TEST: Probability Distributions
NO CALCULATOR SECTION

name BB

[1] Evaluate each of the following to two significant figures

[a] $P(-1<Z<1)$ $=0.68$ [b] $P(-2<Z<2)$ $=0.95$ 2

[2] American adult women have an average height of 64 inches with a standard deviation of 3 inches.

[a] Find the probability that a randomly selected woman has a height between 61 and 67 inches. (2 significant figures)

$P(-1<Z<1) = 0.68$ 2

[b] Out of a randomly selected sample of 1000 women, how many have a height between 58 and 70 inches? (2 significant figures)

$P(-2<Z<2) = 0.95$ $(0.95)(1000) = 950$ 2

[3] For random variable X, we know that $X \sim B\left(4, \frac{1}{4}\right)$. Find each of the following.

[a] $P(X=0) = \binom{4}{0}\left(\frac{1}{4}\right)^0\left(\frac{3}{4}\right)^4 = \frac{81}{256}$ 3

[b] $P(X=1) = \binom{4}{1}\left(\frac{1}{4}\right)^1\left(\frac{3}{4}\right)^3 = \frac{108}{256} = \frac{27}{64}$ 3

2 27 4 108

[c] $E(X) = 4\left(\frac{1}{4}\right) = 1$ 2

[d] $\mathrm{Var}(X) = 4\left(\frac{1}{4}\right)\left(\frac{3}{4}\right) = \frac{3}{4}$ 2

25 22 19 66

[4] Three fair dice are rolled and the number of ⚀'s counted.

[a] Find the probability that there are two ⚀'s.

3 36 6 216

$\binom{3}{2}\left(\frac{1}{6}\right)^2\left(\frac{5}{6}\right)^1 = \frac{15}{216} = \frac{5}{72}$ 3

[b] Write down the average number of ⚀'s. $3\left(\frac{1}{6}\right) = \frac{1}{2}$ 2

10 12 12 4 1 39

[5] The random variable X has the following probability distribution. Find the value of p and then compute E(X).

x	0	1	2	3	4	5
P(X=x)	$3p$	p	$2p$	$4p$	$3p$	$2p$

$15p = 1$
$p = \frac{1}{15}$

$E(X) = \frac{3}{15}(0) + \frac{1}{15}(1) + \frac{2}{15}(2) + \frac{4}{15}(3) + \frac{3}{15}(4) + \frac{2}{15}(5)$ 4

$E(X) = \frac{39}{15} = \frac{13}{5}$ or $2\frac{3}{5}$

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Calculator Section – 3 significant figures on all answers

[6] Evaluate each of the following.

[a] $P\left(-\frac{2}{3}<Z<\frac{2}{3}\right)$ = 0.495

[b] $P(Z>1.4)$ = 0.0808

2, 2

[7] For random variable X, we know that $X \sim N(50, 5^2)$. Evaluate each of the following.

[a] $P(47 \le X \le 54)$ = 0.514

$z = \frac{47-50}{5} = -\frac{3}{5}$

$z = \frac{54-50}{5} = \frac{4}{5}$

[b] $P(X<52)$ = $P(z < 2/5)$ = 0.655

$z = \frac{52-50}{5} = \frac{2}{5}$

3, 3

[8] American adult men have an average height of 70 inches with a standard deviation of 3 inches.

[a] Find the probability that a randomly selected man has a height between 69 and 71 inches.

$z = \frac{69-70}{3} = -\frac{1}{3}$

$z = \frac{71-70}{3} = \frac{1}{3}$

$P(-1/3 < z < 1/3)$ = 0.261

3

[b] Out of a randomly selected sample of 1000 men, how many have a height less than 65 inches?

$z = \frac{65-70}{3} = -5/3$

$P(z < -5/3)$ = 0.0478

47.8

3

[c] 10% of men are taller than p inches. Find p.

$z = \text{invNorm}(0.90) = 1.282 = \frac{x-70}{3}$

3

$x = 73.8$ in.

[d] 5% of men are shorter than q inches. Find q.

$z = \text{invNorm}(0.05) = -1.645 = \frac{x-70}{3}$

3

$x = 65.1$ in.