

STATISTICS Solutions-Open Level
2000 Mu Alpha Theta National Convention

1. (B)
$$z = \frac{x - \mu}{\sigma} ; 0.5/0.25 = 2 \text{ std dev of the mean.}$$

From the table, $P(-2.00 < z < 2.00) = .9544$

2. (C) Approximately 95% of normal distribution is within 2 standard deviations of mean. $sd = 2.5$; $2sd = 5$ units on either side of mean— $68 \pm 5 = 63$ to 73

3. (C) No work to perform for solution. You know there are 3 variables or you don't!!

4. (A) Outliers are items of data unusually away from remainder of data. Since approximately 99.7% of all data items in a normal distribution are within 3 std. devs. of the mean and 150 is 5 std. dev. from the mean; it would be suspected as an outlier!!

5. (D)
$$z = \frac{x - \mu}{\sigma} \quad z = \frac{300 - 270}{10} \quad z = 3; \quad p(z > 3) = .0013 \text{ (from table)}$$

6. (A) Same formula as above. Solving for x ; tabled value of z with 25% to the right is .67 therefore $.67 = \frac{x - 110}{25}$ $x = 126.75$; therefore answer is 127.

7. (B) $y = -29.5 + 1.4x$; When $x = 78.2$, $y = -29.5 + 1.4(78.2) = 79.98 \therefore 80.0$ million gallons.

9. (B) Slope is the coefficient of t in the equation $y = 6.9 + 0.27t$; \therefore ans is 0.27

8. (D) You either know this answer or you don't!! There is no mathematical solution! The answer is "this is nonsense because r makes no sense here".

10. (C) Again, you either know the answer for this problem or you don't! A confidence interval has the following meaning: "If the procedure were repeated many times, 95% of the resulting confidence intervals would contain the population mean!!"

11. (B) Another "you know it or you don't" answer. This is a classic example of anecdotal information.

STATISTICS Solutions-Open Level
2000 Mu Alpha Theta National Convention

12. (D) The answer is “a stratified random sample”. When the sample data is divided into strata such as freshman , sophomore, etc. then randomly selected from those strata rather than disregarding the class distribution and letting it fall to chance; the sample becomes stratified rather than simple random sampling.

13. (E) Probability of neither Christian (10%) nor Jewish (5%) is $1 - (.10 + .05)$; \therefore is 0.85 which is not given and the answer is NOTA.

14. (B) Probability distribution must have a sum of 1.00; therefore $P(\text{accident}) = 1.00 - .95$ so the answer is .05

15. (D) Probability of **not happening** is 1 minus the probability of **happening**. Not happening a number of times employs the multiplication rule or power rule if equal probabilities. Therefore the answer is $(.25)^3$ which is 0.0156.

16. (C) The mean of a random variable distribution is $\sum x_i p(x_i)$;

$$0(.10) + 1(.08) + \dots + 12(.01) = 4.89$$

17. (A) See formula in # 16. $0(.2) + 1(.6) + 2(.2) = 1$

18. (E) Neither positive is same as probability of both negative $(.1)(.2) = .02$

19. (A) Probability of at least once is 1 minus the probability of losing every time.
 $1 - (.98)^5 = .0961$

20. (C) $(1/9)^3 = .0014$ (expressed as a decimal)

21. (E) Binomial distribution!! Mean (μ) = np ; $\mu = 450 \times .09 = 40.5$ (NOTA)

STATISTICS Solutions-Open Level
2000 Mu Alpha Theta National Convention

22. (D) Binomial distribution!! Std.Dev. (σ) = $\sqrt{np(1-p)}$; $\sigma = \sqrt{450 \times .09 \times .91} = 6.07$

23. (E) Binomial!! Sum of the probabilities of 0,1,2,3,4,5, & 6 = prob. that 6 or fewer patients die. Read from binomial table and get .117 or calculate $P(0) + P(1) + P(2) + \dots + P(6)$ and get .1178 (using the binomial formula— $nCr p^r q^{n-r}$) NOTA

24. (B) Exactly 2 students yields to the formula much better. So: ${}_{10}C_2 (.2)^2 (.8)^8 = .3020$

25. (D) Using the normal approximation for the binomial distribution yields:

$$z = \frac{275 - 250}{13.69} = 1.83 \quad P(z > 1.83) = .0336 \quad (np = 250; \sqrt{npq} = 13.69)$$

26. (B) $n = [z_{\alpha/2} \sigma / E]^2$ $n = [(1.96 \times 32) / 10]^2 = 33.34$: ALWAYS ROUND UP; so answer is sample size = 40

27. (C) Using the standard z-table to find the z which corresponds to .0250 in the body of the table, produces 1.96

28. (B) P-value mean that the resulting experience would happen by chance 4% of the time. Therefore, we would reject the null hypothesis with a chosen α of .05.

