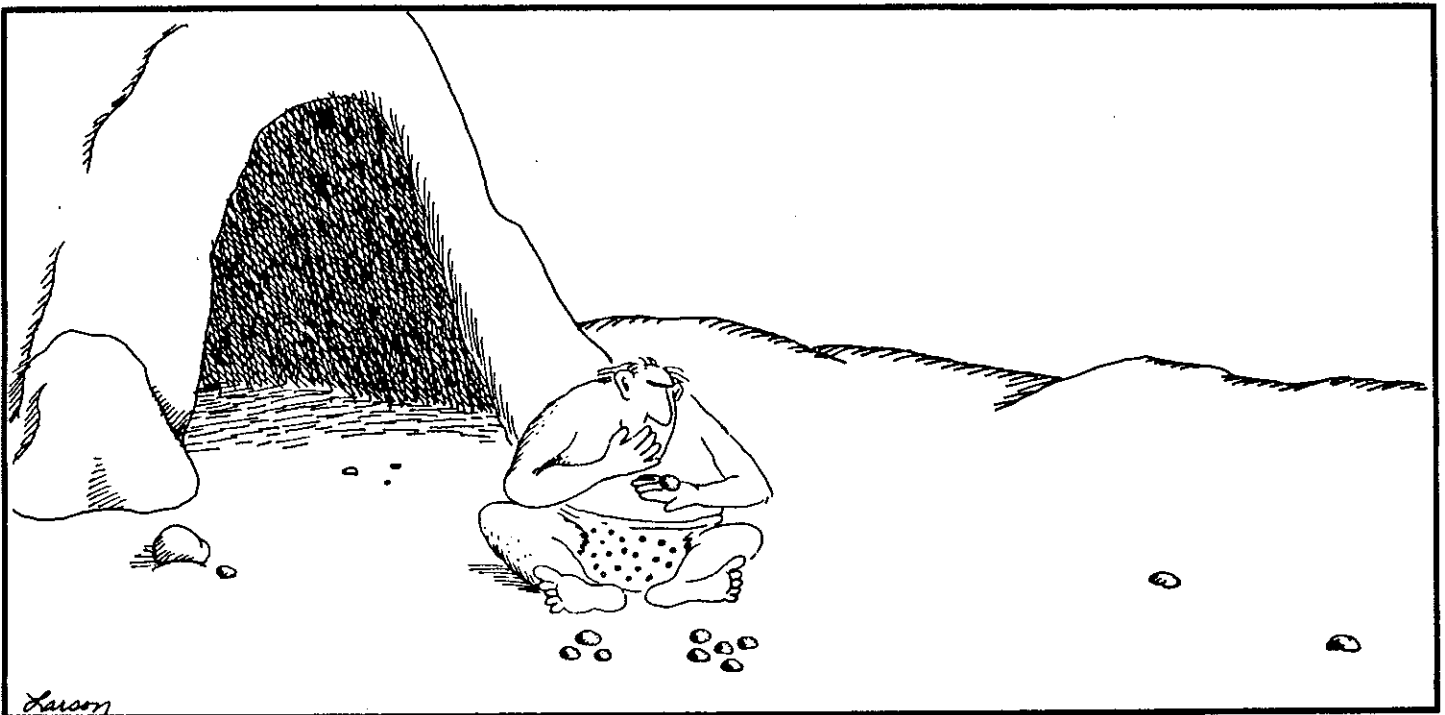


Friendship Junior High School  
Accelerated Math Program  
Mr. Lavine (Room 102A)

# A.T.I.M.

## Advanced Topics In Mathematics



Early stages of math anxiety

*Critical Thinking  
& Problem Solving*

# Focus on: Polynomials

## CRITICAL THINKING - UNIT 1

① Find an expression equivalent to:

$$\left(\frac{2x^2}{y}\right)^3 \quad (A) \frac{8x^5}{3y} \quad (B) \frac{6x^6}{y^3}$$

$$(C) \frac{6x^5}{y^3} \quad (D) \frac{8x^5}{y^3} \quad (E) \frac{8x^6}{y^3}$$

② If  $(a-b)^2 = 64$  and  $ab=3$ , find  $a^2+b^2$

$$(A) 61 \quad (B) 67 \quad (C) 70 \quad (D) 58 \\ (E) 69$$

③ If  $c+d=12$  and  $c^2-d^2=48$ , determine  $c-d$

$$(A) 4 \quad (B) 36 \quad (C) 60 \quad (D) 5 \\ (E) 3$$

④ Which of the following is equivalent to:

$$1 - \frac{x}{y} ?$$

$$(A) \frac{1-x}{y} \quad (B) \frac{y-x}{y} \quad (C) \frac{x-y}{y}$$

$$(D) \frac{1-x}{1-y} \quad (E) \frac{y-x}{xy}$$

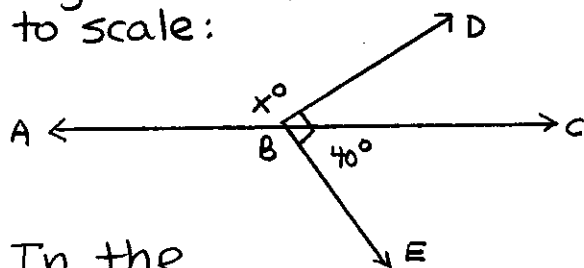
⑤ The trinomial  $x^2+x-20$  is evenly divisible by

$$(A) x-5 \quad (B) x+4 \quad (C) x-10 \\ (D) x-4 \quad (E) x-2$$

## S.A.T.

### PRACTICE PROBLEMS

⑥ Figure not drawn to scale:



In the figure above,  $DB \perp BE$ . Determine  $x$ .

$$(A) 40 \quad (B) 70 \quad (C) 130 \quad (D) 150 \\ (E) 160$$

⑦ If  $x$ ,  $y$ , and  $z$  are odd, which of these are also odd values?

$$(A) (x+y) + (y+z)$$

$$(B) x-y$$

$$(C) x+y+z$$

$$(D) xy+z$$

$$(E) (x-y) + (y-z)$$

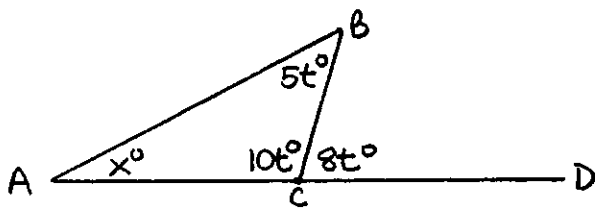
⑧ If  $y = 6x$  and  $x = 2z$ , determine  $y$  in terms of  $z$ :

- (A)  $\frac{1}{3}z$  (B)  $3z$  (C)  $4z$   
 (D)  $8z$  (E)  $12z$

⑨ Which rectangle has an area equal to the area of a circle with radius  $r$ ?

- (A)  $r$  by  $\pi r$  (D)  $r$  by  $\pi$   
 (B)  $\pi r$  by  $\pi r$  (E)  $\pi r$  by  $\frac{1}{r}$   
 (C)  $r$  by  $r$

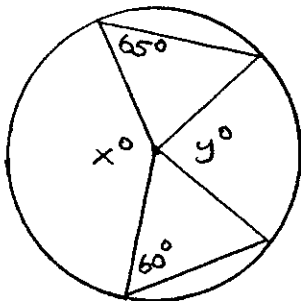
⑩



Determine  $x$ :

- (A) 30 (B) 33 (C) 36  
 (D) 40 (E) 45

⑪

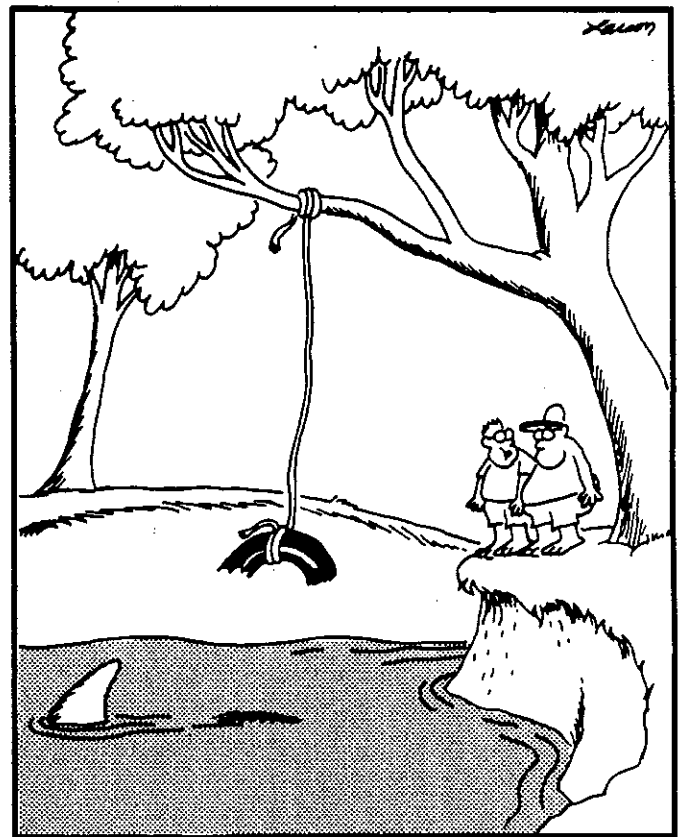


In the figure, the triangles have a common vertex in the center of the circle.

- Determine  $x + y$  (A) 110 (B) 125 (C) 180  
 (D) 240 (E) 250

⑫ In  $2n$  years, Lisa will be  $(6m + 1)$  times her current age. In terms of  $m$  and  $n$ , what is Lisa's current age?

- (A)  $\frac{n}{3m}$  (B)  $\frac{2n}{6m+1}$  (C)  $\frac{2n-1}{6m-1}$   
 (D)  $6m - 2n + 1$   
 (E) Cannot be determined



"Listen ... You go tell Billy's mother, and I'll start looking for another old tire."

# Focus on: Averages

## CRITICAL THINKING - UNIT 2

① What number must be added to 6, 16, and 8 to attain an average of 13?

number, what is the number?

- (A) 72 (B) 60 (C) 48 (D) 24  
(E) 18

② After taking his fourth quiz, Bill's average dropped from 78 to 75. What was his fourth quiz score?

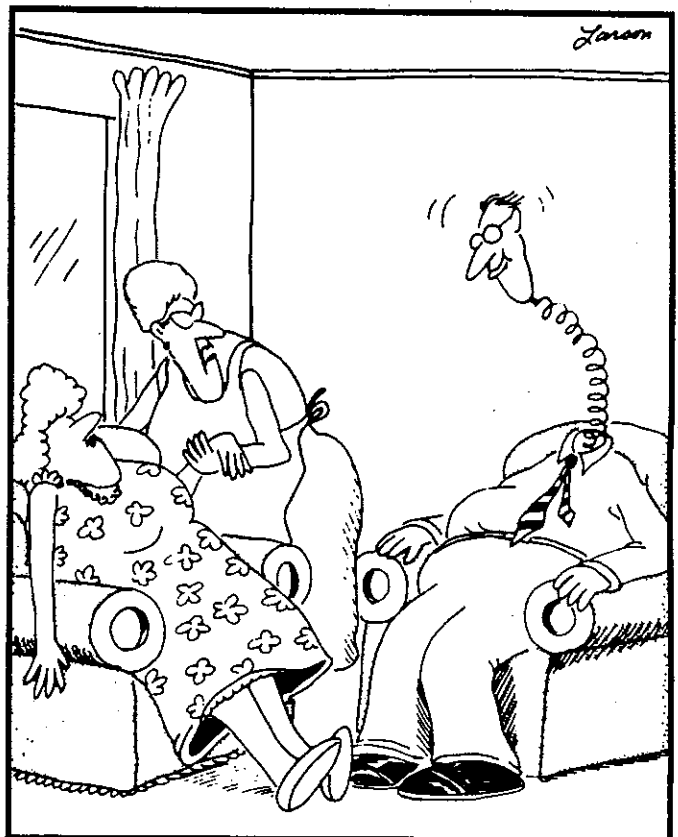
⑦ If  $x = \frac{3}{4}$  and  $y = \frac{9}{8}$ , determine  $x/y$ :

- (A) 1 (B)  $\frac{2}{9}$  (C)  $\frac{2}{3}$  (D)  $\frac{1}{3}$  (E)  $\frac{27}{32}$

③ Find the average of  $x$ ,  $x-3$ ,  $2x-5$ ,  $2x+2$ , and  $1-x$ .

④ The average of  $x$  and  $y$  is 4. If  $x = 5y$ , determine  $y$ .

⑤ The average of  $2x-1$ , 4, 6, 12, and 13 is 9. Determine  $x$ .



"Well, Emily is out like a light... Just can't resist pulling that little stunt of yours, can you, Earl!"

## S.A.T.

### PRACTICE PROBLEMS

⑥ If  $\frac{1}{3}$  of a number is 6 more than  $\frac{1}{4}$  of the

⑧ Let  $m$  equal the greatest possible 3-digit number in which no digit is repeated.

Let  $n$  equal the least possible 3-digit number that can be made using all the digits of  $m$ . Determine  $m-n$ .

- (A) 198 (B) 222 (C) 864  
(D) 885 (E) 888

⑨ The 10 students in Mr. Walker's class averaged 60 on the CRT test. The 15 students in Mrs. Brown's class averaged 80. Determine the average of all 25 students.

- (A) 70 (B) 71 (C) 72 (D) 75  
(E) Cannot be determined

⑩ After each bounce, a ball rises  $\frac{2}{3}$  of the height of the previous bounce. If the height of the 5th bounce is 1 meter, determine the height of the 3rd bounce.

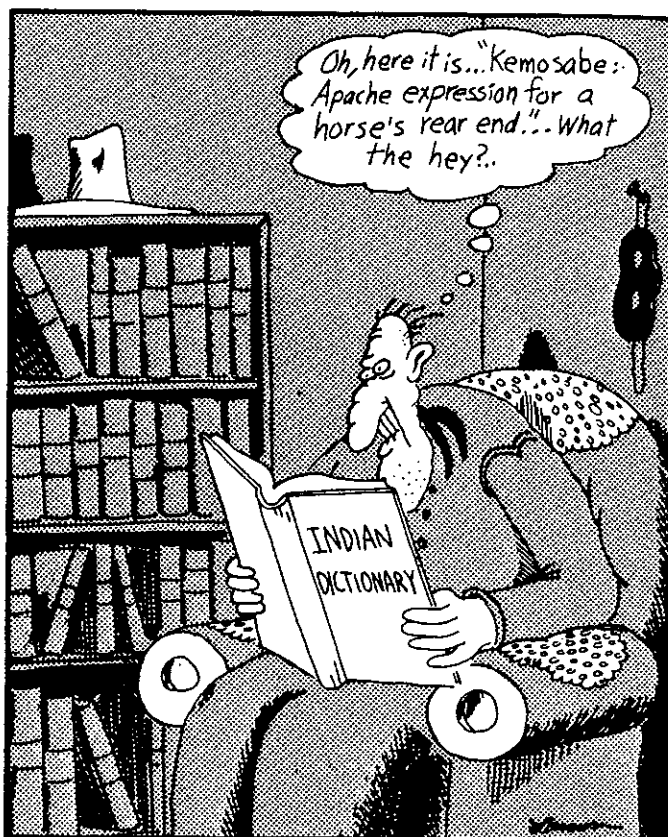
- (A)  $\frac{4}{9}$  (B)  $1\frac{1}{2}$  (C) 2 (D)  $2\frac{1}{4}$  (E)  $2\frac{1}{2}$

⑪ What fraction of 8 hours is 120 seconds?

- (A)  $\frac{1}{60}$  (B)  $\frac{1}{120}$  (C)  $\frac{1}{240}$  (D)  $\frac{1}{1200}$  (E)  $\frac{1}{2400}$

⑫ If the cost of  $p$  pencils is  $c$  cents, determine the cost in cents of  $n$  pencils.

- (A)  $nc$  (B)  $\frac{nc}{p}$  (C)  $\frac{pc}{n}$   
(D)  $pn$  (E)  $\frac{pn}{c}$



The Lone Ranger, long since retired, makes an unpleasant discovery.

# Focus on: Literal Expressions

## CRITICAL THINKING - UNIT 3

Solve by substitution or mathematical reasoning.

Example:

David had  $d$  dollars. After a shopping trip, he returned with  $c$  cents. How many cents did he spend?

- (A)  $d - c$  (B)  $c - d$  (C)  $100d - c$   
(D)  $100c - d$  (E)  $d - 100c$

Substitution

If  $d = 9$  and  $c = 50$ , he spent 850 cents.

(C)  $100d - c$   
 $100(9) - (50) = 850$

Reasoning

change  $d$  dollars to 100 $d$  cents. Then subtract the amount he returned with.

(C)  $100d - c$

- ① How many ounces are there in  $p$  pounds and  $q$  ounces?

- (A)  $\frac{p}{16} + q$  (B)  $pq$  (C)  $p + 16q$   
(D)  $p + q$  (E)  $16p + q$

- ② How many passengers can be seated on a plane with  $r$  rows if each row consists of  $d$  double seats and  $t$  triple seats?

- (A)  $rdt$  (D)  $3dr + 2tr$   
(B)  $rd + rt$  (E)  $rd + t$   
(C)  $2dr + 3tr$

- ③ If  $u$  represents the tens digit of a number and  $t$  represents the units digit, determine the value of the number if the digits are reversed.

- (A)  $10t + u$  (D)  $ut$   
(B)  $10u + t$  (E)  $t + u$   
(C)  $tu$

- ④ Joe spent  $k$  cents of his allowance and has  $r$  cents left. What was his allowance in dollars?

- (A)  $k + r$  (D)  $\frac{k+r}{100}$   
(B)  $k - r$  (E)  $100kr$   
(C)  $100(k+r)$

- ⑤ If  $p$  pounds of potatoes

cost \$K, determine the cost in cents of one pound of potatoes.

- (A)  $K/p$                       (D)  $100K/p$   
 (B)  $K/100p$                 (E)  $100p/K$   
 (C)  $P/K$

⑥ Mr. Rabner rents a car for  $d$  days. He pays  $m$  dollars per day for each of the first 7 days and half that rate for each additional day. Find the total charge if  $d > 7$ .

