

The University of the State of New York  
REGENTS HIGH SCHOOL EXAMINATION

# TENTH YEAR MATHEMATICS

Thursday, January 22, 1981 — 1:15 to 4:15 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.

On page 5 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.

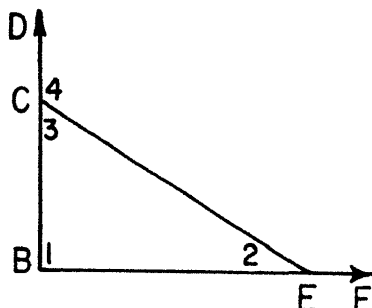
When you have completed the examination, you must sign the statement printed at the end of the answer paper, indicating that you had no unlawful knowledge of the questions or answers prior to the examination and that you have neither given nor received assistance in answering any of the questions during 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**

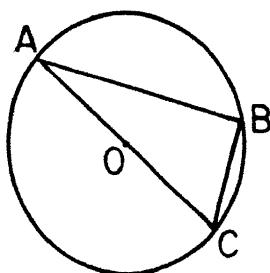
Part I

Answer all questions in this part. Each correct answer will receive 2 credits. No partial credit will be allowed. Unless otherwise specified, answers may be left in terms of  $\pi$  or in radical form. Write your answers in the spaces provided on the separate answer sheet.

- 1 In the accompanying diagram,  $\overrightarrow{BCD}$ ,  $\overrightarrow{BEF}$ ,  $m\angle 1 = 90$ , and  $m\angle 2 = 30$ . Find the number of degrees in the measure of angle 4.



- 2 In the accompanying figure, triangle  $ABC$  is inscribed in circle  $O$ . If  $\overline{AC}$  is a diameter of the circle, find  $m\angle B$ .



- 3 The ratio of the measures of the angles of a triangle are 2:3:7. What is the measure in degrees of the largest angle?

- 4 The slope of  $\overleftrightarrow{AB}$  is  $\frac{3}{5}$  and the slope of  $\overleftrightarrow{CD}$  is  $\frac{9}{k}$ . If  $\overleftrightarrow{AB}$  is parallel to  $\overleftrightarrow{CD}$ , what is the value of  $k$ ?

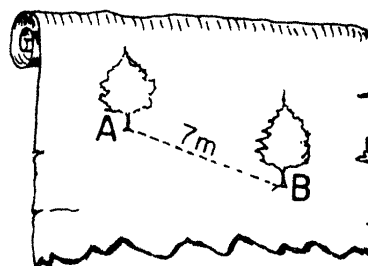
- 5 If the dimensions of a rectangular television screen are 9 inches by 12 inches, find the number of inches in the length of a diagonal of the screen.

- 6 If the length of the diameter of a circle is 8, what is the circumference of the circle in terms of  $\pi$ ?

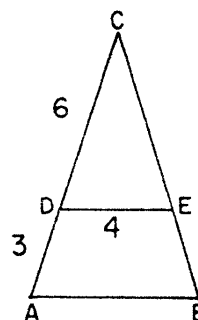
- 7 In triangle  $PQR$ , the measure of angle  $P$  is  $59^\circ$  and an exterior angle at  $Q$  measures  $117^\circ$ . What is the shortest side of the triangle?

- 8 Two circles are externally tangent and the lengths of their diameters are 4 and 8. Find the length of a line segment connecting the centers of the circles.

- 9 The accompanying diagram shows a pirate's map. A treasure is buried at a distance of 3 meters from the foot of tree  $A$  and 5 meters from the foot of tree  $B$ . If  $AB = 7$  meters, what is the total number of possible places in which the treasure might be buried?



- 10 In the accompanying figure of triangle  $ABC$ ,  $\overline{DE} \parallel \overline{AB}$ ,  $DE = 4$ ,  $CD = 6$ , and  $DA = 3$ . Find  $AB$ .



- 11 The length of a side of an equilateral triangle is 10. What is the length, in radical form, of an altitude of the triangle?

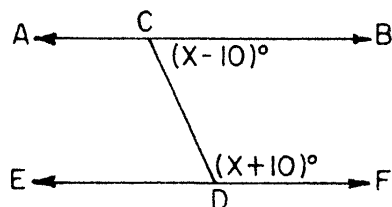
- 12 How many degrees are in the measure of an exterior angle of a regular polygon of 18 sides?

