仅内部使用,严禁商用 www.hanlin.io Institute

1961 AHSME Problems

Problem 1

When simplified, $(-\frac{1}{125})^{-2/3}$ becomes:

$\textbf{(A)}\ \frac{1}{25} \qquad \textbf{(B)}\ -\frac{1}{25} \qquad \textbf{(C)}\ 25 \qquad \textbf{(D)}\ -25 \qquad \textbf{(E)}\ 25\sqrt{-1}$

Problem 2

An automobile travels $a/6$ feet in r seconds. If this rate is maintained for 3 minutes, how many yards does it travel in 3 minutes?

$\textbf{(A)}\ \frac{a}{1080r} \qquad \textbf{(B)}\ \frac{30r}{a} \qquad \textbf{(C)}\ \frac{30a}{r} \qquad \textbf{(D)}\ \frac{10r}{a} \qquad \textbf{(E)}\ \frac{10a}{r}$

Problem 3

If the graphs of $2y+x+3=0$ and $3y+ax+2=0$ are to meet at right angles, the value of a is:

$\textbf{(A)}\ \pm \frac{2}{3} \qquad \textbf{(B)}\ -\frac{2}{3} \qquad \textbf{(C)}\ -\frac{3}{2} \qquad \textbf{(D)}\ 6 \qquad \textbf{(E)}\ -6$

Problem 4

Let the set consisting of the squares of the positive integers be called u; thus u is the set $1, 4, 9, 16 \ldots$. If a certain operation on one or more members of the set always yields a member of the set, we say that the set is closed under that operation. Then u is closed under:

$\text{(A) Addition} \qquad \text{(B) Multiplication} \qquad \text{(C) Division}$
$\text{(D) Extraction of a positive integral root} \qquad \text{(E)None of these}$

Problem 5

Let $S=(x-1)^4+4(x-1)^3+6(x-1)^2+4(x-1)+1$. Then S equals:

$\textbf{(A)}\ (x-2)^4 \qquad \textbf{(B)}\ (x-1)^4 \qquad \textbf{(C)}\ x^4 \qquad \textbf{(D)}\ (x+1)^4 \qquad \textbf{(E)}\ x^4+1$

Problem 6

When simplified, $\log 8 \div \log \frac{1}{8}$ becomes:

$\textbf{(A)}\ 6\log 2 \qquad \textbf{(B)}\ \log 2 \qquad \textbf{(C)}\ 1 \qquad \textbf{(D)}\ 0 \qquad \textbf{(E)}\ -1$

Problem 7

When simplified, the third term in the expansion of $(\frac{a}{\sqrt{x}}-\frac{\sqrt{x}}{a^2})^6$ is:

$\textbf{(A)}\ \frac{15}{x} \qquad \textbf{(B)}\ -\frac{15}{x} \qquad \textbf{(C)}\ -\frac{6x^2}{a^9} \qquad \textbf{(D)}\ \frac{20}{a^3} \qquad \textbf{(E)}\ -\frac{20}{a^3}$

Problem 8

www.hanlin.io 仅内部使用,严禁商用

Let the two base angles of a triangle be A and B, with B larger than A. The altitude to the base divides the vertex angle C into two parts, C_1 and C_2, with C_2 adjacent to side a. Then:

$\textbf{(A)}\ C_1+C_2=A+B \qquad \textbf{(B)}\ C_1-C_2=B-A$
$\textbf{(C)}\ C_1-C_2=A-B \qquad \textbf{(D)}\ C_1+C_2=B-A \qquad \textbf{(E)}\ C_1-C_2=A+B$

Problem 9

Let r be the result of doubling both the base and exponent of a^b, and b does not equal to 0. If r equals the product of a^b by x^b, then $x$equals:

$\textbf{(A)} a \qquad \textbf{(B)}\ 2a \qquad \textbf{(C)}\ 4a \qquad \textbf{(D)}\ 2 \qquad \textbf{(E)}\ 4$

Problem 10

Each side of $\triangle ABC$ is 12 units. D is the foot of the perpendicular dropped from A on BC, and E is the midpoint of AD. The length of BE, in the same unit, is:

$\textbf{(A)}\ \sqrt{18} \qquad \textbf{(B)}\ \sqrt{28} \qquad \textbf{(C)}\ 6 \qquad \textbf{(D)}\ \sqrt{63} \qquad \textbf{(E)}\ \sqrt{98}$