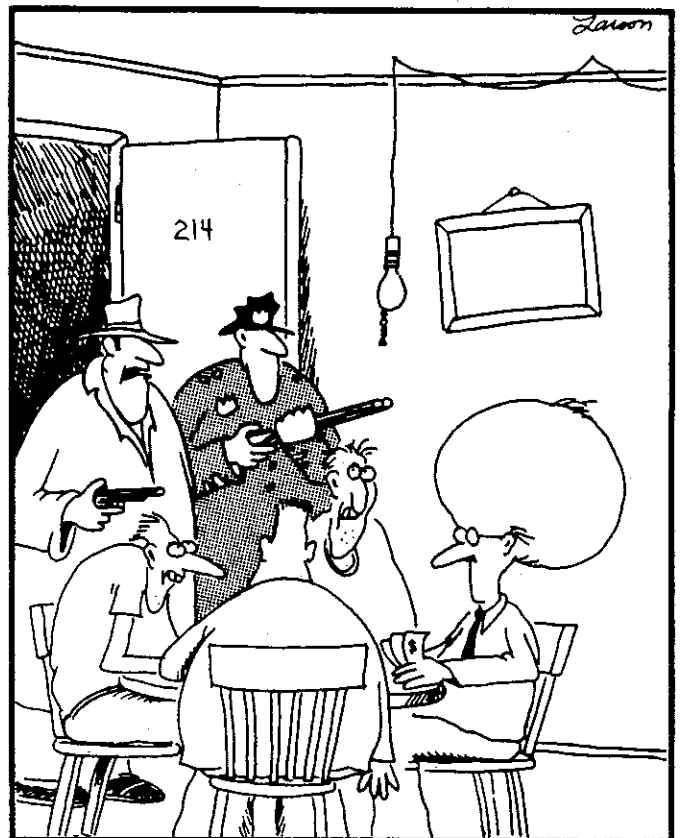
- (A)  $m + 2m(d-7)$       (D)  $7m + \frac{md}{2}$   
 (B)  $m + \frac{m}{2}(d-7)$     (E) Cannot be  
 (C)  $7m + \frac{m}{2}(d-7)$       determined

⑦ A salesperson earns 900 dollars per month plus 10% of sales after the first \$1000 she sells. One month she sells  $R$  dollars worth of merchandise ( $R > 1000$ ). How many dollars does she earn that month?

- (A)  $800 + .1R$                 (D)  $900 - .1R$   
 (B)  $800 - .1R$                 (E)  $810 + .1R$   
 (C)  $900 + .1R$

⑧ Elliott's allowance was just raised to  $k$  dollars per week. He gets a raise of  $c$  dollars per week every 2 years. How much will his allowance be  $y$  years from now?

- (A)  $k + cy$                       (D)  $k + 2c$   
 (B)  $k + 2cy$                     (E) none of  
 (C)  $k + \frac{1}{2}cy$                     the above

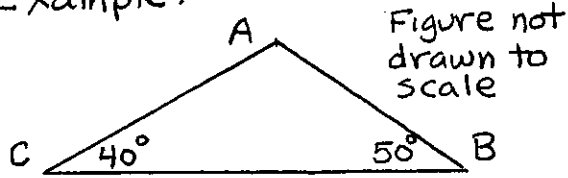


"Freeze! ... Okay, now ... Who's the brains of this outfit?"

# Focus on: Inequalities

## CRITICAL THINKING - UNIT 4

Example:



Which of the following statements about the triangle above is true?

- (A)  $\overline{AB} > \overline{AC}$       (D)  $\overline{AC} > \overline{AB}$   
 (B)  $\overline{AC} > \overline{BC}$       (E)  $\overline{BC} > \overline{AB} + \overline{AC}$   
 (C)  $\overline{AB} > \overline{BC}$

Solution: (D)

In a triangle, the smallest angle is opposite the smallest side and the largest angle is opposite the longest side.

① If  $x < y$ ,  $2x = A$ , and  $2y = B$ , then:

- (A)  $A = B$       (D)  $A < x$   
 (B)  $A < B$       (E)  $B < y$   
 (C)  $A > B$

② If  $a > b$  and  $c > d$ , then:

- (A)  $a = c$   
 (B)  $a < d$   
 (C)  $a + d = b + c$   
 (D)  $a + c = b + d$   
 (E)  $a + c > b + d$

③ If  $ab > 0$  and  $a < 0$ , which of the following is negative?

- (A)  $b$       (D)  $(a-b)^2$   
 (B)  $-b$       (E)  $-(a+b)$   
 (C)  $-a$

④ If  $4 - x > 5$ , then:

- (A)  $x > 1$       (D)  $x < -1$   
 (B)  $x > -1$       (E)  $x = -1$   
 (C)  $x < 1$

⑤ Point  $x$  is located on line segment  $\overline{AB}$ , and point  $y$  is located on segment  $\overline{CD}$ . If  $\overline{AB} = \overline{CD}$  and  $\overline{AX} > \overline{CY}$ , then:

- (A)  $\overline{XB} > \overline{yD}$       (D)  $\overline{AX} < \overline{XB}$   
 (B)  $\overline{XB} < \overline{yD}$       (E)  $\overline{AX} > \overline{AB}$   
 (C)  $\overline{AX} > \overline{XB}$

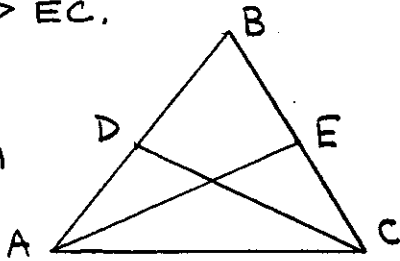
⑥ In triangle  $ABC$ ,  $\overline{AB} = \overline{BC}$ . Point  $D$  is located on  $\overline{AB}$  between  $A$  and  $B$ . Which statement is always true?

- (A)  $\overline{AD} < \overline{DC}$   
 (B)  $\overline{AD} = \overline{DC}$   
 (C)  $\overline{AD} > \overline{DC}$   
 (D)  $\overline{AD} \geq \overline{DC}$   
 (E) none of these



- ⑦ In the diagram,  $\overline{BD} = \overline{BE}$  and  $\overline{DA} > \overline{EC}$ .

Figure not drawn to scale



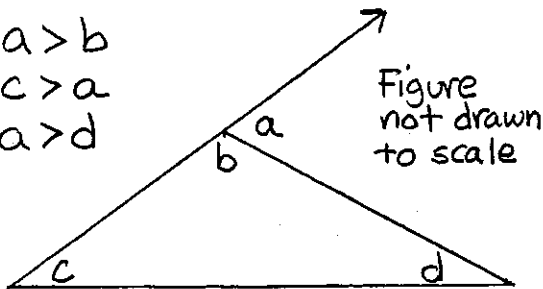
- (A)  $\overline{AE} = \overline{DC}$       (D)  $\overline{AB} < \overline{BC}$   
 (B)  $\angle BCA > \angle BAC$       (E)  $\overline{AD} < \overline{BD}$   
 (C)  $\angle DCA < \angle EAC$

- ⑩ If  $x > 0$ ,  $y > 0$ , and  $x - y < 0$ , then:

- (A)  $x > y$   
 (B)  $x < y$   
 (C)  $x + y < 0$   
 (D)  $y - x < 0$   
 (E)  $x = -y$

- ⑧ In the diagram below, which is always true?

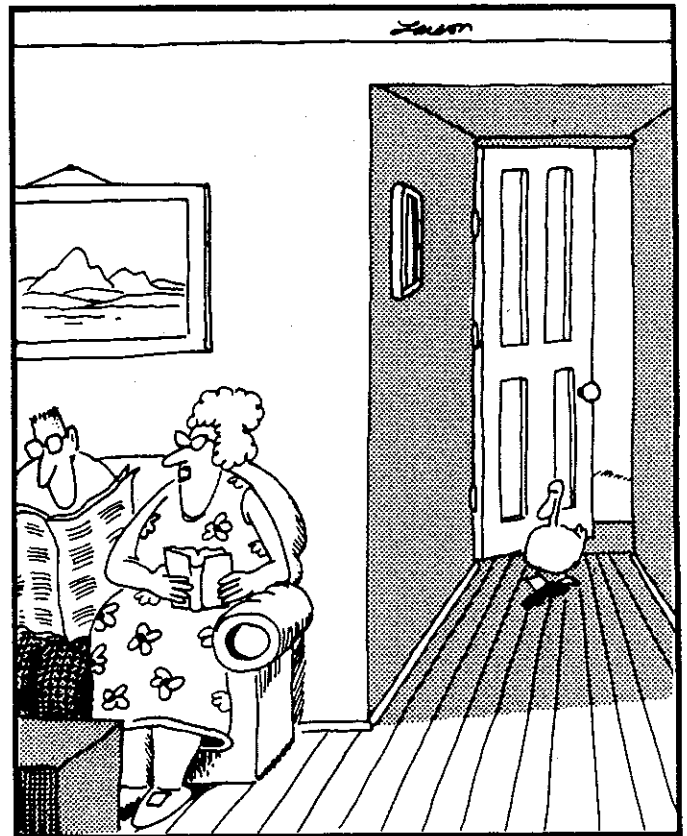
- I.  $a > b$   
 II.  $c > a$   
 III.  $a > d$



- (A) I only      (D) III only  
 (B) II and III only      (E) None of these  
 (C) I, II, and III

- ⑨ If point  $x$  is on line segment  $\overline{AB}$ , all of the following could be true except:

- (A)  $\overline{AX} = \overline{XB}$       (D)  $\overline{AB} > \overline{XB}$   
 (B)  $\overline{AX} > \overline{XB}$       (E)  $\overline{AX} + \overline{XB} < \overline{AB}$   
 (C)  $\overline{AX} < \overline{XB}$



"Here he comes, Earl... Remember, be gentle but firm... we are absolutely, positively, NOT driving him south this winter."

# Focus on: Functions

## CRITICAL THINKING - UNIT 5

① If  $A * B * C = \frac{A}{\left(\frac{B}{C}\right)}$  for all positive integers, determine the value of  $3 * 4 * 6$ .

② If  $\triangle y = (y+1)^2 - (y-1)^2 + 1$ , determine  $\triangle 3$

③ For all positive integers, if  $(p, q \uparrow x, y) = py - qx$ , determine the value of:  
 $(4, 6 \uparrow 2, 8) - (3, 5 \uparrow 2, 3)$

④ For all positive values of  $x$ ,  $\downarrow x = (x-1)^2$   
 Determine the value of  $\downarrow \frac{3}{4}$

⑤ If  $x \circ y$  means  $y^2 - 2x^2$ , determine the value of  
 $2 \circ (-3) \circ (-1)$

⑥ If  $p \square q = \left(\frac{p-1}{q+1}\right)^2$ , determine the value of:  
 $\frac{3}{2} \square \frac{2}{3}$

⑦ If  $\textcircled{p} = \frac{p}{4}$ , determine the

value of  $p$  such that  $\textcircled{0} = 3$

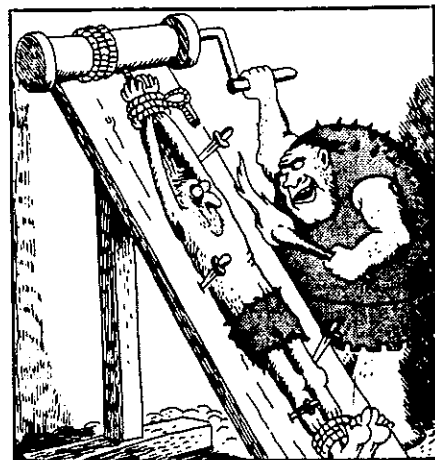
⑧ For all values of  $x$ :  $x \uparrow = 3x$  and  $x \downarrow = \frac{1}{3}x$  and  $(x \uparrow)(x \downarrow) = ax^b$ , determine the value of  $a + b$

⑨ Let  $[x]$  denote the greatest integer less than or equal to  $x$ . For example,  $[3.4] = 3$  and  $[-.4] = -1$ . Determine  
 $[2.3] - [-2.3] + [-5.3]$

⑩ If  $a$  and  $b$  are both positive or both negative:  
 $a \odot b = a^2 b^3$

If  $a$  and  $b$  have opposite signs:  
 $a \odot b = a^3 b$

Determine:  $(-2) \odot (1) \odot (-1)$



"Still won't talk, huh? ... Okay, no more Mr. Nice Guy."

# Focus on: Quantitative Comparisons

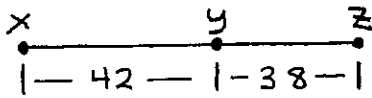
## CRITICAL THINKING - UNIT 6

	<u>Column A</u>	<u>Column B</u>
①	$59,000 \div 10$	$590 \cdot 10$

---

②	$\frac{10x - 60}{2}$	$5x - 30$
---	----------------------	-----------

---



③	The distance from x to the midpoint of $\overline{yz}$	60
---	--	----

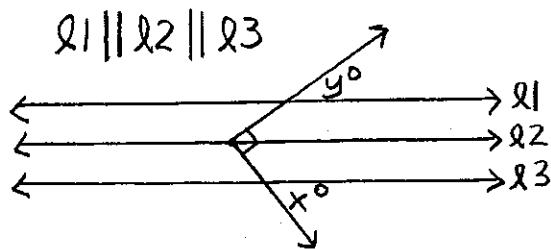
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④	$(-1)^{87}$	$(-1)^{78}$
	$-3 < x < 3$	

---

⑤	$-x$	$-4$
---	------	------

---



⑥	$x + y$	90
---	---------	----

---

⑦	$(\frac{1}{2})^4$	$(\frac{1}{3})^2$
---	-------------------	-------------------

---

	$a = -b$	
⑧	$a + b$	0

---

<u>Column A</u>	<u>Column B</u>
-----------------	-----------------

In a school with 6 classrooms, there are more than 1 and less than 20 students in 1 of the rooms and exactly 20 in each of the other 5 rooms.

⑨	mean number of students per classroom	20
---	---------------------------------------	----

---

$$88 < 8x < 100$$

⑩	$x$	11.5
---	-----	------

---

⑪	$p(r+s) + q(r+s)$	$(p+q)(r+s)$
---	-------------------	--------------

---

$$4k = 5m$$

$$k > 0$$

⑫	$k$	$m$
---	-----	-----

---

A scale drawing is made of the floor of a room

⑬	The length of the perimeter of the drawing if the scale is	The length of the perimeter of the drawing if the scale is
---	--	--

$1 \text{ cm to } 1 \text{ m}$	$1 \text{ cm to } \frac{1}{2} \text{ m}$
--------------------------------	--

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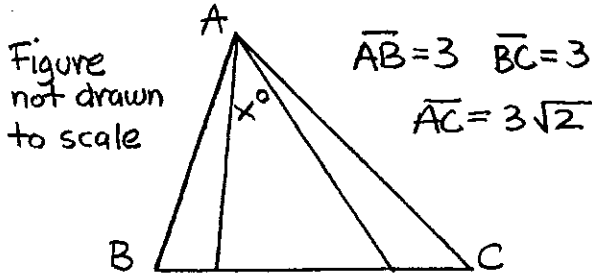
Column A      Column B

$$(x-p)(x+q)=15$$

$$x > p$$

⑭                       $x$                        $q$

---



⑮                       $x$                        $45$

---

In a sequence of  $s$  numbers, the first term is 3, the second term is  $-3$ , the third term is 3, and so on.  $x$  and  $y$  are consecutive terms of  $s$

⑯                       $x+y$                        $xy$

---

The volume of a cylinder is equal to the area of its base times height

⑰ Volume of a cylinder with base radius  $r$  and height  $h$       Volume of a cylinder with base radius  $2h$  and height  $r$

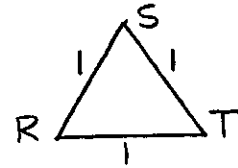
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Column A                      Column B

$$n > 0$$

⑱ 16% of  $n$                        $\frac{4n}{25}$

---



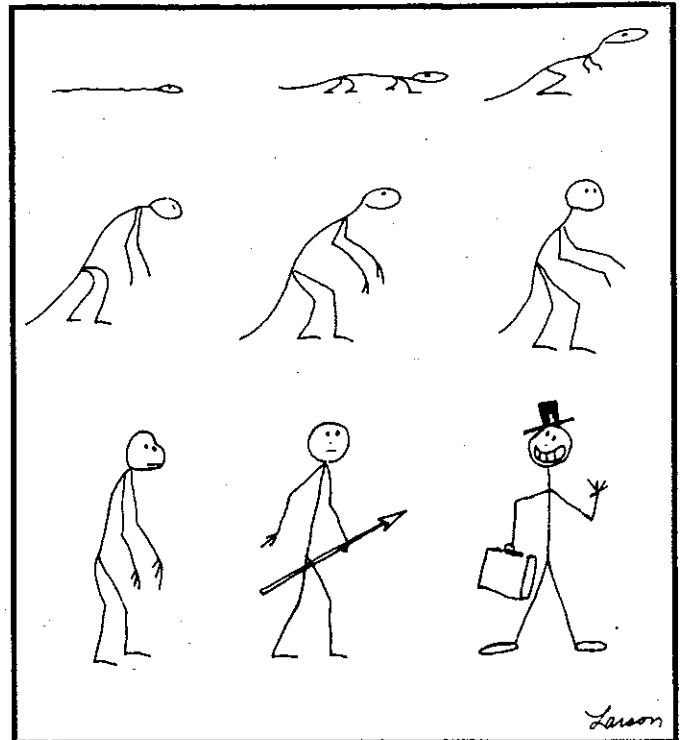
⑲ Area of  $\triangle RST$                        $\frac{1}{2}$

---

$r$  is an integer greater than 1 and  $\square$  is the smallest integer factor of  $r$  (other than 1).

⑳                       $\square$                        $\square+1$

---



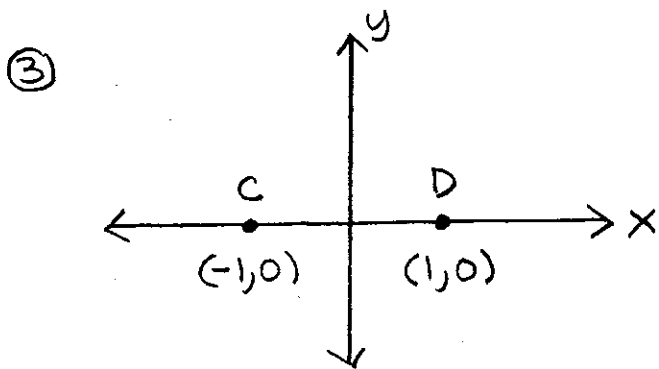
Evolution of the Stickman

# Focus on: Mathematic Reasoning

## CRITICAL THINKING - UNIT 7

- ① In the addition problem at the right,  $\square$  is the same digit in each number. Determine  $\square$ .
- $$\begin{array}{r} \square 4 \\ 3 \square \\ \square 3 \\ 5 \square \\ + \square 1 \\ \hline 15 \square \end{array}$$
- (A) 8 (B) 6 (C) 5 (D) 4 (E) 2

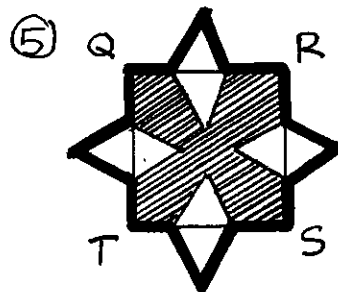
- ② Which of the following numbers can be used to show that not all odd numbers are prime?
- (A) 3 (B) 5 (C) 7 (D) 11 (E) 15



If point Q (not shown) is on the same plane as the axis above and equidistant from C and D, then Q can be any point on the:

- (A) y-axis (D) line  $x=y$   
 (B) x-axis (E) line  $x=-y$   
 (C) segment  $\overline{CD}$

- ④ Three people line up at a ticket window. In how many different orders can they arrange themselves in line?
- (A) 3 (B) 4 (C) 6 (D) 9 (E) 12



All triangles at the left have the same area.