- 13 Find, in radical form, the length of the line segment that joins the points  $A(4,7)$  and  $B(7,9)$ .

- 14 In a circle, chords  $\overline{AB}$  and  $\overline{CD}$  intersect at point  $E$  so that  $CE = ED$ . If  $AE = 2$  and  $EB = 8$ , what is the length of  $\overline{CE}$ ?

Directions (15–29): Write in the space provided on the separate answer sheet the numeral preceding the word or expression that best completes each statement or answers each question.

- 15 In the accompanying diagram,  $\overleftrightarrow{AB} \parallel \overleftrightarrow{EF}$ , and the measure in degrees of the interior angles on the same side of transversal  $\overline{CD}$  are  $(x + 10)$  and  $(x - 10)$ . What is the value of  $x$ ?



- (1) 80  
(2) 90  
(3) 100  
(4) 110
- 16 What is the converse of the statement, "If two angles are adjacent, they have the same vertex"?
- (1) If two angles have the same vertex, they are adjacent.  
(2) If two angles do not have the same vertex, they are adjacent.  
(3) If two angles are adjacent, they do not have the same vertex.  
(4) If two angles do not have the same vertex, they are not adjacent.

- 17 Line segment  $\overline{AB}$  has midpoint  $M$ . If the coordinates of  $A$  are  $(-3, 2)$  and the coordinates of  $M$  are  $(-1, 5)$ , what are the coordinates of  $B$ ?

- (1)  $(1, 10)$   
(2)  $(1, 8)$   
(3)  $(0, 7)$   
(4)  $(-5, 8)$

- 18 In a right triangle, the altitude to the hypotenuse has length 6. If the altitude divides the hypotenuse into segments with lengths 4 and  $x$ , the value of  $x$  is

- (1) 6  
(2) 8  
(3) 9  
(4) 10

- 19 If the lengths of two sides of a triangle are 5 and 7, the length of the third side may not be

- (1) 12  
(2) 7  
(3) 3  
(4) 5

- 20 An equation of the line which passes through the point  $(0, 2)$  and which has a slope of 4 is

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

- 21 The ratio of the circumferences of two circles is 1:16. If the length of the radius of the smaller circle is 1, the length of the radius of the larger circle is

- (1)  $16\pi$   
(2) 16  
(3)  $4\pi$   
(4) 4

- 22 If the area of a trapezoid is 32 and the length of its median is 8, the length of an altitude of the trapezoid is

- (1) 8  
(2) 2  
(3) 12  
(4) 4

- 23 Which equation represents the locus of points whose ordinates are 2 less than 3 times their abscissas?

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

- 24 In right triangle  $ABC$ , if  $AB = 13$ ,  $AC = 12$ , and  $BC = 5$ , then  $\sin A$  is equal to

- (1)  $\frac{5}{13}$   
(2)  $\frac{5}{12}$   
(3)  $\frac{12}{13}$   
(4)  $\frac{12}{5}$

- 25 Two squares have areas of 9 square centimeters and 16 square centimeters. What is the ratio of the perimeter of the smaller square to the perimeter of the larger square?

- (1) 81:256  
(2) 9:16  
(3) 3:4  
(4)  $\sqrt{3}:2$

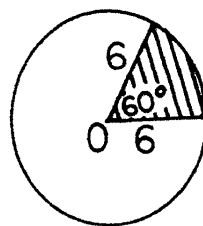
- 26 If the perimeter of an equilateral triangle is 12, its area is equal to

- (1)  $36\sqrt{3}$   
(2)  $2\sqrt{3}$   
(3)  $6\sqrt{3}$   
(4)  $4\sqrt{3}$

- 27 If the midpoints of the sides of a quadrilateral are joined consecutively, the resulting figure will always be a

- (1) rhombus  
(2) square  
(3) rectangle  
(4) parallelogram

- 28 In the accompanying figure, a circle has a radius of length 6 and a central angle which measures  $60^\circ$ . What is the area of the shaded region?



