

10

MIAMI SUNSET SENIOR HIGH SCHOOL INVITATIONAL

**GEOMETRY INDIVIDUAL**

January 26, 2002

1. Which of the following are true given  $\sqrt{x^2} = x$ ?

I.  $x \geq 0$

II.  $\frac{1}{x} > 0$

III.  $x < 0$

- A. I and III only
- B. I, II, and III
- C. I and II only
- D. II and III only
- E. NOTA

2. If A, B, C, and D are distinct point such that  $\overleftrightarrow{AC}$  contains B and  $\overleftrightarrow{BD}$  contains C. Which of the following **MUST** be true?

- A. B is between A and C.
- B.  $\overleftrightarrow{AD}$  and  $\overleftrightarrow{BC}$  do not intersect.
- C.  $\overrightarrow{AC}$  is opposite to  $\overrightarrow{BD}$ .
- D.  $\overleftrightarrow{BC}$  contains A.
- E. NOTA

3. If two lines do not intersect, then

- A. the lines are always parallel.
- B. The lines are always skew.
- C. The lines are sometimes parallel.
- D. The lines are never skew.
- E. NOTA

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4. Twice the measure of an angle is  $30^\circ$  less than five times the measure of its supplement. What is the measure, to the nearest tenth of a degree of the angle?
- A.  $124.3^\circ$
  - B.  $104.2^\circ$
  - C.  $124.2^\circ$
  - D.  $104.3^\circ$
  - E. NOTA
5. What is the contrapositive of:
- If two angles are congruent, then they are right angles.
- A. If two angles are not congruent, then they are not right angles.
  - B. If two angles are right angles, then they are congruent.
  - C. If two angles are not congruent, then they are right angles.
  - D. If two angles are not right angles, then they are not congruent.
  - E. NOTA
6. Which of the following statements, if any, is/are true?
- A. In a plane there are at most two perpendiculars to a line at a point on that line.
  - B. Proving that "*there is exactly one*" means proving both existence and uniqueness.
  - C. The longest side of any triangle is called the hypotenuse.
  - D. The point where the medians of a triangle meet is called the *incenter*.
  - E. NOTA
7. A point A lies on line  $\ell$ . How many lines are perpendicular to  $\ell$  at A?
- A. infinitely many
  - B. one
  - C. two
  - D. impossible to tell
  - E. NOTA

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8. The measure of an angle of a triangle is five times that of a second angle. The measure of an exterior angle at the third vertex is  $120^\circ$ . Find the sum of the measure of the two smallest angles of the triangle.
- A.  $120^\circ$
  - B.  $60^\circ$
  - C.  $160^\circ$
  - D.  $100^\circ$
  - E. NOTA
9. The bisectors of the interior angles on the same side of a transversal to two parallel lines are:
- A. parallel.
  - B. intersecting, but not perpendicular.
  - C. perpendicular.
  - D. skew.
  - E. NOTA
10. Which one of the following statements guarantees that a quadrilateral is a parallelogram?
- A. The diagonals are perpendicular.
  - B. One diagonal is the perpendicular bisector of the other.
  - C. A pair of opposite sides is parallel and congruent.
  - D. One pair of sides is congruent and another pair of sides is parallel.
  - E. NOTA
11. The perimeter of rhombus ABCD is 12 and the length of the diagonal  $BD = 3$ . What is the measure of the smallest angle of the rhombus?
- A.  $30^\circ$
  - B.  $40^\circ$
  - C.  $45^\circ$
  - D.  $60^\circ$
  - E. NOTA

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12. List the following set of numbers in increasing order.

$$2^{800}, 3^{600}, 5^{400}, 6^{200}$$

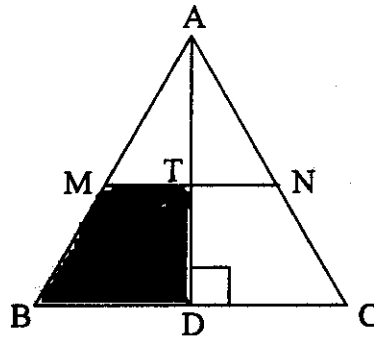
- A.  $3^{600}, 5^{400}, 2^{800}, 6^{200}$   
 B.  $6^{200}, 2^{800}, 5^{400}, 3^{600}$   
 C.  $6^{200}, 5^{400}, 3^{600}, 2^{800}$   
 D.  $2^{800}, 3^{600}, 6^{200}, 5^{400}$   
 E. NOTA

