1) 200 patients are given a new drug. 90 patients show improvement. 35 patients have side effects. 95 have no effect from the drug at all. How many show improvement and have side effects?

a. 20   b. 32   c. 105   d. 125

2) A test is given with 10 multiple choice questions worth 4 points each and 12 true/false questions worth 5 points each. Which is not a possible grade to get on the test?

a. 55   b. 71   c. 83   d. 89

3) The floor plan shows the total area of an apartment to be covered with carpet that costs $27 per square yard. How much will it cost to carpet the entire apartment?
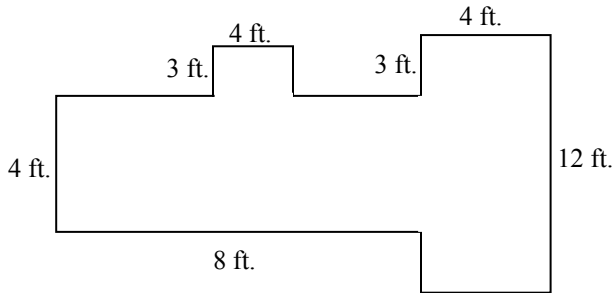
a. $276
b. $810.67
c. $837
d. $2484

4) A student's final grade is computed based on the following distribution:

Quizzes/test	50%
Project presentation	30%
Paper	20%

If she got 79, 77, and 83 on the tests, an 84 on the project, and 89 on the paper, what was her final grade to the nearest tenth?

a. 81.9   b. 82.0   c. 82.8   d. 83.0

5) An $8 \times 8 \times 8$ cube consists of 512 unit cubes. Find the number of unit cubes having at least one face on the outside surface of the large cube.

a. 216   b. 296   c. 343   d. 384

6) What is the coefficient of the 75th term of the binomial expansion, $(x + y)^{100}$?

a. $\dfrac{100!}{25!}$ b. $\dfrac{100!}{25!\,25!}$ c. $\dfrac{100!}{75!}$ d. $\dfrac{100!}{25!\,75!}$

7) 312_{eight} is equivalent to what number in base six?

a. 202_{six}

b. 432_{six}

c. 534_{six}

d. Cannot be determined from the given information.

8) The graph of $f(x)$ includes the point $(-1, 5)$ and $f^{-1}(x)$ exists. What is the value of $f^{-1}(5)$?

a. -5   b. -1   c. $-\frac{1}{5}$ d. $\frac{1}{5}$

9) Every year that a fossil dissolves some part of the fossil is lost. The amount of the fossil remaining is given by the formula, $C = C_0 e^{-0.0012t}$, where C is the amount of the fossil remaining after t years and C_0 is the original amount of the fossil. To the nearest year, how many years will it take for the fossil to have 20% of the original amount remaining?

a. 134 years   b. 186 years   c. 1155 years   d. 1341 years

10) John and Mary are painting the porch. Mary can paint twice as fast as John, but together they can paint the porch in 4 hours. What formula could be used to determine how long it takes Mary to paint the porch alone if t represents the amount of time she takes to complete the job alone?

a. $\frac{1}{t} + \frac{1}{2t} = 4$ b. $t + 2t = 4$ c. $\dfrac{t + 2t}{2} = 4$ d. $\frac{4}{t} + \frac{4}{2t} = 1$

OR

What formula can be used to determine how long it takes John to paint the porch alone if t represents the amount of time he takes to complete the job alone?

a. $\frac{1}{t} + \frac{1}{2t} = 4$ b. $\frac{t}{2} + t = 4$ c. $\frac{4}{t} + \frac{8}{t} = 1$ d. $\frac{4}{t} + \frac{4}{2t} = 1$

11) Given two points on an ellipse, $(\sqrt{3},0)$ and $(0,2)$, which could be the equation of the ellipse?

a. $\dfrac{x^2}{3} - \dfrac{y^2}{4} = 1$ b. $\dfrac{x^2}{3} + \dfrac{y^2}{2} = 1$ c. $\dfrac{y^2}{3} - \dfrac{x^2}{4} = 1$ d. $\dfrac{x^2}{3} + \dfrac{y^2}{4} = 1$

12) A 12-foot ladder, leaning against a wall rests 10 feet up the side of the wall. When it slides down 1 foot, to the nearest degree by how much has the angle of the ladder with the wall changed?

10 ft.

