GEOMETRY TEST

1979

Scoring Formula: 4R - W + 40

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This test was prepared from a list of Geometry questions submitted by Carson-Newman College.

DIRECTIONS:

Do not open this booklet until you are told to do so.

This is a test of your competence in high school mathematics. For each problem there are listed 5 possible answers; one and only one is correct. You are to work each problem, determine the correct answer, and indicate your choice by making a heavy black mark in the correct place on the separate answer sheet provided. You must use a pencil with soft lead (No. 2 lead or softer). A sample problem follows:

1. If $2x = 3$, then x equals

    (a) 2/3   (b) 3   (c) 6

    (d) 3/2   (e) none of the above

	A	B	C	D	E
1.	☐	☐	☐	■	☐

The correct answer for the sample problem is 3/2, which is answer (d); so you would answer this problem by making a heavy black mark under space D as indicated above.

This test has been constructed so that most of you are not expected to answer all questions. Do your very best on the questions you feel you know how to work. You will be penalized for incorrect answers, so it is advisable not to do much wild guessing.

If you should change your mind about an answer, be sure to erase completely. Do not mark more than one answer for any problem. Make no stray marks of any kind on your answer sheet.

The answer sheets will be used for a statistical compilation and will not be returned to you. If you wish a record of your performance, mark your answers in this booklet also. You will be able to keep this booklet after the test is completed.

When told to do so, open your test booklet to page 1 and begin. When you have finished one page, go on to the next. The working time for the entire test is 80 minutes.

1. The length of one side of an equilateral triangle is 3. The perimeter of the triangle is

    (a) $4\frac{1}{2}$

    (b) 6

    (c) 9

    (d) $\frac{9\sqrt{3}}{4}$

    (e) none of the above

2. The length of a diagonal of a square is 10. The area of the square is

    (a) 50

    (b) 100

    (c) $20\sqrt{2}$

    (d) 40

    (e) none of the above

3. Three angles of a quadrilateral have measures of 30°, 110°, and 115°. The measure of the fourth angle is

    (a) 205°

    (b) 105°

    (c) 255°

    (d) 65°

    (e) none of the above

4. A square, 8 meters by 8 meters, is divided into sixteen congruent squares by equally spaced lines parallel to its sides, and a circle is inscribed in each of the sixteen squares. The sum of the areas of the interiors of the sixteen circles is

    (a) 64π

    (b) 16

    (c) 8π

    (d) 32

    (e) none of the above

5. The volume of a sphere of radius 5 is given by

   (a) $\frac{25}{3}\pi$

   (b) 160π

   (c) $\frac{100}{3}\pi$

   (d) $\frac{500}{3}\pi$

   (e) none of the above

6. A line segment 150 cm. long is divided into two segments in the ratio 2:3. The length (in cm.) of one of the segments is

   (a) 30

   (b) 50

   (c) 60

   (d) 75

   (e) none of the above

7. A rectangle has a side of length 4 and a diagonal of length 10. The area of the rectangle is

   (a) 20

   (b) 16

   (c) $8\sqrt{21}$

   (d) $4\sqrt{21}$

   (e) none of the above

8. In proving a theorem of the form "If A, then B," we sometimes assume the opposite of B and seek to reach a contradiction from this. This method of proof is called

   (a) Direct Proof

   (b) Indirect Proof

   (c) Mathematical Induction

   (d) Proof by Exhaustion

   (e) none of the above

9. The measures of the three angles of a triangle are in the ratio 2:3:5. The measure, in degrees, of the smallest angle is

