

1. Head Start's latest addition is, Diesel, the cow. On arrival it starts grazing in the cricket ground with a rope around her neck. The other end of the rope is tied to a pole. The length of the rope is 10 meters. There are two boundary walls perpendicular to each other, one at a distance of 5 meters to the east of the pole and another at a distance of $5\sqrt{2}$ to the north of the pole. Find the area Diesel can happily graze on.

2. Negate the below statements and express the negations in English,
 - (a) Every student in this class has taken Mathematics or Physics in Class XI.
 - (b) Every student in this class has taken Mathematics and Biology in Class XI.
 - (c) All classrooms in the Primary block of Head Start have at least one chair that is broken.
 - (d) No classroom in the ground floor of has only chairs that are not broken.
 - (e) In every section of class XI there is a student who has taken neither Mathematics nor Biology in class X.

3. Draw the graph of

$$f(x) = \min\{|x| - 1, |x - 1| - 1, |x - 2| - 1\}$$

4. Define what is meant by domain of a function f . Find the domain of the function:
 $f(x) = \sqrt{x} + \frac{1}{\sqrt{1-x^2}}$.

5. The Sierpinski triangle is constructed from an equilateral triangle by repeated removal of triangular subsets. That is: start with an equilateral triangle; next subdivide it into four smaller congruent equilateral triangles; and shade the central triangle; repeat the process for each of the un-shaded triangles; and repeat the process for each of the un-shaded triangles.
 - (a) Can you find a formula to determine the total number of the shaded and un-shaded triangles at this stage ?
 - (b) What else can you infer about this object ?

1. Riad Uncle has installed a flagstaff vertically on top of Primary block of the school. Priya Aunty is walking towards the Primary block and observes that the angle subtended by the flagstaff to be the greatest when she is at a distance 100 meters from the building. If 30° is the observed greatest angle, find the height of the flagstaff.

2. Let $[x]$ denote the largest integer less than or equal to x . For example $[4.5] = 4$. Draw the graph of

$$f(x) = [x], g(x) = x - [x], h(x) = \frac{1}{[x]}$$

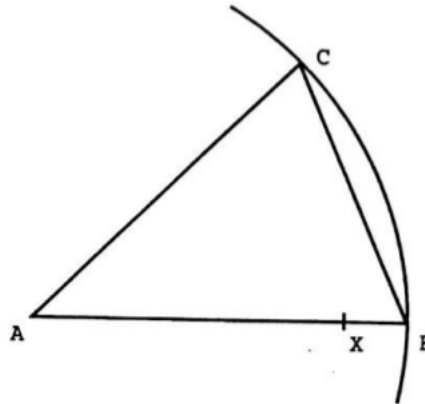
3. At time 0, a particle is at point 0 on the line. At time 1, the particle divides into two and instantaneously after division, one particle moves 1 unit to the left and the other moves one unit to the right. At time 2, each of these particles divides into two, and one of the two new particles moves one unit to the left and the other moves one unit to the right. Whenever two particles meet, they destroy each other leaving nothing behind. How many particles will be there after time $2^{11} + 1$?

4. The Sierpinski triangle is constructed from an equilateral triangle by repeated removal of triangular subsets. That is: start with an equilateral triangle; next subdivide it into four smaller congruent equilateral triangles; and shade the central triangle; repeat the process for each of the unshaded triangles; and repeat the process for each of the unshaded triangles.

(a) Can you find a formula to determine the total number of the shaded and un-shaded triangles at this stage ?

(b) What else can you infer about this object ?

- Let X be a point on a straight line segment AB such that $AB \cdot BX = AX^2$. Let C be a point on the circle with centre at A and radius AB such that $BC = AX$. Find $\angle BAC$



- In Head Start's Raagi-Porridge Fan Club of 80 members, 10 members do not eat any of the items: French Fries; Burger; and Poorie. 30 members eat exactly one of these three items and 30 members eat exactly two of these items. 45 members eat at least one of the items among French Fries and Burger, whereas 18 members eat both French Fries and Burger. Determine the number of Poorie eating members.
- On sports day, Head Start's Venus House start marching in a single file 5 meters long. Ria at the end of the file steps out and starts marching forward at a higher speed. On reaching the head of the column, she turns around and marches back at the same speed. As soon as she reaches the end of the line, the entire team stops marching and its is found that the team has moved by exactly 5 meters. What distance has Ria traveled ?
- The Sierpinski triangle is constructed from an equilateral triangle by repeated removal of triangular subsets. That is: start with an equilateral triangle of area 1; next subdivide it into four smaller congruent equilateral triangles; and shade the central triangle; repeat the process for each of the unshaded triangles; and repeat the process for each of the unshaded triangles.
 - Can you find a formula to determine the total area of the shaded and un-shaded triangles at this stage ?
 - What else can you infer about this object ?

1. Draw the Triangle

(Step 0) Draw an equilateral triangle with sides of 32 cm. Label this triangle as step 0.

(Step 1) Determine the midpoints of each side. Use these midpoints as the vertices of a new triangle, then shade the centre triangle within the original triangle. Label these set of triangles as step 1.

(Step 2) Repeat Step 1 for each unshaded triangle in step 1. Label these set of triangles as step 2.

(Step 3) Repeat Step 2 for each unshaded triangle in step 2. Label these set of triangles as step 1.

(a) Fill in the following table:

| Step # | # of Shaded triangles | # of Un-shaded triangles |
|--------|-----------------------|--------------------------|
| 0 | | |
| 1 | | |
| 2 | | |
| 3 | | |

(b) Can you find a formula to determine the total number of shaded and un-shaded triangles after n -th step ?

(c) Fill in the following table:

| Step # | Area of un-Shaded triangles | Total Shaded Area |
|--------|-----------------------------|-------------------|
| 0 | | |
| 1 | | |
| 2 | | |
| 3 | | |

(d) Can you find a formula to determine the total area of the shaded and un-shaded triangles after n -th step ?

(e) Describe the procedure to construct the Sierpinski triangle in your own words.

(f) Classify the triangles as right, acute, obtuse, equilateral, scalene or isosceles in each of the steps 0, 1, 2, 3?

(g) Can you identify congruent triangles at each of the steps 0, 1, 2, 3

(h) Give examples to show the self-similarity of the Sierpinski Triangle. Can you explain the self-similarity ?