ANSWERS => EQUATIONS OF A CIRCLE WORKSHEET #1.

1.a) $r = 3$

$$x^2 + y^2 = r^2$$
$$x^2 + y^2 = (3)^2$$
$$x^2 + y^2 = 9$$

b) $r = \sqrt{3}$

$$x^2 + y^2 = r^2$$
$$x^2 + y^2 = (\sqrt{3})^2$$
$$x^2 + y^2 = 3$$

c) $r = 2\sqrt{5}$

$$x^2 + y^2 = r^2$$
$$x^2 + y^2 = (2\sqrt{5})^2$$
$$x^2 + y^2 = 4(5)$$
$$x^2 + y^2 = 20.$$

d) $r = 2r$

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

2. A: $x^2 + y^2 = 16$

a) radius $= \sqrt{16} = 4$ units

b) x-intercepts $\Rightarrow -4$ and $+4$

c) y-intercepts $\Rightarrow -4$ and $+4$.

d) domain: $\{x \mid -4 \leq x \leq 4, x \in R\}$

e) range: $\{y \mid -4 \leq y \leq 4, y \in R\}$

B: $x^2 + y^2 = 50$

a) radius $= \sqrt{50} = \sqrt{25 \times 2} = 5\sqrt{2}$ units

b) x-intercepts $\Rightarrow -5\sqrt{2}$ and $5\sqrt{2}$

c) y-intercepts $\Rightarrow -5\sqrt{2}$ and $5\sqrt{2}$

d) domain: $\{x \mid -5\sqrt{2} \le x \le 5\sqrt{2}, x \in R\}$

e) range: $\{y \mid -5\sqrt{2} \le y \le 5\sqrt{2}, y \in R\}$

3. $x^2 + y^2 = 100$

a) $(-6, ?)$

If $x = -6$

$\hookrightarrow (-6)^2 + y^2 = 100$

$$36 + y^2 = 100$$
$$y^2 = 100 - 36$$
$$y^2 = 64$$
$$y = \pm\sqrt{64}$$
$$y = \pm 8.$$

$\Rightarrow (-6, \boxed{8})$

or

$(-6, \boxed{-8})$

b) $(?, 8)$

If $y = 8$

$\hookrightarrow x^2 + (8)^2 = 100$

$$x^2 + 64 = 100$$
$$x^2 = 100 - 64$$
$$x^2 = 36$$
$$x = \pm\sqrt{36}$$
$$x = \pm 6$$

$\Rightarrow (\boxed{6}, 8)$

or

$(\boxed{-6}, 8)$

c) $(10, ?)$

If $x = 10$.

$\hookrightarrow (10)^2 + y^2 = 100$

$$100 + y^2 = 100$$
$$y^2 = 100 - 100$$
$$y^2 = 0$$
$$y = \pm\sqrt{0}$$
$$y = 0$$

$\Rightarrow (10, \boxed{0})$

e) $(?, 5)$

If $y = 5$

$\hookrightarrow x^2 + (5)^2 = 100$

$$x^2 + 25 = 100$$
$$x^2 = 100 - 25$$
$$x^2 = 75$$
$$x = \pm\sqrt{75}$$
$$x = \pm\sqrt{25 \times 3}$$
$$x = \pm\, 5\sqrt{3}$$

$\Rightarrow (\boxed{5\sqrt{3}}, 5)$

or

$(\boxed{-5\sqrt{3}}, 5)$

f) $(?, 5\sqrt{2})$

If $y = 5\sqrt{2}$

$\hookrightarrow x^2 + (5\sqrt{2})^2 = 100$

$$x^2 + 25(2) = 100$$
$$x^2 + 50 = 100$$
$$x^2 = 100 - 50$$
$$x^2 = \underline{50}$$
$$x = \pm\sqrt{50}$$
$$x = \pm\sqrt{25 \times 2}$$
$$x = \pm 5\sqrt{2}$$

$\Rightarrow (\boxed{5\sqrt{2}}, 5\sqrt{2})$

or

$(\boxed{-5\sqrt{2}}, 5\sqrt{2})$

* d) $(0, ?)$

If $x = 0$

$\hookrightarrow (0)^2 + y^2 = 100$

$$0 + y^2 = 100$$
$$y^2 = 100 - 0$$
$$y^2 = 100$$
$$y = \pm\sqrt{100}$$
$$y = \pm 10$$

$\Rightarrow (0, \boxed{10})$

or

$(0, \boxed{-10})$

4. $x^2+y^2=25$

a) $(-5,0)$

L.S	R.S
x^2+y^2	25
$(-5)^2+(0)^2$	
$25+0$	
25	

Since L.S = R.S, $(-5,0)$ is located on the circle.

b) $(0,25)$

L.S	R.S
x^2+y^2	25
$(0)^2+(25)^2$	
$0+625$	
625	

Since L.S $\neq$ R.S, $(0,25)$ is not located on the circle.

c) $(0,5)$

L.S	R.S
x^2+y^2	25
$(0)^2+(5)^2$	
$0+25$	
25	

Since L.S = R.S, $(0,5)$ is located on the circle.

d) $(3,-4)$

L.S	R.S
x^2+y^2	25
$(3)^2+(-4)^2$	
$9+16$	
25	

Since L.S = R.S, $(3,-4)$ is located on the circle.

e) $(12\frac{1}{2}, 12\frac{1}{2})$
$\Rightarrow \left(\frac{25}{2}, \frac{25}{2}\right)$

L.S	R.S
x^2+y^2	25
$\left(\frac{25}{2}\right)^2+\left(\frac{25}{2}\right)^2$	
$\frac{625}{4}+\frac{625}{4}$	
$\frac{1250}{4}$	
$\frac{625}{2}$	

Since L.S $\neq$ R.S, $(12\frac{1}{2}, 12\frac{1}{2})$ is <u>not</u> located on the circle.

f) $(-2\sqrt{2}, 4)$

L.S	R.S
x^2+y^2	25
$(-2\sqrt{2})^2+(4)^2$	
$4(2)+16$	
$8+16$	
24	

Since L.S $\neq$ R.S, $(-2\sqrt{2}, 4)$ is <u>not</u> located on the circle.

