#### Study Island: Area, Perimeter & Circumference

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**1.**



What is the approximate perimeter of the figure above?

|  |  |  |
| --- | --- | --- |
| Bubble | **A.** | 35.3 in |

|  |  |  |
| --- | --- | --- |
| Bubble | **B.** | 36.1 in |

|  |  |  |
| --- | --- | --- |
| Bubble | **C.** | 40.8 in |

|  |  |  |
| --- | --- | --- |
| Bubble | **D.** | 30.6 in |

**2.**



What is the approximate circumference of the circle above?

|  |  |  |
| --- | --- | --- |
| Bubble | **A.** | 4.7 ft |

|  |  |  |
| --- | --- | --- |
| Bubble | **B.** | 11.3 ft |

|  |  |  |
| --- | --- | --- |
| Bubble | **C.** | 7.1 ft |

|  |  |  |
| --- | --- | --- |
| Bubble | **D.** | 9.4 ft |

**3.**



What is the approximate perimeter of the figure above?

|  |  |  |
| --- | --- | --- |
| Bubble | **A.** | 25.5 in |

|  |  |  |
| --- | --- | --- |
| Bubble | **B.** | 26.5 in |

|  |  |  |
| --- | --- | --- |
| Bubble | **C.** | 31.5 in |

|  |  |  |
| --- | --- | --- |
| Bubble | **D.** | 29.5 in |

**4.**



![https://media.studyisland.com/cgi-bin/mimetex.cgi?\text%7bWhat%20is%20the%20approximate%20area%20of%20the%20green%20figure%20above?](data:None;base64...)

|  |  |  |
| --- | --- | --- |
| Bubble | **A.** | https://media.studyisland.com/cgi-bin/mimetex.cgi?\text%7b65%20square%20centimeters%7d |

|  |  |  |
| --- | --- | --- |
| Bubble | **B.** | https://media.studyisland.com/cgi-bin/mimetex.cgi?\text%7b90%20square%20centimeters%7d |

|  |  |  |
| --- | --- | --- |
| Bubble | **C.** | https://media.studyisland.com/cgi-bin/mimetex.cgi?\text%7b190%20square%20centimeters%7d |

|  |  |  |
| --- | --- | --- |
| Bubble | **D.** | https://media.studyisland.com/cgi-bin/mimetex.cgi?\text%7b130%20square%20centimeters%7d |

**5.**



![https://media.studyisland.com/cgi-bin/mimetex.cgi?\text%7bWhat%20is%20the%20best%20estimate%20of%20the%20shaded%20area%20of%20the%20figure%20above?](data:None;base64...)

|  |  |  |
| --- | --- | --- |
| Bubble | **A.** | https://media.studyisland.com/cgi-bin/mimetex.cgi?\text%7b8%20square%20centimeters%7d |

|  |  |  |
| --- | --- | --- |
| Bubble | **B.** | https://media.studyisland.com/cgi-bin/mimetex.cgi?\text%7b31%20square%20centimeters%7d |

|  |  |  |
| --- | --- | --- |
| Bubble | **C.** | https://media.studyisland.com/cgi-bin/mimetex.cgi?\text%7b48%20square%20centimeters%7d |

|  |  |  |
| --- | --- | --- |
| Bubble | **D.** | https://media.studyisland.com/cgi-bin/mimetex.cgi?\text%7b64%20square%20centimeters%7d |

**6.**


*\*Note: Picture not drawn to scale.*

In the figure above, the radius of circle *C* is 3 cm. What is the approximate area of the shaded region?

|  |  |  |
| --- | --- | --- |
| Bubble | **A.** | 69 cm2 |

|  |  |  |
| --- | --- | --- |
| Bubble | **B.** | 28.3 cm2 |

|  |  |  |
| --- | --- | --- |
| Bubble | **C.** | 53.1 cm2 |

|  |  |  |
| --- | --- | --- |
| Bubble | **D.** | 12.4 cm2 |

**7.**



![https://media.studyisland.com/cgi-bin/mimetex.cgi?\text%7bWhat%20is%20the%20best%20estimate%20of%20the%20combined%20area%20of%20the%20red%20figures%20above?](data:None;base64...)

