MATHS

NCERT - NCERT MATHEMATICS(HINGLISH)

STRAIGHT LINES

Exercise 10 4

1. Find the equation of the line through the intersection of $5x - 3y = 1$and

$2x - 3y - 23 = 0$and perpendicular to the line $5x - 3y - 1 = 0$.

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2. Find the equation if the line through the intersection of lines $x + 2y - 3 = 0$ and $4x - y + 7 = 0$ and which is parallel to $5x + 4y - 20 = 0$

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3. Find the equation of the line through the intersection of the lines $2x + 3y\,4 = 0$ and $x - 5y = 7$that has its x-intercept equal to 4.

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4. Find the equation of the line through the intersection of lines $3x + 4y = 7$ and $x - y + 2 = 0$and whose slope is 5.

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Solved Examples

1. Find the distance between the parallel lines

$3x4y + 7 = 0 \text{and} 3x4y + 5 = 0.$

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2. Find the distance of the point $(3, -5)$ from the line $3x - 4y - 26 = 0.$

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3. Find the equation of the line whose perpendicular distance from the origin is 4 units and the angle which the normal makes with the positive direction of x–axis is 15°.

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4. Find the equation of the line, which makes intercepts 3 and 2 on the x and y axes respectively.

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5. Equation of a line is $3x - 4y + 10 = 0$. Find its (i) slope, (ii) x and yintercepts.

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6. The Fahrenheit temperature F and absolute temperature K satisfy a linear equation. Given that $K = 273$when $F = 32$and that $K = 373$ when$F = 212$. Express K in terms of F and find the value of F, when $K = 0$.

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7. Find the angle between the lines $y - \sqrt{3}x - 5 = 0$and $\sqrt{3}y - x + 6 = 0.$

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8. Reduce the equation $\sqrt{3}x + y - 8 = 0$ into normal form. Find the values of p and $\omega.$

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9. Find the equation of a line perpendicular to the line $x - 2y + 3 = 0$and passing through the point $(1, 2)$.

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10. Show that two lines $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$, where $b_1, b_2 \neq 0$are : (i) Parallel if $\frac{a_1}{b_1} = \frac{a_2}{b_2}$, and (ii) perpendicular if $a_1a_2 + b_1b_2 = 0$.

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11. If the lines $2a + y3 = 0$, $5x + ky3 = 0$and $3xy2 = 0$are concurrent, find the value of k.

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12. Find the distance of the line $4xy = 0$ from the point $P(4, 1)$ measured along the line making an angle of $135^0$with the positive x-axis.

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13. Assuming that straight lines work as the plane mirror for a point, find the image of the point (1, 2) in the line $x - 3y + 4 = 0$.

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14. Show that the area of the triangle formed by the lines $y = m_1x + c_1, y = m_2x + c_2$ and $x = 0$ is $\frac{(c_2 - c_1)^2}{2|m_1 - m_2|}$

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15. A line is such that its segment between the lines $5x - y + 4 = 0$and $3x + 4y - 4 = 0$ is bisected at the point (1, 5). Obtain its equation.

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16. Show that the path of a moving point such that its distances from two lines $3x - 2y = 5$ and $3x + 2y = 5$are equal is a straight line.

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17. Write the equation of the line through the points $(1, 1)$and $(3, 5)$.

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18. Write the equation of the line for which $\tan\theta = \frac{1}{2}$, where $\theta$is the inclination of the line and

(i) yintercept is $-\frac{3}{2}$

(ii) xintercept is 4.

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19. Find the equations of the lines parallel to axes and passing through$(-2, 3)$.

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20. Find the equation of the line through $(2, 3)$with slope 4.

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21. Three points $P(h, k), Q(x_1, y_1)$ and $R(x_2, y_2)$ lie on a line. Show that $(h - x_1)(y_2 - y_1) = (k - y_1)(x_2 - x_1)$.