Shaded area = 84

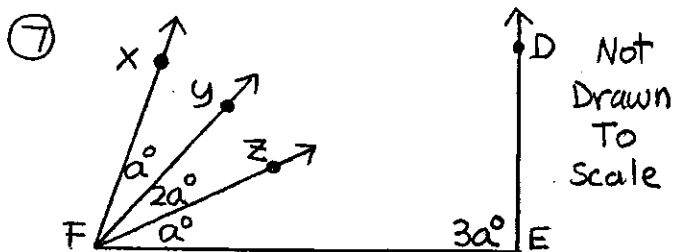
Area of  $\square QRST = 100$

What is the total area inside the heavy black line?

- (A) 16 (D) 116  
 (B) 92 (E) 132  
 (C) 108

- ⑥ One-eighth of an hour is what fraction of the time between Monday noon and Wednesday noon of the same week?

- (A)  $\frac{1}{16}$  (C)  $\frac{1}{384}$  (E)  $\frac{1}{476}$   
 (B)  $\frac{1}{192}$  (D)  $\frac{1}{392}$



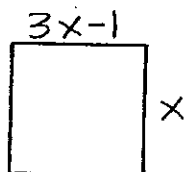
If  $a = 30$  and all rays extend according to arrows, how many points of intersection will there be (not including E and F)?

- (A) 0 (B) 1 (C) 2 (D) 3 (E) 4

⑧ Two runners, Bud and Lou, pass a post 100 m from the finish line at the same time and then run the final 100 m at different constant speeds. In the final 100 m, Bud runs 80 m in the same time that Lou runs 60 m. How many meters will Lou have left to run when Bud reaches the finish line?

- (A) 15 (D) 35  
 (B) 20 (E) 40  
 (C) 25

⑨ The figure at the right is a square

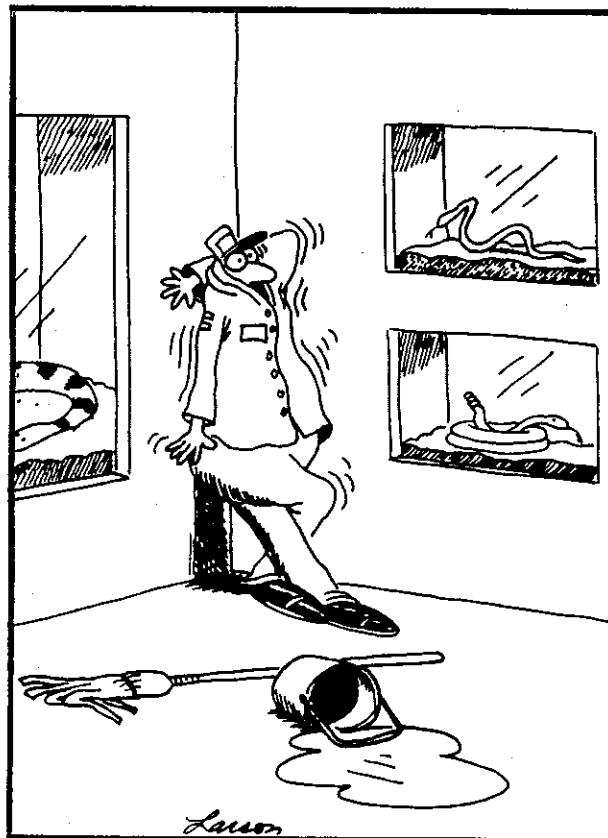


Determine the area of the square.

- (A) 9 (B) 4 (C) 1 (D)  $\frac{1}{4}$   
 (E) Cannot be determined

⑩ M is 10% greater than y. n is 20% greater than x. By what percent is mn greater than xy?

- (A) 20% (D) 100%  
 (B) 30% (E) 200%  
 (C) 32%



After 23 uneventful years at the zoo's snakehouse, curator Ernie Schwartz has a cumulative attack of the willies.

# Focus on: Math League Competition

## CRITICAL THINKING - UNIT 8

① A square and an equilateral triangle have equal perimeters. The perimeter of the triangle is 12. Find the area of the square.

(A) 9 (B) 16 (C) 36 (D) 81

② Determine the number of prime numbers between 45 and 65.

(A) 3 (B) 4 (C) 5 (D) 6

③ If the circumference of a circle is divided by the length of its radius, the result is:

(A) 1 (B)  $\pi$  (C) 2 (D)  $2\pi$

④ The area of a triangle is 16. The length of one side is 8. The length of the altitude to this side is:

(A) 1 (B) 2 (C) 4 (D) 8

⑤ Determine  $x$ :

$$\frac{4\frac{1}{3}}{4} = \frac{x}{12}$$

(A) 26 (C) 8  
(B) 13 (D) 7

⑥ Which of the following sets of numbers could represent the lengths of the sides of a right triangle?

(A) 9-16-25 (C)  $1-\sqrt{2}-\sqrt{3}$

(B) 1-2-3 (D) 5-15-17

⑦ If 2 is divided by  $\frac{1}{2}$ , the result is:

(A) 1 (B)  $\frac{1}{4}$  (C) 2 (D) 4

⑧ How many whole numbers between 700 and 900 begin and/or end with 8?

(A) 100 (B) 110 (C) 120 (D) 140

⑨ If  $\frac{3}{4}$  of a number is 48, then  $\frac{3}{16}$  of the number is:

(A) 12 (B) 18 (C) 24 (D) 192

⑩ If each side of a square is decreased by 10%, then the area of the square is decreased by what percent?

(A) 40% (C) 19%

(B) 20% (D) 10%

⑪ If  $\frac{1}{3}$  is subtracted from its reciprocal, the result is:

- (A)  $\frac{7}{12}$  (B) 0 (C)  $-\frac{1}{12}$  (D)  $-\frac{7}{12}$

⑫ Marina types 5 pages in 4 minutes. Ruth types 1 page per minute. In 7 hours, how many more pages will Marina type than Ruth?

- (A) 105 (B) 84 (C) 15 (D) 140

⑬ If half as many people lived in Toronto as lived in the rest of Ontario, what percent of Ontario's residents would live in Toronto?

- (A)  $33\frac{1}{3}\%$  (C) 20%  
(B) 25% (D) 50%

⑭ The 1985th odd whole number is:

- (A) 1985 (C) 3969  
(B) 1987 (D) 3971

⑮ If 10% of a number is 2 less than 20% of the same number, what is 80% of the number?

- (A) 4 (B) 8 (C) 16 (D) 32

⑯ Five cars (all the same length) plus eight trucks (all the same length) take up the same room in a warehouse as 11 trucks. How many cars can fit into a warehouse that can hold 30 trucks?

- (A) 18 (B) 30 (C) 50 (D) 80

⑰ What fraction of the integer multiples of 3 (from 1 to 100) are also multiples of 4?

- (A)  $\frac{1}{4}$  (B)  $\frac{8}{33}$  (C)  $\frac{25}{33}$  (D)  $\frac{1}{12}$

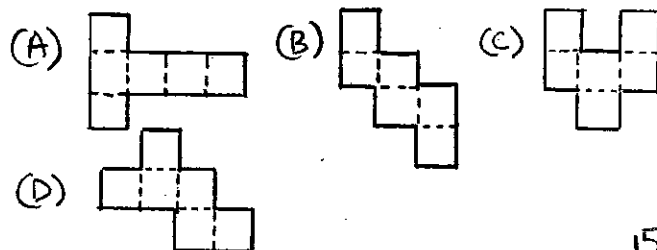
⑱ If  $a * b = \frac{a+b}{ab}$ , determine the value of:  $3 * 4 * 5$

- (A)  $\frac{35}{12}$  (B)  $\frac{67}{420}$  (C)  $\frac{1}{35}$  (D)  $\frac{67}{35}$

⑲ The 1985th digit to the right in the decimal expansion of  $\frac{1}{7}$  is:

- (A) 2 (B) 4 (C) 5 (D) 8

⑳ Which cannot be folded on the dotted lines to form a cube?





# Focus on: Equations

## CRITICAL THINKING - UNIT 9

① Solve for  $x$ :  $\frac{2x}{3} + \frac{5}{6} = \frac{x}{6}$   
(A)  $\frac{5}{3}$  (B) -1 (C)  $\frac{5}{3}$  (D) 1 (E) -5

② Solve for  $x$ :  $4x - 6(3 - \frac{1}{2}x) = 10$   
(A) 28 (B) 4 (C) 18 (D) 2 (E) 6

③ Solve for  $y$ :  $4(y-3)+1 = 2(y+4)-3$   
(A) -5 (B) 2 (C) 8 (D) 12 (E) -8

④ If  $\frac{1}{x+y} = 2$ , then  $y =$   
(A)  $\frac{1}{2} - x$  (D)  $\frac{1}{2} + x$   
(B)  $-x$  (E)  $1 + 2x$   
(C)  $1 - 2x$

⑤ If  $E = IR$ , then  $R =$

(A)  $E/I$  (D)  $I/E$   
(B)  $E - I$  (E)  $E/I$   
(C)  $E + I$

⑥ If  $\frac{p+q+r}{3} = \frac{p+q}{2}$ , then  $r =$

(A)  $q+p$  (D) 1  
(B)  $2p+2q$  (E) 3  
(C)  $\frac{1}{2}(p+q)$

⑦ If  $a+b=3$ , then  $a+b-6 =$   
(A) -3 (B) 0 (C) 3 (D) 6 (E) 1

⑧ If  $a = b - c$  and  $d = c - b$ , determine the value of  $d - a$  when  $b = 4$  and  $c = -4$   
(A) 0 (B) 8 (C) -8 (D) 16 (E) -16

⑨ Solve for  $n$ :  $\frac{3}{m} + \frac{4}{n} = 1$

(A)  $\frac{4m}{m-3}$  (D)  $\frac{1-4m}{3}$

(B)  $\frac{12-4m}{3}$  (E)  $\frac{3m}{m-4}$

(C)  $7 - m$

⑩ If  $7x - 4y = 7$  and  $x = \frac{3}{7}y$ , then  $x =$

(A) -7 (D) 5

(B) -5 (E) 7

(C) -3

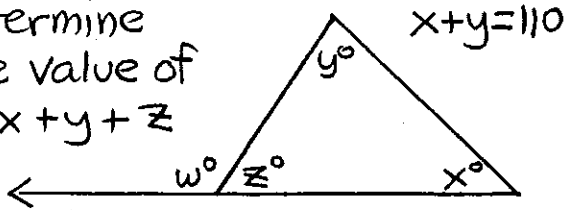
# Focus on: Geometric Reasoning

## CRITICAL THINKING - UNIT 10

- ① A right triangle has one leg of 16 and a hypotenuse of 20. Determine the perimeter.

(A) 36 (B) 40 (C) 44 (D) 48 (E) 52

- ② Determine the value of  $w + x + y + z$



(A) 220 (B) 235 (C) 250 (D) 290  
(E) Cannot be determined

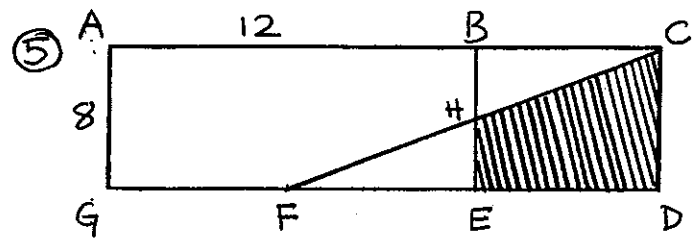
- ③ A circle has the same area as a square with side =  $\frac{1}{\sqrt{\pi}}$ . Determine the circle's diameter.

(A)  $\frac{1}{\pi}$  (C)  $\frac{1}{\pi\sqrt{\pi}}$  (E)  $\frac{1}{\pi^3}$

(B)  $\frac{2}{\sqrt{\pi}}$  (D)  $\frac{2}{\pi\sqrt{\pi}}$

- ④ In  $\triangle MNP$ ,  $\angle M$  is  $65^\circ$  and  $\angle P$  is  $40^\circ$ .  $Q$  is a point on  $\overline{MP}$  such that  $\overline{NQ} \perp \overline{MP}$ . Of the following, the shortest is:

(A)  $\overline{MN}$  (B)  $\overline{NP}$  (C)  $\overline{PQ}$  (D)  $\overline{NQ}$  (E)  $\overline{MQ}$



ABEG is a rectangle  
ACDG is a rectangle  
F is the midpoint of  $\overline{GD}$   
H is the midpoint of  $\overline{BE}$   
E is the midpoint of  $\overline{FD}$

Determine the shaded area

(A) 24 (B) 36 (C) 42 (D) 48 (E) 96

- ⑥ If  $\frac{3}{4}$  the area of a square is 48, what will the perimeter be if all sides are reduced by 25%?

(A) 24 (B) 36 (C) 48 (D) 64  
(E) Cannot be determined

- ⑦ ABCD is a rectangle. Determine the value of  $x$ .

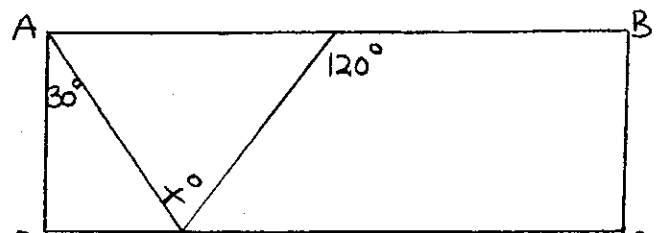
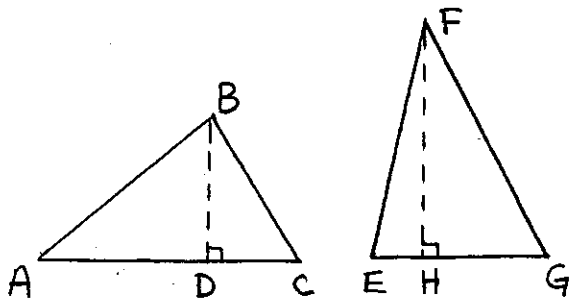


Figure not drawn to scale

(A) 150 (B) 125 (C) 100 (D) 75 (E) 60

Column A

Column B



$$\overline{AC} = \overline{FH}, \overline{BD} = \overline{EG}$$

⑧ Area of  $\triangle ABC$

Area of  $\triangle EFG$

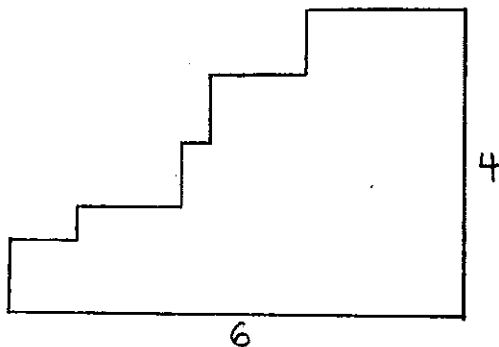
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$$x > 0$$

⑨ Volume of a cube with an edge of  $x+1$

Volume of a rectangular prism with edges  $x, x+1, x+2$

All line segments in the figure below are either horizontal or vertical



⑩ Perimeter of the figure

22

Column A

Column B

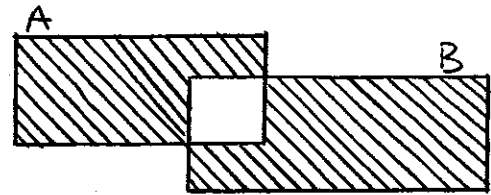
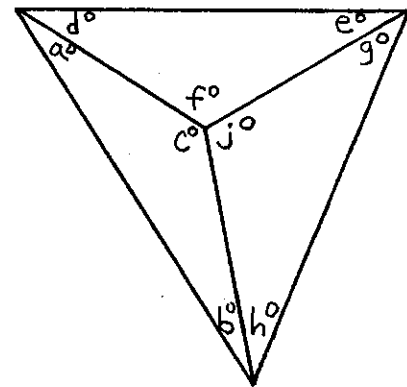


Figure not drawn to scale

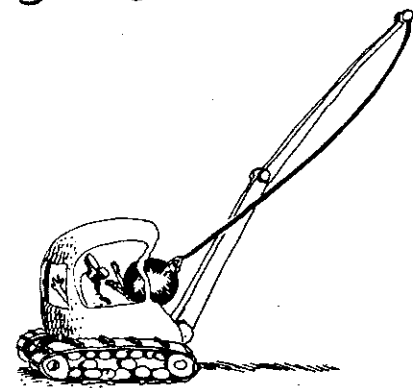
The shaded area of A is greater than the shaded area of B

⑪ Area of rectangle A

Area of rectangle B



⑫  $(a+b-c) + (d+e-f) + (g+h-j) - (a+b+c)$



(A)

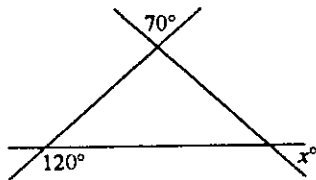
S.A.T. (A)

(A)

SECTION 1

1. If  $9x + 5 = 23$ , what is the numerical value of  $18x + 5$ ?
- (A) 46  
(B) 41  
(C) 36  
(D) 32  
(E) It cannot be determined from the information given.

2.



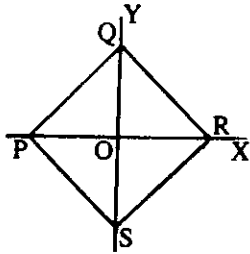
**Note:** Figure not drawn to scale.

In the figure above,  $x =$

- (A) 35  
(B) 50  
(C) 70  
(D) 90  
(E) 110
3. If  $2y = \frac{1}{3}$ , then  $\frac{1}{4y} =$
- (A)  $\frac{3}{2}$   
(B)  $\frac{3}{4}$   
(C)  $\frac{2}{5}$   
(D)  $\frac{1}{5}$   
(E)  $\frac{4}{3}$
4. Pieces of wire are soldered together so as to form the edges of a cube, whose volume is 64 cubic inches. The number of inches of wire used is
- (A) 24  
(B) 48  
(C) 64  
(D) 96  
(E) 120
5. If a box of note paper costs \$4.20 after a 40% discount, what was its original price?
- (A) \$2.52  
(B) \$4.60  
(C) \$5.33  
(D) \$7.00  
(E) \$10.50
6. A is 15 years old. B is one-third older. How many years ago was B twice as old as A?
- (A) 3  
(B) 5  
(C) 7.5  
(D) 8  
(E) 10
7. The distance,  $s$ , in feet that an object falls in  $t$  seconds when dropped from a height is obtained by use of the formula  $s = 16t^2$ . How many feet will an object fall in 8 seconds?
- (A) 256  
(B) 1,024  
(C) 2,048  
(D) 15,384  
(E) 16,000
8. Three circles are tangent externally to each other and have radii of 2 inches, 3 inches, and 4 inches, respectively. How many inches are in the perimeter of the triangle formed by joining the centers of the three circles?
- (A) 9  
(B) 12  
(C) 15  
(D) 18  
(E) 21
9. One-tenth is what part of three-fourths?
- (A)  $\frac{3}{40}$   
(B)  $\frac{1}{8}$   
(C)  $\frac{2}{15}$   
(D)  $\frac{15}{2}$   
(E)  $\frac{40}{3}$

10. The area of square  $PQRS$  is 49. What are the coordinates of  $Q$ ?

- (A)  $(\frac{7}{2}\sqrt{2}, 0)$   
 (B)  $(0, \frac{7}{2}\sqrt{2})$   
 (C)  $(0, 7)$   
 (D)  $(7, 0)$   
 (E)  $(0, 7\sqrt{2})$



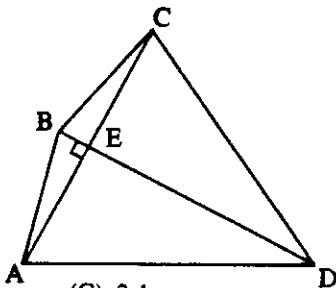
11. If one-half of the female students in a certain college eat in the cafeteria and one-third of the male students eat there, what fractional part of the student body eats in the cafeteria?

