german
math
olympiad

SAMPLE QUESTIONS

Grades 9-10-11

1- **Which of the following statements about these numbers are correct?**

I. π **is an irrational and transcendental number.**

II. $\sqrt{2} + \sqrt{3}$ **is an irrational number.**

III. $\frac{22}{7}$ **is a rational number that approximates** π**, but not equal to it.**

IV. $(\sqrt{2} + \sqrt{3}) < \pi < \frac{22}{7}$

A) I and II
B) I, II and III
C) I, III and IV
D) All of the statements above

2- **Which fraction is the largest?**

A) $\frac{2224}{2222}$

B) $\frac{3336}{3333}$

C) $\frac{4448}{4444}$

D) They are all the same

3- **Factorise:**

$2x^2 + 7x - 15$

A) $(2x + 5) \cdot (x - 3)$
B) $(2x + 3) \cdot (x - 5)$
C) $(2x - 3) \cdot (x + 5)$
D) $(2x - 5) \cdot (x + 3)$

4- **Solve for x:**

$x^2 - 5x + 6 = 0$

A) x = 1 or 6

B) x = 2 or 3

C) x = –2 or –3

D) x = 3 or 5

5- **Let f be a function defined on the set of real numbers, satisfying the equation**

$f(x+y) = f(\frac{x}{2}) + f(\frac{y}{2})$ **for all real numbers x and y.**

Given that f(8) + f(2) = 6, what is the value of f(128) ?

A) 4 B) 8 C) 16 D) 32

6-

If Halloween (October 31) is on a Sunday, what day of the week will Christmas (December 25) be on? There are 31 days in October and 30 days in November.

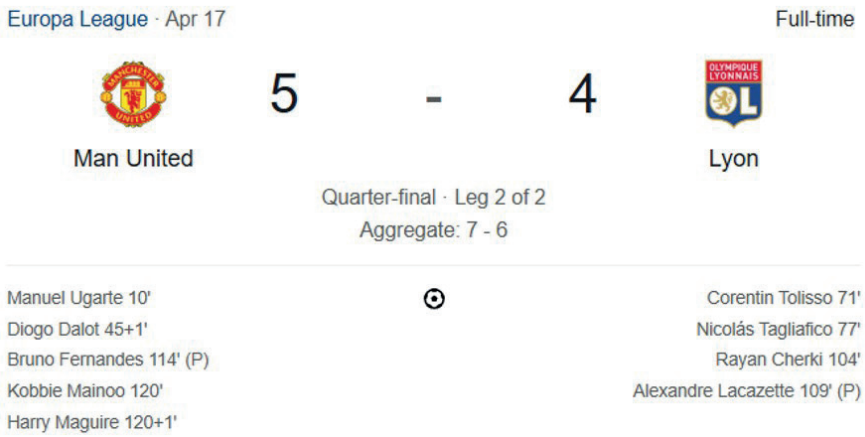
A) Saturday

B) Sunday

C) Monday

D) Tuesday

7-



The chart above displays the scorers and the minutes at which goals were scored during the UEFA Europa League quarter-final second leg match between Manchester United and Lyon. Ignoring any additional stoppage time and considering that the match lasted 120 minutes including extra time, what is the correct order (from longest to shortest) of the total durations during which:

M — Manchester United was leading

L — Lyon was leading

D — the score was level (draw)?

A) M > D > L

B) M > L > D

C) D > M > L

D) L > M > D

8-

Given that $3^x=16$, what is the value of the sum $|x-2|+|x-3|$?

A) 5

B) 3

C) 1

D) 0

9- **What is the distance between the points (–3, 4) and (1, 1)?**

A) 3
B) 4
C) 5
D) $\sqrt{10}$

10- **If $\vec{a}$ = (2, –1) and $\vec{b}$ = (–3, 4), what is $\vec{a}$ + $\vec{b}$?**

A) (–1, 3)
B) (1, 5)
C) (–6, 5)
D) (5, –5)

11- **Three rods k, l and m of equal length are fixed at a common point.**

Rods k and m are placed perpendicular to each other, and rod l lies between them.

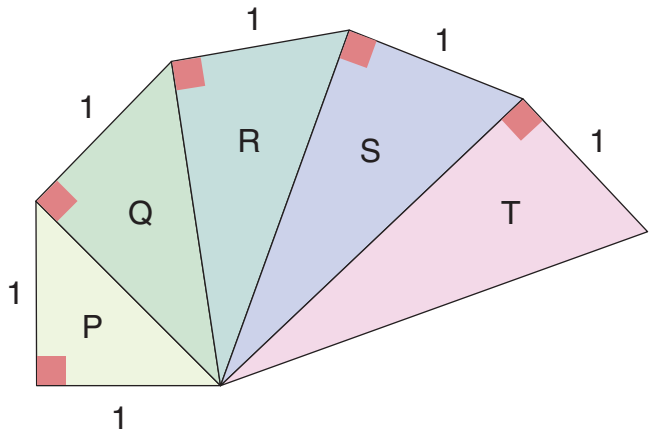
It is measured that:

- **The distance between the free ends of rods k and l is $5\sqrt{2}$ cm,**
- **The distance between the free ends of rods l and m is 7 cm.**

Accordingly, what is the distance between the free ends of rods k and m?

A) 12 cm
B) 13 cm
C) 14 cm
D) 15 cm

12-



In the diagram above, each right triangle has one leg of length 1 unit, and the other leg is the hypotenuse of the previous triangle in the sequence. The triangles are labelled P, Q, R, S, T from left to right.

What is the length, in units, of the hypotenuse of triangle T?

