Math 10 Lecture Videos

Section 3.1: Graphing Linear Equations in Two Variables

PAUL ANDREW GORGONIO

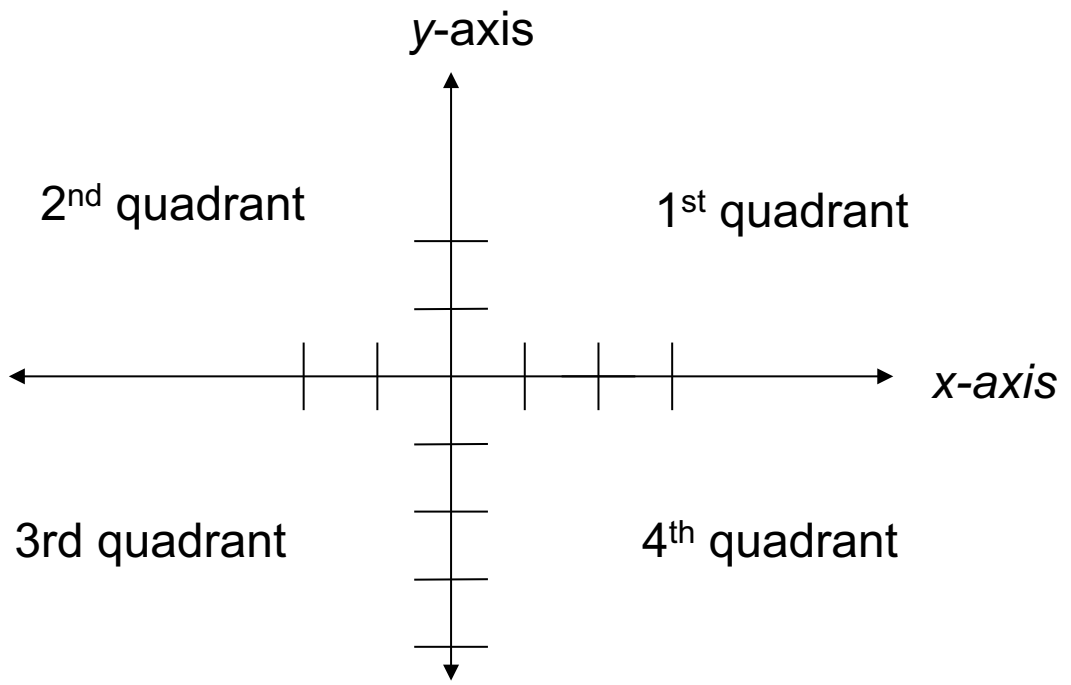
OBJECTIVES:

1. Plot ordered pairs in the rectangular coordinate system.
2. Find coordinates of points in the rectangular coordinate system.
3. Determine whether an ordered pair is a solution of an equation.
4. Find solutions of an equation in two variables.
5. Use point plotting to graph linear equations.
6. Use graphs of linear equations to solve problems.

Objective 1: Plot ordered pairs in the rectangular coordinate system.

The Rectangular Coordinate System

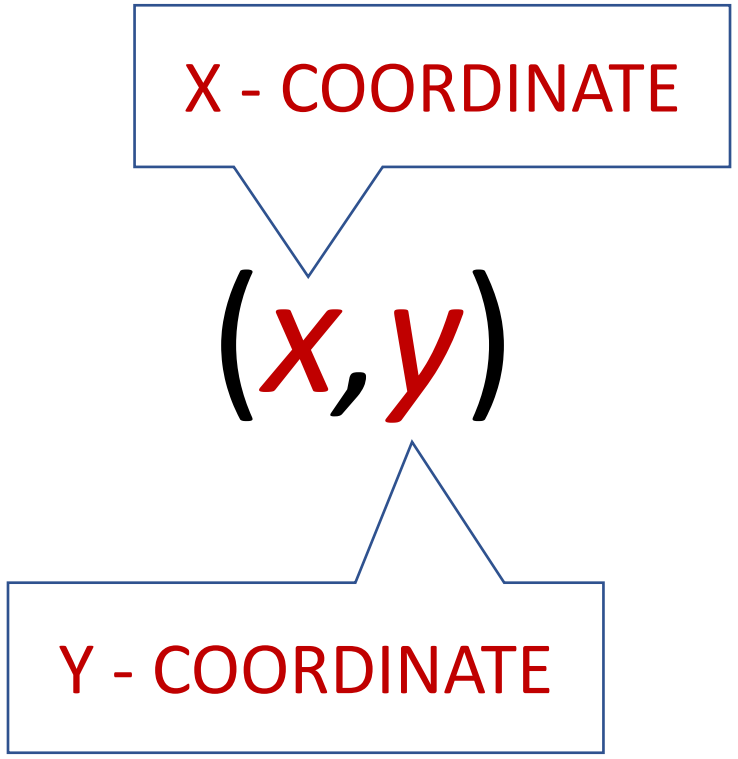
- Horizontal number line is the ***x-axis***.
- Vertical number line is the ***y-axis***.
- The point of intersection of these axes is their zero points, called the ***origin***.
- The axes divide the plane into 4 regions, called **quadrants**.