    (a) 23

    (b) 35

    (c) 36

    (d) 45

    (e) none of the above

10. If the measure of an exterior angle of a triangle is given, it is possible to find the measure of

    (a) each of the interior angles

    (b) each of the non-adjacent interior angles

    (c) the adjacent interior angle

    (d) at least one of the non-adjacent interior angles

    (e) none of the above

11. A regular hexagon is inscribed in a circle of radius 5. The area of the hexagon is

    (a) 25π

    (b) 30

    (c) $\frac{75\sqrt{3}}{4}$

    (d) $\frac{50\sqrt{3}}{3}$

    (e) none of the above

12. The center of a circle is the point (1, 2) and the point (5, 6) is on the circle. The area of the circle is

    (a) 90π

    (b) 32π

    (c) 30π

    (d) 14π

    (e) none of the above

13. The equation of the line which contains the point $(2, 3)$ and is parallel to the graph of the line whose equation is $2x + 3y = 6$ is

(a) $y = \frac{3}{2}x + 13$

(b) $y = -\frac{2}{3}x + 13$

(c) $y = -\frac{3}{2}x - \frac{13}{3}$

(d) $y = -\frac{2}{3}x + \frac{13}{3}$

(e) none of the above

14. The area of the figure at right, in terms of the indicated lengths is given by

(a) $(b - a)(a + c)$

(b) $b(a + c) - a(c - a)$

(c) $b(a + b + c)$

(d) $(b + a)(a - c)$

(e) $b(a + c) + a(c - a)$
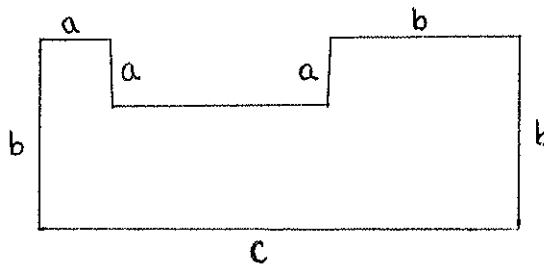
15. The sum of the measures (in degrees) of the exterior angles of a convex polygon which are formed by extending each side in succession is

(a) 90^0

(b) 180^0

(c) 540^0

(d) 360^0

(e) none of the above

16. The contrapositive of the statement "If A, then (not B)" is the statement

(a) If B, then A

(b) If (not A), then (not B)

(c) If (not B), then (not A)

(d) If B, then (not A)

(e) If (not B), then A

17. If the diagonals of an isosceles trapezoid are drawn, how many pairs of congruent triangles are formed?

    (a) 0

    (b) 1

    (c) 2

    (d) 3

    (e) 4
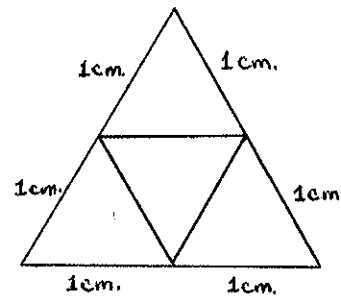

18. Through how many squares does the slanted line in the figure below pass?

    (a) 6

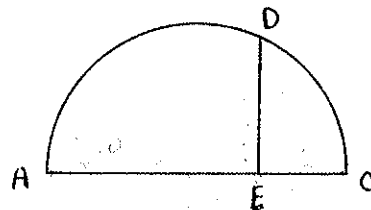   (b) 8

    (c) 10

    (d) 12

    (e) none of the above
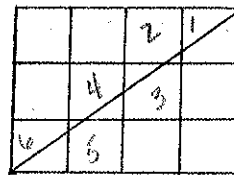
19. Two of the legs of the smaller triangles are each 1 cm. as shown in the figure below. What is the area of the inner triangle?

    (a) $\frac{\sqrt{3}}{4}$

    (b) $\frac{1}{2}$

    (c) $\frac{\sqrt{3}}{2}$

    (d) $\frac{1}{4}$

    (e) none of the above

20. The arc $\overarc{AC}$ in the figure is a semicircle of radius 10. D is a point on the semicircle such that the length of $\overline{DE}$ is 8, where $\overline{DE} \perp \overline{AC}$. The length of $\overline{EC}$ is

