## REGENTS HIGH SCHOOL EXAMINATION

# ELEVENTH YEAR MATHEMATICS

Friday, June 17, 1966 - 1:15 to 4:15 p.m., only

The last page of the booklet is the answer sheet, which is perforated. Fold the last page along the perforation and then, slowly and carefully, tear off the answer sheet. Now fill in the heading of your answer sheet. When you have finished the heading, you may begin the examination immediately.

#### 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 If a varies directly as b and a = 1.2 when b = 1.5, find a when b = 20.
- 2 Find the value of  $\cos \theta$  if  $\sin \theta = \frac{-3}{5}$  and  $\tan \theta$  is negative.
- 3 Write  $\sin^3 \theta \sin \theta$  as an indicated product of three factors.
- 4 Solve for x in terms of a: 2x + 3y + a = 03x + 3y - 4a = 0
- 5 What is the negative value of tan x which satisfies the equation  $2 \tan^2 x - 3 \tan x - 2 = 0$ ?
- 6 Express  $\frac{a+b}{1-\frac{b}{a+b}}$  in simplest form.
- 7 Find the number of inches in the length of an arc intercepted by a central angle of 3.2 radians in a circle of radius 5.0 inches.
- 8 Express the sum of  $\sqrt{-8}$  and  $2\sqrt{-18}$  as a monomial in terms of the imaginary unit i.
- 9 If  $\log x = 9.8239 10$ , find x.
- 10 Solve for  $x: 4^{x-2} = 1$

- 11 The first three terms of an arithmetic progression are -9, -5 and -1. Write the 20th term.
- 12 Find log cot 42° 14'.
- 13 In triangle ABC, side b = 4, side c = 6 and angle  $B = 30^{\circ}$ . Find the value of sin C.
- 14 Write an equation of the line whose slope is 2 and which passes through the point (3,1).
- 15 In triangle ABC, a = 10 and b = 10. If the area of the triangle is 50, find the number of degrees in angle C.
- 16 In  $\triangle ABC$ , a=3, b=2 and  $\cos C=-\frac{1}{4}$ . Find c.
- 17 Express tan (-220°) as a function of a positive acute angle.
- 18 Find the positive geometric mean between 3a2 and

Directions (19-30): Write in the space provided on the separate answer sheet the number preceding the expression that best completes each statement or answers each question.

- 19 Between  $x = 0^{\circ}$  and  $x = 360^{\circ}$ , the graphs of the equations  $y = \sin x$  and  $y = \cos x$  have in common
  - (1) one point (2) two points
- (3) no points (4) four points
- 20 Which is an example of an identity?
  - (1)  $\tan x \cot x = 1$ (2)  $\sin x \sec x = 1$
- (3)  $\sin x \cos x = 1$ (4)  $\sec x \csc x = 1$

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- 21 If  $\cos \theta = \frac{1}{8}$ , then the positive value of  $\cos \frac{\theta}{2}$  is
  - (1)  $\frac{3}{2}$

 $(3) \frac{9}{16}$ 

(2)  $\frac{\sqrt{7}}{4}$ 

- $(4) \frac{3}{4}$
- 22 The expression  $\frac{\sqrt{3}+1}{\sqrt{3}-1}$  is equivalent to
  - (1) -1

(3)  $2 + \sqrt{3}$ 

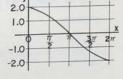
(2) 2

- $(4) \ 5 + \sqrt{3}$
- 23 The graph of the equation 2xy = 7 will lie in quadrant(s)
  - (1) I only
- (3) I and III
- (2) I and II
- (4) II and IV
- 24 In which computation is the distributive law of multiplication with respect to addition used?
  - (1) 5(6)(2) = 5(2)(6) = (10)(6) = 60
  - (2) 83(7) + 83(93) = 83(7 + 93) = 83(100) =
  - (3)  $\sqrt{3600} = (\sqrt{36}) (\sqrt{100}) = (6) (10) = 60$
  - (4) (5+8)+2=5+(8+2)=5+(10)=15
- 25 If the perimeter of a rectangle is x and the length is y, the area expressed in terms of x and y is
  - $(1) \ \frac{x(x-2y)}{2}$
- $(3) \ \frac{x(x-y)}{2}$

 $(2) \ \frac{xy}{2}$ 

 $(4) \ \frac{y(x-2y)}{2}$ 

- 26 If  $2^{a,a_{124}} = x$ , the mantissa of  $\log_2 x$  is
  - (1) .6123
- (3)
- 27 The  $\cos \left[ \frac{\pi}{4} + x \right]$  is equal to
  - (1)  $\frac{1}{2}(\cos x \sin x)$
  - (2)  $\frac{1}{2}(\cos x + \sin x)$
  - $(3) \ \frac{\sqrt{2}}{2} (\cos x \sin x)$
  - $(4) \ \frac{\sqrt{2}}{2} (\cos x + \sin x)$
- 28 Given the equation  $ax^2 + bx + c = 0$ . If  $b^2 < 4ac$ , then the roots of the equation must be
  - (1) real and irrational
- (3) equal
- (2) real and rational
- (4) imaginary
- 29 The accompanying graph is a sketch of
  - $(1) y = \cos \frac{1}{2}x$
  - (2)  $y = \frac{1}{2} \cos x$
  - (3)  $y = 2 \cos \frac{1}{2}x$
  - (4)  $y = 2 \cos 2x$



