# TENTH YEAR MATHEMATICS

Tuesday, August 18, 1981 — 8:30 to 11:30 a.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**

*37*

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 figures, $\triangle ABC \cong \triangle DEF$. If $m\angle C = 90$, $m\angle F = 90$, $AC = 12$, $BC = 5$, $AB = 13$, and $EF = 5$, find $ED$.
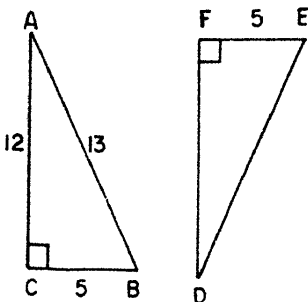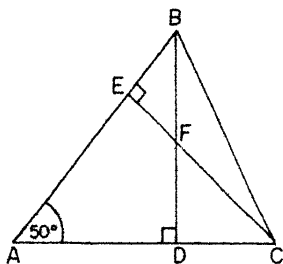


2 The lengths of the three sides of a triangle are 8, 20, and 24. The length of the longest side of a similar triangle is 12. Find the perimeter of the *smaller* triangle.

3 In the accompanying diagram, $ABCD$ is a parallelogram with altitude $\overline{DE}$ drawn to side $\overline{AB}$. If $DE = AE$, find $m\angle A$.
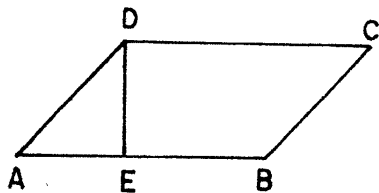


4 In triangle $ABC$, the measure of an exterior angle at $A$ is $80°$ and the measure of an exterior angle at $B$ is $160°$. What is the number of degrees in the measure of an exterior angle at $C$?

5 In the accompanying diagram of triangle $ABC$, $\overline{BD} \perp \overline{ADC}$, $\overline{CE} \perp \overline{AEB}$, and $\overline{CE}$ intersects $\overline{BD}$ at $F$. If $m\angle EAD = 50$, find $m\angle BFE$.



6 The bases of a trapezoid have lengths 6 and 12. What is the length of the median of the trapezoid?

7 The circumference of a circle is $16\pi$. Express the area of the circle in terms of $\pi$.

8 The measures of the acute angles of a right triangle are in the ratio 1:4. What is the number of degrees in the measure of the *smaller* angle?

9 The radius of a circle is ten times the radius of a smaller circle. What is the ratio of the diameter of the smaller circle to the diameter of the larger circle?

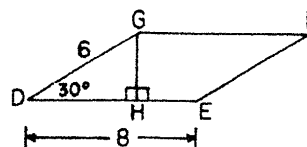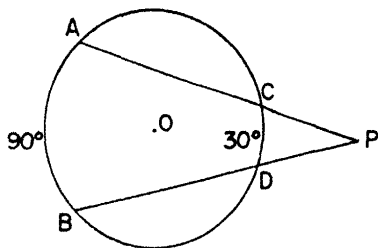10 In the accompanying diagram, regular polygon $ABCDE$ is inscribed in circle $O$. Find $m\angle AOB$.
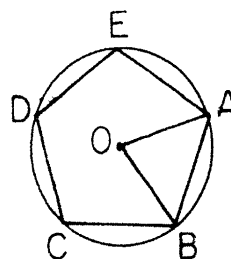


11 In the accompanying diagram, chord $\overline{AB} \cong$ chord $\overline{CB}$. If $m\angle B = 40$, find $m\overparen{BC}$.
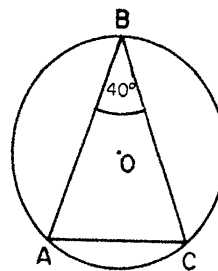


12 In the accompanying diagram, $\overline{GH}$ is an altitude of parallelogram $DEFG$, $DG = 6$, $DE = 8$, and $m\angle D = 30$. What is the area of the parallelogram?

13 In the accompanying figure, $\overline{PCA}$ and $\overline{PDB}$ are secants. If $m\overgroup{CD} = 30$ and $m\overgroup{AB} = 90$, find $m\angle APB$.



