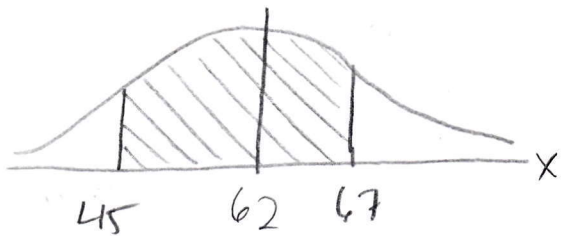
6.3 – Percentiles

Normal(62, 11) X, 10k run times

(μ = 62, σ = 11)

a) Percent b/w 45 and 67 minutes.



$P(X < 67) - P(X < 45)$

$Z_u = \frac{67-62}{11} = \frac{5}{11} \approx 0.4545$

$Z_L = \frac{45-62}{11} = \frac{-17}{11} \approx -1.5455$

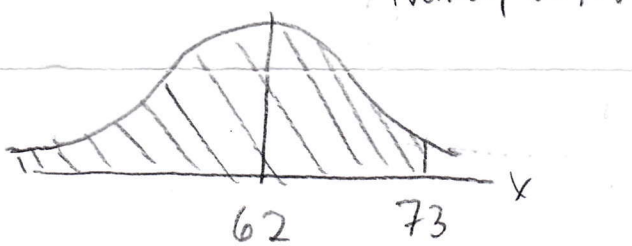
$P(Z < 0.4545) - P(Z < -1.5455)$

$= 0.6753 - 0.0611$

$= 0.6142$

61.42% have times b/w 45 and 67 minutes.

b) Percent less than 73 minutes.



$P(X < 73)$

$Z = \frac{73-62}{11} = \frac{11}{11} = 1$

$P(Z < 1) = 0.8413$ → 84.13% finished 10k in less than 73 minutes.

The 84.13th percentile is at $z = 1$ or $X = 73$.

c) Find and interpret the 30th percentile. (30%)

$P(Z < z) = 0.3$

$z = -0.524$

$X = (-0.524) \times 11 + 62$

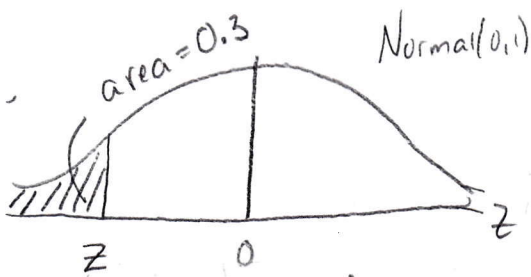
$= 56.236$ This is the 30th percentile!

30% of 10k times are less than 56.2 min.

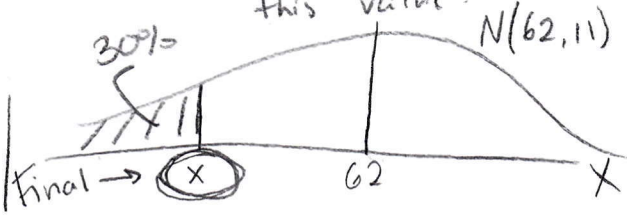
$Z = \frac{X-\mu}{\sigma}$

$Z\sigma = X - \mu$

$Z\sigma + \mu = X$



↖ want to find this value



Find the ninth decile. 10 20 30 ...

90%

-OR-

Find the 90th percentile.

$P(X < x) = 0.9$

$P(Z < z) = 0.9$ $\quad z = \frac{x-\mu}{\sigma}$

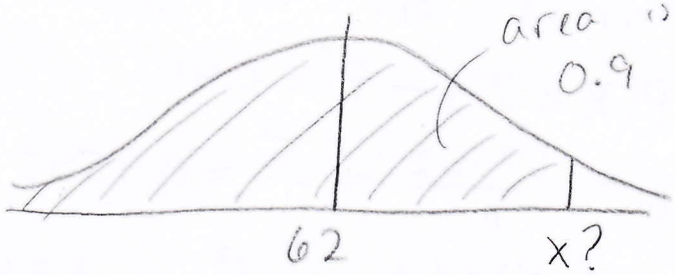
$z = 1.282$

$1.282 = \frac{x-62}{11}$

$14.102 = x - 62$

$72.102 = x$

Normal (62, 11)



72.102

90% of 10k times were under 72.102 minutes.

6.5 Review

6.170 golf course yes or no

$P(\text{golf course}) = 0.039$

Sample size $n = 250$

X = number on golf course

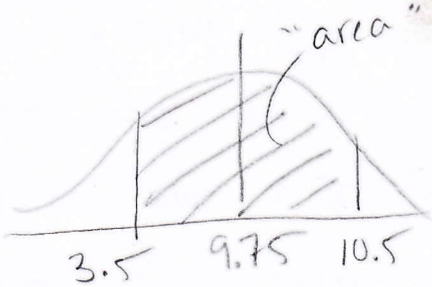
Let "golf course" be success

Not golf course = failure

Binomial $(n = 250, \quad p = 0.039)$

$np = 9.75$ <10! This will cause some issues!

$n(1-p) = 240.25$



Now assume normal approx is okay.

Find $P(4 \le X \le 10) \approx$ "area" Normal $\left(np, \sqrt{np(1-p)}\right)$

Use normal: Normal(9.75, 3.06)

$P(4 < X < 10)$ BUT we need to adjust this for intervals!

$P(4 - 0.5 < X < 10 + 5) = P(3.5 < X < 10.5)$