PROVE UFFICIALI DEGLI ANNI PASSATI

TEST ARCHITETTURA

2015

IN INGLESE

PROVA UFFICIALE MUR

Il testo originale della prova

Ministero dell'Istruzione, dell'Università e della Ricerca

PROVA DI AMMISSIONE AI CORSI DI LAUREA E DI LAUREA MAGISTRALE A CICLO UNICO DIRETTAMENTE FINALIZZATI ALLA FORMAZIONE DI ARCHITETTO (IN LINGUA INGLESE)

Anno Accademico 2015/2016

Test di Ragionamento Logico

1. **The death rate in car accidents among young drivers in the first year after passing their test is far higher than that of experienced drivers. Analysis of those caught on cameras exceeding the speed limit shows that these new drivers generally drive faster than any other category of motorist. The government should pass a law placing a limiter on cars belonging to new drivers so that they cannot exceed 80 km/h for the first two years after their test. This would mean that there would be a dramatic reduction in the number of deaths of young drivers.**
   Which one of the following is an underlying assumption of the argument above?
   A) A large percentage of deaths of young, new drivers is caused by speeding
   B) The reaction times of younger drivers are quicker than those of older drivers
   C) Older drivers have developed more driving skills than younger drivers
   D) The police target young road users when trying to catch speeding motorists
   E) Younger drivers tend to drive cars with more powerful engines

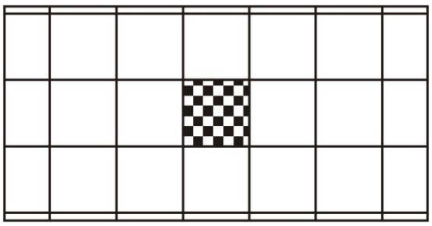
2. **The price of oil affects food prices. Food prices have risen steeply recently so the price of oil must have increased dramatically.**
   Which one of the following most closely parallels the reasoning used in the above argument?
   A) Lack of exercise causes people to become unfit. A growing number of people today are unfit so exercise must be less common than it was
   B) Wearing a crash helmet when riding a bike is essential to avoid a head injury. John never wears a helmet when riding his bike so he will not avoid a head injury
   C) Being good at maths is necessary for a job in accountancy. Mary is good at maths, so she must be an accountant
   D) A high level of intelligence is needed to be accepted as a member of MENSA, the club for brainy people. Peter is very clever, so he must be a member of MENSA
   E) That elderly gentleman needs to use a wheelchair so he must not be able to walk. If he did not need to use a wheelchair, he would be able to walk

3. **The Italian government's demand that the *Mona Lisa* (currently in the Louvre) be returned to Italy could have unfortunate consequences for museum lending. In 2002, 18 directors of the world's leading museums declared that in return for holding on to their treasures they had a duty to make them available to the world. This has led to a new era of cooperation among museums over training, restoration and loans. Thousands of works are now lent every year between museums on every continent. For example, the Louvre will lend the statue of Ramses II to Egypt in the near future. Italy should give up its claim to the *Mona Lisa.* The Italian insistence on the permanent return of the *Mona Lisa* could lead to a moratorium on museum loans.**

Which one of the following best expresses the main conclusion of the above argument?

A) Italy should give up its claim to the *Mona Lisa*
B) The Italian demand for the return of the *Mona Lisa* will have no effect on museum lending
C) The *Mona Lisa* belongs to the Louvre
D) The Louvre should not lend the statue of Ramses II to Egypt.
E) Museum cooperation should be encouraged

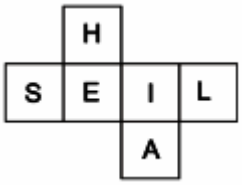
4. **I am using 6 cm square tiles to cover a rectangular space 20 cm by 38 cm. I want there to be a single central tile, different from the others, placed exactly in the middle of the rectangle like this:**



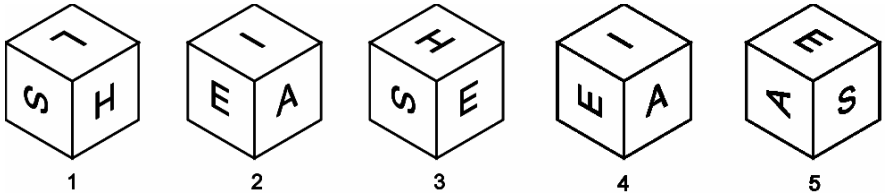
I can cut tiles perfectly, with no wastage, into the required number of pieces so that the edge of a complete tile looks no different from one of my cut tiles. If I use the smallest possible number of tiles, how many will be cut up to make the part-tiles around the edge?

A) 7
B) 3
C) 9
D) 11
E) 15

5. **Here is a net of a cube:**



The following diagrams show five suggested views of the cube once it has been assembled.



Which two of these are possible views?

A) 1 and 4
B) 1 and 2
C) 2 and 3
D) 3 and 5
E) 4 and 5

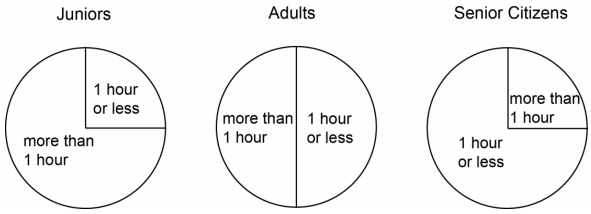
6. A class of children are sorting the letters of the alphabet. Letters are equivalent if they have the same number of closed loops and branches. Corners do not matter. So, for example the letters A and R in the alphabet shown below are equivalent as they both consist of a closed loop with two branches sticking out. Similarly, C, J, M, S, V and Z are all equivalent because they all consist of a single line with no branches or loops.

ABCDEFGHIJKLMNOPQRSTUVWXYZ

Which one of the following letters is equivalent to Y using the rules given above?

A) E
B) K
C) H
D) N
E) Q

7. Last Saturday 40 juniors, 100 adults and 60 senior citizens went to the Swimming Pool. A survey was made of how long each of these customers stayed in the water, with the following results.

