

**FORMULA SHEET**

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

**Midpoint**  $\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$

**Slope**  $m = \frac{y_2 - y_1}{x_2 - x_1}$

**Point-Slope**

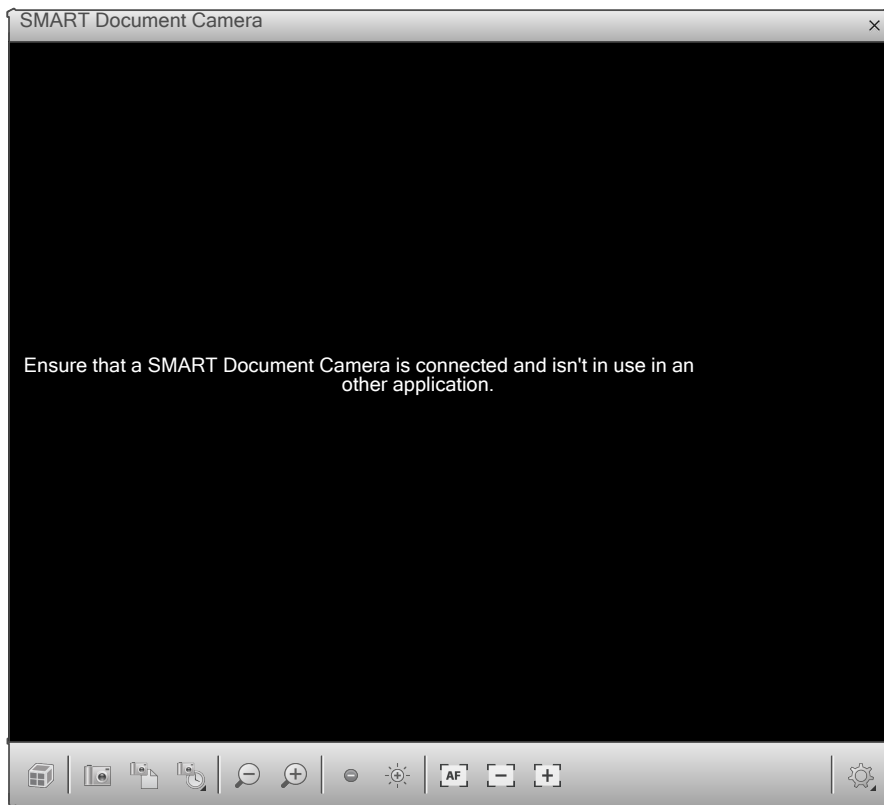
$$y - y_1 = m(x - x_1)$$

**Slope-Intercept**

$$y = mx + b$$

**General Form**

$$Ax + By + C = 0$$



①

Examples: Factors and Products

GCF

$$\begin{array}{l} 80 \rightarrow (2 \times 2 \times 2 \times 2 \times 5) \\ 50 \rightarrow (2 \times 5 \times 5) \end{array} \quad \begin{array}{l} \text{GCF} = 2 \times 5 \\ = 10 \end{array}$$

LCM

$$\begin{array}{l} 80 \rightarrow 2 \times 2 \times 2 \times 2 \times 5 = (2^4) \times 5 \\ 50 \rightarrow 2 \times 5 \times 5 = 2 \times (5^2) \end{array} \quad \begin{array}{l} \text{LCM} = 2^4 \times 5^2 \\ = 16 \times 25 \\ = 400 \end{array}$$

LCM

GCF

Square root

$$\sqrt{64} = (2 \times 2) \times (2 \times 2) \times (2 \times 2)$$

$$2 \times 2 \times 2$$

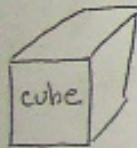
$$8$$

Cube root

$$\sqrt[3]{64} = (2 \times 2 \times 2) \times (2 \times 2 \times 2)$$

$$2 \times 2$$

$$4$$



Volume = 4096

STEP 1

$$\sqrt[3]{4096} =$$

$$(2 \times 2 \times 2) \times (2 \times 2 \times 2) \times (2 \times 2 \times 2) \times (2 \times 2 \times 2)$$

$$2 \times 2 \times 2 \times 2 \times 2$$

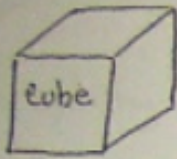
$$16$$

Surface Area

$$\square_{16}$$

$$A = 16 \times 16 = 256$$

$$\frac{\times 6 \text{ sides}}{1536}$$



Surface Area = 1944

STEP 1  
 $1944 \div 6 \text{ sides}$   
 324

STEP 2  
 $\sqrt[3]{324}$   
 $(2 \times 2) \times (3 \times 3) \times (3 \times 3)$   
 $2 \times 3 \times 3$   
 18

