Application of Z score

height of student

$$Z\text{score} = \frac{x - \mu}{\sigma}$$

Q. $N(\mu = 50\text{cm}, \sigma = 20\text{cm}, D = 110)$

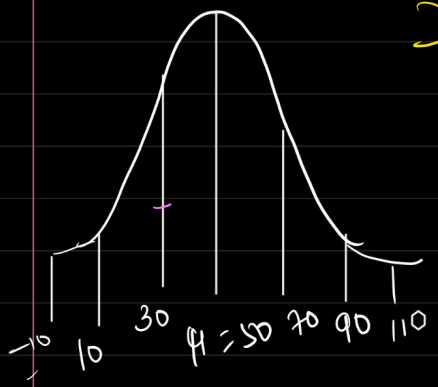
→ How many standard deviation D is away from mean?

$$Z\text{score} = \frac{x_i - \mu}{\sigma} = \frac{110 - 50}{20} = \frac{60}{20} = 3$$

$D = 110$ is 3σ away from mean

$Z = 3 \Rightarrow D = 110$ is 3 sd away from mean

$\sigma = 20 \rightarrow$ The datapoints on an average is 20 units away from mean



1sd away from mean $\mu \pm \sigma = (50+20, 50-20)$

2d " " " $\mu \pm 2\sigma = (50+2\times20, 50-2\times20)$

$\mu \pm 3\sigma = (50+3\times20, 50-3\times20)$

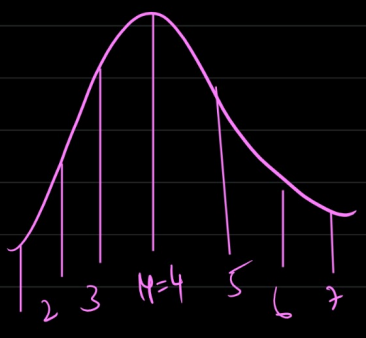
Q Students marks $X = \{1, 2, 3, 4, 5, 6, 7\}$

$\mu = 4$

$\sigma = 1$

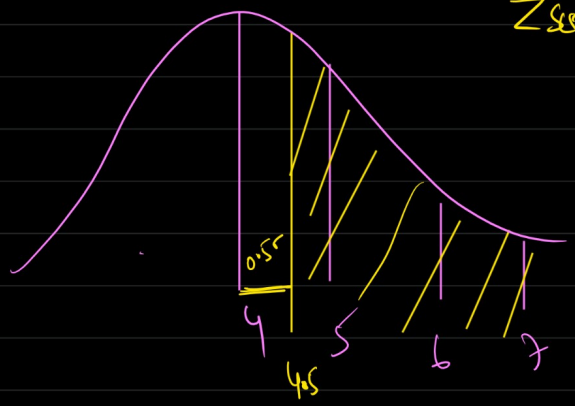
What %age of score will fall above 4.5 ?

→ What is the probability that score is more than 4.5



Total area = is 1

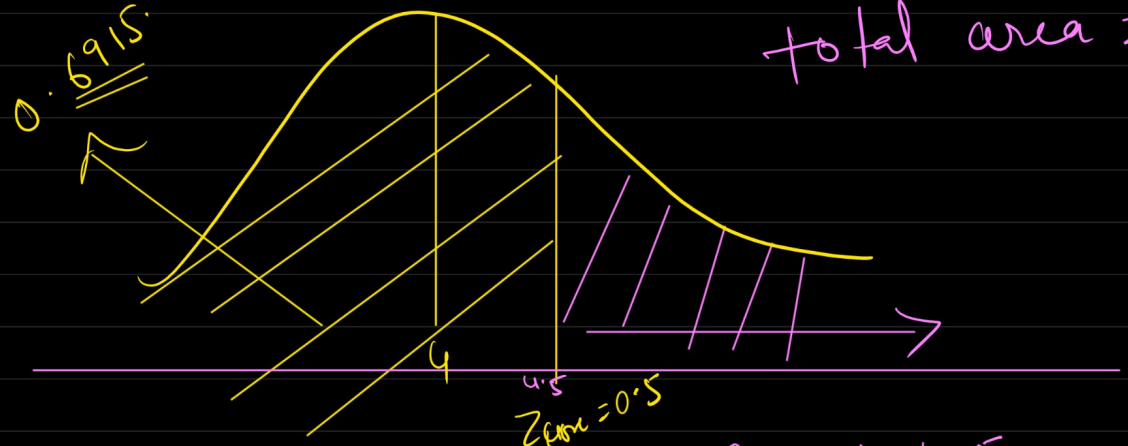
50% area on left side & 50% area on right side of μ



$$Z\text{score} = \frac{x-\mu}{\sigma} = \frac{4.5-4}{1} = 0.5$$

4.5 is 0.5 σ away from mean

→ for each Zscore → Prob value (area under curve)



total area = 1

area > 4.5

$\Rightarrow 1 - 0.6915$

$= 0.31$

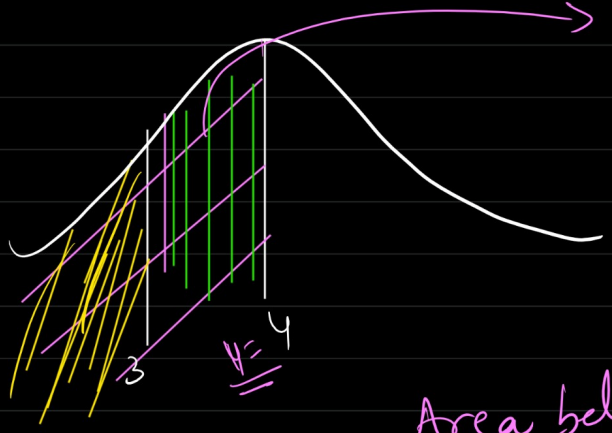
The prob of score greater than 4.5 is 0.31

31% chance is there that marks score will be greater than 4.5.

Q What is percentage of marks below 3.

$$Z = \frac{x-\mu}{\sigma} = \frac{3-4}{1} = -1$$

Q. What is % age of marks b/w 4 & 3



TA = 1
50% on left side and 50% on right side of mean

Area below 4 − Area below 3 will give area b/w 4 & 3

$P(3 \leq X \leq 4) = 0.5 - 0.15$

$= 0.35$

Q. The score follows a SND $\mu = 75$, & $\sigma = 10$ find prob that a randomly selected student will score below 80.

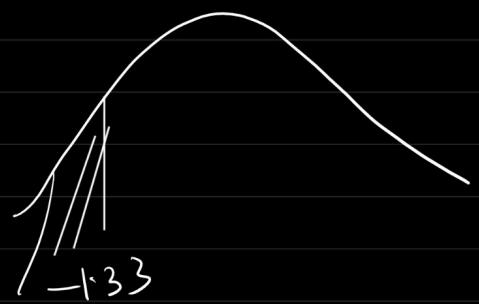
→

$$Z = \frac{x - \mu}{\sigma} = \frac{80 - 75}{10} = \frac{1}{2} = 0.5$$

for $Z = 0.5$, AUC / cumulative Prob = 0.6915

Q. The avg IQ is 100 with $\sigma = 15$
what % age of people lower than IQ 80.

$$\rightarrow Z_{score} = \frac{80 - 100}{15} = \frac{-20}{15} = -1.33$$



$\Rightarrow$ 0.9082