14 How many degrees are there in the measure of each exterior angle of a regular polygon with 8 sides?

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

15 If the lengths of the legs of a right triangle are 2 and 5, what is the length of the hypotenuse of the triangle?
(1) 29
(3) $\sqrt{21}$
(2) $\sqrt{29}$
(4) 7

16 The sum of the measures of two angles of a triangle is 160°. One of these angles is three times the other. What is the number of degrees in the *smallest* angle of the triangle?
(1) 35
(3) 20
(2) 25
(4) 15

17 Tangent $\overline{PA}$ and secant $\overline{PBC}$ are drawn to circle $O$ from external point $P$ and chord $\overline{AB}$ is drawn. If $m\overgroup{AC} = 2m\overgroup{AB}$, what is the ratio of $m\angle PAB$ to $m\angle ABC$?
(1) 1:1
(3) 3:2
(2) 1:2
(4) 1:4

18 In the accompanying figure, $\overleftrightarrow{ACE}$ is a straight line. If $m\angle ACB = 2x$, $m\angle BCD = 3x$, and $m\angle DCE = x + 30$, what is $m\angle BCE$?
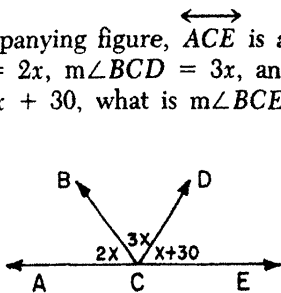


(1) 50
(3) 125
(2) 55
(4) 130

19 A right triangle is inscribed in a circle whose diameter has a length of 10. The lengths of the legs of this triangle could be equal to
(1) 1 and 4
(3) 3 and 4
(2) $\sqrt{2}$ and $\sqrt{3}$
(4) 6 and 8

20 Which statement is true?
(1) All parallelograms are quadrilaterals.
(2) All parallelograms are rectangles.
(3) All quadrilaterals are trapezoids.
(4) All trapezoids are parallelograms.

21 The ratio of the sides of two similar regular polygons is 1:2. If the area of the smaller polygon is 9, what is the area of the larger polygon?
(1) 6
(3) 24
(2) 12
(4) 36

22 The coordinates of three of the vertices of parallelogram $EFGH$ are $E(2,3)$, $F(0,0)$, and $G(6,0)$. The coordinates of H are
(1) (8,3)
(3) (6,3)
(2) (7,3)
(4) (5,3)

23 What is the slope of the line whose equation is $y = 2x - 4$?
(1) $-2$
(3) $-\frac{1}{2}$
(2) 2
(4) $\frac{1}{2}$

24 Which is the converse of the statement, "If a building is a church, then it is painted white"?
(1) If a building is painted white, then it is a church.
(2) If a building is not a church, then it is not painted white.
(3) If a building is not painted white, then it is not a church.
(4) If a building is not a church, then it is painted white.

25 A line which is perpendicular to the $y$-axis contains the point (3,4). This line also contains the point
(1) (0,3)
(3) (3,0)
(2) (0,4)
(4) (4,0)

26 In triangle $ABC$, $\sin A = \frac{1}{2}$ and $m\angle C = 90$. What is $m\angle A$?
(1) 30
(3) 60
(2) 45
(4) 90

*39*

27 In the accompanying diagram, circle $O$, chord $\overline{ACB}$, $\overline{OC} \perp \overline{AB}$, $OC = 12$ centimeters, and $OB = 15$ centimeters. What is the number of centimeters in the length of $\overline{AB}$?
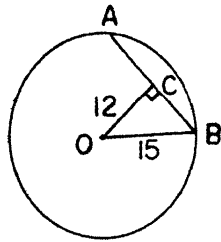


(1) 27  
(2) 18  
(3) 3  
(4) 9  

28 If the length of a leg of an isosceles right triangle is 8, the area of the triangle is

(1) 8  
(2) 16  
(3) 32  
(4) 64  

29 A circle whose center is at the point $(1,2)$ passes through the point $(4,-2)$. What is the length of the radius of the circle?

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

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

30 *On the answer sheet*, locate by construction the center of the circle that can be circumscribed about given triangle $ABC$.

40

## Part II

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

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

    *a* The square of the length of the hypotenuse of a right triangle is equal to the sum of the squares of the lengths of the legs.   [10]
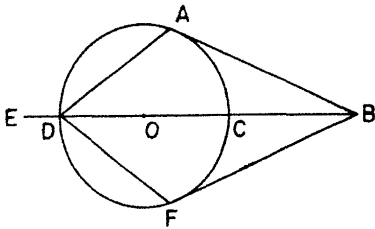
### OR

    *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 In the accompanying diagram, $\overline{BA}$ and $\overline{BF}$ are tangent to circle $O$ at $A$ and $F$, respectively, chord $\overline{DA} \cong$ chord $\overline{DF}$, $\overline{BCODE}$ is a secant, and $m\overparen{AD} : m\overparen{AC} = 3:2$.



