ONLINE MATHS CLASS- X – 30 (02 / 09 / 2021)

3 . MATHEMATICS OF CHANCE - CLASS- 3

What did we study in the last class ?

- **The probability of something we have to find is how much part of the total number of results to the number of results favourable to it .**
- **In some situations , probability can be calculated in terms of the areas of the geometrical figures . Here probability is how much part is the desired area out of the total area . It is known as the geometrical probability**

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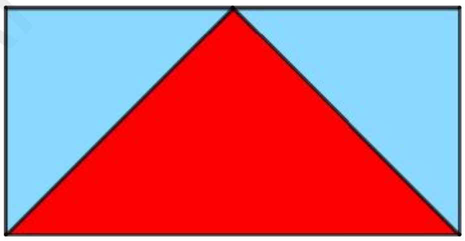
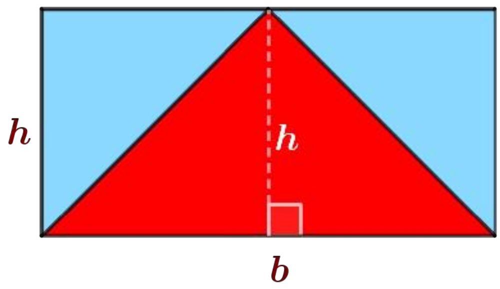
Activity 1

A cardboard rectangle is cut out and the midpoint of one side is joined to the ends of the opposite sides to make a triangle .If you shut your eyes and put a dot in this rectangle , what is the probability that it would be within the red triangle ?



Answer-

(Here the triangle and rectangle have the same base and the height)



Take the length of the rectangle as b **and the breadth as** h **.**

Area of the rectangle $= b \times h$

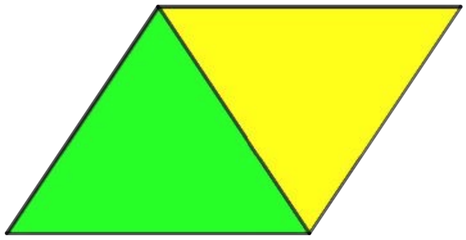
Area of the triangle $= \frac{1}{2} \times b \times h$

That is , area of the triangle is $\frac{1}{2}$ **of the area of the rectangle .**

Therefore , probability of the dot falling within green triangle $= \frac{1}{2}$

Activity 2

A cardboard parallelogram is cut out and divide it into two triangles by drawing a diagonal . If you shut your eyes and put a dot in this parallelogram , what is the probability that it would be within the green triangle ?



Answer

We know that diagonal of a parallelogram divide it into two equal triangles . So their areas are equal .

That is , area of a triangle is $\frac{1}{2}$ of the area of the parallelogram .

Therefore , probability of the dot falling within the green triangle $= \frac{1}{2}$

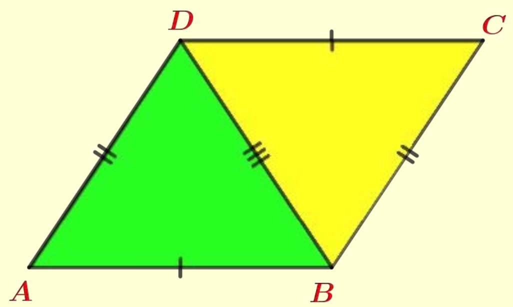
NB :

In parallelogram ABCD ,

AB = CD , AD = BC (Opposite sides of a parallelogram are equal)

ABD and BCD are equal triangles .

(AB = CD , AD = BC , BD = BD)



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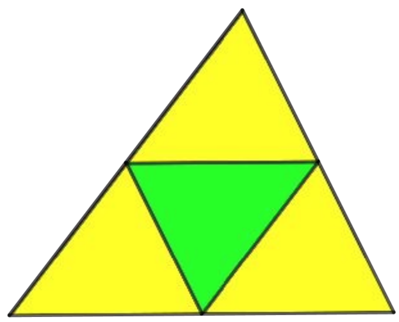
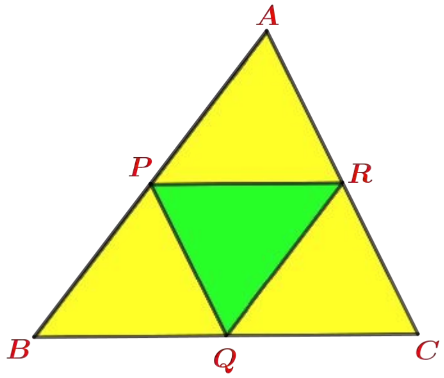
Activity 3

In the figure midpoints of the sides of the larger triangle are joined . If you shut your eyes and put a dot in this figure , what is the probability that it would be within the green triangle ?



