نمونه سوالات آزمون CEnT-S (سنت اس)

سنت اس

ENTRANCE EXAM

Consorzio per l'Educazione e i Test *Scienze*

آکادمی دان

نمونه سوالات جدید هر ماه در CEnT-S.ir

آموزش مفهومی و تحلیل این سوالات در دوره طلایی است.

بخش ریاضی و منطق (Mathematics and Logic)

Question 01:

Consider the following six numbers: 450; 183; 705; 822; 231; 556

How many of them are divisible by 6?

A. One

B. Five

C. Three

D. Two

E. Four

Question 02:

Which is the largest natural number smaller than $\log_2 200$?

A. 100

B. 8

C. 20

D. 7

E. 10

Question 03:

Look at the polygon in the figure:
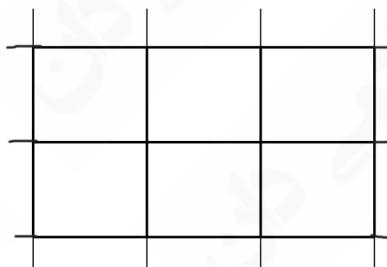
Consider the following polygons, using as unit of length the side of each square of the grid in the figure:

1. a square with side 2 (perimeter 8)

2. a rectangle with dimensions 3 and 2 (perimeter 10)

3. a rectangle with dimensions 1 and 4 (perimeter 10)

4. a rectangle with dimensions 3 and 1 (perimeter 8)

   Which of them have the same perimeter as the polygon in the figure?

   A. Only polygons 1 and 4

   B. Only polygons 1 and 3

Question 04:

Which of the listed functions is a strictly increasing function?

A. $f(x) = \frac{1}{x^3}$

B. $f(x) = \sqrt{\ln x}$

C. $f(x) = e^{x^2}$

D. $f(x) = x(x^2 - 1)$

E. $f(x) = |x + 1|$

Question 05:

Consider the expression $\quad \pi - |m \cdot n| + 1$

If $l = -3$, $m = -1$ and $n = 5$; what is the value of the expression?

A. -2

B. -10

C. 0

D. -12

E. 2

Question 06:

Consider the following system in the variables (x, y), where k is a real parameter:

$$\begin{cases} 3x + (k - 1)y = 0 \\ x - ky = 2 - k \end{cases}$$

If (m, 1) is a solution of the system, what is the value of m?

A. It is not uniquely determined

B. 0

C. -5

D. 2

E. 2 - 2k

Question 07:

In the Cartesian plane, consider the subset of points whose coordinates satisfy the following system:

$$\begin{cases} (x - 1)^2 + (y + 4)^2 \le 4 \\ y \ge x - 4 \end{cases}$$

Let S be the area of this subset. Then:

A. $2\pi < S < 4\pi$

B. $S = 2\pi$

C. $S = 4\pi$

D. $S = 0$

E. $0 < S < 2\pi$

Question 08:
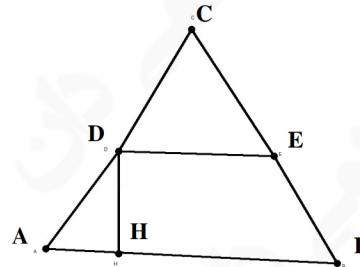
The figure shows an equilateral triangle ABC. We know that DE is parallel to AB, DH is perpendicular to AB, and that AB measures 1.

If we let $AH = x$, which of the proposed expressions is the area of the triangle CDE in terms of x?

A. $\frac{\sqrt{3}}{3} \cdot (1 + x)^2$

Question 09:

Let $f : \mathbb{R} \to \mathbb{R}$ be an invertible function and let $g : \mathbb{R} \to \mathbb{R}$ be the function defined as follows:

$g(x) = f(x + 2) \quad \forall x \in \mathbb{R}$

Then, the value of $f^{-1}(g(2))$ is:

A. 4

B. $f^{-1}(f(2) + 2)$

C. 0

D. $f^{-1}(4)$

E. $f(0)$

Question 10:

Two real numbers x and y, with $x \neq 0$, satisfy the following equality:

$\frac{y}{x} = y^2 - 2y$

Then all the listed equalities are certainly true, except for one. Which one?

