A TRADITION OF EXCELLENCE

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1. Calculate the sum $1 + 5 + 10 + 15 + 19$.

A) 30
B) 40
C) 50
D) 60

2. Which answer is equal to $300 + 100 + 70 + 50 + 4 + 2$?

A) $374 + 152$
B) $400 + 76$
C) 300100705042
D) $500 + 120 + 6$

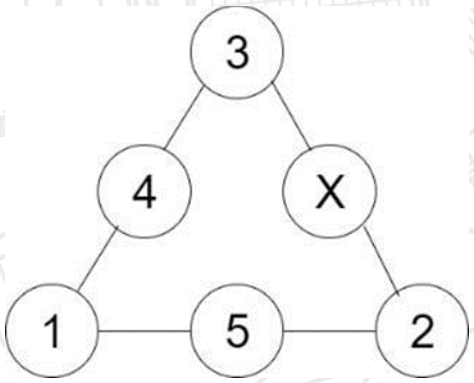
3. Daniel started the lesson at 09:15 and finished at 13:05. How long did Daniel study?

A) 4 hours
B) 4 hours, 10 minutes
C) 3 hours, 50 minutes
D) 3 hours

4. Using the digits 1, 2, 3, and 4, make three numbers with maximal sum (without repeat, and one digit can be used only once). What will be this sum?

A) 10
B) 46
C) 37
D) 19

5. What number should be instead of X?



A) 1
B) 2
C) 3
D) 4

6. What is the next number in the sequence below?

$$2, 5, 10, 17, 26, 37, \ldots$$

A) 38
B) 74
C) 50
D) 65

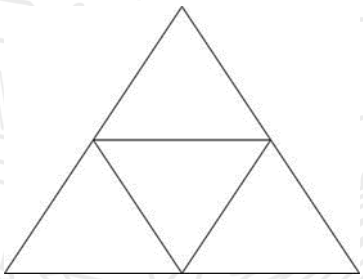
7. If $X \Delta Y = X + Y$ and $X \otimes Y = X \times Y$, what will be $(4\Delta 3) \otimes 2$?

A) 14
B) 9
C) 10
D) 16

8. The sum of the ages of mother and child is 36. How old is the child if mother is three times older?

A) 10
B) 9
C) 8
D) 7

9. How many quadrilaterals are on the picture?

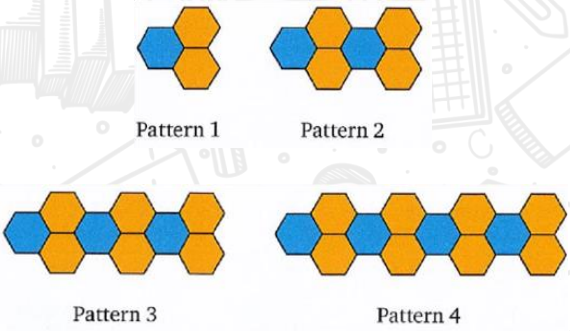


A) 6
B) 5
C) 4
D) 7

10. Two plums weigh one apple and three apples weigh two oranges. How many plums does one orange weigh?

A) 2
B) 3
C) 4
D) 6

11. These pattern of shapes from a sequence. Find pattern 42.



A) 114
B) 92
C) 112
D) 126

12. What is the smallest 3-digit number whose tens digit is 4, while the sum of units and hundreds is 2?

A) 342
B) 141
C) 240
D) 042

13. Grandma poured 30 liters of water into five three-liter and four two-liter jars, and the rest into half-liter jars. How many half-liter jars did Grandma use?

A) 12
B) 14
C) 16
D) 18

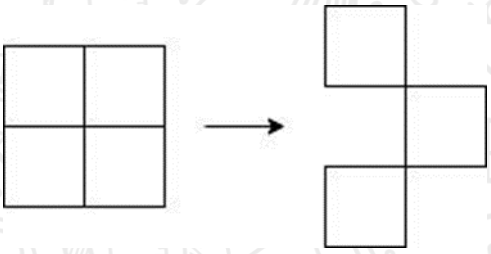
14. The mother counted and if she gave each child 4 candies, then there would be 3 candies left. And if she gives each one 5 candies, then 2 candies will be missing. How many children does the mother have?

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

15. We have the numbers 1, 2, 3, 4, 5, and 6. Using all of these numbers, we need to take two three-digit numbers so that their difference is the smallest. What will be this difference?

A) 47
B) 56
C) 333
D) 42

16. Each side of little square is 1 stick. What is the minimum quantity of sticks to move to get from one figure to another?

