The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

TENTH YEAR MATHEMATICS

Tuesday, January 28, 1986—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.

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

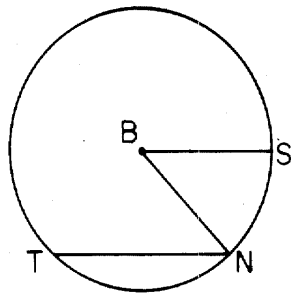
Answer all questions in this part. Each correct answer will receive 2 credits. No partial credit will be allowed. Unless otherwise specified, answers may be left in terms of π or in radical form. Write your answers in the spaces provided on the separate answer sheet. [60]

1 If each interior angle of a regular polygon has a measure of 90°, find the total number of sides of the polygon.

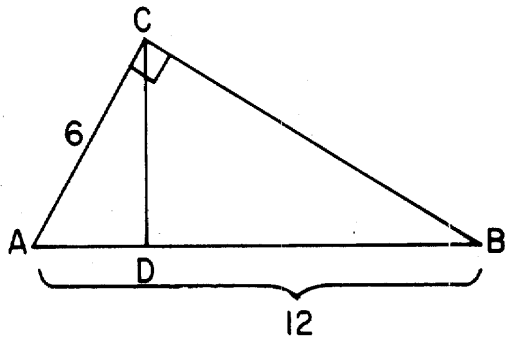
2 The length of diameter $\overline{AB}$ of circle O is 10. What is the maximum distance from a point on the circle to $\overline{AB}$?

3 In parallelogram $RSTW$, the measure of an exterior angle at R is 115°. What is $m\angle T$?

4 In the accompanying diagram of circle B, chord $\overline{TN}$ is parallel to radius $\overline{BS}$. If $m\angle N = 48$, what is $m\widehat{NS}$?

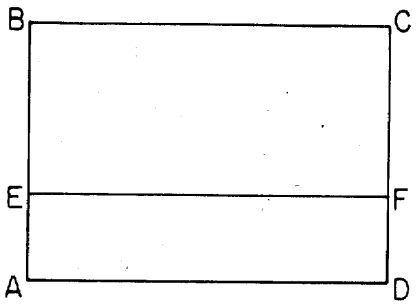


5 In the accompanying diagram of right triangle ABC, the right angle is at C and $\overline{CD} \perp \overline{ADB}$. If $AB = 12$ and $AC = 6$, find AD.

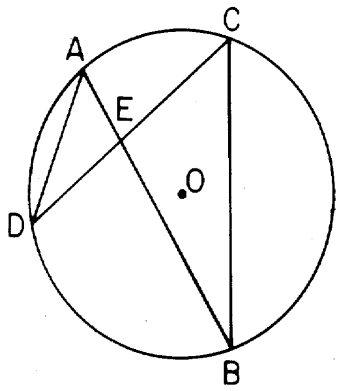


6 In rhombus $ABCD$, $AC = 9$ and $BD = 10$. Find the area of rhombus $ABCD$.

7 In the accompanying diagram, rectangles $ABCD$ and $AEFD$ have common base $\overline{AD}$. The ratio of the lengths of altitudes $\overline{EA}$ and $\overline{BA}$ is 1:3. What is the ratio of the area of rectangle $AEFD$ to the area of rectangle $ABCD$?



8 In the accompanying diagram of circle O, chords $\overline{AB}$ and $\overline{CD}$ intersect at E. Chords $\overline{AD}$ and $\overline{BC}$ are drawn. If $AD = 4$, $DE = 3$, $EB = 6$, and $AE = 2$, find BC.