Problem 11

Two tangents are drawn to a circle from an exterior point A; they touch the circle at points B and C respectively. A third tangent intersects segment AB in P and AC in R, and touches the circle at Q. If $AB=20$, then the perimeter of $\triangle APR$ is

$\textbf{(A)}\ 42 \qquad \textbf{(B)}\ 40.5 \qquad \textbf{(C)}\ 40 \qquad \textbf{(D)}\ 39\frac{7}{8} \qquad \textbf{(E)}\ \text{not determined by the given information}$

Problem 12

The first three terms of a geometric progression are $\sqrt{2}, \sqrt[3]{2}, \sqrt[6]{2}$. Find the fourth term.

$\textbf{(A)}\ 1 \qquad \textbf{(B)}\ \sqrt[7]{2} \qquad \textbf{(C)}\ \sqrt[8]{2} \qquad \textbf{(D)}\ \sqrt[9]{2} \qquad \textbf{(E)}\ \sqrt[10]{2}$

Problem 13

The symbol $|a|$ means a is a positive number or zero, and $-a$ if a is a negative number. For all real values of t the expression $\sqrt{t^4+t^2}$ is equal to?

$\textbf{(A)}\ t^3 \qquad \textbf{(B)}\ t^2+t \qquad \textbf{(C)}\ |t^2+t| \qquad \textbf{(D)}\ t\sqrt{t^2+1} \qquad \textbf{(E)}\ |t|\sqrt{1+t^2}$

Problem 14

A rhombus is given with one diagonal twice the length of the other diagonal. Express the side of the rhombus is terms of K, where K is the area of the rhombus in square inches.

$\textbf{(A)}\ \sqrt{K} \qquad \textbf{(B)}\ \frac{1}{2}\sqrt{2K} \qquad \textbf{(C)}\ \frac{1}{3}\sqrt{3K} \qquad \textbf{(D)}\ \frac{1}{4}\sqrt{4K} \qquad \textbf{(E)}\ \text{None of these are correct}$

Problem 15

If x men working x hours a day for x days produce x articles, then the number of articles (not necessarily an integer) produced by $y$men working y hours a day for y days is:

$\textbf{(A)}\ \frac{x^3}{y^2} \qquad \textbf{(B)}\ \frac{y^3}{x^2} \qquad \textbf{(C)}\ \frac{x^2}{y^3} \qquad \textbf{(D)}\ \frac{y^2}{x^3} \qquad \textbf{(E)}\ y$

www.hanlin.io 仅内部使用,严禁商用 Institute

Problem 16

An altitude h of a triangle is increased by a length m. How much must be taken from the corresponding base b so that the area of the new triangle is one-half that of the original triangle?

$\textbf{(A)}\ \frac{bm}{h+m} \qquad \textbf{(B)}\ \frac{bh}{2h+2m} \qquad \textbf{(C)}\ \frac{b(2m+h)}{m+h} \qquad \textbf{(D)}\ \frac{b(m+h)}{2m+h} \qquad \textbf{(E)}\ \frac{b(2m+h)}{2(h+m)}$

Problem 17

In the base ten number system the number 526 means $5 \times 10^2 + 2 \times 10 + 6$. In the Land of Mathesis, however, numbers are written in the base r. King Rusczyk purchases an automobile there for 440 monetary units (abbreviated m.u). He gives the salesman a 1000 m.u bill, and receives, in change, 340 m.u. The base r is:

$\textbf{(A)}\ 2 \qquad \textbf{(B)}\ 5 \qquad \textbf{(C)}\ 7 \qquad \textbf{(D)}\ 8 \qquad \textbf{(E)}\ 12$

Problem 18

The yearly changes in the population census of a town for four consecutive years are, respectively, 25% increase, 25% increase, 25% decrease, 25% decrease. The net change over the four years, to the nearest percent, is:

$\textbf{(A)}\ -12 \qquad \textbf{(B)}\ -1 \qquad \textbf{(C)}\ 0 \qquad \textbf{(D)}\ 1 \qquad \textbf{(E)}\ 12$

Problem 19

Consider the graphs of $y = 2\log x$ and $y = \log 2x$. We may say that:

(A) They do not intersect
(B) They intersect at 1 point only
(C) They intersect at 2 points only
(D) They intersect at a finite number of points but greater than 2
(E) They coincide

