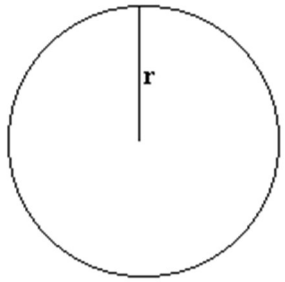
Lesson 8.5 – Area of Circles

Circle Area Conjecture - The area of a circle is given by the formula $A = \pi r^2$ where A is the area and r is the radius of the circle.



**When working with area, we must ALWAYS work from radius.

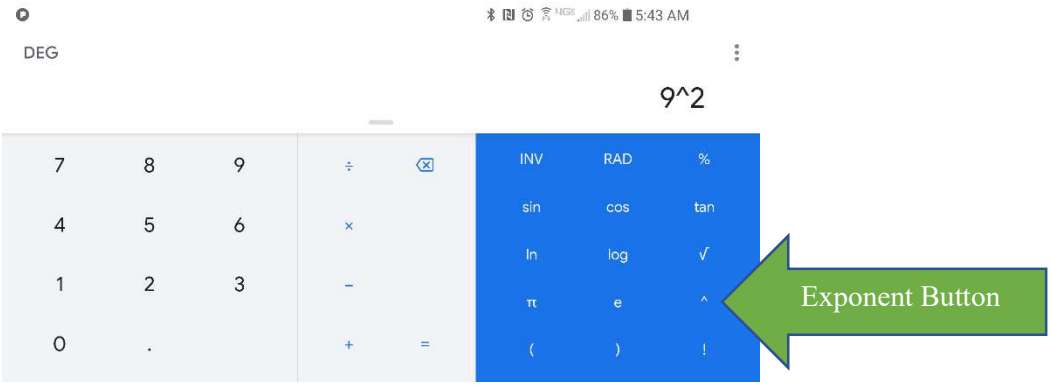
***In this lesson it will be important to distinguish between $\approx$ and $=$. Any time you are asked to calculate a value with an $=$, you will leave the answer in terms of π. Any time you asked to calculate a value with an $\approx$, you will calculate the value by multiplying π out.

Example 1: Find exact area of a circle given radius

If $r = 9$ cm, $A =$_____

$A = \pi r^2$

$A = \pi(9)^2$ **To square a number, you can either multiply it by itself or use the exponent button on your calculator.



$A = \pi(81)$

$\boldsymbol{A = 81\pi}$ **cm²** **Because this problem gave us an "equal sign", we leave our answer in terms of π.

Example 2: Find exact area of a circle given diameter

If $d = 6.4$ cm, $A =$_____

We are given diameter, but we need radius. Remember that radius is half of the diameter.

$r = \frac{6.4}{2} = 3.2$

$A = \pi r^2$

$A = \pi(3.2)^2$

$A = \pi(10.24)$

$\boldsymbol{A = 10.24\pi \text{ cm}^2}$ **Because this problem gave us an "equal sign", we leave our answer in terms of π.

Example 3: Find radius and diameter given exact area

If $A = 529\pi$ cm^2, $r =$_____, $d =$_____

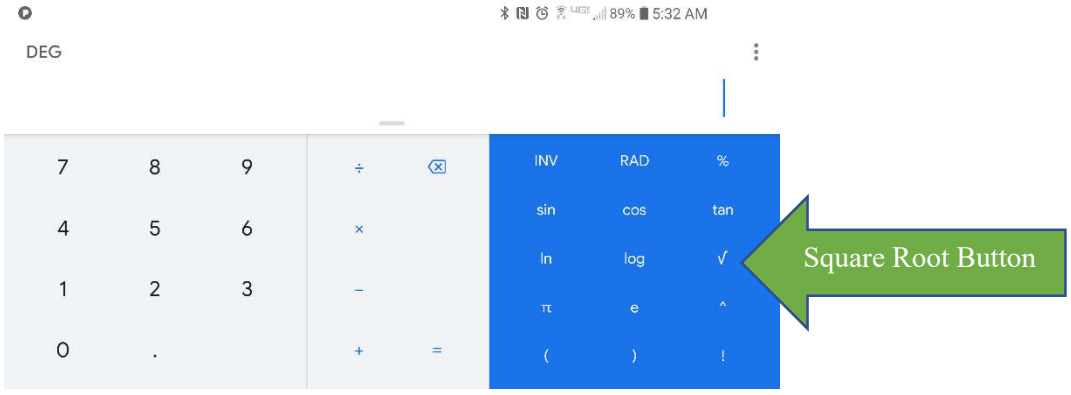
This problem will have two answers.

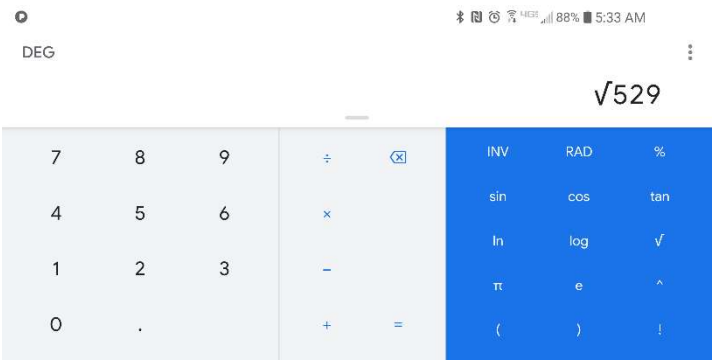
$A = \pi r^2$

$529\pi = \pi r^2$ **Since there is a π on both sides of the equation, we can divide it out.

