Math 7 Unit 9 worksheet: Area of a circle (answer key)

ANSWERS AT A GLANCE

1. (a) 25π cm$^2 \approx 78.5$ cm^2 (b) 64π m$^2 \approx 201.1$ m^2 (c) 6.25π m$^2 \approx 19.6$ m^2 (d) 225π in$^2 \approx 706.9$ in^2 (e) 1.44π cm$^2 \approx 4.5$ cm^2 (f) 42.25π ft$^2 \approx 132.7$ ft^2
2. (a) $r = 9$ cm, $d = 18$ cm (b) $r = 12$ m, $d = 24$ m (c) $r = 2.5$ in, $d = 5$ in (d) $r = 0.7$ m, $d = 1.4$ m
3. 10π m, about 31.4 m
4. (a) He used the diameter 10 cm as the radius. (b) 25π cm$^2 \approx 78.5$ cm^2; his answer is 4 times the correct area.
5. Small 4π cm^2, large 25π cm^2. Elena is wrong: the large sticker uses 6.25 times as much paper.
6. (a) 200π cm$^2 \approx 628.3$ cm^2 (b) $\frac{8}{9}$
7. (a) $r \approx 28.2$ cm, $d \approx 56.4$ cm (b) Wider: 56.4 cm is more than 50 cm.

WORKED SOLUTIONS

1. Find the area of each circle from its radius r or diameter d. Give it exactly in terms of π and rounded to one decimal place, with its unit.

(a) $r = 5$ cm (b) $d = 16$ m (c) $r = 2.5$ m

(d) $d = 30$ in (e) $r = 1.2$ cm (f) $d = 13$ ft

ANSWER

(a) 25π cm$^2 \approx 78.5$ cm^2 (b) 64π m$^2 \approx 201.1$ m^2 (c) 6.25π m$^2 \approx 19.6$ m^2 (d) 225π in$^2 \approx 706.9$ in^2 (e) 1.44π cm$^2 \approx 4.5$ cm^2 (f) 42.25π ft$^2 \approx 132.7$ ft^2

SOLUTION

(a) $A = \pi \times 5^2 = 25\pi \approx 78.5$ cm^2.

(b) The radius is 16 ÷ 2 = 8 m, so $A = \pi \times 8^2 = 64\pi \approx 201.1$ m^2.

(c) $A = \pi \times 2.5^2 = 6.25\pi \approx 19.6$ m^2.

(d) The radius is 30 ÷ 2 = 15 in, so $A = \pi \times 15^2 = 225\pi \approx 706.9$ in^2.

(e) $A = \pi \times 1.2^2 = 1.44\pi \approx 4.5$ cm^2.

(f) The radius is 13 ÷ 2 = 6.5 ft, so $A = \pi \times 6.5^2 = 42.25\pi \approx 132.7$ ft^2.

2. Each circle's area is given. Find its radius and its diameter.

(a) $A = 81\pi$ cm^2 (b) $A = 144\pi$ m^2

(c) $A = 6.25\pi$ in^2 (d) $A = 0.49\pi$ m^2

ANSWER

(a) $r = 9$ cm, $d = 18$ cm (b) $r = 12$ m, $d = 24$ m (c) $r = 2.5$ in, $d = 5$ in (d) $r = 0.7$ m, $d = 1.4$ m

SOLUTION

In each, divide the area by π to get r^2, take the positive number whose square that is, then double it for the diameter.

(a) $r^2 = 81$, so $r = 9$ cm and $d = 18$ cm.

(b) $r^2 = 144$, so $r = 12$ m and $d = 24$ m.

(c) $r^2 = 6.25$, and 2.5 × 2.5 = 6.25, so $r = 2.5$ in and $d = 5$ in.

(d) $r^2 = 0.49$, and 0.7 × 0.7 = 0.49, so $r = 0.7$ m and $d = 1.4$ m.

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3. A round gym mat covers 25π m^2 of floor. A strip of tape runs once around its edge. How long is the tape? Give the length exactly and rounded to one decimal place.

ANSWER
10π m, about 31.4 m

SOLUTION
First find the radius from the area: $\pi r^2 = 25\pi$, so $r^2 = 25$ and $r = 5$ m, since 5 × 5 = 25.

