1. Calculate $\dfrac{9.67 + 2.58}{15.21 - 14.25}$ to the nearest hundredth.

    a. -13.44
    b. -4.41
    c. 4.41
    d. 12.76
    e. 0.51

2. Each penny contains 2.4375 grams of zinc. How many pennies could be made from a kilogram of zinc and how many milligrams zinc would be left over (to the nearest milligram)?

    a. 405 pennies with 268 milligrams left over
    b. 410 pennies with 256 milligrams left over
    c. 410 pennies with 26 milligrams left over
    d. 405 pennies with 27 milligrams left over
    e. 410 pennies with 625 milligrams left over

3. Fran drove at an average speed of 70 miles per hour (mph) for 30 minutes. For the next 20 minutes, Fran drove at an average speed of 40 mph. For the next 10 minutes Fran drove at an average speed of 30 mph. What was Fran's average speed for the whole hour? (Round to the nearest mile per hour.)

    a. 47 mph
    b. 53 mph
    c. 60 mph
    d. 62 mph
    e. 65 mph

4. What is the closest estimate of the volume of a plastic case that holds one compact disc?

    a. 100 cubic centimeters
    b. 10 cubic centimeters
    c. 100 cubic millimeters
    d. 1 cubic decimeter
    e. 0.1 cubic meters

5. Solve for x: $\sqrt{x-5} + 3 = -2$

    a. 0
    b. 10
    c. 30
    d. 1
    e. There is no real number solution.

6. A snowman is built with three spheres made of packed snow. The top sphere has half the diameter of the middle sphere. The middle sphere has half the diameter of the bottom sphere. The top sphere weighs 5 pounds. What is the total weight of the snowman?

    a. 30 pounds
    b. 65 pounds
    c. 125 pounds
    d. 250 pounds
    e. 365 pounds

7. On a recent reality series, contestants performed before an audience and a panel of judges. There were three contestants in the finals. Each contestant received scores from the judges and votes from the audience. Those scores and votes were used as shown in the tables and equation below to make a contestant's Final Score.

RANKING POINTS	Judges' Scores	RANKING POINTS	Audience Votes
3	Highest Total	3	Most Votes
2	Second Highest Total	2	Second Most Votes
1	Lowest Total	1	Fewest Votes

Ranking Points from Judges + Ranking Points from Audience = Final Score.

Assume there were no ties from either the audience or the judges. The contestant with the highest Final Score wins. If there is a tie in Final Scores, the contestant with the highest number of audience votes wins. What is the probability that the contestant who wins the audience vote will win the competition?

    a. $\dfrac{1}{2}$

    b. $\dfrac{2}{3}$

    c. $\dfrac{5}{6}$

    d. $\dfrac{11}{12}$

    e. $\dfrac{35}{36}$

8. Which of the following statements is false?

    a. Any two circles are similar figures.
    b. Any two squares are similar figures.
    c. Any two rectangles are similar figures.
    d. Any two spheres are similar solids.
    e. Any two cubes are similar solids.

9. In the picture below, points D, E, F, I, J and K are midpoints. If the area of ΔABC is 144 square units, what is the area ΔKIJ?
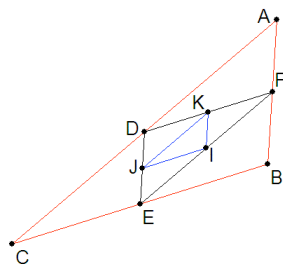
    a. 38 square units
    b. 19 square units
    c. 12 square units
    d. 9 square units
    e. 8 square units

10. A square-shaped spiral is plotted on a coordinate plane. The first 8 points in the spiral are $(0, 0), (-1, 1), (-2, 0), (-1, -1), (0, -2), (1, -1), (2, 0)$, and $(1, 1)$. If the spiral is continued in this manner, how far from the origin is the 19th point in the pattern? (Consider the distance from the origin to $(1, 0)$ as one unit. Assume that the distance from the origin to $(0, 1)$ is also 1 unit.)