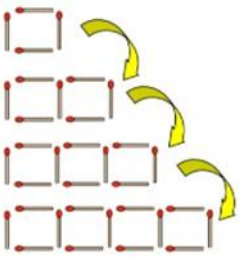


A) 2
B) 3
C) 4
D) 6

17. To bake 400 grams of cake you need 280 grams of flour. How many grams of flour are needed to bake 600 grams of cake?

A) 560
B) 500
C) 400
D) 420

18. How many sticks are required for the 12th pattern in the sequence?

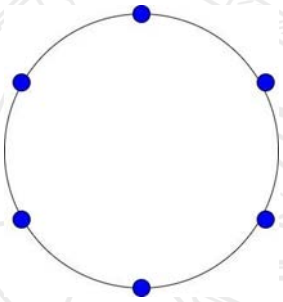


A) 51
B) 29
C) 27
D) 37

19. The boys caught 75 fish. How many boys were fishing if some caught 10 fish and some 11?

A) 5
B) 6
C) 7
D) 8

20. There are 6 points on circle. How many segments can we take with those points?



A) 6
B) 10
C) 15
D) 30

21. Solve:

A) 5
B) 6
C) 7
D) 8

22. Find the value of $2023 + 202 - 23 + 222$.

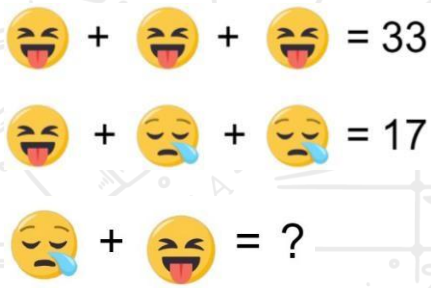
A) 2023
B) 2024
C) 2424
D) 1999

23. Find the next term In the sequence below:

$$5, 8, 11, 13, \ldots$$

A) 15
B) 16
C) 17
D) 18

24. Solve:



A) 14
B) 16
C) 11
D) 8

25. Solve the expression below.

$$(12 - 0.8 \times 0.5) : (3.26 + 0.74)$$

A) 0.8
B) 2.9
C) 2
D) 3.2

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

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1. Using the digits 1, 2, 3, 4, 5, 6, and 7, make four numbers with maximal sum (without repeat, and one digit can be used only once). What will be this maximal sum?

A) 7660
B) 28
C) 109
D) 163

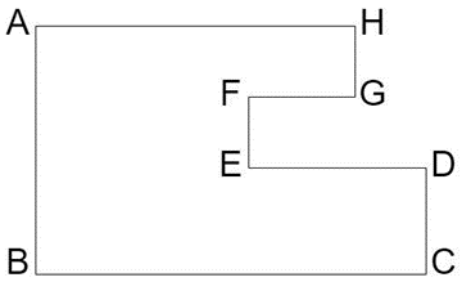
2. There are 12 bicycles in the garden, with 2 or 3 wheels. Total number of wheels are 30. How many bicycles are with 2 wheels?

A) 3
B) 4
C) 6
D) 8

3. Consider $X\Delta Y = X + 2 \times Y$ and $X\Omega Y = X \times Y$. What will be $(107\Delta 115)\Omega 6$?

A) 228
B) 2022
C) 1332
D) 80730

4. Find the perimeter of $ABCDEFGH$ if $AB = 6$, $BC = 9$, and $FG = 2$.



A) 20
B) 24
C) 26
D) 34

5. What will be the sum of the digits A, B, and C if $A + BB + A = CCC$?

A) 10
B) 15
C) 16
D) 20

6. How many three-digit numbers can be written only with even number?

A) 900
B) 450
C) 500
D) 100

7. The length, width and height of an aquarium is $10\ cm$, $20\ cm$ and $30\ cm$. What will be the water volume if a quarter of the aquarium is filled?

A) 1000
B) 1500
C) 2000
D) 3000

8. What is the value of the expression below?

$$\left(1-\frac{1}{2}\right)\cdot\left(1-\frac{1}{3}\right)\cdot\left(1-\frac{1}{4}\right)\cdot\ldots\cdot\left(1-\frac{1}{21}\right)\cdot\left(1-\frac{1}{22}\right)$$

A) $\frac{1}{2}$
B) $\frac{1}{10}$
C) $\frac{1}{22}$
D) $\frac{1}{2\cdot3\cdot4\cdot\ldots\cdot22}$

9. Nick has 3 pairs of shoes, 4 pants and 5 t-shirts. How many different ways are to put on clothes?

A) 12
B) 24
C) 30
D) 60

10. Two equal three-digit numbers are multiplied by each other. Accordingly, by what number does this multiplication cannot end?

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

11. Find the last digit of the product of two numbers ending with 3.

A) 1
B) 3
C) 7
D) 9

12. Every family in the village has a cow, a horse or both, with 26 families having cows, 31 families having a horse and 12 families having both. How many families are there in the village?

A) 45
B) 48
C) 56
D) 62

13. Calculate the sum below:

$$1+3+5+\cdots+197+199$$

A) 25050
B) 5050
C) 10000
D) 4950

14. The letters in the word MATHEMATICIAN were put in a box. What is the chance of getting letter A?

A) 3 out of 9
B) 3 out of 10
C) 3 out of 13
D) 3 out of 11

15. The 7-digit numbers $74A52B1$ and $326AB4C$ are multiples of 3. Which one of the following is the value of C?

A) 1
B) 2
C) 3
D) 6

16. How many numbers are there in the sequence below?

$$11, 14, 17, 20, \ldots, 71, 74$$

A) 20
B) 21
C) 22
D) 23

17. I added the first ten whole numbers greater than 0. I forgot to include one whole number and I got 50 as the sum. Which one of these ten whole numbers I did not add?