The tape runs around the edge, so its length is the circumference:

$$C = 2\pi r = 2 \times 5 \times \pi = 10\pi \approx 31.4$$

The tape is 10π m, about 31.4 m long. It is a length, so its unit is meters, not square meters.

4. Lucas finds the area of a round mirror 10 cm across. He writes $A = \pi \times 10^2 = 100\pi$ cm^2.

(a) What mistake did Lucas make?

(b) Find the correct area, exactly and to one decimal place. How many times the correct area is Lucas's answer?

ANSWER
(a) He used the diameter 10 cm as the radius. (b) 25π cm$^2 \approx 78.5$ cm^2; his answer is 4 times the correct area.

SOLUTION
(a) "10 cm across" is the diameter. The formula $A = \pi r^2$ needs the radius, which is half the diameter, 5 cm. Lucas put the diameter in place of the radius.

(b) $A = \pi \times 5^2 = 25\pi \approx 78.5$ cm^2.

Lucas's answer is $100\pi \div 25\pi = 4$ times the correct area. Using the diameter doubles the length that is squared, and squaring a doubled length gives 2 × 2 = 4 times as much.

5. Elena prints round stickers in two sizes, 4 cm across and 10 cm across. She says the large sticker uses 2.5 times as much paper as the small one, because 10 ÷ 4 = 2.5.

Find the area of each sticker exactly, then decide whether Elena is right.

ANSWER
Small 4π cm^2, large 25π cm^2. Elena is wrong: the large sticker uses 6.25 times as much paper.

SOLUTION
The small sticker has radius 2 cm, so its area is $\pi \times 2^2 = 4\pi$ cm^2 (about 12.6 cm^2).

The large sticker has radius 5 cm, so its area is $\pi \times 5^2 = 25\pi$ cm^2 (about 78.5 cm^2).

$25\pi \div 4\pi = 6.25$, so the large sticker uses 6.25 times as much paper, not 2.5 times. The width is 2.5 times as big, and the area grows by the square of that: $2.5^2 = 6.25$.

6. A vinyl record is a circle 30 cm across. Its paper label in the middle is a circle 10 cm across with the same center. The rest of the face carries the grooves.

(a) Find the area of the grooved part, exactly and to one decimal place.

(b) What fraction of the record's face is grooved?

ANSWER

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(a) 200π cm$^2 \approx 628.3$ cm^2 (b) $\dfrac{8}{9}$

SOLUTION

(a) The grooved part is a ring. The record has radius 15 cm and the label radius 5 cm, so

$$\pi \times 15^2 - \pi \times 5^2 = 225\pi - 25\pi = 200\pi \approx 628.3$$

The grooved part is 200π cm^2, about 628.3 cm^2.

(b) The whole face is 225π cm^2, so the grooved fraction is $\dfrac{200\pi}{225\pi} = \dfrac{8}{9}$. The label takes only $\dfrac{1}{9}$ of the face, even though it is a third of the width across.

7. Maya has a square of fabric 50 cm on each side. She wants to make a round cushion top with exactly the same area as the square.

(a) Find the radius and the diameter of the round top, each to one decimal place. Check the radius by squaring.

(b) Is the round top wider or narrower than the square? Explain why that makes sense.

ANSWER

(a) $r \approx 28.2$ cm, $d \approx 56.4$ cm (b) Wider: 56.4 cm is more than 50 cm.

SOLUTION

(a) The square has area $50 \times 50 = 2500$ cm^2. For the circle,

$$\pi r^2 = 2500, \quad r^2 = \frac{2500}{\pi} \approx 795.77$$

Since $28^2 = 784$ and $29^2 = 841$, r is between 28 and 29; the square root key gives $r \approx 28.21$, so $r \approx 28.2$ cm. Check: $28.21^2 \approx 795.8$, very close to 795.77. The diameter is twice the unrounded radius, $2 \times 28.209\ldots \approx 56.4$ cm.

(b) Wider. A circle 50 cm across fits inside the square and misses its four corners, so it has less area than the square. To make up the corners, the circle has to be wider than 50 cm.

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