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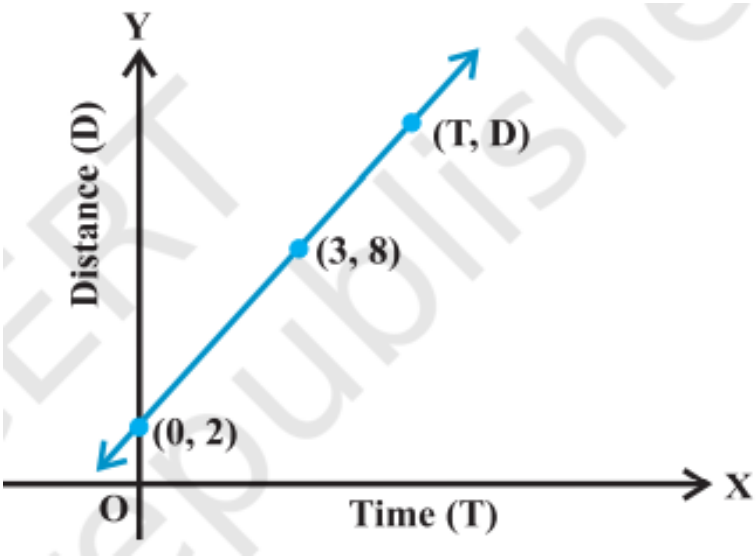
22. In Figure, time and distance graph of a linear motion is given. Two positions of time and distance are recorded as, when T = 0, D = 2 and when T = 3, D = 8. Using die concept of slope, find law of motion, i.e., how distance

depends upon time.



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23. If the angle between two lines is $\frac{\pi}{4}$ and slope of one of the lines is $\frac{1}{2}$, find the slope of the other line.

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24. Line through the points $(-2, 6)$ and $(4, 8)$ is perpendicular to the line through the points $(8, 12)$ and $(x, 24)$. Find the value of x.

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25. Find the slope of the lines:

(a) Passing through the points $(3, -2)$ and $(-1, 4)$,

(b) Passing through the points $(3, -2)$ and

$(7, -2)$,

(c) Passing through the points $(3, -2)$and $(3, 4)$,

(d) Making inclination of $60^\circ$with the positive direction of x-axis.

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26. Find the equation of line parallel to the y-axis and drawn through the point of intersection of $x\ 7y + 5 = 0$and $3x + y\ 7 = 0$.

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27. Find the new coordinates of point $(3, 4)$ if the origin is shifted to (1, 2) by a translation.

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28. Find the transformed equation of the straight line $2x - 3y + 5 = 0$, when the origin is shifted to the point $(3, -1)$ after translation of axes.

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Exercise 10 3

1. The line through the points (h, 3) and (4, 1) intersects the line $7x - 9y - 19 = 0$at right angle. Find the value of h.

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2. Prove that the line through the point $(x_1, y_1)$and parallel to the line

$Ax + By + C = 0$is

$A(x - x_1) + B(y - y_1) = 0.$

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3. Two lines passing through the point (2, 3) intersects each other at an angle of $60o$. If slope of one line is 2, find equation of the other line.

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4. Find the equation of the right bisector of the line segment joining the points (3, 4) and (–1, 2).

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5. Find the coordinates of the foot of perpendicular from the point $(1, 3)$to the line $3x4y16 = 0.$

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6. The perpendicular from the origin to the line $y = mx + c$ meets it at the point $(-1, 2)$. Find the values of m and c.

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7. If p and q are the lengths of perpendiculars from the origin to the lines $x\cos\theta - y\sin\theta = k\cos 2\theta$and $x\sec\theta + ycosec\theta = k$, respectively, prove that $p^2 + 4q^2 = k^2$.

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8. In the triangle ABC with vertices A (2, 3), B (4, –1) and C (1, 2), find the equation and length of altitude from the vertex A.

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9. If p is the length of perpendicular from the origin to the line whose intercepts on the axes are a and b, then show that $\frac{1}{p^2} = \frac{1}{a^2} + \frac{1}{b^2}$.

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10. Reduce the following equations into normal form. Find their perpendicular distances from the origin and angle between perpendicular and the positive xaxis.(i) $x - \sqrt{3}y + 8 = 0$, (ii) $y - 2 = 0$, (iii) $x - y = 4$.

