5.3   Finding Slope Using a Formula
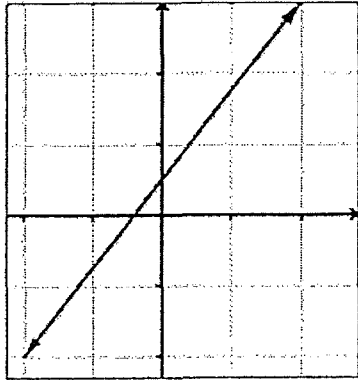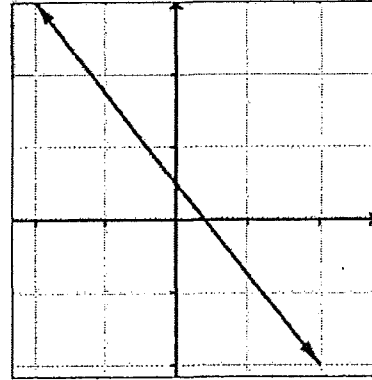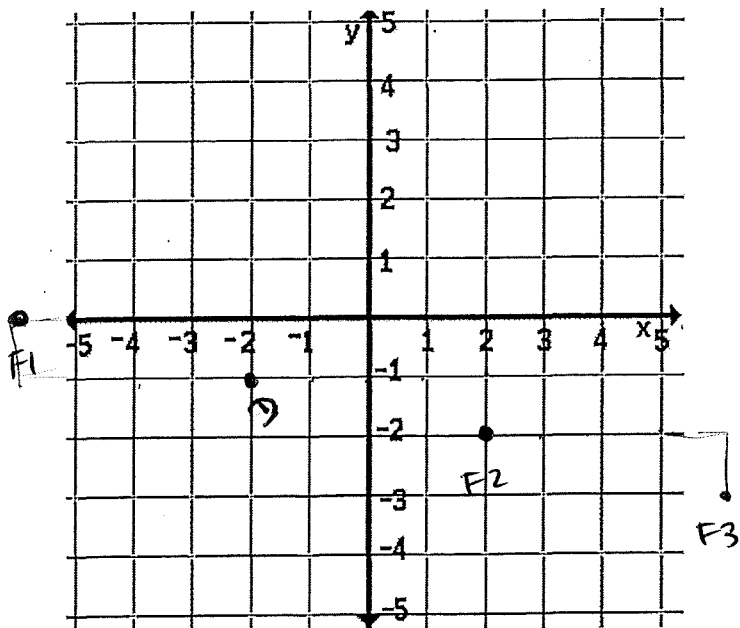
Remember:

Line with positive slope i.e. m>0   Line with negative slope i.e. m<0.

Formula for Slope:

$$slope = \frac{rise}{run}$$

Example 1. If $D(-2, -1)$ is a point on the line segment DF with slope of $\frac{-1}{4}$, find some possibilities for F.

F1(-6, 0)
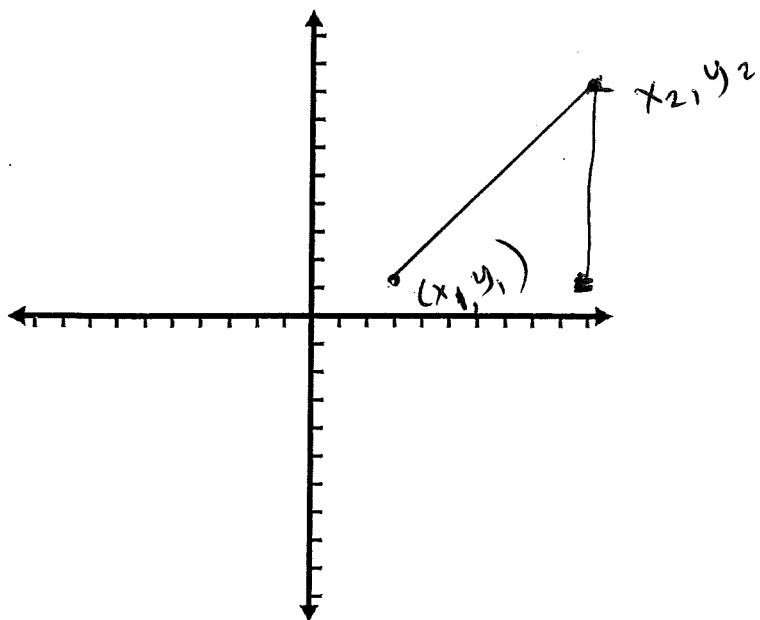
F2(2, -2)