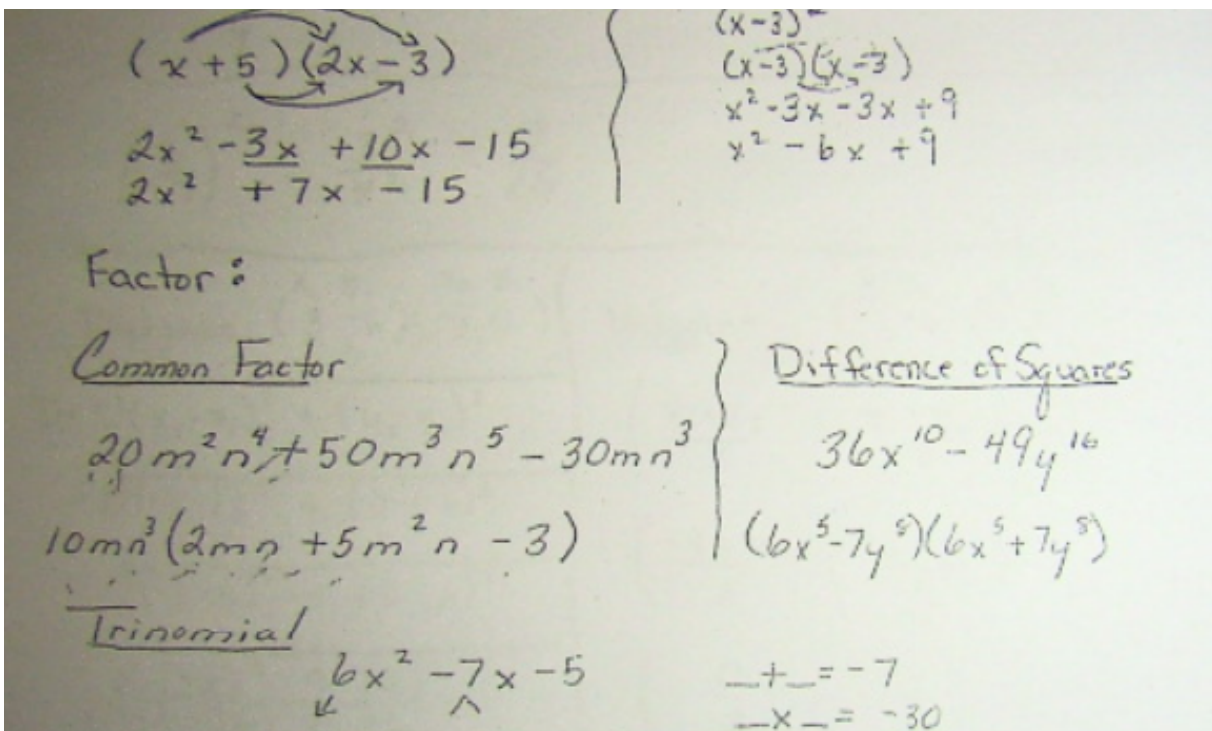
STEP 3  
 Volume  
 $V = L \times W \times H$   
 $= 18 \times 18 \times 18$   
 $= 5832$

Simplify

$$5(3x^2 + 6x - 1) - 3(8x^2 + 3x - 5)$$

$$\underline{15x^2} + \underline{30x} - \underline{5} - \underline{24x^2} - \underline{9x} + \underline{15}$$

$$-9x^2 + 21x + 10$$



$$\left(\frac{6x}{6} - \frac{10}{6}\right) \left(\frac{6x}{6} + \frac{3}{6}\right)$$

