

## EXERCISE SET 5 ANSWER KEY

## No Calculator

1. **8**

Substitute  $y = 3x$ :  $3x + 2y = 72$   
 $3x + 2(3x) = 72$   
 Simplify:  $9x = 72$   
 Divide by 9:  $x = 8$

2. **20**

Factor:  $4a^2 - 49b^2$   
 $(2a - 7b)(2a + 7b)$   
 Substitute:  $(10)(2) = 20$

3. **2**

Substitute  $x = -1, y = c$ :  $y = -4x - 3$   
 $c = -4(-1) - 3$   
 Simplify:  $c = 1$   
 Other equation:  $y = -3x - b$   
 Substitute  $x = -1, y = 1$ :  $1 = -3(-1) - b$   
 Simplify:  $1 = 3 - b$   
 Subtract 3:  $-2 = -b$   
 Divide by  $-1$ :  $2 = b$

4. **3.2 or 16/5** Parallel lines must have equal slopes. The slope of  $4x + 5y = 13$  is  $-4/5$ , and the slope of  $4y + kx = 2$  is  $-k/4$ .

$$\frac{-4}{5} = \frac{-k}{4}$$

Cross-multiply:  $-5k = -16$   
 Divide by  $-5$ :  $k = 16/5 = 3.2$

5. **7.5 or 15/2** Perpendicular lines have slopes that are opposite reciprocals. The slope of  $4x + 5y = 13$  is  $-4/5$ , and the slope of  $6y - kx = 6$  is  $k/6$ .

$$\frac{-4}{5} = \frac{-6}{k}$$

Cross-multiply:  $-4k = -30$   
 Divide by  $-4$ :  $k = 7.5$

6. **.25 or 1/4** First equation:  $\frac{2a}{b} = \frac{1}{3}$

Divide by 2:  $\frac{a}{b} = \frac{1}{6}$

Second equation:  $\frac{c}{b} + 1 = \frac{5}{3}$

Subtract 1:  $\frac{c}{b} = \frac{2}{3}$

Reciprocate:  $\frac{b}{c} = \frac{3}{2}$

Multiply:  $\left(\frac{a}{b}\right)\left(\frac{b}{c}\right) = \frac{a}{c} = \left(\frac{1}{6}\right)\left(\frac{3}{2}\right) = \frac{3}{12} = \frac{1}{4}$

7. **.75 or 3/4**

Substitute  $ab = -4$ :  $abc = 12$   
 $(-4)c = 12$   
 Divide by  $-4$ :  $c = -3$   
 Expression to evaluate:  $\frac{c}{ab}$   
 Substitute  $c = -3$  and  $ab = -4$ :  $\frac{c}{ab} = \frac{-3}{-4} = \frac{3}{4}$

8. **4.5 or 9/2** The slope of  $2x - 3y = 8$  is  $2/3$ , and the slope of  $ax + by = 2$  is  $-a/b$ . If the two lines are perpendicular, then the slopes are

opposite reciprocals:  $\frac{2}{3} = \frac{b}{a}$   
 Reciprocate:  $\frac{a}{b} = \frac{3}{2}$   
 Multiply by 3:  $\frac{3a}{b} = \frac{9}{2}$

9. **C**

$5x - y = 11$   
 $2x - 2y = 9$   
 Subtract equations:  $3x + y = 2$

10. **C**

$a - b = 4$   
 $a + b = -7$   
 Add equations:  $2a = -3$   
 Divide by 2:  $a = -1.5$   
 Substitute  $a = -1.5$ :  $-1.5 + b = -7$   
 Add 1.5:  $b = -7 + 1.5 = -5.5$   
 Evaluate product:  $ab = (-1.5)(-5.5) = 8.25$

11. **B** Let  $c$  = the cost to make each one of Emma's bracelets.