F3(6, -3)

In general, for any points $A(x_1, y_2)$ and point $B(x_2, y_2)$ the slope of a line segment can be calculated.

x_2, y_2

(x_1, y_1)

$m = \dfrac{rise}{run} = \dfrac{\Delta y}{\Delta x}$

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

Examples:

$x_1 \; y_1 \qquad x_2 \; y_2$

1. Use the slope formula to calculate the slope of the line segment with points $D(6,8)$ and $H(12,10)$.

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

$= \dfrac{10 - 8}{12 - 6}$

$= \dfrac{2}{6}$

$= \frac{1}{3}$

2. Use the formula to find the slope of the line segment with points $D(-5,3)$ and $E(5, -3)$.

$m = \dfrac{-3 - 3}{5 - (-5)}$

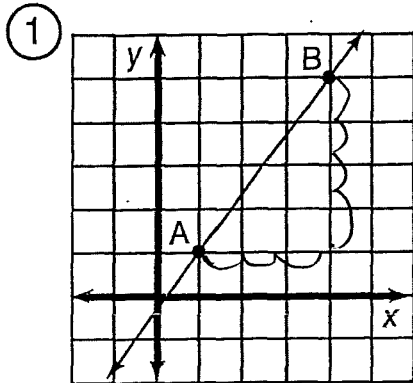$= \dfrac{-6}{10} = \dfrac{-3}{5}$
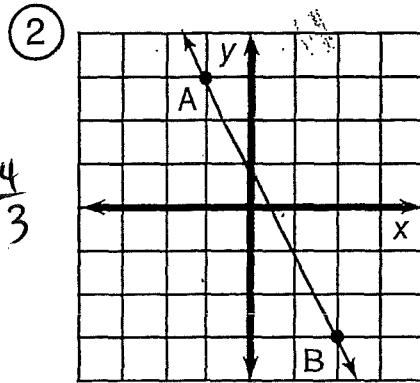
reduce/simplify.

Reminder $\dfrac{1}{0}$ undefined

$\dfrac{0}{1} = 0$
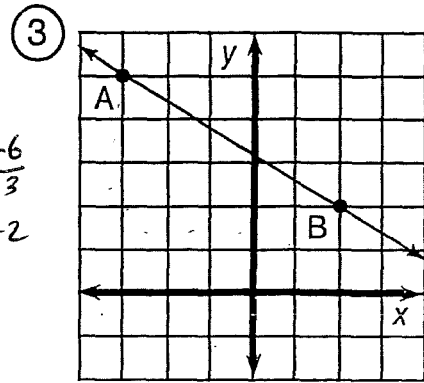
What Do You Call a Duck That Steals?

For the first six exercises, find the slope of the line $\overleftrightarrow{AB}$. For the remaining exercises, find the slope of the line that passes through the two given points. Cross out each box in the rectangle below that contains a correct answer. When you finish, print the letters from the remaining boxes in the spaces at the bottom of the page.
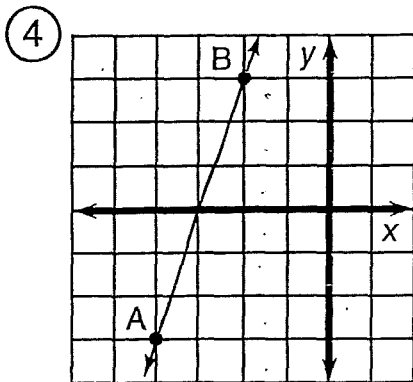
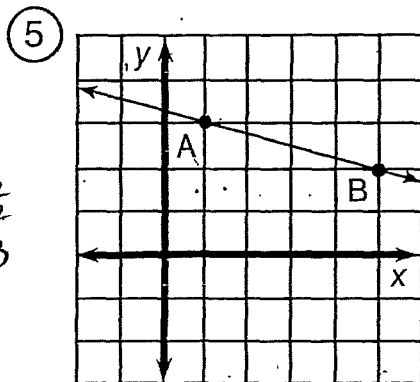① [graph with points A and B] $m = \frac{4}{3}$

