1. It is known that 75% of the eligible voters in the U.S. voted in the last *(undecided at the time of this writing)* presidential election. What is the probability that at least 218 of 300 eligible voters chosen at random in the U.S. actually did vote? *(Use the normal approximation to the binomial.)*

(a) 0.1760 (b) 0.8413 (c) 0.8512 (d) 0.8240 (e) 0.1587

2. Let Z be the standard normal random variable. Find

$$P(-0.55 \le Z \le 0.85)$$

(a) 0.8023 (b) -0.5111
(c) 0.2912 (d) 0.5111
(e) 0.7088

3. Let Z be the standard normal random variable. Find a value z_o so that

$$P(-z_o \leq Z \leq z_o) = 0.8064$$

(a) $z_o = 0.5$
(b) $z_o = -1.3$
(c) $z_o = 1.3$
(d) $z_o = 0$
(e) $z_o = 1.5$

4. Here is a game which you are to play against me. You toss one fair coin, and if it shows "Heads" you give me \$ 6.00 (six dollars.) If the coin shows "Tails" you toss one fair die. If the top face of the die is odd you pay me \$ 6.00 (six dollars.) If the top face of the die is even I pay you three times the amount shown on the face. ***For example***, if you toss "Heads", or you toss first "Tails" and then a "3" you pay me six dollars. If you toss "Tails" and then a "4" I pay you twelve (three times four) dollars. Who should pay whom how much to play this game and make it fair? (That is, neither in my favor nor in yours.) The table below shows your possible earnings in dollars

-6.00	6.00	12.00	18.00

(a) you should pay me \$ 3.00
(b) I should pay you \$ 3.00
(c) I should pay you \$ 1.50
(d) you should pay me \$ 1.50
(e) none of the above

5. The probability distribution for a random variable X is given below. What is the variance of X?

k	Pr(X=k)
-1	0.4
0	0.1
2	0.1
3	0.4

(a) $\sqrt{4.4}$ (b) 6.8 (c) $\sqrt{3.4}$ (d) $\sqrt{6.8}$ (e) 3.4

6. The amount of jet fuel consumed by a Boeing 747 in a flight from Chicago to London is a normally distributed random variable which averages at 2,720 gallons, with a standard deviation of 400 gallons. What is the smallest amount of jet fuel which a Boeing 747 should depart with from Chicago in order to be 99.9% certain to reach London?

(a) 4,400 gallons (b) 3,960 gallons

(c) 4,960 (d) 4,356 gallons

(e) none of the above

7. If 30% of the students at Notre Dame are 6 feet or more in height, and 60 students are chosen at random for the Social Glee Choir, estimate the probability that there are 15 or less students over 6 feet tall among the 60 chosen.*(Only one among the answers shown is the most accurate)*

(a) 0.7580 (b) 0.1 (c) 0.9994 (d) 0.2420 (e) 0.9452

Questions 8 and 9 refer to the random variable X whose distribution is shown below

k	P(X=k)
1	0.6
2	0.4

8. Among the four distributions shown below identify the sampling distribution for a sample of size 3 of the statistic **S** = "first value plus second value minus third value." (Note that (e) is a possibly correct answer.)

(a)

k	P(**S**=k)
0	0.144
1	0.760
2	0.096

(b)

k	P(**S**=k)
0	0.144
1	0.408
2	0.352
3	0.096

(c)

k	P(**S**=k)
0	0.250
1	0.250
2	0.250
3	0.250

(d)

k	P(**S**=k)
0	0.096
1	0.760
2	0.144

(e) none of the above.

9. The mean of the sampling distribution of the statistic **S** equals:

(a) 1.4 (b) 1.5 (c) 0 (d) 1 (e) 0.962

Questions 10 and 11 refer to the following (hypothetical) situation:

Each time you open an e-mail message there is an independent 20% chance you'll get a virus with it.

10. Let X be the number of infected e-mail messages you get out of 100. What is the standard deviation of X ?

(a) 2 (b) 3 (c) 4 (d) 5 (e) 6

11. Estimate the probability that the number of infected messages you receive out of 100 messages does not exceed 24 (Note: 24 does NOT exceed 24) *(Only one among the answers shown is the most accurate)*

(a) 0.9982 (b) 0.6983 (c) 0.5 (d) 0.8413 (e) 0.8697

12. Let X be a random variable with distribution as shown below:

k	P(X=k)
1	0.5
2	0.3
3	0.2

The mean of the sampling distribution for a sample of size 2 of the statistic
S = "distance between the two values" is:

(a) 0.42 (b) 0.52 (c) 0.62 (d) 0.72 (e) 0.82

13. A device which measures speed of automobiles is placed alongside a North–South, 60 mph speed limit interstate highway in Pokemonia. The device reads Northbound speeds as positive, Southbound speeds as negative. Of course the speed S is a random variable highly non-normal (it is called bi-modal, but never mind), with mean 0 (because North- and South-bound speeds tend to cancel each other out) and standard deviation 30 mph. Use Tchebishev's to estimate the number of cars which break the speed limit out of 80 cars going by the device.*(Only one of the answers below is the most accurate.)*

(a) at least 20 (b) at most 36

(c) at least 36 (d) at most 20

(e) not enough information provided

14. The daily demand for MountainDoo in the TuttiPazzi retirement community is normally distributed with $\mu = 144$ fluid ounces and $\sigma = 16$ fluid ounces. This morning the pantry at the community received a shipment of 170 fluid ounces of MountainDoo. What is the probability that today's demand for MountainDoo will be met? *(Only one of the answers below is the most accurate.)*

(a) 50% (b) 94.8% (c) 90.6% (d) 65.5% (e) 80.2%

15. For certain types of FordFire tires the lifelength of one tire is a random variable *(not necessarily normal)* with mean $\mu = 40{,}000$ miles and $\sigma = 1{,}500$ miles. Suppose that 3,000 such tires are sold to the Armed Forces. Estimate the number that will require replacement between 37,000 and 43,000 miles of usage.

(a) $\geq 2{,}250$ (b) $\leq 1{,}500$ (c) $\geq \frac{3}{4}$ (d) ≥ 313 (e) $\geq 2{,}688$

16. Repeat question No. 15, but now assume that the lifelength of one tire ***IS*** normally distributed, with mean $\mu = 40{,}000$ miles and $\sigma = 1{,}500$ miles.

(a) 2,864 (b) 1,246 (c) $\frac{3}{4}$ (d) 517 (e) 2,688

Questions 17, 18 and 19 refer to the following situation:

On four consecutive days a group of fifty people (always the same group, ,and you are included among them) shows up at GMG studios to be employed as extras, The studio pays $ 130.00 per day of work. Each person has an independent 80% chance of being used on any given day among the four.

17. After four days of showing up, what is your expected pay from the studio?
(a) 266 (b) 416 (c) 306 (d) 516 (e) 130

18. What is the standard deviation of the number of extras used in any one day from among the group of fifty

(a) $2\sqrt{2}$ days (b) $2\sqrt{2}$ dollars (c) $2\sqrt{2}$ persons (d) 8 (e) 2

19. What is the probability that you will be used at least for one of the four days?

(a) 80.66% (b) 98.88% (c) 89.64% (d) 75.46% (e) 99.84%

20. SAT scores for High School seniors throughout the nation this past year turned out to be normally distributed, with mean $\mu = 790$ and $\sigma = 45$.. What is the probability that a student selected at random from among this year's freshmen in the nation is below average?

(a) 85.00% (b) 80.00% (c) 75.00% (d) 50.00% (e) 25.00%