A) 1
B) 3
C) 5
D) 7

18. There were 60 birds on three trees. Then 6 birds flew away from the first tree, 8 birds flew away from the second tree and 4 birds flew away from the third tree. Now there are the same number of birds on each tree. How many birds were there on the second tree in the beginning?

A) 18
B) 20
C) 22
D) 24

19. Let the operation $*$ be defined by $a * b = ab - a - b + 2$. If $7 * b = 13$, what is the value of b?

A) 1
B) 2
C) 3
D) 4

20. Find value of x.

$$3 + \frac{10}{2 + \frac{6}{5 - x}} = 9$$

A) 22
B) 23
C) 24
D) 25

21. On the way home, my mother noticed that the glass had fallen off the table and shattered. Jane said: "Jimmy broke the glass." "I did not break the glass", Jimmy said. John added: "I did not break the glass either". We know that only one is telling the truth. Then who broke the glass and who is telling the truth?

A) Jane broke and John is telling the truth
B) Jimmy broke and Jane is telling the truth
C) John broke and Jimmy is telling the truth
D) Jimmy broke and John is telling the truth

22. Solve:

A) 11
B) 12
C) 3
D) 4

23. The following numbers are written according to a rule. Which number should come instead of the question mark?

$$5, 7, 11, ?, 35, 67$$

A) 15
B) 17
C) 19
D) 23

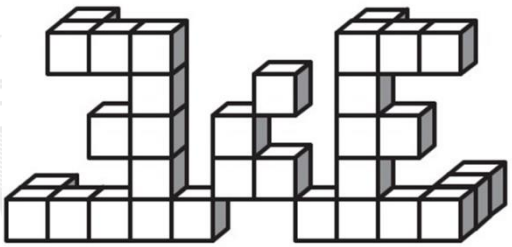
24. Find the value of a.

×	a	b	c
a		8	
b			12
c	6		

$$a > 0, \quad b > 0, \quad c > 0$$

A) 1
B) 2
C) 3
D) 8

25. How many small cubes are there in the image below?



A) 1
B) 32
C) 23
D) 18

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

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1. Find the value of the expression below.

$$(0.2)^{-1} - \frac{1}{0.2 + \frac{1}{(0.2)^{-1}}}$$

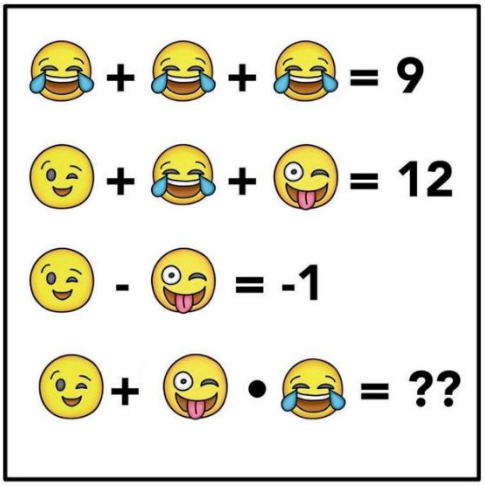
A) $-\frac{5}{2}$

B) $-\frac{1}{5}$

C) 1

D) $\frac{5}{2}$

2. Solve:



A) 17

B) 15

C) 19

D) 21

3. Find the simplest form of the expression below.

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

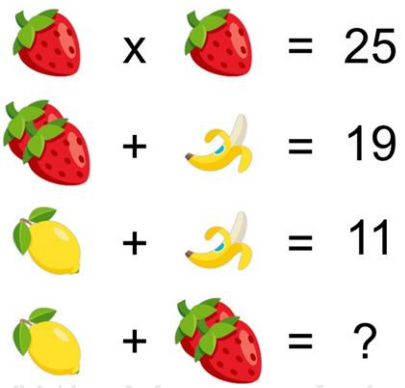
A) $3\sqrt{2}$

B) $2\sqrt{3}$

C) $\sqrt{2}$

D) $\sqrt{3}$

4. Solve:



A) 7

B) 10

C) 12

D) 14

5. With the information given below, find the value of $6x$.

$$m\Delta n = 7m - 3n - 5$$

$$x\Delta x = x$$

A) 4

B) 5

C) 8

D) 10

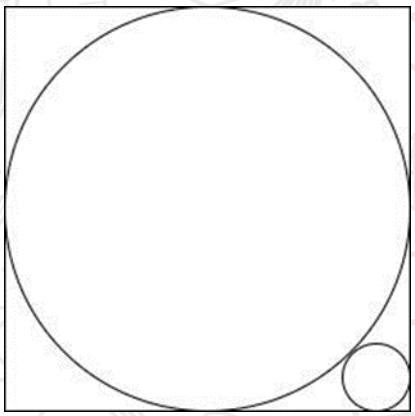
6. Seven-digit number $62AB427$ is divisible by 99. Find the value of $A + B$.

A) 7
B) 5
C) 6
D) 4

7. There are 37 numbers on a roulette wheel: 0 and the whole numbers from 1 to 36. What is the chance of getting a perfect square number?

