Geometry Circles Workbook

3 lessons · printable · answer key at the back

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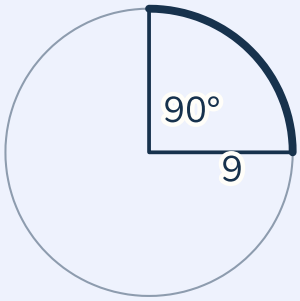
Name _____ Date _____

Contents

Parts of a Circle

WORKED EXAMPLE



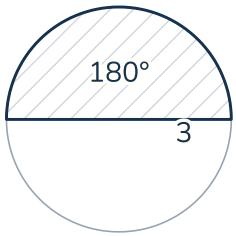
Length of the curved edge

14.13 cm

1. Arc length and sector area

Use π = 3.14. Each shape is part of a circle — find what the label asks for.

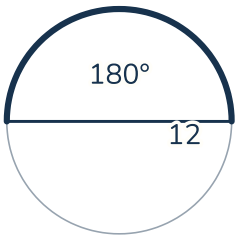
1



Area of the slice

_____ cm²

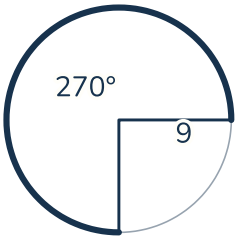
2



Length of the curved edge

_____ cm

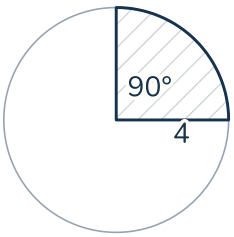
3



Length of the curved edge

_____ cm

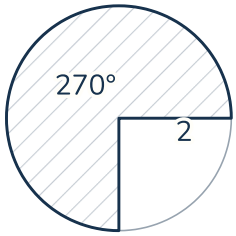
4



Area of the slice

_____ cm²

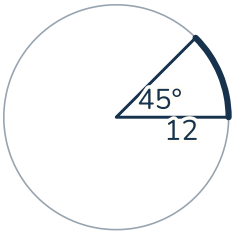
5



Area of the slice

_____ cm²

6



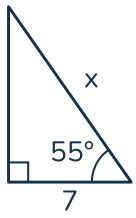
Length of the curved edge

_____ cm

2. Right-triangle trigonometry

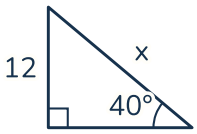
Find the side marked x, to one decimal place. Use a calculator.

7



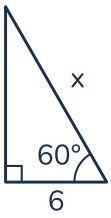
_____ cm

8



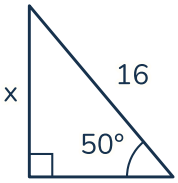
_____ cm

9



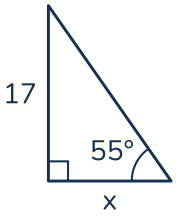
_____ cm

10



_____ cm

11



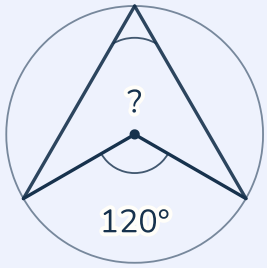
_____ cm

12

_____ cm

Inscribed Angles

WORKED EXAMPLE

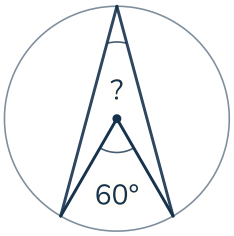


60 degrees

3. Inscribed angle in a circle

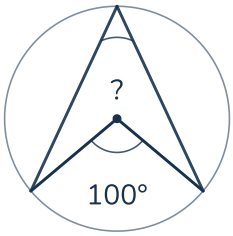
The angle at the center is given. Find the angle on the circle.