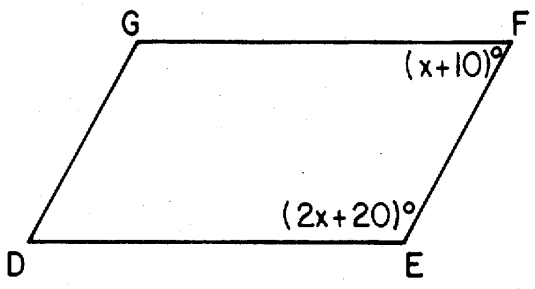


9 If the points $A(2,a)$ and $B(5,8)$ determine a line with slope $\frac{2}{3}$, find the value of a.

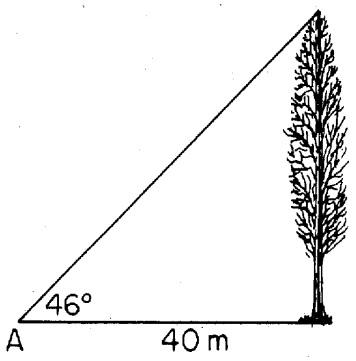
10 What is the area of the triangle whose vertices are $A(0,0)$, $B(-10,0)$, and $C(0,-6)$?

11 Find, in radical form, the distance between (2,1) and (−1,3).

12 In the accompanying diagram of parallelogram $DEFG$, $m\angle E = 2x + 20$ and $m\angle F = x + 10$. Find the number of degrees in the measure of angle G.

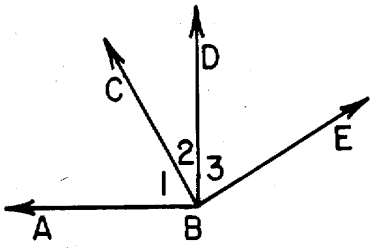


13 In the accompanying figure, the measure of the angle of elevation from A to the top of the tree is 46°. If A is 40 meters from the base of the tree, find the height of the tree to the *nearest meter.*



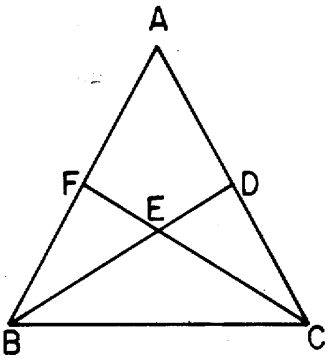
Directions (14 – 29): Write in the space provided on the separate answer sheet the *number* preceding the expression that best completes *each* statement or answers *each* question.

14 In the accompanying diagram, $\overrightarrow{BA} \perp \overrightarrow{BD}$ and $\overrightarrow{BC} \perp \overrightarrow{BE}$. Which statement is true?



(1) $m\angle 1 = m\angle 3$
(2) $m\angle 1 > m\angle 3$
(3) $m\angle 1 + m\angle 2 + m\angle 3 = 180$
(4) $m\angle 1 + m\angle 2 = m\angle 3$

15 In the accompanying diagram of equilateral triangle ABC, $\overline{BD}$ and $\overline{CF}$ are the bisectors of $\angle B$ and $\angle C$, respectively, and intersect at E. What is $m\angle BEC$?



(1) 60
(2) 90
(3) 120
(4) 150

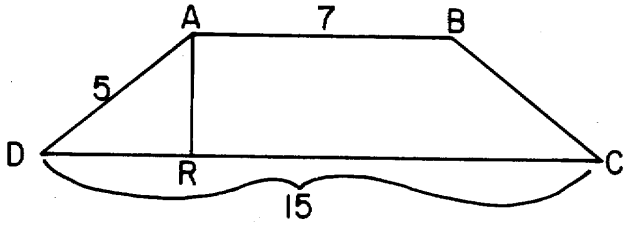
16 Which set of numbers may be the lengths of the sides of a triangle?

(1) {5,4,1}
(2) {5,4,6}
(3) {5,4,9}
(4) {5,4,10}

17 The coordinates of the endpoints of the diameter of a circle are (–1,5) and (3,–1). The center of the circle has coordinates

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

18 In the accompanying diagram, $ABCD$ is an isosceles trapezoid with bases $\overline{AB}$ and $\overline{DC}$. If $AB = 7$, $DC = 15$, and $AD = 5$, what is the length of altitude $\overline{AR}$?