$$(1x - \frac{5}{3}) (1x + \frac{1}{2})$$

$$(3x - 5) (2x + 1)$$

- 1 x 30
- 2 x 15
- 3 x 10
- 5 x 6

③

Examples: Roots and Powers

$$\sqrt[n]{128}$$

↑ index  
 ↓ radicand

Mixed Radicals

$$\sqrt[5]{96} = (2 \times 2 \times 2 \times 2 \times 2) \times 3$$

↓  
 2  $\sqrt{3}$

$$\sqrt[3]{648} = (2 \times 2 \times 2) \times (3 \times 3 \times 3) \times 3$$

↓                      ↓  
 3 × 2 × 3  $\sqrt{3}$   
 18  $\sqrt{3}$

## Entire Radicals

$$-3\sqrt[4]{5} = \sqrt[4]{5 \times 3 \times 3 \times 3 \times 3}$$

$$= -\sqrt[4]{405}$$

## Fractional Exponents

$$4^{1/2} = \sqrt{4}$$

$$6^{2/3} = (\sqrt[3]{6})^2$$

$$9^{0.5} = 9^{1/2} = \sqrt{9}$$

$$8^{-3} = \frac{1}{8^3}$$

$$\frac{x^4}{u^{-5}} = x^4 y^5$$

$$\left. \begin{array}{l} \left(\frac{4}{9}\right)^{-1/2} \\ \left(\frac{9}{4}\right)^{1/2} \\ \sqrt{\frac{9}{4}} \end{array} \right\} \text{m/w}$$



Simplify

$$\frac{x^9}{x^7} = x^2 \quad \left\{ \begin{array}{l} x^9 \cdot x^{-7} = x^{16} \\ (x^9)^7 = x^{63} \end{array} \right.$$


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$$\left( \frac{48 x^5 y^2}{6 x^{-3} y^6} \right)^{1/2}$$

$$\left( 8 x^8 y^{-4} \right)^{1/2} \quad \text{Simplify inside brackets.}$$

$$8^{1/2} x^4 y^{-2} \quad \text{Express with positive exponents}$$

$$\frac{8^{1/2} x^4}{y^2}$$


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$$\left( \frac{3}{4} \right)^2 = \frac{3^2}{4^2} = \frac{9}{16}$$

Distance	$x_1, y_1$	$x_2, y_2$
	$(3, -6)$	$(-3, 0)$

$$D = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$
$$= \sqrt{(-3 - 3)^2 + (0 - (-6))^2}$$
$$= \sqrt{(-3 - 3)^2 + (0 + 6)^2}$$
$$= \sqrt{(-6)^2 + (6)^2}$$
$$= \sqrt{36 + 36}$$
$$= \sqrt{72}$$
$$= 8.5$$

Midpoint	$x_1, y_1$	$x_2, y_2$
	$(-4, -6)$	$(4, 2)$

$$\left( \frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$
$$\left( \frac{-4 + 4}{2}, \frac{-6 + 2}{2} \right)$$
$$\left( \frac{0}{2}, \frac{-4}{2} \right)$$
$$(0, -2)$$

(5)

Domain (x-values)  $\{ \leq x \leq , x \in \}$

Range (y-values)  $\{ \leq y \leq , y \in \}$

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x	y
5	40
6	45
7	50

$$y = 5x + 15$$

$$f(x) = 3x - 2$$

$$g(x) = \frac{3}{2}(x-2)$$

$$f(2) = 3(2) - 2$$

$$f(2) = 6 - 2$$

$$f(2) = 4$$

$$g(10) = \frac{3}{2}(10-2)$$

$$g(10) = \frac{3}{2}(8)$$

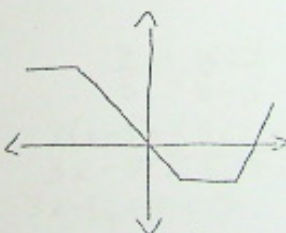
$$g(10) = 1.5(8)$$

$$g(10) = 12$$

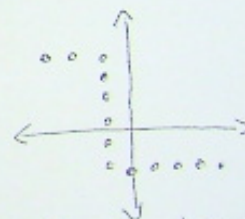
### Functions

x	y
3	11
8	22
15	33
30	44

There is only one y value for every x value.



vertical line test



Non-function vertical line hits more than one

slope

$$m = \frac{\text{rise}}{\text{run}}$$

$$\begin{array}{cc} x_1 & y_1 & x_2 & y_2 \\ (-4, -8) & & (6, 5) \end{array}$$

$$\begin{aligned} m &= \frac{y_2 - y_1}{x_2 - x_1} \\ &= \frac{5 - (-8)}{6 - (-4)} \\ &= \frac{5 + 8}{6 + 4} \\ &= \frac{13}{10} \end{aligned}$$