    a. $2\sqrt{2}$ units
    b. 3 units
    c. 18 units
    d. 4 units
    e. $3\sqrt{2}$ units
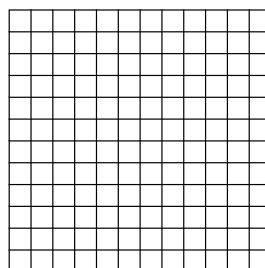
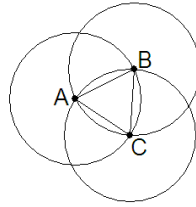11. If the figure below represents $3\frac{3}{4}$, which of the choices would represent $\frac{5}{6}$ of 1 (NOT $\frac{5}{6}$ of $3\frac{3}{4}$)?

    a.

    b.

    c.

    d.

    e.

12. Each of the three circles pictured below has a radius of 2 units. Points A, B and C are each the center of one of the circles as pictured. What is the area of triangle ABC?


    a. $2\sqrt{3}$ square units

    b. $\sqrt{3}$ square units

    c. $\dfrac{\sqrt{3}}{2}$ square units

    d. $\dfrac{2\pi}{3}$ square units

    e. $\dfrac{2\pi}{3}-1$ square units

13. A salesman gets $5.00 for every coat he sells, $2.00 for every pair of pants he sells, and $0.50 for every shirt he sells. The salesman earned $17.00 for selling seven items. He sold at least one of each type of item. Which statement is true about the items he sold?
    a. He sold an odd number of shirts.
    b. He sold an even number of pants.
    c. He sold an odd number of coats.
    d. He sold more coats than pants.
    e. He sold the same number of shirts as coats.

14. Triangles ABC and DEC are similar triangles. BE = 8 units, AD = 10 units, EC = 20 units. Find AC.
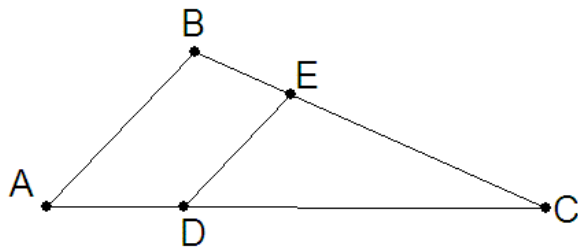
    a. 25 units
    b. 26 units
    c. 32 units
    d. 34 units
    e. 35 units

15. In trapezoid QBDE, the distance between E and F is 3 units, the distance between F and H is 1.5 units and the distance between H and D is 1 unit. $\overline{ED}$ is parallel to $\overline{AB}$. $\overline{FA}$ and $\overline{HB}$ are both perpendicular to $\overline{ED}$. What is the ratio of the area of triangle AFE to trapezoid ABDE?
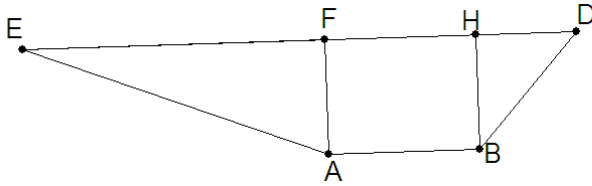
   a. $\dfrac{1}{3}$

   b. $\dfrac{1}{2}$

   c. $\dfrac{3}{7}$

   d. $\dfrac{2}{5}$

   e. $\dfrac{4}{9}$

16. Hypotheses:

         Some gidgets are widgets.

         No gadgets are gidgets.

  Given the above hypotheses, which is a valid conclusion?

   a. Some widgets are not gadgets.
   b. No gadgets are widgets.
   c. Some gadgets are widgets.
   d. All gadgets are widgets.
   e. No valid conclusion can be reached from these hypotheses.

