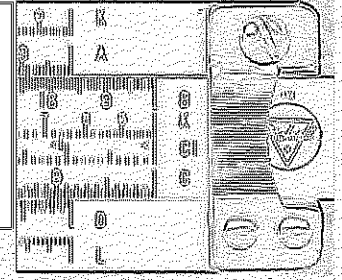
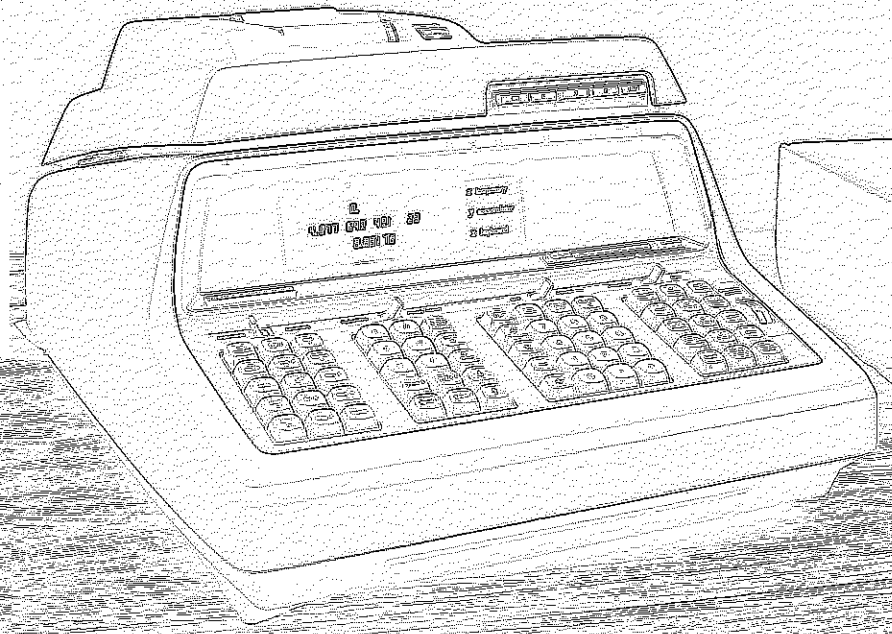
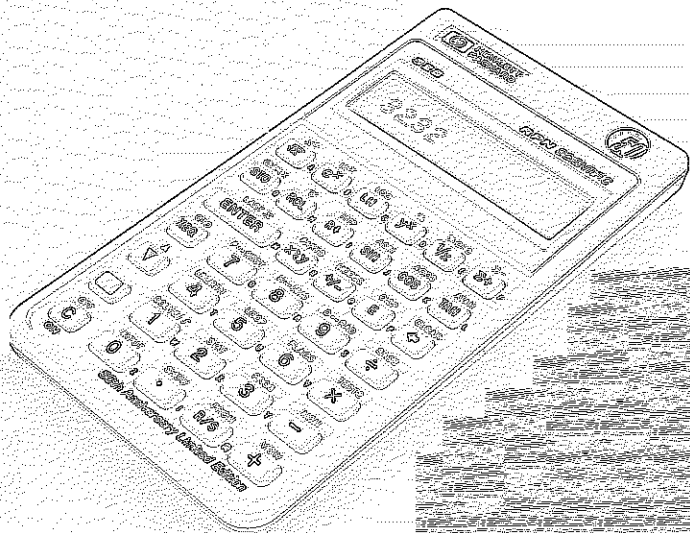
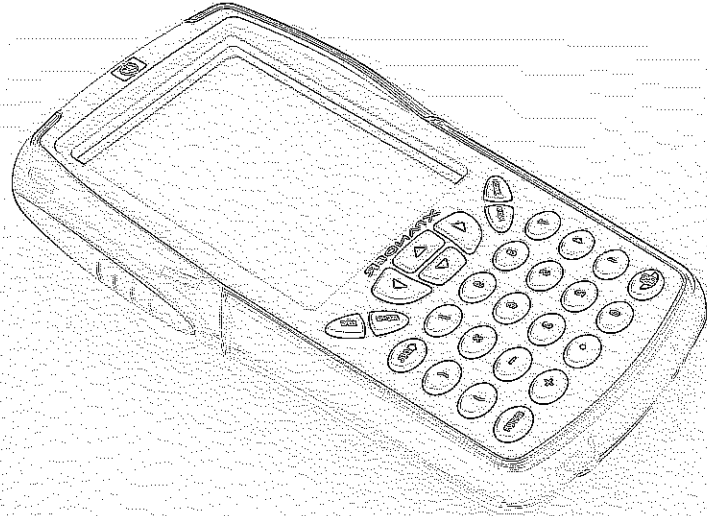
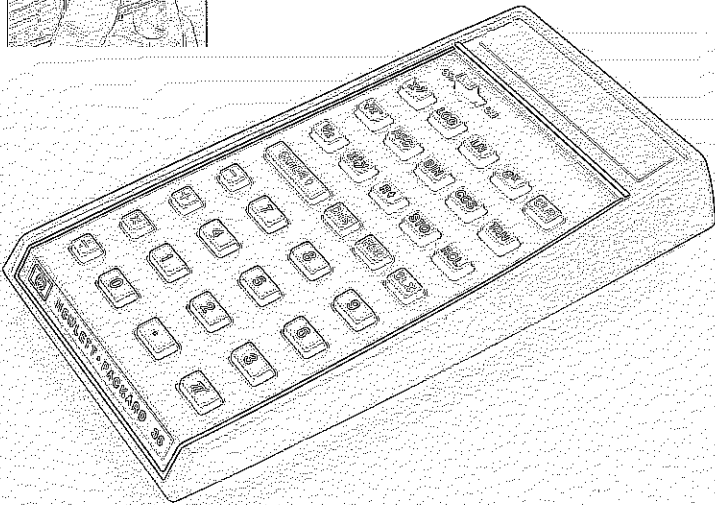