Objective 1: Plot ordered pairs in the rectangular coordinate system.

The Rectangular Coordinate System

- Each point in the rectangular coordinate system corresponds to an **ordered pair** of real numbers (x, y).
- The ***x-coordinate*** denotes the horizontal distance and direction from the origin parallel or along the *x*-axis.
- The ***y-coordinate*** denotes vertical distance and direction along a line parallel to the *y*-axis or along the *y*-axis itself.

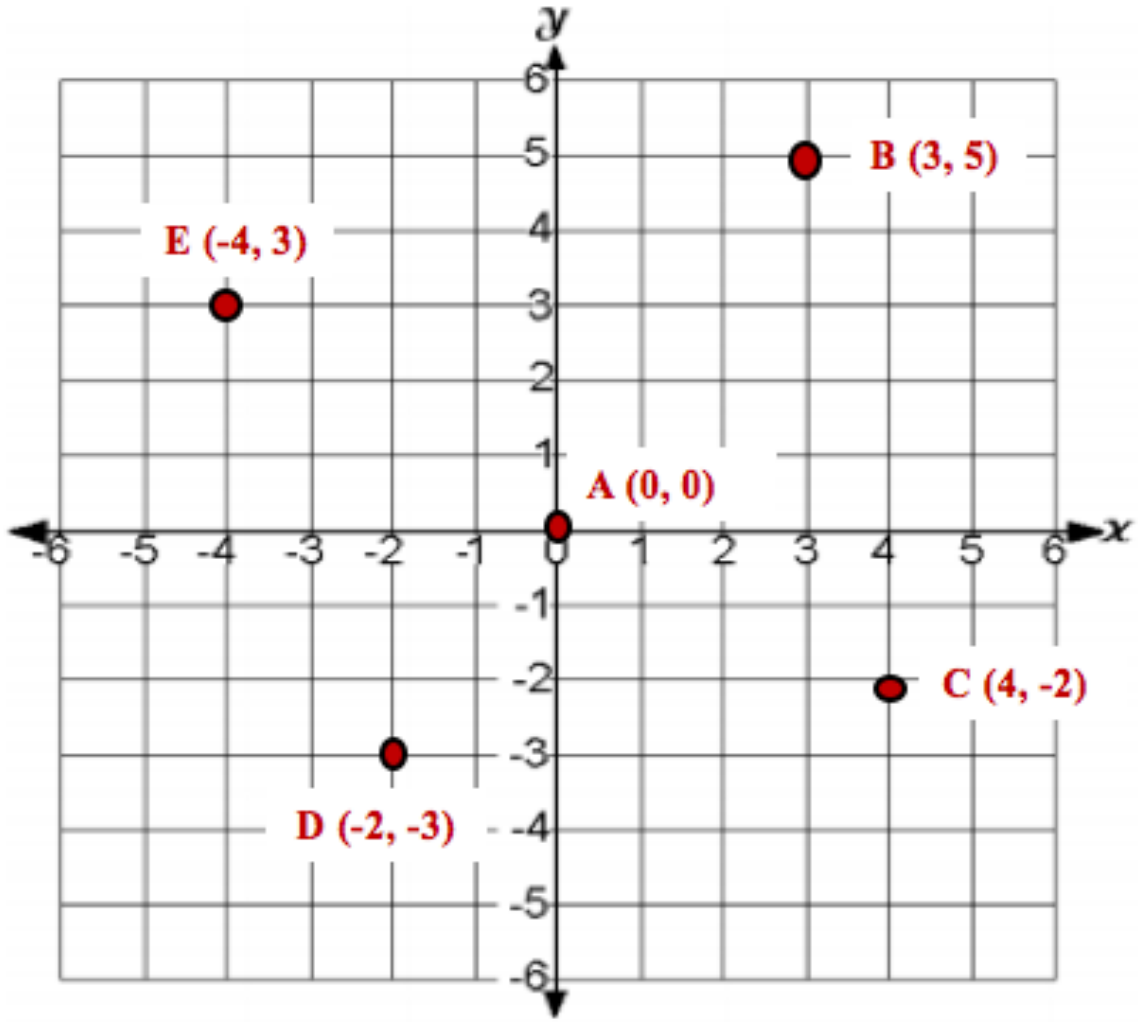


