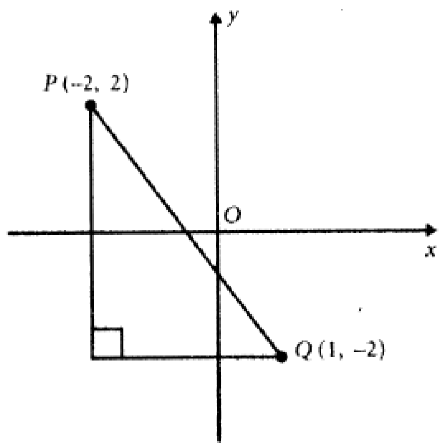
COORDINATE GEOMETRY

71. FINDING THE DISTANCE BETWEEN TWO POINTS

To find the distance between points, **use the Pythagorean theorem or special right triangles.** The difference between the *x*s is one leg and the difference between the *y*s is the other leg.



In the figure above, $\overline{PQ}$ is the hypotenuse of a 3-4-5 triangle, so $PQ = 5$.

You can also use the **distance formula:**

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

To find the distance between $R(3, 6)$ and $S(5, -2)$:

$$\begin{aligned} d &= \sqrt{(5-3)^2 + (-2-6)^2} \\ &= \sqrt{(2)^2 + (-8)^2} \\ &= \sqrt{68} = 2\sqrt{17} \end{aligned}$$

72. USING TWO POINTS TO FIND THE SLOPE

In mathematics, the slope of a line is often called m.

$$\text{Slope} = m = \frac{\text{Change in } y}{\text{Change in } x} = \frac{\text{Rise}}{\text{Run}}$$

The slope of the line that contains the points $A(2, 3)$ and $B(0, -1)$ is:

$$\frac{y_2 - y_1}{x_2 - x_1} = \frac{-1 - 3}{0 - 2} = \frac{-4}{-2} = 2$$

73. USING AN EQUATION TO FIND THE SLOPE

To find the slope of a line from an equation, put the equation into the **slope-intercept** form:

$$y = mx + b$$

The slope is m. To find the slope of the equation $3x + 2y = 4$, reexpress it:

$$\begin{aligned} 3x + 2y &= 4 \\ 2y &= -3x + 4 \\ y &= -\frac{3}{2}x + 2 \end{aligned}$$

The slope is $-\frac{3}{2}$.

74. USING AN EQUATION TO FIND AN INTERCEPT

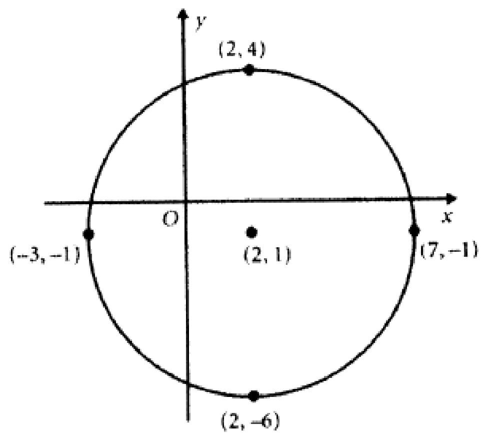
To find the y-intercept, you can either put the equation into $\boldsymbol{y = mx + b}$ **(slope-intercept)** form—in which case b is the y-intercept—or you can just plug $x = 0$ into the equation and solve for y. To find the x-intercept, plug $y = 0$ into the equation and solve for x.

75. EQUATION FOR A CIRCLE

The equation for a circle of radius r and centered at (h, k) is:

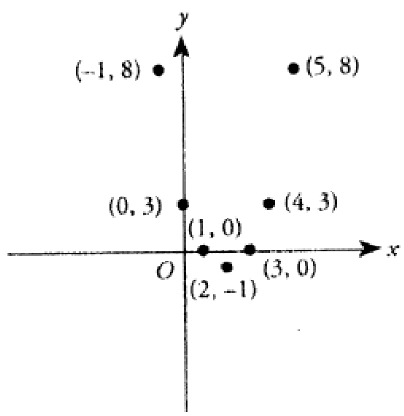
$$(x - h)^2 + (y - k)^2 = r^2$$

The following figure shows the graph of the equation $(x - 2)^2 + (y + 1)^2 = 25$:



76. EQUATION FOR A PARABOLA

The graph of an equation in the form $y = ax^2 + bx + c$ is a parabola. The figure below shows the graph of seven pairs of numbers that satisfy the equation $y = x^2 - 4x + 3$:

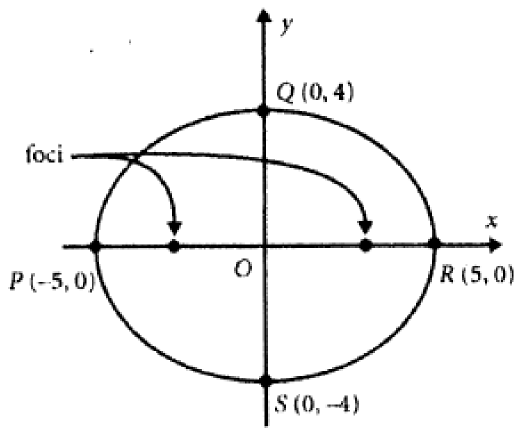


77. EQUATION FOR AN ELLIPSE

The graph of an equation in the form

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

is an ellipse with $2a$ as the sum of the focal radii and with foci on the x-axis at $(0, -c)$ and $(0, c)$, where $c = \sqrt{a^2 - b^2}$. The following figure shows the graph of $\frac{x^2}{25} + \frac{y^2}{16} = 1$:



The foci are at (−3, 0) and (3, 0). $\overline{PR}$ is the **major axis,** and $\overline{QS}$ is the **minor axis.** This ellipse is symmetrical about both the *x*- and *y*-axes.