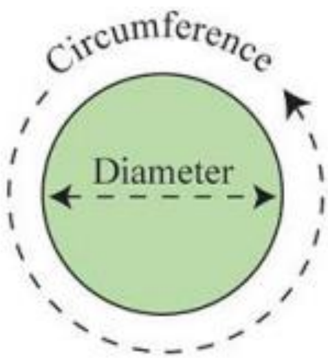
The Common Core State Standards for seventh grade mathematics require students to "Know the formulas for the area and circumference of a circle and use them to solve problems." Key to this knowledge are radius, diameter, circumference and area; and the ability to use formulas to move among these terms.



The distance around a circle is the circumference, while the distance across a circle, through the center, is the diameter. The ratio of the circumference to the diameter is always the same: 3.14159265358979323… This is an irrational number because it never terminates and never repeats. It is called pi, a Greek letter whose symbol is π.

$$\pi = C/d$$

If we know the diameter of a circle, we can multiply it by π to find the circumference:

$$C = \pi d$$

Given the radius of a circle, we can double it (since a diameter is twice a radius) then multiply it by π to find the circumference:

$$C = 2\pi r$$

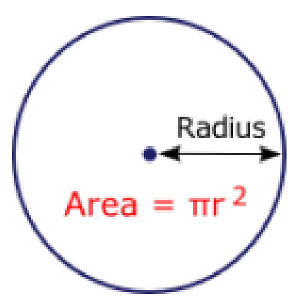
If we are given the circumference, we can find the diameter by dividing it by π, with the radius being half that number:

$$\frac{C}{\pi} = d \quad or \quad \frac{C}{2\pi} = r$$

To find the area of a circle, use this formula:

$$A = \pi r^2$$

If you are given the diameter of a circle, you must first divide it by two to find the radius.



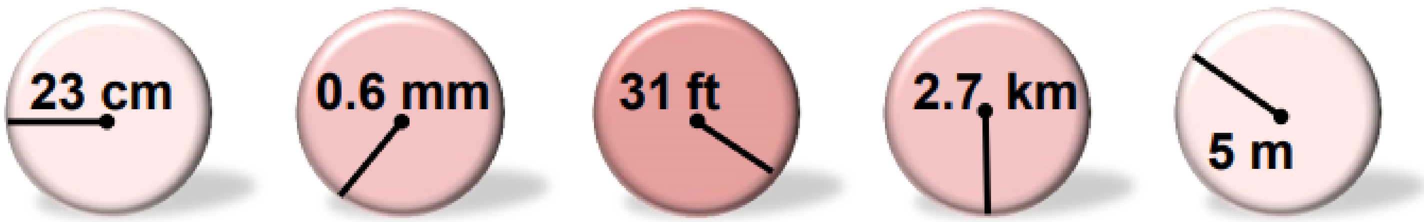
Note: circumference, radius and diameter would be expressed as cm, in, ft, m, yd, mi, km, etc., while area is expressed in square units such as cm^2, in^2, ft^2, yd^2 and mm^2.

CIRCLE PRACTICE PROBLEMS

Find the radius:

1. ________ 2. ________ 3. ________ 4. ________ 5. ________

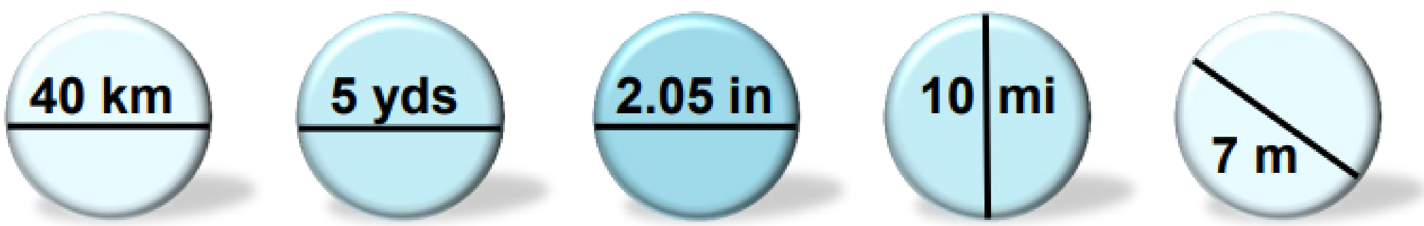
Find the diameter:



6. ________ 7. ________ 8. ________ 9. ________ 10. ________

11. Write the formula to find the circumference of a circle when given the diameter.

Use this formula to find the circumference. Use 3.14 for π.



