1. One hundred draws are going to be made at random with replacement from the box

\[
\begin{array}{cccccc}
0 & 2 & 3 & 4 & 6 \\
\end{array}
\]

True or false, and explain.

(a) The expected value for the sum of the draws is 300.

\[
\text{mean of box } = \frac{20}{5} = 4 \\
\text{Expected value if sum } = \text{# draws } \times \text{mean of box } = 100 \times 3 = 300.
\]

True.

(b) The expected value for the sum of the draws is 300, give or take 20 or so.

False - the expected value is 300 with no uncertainty.

(c) The sum of the draws will be 300.

False - the sum of the draws will show sampling variation.

(d) The sum of the draws will be around 300, give or take 20 or so.

\[
\text{true - SD_{box}} = \sqrt{(0-3)^2 + (2-3)^2 + (3-3)^2 + (4-3)^2 + (6-3)^2}/5
\]

\[
= \sqrt{(9+1+0+1+9)/5} = 2.
\]

\[
\text{SE} = \sqrt{100 \times 2} = 20.
\]

Sum will be 300 ± 20.

[TURN OVER]
2. Draws are being made at random with replacement from a box. The number of draws is getting larger and larger. Say whether each of the following statements is true or false, and explain. ("Converges" means "gets closer and closer").

(a) The probability histogram for the sum of the draws (when put in standard units) converges to the normal curve.

1. True - central limit theorem says prob. histogram for sum converges to normal curve.

(b) The histogram for the numbers in the box (when put in standard units) converges to the normal curve.

1. False - the numbers in the box are what they are and have an arbitrary distribution (The convergence is for the sum of draws).

(c) The histogram for the numbers drawn (when put in standard units) converges to the normal curve.

1. False - the histogram of the numbers drawn converges to the histogram of the numbers in the box.

(d) The probability histogram for the product of draws (when put in standard units) converges to the normal curve.

1. False - the sum of draws converge to the normal curve, not the product.

(e) The histogram for the numbers drawn converges to the histogram for the numbers in the box.

1. True - the frequency with which each number is drawn converges to its frequency in the box.