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

13-

Find the sum of the first 5 terms of the geometric sequence:

3, 6, 12, 24, ...

A) 90

B) 93

C) 96

D) 99

14-

Consider a series which is both an arithmetic and a geometric series. Which of the following statements are correct about it?

I. As an arithmetic series, the common difference is 0.

II. As a geometric series, the common ratio is 1.

III. If the series is defined as $a_n=\sqrt[4]{5}$, then the sum of the first five terms is equal to the product of the first five terms.

A) I and II

B) II and III

C) I and III

D) I, II, and III

15-

Four identical blonde dolls and three identical brunette dolls will be placed side by side in a row.

Including the one depicted in the picture above, how many different arrangements are possible?

A) 28

B) 30

C) 32

D) 35

16-

Jessie flips a fair coin six times in a row.

What's the probability that she gets more heads than tails?

A) $\frac{3}{32}$ B) $\frac{15}{64}$ C) $\frac{5}{16}$ D) $\frac{11}{32}$

17-

A dataset contains the following values:

5,8,12,13,15,18,20

What are the median, mean, and range of the dataset, respectively?

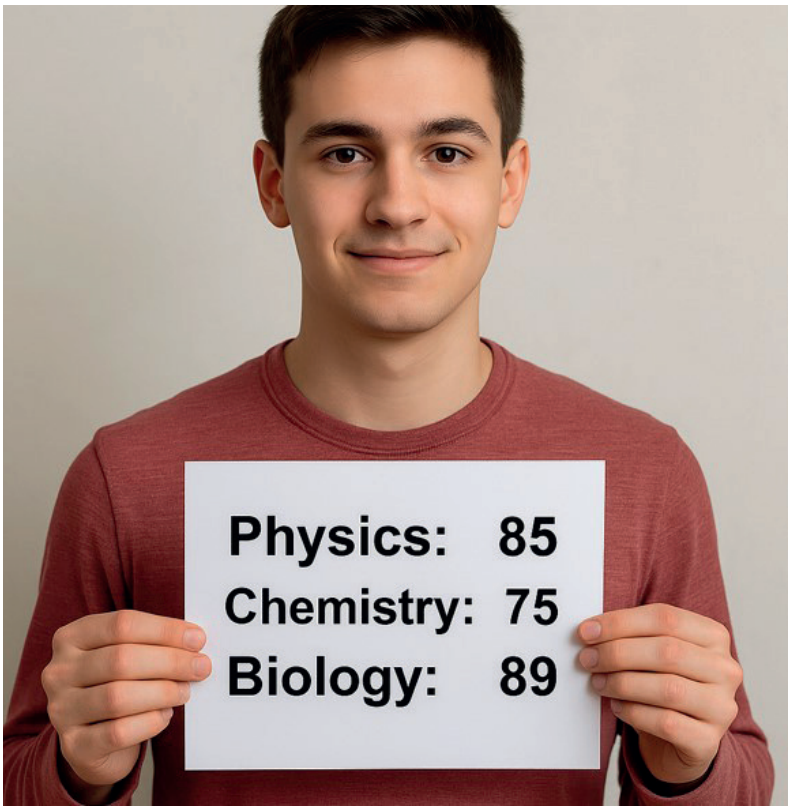
A) 13, 13, 15

B) 13, 13, 12

C) 13, 14, 15

D) 12, 13, 15

18-



A student scores as follows:

- **Physics: Mean = 80, Standard Deviation = 10, Student's score = 85**
- **Chemistry: Mean = 60, Standard Deviation = 15, Student's score = 75**
- **Biology: Mean = 65, Standard Deviation = 12, Student's score = 89**

Using the student's z-scores, rank the subjects from best to worst relative to classmates. (Higher z-score = better relative performance.)

Which option matches this order?

A) Physics, Biology, Chemistry

B) Biology, Chemistry, Physics

C) Biology, Physics, Chemistry

D) Chemistry, Physics, Biology

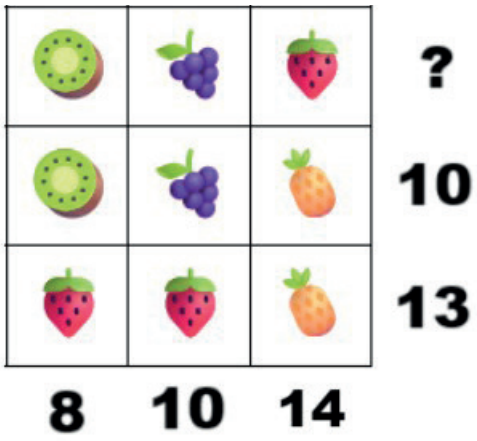
19- **Use the information below to find the last two digits of the number 3^{2043}.**

*** The number of integers from 1 to 99 that have no common factor with 100 other than 1 (i.e., are relatively prime to 100) equals 40. (Two numbers are said to be relatively prime if their greatest common divisor is 1.)**

*** If a number is relatively prime to 100, raising it to this count — that is, to the number 40 — will give a result ending in 01 as the last two digits.**

A) 01 B) 03 C) 27 D) 81

20-



In the array puzzle above, each shape has a specific value. The number at the end of each row or column represents the sum of the values in that row or column.

What number should replace the question mark?

A) 8 B) 9 C) 10 D) 13

Answers: 1-D, 2-D, 3-C, 4-B, 5-C, 6-A, 7-A, 8-C, 9-C, 10-A, 11-B, 12-C, 13-B, 14-D, 15-D, 16-D, 17-A, 18-B, 19-C, 20-B