    (a) 2
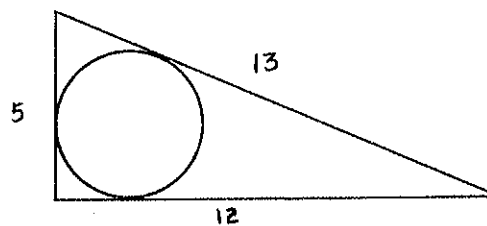
    (b) $\sqrt{8}$

    (c) 2.5

    (d) 4

    (e) 6

6

21. Two secants $\overline{AB}$ and $\overline{AC}$, intersect the circle as show. O is the center of the circle, the measure of angle CAB is 19^0, and the measure of angle EHG is 100^0. The number of degrees in $\overset{\frown}{DF}$ is:

    (a) 38^0

    (b) 19^0

    (c) 119^0

    (d) 81^0

    (e) 100^0
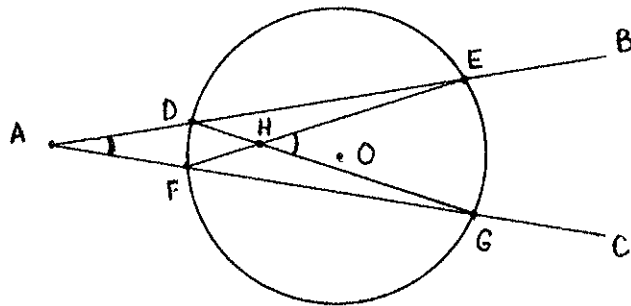
22. In the figure at right, the circle is inscribed in a right triangle with sides 5 cm., 12 cm., and 13 cm. The radius of the circle is
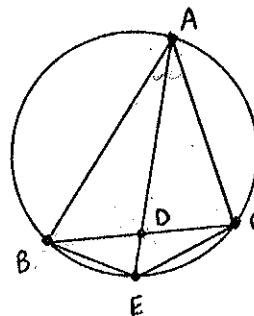
    (a) $\dfrac{12}{\pi}$ cm.

    (b) $\sqrt{3\pi}$ cm.

    (c) 2 cm.

    (d) $\dfrac{12}{5}$ cm.

    (e) none of the above

23. In the figure at right, given that the measure of angle BAD equals the measure of angle CAD, which of the following is necessarily true?

    (a) $\angle$ ABE is a right angle

    (b) $\triangle$ ABE is similar to $\triangle$ ADC

    (c) $\angle$ ACB is congruent to $\angle$ EDC

    (d) $\triangle$ BAD is congruent to $\triangle$ CAD
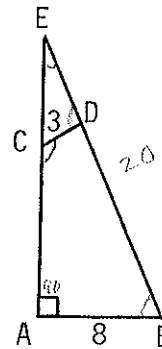
    (e) none of the above

24. Line segment $\overline{AB}$ is tangent to the circle whose center is O, and whose radius is 10 mm. If $\overline{AC}$ is 10 mm. in length, then the length of the line segment $\overline{AB}$ is