$\frac{529\pi}{\pi} = \frac{\pi r^2}{\pi}$

$529 = r^2$ **To undo a square, we must square root.





$\sqrt{529} = \sqrt{r^2}$

$23 = r$

$\boldsymbol{r = 23}$ **cm

**Remember that radius is a length, so the power on the units is 1.

$d = 23 \cdot 2 = 46$

$\boldsymbol{d = 46}$ **cm**

<u>Example 4: Find exact area given circumference</u>

If $C = 36\pi$ ft, $A =$_____

$C = \pi d$

$36\pi = \pi d$

$\frac{36\pi}{\pi} = \frac{\pi d}{\pi}$

$36 = d$

$r = \frac{36}{2} = 18$

$A = \pi r^2$

$A = \pi(18)^2$

$A = \pi(324)$

$\boldsymbol{A = 324\pi}$ **ft²**

**Because this problem gave us an "equal sign", we leave our answer in terms of π.

Example 5: Find exact circumference given area

If $A = 196\pi$ in^2, $C =$_____

$A = \pi r^2$

$196\pi = \pi r^2$

$\frac{196\pi}{\pi} = \frac{\pi r^2}{\pi}$

$196 = r^2$

$\sqrt{196} = \sqrt{r^2}$

$14 = r$

$d = 14 \cdot 2 = 28$

$C = \pi d$

$C = \pi(28)$

$\boldsymbol{C = 28\pi}$ **in** **Because this problem gave us an "equal sign", we leave our answer in terms of π.

Example 6: Find approximate area given radius

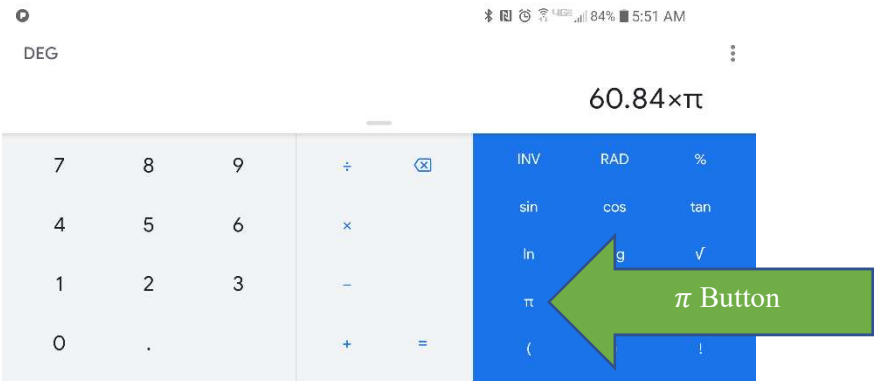
If $r = 7.8$ cm, $A \approx$_____

$A = \pi r^2$

$A = \pi(7.8)^2$

$A = \pi(60.84)$

$\boldsymbol{A \approx 191.13}$ **cm^2** **Because this problem gave us an "approximate sign", we multiply π out (take $60.84 \cdot \pi$).



Example 7: Find approximate area given diameter

If $d = 3.12$, $A \approx$_____

We are given diameter, but we need radius. Remember that radius is half of the diameter.

$r = \frac{3.12}{2} = 1.56$

$A = \pi r^2$

$A = \pi(1.56)^2$

$A = \pi(2.4336)$

$\boldsymbol{A \approx 7.65}$ **units²** **Because this problem gave us an "approximate sign", we multiply π out.

**If the problem does not give you units (cm, in, ft, etc.), just write "units" as the unit of measure.

Example 8: Find radius and diameter given area

If $A = 907.9$ m², $r \approx$_____, $d \approx$_____

This problem will have two answers.

$A = \pi r^2$

$907.9 = \pi r^2$

$\frac{907.9}{\pi} = \frac{\pi r^2}{\pi}$

$288.99 \approx r^2$ **You will actually calculate $\frac{907.9}{\pi}$ and round (which is why this now becomes ≈.

$\sqrt{288.99} \approx \sqrt{r^2}$

$17 \approx r$ **You will have to round.

$\boldsymbol{r \approx 17}$ **m**

$d \approx 17 \cdot 2 = 38$

$\boldsymbol{d \approx 38}$ **m**

Example 9: Find approximate area given circumference

If $C = 7.85$, $A \approx$_____

$C = \pi d$

$7.85 = \pi d$

$\frac{7.85}{\pi} = \frac{\pi d}{\pi}$

$2.50 \approx d$ **You calculate $\frac{7.85}{\pi}$ and round (which is why this becomes $\approx$).

$r \approx \frac{2.50}{2} \approx 1.25$

$A = \pi r^2$

$A \approx \pi(1.25)^2$

$A \approx \pi(1.5625)$

$\boldsymbol{A = 4.91 \text{ units}^2}$ **Because this problem gave us an "approximate sign", we multiply π out.

**If the problem does not give you units (cm, in, ft, etc.), just write "units" as the unit of measure.

Example 10: Find approximate circumference given area

If $A = 136.46$ in^2, $C \approx$_____

$A = \pi r^2$

$136.46 = \pi r^2$

$\frac{136.46}{\pi} = \frac{\pi r^2}{\pi}$

$43.44 \approx r^2$ **You calculate $\frac{136.46}{\pi}$ and round (which is why this becomes $\approx$).

$\sqrt{43.44} \approx \sqrt{r^2}$

$6.59 \approx r$

$d \approx 6.59 \cdot 2 \approx 13.18$

$C = \pi d$

$C \approx \pi(13.18)$

$\boldsymbol{C \approx 41.41 \text{ in}}$ **Because this problem gave us an "approximate sign", we multiply π out.