2x - y - 10 = 0$ intersect at P. Without finding the co-ordinate of P prove that the equation of the line through P and the origin of co-ordinates is perpendicular to $39x + 33y - 580 = 0$.

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2. A point P moves so that its distance from the line given by $x = -3$ is equal to its distance from the point (3, 0). Show that the locus of P is $y^2 = 12x$.

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3. A(2, 5), B(4, -11) are two fixed points and C is a point which moves on the line $3x + 4y + 5 = 0$. Find the locus of the centroid of the triangle ABC.

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4. Find the cartesian equation of the curve whose parametric equations are :

$x = t, y = 3t + 5$

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5. Find the cartesian equation of the curve whose parametric equations are :

$x = t, y = t^2$

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6. Find the cartesian equation of the curve whose parametric equations are :

$x = 4\cos\theta, y = 4\sin\theta$

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7. Find the cartesian equation of the curve whose parametric equations are :

$x = 4\cos\theta, y = 3\sin\theta$

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8. Find the locus of the point of intersection of the lines $x = \frac{a}{m^2}$ and $y = \frac{2a}{m}$, where m is a parameter.

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9. Find the intersection S of the lines $x - ty + t^2 = 0, tx + y - t^3 - 2t = 0.$

Show that S lies on the curve whose equation is $y^2 = 4x$. Sketch this curve.

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10. Find the locues of the middle point of the portion of the line $x\cos\alpha + y\sin\alpha = p$, where p is a costant, intercepted between the axes.

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Chapter Test

1. The coordinates of the points A, B, C are (0, 4), (2, 5) and (3 , 3) respectively. Prove that AB=BC and the angle ABC is a right angle.

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2. Find the coordinates of the point which divides the line joining (5, -2) and (9, 9) in the ratio $3:1$.

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3. The vertices of a quadrilateral. PMQS are P(0, 0), M(3, 2), Q(7, 7) and S(4, 5). Show that PMQS is a parallelogram.

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4. The vertices of a quad. PMQS are P(0, 0), M(3, 2), Q(7, 7) and S(4, 5). Show that PMQS is a parallelogram.

The mid-point of one diagonal in the samer as that of the other diagonal.

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5. The vertices of a quad. PMQS are P(0, 0), M(3, 2), Q(7, 7) and S(4, 5). Show that PMQS is a parallelogram.

opposite sides are parallel.

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6. P, Q and R are three collinear points. P and Q are (3, 4) and (7, 7) respectively, and PR =10 units. Find the coordinates of R.

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7. The coordinates of the vertices of a triangle are (4, -3), (-5, 2) and (x, y). If the centroid of the triangle is at the origin, show that $x = y = 1$.

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8. Find the equation of the line passing through the point (-4, -5) and perpendicular to the line joining the points (1, 2) and (5, 6).

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9. Find the equation of the straight line which passes through the points (3, 4) and has intercepts on the axes such that their sum is 14.

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10. Reduce the equation of the straight line $3x + 4y + 15 = 0$ to normal form and find the perpendicular distance of the line from the origin.

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11. Find the equation of the straight line which passes through the point of intersection of the straight lines $x + y = 8$ and $3x - 2y + 1 = 0$ and is parallel to the straight line joining the points (3, 4) and (5, 6).

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12. Find the equation of the straight line which passes through the point of intersection of the straight lines $3x - 4y + 1 = 0$ and $5x + y - 1 = 0$ and cuts off equal intercepts from the axes.

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13. Find the locus of a point such that the line segments having end points (2, 0) and (-2, 0) substend a right angle at that point.

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14. Find the coordinates of the orthocentre of the triangle whose vertices are (1, 2), (2, 3) and (4, 3).

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15. Find the equation of the bisector of the acute angle between the lines $3x - 4y + 7 = 0$ and $12x + 5y - 2 = 0$.

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