|  |  |  |
| --- | --- | --- |
| Bubble | **A.** | https://media.studyisland.com/cgi-bin/mimetex.cgi?\text%7b85%20square%20inches%7d |

|  |  |  |
| --- | --- | --- |
| Bubble | **B.** | https://media.studyisland.com/cgi-bin/mimetex.cgi?\text%7b45%20square%20inches%7d |

|  |  |  |
| --- | --- | --- |
| Bubble | **C.** | https://media.studyisland.com/cgi-bin/mimetex.cgi?\text%7b50%20square%20inches%7d |

|  |  |  |
| --- | --- | --- |
| Bubble | **D.** | https://media.studyisland.com/cgi-bin/mimetex.cgi?\text%7b110%20square%20inches%7d |

**8.**



Estimate the perimeter of the figure above.

|  |  |  |
| --- | --- | --- |
| Bubble | **A.** | 44 m |

|  |  |  |
| --- | --- | --- |
| Bubble | **B.** | 30 m |

|  |  |  |
| --- | --- | --- |
| Bubble | **C.** | 38 m |

|  |  |  |
| --- | --- | --- |
| Bubble | **D.** | 22 m |

**9.**

|  |  |
| --- | --- |
|  |  https://www108.studyisland.com/pics/52235prob2a.png |
| https://www108.studyisland.com/pics/52235prob5b.png | https://www108.studyisland.com/pics/est.area.figure19.PNG |

![https://media.studyisland.com/cgi-bin/mimetex.cgi?\text%7bWhat%20is%20the%20approximate%20area%20of%20the%20figure%20above?](data:None;base64...)

|  |  |  |
| --- | --- | --- |
| Bubble | **A.** | https://media.studyisland.com/cgi-bin/mimetex.cgi?6\%20\text%7bcm%5e%7b2%7d%7d |

|  |  |  |
| --- | --- | --- |
| Bubble | **B.** | https://media.studyisland.com/cgi-bin/mimetex.cgi?11\%20\text%7bcm%5e%7b2%7d%7d |

|  |  |  |
| --- | --- | --- |
| Bubble | **C.** | https://media.studyisland.com/cgi-bin/mimetex.cgi?9\%20\text%7bcm%5e%7b2%7d%7d |

|  |  |  |
| --- | --- | --- |
| Bubble | **D.** | https://media.studyisland.com/cgi-bin/mimetex.cgi?10\%20\frac%7b1%7d%7b2%7d\%20\text%7bcm%5e%7b2%7d%7d |

**10.**



![https://media.studyisland.com/cgi-bin/mimetex.cgi?\text%7bWhat%20is%20the%20approximate%20area%20of%20the%20figure%20above?](data:None;base64...)

|  |  |  |
| --- | --- | --- |
| Bubble | **A.** | https://media.studyisland.com/cgi-bin/mimetex.cgi?47\%20\text%7bmm%5e%7b2%7d%7d |

|  |  |  |
| --- | --- | --- |
| Bubble | **B.** | https://media.studyisland.com/cgi-bin/mimetex.cgi?40\%20\text%7bmm%5e%7b2%7d%7d |

|  |  |  |
| --- | --- | --- |
| Bubble | **C.** | https://media.studyisland.com/cgi-bin/mimetex.cgi?55\%20\text%7bmm%5e%7b2%7d%7d |

|  |  |  |
| --- | --- | --- |
| Bubble | **D.** | https://media.studyisland.com/cgi-bin/mimetex.cgi?36\%20\text%7bmm%5e%7b2%7d%7d |

# Answers

1. D
2. D
3. D
4. B
5. B
6. D
7. A
8. C
9. C
10. A

# Explanations

1. The figure is made up of two overlapping circles. The perimeter of the figure is made up of about ![https://media.studyisland.com/cgi-bin/mimetex.cgi?\frac%7b3%7d%7b4%7d](data:None;base64...)of each circle's circumference.

Use the length of one grid square to estimate the diameter of each circle.



The diameter of the smaller circle is about 6 in, so its radius is about
3 in. The diameter of the larger circle is about 7 in, so its radius is about 3.5 in.