13. If the radius of a circle is increased by 20%, by what percent is the area increased?

- A. 20%  
 B. 30%  
 C. 40%  
 D. 44%  
 E. NOTA

14.  $\triangle ABC$  has  $AB = AC$  and  $M$  and  $N$  are midpoints of  $\overline{AB}$  and  $\overline{AC}$ , respectively. What is the ratio of the area of the shaded region to the area of  $\triangle ABC$ ?

- A.  $\frac{3}{8}$   
 B.  $\frac{3}{5}$   
 C.  $\frac{3}{4}$   
 D.  $\frac{5}{8}$   
 E. NOTA

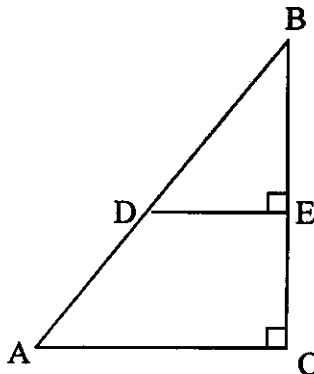


# GEOMETRY INDIVIDUAL

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15. In  $\triangle ABC$ ,  $m\angle C = 90^\circ$ ,  $AC = 6$ ,  $BC = 8$ , points D and E are on  $\overline{AB}$  and  $\overline{BC}$  respectively, and  $m\angle BED = 90^\circ$ . If  $DE = 4$ , then  $BD =$

- A. 5
- B.  $\frac{16}{3}$
- C.  $\frac{20}{3}$
- D.  $\frac{15}{2}$
- E. NOTA



16. The ordered list of numbers

18, 21, 24,  $a$ , 36, 37,  $b$

has median 30 and mean 32. Find  $|a - b|$ .

- A. 58
- B. 38
- C. 18
- D. 28
- E. NOTA

17. A regular hexagon is inscribed in a circle of radius 4. What is the area of the hexagon?

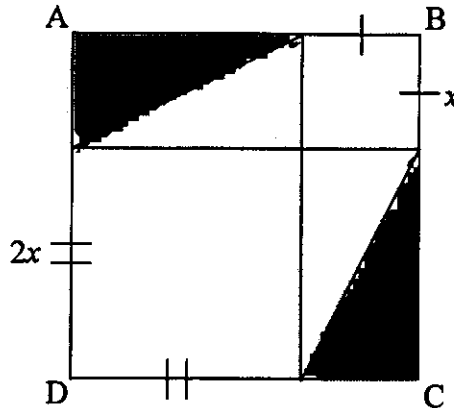
- A.  $24\sqrt{3}$
- B.  $12\sqrt{3}$
- C.  $4\sqrt{3}$
- D.  $6\sqrt{3}$
- E. NOTA

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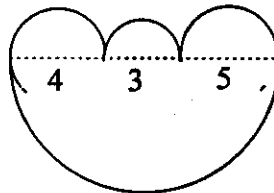
18. If ABCD is a square with sides of length 1, find the area of the unshaded region.

- A.  $\frac{1}{3}$   
 B.  $\frac{7}{9}$   
 C.  $\frac{2}{3}$   
 D.  $\frac{2}{9}$   
 E. NOTA



19. The plane figure shown is composed of four semicircles, three of which have their diameters shown. Find the perimeter of the figure.

- A.  $24\pi$   
 B.  $6\pi$   
 C.  $12\pi$   
 D.  $3\pi$   
 E. NOTA



20. If  $n = 3^x + 3^x + 3^x$ , then  $n^2 =$

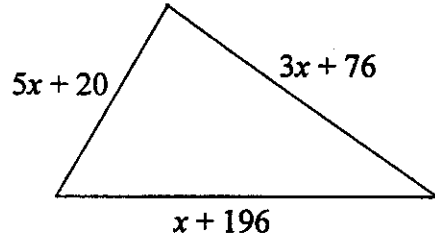
- A.  $9^{3x}$   
 B.  $27^{2x}$   
 C.  $27^{6x}$   
 D.  $27^{3x}$   
 E. NOTA

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January 26, 2002

21. If the triangle shown has exactly two equal sides and the measures of each side are shown. What is the greatest possible perimeter?

