

FORMULAS:

I. Triangles in General

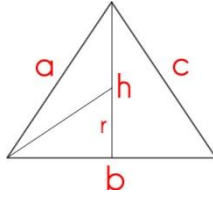
1. $P = a + b + c$

2. $A = \frac{bh}{2}$

3. $A = \frac{1}{2} rP$

4. $A = \sqrt{s(s-a)(s-b)(s-c)}$

5. $s = \frac{a + b + c}{2}$



P = perimeter
A = Area
r = apothem
b = base
h = height
a, b, c, e = sides

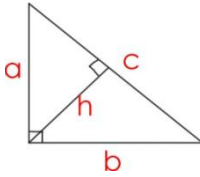
II. Right Triangles

6. $c^2 = a^2 + b^2$

7. $A = \frac{ab}{2}$

8. $h = \sqrt{bc \cdot ac}$

9. $h = \frac{ab}{c}$



III. Equilateral Triangles

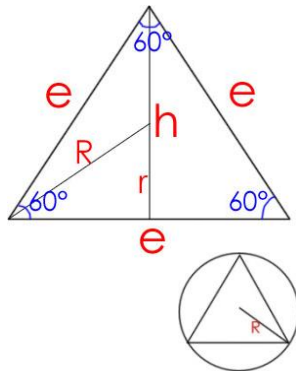
10. $P = 3e$

11. $h = \frac{\sqrt{3}}{2} e$

12. $A = \frac{\sqrt{3}}{4} e^2$

13. $r = \frac{\sqrt{3}}{6} e$

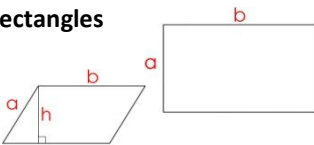
14. $R = \frac{2}{3} h = \frac{\sqrt{3}}{3} e$



IV. Parallelograms/Rectangles

15. $P = 2a + 2b$

16. $A = bh = ab$



V. Squares

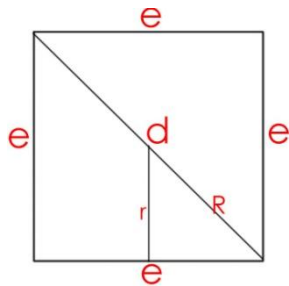
17. $r = \frac{e}{2}$

18. $P = 4e$

19. $d = \sqrt{2} e$

20. $A = e^2 = \frac{d^2}{2}$

21. $R = \frac{\sqrt{2}}{2} e$



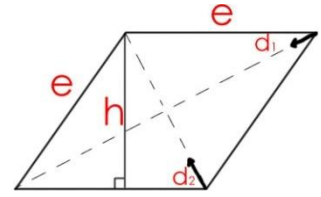
VI. Rhombus

22. $A = eh$

23. $A = \frac{d_1 d_2}{2}$

24. $P = 4e$

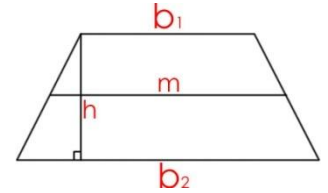
25. $e^2 = \left(\frac{d_1}{2}\right)^2 + \left(\frac{d_2}{2}\right)^2$



VII. Trapezoids

26. $A = \frac{1}{2} (b_1 + b_2)h$

27. $A = mh$



VIII. General Polygon: n-gon

28. $A = \frac{rP}{2} = \frac{rne}{2}$

29. $r = \frac{e}{2 \tan \frac{\theta}{2}}$

30. $R = \frac{e}{2 \sin \frac{\theta}{2}}$

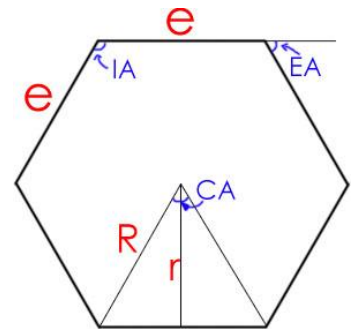
31. sum of interior angles = $180(n - 2)$

32. one interior angle = $\frac{180(n - 2)}{n}$

33. one exterior angle = $\frac{360}{n}$

34. central angle = $\frac{360}{n}$

***n = number of sides



Samples:

1. The area of an equilateral triangle is $16\sqrt{3} \text{ cm}^2$. Find the altitude of the triangle.

$$A = \frac{\sqrt{3}}{4} e^2 = \frac{1}{2} bh = 16\sqrt{3}$$

$$16\sqrt{3} = \frac{\sqrt{3}}{4} e^2$$

$$e^2 = 16\sqrt{3} \times \frac{4}{\sqrt{3}}$$

$$e = \sqrt{64} = 8\text{cm}$$

$$16\sqrt{3} = \frac{1}{2} bh$$

$$16\sqrt{3} = \frac{1}{2} 8h$$

$$h = 4\sqrt{3} \text{ cm}$$

2. Find the area of the largest circle that can be cut from an octagon of edge 12cm.

$$\theta = \frac{360}{8} = 45^\circ$$

$$r = \frac{e}{2 \tan \frac{\theta}{2}}$$

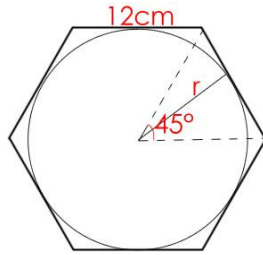
$$r = \frac{12}{2 \tan \frac{45}{2}}$$

$$r = 14.49 \text{ cm}$$

$$\text{A of the circle} = \pi r^2$$

$$A = (14.49)^2 \pi$$

$$A = 659.18 \text{ cm}^2$$



3. The sides of a triangle are 14cm, 28cm, and 27cm. Find the base of a rectangle whose altitude is 20cm and whose area is equal to the area of the triangle.

$$s = \frac{a + b + c}{2}$$

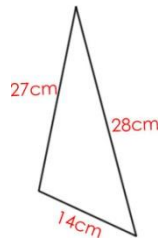
$$s = \frac{14 + 27 + 28}{2} = 34.5 \text{ cm}$$

$$A = \sqrt{s(s-a)(s-b)(s-c)}$$

$$A = \sqrt{34.5(34.5-14)(34.5-27)(34.5-28)}$$

$$A = \sqrt{34.5(20.5)(7.5)(6.5)}$$

$$A = 185.68 \text{ cm}^2$$



$$A = ab$$

$$185.86 = 20x$$

$$x = 9.28 \text{ cm}$$



4. Find the area of the shaded portion. ABCD is a square. AB = 10cm, AOB, AOD, DOC and BOC are semicircles.

$$\begin{aligned} \text{Area of the Square} &= 10^2 \\ &= 100 \text{ cm}^2 \end{aligned}$$

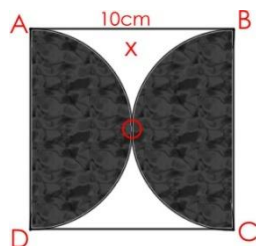
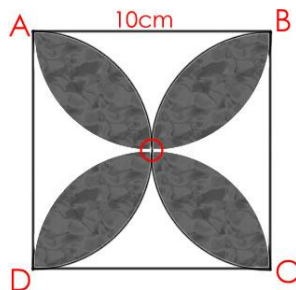
Area of one circle (or two semi-circles):

$$A = \pi \left(\frac{d}{2}\right)^2$$

$$A = \pi \left(\frac{10}{2}\right)^2$$

$$A = 25\pi \text{ cm}^2$$

So the area of the shaded region here is $25\pi \text{ cm}^2$

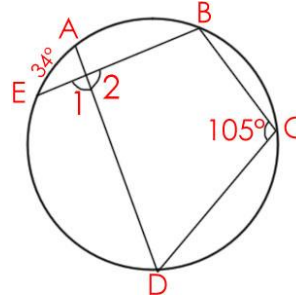


We subtract the area of the 2 semi-circles from the area of the square to get the unshaded area of the last figure. Let's represent the 2 unshaded areas by x. Sooo...
 $100 - 25\pi = 21.46 \text{ cm}^2$

Then we subtract twice the value of the 2 unshaded regions (21.46 cm^2) from the area of the square.

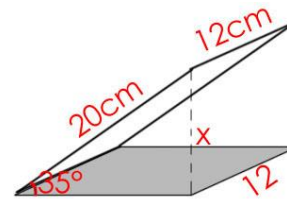
$$100 - (21.46 \times 2) = 57.08 \text{ cm}^2$$

5. Find $\angle 1$, Arc ED, $\angle 2$ and Arc BD.

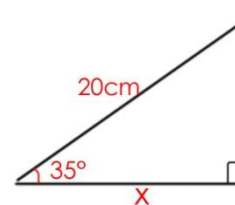


6. A rectangle measures 12cm x 20cm. If the shorter side is parallel to the plane and the longer side forms an angle of 35° with the plane, what is the area of the projection on the plane?

