計算題：

1. An oil drilling company ventures into various locations, and their success or failure is independent from on location to another. Suppose the probability of a success at any specific location is 0.25.

   (a) What is the probability that a driller drills 10 locations and finds 1 success? (5%)

   (b) The driller feels that he will go bankrupt if he drills 10 times before the first success occurs. What is the driller's prospect for bankrupt? (5%)

   (c) The driller feels that he will "hit the big" if the second success occurs on sixth attempt. What is the probability that the driller "will hit it big"? (5%)


2. A multiple-choice quiz has 200 questions each with 4 possible answers of which only 1 is correct answer. What is the probability that sheer guesswork yields from 25 to 30 correct answer for 80 of the 200 problems about which the students has no knowledge? (10%)


3. A commonly prescribed drug for relieving nervous tension is believed to be only 60% effective. Experimental results with a new drug administered to a random sample of 100 adults who were suffering from nervous tension show that 70 received relief. Is this sufficient evidence to conclude that the new drug is superior to the one commonly prescribed? Use a 0.05 significance level. (15%)


4. Suppose that a random sample of 150 observations was drawn from a population. After calculating the mean and standard deviation, each observation was standardized and the number of observations in each of the intervals below was counted. Can we infer at the 5% significance level that the data were drawn from a normal population? (15%)

   | Intervals | Frequency |
   | --- | --- |
   | $Z \leq -1.5$ | 15 |
   | $-1.5 < Z \leq -.5$ | 32 |
   | $-.5 \leq Z \leq .5$ | 65 |
   | $.5 < Z \leq 1.5$ | 25 |
   | $Z > 1.5$ | 13 |

5. A partial ANOVA table in a randomized block design is shown below, where the treatments refer to different acid reflux medicines, and the blocks refer to groups of men with similar levels of stomach acid. (15%)

| Source of Variation | SS | df | MS | F |
|---|---|---|---|---|
| Treatments | * | 4 | * | * |
| Blocks | 3,120 | 6 | * | * |
| Error | * | * | 115 | |
| Total | 12,600 | 34 | | |

(a) Fill in the missing values (identified by asterisks) in the above ANOVA Table.

(b) Can we infer at the 5% significance level that the treatment means differ?

(c) Can we infer at the 5% significance level that the block means differ?

6. At a recent Wayne Newton concert, a survey was conducted that asked a random sample of 20 people their age and how many concerts they have attended since the first of the year. The following data were collected: (15%)

| Age | 62 | 57 | 40 | 49 | 67 | 54 | 43 | 65 | 54 | 41 |
|---|---|---|---|---|---|---|---|---|---|---|
| Number of Concerts | 6 | 5 | 4 | 3 | 5 | 5 | 2 | 6 | 3 | 1 |

| Age | 44 | 48 | 55 | 60 | 59 | 63 | 69 | 40 | 38 | 52 |
|---|---|---|---|---|---|---|---|---|---|---|
| Number of Concerts | 3 | 2 | 4 | 5 | 4 | 5 | 4 | 2 | 1 | 3 |

An Excel output follows:

SUMMARY OUTPUT

| Regression Statistics | |
|---|---|
| Multiple R | 0.80203 |
| R Square | 0.64326 |
| Adjusted R Square | 0.62344 |
| Standard Error | 0.93965 |
| Observations | 20 |

DESCRIPTIVE STATISTICS

| | Age | | Concerts | |
|---|---|---|---|---|
| Mean | 53 | Mean | 3.65 |
| Standard Error | 2.1849 | Standard Error | 0.3424 |
| Standard Deviation | 9.7711 | Standard Deviation | 1.5313 |
| Sample Variance | 95.4737 | Sample Variance | 2.3447 |
| Count | 20 | Count | 20 |

SPEARMAN RANK CORRELATION COEFFICIENT=0.8306

ANOVA

| | df | SS | MS | F | Significance F |
|---|---|---|---|---|---|
| Regression | 1 | 28.65711 | 28.65711 | 32.45653 | 2.1082E-05 |
| Residual | 18 | 15.89289 | 0.88294 | | |
| Total | 19 | 44.55 | | | |

| | Coefficients | Standard Error | t Stat | P-value | Lower 95% | Upper 95% |
|---|---|---|---|---|---|---|
| Intercept | -3.01152 | 1.18802 | -2.53491 | 0.02074 | -5.50746 | -0.5156 |
| Age | 0.12569 | 0.02206 | 5.69706 | 0.00002 | 0.07934 | 0.1720 |

(a) Predict with 95% confidence the number of concerts attended by a 45 years-old individual.

(b) Estimate with 95% confidence the average number of concerts attended by all 45 year-old individuals.

(c) Which interval in the previous two questions is narrower: the confidence interval estimate of the expected value of y or the prediction interval for the same given value of x (10 years) and same confidence level? Why?

7. Ten administration assistants were selected at random from a large university. The keyboard speed (number of words per minute) was recorded for each secretary on two different brands of computer keyboards. Assume that the typing speeds are not normally distributed. The following results were obtained. (15%)

*Computer Keyboard*

| Secretary | Brand A | Brand B |
| --- | --- | --- |
| Barry | 72 | 74 |
| Betty | 80 | 86 |
| Carol | 68 | 72 |
| Cliff | 74 | 70 |
| Ellen | 86 | 85 |
| Fred | 75 | 73 |
| Gwen | 78 | 72 |
| Harry | 69 | 65 |
| Ingrid | 76 | 79 |
| Jerome | 65 | 64 |

Perform the appropriate test to determine if these data provide enough evidence at the 5% significance level to infer that the brands differ with respect to keyboard speed.

## STANDARD NORMAL TABLE

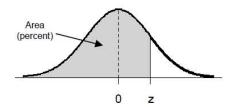(Cumulative area to the left of POSITIVE z-values are shown in this table.)



| 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 |