- (1)  $6\pi$   
(2)  $9\pi$   
(3)  $18\pi$   
(4)  $36\pi$

- 29 A parallelogram must be a rectangle if the diagonals

- (1) are perpendicular  
(2) are congruent  
(3) bisect the angles  
(4) bisect each other

Directions (30): Leave all construction lines on the answer sheet.

- 30 On the answer sheet, construct the perpendicular bisector of side  $\overline{AB}$  of triangle  $ABC$ .

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

Part II

Answer four questions from this part. Show all work unless otherwise directed.

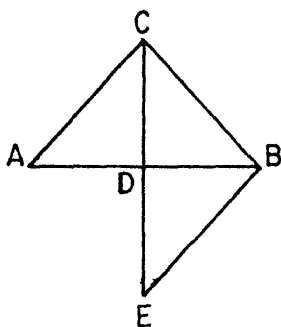
31 Prove either *a* or *b* but *not* both.

*a* If two angles of a triangle are congruent, the sides opposite these angles are congruent. [10]

OR

*b* The area of a trapezoid is equal to one-half the product of the length of the altitude and the sum of the lengths of the bases. [10]

32 Given:  $\overline{AC} \cong \overline{CB}$ ,  $\overline{CDE} \perp \overline{ADB}$ ,  $\overline{EB} \parallel \overline{AC}$ .

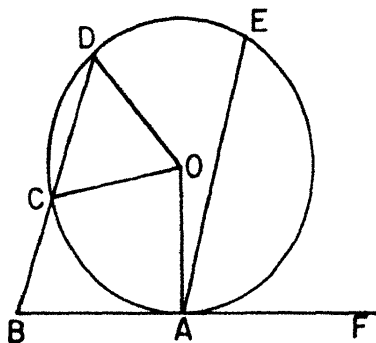


Prove:

*a*  $\angle ACD \cong \angle BCD$  [4]

*b*  $\overline{CD} \cong \overline{DE}$  [6]

33 Given: circle *O*,  $\overline{BAF}$  is tangent to circle *O* at *A*, secant  $\overline{BCD}$ , radii  $\overline{OC}$ ,  $\overline{OA}$ ,  $\overline{OD}$ , chord  $\overline{AE}$ ,  $m\widehat{AC} = 80$ ,  $m\widehat{DE} = 60$ ,  $m\angle EAF = 75$ .



Find:

*a*  $m\widehat{AE}$  [2]

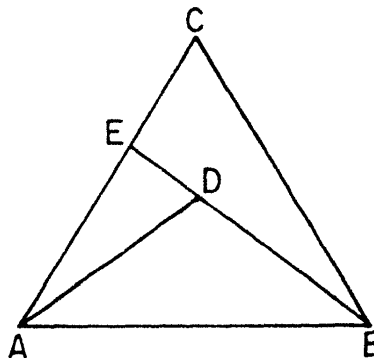
*b*  $m\angle DOC$  [2]

*c*  $m\angle OAB$  [2]

*d*  $m\angle OAE$  [2]

*e*  $m\angle DCO$  [2]

34 Given:  $\overline{AC} \cong \overline{BC}$ ,  $\overline{AD} \cong \overline{BD}$ ,  $\overline{AEC}$ , and  $\overline{BDE}$ .



Prove:

*a*  $\angle CAD \cong \angle CBD$  [4]

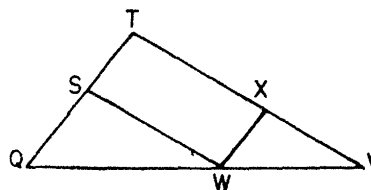
*b*  $AD > DE$  [6]

35 In a regular polygon of 9 sides, the length of each side is 8.

*a* Find the length of the apothem to the nearest integer. [6]

*b* Using the answer obtained in part *a*, find the area of the polygon. [4]

36 In the accompanying figure,  $\overline{QWV}$ ,  $\overline{SW} \parallel \overline{TXV}$ , and  $\overline{XW} \parallel \overline{QST}$ .



Prove:  $\frac{QS}{ST} = \frac{TX}{XV}$  [10]

\*37 The vertices of triangle *ABC* are *A*(1,1), *B*(10,4), and *C*(7,7).