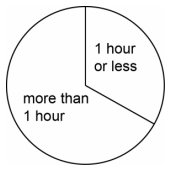


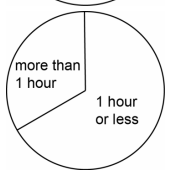
Which one of the following pie charts illustrates the overall result for all the customers together?

A)


B)


C)


D)


E)


8. A teacher is going to award a prize to her most deserving pupil in the current school year. She has narrowed it down to five students and must make her final judgements based on the following criteria:
She won't give the prize to anyone who has been late to her lesson more than twice and she won't give it to anyone who has failed to complete more than two pieces of homework by the deadline set.
In addition, the prize will be awarded to the student with the fewest non-A grade pieces of work.
The finalists are as follows:

Pupil	*Class*	*No. of lessons missed*	*No. of times late for lesson*	*No. of homeworks set*	*Homeworks completed by deadline*	*Homeworks with grade A*
Andrea	IC	4	1	60	56	58
Carla	IIB	2	2	56	56	53
Enrico	IA	6	2	59	56	58
Greta	IIID	6	3	58	57	56
Ilaria	IVB	10	2	54	53	52

Which student will be awarded the prize?

A) Ilaria
B) Andrea
C) Carla
D) Enrico
E) Greta

9. Which is the only pair of words that logically completes the following verbal equation?
x : alpha = terminal : y

A) x = initial; y = omega
B) x = principal; y = delta
C) x = introductory; y = gamma
D) x = preliminary; y = conclusive
E) x = inductive; y = final

10. Identify the word whose etymology does NOT follow the same 'logic' as the other words:

A) Nemesis
B) Biomimesis
C) Mimetic
D) Mimesis
E) Pantomime

Passage I

The Message of Structure

The visual perception of natural structures has been essential in extending our intuitive understanding of man-made structures. The branches of a tree (Fig. 1.1), acted upon by their own weight and snow or wind, suggest the shape and behaviour of cantilevers, with their larger dimensions at the root and their slender dimensions at the tip. The shape of a tree trunk introduces us to the requirements of gravity loads in tall buildings, accumulating from top to bottom. Because of these primordial experiences, we feel an instinctive puzzlement at the sight of Cretan columns (Fig. 1.2), larger at the top than at the bottom, but we accept as natural the shape of a Greek Doric column (Fig. 1.2). Similarly, we would consider a cantilever beam, with a larger section at its tip than at its root, "ugly" (Fig. 1.3), since it is an insult to the kind of structural behaviour of which we might not be conscious, but to which nature has exposed us. Similar feelings of unease occur whenever we are confronted with, say, a large mass in the shape of an inverted pyramid. Mountains, due to the action of gravity, are shaped as right-side-up pyramids. The Egyptian pyramids have a shape, geometrically idealized, but basically identical to that of all the mountains we have ever seen. But a modern building in the shape of an inverted pyramid (Fig. 1.4) does not "say" to the layman how and why it stands up: it tells him that some "trick" has been used to achieve an "unnatural" result. This unnaturalness elicits in us a surprising sense of unease rather than the feeling of balance related to "honest" structural behaviour. Natural arches have taught us that when stone is used to span a gap, a downward curvature is needed to achieve the goal. We need only refer to natural caves, where curved inner surfaces give us a feeling for arch action in space. Sea shells (Fig. 1.5) are a symbol of protection, but they also have a strong aesthetic content whenever they are ribbed. It would seem, therefore, that to the layman the message of structure comes from a series of primordial intuitions and that the accumulation of these

intuitions results in a set of aesthetic responses. This is why the layman considers a correctly designed cantilever beam as "beautiful" and a cantilever with incorrect structural dimensions as "ugly".



Fig. 1.1 THE STRUCTURE OF A TREE



Fig. 1.2. CRETAN COLUMN/DORIC COLUMN

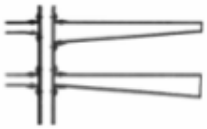


Fig. 1.3 CORRECT AND INCORRECT CANTILEVERS



Fig. 1.4 INVERTED PYRAMID BUILDING



Fig. 1.5 RIBBED SEA SHELL

11. From the information in the *passage I*, what has developed our intuitive knowledge of artificial structures?

A) The visual experience of natural structures
B) Our awareness of the difference between natural structures and artificial structures
C) The absence of the boundary between form and function
D) The missing correspondence between form and function
E) The exclusive empirical experience of artificial structures

12. According to the author of the *passage I*, why do we accept as natural the profile of the Doric column?

A) Because the shaft of the column narrows upwards
B) Because the base is missing and the shaft of the column rests directly on the floor
C) Because the centre of gravity is towards the top of the column
D) Because the column is wider at the top than at the base
E) Because the capital is not like that of a Cretan column

13. From the information in the *passage I*, why are the cantilevers bigger at the base than at the top?

A) To better withstand the loads of their weight
B) In order to be aesthetically pleasing
C) So that the wider section at its tip can withstand heavy loads
D) Because it is a type of unnatural structural behaviour and therefore counterintuitive
E) In order to emulate Cretan columns

14. According to the author of the *passage I*, why do we have a sense of unease in front of a modern building in the shape of an inverted pyramid?

