MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Provide an appropriate response.

1) In an area of Russia, records were kept on the relationship between the rainfall (in inches) and the yield of wheat (bushels per acre). The data for a 9 year period is as follows: 1) _____

Rain Fall, x	13.1	11.4	16.0	15.1	21.4	12.9	9.6	18.2	18.6
Yield, y	48.5	44.2	56.8	80.4	47.2	29.9	74.0	74.0	76.8

The equation of the line of least squares is given as $\hat{y} = -9.12 + 4.38x$. How many bushels of wheat per acre can be predicted if it is expected that there will be 30 inches of rain?

A) 140.52
B) 122.28
C) 8.93
D) Cannot be certain of the result because 30 inches of rain exceeds the observed data.

2) The data below are the final exam scores of 10 randomly selected history students and the number of hours they slept the night before the exam. Find the equation of the regression line for the given data. What would be the predicted score for a history student who slept 15 hours the previous night? Is this a reasonable question? Round your predicted score to the nearest whole number. Round the regression line values to the nearest hundredth. 2) _____

Hours, x	3	5	2	8	2	4	4	5	6	3
Scores, y	65	80	60	88	66	78	85	90	90	71

A) $\hat{y} = 5.04x + 56.11$; 132; Yes, it is reasonable.
B) $\hat{y} = 5.04x + 56.11$; 132; No, it is not reasonable. 15 hours is well outside the scope of the model.
C) $\hat{y} = -5.04x + 56.11$; -20; No, it is not reasonable.
D) $\hat{y} = -5.04x + 56.11$; -20; Yes, it is reasonable.

3) Each year a nationally recognized publication conducts its "Survey of America's Best Graduate and Professional Schools." An academic advisor wants to predict the typical starting salary of a graduate at a top business school using GMAT score of the school as a predictor variable. A simple linear regression of SALARY versus GMAT using 25 data points shown below. 3) _____

$b_0 = -92040$ $b_1 = 228$ $s = 3213$ $R^2 = 0.66$ $r = 0.81$ $df = 23$ $t = 6.67$

Give a practical interpretation of $R^2 = 0.66$.

A) 66% of the sample variation in SALARY can be explained by using GMAT in a straight-line model.
B) We estimate SALARY to increase $.66 for every 1-point increase in GMAT.
C) 66% of the differences in SALARY are caused by differences in GMAT scores.
D) We can predict SALARY correctly 66% of the time using GMAT in a straight-line model.

4) A residual is the difference between 4) _____

A) the observed value of y and the predicted value of x.
B) the observed value of x and the predicted value of x.
C) the observed value of y and the predicted value of y.
D) the observed value of x and the predicted value of y.

5) The data below are the ages and systolic blood pressure (measured in Millimeters of mercury) of 9 randomly selected adults. 5) _____

Age, x	Pressure, y
38	116
41	12.
45	123
48	131
51	142
53	145
57	148
61	150
65	152

A) 1.41 B) 123.63 C) 11.11 D) 1.99

6) The data below are the number of absences and the salaries (in thousands of dollars) of 9 randomly selected employees from an engineering firm. What is the best predicted value for y given x = 10? 6) _____

Number of absences, x	0	3	6	4	9	2	15	8	5
Salary, y	98	86	80	82	71	92	55	76	82

A) 68 B) 71 C) 70 D) 69

7) If the coefficient of determination is close to 1, then 7) _____

A) the least squares regression line equation has no explanatory value.
B) the sum of the square residuals is large compared to the total variation.
C) the linear correlation coefficient is close to zero.
D) the least squares regression line equation explains most of the variation in the response variable.

8) A county real estate appraiser wants to develop a statistical model to predict the appraised value of houses in a section of the county called East Meadow. One of the many variables thought to be an important predictor of appraised value is the number of rooms in the house. Consequently, the appraiser decided to fit the simple linear regression model, $\hat{y} = \beta_0 + \beta_1 x$, where y = appraised value of the house (in $thousands) and x = number of rooms. Using data collected for a sample of n = 74 houses in East Meadow, the following results were obtained: 8) _____

$\hat{y} = 74.80 + 19.72x$
$s_\beta = 71.24$, t = 1.05 (for testing β_0)
$s_\beta = 2.63$, t = 7.49 (for testing β_1)
SSE = 60,775, MSE = 841, s = 29, $r^2 = 0.44$
Range of the x-values: 5 - 11
Range of the y-values: 160 - 300

Give a practical interpretation of the estimate of the y-intercept of the least squares line.

