GRADE 7 · UNIT 4 · LESSON 5

Exploring Relationships in Circles

MA.7.GR.1.3

I can explain the relationship between the circumference and the diameter of a circle.

Warm-Up

1. A 6 cm by 4 cm rectangle. How far is it all around?
2. The same rectangle. What is its area?
3. Which answer is in cm? Which is in cm^2?
4. How would you measure the distance around a circle?

Warm-Up

1. A 6 cm by 4 cm rectangle. How far is it all around? **20 cm**
2. The same rectangle. What is its area? **24 cm^2**
3. Which answer is in cm? Which is in cm^2?

   Perimeter cm; area cm^2.
4. How would you measure the distance around a circle?

   Answers vary — string, a tape measure.

Vocabulary

circle

all the points the same distance from one point, the center

radius

a segment from the center to a point on the circle; plural radii

diameter

a segment through the center, from one side of the circle to the other

circumference

the distance all the way around a circle

Notes

I. The Parts of a Circle

circle — all the points the same distance from one point, the center

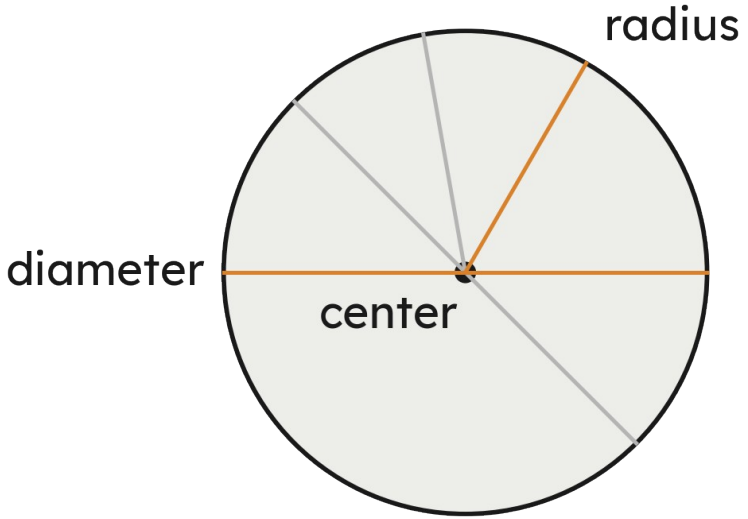
radius — a segment from the center to a point on the circle

diameter — a segment through the center, from one side to the other

Notes

The Parts of a Circle

A diameter is two radii. d = 2r r = d ÷ 2



A circle has infinitely many radii and diameters — the picture shows two of each.

Notes

II. Circumference, and How to Measure It

circumference — the distance all the way around a circle

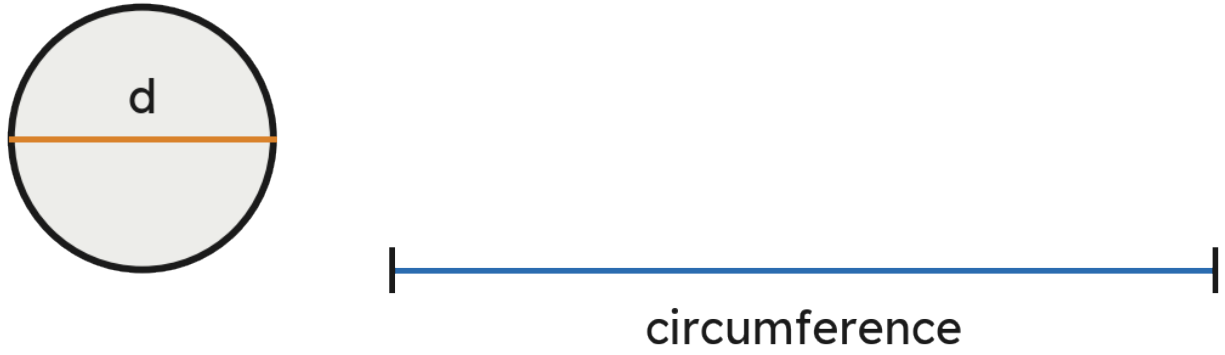
Circumference is a length, not an area. Units are cm, in or ft — never squared.

Notes

Circumference, and How to Measure It

Wrap string round the circle, mark where it meets, straighten it on a ruler.

Snug, but not stretched. Stretched string reads too long.



Notes

Measuring Circles

1. Check the bar at the top of the page. It must be exactly 10 cm.
2. Measure straight across each circle, through the dot, to get the diameter.
3. Wrap the string, mark it, straighten it on the ruler to get the circumference.
4. Record both to the nearest tenth of a centimeter.
5. Then divide: circumference ÷ diameter, for each circle.

Notes

III. What Everybody Found

Four different circles. The last column was not four different numbers.

