

Grade 7 & 8 Math Circles Review Challenge Answers

APRIL 2/3, 2013

Note that some questions have solutions while others simply have the answer.

11. 144

12. 2 years old.

13. 39 years old.

14. 35. You can just multiply each term in Pascal's triangle by 7.

15. $8\text{cm} \times 8\text{cm} \times 16.8\text{cm} = 1075.2\text{cm}^3$. Radius of 1 cracker is 4cm. Use this and the volume of 42 crackers to calculate the height of the 42 crackers and thus the height of the box.

16. 150°

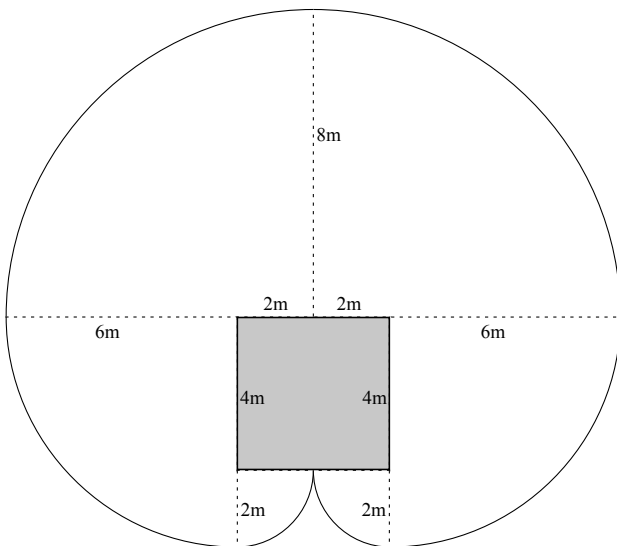
21. Angle ABC and angle ADC are 90° since they are tangent to the circumference. $\angle BAD = 80^\circ$ and the sum of interior angles in a quadrilateral is 360° . So angle BCD is 100° . Converting to radians, we get angle BCD = $\frac{5\pi}{9}$ rad. So length of arc BD is $5\pi\text{cm}$.

22. 60 vertices. Use Euler's Formula and solve for V.

23. 6. Round 1, 2, 3, 4, 6, 12. Notice how these are the factors of 12!

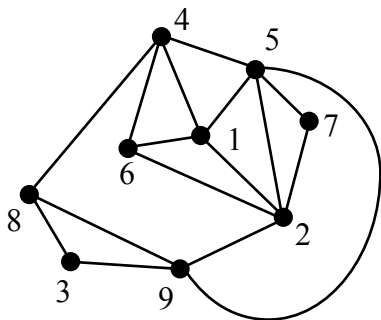
24. Bob goes every odd round. He stops at 63 last in round 63. After round 1: open, round 3: closed, round 7: open, round 9: closed, round 21: open, round 63: closed. So he closes the locker.

25. 10 lockers are open. 1, 4, 9, 16, 25, 36, 49, 64, 81, 100. Notice how these are all perfect squares! Why is this? (Think about how many times someone stops at these lockers and why this is the case.)
26. 53, 98, 180. The pattern is to add the 3 previous terms together, given the first three terms of 3, 5, 8.
31. A, C, B, D, H, G, F, E, A (There are other possibilities)
32. 5.0832cm. Remember in a golden rectangle, the longer edge divided by the shorter edge equals φ .
33. 5 squares, 4 rectangles, 4 hexagons (we aren't looking for *regular* polygons), 0 circles.
34. 4843.3cm^3 . Find the area of the sector (i.e. the base) and multiply by the height of the cake. Essentially we have a 'sector based prism'
35. 119°
36. 12cm. Find the volume of the sphere (scoop) of ice cream. This equals the volume of the cone. Having volume and radius, you can solve for height in the volume of cone equation.
41. Area = $52\pi\text{m}^2$. The following sketch will help:



42. Area = $53\pi\text{m}^2$. Try drawing a similar sketch to problem 41.
43. 23 edges. (1 less than the number of vertices)
44. 2.408cm^2 . Similar to question 32.
45. $\frac{3}{20}$
46. 63 triangles. Be sure to follow some pattern to count all triangles exactly once.
51. 14 different paths.
52. 183cm^2
53. $40\pi\text{m}^2$
54. $f(A)=1, f(B)=2, f(C)=3, f(D)=4, f(E)=5, f(F)=6$ (There are other solutions.)
55. 23 days, 0 hours
56. 34.3% of the distance. Note the snail is 6m from the centre of the blade (11.5m from the slug.)
61. 210. There is no simple pattern to calculate the answer. You must fill out the triangle to get the fourth position in the ninth row.

62. 19

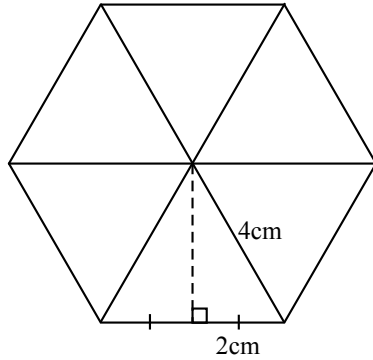


63.

64. $52\pi\text{cm}$. We need to calculate a quarter of the circumference of a circle with a radius of the side length of each square.

65. 37 different routes. Giovanni can travel on the diagonal canals which run Northwest and the curved canal since he doesn't ever travel South or East.

66. 41.569cm^2 . Each side of the hexagon is 4cm long. We can divide the area of the hexagon into 6 equilateral triangles. You will find the following occurs:



To find the height, use Pythagorean Theorem, then find area of 1 triangle. Since all the triangles are congruent, multiply the area by 6 to get the area of the hexagon.