A) Because it is not an exact reproduction of the corresponding natural structures
B) Because it generates a feeling of balance linked to an "honest" structural behaviour
C) Because it has a geometrically idealised shape similar to trunks and mountains
D) Because it follows the laws of gravity
E) Because it has a geometric shape similar to the pyramids

15. This *passage I* argues that:

A) our understanding of man-made structures is strongly based on our primitive intuitions
B) the intuition of the forms of nature does not encourage a good reading of architecture
C) visual perception is not useful in understanding architecture
D) aesthetic reactions are independent of primitive intuitions
E) the 'naturalness' evokes in us a sense of surprised unease

Passage II

Space – Protagonist of Architecture

The feature distinguishing architecture from all other forms of art consists in its working with a three-dimensional vocabulary which includes man. Painting functions in two dimensions, even if it can suggest three or four. Sculpture works in three dimensions, but man remains apart, looking on from the outside. Architecture, however, is like a great hollowed-out sculpture which man enters and apprehends by moving about within it. […]

The discovery of perspective or graphic representation in three dimensions – height, width, depth – led Renaissance artists of the fifteenth century to believe they had finally mastered the dimensions of architecture and the means of reproducing them. […] But [in the last decade of the nineteenth century], the mind of a man discovered that a fourth dimension existed in addition to the three dimensions of perspective. This was the Cubist revolution in the concept of space. […] The Paris painter of 1912 reasoned more or less as follows: I see and represent an object, for example a box or a table. I see it from one point of view. But if I hold the box in my hands and turn it, or if I walk around the table, my point of view changes, and to represent the object from each new view-point I must draw a new perspective of it. The reality of the object, therefore, is not exhausted by its representation in the three dimensions from one perspective. To capture it completely, I must draw an infinite number of perspectives from the infinite points of view possible. This successive displacement in time of the angle of vision adds a new dimension to the three dimensions of tradition. Thus time was baptized the "fourth dimension". […]

The concept of the fourth dimension seemed to end, once and for all, the search for the dimensions of architecture. […] No work of architecture can be experienced and understood without the fourth dimension, without the time needed for our walk of discovery within it. […] However, a dimension common to all the arts obviously cannot be peculiar to any one of them, and therefore architectural space cannot be thought of entirely in terms of four dimensions. This new factor of time has, in fact, a meaning in architecture which is antithetical to its meaning in painting. In painting, the fourth dimension is a quality inherent in the representation of an object, an element of its reality which a painter may choose to project on a flat surface without requiring physical participation on the part of the observer. The same thing is true of sculpture: in sculpture the "movement" of a form, for example by Boccioni, is a quality inherent in the statue we are looking at, which we must relive visually and psychologically. But in architecture we are dealing with a concrete phenomenon which is entirely different: here, man moving about within the building, studying it from successive points of views, himself creates, so to speak, the fourth dimension, giving the space an integrated reality. […]

To be more precise, the fourth dimension is sufficient to define the architectural volume, that is, the box formed by the walls which enclose space. But the space itself – the essence of architecture – transcends the limits of the four dimensions.

How many dimensions, then, does space, this architectural "void", have? Five, ten, an infinite number perhaps. For our purpose it is enough to establish that architectural space cannot be defined in terms of the dimensions of painting and sculpture. The phenomenon of space becomes concrete reality only in architecture and therefore constitutes its specific character.

16. From the information in the *passage II*, what made the artists of the 15th century believe that they mastered the dimensions of architecture?

A) The discovery of perspective
B) The collaboration between architects and painters
C) The discovery of the fourth dimension
D) The emergence of new architectural styles
E) The renewed interest in the Arts and Humanities typical of that time

17. From the information in the *passage II*, the Cubist revolution in the concept of space introduced:

A) time, the 'fourth dimension'
B) the representation of an object in its three dimensions (height, width and depth)
C) the representation of everyday objects such as boxes and tables
D) the use of perspective in painting and sculpture
E) a three-dimensional vocabulary which includes man

18. According to the author of the *passage II*, the physical participation on the part of the observer is essential:
- A) only in architecture
- B) only in sculpture
- C) only in painting
- D) in sculpture and painting
- E) in sculpture and architecture

19. From the information in the *passage II*, the fourth dimension in architecture is sufficient to define:
- A) the architectural volume which encloses space
- B) the representational quality of an object
- C) the movement of a form which we must relive visually and psychologically
- D) a technique which allows the representation of perspective
- E) the complete reality of an object

20. According to the author of the *passage II*, which one of the following is the specific character, that is the essence, of architecture?
- A) Space
- B) Time
- C) The fourth dimension
- D) Perspective
- E) The coexistence of the four dimensions

Test di Cultura Generale

21. The term 'protectionism' indicates:
- A) an economic policy which contrasts with free trade
- B) an enhancement of border checks for people travelling among countries participating in the Schengen Area
- C) a policy for the development of police force within a country
- D) an increase of the military forces engaged at the borders
- E) the prohibition of manufacturing, storing, transporting and selling alcohol

22. Which of the following pairs is NOT correct?
- A) Carlo Alberto dalla Chiesa – Magistrate
- B) Giovanni Falcone – Magistrate
- C) Aldo Moro – Politician
- D) Piersanti Mattarella – Politician
- E) Luigi Calabresi – Police Officer

23. Which of the following couples from Greco-Roman mythology is the subject of the sculpture by Gian Lorenzo Bernini (shown below)?



A) Apollo and Daphne
B) Perseus and Andromeda
C) Cupid and Psyche
D) Pluto and Proserpina
E) Orpheus and Eurydice

24. The painting *The Song of Love* shown below is a work by:



A) Giorgio de Chirico
B) René Magritte
C) Marc Chagall
D) Carlo Carrà
E) Salvador Dalí

25. The 'Battle for Grain' was:

A) a fascist campaign aimed at making Italy less dependant on imports
B) a popular revolt of German peasants led by Thomas Müntzer
C) a popular insurrection in Paris that led to the storming of the Bastille
D) the climax of the revolt of the Cossacks against the Russian Army
E) the war between Venice and the Ottoman Empire for the control of the Mediterranean Sea

26. Who is depicted in the painting shown below?



A) Jean-Paul Marat
B) Jean-Jacques Rousseau
C) Cesare Beccaria
D) Voltaire
E) Maximilien Robespierre

27. Which of the following events gave Hitler the pretext to initiate a repressive campaign against the communists in 1933?

A) The Reichstag fire
B) The Night of the Long Knives
C) The Nazi book burning in Berlin
D) The failed annexation of Austria into Nazi Germany
E) The rise to power of Stalin in Russia

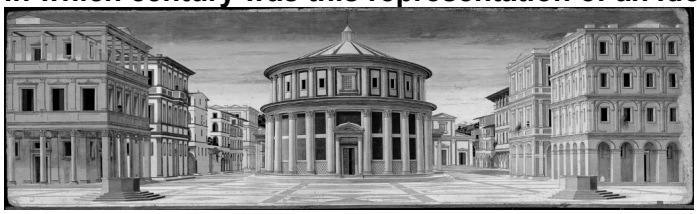
28. Which of the following is one of the peace treaties that officially ended the First World War (signed on 28th June 1919)?

