

FIRST SEMESTER GEO w/ Proof Review

1. Given that quadrilateral $ABCD$ in Figure 4 is a parallelogram, which of the following statements would lead to the conclusion that $ABCD$ is a rectangle?

- (A) AC and BD are the perpendicular bisectors of each other
- (B) $AB = CD$
- (C) $AB = BC$
- (D) $\angle DAB$ and $\angle CBA$ are supplementary
- (E) $\angle DAB$ and $\angle CBA$ are equal in measure

2. A set of points is said to "determine" a plane if there is exactly one plane that contains all of the points. Which of the following does not determine a plane?

- (A) A triangle
- (B) Any three points
- (C) A line and a point not on the line
- (D) A pair of intersecting rays
- (E) A pair of intersecting lines

3. If A and B are two different points that lie on line CD and also on line EF , which of the following statements must be true?

- I. Lines AC , BF , and ED are all parallel.
- II. Points A , B , C , D , E , and F all lie on the same line.
- III. Points A , B , C , and E all lie in the same plane.

- (A) I only
- (B) I and II only
- (C) II only
- (D) II and III only
- (E) III only

4. If A , B , C , and D are any four distinct points of a plane P , which of the following must be true?

- I. Line AB must intersect line CD .
- II. Line AB can contain a point not in plane P .
- III. Any point of intersection of any of the pairs of lines containing A , B , C , and D must lie in plane P .

- (A) I only
- (B) I and II only
- (C) II and III only
- (D) II only
- (E) III only

5. In Figure 2, lines L_1 and L_2 are NOT parallel and will intersect at some point to the right of the page. Which of the following must be true?

- I. $c = e$
- II. $b > d$
- III. $a = c$

- (A) I only
- (B) II only
- (C) III only
- (D) I and II only
- (E) II and III only

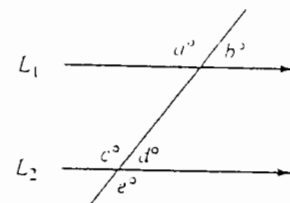


Figure 2

6. If $A = (-1, 2)$ and $B = (2, -1)$, where A and B are two points in the coordinate plane, then what is the length of segment AB ?

- (A) 1
- (B) 2
- (C) 3
- (D) 4.24
- (E) 3.46

7. An operation, \circ , on the numbers a and b is defined by the formula $a \circ b = 2(a + 2b)$. For what values of x and y is $x \circ y = y \circ x$?

- (A) All real values
- (B) Only when $x = y$
- (C) Only when both x and y are 0
- (D) Only when $x = -y$
- (E) Only when x and y are both 1

8. Which of the following statements about angles is NOT true?

- (A) An angle of a triangle may have a degree measure of 180.
- (B) An angle of a triangle may not have a degree measure greater than 180.
- (C) Two angles may be complementary without having a common side.
- (D) The degree measure of an angle does not depend on the lengths of its sides.
- (E) A triangle cannot have two right angles

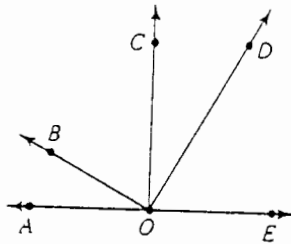
9. If (1) point P is in the interior of $\angle LMN$, (2) point W is in the interior of $\angle XYZ$, (3) the measures of $\angle LMN$ and $\angle XYZ$ are equal, and (4) the measures of $\angle PMN$ and $\angle WYZ$ are equal, which of the following must be true?

- I. $\angle LMP$ and $\angle PMN$ are adjacent angles.
- II. The measure of $\angle LMN$ equals the sum of the measures of $\angle LMP$ and $\angle PMN$.
- III. The measure of $\angle ZYW =$ measure of $\angle LMP$.