Objective 1: Plot ordered pairs in the rectangular coordinate system.

In plotting points, we move **across first** (either left or right), and **then move either up or down**, always starting **from the origin**.

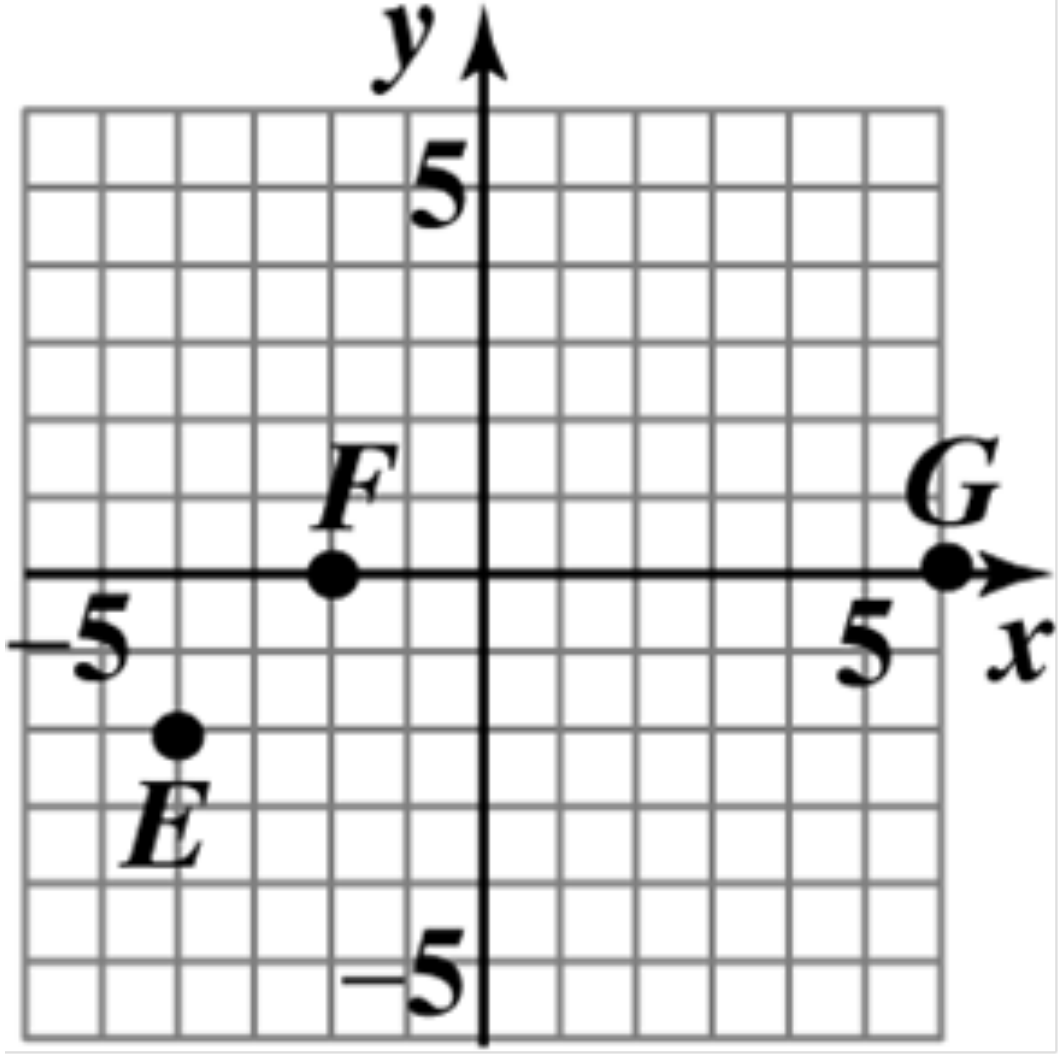
POINT	MOVEMENT FROM ORIGIN	QUADRANT
(0,0)	0 right or left, 0 up or down	Origin
(3,5)	3 units right, 5 units up	I
(4,-2)	4 units right, 2 units down	IV
(-2,-3)	2 units left, 3 units down	II
(-4, 3)	4 units left, three units up	II