    (a) $10\sqrt{3}$ mm.
    (b) 20 mm.
    (c) $3\sqrt{10}$ mm.
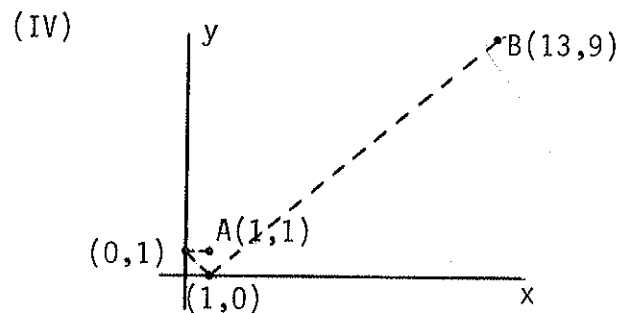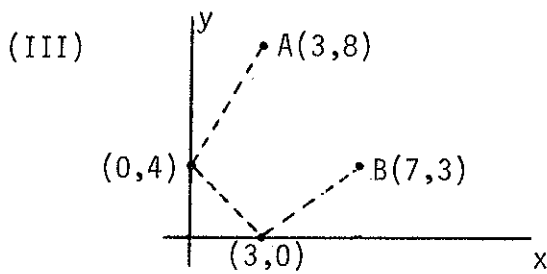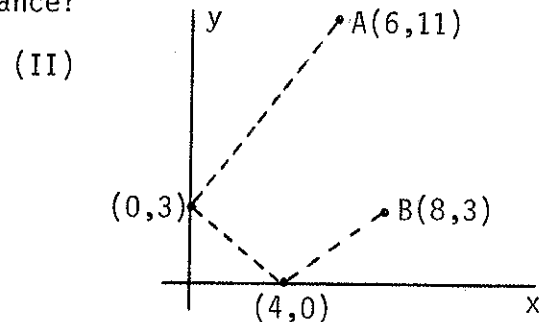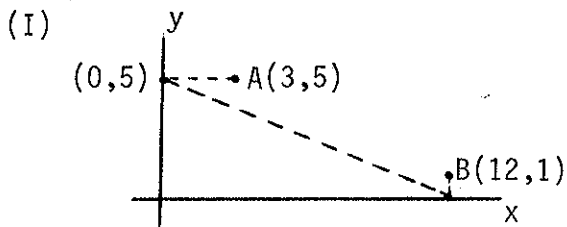   (d) $10\sqrt{2}$ mm.
    (e) none of the above

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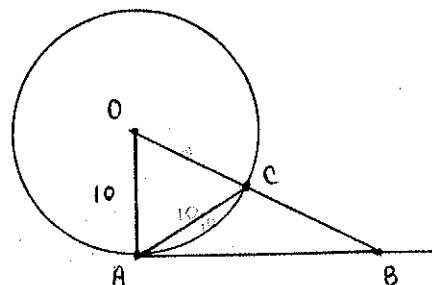
25. In the right triangle EAB, ∠ACD and ∠ABD are supplementary angles. If $\overline{CD}$ is 3 cm. in length, $\overline{AB}$ is 8 cm. in length, and $\overline{EB}$ is 20 cm. in length, then the length of $\overline{CE}$ is

   (a) $\dfrac{15}{2}$

   (b) 5

   (c) $8\sqrt{2}$

   (d) $\sqrt{55}$
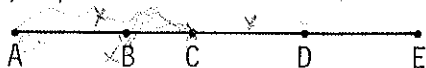
   (e) none of the above

26. In each of the following coordinate planes, point A moves first to the y-axis, then to the x-axis, and then to point B along the path shown. In which figure will the point travel the shortest distance?

   (I)

   (0,5) ---→A(3,5)

   •B(12,1)

   (II)

   ➚A(6,11)

   (0,3)←

   ↗B(8,3)

   (4,0)

   (III)

   ↗A(3,8)

   (0,4)←

   •B(7,3)

   (3,0)

   (IV)

   ↗B(13,9)

   A(1,1)

   (0,1)←

   (1,0)

   (a) I
   (b) II
   (c) III
   (d) IV
   (e) none of the above

27. On line segment $\overline{AE}$, $\overline{AB}$ and $\overline{CD}$ are equal in length, and the length of $\overline{AB}$ is the mean proportional between the lengths of $\overline{BC}$ and $\overline{AC}$. Thus, the length of $\overline{AC}$ is the mean proportional between the lengths of:

   A   B   C   D   E

   (a) $\overline{AB}$ and $\overline{CD}$

   (b) $\overline{AD}$ and $\overline{BE}$

   (c) $\overline{AB}$ and $\overline{AD}$

   (d) $\overline{CD}$ and $\overline{DE}$

   (e) none of the above

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28. In a coordinate plane, a triangle has vertices A(0, 0), B(1, 4), and C(4, 1). The slope of the median containing C is
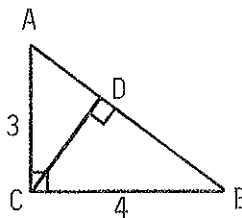
(a) -1