- A. 382
- B. 823
- C. 238
- D. 832
- E. NOTA



22. An equilateral triangle is inscribed in a circle of area of  $16\pi$ . Find the length of the altitude of the triangle.

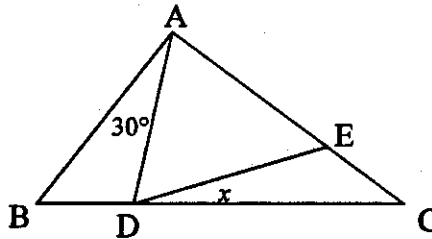
- A. 4
- B. 8
- C.  $4\sqrt{3}$
- D. 6
- E. NOTA

23. The supplement of an angle is  $78^\circ$  less than twice the supplement of the complement of the angle. Find the measure of the angle.

- A.  $78^\circ$
- B.  $12^\circ$
- C.  $24^\circ$
- D.  $72^\circ$
- E. NOTA

24. In the figure,  $AB = AC$ ,  $m\angle BAD = 30^\circ$  and  $AE = AD$ . Find  $x$ .

- A.  $15^\circ$
- B.  $20^\circ$
- C.  $30^\circ$
- D.  $40^\circ$
- E. NOTA



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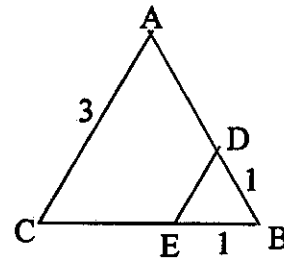
January 26, 2002

25. Find the area of a triangle determined by the  $x$ -axis,  $y$ -axis, and the line  $y = -2x + 10$ .

- A. 15
- B. 10
- C. 50
- D. 25
- E. NOTA

26. A triangular corner with side  $DB = EB = 1$  is cut from equilateral  $\triangle ABC$  of side length 3 as shown. What is the perimeter of the remaining quadrilateral  $ADEC$ ?

- A. 6
- B. 8
- C. 7
- D.  $6\frac{1}{2}$
- E. NOTA



27. The lengths of the sides of a triangle are 5, 6, and 9. Find the length of the altitude drawn to the longest side.

- A.  $\frac{20\sqrt{2}}{9}$
- B.  $\frac{10\sqrt{2}}{9}$
- C.  $10\sqrt{2}$
- D.  $20\sqrt{2}$
- E. NOTA

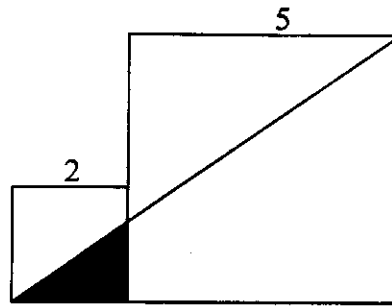


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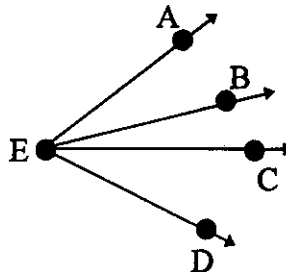
28. The two squares have dimensions as shown. What is the area of the shaded triangle?

- A.  $\frac{5}{7}$
- B.  $\frac{2}{7}$
- C.  $\frac{10}{7}$
- D.  $\frac{7}{10}$
- E. NOTA



29. If  $\angle AED$  is an acute angle, how many other acute angles are there in the diagram?

- A. 6
- B. 3
- C. 4
- D. 5
- E. NOTA



30. In the figure,  $l \parallel n$ ,  $m\angle 1 = 100^\circ$ , and  $m\angle 2 = 120^\circ$ . Find  $m\angle 3$ .

- A.  $100^\circ$
- B.  $140^\circ$
- C.  $120^\circ$
- D.  $150^\circ$
- E. NOTA

