1955 AHSME Problems

Problem 1

Which one of the following is not equivalent to 0.000000375?

$\textbf{(A)}\ 3.75\times 10^{-7}\qquad\textbf{(B)}\ 3\frac{3}{4}\times 10^{-7}\qquad\textbf{(C)}\ 375\times 10^{-9}\qquad$
$\textbf{(D)}\ \frac{3}{8}\times 10^{-7}\qquad\textbf{(E)}\ \frac{3}{80000000}$

Problem 2

The smaller angle between the hands of a clock at $12:25$ p.m. is:

$\textbf{(A)}\ 132^\circ 30'\qquad\textbf{(B)}\ 137^\circ 30'\qquad\textbf{(C)}\ 150^\circ\qquad\textbf{(D)}\ 137^\circ 32'\qquad\textbf{(E)}\ 137^\circ$

Problem 3

If each number in a set of ten numbers is increased by 20, the arithmetic mean (average) of the ten numbers:

$\textbf{(A)}\ \text{remains the same}\qquad\textbf{(B)}\ \text{is increased by 20}\qquad\textbf{(C)}\ \text{is increased by 200}$
$\textbf{(D)}\ \text{is increased by 10}\qquad\textbf{(E)}\ \text{is increased by 2}$

Problem 4

The equality $\frac{1}{x-1}=\frac{2}{x-2}$ is satisfied by:

$\textbf{(A)}\ \text{no real values of }x\qquad\textbf{(B)}\ \text{either }x=1\text{ or }x=2\qquad\textbf{(C)}\ \text{only }x=1$
$\textbf{(D)}\ \text{only }x=2\qquad\textbf{(E)}\ \text{only }x=0$

Problem 5

$5y$ varies inversely as the square of x. When $y=16, x=1$. When $x=8, y$ equals:

$\textbf{(A)}\ 2\qquad\textbf{(B)}\ 128\qquad\textbf{(C)}\ 64\qquad\textbf{(D)}\ \frac{1}{4}\qquad\textbf{(E)}\ 1024$

Problem 6

A merchant buys a number of oranges at 3 for 10 cents and an equal number at 5 for 20 cents. To "break even" he must sell all at:

$\textbf{(A)}\ \text{8 for 30 cents}\qquad\textbf{(B)}\ \text{3 for 11 cents}\qquad\textbf{(C)}\ \text{5 for 18 cents}$
$\textbf{(D)}\ \text{11 for 40 cents}\qquad\textbf{(E)}\ \text{13 for 50 cents}$

Problem 7

If a worker receives a 20% cut in wages, he may regain his original pay exactly by obtaining a raise of:

$\textbf{(A)}\ \text{20\%}\qquad\textbf{(B)}\ \text{25\%}\qquad\textbf{(C)}\ 22\frac{1}{2}\text{\%}\qquad\textbf{(D)}\ \textdollar{20}\qquad\textbf{(E)}\ \textdollar{25}$

Problem 8

The graph of $x^2-4y^2=0$:

(A) is a hyperbola intersecting only the x-axis
(B) is a hyperbola intersecting only the y-axis
(C) is a hyperbola intersecting neither axis
(D) is a pair of straight lines
(E) does not exist

Problem 9

A circle is inscribed in a triangle with sides $8, 15$, and 17. The radius of the circle is:

(A) 6 **(B)** 2 **(C)** 5 **(D)** 3 **(E)** 7

Problem 10

How many hours does it take a train traveling at an average rate of 40 mph between stops to travel a miles it makes n stops of m minutes each?

(A) $\frac{3a+2mn}{120}$ **(B)** $3a+2mn$ **(C)** $\frac{3a+2mn}{12}$ **(D)** $\frac{a+mn}{40}$ **(E)** $\frac{a+40mn}{40}$

Problem 11

The negation of the statement "No slow learners attend this school" is:

(A) All slow learners attend this school
(B) All slow learners do not attend this school
(C) Some slow learners attend this school
(D) Some slow learners do not attend this school
(E) No slow learners do not attend this school

Problem 12

The solution of $\sqrt{5x-1}+\sqrt{x-1}=2$ is:

(A) $x=2, x=1$ **(B)** $x=\frac{2}{3}$ **(C)** $x=2$ **(D)** $x=1$ **(E)** $x=0$

Problem 13

The fraction $\frac{a^{-4}-b^{-4}}{a^{-2}-b^{-2}}$ is equal to:

