**Choose the letter of the correct answer. In all cases, E) NOTA means “none of these answers”. You have 60 minutes to complete this test. Figures are not drawn to scale.**

1. BnL’s flagship is named the *Axiom.* Which one of the following is an axiom of Euclidean geometry?

**A) all right angles are congruent**

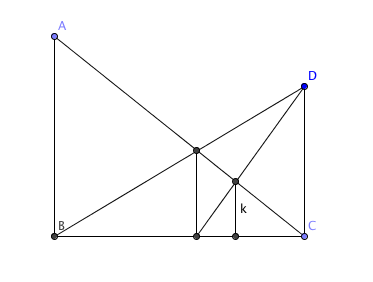
**B) the sum of the angles of a triangle is 180**

**C) sum of the exterior angles is 360**

**D) the inscribed triangle containing the diameter is a right triangle**

**E) NOTA**

2. Solve for k given that lines AB and DC are perpendicular to BC, and all line segments with an endpoint on BC are straight. AB = 4 and DC = 3:



**A)  B)  C)  D)  E) NOTA**

3. One of Wall-E’s many trinkets was a Rubik’s cube. If the hollow cube (center piece is missing) is comprised of 26 unit cubes, find the *total* surface area, both inside and out.

**A) 42 B) 54 C) 60 D) 66 E) NOTA**

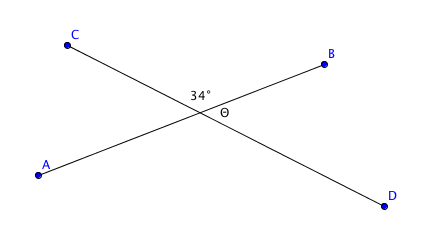
4. There are over 43 quintillion total possible configurations for a Rubik’s cube. If one were to twist a Rubik’s Cube only twice (a quarter turn only), how many unique configurations are possible?

**A) 243 B) 279 C) 288 D) 324 E) NOTA**

5. Which of the following is NOT a way to prove similarity for a triangle?

**A) SAS B) SSS C) AA D) AAS E) NOTA**

6. During the short film Presto, the ladder managed to be at two completely different angles due the magical hat. The lines of the figure below are the actual ladder (yes, there's a grammar mistake... but it's just ONE ladder) and the expressions denote the angle values. Find theta.



**A) 34 B) 43 C) 146 D) 164 E) NOTA**

7. Once again from Presto. There’s a scene where lots of stuff comes crashing down. An audience member notices that the background is a chessboard. A particle falls in front of it in a straight line. What’s the maximum number of squares the path of the particle can pass through (not just intersecting a vertex) assuming one can move/rotate the chessboard?

**A) 8 B) 9 C) 10 D) 11 E) NOTA**

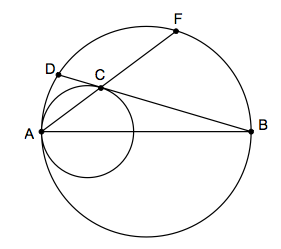
8. Wall-E needed to fix one of his parts so he scavenged one from a defunct Wall-E. Unfortunately, the temperature was unusually cold that day, causing the part to be smaller than expected. Assuming the areas are in a ratio of 4:1, by what factor is the part too small?

**A) 1:1 B) 2:1 C) 3:1 D) 4:1 E) NOTA**

9. One of Wall-E’s eyes has a perimeter of . What is the area of the eye?

**A) 9π B) 9 C) 36 D) 36π E) NOTA**

10. Two circles are internally tangent at point A; diameter AB of the larger circle passes through the center of the smaller circle. Chord BD of the larger circle is tangent to the smaller circle at C; AC intersects the larger circle at F. If arc FB is 82 degrees, find arc AD.



**A) 8 B) 16 C) 24 D) 32 E) NOTA**

11. The captain of the *Axiom* wants to refloor the surface of the ship, but he can’t make up his mind on what shape to use. Which regular polygon would tessellate from the choices below?

**A) hexagon B) dodecagon C) pentagon**

**D) octagon E) NOTA**

12. In the future, there will be a game where two players take turns choosing 1 square from different halves of a 2 by 2 board. If we fold the two sides together, and there are intersecting squares, then Player 1 won. What is the probability player 1 won?

**A) 0 B)  C)  D)  E) NOTA**

13. Wall-E must compress a bunch of trash together. If the surface area of the final cube in 54 cubic inches, what is the volume in CUBIC FEET?

**A) 54 B) 27 C)  D)  E) NOTA**

14. The shortest distance a point on a line that is the perpendicular bisector of a segment is to the line itself is 5 units long; the longest distance is 13 units long. How long is the segment itself?

**A) 6 B) 12 C) 13 D) 24 E) NOTA**

15. Foreign contaminant A is 5 units from the cleaner robot, while contaminant B is 7 units away. Assuming the points A, B, and the robot lies on the same plane, what’s the minimum distance the robot has to travel to clean up the mess?

**A) -2 B) 2 C) 5 D) 7 E) NOTA**

16. The cleaner robot now hates his job and wants to be away from all foreign contaminants. If the distances from the robot to the three contaminants are all 5, what is the maximum area enclosed within the contaminants.

**A) 0 B) 12.5 C)  D)  E) NOTA**

17. If Wall-E loves Eve, then Eve loves Wall-E. Which of the following is a VALID conclusion based on the previous statement?