- (A)  $5/12$   
 (B)  $2/5$   
 (C)  $3/4$   
 (D)  $5/6$   
 (E) Cannot be determined

12. A recent report states that if you were to eat each meal in a different restaurant in New York City, it would take you more than 19 years to cover all of New York City's eating places, assuming that you eat three meals a day. On the basis of this information, the number of restaurants in New York City

- (A) exceeds 20,500  
 (B) is closer to 20,000 than 21,000  
 (C) exceeds 21,000  
 (D) exceeds 21,000 but does not exceed 21,500.  
 (E) is less than 20,500

13. In the figure below,  $AB = BC$  and angle  $BEA$  is a right angle. If the length of  $DE$  is four times the length of  $BE$ , then what is the ratio of the area of  $\triangle ACD$  to the area of  $\triangle ABC$ ?



- (A) 1:4  
 (B) 1:2  
 (C) 2:1  
 (D) 4:1  
 (E) It cannot be determined from the information given.

14. A pound of water is evaporated from 6 pounds of sea water containing 4% salt. The percentage of salt in the remaining solution is

- (A) 3.6%  
 (B) 4%  
 (C) 4.8%  
 (D) 5.2%  
 (E) 6%

15. The product of  $75^3$  and  $75^7$  is

- (A)  $(75)^5$   
 (B)  $(75)^{10}$   
 (C)  $(150)^{10}$   
 (D)  $(5625)^{10}$   
 (E)  $(75)^{21}$

16. The distance from City A to City B is 150 miles and the distance from City A to City C is 90 miles. Therefore, it is necessarily true that

- (A) the distance from B to C is 60 miles  
 (B) six times the distance from A to B equals 10 times the distance from A to C  
 (C) the distance from B to C is 240 miles  
 (D) the distance from A to B exceeds by 30 miles twice the distance from A to C  
 (E) three times the distance from A to C exceeds by 30 miles twice the distance from A to B

17. If  $a + b = 3$  and  $ab = 4$ , then  $\frac{1}{a} + \frac{1}{b} =$

- (A)  $\frac{3}{4}$   
 (B)  $\frac{3}{7}$   
 (C)  $\frac{4}{7}$   
 (D)  $\frac{1}{7}$   
 (E)  $\frac{1}{12}$

18.  $(x)^6 + (2x^2)^3 + (3x^3)^2 =$

- (A)  $5x^5 + x^6$   
 (B)  $17x^5 + x^6$   
 (C)  $6x^6$   
 (D)  $18x^6$   
 (E)  $6x^{18}$

19. The scale of a map is  $\frac{3}{4}$  inch = 10 miles. If the distance on the map between two towns is 6 inches, the actual distance in miles is

- (A) 45
- (B) 60
- (C) 75
- (D) 80
- (E) 90

20. If  $d = m - \frac{50}{m}$ , and  $m$  is a positive number, then as  $m$  increases in value,  $d$

- (A) increases in value
- (B) decreases in value
- (C) remains unchanged
- (D) increases, then decreases
- (E) decreases, then increases

21. If a cubic inch of a metal weighs 2 pounds, a cubic foot of the same metal weighs how many pounds?

- (A) 8
- (B) 24
- (C) 96
- (D) 288
- (E) 3,456

22. If the number of square inches in the area of a circle is equal to the number of inches in its circumference, the diameter of the circle in inches is

- (A) 4
- (B)  $\pi$
- (C) 2
- (D)  $\frac{\pi}{2}$
- (E) 1

23. John is now three times Pat's age. Four years from now John will be  $x$  years old. In terms of  $x$ , how old is Pat now?

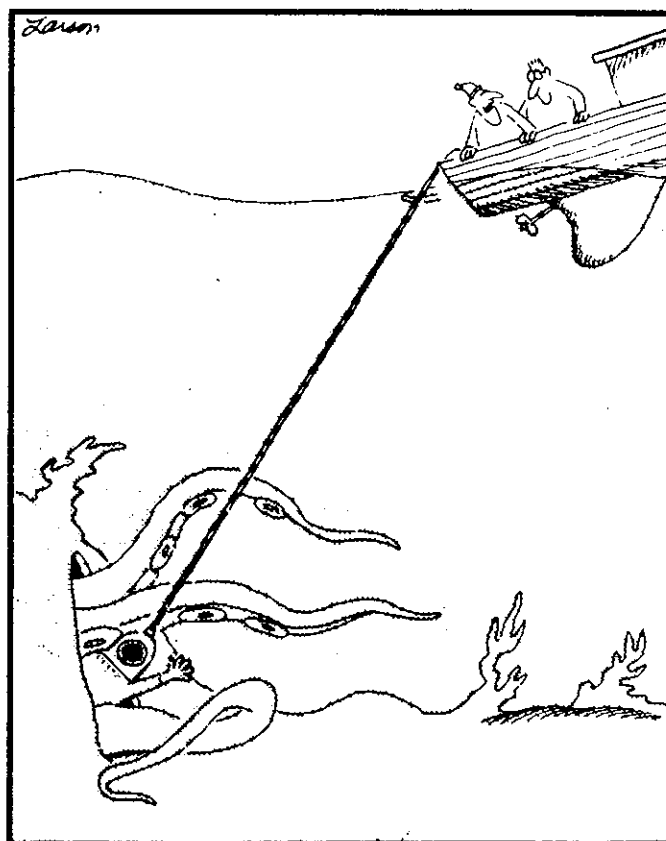
- (A)  $\frac{x + 4}{3}$
- (B)  $3x$
- (C)  $x + 4$
- (D)  $x - 4$
- (E)  $\frac{x - 4}{3}$

24. Which of the following sets of fractions appears in ascending order of size?

- (A)  $\frac{8}{11}$   $\frac{5}{7}$   $\frac{9}{13}$   $\frac{2}{3}$
- (B)  $\frac{5}{7}$   $\frac{8}{11}$   $\frac{2}{3}$   $\frac{9}{13}$
- (C)  $\frac{2}{3}$   $\frac{8}{11}$   $\frac{5}{7}$   $\frac{9}{13}$
- (D)  $\frac{2}{3}$   $\frac{9}{13}$   $\frac{5}{7}$   $\frac{8}{11}$
- (E)  $\frac{9}{13}$   $\frac{2}{3}$   $\frac{8}{11}$   $\frac{5}{7}$

25. In a certain course a student takes eight tests, all of which count equally. When figuring out the final grade, the instructor drops the best and the worst grade and averages the other six. The student calculates that his average for all eight tests is 84%. After dropping the best and the worst grade the student averages 86%. What was the average of the best and the worst test?

- (A) 68
- (B) 72
- (C) 78
- (D) 88
- (E) It cannot be determined from the information given.



"Now wait a minute . . . He said two jerks means 'more slack' and three means 'come up' . . . but he never said nothin' about one long, steady pull."

(A)

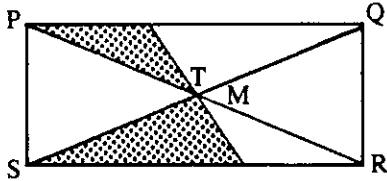
S.A.T. (A)

(A)

SECTION 3

1. In the figure, what percent of the area of rectangle  $PQRS$  is shaded?

- (A) 15  
(B) 25  
(C) 35  
(D) 45  
(E) 50



2. One wheel has a diameter of 30 inches and a second wheel has a diameter of 20 inches. The first wheel traveled a certain distance in 240 revolutions. In how many revolutions did the second wheel travel the same distance?

- (A) 120  
(B) 160  
(C) 360  
(D) 420  
(E) 480

3. The one of the following to which  $1.86 \times 10^5$  is equivalent is

- (A) 18,600  
(B) 186,000  
(C) 18,600,000  
(D)  $186 \times 500,000$   
(E) 1,860,000

4. How many of the numbers between 100 and 300 begin or end with 2?

- (A) 20  
(B) 40  
(C) 100  
(D) 110  
(E) 180

5. The area of a square is  $49x^2$ . What is the length of a diagonal of the square?

- (A)  $7x$   
(B)  $7x\sqrt{2}$   
(C)  $14x$   
(D)  $7x^2$   
(E)  $\frac{7x}{\sqrt{2}}$

6. If shipping charges to a certain point are 62 cents for the first five ounces and 8 cents for each additional ounce, the weight of a package, in pounds, for which the charges are \$1.66 is

- (A)  $\frac{7}{8}$   
(B) 1  
(C)  $1\frac{1}{8}$   
(D)  $1\frac{1}{4}$   
(E)  $1\frac{1}{2}$

7. If 15 cans of food are needed for seven adults for two days, the number of cans needed to feed four adults for seven days is

- (A) 15  
(B) 20  
(C) 25  
(D) 30  
(E) 35

8. A rectangular sign is cut down by 10% of its height and 30% of its width. What percent of the original area remains?

- (A) 30  
(B) 37  
(C) 57  
(D) 63  
(E) 70

9. If the average (arithmetic mean) of a series of numbers is 20 and their sum is 160, how many numbers are in the series?

- (A) 8  
(B) 16  
(C) 32  
(D) 48  
(E) 80

10. If the result of squaring a number is less than the number, the number is

- (A) negative and greater than  $-1$   
(B) negative and less than  $-1$   
(C) a positive fraction greater than 1  
(D) positive and less than 1  
(E) 1 and only 1

(A)

S.A.T. (A)

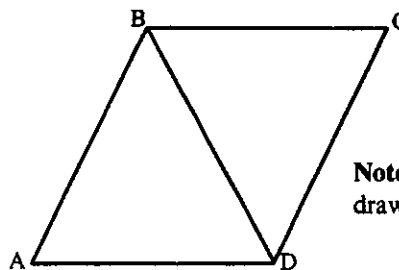
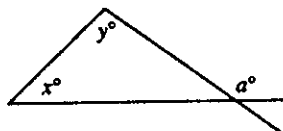
(A)

SECTION 5

PART I

Column A

Column B



Note: Figure not drawn to scale.

Parallelogram  $ABCD$   
side  $AD = 4$ , side  $AB = 5$

1. 

$a - y$
---------

$x$
-----

6. 

Area of $\triangle ABD + \triangle BCD$
---

Area of parallelogram $ABCD$
------------------------------

Questions 2–3 refer to the following definition.

$$\boxed{u} = u^2 - u$$

$$3x + 4 = y$$

$x$  is a positive integer less than or equal to 7

2. 

3
---

-3
----

7. 

The number of values for $y$ which are prime numbers
--

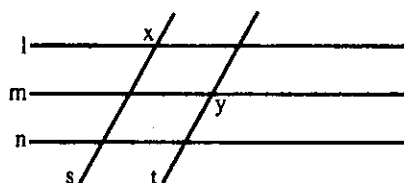
2
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3. 

$u + 1$
---------

$u - 1$
---------

$r$  is the radius of a given circle.



$$\begin{matrix} l & | & m & | & n \\ s & | & t \end{matrix}$$

8. 

$r^2$
-------

$r^3$
-------

4. 

$\angle x$
------------

$\angle y$
------------

9. 

$9 + 3(-2)(4 - 5) + 1$
------------------------

$(3 - 6)[2 - 5(3 - 4)]$
-------------------------

5. 

Area of a square with side 4
------------------------------

Twice the area of a triangle with base 4 and height 4
---

10. 

The average of the degrees in all the angles in a quadrilateral
---

The average of the degrees in all the angles of two triangles
---

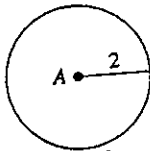


$$\begin{aligned} s &= 1 \\ t &= 4 \\ r &= -3 \end{aligned}$$

11.  $4s + 3t$        $2t - 2r$

12. 12% of 72,000      7% of 37,000

13. The average of 17, 19, 21, 23, 25, 27      The average of 18, 20, 22, 24, 26



Point A is the center of the circle

14. Area of circle A      12

15.  $\frac{1}{6}(\frac{3}{8} + \frac{9}{24})$        $(\frac{1}{6})(\frac{3}{8}) + (\frac{9}{24})(\frac{1}{6})$

## PART II

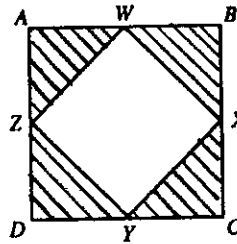
16. Joshua bought two dozen apples for 3 dollars. At this rate, how much will 18 apples cost? (Do not grid the dollar sign.)

17. What is  $\frac{1}{10}\%$  of  $\frac{1}{10}$  of 10?

18. 
$$\frac{-1}{\frac{3}{3}} - \frac{3}{\frac{1}{-3}} =$$

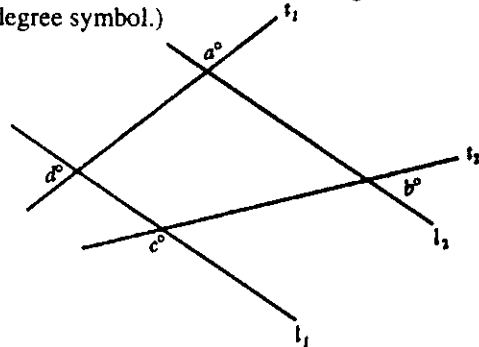
19. Dawn's average for four math tests is 80. What score must she receive on her next exam to increase her average by three points?

20. In the figure below, square WXYZ is formed by connecting the midpoints of the sides of square ABCD. If the length of  $AB = 6$ , what is the area of the shaded region?



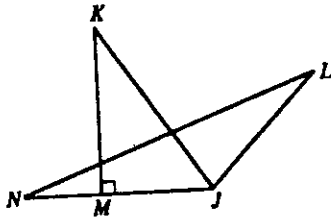
21. Thirty thousand two hundred and forty minutes is equivalent to how many weeks?

22. In the figure below, line  $l_1$  is parallel to line  $l_2$ . Transversals  $t_1$  and  $t_2$  are drawn. What is the value of  $a + b + c + d$ ? (Do not grid the degree symbol.)

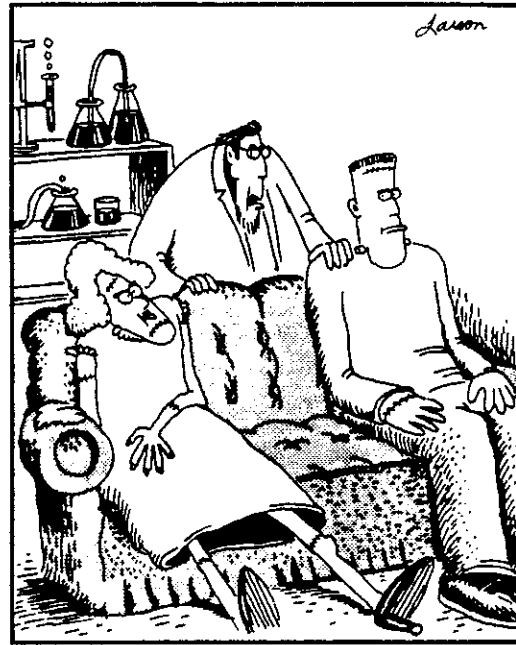


23. A car travels from town A to town B, a distance of 360 miles, in 9 hours. How many hours would the same trip have taken had the car travelled 5 mph faster?

24. In the figure below,  $KJ$  bisects  $\angle J$ . The measure of  $\angle K$  is  $40^\circ$  and the measure of  $\angle L$  is  $20^\circ$ . What is the measure of  $\angle N$ ? (Do not grid the degree symbol.)



25. The area of a circle that is inscribed in a square with a diagonal of 8 is  $a\pi$ . What is the value of  $a$ ?



"Hey, c'mon now! ... You two were MADE for each other!"

16.

	7	7	
0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

17.

	7	7	
0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

18.

	7	7	
0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

19.

	7	7	
0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

20.

	7	7	
0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

21.

	7	7	
0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

22.

	7	7	
0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

23.

	7	7	
0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

24.

	7	7	
0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

25.

	7	7	
0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

(B)

S.A.T. (B)

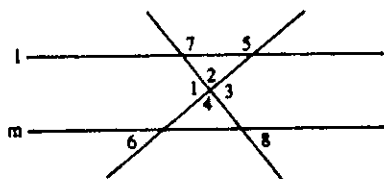
(B)

SECTION 1

- If for all real numbers (a,b,c, - d,e,f.) =  $(a - d) \times (b - e) \times (c - f)$ , then (4.5.6. - 1.2.3.) =  
(A) -27  
(B) 0  
(C) 27  
(D) 54  
(E) 108
- The sum of an odd number and an even number is  
(A) sometimes an even number  
(B) always divisible by 3 or 5 or 7  
(C) always an odd number  
(D) always a prime number (not divisible)  
(E) always divisible by 2
- If  $6x + 12 = 9$ ,  $x^2 =$   
(A)  $21/6$   
(B)  $-1/2$   
(C)  $9/12$   
(D)  $1/4$   
(E)  $9/6$
- Under certain conditions, sound travels at about 1,100 ft. per second. If 88 ft. per second is approximately equivalent to 60 miles per hour, the speed of sound in miles per hour under the above conditions is closest to  
(A) 730  
(B) 740  
(C) 750  
(D) 760  
(E) 780
- On a blueprint,  $1/4$  inch = 12 inches. What is the actual length in feet of a steel bar that is represented on the blueprint by a line  $3 \frac{3}{8}$  inches long?  
(A)  $2 \frac{1}{2}$   
(B)  $3 \frac{3}{8}$   
(C)  $6 \frac{3}{4}$   
(D) 9  
(E)  $13 \frac{1}{2}$
- If one angle of a triangle is three times a second angle and the third angle is 20 degrees more than the second angle, the second angle, in degrees, is  
(A) 64  
(B) 50  
(C) 40  
(D) 34  
(E) 32
- If  $x = 3/2$  and  $y = 2$ , then  $x + y^2 - 1/2 =$   
(A) 5  
(B) 10  
(C) 11.5  
(D) 9.5  
(E) 3
- A math class has 27 students in it. Of those students 14 are also enrolled in history and 17 are enrolled in English. What is the minimum percentage of the students in the math class who are also enrolled in history and English?  
(A) 15%  
(B) 22%  
(C) 49%  
(D) 63%  
(E) 91%
- A cylindrical container has a diameter of 14 inches and a height of 6 inches. Since one gallon equals 231 cubic inches, the capacity of the tank in gallons is approximately  
(A)  $2/3$   
(B)  $1 \frac{1}{7}$   
(C)  $2 \frac{2}{7}$   
(D)  $2 \frac{2}{3}$   
(E) 4
- If  $\frac{1}{x + y} = 6$  and  $x = 2$ , then  $y =$   
(A)  $-\frac{11}{6}$   
(B)  $-\frac{9}{4}$   
(C) -2  
(D) -1  
(E) 4

11. The number of grams in one ounce is 28.35. The number of grams in a kilogram is 1,000. Therefore, the number of kilograms in one pound is approximately
- (A) 0.045  
(B) 0.45  
(C) 1.0  
(D) 2.2  
(E) 4.5

12. Which one of the following numbers is not the square of a rational number?
- (A) .0016  
(B) .16  
(C) 1.6  
(D) 16  
(E) 1,600

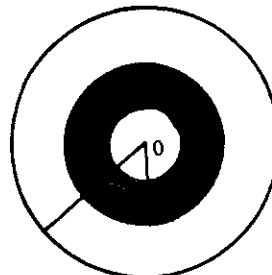


13. In the figure above, lines  $l$  and  $m$  are parallel. Which of the following must be equal to 180 degrees?
- I. 1 plus 3  
II. 2 plus 4  
III. 5 plus 6  
IV. 7 plus 8  
V. 8 plus 6
- (A) I and II only  
(B) III and IV only  
(C) V only  
(D) I, II, III, IV only  
(E) I, II, III, IV, V

14. If  $x$  is a fraction which ranges from  $1/4$  to  $1/2$  and  $y$  is a fraction which ranges from  $3/4$  to  $11/12$ , what is the maximum value for  $x/y$ ?
- (A)  $3/16$   
(B)  $11/48$   
(C)  $3/8$   
(D)  $11/24$   
(E)  $2/3$

15. Three circles share a common center, point O. The smallest circle has a radius of 2, the next circle a radius of 5, and the largest circle a radius of 9. What fraction of the area of the largest circle is the area of the shaded region?