12. ________ 13. ________ 14. ________ 15. ________ 16. ________

17. Write the formula to find the circumference of a circle when given the radius.

Use this formula to find the circumference. Express your answer in terms of π.

18. ________ 19. ________ 20. ________ 21. ________ 22. ________

The instructions for this portion say "answer to the nearest hundredth." Where are the hundredths located, and how do we round to them? Consider these two numbers.

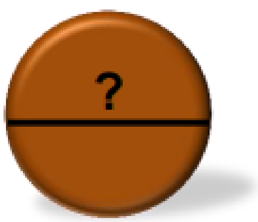
458.2736 **9,003.61682**

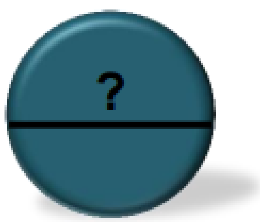
The hundredths place is the second digit after the decimal point. To decide which number to write there, we look at the third place after the decimal (the thousandths place).

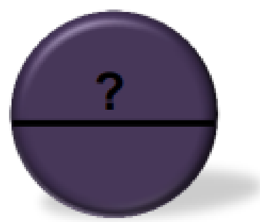
- If the third digit is 4 or less, we keep the digit in the hundredths place. In 458.2736, the digit in the thousandths place -- 3 -- is 4 or less, so the answer is 458.27.
- If the third digit is 5 or more, we round up the digit in the hundredths place. In 9,003.61582, the digit in the thousandths place -- 6 -- is 5 or more, so the answer becomes 9,003.62.

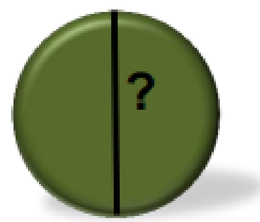
23. Write the formula to find the diameter of a circle when given the circumference.

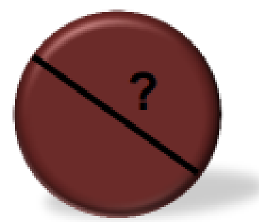
Use this formula to find the diameter. Use 3.14 for π. Answer to the nearest hundredth.











24. C = 30 cm

d = ________

25. C = 14 in

d = ________

26. C = 3.5 mi

d = ________

27. C = 65 yds

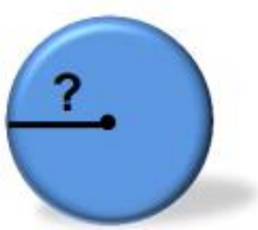
d = ________

28. C = 0.6 m

d = ________

29. Write the formula to find the radius of a circle when given the circumference.

Use this formula to find the radius. Use 3.14 for π. Answer to the nearest hundredth.



30. C = 2.9 ft

r = ________

31. C = 105 m

r = ________

32. C = 88 km

r = ________

33. C = 11 yds

r = ________

34. C = 7 mi

r = ________

Calculators are incredibly helpful with the types of problems we are doing. However, they only give us the correct answer if we enter the information properly. For example, there is a good chance that you may have answered 30 – 34 above incorrectly.

Consider: $\frac{24}{(2)(3)} = r$

To make things easy, we used 3 for pi in the example above.
This problem would actually be easier to do in our head than on the calculator. In the denominator we multiply 2 times 3 to get 6. 24 divided by 6 equals 4, so our radius is 4, and of course we write the units in our answer.

Now try it on the calculator. Did you get 4, or did you get 36? You will get the incorrect answer 36 if you key in the problem like this: 24 ÷ 2 x 3 =

To get the correct answer, 4, use the parentheses when keying in your equation:
24 ÷ (2 x 3) =

Check your answers for problems 30 – 34 above. If you found 4.55 ft for #30, re-do them. If your answer was 0.46 ft, then you keyed in the problem correctly. Remember, the circumference of a circle is a little more than three times as long as its diameter, and a little more than six times as long as its radius, so use estimation to check your answer.