A) $\frac{1}{6}$
B) $\frac{7}{37}$
C) $\frac{6}{37}$
D) $\frac{5}{37}$

8. The square in the figure has side length equal to 2. What is the radius of the small circle? (Circles are touching)



A) $\sqrt{2} - 1$
B) $\frac{2}{\sqrt{2}+1}$
C) $\sqrt{2}$
D) $3 - 2\sqrt{2}$

9. The average of five weights is 13 grams. If a 7-gram weight is added, what is the average of the six weights?

A) 11
B) 12
C) 13
D) 14

10. A tournament had six players. Each player played every other player only once, with no ties. If Jane won 4 games, John won 3 games, Janet won 2 games, Jordan won 2 games and Jimmy won 2 games, how many games did Jessey win?

A) 1
B) 2
C) 3
D) 4

11. Girl is 9 years old. Mother is 41 years old. In how many years from now will the mother age be 3 times more than the child's age?

A) 3
B) 5
C) 6
D) 7

12. Let k, m, and n be natural numbers less than 10. Find the value of $m + n$ if $m + n + 8k = 89$.

A) 16
B) 17
C) 18
D) 19

13. The sum of 10 consecutive natural numbers are 195. Find the value of the first one.

A) 13
B) 14
C) 15
D) 16

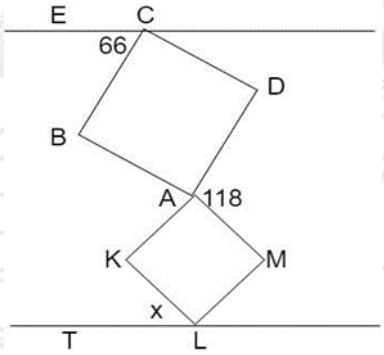
14. Every day at school, Jo climbs a flight of 6 stairs. Jo can climb using 1, 2 or 3 steps, or a combination of any of them. How many ways can Jo climb the flight of 6 stairs?

A) 18
B) 20
C) 22
D) 24

15. Find the simplest form of $\frac{(\sqrt{10}-1)^2-3}{\sqrt{10}+\sqrt{3}-1}$.

A) $\sqrt{10}-\sqrt{3}-1$
B) $\sqrt{10}+\sqrt{3}-1$
C) $\sqrt{7}-1$
D) $\sqrt{3}+1$

16. Inside two parallel lines there are two squares $ABCD$ and $AKLM$. Find the angle $\angle TLK$, if $\angle BCE = 66°$ and $\angle DAM = 118°$.



A) 42°
B) 48°
C) 52°
D) 58°

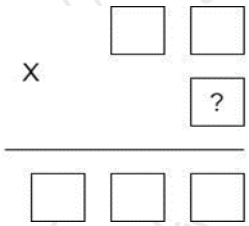
17. If $a_1 + a_2 = 1$, $a_2 + a_3 = 2$, $a_3 + a_4 = 3$, …, $a_{50} + a_{51} = 50$ and $a_{51} + a_1 = 51$, then what is the sum of $a_1, a_2, a_3, \ldots, a_{51}$?

A) 538
B) 1075
C) 663
D) 754

18. The solution set of $\frac{x}{a} + \frac{1}{b} > 0$ is $x < \frac{1}{3}$, where a and b are constants. Determine the solution set of $bx - a > 0$.

A) $x > \frac{1}{3}$
B) $x > -\frac{1}{3}$
C) $x < \frac{1}{3}$
D) $x < -\frac{1}{3}$

19. The digits 1, 2, 3, 4, 5, and 6 are each placed in one of the boxes so that the multiplication below is correct. What is the digit represented by the question mark?

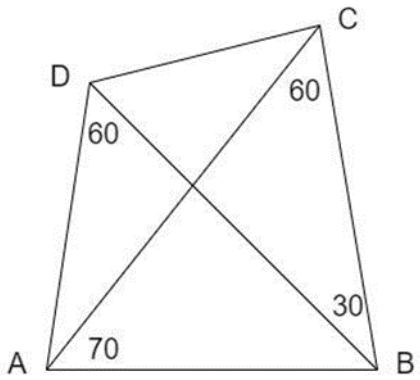


A) 2
B) 3
C) 4
D) 5

20. If $a^2 + b^2 = 117$ and $ab = 54$, then find the value of $\frac{a+b}{a-b}$.

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

21. In the given figure, $ABCD$ is a quadrilateral. $\angle ADB = 60°$, $\angle BAC = 70°$, $\angle DBC = 30°$ and $\angle ACB = 60°$. Find $\angle DAC$.



A) 20°
B) 30°
C) 40°
D) 50°

22. What is the positive square root of $(\sqrt{48} - \sqrt{45})$?

A) $\frac{\sqrt[4]{3}}{\sqrt{2}}(\sqrt{5} - \sqrt{3})$
B) $\frac{\sqrt[4]{3}}{2}(\sqrt{5} - \sqrt{3})$
C) $\frac{\sqrt{2}}{\sqrt[4]{3}}(\sqrt{5} - \sqrt{3})$
D) $\frac{\sqrt[4]{3}}{\sqrt{2}}(\sqrt{5} + \sqrt{3})$

23. If $x + \frac{1}{x} = 4$, find the value of $x^3 + \frac{1}{x^3}$.

A) 8
B) 16
C) 52
D) 12

24. If $A = 1{,}111{,}111{,}111$ and $B = 22{,}222$, what is the value of $A - B$?

A) $33\,333^2$

B) $12\,123^2$

C) $76\,543^2$

D) $30\,303^2$

25. In $ABCD$ quadrilateral $AB : BC : CD : DA = 2 : 3 : 4 : 5$. The perimeter of ABC is equal to $15\ cm$ and the perimeter of ACD is equal to $27\ cm$. What is the length of CD?

