The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

THREE-YEAR SEQUENCE FOR HIGH SCHOOL MATHEMATICS

COURSE II

Friday, June 14, 1991 — 9:15 a.m. to 12:15 p.m., only

Notice . . .

If your school allows the use of calculators for this examination, they may be used for checking purposes **only**. In Part II, all work, including calculations, must be shown on your answer paper.

The last page of the booklet is the answer sheet. Fold the last page along the perforations and, slowly and carefully, tear off the answer sheet. Then fill in the heading of your answer sheet.

On page 9 you will find the "Tables of Natural Trigonometric Functions" which you may need to answer some questions in this examination. Fold this page along the perforations, and tear it off also slowly and carefully.

When you have completed the examination, you must sign the statement printed at the end of the answer paper, indicating that you had no unlawful knowledge of the questions or answers prior to the examination and that you have neither given nor received assistance in answering any of the questions during the examination. Your answer paper cannot be accepted if you fail to sign this declaration.

DO NOT OPEN THIS EXAMINATION BOOKLET UNTIL THE SIGNAL IS GIVEN

Part I

Answer 30 questions from this part. Each correct answer will receive 2 credits. No partial credit will be allowed. Write your answers in the spaces provided on the separate answer sheet. Where applicable, answers may be left in radical form. [60]

1 The vertex angle of an isosceles triangle measures 70°. Find the number of degrees in a base angle.

2 Three sides of a triangle measure 4, 5, and 8. Find the length of the *longest* side of a similar triangle whose perimeter is 51.

3 Find the value of $O \alpha (I \alpha L)$ in the system defined below.

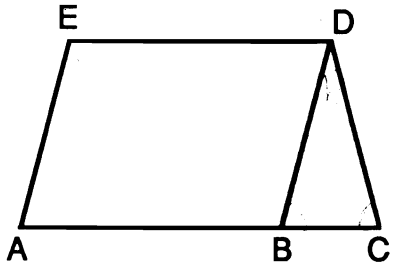
α	F	O	I	L
F	I	L	F	O
O	L	F	O	I
I	F	O	I	L
L	O	I	L	F

4 Find the area of the triangle whose vertices are (0,8), (0,0), and (7,0).

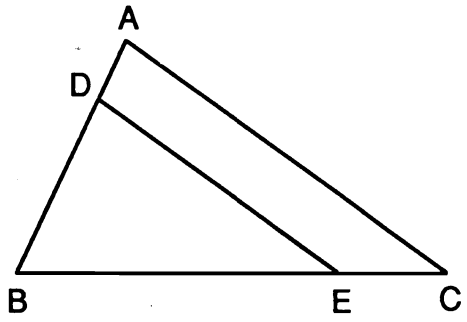
5 In quadrilateral $ABCD$, $m\angle A = 80$, $m\angle B = 2x$, $m\angle C = x$, and $m\angle D = 4x$. Find x.

6 The slope of $\overleftrightarrow{RU}$ is $\frac{3}{5}$. If $\overleftrightarrow{RU} \parallel \overleftrightarrow{ST}$ and the slope of $\overleftrightarrow{ST}$ is $\frac{x-6}{x}$, what is the value of x?

7 In the accompanying diagram of $ACDE$, $ABDE$ is a parallelogram, $\overline{ABC}$, and $\overline{BD} \cong \overline{DC}$. If $m\angle E = 105$, find $m\angle BDC$.



8 In the diagram below of $\triangle ABC$, $\overline{DE} \parallel \overline{AC}$, $DB = 6$, $AD = 2$, and $DE = 9$. Find AC.

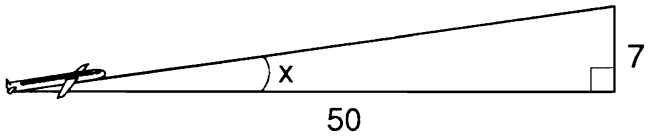


9 A committee of three is to be chosen from ten teachers. How many different committees can be formed?

10 What is the midpoint of the line segment that connects the points (1,2) and (6,7)?

11 Find the length of the line segment that joins the midpoints of two sides of a triangle whose third side is 10.

12 In the accompanying diagram, the slope of the ascent of an aircraft is $\frac{7}{50}$. Find $m\angle x$, the angle of elevation, to the *nearest degree*.



13 Solve the following system of equations for the positive value of y:

$$x = 2y$$
$$x + y^2 = 15$$

Directions (14–35): For *each* question chosen, write on the separate answer sheet the *numeral* preceding the word or expression that best completes the statement or answers the question.