A. $y^2 = 2y + \frac{y}{x}$

B. $\frac{1}{x} = y - 2$

C. $-\frac{y}{x} = 2y - y^2$

D. $y = x(y^2 - 2y)$

E. $\frac{2xy - xy^2 + y}{x} = 0$

Question 11:

Consider a real number $a > 0$ such that $\sqrt{a} > a$. Then, which of the listed inequalities is FALSE?

A. $2a > 3$

B. $1 - a > 0$

C. $a^{\frac{3}{2}} > a^3$

D. $\frac{1}{a} > a$

E. $a^2 < 1$

Question 12:

The figure shows a portion of the graph of two functions, f (dashed black curve) and g (solid red curve), in the interval –3 < x < 4.

In which of the intervals proposed f(x) < g(x) for each value of x?

A. –1 < x < 1

B. $\frac{6}{5} < x < \frac{5}{2}$

[گزینه‌های بیشتر احتمالاً شامل بازه‌های دیگر]
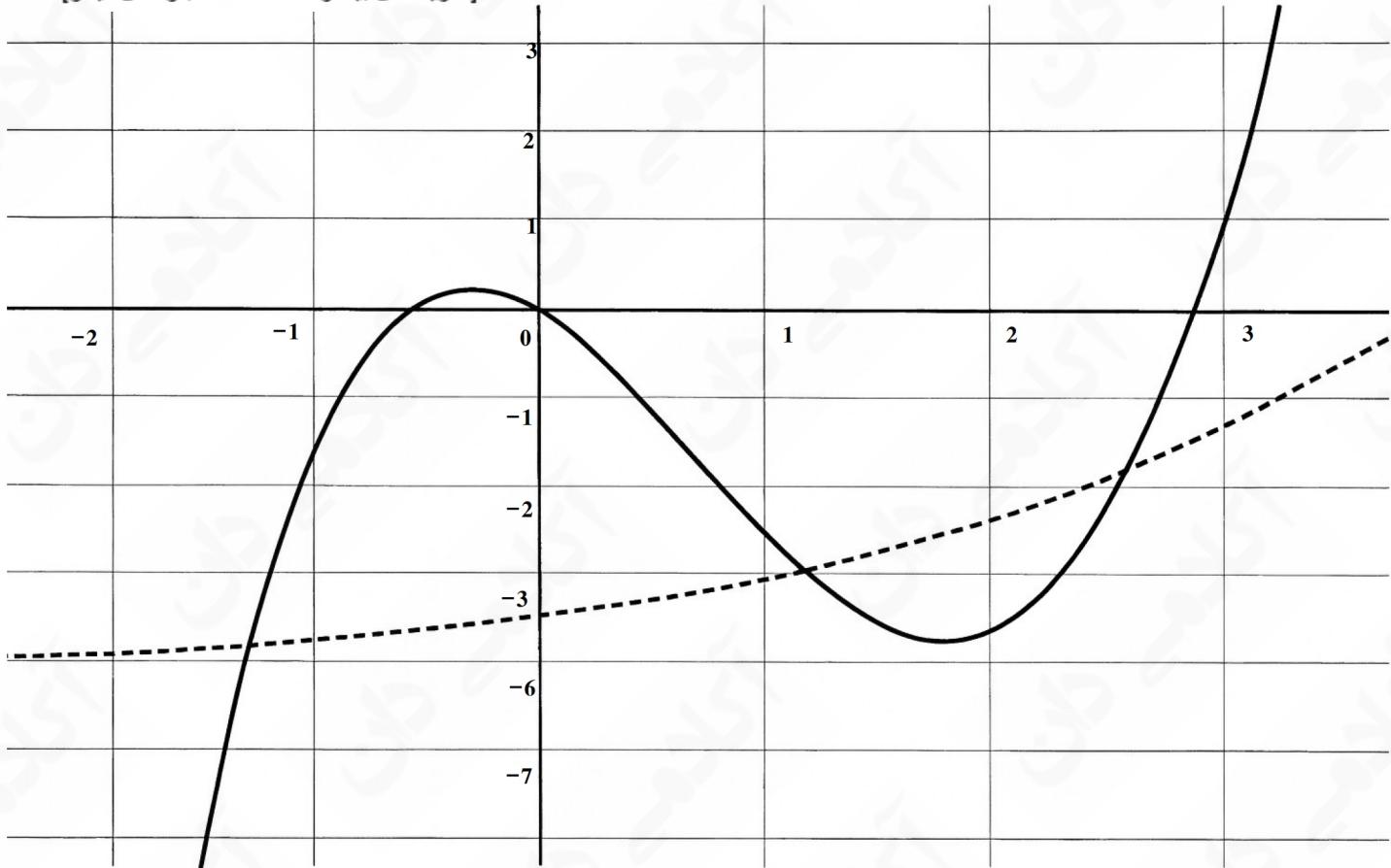
Question 13:

Roger has on his smartphone 206 different photos with his friend Rafael. He wants to print 4 of these photos as a present for Rafael's birthday. Which of the listed calculations gives the number of different sets of photos that Roger can choose to print?

A. $\frac{206^4}{4}$

B. $206 \cdot 205 \cdot 204 \cdot 203 \cdot 202$

C. $\frac{206 \cdot 205 \cdot 204 \cdot 203}{4}$

D. $\frac{206^4}{24}$

E. $\frac{206 \cdot 205 \cdot 204 \cdot 203}{24}$

Question 15:

All the listed expressions represent the 225% of x (for each value of the number x), except for one expression. Which one?

A. $\frac{8x+1}{4}$

B. $\frac{9}{4x}$

C. $2x + 0.25x$

D. $\frac{22.5x}{10}$

E. $2.25x$

Question (Martin TV series – page 15):

Martin is watching a TV series divided into 4 seasons. The first season consists of 10 episodes, while the other three seasons have 8 episodes each. Additionally, there are 4 special episodes of one hour each.

Martin wants to calculate the total duration of the series in minutes, including the special episodes. If he indicates with M the average duration, in minutes, of the episodes of the 4 seasons, which of the proposed expressions certainly gives the correct result?

A. $(10 + 3 \cdot 8)M + 4 \cdot 60$

B. $(10 + 3 \cdot 8)4M + 4$

C. $(10 + 3 \cdot 8 + 4)M$

D. $4 \cdot 8 \cdot M + 4 \cdot 60$

E. $(4 \cdot 10)M + 4$

Question (Trailers – page 16):

To promote a film, two different trailers are made. Initially, one is 23 seconds longer than the other. Later, a scene is removed from the longer trailer and added, leaving the scene perfectly identical, to the shorter one. In this way, the trailer that was initially shorter becomes 3 seconds longer than the other.

What is the duration of the scene that was moved from one trailer to the other?

A. 10 seconds

B. 20 seconds

C. 26 seconds

D. 13 seconds

E. It is not possible to determine with the provided information

Question 04 (Venn diagrams – page 17):

Consider the following groups of numbers:

· Multiples of 4

· Multiples of 8

· Divisors of 20

· Odd numbers

The figure shows five Venn diagrams, identified by numbers from 1 to 5. [با ون دیاگرام پنج چیدمان‌های مختلف گروه‌ها.]

Which of the diagrams accommodates the groups correctly?

A. 2

[گزینه‌های بیشتر: B. 1, C. 5, D. 3, E. 4 – بر اساس تصویر.]