(A) $a^{-6}-b^{-6}$ **(B)** $a^{-2}-b^{-2}$ **(C)** $a^{-2}+b^{-2}$
(D) a^2+b^2 **(E)** a^2-b^2

Problem 14

The length of rectangle R is 10% more than the side of square S. The width of the rectangle is 10% less than the side of the square. The ratio of the areas, $R:S$, is:

(A) $99:100$ **(B)** $101:100$ **(C)** $1:1$ **(D)** $199:200$ **(E)** $201:200$

Problem 15

The ratio of the areas of two concentric circles is $1:3$. If the radius of the smaller is r, then the difference between the radii is best approximated by:

(A) $0.41r$ **(B)** 0.73 **(C)** 0.75 **(D)** $0.73r$ **(E)** $0.75r$

Problem 16

The value of $\frac{3}{a+b}$ when $a=4$ and $b=-4$ is:

$\textbf{(A)}\ 3 \qquad \textbf{(B)}\ \frac{3}{8} \qquad \textbf{(C)}\ 0 \qquad \textbf{(D)}\ \text{any finite number} \qquad \textbf{(E)}\ \text{meaningless}$

Problem 17

If $\log x - 5\log 3 = -2$, then x equals:

$\textbf{(A)}\ 1.25 \qquad \textbf{(B)}\ 0.81 \qquad \textbf{(C)}\ 2.43 \qquad \textbf{(D)}\ 0.8 \qquad \textbf{(E)}\ \text{either 0.8 or 1.25}$

Problem 18

The discriminant of the equation $x^2+2x\sqrt{3}+3=0$ is zero. Hence, its roots are:

$\textbf{(A)}\ \text{real and equal} \qquad \textbf{(B)}\ \text{rational and equal} \qquad \textbf{(C)}\ \text{rational and unequal}$
$\textbf{(D)}\ \text{irrational and unequal} \qquad \textbf{(E)}\ \text{imaginary}$

Problem 19

Two numbers whose sum is 6 and the absolute value of whose difference is 8 are roots of the equation:

$\textbf{(A)}\ x^2-6x+7=0 \qquad \textbf{(B)}\ x^2-6x-7=0 \qquad \textbf{(C)}\ x^2+6x-8=0$
$\textbf{(D)}\ x^2-6x+8=0 \qquad \textbf{(E)}\ x^2+6x-7=0$

Problem 20

The expression $\sqrt{25-t^2}+5$ equals zero for:

$\textbf{(A)}\ \text{no real or imaginary values of }t \qquad \textbf{(B)}\ \text{no real values of }t\text{ only}$
$\textbf{(C)}\ \text{no imaginary values of }t\text{ only} \qquad \textbf{(D)}\ t=0 \qquad \textbf{(E)}\ t=\pm 5$

Problem 21

Represent the hypotenuse of a right triangle by c and the area by A. The altitude on the hypotenuse is:

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

Problem 22

On a \textdollar{10000} order a merchant has a choice between three successive discounts of 20%, 20%, and 10% and three successive discounts of 40%, 5%, and 5%. By choosing the better offer, he can save:

$\textbf{(A)}\ \text{nothing at all} \qquad \textbf{(B)}\ \$440 \qquad \textbf{(C)}\ \$330 \qquad \textbf{(D)}\ \$345 \qquad \textbf{(E)}\ \$360$

Problem 23

In checking the petty cash a clerk counts q quarters, d dimes, n nickels, and c cents. Later he discovers that x of the nickels were counted as quarters and x of the dimes were counted as cents. To correct the total obtained the clerk must:

$\textbf{(A)}\ \text{make no correction} \qquad \textbf{(B)}\ \text{subtract 11 cents} \qquad \textbf{(C)}\ \text{subtract 11}x\text{ cents}$
$\textbf{(D)}\ \text{add 11}x\text{ cents} \qquad \textbf{(E)}\ \text{add }x\text{ cents}$

Problem 24

The function $4x^2 - 12x - 1$:

$\textbf{(A)}$ always increases as x increases
$\textbf{(B)}$ always decreases as x decreases to 1
$\textbf{(C)}$ cannot equal 0
$\textbf{(D)}$ has a maximum value when x is negative
$\textbf{(E)}$ has a minimum value of-10

Problem 25

One of the factors of $x^4 + 2x^2 + 9$ is:

$\textbf{(A)}\ x^2+3 \qquad \textbf{(B)}\ x+1 \qquad \textbf{(C)}\ x^2-3 \qquad \textbf{(D)}\ x^2-2x-3 \qquad \textbf{(E)}\ \text{none of these}$

Problem 26

Mr. A owns a house worth \textdollar{10000}. He sells it to Mr. B at 10% profit. Mr. B sells the house back to Mr. A at a 10% loss. Then:

$\textbf{(A)}\ \text{Mr. A comes out even} \qquad \textbf{(B)}\ \text{Mr. A makes \$100} \qquad \textbf{(C)}\ \text{Mr. A makes \$1000}$
$\textbf{(D)}\ \text{Mr. B loses \$100} \qquad \textbf{(E)}\ \text{none of the above is correct}$

Problem 27

If r and s are the roots of $x^2 - px + q = 0$, then $r^2 + s^2$ equals:

$\textbf{(A)}\ p^2+2q \qquad \textbf{(B)}\ p^2-2q \qquad \textbf{(C)}\ p^2+q^2 \qquad \textbf{(D)}\ p^2-q^2 \qquad \textbf{(E)}\ p^2$

Problem 28

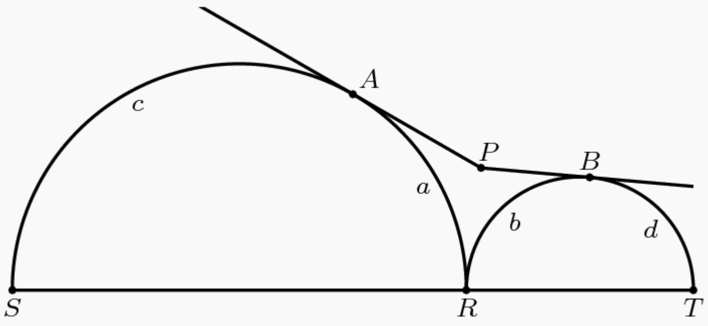
On the same set of axes are drawn the graph of $y=ax^2+bx+c$ and the graph of the equation obtained by

replacing x by $-x$ in the given equation. If $b \neq 0$ and $c \neq 0$ these two graphs intersect:

$\textbf{(A)}$ in two points, one on the x-axis and one on the y-axis
$\textbf{(B)}$ in one point located on neither axis
$\textbf{(C)}$ only at the origin
$\textbf{(D)}$ in one point on the x-axis
$\textbf{(E)}$ in one point on the y-axis

Problem 29

In the figure, PA is tangent to semicircle SAR; PB is tangent to semicircle RBT; SRT is a straight line; the arcs are indicated in the figure. $\angle APB$ is measured by:



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

Problem 30

Each of the equations $3x^2-2=25, (2x-1)^2=(x-1)^2, \sqrt{x^2-7}=\sqrt{x-1}$ has:

$\textbf{(A) }$ two integral roots $\qquad\textbf{(B) }$ no root greater than 3 $\qquad\textbf{(C) }$ no root zero
$\textbf{(D) }$ only one root $\qquad\textbf{(E) }$ one negative root and one positive root

Problem 31

An equilateral triangle whose side is 2 is divided into a triangle and a trapezoid by a line drawn parallel to one of its sides. If the area of the trapezoid equals one-half of the area of the original triangle, the length of the median of the trapezoid is:

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

Problem 32

If the discriminant of $ax^2+2bx+c=0$ is zero, then another true statement about a, b, and c is that:

$\textbf{(A)}$ they form an arithmetic progression
$\textbf{(B)}$ they form a geometric progression
$\textbf{(C)}$ they are unequal
$\textbf{(D)}$ they are all negative numbers
$\textbf{(E)}$ only b is negative and a and c are positive

Problem 33

Henry starts a trip when the hands of the clock are together between 8 a.m. and 9 a.m. He arrives at his destination between 2 p.m. and 3 p.m. when the hands of the clock are exactly 180° apart. The trip takes:

$\textbf{(A)}\ \text{6 hr.}\qquad\textbf{(B)}\ \text{6 hr. 43-7/11 min.}\qquad\textbf{(C)}\ \text{5 hr. 16-4/11 min.}\qquad\textbf{(D)}\ \text{6 hr. 30 min.}\qquad\textbf{(E)}\ \text{none of these}$

Problem 34

A 6-inch and 18-inch diameter pole are placed together and bound together with wire. The length of the shortest wire that will go around them is:

$\textbf{(A)}\ 12\sqrt{3}+16\pi\qquad\textbf{(B)}\ 12\sqrt{3}+7\pi\qquad\textbf{(C)}\ 12\sqrt{3}+14\pi$
$\textbf{(D)}\ 12+15\pi\qquad\textbf{(E)}\ 24\pi$

Problem 35

Three boys agree to divide a bag of marbles in the following manner. The first boy takes one more than half the marbles. The second takes a third of the number remaining. The third boy finds that he is left with twice as many marbles as the second boy. The original number of marbles:

$\textbf{(A)}\ \text{is none of the following}\qquad\textbf{(B)}\ \text{cannot be determined from the given data}$
$\textbf{(C)}\ \text{is 20 or 26}\qquad\textbf{(D)}\ \text{is 14 or 32}\qquad\textbf{(E)}\ \text{is 8 or 38}$

Problem 36

A cylindrical oil tank, lying horizontally, has an interior length of 10 feet and an interior diameter of 6 feet. If the rectangular surface of the oil has an area of 40 square feet, the depth of the oil is:

$\textbf{(A)}\ \sqrt{5}\qquad\textbf{(B)}\ 2\sqrt{5}\qquad\textbf{(C)}\ 3-\sqrt{5}\qquad\textbf{(D)}\ 3+\sqrt{5}$
$\textbf{(E)}\ \text{either }3-\sqrt{5}\text{ or }3+\sqrt{5}$

Problem 37

A three-digit number has, from left to right, the digits h, t, and u, with $h > u$. When the number with the digits reversed is subtracted from the original number, the units' digit in the difference of r. The next two digits, from right to left, are:

$\textbf{(A) }5\text{ and }9\qquad\textbf{(B) }9\text{ and }5\qquad\textbf{(C) }\text{impossible to tell}\qquad\textbf{(D) }5\text{ and }4\qquad\textbf{(E) }4\text{ and }5$

Problem 38

Four positive integers are given. Select any three of these integers, find their arithmetic average, and add this result to the fourth integer. Thus the numbers $29, 23, 21$, and 17 are obtained. One of the original integers is:

$\textbf{(A) }19\qquad\textbf{(B) }21\qquad\textbf{(C) }23\qquad\textbf{(D) }29\qquad\textbf{(E) }17$

Problem 39

If $y = x^2 + px + q$, then if the least possible value of y is zero q is equal to:

$\textbf{(A) }0\qquad\textbf{(B) }\frac{p^2}{4}\qquad\textbf{(C) }\frac{p}{2}\qquad\textbf{(D) }-\frac{p}{2}\qquad\textbf{(E) }\frac{p^2}{4}-q$

Problem 40

The fractions $\frac{ax+b}{cx+d}$ and $\frac{b}{d}$ are unequal if:

$\textbf{(A) }a=c=1, x\neq 0\qquad\textbf{(B) }a=b=0\qquad\textbf{(C) }a=c=0$
$\textbf{(D) }x=0\qquad\textbf{(E) }ad=bc$

Problem 41

A train traveling from Aytown to Beetown meets with an accident after 1 hr. It is stopped for $\frac{1}{2}$ hr., after which it proceeds at four-fifths of its usual rate, arriving at Beetown 2 hr. late. If the train had covered 80 miles more before the accident, it would have been just 1 hr. late. The usual rate of the train is:

$\textbf{(A) }20\text{ mph}\qquad\textbf{(B) }30\text{ mph}\qquad\textbf{(C) }40\text{ mph}\qquad\textbf{(D) }50\text{ mph}\qquad\textbf{(E) }60\text{ mph}$

Problem 42

If a, b, and c are positive integers, the radicals $\sqrt{a+\frac{b}{c}}$ and $a\sqrt{\frac{b}{c}}$ are equal when and only when:

$\textbf{(A) }a=b=c=1\qquad\textbf{(B) }a=b\text{ and }c=a=1\qquad\textbf{(C) }c=\frac{b(a^2-1)}{a}$
$\textbf{(D) }a=b\text{ and }c\text{ is any value}\qquad\textbf{(E) }a=b\text{ and }c=a-1$