5. a) $(6,0)$
$\hookrightarrow x=6$ and $y=0$

$$x^2+y^2=r^2$$
$$(6)^2+(0)^2=r^2$$
$$36+0=r^2$$
$$36=r^2$$

Equation $\Rightarrow x^2+y^2=36$

b) $(0,-3)$
$\hookrightarrow x=0$ and $y=-3$

$$x^2+y^2=r^2$$
$$(0)^2+(-3)^2=r^2$$
$$0+9=r^2$$
$$9=r^2$$

Equation $\Rightarrow x^2+y^2=9$

c) $(-3, 4)$
↳ $x = -3$ and $y = 4$

$$x^2 + y^2 = r^2$$
$$(-3)^2 + (4)^2 = r^2$$
$$9 + 16 = r^2$$
$$25 = r^2$$

Equation ⇒ $x^2 + y^2 = 25$

d) $(1, -\sqrt{2})$
↳ $x = 1$ and $y = -\sqrt{2}$

$$x^2 + y^2 = r^2$$
$$(1)^2 + (-\sqrt{2})^2 = r^2$$
$$1 + (2) = r^2$$
$$1 + 2 = r^2$$
$$3 = r^2$$

Equation ⇒ $x^2 + y^2 = 3$

Equation	Centre	Domain	Range	x-int	y-int
$x^2+y^2=4$	(0,0)	$\{x \mid -2 \le x \le 2, x \in R\}$	$\{y \mid -2 \le y \le 2, y \in R\}$	-2 and 2	-2 and 2
$x^2+y^2=16$	(0,0)	$\{x \mid -4 \le x \le 4, x \in R\}$	$\{y \mid -4 \le y \le 4, y \in R\}$	-4 and 4	-4 and 4
$x^2+y^2=100$	(0,0)	$\{x \mid -10 \le x \le 10, x \in R\}$	$\{y \mid -10 \le y \le 10, y \in R\}$	-10 and 10	-10 and 10

$$x^2 + y^2 = r^2$$
↓
to find Radius $\sqrt{r^2}$ = radius

7. $4x^2 + 4y^2 = 1$

a) If you divide by the common factor of 4:

$$\frac{\cancel{4}x^2}{\cancel{4}} + \frac{\cancel{4}y^2}{\cancel{4}} = \frac{1}{4}$$

$$x^2 + y^2 = \frac{1}{4}$$ * Now in standard form of circle with center at (0,0)

b) The radius $= \sqrt{\frac{1}{4}}$

$= \frac{1}{2}$ units.

8.

a) radius = 8 units

Equation: $x^2 + y^2 = (8)^2$

$x^2 + y^2 = 64$

b) Point (-4,3)

If $x = -4$ and $y = 3$:

$x^2 + y^2 = r^2$

$(-4)^2 + (3)^2 = r^2$

$16 + 9 = r^2$

$25 = r^2$

$\sqrt{25} = r$

$5 = r$

Equation: $x^2 + y^2 = (5)^2$

$x^2 + y^2 = 25$

c) Point $(\sqrt{3},-2)$

If $x=\sqrt{3}$ and $y=-2$:

$$x^2+y^2=r^2$$
$$(\sqrt{3})^2+(-2)^2=r^2$$
$$3+4=r^2$$
$$7=r^2$$
$$\sqrt{7}=r$$

Equation: $x^2+y^2=(\sqrt{7})^2$

$x^2+y^2=7$

d) x-int $=-5$

↳ Point $(-5,0)$

If $x=-5$ and $y=0$:

$$x^2+y^2=r^2$$
$$(-5)^2+(0)^2=r^2$$
$$25+0=r^2$$
$$25=r^2$$
$$\sqrt{25}=r$$
$$5=r$$

Equation: $x^2+y^2=(5)^2$

$x^2+y^2=25$

e) y-int $=4$

↳ Point $(0,4)$

If $x=0$ and $y=4$:

$$x^2+y^2=r^2$$
$$(0)^2+(4)^2=r^2$$
$$0+16=r^2$$
$$16=r^2$$
$$\sqrt{16}=r$$
$$4=r$$

Equation: $x^2+y^2=(4)^2$

$x^2+y^2=16$

9. $x^2 + y^2 = 36$

a) $(m, 3)$

If $y = 3$:

$$x^2 + (3)^2 = 36$$
$$x^2 + 9 = 36$$
$$x^2 = 36 - 9$$
$$x^2 = 27$$
$$x = \pm\sqrt{27}$$
$$x = \pm\sqrt{9 \times 3}$$
$$x = \pm 3\sqrt{3}$$

b) $(-\sqrt{6}, K)$

If $x = -\sqrt{6}$

$$(-\sqrt{6})^2 + y^2 = 36$$
$$6 + y^2 = 36$$
$$y^2 = 36 - 6$$
$$y^2 = 30$$
$$y = \pm\sqrt{30}$$

c) $(8, K)$

If $x = 8$:

$$x^2 + y^2 = 36$$
$$(8)^2 + y^2 = 36$$
$$64 + y^2 = 36$$
$$y^2 = 36 - 64$$
$$y^2 = -28$$

$$y = \pm\sqrt{-28}$$

Since you cannot take the $\sqrt{}$ of a negative number in the real number system, $(8, K)$ cannot be a point on the circle.