17. What is the ratio of the volume of a cube to its surface area if the length of a side is s?

   a. $\dfrac{s}{6}$

   b. $\dfrac{6}{s}$

   c. $\dfrac{s^2}{6}$

   d. $\dfrac{s}{5}$

   e. $\dfrac{5}{s}$

18. A function is defined as $f(x) = 3x + 4$. The inverse of a function "undoes" the function. Which of the following statements is true?

    a. $g(x) = \dfrac{x}{3} - 4$ is the inverse of $f(x)$.

    b. There is no function that is the inverse of $f(x)$.

    c. $g(x) = \dfrac{x}{4} - 3$ is the inverse of $f(x)$.

    d. $g(x) = \dfrac{x - 4}{3}$ is the inverse of $f(x)$.

    e. $g(x) = \dfrac{x - 3}{4}$ is the inverse of $f(x)$.

19. The mean high temperature in Nashville for the first twenty-one days of February was 46 degrees. What must the mean high temperature for the days from February 22 to February 28 be in order to raise the mean temperature for the entire month to 50 degrees?

    a. 54°
    b. 56°
    c. 58°
    d. 60°
    e. 62°

20. The length of a rectangle is increased by 20% and its width is increased by 50%. What is the percent increase in its area?

    a. 10%
    b. 30%
    c. 70%
    d. 80%
    e. 100%

21. Pat has a collection of stickers for numbering pages in a scrapbook. Each sticker has 1 digit on it (0, 1, 2, 3, 4, 5, 6, 7, 8, or 9). Pat has twenty-two stickers that have "2" on them. Pat has plenty of the rest of the digits. If Pat starts at 1, how many pages can he number?

    a. 22
    b. 99
    c. 112
    d. 119
    e. 199

22. In my pocket, I have only dimes and quarters. I have twice as many dimes as quarters and I have at least one quarter. If the number of dimes and quarters is reversed, by what percent will the value of the money in my pocket increase?

    a. $33\frac{1}{3}\%$

    b. $66\frac{2}{3}\%$

    c. 50%

    d. 150%

    e. 100%

23. In modular arithmetic, the statement $15 \equiv 3 \mod 4$ means that 15 and 3 both have the same remainder when they are divided by 4. These would all be true statements in modular arithmetic:

$$12 \equiv 7 \mod 5$$
$$7 \equiv 13 \mod 2$$
$$14 \equiv 42 \mod 7$$

Consider the following statement where, a, b, c, d, and m are whole numbers $\{0, 1, 2, 3, ...\}$.

A: If $a \equiv b \pmod{m}$ and $c \equiv d \pmod{m}$, then $(a + b) \equiv (c + d) \pmod{m}$

B: If $a \equiv b \pmod{m}$ and $c \equiv d \pmod{m}$, then $(a \cdot b) \equiv (c \cdot d) \pmod{m}$

C: If $a \equiv b \pmod{m}$, then $(a^c) \equiv (b^c) \pmod{m}$

Which of the following is true?

    a. Only Statement A is true for all whole numbers a, b, c, d, and m.
    b. Only Statement B is true for all whole numbers a, b, c, d, and m.
    c. Only Statement C is true for all whole numbers a, b, c, and m.
    d. All three statements are true.
    e. None of the statements is true for all whole numbers a, b, c, d, and m.

24. Which of the following pairs of algebraic expressions are equivalent?

    a. $(x + 2)^2 - x^2$ and $2(x + 2) + 2x$

    b. $(x + 3)^2$ and $x^2 + 9$

    c. $2(xy)$ and $2x \cdot 2y$

    d. $\sqrt{x^2 + 9}$ and $x + 3$

    e. $0x^0$ and 0^0

25. A nickel, a dime, and a penny are tossed. What is the probability that they do not all land the same way—they are not all either heads nor are they all tails?

