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Geometry

## Equations of Lines and Circles Review

1. What is an equation of the line that is perpendicular to the line whose equation is  $y = \frac{3}{5}x - 2$  and that passes through the point  $(3, -6)$ ? *negative reciprocal slopes*

1)  $y = \frac{5}{3}x - 11$

3)  $y = -\frac{5}{3}x - 1$

2)  $y = -\frac{5}{3}x + 11$

4)  $y = \frac{5}{3}x + 1$

$m_{\perp} = -\frac{5}{3}$

$x_1 = 3$

$y_1 = -6$

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

$y + 6 = -\frac{5}{3}(x - 3)$

$y + 6 = -\frac{5}{3}x + 5$

$y = -\frac{5}{3}x - 1$

2. The equation of a line is  $y = \frac{2}{3}x + 5$ . What is an equation of the line that is perpendicular to the given line and that passes through the point  $(4, 2)$ ? *negative reciprocal slopes*

1)  $y = \frac{2}{3}x - \frac{2}{3}$

3)  $y = -\frac{3}{2}x + 7$

2)  $y = \frac{3}{2}x - 4$

4)  $y = -\frac{3}{2}x + 8$

$m_{\perp} = -\frac{3}{2}$

$x_1 = 4$

$y_1 = 2$

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

$y - 2 = -\frac{3}{2}(x - 4)$

$y - 2 = -\frac{3}{2}x + 6$

$y = -\frac{3}{2}x + 8$

3. What is an equation of the line that passes through the point  $(6, 8)$  and is perpendicular to a line with equation  $-3x + 2y = 10$ ? *negative reciprocal slopes*

1)  $y - 8 = \frac{3}{2}(x - 6)$

$-3x + 2y = 10$   
 $+3x$   $+3x$

3)  $y + 8 = \frac{3}{2}(x + 6)$

2)  $y - 8 = -\frac{2}{3}(x - 6)$

$2y = 3x + 10$   
 $\frac{2y}{2} = \frac{3x + 10}{2}$

4)  $y + 8 = -\frac{2}{3}(x + 6)$

$y = \frac{3}{2}x + 5$

$m_{\perp} = -\frac{2}{3}$

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

$x_1 = 6$

$y_1 = 8$

$y - 8 = -\frac{2}{3}(x - 6)$

4. What is an equation of a line which passes through  $(6, 9)$  and is perpendicular to the line whose equation is  $4x - 6y = 15$ ? *negative reciprocal slopes*

1)  $y - 9 = -\frac{3}{2}(x - 6)$

3)  $y + 9 = -\frac{3}{2}(x + 6)$

$m_{\perp} = -\frac{3}{2}$

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

2)  $y - 9 = \frac{2}{3}(x - 6)$

4)  $y + 9 = \frac{2}{3}(x + 6)$

$x_1 = 6$

$y - 9 = -\frac{3}{2}(x - 6)$

$y_1 = 9$

$4x - 6y = 15$   
 $-4x$   $-4x$

$-6y = -4x + 15$   
 $\frac{-6y}{-6} = \frac{-4x + 15}{-6}$

$y = \frac{2}{3}x - \frac{5}{2}$

# Line Dilations

Shortcut (always same slope)

origin multiply scale factor and b  
not origin same equation

multiply scale factor and b

5. The line  $y = \frac{1}{2}x - 2$  is dilated by a scale factor of 2 centered at the origin. Write an equation that represents the image of the line after the dilation.

1)  $y = \frac{1}{2}x - 4$

3)  $y = x - 4$

$m = \frac{1}{2}$

2)  $y = \frac{1}{2}x - 2$

4)  $y = x - 2$

$b = -2(2) = -4$

6. The line  $y = \frac{1}{2}x - 2$  is dilated by a scale factor of 2 and centered at (0,-2). Write an equation that represents the image of the line after the dilation.

1)  $y = \frac{1}{2}x - 4$

3)  $y = x - 4$

not origin

same equation

2)  $y = \frac{1}{2}x - 2$

4)  $y = x - 2$

7. The line  $y = 2x - 4$  is dilated by a scale factor of  $\frac{3}{2}$  and centered at (1,-2). Write an equation that represents the image of the line after the dilation.

