

Problem 1**point 1**

If $5x + 32 = 4 - 2x$, what is the value of x ?

- a) -4 b) -3 c) 4 d) 12

Problem 2**point 1**

If $y = 3x$ and $z = 2y$, what is $x + y + z$ in terms of x ?

- a) $10x$ b) $9x$ c) $8x$ d) $6x$

Problem 3**point 1**

If $x \neq 0$, which of the following equals to $\frac{x \cdot (x^2)^3}{x^2}$

- a) x^3 b) x^4 c) x^5 d) x^6

Problem 4**point 1**

Which of the following numbers is farthest from the number 1 on the number line?

- a) -10 b) -5 c) 5 d) 10

Problem 5**point 1**

If $y^{-2} + 2y^{-1} - 15 = 0$, which of the following could be the value of y ?

- a) $\frac{1}{5}$ b) $-\frac{1}{3}$ c) $-\frac{1}{5}$ d) -5

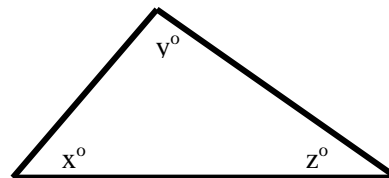
Problem 6**point 1**

The function $f(x)$ is defined by $f(x) = x^2 + x$. If t is a number such that $f(2t) = 30$, which of the following could be the number t ?

- a) -5 b) $-\frac{1}{2}$ c) 2 d) $\frac{5}{2}$

Problem 7**point 1**

In the figure above, what is the value of $\frac{x + y + z}{45}$?



- a) 3 b) 4 c) 5 d) 6

Problem 8**point 1**

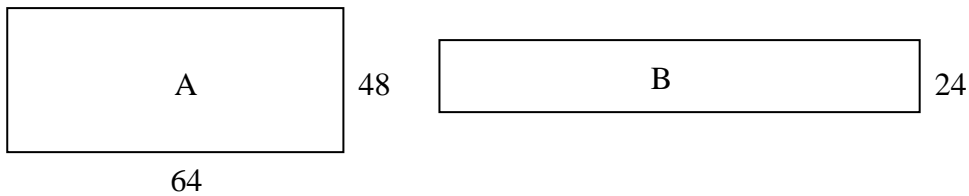
A store sells two types of pens: one type for \$2 per pen and the other type for \$3 per pen. If a customer can spend up to \$25 to buy pens at the store, what is the greatest number of pens the customer can buy?

- a) 9 b) 10 c) 11 d) 12

Problem 9**point 1**

If $\frac{d-3n}{7n-d} = 1$, which of the following describes d in terms of n .

- a) $n - 4$ b) $n + 4$ c) $2n$ d) $5n$

Problem 10**point 1**

The rectangles A and B have equal areas. The lengths of their sides are indicated above. Find the perimeter of the rectangular B .

- a) 112 b) 224 c) 304 d) 256

Problem 11**point 1**

If $2x = 3y = 4z = 20$, then $12xyz =$

- a) 4000 b) 800 c) 8000 d) 400

Problem 12**point 1**

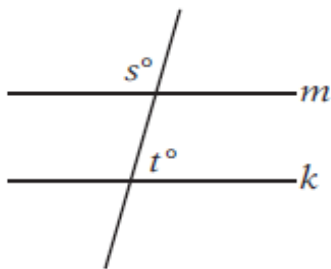
If $x^2 - 6x = -9$, then $(x - 3)^3$ can be

- a) 3 b) 0 c) 6 d) 9

Problem 13**point 1**

If x is a positive integer, for which of the following equations must y be a negative integer?

- a) $xy = 9$ b) $x + y = 7$ c) $-x - y = 3$ d) $x - y = 4$

Problem 14**point 1**

In the figure above, if $m \parallel k$ and $s = t + 30$, then $t =$

- a) 60 b) 75 c) 80 d) 105

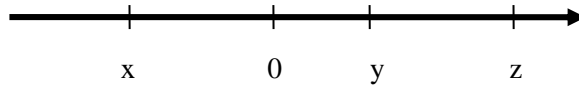
Problem 15**point 1**

If the lengths of two sides of a triangle are 5 and 9 respectively, which of the following could be the length of the third side of the triangle?

