

Circles: Area, Squaring & Pi

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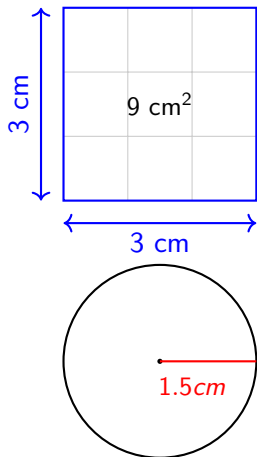
Questions and short answers

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Retrieve and Connect



1. $4 \times 4 = ?$

2. $7 \times 7 = ?$

3. $10^2 = ?$

4. $3^2 = ?$

5. 2×6 and 6^2 — are these the same?

6. $3.14 \times 9 = \underline{\hspace{2cm}}$

7. $3.14 \times 25 = \underline{\hspace{2cm}}$

7. A circle has **diameter** 14 cm. Find:

(a) the radius

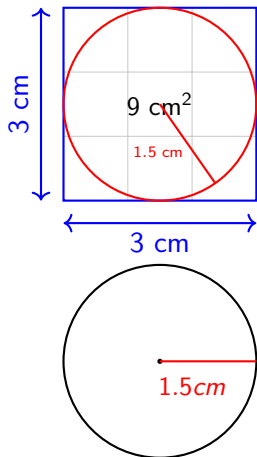
(b) the circumference .

($\pi \approx 3.14$)

8. A circle has **radius** 5 cm. What is the circumference?

9. The square has side 3 cm and area 9 cm². A circle has radius 1.5 cm. Is the circle's area more or less than 9 cm²?

Retrieve and Connect



1. $4 \times 4 = 16$

2. $7 \times 7 = 49$

3. $10^2 = 100$

4. $3^2 = 9$

5. 2×6 and 6^2 — are these the same? **No:**
 $12 \neq 36$.

6. $3.14 \times 9 = 28.26$

7. $3.14 \times 25 = 78.5$

7. A circle has **diameter** 14 cm. Find:

(a) the radius **7 cm**

(b) the circumference **43.96 cm**.

($\pi \approx 3.14$)

8. A circle has **radius** 5 cm. What is the circumference? **31.4 cm**

9. The square has side 3 cm and area 9 cm². A circle has radius 1.5 cm. Is the circle's area more or less than 9 cm²? **Less:**
 $\pi(1.5)^2 \approx 7.07 \text{ cm}^2$.

Worked Solution: Retrieve and Connect 1, Question 1

Question: $4 \times 4 = ?$

Worked Solution:

Worked Solution: Retrieve and Connect 1, Question 1

Question: $4 \times 4 = 16$

Worked Solution: $4 \times 4 = 16$ because $4 + 4 + 4 + 4 = 16$.

Worked Solution: Retrieve and Connect 1, Question 2

Question: $7 \times 7 = ?$

Worked Solution:

Worked Solution: Retrieve and Connect 1, Question 2

Question: $7 \times 7 = 49$

Worked Solution: $7 \times 7 = 49$, from the 7 times table or
 $7 + 7 + 7 + 7 + 7 + 7 + 7 = 49$.

Worked Solution: Retrieve and Connect 1, Question 3

Question: $10^2 = ?$

Worked Solution:

Worked Solution: Retrieve and Connect 1, Question 3

Question: $10^2 = 100$

Worked Solution: $10^2 = 10 \times 10 = 100.$

Worked Solution: Retrieve and Connect 1, Question 4

Question: $3^2 = ?$

Worked Solution:

Worked Solution: Retrieve and Connect 1, Question 4

Question: $3^2 = 9$

Worked Solution: $3^2 = 3 \times 3 = 9.$

Worked Solution: Retrieve and Connect 1, Question 5

Question: Are 2×6 and 6^2 the same?

Worked Solution:

Worked Solution: Retrieve and Connect 1, Question 5

Question: Are 2×6 and 6^2 the same?

Worked Solution: No. $2 \times 6 = 12$, while $6^2 = 36$. Since $12 \neq 36$, they are not the same.