A) Treaty of Versailles
B) Peace of Augsburg
C) Peace of Westphalia
D) Treaty of Vienna
E) Peace of Cateau-Cambrésis

29. Which one of the following artists does NOT belong to the Art Nouveau movement?

A) Paul Cézanne
B) Victor Horta
C) Gustav Klimt
D) Henry van de Velde
E) Otto Wagner

30. In which century was this representation of an *Ideal City* painted?



A) 15th
B) 16th
C) 18th
D) 19th
E) 20th

31. To which artistic movement does the painting shown below belong?



A) Impressionism
B) Pointillism
C) Symbolism
D) Romanticism
E) Realism

32. Which one of the following terms does NOT correspond to a type of vault?

A) Truss vault
B) Schifo vault
C) Rib vault
D) Barrel vault
E) Pavilion vault

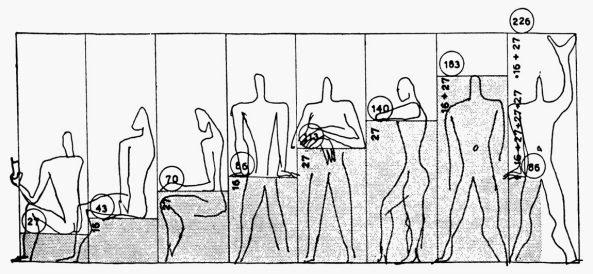
33. What is the correct chronological order of the buildings shown below?

a.  **b.**  **c.** 

d.  **e.** 

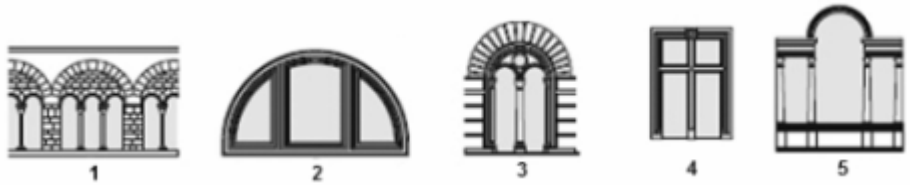
A) d - a - c - b - e
B) c - d - e - a - b
C) a - b - c - d - e
D) d - b - a - c - e
E) a - d - b - c - e

34. Who invented the *Modulor*, a scale of proportions based on measurements of the human body illustrated below?



A) Le Corbusier
B) Ludwig Mies van der Rohe
C) Alvar Aalto
D) Frank Lloyd Wright
E) Frank Gehry

35. Which one of the following pictures shows a three mullioned window?



A) 1
B) 2
C) 3
D) 4
E) 5

36. The *Veiled Christ* is a marble sculpture by:



A) Giuseppe Sanmartino
B) Gian Lorenzo Bernini
C) Giovanni da Nola
D) Michelangelo Buonarroti
E) Antonio Canova

37. To which artistic movement does this building belong?



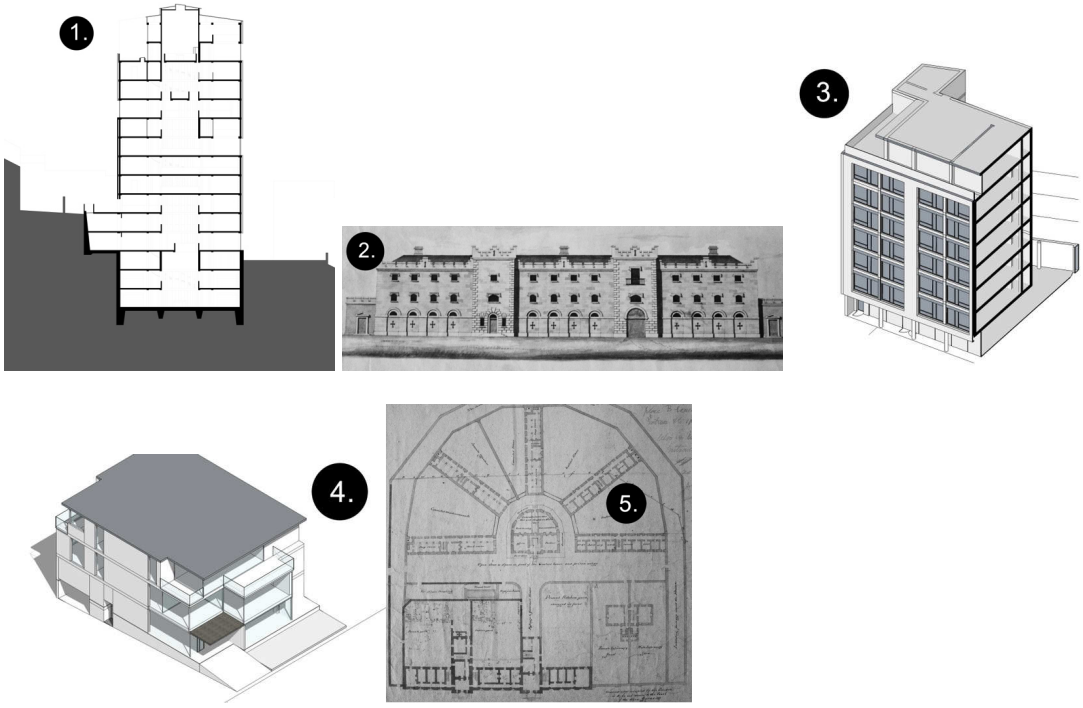
A) De Stijl
B) Cubism
C) Dadaism
D) Pop Art
E) Surrealism