Objective 1: Plot ordered pairs in the rectangular coordinate system.



POINT	MOVEMENT	QT
A. (0,0)	0 right or left, 0 up or down	Origin
B. (3,5)	3 units right, 5 units up	I
C. (4,-2)	4 units right, 2 units down	IV
D. (-2,-3)	2 units left, 3 units down	III
E.(-4, 3)	4 units left, three units up	II

Objective 2: Find coordinates of points in the rectangular coordinate system.



E	(-4,-2)
F	(-2,0)
G	(6,0)

Objective 3: Determine whether an ordered pair is a solution of an equation.

- The graph of an equation in two variables is the set of points whose coordinates satisfy the equation.

- An ordered pair of real numbers (x, y) is said to satisfy the equation when substitution of the x and y coordinates into the equation makes it a true statement.

Objective 3: Determine whether an ordered pair is a solution of an equation.

Example: $y = 2x + 6$

1. Is (1,8) a solution?

$y = 2x + 6$

$8 = 2(1) + 6$

$8 = 8$

2. Is (2,3) a solution?

$y = 2x + 6$

$3 = 2(2) + 6$

$3 \neq 10$

Objective 4: Finding Solutions to an Equation

Find five *solutions* to the equation:

$y = 3x + 1$

*Start by choosing x **values** and then computing the corresponding y values.*

Value of X	Value Y given X	Ordered Pair
If x = -2	Y = 3(-2) + 1 = -6 + 1 = -5	(-2,-5)
If x = -1	Y = 3(-1) + 1 = -3 + 1 = -2	(-1,-2)
If x = 0	Y = 3(0) + 1 = 0 + 1 = 1	(0,1)
If x = 1	Y = 3(1) + 1 = 4	(1,4)
If x = 2	Y = 3(2) + 1 = 7	(2, 7)

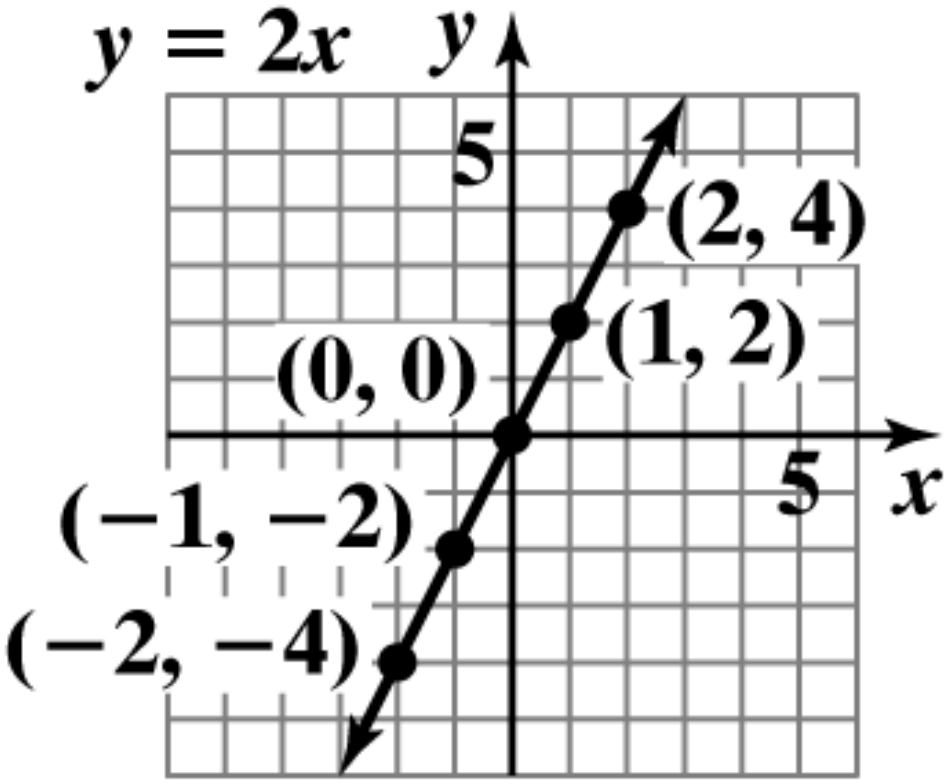
Objective 5: Use Point Plotting to Graph Linear Equations

