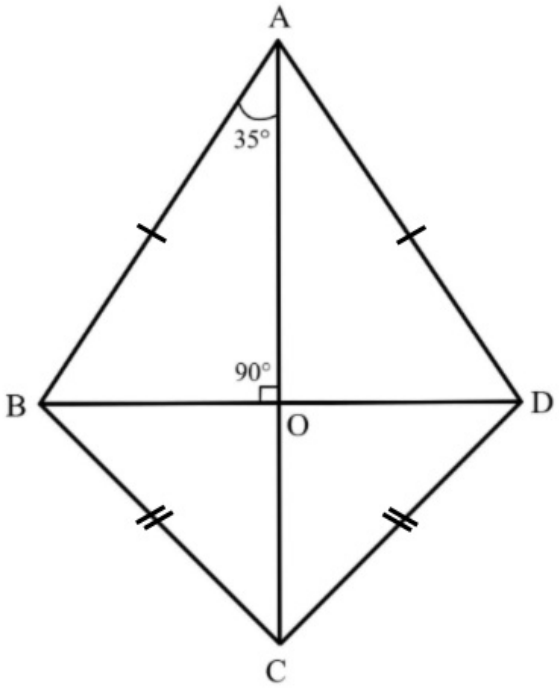
1. Susi wants to create a password for the Komodo Math Competition site by only containing different numbers.

If the password consists of at least 9 numbers, **how many possible passwords can be formed?**
($n!$ is the product of all positive integers from 1 to n. For example, $5! = 5 \times 4 \times \times 2 \times 1 = 120$)

A) 2 . 9!
B) 10!
C) 2 . 10!
D) 11!

(Correct +3, Wrong 0, Blank 0)

2. Look at the following kite diagram!



If $OB = OC = OD$ and $\angle BAC = 35°$, then the measure of $\angle ADC$ is ...

A) $140°$
B) $130°$
C) $100°$
D) $120°$

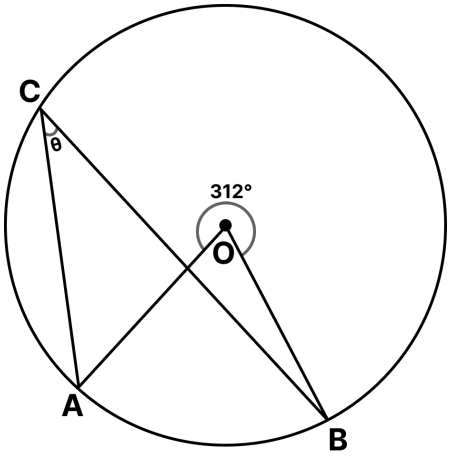
(Correct +3, Wrong 0, Blank 0)

3. If a, b, and c are real numbers that satisfy $a + b + c = 10$ and $ab + bc + ca = 31$, **then the value of $a^2 + b^2 + c^2$ is ...**

A) 42
B) 44
C) 38
D) 40

(Correct +3, Wrong 0, Blank 0)

4.



Given the circle, what is the angle of θ ?

A) 10°
B) 66°
C) 156°
D) 24°

(Correct +3, Wrong 0, Blank 0)

5. Consider the following statements:

1. The difference between any two prime numbers is always even.
2. The difference between any two prime numbers is always odd.
3. The sum of two odd prime numbers is always even.
4. There is no even prime number other than 2.

Which of the statements are true?

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

(Correct +3, Wrong 0, Blank 0)

6. A box contains red, blue, and green marbles. There are 3 red marbles, 5 blue marbles, and x green marbles.

If the probability of picking a green marble at random is 0.2 , what is the value of x?

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

(Correct +3, Wrong 0, Blank 0)

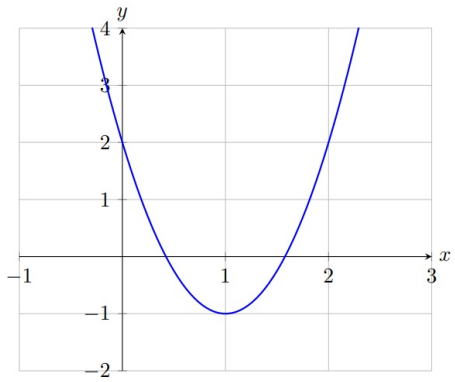
7. A group conducted a survey on the body weights of its members. The average weight of 9 members is 54. If the weight of one member was excluded, the average would become 53.25.

What is the weight of the excluded member?

