**General Aptitude**

1. Select the word that fits the analogy:
   Cover: Uncover:: Associate: _____
   a) Dissociate
   b) Inassociate
   c) Misassociate
   d) Unassociate

**Answer: A**

2. The profit shares of two companies P and Q are shown in the figure. If the two companies have invested a fixed and equal amount every year, then the ratio of the total revenue of company P to the total revenue of company Q, during 2013-2018 is _____
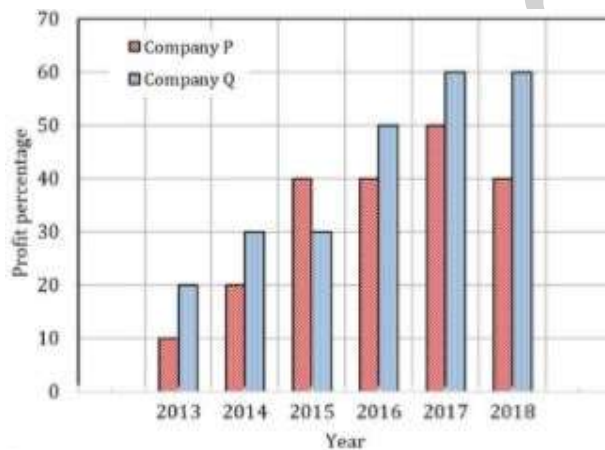


   a) 17:16
   b) 17:15
   c) 16:17
   d) 15:17

**Answer: C**

**Explanation:** Let the fixed investment annually be 'A'.

Total revenue of company P (2013 to 2018) = 1.1A + 1.2A + 1.4A + 1.4A + 1.5A + 1.4A = 8A

Total revenue of Company Q (2013 to 2018) = 1.2A + 1.3A + 1.3A + 1.5A + 1.6A + 1.6A = 8.5 A

3. The difference between the sum of the first 2n natural numbers and the sum of the first n odd numbers is _____
   a) $2n^2 + n$
   b) $2n^2 - n$
   c) $n^2 + n$
   d) $n^2 - n$

**Answer: C**

4. The distance between Delhi and Agra is 233Km. A car P started travelling from Delhi to Agra and another car Q started from Agra to Delhi along the same road 1 hour after the car P started. The two cars crossed each other 75 minutes after the car Q started. Both cars were travelling at constant speed. The speed of car P was 10km/hr more than the speed of car Q. How many kilometres the car Q had travelled when the cars crossed each other?

a) 75.2
b) 66.6
c) 116.5
d) 88.2

**Answer: A**

5. Despite a string of poor performances, the chances of K.L Rahul's selection in the team are _____

a) Slim
b) Uncertain
c) Bright
d) Obvious

**Answer: C**

6. Rajiv Gandhi Khel Ratana Award was conferred _____ Mary Kom, a six time world champion in boxing, recently in ceremony _____ the Rashtrapati Bhawan (the President's official residence) in New Delhi.

a) with, at
b) on, in
c) to, at
d) on, at

**Answer: D**

7. P,Q,R,S,T,U,V and W are seated around a circular table
   I.   S is seated opposite to W
   II.  U is seated at the seond place to the right of R
   III. T is seated at the second place to the right of R
   IV.  V is a neighnour of S
   Which of the following must be true?

a) P is not seated opposite to Q
b) Q is a neighbour of R
c) P is a neighbour of R
d) R is the left neighbour of S

**Answer: A**

8. For a matrix M = [$m_{ij}$]: $i,j$ = 1,2,3,4: the diagonal elements are all zero and $m_{ij} = -m_{ji}$. The minimum number of elements required to fully specify the matrix is _____.

a) 12
b) 0
c) 6
d) 16

**Answer: C**

**Explanation:** Total no. of elements in in 4*4 matrix is 16; of which four diagonal elements are zero. Remaining 12 elements can be divided in to two equal groups of 6 elements each. Both groups are opposite signed elements to meet the given condition.

9. Hit by floods, the kharif (summer sown) crops in various parts of the country have been affected. Officials believe that the loss in production of the kharif crops can be recovered in the output of the rabi (winter sown) crops so that the country can achieve its food-grain production target of 291 million tons in the crop year 2019-20 (July-June). They are hopeful that good rains in July- August will help the soil retain moisture for a longer period, helping winter sown crops such as wheat and pulses during the November-February period.
   Which of the following statements can be inferred from the given passage?
   a) Officials hope that the food grain production target will be met due to a good rabi produce
   b) Officials declared that the food grain production target will be met due to good rains
   c) Officials feel that the food grain production target cannot be met due to floods
   d) Officials want the food grain production target to be met by the November-February period.