38. Which one of the following is NOT commonly found in classical Greek architecture?

A) Vault
B) Column
C) Tympanum
D) Moulding
E) Capital

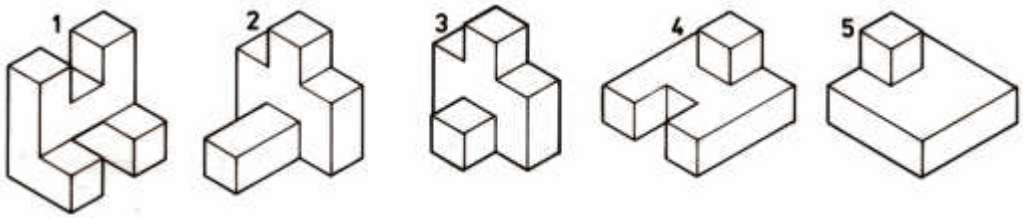
Test di Disegno e Rappresentazione

39. Classify each of the drawings below, according to the correct architectural terminology.



A) 1– Section, 2– Elevation, 3– Sectional Axonometric, 4– Isometric, 5– Plan
B) 1– Elevation, 2– Plan, 3– Section, 4– Isometric, 5– Sectional Axonometric
C) 1– Plan, 2– Section, 3– Isometric, 4– Sectional Axonometric, 5– Elevation
D) 1– Section, 2– Sectional Axonometric, 3– Elevation, 4– Isometric, 5– Plan
E) 1– Sectional Axonometric, 2– Elevation, 3– Section, 4– Plan, 5– Isometric

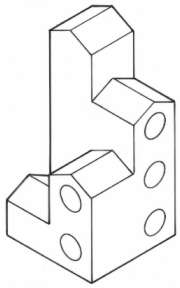
40. The five blocks shown below are parts of a construction toy.
By turning and orientating, some of the blocks can be fitted together.



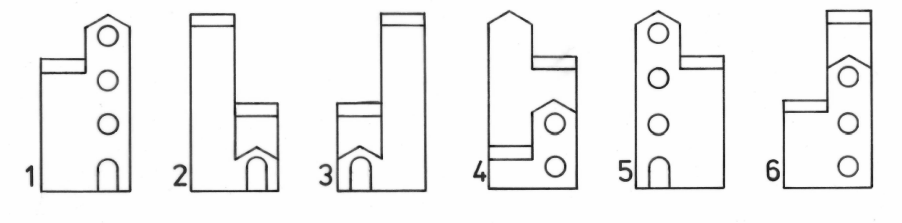
Which three of the five blocks could fit together to make a perfect cube?

A) 1, 2 and 4
B) 3, 4 and 5
C) 2, 3 and 5
D) 1, 2 and 5
E) 1, 3 and 4

41. A pictorial view of a model house is shown below.

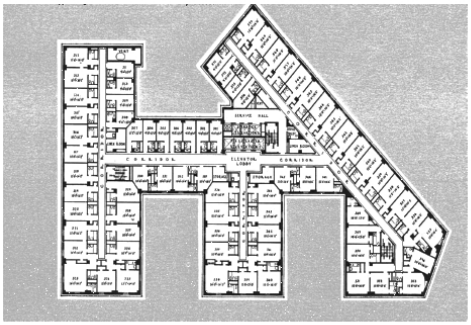


Which two of the drawings below CAN NOT be elevations of the model?

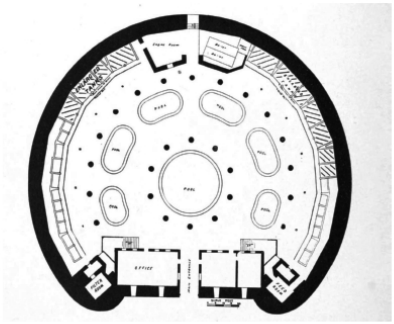


A) 3 and 5
B) 4 and 5
C) 1 and 2
D) 4 and 6
E) 2 and 6

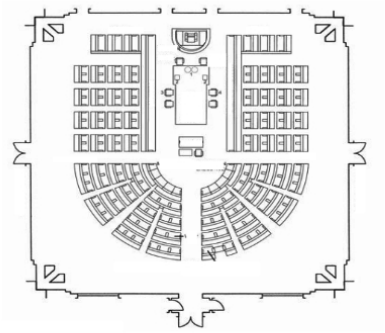
42. The plans of four buildings are shown below.