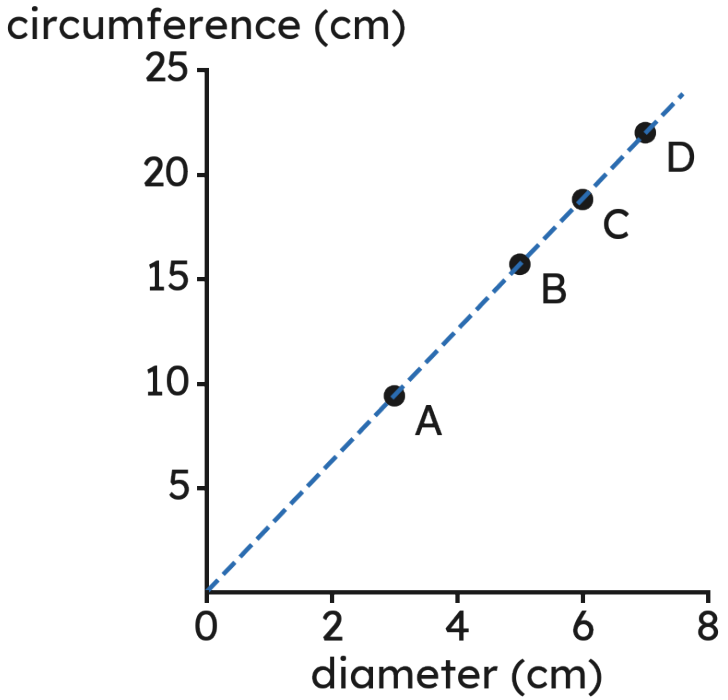
Every answer landed near 3.1, whatever the circle.

Plot circumference against diameter: the points lie on a line through the origin.

Notes

What Everybody Found

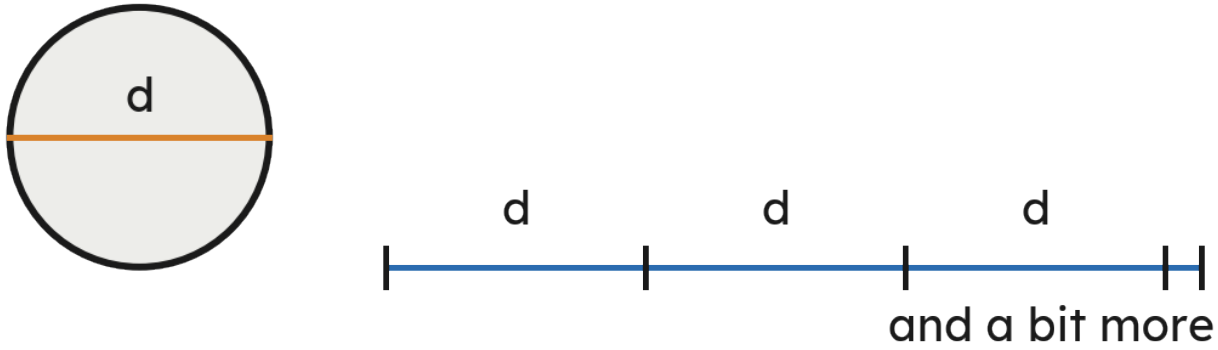
That is what proportional looks like.



Notes

IV. Three Diameters, and a Bit More

The circumference is about 3.14 times the diameter, for every circle.



Notes

Three Diameters, and a Bit More

Forwards: diameter × 3.14 = circumference.

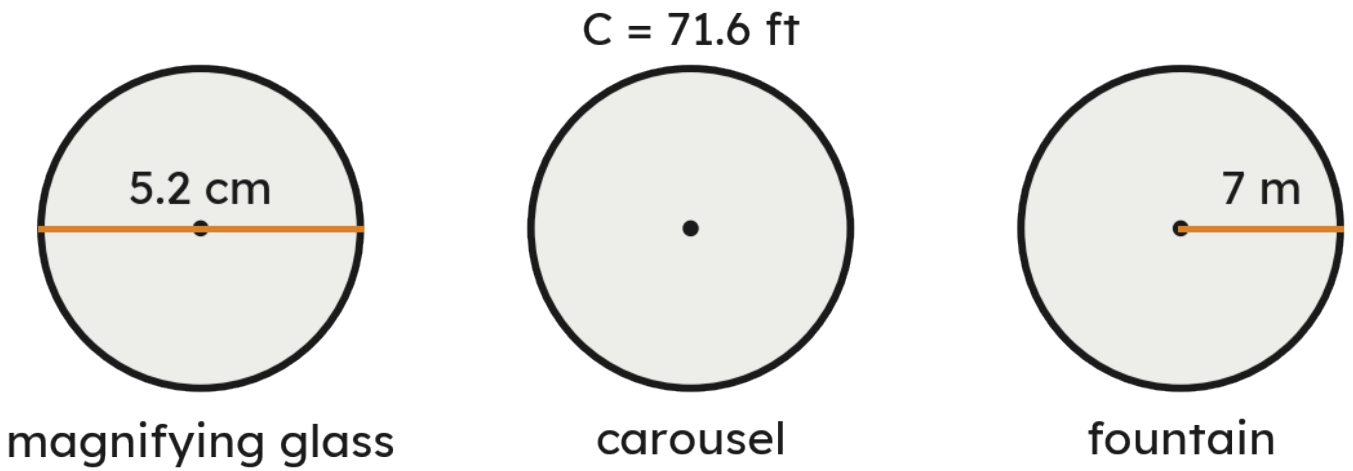
Backwards: circumference ÷ 3.14 = diameter.