- (A)  $7/27$   
(B)  $25/81$   
(C)  $1/3$   
(D)  $7/11$   
(E)  $12/17$



16. If  $n$  and  $d$  represent positive whole numbers ( $n > d > 1$ ), the fractions
- I.  $\frac{d}{n}$  II.  $\frac{d+1}{n+1}$  III.  $\frac{d-1}{n-1}$  IV.  $\frac{n}{d}$  V.  $\frac{n-1}{d-1}$

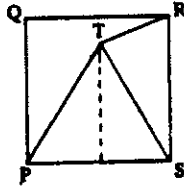
arranged in ascending order of magnitude are represented correctly by

- (A) III, II, I, V, IV  
(B) IV, V, III, I, II  
(C) II, I, IV, III, V  
(D) III, V, IV, I, II  
(E) III, I, II, IV, V

17. A train running between two towns arrives at its destination 10 minutes late when it goes 40 miles per hour and 16 minutes late when it goes 30 miles per hour. The distance in miles between the towns is
- (A)  $8 \frac{6}{7}$   
(B) 12  
(C) 192  
(D) 560  
(E) 720

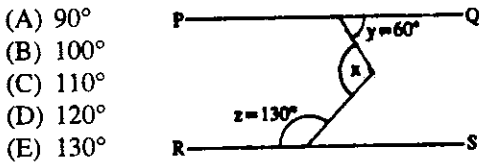
18. A square has a diagonal of  $x$  units. If the diagonal is increased by 2 units, what is the length of the side of the new square?
- (A)  $x + 2$   
(B)  $(x + 2)\sqrt{2}$  (D)  $(x + 2)2$   
(C)  $\frac{(x + 2)\sqrt{2}}{2}$  (E)  $\frac{(x + 2)\sqrt{2}}{4}$

19.  $PQRS$  is a square and  $PTS$  is an equilateral triangle. How many degrees are there in angle  $TRS$ ?



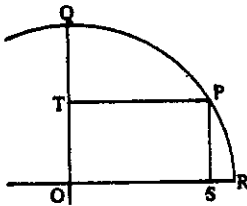
- (A) 60  
 (B) 75  
 (C) 80  
 (D) 90  
 (E) It cannot be determined from the information given.

20. In the figure, line  $PQ$  is parallel to line  $RS$ , angle  $y = 60^\circ$ , and angle  $z = 130^\circ$ . How many degrees are there in angle  $x$ ?



- (A)  $90^\circ$   
 (B)  $100^\circ$   
 (C)  $110^\circ$   
 (D)  $120^\circ$   
 (E)  $130^\circ$

21. In the figure below,  $QOR$  is a quadrant of a circle.  $PS = 6$  and  $PT = 8$ . What is the length of arc  $QR$ ?



- (A)  $5\pi$   
 (B)  $10\pi$   
 (C)  $20\pi$   
 (D) 24  
 (E) It cannot be determined from the information given.

22. The ice compartment in a refrigerator is 8 inches deep, 5 inches high, and 4 inches wide. How many ice cubes will it hold if each cube is 2 inches on each edge?

- (A) 16  
 (B) 20  
 (C) 24  
 (D) 80  
 (E) 160

23. If Paul can paint a fence in 2 hours and Fred can paint the same fence in 3 hours, Paul and Fred working together can paint the fence in how many hours?

- (A) 2.5  
 (B)  $5/6$   
 (C) 5  
 (D) 1  
 (E) 1.2

24. If one-third of the liquid contents of a can evaporates on the first day and three-fourths of the remainder evaporates on the second day, the fractional part of the original contents remaining at the close of the second day is

- (A)  $1/6$   
 (B)  $1/4$   
 (C)  $5/12$   
 (D)  $1/2$   
 (E)  $7/12$

25. A motorist drives 60 miles to her destination at an average speed of 40 miles per hour and makes the return trip at an average rate of 30 miles per hour. Her average speed in miles per hour for the entire trip is

- (A) 17  
 (B)  $34 \frac{2}{7}$   
 (C) 35  
 (D)  $43 \frac{1}{3}$   
 (E) 70



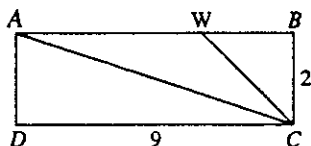
"And now we're going to play she-loves-me, she-loves-me-not!"

(B)

S.A.T. (B)

(B)

SECTION 3



1. In the figure above,  $BW$  is one-third the length of  $AB$ . What is the area of triangle  $ACW$ ?

- (A) 4
- (B) 5
- (C) 6
- (D) 8
- (E) 9

2. Of the following, the one that is *not* equivalent to 376 is

- (A)  $(3 \times 100) + (6 \times 10) + 16$
- (B)  $(2 \times 100) + (17 \times 10) + 6$
- (C)  $(3 \times 100) + (7 \times 10) + 6$
- (D)  $(2 \times 100) + (16 \times 10) + 6$
- (E)  $(2 \times 100) + (7 \times 10) + 106$

3. Emily can pack 6 cartons in  $h$  days. At this rate she can pack  $3h$  cartons in how many days?

- (A) 18
- (B)  $2h$
- (C)  $h^2$
- (D)  $\frac{h^2}{2}$
- (E)  $2h^2$

4. What is the total length of fencing needed to enclose a rectangular area 46 feet by 34 feet (3 ft. = 1 yd.)?

- (A) 26 yards 1 foot
- (B) 26  $\frac{2}{3}$  yards
- (C) 52 yards 2 feet
- (D) 53  $\frac{1}{3}$  yards
- (E) 37  $\frac{2}{3}$  yards

5. On an income of \$15,000 a year, a clerk pays 15% in federal taxes and 10% of the remainder in state taxes. How much is left?

- (A) \$9,750
- (B) \$11,475
- (C) \$12,750
- (D) \$13,500
- (E) \$14,125

6.  $(x^a)^b =$

- (A)  $x \cdot a \cdot b$
- (B)  $x^{a+b}$
- (C)  $x^{ab}$
- (D)  $(ax)^b$
- (E)  $b^{xa}$

7.  $A$  is 300 miles from  $B$ . The path of all points equidistant from  $A$  and  $B$  can best be described as

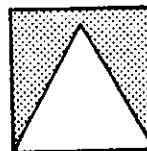
- (A) a line  $\parallel$  to  $AB$  and 150 miles north of  $AB$
- (B) a transverse segment cutting through  $AB$  at a  $45^\circ$  angle
- (C) a circle with  $AB$  as its diameter
- (D) the perpendicular bisector of  $AB$
- (E) the line  $AB$

8. If  $y = x^2$ ,  $z = x^3$ , and  $w = xy$ , then  $y^2 + z^2 + w^2 =$

- (A)  $x^4 + x^6 + x^{10}$
- (B)  $x^4 + 2x^5$
- (C)  $x^4 + 2x^6$
- (D)  $2x^9$
- (E)  $2x^{10}$

9. The number missing in the series 2, 6, 12, 20, ?, 42, 56, 72 is

- (A) 24
- (B) 30
- (C) 36
- (D) 38
- (E) 40



10. The square and the equilateral triangle in the above drawing both have a side of 6. If the triangle is placed inside the square with one side of the triangle directly on one side of the square, what is the area of the shaded region?

- (A)  $36 - 18\sqrt{3}$
- (B)  $36 - 9\sqrt{3}$
- (C)  $36 - 6\sqrt{3}$
- (D)  $36 + 6\sqrt{3}$
- (E)  $36 + 9\sqrt{3}$

(B)

S.A.T. (B)

(B)

SECTION 5

PART I

Column A

Column B

1.  $r = -3$

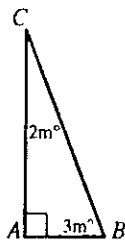
$r^3 + 5r^2 - 6r + 4$	$3r^2 - 7r - 8$
-----------------------	-----------------

2.  $x \neq 0$

$x$	$\frac{1}{x}$
-----	---------------

3. The average of  $a$ ,  $b$ , and  $c$

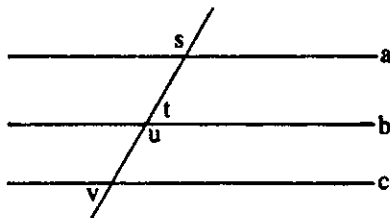
	$b$
--	-----



Note: Figure not drawn to scale.

4. side AC

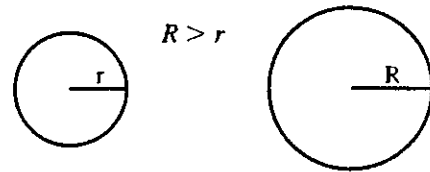
	side AB
--	---------



$a \parallel b \parallel c$   
 $\angle u > \angle v$

5.  $s$

	$t$
--	-----



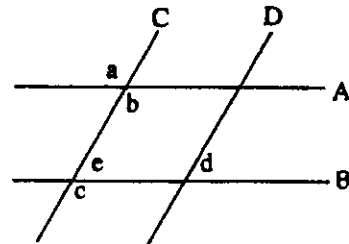
6. Circumference of circle with radius  $r$

	Area of circle with radius $R$
--	--------------------------------

7.  $s > t$

$s^2$	$t^2$
-------	-------

Questions 8–10 refer to the figure below.



$C \parallel D$   
 $A \parallel B$   
 $a = 100^\circ$

8.  $a + b$

	$b + d$
--	---------

9. 180

	$b + c$
--	---------

10.  $d$

	$180 - a$
--	-----------

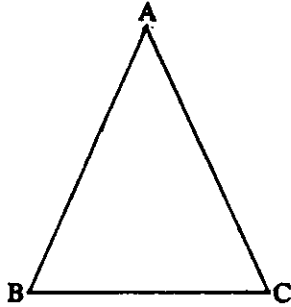
11.  $(\frac{1}{2})x - (\frac{1}{2})a = 4$

$x$	$a$
-----	-----

12. 

6% of 200
-----------

7% of 300
-----------

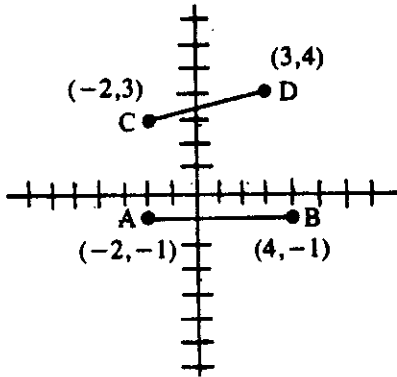


Side  $AB =$  Side  $AC$

13. 

$\angle A$
------------

$\angle B$
------------



14. 

$AB$
------

$CD$
------

$$A * B = \frac{A}{4} + 2B$$

15. 

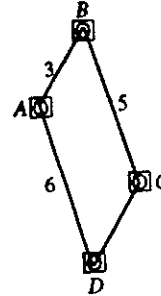
$\left(\frac{1}{4}\right) * 2$
--------------------------------

$5 * \left(\frac{1}{2}\right)$
--------------------------------

## PART II

16. What is the ratio of 6 minutes to 6 hours?
17. At Ungerville High School, the ratio of girls to boys is 2:1. If  $\frac{3}{5}$  of the boys are on a team and the remaining 40 boys are not, how many girls are in the school?

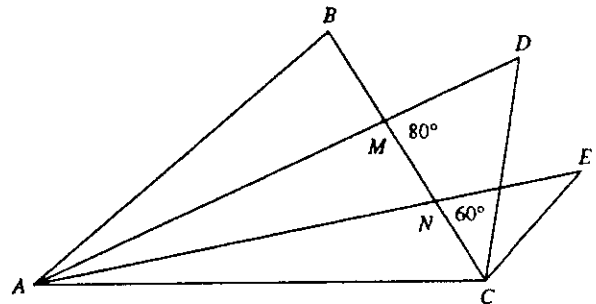
18. In the polygon below, the vertices are hinged to open and close. What integer value is the maximum possible length of the side  $CD$ ?



19. Seth bought  $4\frac{5}{6}$  pounds of peanuts. He gave  $\frac{1}{4}$  of his purchase to his sister. How many pounds of peanuts did Seth keep for himself?

20. If  $p = 2r = 3s = 4t$ , then  $\frac{pr}{st} =$

21.  $\sqrt{7+9+7+9+7+9+7+9} =$



$DA$  and  $EA$  trisect angle  $A$ .

22. If  $\angle DMC = 80^\circ$  and  $\angle ENC = 60^\circ$ , then angle  $A =$   
(Do not grid the degree symbol.)

23. 
$$\frac{\frac{7}{8} + \frac{7}{8} + \frac{7}{8}}{\frac{8}{7} + \frac{8}{7} + \frac{8}{7}} =$$

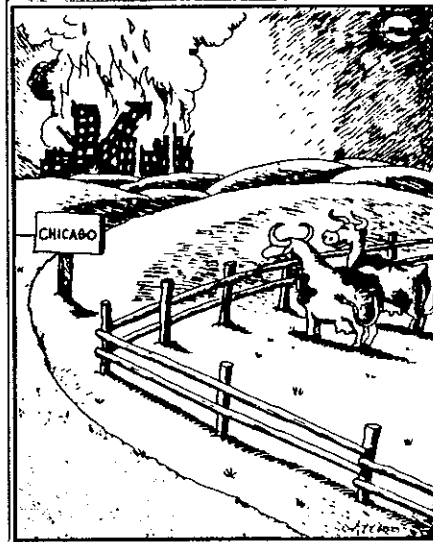


24. The average of 8 numbers is 6; the average of 6 other numbers is 8. What is the average of all 14 numbers?

25. If the ratio of  $4a$  to  $3b$  is 8 to 9, what is the ratio of  $3a$  to  $4b$ ?



"Hey! I got one! I got one!"



"It seems that agent 6373 has accomplished her mission."

16.

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17.

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25.

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(C)

S.A.T. (C)

(C)

SECTION 1

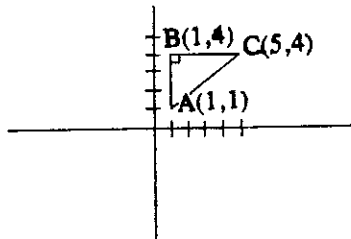
1. If  $3x + 2 > 2x + 7$ , then  $x$  is

- (A) 5
- (B)  $< 5$
- (C)  $> 5$
- (D)  $< 1$
- (E)  $< -1$

2. If  $x \neq \frac{2}{3}$ ,  $\frac{6x^2 - 13x + 6}{3x - 2} =$

- (A)  $3x - 2$
- (B)  $3x - 3$
- (C)  $2x - 6$
- (D)  $2x - 3$
- (E)  $2x^2 + 3x - 3$

3.



What is the length of side  $AC$ ?

- (A)  $2\frac{1}{2}$
- (B) 5
- (C) 7
- (D) 11
- (E) 25

4. If  $3!$  means  $3 \cdot 2 \cdot 1$  and  $4!$  means  $4 \cdot 3 \cdot 2 \cdot 1$ , then what does  $\frac{8!}{9!}$  equal?

- (A) 9
- (B)  $\frac{8}{9}$
- (C)  $\frac{1}{9}$
- (D)  $\frac{1}{89}$
- (E) 0

5. If a distance estimated at 150 feet is really 140 feet, the percent of error in this estimate is

- (A) 10%
- (B)  $7\frac{1}{7}\%$
- (C)  $6\frac{2}{3}\%$
- (D) 1%
- (E) 0.71%

6. There are  $x$  cookies in a cookie jar. One child eats  $\frac{1}{4}$  of all the cookies. A second child eats  $\frac{1}{3}$  of the remaining cookies. If the remaining cookies are distributed among four other children, what fraction of the original number of cookies did each of the four children receive?

- (A)  $\frac{7}{12}$
- (B)  $\frac{1}{2}$
- (C)  $\frac{5}{12}$
- (D)  $\frac{1}{6}$
- (E)  $\frac{1}{8}$

7.  $|2y - 4| = 6$ ,  $y =$

- (A) -5, 1
- (B) -8
- (C) -4, 3
- (D) 5, -1
- (E) 0

8. Given the system of equations  $3x + 2y = 4$  and  $6x - 3y = 6$ , what does  $y$  equal?

- (A) 14
- (B)  $\frac{14}{6}$
- (C) 2
- (D)  $\frac{11}{7}$
- (E)  $\frac{2}{7}$

9. If the radius of a circle is diminished by 20%, the area is diminished by

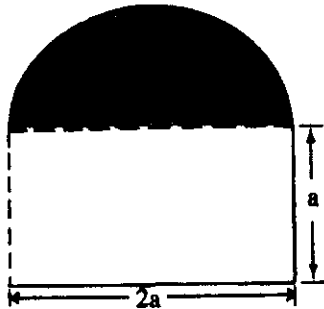
- (A) 20%
- (B) 36%
- (C) 40%
- (D) 64%
- (E) 400%

10. If  $x - y = 10$  and  $x + y = 20$  then what is the value of  $x^2 - y^2$ ?

- (A) 400
- (B) 200
- (C) 100
- (D) 30
- (E) It cannot be determined from the information given.