- 30 In  $\triangle ABC$ ,  $A = \arccos\left(-\frac{\sqrt{3}}{2}\right)$ . Expressed i radians, A equals
  - $(1) \frac{\pi}{6}$

 $(3) \frac{4\pi}{3}$ 

(2)  $\frac{2\pi}{3}$ 

 $(4) \frac{5\pi}{6}$ 

#### Part II

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

31 a In the following equation, solve for sin x to the nearest tenth: [8]

 $4 \sin^2 x = 2 + \sin x$ 

x - 2y = 7

- b How many values of x between 0° and 360° satisfy the equation  $4 \sin^2 x = 2 + \sin x$ ? [2]
- 32 a Solve the following set of equations algebraically and check in both equations: [6, 2]  $2v^2 = x^2 1$ 
  - b [After the letter b on your answer paper, write the number of the expression which correctly completes the statement.] The graph defined by the equation  $2y^2 = x^2 1$  is (1) a parabola (2) a circle (3) an ellipse (4) a hyperbola. [2]
- 33 The radius of the base of a certain right circular cone

is given by the formula  $r = \sqrt{\frac{24}{3.14 \sin 50^{\circ}}}$ .

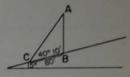
Using logarithms, find the value of r to the nearest tenth. [10]

- 34 Write an equation or a system of equations which can be used to solve each of the following problems. In each case state what the variable or variables represent. [Solution of the equations is not required.]
  - a A pet shop bought a litter of puppies for \$80. All except three were sold, and the total received from the sale was also \$80. If each puppy was sold for \$6 more than was paid for it, how many puppies were there in the litter? [5]
  - b A certain solution of salt and water was 15% salt.
     When 30 pounds of water was evaporated from this solution, it became a 20% salt solution. Find the total number of pounds in the original solution. [5]
- 35 Answer both a and b:
  - a Starting with the formula for  $\cos (x + y)$ , derive the formula for  $\cos 2x$  in terms of  $\sin x$ . [5]
  - b Show that the following equality is an identity: [5]  $\frac{\sin 2\theta}{\tan \theta} = \frac{2}{1 + \tan^2 \theta}$

- 36 Answer either a or b but not both:
  - a A ship sails due west from Harbor A for 20 nautical miles to point B. It then sails in the direction 235° 10′ (S 55° 10′ W) for 22 nautical miles to point C. Find to the nearest nautical mile the distance from A to C. [10]

OR

b A vertical transmitting tower AB, as shown, is located on a slope that is inclined 15° to the horizontal. At a point C, 80 feet down the slope from the foot of



the tower, the tower subtends an angle of 40° 10°. Find to the nearest foot the height of the tower. [10]

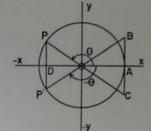
\*37 In the diagram, trigonometric functions of  $\theta$  and of  $-\theta$  are represented by line segments. Angle  $AOP = \theta$  and angle  $AOP' = -\theta$ . The equation of the circle is  $x^2 + y^2 = 1$ , and the equation of line BC is x = 1. Line PDP' is perpendicular to the x-axis at D. From the diagram, select a line segment which represents each of the following: [10]

 $a \sin \theta$ 

 $b \cos \theta$   $c \tan \theta$ 

d cos (-θ)

 $e \tan (-\theta)$ 



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

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

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#### ANSWER SHEET

Pupil	Teacher	
School		
Your answer	s 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
		Part I Score:
		Rater's Initials:
Your answers for	Part II should be placed on paper curp	

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



# FOR TEACHERS ONLY

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#### SCORING KEY

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Use only red ink or 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. In problems involving logarithms, answers should be left correct to four significant digits unless directions say otherwise. 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 19-30, allow credit if the pupil has written the correct answer instead of the number 1, 2, 3 or 4.

- (1) 16
- (2) 4
- (3)  $\sin \theta \ (\sin \theta 1)(\sin \theta + 1)$
- (4) 5a
- $(5) \frac{1}{2}$
- (6) 1
- (7) 16
- (8) 8i\square
- (9) 0.6667
- (10) 2
- (11) 67
- (12) 10.0420 10 or 0.0420
- (13) 3
- (14) y = 2x 5 or y 1 = 2(x 3)
- (15) 90

- (16) 4
- (17) -tan 40° or cot 50°
- (18) 12a2
- (19) 2
- (20) 1
- (21) 4
- (22) 3
- (23) 3
- (24) 2
- (25) 4
- (26) 1
- (27) 3
- (28) 4
- (29) 3
- (30) 4



#### 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.

(34) 
$$a = \text{number of puppies in litter}$$

$$(x - 3) \left(\frac{80}{x} + 6\right) = 80 \quad [5]$$

$$b = \text{number of pounds in original solution}$$

$$0.15x = 0.20 (x - 30) \quad [5]$$