Find:

  *a* $m\overparen{AC}$   [2]
  *b* $m\angle ADC$   [2]
  *c* $m\angle FDE$   [2]
  *d* $m\angle ABF$   [2]
  *e* $m\angle BFD$   [2]

33 Triangle $ABC$ has coordinates $A(2,5)$, $B(9,8)$, and $C(7,2)$. Find the area of triangle $ABC$.   [10]

34 Given: $V$ is a point on $\overline{ST}$ such that $\overline{RVW}$ bisects $\angle SRT$ and $\overline{TW} \cong \overline{TV}$.
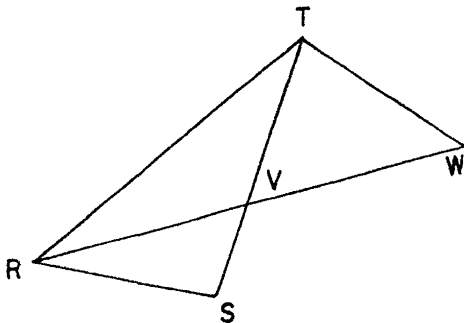


Prove: $RW \times SV = RV \times TW$   [10]

35 Given: isosceles trapezoid $ABCD$ with $\overline{AB}$ parallel to $\overline{CD}$, $\angle A \cong \angle B$, and $E$ and $F$ are midpoints of $\overline{AB}$ and $\overline{CD}$, respectively.
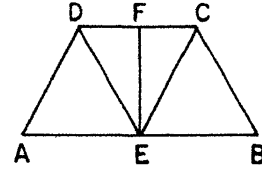


Prove: *a* $\overline{ED} \cong \overline{EC}$   [4]
       *b* $\overline{EF} \perp \overline{CD}$   [6]

36 Given: $\triangle ABC$, $\overline{BDC}$, and $\overline{AD}$ bisects $\angle CAB$.
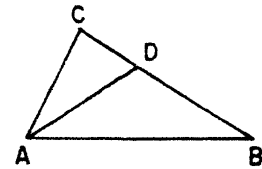


Prove: $AB > BD$   [10]

37 A regular polygon of 10 sides is inscribed in a circle whose radius has length 12.

    *a* Find to the *nearest tenth* the length of the apothem of the polygon.   [4]
    *b* Find to the *nearest tenth* the length of a side of the polygon.   [4]
    *c* Using the results from parts *a* and *b*, find to the *nearest integer* the area of the polygon.   [2]

42

43

44

## 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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# TENTH YEAR MATHEMATICS

Tuesday, August 18, 1981 — 8:30 to 11:30 a.m., only

Part I Score: ...............................

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.** |

47
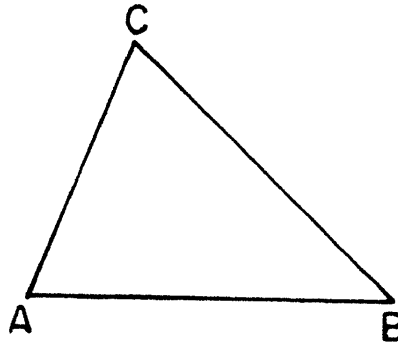
Your answers for Part II should be placed on paper provided by the school.

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

48

# FOR TEACHERS ONLY

SCORING KEY

## 10

## TENTH YEAR MATHEMATICS

Tuesday, August 18, 1981 — 8:30 to 11:30 a.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) 13 | (11) 140 | (21) 4 |
| (2) 26 | (12) 24 | (22) 1 |
| (3) 45 | (13) 30 | (23) 2 |
| (4) 120 | (14) 45 | (24) 1 |
| (5) 50 | (15) 2 | (25) 2 |
| (6) 9 | (16) 3 | (26) 1 |
| (7) $64\pi$ | (17) 2 | (27) 2 |
| (8) 18 | (18) 4 | (28) 3 |
| (9) 1:10 *or* $\frac{1}{10}$ | (19) 4 | (29) 4 |
| (10) 72 | (20) 1 | |

## 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.

| | | | | | | |
|---|---|---|---|---|---|---|
| (32) | *a* | 72 | [2] | (37) | *a* | 11.4 | [4] |

(32)   *a*   72   [2]
      *b*   36   [2]
      *c*   144   [2]
      *d*   36   [2]
      *e*   126   [2]

(37)   *a*   11.4   [4]
      *b*   7.4   [4]
      *c*   422   [2]

(33) 18   [10]