A) 10

B) $\frac{27}{5}$

C) 15

D) 12

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

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1. Given that $4^{63}-1$ is divisible by 103, find the integer $46<n<103$ such that n^3-1 is divisible by 103.

A) 48
B) 56
C) 64
D) 68

2. Which prime number can be written in the form $n^2+2n-63$ for some positive integer n?

A) 11
B) 13
C) 17
D) 19

3. For how many integers $1 \leq n \leq 100$ is n^3-1 divisible by 7?

A) 36
B) 40
C) 44
D) 48

4. We place N cars on a 10×10 grid. Each car occupies a single cell and points up, down, left, or right. In a move, we may choose a car and shift it one cell forward to a vacant cell or remove it from the grid if it has reached the edge. Suppose that it is not possible to remove all of the cars from the grid. Find the smallest possible value of N.

A) 1
B) 2
C) 3
D) 4

5. Triangle ABC has $AB=13$, $AC=15$, and $BC=14$. If $D \neq A$ is on segment AC such that $BD=13$, find the ratio of the inradius of ABD to the inradius of BDC.

A) $\frac{248}{49}$
B) $\frac{256}{49}$
C) $\frac{264}{49}$
D) $\frac{272}{49}$

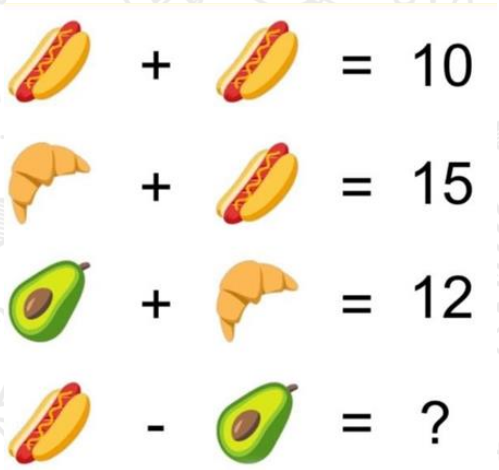
6. Find $x-y$ if $\begin{cases} y^2=x^3-3x^2+2x \\ x^2=y^3-3y^2+2y \end{cases}$.

A) 0
B) 0 or 1
C) 0 or 2
D) 1 or 2

7. How many ways are there to cover a 4×4 square with only 2×2 and 1×1 squares, if tiles cannot be cut, exceed the boundary of the big square, or overlap each other?

A) 39
B) 41
C) 43
D) 45

8. Solve:



A) 1
B) 3
C) 5
D) 9

9. Simplify the expression below:

$$\frac{0.4 \cdot 10^{-2} - 3 \cdot 10^{-3}}{20 \cdot 10^{-2}}$$

A) $\frac{1}{250}$
B) $\frac{1}{50}$
C) 0.005
D) 0.001

10. Find the value of the expression below:

$$\frac{\left(\frac{1}{6} + 0.1 + \frac{1}{15}\right) : \left(\frac{1}{6} + 0.1 - \frac{1}{15}\right) \cdot 2.52}{\left(0.5 - \frac{1}{3} + 0.25 - \frac{1}{5}\right) : \left(0.25 - \frac{1}{6}\right) \cdot \frac{7}{13}}$$

A) 0
B) 1
C) 2
D) 3

11. Solve:

A) 19
B) 24
C) 27
D) 59

12. With the information given below, find the value of c.

$$a, b, c \in \mathbb{Z}^+$$
$$b^2 = a$$
$$b + c = a$$
$$c = 5b$$

A) 15
B) 20
C) 25
D) 30

13. Per, Ragnar, and Lars live in the same neighbourhood. They have found out that the straight line distance from Per's house to Ragnar's house is $250\ m$, and from Ragnar's house to Lars' house is $300\ m$. Which of the following is true about the distance between Per's house and Lars' house?

A) The distance is precisely $550\ m$.

B) The distance is between $0\ m$ and $550\ m$.

C) The distance is between $50\ m$ and $550\ m$.

D) The distance is between $250\ m$ and $300\ m$.

14. A city is divided into four regions. The city council has decided that a new city hall, a new school, and a new movie theatre shall be built. The only condition is that the school and the movie theatre must not be in the same region. How many ways these four buildings can be built in the city? (Ignore the time of construction)

A) 16

B) 24

C) 48

D) 64

15. On a birthday, every boy knows 4 girls, and every girl does not know 5 boys. What is the minimum number of girls and boys on this birthday?

