The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

THREE-YEAR SEQUENCE FOR HIGH SCHOOL MATHEMATICS

COURSE III

Tuesday, January 23, 1990 — 9:15 a.m. to 12:15 p.m., only

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.

The "Reference Tables for Mathematics" and a formula sheet which you may need to answer some questions in this examination are stapled in the center of this booklet. Open the booklet and carefully remove the reference tables.

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.

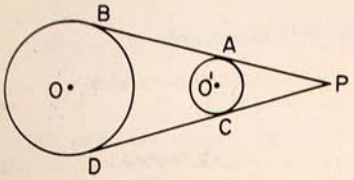
DO NOT OPEN THIS EXAMINATION BOOKLET UNTIL THE SIGNAL IS GIVEN

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 terms of π or in radical form. [60]

1 Express 240° in radian measure.

2 In the accompanying diagram, $\overline{PAB}$ and $\overline{PCD}$ are externally tangent to circles O and O'. If $PB = 16$ and $CD = 10$, find PA.



3 If x is a positive acute angle and $\cos x = \frac{3}{5}$, find the value of $\sin x$.

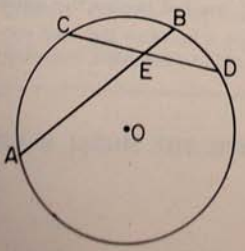
4 Evaluate: $\sum_{k=1}^{3} \frac{6}{k}$

5 A fair coin is tossed three times. What is the probability of obtaining exactly three heads?

6 Find the area of $\triangle ABC$ if $a = 6$, $b = 12$, and $m\angle C = 150$.

7 Solve for all values of x: $|3x - 1| = 5$

8 In the accompanying diagram, chords $\overline{AB}$ and $\overline{CD}$ of circle O intersect at E. If $AE = x$, $EB = x - 6$, and $CE = ED = 4$, find AE.



9 Express the sum of $(2 - \sqrt{-4})$ and $(-3 + \sqrt{-16})$ in $a + bi$ form.

10 Find the value of x that satisfies the equation $x^{\frac{3}{2}} = 64$.

11 Solve for x: $3\sqrt{2x + 5} - 15 = 0$

12 If $f(x) = \cos 2x$, find $f\left(\frac{\pi}{2}\right)$.

13 A function is defined by the equation $y = 8x - 3$. If the domain is $2 \leq x \leq 4$, find the minimum value in the range of the function.

14 If $P(4,-3)$ is transformed under the dilation D_{-2}, what is the image P'?

15 In $\triangle ABC$, $m\angle A = 30$, $b = 14$, and $a = 10$. Find $\sin B$.

16 Express in simplest form: $\dfrac{1 + \frac{2}{x}}{x - \frac{4}{x}}$

Directions (17–35): 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.

17 Reflecting (5,1) in the y-axis yields an image of
(1) (5,–1)
(2) (–5,–1)
(3) (5,1)
(4) (–5,1)

18 In a standardized test with a normal distribution of scores, the mean is 63 and the standard deviation is 5. Which score can be expected to occur most often?
(1) 45
(2) 55
(3) 65
(4) 74

19 The transformation $T_{(-2,3)}$ maps the point (7,2) onto the point whose coordinates are

(1) (9,5)
(2) (5,5)
(3) (5,−1)
(4) (−14,6)

20 If $f(x) = |x^3 - 3|$, then $f(-1)$ is equivalent to

(1) 0
(2) 2
(3) −2
(4) 4

21 The value of Arc sin $\left(\frac{1}{2}\right)$ + Arc tan (1) is

(1) 120°
(2) 105°
(3) 90°
(4) 75°

22 What is the fifth term in the expansion $(a + bi)^7$?

(1) $35a^3b^4$
(2) $-35a^3b^4$
(3) $21a^2b^5i$
(4) $-21a^2b^5i$

23 In a circle, a central angle containing 1.5 radians intercepts an arc whose measure is 18 centimeters. The length of the radius is

(1) 6 cm
(2) 12 cm
(3) 24 cm
(4) 27 cm

24 The inverse function of $\{(2,6),(-3,4),(7,-5)\}$ is

(1) $\{(-2,6),(3,4),(-7,-5)\}$
(2) $\{(2,-6),(-3,-4),(7,5)\}$
(3) $\{(6,2),(4,-3),(-5,7)\}$
(4) $\{(-6,-2),(-4,3),(5,-7)\}$

25 Log $\frac{\sqrt{xy}}{z}$ is equal to

(1) $\frac{1}{2}\log x + \frac{1}{2}\log y - \log z$

(2) $\frac{1}{2}\log x + \log y - \log z$

(3) $\frac{1}{2}(\log x + \log y - \log z)$

(4) $\frac{\frac{1}{2}\log xy}{\log z}$

26 If $\sin A = k$, then the value of the expression $(\sin A)(\cos A)(\tan A)$ is equivalent to

(1) 1
(2) $\frac{1}{k}$
(3) k
(4) k^2

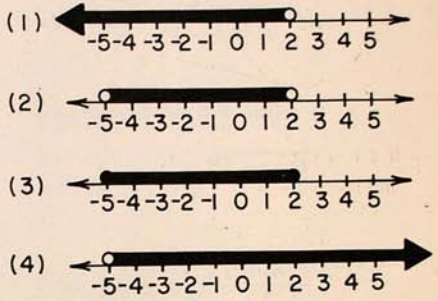
27 What is the value of $\sin(-240°)$?

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

28 How many distinct triangles can be formed if $m\angle A = 30$, $b = 12$, and $a = 6$?

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

29 Which graph is the solution set of $x^2 + 3x < 10$?



30 The expression $\frac{7}{3 - \sqrt{2}}$ is equivalent to

(1) $3 + \sqrt{2}$
(2) $3 - \sqrt{2}$
(3) $\frac{3 + \sqrt{2}}{7}$
(4) $\frac{21 + \sqrt{2}}{7}$

31 For which value of k will the roots of $2x^2 + kx + 1 = 0$ be real?

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

32 The expression $\frac{\sin 2A}{\sin^2 A}$ is equivalent to

(1) 1
(2) 2
(3) $2 \tan A$
(4) $2 \cot A$

33 What is the maximum value of y for the equation $y = 1 + 3 \sin x$?

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

[OVER]

34 What is the period of the graph of the function $y = 4 \sin 2x$?

(1) π
(2) 2π
(3) 3
(4) 4

35 The product of $(3 - 2i)$ and $(7 + 6i)$ is

(1) $21 - 12i$
(2) $33 + 4i$
(3) $9 + 4i$
(4) $21 + 16i$