

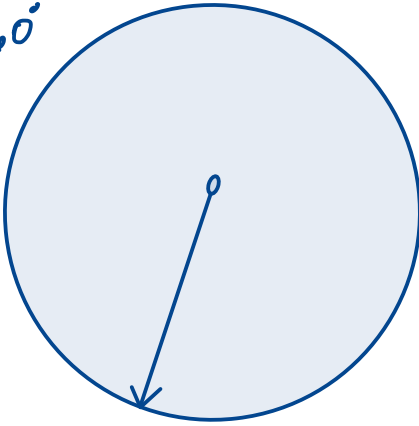
Day 6

8:16am

7th December, 22

# PROBABILITY DISTRIBUTION

$0 \dots 360^\circ$



What is the probability that object has an angle  $180^\circ$ ?

0

It's 0 for every angle. Quite impossible to get for an exact angle

CONUNDRUM: Does it mean the object stops  
nowhere? ☐ Yes ☒ No

IN CONTINUOUS DISTRIBUTION, EVERY OUTCOME HAS A PROBABILITY OF

$$P(X=a) = \frac{a}{\text{total no of outcomes}}$$

$$P(X=a) = \frac{a}{\text{infinity}} = 0$$

## Range Probability

Outcome:  $x$

$$P(0 < x < 180^\circ) = 0.5$$

$$P(180 < x < 360^\circ) = 0.5$$



$$P(260^\circ < x < 290^\circ) = 0.083$$

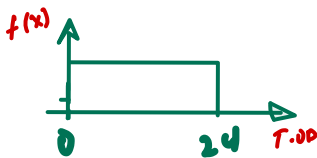
Total area it can fall =  $\pi r^2 = 1$

$$\text{Area} = \pi r^2 \cdot \frac{30}{360}$$

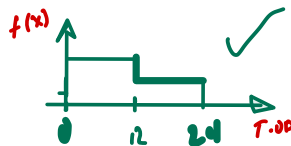
$$P(260 < x < 290) = \frac{30}{360} = 0.083$$

DENSITY  $\sim$  (Probability for continuous spaces)

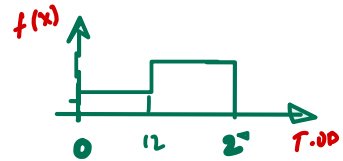
QUIZ : Densities that are non-uniform  
Time of the day when people are born is twice as likely to be born before noon



(a)



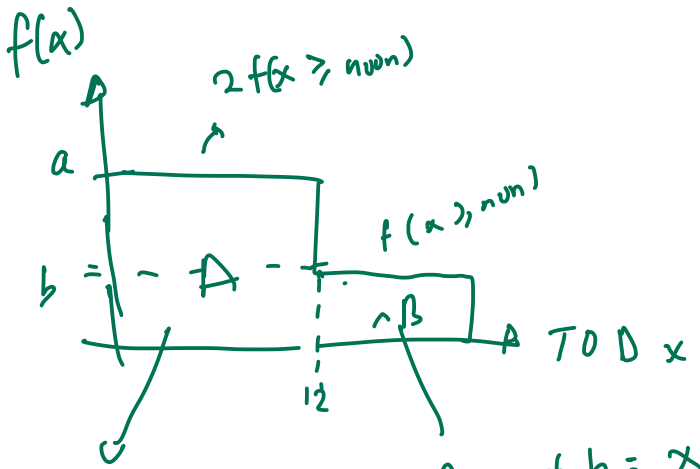
~~(b)~~



(c)

$$f(x \leq \text{noon}) : 2.f(x > \text{noon})$$

↓  
x



$$\text{Area of } A = 2x$$

$$\begin{aligned} \text{Total area} &= 2x + x = 1 \\ 3x &= 1/3 \\ x &= 1/3 \end{aligned}$$

$$\begin{aligned} \text{Area of } b &= 12b \\ 1/3 &= \frac{12b}{12} \\ b &= 1/36 \end{aligned}$$

$$\text{Area of } a = 2 \cdot 1/3$$

$$\text{Area of } A = 2/3$$

$$12a = \frac{2}{3}$$

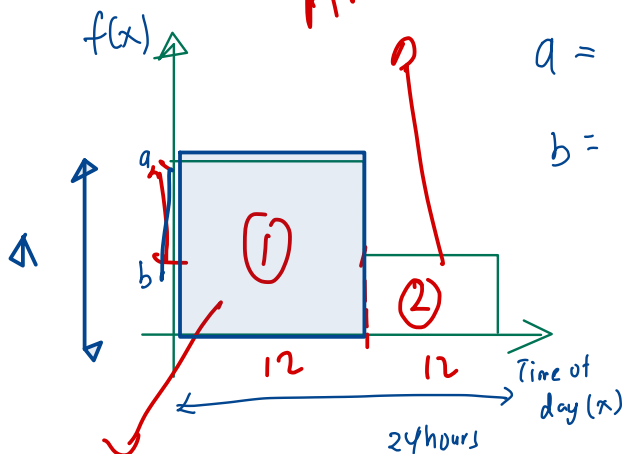
$$a = \frac{2}{3 \times 12}$$

$$a = \frac{1}{18}$$

Quiz:  $f(x \leq \text{noon}) = 2 \cdot f(x > \text{noon})$

$\downarrow$   
 $z$

Area =  $z$



Area =  $2z$

Density fn = area under the curve.

$\therefore$  Total area = Area of 1 + Area of 2

$$1 = 2z + z$$

$$z = \frac{1}{3}$$

$$\text{Area of 1} = 2 \cdot \frac{1}{3} = \frac{2}{3}$$

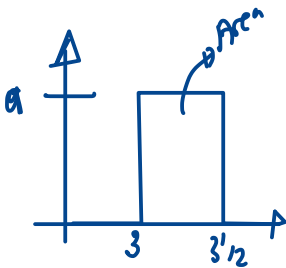
$$\downarrow$$

$$b \quad a = \frac{2}{3} \Rightarrow a = \frac{2}{3 \cdot 12}$$

Area of  $b = \frac{1}{3}$

$$12b = \frac{1}{3} \Rightarrow b = \frac{1}{36}$$

$$\frac{1}{2}a = 1$$



what is  $a$ ?

$$\begin{aligned} \text{Area} &= 1 \\ \therefore \frac{1}{2}a &= 1 \\ a &= 2 \end{aligned}$$