**Answer: A**

10. Repo rate is the rate at which Reserve Bank of India (RBI) lends commercial banks, and reverse repo rate at which RBI borrows money from commercial banks.
    Which of the following statements can be inferred from the above passage?
    a) Increase in repo-rate will decrease cost of borrowing and increase lending by commercial banks
    b) Decrease in repo-rate will decrease cost of borrowing and increase lending by commercial banks
    c) Increase in repo-rate will decrease cost of borrowing and decrease lending by commercial banks
    d) Decrease in repo-rate will increase cost of borrowing and decrease lending by commercial banks

**Answer: B**

**Architecture and Planning**

1. 'Formation of GSI based master plan' is a sub scheme of
a) Shyama Prasad Mukherji Rurban Mission
b) Jawaharlal Nehru National Urban Renewal Mission
c) Atal Mission for Rejuvenation and Urban Transformation
d) Smart Cities Mission

**Answer: C**

2. One hectare is equal to
a) $4048m^2$
b) $4840 \ m^2$
c) $10000 \ m^2$
d) $4000 \ m^2$

**Answer: C**

3. 'Tendon' is primary used
a) To pre-stress concrete
b) As a compression member
c) To prepare a tender document
d) As a roof sheathing

**Answer: A**

4. The stone used in the construction of 'Kailasa' temple at Ellora is
a) Marble
b) Basalt
c) Limestone
d) Sandstone

**Answer: B**

5. One of the sites added to the list of UNESCO World Heritage Sites in 2019 is
a) Fatehpur Sikri
b) Chandigarh
c) Walled City, Ahmedabad
d) Walled City, Jaipur

**Answer: D**

6. The correct Chronological order of the given architecture movements is
a) Roman; Romanesque; Gothic; Baroque; Renaissance
b) Romanesque; Roman; Renaissance; Gothic; Baroque
c) Roman; Romanesque; Gothic; Renaissance; Baroque
d) Romanesque; Roman; Baroque; Gothic; Renaissance

**Answer: C**

7. A 1.2m high window is located on a south facing wall. The solar azimuth angle is equal to the wall azimuth angle and the solar altitude angle is 60 degree. The minimum depth (in meters round off to two decimal places) of overhang required to completely shade the window is _____

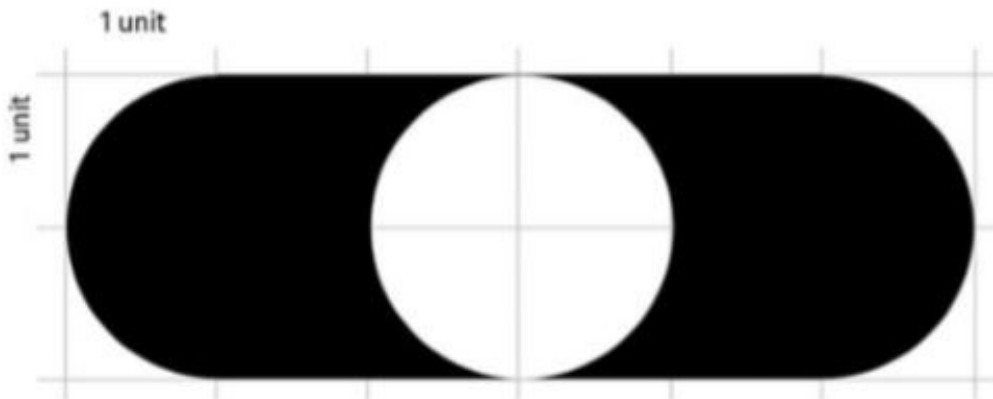   (Assume that the overhang is located at the lintel level of the window)

**Answer: 0.6928**

**Explanation:** Solar azimuth is equal to wall azimuth. This implies that the projection of sun on horizontal coincides with the normal at window surface.
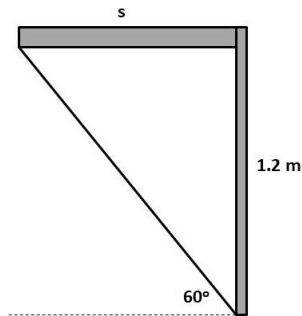


Tan 60 = 1.2/s = √3

⇨ Shading depth, s = 1.2/1.732 = 0.6928 meter

8. In the given figure, the area of the shaded portion is _____



**Answer: 8**

**Explanation:** The semi-circular ends on either extreme can be filled into the white circular part at centre. It gives a rectangle with dimensions; (2 units x 4 units). So, area will be 8 sq. units.