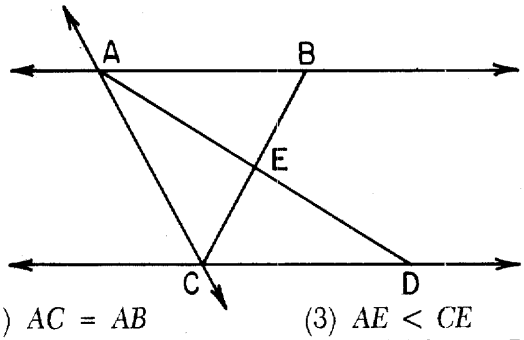


(1) 8
(2) 2.5
(3) 3
(4) 4

19 What is the length of an altitude of an equilateral triangle whose perimeter is 12?

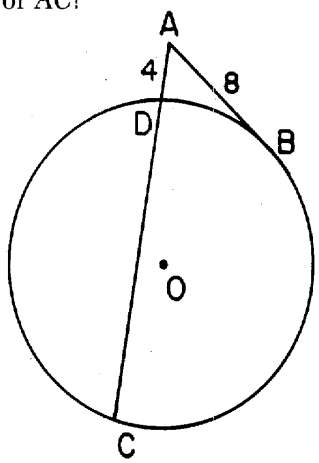
(1) 6
(2) 2
(3) $2\sqrt{2}$
(4) $2\sqrt{3}$

20 In the accompanying diagram, parallel lines $\overleftrightarrow{AB}$ and $\overleftrightarrow{CD}$ are cut by transversal $\overleftrightarrow{AC}$. Segments $\overline{BC}$ and $\overline{AD}$ intersect at E, and $m\angle BAC < m\angle ACD$. If $\overline{CB}$ bisects $\angle ACD$ and $\overline{AD}$ bisects $\angle BAC$, then which statement is true?



(1) $AC = AB$
(2) $AD < CD$
(3) $AE < CE$
(4) $\angle DAC > \angle BCD$

21 In the accompanying diagram, secant $\overline{ADC}$ and tangent $\overline{AB}$ are drawn to circle O from external point A. If $AB = 8$ and $AD = 4$, what is the length of $\overline{AC}$?



(1) 16
(2) 12
(3) 8
(4) 4

22 The locus of points in a plane at a given distance from a given point is
(1) one point
(2) one line
(3) a pair of lines
(4) a circle

23 A regular hexagon with an apothem of 3 centimeters circumscribes a circle. What is the area of the circle in square centimeters?
(1) 6π
(2) 9π
(3) 12π
(4) $18\sqrt{3}$

24 Which statement is *always* true?
(1) If two polygons are similar, then they are equal in area.
(2) If two polygons are equal in area, then they are congruent.
(3) If two polygons are congruent, then they are equal in area.
(4) If two polygons are equal in area, then they are similar.

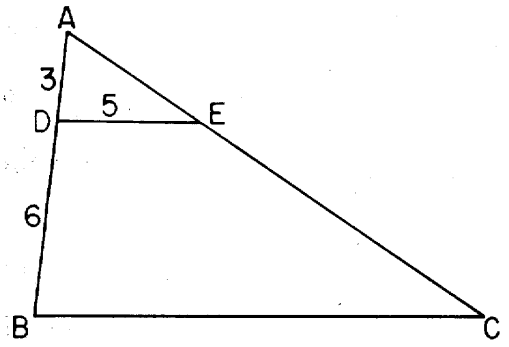
25 Given the statement, "If John is a member of the mathematics team, then he has passed tenth year mathematics." What is the converse of this statement?
(1) If John is not a member of the mathematics team, then he has not passed tenth year mathematics.
(2) If John has not passed tenth year mathematics, then he is not a member of the mathematics team.
(3) If John is a member of the mathematics team, then he has passed tenth year mathematics.
(4) If John has passed tenth year mathematics, then he is a member of the mathematics team.

26 In a right triangle, the altitude to the hypotenuse divides the triangle into two triangles that are *always*
(1) congruent
(2) similar
(3) equal in area
(4) equal in perimeter

27 Rectangle $ABCD$ is inscribed in a circle whose radius is 5. If $AB = 6$, what is the length of $\overline{BC}$?
(1) 8
(2) 10
(3) 3
(4) 6

28 Which statement *must* be true?
(1) If a parallelogram is not a rectangle, then it is not a square.
(2) If a parallelogram is not a square, then it is not a rectangle.
(3) All rectangles are squares.
(4) If a parallelogram is a rectangle, then it is a square.