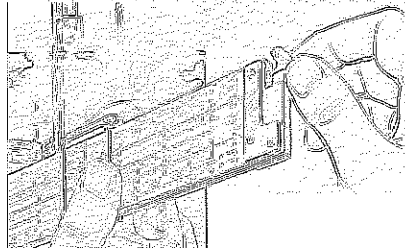
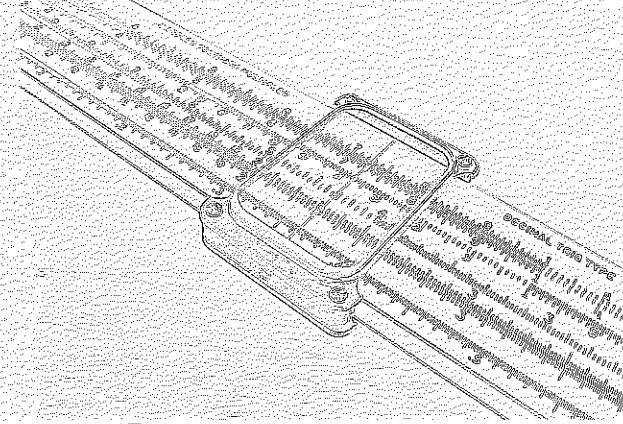
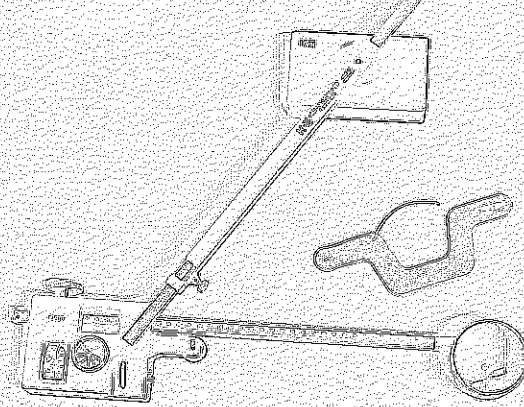
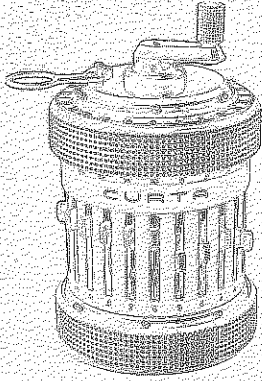