1



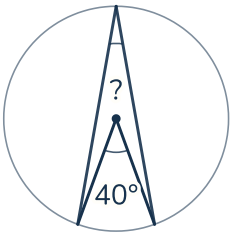
_____ degrees

2



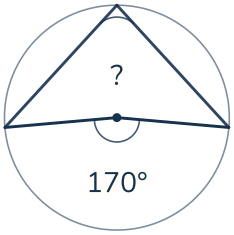
_____ degrees

3



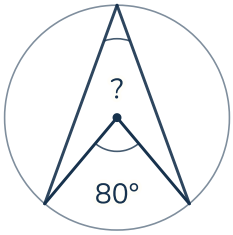
_____ degrees

4



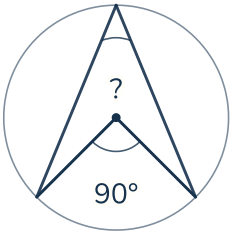
_____ degrees

5



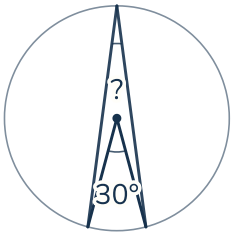
_____ degrees

6



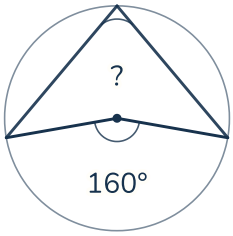
_____ degrees

7



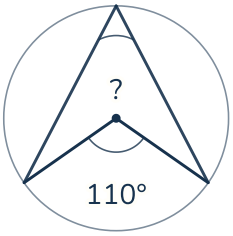
_____ degrees

8



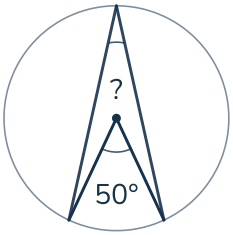
_____ degrees

9



_____ degrees

10

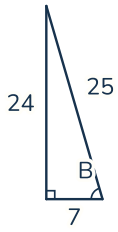


_____ degrees

4. Write a trigonometric ratio

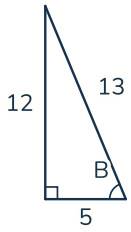
Write each ratio as a fraction. Read the sides straight off the triangle.

11



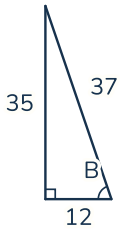
sin B = _____

12



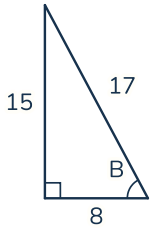
tan B = _____

13



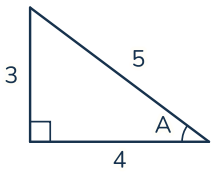
sin B = _____

14



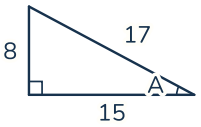
cos B = _____

15



tan A = _____

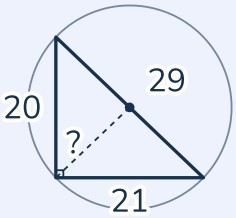
16



cos A = _____

Triangles and Circles

WORKED EXAMPLE

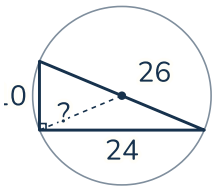


14.5 cm

5. Circles of a right triangle

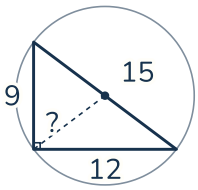
Each circle passes through all three corners. Find its radius.

1



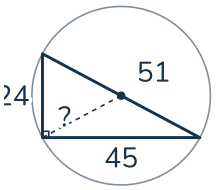
_____ cm

2



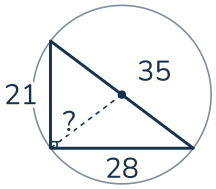
_____ cm

3



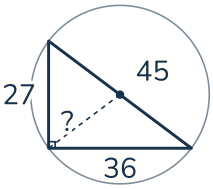
_____ cm

4



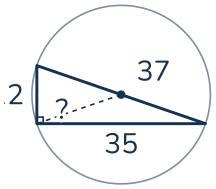
_____ cm

5



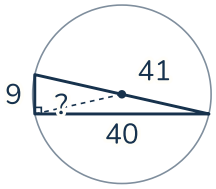
_____ cm

6



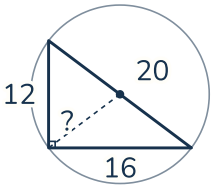
_____ cm

7



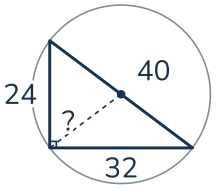
_____ cm

8



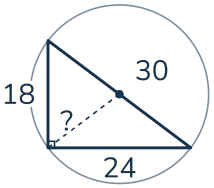
_____ cm

9



_____ cm

10



_____ cm

6. Laws of sines and cosines

Use the law of sines. Round each length to one decimal place.