11. A semicircle surmounts a rectangle whose length is  $2a$  and whose width is  $a$ , as shown in the diagram. A formula for finding the area of the whole figure is

- (A)  $2a^2 + \frac{\pi a^2}{2}$   
 (B)  $2\pi a^2$   
 (C)  $3\pi a^2$   
 (D)  $2a^2 + \pi a^2$   
 (E)  $2a^2 + 2\pi a^2$



12. An airplane flies 550 yards in 3 seconds. What is the speed of the airplane, expressed in miles per hour? (5,280 ft. = 1 mi.)

- (A) 1,125  
 (B) 375  
 (C) 300  
 (D) 125  
 (E) 90

13. Given that 1 meter = 3.28 ft., the distance run in a 100-meter race approximates most closely

- (A) 100 yards  
 (B) 90 yards  
 (C) 105 yards  
 (D) 110 yards  
 (E) 103 yards

14. Of the following sets of fractions, the set that is arranged in increasing order is

- (A)  $\frac{7}{12}$   $\frac{6}{11}$   $\frac{3}{5}$   $\frac{5}{8}$   
 (B)  $\frac{6}{11}$   $\frac{7}{12}$   $\frac{5}{8}$   $\frac{3}{5}$   
 (C)  $\frac{6}{11}$   $\frac{7}{12}$   $\frac{3}{5}$   $\frac{5}{8}$   
 (D)  $\frac{3}{5}$   $\frac{5}{8}$   $\frac{6}{11}$   $\frac{7}{12}$   
 (E)  $\frac{7}{12}$   $\frac{6}{11}$   $\frac{5}{8}$   $\frac{3}{5}$

15. If one pipe can fill a tank in 1.5 hours and another can fill the same tank in 45 minutes, then how many hours will it take the two pipes to fill the tank if they are working together?

- (A)  $\frac{1}{3}$   
 (B)  $\frac{1}{2}$   
 (C)  $\frac{5}{6}$   
 (D) 1  
 (E) 1.5

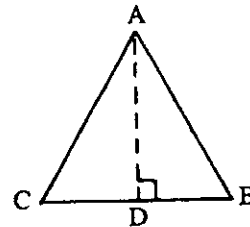
16. If the sum of the edges of a cube is 48 inches, the volume of the cube in cubic inches is

- (A) 64  
 (B) 96  
 (C) 149  
 (D) 512  
 (E) 1,728

17. If the length of each side of a square is  $\frac{2x}{3} + 1$ , the perimeter of the square is

- (A)  $\frac{8x + 4}{3}$   
 (B)  $\frac{8x + 12}{3}$   
 (C)  $\frac{2x}{3} + 4$   
 (D)  $\frac{2x}{3} + 16$   
 (E)  $\frac{4x}{3} + 2$

18. Equilateral triangle  $ABC$  has a perpendicular line drawn from  $A$  to point  $D$ . If the triangle is "folded over" on the perpendicular line so that points  $B$  and  $C$  meet, the perimeter of the new triangle is approximately what percent of the perimeter of the triangle before the fold?



- (A) 100%  
 (B) 78%  
 (C) 50%  
 (D) 32%  
 (E) It cannot be determined from the information given.

19. To find the radius of a circle whose circumference is 60 inches

- (A) multiply 60 by  $\pi$   
 (B) divide 60 by  $2\pi$   
 (C) divide 30 by  $2\pi$   
 (D) divide 60 by  $\pi$  and extract the square root of the result  
 (E) multiply 60 by  $\frac{\pi}{2}$

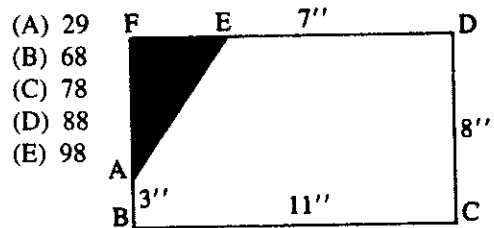
20. If the outer diameter of a metal pipe is 2.84 inches and the inner diameter is 1.94 inches, the thickness of the metal in inches is
- (A) .45  
 (B) .90  
 (C) 1.42  
 (D) 1.94  
 (E) 2.39

22.  $(x + 9)(x + 2) =$
- (A)  $x^2 + 18$   
 (B)  $11x$   
 (C)  $x^2 + 11$   
 (D)  $x^2 + 11x + 18$   
 (E)  $9(x + 2) + 2(x + 9)$

23. The points  $(3,1)$  and  $(5,y)$  are  $\sqrt{13}$  units apart. What does  $y$  equal?
- (A)  $-3$   
 (B)  $4$   
 (C)  $\sqrt{17}$   
 (D)  $10$   
 (E)  $17$

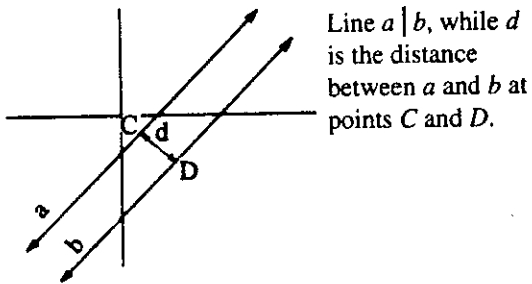
24. In a baseball game, a pitcher needs to throw nine strikes to complete an inning. If a pitcher is able to throw strikes on 85% of his pitches, how many pitches to the nearest whole number would it take for him to throw the necessary number of strikes for a nine-inning game?
- (A) 95  
 (B) 97  
 (C) 103  
 (D) 105  
 (E) 111

25. Corner  $AFE$  is cut from the rectangle as shown in the figure below. The area of the remaining polygon  $ABCDE$  in square inches is



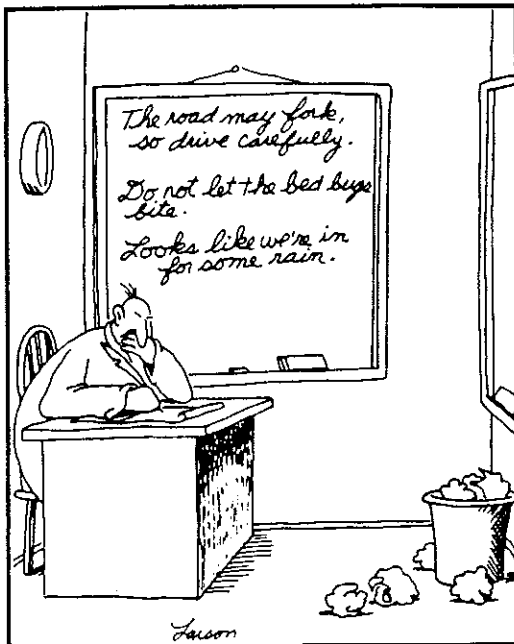
Note: Figure not drawn to scale.

21



The length of segment  $d$

- (A) steadily increases as it is moved along lines  $a$  and  $b$  to the right  
 (B) steadily decreases as it is moved toward the left  
 (C) fluctuates in both directions  
 (D) remains constant  
 (E) none of the above



Confucius at the office

(C)

S.A.T. (C)

(C)

SECTION 3

- If a triangle of base 7 is equal in area to a circle of radius 7, what is the altitude of the triangle?  
(A)  $8\pi$   
(B)  $10\pi$   
(C)  $12\pi$   
(D)  $14\pi$   
(E) It cannot be determined from the information given.
- If the following numbers are arranged in order from the smallest to the largest, what will be their correct order?  
I.  $\frac{9}{13}$   
II.  $\frac{13}{9}$   
III. 70%  
IV.  $\frac{1}{.70}$   
(A) II, I, III, IV  
(B) III, II, I, IV  
(C) III, IV, I, II  
(D) II, IV, III, I  
(E) I, III, IV, II
- The coordinates of the vertices of quadrilateral PQRS are P(0,0), Q(9,0), R(10,3), and S(1,3), respectively. What is the area of PQRS?  
(A)  $9\sqrt{10}$   
(B)  $\frac{1}{2}\sqrt{10}$   
(C)  $\frac{1}{2}$   
(D) 27  
(E) It cannot be determined from the information given.
- If  $8x + 4 = 64$ , then  $2x + 1 =$   
(A) 12  
(B) 13  
(C) 16  
(D) 24  
(E) 60
- A circle whose radius is 7 has its center at the origin. Which of the following points are outside the circle?  
I. (4,4)      III. (4,5)  
II. (5,5)     IV. (4,6)  
(A) I and II only                      (D) II and IV only  
(B) II and III only                     (E) III and IV only  
(C) II, III, and IV only
- What is the difference in surface area between a square with side = 9 and a cube with edge = 3?  
(A) 516  
(B) 432  
(C) 72  
(D) 27  
(E) 18
- A set of numbers is "quarked" if the sum of all the numbers in the set is evenly divisible by each of the numbers in the set. Which of the following sets is "quarked"?  
(A) (1,3,5,7)  
(B) (4,6,8)  
(C) (6,7,8,9)  
(D) (2,4,6)  
(E) (5,10,15,20)
- If  $x \neq -2$ ,  $\frac{3(x^2 - 4)}{x + 2} =$   
(A)  $3x^2 + 4$   
(B)  $3x - 2$   
(C)  $x - 2$   
(D)  $3x - 6$   
(E)  $3x + 6$
- An ice-cream truck runs down a certain street 4 times a week. This truck carries 5 different flavors of ice-cream bars, each of which comes in 2 different designs. Considering that the truck runs Monday through Thursday, and Monday was the first day of the month, by what day of the month could a person, buying one ice-cream bar each truck run, purchase all the different varieties of ice-cream bars?  
(A) 11th      (C) 21st              (E) 30th  
(B) 16th      (D) 24th
- If  $N! = N(N - 1)(N - 2) \dots [N - (N - 1)]$ , what does  $\frac{N!}{(N - 2)!}$  equal?  
(A)  $N^2 - N$   
(B)  $N^3 + N^1 - N^2 + \frac{N}{N^2}$   
(C)  $N + 1$   
(D) 1  
(E) 6

(C)

S.A.T. (C)

(C)

SECTION 5

PART I

$$m^3 = 64$$

$$\sqrt{n} = 16$$

Column A

Column B

$s > t$

1. 

$s - t$
---------

$t - s$
---------

2. 

The cost of a complete stereo that is discounted 30%
--

The cost of a pair of speakers that is discounted 30%
---

$$p > 0$$

$$q < 0$$

3. 

$p + q$
---------

$p - q$
---------

Distance from A to B is 12 miles  
Distance from A to C is 10 miles

4. 

Distance from A to B
----------------------

Distance from B to C
----------------------

5. 

The number that 63 is 7% of
-----------------------------

7% of 63
----------

$r = \frac{1}{2}$

6. 

$2r^3 - 12r + 7$
------------------

$r^2 + 1$
-----------

$x \neq 0$

7. 

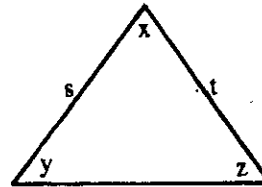
$\frac{1}{x^2}$
-----------------

$x^2$
-------

8. 

$m$
-----

$n$
-----



Note: Figure not drawn to scale.

$x = y = z$

9. 

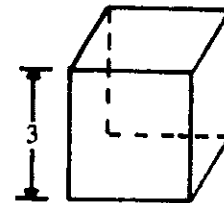
side $s$
----------

side $t$
----------

10. 

Area of a rectangle with a length of 4 and a width of $\pi$
---

Area of a circle with radius 4
--------------------------------



11. 

Surface area of the cube
--------------------------

Cutting the cube in half to form 2 smaller boxes: the sum of the surface area of both the boxes
---

$r < 0 < s$

12. 

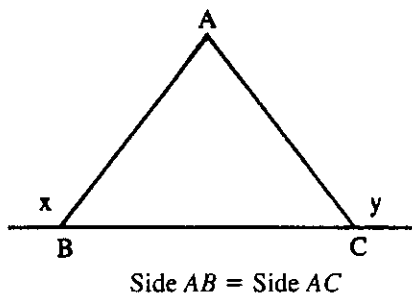
$r^5$
-------

$s^4$
-------

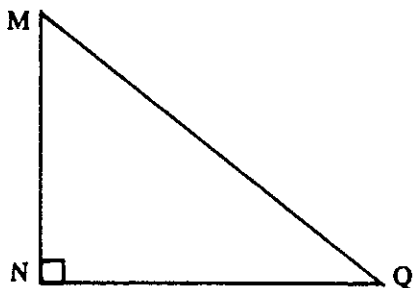
$$x^2 = 25$$

$$2y + 3 = 27$$

13.



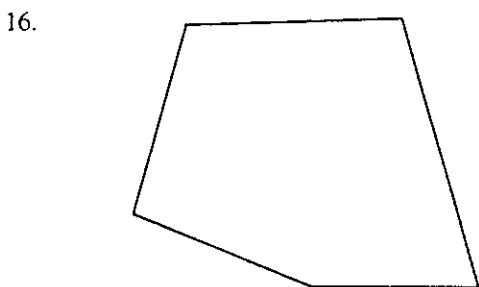
14.



$\angle MNQ$  is a right angle

15.

## PART II



In the pentagon above, what is the maximum number of different diagonals that can be drawn?

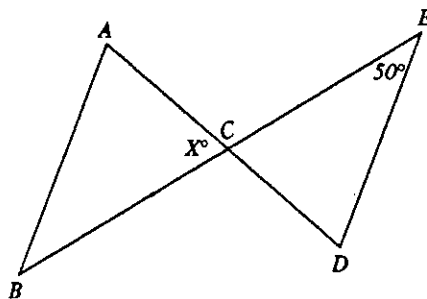
17. If  $4x = 2(2 + x)$  and  $6y = 3(2 + y)$ , then  $2x + 3y =$

18. Let the "JOSH" of a number be defined as three less than three times the number. What number is equal to its "JOSH"?

19. Machine A produces flue covers at a uniform rate of 2,000 per hour. Machine B produces flue covers at a uniform rate of 5,000 in  $2\frac{1}{2}$  hours. After  $7\frac{1}{4}$  hours, machine A has produced how many more flue covers than machine B?

20. .01 is the ratio of .1 to what number?

- 21.



In the figure above,  $AB$  is parallel to  $ED$  and  $AC = BC$ . If angle  $E$  is  $50^\circ$ , then  $x =$

22. At NJL High School,  $\frac{1}{4}$  of the school's population are seniors,  $\frac{1}{5}$  are juniors and  $\frac{1}{3}$  are sophomores. If there are 390 freshmen, what is the total school population?

23. From the town of Williston Park to Albertson there are 3 different roads. From the town of Albertson to Mineola there are 5 routes. How many different paths are there to go from Williston Park to Mineola through Albertson?

24. If 12 candies cost \$1.70, how many of these candies can be bought for \$10.20?

25. Two roads intersect at right angles. A pole is 30 meters from one road and 40 meters from the other road. How far (in meters) is the pole from the point where the roads intersect?



"Anthropologists! Anthropologists!"

16.

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(D)

S.A.T. (D)

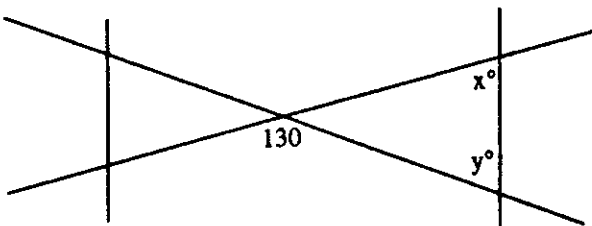
(D)

SECTION 1

1. If  $2/3 + 3/4 + 5/6 + p = 3$ , then  $p =$

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

2. In the figure below,  $x + y =$



- (A) 360
- (B) 180
- (C) 130
- (D) 50
- (E) It cannot be determined from the information given.

3. If  $P = QR$  and  $Q = S + 2$ , then which of the following is equal to  $\frac{P}{R}$ ?

- (A)  $S + 2$
- (B)  $S$
- (C)  $S - 2$
- (D)  $Q(S + 2)$
- (E)  $SQ$

4. If  $x = -\frac{1}{2}$ , then which of the following is the greatest?

- (A)  $x^5$
- (B)  $x^4$
- (C)  $x^3$
- (D)  $x^2$
- (E)  $x$

5. A man runs 5 miles per hour for one and one-half hours. If a woman runs the same distance in one hour, what is the woman's average speed in miles per hour?

- (A) 10
- (B) 9.5 (D) 5
- (C) 7.5 (E) 4.5

6. What is the sum of four integers whose average is 11?

- (A) 36
- (B) 38
- (C) 40
- (D) 42
- (E) 44

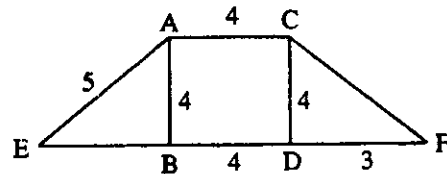
7. In a basket containing 180 pears, 9 are spoiled. What percent of the pears in the basket are not spoiled?

- (A) 95%
- (B) 90% (D) 25%
- (C) 50% (E) 20%

8. A number  $r$  is tripled, the new number is decreased by three, and that number is then divided by three. Which of the following reflects the above statements?

- (A)  $3(r - 3)$
- (B)  $9r$  (D)  $r$
- (C)  $r - 3$  (E)  $r - 1$

9. If  $ABCD$  is a square with a side of 4, then what is the sum of the perimeter of  $\triangle ABE$  and  $\triangle CDF$ ?



Note: Figure not drawn to scale.

- (A) 48
- (B) 36 (D) 12
- (C) 24 (E) 6

10.  $\sqrt{3/4 - 3/16} =$

- (A)  $4/3$
- (B)  $3/4$  (D)  $1/3$
- (C)  $9/16$  (E)  $1/4$

11. If  $\{w, x, y, z\} = z(w + x + y)$ , so that  $\{1, 2, 3, 4\} = 4(1 + 2 + 3) = 24$ , then all of the following are equal *except*

- (A)  $\{2, 3, 4, 6\}$
- (B)  $\{4, 3, 2, 6\}$  (D)  $\{4, 1, 5, 6\}$
- (C)  $\{3, 5, 1, 6\}$  (E)  $\{1, 5, 3, 6\}$

12. If a pound contains 16 ounces, 16.4 ounces would be how many pounds?

- (A) 1.75
- (B) 1.5
- (C) 1.25
- (D) 1.025
- (E) 1.0025

13. If a certain circle has a circumference of  $x$ , then which of the following is the radius of the circle?

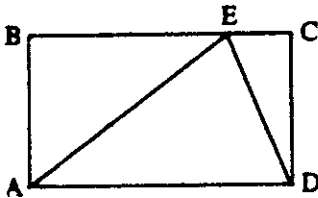
- (A)  $\frac{x}{2\pi}$
- (B)  $\frac{x}{\pi}$
- (C)  $\frac{2x}{\pi}$
- (D)  $2 \times \pi$
- (E)  $4 \times \pi$

14. If  $(x + 1)(x - 2)$  is positive, then

- (A)  $x < -1$  or  $x > 2$
- (B)  $x > -1$  or  $x < 2$
- (C)  $-1 < x < 2$
- (D)  $-2 < x < 1$
- (E)  $x = -1$  or  $x = 2$

15. If rectangle  $ABCD$  has a length of 12 and a width of 8, what is the ratio of the area of  $\triangle AED$  to the area of  $ABCD$ ?