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11. Reduce the following equations into intercept form and find their intercepts on the

axes.(i) $3x + 2y - 12 = 0$, (ii) $4x - 3y = 6$, (iii) $3y + 2 = 0$.

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12. Reduce the following equations into slope intercept form and find their slopes and the y intercepts.(i) $x + 7y = 0$, (ii) $6x + 3y5 = 0$, (iii) $y = 0$.

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13. Find equation of the line parallel to the line $3x - 4y + 2 = 0$and passing through the point $(2, 3)$.

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14. Find the distance between parallel lines

(i) $15x + 8y34 = 0$and $15x + 8y + 31 = 0$

(ii) $l(x + y) + p = 0$ and $l(x + y) - r = 0.$

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15. Find the points of the xaxis, whose distances from the line $\frac{x}{3} + \frac{y}{4} = 1$are 4 unit is.

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16. Find the distance of the point $(1, 1)$from the line $12(x + 6) = 5(y2)$.

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17. Find angles between the lines $\sqrt{3}x + y = 1$and $x + \sqrt{3}y = 1$.

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18. Find equation of the line perpendicular to the line $x - 7y + 5 = 0$and having x intercept 3.

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Miscellaneous Exercise

1. A person standing at the junction (crossing) of two straight paths represented by the equations $2x + 3y + 4 = 0$and $3x + 4y - 5 = 0$ wants to reach the path whose equation is $6x - 7y + 8 = 0$in the least time. Find

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2. Find equation of the line which is equidistant from parallel lines $9x + 6y - 7 = 0$and $3x + 2y + 6 = 0.$

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3. If sum of the perpendicular distances of a variable point $P(x, y)$from the lines $x + 5y = 0$and $3x - 2y + 7 = 0$is always 10. Show that P must move on a line.

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4. Prove that the product of the lengths of the perpendiculars drawn from the points

$\left(\sqrt{a^2-b^2}, 0\right)$ and $\left(-\sqrt{a^2-b^2}, 0\right)$ to the line $\frac{x}{a}\cos\theta + \frac{y}{b}\sin\theta = 1$ is b^2.

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5. A ray of light passing through the point (1, 2) reflects on the x–axis at point A and the reflected ray passes through the point (5, 3). Find the coordinates of A.

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6. Find the direction in which a straight line must be drawn through the point $(-1, 2)$so that its point of intersection with the line $x + y = 4$ may be at a distance of 3 units from this point.

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7. The hypotenuse of a right angled triangle has its ends at the points $(1, 3)$and $(-4, 1)$.

Find the equation of the legs (perpendicular sides) of the triangle.

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8. In what ratio, the line joining $(1, -1)$and $(5, 7)$is divided by the line $x + y = 4$?

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9. Find the distance of the line $4x + 7y + 5 = 0$ from the point $(1, 2)$ along

the line $2x - y = 0$.

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10. If three lines whose equations are $y = m_1x + c_1, y = m_2x + c_2$and $y = m_3x + c_3$are concurrent, then show that $m_1(c_2 - c_3) + m_2(c_3 - c_1) + m_3(c_1 - c_2) = 0$.

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11. Find the equation of the lines through the point (3, 2) which make an angle of 45° with the line $x - 2y = 3$.

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12. Find the equation of the line passing through the point of intersection of the lines $4x + 7y - 3 = 0$and $2x - 3y + 1 = 0$that has equal intercepts on the axes.

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13. Show that the equation of the passing through the origin and making an angle $\theta$with the $y = mx + c$is $\frac{y}{x} = \pm \frac{m + \tan\theta}{1 - m\tan\theta}$.

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14. Find the image of the point $(3, 8)$with respect to the line $x + 3y = 7$assuming the line to be a plane mirror.

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15. If the lines $y = 3x + 1$and $2y = x + 3$are equally inclined to the line$y = mx + 4$, find the value of m.