Worked Solution: Retrieve and Connect 1, Question 6

Question: $3.14 \times 9 = \underline{\hspace{2cm}}$

Worked Solution:

Worked Solution: Retrieve and Connect 1, Question 6

Question: $3.14 \times 9 = 28.26$

Worked Solution: $3.14 \times 9 = 3.14 \times (10 - 1) = 31.4 - 3.14 = 28.26.$

Worked Solution: Retrieve and Connect 1, Question 7

Question: $3.14 \times 25 = \underline{\hspace{2cm}}$

Worked Solution:

Worked Solution: Retrieve and Connect 1, Question 7

Question: $3.14 \times 25 = 78.5$

Worked Solution: $3.14 \times 25 = 3.14 \times \frac{100}{4} = \frac{314}{4} = 78.5.$

Worked Solution: Retrieve and Connect 1, Question 8

Question: A circle has diameter 14 cm. Find: (a) the radius _____ and (b) the circumference _____. ($\pi \approx 3.14$)

Worked Solution:

Worked Solution: Retrieve and Connect 1, Question 8

Question: A circle has diameter 14 cm. Find: (a) the radius **7 cm** and (b) the circumference **43.96 cm**. ($\pi \approx 3.14$)

Worked Solution: Radius = $\frac{14}{2} = 7$ cm. Circumference
 $= \pi d = 3.14 \times 14 = 43.96$ cm.

Worked Solution: Retrieve and Connect 1, Question 9

Question: A circle has radius 5 cm. What is the circumference?

Worked Solution:

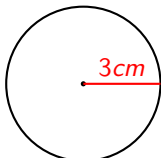
Worked Solution: Retrieve and Connect 1, Question 9

Question: A circle has radius 5 cm. What is the circumference?

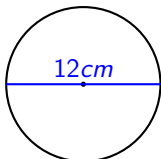
31.4 cm

Worked Solution: $C = 2\pi r = 2 \times 3.14 \times 5 = 31.4 \text{ cm}.$

Retrieve and Connect



Circle A

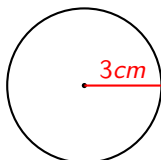


Circle B

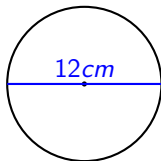
1. Halve 12 cm ____
2. Halve 9.4 cm

3. $6^2 = ?$
4. $1.5^2 = ?$
5. $3 \times 4^2 = \underline{\hspace{1cm}}$
6. True or false?
 $\pi \times (2r) = 2 \times \pi \times r$
7. Consider circle A
 - (a) What is the circumference? _____
 - (b) What is the area? _____
8. Consider circle B
 - (a) What is the circumference? _____
 - (b) What is the area? _____
9. Is the ratio of the circumferences of circle's A and B the same as the ratio of the areas?

Retrieve and Connect



Circle A



Circle B

1. Halve 12 cm **6 cm**
2. Halve 9.4 cm
4.7 cm
3. $6^2 =$ **36**
4. $1.5^2 =$ **2.25**
5. $3 \times 4^2 =$ **48**
6. True or false?
 $\pi \times (2r) = 2 \times \pi \times r$
True
7. Consider circle A
 - (a) What is the circumference? **18.84 cm**
 - (b) What is the area? **28.26 cm²**
8. Consider circle B
 - (a) What is the circumference? **37.68 cm**
 - (b) What is the area? **113.04 cm²**
9. Is the ratio of the circumferences of circle's A and B the same as the ratio of the areas? **No: 1 : 2 vs 1 : 4.**

Worked Solution: Retrieve and Connect 2, Question 1

Question: Halve 12 cm. _____

Worked Solution:

Worked Solution: Retrieve and Connect 2, Question 1

Question: Halve 12 cm. 6 cm

Worked Solution: $12 \div 2 = 6$, so the answer is 6 cm.

Worked Solution: Retrieve and Connect 2, Question 2

Question: Halve 9.4 cm. _____

Worked Solution:

Worked Solution: Retrieve and Connect 2, Question 2

Question: Halve 9.4 cm. 4.7 cm

Worked Solution: $9.4 \div 2 = 4.7$, so the answer is 4.7 cm.

Worked Solution: Retrieve and Connect 2, Question 3

Question: $6^2 = ?$

Worked Solution:

Worked Solution: Retrieve and Connect 2, Question 3

Question: $6^2 = 36$

Worked Solution: $6^2 = 6 \times 6 = 36$.

Worked Solution: Retrieve and Connect 2, Question 4

Question: $1.5^2 = ?$

Worked Solution:

Worked Solution: Retrieve and Connect 2, Question 4

Question: $1.5^2 = 2.25$

Worked Solution: $1.5 \times 1.5 = 2.25$.

Worked Solution: Retrieve and Connect 2, Question 5

Question: $3 \times 4^2 = \underline{\hspace{1cm}}$

Worked Solution:

Worked Solution: Retrieve and Connect 2, Question 5

Question: $3 \times 4^2 = 48$

Worked Solution: Square first: $4^2 = 16$, then $3 \times 16 = 48$.

