AMC 8 Problem Set (Advanced Level)
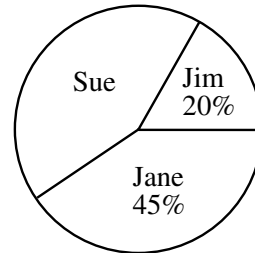
1. The value of $(0.3)^2 + 0.1$ is

   (A) 0.7   (B) 1   (C) 0.1   (D) 0.19   (E) 0.109

2. The pie chart shows a percentage breakdown of 1000 votes in a student election. How many votes did Sue receive?

   (A) 550   (B) 350   (C) 330

   (D) 450   (E) 935

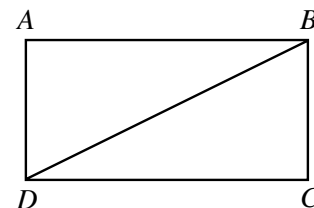3. The expression $\dfrac{a^9 \times a^{15}}{a^3}$ is equal to

   (A) a^{45} (B) a^8 (C) a^{18} (D) a^{14} (E) a^{21}

4. The product of two positive integers p and q is 100. What is the largest possible value of $p+q$?

   (A) 52   (B) 101   (C) 20   (D) 29   (E) 25

5. In the diagram, $ABCD$ is a rectangle with $DC = 12$. If the area of triangle BDC is 30, what is the perimeter of rectangle $ABCD$?

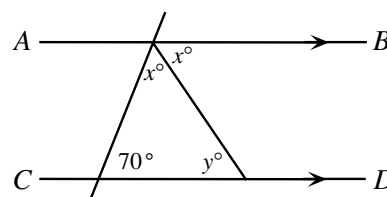   (A) 34   (B) 44   (C) 30

   (D) 29   (E) 60

6. If $x = 2$ is a solution of the equation $qx - 3 = 11$, the value of q is

   (A) 4   (B) 7   (C) 14   (D) -7 (E) -4

7. In the diagram, AB is parallel to CD. What is the value of y?

   (A) 75   (B) 40   (C) 35

   (D) 55   (E) 50

8. If p, q, r, s, and t are numbers such that $r < s$, $t > q$, $q > p$, and $t < r$, which of these numbers is greatest?

   (A) t **(B)** s **(C)** r **(D)** q **(E)** p

9. The sum of seven consecutive integers is 77. The smallest of these integers is

   (A) 5   **(B)** 7   **(C)** 8   **(D)** 11   **(E)** 14

10. Each of the numbers 1, 2, 3, and 4 is assigned, in some order, to $p, q, r,$ and s. The largest possible value of $p^q + r^s$ is

    (A) 12   **(B)** 19   **(C)** 66   **(D)** 82   **(E)** 83

11. In the chart, the products of the numbers represented by the letters in each of the rows and columns are given. For example, $xy = 6$ and $xz = 12$. If $x, y, z,$ and w are integers, what is the value of xw?
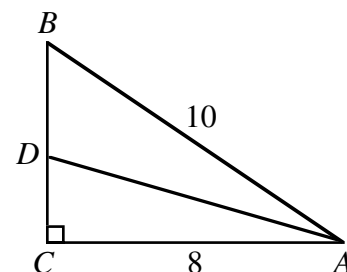
    (A) 150   **(B)** 300   **(C)** 31
    (D) 75   **(E)** 30

x	y	6
z	w	50
12	25	

12. Three small rectangles, of the same depth, are cut from a rectangular sheet of metal. The area of the remaining piece is 990. What is the depth of each cut?
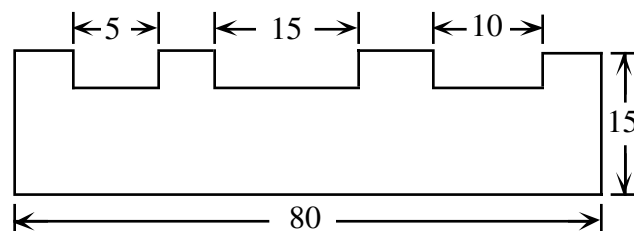
    (A) 8   **(B)** 7   **(C)** 6
    (D) 5   **(E)** 4

13. Triangle ABC is right-angled with $AB = 10$ and $AC = 8$. If $BC = 3DC$, then AD equals

    (A) 9   **(B)** $\sqrt{65}$ **(C)** $\sqrt{80}$
    (D) $\sqrt{73}$ **(E)** $\sqrt{68}$

14. The digits 1, 2, 3, 4 can be arranged to form twenty-four different four digit numbers. If these twenty-four numbers are then listed from smallest to largest, in what position is 3142?
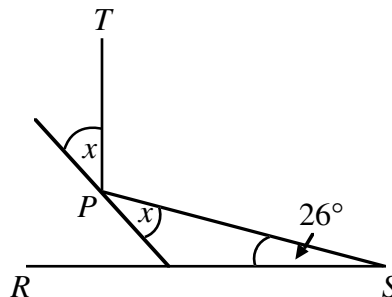
    (A) 13th   **(B)** 14th   **(C)** 15th   **(D)** 16th   **(E)** 17th