- a) 3 b) 5 c) 15 d) 16

Problem 16

point 1



On this number line the numbers x , y , and z are shown. Which of the following statements about the numbers x , y , and z must be true?

- a) $x \cdot y \cdot z > 0$ b) $(x - y) \cdot x > 0$ c) $(y + z) \cdot x > 0$ d) $(y - z) \cdot x < 0$

Problem 17

point 1

If $1 + x + x^2 + x^3 = 60$, then the average (arithmetic mean) of x, x^2, x^3, x^4 is

- a) $15x$ b) $20x$ c) $30x$ d) $60x$

Problem 18

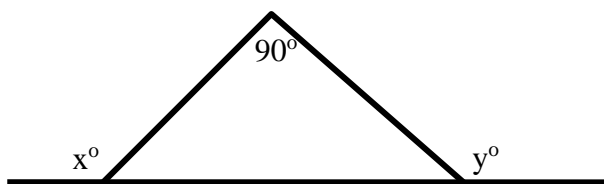
point 1

15 is 60% of what number?

- a) 25 b) 30 c) 20 d) 24

Problem 19

point 1

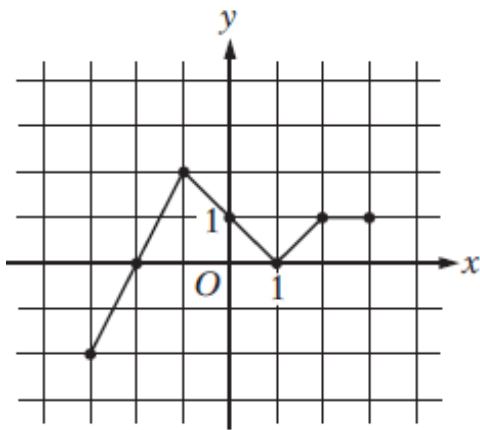


$x + y =$

- a) 150 b) 180 c) 270 d) 360

Problem 20

point 1

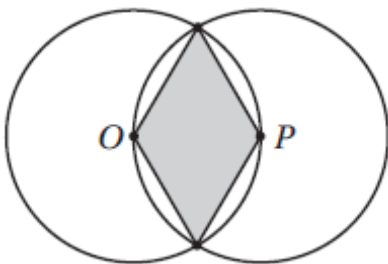


The figure above shows the graph of the function $f(x)$. What is the value of $f(f(-1))$?

- a) -2 b) 0 c) 1 d) 2

Problem 21

point 1



In the figure above, O and P are the centres of two circles. If each circle has radius r , what is the area of the shaded region?

- a) $\frac{\sqrt{3}}{2}r^2$ b) $\frac{\sqrt{2}}{2}r^2$ c) $\sqrt{3}r^2$ d) $2\sqrt{3}r^2$

Problem 22

point 1

In arithmetic progression $a_1, a_2, a_3, \dots, a_n, \dots$ one has $a_1 + a_3 + a_5 = 27$. Find $a_2 + a_4$.

- a) 9 b) 16 c) 18 d) 36

Problem 23**point 1**

If $n = 2^3$, then $n^n =$

- a) 2^{11} b) 2^{18} c) 2^{24} d) 2^{27}

Problem 24**point 1**

The ratio of $\frac{1}{3}$ and $\frac{3}{8}$ equals to the ratio of

- a) 1 to 8 b) 8 to 1 c) 8 to 3 d) 8 to 9

Problem 25**point 1**

Which of these integers is not a factor (divisor) of the factorial $25! = 1 \cdot 2 \cdot 3 \cdot \dots \cdot 24 \cdot 25$?

- a) 28 b) 36 c) 56 d) 58

Problem 26**point 2**

$9x^2 = y$, x is a natural number. Then

- a) $x > y$ b) $y > x$ c) $x = y$ d) can't tell

Problem 27**point 2**

Which of the following functions intersect the graph of the function $f(x) = |2 \cdot x| + 4$?