*a* Find the slope of  $\overrightarrow{AB}$ . [2]

*b* If *D*(7,*k*) is a point on  $\overline{AB}$ , find *k*. [3]

*c* Show by means of coordinate geometry that  $\triangle ABC$  is a right triangle and state a reason for your conclusion. [5]

\* This question is based on an optional topic in the syllabus.

THE UNIVERSITY OF THE STATE OF NEW YORK  
THE STATE EDUCATION DEPARTMENT  
DIVISION OF EDUCATIONAL TESTING

Tables of Natural Trigonometric Functions  
(For use with 9th and 10th Year Mathematics Regents Examinations)

Angle	Sine	Cosine	Tangent	Angle	Sine	Cosine	Tangent
1°	.0175	.9998	.0175	46°	.7193	.6947	1.0355
2°	.0349	.9994	.0349	47°	.7314	.6820	1.0724
3°	.0523	.9986	.0524	48°	.7431	.6691	1.1106
4°	.0698	.9976	.0699	49°	.7547	.6561	1.1504
5°	.0872	.9962	.0875	50°	.7660	.6428	1.1918
6°	.1045	.9945	.1051	51°	.7771	.6293	1.2349
7°	.1219	.9925	.1228	52°	.7880	.6157	1.2799
8°	.1392	.9903	.1405	53°	.7986	.6018	1.3270
9°	.1564	.9877	.1584	54°	.8090	.5878	1.3764
10°	.1736	.9848	.1763	55°	.8192	.5736	1.4281
11°	.1908	.9816	.1944	56°	.8290	.5592	1.4826
12°	.2079	.9781	.2126	57°	.8387	.5446	1.5399
13°	.2250	.9744	.2309	58°	.8480	.5299	1.6003
14°	.2419	.9703	.2493	59°	.8572	.5150	1.6643
15°	.2588	.9659	.2679	60°	.8660	.5000	1.7321
16°	.2756	.9613	.2867	61°	.8746	.4848	1.8040
17°	.2924	.9563	.3057	62°	.8829	.4695	1.8807
18°	.3090	.9511	.3249	63°	.8910	.4540	1.9626
19°	.3256	.9455	.3443	64°	.8988	.4384	2.0503
20°	.3420	.9397	.3640	65°	.9063	.4226	2.1445
21°	.3584	.9336	.3839	66°	.9135	.4067	2.2460
22°	.3746	.9272	.4040	67°	.9205	.3907	2.3559
23°	.3907	.9205	.4245	68°	.9272	.3746	2.4751
24°	.4067	.9135	.4452	69°	.9336	.3584	2.6051
25°	.4226	.9063	.4663	70°	.9397	.3420	2.7475
26°	.4384	.8988	.4877	71°	.9455	.3256	2.9042
27°	.4540	.8910	.5095	72°	.9511	.3090	3.0777
28°	.4695	.8829	.5317	73°	.9563	.2924	3.2709
29°	.4848	.8746	.5543	74°	.9613	.2756	3.4874
30°	.5000	.8660	.5774	75°	.9659	.2588	3.7321
31°	.5150	.8572	.6009	76°	.9703	.2419	4.0108
32°	.5299	.8480	.6249	77°	.9744	.2250	4.3315
33°	.5446	.8387	.6494	78°	.9781	.2079	4.7046
34°	.5592	.8290	.6745	79°	.9816	.1908	5.1446
35°	.5736	.8192	.7002	80°	.9848	.1736	5.6713
36°	.5878	.8090	.7265	81°	.9877	.1564	6.3138
37°	.6018	.7986	.7536	82°	.9903	.1392	7.1154
38°	.6157	.7880	.7813	83°	.9925	.1219	8.1443
39°	.6293	.7771	.8098	84°	.9945	.1045	9.5144
40°	.6428	.7660	.8391	85°	.9962	.0872	11.4301
41°	.6561	.7547	.8693	86°	.9976	.0698	14.3007
42°	.6691	.7431	.9004	87°	.9986	.0523	19.0811
43°	.6820	.7314	.9325	88°	.9994	.0349	28.6363
44°	.6947	.7193	.9657	89°	.9998	.0175	57.2900
45°	.7071	.7071	1.0000	90°	1.0000	.0000	



The University of the State of New York  
REGENTS HIGH SCHOOL EXAMINATION

**TENTH YEAR MATHEMATICS**

Thursday, January 22, 1981 — 1:15 to 4:15 p.m., only

**ANSWER SHEET**

Part I Score: .....