1)  $y = 2x - 4$

2)  $y = 2x - 6$

3)  $y = 3x - 4$

4)  $y = 3x - 6$

not origin

same equation

8. The line  $y = 2x - 4$  is dilated by a scale factor of  $\frac{3}{2}$  and centered at the origin. Which equation represents the image of the line after the dilation?

1)  $y = 2x - 4$

2)  $y = 2x - 6$

3)  $y = 3x - 4$

4)  $y = 3x - 6$

$m = 2$

$b = -4(\frac{3}{2}) = -6$

multiply scale factor and b

9. The line  $y = 2x - 1$  is dilated centered at (4,1). Which linear equation could be its image?

1)  $-2x + y = 3$

3)  $-x + 2y = 5$

2)  $-2x - y = 7$

4)  $-x - 2y = 6$

$-2x + y = 3$   
+2x +2x

$y = 2x + 3$   
 $m = 2$

Parallel! Same slope!

$$m = \frac{2}{3}$$

Same slope

10. The line  $y = \frac{2}{3}x + 3$  is dilated centered at the origin. Which linear equation could be its image?

1)  $2x + 3y = 7$

3)  $3x - 2y = 7$

2)  $2x - 3y = 7$

4)  $3x + 2y = 7$

$$\frac{-3y}{3} = \frac{-2x+7}{3} \quad y = \frac{2}{3}x - \frac{7}{3}$$

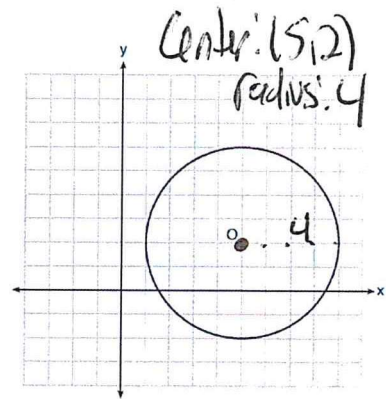
11. Which of the following is the equation of the given circle?

1)  $(x-5)^2 + (y-2)^2 = 16$

2)  $(x+5)^2 + (y+2)^2 = 16$

3)  $(x-5)^2 + (y-2)^2 = 4$

4)  $(x+5)^2 + (y+2)^2 = 4$



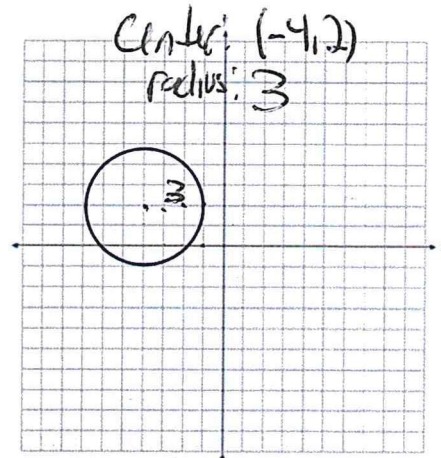
12. Which of the following is the equation of the given circle?

1)  $(x-4)^2 + (y+2)^2 = 9$

2)  $(x-4)^2 + (y+2)^2 = 3$

3)  $(x+4)^2 + (y-2)^2 = 9$

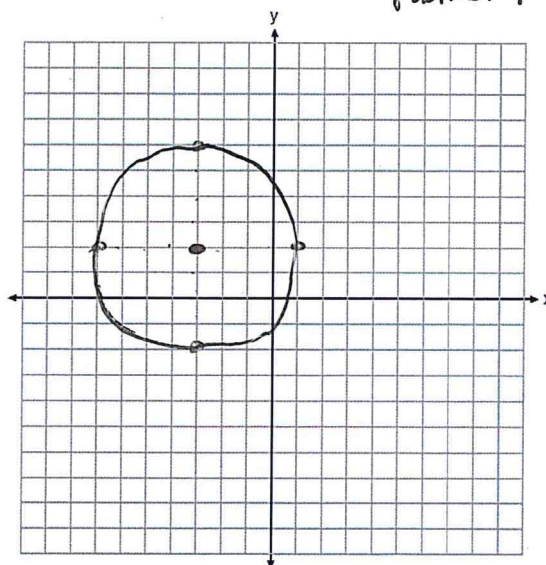
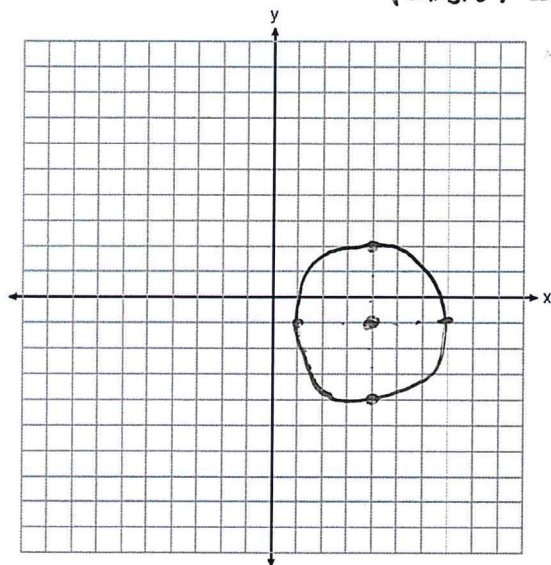
4)  $(x+4)^2 + (y-2)^2 = 3$