- Find several ordered pairs that are solutions of the equation.
- Plot these ordered pairs as points in the rectangular coordinate system.
- Connect the points with a smooth curve or line.

Objective 5: Use Point Plotting to Graph Linear Equations

Example: Graph the equation y = 2x

x	$y = 2x$	(x, y)
-2	$y = 2(-2) = -4$	$(-2, -4)$
-1	$y = 2(-1) = -2$	$(-1, -2)$
0	$y = 2(0) = 0$	$(0, 0)$
1	$y = 2(1) = 2$	$(1, 2)$
2	$y = 2(2) = 4$	$(2, 4)$



Objective 5: Use Point Plotting to Graph Linear Equations

Example: Graph the equation $y = \frac{1}{2}x + 2$

x	$y = \frac{1}{2}x + 2$	(x, y)
–4	$y = \frac{1}{2}(-4) + 2 = 0$	(–4,0)
–2	$y = \frac{1}{2}(-2) + 2 = 1$	(–2,1)
0	$y = \frac{1}{2}(0) + 2 = 2$	(0,2)
2	$y = \frac{1}{2}(2) + 2 = 3$	(2,3)
4	$y = \frac{1}{2}(4) + 2 = 4$	(4,4)

Objective 6: Use graphs of linear equations to solve problems.

Part of the beauty of the rectangular coordinate system is that it allows us to “see” mathematical models and visualize the solution to a problem.

Objective 6: Use graphs of linear equations to solve problems.

Example: The mathematical model $D = 1.4n + 1$ describes the percentage of consumers, *D*, who paid primarily with debit cards *n* years after 1995.

a. Let $n = 0, 5, 10,$ and 15. Make a table of values showing four solutions of the equation.

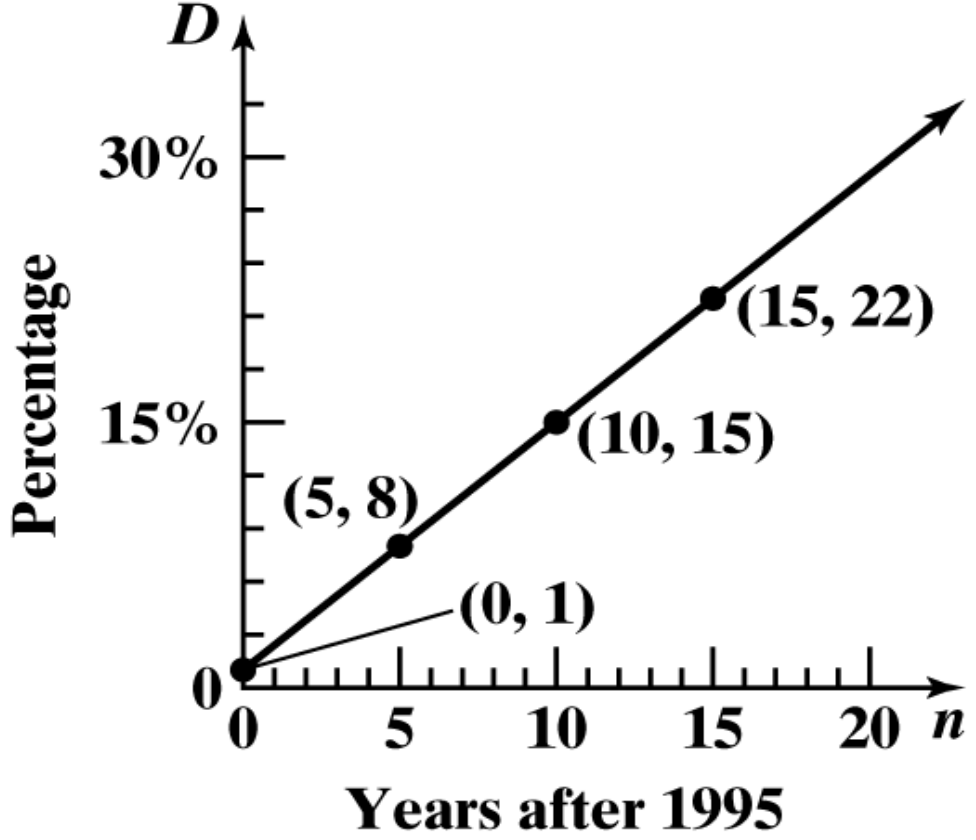
n	$D = 1.4n + 1$	(n, D)
0	$D = 1.4(0) + 1 = 1$	(0,1)
5	$D = 1.4(5) + 1 = 8$	(5,8)
10	$D = 1.4(10) + 1 = 15$	(10,15)
15	$D = 1.4(15) + 1 = 22$	(15,22)