A) There is no practical interpretation, since a house with 0 rooms is nonsensical.
B) For each additional room in the house, we estimate the appraised value to increase $74,800.
C) We estimate the base appraised value for any house to be $74,800.
D) For each additional room in the house, we estimate the appraised value to increase $19,720.

9) The regression line for the given data is $\hat{y} = 6.91x + 46.26$. Determine the residual of a data point for which $x = 3$ and $y = 72$. 9) _____

Number of years, x	3	4	4	5	3	6	2	7	3
Grades on test, y	61	68	75	82	73	90	58	93	72

A) -540.78 B) 66.99 C) 5.01 D) 138.99

10) Each year a nationally recognized publication conducts its "Survey of America's Best Graduate and Professional Schools." An academic advisor wants to predict the typical starting salary of a graduate at a top business school using GMAT score of the school as a predictor variable. Total GMAT scores range from 200 to 800. A simple linear regression of SALARY versus GMAT using 25 data points shown below. 10) _____

$\hat{\beta}_0 = -92040$ $\hat{\beta}_1 = 228$ $s = 3213$ $R^2 = 0.66$ $r = 0.81$ $df = 23$ $t = 6.67$

Give a practical interpretation of $\hat{\beta}_0 = -92040$.

A) The value has no practical interpretation since a GMAT of 0 is nonsensical and outside the range of the sample data.
B) We expect to predict SALARY to within 2(92040) = $184,080 of its true value using GMAT in a straight-line model.
C) We estimate the base SALARY of graduates of a top business school to be $-92,040.
D) We estimate SALARY to decrease $92,040 for every 1-point increase in GMAT.

11) The least squares regression line 11) _____

A) maximizes the mean difference between the residuals squared.
B) minimizes the sum of the residuals squared.
C) maximizes the sum of the residuals squared.
D) minimizes the mean difference between the residuals squared.

12) The data below are the average one-way commute times (in minutes) for selected students and the number of absences for those students during the term. Find the equation of the regression line for the given data. What would be the predicted number of absences if the commute time was 95 minutes? Is this a reasonable question? Round the predicted number of absences to the nearest whole number. Round the regression line values to the nearest hundredth. 12) _____

Commute time (min), x	72	85	91	90	88	98	75	100	80
Number of absences, y	3	7	10	10	8	15	4	15	5

A) $\hat{y} = 0.45x + 30.27$; 73 absences; No, it is not reasonable. 95 minutes is well outside the scope of the model.
B) $\hat{y} = 0.45x + 30.27$; 73 absences; Yes, it is reasonable.
C) $\hat{y} = 0.45x - 30.27$; 12 absences; No, it is not reasonable. 95 minutes is well outside the scope of the model.
D) $\hat{y} = 0.45x - 30.27$; 12 absences; Yes, it is reasonable.

13) The coefficient of determination is the _____ of the linear correlation coefficient. 13) _____

A) reciprocal B) opposite C) square root D) square

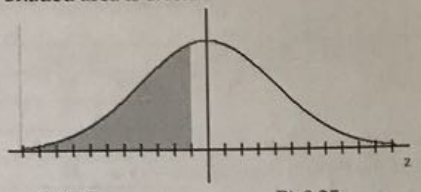
14) The regression line for the given data is $\hat{y} = 1.488x + 60.46$. Determine the residual of a data point for which $x = 45$ and $y = 123$. 14) _____

Age, x	38	41	45	48	51	53	57	61	65
Pressure, y	116	120	123	131	142	145	148	150	152

A) -4.42 B) 127.42 C) 250.42 D) -198.484

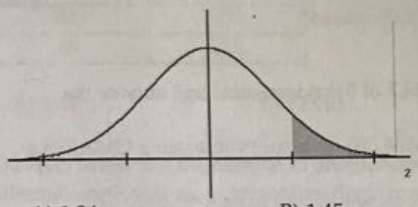
Find the indicated z score. The graph depicts the standard normal distribution with mean 0 and standard deviation 1.

