

Discussion  
Section,  
week of  
5-9 Nov  
2018

Discussion section  
4, #2, p. R - (56) + (57) ①

AMS 7  
5 Nov 18

prob. model

sample ①  
the observed  
escalator  
weights,

imaginary  
data set ③  
all possible  
values of  $S'$

pop  
all adult  
Londoners  
who use  
Piccadilly  
station

full trip  
weight (lb.)  
 $y_1$  170  
 $y_2$  115  
 $\vdots$   
 $y_n$   
 $n = 192$   
sum  $S = ?$   
(ex. 30,010)

30,010  
31,800  
 $\vdots$   
 $\mu + \sigma$

weight  
 $N = ?$   
(big)

~~life~~  
IID

~~hyp~~  
IID

$\}$   $n = 192$

long run  
mean EV of  
 $S' = 30,336$  lb.

pop. mean  $\mu = 158$  lb.

pop. SD  $\sigma = 33$  lb.

sum  $S = ?$   
(ex. 31,800)

long run  
SD SE of  $S'$   
 $= 457$  lb.



long run  
hist

✱✱

$P(\text{escalator breaks on any single } \textcircled{2} \text{ fully-loaded trip}) = P(\sum > 31,400 \text{ lb.})$

The world  
 the total weight of all 192 people on escalator at rush hour

is like

The model  
 the sum of  $n=192$  IID draws from population  $\oplus$

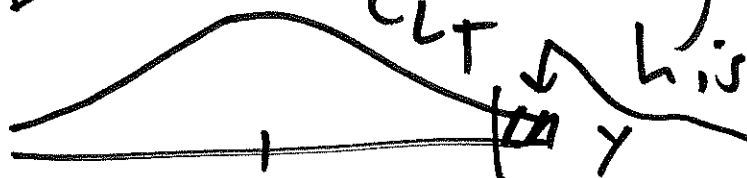
expected value of  $\sum =$  EV of  $\sum$

$$= \boxed{E_{\text{IID}}(\sum) = n\mu} = (\# \text{ draws}) (\text{pop. mean})$$

$$= (192)(158 \text{ lb.}) = 30,336 \text{ lb.}$$

$$\text{(standard error of } \sum) = \left( \begin{array}{l} \text{SE} \\ \text{of} \\ \sum \end{array} \right) = SE_{\text{IID}}(\sum) = \sigma\sqrt{n} = (33 \text{ lb.})\sqrt{192} \doteq 457.9 \text{ lb.}$$

SE 457 lb.



30,336  
lb  
EV

31,400 lb.

0.0099  
= 0.99% = 1%

CLT<sup>(3)</sup>  
(Central  
Limit  
Theorem)

+2.33  
+ z

L - (124)

31,400 lb. - 30,336 lb.

457 lb.

P(failure) = 1%  
= 1/100

90 fully loaded trips/day →  
expect to fail about once a day (!)

(c) Are there any observations  
you would change or set aside  
in sensibly analyzing this data set?