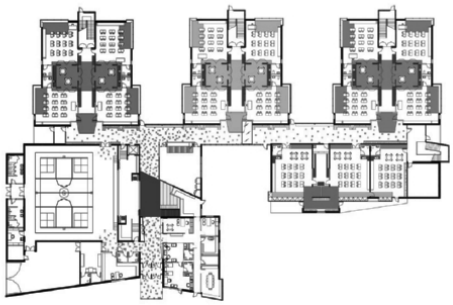
1



2



3

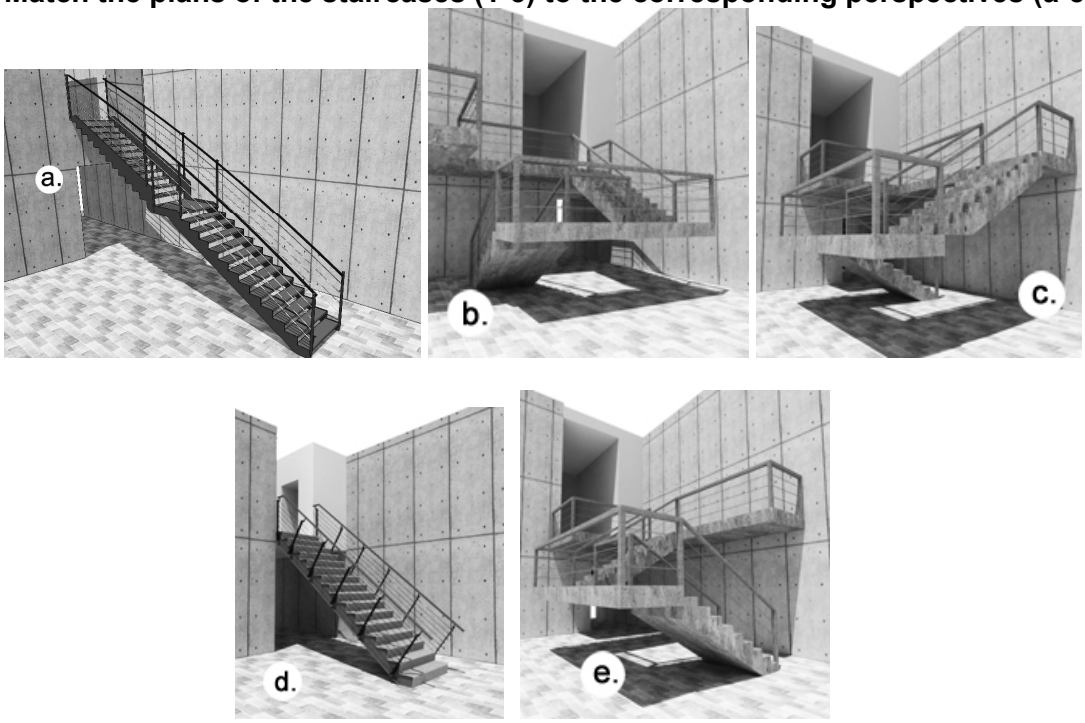


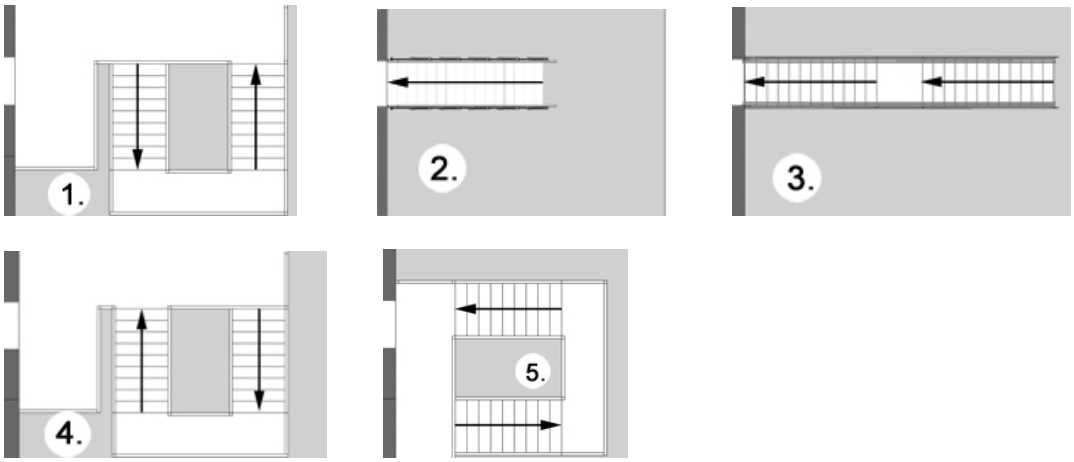
4

Which one of the following correctly identifies each building type?

A) 1 – hotel; 2 – aquarium; 3 – assembly chamber; 4 – school
B) 1 – hotel; 2 – assembly chamber; 3 – aquarium; 4 – school
C) 1 – school; 2 – aquarium; 3 – assembly chamber; 4 – hotel
D) 1 – school; 2 – assembly chamber; 3 – aquarium; 4 – hotel
E) 1 – parliament chamber; 2 – aquarium; 3 – school; 4 – hotel

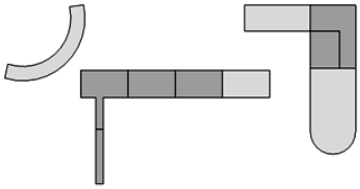
43. Match the plans of the staircases (1-5) to the corresponding perspectives (a-e).



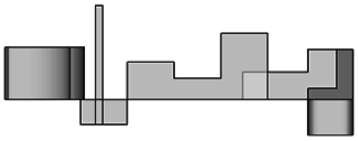


A) 1-c, 2-d, 3-a, 4-e, 5-b
B) 1-c, 2-a, 3-d, 4-b, 5-e
C) 1-e, 2-d, 3-a, 4-c, 5-b
D) 1-e, 2-a, 3-d, 4-b, 5-c
E) 1-e, 2-d, 3-a, 4-b, 5-c

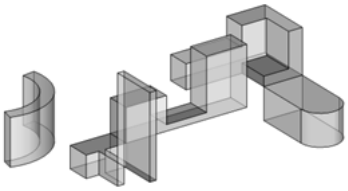
44. The plan and front elevations below show a composition of perspex blocks. Which one of the perspective views corresponds to the assembly of the blocks?



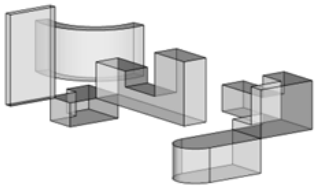
Plan elevation



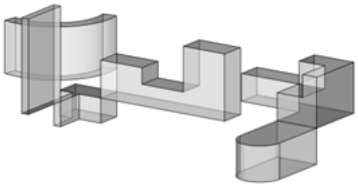
Front elevation



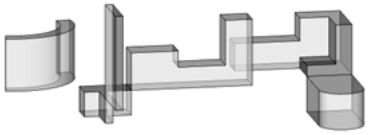
1



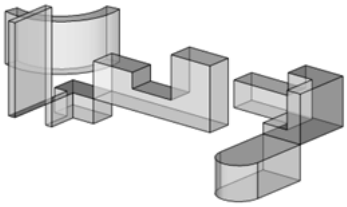
2



3



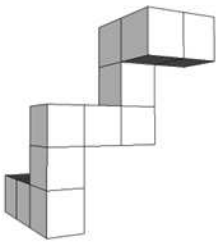
4



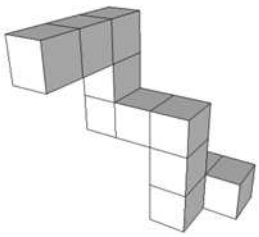
5

A) 5
B) 1
C) 2
D) 3
E) 4

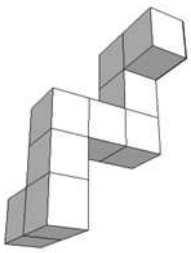
45. Which two of the following forms are NOT identical to the other four?



