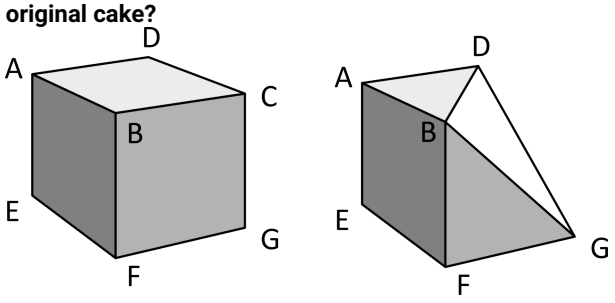
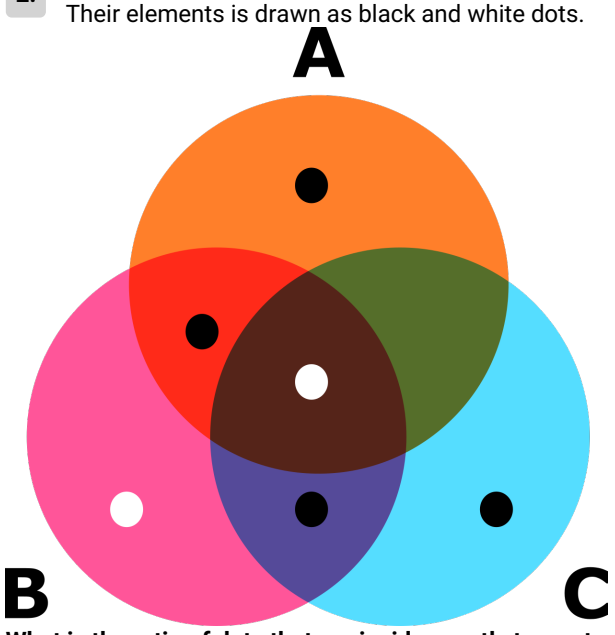
1. A cake in the shape of a cube ABCD.EFGH is cut.The cut starts from the line BD straight to the corner G as shown. After that the smaller part is eaten.
What is the proportion of the cake left compared to the original cake?



A) $\frac{2}{3}$
B) $\frac{3}{5}$
C) $\frac{5}{6}$
D) $\frac{5}{7}$

(Correct +3, Wrong 0, Blank 0)

2. The following diagram shows three sets A, B, and C. Their elements is drawn as black and white dots.



What is the ratio of dots that are inside exactly two sets compared to all of the dots?

A) $2:5$
B) $1:3$
C) $1:5$
D) $1:6$

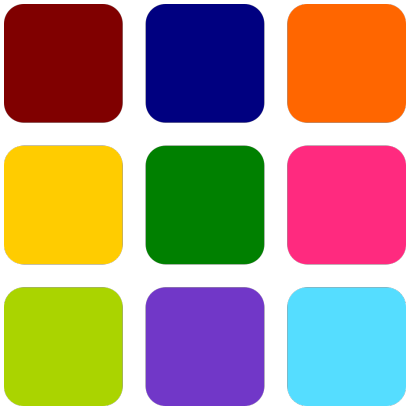
(Correct +3, Wrong 0, Blank 0)

3. If $\frac{x}{y} = \frac{x+y}{2x-y}$ and $xy > 0$, then $\frac{x}{y} = \cdots$

A) $\frac{1+\sqrt{3}}{2}$
B) $\frac{1+\sqrt{5}}{2}$
C) $\frac{1-\sqrt{3}}{2}$
D) $\frac{1-\sqrt{5}}{2}$

(Correct +3, Wrong 0, Blank 0)

4. The following are cards arranged into 3 by 3 table. Each card contains number from 1 to 9. Also the number on each card is different from each other.