Problem 20

The set of points satisfying the pair of inequalities $y > 2x$ and $y > 4 - x$ is contained entirely in quadrants:

$\textbf{(A)}\ \text{I and II} \qquad \textbf{(B)}\ \text{II and III} \qquad \textbf{(C)}\ \text{I and III} \qquad \textbf{(D)}\ \text{III and IV} \qquad \textbf{(E)}\ \text{I and IV}$

Problem 21

Medians AD and CE of $\triangle ABC$ intersect in M. The midpoint of AE is N. Let the area of $\triangle MNE$ be k times the area of $\triangle ABC$. Then k equals:

$\textbf{(A)}\ \frac{1}{6} \qquad \textbf{(B)}\ \frac{1}{8} \qquad \textbf{(C)}\ \frac{1}{9} \qquad \textbf{(D)}\ \frac{1}{12} \qquad \textbf{(E)}\ \frac{1}{16}$

Problem 22

If $3x^3 - 9x^2 + kx - 12$ is divisible by $x - 3$, then it is also divisible by:

$\textbf{(A)}\ 3x^2 - x + 4 \qquad \textbf{(B)}\ 3x^2 - 4 \qquad \textbf{(C)}\ 3x^2 + 4 \qquad \textbf{(D)}\ 3x - 4 \qquad \textbf{(E)}\ 3x + 4$

Problem 23

Points P and Q are both in the line segment AB and on the same side of its midpoint. P divides AB in the ratio $2:3$, and Q divides AB in the ratio $3:4$. If $PQ = 2$, then the length of AB is:

$\textbf{(A)}\ 60 \qquad \textbf{(B)}\ 70 \qquad \textbf{(C)}\ 75 \qquad \textbf{(D)}\ 80 \qquad \textbf{(E)}\ 85$

仅内部使用,严禁商用 www.hanlin.io Institute

Problem 24

Thirty-one books are arranged from left to right in order of increasing prices. The price of each book differs by $\$2$ from that of each adjacent book. For the price of the book at the extreme right a customer can buy the middle book and the adjacent one. Then:

$\textbf{(A)}$ The adjacent book referred to is at the left of the middle book
$\textbf{(B)}$ The middle book sells for \$ 36
$\textbf{(C)}$ The cheapest book sells for \$4
$\textbf{(D)}$ The most expensive book sells for \$64
$\textbf{(E)}$ None of these is correct

Problem 25

$\triangle ABC$ is isosceles with base AC. Points P and Q are respectively in CB and AB and such that $AC = AP = PQ = QB$. The number of degrees in $\angle B$ is:

$\textbf{(A)}\ 25\frac{5}{7} \qquad \textbf{(B)}\ 26\frac{1}{3} \qquad \textbf{(C)}\ 30 \qquad \textbf{(D)}\ 40 \qquad \textbf{(E)}$ Not determined by the information given

Problem 26

For a given arithmetic series the sum of the first 50 terms is 200, and the sum of the next 50 terms is 2700. The first term in the series is:

$\textbf{(A)}\ -1221 \qquad \textbf{(B)}\ -21.5 \qquad \textbf{(C)}\ -20.5 \qquad \textbf{(D)}\ 3 \qquad \textbf{(E)}\ 3.5$

Problem 27

Given two equiangular polygons P_1 and P_2 with different numbers of sides; each angle of P_1 is x degrees and each angle of P_2 is kxdegrees, where k is an integer greater than 1. The number of possibilities for the pair (x, k) is:

$\textbf{(A)}\ \infty \qquad \textbf{(B)}$ finite, but greater than 2 $\qquad \textbf{(C)}\ 2 \qquad \textbf{(D)}\ 1 \qquad \textbf{(E)}\ 0$

Problem 28

If 2137^{753} is multiplied out, the units' digit in the final product in the final product is:

$\textbf{(A)}\ 1 \qquad \textbf{(B)}\ 3 \qquad \textbf{(C)}\ 5 \qquad \textbf{(D)}\ 7 \qquad \textbf{(E)}\ 9$

Problem 29

Let the roots of $ax^2 + bx + c = 0$ be r and s. The equation with roots $ar + b$ and $as + b$ is:

$\textbf{(A)}\ x^2 - bx - ac = 0 \qquad \textbf{(B)}\ x^2 - bx + ac = 0$
$\textbf{(C)}\ x^2 + 3bx + ca + 2b^2 = 0 \qquad \textbf{(D)}\ x^2 + 3bx - ca + 2b^2 = 0$
$\textbf{(E)}\ x^2 + bx(2 - a) + a^2c + b^2(a + 1) = 0$

Problem 30

If $\log_{10} 2 = a$ and $\log_{10} 3 = b$, then $\log_5 12 =$?