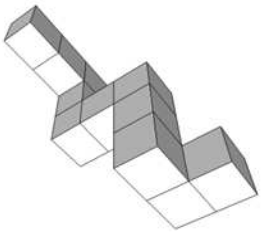
1



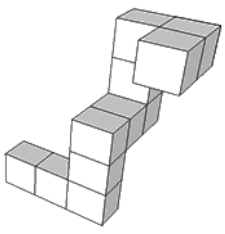
2



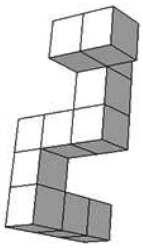
3



4



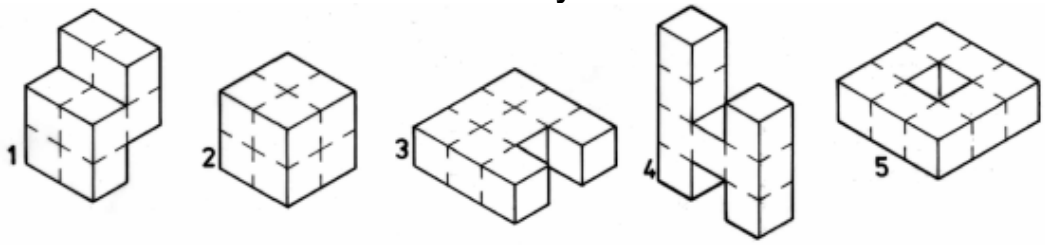
5



6

A) 3 and 5
B) 4 and 6
C) 1 and 3
D) 5 and 6
E) 2 and 4

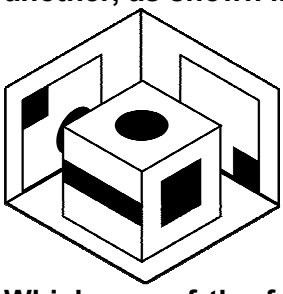
46. All five blocks shown below have exactly the same volume.



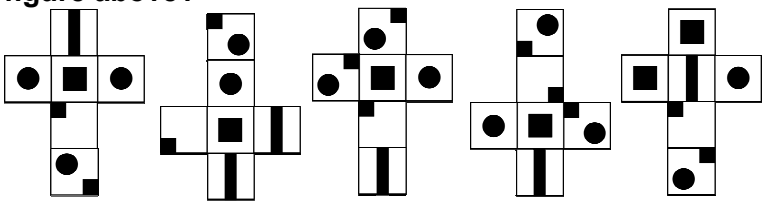
Which one of the following sequences correctly places the blocks in order of ascending surface area (from smallest to largest)?

A) 2, 1, 3, 5, 4
B) 2, 1, 3, 4, 5
C) 1, 2, 3, 5, 4
D) 3, 1, 2, 4, 5
E) 3, 1, 2, 5, 4

47. A cube is placed in front of two mirrors which are positioned perpendicularly to one another, as shown in the figure below.

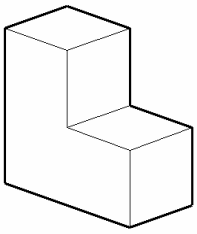


Which one of the following cards, when folded, could produce a cube as shown in the figure above?

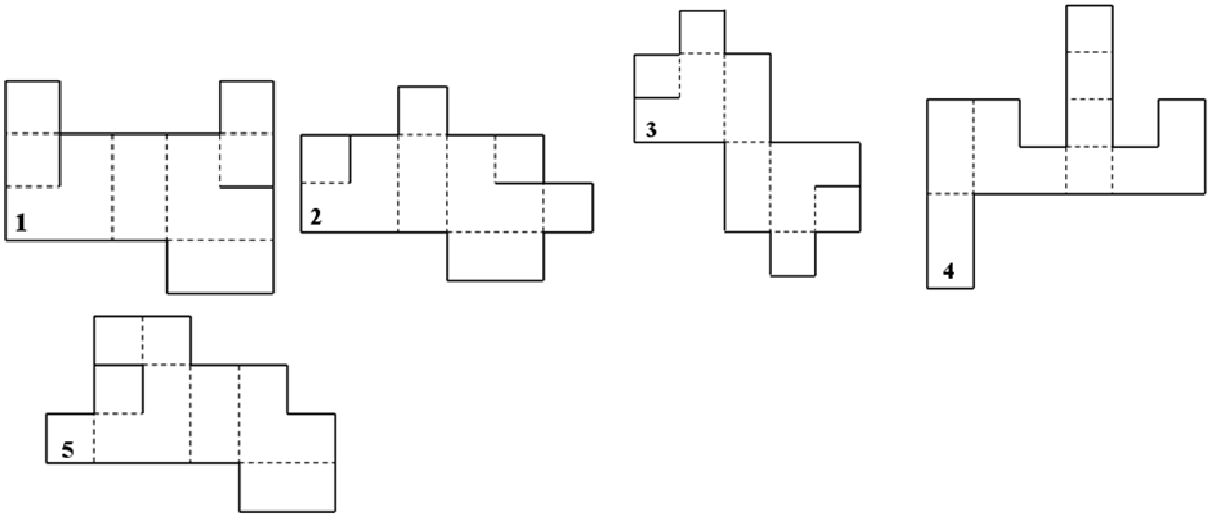


A) 1
B) 2
C) 3
D) 4
E) 5

48. Analyze the solid figure.



Considering the solid lines within the perimeter as cuts and the dashed lines as folds, which of the following developments does NOT match the solid figure?