15) Shaded area is 0.4013. 15) _____



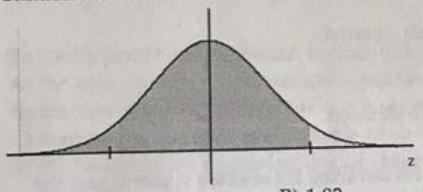
A) 0.57 B) 0.25 C) -0.57 D) -0.25

16) Shaded area is 0.0901. 16) _____



A) 1.34 B) 1.45 C) 1.26 D) 1.39

17) Shaded area is 0.9599. 17) _____



A) 1.03 B) 1.82 C) -1.38 D) 1.75

Find the indicated probability.

18) If you flip a coin three times, the possible outcomes are HHH HHT HTH HTT THH THT TTH TTT. 18) _____
What is the probability of getting at least one head?

A) $\frac{1}{4}$ B) $\frac{3}{4}$ C) $\frac{1}{2}$ D) $\frac{7}{8}$

19) A survey asked subjects whether they favored or opposed the death penalty for persons convicted o 19) _____
murder and whether they favored or opposed a law requiring a person to obtain a permit before he or she could buy a gun. The results are summarized in the table below:

Frequency Distribution

		GUNLAW		
		1: Favor	2: Oppose	TOTAL
DEATH PENALTY	1: Favor	979	280	1259
	2: Oppose	500	99	599
	TOTAL	1479	379	1858

What is the probability that a randomly selected respondent opposes the death penalty for persons convicted of murder?

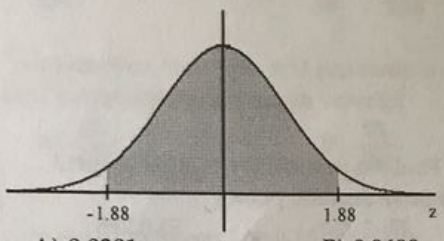
A) 0.269 B) 0.322 C) 0.204 D) 0.053 E) 0.678

20) If you flip a coin three times, the possible outcomes are HHH HHT HTH HTT THH THT TTH TTT. What is the probability of getting at least one head? 20) _____

A) $\frac{1}{2}$ B) $\frac{7}{8}$ C) $\frac{1}{8}$ D) $\frac{1}{4}$ E) $\frac{3}{4}$

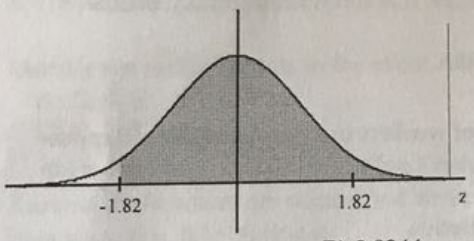
Find the area of the shaded region. The graph depicts the standard normal distribution with mean 0 and standard deviation 1.

21) 21) _____



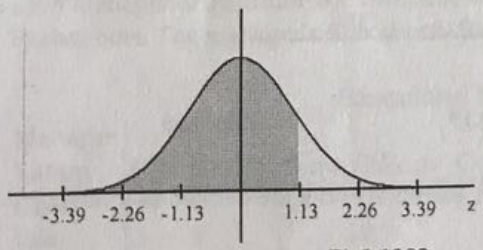
A) 0.0301 B) 0.9699 C) 0.0602 D) 0.9398

22) 22) _____



A) 0.4656 B) 0.0344 C) -0.0344 D) 0.9656

23) 23) _____



A) 0.8907 B) 0.1292 C) 0.8708 D) 0.8485

Find the probability

24) The age distribution of students at a community college is given below. 24) _____

Age (years)	Number of students (f)
Under 21	409
21–24	404
25–28	276
29–32	155
33–36	97
37–40	63
Over 40	86
	1490

A student from the community college is selected at random. Find the probability that the student is 21 years or over. Give your answer as a decimal rounded to three decimal places.