**Texas Competitive Mathematics  
Web - <http://www.texasmath.org>  
Fax - (866) 606-3535  
E-Mail - [webmaster@texasmath.org](mailto:webmaster@texasmath.org)**



**2006 UIL Mathematics SAC Test  
(6 pages)**



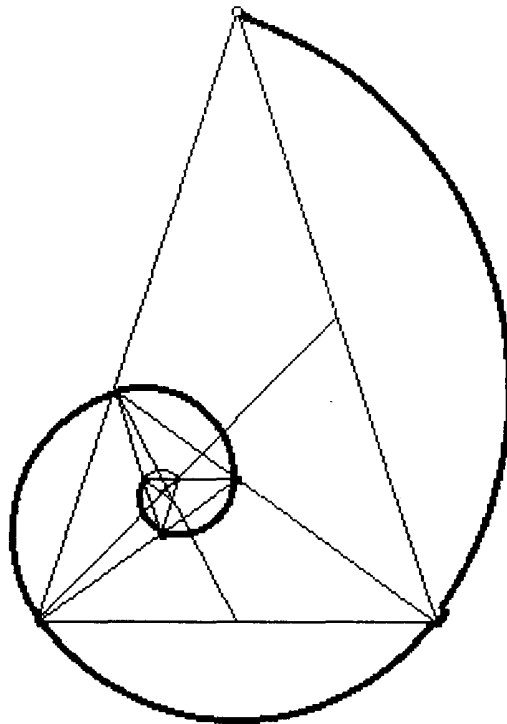


UNIVERSITY INTERSCHOLASTIC LEAGUE

Making a World of Difference

# Mathematics

SAC • Fall 2006



**WRITE ALL ANSWERS WITH  
CAPITAL LETTERS**

DO NOT TURN THIS PAGE UNTIL  
YOU ARE INSTRUCTED TO DO SO!

1. Evaluate:  $1 \times (2 + 3)^{-1} - 4 \div \frac{5}{6} + 7 \times (8)^0$
- (A)  $2\frac{2}{5}$       (B)  $3\frac{3}{5}$       (C)  $2\frac{3}{5}$       (D)  $-3\frac{3}{5}$       (E)  $-2\frac{1}{5}$
2. If x is 40% less than y and y is 30% more than z, then x is \_\_\_\_\_ than z.
- (A) 10% more    (B) 12% less      (C) 7.8% more    (D) 78% less      (E) 22% less
3. Mora Doe goes to the 25% off book sale. She buys 4 romantic novels which cost \$11.95 each before the sale and includes tax. She gave the clerk 2 twenty-dollar bills. How much change should Mora receive?
- (A) \$13.11      (B) \$7.80      (C) \$4.15      (D) \$3.59      (E) \$1.95
4. If  $9x^2 - 12x + 4 = (ax - b)^2$  then  $a + b =$  \_\_\_\_\_.
- (A) -6      (B) -3      (C) 1      (D) 5      (E) 6
5. Harry Hare drove 210 km to Myrtle Turtle's house. Part of the 4 hour trip was in town at 30 km/h and the rest was on a major highway at 60 km/h. How many km did Harry drive on the major highway?
- (A) 30 km      (B) 60 km      (C) 120 km      (D) 150 km      (E) 180 km
6. Which equality axiom of addition is demonstrated by  $(ax + by) + c = ax + (by + c)$ ?
- (A) Identity      (B) Associative      (C) Inverse      (D) Commutative      (E) Distributive
7. The sides of a triangle are 9 in, 12 in, and 15 in. The triangle is a(n) \_\_\_\_\_ triangle:
- (A) Acute      (B) Equilateral    (C) Isosceles      (D) Obtuse      (E) Right
8. An isosceles trapezoid has a top base of 8 cm, a bottom base of 14 cm, and a slanted side length of 5 cm. Find the area of the isosceles trapezoid.
- (A)  $55 \text{ cm}^2$       (B)  $44 \text{ cm}^2$       (C)  $22 \text{ cm}^2$       (D)  $16 \text{ cm}^2$       (E)  $4 \text{ cm}^2$
9. Rene drew  $\triangle ABC$  using the coordinates (1,2), (2, - 2) and (5,1). Find the area of Rene's triangle.
- (A)  $7.5 \text{ units}^2$       (B)  $5.5\sqrt{2} \text{ units}^2$       (C)  $7.5 \text{ units}^2$       (D)  $6 \text{ units}^2$       (E)  $.5\sqrt{2} \text{ units}^2$
10. Simplify:  $\log_b(3xy) - \log_b\left(\frac{3x}{2y}\right) + \log_b(3y^2)$
- (A)  $2\log_b(3y)$       (B)  $2\log_b(6x)$       (C)  $6\log_b(2xy)$       (D)  $4\log_b(6y)$       (E)  $4\log_b(3xy)$