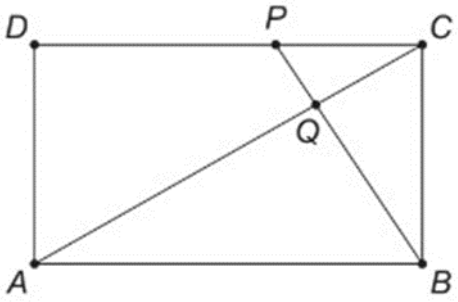
A) 4

B) 8

C) 18

D) 20

16. Knowing that the areas of the triangles BCQ and QCP of the figure are, respectively, 6 and 2, what is the area of the rectangle $ABCD$?



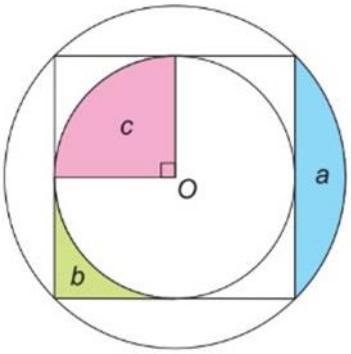
A) 48

B) 50

C) 52

D) 54

17. The figure shows three regions, a, b, and c, determined by an O-center square, and their circumferences inscribed and circumscribed. Which of the following equalities is true?



A) $c = a + b$

B) $c = a - b$

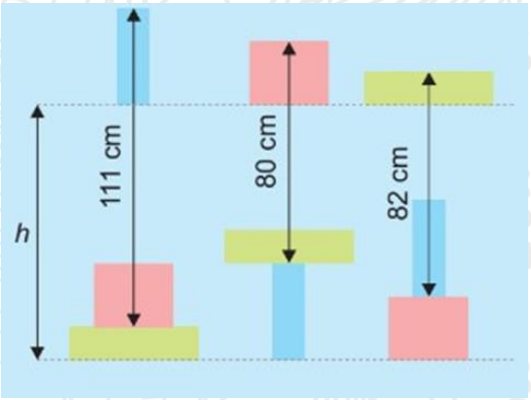
C) $c = 2a + b$

D) $c = a + 2b$

18. John has a strange habit of lying on Mondays, Tuesdays and Wednesdays. The other days of the week he speaks the truth. Every day John tells Mary whether or not he will lie the next day. On how many days of the week can John say "Yesterday I told Mary I would lie today"?

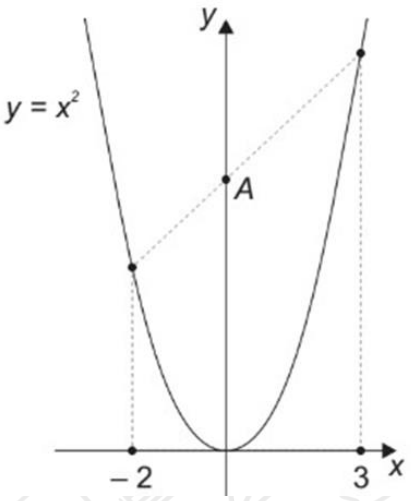
A) 1
B) 2
C) 3
D) 4

19. In the figure below, the sides of the rectangles are horizontal or vertical, and the rectangles of the same color are identical. What is the value of h?



A) 88 cm
B) 89 cm
C) 90 cm
D) 91 cm

20. The figure shows the graph of the function defined by $y = x^2$. Point A has coordinates $(0, p)$. What is the value of p?



A) 5
B) 5.5
C) 6
D) 6.25

21. Four cards, each with a positive integer, are such that every time we add up the numbers of three of them we get a number equal to or greater than 24. Consider the following statements:

I) All numbers are equal to or greater than 8.
II) There are two numbers whose sum is equal to or greater than 16.
III) There are two numbers whose product is equal to or greater than 64.

Which statements are necessarily true?

A) Only I and II
B) Only I and III
C) Only II and III
D) Only II

22. On Monday, Ed drove to work at an average speed of 70 km/h and arrived 1 minute late. On Tuesday, he left at the same time and made the same way. This time he drove at an average speed of 75 km/h and arrived 1 minute early. How far is the fistance from his house to work?

A) 30 km
B) 35 km
C) 45 km
D) 50 km

23. Let α and β be the roots of $x\text{^}2 + 7x - 9 = 0$. Evaluate $3\alpha^2\beta + 3\alpha\beta^2$.

A) 63
B) -63
C) 189
D) 0

24. Find the greatest prime factor of the sum $5! + 6! + 7! + 8!$.

A) 5
B) 7
C) 11
D) 13

25. Given that $2^{510} - 1$ is a multiple of $2^d - 1$, where d is a positive integer, find the sum of all possible values of d.

A) 758
B) 786
C) 1268
D) 1296

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

A TRADITION OF EXCELLENCE

INSTRUCTIONS

You are about to take Copernicus Exam.

Please read the followings carefully.