A) 0.274 B) 0.271 C) 0.729 D) 0.726 E) 0.295

Solve the problem.

25) Suppose that for a certain experiment $P(A) = .33$ and $P(B) = .29$. If A and B are mutually exclusive events, find $P(A \cup B)$. 25) _____

A) .03 B) .62 C) .38 D) .31

26) The table shows the political affiliations and types of jobs for workers in a particular state. Suppose a worker is selected at random within the state and the worker's political affiliation and type of job are noted. 26) _____

		Political Affiliation		
		Republican	Democrat	Independent
Type of job	White collar	17%	18%	16%
	Blue Collar	10%	9%	30%

Find the probability the worker is not an Independent.

A) 0.54 B) 0.35 C) 0.19 D) 0.46

27) A number between 1 and 10, inclusive, is randomly chosen. Events A and B are defined as follows. 27) _____

A: {The number is even}
B: {The number is less than 7}

Identify the sample points in the event $A \cap B$.

A) {1, 2, 3, 4, 5, 6, 7, 8, 10}
B) {2, 4, 6}
C) {1, 2, 3, 4, 5, 6, 7, 9}
D) {1, 2, 3, 4, 5, 6, 8, 10}

28) Four hundred accidents that occurred on a Saturday night were analyzed. The number of vehicles involved and whether alcohol played a role in the accident were recorded. The results are shown below: 28) _____

	Number of Vehicles Involved			
Did Alcohol Play a Role?	1	2	3 or more	Totals
Yes	51	98	21	170
No	28	170	32	230
Totals	79	268	53	400

Suppose that one of the 400 accidents is chosen at random. What is the probability that the accident involved more than a single vehicle?

A) $\frac{321}{400}$ B) $\frac{53}{400}$ C) $\frac{79}{400}$ D) $\frac{21}{400}$

29) A number between 1 and 10, inclusive, is randomly chosen. Events A and B are defined as follows. 29) _____

A: {The number is even}
B: {The number is less than 7}

Identify the sample points in the event $A \cup B$.

A) {2, 4, 6} B) {1, 2, 3, 4, 5, 6, 8, 10}
C) {1, 2, 3, 4, 5, 6, 7, 9} D) {1, 2, 3, 4, 5, 6, 7, 8, 10}

30) Assume that z scores are normally distributed with a mean of 0 and a standard deviation of 1. If $P(-a < z < a) = 0.4314$, find a. 30) _____

A) 0.3328 B) -0.18 C) 0.57 D) 1.49

31) Each manager of a Fortune 500 company was rated as being either a good, fair, or poor manager by his/her boss. The manager's educational background was also noted. The data appear below: 31) _____

	Educational Background				
Manager Rating	H. S. Degree	Some College	College Degree	Master's or Ph.D.	Total
Good	2	3	23	11	39
Fair	9	19	44	15	87
Poor	1	7	4	22	34
Total	12	29	71	48	160

What is the probability that a randomly chosen manager has earned at least one college degree?

A) $\frac{3}{10}$ B) $\frac{119}{160}$ C) $\frac{71}{160}$ D) $\frac{41}{160}$

Use the given data to find the equation of the regression line. Round the final values to three significant digits, if necessary.

32) Ten students in a graduate program were randomly selected. Their grade point averages (GPAs) when they entered the program were between 3.5 and 4.0. The following data were obtained regarding their GPAs on entering the program versus their current GPAs. 32) _____

Entering GPA	Current GPA
3.5	3.6
3.8	3.7
3.6	3.9
3.6	3.6
3.5	3.9
3.9	3.8
4.0	3.7
3.9	3.9
3.5	3.8
3.7	4.0

A) $\hat{y} = 5.81 + 0.497x$
B) $\hat{y} = 3.67 + 0.0313x$
C) $\hat{y} = 4.91 + 0.0212x$
D) $\hat{y} = 2.51 + 0.329x$

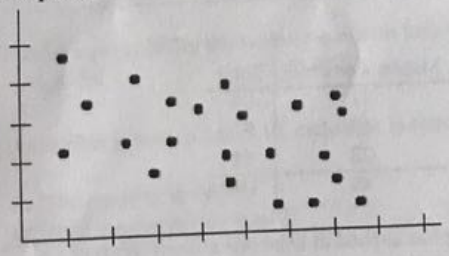
Find the indicated value.