Question (Medal table – pages 18 and 21):

Consider the following medal table from a tournament, showing the numbers of gold, silver, and bronze medals won by the four participating countries:

Country	Gold	Silver	Bronze
France	8	10	1
Germany	6	10	13
Italy	10	6	8
United States	10	7	5

Now consider two ranking systems:

Ranking A) The countries are ranked by the number of gold medals won; in the event of a tie, silver medals are considered, and if there is still a tie, bronze medals are counted;

Ranking B) The countries are ranked based on a score calculated by awarding 3 points

for each gold, 2 points for each silver, and 1 point for each bronze medal.

How would Italy be ranked in the two ranking systems, A and B?

A) Ranking A) First; Ranking B) Third

B) Ranking A) First; Ranking B) First

C) Ranking A) Second; Ranking B) Second

D) Ranking A) First; Ranking B) Second

E) Ranking A) Second; Ranking B) First

Question (Kate cyclist - page 19):

Kate is an amateur cyclist; in her training sessions, she likes to climb. The table shows her average pace depending on the average gradient.

Avg gradient	Avg pace
<7%	5 min/km
Between 7% and 9%	6 min/km
>9%	8 min/km

For instance, it takes her 5 minutes to climb 1 km with an average gradient of 6%. Which of the proposed climbs does Kate take the least time to complete?

A. 8-km climb, with each km at 8%

[.گزینه‌های بیشتر احتمالاً شامل صعودهای دیگر با گرادیان‌های متفاوت]

Question (Olivia magazines - page 20):

Olivia is arranging all the copies she owns of a magazine on the three shelves of her new bookcase. Initially, she puts the same number of copies on the first two shelves, and the remaining copies on the third shelf. At this point, she realizes there are 12 more copies on the third shelf, compared to the other two.

What can Olivia do if she wants to have the same number of magazine copies on each of the three shelves?

A. It is impossible to have the same number of copies on each shelf

B. Move 6 copies from the third shelf to each of the other two

C. Move 6 copies from the third to the first shelf

D. Move 3 copies from the third shelf to each of the other two

[گزینه E مثل چیزی احتمالاً move 4 to one.]

Question (Bicycle users - page 22):

Each year, from 2021 to 2024, a sample of people was asked whether they used a bicycle to travel from their home to work, and the data was collected in the following table:

Year	People in the sample	Bicycle users
2021	100 000	7 000
2022	500 000	34 000
2023	50 000	4 000
2024	10 000	650

In which years after 2021 was there a percentage decrease in bicycle users in the sample compared to the previous year?
A. Only in 2024
B. Only in 2022 and 2024
C. Only in 2023
D. Only in 2022, 2023, and 2024
[none. احتمالاً گزینه E]

Question 15 (Master's admission – page 23):

Name	Years taken to obtain a bachelor's degree	Final bachelor's grade	English certificate level
Maria	3	100	C2
Dario	6	101	B2
Giovanni	3	109	B1
Angela	6	106	B2

Which of these candidates meet the admission requirements for the master's degree?
A. Only Giovanni
B. Only Dario and Giovanni
C. Only Maria, Giovanni and Angela
D. Only Dario and Angela
E. Only Maria and Angela

بخش زیست‌شناسی (Biology)

Question 01:
Certain endocrine cells are specialised in the production and secretion of protein hormones. Which cell component is particularly abundant in these cells?
A. Cytoskeleton
B. Rough endoplasmic reticulum
C. Lysosomes

D. Membrane proteins

E. Smooth endoplasmic reticulum

Question 02:

Which one of the listed statements about the extracellular matrix is correct?

A. It is particularly abundant in adipose tissue

B. Its organizational properties determine the function of connective tissues

C. It is produced by bone marrow cells

D. Its organizational properties are usually the same within a given tissue or organ

E. It is mainly composed of globular proteins, lipoproteins and mucopolysaccharides

Question 03:

Which one of the gradients proposed controls respiratory gas exchange between blood and tissues?

A. The osmotic gradient

B. The gradient of pH

C. The gradient of temperature

D. The gradient of partial pressure

E. The gradient of ion concentration

Question 04:

Which organelle in animal cells shares functional similarities with vacuoles of plant cells?