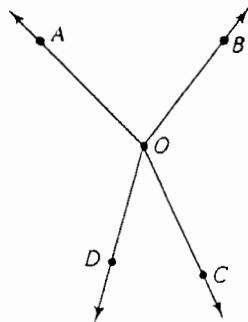
- (A) I only
- (B) II only
- (C) I and II only
- (D) II and III only
- (E) I and III only

10. If in the figure $\angle COE$ and $\angle BOD$ are right angles and the measure of $\angle BOC$ is three times the measure of $\angle COD$, then the measure of $\angle AOB$ is

- (A) 20°
- (B) $22\frac{1}{2}^\circ$
- (C) 30°
- (D) 45°
- (E) 60°



11. If $\angle AOB$ is a right angle, decide whether you can conclude that $\angle AOD$ and $\angle BOC$ have the same measure. Which of the following justifies your conclusion?

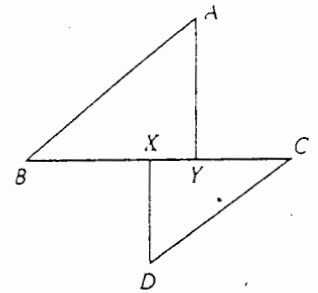


(Figure is not drawn to scale.)

- (A) This conclusion cannot be justified from the information given.
- (B) Complements of congruent angles are congruent.
- (C) Supplements of congruent angles are congruent.
- (D) Vertical angles are congruent.
- (E) If two intersecting lines form one right angle, they must form four right angles.

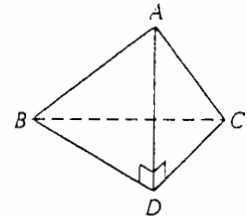
12. In the figure $\angle AYB$ and $\angle CXD$ are right angles. $AY = CX$, and $BX = DX = CY$. Each of the following is true EXCEPT

- (A) $BX + XY = BY$
- (B) $XY + CY = CX$
- (C) $XY = BY - BX = CX - CY$
- (D) $BX = CX$
- (E) $BY = CX$



(Figure is not drawn to scale.)

13. If, in the accompanying figure, $AD \perp DC$, $AD \perp BD$, and $DC = BD$, which of the following statements is NOT necessarily true?

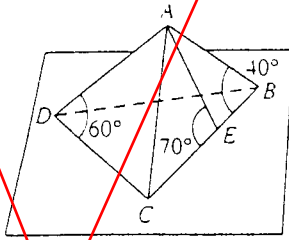


- (A) $\angle DBC$ and $\angle DCB$ are equal in measure.
- (B) $\triangle ADB \cong \triangle ADC$.
- (C) $AB = AC$.
- (D) $\angle ABC$ and $\angle ACB$ are equal in measure.
- (E) $\angle BAC$ and $\angle BDC$ have the same measure.

14. If A , B , and C are any three points of a plane for which $AB = 5$ and $BC = 7$, which of the following can be the length of AC ?

- (A) 0
- (B) 1
- (C) 2
- (D) 13
- (E) 15

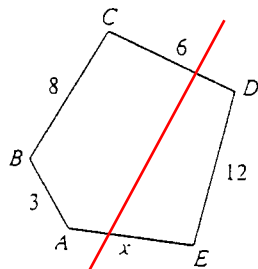
15. Segment AC is perpendicular to plane E . The angles have the measures indicated while $\angle ADB$ and $\angle ABD$ have measures 70 and 50 respectively. If segments AD , AC , AE , and AB are arranged in order from shortest to longest, which of the following is the result?



- (A) AE, AD, AB, AC
 (B) AE, AB, AC, AD
 (C) AC, AB, AE, AD
 (D) AC, AB, AD, AE
 (E) AC, AE, AD, AB

16. For a pentagon, 5 is the longest side and 2 is the shortest. Which of the following could not be the length of a diagonal?

- (A) 3 *HINT: A Pentagon has 5 sides.*
 (B) 4
 (C) 5
 (D) 7
 (E) 11

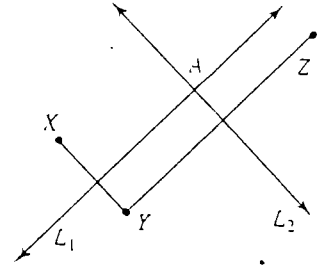


A pentagon has sides of lengths shown in the figure. The range of possible values of x is?