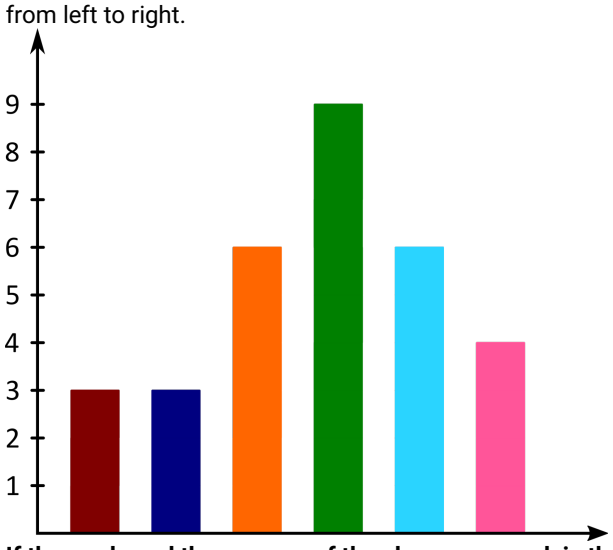


The sum of the numbers on the left column is 14 and the sum on the right column is 15.
What is the sum of the numbers in the middle column?

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

(Correct +3, Wrong 0, Blank 0)

5. Below is the chart of marks of mathematics exam in a classroom. The marks is multiple of 10, so a student can get for example 100, 40, 70 etc. And also the difference between marks on the neighboring bar is 10 and its increasing from left to right.



If the mode and the average of the classroom mark is the same, what is the maximum mark in the classroom?

A) 100
B) 90
C) 80
D) 70

(Correct +3, Wrong 0, Blank 0)

6. Consider the following unordered data: $4, x, 0, 3, x, x, 2, x^2, 2, 1$. It is known that the mode and mean have the same value.

How many values of x is possible?

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

(Correct +3, Wrong 0, Blank 0)

7. Given $a > b > \frac{1}{b} > \frac{1}{a}$, find the biggest one among the folowing three numbers: $ab + \frac{1}{ab}$, 2, $\frac{a}{b} + \frac{b}{a}$

A) 2
B) $ab + \frac{1}{ab}$
C) $ab + \frac{1}{ab} = \frac{a}{b} + \frac{b}{a} = 2$
D) $\frac{a}{b} + \frac{b}{a}$

(Correct +3, Wrong 0, Blank 0)

8. Let a, b, c be three distinct integers.

If the sets $\{a, b, c\}$, $\{a^2, b, c\}$, $\{a+1, b+c, c\}$ all represent the same set (probably with a different order of elements), then $c =$____.

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

(Correct +3, Wrong 0, Blank 0)

9. Andy, Ben, and Charles are playing a card game using the cards below. Each player is given three cards with different colors at random. Then, the player calculates the sum of the numbers in their cards.
It's known that Andy got card 1, Ben got card 5, and Charlie got card 9. **What is the probability that Andy and Charlie got the same result?**

A) $\frac{1}{16}$
B) $\frac{1}{8}$
C) $\frac{1}{2}$
D) $\frac{1}{4}$

(Correct +3, Wrong 0, Blank 0)

10. Consider the following financial report.

Komodo Company
Income Statement
September, 2021

Net sales	5,800,000
Cost of sales	2,550,000
Gross profit	**3,250,000**
Operating Expenses	600,000
Operating Income	**2,650,000**
Gain (Loss)	(900,000)
Other Income	250,000
Income before taxes	**2,000,000**
Tax expenses	500,000
Net Income	**1,500,000**

According to the above report. Which of the following formula is ***incorrect***?

A) Net Income = Income before taxes - Tax expenses
B) Gross profit = Net sales + Cost of sales
C) Income before taxes = Operating Income - Loss + Other

11. The following is formula used to calculate the length of an object moving very fast. In the formula, v is the object's speed, c is a constant (which is speed of light), l is the object's length when it's at rest, and l' is the object's length when it's moving with speed v.

$$l' = l\sqrt{1 - \frac{v^2}{c^2}}$$

Which of the statements is ***correct*** according to the formula?
1. As an object moves faster it becomes shorter.
2. As speed of an objects get nearer to c its length goes to 0.
3. If the object stands still then $l = l'$.
4. As an object moves faster it becomes longer.