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16. Find the equation of a line drawn perpendicular to the line $\frac{x}{4} + \frac{y}{6} = 1$through the point, where it meets the yaxis

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17. Find the equation of the line parallel to yaxis and drawn through the point of intersection of the lines $x - 7y + 5 = 0$and $3x + y = 0$.

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18. Find perpendicular distance from the origin of the line joining the points $(\cos\theta, \sin\theta)$and $(\cos\phi, \sin\phi)$.

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19. What are the points on the yaxis whose distance from the line $\frac{x}{3} + \frac{y}{4} = 1$is 4 units.

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20. Find the equations of the lines, which cutoff intercepts on the axes whose sum and product are 1 and -6, respectively.

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21. Find the values of θ and p, if the equation $x\cos\theta + y\sin\theta = p$is the normal form of the line $\sqrt{3}x + y + 2 = 0$.

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22. Find the values of k for which the line $(k-3)x - \left(4-k^2\right)y + k^2 - 7k + 6 = 0$is

(a) Parallel to the xaxis,

(b) Parallel to the y axis,

(c) Passing through the origin.

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23. Find the value of p so that the three lines $3x + y - 2 = 0, px + 2y - 3 = 0$ and $2x - y - 3 = 0$ may intersect at one point.

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24. Find the area of the triangle formed by the lines $y - x = 0, x + y = 0$ and $x - k = 0.$

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Exercise 10 1

1. A line passes through $(x_1, y_1)$and (h, k). If slope of the line is m, show that $k - y_1 = m(h - x_1)$.

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2. If three points (h, 0), (a, b) and (o, k) lie on a line, show that $\frac{a}{h} + \frac{b}{k} = 1$.

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3. Find the angle between the horizontal axis and the line joining the points $(3, -1)$and $(4, -2)$.

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4. The slope of a line is double of the slope of another line. If tangent of the angle between them is $\frac{1}{3}$, find the slopes of the lines.

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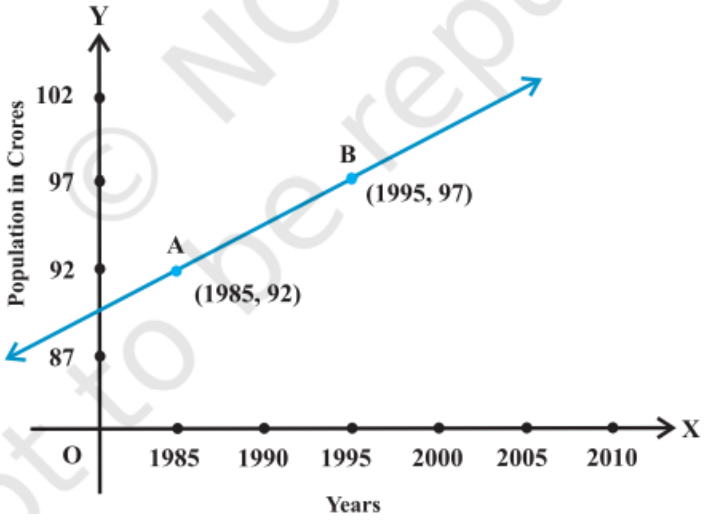
5. Consider the following population and year graph, find the slope of the line AB and using it, find what will be the population in the year 2010?



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6. Find the slope of a line, which passes through the origin, and the midpoint of the line segment joining the points $P(0, 4)$and $B(8, 0)$.

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7. Find a point on the x–axis, which is equidistant from the points (7, 6) and (3, 4).

A. $\left(\frac{15}{2}, 0\right)$

B. $\left(\frac{17}{2}, 0\right)$

C. $\left(-\frac{17}{2}, 0\right)$

D. $\left(-\frac{15}{2}, 0\right)$

Answer: A $\left(\frac{15}{2}, 0\right)$

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8. Find the slope of the line, which makes an angle of 30° with the positive direction of yaxis measured anticlockwise.

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9. Without using the Pythagoras theorem, show that the points $(4, 4)$, $(3, 5)$and $(1, 1)$ are the vertices of a right angled triangle.

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10. Draw a quadrilateral in the Cartesian plane, whose vertices are $(4, 5)$, $(0, 7)$, $(5, 5)$and $(4, 2)$. Also, find its area.