15. The product of 20^{50} and 50^{20} is written as an integer in expanded form. The number of zeros at the end of the resulting integer is

   (**A**) 70   (**B**) 71   (**C**) 90   (**D**) 140   (**E**) 210

16. A beam of light shines from point *S*, reflects off a reflector at point *P*, and reaches point *T* so that *PT* is perpendicular to *RS*. Then *x* is

   (**A**) 32°   (**B**) 37°   (**C**) 45°
   (**D**) 26°   (**E**) 38°

17. In the diagram adjacent edges are at right angles. The four longer edges are equal in length, and all of the shorter edges are also equal in length. The area of the shape is 528. What is the perimeter?

   (**A**) 132   (**B**) 264   (**C**) 92
   (**D**) 72   (**E**) 144
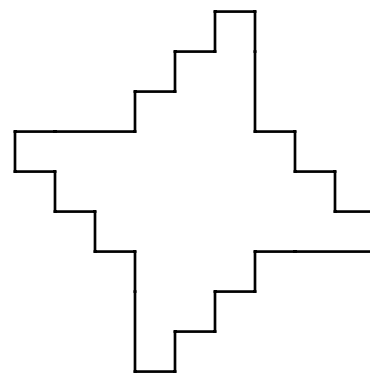
18. If $\dfrac{30}{7} = x + \dfrac{1}{y + \dfrac{1}{z}}$, where *x*, *y*, and *z* are positive integers, then what is the value of $x + y + z$?
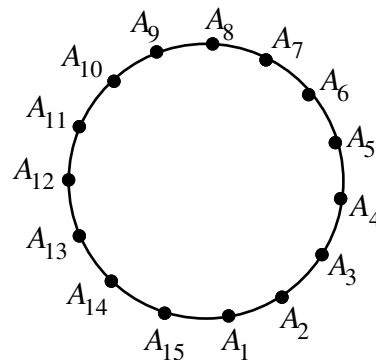
   (**A**) 13   (**B**) 9   (**C**) 11   (**D**) 37   (**E**) 30

19. If $x^2 y z^3 = 7^4$ and $xy^2 = 7^5$, then xyz equals

   (**A**) 7   (**B**) 7^2 (**C**) 7^3 (**D**) 7^8 (**E**) 7^9

20. On a circle, fifteen points $A_1, A_2, A_3, ..., A_{15}$ are equally spaced. What is the size of angle $A_1 A_3 A_7$?

   (**A**) 96°   (**B**) 100°   (**C**) 104°
      (**D**) 108°   (**E**) 120°

21. In her last basketball game, Jackie scored 36 points. These points raised the average (mean) number of points that she scored per game from 20 to 21. To raise this average to 22 points, how many points must Jackie score in her next game?

    (A) 38   (B) 22   (C) 23   (D) 36   (E) 37

22. Alain and Louise are driving on a circular track with radius 25 km. Alain leaves the starting line first, going clockwise around the track at a speed of 80 km/h. Fifteen minutes after Alain starts, Louise leaves the same starting line, going counter-clockwise around the track at a speed of 100 km/h. For how many hours will Louise have been driving when the two of them pass each other for the fourth time?

    (A) $\frac{50\pi-6}{45}$ (B) $\frac{4\pi+1}{4}$ (C) $\frac{10\pi-1}{9}$ (D) $\frac{15\pi+6}{16}$ (E) $\frac{25\pi-1}{24}$

23. Suppose that $PQRSTUVW$ is a regular octagon. (A *regular octagon* is an octagon with eight equal side lengths and eight equal interior angles.) There are 70 ways in which four of its sides can be chosen at random. If four of its sides are chosen at random and each of these sides is extended infinitely in both directions, what is the probability that they will meet to form a quadrilateral that contains the octagon?

    (A) $\frac{1}{2}$ (B) $\frac{19}{35}$ (C) $\frac{37}{70}$ (D) $\frac{17}{35}$ (E) $\frac{18}{35}$

24. What is the sum of all numbers q which can be written in the form $q = \dfrac{a}{b}$ where a and b are positive integers with $b \leq 10$ and for which there are exactly 19 integers n that satisfy $\sqrt{q} < n < q$?

    (A) 871.5   (B) 743.5   (C) 777.5   (D) 808.5   (E) 1106.5

25. A new language uses only the letters A, B, C, D, and E. The letters A and E are called *vowels*, while the letters B, C and D are called *consonants*. A sequence of letters is called a *word* if it does not include the same letter twice in a row, and it does not include two vowels in a row. How many words are there in this language that are 10 letters long and that begin with a vowel?

    (A) 199 680   (B) 199 968   (C) 199 584   (D) 199 872   (E) 199 776

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