Graph the following circles on the provided graphs

13.  $(x-4)^2 + (y+1)^2 = 9$  Center: (4, -1)  
radius:  $\sqrt{9} = 3$

14.  $(x+3)^2 + (y-2)^2 = 16$  Center: (-3, 2)  
radius: 4



Negative constants in parentheses for center  
 Square root of right hand side for radius

Sign of plus minus affects  
 sign of plus minus

If multiple choice:

If open response

CONICS app

Alpha Enter

Completing the square

15. Find the center and radius of a circle whose equation is  $x^2 + y^2 - 2x + 6y + \frac{15}{4} = 0$ ?

CONICS A=1

B=-2

C=6

D= $\frac{15}{4}$

1) center = (-1, 3); radius =  $\frac{25}{4}$

Center: (1, -3)

2) center = (-1, 3); radius =  $\frac{5}{2}$

radius: 2.5

3) center = (1, -3); radius =  $\frac{25}{4}$

$\frac{5}{2} = 2.5$

4) center = (1, -3); radius =  $\frac{5}{2}$

16. Find the center and radius of a circle whose equation is  $x^2 + y^2 - 16x + 6y + 53 = 0$ ?

1) center (-8, 3) and radius 20

CONICS

A=1

2) center (-8, 3) and radius  $2\sqrt{5}$

Center: (8, -3)

B=-16

3) center (8, -3) and radius 20

radius: = 4.4721

C=6

4) center (8, -3) and radius  $2\sqrt{5}$

$2\sqrt{5} = 4.4721$

D=53

Find the center and radius of the following circles:

17.  $x^2 + y^2 + 16x + 6y + 1 = 0$

$(\frac{16}{2})^2 = 64$

$\sqrt{72}$

$x^2 + 16x + y^2 + 6y = -1$

$(\frac{6}{2})^2 = 9$

$\sqrt{36} \sqrt{2}$

$x^2 + 16x + 16 + y^2 + 6y + 9 = -1 + 16 + 9$

$(x+8)(x+8) + (y+3)(y+3) = 72$

Center: (-8, -3)

$6\sqrt{2}$

$(x+8)^2 + (y+3)^2 = 72$

radius:  $\sqrt{72}$  or  $6\sqrt{2}$

18.  $x^2 + y^2 - 4x + 6y = 15$

$(\frac{-4}{2})^2 = 4$

$\sqrt{28}$

$x^2 - 4x + y^2 + 6y = 15$

$(\frac{6}{2})^2 = 9$

$\sqrt{4} \sqrt{7}$

$x^2 - 4x + 4 + y^2 + 6y + 9 = 15 + 4 + 9$

$(x-2)(x-2) + (y+3)(y+3) = 28$

$2\sqrt{7}$

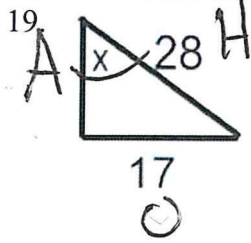
$(x-2)^2 + (y+3)^2 = 28$

Center (2, -3)