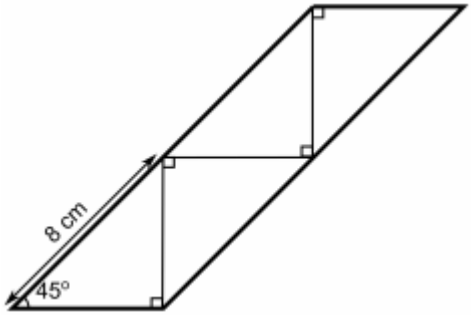
A) 1
B) 2
C) 3
D) 4
E) 5

Test di Fisica e Matematica

49. Which one of the following has the same value as $\frac{\text{sen } 20°}{\text{sen}70°}$?

A) $\tan 20^{\circ}$
B) $\text{sen}\left(\frac{2}{7}^{\circ}\right)$
C) $\cos 20^{\circ}$
D) $\frac{2}{7}$
E) $\tan 70^{\circ}$

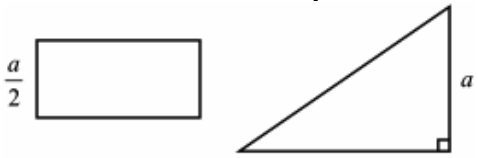
50. A parallelogram is made up of 4 congruent right-angled triangles as shown below. The length of the hypotenuse of each triangle is 8 cm.



Calculate the area of the parallelogram.

A) 64 cm^2
B) 32 cm^2
C) 16 cm^2
D) 128 cm^2
E) 256 cm^2

51. A child's toy consists of a number of shapes which must be placed into the matching holes. Two of the pieces are a rectangle and a right-angled triangle.
- The rectangle is three times as long as it is wide.
- The sides of the triangle are *a*, *b*, *c*, in order of increasing length.
- Side *a* of the triangle is twice the width of the rectangle.
- The areas of the two pieces are equal.



(not to scale)

What is the ratio *a* : *b*?

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

52. Solve the inequality: $(2x+1)^2 < 9$

A) $-2 < x < 1$
B) $-1 < x < 2$
C) $-\frac{1}{2} < x < 1$
D) $x < -2$ o $x > 1$
E) $x < 1$

53. A straight line has the equation $2x + y - 3 = 0$. This line intersects the x-axis at the point P and the y-axis at the point Q.
What is the length of the line segment PQ?

A) $\frac{3\sqrt{5}}{2}$

B) $\sqrt{\frac{21}{2}}$

C) $\frac{9}{2}$

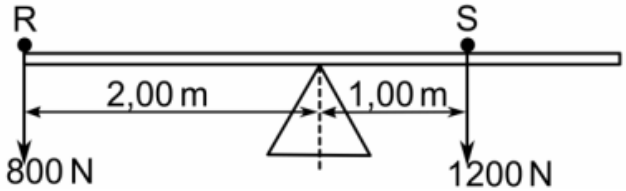
D) $\frac{45}{4}$

E) $\frac{3\sqrt{3}}{2}$

54. Which quantity has the units of kg m^2 s^{-3} in the International System of Units?

A) Power
B) Momentum
C) Energy
D) Force
E) Pressure

55. Two children R and S are sitting on a see-saw in the positions shown in the diagram. The see-saw is 4.00 m long, uniform and is pivoted at its centre. R weighs 800 N and S weighs 1200 N. The see-saw is not balanced.



One of the children moves so that the see-saw balances. Which single move will balance the see-saw?
In each case, only one child moves, and the child stays on the same side of the pivot.

A) R moves to a point 1.50 m from the pivot
B) S moves to a point 0.75 m from the pivot
C) S moves to a point 2.00 m from the pivot
D) R moves to a point 1.75 m from the pivot
E) S moves to a point 0.50 m from the pivot

56. The driver of a car turns the steering wheel by applying two opposite forces, each of magnitude 12 N, with his hands. His hands are placed directly opposite each other on the two sides of the steering wheel, and the external radius of the steering wheel is 15 cm.
What is the maximum torque (total moment) that could be produced by these coupled forces?

A) 3.60 Nm
B) 1.80 Nm
C) 0.90 Nm
D) 7.20 Nm
E) 18 Nm

57. The First Law of Thermodynamics, when applied to transformations of an ideal gas, can be written as:
increase in internal energy of gas = heat supplied to gas + work done on gas
(ΔU) (Q) (W)
Which of the following transformations matches the condition given?

1. **Adiabatic transformation: Condition W = 0**
2. **Adiabatic transformation: Condition W = ΔU**
3. **Isothermal transformation: Condition Q = 0**
4. **Isothermal transformation: Condition Q = ΔU**

A) 2 only
B) 1 only
C) none of them
D) 3 only
E) 4 only

58. There is air in the gap between the two parallel plates of a parallel-plate capacitor. The capacitor is connected to a 100 V d.c. power supply.
Later, a sheet of dielectric material is inserted between the two parallel plates of the capacitor.
The values of which quantities change as the dielectric is inserted into the gap?

A) Both the capacitance of the capacitor and the charge on the parallel plates
B) Only the potential difference between the parallel plates
C) Both the capacitance of the capacitor and the potential difference between the parallel plates
D) Only the capacitance of the capacitor
E) The capacitance of the capacitor, the potential difference between the parallel plates and the charge on the plates

59. A piece of aluminium is hung from a spring balance, which records that it has a weight of 13.5 N in air.
The balance is lowered until the piece of aluminium is completely immersed in an inert liquid of density 1.50 g/cm^3.
What is the new reading on the spring balance?
[Take density of aluminium = 2.70 g/cm^3, and neglect any immersion of the spring balance.]

A) 6.0 N
B) 8.5 N
C) 0 N
D) 7.5 N
E) 13.5 N

60. A mass, hung on a spring, oscillates along a vertical line about a stable equilibrium position. Below are four statements about the motion of the mass.

1. **The velocity is greatest at the equilibrium position.**
2. **The acceleration is greatest at the equilibrium position.**
3. **The acceleration is directed towards the equilibrium position.**
4. **The kinetic energy is greatest at maximum displacement.**

Which statement(s) is/are correct?

A) 1 and 3 only
B) 1, 3 and 4 only
C) 2 and 4 only
D) 4 only
E) none of them

********** FINE DELLE DOMANDE **********

In all the presented questions the right answer is at letter A)

TEST ARCHITETTURA 2015

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