Given a radius, double it first. The 3.14 goes with the diameter.

Example 1

A magnifying glass, a carousel and a fountain are circles.

Find the circumference of the magnifying glass and of the fountain, and the diameter of the carousel.



One of these three needs an extra step. Which, and why?

Example 1

$$d = 5.2$$

$$C \approx 5.2 \times 3.14 \approx 16.3$$

Centimeters. Not square centimeters.

Answer: $C \approx 16.3$ cm

Example 1

$$C = 71.6$$

$$d \approx 71.6 \div 3.14 \approx 22.8$$

3.14 times what gives 71.6?

Answer: d ≈ 22.8 ft

Your Turn

A pizza has a diameter of 31 cm.

Jan says its circumference is 63 cm.

Is Jan right? About how long is the circumference?

Your Turn

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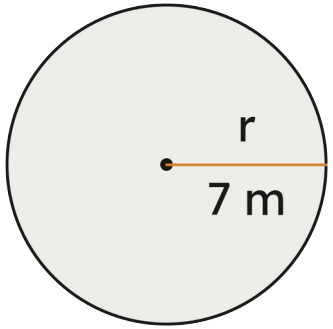
Jan's numbers: $63 \div 31 \approx 2.03$, not 3.14

Circumference: $31 \times 3.14 = 97.34$

Answer: No — about 97 cm

Example 2

A circular fountain has a radius of 7 m.



Find the distance all the way around it.

Example 2

$$r = 7$$

$$d = 2 \times 7 = 14$$

$$C \approx 14 \times 3.14 = 43.96$$

$7 \times 3.14 = 21.98$, which is half the way round. A real distance, and the wrong one.

Answer: $C \approx 43.96$ m

Your Turn

A circle has a radius of 9 cm. Find its diameter.

Another has a diameter of 25 in. Find its radius.

Your Turn

A circle has a radius of 9 cm. Find its diameter.

Another has a diameter of 25 in. Find its radius.

Diameter: $2 \times 9 = 18$

Radius: $25 \div 2 = 12.5$

Answer: d = 18 cm · r = 12.5 in

Whiteboards · Question 1 of 9

A circle has a radius of 11 cm.

What is its diameter?

Answer it.

Whiteboards · Question 1 of 9

A circle has a radius of 11 cm.

What is its diameter?

$$\text{Diameter} = 2 \times \text{radius}$$

$$2 \times 11 = 22$$

Answer: d = 22 cm

Whiteboards · Question 2 of 9

A circle has a diameter of 9 in.

What is its radius?

Answer it.

Whiteboards · Question 2 of 9

A circle has a diameter of 9 in.

What is its radius?

$$\text{Radius} = \text{diameter} \div 2$$

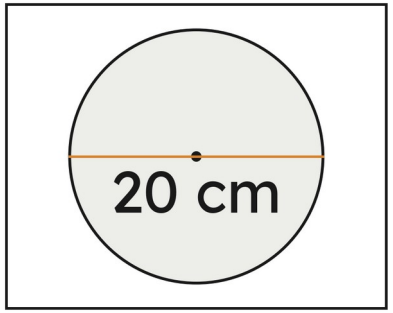
$$9 \div 2 = 4.5$$

Answer: r = 4.5 in

Whiteboards · Question 3 of 9

A plate 20 cm across sits on a placemat 30 cm wide.

Find the circumference of the plate.



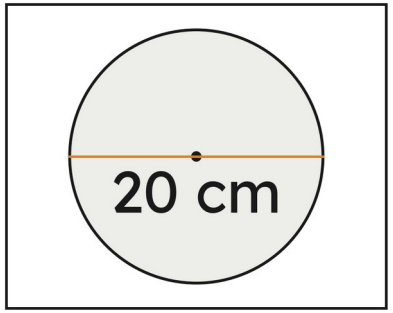
placemat: 30 cm wide

Answer it.

Whiteboards · Question 3 of 9

A plate 20 cm across sits on a placemat 30 cm wide.