1. The exam has 25 multiple choice-questions. Each question weighs 4 points. The maximum score a student can get is 100. There is a penalty of one point for each incorrect answer. So only answer the questions you are sure of.
2. Start with the easier questions, you can always come back to the questions you leave.
3. The time allocated for the exam is 60 minutes. You will start when the invigilator tells you to start.
4. You are required to comply with the directions given by the head invigilator before the examination.
5. Those who are taking the exam with a mobile phone MUST make sure that during the examination no one calls.
6. If anything in the examination is unclear, you can contact the invigilator.
7. Where permitted you may use a translation dictionary.
8. Students must not give or receive assistance of any kind during the exam. Any cheating, any attempt to cheat, assisting others to cheat, participating therein, or engaging in such improper conduct is a serious violation and will generally result in disqualifying.

Remember that “Hard work beats talent when talent doesn't work hard”

We wish you the very best luck on the exam.

1. Find n, if $n+\lfloor\sqrt{n}\rfloor+\lfloor\sqrt[3]{n}\rfloor=2022$. ($\lfloor x\rfloor$ is biggest natural number no more than x).

A) 1964
B) 1965
C) 1966
D) 1967

2. Consider a triangle ABC with $AB=AC$, and D the foot of the altitude from the vertex A. The point E lies on the side AB such that $\angle ACE=\angle ECB=18°$. If $AD=3$, find the length of the segment CE.

A) 4
B) 5
C) $3\sqrt{3}$
D) 6

3. Let $ABCDEF$ be a regular hexagon with $M\in DE$ and $N\in CD$ such that $\angle AMN=90°$ and $AN=CM\cdot\sqrt{2}$. Find the value of $\frac{DM}{ME}$.

A) 2
B) 3
C) $2\sqrt{3}$
D) $\frac{2}{\sqrt{3}}$

4. Find the greatest positive integer x such that 23^{x+6} divides $2000!$.

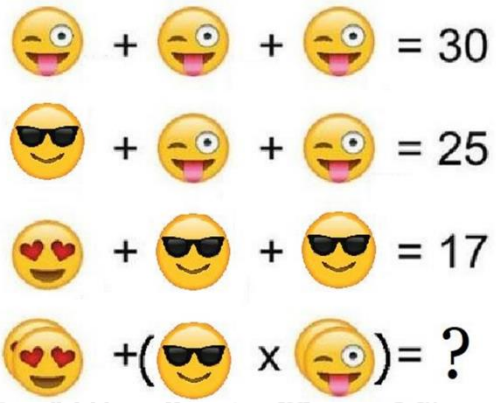
A) 82
B) 83
C) 84
D) 85

5. Find the 70th term of the pattern below.

1st	2nd	3rd	4th	5th	…	70th
1	4	7	10	13	…	x

A) 172
B) 195
C) 208
D) 301

6. Solve:



A) 82
B) 93
C) 114
D) 125

7. Find the value of K.

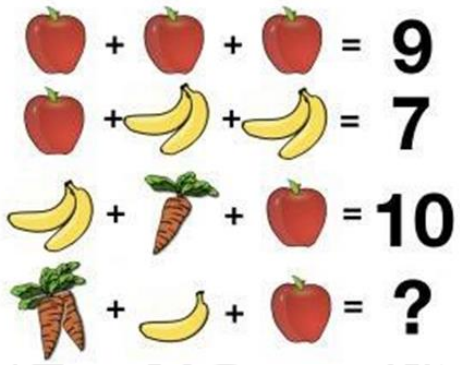
$$\begin{array}{cccc} & K & K \\ - & L & L \\ \hline & M & M \end{array} \qquad \begin{array}{cccc} & K & K \\ & L & L \\ + & M & M \\ \hline 1 & 5 & 4 \end{array}$$

A) 3
B) 5
C) 6
D) 7

8. What is $3a^b + 8a^{-3b}$, *if* $a^b = 2$?

A) 5
B) 7
C) 8
D) 24

9. Solve:



A) 14
B) 23
C) 34
D) 35

10. Find the value of x in the pattern below.

$$2, 9, 19, 32, 48, 67, x$$

A) 79
B) 83
C) 89
D) 91

11. Find the simplest form of the following expression:

$$\frac{16-(4a-a^2)^2}{a^2-4a-4} \cdot \frac{1}{2-a}$$

A) $a-2$
B) $a+2$
C) $\frac{1}{a-2}$
D) 1

12. Find the value of x.

$$\frac{\frac{1}{x}}{1-\frac{3}{x}} = \frac{2}{3}$$

A) $\frac{9}{2}$
B) $\frac{7}{3}$
C) $\frac{3}{8}$
D) 1

13. Students from Mrs. Hein's class are standing in a circle. They are evenly spaced and consecutively numbered starting with 1. The student with number 3 is standing directly across from the student with number 17. How many students are there in Ms. Hein's class?

A) 28
B) 29
C) 30
D) 31

14. The numbers a_1, a_2, a_3, and a_4 are drawn one at a time from the set $\{0, 1, 2, \ldots, 9\}$. If these four numbers are drawn with replacement, what is the probability that $a_1a_4 - a_2a_3$ is an even number?

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

B) $\frac{3}{8}$

C) $\frac{3}{4}$

D) $\frac{5}{8}$

15. Arne has a box with 100 chips of colors red, white, blue, and black. Each chips has only one color. Arne told Berit that she (Berit) must pick at least 81 chips from the box to be sure of getting at least one of each color, if she picks them without looking. After some thought, Berit concluded correctly that the box contains at least N chips of each color, but at most M of each. What is the smallest possible value of $M - N$?