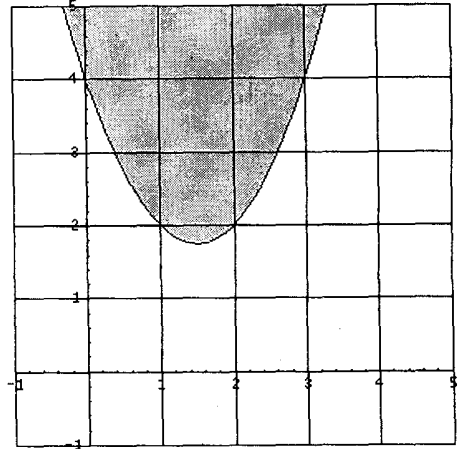
11. The graph of  $x^2 + y^2 - 4x + 12y + 30 = 0$  is a circle with a diameter of: (nearest tenth)

- (A) 3.2 units    (B) 5.0 units    (C) 6.3 units    (D) 8.9 units    (E) 10.0 units

12. Line  $m$  goes through points  $(1, -1)$  and  $(-3, 1)$ . Line  $n$  goes through points  $(1, 1)$  and  $(x, y)$ . Which of the following points lies on line  $n$  if  $m \perp n$ ?

- (A)  $(0,1)$     (B)  $(1, -1)$     (C)  $(1, -3)$     (D)  $(-1, -3)$     (E)  $(0,0)$

13. Which of the equations will produce the shaded portion of the graph shown?



- (A)  $y < x^2 + 3x + 3$     (B)  $y > x^2 - 3x + 4$     (C)  $y < x^2 - 2.5x + 5$   
 (D)  $y > x^2 - 2.5x + 4$     (E)  $y > x^2 - 3x + 5$

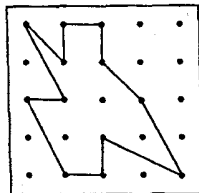
14. Let  $\tan A = \frac{7}{24}$ , where  $A$  is in QIII. Find  $\cos A$ .

- (A)  $-\frac{7}{25}$     (B)  $-\frac{7}{24}$     (C)  $-\frac{24}{25}$     (D)  $\frac{7}{25}$     (E)  $\frac{24}{25}$

15. An equivalent expression for  $(\sin x + \cos x)^2 + (\sin x - \cos x)^2$  is:

- (A) 2    (B)  $2\cos x$     (C)  $\sin x \cos x$     (D)  $-2\sin x$     (E)  $\sin^2 x - \cos^2 x$

16. Georg Alexander picks the special figure and places it on a five-peg-by-five-peg geoboard. Find the area enclosed in the figure.