11 In ΔABC, $a = 6$, $\angle A = 60°$, $\angle B = 45°$. Find b:

_____

12 In ΔABC, $a = 9$, $\angle A = 45°$, $\angle B = 55°$. Find b:

_____

13 In ΔABC, $a = 7$, $\angle A = 40°$, $\angle B = 60°$. Find b:

_____

14 In ΔABC, $a = 10$, $\angle A = 50°$, $\angle B = 70°$. Find b:

_____

15 In ΔABC, $a = 12$, $\angle A = 40°$, $\angle B = 50°$. Find b:

_____

16 In ΔABC, $a = 9$, $\angle A = 65°$, $\angle B = 40°$. Find b:

_____

Answer Key

Parts of a Circle

Arc length and sector area

1. r = 3, 180°, area: 14.13 cm²
2. r = 12, 180°, arc: 37.68 cm
3. r = 9, 270°, arc: 42.39 cm
4. r = 4, 90°, area: 12.56 cm²
5. r = 2, 270°, area: 9.42 cm²
6. r = 12, 45°, arc: 9.42 cm

Right-triangle trigonometry

7. 55°, adj 7 → hyp x = 12.2
8. 40°, opp 12 → hyp x = 18.7
9. 60°, adj 6 → hyp x = 12
10. 50°, hyp 16 → opp x = 12.3
11. 55°, opp 17 → adj x = 11.9
12. 65°, opp 17 → adj x = 7.9

Inscribed Angles

Inscribed angle in a circle

1. center 60° → circle 30°
2. center 100° → circle 50°
3. center 40° → circle 20°
4. center 170° → circle 85°
5. center 80° → circle 40°
6. center 90° → circle 45°
7. center 30° → circle 15°
8. center 160° → circle 80°
9. center 110° → circle 55°
10. center 50° → circle 25°

Write a trigonometric ratio

11. sin B (legs 24, 7, hyp 25) = 24/25
12. tan B (legs 12, 5, hyp 13) = 12/5
13. sin B (legs 35, 12, hyp 37) = 35/37
14. cos B (legs 15, 8, hyp 17) = 8/17
15. tan A (legs 3, 4, hyp 5) = 3/4
16. cos A (legs 8, 15, hyp 17) = 15/17

Triangles and Circles

Circles of a right triangle

1. 10, 24, 26 — through the corners: 13 cm
2. 9, 12, 15 — through the corners: 7.5 cm
3. 24, 45, 51 — through the corners: 25.5 cm
4. 21, 28, 35 — through the corners: 17.5 cm
5. 27, 36, 45 — through the corners: 22.5 cm
6. 12, 35, 37 — through the corners: 18.5 cm
7. 9, 40, 41 — through the corners: 20.5 cm

Triangles and Circles (continued)

Circles of a right triangle (continued)

8. 12, 16, 20 — through the corners: 10 cm
9. 24, 32, 40 — through the corners: 20 cm
10. 18, 24, 30 — through the corners: 15 cm

Laws of sines and cosines

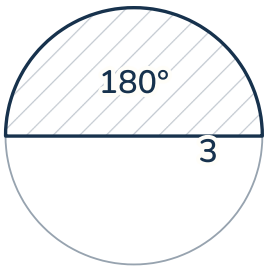
11. In ΔABC, a = 6, ∠A = 60°, ∠B = 45°. Find b: 4.9
12. In ΔABC, a = 9, ∠A = 45°, ∠B = 55°. Find b: 10.4
13. In ΔABC, a = 7, ∠A = 40°, ∠B = 60°. Find b: 9.4
14. In ΔABC, a = 10, ∠A = 50°, ∠B = 70°. Find b: 12.3
15. In ΔABC, a = 12, ∠A = 40°, ∠B = 50°. Find b: 14.3
16. In ΔABC, a = 9, ∠A = 65°, ∠B = 40°. Find b: 6.4

Solutions (1 of 7)

Parts of a Circle

Arc length and sector area

1.