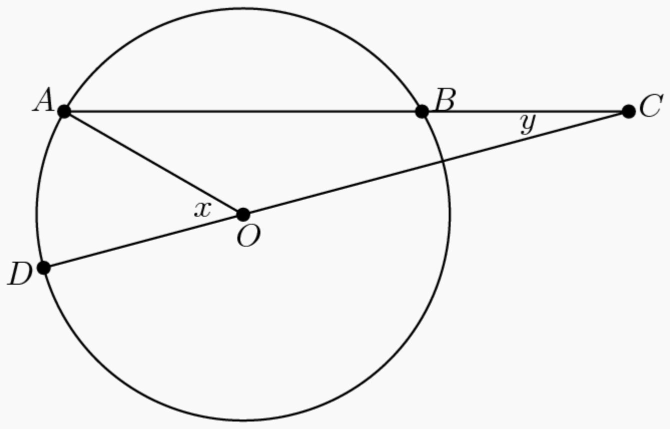
Problem 43

The pairs of values of x and y that are the common solutions of the equations $y=(x+1)^2$ and $xy+y=1$ are:

$\textbf{(A) }3\text{ real pairs}\qquad\textbf{(B) }4\text{ real pairs}\qquad\textbf{(C) }4\text{ imaginary pairs}$
$\textbf{(D) }2\text{ real and }2\text{ imaginary pairs}\qquad\textbf{(E) }1\text{ real and }2\text{ imaginary pairs}$

Problem 44

In circle O chord AB is produced so that BC equals a radius of the circle. CO is drawn and extended to D. AO is drawn. Which of the following expresses the relationship between x and y?



$\textbf{(A)}\ x=3y$
$\textbf{(B)}\ x=2y$
$\textbf{(C)}\ x=60^\circ$
$\textbf{(D)}$ there is no special relationship between x and y
$\textbf{(E)}\ x=2y$ or $x=3y$, depending upon the length of AB

Problem 45

Given a geometric sequence with the first term $\neq 0$ and $r \neq 0$ and an arithmetic sequence with the first term $=0$. A third sequence $1, 1, 2\ldots$ is formed by adding corresponding terms of the two given sequences. The sum of the first ten terms of the third sequence is:

$\textbf{(A)}\ 978 \qquad \textbf{(B)}\ 557 \qquad \textbf{(C)}\ 467 \qquad \textbf{(D)}\ 1068$
$\textbf{(E)}$ not possible to determine from the information given

Problem 46

The graphs of $2x+3y-6=0, 4x-3y-6=0, x=2$, and $y=\frac{2}{3}$ intersect in:

$\textbf{(A)}$ 6 points $\qquad \textbf{(B)}$ 1 point $\qquad \textbf{(C)}$ 2 points $\qquad \textbf{(D)}$ no points
$\textbf{(E)}$ an unlimited number of points

Problem 47

The expressions $a+bc$ and $(a+b)(a+c)$ are:

$\textbf{(A)}$ always equal $\qquad \textbf{(B)}$ never equal $\qquad \textbf{(C)}$ equal whenever $a+b+c=1$
$\textbf{(D)}$ equal when $a+b+c=0 \qquad \textbf{(E)}$ equal only when $a=b=c=0$

Problem 48

Given $\triangle ABC$ with medians AE, BF, CD; FH parallel and equal to AE; $BH and HE$ are drawn; FE extended meets BH in G. Which one of the following statements is not necessarily correct?

$\textbf{(A)}\ AEHF$ is a parallelogram $\qquad \textbf{(B)}\ HE=HG$
$\textbf{(C)}\ BH=DC \qquad \textbf{(D)}\ FG=\frac{3}{4}AB \qquad \textbf{(E)}\ FG$ is a median of triangle BFH

Problem 49

The graphs of $y=\frac{x^2-4}{x-2}$ and $y=2x$ intersect in:

$\textbf{(A)}$ 1 point whose abscissa is 2 $\qquad \textbf{(B)}$ 1 point whose abscissa is 0
$\textbf{(C)}$ no points $\qquad \textbf{(D)}$ two distinct points $\qquad \textbf{(E)}$ two identical points

Problem 50

In order to pass B going 40 mph on a two-lane highway, A, going 50 mph, must gain 30 feet. Meantime, $C, 210$ feet from A, is headed toward him at 50 mph. If B and C maintain their speeds, then, in order to pass safely, A must increase his speed by:

$\textbf{(A)}\ 30\text{ mph}\qquad\textbf{(B)}\ 10\text{ mph}\qquad\textbf{(C)}\ 5\text{ mph}\qquad\textbf{(D)}\ 15\text{ mph}\qquad\textbf{(E)}\ 3\text{ mph}$