A. Peroxisome

B. Golgi apparatus

C. Mitochondrion

D. Lysosome

E. Ribosome

Question 05:

Ecological pyramids graphically describe the trophic structure and function of a community. Which one of the listed statements about ecological pyramids is NOT correct?

A. The pyramid of biomass could be inverted if the consumer level is larger than the producer level

B. Pyramids of numbers and pyramids of biomass represent all the organisms of a community in a specific moment

C. The pyramid of energy estimates the amount of energy dispersed along the food chain

D. Pyramids of numbers and pyramids of biomass estimate the transfer rate of food mass through food chains

E. Examples of inverted pyramids of biomass are common in aquatic ecosystems

Question 06:

The "karyotype test" is commonly used to detect genetic abnormalities on heterochromatic DNA. Consider the following mutations:

1. point mutations

2. loss of a sexual chromosome

3. trisomies

4. large chromosome deletions

5. single nucleotide insertions

   Which ones could be diagnosed using the karyotype test?

   A. Only 1, 4 and 5

   B. Only 1 and 5

   C. Only 2 and 4

   D. Only 2 and 3

   E. Only 2, 3 and 4

Question 07:

Which human cells undergo crossing-over?

A. Lymphocyte B cells

B. Muscular cells

C. Neurons

D. Ependymal cells

E. Germ cells

Question 08:

Protein denaturation causes loss of biological activity due to:

A. unfolding from the native state

B. disruption of the primary structure

C. esterification of carboxyl groups

D. acetylation of functional groups

E. N-terminal modifications

Question 09:

Glucose is vital for both plant and animal life. Which one of these glucose characteristics is crucial for cell metabolism?

A. It is a universal substrate for ATP synthesis

B. It regulates energy consumption by hampering passive membrane transport

C. It regulates energy consumption by improving passive membrane transport

D. It is the universal substrate for $NADP^+$ production

E. It plays a key role in membrane signalling in all cells

Question 10:

During photosynthesis, what is the main process of the light-independent phase?

A. Lysis of water

B. Carbon fixation and reduction

C. Release of O_2

D. Release of CO_2

E. Production of ATP

بخش شیمی (Chemistry)

Question 01:

In the following chemistry pun, there is the chemical symbol of a non-toxic metalloid used in the production of microchips for electronic components: which metalloid is it?

"Chemistry is a P As Si O N" [با نمادهای P, As, Si, O, N]

A. O

B. P

C. Si

D. As

E. N

Question 02:

The initial mass of a candle is 100 g. What will be the mass of the candle after it has burned for 1 hour in air?

A. Lower than 100 g because Lavoisier law doesn't apply to combustion

B. Equal to 100 g according to the Lavoisier law

C. Lower than 100 g because products escape as gases

D. Higher than 100 g because O_2 mass is added as a reactant

E. Equal to 100 g since its burning process is a physical transformation

Question 03:

Which of the listed groups of metallic elements belongs to the d-block of the periodic table and can form ions with different oxidation number?

A. Alkali metals

B. Alkaline earth metals

C. Lanthanoids

D. Actinoids

E. Transition metals

Question 04:

According to the VSEPR theory, the molecular geometry of the ClO_3^- ion is:

A. linear

B. trigonal pyramidal

C. trigonal planar

D. tetrahedral

E. octahedral

Question 05:

Consider the following table that lists features of oxidation and reduction processes in their respective columns:

OXIDATION	REDUCTION
1) Gain of electrons	2) Loss of electrons
3) Occurs in reducing agents	4) Occurs in oxidizing agents
5) Oxidation number increases	6) Oxidation number decreases
7) Gain of oxygen, loss of hydrogen	8) Loss of oxygen, gain of hydrogen

Were any features swapped in the same row, and if so, which ones?

A. None

B. Yes, 5 and 6

C. Yes, 1 and 2

D. Yes, 7 and 8

E. Yes, 3 and 4

Question 06:

Which of the listed sets of quantum numbers corresponds to the highest energy level?