Rater's Initials:

.....

Pupil.....Teacher.....

School.....

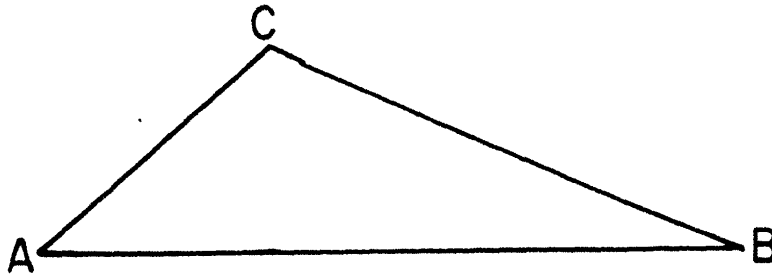
Name and author of textbook used.....

Your answers to Part I should be recorded on this answer sheet.

**Part I**

Answer all questions in this part.

- |         |         |   |
|---------|---------|---|
| 1.....  | 11..... | 21.....   |
| 2.....  | 12..... | 22.....   |
| 3.....  | 13..... | 23.....   |
| 4.....  | 14..... | 24.....   |
| 5.....  | 15..... | 25.....   |
| 6.....  | 16..... | 26.....   |
| 7.....  | 17..... | 27.....   |
| 8.....  | 18..... | 28.....   |
| 9.....  | 19..... | 29.....   |
| 10..... | 20..... | 30 Answer question 30 on the other<br>side of this sheet. |



Your answers for Part II should be placed on paper provided by the school.

The declaration below should be signed when you have completed the examination.

I do hereby affirm, at the close of this examination, that I had no unlawful knowledge of the questions or answers prior to the examination, and that I have neither given nor received assistance in answering any of the questions during the examination.

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Signature



# FOR TEACHERS ONLY

# 10

## SCORING KEY

## TENTH YEAR MATHEMATICS

Thursday, January 22, 1981 — 1:15 to 4:15 p.m., only

Use only *red* ink or *red* pencil in rating Regents papers. Do not attempt to *correct* the pupil's work by making insertions or changes of any kind. Use checkmarks to indicate pupil errors.

Unless otherwise specified, mathematically correct variations in the answers will be allowed. Units need not be given when the wording of the questions allows such omissions.

### Part I

Allow 2 credits for each correct answer; allow no partial credit. For questions 15–29, allow credit if the pupil has written the correct answer instead of the numeral 1, 2, 3, or 4.

(1) 120	(11) $5\sqrt{3}$ or $\sqrt{75}$	(21) 2
(2) 90	(12) 20	(22) 4
(3) 105	(13) $\sqrt{13}$	(23) 1
(4) 15	(14) 4	(24) 1
(5) 15	(15) 2	(25) 3
(6) $8\pi$	(16) 1	(26) 4
(7) $\overline{PQ}$ or $PQ$ or $r$	(17) 2	(27) 4
(8) 6	(18) 3	(28) 1
(9) 2	(19) 1	(29) 2
(10) 6	(20) 1	

[OVER]

TENTH YEAR MATHEMATICS — *concluded*

Part II

Please refer to the Department's pamphlet *Suggestions on the Rating of Regents Examination Papers in Mathematics*. Care should be exercised in making deductions as to whether the error is purely a mechanical one or due to a violation of some principle. A mechanical error generally should receive a deduction of 10 percent, while an error due to a violation of some cardinal principle should receive a deduction ranging from 30 percent to 50 percent, depending on the relative importance of the principle in the solution of the problem.

(33)  $a$  150 [2]

$b$  70 [2]

$c$  90 [2]

$d$  15 [2]

$e$  55 [2]

(35)  $a$  11 [6]

$b$  396 [4]

(37)  $a$   $\frac{1}{3}$  [2]

$b$  3 [3]