(b) $\frac{1}{4}$

(c) 4

(d) $-\frac{3}{16}$

(e) $-\frac{2}{7}$

29. ABCD is a square of side 2 units. A circle, C_1, is inscribed in ABCD and a circle, C_2, is circumscribed about ABCD. The area of the circle C_2 minus the area of the circle C_1 is

(a) 3π

(b) $\sqrt{2} \cdot \pi$

(c) 4π

(d) π

(e) none of the above

30. In the indicated right triangle, the length of the segment $\overline{CD}$ is

(a) $\frac{6\sqrt{6}}{7}$

(b) $\frac{12}{5}$

(c) $\frac{6}{5}$

(d) $\frac{8\sqrt{6}}{7}$

(e) none of the above

31. The length of a side of a rhombus is the geometric mean between the lengths of the diagonals. The measure of the acute angle formed by two adjacent sides of the rhombus is

(a) 75^0

(b) 60^0

(c) 45^0

(d) 30^0

(e) none of the above

9

32. The inscribed circle of right triangle XYZ is tangent to the hypotenuse $\overline{YZ}$ at the point T. If the lengths of $\overline{YT}$ and $\overline{ZT}$ are 3 and 13, respectively, then the area of the triangle is

    (a) 18.5

    (b) 39

    (c) 30

    (d) 60

    (e) none of the above

33. A diameter, $\overline{XY}$, of circle O is extended through Y to Z so that the length of $\overline{YZ}$ is 3. At X, the line $\overleftrightarrow{XT}$ is drawn perpendicular to the line $\overleftrightarrow{XY}$ so that the length of $\overline{XT}$ is 9. Determine the length of $\overline{XY}$ so that the line $\overleftrightarrow{TZ}$ is tangent to the circle.

    (a) 15

    (b) 12

    (c) 10

    (d) 9

    (e) none of the above.

34. In △ABC the ratio of the lengths of $\overline{AC}$ and $\overline{CB}$ is 3:5. The bisector of the exterior angle at C intersects $\overline{BA}$ extended at P (A is between P and B). The ratio of the lengths of $\overline{PA}$ and $\overline{AB}$ is

    (a) 5:3

    (b) 8:1

    (c) 2:3

    (d) 1:8

    (e) 3:2

35. In the parallelogram ABCD, $\overline{AB}$ is of length 12, $\overline{AD}$ of length 8, the measure of angle A is 30^0, and the measure of angle AXD is 90^0.
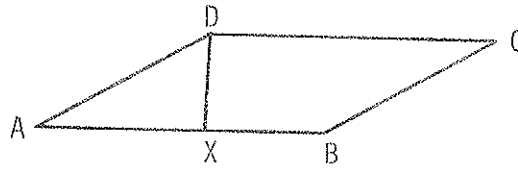

The ratio of the area of triangle AXD to the area of the trapezoid XBCD is

(a) $\dfrac{1}{11}$

(b) $\dfrac{1}{5}$

(c) $\dfrac{\sqrt{3}}{6 + \sqrt{3}}$

(d) $\dfrac{2\sqrt{3} + 1}{11}$

(e) none of the above

36. Which of the following is <u>not</u> always true in Euclidean geometry?

(a) Two lines perpendicular to the same line are parallel to each other.

(b) Two lines parallel to the same line are parallel to each other.

(c) If two parallel lines are cut by a transversal, the alternate interior angles are congruent.

(d) The sum of the measures of the (interior) angles of a triangle is 180^0.

(e) None of the above are always true.