A) 61
B) 59
C) 60
D) 58

(Correct +3, Wrong 0, Blank 0)

8. Choose the following function that correspond to the given graph:



A) $y = 3x^2 - 6x + 2$
B) $y = 3x^2 - 6x - 2$
C) $y = 3x^2 + 6x + 2$
D) $y = 3x^2 + 6x - 2$

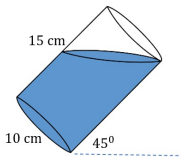
(Correct +3, Wrong 0, Blank 0)

9. Given that a,b, and c are positive real numbers. If $\frac{a}{b+c} = \frac{b}{c+a} = \frac{c}{a+b} = k$, **then the value of k that satisfies the equation is ...**

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

(Correct +3, Wrong 0, Blank 0)

10. A cylinder container with a diameter 10 cm and a height 15 cm is filled with water until full. After some time, the cylinder is tilted at a 45 degree angle so some of the water is spilled out.



If the remaining water in the tube can be expressed as $p\pi\ cm^3$, then determine $\frac{p}{5}$

A) 5
B) 20
C) 50
D) 15

(Correct +3, Wrong 0, Blank 0)

11. Given that x and y are rational numbers.

$$5 + \cfrac{1}{5+\cfrac{1}{5+\cfrac{1}{5+\cfrac{1}{5+\ldots}}}} = x + \sqrt{y}$$

Determine the value of $8xy$

A) 5
B) 50
C) 145
D) 250

(Correct +3, Wrong 0, Blank 0)

12. Let a, b, c, d are positive integer that satisfy $\frac{a}{b} < \frac{c}{d}$.

Which following statement is always true?

A) $\frac{a}{b} < \frac{a}{b+d} < \frac{c}{d}$
B) $\frac{a}{b} < \frac{b+d}{a+c} < \frac{c}{d}$
C) $\frac{a}{b} < \frac{a+c}{b+d} < \frac{c}{d}$
D) $\frac{a}{b} < \frac{a+d}{b+c} < \frac{c}{d}$

(Correct +3, Wrong 0, Blank 0)

13. Given a number n that satisfies

$$1+\frac{1}{2}+\frac{1}{3}+\cdots+\frac{1}{10}=\frac{n}{1\times2\times3\times4...\times10}$$

Find the remainder of dividing n by 7

A) 3
B) 6
C) 0
D) 1

(Correct +3, Wrong 0, Blank 0)

14. Let x and y are distinct positive real numbers that satisfy

$$\frac{x}{y}+\frac{x+2y}{y+3x}=2$$

Determine $\frac{y}{x}$

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

(Correct +3, Wrong 0, Blank 0)

15. The remainder when $(1!+2!+3!+...+100!)$ is divided by 12 is...

A) 3
B) 0
C) 6
D) 9

(Correct +3, Wrong 0, Blank 0)

16. A cone is placed on top of a cube so the base of cone touch all the top edges of the cube. The radius of the cone's base is 7 cm, and the height of the cone is 24 cm. The side length of the cube is 14 cm.

Calculate the total surface area of the composite solid (use : $\pi=\frac{22}{7}$)

A) $980\ cm^2$
B) $1572\ cm^2$
C) $1176\ cm^2$
D) $1726\ cm^2$

(Correct +3, Wrong 0, Blank 0)

17. Given an arithmetic sequence with the first term a and common difference d.

If the sum of the first n terms of the sequence is S_n, and it is known that $S_{2n} = 3S_n$, **then the value of** $\frac{S_{3n}}{S_n}$ **is...**

A) 6
B) 8
C) 7
D) 9

(Correct +3, Wrong 0, Blank 0)

18. Let a six digit number formed by a, b, c with $a, b, c \in \{1, 2, 3, \ldots, 8, 9\}$.

Which of the following numbers is always divisible by 11?

A) $\overline{abccba}$
B) $\overline{bcacab}$
C) $\overline{abccbc}$
D) $\overline{abccab}$

(Correct +3, Wrong 0, Blank 0)

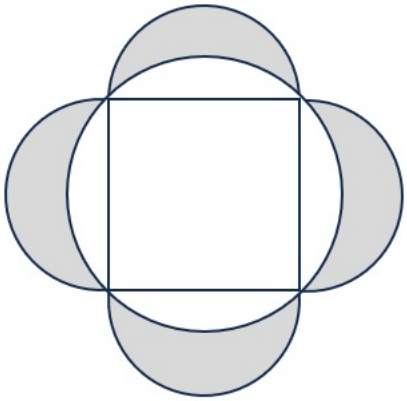
19. **Calculate**

$$sin^2 10° + \sin^2 20° + \sin^2 30° + \ldots$$
$$\ldots + \sin^2 70° + \sin^2 80°$$

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

(Correct +3, Wrong 0, Blank 0)

20. Given a two-dimentional figure below



If the shaded area is O, **then the area of** $\frac{1}{2}$ **of the square is?**

A) $2O$
B) O
C) $\frac{1}{2}O$
D) 100

(Correct +3, Wrong 0, Blank 0)

21. **The number of solution to the equation $\sin t + \cos^2 t = \cos t + \sin^2 t$ with $0 \leq t \leq \pi$ is ____.** (Write only in numbers.)