Use the circumference formula to find the approximate circumferences of the circles.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| smaller circle: |  | *C* |  =  | 2https://media.studyisland.com/cgi-bin/mimetex.cgi?\pi*r* |
|  |  |  |  https://www108.studyisland.com/userfiles/approx.gif  | 2(3.14)(3 in) |
|  |  |  |  https://www108.studyisland.com/userfiles/approx.gif  | 18.8 in |
| larger circle: |  | *C* |  =  | 2https://media.studyisland.com/cgi-bin/mimetex.cgi?\pi*r* |
|  |  |  |  https://www108.studyisland.com/userfiles/approx.gif  | 2(3.14)(3.5 in) |
|  |  |  |  https://www108.studyisland.com/userfiles/approx.gif  | 22 in |

Then, use the approximate circumferences to estimate the perimeter of the figure.

![https://media.studyisland.com/cgi-bin/mimetex.cgi?\begin%7beqnarray%7d%20P%20&=&%20\frac%7b3%7d%7b4%7d(18.8%20\%20\text%7bin%7d)%20\%20+%20\%20\frac%7b3%7d%7b4%7d(22%20\%20\text%7bin%7d)%20\\%20\vspace*%7b,%20\hspace*%7b-10%7d%7d%20\\%20&=&%2014.1%20\%20\text%7bin%7d%20\%20+%20\%2016.5%20\%20\text%7bin%7d%20\\%20\vspace*%7b,%20\hspace*%7b-10%7d%7d%20\\%20&\approx&%2030.6%20\%20\text%7bin%7d%20\end%7beqnarray%7d](data:None;base64...)

2. Use the lengths of the sides of the square to approximate the diameter of the circle.



Since the diameter of the circle is about 3 ft, its radius is about 1.5 ft. Use the circumference formula to approximate the circumference of the circle.

|  |  |  |
| --- | --- | --- |
| *C* |  =  | 2https://media.studyisland.com/cgi-bin/mimetex.cgi?\pi*r* |
|  |  https://www108.studyisland.com/userfiles/approx.gif  | 2(3.14)(1.5 ft) |
|  |  https://www108.studyisland.com/userfiles/approx.gif  | **9.4 ft** |

3. Use the lengths of the sides of the square to approximate the length of each side of the figure.



Then, add the approximate side lengths.

8.5 in + 8 in + 2 × 5 in + 3 in = **29.5 in**

4. ![https://media.studyisland.com/cgi-bin/mimetex.cgi?\text%7bNotice%20that%20the%20green%20area%20fills%20a%20little%20less%20than%20half%20of%20the%20square.%20%20The%7d\\%20\text%7barea%20of%20the%20square%20is%7d\\\begin%7barray%7d%7bc%7d%20\hspace*%7b550%7d\\\vspace*%7b9%20\hspace*%7b-10%7d%7d\\\text%7b14%20centimeters%20\times\%2014%20centimeters%20=%20196%20square%20centimeters.\\\vspace*%7bd%20\hspace*%7b-15%7d%7d\\\end%7barray%7d\\\text%7bIf%20the%20green%20area%20filled%20exactly%20half%20the%20square,%20the%20area%20would%20be%7d\\\begin%7barray%7d%7bc%7d%20\hspace*%7b550%7d\\\vspace*%7b9%20\hspace*%7b-10%7d%7d\\\text%7b196%20square%20centimeters%20\div\%202%20=%2098%20square%20centimeters.%7d\\\vspace*%7b9%20\hspace*%7b-10%7d%7d\\\end%7barray%7d\\\text%7bHowever,%20because%20the%20green%20area%20fills%20a%20little%20less%20than%20half%20the%20square,%20the%7d\\%20\text%7barea%20must%20be%20less%20than%2098%20square%20centimeters.%20%20Therefore,%20the%20best%20answer%20is%7d\\%20\text%7b90%20square%20centimeters.%7d](data:None;base64...)