A. $n = 1, l = 0, m = 0$

B. $n = 2, l = 1, m = -1$

C. $n = 2, l = 0, m = 0$

D. $n = 3, l = 2, m = -1$

E. $n = 4, l = 0, m = 0$

Question 07:

According to the Bronsted-Lowry theory, which of the listed options defines an acid?

An acid is a substance that:

A. donates an electrons pair to a base

B. donates a proton (H^+) to a base

C. accepts a proton (H^+) from a base

D. accepts an electrons pair from a base

E. releases a proton (H^+) only in water

Question 08:

Which of the listed substances has a higher molar mass than $CaCO_3$?

A. K_2CO_3

B. Ca

C. CH₄

D. H₂CO₃

E. O₂

Question 09:

Which of the listed molecular formulas represents an alkyne that contains 4 carbon atoms and more than one triple bond?

A. C₄H₂

B. C₄H₆

C. C₄H₂

D. C₄H₁₀

E. C₄H₈

Question 10:

Calcium carbonate releases carbon dioxide upon heating, according to the following equation:

$$CaCO_3(s) \rightarrow CaO(s) + CO_2(g)$$

What does it mean in terms of enthalpy change (ΔH) and entropy change (ΔS)?

A. ΔH<0, ΔS>0

B. ΔH>0, ΔS<0

C. ΔH = ΔS

D. ΔH>0, ΔS>0

E. ΔH<0, ΔS<0

بخش فیزیک (Physics)

Question 01:

Two cars, A and B, are travelling along two concentric circular tracks at constant speed, with radii of 10 m and 15 m respectively. If they start the first lap at the same time and both complete 10 laps in the same time interval Δt, what is the tangential speed of B compared to that of A?

A. $v_B = \frac{2}{3}v_A$

B. $v_B = \frac{2}{3}\pi v_A$

C. $v_B = 2\pi v_A$

D. $v_B = \frac{9}{4}v_A$

E. $v_B = \frac{3}{2}v_A$

نمونه سوالات جدید هر ماه در CEnT-S.ir

Question 02:

Some workers use a frictionless ramp inclined at $\alpha = 30°$ to lift a stone block with a mass of $2 \cdot 10^4$ kg from the ground up to a height of 5 m. Each worker performs a work equal to $2 \cdot 10^4$ J. How many workers are involved? (Let the gravity acceleration $g = 10 \text{ m/s}^2$)

A. 1000

B. 500

C. 50000

D. 50

E. 5000

Question 03:

A metallic sphere A, completely immersed in water in a glass, is subjected to a buoyant force F_A. A second sphere B, with twice the mass of A and the same volume, is fully immersed in water inside a glass that is half the volume of the first glass. The buoyant force on sphere B is F_B. The ratio F_A/F_B is equal to:

A. 1/2

B. 4

C. 1/4

D. 2

E. 1

Question 04:

Although it may seem otherwise in most of our daily experiences, the speed of light is not infinite. Below there are three experimental observations:

1. The time elapsed between the flash of a lightning and the sound of the associated thunder

2. The time elapsed between flipping a switch and the associated light bulb turning on

3. The time elapsed between the emission of a radio signal on Earth and the moment the signal arrives on the Moon

   Which of these provide experimental proof that the speed of light is finite?

   A. All of them

   B. Only 3

   C. Only 2 and 3

   D. Only 1 and 2

   E. Only 1 and 3

Question 05:

Let F be a force, m a mass, and t a time interval. Consider the expressions:

1. $\dfrac{F^2}{m}$

2. $\dfrac{F}{t^2 m}$

3. $\dfrac{F^2}{tm}$

   Which of the listed expressions have the dimension of a distance?