Despite the wisdom of the t-shirt at left, pie *are* squared, at least for the purpose of remembering the formula for the area of a circle.

$$A = \pi r^2$$

Because the formula for the area of a circle only includes the radius of a circle, we have to calculate the radius if we are given the diameter. Simply divide the diameter by 2 to find the radius. Then square the radius (multiply it by itself) and multiply it by pi to find the area.

$$A = \pi \left(\frac{d}{2}\right)^2$$

Given the radius, find r^2.

35. r = 1,200 in	36. r = 23 cm	37. r = 19.2 ft	38. r = 0.3 mi	39. r = 7 m

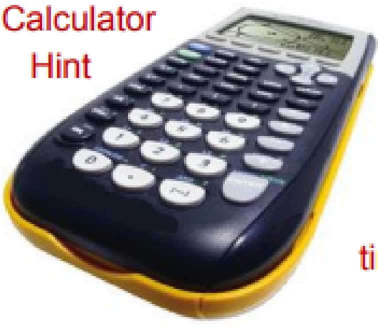
r^2 = ________	r^2 = ________	r^2 = ________	r^2 = _______	r^2 = _____

Given the diameter, find r^2.

40. d = 120 in	41. d = 23 cm	42. d = 19.2 ft	43. d = 0.3 mi	44. d = 7 m

r^2 = ________	r^2 = ________	r^2 = ________	r^2 = _______	r^2 = _____

Calculator Hint



When calculating the area of a circle, square the radius before multiplying by pi. In fact, if the formula had been written *after* the invention of the calculator (instead of thousands of years before), it would be $A = r^2\pi$. The answer is the same, but if you square the radius first, you will avoid the error of multiplying pi times the radius and then squaring both of those numbers.

Let's use these keys to calculate area: enter value of r, then [x^2] [x] [π] [=]

… and when given diameter: enter d, then [÷] [2] [=] [x^2] [x] [π] [=]

Given the radius, find the area of the circle to the nearest hundredth. Use 3.14 for π.

45. r = 4 mi	46. r = 5 cm	47. r = 5.2 km	48. r = 17 ft	49. r = 9.1 in

A = ________	A = ________	A = ________	A = _______	A = _______

50. Write the formula used to find the area of a circle when given its diameter.

Given the diameter, find the area of the circle to the nearest hundredth. Use 3.14 for π.

51. d = 24 ft	52. d = 6.4 cm	53. d = 20 mi	54. d = 6 yds	55. d = 43 in

A = ________	A = ________	A = ________	A = _______	A = _______

The base of a farmer's circular silo is 3,600 ft^2. What is the diameter or this silo?

We start with the formula for the area of a circle: $A = \pi r^2$

To find the diameter, we will ultimately have to double the radius, so let's isolate the *r* term.

If we divide both sides of the equation by pi, we will have this new representation of the area equation:

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

We know the area of the circular base of the silo, and pi never changes, so divide:

$3{,}600 \div 3.14 = r^2$	To increase accuracy, leave the quotient in your calculator instead of rounding the result.
$1{,}146.49681528 = r^2$	The inverse, or opposite, or squaring a number is finding its square root. Find the square root of both sides of the equation.
$\sqrt{1{,}146.49681528} = \sqrt{r^2}$	$\sqrt{r^2}$ is the same thing as *r*.
$33.86 = r$ $\underline{\times 2 \qquad \times 2}$	Double the result to find the diameter.
$67.17 = d$ **d = 67.17 ft**	Remember to include the units in the answer. For area, the units are expressed as units squared. The units for radius and diameter are not squared.

From this problem, we devised two new formulas we can use when given the area:

$$\sqrt{\frac{A}{\pi}} = r \qquad\qquad 2\left(\sqrt{\frac{A}{\pi}}\right) = d$$

Remember, divide by the area by pi before finding the square root.

Given the area of the circle, find the radius. Round to the nearest hundredth. Use 3.14 for π.

800 in^2	1,250 yds^2	390 km^2	2,408 ft^2	11,162 cm^2
56. $r =$ ______	57. $r =$ ______	58. $r =$ ______	59. $r =$ ______	60. $r =$ _____

Given the circle's area, find the diameter. Round to the nearest hundredth. Use 3.14 for π.

484 mm^2	999.8 ft^2	86,000 in^2	0.55 mi^2	8.612 km^2
61. d = ______	62. d = ______	63. d = ______	64. d = ______	65. d = _____