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11. Find the distance between $P(x_1, y_1)$and $Q(x_2, y_2)$when:

(i) $PQ$is parallel to the yaxis,

(ii) PQ is parallel to the x-axis.

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12. The base of an equilateral triangle with side 2a lies along the y–axis such that the mid–point of the base is at the origin. Find vertices of the triangle.

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13. Without using distance formula, show that points $(-2, -1), (4, 0), (3, 3)$ and $(-3, 2)$ are the vertices of a parallelogram.

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14. Find the value of x for which the points $(x, 1), (2, 1)$ and $(4, 5)$ are collinear.

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Exercise 10 2

1. By using the concept of equation of a line, prove that the three points $(3, 0), (-2, -2)$ and $(8, 2)$ are collinear.

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2. Write the equations for the x–and y–axes.

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3. Find the equation of the line which satisfy the given conditions : Passing through the point $(-4, 3)$with slope $\frac{1}{2}$.

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4. Find the equation of the line which satisfy the given conditions : Passing through (0, 0) with slope m.

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5. Find the equation of the line which satisfy the given conditions : Passing through $(2, 2\sqrt{3})$ and inclined with the xaxis at an angle of 75°.

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6. Find the equation of the line which satisfy the given conditions : Intersecting the xaxis at a distance of 3 units to the left of origin with slope 2.

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7. Find the equation of the line which satisfy the given conditions : Intersecting the yaxis at a distance of 2 units above the origin and making an angle of 30° with positive direction of the xaxis.

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8. Find the equation of the line which satisfy the given conditions : Passing through the

point $(-1, 1)$and $(2, -4)$

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9. Point R (h, k) divides a line segment between the axes m the ratio $1:2$. Find equation of the line.

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10. P (a, b) is the midpoint of a line segment between axes. Show that equation of the line

is $\frac{x}{a}+\frac{y}{b}=2$.

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11. Find equation of the line passing through the point (2, 2) and cutting off intercepts on the axes whose sum is 9.

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12. Find the equation of a line that cuts off equal intercepts on the coordinate axes and

passes through the point (2, 3).

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13. A line perpendicular to the line segment joining the points (1, 0) and (2, 3) divides it in the ratio $1:n$. Find the equation of the line.

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14. Find the equation of the line passing through $(3, -5)$and perpendicular to the

line through the points $(1, 0)$and $(-4, 1)$.

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15. The owner of a milk store finds that, he can sell 980 litres of milk each week at Rs 14/litre and 1220 litres of milk each week at Rs 16 / litre. Assuming a linear relationship between selling price and demand, how many litres could he sell weekly at Rs 17 / litre?

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16. The length L (in centimetre) of a copper rod is a linear function of its Celsius temperature C. In an experiment, if $L = 124.942$when $C = 20$and $L = 125.134$when $C = 110$, express L in terms of C.

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17. The perpendicular from the origin to a line meets it at the point $(2, 9)$, find the equation of the line.

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18. Find equation of the line through the point (0, 2) making an angle $\frac{2\pi}{3}$ with the positive xaxis. Also, find the equation of line parallel to it and crossing the xaxis at a distance of 2 units below the origin.

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19. Find the equation of the line which satisfy the given conditions : Perpendicular distance

from the origin is 5 units and the angle made by the perpendicular with the positive xaxis is 30°.

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20. The vertices of Δ PQR are $P(2, 1)$, $Q(-2, 3)$and $R(4, 5)$. Find equation of the median through the vertex R.

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Exercise 10 5

1. Find the new coordinates of the points in each of the following cases if the origin is shifted to the point (–3, –2) by a translation of axes.(i) (1, 1) (ii) (0, 1) (iii) (5, 0) (iv) (–1, –2) (v) (3, –5)

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2. Find what the following equations become when the origin is shifted to the point (1, 1)

(i) $x^2 + xy - 3x - y + 2 = 0$

(ii) $xy - y^2 - x + y = 0$

(iii) $xy - x - y + 1 = 0$

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