radius:  $\sqrt{28}$  or  $2\sqrt{7}$

S/A H C/A H T/A

Find x in each of the following pictures rounding to the nearest integer

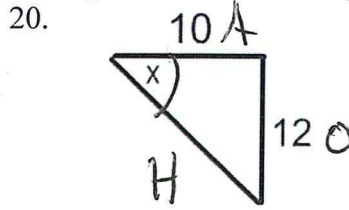


$$\sin Q = \frac{O}{H}$$

$$\sin x = \frac{17}{28}$$

$$x = \sin^{-1} \frac{17}{28}$$

$$x = 37$$



$$\tan Q = \frac{O}{A}$$

$$\tan x = \frac{12}{10}$$

$$x = \tan^{-1} \frac{12}{10}$$

$$x = 50$$

21. Triangle ABC shown below is a right triangle with altitude AD drawn to the hypotenuse BC.

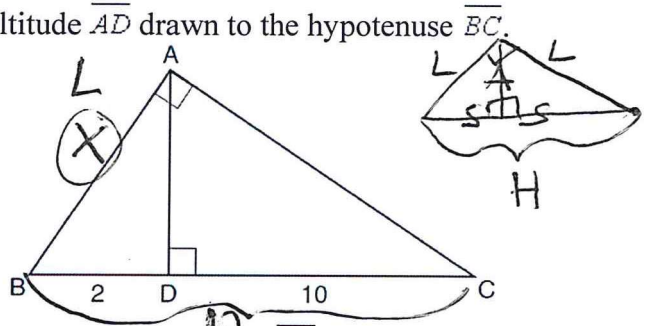
If BD = 2 and DC = 10, what is the length of AB?

- 1)  $2\sqrt{2}$
- 2)  $2\sqrt{5}$
- 3)  $2\sqrt{6}$  4.89..
- 4)  $2\sqrt{30}$

$$\frac{H}{L} = \frac{L}{S}$$

$$\sqrt{x^2} = \sqrt{24}$$

$$x = 4.89..$$



22. In the diagram below of right triangle ABC, altitude BD is drawn to hypotenuse AC, AC = 16, and CD = 7.

What is the length of AB?

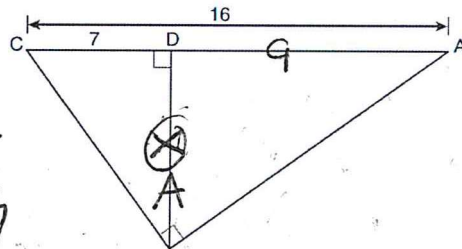
- 1)  $3\sqrt{7}$  7.93..
- 2)  $4\sqrt{7}$
- 3)  $7\sqrt{3}$
- 4) 12

$$\frac{S}{A} = \frac{A}{S}$$

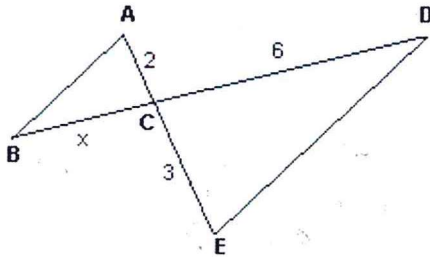
$$\frac{7}{x} = \frac{x}{9}$$

$$\sqrt{x^2} = \sqrt{63}$$

$$x = 7.93..$$



23. In the diagram below, AB || DE. If AC = 2, CD = 6, and CE = 3, what is BC?



$$\frac{2}{x} = \frac{3}{6}$$

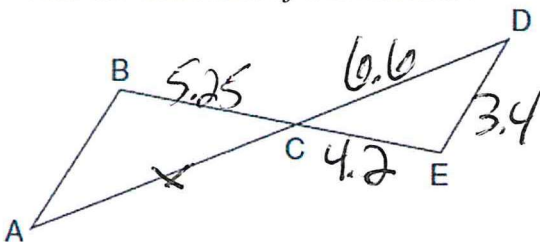
$$\frac{3x}{3} = \frac{12}{3}$$

$$x = 4$$

Box Tie  
Corresponding sides are on the same diagonal

24. In the diagram below, AD intersects BE at C, and AB || DE.

If CD = 6.6 cm, DE = 3.4 cm, CE = 4.2 cm, and BC = 5.25 cm, what is the length of AC, to the nearest hundredth of a centimeter?



$$\frac{x}{6.6} = \frac{5.25}{4.2}$$

$$\frac{4.2x}{4.2} = \frac{34.65}{4.2}$$

$$x = 8.25$$