33) $z_{0.005}$ 33) _____
A) 2.835 B) 2.575 C) 2.535 D) 2.015

34) $z_{0.36}$ 34) _____
A) 1.60 B) 1.76 C) 0.45 D) 0.36

Choose the coefficient of determination that matches the scatterplot. Assume that the scales on the horizontal and vertical axes are the same.

35) Response 35) _____



Explanatory

A) $R^2 = -0.31$ B) $R^2 = 0.097$ C) $R^2 = 0.76$ D) $R^2 = 0.41$

Find the value of the linear correlation coefficient r.

36) The paired data below consist of the temperatures on randomly chosen days and the amount a certain kind of plant grew (in millimeters): 36) _____

Temp	62	76	50	51	71	46	51	44	79
Growth	36	39	50	13	33	33	17	6	16

A) 0 B) -0.210 C) 0.256 D) 0.196

Determine whether the situation proposed is a relative frequency definition or a subjective definition.

37) Potential investors for a new housing community would like an estimate for the probability that 80% of the lots will be sold by the end of the first six months of sales. 37) _____

A) Subjective definition B) Relative frequency definition

38) A travel agent calculates the probability that an airline will be on time for a given flight by looking at their flight records for that city pair over the past two years. 38) _____

A) Subjective definition B) Relative frequency definition

Use the given information to find the coefficient of determination.

39) Find the coefficient of determination, given that the value of the linear correlation coefficient, r, is 0.611. 39) _____

A) 0.611 B) 0.627 C) 0.389 D) 0.373

40) The test scores of 6 randomly picked students and the numbers of hours they prepared are as follows: 40) _____

Hours	5	10	4	6	10	9
Score	64	86	69	86	59	87

The equation of the regression line is $\hat{y} = 1.06604x + 67.3491$. Find the coefficient of determination.

A) 0.2242 B) 0.0503 C) -0.2242 D) 0.6781

Estimate the probability of the event.

41) A frequency distribution on employment information from Alpha Corporation follows.. Find the probability that an employee has been with the company 10 years or less. 41) _____

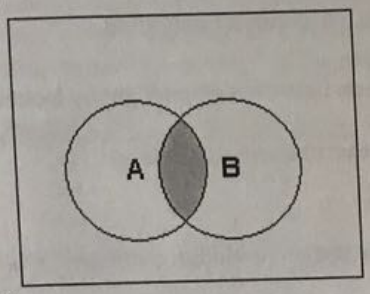
Years Employed	No. of Employees
1–5	5
6–10	30
11–15	25
16–20	10
21–25	5
26–30	3

A) 0.735 B) 0.449 C) 0.294 D) 0.551

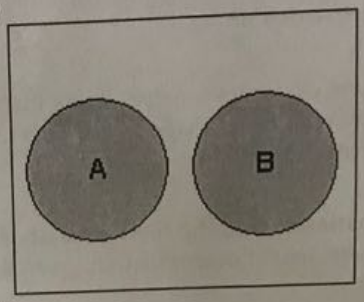
Draw a Venn diagram and shade the described events.

42) From a finite sample, events A and B are disjoint. Shade the collection A or B. 42) _____

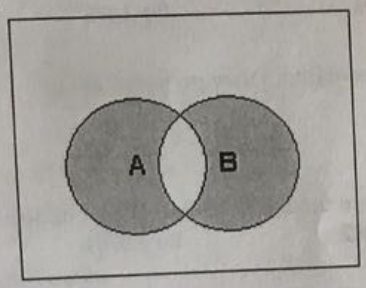
A)



B)



C)



D)