14 If $\sim(a \wedge \sim b)$ is a true statement, which statement must also be true?

(1) $\sim a \wedge b$
(2) $a \wedge b$
(3) $\sim a \vee b$
(4) $a \vee \sim b$

15 In the step-by-step simplification of the expression below, which property is *not* used?

$3(1 + x)$
$3(x + 1)$
$3 \cdot x + 3 \cdot 1$
$3x + 3$

(1) associative
(2) commutative
(3) distributive
(4) identity

16 What is the y-intercept of the parabola whose equation is $y = x^2 + 7x + 5$?

(1) $-\frac{7}{2}$
(2) 5
(3) 3
(4) $\frac{7}{2}$

17 Which figure does *not* always have congruent diagonals?

(1) square
(2) rhombus
(3) rectangle
(4) isosceles trapezoid

18 Which statement is logically equivalent to the statement, "If she does not mean it, she does not say it"?

(1) If she says it, she means it.
(2) If she means it, she says it.
(3) If she does not say it, she means it.
(4) If she does not mean it, she says it.

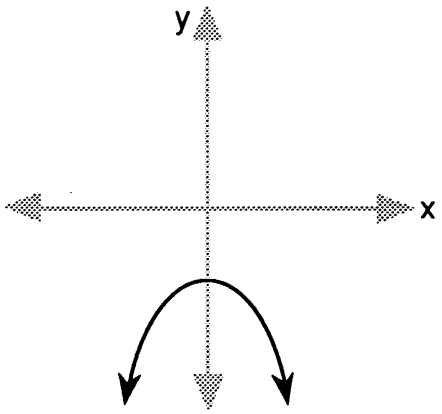
19 A pencil holder contains only six blue pencils and three red pencils. If two pencils are drawn at random, what is the probability both are blue?

(1) $\frac{2}{9}$
(2) $\frac{6}{9}$
(3) $\frac{30}{72}$
(4) $\frac{30}{81}$

20 The coordinates of two points are $A(1,4)$ and $B(3,4)$. What is an equation of the locus of points equidistant from A and B?

(1) $x = 2$
(2) $y = 2$
(3) $x = 4$
(4) $y = 4$

21 Which equation can represent the parabola in the diagram below?

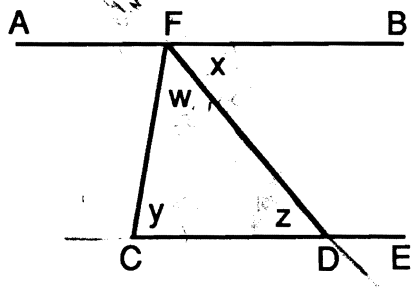


(1) $y = -x^2$
(2) $y = x^2$
(3) $y = x^2 - 3$
(4) $y = -x^2 - 3$

22 What is the slope of the line containing points $A(4,-1)$ and $B(0,2)$?

(1) $\frac{3}{4}$
(2) $\frac{4}{3}$
(3) $-\frac{3}{4}$
(4) $-\frac{4}{3}$

23 In the accompanying diagram, $\overline{AFB} \parallel \overline{CDE}$. If $\overline{FD}$ bisects $\angle CFB$, which statement is true?



(1) $\angle w \cong \angle y$
(2) $\angle y \cong \angle z$
(3) $\angle w \cong \angle z$
(4) $\angle x \cong \angle y$

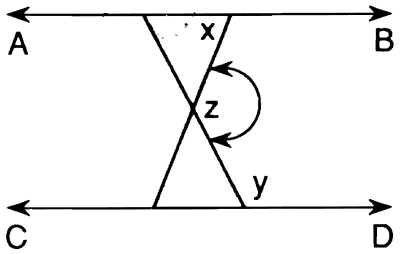
24 If $(x - 3)^2 + (y + 5)^2 = 9$ is the equation of a circle, the coordinates of the center and the length of the radius are

(1) center (−3,5), radius 9
(2) center (−3,5), radius 3
(3) center (3,−5), radius 9
(4) center (3,−5), radius 3

25 What are the roots of the equation $2x^2 - 3x - 4 = 0$?

(1) $x = \frac{-3 \pm \sqrt{41}}{2}$
(2) $x = \frac{3 \pm \sqrt{41}}{2}$
(3) $x = \frac{-3 \pm \sqrt{41}}{4}$
(4) $x = \frac{3 \pm \sqrt{41}}{4}$

26 In the diagram below, $\overleftrightarrow{AB} \parallel \overleftrightarrow{CD}$, $m\angle x = 68$, and $m\angle y = 117$. What is $m\angle z$?



(1) 131
(2) 117
(3) 112
(4) 49

27 What is the radius of the circle whose center is the origin and that passes through the point (5,12)?

(1) 12
(2) 13
(3) 15
(4) 169

28 In right triangle ABC, if $m\angle C = 90$ and $\sin A = \frac{3}{5}$, $\cos B$ is equal to

(1) $\frac{3}{5}$
(2) $\frac{4}{5}$
(3) $\frac{3}{4}$
(4) $\frac{4}{3}$

29 Under which operation is the set of even integers *not* closed?

(1) addition
(2) subtraction
(3) multiplication
(4) division

30 The sum of the measures of the interior angles of a hexagon is

(1) 360
(2) 540
(3) 720
(4) 1280

31 A parallelogram *must* be a rhombus if the

(1) diagonals are perpendicular
(2) opposite angles are congruent
(3) diagonals are congruent
(4) opposite sides are congruent