A) only 1
B) 1 and 2
C) 1,2, and 3
D) only 4

(Correct +3, Wrong 0, Blank 0)

12. A wire in a shape of a circle is cut into n parts, each of the same length. The n parts is then bent to make n new circles.
What is the ratio between the total are of the n new circles compared to the initial one?

A) $1 : n$
B) $1 : 2n^2$
C) $1 : 2n$
D) $1 : n^2$

(Correct +3, Wrong 0, Blank 0)

Income

D) Operating Income = Gross profit - Operating Expenses

(Correct +3, Wrong 0, Blank 0)

13. **The largest domain of the function $f(x) = \sqrt{1 - \frac{1}{x}}$ is ____.**

A) $x \leq 0 \vee x > 1$
B) $x < 0 \vee x \geq 1$
C) $x < 0 \vee x > 1$
D) $x \leq 0 \vee x \geq 1$
(Correct +3, Wrong 0, Blank 0)

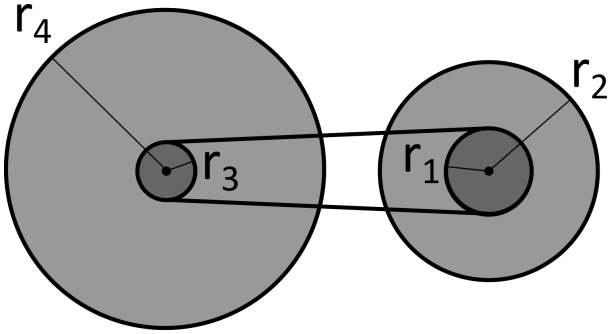
14. **If $(x-1)(x+2) > 0$ and $(x+1)(x-2) > 0$, then the range of x is ____.**

A) $x < -1 \vee x > 1$
B) $x < -2 \vee x > 2$
C) $x < -2 \vee x > 1$
D) $x < -1 \vee x > 2$
(Correct +3, Wrong 0, Blank 0)

15. Adam is a rabbit breeder. In the beginning he had 80 white rabbits and 20 black rabbits.
It is known that among the babies of white rabbits, 60% are white and 40% are black. Meanwhile, among the babies of black rabbit, 20 percent white and 80 percent are black.
If Adam's rabbits have 100 babies, how many black baby rabbits does Adam have?

A) 64
B) 24
C) 20
D) 48
(Correct +3, Wrong 0, Blank 0)

16. Two gears with the same center rotates with the same rotation speed ω. Therefore given the same amount of time, the two will rotates the same amount of rotation.
Two gears connected with chain rotates with different rotation speed ω, but if we multiply each rotation speeds with their respective radii r. We'll get the same result for both gear. In other words $\omega \cdot r$ for two gears connected with a chain is the same.



Consider the gear set above. It's known that
$r_1 : r_2 : r_3 : r_4 = 2 : 4 : 1 : 6$.
If r_2 rotates twenty times per minute, how many rotation does r_4 rotates in one minute?

A) 40
B) 80
C) 20
D) 10
(Correct +3, Wrong 0, Blank 0)

17. A four-digit number $\overline{abcd}$ is ***special*** if the sum of all its digits is 19.

How many special four-digit numbers are there?

A) $\binom{21}{3} - \binom{10}{3} - 3\binom{9}{3}$
B) $\binom{22}{3}$
C) $\binom{22}{3} - \binom{21}{2}$
D) $\binom{21}{3} - \binom{20}{2} - 3\binom{19}{1}$

(Correct +3, Wrong 0, Blank 0)

18. Given the sets $A = \{1, 2, 4, 8\}$, $B = \{1, 3, 5, 7\}$, $C = \{2, 4, 6, 8\}$.

Find the set $(A \cup B) \cap C$.