② [graph with points A and B] $m = \frac{-6}{3} = -2$

③ [graph with points A and B] $m = \frac{-3}{5}$

④ [graph with points A and B] $m = \frac{6}{2} = 3$

⑤ [graph with points A and B] $m = \frac{-1}{4}$

⑥ [graph with points A and B] $m = 0$

⑦ (2, 1); (5, 3) $m = \frac{2}{3}$

⑧ (8, 3); (2, 5) $m = \frac{5-3}{2-8} = \frac{2}{-6}$ $-\frac{1}{3}$

⑨ (1, −4); (6, −2) $= \frac{2}{5}$

⑩ (−3, 1); (−7, 4) $\frac{3}{-4}$

⑪ (9, 2); (3, −1) $m = \frac{-3}{-6} = \frac{1}{2}$

⑫ (−5, 8); (−4, 2) $\frac{-6}{1}$

⑬ (0, −1); (4, −7) $\frac{-6}{4} = \frac{-3}{2}$

⑭ (1, −1); (−2, −6) $\frac{-5}{-3} = \frac{5}{3}$

⑮ (−4, −8); (−2, 0) $m = \frac{8}{2} = 4$

⑯ (−3, −3); (0, 0) $\frac{3}{3} = 1$

⑰ (2, 5); (9, 1) $\frac{-4}{7}$

⑱ (0, 0); (−2, 7) $\frac{7}{-2}$

DU	AB	CK	ST	AR	IG	AT	OB	IG	ET	BE	ST
0	−6	$\frac{3}{5}$	$-\frac{4}{7}$	9	$\frac{1}{2}$	$-\frac{7}{2}$	$-\frac{7}{6}$	$\frac{4}{8}$	$\frac{2}{3}$	$-\frac{5}{4}$	$\frac{5}{3}$

CA	RD	RI	CH	UC	RI	ME	AO	UA	KY	ET	CK
$\frac{2}{5}$	$\frac{1}{6}$	$-\frac{1}{4}$	-2	-8	$-\frac{3}{2}$	1	$-\frac{1}{3}$	$-\frac{3}{4}$	$\frac{8}{5}$	4	3

| A | R | O | B | B | E | R | D | U | C | K | Y |

OBJECTIVE 5–h: To find the slope of a line given two points on the line (not using the graph).

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

SLOPE FORMULA (PRACTICE)

Calculate the slope of the line containing the points:

1. $A(-2, 0)$ $B(0, 3)$

    $m = \dfrac{3-0}{0+2} = \dfrac{3}{2}$

2. $C(2, 3)$ $D(5, 1)$

    $m = \dfrac{1-3}{5-2}$

    $= -\dfrac{2}{3}$

3. $E(-1, 4)$ $F(2, 5)$

    $m = \dfrac{5-4}{2-(-1)} = \dfrac{1}{3}$

4. $G(3, -2)$ $H(1, 4)$

    $m = \dfrac{4+2}{1-3}$

    $= \dfrac{6}{-2} = -3$

5. $I(-1, -2)$ $J(-3, 2)$

    $m = \dfrac{2+2}{-3+1} = \dfrac{4}{-2}$

    $= -2$

6. $K(1, 3)$ $L(3, 1)$

    $m = \dfrac{1-3}{3-1}$

    $= \dfrac{-2}{2} = -1$

7. $M(2, 4)$ $N(2, -2)$

    $m = \dfrac{-2-4}{2-2} = \dfrac{-6}{0}$

    undefined

8. $P(-3, 4)$ $Q(-2, 1)$

    $m = \dfrac{1-4}{-2+3}$

    $= \dfrac{-3}{1} = -3$

9. $R(4, -2)$ $S(2, -4)$

    $m = \dfrac{-4+2}{2-4}$

    $= \dfrac{-2}{-2} = 1$

10. $T(-3, -1)$ $U(-3, 4)$

    $m = \dfrac{4+1}{-3+3}$

    $= \dfrac{5}{0}$ undefined

11. $V(-2, -5)$ $W(-4, -1)$

    $m = \dfrac{-1+5}{-4+2} = \dfrac{4}{-2}$

    $= -2$

12. $A(-3, -2)$ $B(0, -5)$

    $m = \dfrac{-5+2}{0+3} = \dfrac{-3}{3}$

    $= -1$

13. $C(3, -1)$ $D(-2, -1)$

    $m = \dfrac{-1+1}{-2-3}$

    $= \dfrac{0}{-5} = 0$

14. $E\left(\dfrac{1}{2}, \dfrac{3}{2}\right)$ $F\left(\dfrac{3}{2}, \dfrac{5}{2}\right)$