Area of the slice

_____ cm²

180/360 = **1/2**

3.14 × 3 × 3 = **28.26**

1/2 of 28.26 = **14.13**

14.13 cm²

A slice is a FRACTION of the whole circle, and the angle says which fraction. A full turn is 360°, so 180° is 180 out of 360 — that is 1/2 of the circle. Write that down before touching a formula.

Now the whole circle, as if there were no slice. Its area is π × r × r — only the r is squared: 3.14 × 3 × 3 = 28.26.

Then take the slice's share of it: 1/2 of 28.26 is 14.13.

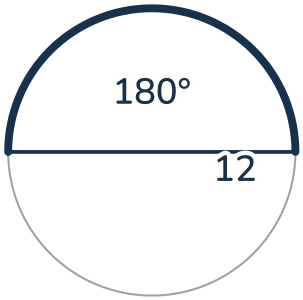
So the area of the slice is 14.13 cm². Check the unit against what was asked — a curved edge is a length and a slice is an area, and getting cm² where you expected the other one means you answered the other question.

Solutions (2 of 7)

Parts of a Circle (continued)

Arc length and sector area (continued)

2.



Length of the curved edge

_____ cm

180/360 = **1/2**

2 × 3.14 × 12 = **75.36**

1/2 of 75.36 = **37.68**

37.68 cm

A slice is a FRACTION of the whole circle, and the angle says which fraction. A full turn is 360°, so 180° is 180 out of 360 — that is 1/2 of the circle. Write that down before touching a formula.

Now the whole circle, as if there were no slice. All the way round is 2 × π × r: 2 × 3.14 × 12 = 75.36 cm.

Then take the slice's share of it: 1/2 of 75.36 is 37.68.

So the curved edge is 37.68 cm. Check the unit against what was asked — a curved edge is a length and a slice is an area, and getting cm where you expected the other one means you answered the other question.

Solutions (3 of 7)

Parts of a Circle (continued)

Right-triangle trigonometry

7.

_____ cm

adjacent ÷ hypotenuse = **cosine**

cos 55° = 7 ÷ x

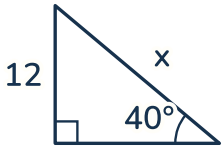
x = **12.2**

The angle is 55°. You know the adjacent (7) and you want the hypotenuse (x). Those two sides are the adjacent and the hypotenuse, so the ratio is the cosine.

Write it with the numbers: cos 55° = 7 ÷ x.

Rearrange for x and work it out on a calculator: x = 7 ÷ cos 55° = 12.2.

8.



_____ cm

opposite ÷ hypotenuse = **sine**

sin 40° = 12 ÷ x

x = **18.7**

The angle is 40°. You know the opposite (12) and you want the hypotenuse (x). Those two sides are the opposite and the hypotenuse, so the ratio is the sine.

Write it with the numbers: sin 40° = 12 ÷ x.

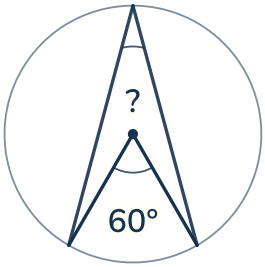
Rearrange for x and work it out on a calculator: x = 12 ÷ sin 40° = 18.7.

Solutions (4 of 7)

Inscribed Angles

Inscribed angle in a circle

1.



___ degrees

same arc, two angles

center = 2 × circle so

circle = center ÷ 2

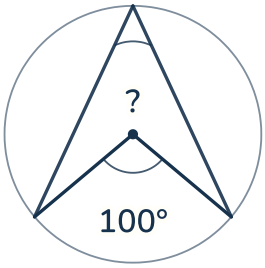
60 ÷ 2 = **30**

Both marked angles stand on the SAME arc — the two chords and the two radii end at the same two points on the circle. That is what makes them a pair; two angles in a circle that do not share an arc have nothing to say to each other.

