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

# TENTH YEAR MATHEMATICS

Tuesday, June 21, 1983 — 1:15 to 4:15 p.m., only

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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**

Arranged by

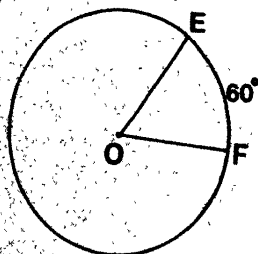
Part I

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  $\triangle ABC$ ,  $\overline{AC} \cong \overline{BC}$ . If  $m\angle A = 50$ , find  $m\angle C$ .

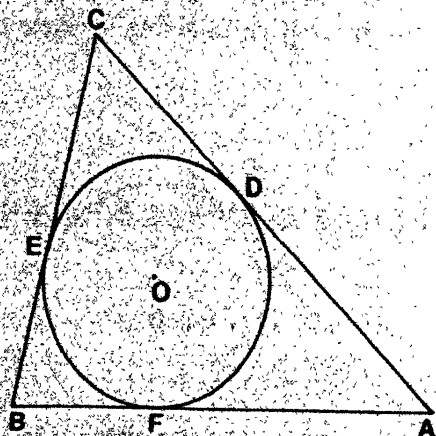
2 The lengths of the corresponding sides of two similar polygons are 3 and 4, respectively. If the perimeter of the smaller polygon is 18, find the perimeter of the larger polygon.

3 In the accompanying diagram, radii  $\overline{OE}$  and  $\overline{OF}$  of circle  $O$  intercept an arc of  $60^\circ$ . Find  $m\angle EOF$ .



4 Find the number of degrees in the measure of the angle formed by radius  $\overline{OA}$  of circle  $O$  and tangent  $\overline{PA}$  drawn to the circle.

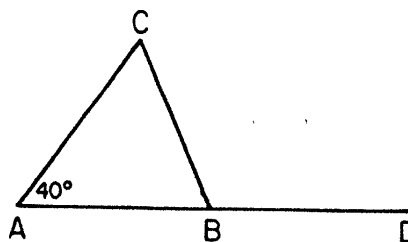
5 In the diagram below, circle  $O$  is inscribed in triangle  $ABC$ . If  $AB = 6$ ,  $AF = 4$ , and  $EC = 3$ , what is the perimeter of triangle  $ABC$ ?



6 In an isosceles right triangle, the length of a leg is 3. Find, in radical form, the length of the hypotenuse.

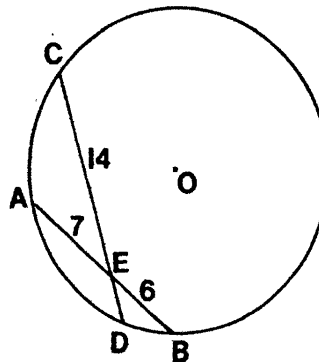
7 If the radius of a circle is multiplied by two, by what number will the circumference of the circle be multiplied?

8 In the accompanying diagram of triangle  $ABC$ ,  $\overline{ABD}$ ,  $\overline{AB} \cong \overline{AC}$ , and  $m\angle CAB = 40$ . Find  $m\angle CBD$ .



9 What is the measure in degrees of each central angle of a regular 15-sided polygon?

10 In the accompanying diagram of circle  $O$ , chords  $\overline{AB}$  and  $\overline{CD}$  intersect at point  $E$ . If  $AE = 7$ ,  $EB = 6$ , and  $CE = 14$ , find  $ED$ .



11 The diagonals of a rhombus have lengths 4 and 12. What is the area of the rhombus?

360

12 In  $\triangle ABC$ , the coordinates of the vertices are  $A(2,3)$ ,  $B(9,1)$ , and  $C(5,11)$ . If  $\overline{AM}$  is the median drawn from  $A$  to  $\overline{BC}$ , what are the coordinates of  $M$ ?

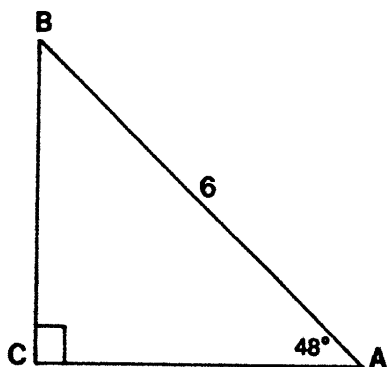
13 In parallelogram  $ABCD$ , the measure of angle  $B$  exceeds the measure of angle  $A$  by  $50^\circ$ . Find  $m\angle C$ .

