1. B. Using Euler’s Formula V + F – E = 2, yields 18 + F – 32 = 2. Therefore, F = 16.
2. A. Suppose A is the one false statement. Then all three B, C, and D must be true. Assuming E is also true but A is false, then we have that C must be false, which is a contradiction.
3. C. Since sin (90 - x) = cos x and cos (90 - x) = sin x, we get tan (90 - x) tan x = 1. Applying the formula for x = 5, 15, 25 and 35, and taking into account tan 45 = 1, the value of the product is 1.

1. C. We have A = rs or = A = 108.

1. D. We know P(n) = 360. Thus, P(4) + P(5) + … + P(n) = 360(n – 4 + 1) = 360n – 1080.
2. C. Since AE = 20 cm and BE = 10 cm, AB = 10 cm. Similarly, since AE = 20 cm and AD = 15 cm, DE = 5 cm. Thus, BD = 5 cm and BC = 2.5 cm.
3. B. There are 8 possible ways a circle and a square might intersect beginning with 1 point, 2 points, etc., ending with 8 points of intersection.
4. **(Thrown Out at Convention)**B. If the two lines intersect at right angles, their slopes are opposite reciprocals of each other. Putting both lines into slope-intercept form yields and . So .

1. C. The region is enclosed by the polygon with vertices A(1,0), B(0,1), C(-1,1), D(-1,0), E(0,-1) and F(1,-1). The region enclosed by the vertices A, E, F and the origin has an area of 1 square unit. The region enclosed by the vertices B, C, D and the origin has an area of 1 square unit. The area enclosed by the origin and vertices A and B has an area of 0.5 square units as does the area enclosed by the origin and vertices D and E. Total area enclosed is 3 sq. units.
2. B. Since the points are evenly spaced, the arch subtended by the segment joining successive points will be degrees. The desired inscribed angle will have half this measure so it will be .

1. A. The sum of the same side interior angles is 3x = 180 so x = 60. Thus, . Draw auxiliary lines perpendicular to through A and R can call the points of intersection with points X and Y, respectively. XY = s. We find PX = TY = because and are 30-60-90 degrees right triangles. Thus PT = 2s. The length of the median is .

1. D. Use Heron’s Formula with semi-perimeter of 16.

1. A. Let r be the radius of the smaller circle and R the radius of the larger circle. The area of the non-shaded region can be expressed as π - π = π. By the Pythagorean Theorem, = 36. Hence, the area of the non-shaded region is ππ.

1. D. Truncating the cube at each vertex creates a triangular face and each square face is replaced with an octagonal face.
2. B. Doubling the square is not one of the famous impossible constructions.
3. E. The Pythagorean Triple (8, 15, 17) satisfies 17 – 8 = 9. The area of the right triangle is 
4. A. The last statement places 15 drama students in the drama circle among the seniors and further put 20% (3) of them as males and 12 as females. Then there must be 10 other males seniors by the second statement. The first statement tells us that there are 36 female students and one-third (12) of them are drama majors but are not seniors. Now by the fourth statement, there must be 24 male drama majors, placing 21 in the non-senior category. Finally, since there are 41 non-drama majors, the remaining 19 are non-seniors. Adding al the non-overlapping categories gives 89 total students. 3+12+10+12+12+21+19= 89.
5. D. Let A be the area of the rectangle. Then A = 10z +z = 11z. Since A = xz, xz = 11z which implies x = 11 or x = 0 (clearly impossible). So, x = 11 and z = 6 (sum of digits in x is 1/3 of z), making A = 11  6 or 66.
6. D. The equation for the given lines are y = mx + 2 and y = 2x + m so they intersect when mx + 2 = 2x + m. thus, mx – 2x = m – 2 or x(m – 2) = m – 2, and x = 1 (provided m  2). Then y = mx + 2, so substituting 1 for x gives y = m(1) + 2 = m + 2. Note:  because m = 2 means we do not have two distinct lines.
7. B. The volume of the water can be computed by . If the tank is put on its 10 X 6 m base, the volume will be , so h = 2 m.
8. C. Coordinates of C are (30, y + 10). Compute the area of the parallelogram as the area of the rectangle XAYC minus the sum of the areas of triangles AYB, YCB, CXD and XAD. 30(y + 10) – . Therefore, 20y – 100 = 600 and y = 35.
9. D. In the extreme case, if all four points are on the same half of the circle and A and B approach the same point while C and D approach the same point, BC and AD are both less than the diameter and AB and CD are close to zero, so proposition y is false while the others are always true.
10. C. Since arc CAD measures 2/3 circumference = 240, then arc CD measures 120. Central angle DOC subtends this arc and is the vertex of isosceles triangle DOC. is opposite the  angle in 30-60-90 triangle COE. OE = ½, AO = 1 and AE = 3/2.
11. C. Triangles SFT and PQT are similar with a scale factor of 5:8. Segments ST and QT are corresponding sides of these similar triangles, and , letting ST = x, we have .
12. A. The length of each side is  , so the coordinates for E are . p – q = - 4. Another solution: The line through B and E is given by y = x + 4, so (p, q) is on the line if and only if q = p + 4 which yields p – q = -4.
13. B. The distance between the center of the sphere of radius 2 and the plane determined by the centers of the spheres of radius 1 is . Therefore the plane to the top of the larger sphere is .
14. A. When the pole cracked, a right triangle formed. The ground between the two parts = 10 m. Let the remaining part = x. The part that fell = 15 – x. Using the Pythagorean Theorem, . Solving for x, .
15. D. This problem involves the similarity of the two pairs of triangles involved. Let h = the distance above the ground the two lines intersect. Let a and x – a be the two sections of the ground separated by h between p and q.  are the ratios of the two pairs of triangles. Therefore, .
16. D. Read as reflection the line y = x following a reflection in the y-axis. Reflection in the y axis: (x, y) maps into (-x, y). Taking (-x, y) and reflecting it in y = x yields (y, -x). Same as the Rotation of 270 degrees.
17. A. Points on both circles must satisfy both equations. Squaring both and subtracting gives  or 8x-6y=2 which yields 4x – 3y = 1.