Find the circumference of the plate.



placemat: 30 cm wide

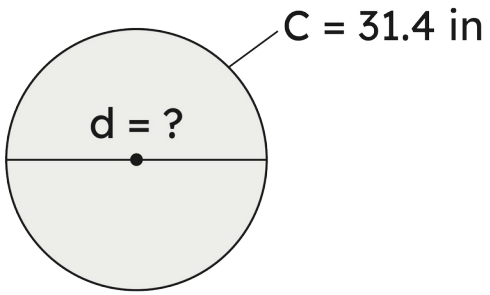
The plate is 20 cm across.

$C = 3.14 \times 20 = 62.8$

Answer: C = 62.8 cm

Whiteboards · Question 4 of 9

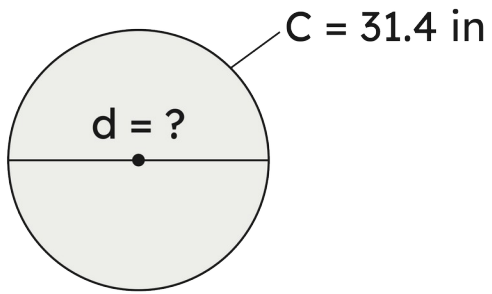
Find the diameter.



Answer it.

Whiteboards · Question 4 of 9

Find the diameter.



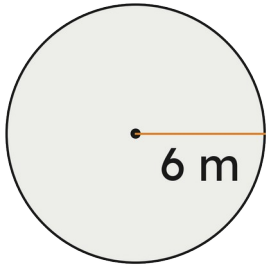
$d = C \div 3.14$

$d = 31.4 \div 3.14 = 10$

Answer: d = 10 in

Whiteboards · Question 5 of 9

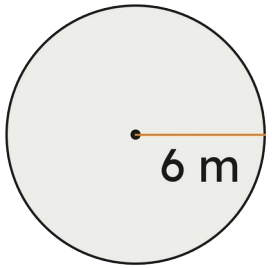
Find the circumference.



Answer it.

Whiteboards · Question 5 of 9

Find the circumference.



The 6 m is a radius: $d = 2 \times 6 = 12$

$C = 3.14 \times 12 = 37.68$

Answer: C = 37.68 m

Whiteboards · Question 6 of 9

A wheel has a diameter of 5 ft. Someone says the distance around is 40 ft.

Could 40 ft be right?

Answer it.

Whiteboards · Question 6 of 9

A wheel has a diameter of 5 ft. Someone says the distance around is 40 ft.

Could 40 ft be right?

$C = 3.14 \times 5 = 15.7$

40 ft would be $40 \div 5 = 8$ diameters.

Answer: No — about 15.7 ft

Whiteboards · Question 7 of 9

A drink coaster has a diameter of 9.5 cm.

Find its circumference. Use 3.14 for π.

A. 3.03 cm

B. 12.64 cm

C. 59.66 cm

D. 29.83 cm

Answer it.

Whiteboards · Question 7 of 9

A drink coaster has a diameter of 9.5 cm.

Find its circumference. Use 3.14 for π.

$$C = 3.14 \times 9.5 = 29.83$$

Answer: D — about 29.83 cm

Whiteboards · Question 8 of 9

A round manhole cover has a circumference of 80.4 in.

Find its diameter. Use 3.14 for π.

A. 25.6 in

B. 252.5 in

C. 40.2 in

D. 12.8 in

Answer it.

Whiteboards · Question 8 of 9

A round manhole cover has a circumference of 80.4 in.

Find its diameter. Use 3.14 for π.

$$d = C \div 3.14$$

$$d = 80.4 \div 3.14 \approx 25.6$$

Answer: A — about 25.6 in

Whiteboards · Question 9 of 9

Which pairs could be one circle's diameter and its circumference?

A. 7 m and 22 m B. 15 in and 63 in C. 27 cm and 85 cm

Show how you decided.

Write your answer in sentences.

Whiteboards · Question 9 of 9

Which pairs could be one circle's diameter and its circumference?

A. 7 m and 22 m B. 15 in and 63 in C. 27 cm and 85 cm

Show how you decided.

A: $22 \div 7 \approx 3.14$

B: $63 \div 15 = 4.2$

C: $85 \div 27 \approx 3.15$

Answer: A and C

Before You Go

Circumference is a length. Never squared.

About 3.14 times the diameter, for every circle.

Given a radius, double it first.

IXL

1. Open IXL and start today's skills.
2. Work on paper where the question needs work. The answer box does not show it.
3. Every skill listed is required, to a SmartScore of 60. These skills continue tomorrow: one assignment, due at the start of the class after 4.06.

Today's skills — all required

Center, radius, and diameter of a circle (7RY)

Circumference of circles (9FM)