(Correct +4, Wrong 0, Blank 0)

22. **Simplify**

$$\frac{\cot A(1-\cos 2A)}{\sin 2A}$$

(Write only in numbers.)

(Correct +4, Wrong 0, Blank 0)

23. **The number of integer solution to $|x-1| + |x+1| = 2x$ with $-20 \leq x \leq 25$ is ____.** (Write only in numbers.)

(Correct +4, Wrong 0, Blank 0)

24. Define the function $f : A \to B$ with $A = \{m, a, t, h\}$ and $B = \{3, 1, 4\}$.

Determine the number of ways to define the surjective function from A to B. (Write only in numbers.)

(A **surjective function** (**onto function)** is a function f such that, for every element y of the function's codomain, there exists at least one element x in the function's domain such that f(x) = y)

(Correct +4, Wrong 0, Blank 0)

25. Three people go fishing. The first person catches 5 fish, the second person catches 3 fish, and the third person catches 2 fish. If all the fish are put into one container, the probability that 2 fish randomly selected from the container were both caught by the same person is $\frac{p}{q}$ (where gcd (p,q) = 1) .

What is the value of $p + q$? (Write only in numbers.)

(Correct +4, Wrong 0, Blank 0)

26. A party is attended by 5 people. Two attendee will shake hands once if and only if they know each other before the party. Every three people shook hands exactly twice.

What is the maximum number of handshakes that happened in the party? (Write your answer only in numbers)

(Correct +4, Wrong 0, Blank 0)

27. A box contains 3 blue balls, 6 red balls, 2 white balls.

If 6 balls are randomly chosen at once, **the probability of drawing 3 red balls and 1 white ball is $\frac{p}{77}$, what is p?** (Write only in numbers.)

(Correct +4, Wrong 0, Blank 0)

28. There are 10 exam scores, where the scale is 0 to 2. The mean and standard deviation are both equal to 1.

How many distinct scores are there? (Write only in numbers.)

(Correct +4, Wrong 0, Blank 0)

29. Let's say we have a function:

$f(\frac{x-3}{x+1}) + f(\frac{x+3}{1-x}) = x$

Find $f(3)$. (Write only in numbers.)

(Correct +4, Wrong 0, Blank 0)

30. For a quadrilateral ABCD it is known that BC = 3 cm, CD = 7 cm, and DA = 11 cm.

If both diagonals (namely AC and BD) are perpendicular to each other, then the length of AB is ____ cm.

(Write only in numbers.)

(Correct +4, Wrong 0, Blank 0)

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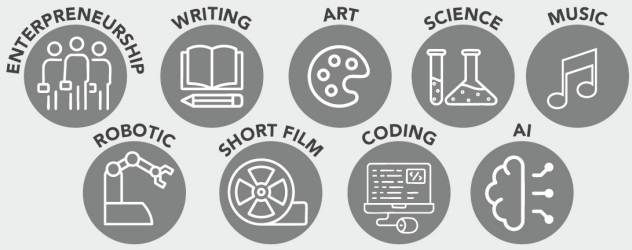

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Answer Keys

No	Key	Code
1	C	KMF/4047/XBNG4
2	C	KMF/4003/U62IU
3	C	KMF/4006/7D134
4	D	KMF/4096/2AZ9I
5	D	KMF/4002/R8JSC
6	D	KMF/4166/6G8R0
7	C	KMF/4038/HAWAM
8	A	KMF/3998/T4UOM
9	B	KMF/4004/MUPLV
10	C	KMF/4042/TSBBQ
11	C	KMF/4039/22MHS
12	C	KMF/4045/NC7KC
13	D	KMF/4043/DIYD3
14	A	KMF/4046/XAZNA
15	D	KMF/4005/G7DEZ
16	B	KMF/4001/CYIL0
17	A	KMF/4014/0KHEX
18	A	KMF/4088/Y5BTB
19	A	KMF/3999/AHZFK
20	C	KMF/4044/HG4AJ