ACTIVITY: The making of loans depends on statistics describing the probability that customers will pay back loans. In this activity, students are given data on how much loan customers paid back on several loan types. They decide which loans they will make. Students start with $1.00. They choose what loans to make with their money.

Two rounds of loans. In each round, there are two loan types to choose from. Some data on payback rates for the loans is given. Students get to decide how much of their $1 to invest in each type of loan. Students work in groups. Everyone in a group must invest the same amounts as the others.

Data for Students for Round 1:

Loan Type I Return (on loan of $1.00)

Customer	A	B	C
Paid Back	$1.60	$2.00	$1.20

Loan Type II Return (on loan of $1.00)

Customer	A	B	C	D	E
Paid Back	$1.65	$1.50	$1.35	$1.50	$1.35

For Teacher:

Data underlying Loan Type I: Roll one 6-sided die. Take number times by $0.40.

Expected value is $\mu = 1 \bullet 3.5 \bullet \$0.40$ $1.40.

Standard deviation is $\sigma = \sqrt{n} \cdot \sqrt{\frac{1}{6}\sum_{i=1}^{6} i^2 - \left(\frac{1}{6}\sum_{i=1}^{6} i\right)^2} \cdot \$0.40 = \sqrt{\frac{35}{12}} \cdot \$0.40 = \$0.68$

Data underlying Loan Type II: Roll 3 dice, multiply sum by $0.15.

Expected value is $\mu = 3 \bullet 3.5 \bullet \$0.15 = \$1.58$.

Standard deviation is $\sigma = \sqrt{n} \cdot \sqrt{\frac{1}{6}\sum_{i=1}^{6} i^2 - \left(\frac{1}{6}\sum_{i=1}^{6} i\right)^2} \cdot \$0.15 = \sqrt{5}\sqrt{\frac{35}{12}} \cdot \$0.15 = \$0.44$.

Processing Loans for Round 1:

Students write their names and the amount they are investing in Loan Type I and Loan Type II on a 3 x 5 index card. They hand in the cards before rolling dice.

Data for Students for Round 2:

Round 2, the students are given the sample mean and sample standard deviation directly. (It would take too long to compute these quantities from $n = 16$ samples.)

Loan Type III Return (on loan of $1.00)

Customer	A	B	C
Paid Back	$0.40	$2.00	$1.60

$n = 3$ customers

$\bar{x} = \$1.33$ (average amount paid back on a $1.00 loan)

$s = \$0.83$ (sample standard deviation of amount paid back on a $1.00 loan)

Loan Type IV Return (on loan of $1.00)

Customer	A	B	C	D	E	F	G	...
Paid Back	$1.40	$1.30	$1.70	$1.20	$2.20	$1.60	$1.80	...

$n = 16$ customers

$\bar{x} = \$1.47$ (average amount paid back on a $1.00 loan)

$s = \$0.21$

For Teacher:

Data underlying Loan Type III: Roll 1 die and multiply by $0.40 = Loan Type I.

Data underlying Type IV loan: Roll 5 dice and multiply by $0.10.

Expected value is $\mu = 5 \bullet 3.5 \bullet \$0.10 = \$1.75$.

Standard deviation is $\sigma = \sqrt{n} \cdot \sqrt{\frac{1}{6}\sum_{i=1}^{6} i^2 - \left(\frac{1}{6}\sum_{i=1}^{6} i\right)^2} \cdot \$0.05 = \sqrt{5}\sqrt{\frac{35}{12}} \cdot \$0.10 = \$0.38$.