    a. $33\frac{1}{3}\%$

    b. 20%

   c. 50%

    d. 25%

    e. 75%

26. The graph below shows the distribution for 100 rolls of two dice.

100 Rolls of Two Dice
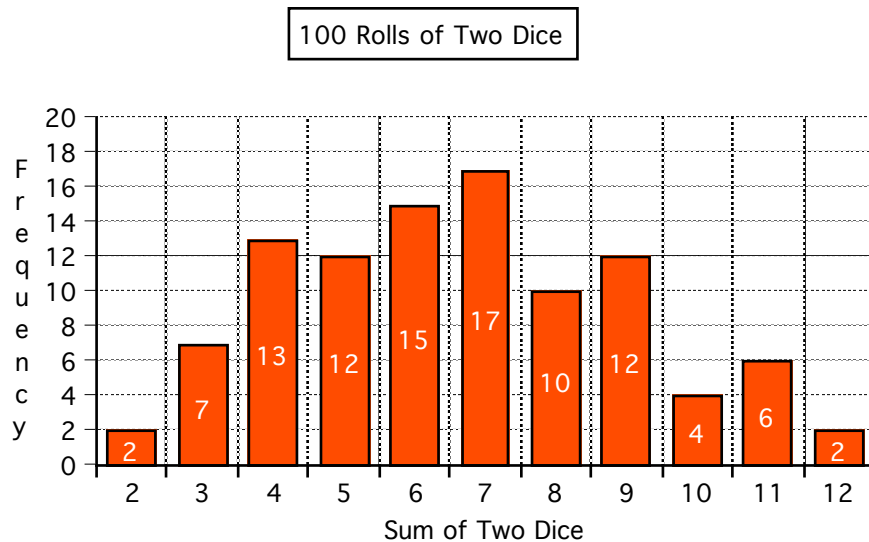
Which statement is true about the distribution of the sums of the two dice?

    a. The standard deviation is 0.
    b. The mean is 9.09.
    c. The median is 6.
    d. The mean is 6.64
    e. The median is 6.5

27. When $10^{93} - 93$ is expressed as a single whole number, what is the sum of its digits?

    a. 10
    b. 93
    c. 819
    d. 826
    e. 833

28. A calculator displays 5.1698788285E+58 when 25^{42} is entered. Which statement is true?

    a. The answer displayed is not exact.
    b. The answer to 25^{42} would have 58 zeros at the end, if the calculator had a big enough display.
    c. The answer to 25^{42} would have 48 zeros at the end, if the calculator had a big enough display.
    d. The answer to 25^{42} would have 47 zeros at the end, if the calculator had a big enough display.
    e. The answer to 25^{42} would have 49 zeros at the end, if the calculator had a big enough display.

29. A student sketched a graph of a situation as shown below:
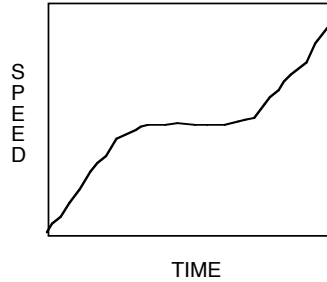
Which situation would fit the above sketch?

   a. A runner ran up a hill at a constant speed. The runner slowed down halfway up the hill and then sped back up again.
   b. A runner ran down a hill at a constant speed. The runner stopped to drink some water. Then the runner started running at a constant speed again.
   c. A runner started at the top of a hill. As he ran down, he gained speed. When he got to a level part, he maintained his speed at a constant rate. Then the runner started speeding up again.
   d. A runner started a race at a constant speed. Then the runner gained speed during the middle of the race. Finally the runner ended at a constant speed that was faster than her beginning speed.
   e. A runner started a race running very slowly and gradually accelerated at a constant rate throughout the race.

30. A triangle has vertices A (3, 7), B (0, -1), and C (6, 2). The coordinates of each point are multiplied by 6 to produce three new points. The new points are the vertices of a second triangle. Which statement is true?

   a. The new triangle is not necessarily similar to the original triangle.
   b. The area of the new triangle is 36 times the area of the original triangle.
   c. The perimeter of the new triangle is 36 times the area of the original triangle.
   d. The area of the new triangle is 6 times the area of the original triangle.
   e. The new triangle is congruent to the original triangle.