**9.** If Beam : Column :: Transom: X,
Which of the following options can replace X

a) Ceiling
b) Sill
c) Balustrade
d) Mullion

**Answer: D**

**10.** For the same thickness of material layers, relative position of insulation in the wall section 1 and 2 shown below will have an impact on
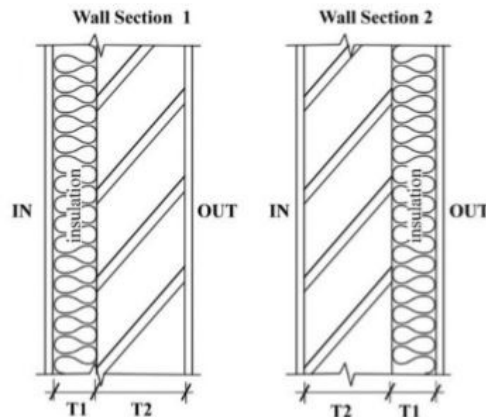


a) Thermal Resistivity
b) Thermal Conductivity
c) Thermal Transmittance
d) Thermal Time Constant

**Answer: D**

**Explanation:** Thermal transmittance (U value) of a composite wall depends on thickness of each layer ad their thermal conductivities; but not the order of those layers. Thermal resistivity and thermal conductivity are material properties.

**11.** The solar altitude angle on April 16 at 7:00AM in Kochi is 16 degree. The same solar altitude will occur at the same time in the sme year at the same location on

a) October 21
b) September 23
c) July 21
d) August 27

**Answer: D**

**Explanation:** The sun-path oscillates between summer solstice (June 21) and winter solstice (Dec 21) with equinox at Mar 21 and Sept 21 (approx.). Almost same solar altitude angle is observed

in the following pairs of months: (June); (July, May); (Aug, April); (Sept, March); (Oct, Feb); (Nov, Jan); (Dec).
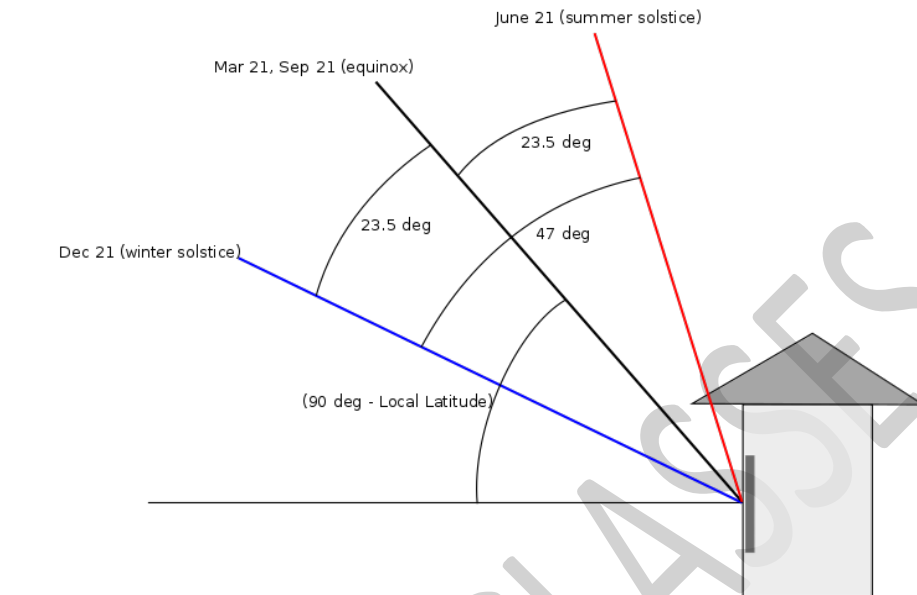