A) $\{1, 2, 4, 6, 8\}$
B) $\{3, 7\}$
C) $\{1, 2, 3\}$
D) $\{2, 4, 8\}$

(Correct +3, Wrong 0, Blank 0)

19. **If x and y are positive integers such that $x^3 + 3xy - 4x$ is a prime number, then $y =$ ____.**

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

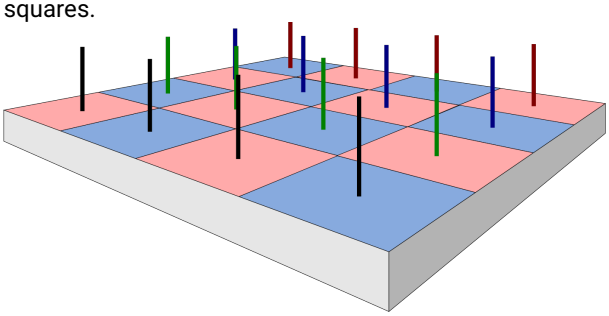
(Correct +3, Wrong 0, Blank 0)

20. Which of the following has the greatest reminder when divided by 7?

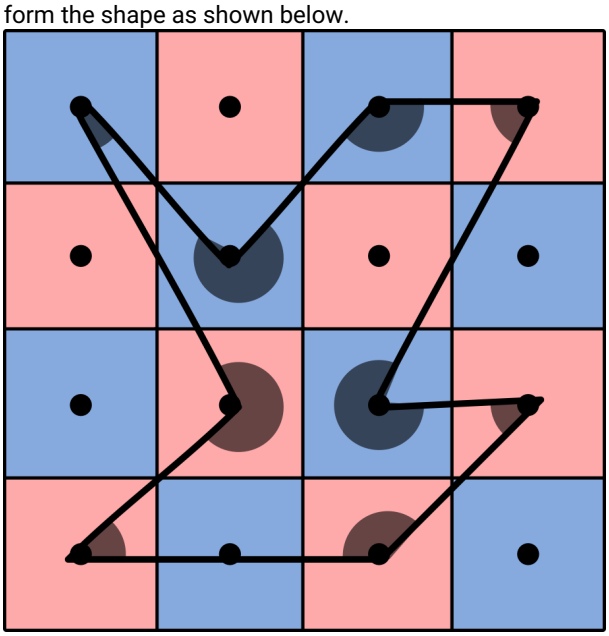
A) $2^{50} + 3^{50}$
B) 6^{50}
C) 3^{50}
D) 2^{50}

(Correct +3, Wrong 0, Blank 0)

21. A checkerboard consists of 4 x 4 unit square. Sixteen pegs are fixed on the board, each in the center of all the squares.



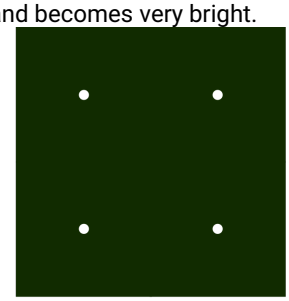
Then a rubber band is inserted into the pegs in such a way to form the shape as shown below.



What is the sum of all the internal angles of the shape in degree? (Write your answer only in numbers.)
(Correct +4, Wrong 0, Blank 0)

22. How many 3-digit numbers can be formed if we must use the digit 9 at least once? (Write your answer only in numbers.)
(Correct +4, Wrong 0, Blank 0)

23. A neighborhood park has width of 20 meters and length of 20 meters. Four lamps are installed in a specific place as shown in the first picture. The four lamps can light its surrounding area up to $5\sqrt{2}$ meters away froom the lamp as shown in the second picture such that some areas are lit twice and becomes very bright.