- (A) 1:6
- (B) 1:4
- (C) 2:5
- (D) 3:7
- (E) 1:2



16. A "full" number is one that is the sum of all the other numbers besides itself by which it can be divided without leaving a remainder. Which of the following is a "full" number?

- I. 6
- II. 12
- III. 28
- IV. 32

- (A) I only
- (B) I and II only
- (C) I and III only
- (D) III and IV only
- (E) I, III, and IV only

17. ANNUAL SALE OF CASSETTES  
ABC SOUND STORES

Year	Number Sold
1985	7,000
1986	9,000
1987	12,000
1988	16,000
1989	20,000
1990	24,000

In the above table, which yearly period had the smallest percent increase in sales?

- (A) 1985-86
- (B) 1986-87
- (C) 1987-88
- (D) 1988-89
- (E) 1989-90

18. A student scored 70, 75, and 80 on three tests. If the student scored  $y$  on the fourth test, what is the average (arithmetic mean) of the four tests?

- (A)  $\frac{225 + y}{4}$
- (B)  $\frac{225 + y}{3}$
- (C)  $\frac{75 + y}{4}$
- (D)  $\frac{75 + y}{2}$
- (E)  $y$

19. Two snails are three feet apart and directly facing each other. If one snail moves forward continuously at .04 inches per second and the other moves forward continuously at .05 inches per second, how many minutes will it take for the snails to touch?

- (A) 3  $\frac{1}{3}$  minutes
- (B) 6  $\frac{2}{3}$  minutes
- (C) 9 minutes
- (D) 12  $\frac{1}{2}$  minutes
- (E) 18 minutes

20. A person is hired for a job that pays \$500 per month and receives a 10% raise in each following month. In the fourth month, how much will that person earn?

- (A) \$550
- (B) \$600.50
- (C) \$650.50
- (D) \$665.50
- (E) \$700

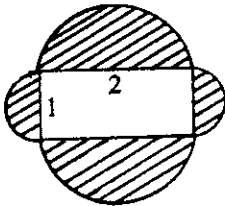
21. John is now four times as old as Anne was six years ago. How old is Anne today if John is 20 years old?

- (A) 8
- (B) 11
- (C) 12
- (D) 14
- (E) 15

22. If  $a^2 - 2ab + b^2 = 36$  and  $a^2 - 3ab + b^2 = 22$ , what is the value of  $ab$ ?

- (A) 6
- (B) 8
- (C) 12
- (D) 14
- (E) It cannot be determined from the information given.

23. In the figure below, four semicircles are drawn on the four sides of a rectangle. What is the total area of the shaded portion?



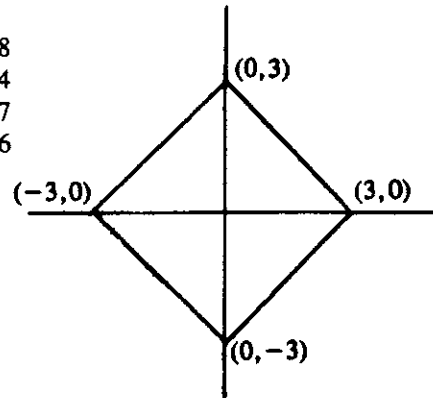
- (A)  $5\pi$
- (B)  $\frac{5\pi}{2}$
- (C)  $\frac{5\pi}{4}$
- (D)  $\frac{5\pi}{8}$
- (E)  $\frac{5\pi}{16}$

24.  $P = 1/2 + 1/3$  and  $Q = P^2$ , what is  $Q - P$ ?

- (A) 1
- (B)  $\frac{5}{36}$
- (C) 0
- (D)  $-\frac{5}{36}$
- (E)  $-\frac{25}{36}$

25. In the figure, the enclosed square has an area of

- (A) 9
- (B) 18
- (C) 24
- (D) 27
- (E) 36



Note: Figure not drawn to scale.



"So then this little sailor dude whips out a can of spinach, this crazy music starts playin', and . . . well, just look at this place."

(D)

S.A.T. (D)

(D)

SECTION 3

1. Which of the following is smaller than  $-1/2$  ?

- (A)  $-3/5$
- (B)  $-3/7$
- (C)  $-2/5$
- (D)  $-1/3$
- (E)  $-1/4$

2.  $2/3$  of a certain number is 6 more than  $1/2$  of the same number. What is the number?

- (A) 48
- (B) 36
- (C) 30
- (D) 24
- (E) 12

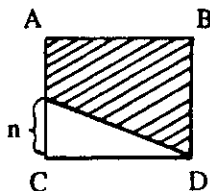
3. What percent is 10 of 2?

- (A) 20%
- (B) 50%
- (C) 200%
- (D) 400%
- (E) 500%

4. A quart of oil usually sells for \$1.39. During a sale, the price is reduced to 59 cents. If a customer buys six quarts at the sale price, how much is she saving off the regular price?

- (A) \$8.34
- (B) \$6.40
- (C) \$4.80
- (D) \$3.54
- (E) \$2.88

5. If square  $ABCD$  has a side of  $m$ , then which of the following represents the shaded area?



- (A)  $m^2 - \frac{mn}{2}$
- (B)  $m^2 + \frac{mn}{2}$
- (C)  $mn + m^2$
- (D)  $m^2 - mn$
- (E)  $m^2 - 2n$

6. John is 6 inches taller than Henry, who is  $3/4$  as tall as Mark. Which of the following could be the heights of the three boys?

- I. Mark = 4'    John =  $3\frac{1}{2}'$     Henry = 3'
- II. Mark = 6'    John =  $5\frac{1}{2}'$     Henry =  $4\frac{1}{2}'$
- III. Mark =  $5\frac{1}{2}'$     John =  $4\frac{1}{2}'$     Henry = 4'

- (A) I only
- (B) I and II only
- (C) II and III only
- (D) I and III only
- (E) None of the above

7. What is the average of  $2/3$ ,  $3/4$ , and  $5/6$  ?

- (A)  $7/9$
- (B)  $3/4$
- (C)  $2/3$
- (D)  $5/12$
- (E)  $5/24$

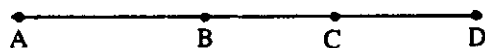
8. If  $k = .75j$  and both  $j$  and  $k$  are positive integers,  $k$  could be any of the following except

- (A) 9
- (B) 12
- (C) 15
- (D) 18
- (E) 20

9. If  $r$  is an even integer greater than 2, then which of the following must also be even?

- (A)  $(r - 1)^2$
- (B)  $(r + 1)^2$
- (C)  $\frac{r}{2} + 1$
- (D)  $2r + 1$
- (E)  $r^2 + r$

10. Segment  $AB$  is three times longer than segment  $BC$ , which is two times as long as segment  $CD$ . If segment  $BC$  is removed from the line and the other two segments are joined to form one line, then what is the ratio of the original line  $AD$  to the new line  $AD$ ?



Note: Figure not drawn to scale.

- (A) 3:2
- (B) 9:7
- (C) 5:4
- (D) 7:6
- (E) 11:10

SECTION 5

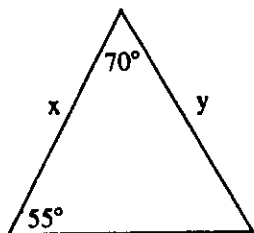
PART I

Column A

Column B

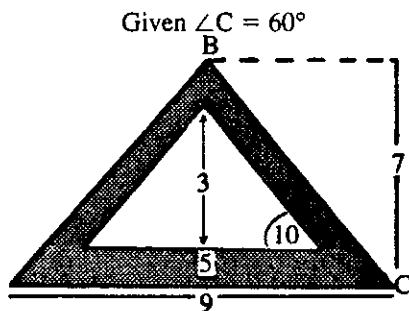
1. The sum of all angles of a square

The sum of all angles of a polygon all of whose sides are equal



2. side x

side y



Note: Figure not drawn to scale.

3. The area of the smaller triangle

The shaded area

$x > 0$

4.  $\frac{1}{x}$

$x$

5.  $(a + 3)(a - 4)$

$a^2 - 7a + 12$

6. Circumference of circle with radius  $2r$

Perimeter of square with side  $\pi r$

7.  $\sqrt{\frac{1}{3} \times \frac{1}{6}}$

$\sqrt{\frac{1}{3} + \frac{1}{6}}$

Questions 8–9 refer to the following definition.

$\boxtimes = (x - 1)^2 + x$

8.  $\boxtimes 2$

$2 \boxtimes$

9.  $0 \boxtimes$

$1 \boxtimes$

10.  $(a + b)(c + d)$

$(d + c)(b + a)$

11. 42% of 165

The number that 80 is 20% of

12. There are eight separate cubes each of which has a side of 1. The eight cubes can be stuck together to make one big cube.

Surface area of one small cube

Surface area of the big cube  

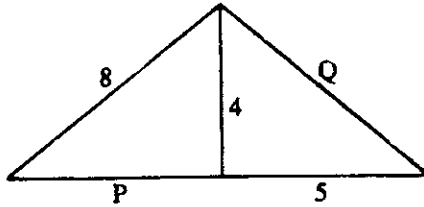
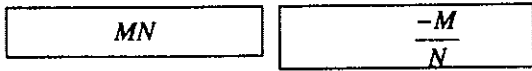
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8

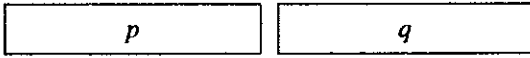
13.

$$M > 0$$

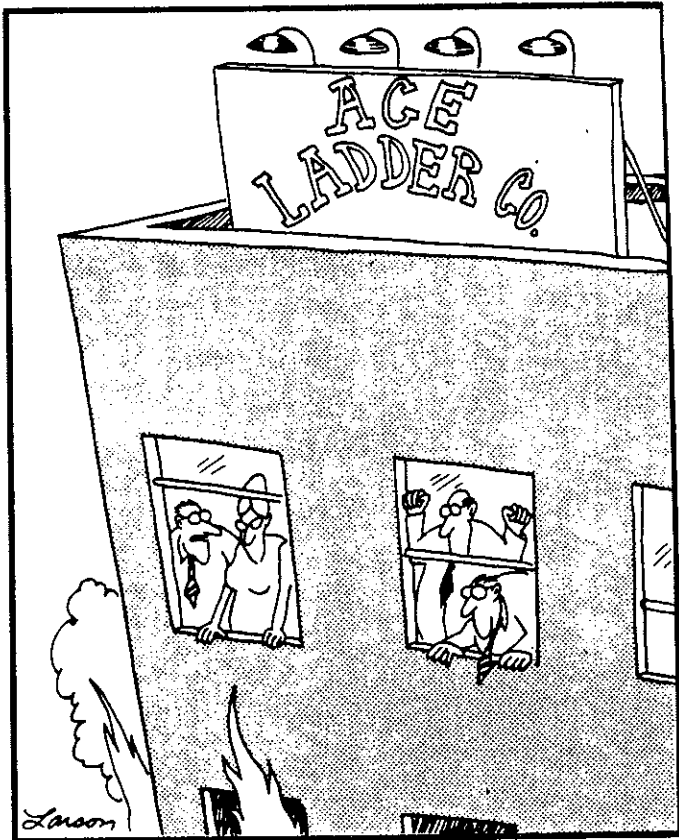
$$N < 0$$



14.



15.



"Wait a minute! Say that again, Doris! . . . You know, the part about, 'if only we had some means of climbing down.'"

## PART II

16. Two adjacent sides of a rectangle measure 4 and 7. What is the perimeter of the rectangle?

17. Based on the table below, what is the median for the set of data?

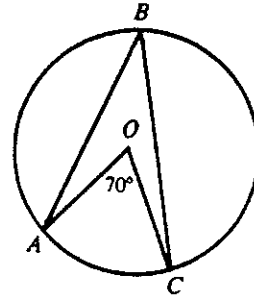
Measure	Frequency
70	4
85	3
90	2
95	1

18. Let  $\odot x = x - 1$  and  $\square x = 2x$ .  
 $\odot 1 + \square 1 =$

19. What is the value of  $x + y^2 - z$ , if  $x = y = z = -1$ ?

20. The expression  $\frac{6}{\frac{1}{2} + \frac{1}{3}} =$

21. In the figure below, if  $\angle AOC$  is a central angle and the measure of  $\angle AOC = 70^\circ$ , what is the measure of  $\angle ABC$ ? (Do not grid the degree symbol)

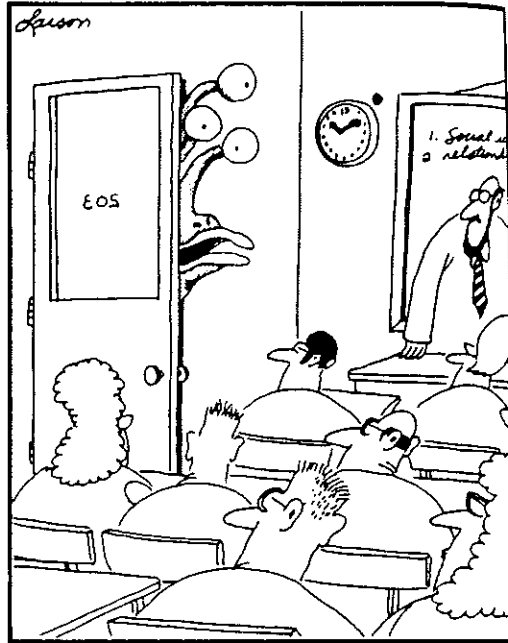


22. In the junior class at Dawnville High School, 44 of 70 juniors take pre-calculus and 46 take chemistry. If 10 take neither course, how many take both pre-calculus and chemistry?

23. If a student's average (arithmetic mean) for five exams is 70 and the two lowest test grades of 50 and 30 are disregarded, what is the student's average for the remaining exams?

24. If  $3a + 5b = 10$  and  $a - b = 6$ , find the value of  $7a + 7b$ .

25.  $a - b = b - c = c - a$ . What is the value of  $\frac{2a + 3b}{c}$  ?



"Whoa! ... Wrong room."

16.

.	7	7	.
0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

17.

.	7	7	.
0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

18.

.	7	7	.
0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

19.

.	7	7	.
0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

20.

.	7	7	.
0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

21.

.	7	7	.
0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

22.

.	7	7	.
0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

23.

.	7	7	.
0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

24.

.	7	7	.
0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

25.

.	7	7	.
0	0	0	0
1	1	1	1
2	2	2	2
3	3	9	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

# Critical Thinking Practice

## S.A.T. SKILLS - SECTION 2

In this section solve each problem, using any available space on the page for scratchwork. Then decide which is the best of the choices given and blacken the corresponding space on the answer sheet.

The following information is for your reference in solving some of the problems.

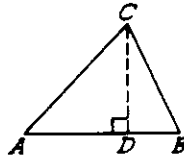
Circle of radius  $r$ : Area =  $\pi r^2$ ; Circumference =  $2\pi r$

The number of degrees of arc in a circle is 360.

The measure in degrees of a straight angle is 180.

Definitions of symbols:

=	is equal to	$\leq$	is less than or equal to
$\neq$	is unequal to	$\geq$	is greater than or equal to
<	is less than		is parallel to
>	is greater than	$\perp$	is perpendicular to



Triangle: The sum of the measures in degrees of the angles of a triangle is 180.

If  $\angle CDA$  is a right angle, then

$$(1) \text{ area of } \triangle ABC = \frac{AB \times CD}{2}$$

$$(2) AC^2 = AD^2 + DC^2$$

**Note:** Figures which accompany problems in this test are intended to provide information useful in solving the problems. They are drawn as accurately as possible EXCEPT when it is stated in a specific problem that its figure is not drawn to scale. All figures lie in a plane unless otherwise indicated. All numbers used are real numbers.

1. If  $5x - 3 = 2a$ , then  $\frac{5x - 3}{2} =$

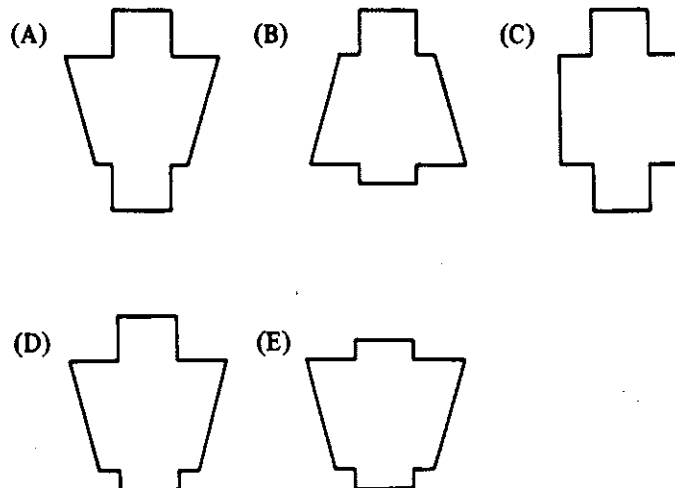
- (A)  $\frac{a}{4}$  (B)  $\frac{a}{2}$  (C)  $a$  (D)  $2a$  (E)  $4a$



2. A train traveling 60 miles per hour for 1 hour covers the same distance as a train traveling 30 miles per hour for how many hours?

- (A) 3 (B) 2 (C) 1 (D)  $\frac{1}{2}$  (E)  $\frac{1}{3}$

3. The container above has a rectangular base with sides that are perpendicular to the base. If a cut is made along each of the four vertical edges and the sides folded out flat, which of the following patterns results?

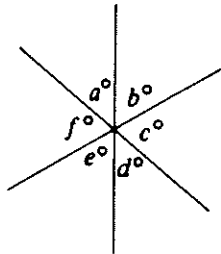




# Critical Thinking Practice

## S.A.T. SKILLS - SECTION 2

4. What is the sum of 5 consecutive integers if the middle one is 70?  
 (A) 14 (B) 75 (C) 272 (D) 330 (E) 350



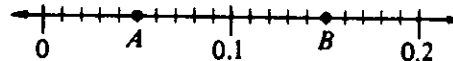
5. In the figure above, if the three lines intersect at a point as shown, then  $a + b$  must be equal to which of the following?
- I.  $d + e$   
 II.  $c + f$   
 III.  $e + f$
- (A) I only (B) II only (C) III only  
 (D) II and III only (E) I, II, and III

6. This question was not counted in computing scores.

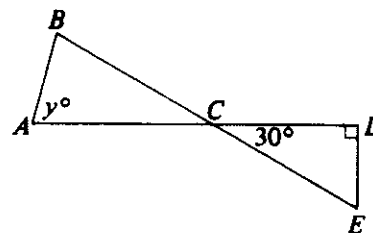


7. On the line above, if  $AB < BC < CD < DE$ , which of the following must be true?
- (A)  $AC < CD$   
 (B)  $AC < CE$   
 (C)  $AD < CE$   
 (D)  $AD < DE$   
 (E)  $BD < DE$

8. In a basket of 120 apples, exactly 6 were rotten. What percent of the apples were rotten?  
 (A) 5% (B) 6% (C) 10%  
 (D) 20% (E) 25%



9. In the figure above, what is the length of  $AB$ ?  
 (A) 1.00  
 (B) 0.50  
 (C) 0.15  
 (D) 0.10  
 (E) 0.05
10. For any sentence  $J$ , the expression  $N_t(J)$  is defined to mean the number of times the letter "t" appears in  $J$ . If  $J$  is the sentence "All cats are good luck," then  $N_t(J) =$   
 (A) 0 (B) 1 (C) 2 (D) 3 (E) 4



11. In the figure above, if  $BC = CA$ , then  $y =$   
 (A) 15  
 (B) 60  
 (C) 75  
 (D) 150  
 (E) 165

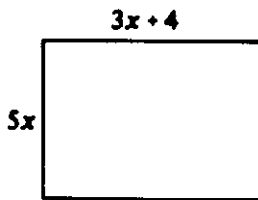
12. If 44 is the average (arithmetic mean) of  $x, x, x, 35$ , and  $65$ , then  $x =$   
 (A) 40  
 (B) 42  
 (C) 44  
 (D) 48  
 (E) 50

# Critical Thinking Practice

## S.A.T. SKILLS - SECTION 2

13. If a sports outfit consisting of a jacket, slacks, and hat can be made up from any of 3 different jackets, 4 different pairs of slacks, and 2 different hats, then the total number of different such sports outfits possible is

(A) 4 (B) 9 (C) 12 (D) 24 (E) 36



14. What is the perimeter of the rectangle above?

(A)  $8x + 4$   
 (B)  $8x + 8$   
 (C)  $15x + 4$   
 (D)  $16x + 4$   
 (E)  $16x + 8$

15. In a relay race, 4 runners each ran 400 meters in 51.0 seconds, 53.2 seconds, 50.8 seconds, and 49.7 seconds, respectively. Their total running time exceeded 3 minutes by how many seconds?