Objective 6: Use graphs of linear equations to solve problems.

Example: The mathematical model D = 1.4n + 1 describes the percentage of consumers, *D*, who paid primarily with debit cards *n* years after 1995.

b. Graph the formula!

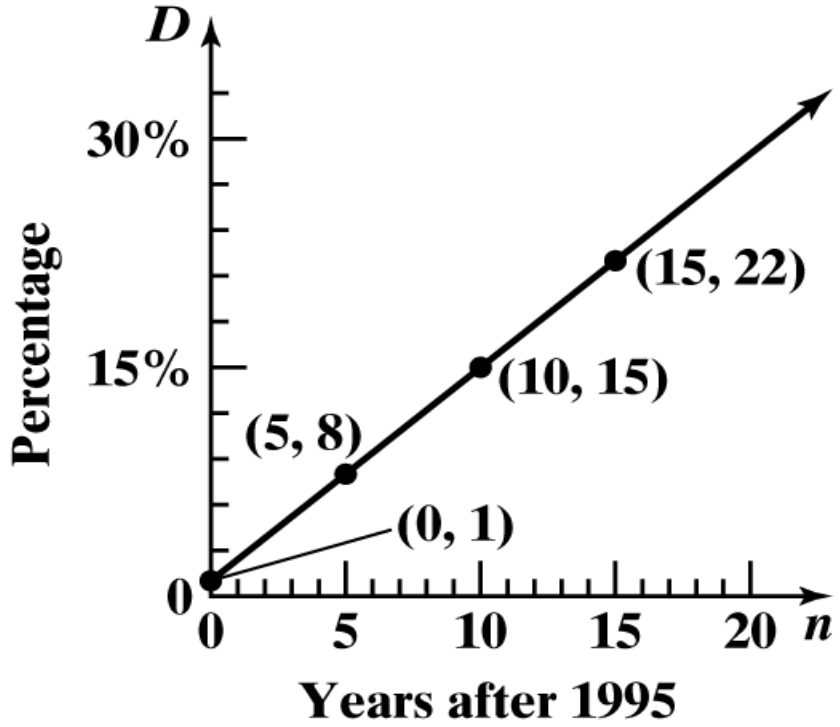
n	$D = 1.4n + 1$	(n, D)
0	$D = 1.4(0) + 1 = 1$	(0,1)
5	$D = 1.4(5) + 1 = 8$	(5,8)
10	$D = 1.4(10) + 1 = 15$	(10,15)
15	$D = 1.4(15) + 1 = 22$	(15,22)



Objective 6: Use graphs of linear equations to solve problems.

Example: The mathematical model $D = 1.4n + 1$ describes the percentage of consumers, *D*, who paid primarily with debit cards *n* years after 1995.

c. Use your graph from part (b) to estimate the percentage of consumers who will pay primarily with debit cards in 2015.



2015 is how many years after 1995?

2015 – 1995 = 20 years

About 29% of consumers will pay primarily with debit cards in 2015.

Objective 6: Use graphs of linear equations to solve problems.

Example: The mathematical model $D = 1.4n + 1$ describes the percentage of consumers, *D*, who paid primarily with debit cards *n* years after 1995.

d. Use the formula to project the percentage of consumers who will pay primarily by debit cards in 2015.

$$D = 1.4n + 1$$

$$D = 1.4(20) + 1$$

$$= 29$$

According to the formula, about 29% of consumers will pay primarily with debit cards in 2015.

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