The angle at the CENTER is always twice the one on the circle, wherever on the far arc that point sits. Here the center angle is the one given, so this is a halving.

Half of 60 is 30, so the angle on the circle is 30°.

2.



___ degrees

same arc, two angles

center = 2 × circle so

circle = center ÷ 2

100 ÷ 2 = **50**

Both marked angles stand on the SAME arc — the two chords and the two radii end at the same two points on the circle. That is what makes them a pair; two angles in a circle that do not share an arc have nothing to say to each other.

The angle at the CENTER is always twice the one on the circle, wherever on the far arc that point sits. Here the center angle is the one given, so this is a halving.

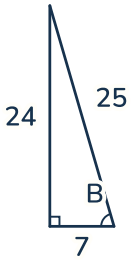
Half of 100 is 50, so the angle on the circle is 50°.

Solutions (5 of 7)

Inscribed Angles (continued)

Write a trigonometric ratio

11.



sin B = _____

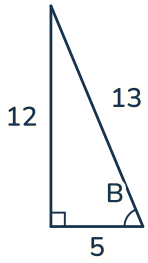
sin B = **24/25**

sin B is opposite over hypotenuse. Name the two sides you need, measured from angle B.

Read them off the triangle: the opposite side of angle B is 24, the hypotenuse is 25.

So sin B = 24/25.

12.



tan B = _____

tan B = **12/5**

tan B is opposite over adjacent. Name the two sides you need, measured from angle B.

Read them off the triangle: the opposite side of angle B is 12, the adjacent is 5.

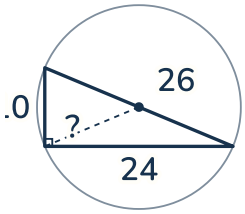
So tan B = 12/5.

Solutions (6 of 7)

Triangles and Circles

Circles of a right triangle

1.



___ cm

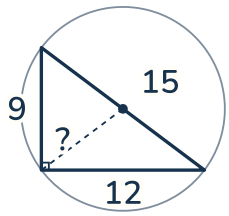
right angle on the circle →
180° at the center
the 26 cm side =
the diameter
26 ÷ 2 = **13**

The corner between the two short sides is a RIGHT angle, and it is sitting on the circle looking straight across at the hypotenuse. An angle on a circle is half the one at the center, so the angle at the center here is 180° — a straight line.

A straight line through the center IS a diameter. So the hypotenuse is the diameter, and the center of the circle is its midpoint — not somewhere inside the triangle.

The radius is half the diameter: 26 ÷ 2 = 13. So the circle through all three corners has a radius of 13 cm, and the two short sides never come into it.

2.



___ cm

right angle on the circle →
180° at the center
the 15 cm side =
the diameter
15 ÷ 2 = **7.5**

The corner between the two short sides is a RIGHT angle, and it is sitting on the circle looking straight across at the hypotenuse. An angle on a circle is half the one at the center, so the angle at the center here is 180° — a straight line.

A straight line through the center IS a diameter. So the hypotenuse is the diameter, and the center of the circle is its midpoint — not somewhere inside the triangle.

The radius is half the diameter: 15 ÷ 2 = 7.5. So the circle through all three corners has a radius of 7.5 cm, and the two short sides never come into it.

Solutions (7 of 7)

Triangles and Circles (continued)

Laws of sines and cosines

11. In ΔABC, $a = 6$, $\angle A = 60°$, $\angle B = 45°$. Find b: ____

$$b = a \cdot \sin B / \sin A$$
$$b = 6 \cdot \sin 45° / \sin 60°$$
$$b \approx 4.9$$

Two angles and the side opposite one — that is the law of sines: a/sin A = b/sin B.

Substitute a = 6, A = 60°, B = 45°.

Evaluate and round to one place: b ≈ 4.9.

12. In ΔABC, $a = 9$, $\angle A = 45°$, $\angle B = 55°$. Find b: ____

$$b = a \cdot \sin B / \sin A$$
$$b = 9 \cdot \sin 55° / \sin 45°$$
$$b \approx 10.4$$

Two angles and the side opposite one — that is the law of sines: a/sin A = b/sin B.

Substitute a = 9, A = 45°, B = 55°.

Evaluate and round to one place: b ≈ 10.4.