(A) 14.7  
 (B) 23.3  
 (C) 24.3  
 (D) 24.7  
 (E) 34.7

16. How many shares of stock must be bought at  $31\frac{1}{4}$  dollars per share and sold at  $31\frac{3}{8}$  dollars per share in order to make a profit of \$100? (Ignore fees and taxes.)

(A) 1,000  
 (B) 800  
 (C) 400  
 (D) 80  
 (E) 40

17. If  $x + y = 3$  and  $x - y = 5$ , then  $x^2 - y^2 =$

(A) 4 (B) 8 (C) 15 (D) 16 (E) 64

Questions 18-19 refer to the following definition.

$\langle x \rangle$  is defined as 1 less than the number of digits in the integer  $x$ . For example,  $\langle 100 \rangle = 3 - 1 = 2$ .

18. If  $x$  is a positive integer less than 1,000,001, then  $\langle x \rangle$  is at most

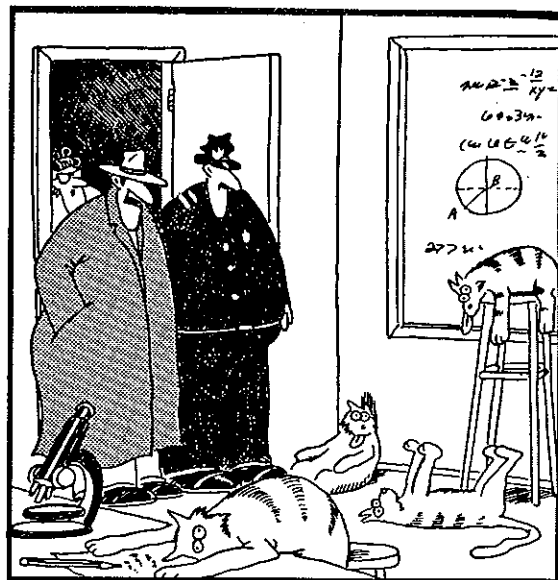
(A) 5 (B) 6 (C) 7  
 (D) 999,999 (E) 1,000,000

19. If  $x$  has 1,001 digits, then what is the value of  $\langle \langle \langle x \rangle \rangle \rangle$ ?

(A) 997  
 (B) 1  
 (C) 0  
 (D) -1  
 (E) It cannot be determined from the information given.

20. In a lottery, a green ticket costs 2 dollars more than a red ticket and a red ticket costs 2 dollars more than a blue ticket. If 12 blue tickets cost  $2x$  dollars, what is the price, in dollars, of 5 green tickets and 7 red tickets?

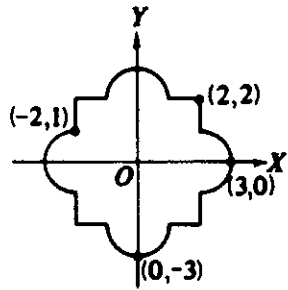
(A)  $2x + 24$  (D)  $12x + 24$   
 (B)  $2x + 34$  (E)  $24x + 34$   
 (C)  $2x + 48$



"Notice all the computations, theoretical scribbles, and lab equipment, Norm... Yes, curiosity killed these cats."

# Critical Thinking Practice

## S.A.T. SKILLS - SECTION 2



21. In the figure above, the two axes divide the enclosed region into four regions that have the same size and shape. Of the following, which is closest to the area of the entire enclosed region?

(A) 7 (B) 10 (C) 19 (D) 22 (E) 29

22. At Central High School, the math club has 15 members and the chess club has 12 members. If a total of 13 students belong to only one of the two clubs, how many students belong to both clubs?

(A) 2  
(B) 6  
(C) 7  
(D) 12  
(E) 14

23. From which of the following statements must it follow that  $x > y$ ?

(A)  $x = 2y$   
(B)  $2x = y$   
(C)  $x + 2 = y$   
(D)  $x - 2 = y$   
(E) None of the above

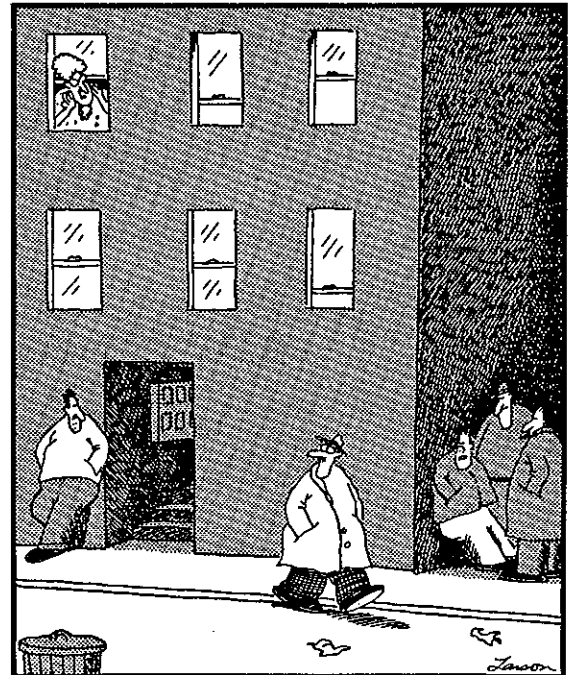
24. The population of Norson, the largest city in Transiania, is 50 percent of the rest of the population of Transiania. The population of Norson is what percent of the entire population of Transiania?

(A) 20% (B) 25% (C) 30%  
(D)  $33\frac{1}{3}\%$  (E) 50%

25. When 30 gallons of water is poured into a cylindrical tank whose sides are perpendicular to a flat base, the water level rises 0.5 foot. If 7.5 gallons of water occupies 1 cubic foot of space, then the base of the tank has an area of how many square feet? (volume of the tank = height  $\times$  area of base)

(A) 37.5 (B) 8 (C) 4.5 (D) 4

(E) It cannot be determined from the information given.



"Sidney! I made a mistake! ... Deposit the \$50 check into savings, and put the \$500 in cash into checking!"

# Critical Thinking Practice

## S.A.T. SKILLS - SECTION 5

In this section solve each problem, using any available space on the page for scratchwork. Then decide which is the best of the choices given and blacken the corresponding space on the answer sheet.

The following information is for your reference in solving some of the problems.

Circle of radius  $r$ : Area =  $\pi r^2$ ; Circumference =  $2\pi r$

The number of degrees of arc in a circle is 360.

The measure in degrees of a straight angle is 180.

Definitions of symbols:

= is equal to

≠ is unequal to

< is less than

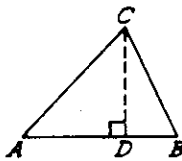
> is greater than

$\leq$  is less than or equal to

$\geq$  is greater than or equal to

$\parallel$  is parallel to

$\perp$  is perpendicular to



Triangle: The sum of the measures in degrees of the angles of a triangle is 180.

If  $\angle CDA$  is a right angle, then

$$(1) \text{ area of } \triangle ABC = \frac{AB \times CD}{2}$$

$$(2) AC^2 = AD^2 + DC^2$$

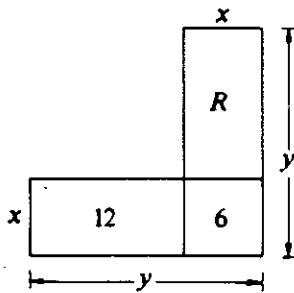
**Note:** Figures which accompany problems in this test are intended to provide information useful in solving the problems. They are drawn as accurately as possible EXCEPT when it is stated in a specific problem that its figure is not drawn to scale. All figures lie in a plane unless otherwise indicated. All numbers used are real numbers.

1. Adding one to which digit of the number 12,345 increases the number by one hundred?

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

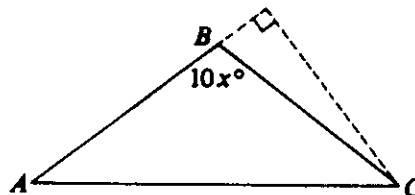
$$\begin{array}{r} 5 \Delta 2 \\ \times \quad 9 \\ \hline 5, 2 \square 8 \end{array}$$

4. In the correctly computed multiplication problem above, if  $\Delta$  and  $\square$  are different digits, then  $\Delta =$
- (A) 1 (B) 5 (C) 6 (D) 7 (E) 8



2. In the figure above, if two identical rectangles overlap to form three regions with areas 12, 6, and  $R$ , respectively, then  $R =$
- (A) 6 (B) 12 (C) 15 (D) 18 (E) 24

3. A person bought 12 cards for 30 cents. If the next day the price of the cards was 5 cents each, how much did the person save per card by buying at the earlier price?
- (A) 2¢ (B)  $2\frac{1}{2}$ ¢ (C) 3¢ (D)  $3\frac{1}{2}$ ¢ (E) 5¢



6. In  $\triangle ABC$  above, which of the following could be a value of  $x$ ?
- (A) 12 (B) 8 (C) 4 (D) 2 (E) 1
7. Carol has twice as many books as Beverly has. After Carol gives Beverly 5 books, she still has 10 more books than Beverly has. How many books did Carol have originally?
- (A) 20 (B) 25 (C) 30 (D) 35 (E) 40

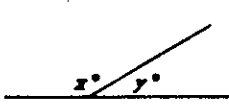
# Critical Thinking Practice

## S.A.T. SKILLS - SECTION 5

Questions 8-27 each consist of two quantities, one in Column A and one in Column B. You are to compare the two quantities and on the answer sheet blacken space

- A if the quantity in Column A is greater;
- B if the quantity in Column B is greater;
- C if the two quantities are equal;
- D if the relationship cannot be determined from the information given.

- Notes:**
1. In certain questions, information concerning one or both of the quantities to be compared is centered above the two columns.
  2. In a given question, a symbol that appears in both columns represents the same thing in Column A as it does in Column B.
  3. Letters such as  $x$ ,  $n$ , and  $k$  stand for real numbers.

EXAMPLES			
	Column A	Column B	Answers
E1.	$2 \times 6$	$2 + 6$	<input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D
E2.		$y$	<input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D
E3.	$p - q$	$q - p$	<input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D

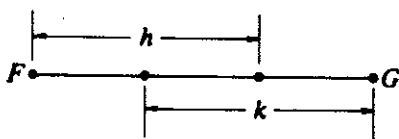
Column A

Column B

8.  $333,733$   $10 \times 33,373$

Of the 100 members of a law school class, exactly 55 are women.

9. Percent of the class members who are men 55%



10. Length  $FG$   $h + k$

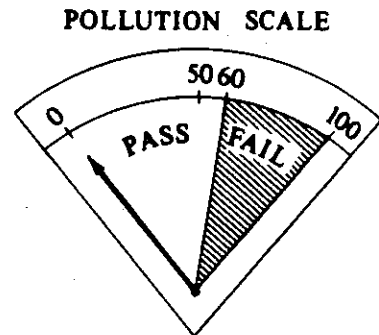
A 3-liter bottle of solution  $P$  costs \$9.66 and a 4-liter bottle of solution  $Q$  costs \$12.88.

11. The average cost per liter of solution  $P$  The average cost per liter of solution  $Q$

12.  $1 - 0.0001$   $1 - 0.0011$

Column A

Column B

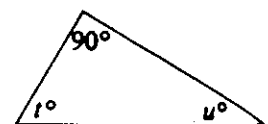
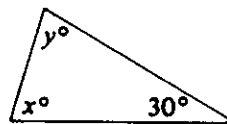


An automobile fails a pollution test if the reading on the meter above is in the shaded region.

13. The reading for an automobile that has passed the test 65

Rita has more than twice the money that Frank and Lisa have together.

14. Amount of money Rita has Three times the amount Lisa has



15.  $x + y$   $t + u$

$$xy = 6$$

$$x^2 + y^2 = 13$$

16.  $(x + y)^2$  18

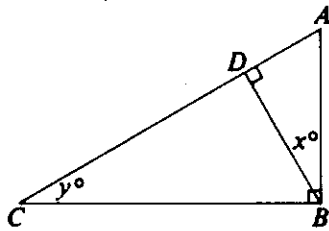
# Critical Thinking Practice

## S.A.T. SKILLS - SECTION 5

### SUMMARY DIRECTIONS FOR COMPARISON QUESTIONS

- Answer:** A if the quantity in Column A is greater;  
 B if the quantity in Column B is greater;  
 C if the two quantities are equal;  
 D if the relationship cannot be determined from the information given.

	Column A	Column B
	The three-digit number 6 ■ 5 is divisible by 5.	
17.	■	5



18.	$x$	$y$
-----	-----	-----

Questions 19-20 refer to the following definition.

For  $x \neq 0$ , let  $(x)$  be defined by  $(x) = x + \frac{1}{x}$ .

19.	$(-4)$	$-4$
-----	--------	------

20.	$(2)$	$(\frac{1}{2})$
-----	-------	-----------------

List A

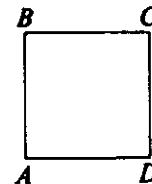
6  
13  
19  
8  
14

List B

17  
24  
11  
16  
19

21.	The sum of 3 different numbers from list A	The sum of 3 different numbers from list B
-----	--	--

	Column A	Column B
22.	$x(x+y) - z(x+y)$	$(x-z)(x+y)$



In square  $ABCD$ ,  $X$  is the midpoint of side  $CD$ , and  $Y$  is the midpoint of segment  $AX$ .

23.	Length $AY$	Length $CY$
-----	-------------	-------------

$x$  is 10% of  $y$ .

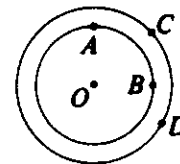
24.	The percent that $y$ is of $x$	100%
-----	--------------------------------	------

$$y^2 - 1 > x^2 - 1$$

25.	$x$	$y$
-----	-----	-----

$S$  is the sum and  $k$  is the average (arithmetic mean) of the consecutive positive integers from 1 to  $n$ , inclusive.

26.	$S$	$nk$
-----	-----	------



**Note:** Figure not drawn to scale.

Minor arcs  $AB$  and  $CD$  have equal length and each lies on a different circle with center  $O$ .

27.	Degree measure of minor arc $AB$	Degree measure of minor arc $CD$
-----	----------------------------------	----------------------------------

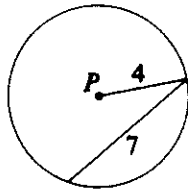
# Critical Thinking Practice

## S.A.T. SKILLS - SECTION 5

Solve each of the remaining problems in this section using any available space for scratchwork. Then decide which is the best of the choices given and blacken the corresponding space on the answer sheet.

28. If  $p$  is an odd integer, which of the following is an even integer?

- (A)  $p - 2$   
 (B)  $p^2$   
 (C)  $p^2 - 2$   
 (D)  $(p - 2)^2$   
 (E)  $p^2 - p$



29. The circle above has center  $P$ . Given segments of the following lengths, which is the length of the longest one that can be placed entirely inside this circle?

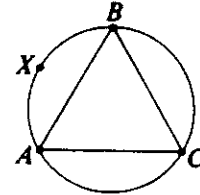
- (A) 6.99  
 (B) 7.00  
 (C) 7.99  
 (D) 8.10  
 (E) 14.00

30. A machine can insert letters in envelopes at the rate of 120 per minute. Another machine can stamp the envelopes at the rate of 3 per second. How many such stamping machines are needed to keep up with 18 inserting machines of this kind?

- (A) 9  
 (B) 12  
 (C) 15  
 (D) 24  
 (E) 27

31. For all numbers  $x, y,$  and  $z,$  if the operation  $\phi$  is defined by the equation  $x \phi y = x + xy,$  then  $x \phi (y \phi z) =$

- (A)  $x + xy + xyz$   
 (B)  $x + xyz$   
 (C)  $x + xy + x + xz$   
 (D)  $x + y + yz$   
 (E)  $x + y + xyz$

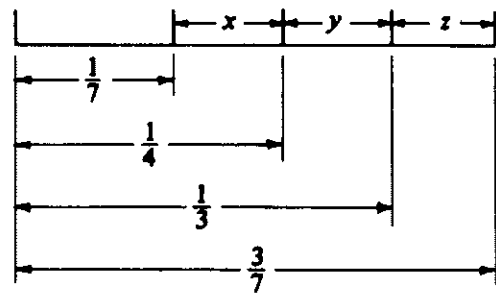


32. In the figure above, inscribed  $\triangle ABC$  is equilateral. If the radius of the circle is  $r,$  then the length of arc  $AXB$  is

- (A)  $\frac{2\pi r}{3}$  (B)  $\frac{4\pi r}{3}$  (C)  $\frac{3\pi r}{2}$   
 (D)  $\frac{\pi r^2}{3}$  (E)  $\frac{2\pi r^2}{3}$

33. If  $x + 2x$  is 5 more than  $y + 2y,$  then  $x - y =$

- (A) -5 (B)  $-\frac{5}{3}$  (C)  $\frac{3}{5}$  (D)  $\frac{5}{3}$  (E) 5



Note: Figure not drawn to scale.

34. In the figure above, if  $x, y,$  and  $z$  are the lengths indicated, what is an arrangement of  $x, y,$  and  $z$  in order of increasing length?

- (A)  $x, y, z$   
 (B)  $z, x, y$   
 (C)  $y, x, z$   
 (D)  $z, y, x$   
 (E)  $y, z, x$

35. If  $(x + y)^2 = x^2 + y^2,$  which of the following statements must also be true?

- I.  $x = 0$   
 II.  $(x - y)^2 = x^2 + y^2$   
 III.  $xy = 0$

- (A) None (B) I only (C) II only  
 (D) III only (E) II and III