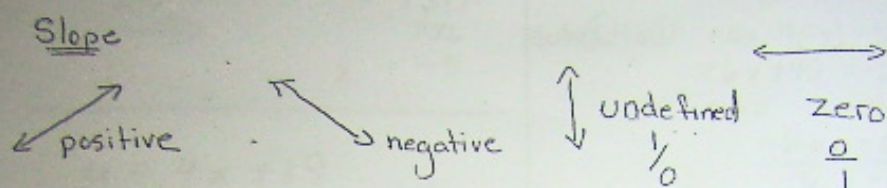
$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$y = mx + b$$

↑                    ↑  
slope            y-int

Get in the form  $y = mx + b$ 

$$\begin{aligned} 5x - 2y + 14 &= 0 \\ -2y + 14 &= -5x - 14 \\ -2y &= -5x - 14 \\ y &= \frac{5}{2}x + 7 \end{aligned}$$



$$m = \frac{4}{5} \quad (10, p) \quad (-5, -2) \quad \text{Find } p$$

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$\frac{4}{5} = \frac{-2 - p}{-5 - 10}$$

$$5(-2 - p) = 4(-5 - 10)$$

$$-10 - 5p = -20 - 40$$

$$-5p = -20 - 40 + 10$$

$$\frac{-5p}{-5} = \frac{-50}{-5}$$

$$p = 10$$

## Equations of Lines

Slope - intercept Form

$$y = mx + b$$

Slope - Point Form

$$y - y_1 = m(x - x_1)$$

General Form

$$ax + by + c = 0$$

Determine the equation of a line passing through the points (11, 9) and (12, -3).

State your answer in slope-point form.

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m = \frac{-3 - 9}{12 - 11}$$

$$m = \frac{-12}{1}$$

$$y - y_1 = m(x - x_1)$$

$$y - 9 = -12(x - 11)$$

$$y - 9 = -12x + 132$$

$$12x + y - 9 - 132 = 0$$

$$12x + y - 141 = 0$$

$$y - y_1 = m(x - x_1)$$

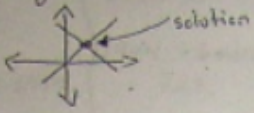
$$y - (-3) = -12(x - 12) \text{ Slope - Point Form}$$

$$y + 3 = -12(x - 12)$$

$$y + 3 = -12x + 144$$

$$12x + y + 3 - 144 = 0$$

$$12x + y - 141 = 0 \text{ General Form}$$

Graph 

Substitution

$$-2x - 6y = 16$$

$$y = 4x + 19$$


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$$-2x - 6(4x + 19) = 16$$

$$-2x - 24x - 114 = 16$$

$$-2x - 24x = 16 + 114$$

$$\begin{array}{r} -26x = 130 \\ \underline{-26} \phantom{x} \\ x = -5 \end{array}$$


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$$y = 4x + 19$$

$$y = 4(-5) + 19$$

$$y = -20 + 19$$

$$y = -1$$

Elimination

$$\begin{array}{r} -6x - 9y = -21 \quad (1) \\ -4x - 4y = -4 \quad (2) \\ \hline \textcircled{1} \times -4 \quad 24x + 36y = 84 \quad (3) \\ \textcircled{2} \times 6 \quad -24x - 24y = -24 \quad (4) \\ \hline \textcircled{3} + \textcircled{4} \quad -12y = 60 \\ \phantom{\textcircled{3} + \textcircled{4}} \phantom{-12} \phantom{y} \phantom{=} \phantom{60} \\ \phantom{\textcircled{3} + \textcircled{4}} \phantom{-12} \phantom{y} \phantom{=} \phantom{60} \\ \phantom{\textcircled{3} + \textcircled{4}} \phantom{-12} \phantom{y} \phantom{=} \phantom{60} \\ \phantom{\textcircled{3} + \textcircled{4}} \phantom{-12} \phantom{y} \phantom{=} \phantom{60} \\ \hline y = -5 \quad (5) \end{array}$$

Sub  $(5)$  in  $(1)$

$$\begin{array}{r} -6x - 9(-5) = -21 \\ -6x + 45 = -21 \\ -6x = -21 - 45 \\ -6x = -66 \\ \underline{-6} \phantom{x} \phantom{=} \phantom{-66} \\ x = 11 \end{array}$$

$(11, -5)$