Worked Solution: Retrieve and Connect 2, Question 6

Question: True or false? $\pi \times (2r) = 2 \times \pi \times r$

Worked Solution:

Worked Solution: Retrieve and Connect 2, Question 6

Question: True or false? $\pi \times (2r) = 2 \times \pi \times r$

Worked Solution: True. By commutativity, $\pi(2r) = 2\pi r$, so both sides are equal.

Worked Solution: Retrieve and Connect 2, Question 7

Question: Circle A has radius 3 cm. Find: (a) the circumference _____ and (b) the area _____.

Worked Solution:

Worked Solution: Retrieve and Connect 2, Question 7

Question: Circle A has radius 3 cm. Find: (a) the circumference 18.84 cm and (b) the area 28.26 cm².

Worked Solution: $C = 2\pi r = 2 \times 3.14 \times 3 = 18.84$ cm.

$A = \pi r^2 = 3.14 \times 3^2 = 3.14 \times 9 = 28.26$ cm².

Worked Solution: Retrieve and Connect 2, Question 8

Question: Circle B has diameter 12 cm. Find: (a) the circumference _____ and (b) the area _____.

Worked Solution:

Worked Solution: Retrieve and Connect 2, Question 8

Question: Circle B has diameter 12 cm. Find: (a) the circumference **37.68 cm** and (b) the area **113.04 cm²**.

Worked Solution: Radius = $12 \div 2 = 6$ cm.

$$C = \pi d = 3.14 \times 12 = 37.68 \text{ cm.}$$

$$A = \pi r^2 = 3.14 \times 6^2 = 3.14 \times 36 = 113.04 \text{ cm}^2.$$

Worked Solution: Retrieve and Connect 2, Question 9

Question: Is the ratio of the circumferences of circles A and B the same as the ratio of the areas?

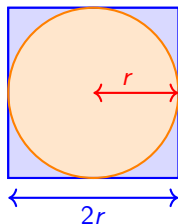
Worked Solution:

Worked Solution: Retrieve and Connect 2, Question 9

Question: Is the ratio of the circumferences of circles A and B the same as the ratio of the areas?

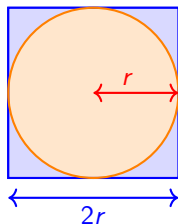
Worked Solution: No. Circumference ratio is $18.84 : 37.68 = 1 : 2$, while area ratio is $28.26 : 113.04 = 1 : 4$. Lengths scale by 2, but areas scale by $2^2 = 4$.

Retrieve and Connect



1. $5 \times 5 = ?$
2. $8^2 = ?$
3. $2.5^2 = ?$
4. $3.14 \times 9 = \underline{\hspace{2cm}}$
5. Area of a $7 \text{ cm} \times 4 \text{ cm}$ rectangle $= ?$
6. What fraction of 360° is 90° ?
7. Write an expression for the area of the circle in the picture
8. Write an expression for the area of the shaded blue region in the picture
9. If the square has a perimeter of 48cm, what is the area of the shaded blue region?

Retrieve and Connect



1. $5 \times 5 = 25$
2. $8^2 = 64$
3. $2.5^2 = 6.25$
4. $3.14 \times 9 = 28.26$
5. Area of a 7 cm $\times$ 4 cm rectangle = 28 cm^2
6. What fraction of 360° is 90° ? $\frac{1}{4}$
7. Write an expression for the area of the circle in the picture πr^2
8. Write an expression for the area of the shaded blue region in the picture $4r^2 - \pi r^2$
9. If the square has a perimeter of 48cm, what is the area of the shaded blue region? 30.96 cm^2

Worked Solution: Retrieve and Connect 3, Question 1

Question: $5 \times 5 = ?$

Worked Solution:

Worked Solution: Retrieve and Connect 3, Question 1

Question: $5 \times 5 = 25$

Worked Solution: $5 \times 5 = 25$.

Worked Solution: Retrieve and Connect 3, Question 2

Question: $8^2 = ?$

Worked Solution:

Worked Solution: Retrieve and Connect 3, Question 2

Question: $8^2 = 64$

Worked Solution: $8^2 = 8 \times 8 = 64$.

Worked Solution: Retrieve and Connect 3, Question 3

Question: $2.5^2 = ?$

Worked Solution:

Worked Solution: Retrieve and Connect 3, Question 3

Question: $2.5^2 = 6.25$

Worked Solution: $2.5 \times 2.5 = 6.25$.