$\textbf{(A)}\ \frac{a+b}{a+1} \qquad \textbf{(B)}\ \frac{2a+b}{a+1} \qquad \textbf{(C)}\ \frac{a+2b}{1+a} \qquad \textbf{(D)}\ \frac{2a+b}{1-a} \qquad \textbf{(E)}\ \frac{a+2b}{1-a}$

Problem 31

In $\triangle ABC$ the ratio $AC : CB$ is $3 : 4$. The bisector of the exterior angle at C intersects BA extended at P (A is between P and B). The ratio $PA : AB$ is:

www.hanlin.io 仅内部使用,严禁商用

(A) $1:3$ **(B)** $3:4$ **(C)** $4:3$ **(D)** $3:1$ **(E)** $7:1$

Problem 32

A regular polygon of n sides is inscribed in a circle of radius R. The area of the polygon is $3R^2$. Then n equals:

(A) 8 **(B)** 10 **(C)** 12 **(D)** 15 **(E)** 18

Problem 33

The number of solutions of $2^{2x}-3^{2y}=55$, in which x and y are integers, is:

(A) 0 **(B)** 1 **(C)** 2 **(D)** 3 **(E)** More than three, but finite

Problem 34

Let S be the set of values assumed by the fraction $\frac{2x+3}{x+2}$. When x is any member of the interval $x \geq 0$. If there exists a number M such that no number of the set S is greater than M, then M is an upper bound of S. If there exists a number m such that such that no number of the set S is less than m, then m is a lower bound of S. We may then say:

(A) m is in S, but M is not in S
(B) M is in S, but m is not in S
(C) Both m and M are in S
(D) Neither m nor M are in S
(E) M does not exist either in or outside S

Problem 35

The number 695 is to be written with a factorial base of numeration, that is, $695=a_1+a_2\times2!+a_3\times3!+\ldots a_n\times n!$ where $a_1, a_2, a_3 \ldots a_n$ are integers such that $0\le a_k\le k$, and $n!$ means $n(n-1)(n-2)\ldots2\times1$. Find a_4

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

Problem 36

In $\triangle ABC$ the median from A is given perpendicular to the median from B. If $BC=7$ and $AC=6$, find the length of AB.

(A) 4 **(B)** $\sqrt{17}$ **(C)** 4.25 **(D)** $2\sqrt{5}$ **(E)** 4.5

Problem 37

In racing over a distance d at uniform speed, A can beat B by 20 yards, B can beat C by 10 yards, and A can beat C by 28 yards. Then d, in yards, equals:

(A) Not determined by the given information **(B)** 58 **(C)** 100 **(D)** 116 **(E)** 120

Problem 38

$\triangle ABC$ is inscribed in a semicircle of radius r so that its base AB coincides with diameter AB. Point C does not coincide with either A or B. Let $s=AC+BC$. Then, for all permissible positions of C:

(A) $s^2\le8r^2$ **(B)** $s^2=8r^2$ **(C)** $s^2\ge8r^2$
(D) $s^2\le4r^2$ **(E)** $x^2=4r^2$

Problem 39

Institute
www.hanlin.io
仅内部使用,严禁商用

Any five points are taken inside or on a square with side length 1. Let a be the smallest possible number with the property that it is always possible to select one pair of points from these five such that the distance between them is equal to or less than a.
Then a is:

$\textbf{(A)}\ \sqrt{3}/3 \qquad \textbf{(B)}\ \sqrt{2}/2 \qquad \textbf{(C)}\ 2\sqrt{2}/3 \qquad \textbf{(D)}\ 1 \qquad \textbf{(E)}\ \sqrt{2}$

Problem 40

Find the minimum value of $\sqrt{x^2+y^2}$ if $5x+12y=60$.

$\textbf{(A)}\ \frac{60}{13} \qquad \textbf{(B)}\ \frac{13}{5} \qquad \textbf{(C)}\ \frac{13}{12} \qquad \textbf{(D)}\ 1 \qquad \textbf{(E)}\ 0$