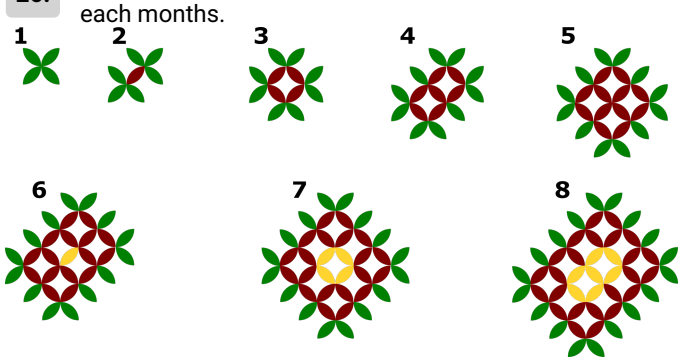


How large is the flower-shape very bright area in the middle of the park in meter squared. (Use $\pi = 3.14$, and write your answer only in numbers.)
(Correct +4, Wrong 0, Blank 0)

24. The three digit number $\overline{abc}$ is divisible by 33.
How many value of b is possible? (Write your answer only in numbers.)
(Correct +4, Wrong 0, Blank 0)

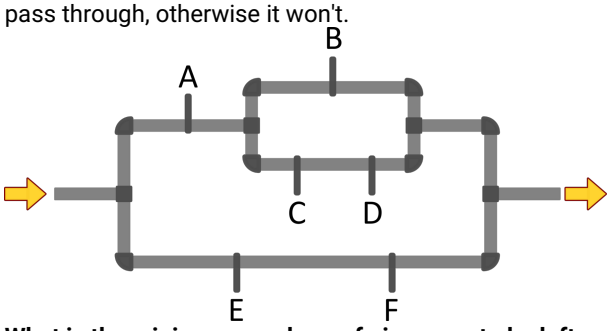
25. If p, q, r are prime numbers such that $p + q = r + 2022$, then $\min\{p, q, r\} =$ ____. (Write your answer only in numbers.)
(Correct +4, Wrong 0, Blank 0)

26. The following shows a growth of a plant at the end of each months.



How many non-green leaves does the plants has at the end of its first year? (Write your answer only in numbers.)
(Correct +4, Wrong 0, Blank 0)

27. The following shows a configuration of pipes. Water current enters the system from left and exitsto the right. In the system there are six valve, A, B, C, D, E, and F. These valves can be closed and opened. If a valve is open it lets water pass through, otherwise it won't.



What is the minimum numbers of pipe nees to be left open to let the water pass through? (Write your answer only in numbers.)
(Correct +4, Wrong 0, Blank 0)

28. One Biology book, two distinct Physics books, and three identical Mathematics books are to be arranged in a line on a bookshelf.
How many arrangements are possible, if the two Physics books must be put next to each other? (Write your answer only in numbers.)
(Correct +4, Wrong 0, Blank 0)

29. The password of Harry's phone consists of four nonzero digits. The second digit is twice that of the first digit. The third digit is three times the second digit and the last digit equals the sum of the second and the third digit.
What is the sum of all digits of Harry's password? (Write your answer only in numbers)
(Correct +4, Wrong 0, Blank 0)

30. **If both x and $\dfrac{x}{x+3}$ are integers, then how many values of x are possible?** (Write your answer only in numbers.)
(Correct +4, Wrong 0, Blank 0)

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Answer Keys

No	Key	Code
1	C	KMF/1958/SREMC
2	B	KMF/1997/YI28N
3	A	KMF/2031/LOUZI
4	D	KMF/2009/JNBB3
5	B	KMF/2020/XQTHG
6	A	KMF/1977/5KX7P
7	B	KMF/1929/FRUB6
8	A	KMF/2036/ODNII
9	B	KMF/1952/3OGJ9
10	B	KMF/1985/ASBYS
11	C	KMF/1982/IKRR1
12	A	KMF/2025/3DVOK
13	B	KMF/2033/EACMO
14	B	KMF/2032/QJ2PM
15	D	KMF/2011/E77TU
16	A	KMF/2017/F4A80
17	A	KMF/1975/WWAMH
18	D	KMF/1933/L3GCE
19	B	KMF/2040/M55Q7
20	A	KMF/1942/VDUJO