14 In a circle, an arc measures  $120^\circ$ . If the length of the arc is  $8\pi$ , find the circumference of the circle.

15 In right triangle  $ABC$ ,  $\overline{CD}$  is the altitude drawn to hypotenuse  $\overline{AB}$ . If  $AD = 4$  and  $DB = 9$ , find  $CD$ .

*Directions (16–29): Write in the space provided on the separate answer sheet the numeral preceding the expression that best completes each statement or answers each question.*

16 In the accompanying diagram of right triangle  $ABC$ ,  $m\angle C = 90$ ,  $m\angle A = 48$ , and  $AB = 6$ . What is  $BC$  to the nearest integer?

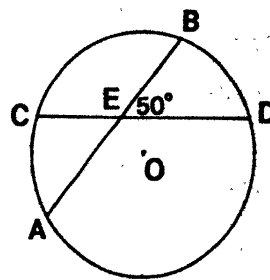


- (1) 8  
(2) 6  
(3) 5  
(4) 4

17 What is the length of a line segment whose endpoints have coordinates  $(-1,-1)$ , and  $(2,3)$ ?

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

18 In the accompanying diagram of circle  $O$ , chord  $\overline{CD}$  intersects chord  $\overline{AB}$  at  $E$ . If  $m\angle BED = 50$ , what is the sum of  $m\widehat{BC}$  and  $m\widehat{DA}$ ?

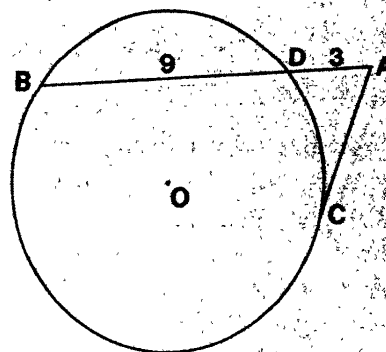


- (1) 50  
(2) 100  
(3) 130  
(4) 260

19 What is the equation of the locus of points that are 4 units above the  $x$ -axis?

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

20 In the accompanying diagram, secant  $\overline{ADB}$  and tangent  $\overline{AC}$  are drawn to circle  $O$  from external point  $A$ . If  $AD = 3$  and  $DB = 9$ , what is the length of  $\overline{AC}$ ?



- (1) 6  
(2)  $\sqrt{6}$   
(3) 27  
(4)  $\sqrt{27}$

21 In  $\triangle ABC$ ,  $m\angle A = 42$  and  $m\angle B = 50$ . Which is *not* true?

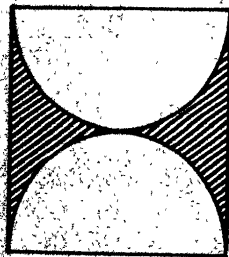
- (1)  $AB > BC$   
(2)  $AC > BC$   
(3)  $AC > AB$   
(4)  $m\angle C > m\angle B$

22 A tangent and a secant drawn to a circle from the same external point  $P$  intercept arcs with measures of  $180^\circ$  and  $70^\circ$ . What is  $m\angle P$ ?

- (1) 35  
(2) 55  
(3) 90  
(4) 125

- 23 In  $\triangle RST$ ,  $X$  is the midpoint of  $\overline{RS}$ ,  $Y$  is the midpoint of  $\overline{ST}$ , and  $Z$  is the midpoint of  $\overline{TR}$ . If  $X$ ,  $Y$ , and  $Z$  are connected to form triangle  $XYZ$ , which statement must be true?
- (1) Triangle  $XYZ$  is congruent to triangle  $RST$ .
  - (2) The perimeter of triangle  $XYZ$  is equal to the perimeter of triangle  $RST$ .
  - (3) Triangle  $XYZ$  is similar to triangle  $RST$ .
  - (4) The area of triangle  $XYZ$  is equal to one-half the area of triangle  $RST$ .

- 24 As shown in the diagram below, two semicircles of radius 2 are drawn in a square. If the length of a side of the square is 4, what is the area of the shaded portion of the figure?