29. (D) Confidence intervals represent numbers equidistant from the mean, therefore the center of the interval would be the mean: in this case 49.2

30. (B) A calculated statistic that falls beyond the 95% position on the normal curve may or may not be beyond the 99% position on that curve, i.e. it may or may not be significant at the 1% level.

Table A

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.5000	.5040	.5080	.5120	.5160	.5199	.5239	.5279	.5319	.5359
0.1	.5398	.5438	.5478	.5517	.5557	.5596	.5636	.5675	.5714	.5753
0.2	.5793	.5832	.5871	.5910	.5948	.5987	.6026	.6064	.6103	.6141
0.3	.6179	.6217	.6255	.6293	.6331	.6368	.6406	.6443	.6480	.6517
0.4	.6554	.6591	.6628	.6664	.6700	.6736	.6772	.6808	.6844	.6879
0.5	.6915	.6950	.6985	.7019	.7054	.7088	.7123	.7157	.7190	.7224
0.6	.7257	.7291	.7324	.7357	.7389	.7422	.7454	.7486	.7517	.7549
0.7	.7580	.7611	.7642	.7673	.7704	.7734	.7764	.7794	.7823	.7852
0.8	.7881	.7910	.7939	.7967	.7995	.8023	.8051	.8078	.8106	.8133
0.9	.8159	.8186	.8212	.8238	.8264	.8289	.8315	.8340	.8365	.8389
1.0	.8413	.8438	.8461	.8485	.8508	.8531	.8554	.8577	.8599	.8621
1.1	.8643	.8665	.8686	.8708	.8729	.8749	.8770	.8790	.8810	.8830
1.2	.8849	.8869	.8888	.8907	.8925	.8944	.8962	.8980	.8997	.9015
1.3	.9032	.9049	.9066	.9082	.9099	.9115	.9131	.9147	.9162	.9177
1.4	.9192	.9207	.9222	.9236	.9251	.9265	.9279	.9292	.9306	.9319
1.5	.9332	.9345	.9357	.9370	.9382	.9394	.9406	.9418	.9429	.9441
1.6	.9452	.9463	.9474	.9484	.9495	.9505	.9515	.9525	.9535	.9545
1.7	.9554	.9564	.9573	.9582	.9591	.9599	.9608	.9616	.9625	.9633
1.8	.9641	.9649	.9656	.9664	.9671	.9678	.9686	.9693	.9699	.9706
1.9	.9713	.9719	.9726	.9732	.9738	.9744	.9750	.9756	.9761	.9767
2.0	.9772	.9778	.9783	.9788	.9793	.9798	.9803	.9808	.9812	.9817
2.1	.9821	.9826	.9830	.9834	.9838	.9842	.9846	.9850	.9854	.9857
2.2	.9861	.9864	.9868	.9871	.9875	.9878	.9881	.9884	.9887	.9890
2.3	.9893	.9896	.9898	.9901	.9904	.9906	.9909	.9911	.9913	.9916
2.4	.9918	.9920	.9922	.9925	.9927	.9929	.9931	.9932	.9934	.9936
2.5	.9938	.9940	.9941	.9943	.9945	.9946	.9948	.9949	.9951	.9952
2.6	.9953	.9955	.9956	.9957	.9959	.9960	.9961	.9962	.9963	.9964
2.7	.9965	.9966	.9967	.9968	.9969	.9970	.9971	.9972	.9973	.9974
2.8	.9974	.9975	.9976	.9977	.9977	.9978	.9979	.9979	.9980	.9981
2.9	.9981	.9982	.9982	.9983	.9984	.9984	.9985	.9985	.9986	.9986
3.0	.9987	.9987	.9987	.9988	.9988	.9989	.9989	.9989	.9990	.9990
3.1	.9990	.9991	.9991	.9991	.9992	.9992	.9992	.9992	.9993	.9993
3.2	.9993	.9993	.9994	.9994	.9994	.9994	.9994	.9995	.9995	.9995
3.3	.9995	.9995	.9995	.9996	.9996	.9996	.9996	.9996	.9996	.9997
3.4	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9998