The sketch would turn out this way:



Solve for x:



$$\cos 35^\circ = \frac{x}{20}$$

$$x = 16.38 \text{ cm}$$

$$A = lw = 12x = (12)(16.38)$$

$$A = 196.5965 \text{ cm}^2$$

7. What is the area of the largest polygon that can be cut from a circle of diameter 12cm?

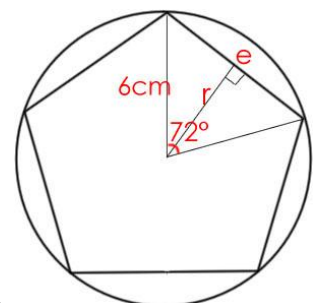
$$\cos \frac{72}{2} = \frac{r}{6}$$

$$r = 6 \cos 36 = 4.85 \text{ cm}$$

$$\sin \frac{72}{2} = \frac{e}{6}$$

$$e = 2(6 \sin 36) = 7.05 \text{ cm}$$

$$A = \frac{1}{2} r P = \frac{1}{2} (4.85)(7.05 \times 5)$$



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$$A = 85.28\text{cm}^2$$

8. Three circles of radii 14cm, 20cm and 18cm are tangent to each other. Find the area of the triangle formed by joining their centers.

$$a = 20 + 14 = 34$$

$$b = 20 + 18 = 38$$

$$c = 14 + 18 = 32$$

$$s = \frac{a + b + c}{2}$$

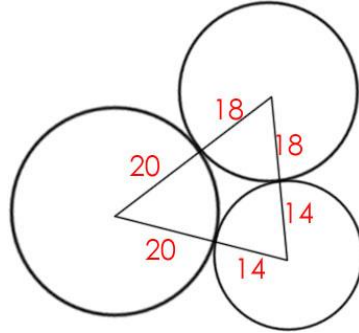
$$s = \frac{34 + 38 + 32}{2} = 52$$

$$A = \sqrt{s(s-a)(s-b)(s-c)}$$

$$= \sqrt{52(52-34)(52-38)(52-32)}$$

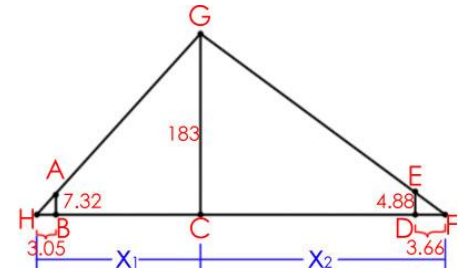
$$A = \sqrt{52(18)(14)(20)}$$

$$A = 511.9375\text{cm}^2$$



12. If $GC = 183\text{cm}$, $BH = 3.05\text{cm}$, $AB = 7.32\text{cm}$, $DF = 3.66\text{cm}$ and $DE = 4.88\text{cm}$, find the length of BD .

Use ratio and proportion to get the values of x_1 and x_2



$$\frac{3.05}{7.32} = \frac{x_1}{183}$$

$$\frac{3.66}{4.88} = \frac{x_2}{183}$$

$$x_1 = 76.25\text{cm}$$

$$x_2 = 137.25\text{cm}$$

$$x = (x_1 - 3.05) + (x_2 - 3.66)$$

$$x = 206.79\text{cm}$$

9. The base angles of the isosceles trapezoid are 70° each. If its altitude is 8cm and the upper base is also 8cm , what is the length of the other base?

$$\tan 70^\circ = \frac{8}{x}$$

$$x = 2.91\text{cm}$$

$$\text{Length of other base: } 8$$

$$+ 2x$$

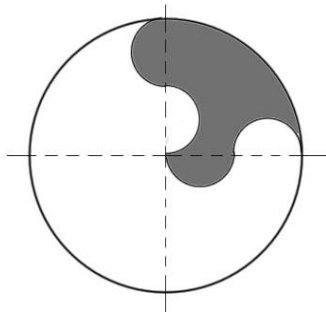
$$8 + 2(2.91) = 13.8235\text{cm}$$



10. The diameter of the circle is 30cm . Find the area of the shaded portion.

*Yung dalawang semi circle na shaded na nasa ibang quadrant, pwede mong ilipat sa missing na semi-circles dun sa 1st quadrant. So in other words, $\frac{1}{4}$ of the whole circle's shaded. Get the area of the whole circle and divide it by 4. ☺

$$A = \pi r^2 = \pi (15)^2 = 706.8583\text{cm}^2 / 4 = 176.7146\text{cm}^2$$



11. The centers of two circles of radii 25cm are 48cm apart. Find the length of their common chord.

Get y .

$$y = 2\sqrt{25^2 - 24^2}$$

$$y = 2(7) = 14\text{cm}$$