- (1)  $8 - 2\pi$
  - (2)  $8 - 4\pi$
  - (3)  $16 - 2\pi$
  - (4)  $16 - 4\pi$
- 25 The measure of an angle is  $(50 - n)$  degrees. What is the measure in degrees of the complement of the angle?
- (1)  $40 - n$
  - (2)  $40 + n$
  - (3)  $130 - n$
  - (4)  $130 + n$
- 26 What is the slope of the line that passes through the points  $(-3, 2)$  and  $(4, -1)$ ?
- (1)  $\frac{7}{3}$
  - (2)  $-\frac{7}{3}$
  - (3)  $\frac{3}{7}$
  - (4)  $-\frac{3}{7}$

- 27 If two circles are internally tangent, what is the total number of common tangents that can be drawn to the circles?
- (1) 1
  - (2) 2
  - (3) 3
  - (4) 0

- 28 If one angle of a trapezoid is a right angle, how many *additional* right angles must the trapezoid have?
- (1) 1
  - (2) 2
  - (3) 3
  - (4) 0

- 29 What is the inverse of the statement, "If Ann goes to the beach, then she will get a sunburn"?
- (1) If Ann does not get a sunburn, then she **did** not go to the beach.
  - (2) If Ann does not go to the beach, then she will not get a sunburn.
  - (3) If Ann got a sunburn, then she went to the beach.
  - (4) If Ann goes to the beach, then she will **not** get a sunburn.

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

- 30 On the answer sheet, in  $\triangle ABC$ , construct the altitude from  $C$  to  $\overline{AB}$ .

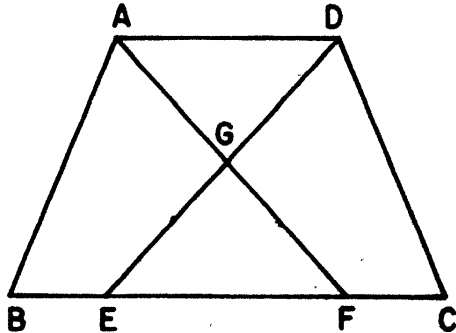
Answers to the following questions are to be written on paper provided by the school.

Part II

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

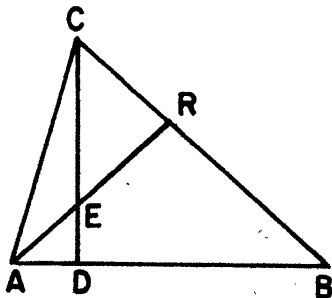
- 31 Prove *either a or b but not both*.  
*a* A diameter perpendicular to a chord of a circle bisects the chord and its arcs. [10]  
 OR  
*b* The measure of an angle formed by two secants is equal to one-half the difference of the measures of the intercepted arcs. [10]

- 32 Given: quadrilateral  $ABCD$ ,  $\overline{BEFC}$ ,  $\overline{BE} \cong \overline{FC}$ ,  $\overline{AF} \cong \overline{DE}$ , and  $\overline{AF}$  and  $\overline{DE}$  bisect each other at  $G$ .



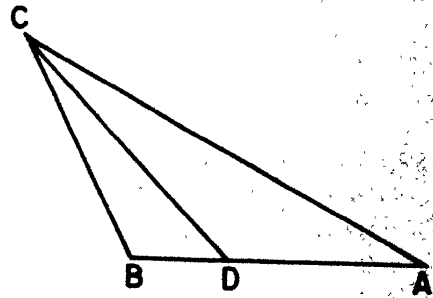
Prove:  $\overline{AB} \cong \overline{DC}$  [10]

- 33 Given:  $\triangle ABC$ ,  $\overline{CD}$  is the altitude to  $\overline{AB}$ ,  $\overline{BRC}$ ,  $\overline{AR} \cong \overline{BR}$ ,  $\overline{AR}$  intersects  $\overline{CD}$  at  $E$ .



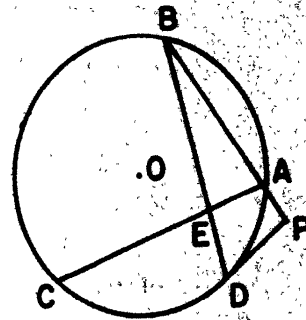
Prove:  $AD \times DC = BD \times DE$  [10]

- 34 Given:  $\triangle ABC$ ,  $\overline{CD}$  intersects  $\overline{AB}$  at  $D$ , and  $\overline{CD}$  bisects  $\angle BCA$ .



Prove:  $CA > DA$  [10]

- 35 In the diagram below, secant  $\overline{PAB}$  and tangent  $\overline{PD}$  are drawn to circle  $O$ , chords  $\overline{BD}$  and  $\overline{AC}$  intersect at  $E$ ,  $\widehat{AB} \cong \widehat{CD}$ ,  $m\widehat{DA} : m\widehat{AB} : m\widehat{BC} = 1:2:4$ .