Answer

In the figure P ,Q , R are the midpoints of the sides of triangle ABC .



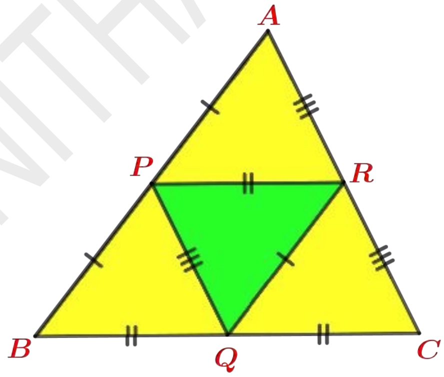
AP = BP , BQ = CQ , AR = CR

Also ,

$$PR = \frac{BC}{2} \quad , \quad PQ = \frac{AC}{2} \quad , \quad QR = \frac{AB}{2}$$

(The length of the line joining the midpoints of two sides of a triangle is half the length of the third side)

BPQ , CQR , APR and PQR are equal triangles .

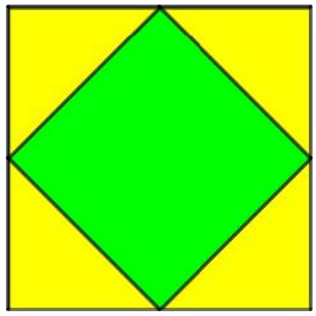


That is , the areas of these triangles are equal .

That is , area of the green triangle is $\frac{1}{4}$ of the area of triangle ABC .

Therefore , probability of the dot falling within the green triangle $= \frac{1}{4}$

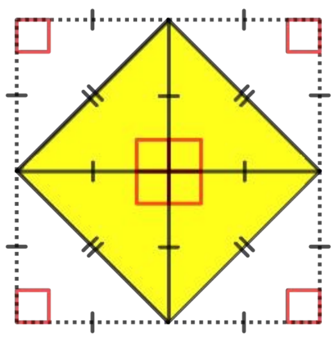
Activity 4



In the figure a square is got by joining the midpoints of a big square

If you shut your eyes and put a dot in this figure , what is the probability that it would be within the green part ?

Answer



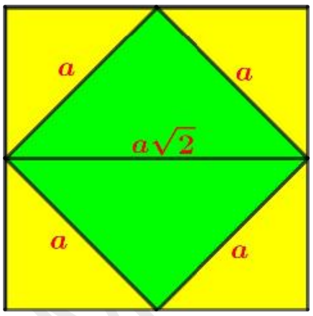
When all the yellow triangles are folded into the green square , all will be all exactly aligned inside the green square .

That is , the sum of the areas of the yellow triangles is equal to the area of the green square .

That is , area of the green square is $\frac{1}{2}$ of the area of the larger square .

Therefore , probability of the dot falling within the green part $= \frac{1}{2}$

Another method



Here , side of the larger square = diagonal of the smaller square

Take the length of the side of the smaller square is a .

Length of the side of the larger square = Length of the diagonal of the smaller square $= a\sqrt{2}$

Area of the smaller square $= side \times side = a \times a = a^2$

Area of the larger square $= a\sqrt{2} \times a\sqrt{2} = a^2 \times 2 = 2a^2$

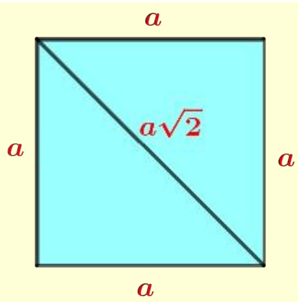
Area of the smaller square is $\frac{a^2}{2a^2}$ of the area of the larger square .