- a) $x + 2$ b) $2x + 2$ c) $2x + 3$ d) $3x - 2$

Problem 28**point 2**

Which of the following inequalities have at least one positive solution and at least one negative solution?

a) $\frac{5}{3}x < x$

b) $x^3 < x$

c) $x - 6 < x - 7$

d) all

Problem 29**point 2**

If an integer is divisible by both 8 and 15, then this integer also must be divisible by which of the following?

a) 24

b) 32

c) 36

d) 45

Problem 30**point 2**

In the xy -plane, points R and S have coordinates $(-2,1)$ and $(4,-7)$, respectively. If the point P is the midpoint of line segment RS , what are the coordinates of point P ?

a) $(-1,-3)$ b) $(1,-4)$ c) $(1,-3)$ d) $(2,-4)$

Problem 31**point 2**

How many different two-digit integers are there in which the tens digit is greater than 6 and the units digit is less than 4?

a) 7

b) 9

c) 10

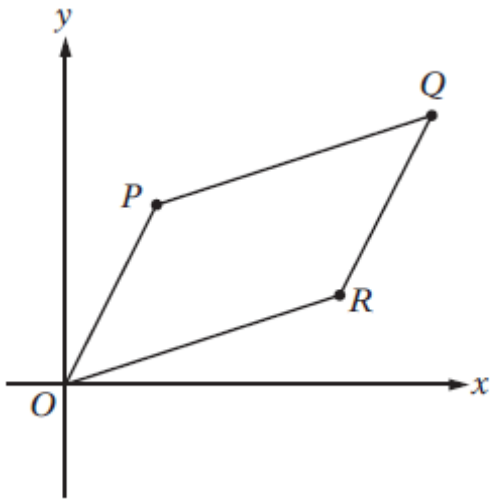
d) 12

Problem 32**point 2**

What is the inner angle of a regular 9-sided polygon?

a) 120° b) 140° c) 160° d) 180°

Problem 33**point 2**



$OPQR$ is a parallelogram. The coordinates of point P are $(2,4)$ and the coordinates of point Q are $(8,6)$. What are the coordinates of point R ?

- a) $(3,3)$ b) $(4,4)$ c) $(5,2)$ d) $(6,2)$

Problem 34**point 2**

If $-\frac{m}{19}$ is an even integer, which of the following **MUST** be true?

- a) m is a negative number b) m is a positive number c) m is an odd integer d) m is an even integer

Problem 35**point 2**

If $0 < a < 1 < b$, which of the following is true?

a) $1 < \frac{1}{a} < \frac{1}{b}$

b) $\frac{1}{a} < \frac{1}{b} < 1$

c) $\frac{1}{b} < 1 < \frac{1}{a}$

d) $\frac{1}{b} < \frac{1}{a} < 1$

Problem 36**point 3**

The relationship between the area A of a circle and its circumference C is given by the formula $A = k \cdot C^2$, where k is a constant. What is the value of k ?

a) $\frac{1}{4\pi}$

b) $\frac{1}{2\pi}$

c) $\frac{1}{4}$

d) 2π

Problem 37**point 3**

Which of the following could be the units digit of 17^{11} ?

a) 3

b) 4

c) 5

d) 6

Problem 38**point 3**

The sequence of numbers $a_1, a_2, a_3, \dots, a_n, \dots$ is defined by $a_n = \frac{1}{n} - \frac{1}{n+2}$. What is the sum of the first 20 terms of this sequence?

- a) $(1 + \frac{1}{2}) - \frac{1}{20}$ b) $(1 + \frac{1}{2}) - (\frac{1}{21} + \frac{1}{22})$ c) $1 - (\frac{1}{20} + \frac{1}{22})$ d) $\frac{1}{20} - \frac{1}{22}$

Problem 39**point 3**

In the xy -plane, the point with coordinates $(-6, -7)$ is the center of the circle C . The point with coordinates $(-6, 5)$ lies strictly inside C , and the point with coordinates $(8, -7)$ lies strictly outside C . If m is the radius of C and m is an integer, what is the value of m ?

- a) 15 b) 14 c) 12 d) 13

Problem 40**point 3**

For all natural numbers, the function f is defined as follows

$$f(n) = \begin{cases} n-1 & \text{if } n \text{ is even} \\ n+1 & \text{if } n \text{ is odd} \end{cases}.$$

If a and b are natural numbers and $f(a) + f(b) = a + b$, which of the following statements must be true?

- a) $a = b$ b) $a + b$ is odd c) both a and b are even d) both a and b are odd