5. ![https://media.studyisland.com/cgi-bin/mimetex.cgi?\text%7bThe%20figure%20shown%20is%20a%208%20cm%20\times%20\%208%20cm%20square%20with%20a%20total%20area%20of%2064%20cm%5e%7b2%7d.%20%20In%20order%7d\\%20\text%7bto%20find%20the%20area%20of%20the%20shaded%20part%20of%20the%20figure,%20start%20by%20finding%20the%20area%20of%20the%7d\\%20\text%7bouter%20section%20that%20is%20not%20shaded.%7d\\\vspace*%7bd%20\hspace*%7b-15%7d%7d\\\text%7bThe%20outer%20section%20covers%2032%20whole%20squares%20and%202%20square%20that%20appear%20to%20be%20about%20half%7d\\%20\text%7bshaded.%20%20Therefore,%20the%20area%20of%20the%20outer%20section%20is%20approximately%2033%20cm%5e%7b2%7d.\\\vspace*%7bd%20\hspace*%7b-15%7d%7d\\\text%7bThe%20approximate%20area%20of%20the%20shaded%20part%20of%20the%20figure%20can%20now%20be%20found%20by%20subtracting%7d\\\text%7bthe%20area%20of%20the%20outer%20section%20from%20the%20total%20area%20of%20the%20square.%20%20Thus,%20the%20approximate%7d\\\text%7barea%20of%20the%20shaded%20part%20of%20the%20figure%20is%7d\\%20\begin%7barray%7d%7bc%7d%20\hspace*%7b550%7d\\\vspace*%7b9%20\hspace*%7b-15%7d%7d\\\text%7b64%20cm%5e%7b2%7d%20-%2033%20cm%5e%7b2%7d%20=%2031%20cm%5e%7b2%7d%7d\\\end%7barray%7d](data:None;base64...)

6. To find the area of the shaded region, first find the area of the smaller circle.

![https://media.studyisland.com/cgi-bin/mimetex.cgi?\begin%7beqnarray%7d\text%7bArea_%7bsmaller%7d%7d%20&=&%20\pi%20r%5e%7b2%7d\\\vspace*%7b9%20\hspace*%7b-10%7d%7d\\&=&%209\pi\%20\text%7bcm%5e%7b2%7d%7d\\\vspace*%7b9%20\hspace*%7b-10%7d%7d\\&\approx&%2028.3\%20\text%7bcm%5e%7b2%7d%7d\end%7beqnarray%7d](data:None;base64...)

Next, find the radius of the larger circle using the Pythagorean theorem.

![https://media.studyisland.com/cgi-bin/mimetex.cgi?\begin%7beqnarray%7d\text%7bDiameter%7d%20&=&%20r\%20+\%20\sqrt%7br%5e%7b2%7d\%20+\%20r%5e%7b2%7d%7d\\\vspace*%7b9%20\hspace*%7b-10%7d%7d\\&=&%20r\%20+\%20\sqrt%7b2r%5e%7b2%7d%7d\\\vspace*%7b9%20\hspace*%7b-10%7d%7d\\&=&%20r\%20+\%20r\sqrt%7b2%7d\\\vspace*%7b9%20\hspace*%7b-10%7d%7d\\&=&%20\left(1\%20+\%20\sqrt%7b2%7d\right)r\\\vspace*%7b9%20\hspace*%7b-10%7d%7d\\&=&%20\left(1\%20+\%20\sqrt%7b2%7d\right)(3\%20\text%7bcm%7d)\\\vspace*%7b9%20\hspace*%7b-10%7d%7d\\&\approx&%207.2\%20\text%7bcm%7d\\\vspace*%7b9%20\hspace*%7b-10%7d%7d\\\vspace*%7b9%20\hspace*%7b-10%7d%7d\\\text%7bRadius%7d%20&\approx&%203.6\%20\text%7bcm%7d\end%7beqnarray%7d](data:None;base64...)

Now, use radius of the larger circle to find the area of the larger circle.

![https://media.studyisland.com/cgi-bin/mimetex.cgi?\begin%7beqnarray%7d\text%7bArea_%7blarger%7d%7d%20&=&%20\pi(3.6\%20\text%7bcm%7d)%5e%7b2%7d\\\vspace*%7b9%20\hspace*%7b-10%7d%7d\\&\approx&%2040.7\%20\text%7bcm%5e%7b2%7d%7d\end%7beqnarray%7d](data:None;base64...)

Finally, subtract the area of the smaller circle from the area of the larger circle.