29 In the accompanying diagram of $\triangle ABC$, $\overline{DE}$ is parallel to $\overline{BC}$. If $AD = 3$, $DB = 6$, and $DE = 5$, what is the length of $\overline{BC}$?



(1) 10
(2) 12
(3) 15
(4) 2.5

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

30 *On the answer sheet*, locate by construction the point on minor arc AB of circle O which is equidistant from points A and B.

☞ **GO RIGHT ON TO THE NEXT PAGE.**

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. [40]

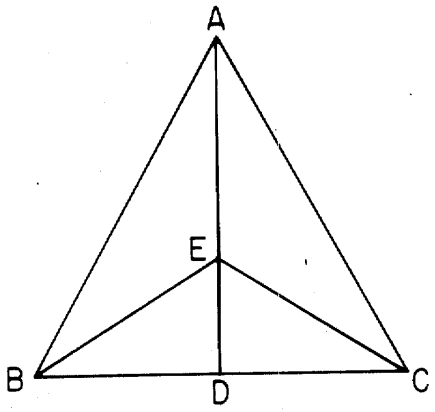
31 Prove either *a* or *b* but *not* both.

a If the three angles of one triangle are congruent to the three angles of another triangle, the triangles are similar. [10]

OR

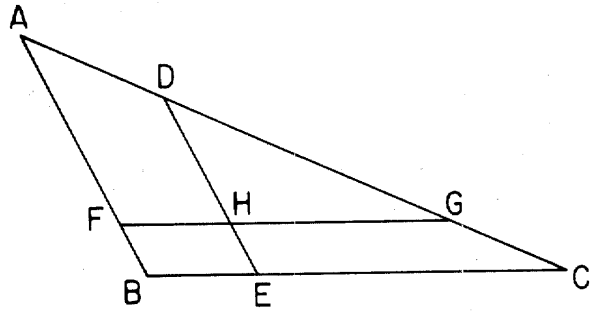
b The area of a parallelogram is equal to the product of the length of one side and the length of the altitude drawn to that side. [10]

32 Given: $\triangle ABC$, $\overline{AED}$, $\overline{BDC}$, $\overline{AB} \cong \overline{AC}$, and $\overline{EB} \cong \overline{EC}$.



Prove: $\overline{AD}$ bisects $\overline{BC}$. [10]

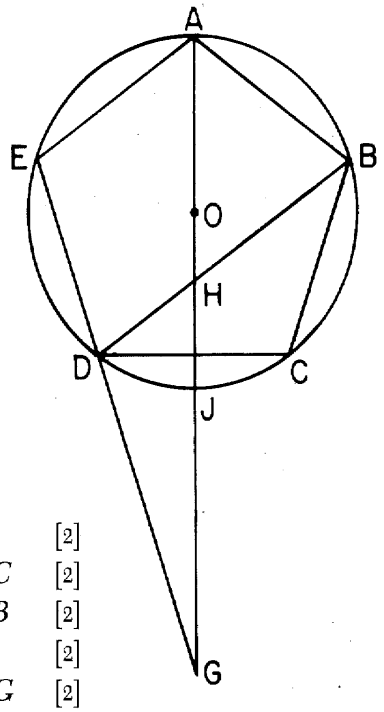
33 Given: $\triangle ABC$, $\overline{DE} \parallel \overline{AB}$ and $\overline{FG} \parallel \overline{BC}$, $\overline{DE}$ and $\overline{FG}$ intersect at H, $\overline{AFB}$, $\overline{BEC}$, $\overline{CGDA}$.



a Prove: $\frac{DH}{AB} = \frac{HG}{BC}$ [7]

b If $DG{:}AC = 2{:}3$ and $DH = 6$, find AB. [3]

34 Regular pentagon $ABCDE$ is inscribed in circle O. Diameter $\overline{AHJ} \perp \overline{DC}$. Segments $\overline{AHJ}$ and $\overline{ED}$ are extended and intersect at external point G.