32 If two sides of a triangle have lengths 4 and 9, then the length of the third side may be any number

(1) greater than 4 but less than 9
(2) greater than 5
(3) less than 13
(4) greater than 5 but less than 13

33 In how many points do the graphs of these functions intersect?

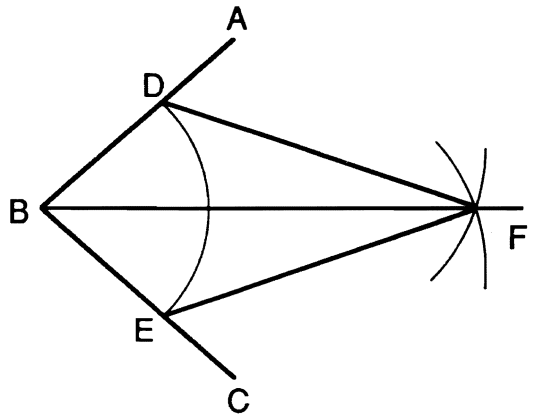
$y = x^2 - 2x$
$y = x$

(1) 1
(2) 2
(3) 3
(4) 0

34 In which quadrant does the image of (−4,1) lie after a reflection in the origin?

(1) I
(2) II
(3) III
(4) IV

35 The diagram below shows the construction of the bisector of $\angle ABC$. Which reason for triangle congruence is used in proving that $\overline{BF}$ bisects $\angle ABC$?



(1) ASA
(2) SAS
(3) SSS
(4) SAA

Answers to the following questions are to be written on paper provided by the school.

Part II

Answer three questions from this part. All work, including calculations, must be shown on your answer paper. [30]

36 Answer both *a* and *b* for all values of x for which these expressions are defined.

a Solve for x and write the answer in simplest radical form:

$$\frac{1}{x} + \frac{1}{x+3} = 2 \qquad [6]$$

b Express the following product in simplest form:

$$\frac{x^2 - 25}{2x - 2} \cdot \frac{x^2 + 4x - 5}{x^2 + 10x + 25} \qquad [4]$$

37 Triangle ABC has coordinates $A(-1,3)$, $B(-6,5)$, and $C(-4,7)$.

a On graph paper, draw and label $\triangle ABC$. [1]

b Graph and label $\triangle A'B'C'$, the image of $\triangle ABC$ after a reflection in the x-axis. [3]

c Graph and label $\triangle A''B''C''$, the image of $\triangle ABC$ after a reflection in the line $y = x$. [3]

d Graph and label $\triangle A'''B'''C'''$, the image of $\triangle ABC$ under the translation which maps (x,y) to $(x + 8, y + 3)$. [3]

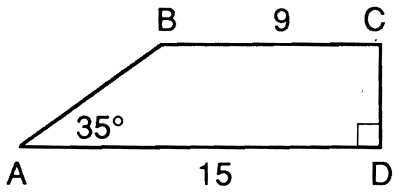
38 *a* On graph paper, sketch the graph of the function $y = x^2 - 4x + 9$ in the interval $-1 \leq x \leq 5$. [6]

b On the same set of axes, sketch the graph of the equation $y - x = 5$. [2]

c Solve the following system of equations:

$$\begin{aligned} y &= x^2 - 4x + 9 \\ y - x &= 5 \end{aligned} \qquad [2]$$

39 In the accompanying diagram of trapezoid $ABCD$, $\overline{CD} \perp \overline{AD}$, $BC = 9$, $AD = 15$, and $m\angle A = 35$.

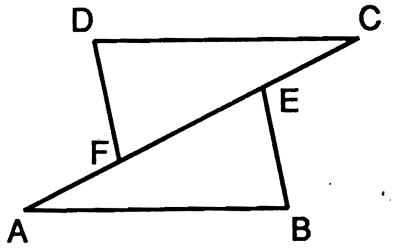


Find, to the *nearest tenth*, the

a area of $ABCD$ [5]

b perimeter of $ABCD$ [5]

40 Given: $\overline{AFEC}$, $\angle D \cong \angle B$, $\overline{AF} \cong \overline{CE}$, and $\overline{DC} \parallel \overline{AB}$.



Prove: $\overline{DF} \cong \overline{EB}$ [10]

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Answers to the following questions are to be written on paper provided by the school.

Part III

Answer one question from this part. All work, including calculations, must be shown on your answer paper. [10]

41 Given: If Io goes swimming, then Hera does not go to the agora.
If Zeus and Pluto eat kale, then Hera goes to the agora.
Io goes swimming.
Zeus eats kale.

Let *I* represent: "Io goes swimming."
Let *H* represent: "Hera goes to the agora."
Let *Z* represent: "Zeus eats kale."
Let *P* represent: "Pluto eats kale."

Using *I*, *H*, *Z*, and *P*, prove that Pluto does not eat kale. [10]

42 Quadrilateral *JAME* has vertices *J*(2,–2), *A*(8,–1), *M*(9,3), and *E*(3,2).

a Prove that *JAME* is a parallelogram. [6]

b Prove that *JAME* is *not* a rectangle. [4]