MATHS

NCERT - NCERT MATHEMATICS (GUJRATI)

STRAIGHT LINES

Examples

1. Find the slope of the lines :

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

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2. Find the slope of the lines :

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

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3. Find the slope of the lines :

Making inclination of 60° with the positive direction of x- axis.

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4. 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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5. 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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6. 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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7. Find the equations of the lines parallel to axes and passing through $(2, \quad 3)$.

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

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

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10. Write the equation of the lines for which $\tan\theta = \frac{1}{2}, \quad \text{where} \quad \theta$ is the inclination of the line and (i) y- intercept is $-\frac{3}{2}$ (ii) x - interecept is 4.

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11. Find the equation of the line, which makes intercepts $-3 \quad \text{and} \quad 2$ on the x - and y- axes respectvely.

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

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13. The Fahrenheit remperature F and absolute temperature K satisfy a linear equation. Given that $K = 273 \text{ when } F = 32$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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14. Equation of a line is $3x - 4y + 10 = 0$. Find its (i) slope , (ii) x - and y - intercepts.

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

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16. Find angle between the lines $y - \sqrt{3}x - 50$ and $\sqrt{3}y - x + 6 = 0$.

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17. 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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18. 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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19. Find the distance of the point $(3, -5)$ from the line $3x - 4y - 26 = 0$.

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20. Find the distance between the parallel lines $3x - 4y + 7 = 0$ and $3x - 4y + 5 = 0$

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21. If the lines $2x + y - 3 = 0, 5x + ky - 3 = 0$ and $3x - y - 2 = 0$ are concurrent , find the value of k.

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

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23. 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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24. 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 $\frac{(c_1 - c_2)^2}{2|m_1 - m_2|}$.

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25. 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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26. 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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Exercise 10 1

1. 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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2. 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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3. Find the distance between $P(x_1, y_1)$ and $Q(x_2, y_2)$ when : (i) PQ is parallel to the y-axis, (ii) PQ is parallel to the x-axis.

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

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

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6. 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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7. Find the slope of the line, which makes an angle of 30° with the positive direction of y-axis measured anticlockwise.

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

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

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10. 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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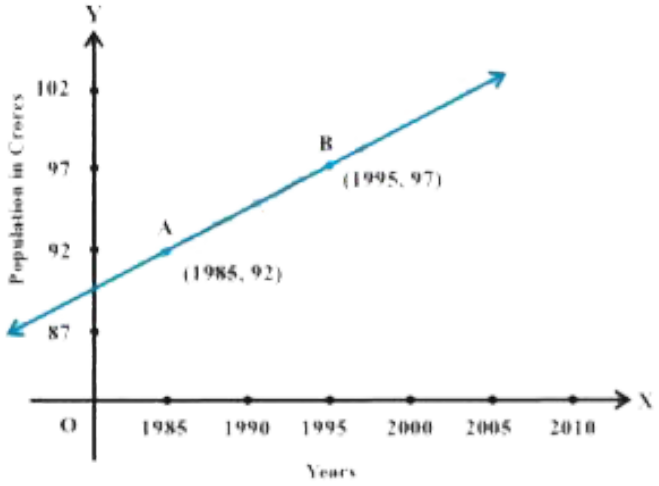
11. Consider the following population and year graph (Fig 10.10), find the slope of the line AB and using it, find what will be the population in the year 2010?



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Exercise 10 2

1. Write the equations for the x-and y-axes.

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2. Find the equation of the line passing through the point $(-4, 3)$ with slope $\frac{1}{2}$.

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3. Find the equation of the line passing through $(0, 0)$ with slope m.

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4. Obtain Equation of line which satisfy given condition :

Passing through $\left(2, 2\sqrt{3}\right)$ and inclined with the X-axis at an angle of 75°.

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5. Find the equation of the line intersecting the x-axis at a distance of 3 units to the left of origin with slope -2.

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6. Find the equation of the line intersecting the y-axis at a distance of 2 units above the origin and making an angle of 30° with positive direction of the x-axis.

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7. Find the equation of the line passing through the points $(-1, 1)$ and $(2, -4)$.

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8. Find the equation of the line which is at a perpendicular distance from the origin is 5 units and the angle made by the perpendicular with the positive x-axis is 30°.

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

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10. Find the equation of the line passing through $(-3, 5)$ and perpendicular to the line through the points $(2, 5)$ and $(-3, 6)$.

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11. 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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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. 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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14. Find equation of the line through the point(0, 2) making an angle $\frac{2\pi}{3}$ with the positive x-axis. Also, find the equation of line parallel to it and

crossing the y-axis at a distance of 2 units below the origin.

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

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17. 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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18. P (a, b) is the mid-point of a line segment between axes. Show that equation of the line is $\frac{x}{a} + \frac{y}{b}$ =2.

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

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Exercise 10 3

1. Reduce the following equations into slope - intercept form and find their slopes and the y-intercepts.

$(i)x + 7y = 0, \quad (ii)6x + 3y - 5 = 0, \quad (iii)y = 0$

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

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

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3. Reduce the following equation in normal form. Find their perpendicular distances from origin and between perpendicular distance with positive side of X- axis :

(i) $x - \sqrt{3}y + 8 = 0$

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4. Find the distance of the point $(-1, 1)$ from the line $12(x + 6) = 5(y - 2)$.

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

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6. Find the distance between parallel lines

$(i) 15x + 8y - 34 = 0$ and $15x + 8y + 31 = 0 (ii) l(x + y) + p = 0$ and

.

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

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

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

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10. The line through the points $(h, 3)$ and $(4, 1)$ intersects the line $7x - 9y - 17 = 0$ at right angle. Find the value of h.

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

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

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14. Find the coordinates of the foot of perpendicular from the point $(-1, 3)$ to the line $3x - 4y - 16 = 0$.

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15. 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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16. 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 $x\sec\theta + y\operatorname{cosec}\theta = k$ respectively, prove that $p^2 + 4q^2 = k^2$.

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17. 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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18. 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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Miscellaneous Exercise On Chapter 10

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

(ii) Parallel to the y-axis.

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

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

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

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

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

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7. 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 y-axis.

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

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9. 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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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 line passing through the origin and making an angle θ with the line $y = mx + c$ is $\frac{y}{x} = \frac{m \pm \tan\theta}{1 \pm m\tan\theta}$.

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

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15. 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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16. 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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17. The hypotenuse of a right angled triangle has its ends at the points $(1, 3)$ and $(-4, 1)$. Find an equation of the legs (perpendicular sides) of the triangle.

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18. 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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19. 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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20. If sum of the perpendicular distances of a variable point $P(x, y)$ form the lines $x + y - 5 = 0$ and $3x - 2y + 7 = 0$ is always 10. Show that P must move on a line.

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

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22. 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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23. 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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24. 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 equation of the path that he should follow.

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