Find: *a* $m\overset{\frown}{BC}$ [2]

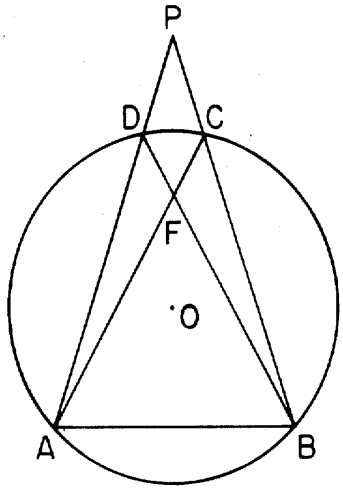
b $m\angle BDC$ [2]

c $m\angle AHB$ [2]

d $m\angle G$ [2]

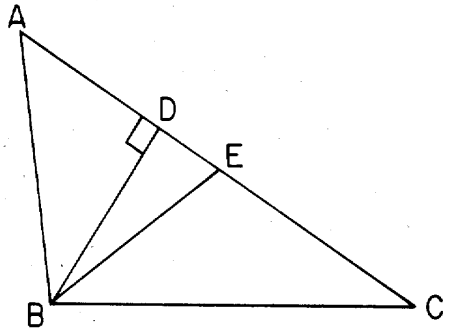
e $m\angle CDG$ [2]

35 Given: secants $\overline{PDA}$ and $\overline{PCB}$ are drawn to circle O, $\overline{PDA} \cong \overline{PCB}$, chords $\overline{AC}$ and $\overline{BD}$ intersect at F.



Prove: $\overline{FC} \cong \overline{FD}$ [10]

36 Given: $\triangle ABC$, $\overline{BD}$ is the altitude to $\overline{AC}$, $\overline{BE}$ is the the median to $\overline{AC}$, $m\angle ABD = 50$, $AB = 10$, and $AC = 20$.



a Find the length of $\overline{AD}$ to the *nearest integer*. [4]

b Find the length of $\overline{BD}$ to the *nearest integer*. [4]

c Using the result in part *b*, find the area of $\triangle ABE$. [2]

*37 The coordinates of the vertices of $\triangle ABC$ are $A(3,3)$, $B(7,7)$, and $C(7,-1)$.

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

b Write an equation of the line which passes through B and is parallel to $\overline{AC}$. [3]

c If circle O is circumscribed about $\triangle ABC$, find the coordinates of O. [2]

*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

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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	

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REGENTS HIGH SCHOOL EXAMINATION

TENTH YEAR MATHEMATICS

Tuesday, January 28, 1986—9:15 a.m. to 12:15 p.m., only

Part I Score	
Part II Score	
Total	
Rater's Initials:	

ANSWER SHEET

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

School .....

Name and author of textbook used .....

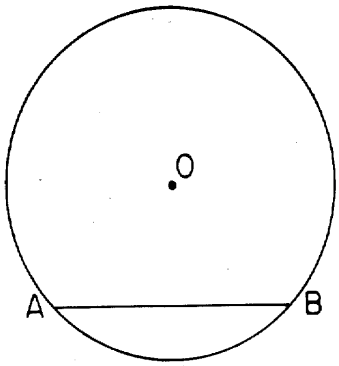
Your answers to Part I should be recorded on this answer sheet.

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 side of this sheet.

30



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.

_____

Signature

FOR TEACHERS ONLY

10

SCORING KEY

TENTH YEAR MATHEMATICS

Tuesday, January 28, 1986—9:15 a.m. to 12:15 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 14 – 29, allow credit if the pupil has written the correct answer instead of the numeral 1, 2, 3, or 4.

(1) 4

(2) 5

(3) 65

(4) 48

(5) 3

(6) 45

(7) 1:3 *or* $\frac{1}{3}$

(8) 8

(9) 6

(10) 30

(11) $\sqrt{13}$

(12) 120

(13) 41

(14) 1

(15) 3

(16) 2

(17) 2

(18) 3

(19) 4

(20) 1

(21) 1

(22) 4

(23) 2

(24) 3

(25) 4

(26) 2

(27) 1

(28) 1

(29) 3

(30) construction

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) *b* 9 [3]

(34) *a* 72 [2]
b 36 [2]
c 54 [2]
d 18 [2]
e 72 [2]

(36) *a* 8 [4]
b 6 [4]
c 30 [2]

(37) *b* $y - 7 = -1(x - 7)$
or
$y = -x + 14$ [3]

c (7,3)
or
$x = 7$
$y = 3$ [2]