37. A pony is tethered to the corner of a barn that is 10 m. by 12 m. in dimension. The tether is 15 m. long and the pony has eaten all the grass from the shaded area around the barn. What is the total amount of area he has grazed from?
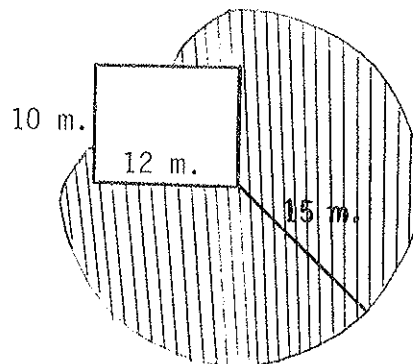
(a) $\dfrac{675\pi}{4}$ sq. m.

(b) $\dfrac{709\pi}{4}$ sq. m.

(c) $\dfrac{120\pi}{15}$ sq. m.

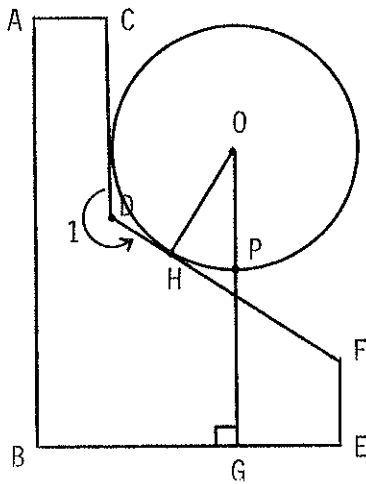(d) $\dfrac{919\pi}{4}$ sq. m.

(e) none of the above

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38.
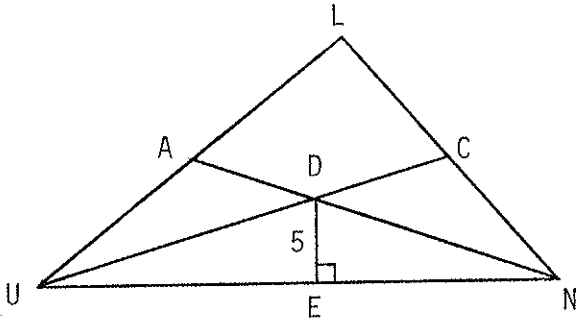
Point A is the midpoint of $\overline{UL}$, and point C is the midpoint of $\overline{LN}$. If $\overline{DE} \perp \overline{UN}$ and the measures of $\overline{DE}$ and $\overline{UN}$ are respectively 5 and 13, the area of the quadrilateral ADCL is

(a) $\frac{65}{4}$

(b) $\frac{65}{2}$

(c) 65

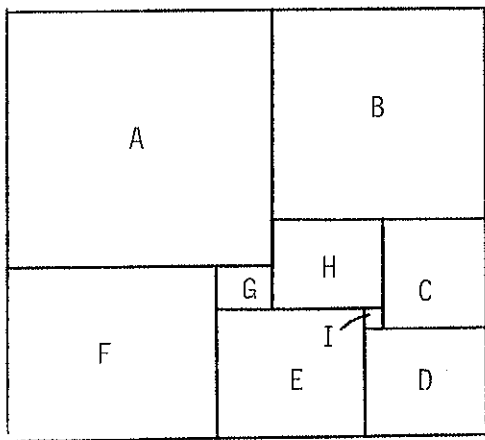(d) $\frac{65}{3}$

(e) none of the above

39.

In the diagram circle 0 is tangent to $\overline{CD}$ and to $\overline{DF}$. $\overline{OG} \perp \overline{BE}$ and $\overline{AB} \parallel \overline{CD}$. The measure of angle 1 is 236^0. $\overline{OH}$ is drawn to the point of tangency on $\overline{DF}$. Then the measure of arc $\overset{\frown}{HP}$ is

(a) 124^0

(b) 68^0

(c) 62^0

(d) 45^0

(e) none of the above

40.

Each of the qualdrilaterals labelled with the letters A, B, C, D, E, F, G, H, I is a square. If the area of square C is 64 sq. cm. and the area of square D is 81 sq. cm., then the area of square A is

(a) 145 sq. cm.

(b) 243 sq. cm.

(c) 384 sq. cm.

(d) 405 sq. cm.

(e) none of the above