    $= \dfrac{\frac{5}{2} - \frac{3}{2}}{\frac{3}{2} - \frac{1}{2}}$

    $= \dfrac{2/2}{2/2} = \dfrac{1}{1} = 1$

15. $G\left(\dfrac{3}{7}, \dfrac{2}{3}\right)$ $H\left(\dfrac{1}{7}, \dfrac{8}{3}\right)$

    $m = \dfrac{\frac{8}{3} - \frac{2}{3}}{\frac{1}{7} - \frac{3}{7}}$

    $= \dfrac{\frac{6}{3}}{\frac{-2}{7}} = 2 \div \dfrac{-2}{7}$

    $= 2 \times \dfrac{7}{-2} = -7$

16. $J(1, 5)$ $K(12, 8)$

$m = \dfrac{8-5}{12-1}$

$= \dfrac{3}{11}$

17. $L(2, 3)$ $N(8, -1)$

$m = \dfrac{-1-3}{8-2}$

$= \dfrac{-4}{6} = \dfrac{-2}{3}$

18. $P(-2, -10)$ $Q(-12, -26)$

$m = \dfrac{-26+10}{-12+2}$

$= \dfrac{-16}{-10} = \dfrac{8}{5}$

19. $R(0, -9)$ $S(15, -6)$

$m = \dfrac{-6+9}{15-0}$

$= \dfrac{3}{15} = \dfrac{1}{5}$

20. $T(5, -1)$ $U(-5, 1)$

$m = \dfrac{1+1}{-5-5} = \dfrac{2}{-10}$

$= -\dfrac{1}{5}$

21. $V(-30, -10)$ $W(-50, 4)$

$m = \dfrac{4+10}{-50+30}$

$= \dfrac{14}{-20} = \dfrac{7}{-10}$

22. $X(19, 0)$ $Y(1, 30)$

$m = \dfrac{30-0}{1-19}$

$= \dfrac{30}{-18}$

$= \dfrac{15}{-9}$

$= \dfrac{5}{-3}$

23. $A\left(\dfrac{1}{5}, \dfrac{2}{7}\right)$ $B\left(\dfrac{3}{5}, \dfrac{1}{7}\right)$

$m = \dfrac{\dfrac{1}{7} - \dfrac{2}{7}}{\dfrac{3}{5} - \dfrac{1}{5}}$

$= \dfrac{-1}{7} \div \dfrac{2}{5}$

$= \dfrac{-1}{7} \times \dfrac{5}{2} = \dfrac{-5}{14}$

24. $C\left(-\dfrac{5}{6}, \dfrac{3}{8}\right)$ $D\left(\dfrac{1}{4}, -\dfrac{1}{2}\right)$

$m = \dfrac{-\dfrac{1}{2} - \dfrac{3}{8}}{\dfrac{1}{4} + \dfrac{5}{6}}$

$= \dfrac{-\dfrac{4}{8} - \dfrac{3}{8}}{\dfrac{3}{12} + \dfrac{10}{12}} = \dfrac{\dfrac{-7}{8}}{\dfrac{13}{12}}$

$= -\dfrac{7}{8} \times \dfrac{12}{13} = \dfrac{-84}{104} = \dfrac{-21}{26}$

ANSWERS

1) $\dfrac{3}{2}$ 2) $-\dfrac{2}{3}$ 3) $\dfrac{1}{3}$ 4) -3 5) -2 6) -1 7) undefined 8) -3 9) 1 10) undefined

11) -2 12) -1 13) 0 14) 1 15) -7 16) $\dfrac{3}{11}$ 17) $-\dfrac{2}{3}$ 18) $\dfrac{8}{5}$ 19) $\dfrac{1}{5}$ 20) $-\dfrac{1}{5}$

21) $-\dfrac{7}{10}$ 22) $-\dfrac{5}{3}$ 23) $-\dfrac{5}{14}$ 24) $-\dfrac{21}{26}$