**12.** Shyam- Rai temple of Bishnupur in west Bengal, is an example of
a) Stone carved Dravidian type temple
b) Pancha-ratna type terracotta temple
c) Nava-ratan type terracotta temple
d) Stone carved Nagar type temple

**Answer: B**

**13.** As per URDPFI Guidelines 2015, Government of India, choose the correct hierarchy of plan from higher to lower order.
a) Perspective plan, Development Plan, Regional Plan, Zonal PLan
b) Regional Plan, Perspective Plan, Development Plan, Zonal Plan
c) Zonal Plan, Development Plan, Regional Plan, Perspective Plan
d) Perspective Plan, Regional Plan, Development Plan, Zonal PLan

**Answer: D**

**14.** Average density of a highway is 25 vehicles per km. Average volume of the vehicles on the highway is 520 vehicles per hour. The mean speed (in km/hour, rounded off to one decimal place) is _____

**Answer: 20.8**

**Explanation:** Mean sped = Average volume/Average density = 520/25 = 20.8

**15.** Emergency preparedness for risk reduction does NOT include
a)  Relief distribution
b)  Revision of code
c)  Rehabilitation
d)  Rescue

**Answer: B**

**16.** In a perspective drawing, the Picture Plane is in between the Object and the Observer. If the Observer comes closer straight towards the Picture Plane, without changing the distance between Object and Picture Plane, the perspective image wil be
a)  Will become the mirror image of the previous
b)  Smaller than the previous image
c)  Bigger than the previous image
d)  Will remain the same as previous image

**Answer: B**

**17.** In India, the constitution (Seventy Fourth Amendment) Act, 1992, delegates powers to institutes forming the third tier of Government, which are
a)  Development Authority, Improvement Trust and Panchayat
b)  Municipal Corporation, Municipality and Nagar Panchayat
c)  Improvement Trust, Nagar Panchayat and Panchayat
d)  Development Authority, Municipal Corporation and Municipality

**Answer: B**

**18.** Four vertical lines having same thickness appear to be of the same height in perspective as shown in the figure. Which line actually has maximum height?



a)  3
b)  1
c)  4
d)  2
**Answer: D**

**Explanation:** Given that all lines are of equal thickness, line 2 which is the thinnest line, needs to be brought forward the most. This makes line 2 the tallest of all.
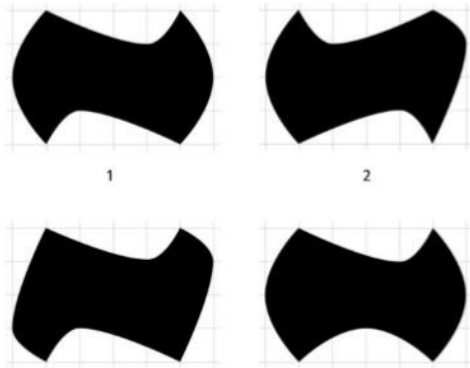
**19.** As on2018 'Right to Property' in India is a

a) Constitunational Right
b) Tertiary Right
c) Secondary Right
d) Fundamental Right

**Answer: A**

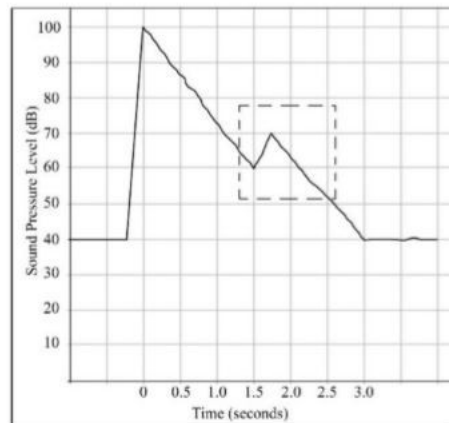**20.** Which of the following shapes can be used as an interlocking paver block without adding any other shape?