- (A)  $7.5 \text{ units}^2$     (B)  $8 \text{ units}^2$     (C)  $8.5 \text{ units}^2$     (D)  $9 \text{ units}^2$     (E)  $9.5 \text{ units}^2$

17. The first five terms of an infinite arithmetic sequence is  $6\frac{1}{4}$ , A, B, C,  $12\frac{1}{2}$ , ... . Find  $A + B + C$ .

- (A)  $9\frac{7}{8}$       (B)  $14\frac{1}{2}$       (C)  $18\frac{3}{4}$       (D) 25      (E)  $28\frac{1}{8}$

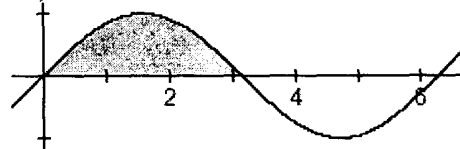
18.  $\triangle DEF$  is an obtuse isosceles triangle such that  $m\angle DEF$  is  $104^\circ$  and  $EF$  is 14 cm. Find the area of  $\triangle DEF$  to the nearest integer.

- (A)  $118 \text{ cm}^2$       (B)  $95 \text{ cm}^2$       (C)  $77 \text{ cm}^2$       (D)  $60 \text{ cm}^2$       (E)  $48 \text{ cm}^2$

19. The relation  $\{(0, 0), (2, 2), (2, -2), (6, 8), (6, -8)\}$  is:

- (A) not a function      (B) a one-to-one function      (C) a function, but not one-to-one  
(D) an even function      (E) an odd function

20. Find the area of the shaded region. (nearest square unit)



- (A) 1      (B) 2      (C) 3      (D) 4      (E) 6

21. Which of the following sequences is divergent?

- (A)  $\left\{ \frac{2n+1}{3n-2} \right\}$       (B)  $\left\{ \frac{-1^n}{n^2+n} \right\}$       (C)  $\left\{ \frac{(-1)^n(n+1)}{n+2} \right\}$       (D)  $\left\{ \frac{4n^2-n^3}{10+2n^3} \right\}$       (E)  $\left\{ \frac{6n^2+3n-1}{n^2+8n+16} \right\}$

22. A box contains 5 green balls, 4 blue balls, and 3 red balls. Two balls are randomly selected, one at a time, without replacement. What is the probability that both are blue?

- (A)  $\frac{4}{33}$       (B)  $\frac{5}{22}$       (C)  $\frac{1}{11}$       (D)  $\frac{20}{33}$       (E)  $\frac{1}{66}$

23. Which of the following numbers is considered to be an "abundant" number?

- (A) 26      (B) 28      (C) 30      (D) 32      (E) 34

24. The number of integers that satisfy the inequality  $\frac{3}{7} < \frac{n}{14} < \frac{2}{3}$  is:

- (A) 1      (B) 2      (C) 3      (D) 4      (E) 5

25. Define  $n\star$  to be  $n^n$ . Compute  $(2\star)\star$ .

- (A) 256      (B) 64      (C) 16      (D) 8      (E) 4

**University Interscholastic League**  
**MATHEMATICS CONTEST**  
**HS • SAC • 2006**  
**Answer Key**

- |       |       |
|-------|-------|
| 1. A  | 21. C |
| 2. E  | 22. C |
| 3. C  | 23. C |
| 4. D  | 24. C |
| 5. E  | 25. A |
| 6. B  |       |
| 7. E  |       |
| 8. B  |       |
| 9. A  |       |
| 10. D |       |
| 11. C |       |
| 12. D |       |
| 13. B |       |
| 14. C |       |
| 15. A |       |
| 16. B |       |
| 17. E |       |
| 18. B |       |
| 19. A |       |
| 20. B |       |