11/10/2023:

Recall: - Normal distribution
- Z-score

$$z = \frac{x - \mu}{\sigma}$$

gives you percentile that x is at

only need to know μ and σ

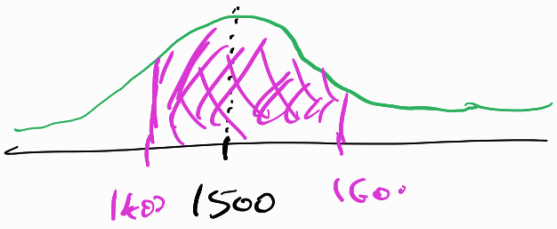
if X is normal distribution

Z-score also gives probabilities

Example. We produce lightbulbs ← lifespan is normal distribution

- avg lifespan = 1500 hours
- standard dev = 75 hours

Q: Probability of a lightbulb having lifespan between 1400 and 1600 hours?



$$z_{1400} = \frac{1400 - 1500}{75}$$

$$= -1.33 \rightarrow 9.176\%$$

$$z_{1600} = 1.33 \rightarrow 90.824\%$$

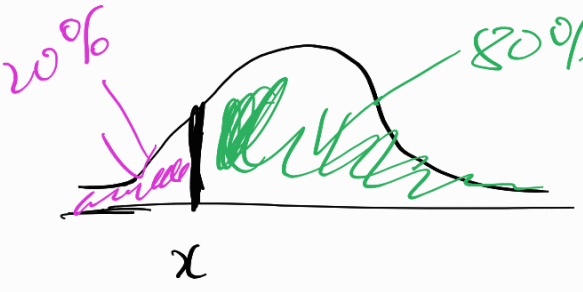
Answer: $90.824 - 9.176$

↳ 81.648 %

Example: A prof fails 20% of students taking a final.

Average score = 62 pts
Std dev = 13 pts
} assume normal dist.

What is the necessary # of pts to pass??



$z_x = 20\%$

z-score table

$z_x = -0.84$

$$\frac{x - 62}{13} = -0.84$$

$$\Rightarrow \boxed{x = 51.08}$$

Practice:

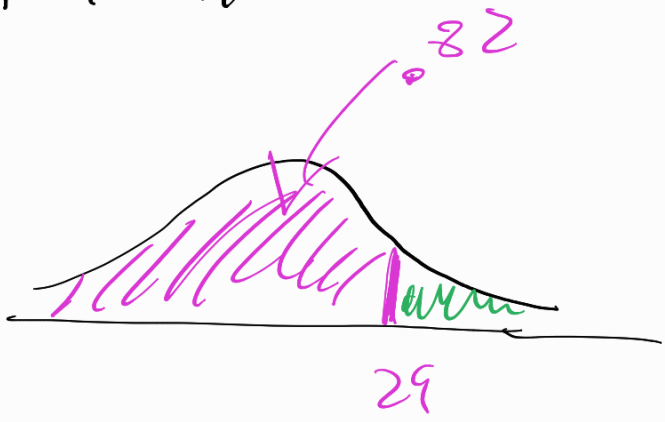
Y is normal dist. w/ $\mu = 25$

- X is normally ...

- σ is k ← unknown

- 18% of values of X live above 29

what is k?



$Z = 0.915$ or 0.92

$$\frac{29-25}{k} = 0.92$$

$$\frac{4}{k} = \frac{0.92}{1} \Rightarrow k = \frac{4}{0.92}$$

$k = 4.347$

Binomial dist (discrete) can be approximated by a normal dist.

if • $np \geq 10$ and

• $n(1-p) \geq 10$

n = # of trials

p = prob. of success