That is , probability of the dot falling within the green part $= \frac{a^2}{2a^2} = \frac{1}{2}$

NB :

The length of the diagonal of a square with a side a is $a\sqrt{2}$

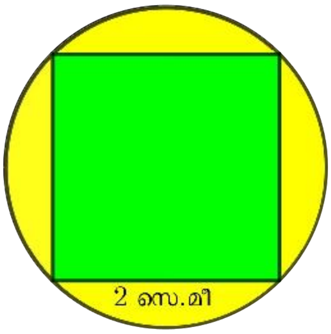
$$\left(\quad Diagonal = \sqrt{a^2 + a^2} = \sqrt{2a^2} = \sqrt{2} \times \sqrt{a^2} = a\sqrt{2} \right)$$



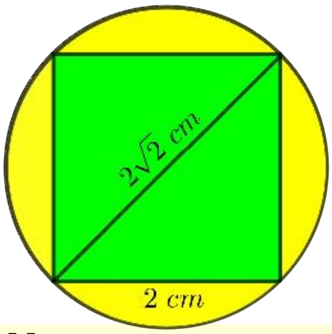
Activity 5

In the figure a square is drawn with all vertices on a circle .

If you shut your eyes and put a dot in this figure , what is the probability that it would be within the green part ?



Answer



Diagonal of the square = Diameter of the circle

Diagonal of the square $= 2\sqrt{2}\ cm$

Diameter of the circle $= 2\sqrt{2}\ cm$

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Radius of the circle $= \frac{2\sqrt{2}}{2} = \sqrt{2}\ cm$

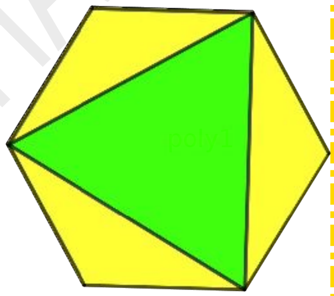
Area of the square $= side \times side = 2 \times 2 = 4\ sq.cm$

Area of the circle $= \pi\ r^2 = \pi \times (\sqrt{2})^2 = 2\pi\ sq.cm$

That is , area of the square is $\frac{4}{2\ \pi}$ of the area of the circle .

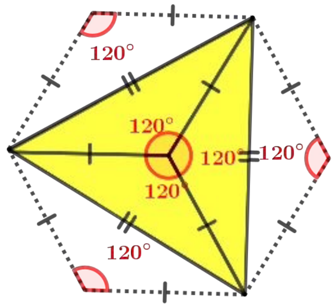
That is , probability of the dot falling within the green part $= \frac{4}{2\ \pi} = \frac{2}{\pi}$

Activity 6



In the figure a triangle is got by joining alternate vertices of a regular hexagon . If you shut your eyes and put a dot in this figure , what is the probability that it would be within the green part ?

Answer



Here , If each yellow triangle is folded into the green triangle , all will be exactly aligned inside the green triangle .

That is sum of the areas of the yellow triangles is equal to the area of green triangle .

That is , area of the green triangle is $\frac{1}{2}$ of the area of the regular hexagon .

That is , probability of the dot falling within the green part $= \frac{1}{2}$

Activity 7

Looking for a clean dress , Johny found a pair of blue pants and three shirts , red , green and blue . In how many ways he can wear the dress ?

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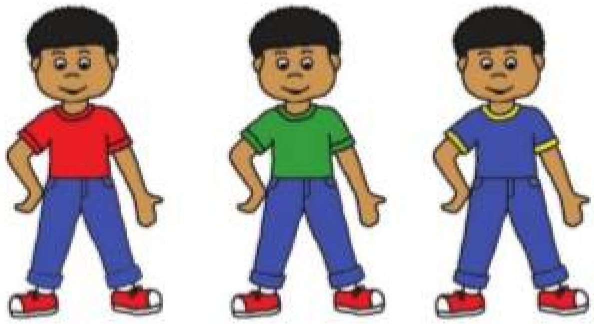
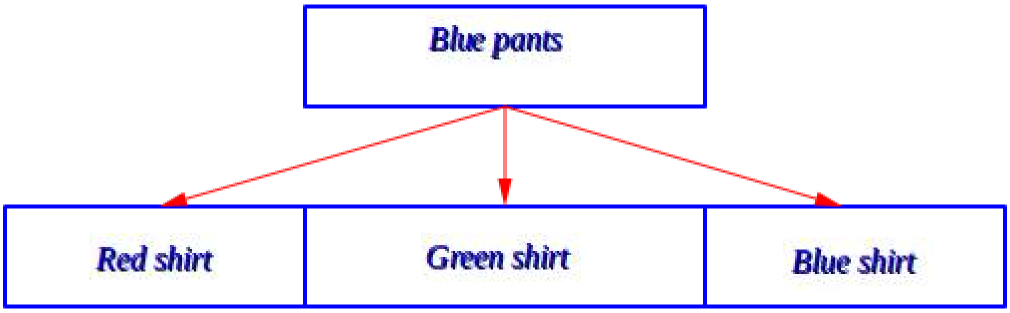


He can wear the dress in three different ways as shown above .