![https://media.studyisland.com/cgi-bin/mimetex.cgi?\begin%7beqnarray%7d\text%7bArea_%7blarger%7d%7d\%20-\%20\text%7bArea_%7bsmaller%7d%7d%20&=&%2040.7\%20\text%7bcm%5e%7b2%7d%7d\%20-\%2028.3\%20\text%7bcm%5e%7b2%7d%7d\\\vspace*%7b9%20\hspace*%7b-10%7d%7d\\&\approx&%2012.4\%20\text%7bcm%5e%7b2%7d%7d\end%7beqnarray%7d](data:None;base64...)

Therefore, the area of the shaded region is approximately **12.4 cm2**.

7. ![https://media.studyisland.com/cgi-bin/mimetex.cgi?\text%7bNotice%20that%20the%20red%20figures%20together%20fill%20more%20than%20half%20of%20the%2010%20in%20by%7d\\%20\text%7b10%20in%20square.%20%20The%20area%20of%20the%20square%20is%7d\\\begin%7barray%7d%7bc%7d%20\hspace*%7b550%7d\\\vspace*%7b9%20\hspace*%7b-10%7d%7d\\\text%7b10%20inches%20\times\%2010%20inches%20=%20100%20square%20inches.\\\vspace*%7bd%20\hspace*%7b-15%7d%7d\\\end%7barray%7d\\\text%7bIf%20the%20red%20figures%20filled%20exactly%20half%20the%20square,%20they%20would%20cover%20an%20area%20of%7d\\\begin%7barray%7d%7bc%7d%20\hspace*%7b550%7d\\\vspace*%7b9%20\hspace*%7b-10%7d%7d\\\text%7b100%20square%20inches%20\div\%202%20=%2050%20square%20inches.%7d\\\vspace*%7b9%20\hspace*%7b-10%7d%7d\\\end%7barray%7d\\\text%7bSince%20they%20cover%20more%20than%20half%20of%20the%20square,%20the%20best%20estimate%20of%20the%20area%7d\\%20\text%7bcovered%20by%20the%20red%20figures%20is%2085%20square%20inches.%7d](data:None;base64...)

8. The bottom of the figure is **8 meters** long.
The left and right sides of the figure are each **9 meters** long.

Next, estimate the length of the two top sections of the figure. Think of the sections as the **hypotenuse** of a right triangle with legs that are 4 meters long.



Each side is just a little less than 6 meters long. So, round the top section lengths to **6 meters**.

Bottom = 8 m
Left Side = 9 m
Right side = 9 m
Top left section = 6 m
Top right section = 6 m

Add the lengths together to find the perimeter.

8 m + 9 m + 9m + 6 m + 6 m = **38 m**

9. ![https://media.studyisland.com/cgi-bin/mimetex.cgi?\text%7bThe%20object%20covers%204%20full%20squares,%202%20almost%20full%20squares,%205%20half%20squares,%7d\\%20\text%7band%203%20almost%20empty%20squares.%20So,%20the%20figure's%20area%20covers%20about%209%20cm%5e%7b2%7d.%7d](data:None;base64...)

![https://media.studyisland.com/cgi-bin/mimetex.cgi?\text%7b4%20cm%5e%7b2%7d%20+%202%20cm%5e%7b2%7d%20+%202%20\frac%7b1%7d%7b2%7d%20cm%5e%7b2%7d%20+%20\frac%7b1%7d%7b2%7d%20cm%5e%7b2%7d%20=%209%20cm%5e%7b2%7d](data:None;base64...)

10. ![https://media.studyisland.com/cgi-bin/mimetex.cgi?\text%7bThe%20figure%20covers%2034%20whole%20squares,%2010%20almost%20whole%20squares,%204%20almost%20half%20squares,%7d\\%20\text%7band%206%20almost%20empty%20squares.%20So,%20the%20figure's%20area%20covers%20about%2047%20mm%5e%7b2%7d.%7d](data:None;base64...)

![https://media.studyisland.com/cgi-bin/mimetex.cgi?\text%7b34%20mm%5e%7b2%7d%20+%2010%20mm%5e%7b2%7d%20+%202%20mm%5e%7b2%7d%20+%201%20mm%5e%7b2%7d%20=%2047%20mm%5e%7b2%7d](data:None;base64...)