A) 0

B) 5

C) 20

D) 40

16. Emmy is playing with a calculator. She enters an integer, and takes its square root. Then she repeats the process with the integer part (round down) of the answer. After the third process, the integer part equals 1 for the first time. What is the difference between the largest and the smallest number Emmy could have started with?

A) 231

B) 239

C) 241

D) 243

17. Peter has three boxes, with ten balls in each. He plays a game in which the goal is to end up with few balls as possible in the boxes. The boxes are each marked with one number from $\{4, 7, 10\}$. It is allowed to remove N balls from the box marked with the number N, put three of them aside, and put the rest in another box. What is the least total number of balls in the boxes can contain in the end?

A) 0

B) 1

C) 2

D) 3

18. The parallelogram $ABCD$ is such that $\angle B < 90°$ and $AB < BC$. Points E and F are chosen on the circumscribed circle ω of triangle ABC so that the tangents to ω at these points pass through point D. If $\angle EDA = \angle FDC$, find angle $\angle ABC$.

A) 30°

B) 45°

C) 60°

D) 90°

19. In how many ways can we exchange a \$20 bill for \$0.10 and \$0.25 coins?

A) 21
B) 36
C) 38
D) 41

20. Grandma Beth wanted to know which of her five granddaughters had made a drawing on the wall of her living room. The granddaughters made the following statements:

- Emily: "It wasn't me."
- Laura: "Mary or Tina were the ones who designed it."
- Mary: "It was not Tina or Vicky."
- Tina: "It was not Laura."
- Vicky: "Laura is not telling the truth."

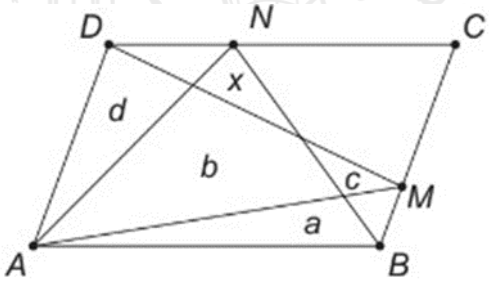
If only one of the granddaughters lied, who drew the drawing?

A) Emily
B) Laura
C) Mary
D) Tina

21. Alice put a liter ($1000\ cm^3$) of water in a jar and measured the water level. Then she placed a solid silver object in the jar and measured the water level again, according to the figure. The mass of one cubic centimeter of silver is 10.5 grams. What is the mass of this object?

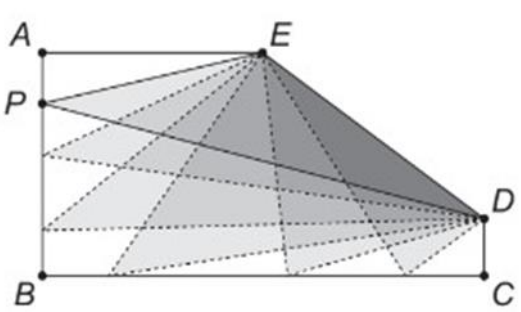
A) $1050\ g$
B) $1500\ g$
C) $1800\ g$
D) $2100\ g$

22. In the $ABCD$ parallelogram of the figure, the points M and N are points on the BC and CD sides, respectively. Areas a, b, c, and d are known. What is the value of the x area?



A) $c + d - a$
B) $a + c + d - b$
C) $a + c + d - 2b$
D) $a + d - b$

23. The figure shows an $ABCDE$ pentagon such that $AB = 4$, $BC = 8$, $CD = 1$, $AE = 4$, and the $\angle ABC$, $\angle BCD$, and $\angle EAB$ angles are straight. The P point moves over the AB and BC sides. How many positions can point P occupy on the AB and BC sides so that the PDE triangle is isosceles?



A) 5

B) 4

C) 3

D) 2

24. A container, initially empty, is filled by two taps with different flow rates. If each tap is opened for $\frac{1}{3}$ of the time required for the other to fulfill the container, it will have $\frac{5}{6}$ of its capacity filled. In addition, the two taps together fulfill the container initially empty in 2 hours and 30 minutes. How long does it take to the higher flow rate tap fulfill the container?

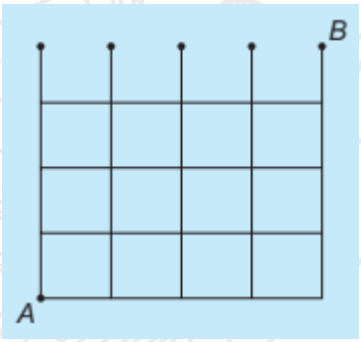
A) 3 hours

B) 3 hours and 15 minutes

C) 3 hours and 30 minutes

D) 3 hours and 45 minutes

25. An ant walks down the grid below and can move just to the right or up. If it has two options to move, it chooses one at random, with $\frac{1}{2}$ probability. What is the probability that the ant starts at point A and ends at point B?



A) $\frac{1}{5}$

B) $\frac{1}{32}$

C) $\frac{1}{2}$

D) $\frac{1}{8}$

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