   A. None of them

   B. Only number 2

C. Only number 1 and number 3

D. Only number 1

E. All of them

نمونه سوالات جدید هر ماه در CEnT-S.ir

شماره سوال	بخش	پاسخ صحیح	توضیح مختصر
01	Math	D (Two)	4160 و 822 تقسیم‌پذیر بر 6 (جمع ارقام و زوج بودن).
02	Math	D (7)	$\log_2 200 \approx 7.64$, بزرگ‌ترین طبیعی کوچکتر 7.
03	Math	B (Only 1 and 3)	محیط شکل 10 واحد؛ 1 و 4: 8 واحد؛ 2 و 3: 10 واحد. اشتباه اولیه: 1 و 3 محیط 8 ندارند، درست B.
04	Math	C (e^x)	تنها تابع سخت افزاینده در دامنه.
05	Math	B (-10)	با m=-1: 2*(-3) -

برای جدول, I will use previous calculations, but correct for question 05 as B, assuming original DOCUMENT was correct, and tool/image OCR error for "m" vs "πl".

جدول پاسخنامه

شماره سوال	پاسخ صحیح	توضیح مختصر
Math 01	D (Two)	4160, 822.
Math 02	D (7)	floor(log2(200))= 7.
Math 03	B	محیط 10, 2 و 3.
Math 04	C	e^x strictly increasing.
Math 05	B (-10)	با فرض πl = -1,
Math 06	D (2)	جایگذاری 1- y=1, from second eq x =2 -k + k =2, then first 3*2 + (k-1)*1 =0, 6 +k -1 =0, k = -5, but m =x =2 fixed.

توضیح مختصر	پاسخ صحیح	شماره سوال
ناحیه intersection دایره و نیم‌صفحه، مساحت کمتر از 2π.	E	Math 07
مثلث کوچک CDE با نسبت (x - 1).	گزینه دیگر (احتمالاً B) $\frac{\sqrt{3}}{4}(x - 1)^2$	Math 08
g(2) =f(4), f^{-1}(f(4)) =4.	A (4)	Math 09
A از معادله اصلی نمی‌آید.	A	Math 10
a in (0,1), 2a <2 <3.	A	Math 11
از تصویر, g > f in (-1,1).	A	Math 12
C(206,4) = P(206,4)/24.	E	Math 13
x =2.25x, B =9/(4x) not 225%.	B	Math 15
مجموع اپیزودها 10+24=34 * 60*4+ M.	A	Martin TV
let short S, long S+23. remove d from long: S+23 -d, add to short: S+d, then S+d = (S+23 -d) +3, 2d =26, d=13.	D (13)	Trailers
از تصویر, diagram 2 correct (multiples 4 includes 8, divisors 20 overlaps, odd separate).	A (2)	Venn 04
A: Italy and US 10 gold, US 7>6 silver, so US first, Italy second. B: Italy 10*3+6*2+8*1=30+12+8=50, US 30+14+5=49, France 24+20+1=45, Germany 18+20+13=51, so Germany first, Italy second. wait, E Second A, First B? wait, B scores: Italy 50, Germany 51, so Italy second. wait, no: Ranking B Italy second? wait, options E is Second A, First B, but Italy second in A, second in B? wait, calculate: Germany 6*3=18, 10*2=20, 13*1=13, total 51. Italy 50, US 30+14+5=49, France 24+20+1=45. so B: Germany 1, Italy 2. A: gold 10 Italy and US, silver Italy 6 < US 7, so US 1, Italy 2. so C Second A, Second B.	E	Medal
نیاز به گزینه‌ها, اما A 8km at		Kate

Mathematics and Logic

1. D
2. D
3. B
4. C
5. B
6. D
7. E
8. B
9. A
10. A
11. A
12. A
13. E
14. B

    Martin TV series: A

    Trailers: D

    Venn diagrams: A

    Medal table: E

    Kate cyclist: A

    Olivia magazines: B

    Bicycle users: D

    Master's admission: E

Biology

1. B

2. B

3. D

4. D

5. D

6. E

7. E

8. A

9. A

10. B

Chemistry

1. C

2. C

3. E

4. B

5. C

6. E

7. B

8. A

9. A

10. D

Physics

1. E

2. D

3. E

4. B

5. A