**A) Marshall loves meat.**

**B) If Eve does not love Wall-e, then Wall-E does not love Eve**

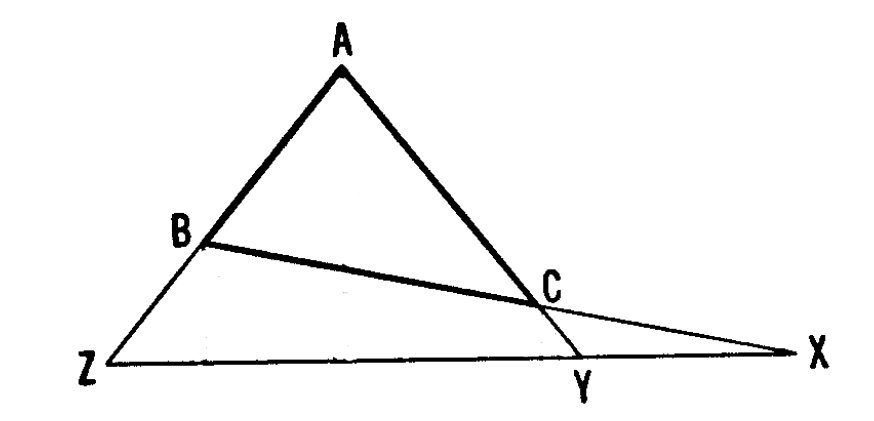
**C) If Eve does not love Wall-e, then Wall-E loves Eve**

**D) If Eve loves Wall-E, then Wall-E loves Eve**

**E) NOTA**

MENELAUS’S Theorem: If points X, Y, Z on sides BC, CA, AB (respectively and suitably extended) of triangle ABC are collinear, then . Use this (or not if you can figure other ways of solving the problem) for the next three problems.

18. Given the figure below; ZB = 3,CY = 2, AY = 7, BX = 14, CX = 6, find AB.



**A)  B)  C)  D) Unsolvable E) NOTA**

19. Triangle ABC is inscribed in a circle. E and F lie on AB and BC respectively. FA and EC intersects at point X. F is the midpoint of BC. BC = 4, BE = 3, CE = 5, XE = 1. Find the area of the circle divided by.

**A) 2 B) 4 C) 8 D) 16 E) NOTA**

20. Triangle ABC has AC = 450, BC = 300. Points K and L are located on AC and AB respectively so that AK = CK and CL is the angle bisector of angle C. Let P be the point of intersection BK and CL and let M be the point on line BK for which K is the midpoint of PM. If AM = 180 find LP. (Hint = Parallelogram)

**A) 36 B) 72 C) 108 D) 180 E) NOTA**

21. Wall-E’s old triangular tracks had 3 circles with their centers on different vertices of an equilateral triangle. What is the area the treads make if they are fitted around the circles with no sag in between; the circles are unit circles and the distance between the centers is 5 units?

**A)  B)  C) **

**D)  E) NOTA**

22. In order to celebrate the return to Earth, the people decided to cut a *cylindrical* cake. What is the maximum number of cake slices with 3 cuts?

**A) 4 B) 6 C) 7 D) 8 E) NOTA**

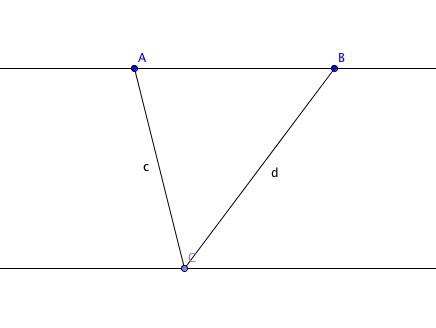
23. John and Mary are playing in the circular pool. They are both on the perimeter though at different points. They’re going to attempt to swim to a beach ball in a straight line. John is 5 meters from the ball and 8 meters from the pool’s edge in the direction of the ball. Mary is 3 meters from the ball, how many meters is Mary from the edge of the pool in the direction of the ball?

**A)  B) 5 C) 4 D) 2 E) NOTA**

24. Given a square, pentagon and a hexagon, all with the same perimeter, which shape has the largest sum of **total** diagonals?

**A) square B) pentagon C) hexagon D) villaragon E) NOTA**

25. The following figure is a common way to prove which theorem?



**A) Sum of the angles of a triangle is 180**

**B) Adjacent angles sum to 180**

**C) Shortest distance between two parallel lines is perpendicular**

**D) Properties of angles of parallel lines**

**E) NOTA**

26. The plant's height in Wall-E is inversely proportional to time. If it is 5 cm tall at day 7, how tall is it at day 35 in centimeters?

**A) 10 B) 5 C) 3 D) 1 E) NOTA**

27. The evil Auto’s shape can be approximated by 3 concentric circles of radius 2, 4 and 6. The area in the circle of radius 4 but outside of the circle of 2 is not part of Auto but the rest are. Find the area of Auto.

**A) 16π B) 24π C) 30π D) 36π E) NOTA**

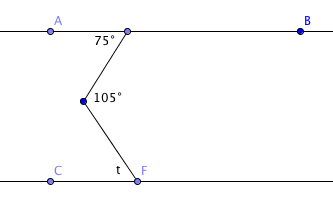
28. If Eve’s arm is a hemisphere on top of a cone with the vertex away from the hemisphere, find the volume of her arm given that the radius is  and the height of the cone is equal the radius.

**A) 216 B) 240 C) 360 D) 480 E) NOTA**

29. A platonic solid with the Wythoff symbol as 3 | 2 4, 48 symmetries and 12 edges is commonly known as what? (Hint: this 3D solid most resembles Wall-E)

**A) Euler Graph B) Hamilton Path C) Cube D) Jiang Samich E) NOTA**

30. Find the measure of angle t given that lines AB and CF are parallel.



**A) 180 B) 75 C) 35 D) 30 E) NOTA**