$5m - 5c = 60$   
 $4m - 5c = 10$   
 Subtract:  $m = 50$   
 Substitute  $m = 50$ :  $5(50) - 5c = 60$   
 Simplify:  $250 - 5c = 60$   
 Subtract 250:  $-5c = -190$   
 Divide by  $-5$ :  $c = 38$

## Calculator

12. **2/7 or .286 or .285**

$2y = x + 1$   
 Subtract 1:  $2y - 1 = x$   
 Given:  $4x + 6y = 0$   
 Substitute  $x = 2y - 1$ :  $4(2y - 1) + 6y = 0$   
 Distribute:  $8y - 4 + 6y = 0$

Simplify:  $14y - 4 = 0$   
 Add 4:  $14y = 4$   
 Divide by 14:  $y = 4/14 = 2/7$

13. **1/6 or .166 or .167**  $6x + 7y = \frac{4}{5}$   
 $6x - 7y = \frac{6}{5}$

Add equations:  $12x = 2$   
 Divide by 12:  $x = 2/12 = 1/6$

14. **25** The slope of  $2x - 5y = 20$  is  $2/5$ . The slope of  $10x - 25y = 4k$  is  $10/25 = 2/5$ . Since the two lines have the same slope, they have no points of intersection unless they are the same line.

$$2x - 5y = 20$$

$$10x - 25y = 4k$$

Multiply first equation by 5:  $10x - 25y = 100$   
 Therefore,  $4k = 100$  and so  $k = 25$ .

15. **16** If the original ratio of cats to dogs is 4 to 5, then we can say there were  $4n$  cats and  $5n$  dogs to start. At the end of the week, therefore, there were  $8n$  cats and  $5n + 12$  dogs. If this ratio was 1:1, then

$$8n = 5n + 12$$

Subtract  $5n$ :  $3n = 12$   
 Divide by 3:  $n = 4$

Therefore, there were  $4n = 4(4) = 16$  cats at the beginning of the week.

16. **40** Let  $x$  = the number of friendship bracelets Emilie had to start. This means that Jenny originally had  $2x$  bracelets. After Jenny gave 5 of them to Emilie, Jenny had  $2x - 5$  and Emilie had  $x + 5$ . If Jenny still had 10 more than Emilie, then

$$2x - 5 = 10 + (x + 5)$$

Simplify:  $2x - 5 = x + 15$   
 Subtract  $x$  and add 5:  $x = 20$

This means that Jenny had  $2x = 2(20) = 40$  to start.

17. **56**

$$\frac{x+y}{2} = 14$$

Multiply by 2:  $x + y = 28$

If  $x$  is doubled and  $y$  is tripled, the average

remains the same:  $\frac{2x+3y}{2} = 14$

Multiply by 2:  $2x + 3y = 28$

Previous equation:  $x + y = 28$

Multiply by 3:  $3x + 3y = 84$

Other equation:  $2x + 3y = 28$

Subtract equations:  $x = 56$

18. **24**

$$7m + 10n = 7$$

$$6m + 9n = 1$$

Subtract equations:  $m + n = 6$

Multiply by 4:  $4m + 4n = 24$

19. **D** Line  $a$  contains the points  $(2, 2)$  and  $(7, 1)$ ; therefore, it has a slope of  $\frac{2-1}{2-7} = -\frac{1}{5}$ . If line  $b$  is perpendicular

to line  $a$ , then it must have a slope of 5 (the opposite reciprocal of  $-1/5$ ). You might find it helpful to sketch the line with slope 5 through the point  $(2, 2)$ , and confirm that it passes through the point  $(3, 7)$ , which is one unit to the right and one 5 units up.

20. **C** In order for two lines in the  $xy$ -plane to have no points in common, they must be parallel and nonidentical. The only two such lines among these choices are  $2x - 3y = 1$  and  $6x - 9y = 2$ , which both have a slope of  $2/3$ , but have different  $y$ -intercepts of  $-1/3$  and  $-2/9$ .

21. **A**

$$\frac{1}{x} + \frac{1}{y} = \frac{1}{2}$$

Multiply by  $2xy$ :  $2y + x = 2x$

Subtract  $x$ :  $2y = x$

Divide by 2:  $y = \frac{1}{2}x$

This line has a slope of  $1/2$ , so the perpendicular must have a slope of  $-2$ .