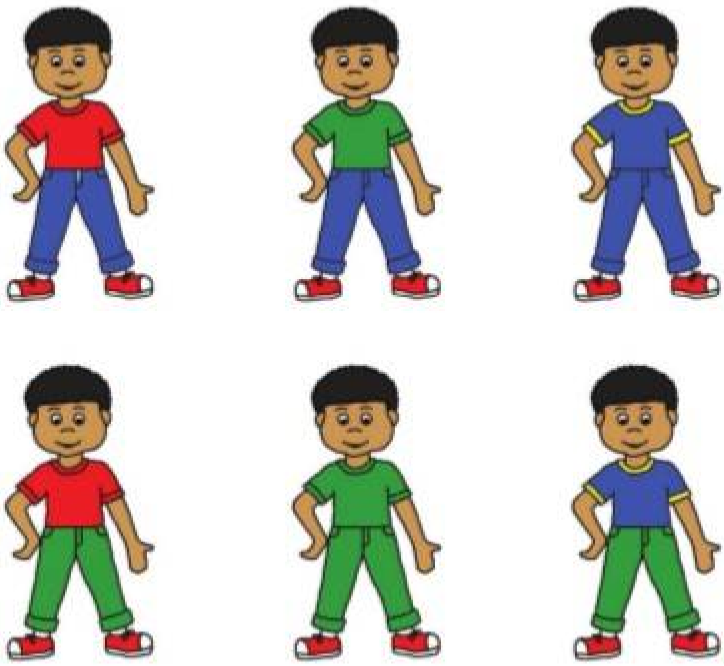


We can write these as pairs .

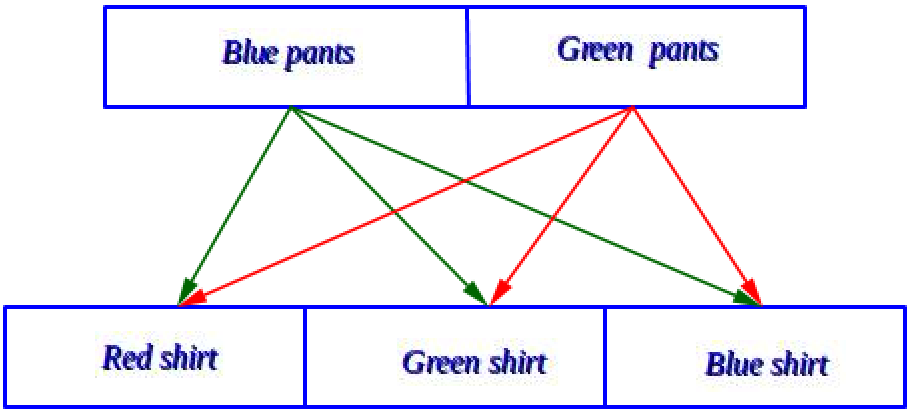
(Blue pants , Red shirt) , (Blue pants , Green shirt) , (Blue pants , Blue shirt)

Activity 8

If Johny got two pants , blue and green in colour and three shirts red , green and blue in colour , in how many ways he could have worn the dress ? What was the probability of wearing shirt and pants of the same colour ?



He could have worn the dress in six different ways as shown above .



We can write these as pairs .

(Blue pants , Red shirt) , (Blue pants , Green shirt) , (Blue pants , Blue shirt)

(Green pants , Red shirt) , (Green pants , Green shirt) , (Green pants , Blue shirt)

Total number of results = 6

Favourable results = (Blue pants , Blue shirt) , (Green pants , Green shirt)

Number of favourable results = 2

Probability of wearing shirt and pants of the same colour

$$= \frac{Number\ of\ favourable\ results}{Number\ of\ total\ results} = \frac{2}{6} = \frac{1}{3}$$

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