- (A) $0 < x < 29$
 (B) $11 < x < 18$
 (C) $3 < x < 12$
 (D) $6 < x < 8$
 (E) $0 < x < 20$

18. If L_1 and L_2 are the perpendicular bisectors of segments XY and YZ , which of the following must be true?

- I. $AX = AY = AZ$
 II. A, X , and Z are collinear
 III. L_1 and L_2 lie in the plane determined by X, Y , and Z

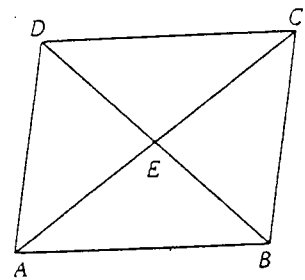


- (A) I only
 (B) I and II only
 (C) I and III only
 (D) II and III only
 (E) III only

19. If it is given that an altitude of a triangle bisects its base, which of the following can be proved?

- (A) the triangle is isosceles
 (B) the triangle is equilateral
 (C) the triangle is a right triangle
 (D) the triangle has an obtuse angle
 (E) the triangle has three acute angles

20. In the figure, $AB \parallel CD$, $AD \parallel BC$, and $DC \neq BC$. Which of the following is NOT a correct conclusion?



- (A) $\triangle ADC \cong \triangle CBA$
 (B) $\angle DCA$ has the same measure as $\angle BCA$
 (C) $\angle ADC$ has the same measure as $\angle CBA$
 (D) $AD = BC$
 (E) $DE = BE$

21. The statement $(p \vee q) \rightarrow p$ is false if

- (A) p is true and q is true
- (B) p is true and q is false
- (C) p is false and q is true
- (D) p is false and q is false
- (E) the statement is a tautology

22. Which of the following is equivalent to the statement "Having equal radii is necessary for two circles to have equal areas"?

- I. Having equal areas is sufficient for two circles to have equal radii.
 - II. Two circles have equal areas only if they have equal radii.
 - III. Having equal radii implies that two circles have equal areas:
- (A) only I
 - (B) only III
 - (C) only I and II
 - (D) only II and III
 - (E) I, II, and III

23. Given the statement "If $x = 2$, then $x^2 = 4$." The negation of this statement is

- (A) $x \neq 2$, and $x^2 \neq 4$
- (B) $x = 2$, and $x^2 \neq 4$
- (C) $x \neq 2$ or $x^2 = 4$
- (D) $x \neq 2$, and $x^2 = 4$
- (E) $x \neq 2$ or $x^2 \neq 4$

24. Given these statements:

- I. Some numbers are not prime.
- II. No primes are squares.

If *some* means "at least one," it can be concluded from I and II that

- (A) some numbers are squares
- (B) some squares are not numbers
- (C) some numbers are not squares
- (D) no numbers are squares
- (E) none of the above is a conclusion of I and II

25. In a particular town the following facts are true:

- I. Some smarties do not smoke cigars.
- II. All men smoke cigars.

A necessary conclusion is

- (A) some smarties are men
- (B) some smarties are not men
- (C) no smartie is a man
- (D) some men are not smarties
- (E) no man is a smartie

26. Given the statement "The student will not pass the course only if he does not come to class," which one of the following can be concluded?

- (A) If the student does not pass the course, then he probably missed too many classes.
- (B) If a student comes to class, then he may pass course.
- (C) If a student comes to class, then he will pass the course.
- (D) If a student passes the course, then he came to class.
- (E) If a student does not come to class, then he will not pass the course.

27. The contrapositive of $p \rightarrow q'$ is

- (A) $p' \rightarrow q$
 - (B) $p' \rightarrow q'$
 - (C) $q' \rightarrow p$
 - (D) $q \rightarrow p'$
 - (E) $q' \rightarrow p'$
- note q' means $\sim q$