Worked Solution: Retrieve and Connect 3, Question 4

Question: $3.14 \times 9 = \underline{\hspace{2cm}}$

Worked Solution:

Worked Solution: Retrieve and Connect 3, Question 4

Question: $3.14 \times 9 = 28.26$

Worked Solution: $3.14 \times 9 = 3.14 \times (10 - 1) = 31.4 - 3.14 = 28.26.$

Worked Solution: Retrieve and Connect 3, Question 5

Question: Area of a $7\text{ cm} \times 4\text{ cm}$ rectangle =?

Worked Solution:

Worked Solution: Retrieve and Connect 3, Question 5

Question: Area of a $7\text{ cm} \times 4\text{ cm}$ rectangle = 28 cm^2

Worked Solution: $7 \times 4 = 28$, so the area is 28 cm^2 .

Worked Solution: Retrieve and Connect 3, Question 6

Question: What fraction of 360° is 90° ?

Worked Solution:

Worked Solution: Retrieve and Connect 3, Question 6

Question: What fraction of 360° is 90° ?

Worked Solution: $\frac{90}{360} = \frac{1}{4}$.

Worked Solution: Retrieve and Connect 3, Question 7

Question: Write an expression for the area of the circle in the picture, which has radius r .

Worked Solution:

Worked Solution: Retrieve and Connect 3, Question 7

Question: Write an expression for the area of the circle in the picture, which has radius r .

Worked Solution: $A = \pi r^2$.

Worked Solution: Retrieve and Connect 3, Question 8

Question: Write an expression for the area of the shaded blue region in the picture, where the square has side $2r$ and the circle has radius r .

Worked Solution:

Worked Solution: Retrieve and Connect 3, Question 8

Question: Write an expression for the area of the shaded blue region in the picture, where the square has side $2r$ and the circle has radius r .

Worked Solution: Square area $= (2r)^2 = 4r^2$. Shaded area $= 4r^2 - \pi r^2$.

Worked Solution: Retrieve and Connect 3, Question 9

Question: If the square has a perimeter of 48 cm, what is the area of the shaded blue region?

Worked Solution:

Worked Solution: Retrieve and Connect 3, Question 9

Question: If the square has a perimeter of 48 cm, what is the area of the shaded blue region?

Worked Solution: Side = $48 \div 4 = 12$ cm, so $2r = 12$ and $r = 6$ cm.
Square area = $12^2 = 144$ cm². Circle area = $\pi \times 6^2 = 3.14 \times 36 = 113.04$ cm². Shaded area = $144 - 113.04 = 30.96$ cm².

Retrieve and Connect

1. $9^2 = ?$

2. $3.5^2 = ?$

3. 3.14×16

4. 3.14×49

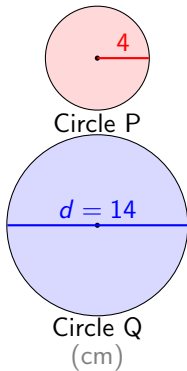
5. Halve 14 cm. Then square your answer.

6. A square has area 64 cm^2 . What is its side length ?

7. **Spot the mistake:** "Circle Q has diameter 14 cm, so its area is $\pi \times 14^2 \approx 615 \text{ cm}^2$." What error was made? Write the correct solution.

8. **Circle P**, radius 4 cm. Find: (a) the area _____ (b) the circumference _____.

9. **Circle Q**, diameter 14 cm. Find: (a) the area _____ (b) the circumference _____.



Retrieve and Connect

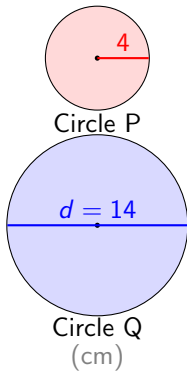
1. $9^2 = 81$

2. $3.5^2 = 12.25$

3. $3.14 \times 16 = 50.24$ 4. $3.14 \times 49 = 153.86$

5. Halve 14 cm. Then square your answer.
7 cm, so 49 cm^2

6. A square has area 64 cm^2 . What is its side length **8 cm**



7. **Spot the mistake:** "Circle Q has diameter 14 cm, so its area is $\pi \times 14^2 \approx 615 \text{ cm}^2$." What error was made? Write the correct solution. **Used diameter not radius: $\pi \times 7^2 \approx 153.86 \text{ cm}^2$.**

8. **Circle P**, radius 4 cm. Find: (a) the area **50.24 cm^2** (b) the circumference **25.12 cm .**

9. **Circle Q**, diameter 14 cm. Find: (a) the area **153.86 cm^2** (b) the circumference

Worked Solution: Retrieve and Connect 4, Question 1

Question: $9^2 = ?$

Worked Solution:

Worked Solution: Retrieve and Connect 4, Question 1

Question: $9^2 = 81$

Worked Solution: $9^2 = 9 \times 9 = 81.$

Worked Solution: Retrieve and Connect 4, Question 2

Question: $3.5^2 = ?$

Worked Solution:

Worked Solution: Retrieve and Connect 4, Question 2

Question: $3.5^2 = 12.25$

Worked Solution: $3.5 \times 3.5 = \frac{7}{2} \times \frac{7}{2} = \frac{49}{4} = 12.25.$

Worked Solution: Retrieve and Connect 4, Question 3

Question: $3.14 \times 16 = ?$

Worked Solution:

Worked Solution: Retrieve and Connect 4, Question 3

Question: $3.14 \times 16 = ?$

Worked Solution:

$$3.14 \times 16 = 3.14 \times (10 + 6) = 31.4 + 18.84 = 50.24.$$

Worked Solution: Retrieve and Connect 4, Question 4

Question: $3.14 \times 49 = ?$

Worked Solution:

Worked Solution: Retrieve and Connect 4, Question 4

Question: $3.14 \times 49 = ?$

Worked Solution: $49 = 50 - 1$, so

$$3.14 \times 49 = 3.14 \times 50 - 3.14 = 157 - 3.14 = 153.86.$$

Worked Solution: Retrieve and Connect 4, Question 5

Question: Halve 14 cm, then square your answer.

Worked Solution:

Worked Solution: Retrieve and Connect 4, Question 5

Question: Halve 14 cm, then square your answer.

Worked Solution: Halving gives $14 \div 2 = 7$ cm. Squaring gives $7^2 = 49$, so the answer is 49 cm^2 .

Worked Solution: Retrieve and Connect 4, Question 6

Question: A square has area 64 cm^2 . What is its side length? ?

Worked Solution:

Worked Solution: Retrieve and Connect 4, Question 6

Question: A square has area 64 cm^2 . What is its side length? 8
cm

Worked Solution: Since $8^2 = 64$, the side length is $\sqrt{64} = 8 \text{ cm}$.

Worked Solution: Retrieve and Connect 4, Question 7

Question: Spot the mistake: “Circle Q has diameter 14 cm, so its area is $\pi \times 14^2 \approx 615 \text{ cm}^2$.” What error was made? Write the correct solution.

Worked Solution:

Worked Solution: Retrieve and Connect 4, Question 7

Question: Spot the mistake: “Circle Q has diameter 14 cm, so its area is $\pi \times 14^2 \approx 615 \text{ cm}^2$.” What error was made? Write the correct solution.

Worked Solution: The diameter was used instead of the radius. The radius is $14 \div 2 = 7$ cm, so the correct area is $\pi \times 7^2 = 3.14 \times 49 \approx 153.86 \text{ cm}^2$.

Worked Solution: Retrieve and Connect 4, Question 8

Question: Circle P has radius 4 cm. Find: (a) the area _____
and (b) the circumference _____.

Worked Solution:

Worked Solution: Retrieve and Connect 4, Question 8

Question: Circle P has radius 4 cm. Find: (a) the area 50.24 cm^2 and (b) the circumference 25.12 cm .

Worked Solution: $A = \pi r^2 = 3.14 \times 4^2 = 3.14 \times 16 = 50.24 \text{ cm}^2$.

$C = 2\pi r = 2 \times 3.14 \times 4 = 25.12 \text{ cm}$.

Worked Solution: Retrieve and Connect 4, Question 9

Question: Circle Q has diameter 14 cm. Find: (a) the area _____ and (b) the circumference _____.

Worked Solution:

Worked Solution: Retrieve and Connect 4, Question 9

Question: Circle Q has diameter 14 cm. Find: (a) the area 153.86 cm^2 and (b) the circumference 43.96 cm .

Worked Solution: Radius $= 14 \div 2 = 7 \text{ cm}$.

$$A = \pi r^2 = 3.14 \times 7^2 = 3.14 \times 49 = 153.86 \text{ cm}^2.$$

$$C = \pi d = 3.14 \times 14 = 43.96 \text{ cm}.$$

Worked Solution: Retrieve and Connect 4, Question 10

Question: Which has the greater area, P or Q? By approximately how many cm^2 ?

Worked Solution:

Worked Solution: Retrieve and Connect 4, Question 10

Question: Which has the greater area, P or Q? By approximately how many cm^2 ?

Worked Solution: Area P is 50.24 cm^2 , and area Q is 153.86 cm^2 .
Therefore Q is greater by $153.86 - 50.24 = 103.62 \text{ cm}^2$.