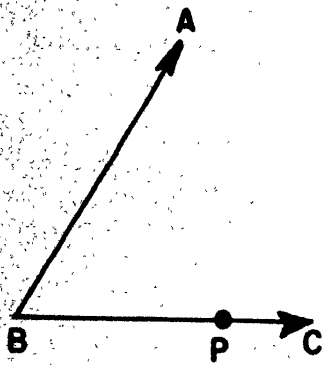


- Find: *a*  $m\widehat{DA}$  [2]  
*b*  $m\angle BAC$  [2]  
*c*  $m\angle AEB$  [2]  
*d*  $m\angle P$  [2]  
*e*  $m\angle PAC$  [2]

➡ GO RIGHT ON TO THE NEXT PAGE



36 In the diagram below, point  $P$  is on  $\overrightarrow{BC}$  of  $\angle ABC$ ,  $BP = 8$ ,  $m\angle ABC = 60$ .



- a Describe fully the locus of points in a plane equidistant from the sides of  $\angle ABC$ . [3]
- b Describe fully the locus of points in a plane  $d$  units from  $P$ . [3]
- c How many points satisfy the conditions in both parts a and b if:
- (1)  $d = 2$  [2]
- (2)  $d = 4$  [2]

\*37 The vertices of a quadrilateral are  $A(1,1)$ ,  $B(-1,k)$ ,  $C(-4,6)$ , and  $D(-2,0)$ .

- a If  $\overline{AB} \parallel \overline{CD}$ , find the value of  $k$ . [4]
- b Show by means of coordinate geometry that  $\overline{AD}$  is perpendicular to  $\overline{CD}$  and state a reason for your conclusion. [3]
- c Write an equation of  $\overleftrightarrow{CD}$ . [3]

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

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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	

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

**TENTH YEAR MATHEMATICS**

Tuesday, June 21, 1983 — 1:15 to 4:15 p.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.

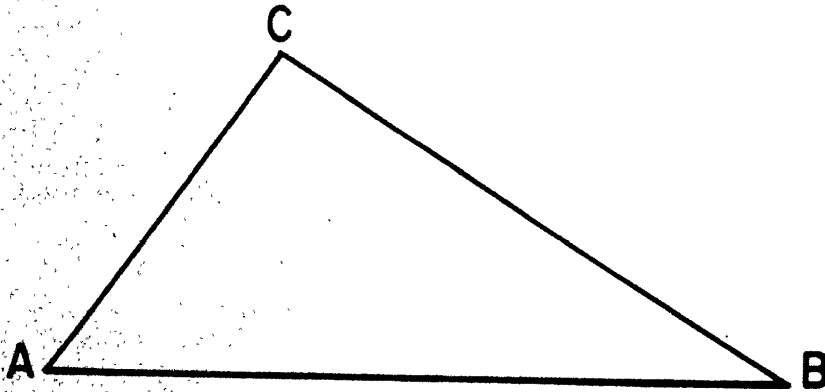
**Part I**

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<br>the other side of this sheet. |

Tear Here

Tear Here



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

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Part II

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# 10

## TENTH YEAR MATHEMATICS

AUG 3 1 1983

Tuesday, June 21, 1983 — 1:15 to 4:15 p.m., only ~~GOVERNMENT~~ DOCUMENTS

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 16–29, allow credit if the pupil has written the correct answer instead of the numeral 1, 2, 3, or 4.

- |                                |  |        |
|--------------------------------|--|--------|
| (1) 80                         | (11) 24  | (21) 3 |
| (2) 24                         | (12) (7,6) or $\begin{matrix} x = 7 \\ y = 6 \end{matrix}$ | (22) 2 |
| (3) 60                         | (13) 65  | (23) 3 |
| (4) 90                         | (14) $24\pi$   | (24) 4 |
| (5) 18                         | (15) 6   | (25) 2 |
| (6) $3\sqrt{2}$ or $\sqrt{18}$ | (16) 4   | (26) 4 |
| (7) 2                          | (17) 2   | (27) 1 |
| (8) 110                        | (18) 4   | (28) 1 |
| (9) 24                         | (19) 4   | (29) 2 |
| (10) 3                         | (20) 1   |        |

[OVER]

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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.

- (35) *a* 40 [2]  
*b* 80 [2]  
*c* 80 [2]  
*d* 100 [2]  
*e* 100 [2]

(37) *a* 7 [4]  
*c*  $y = -3x - 6$  [3]  
*or*  
 $y = -3(x + 2)$   
*or*  
 $y - 6 = -3(x + 4)$

- (36) *a* the angle bisector of  $\angle ABC$  [3]  
*b* a circle with center at *P*  
 having a radius of *d* [3]  
*c* (1) 0 [2]  
 (2) 1 [2]