9 ft.
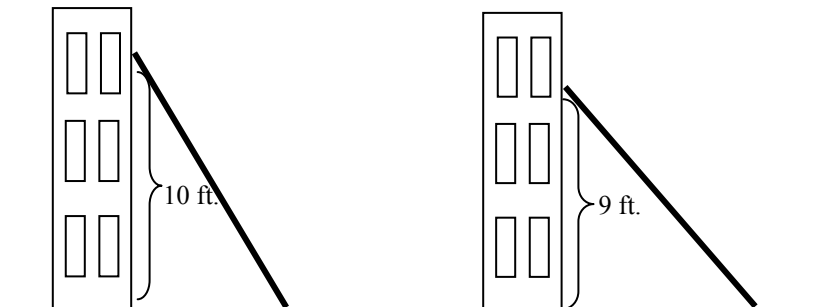
a. 1°   b. 2°   c. 7°   d. 8°

13) A telephone company wants to connect six islands via underwater cables between islands. The numbers on the line segments denote the cost (in millions) to connect various islands. What is the least expensive connection so that every island can communicate with every other island (even if they have to communicate through another island)?
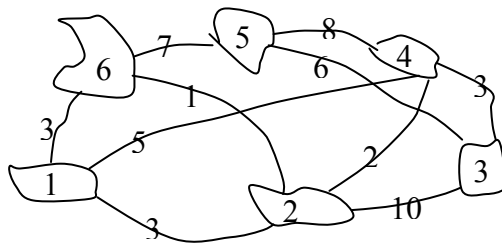

a. $12 million   b. $14 million   c. $15 million   d. $17 million

14) Class 1 had an average test score of 78% and Class 2 had an average of 84%. Together their average was 82%. What is the ratio of the number of students in Class 1 to Class 2?
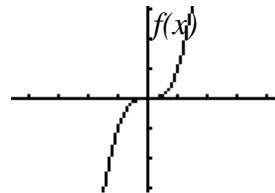
a. 1:3   b. 1:2   c. 2:3   d. 3:5

15) Four square corners, each measuring x on a side are cut out of a 10×10 square piece of cardboard. It is then folded along the dotted lines to create a box. If V represents the volume of the box, what is the volume of the box in terms of x?

10 ft
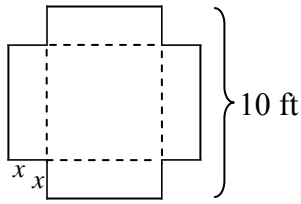
a. $V = x(10 - 2x^2)$ b. $V = x^2(10 - 2x)$ c. $V = x(10 - 2x)^2$ d. $V = x(100 - x^2)$

16) Given the graph of $f(x)$, which is the graph of its inverse, $f^{-1}(x)$?

a.   b.   c.   d.

17) A 300 ml. solution is a mixture with 30% alcohol. By adding pure water, the mixture is to be diluted to create a mixture that is 20% alcohol. How much water should be added to the 30% solution?

OR

A solution is a mixture of 30% alcohol. By adding pure water, 300 ml. of a mixture that is 20% alcohol is created. How much water should be added to the 30% solution?

a. 30 ml.   b. 90 ml.   c. 100 ml.   d. 150 ml.

18) A right triangle has a hypotenuse of length 20. The altitude to the hypotenuse is 8. To the nearest tenth, what is the length of the shortest leg?

a. 4.0   b. 8.0   c. 8.9   d. 18.3

19) A standard deck of cards consists of 52 cards, 12 of which are face cards. Two cards will be drawn from a standard deck at random and without replacement. What is the probability, to the nearest thousandth, that both cards will be face cards?

a. 0.049   b. 0.050   c. 0.053   d. 0.054

20) The graph below is the graph of a normal distribution with mean μ and standard deviation σ. The heights of the people in a certain population have a normal distribution with a mean of 5 feet 6 inches and a standard deviation of 1 inch. Which of the following groups in the population contains the greatest number of people?
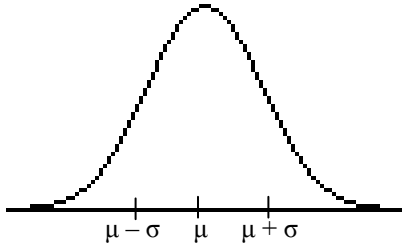
a. Those with heights between 5 feet and 5 feet 3 inches.
b. Those with heights between 5 feet 3 inches and 5 feet 5 inches.
c. Those with heights between 5 feet 8 inches and 5 feet 11 inches.
d. Those with heights over 5 feet 11 inches

Answers

1) a. 20
2) d. 89
3) a. $276
4) c. 82.8
5) b. 296
6) d. $\dfrac{100!}{25!\,75!}$
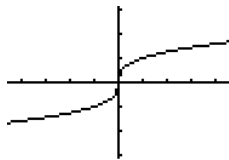
7) c. 534_{six}

8) b. -1
9) d. 1341 years
10) d. $\frac{4}{t} + \frac{4}{2t} = 1$ for the first question and c. $\frac{4}{t} + \frac{8}{t} = 1$ for the second question

11) d. $\dfrac{x^2}{3} + \dfrac{y^2}{4} = 1$

12) d. 8°
13) c. $15 million
14) b. 1:2
15) c. $V = x(10 - 2x)^2$

16) a.

17) The answer to the first question is d. 150 ml.
The answer to the second question is c. 100 ml.
18) c. 8.9
19) b. 0.050
20) b. Those with heights between 5 feet 3 inches and 5 feet 5 inches.