a) 2
b) 3
c) 4
d) 1

**Answer: B**

**Explanation:** Tile 3 gives the tessellation which interlocks without adding any other shape.

**21.** The decay of sound in a large room is indicated in the following figure. The spike within the dashed zone denotes

a) Early reflection
b) Perfect sound diffusion
c) Echo
d) Flutter echo

**Answer: C**

**22.** In the given contour map, the angle 'A' (in degrees, rounded off to two decimal places) is

_____
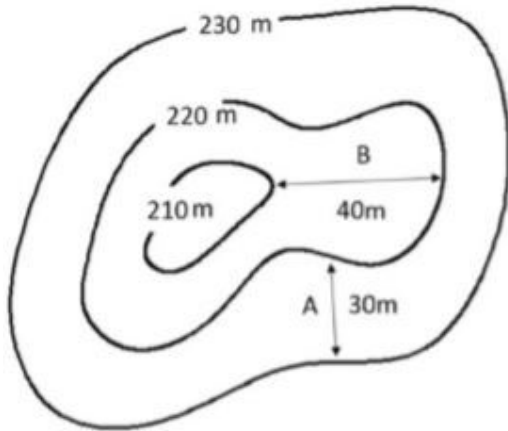


**Answer: 18.4349**

**Explanation:** Slope at point A is; tanθ = rise/run = 10/30

So, angle at A is θ = tan inv (1/3) = 18.43 degrees

**23.** In the architectural style of ancient North Indian Temples, the term 'Adhistana' refers to
a) Base Platform
b) Pinnacle
c) Transept
d) Vestibule

**Answer: A**

**24.** Which one of the following in **NOT** a land use zone?
a) Agriculture Zone
b) Commercial Zone
c) Heritage Zone
d) Industrial Zone

**Answer: C**

**NOTE: Actually heritage comes under 'special zone' as per NBC classification of land use. So, this question can be claimed.**

**25.** Who among the following architects has NOT won the pritzker Architecture Prize till 2019?

a)  Moshe Safdie
b)  B.V Doshi
c)  I.M Pie
d)  Arata Isozaki

**Answer: A**

**26.** Match the terms in **Group I** with the parameters in **Group II**

| **Group I** | **Group II** |
| --- | --- |
| P. Frontal Are Density | 1. Active Green Area |
| Q. Sky View Factor | 2. Urban Density in Third Dimension |
| R. Drift Index | 3. Build Density in two Dimension |
| S. Biotope Factor | 4. Lateral Stiffness |
| | 5. Cross Sectional Property of Urban Canyon |

a)  P-3, Q-4, R-5, S-1
b)  P-2, Q-3, R-4, S-5
c)  P-3, Q-2, R-1, S-4
d)  P-2, Q-5, R-4, S-1

**Answer: D**

**27.** Match the Architects in Group I with their projects in Group II

| **Group I** | **Group II** |
| --- | --- |
| P. Victor Horta | 1. Farnsworth House |
| Q. Gerrit Rietvelt | 2. Robie House |
| R. Mies van der Rohe | 3. Tassel House |
| S. Frank Lloyd Wright | 4. Scroder House |
| | 5. Vanna Ventury House |

a)  P-3, Q-4, R-5, S-2
b)  P-4, Q-3. R-1, S-2
c)  P-2, Q-5, R-4, S-1
d)  P-3, Q-4, R-1, S-2

**Answer: D**

**28.** Match the structural form in **Group I** with their corresponding illustration in



a)  P-2, Q-4, R-5, S-1
b)  P-2, Q-4, R-1, S-5
c)  P-4, Q-1, R-5, S-2
d)  P-5, Q-4, R-2, S-1

**Answer: A**

**29.** Match the images of gardens in Group I with their names in Group II

| Group I | Group II |
|---|---|
| (P)  | (1) Central Park, New York |
| (Q)  | (2) Versailles, Paris |
| (R)  | (3) Nishat Bagh, Srinagar |
| (S)  | (4) Katsura Imperial Garden, Kyoto |
| | (5) Alhambra Moorish Garden, Granada |

     a)   P-5, Q-3, R-1, S-4
     b)   P-1, Q-4, R-3, S-2
     c)   P-3, Q-4, R-1, S-2
     d)   P-3, Q-2, R-4, S-5

**Answer: C**

**30.** A parking area measures 52m x 4.67m is approached through aa driveway as shown in the given illustrations. The parking is designed at an angle of 30 degree with the parking bay of 2.5m x 5m.



Drawing Not to Scale

The number of cars that can be parked in the designated parking area considering no car overshoots the length of the parking area is _____

**Answer: 10**

**Explanation:** Curb length, L required to park N cars at 30 degree layout is given by; L = 0.58 + 5N

Here, L = 52

This gives N = 10 cars

**31.** Match the books in **Group I** with the corresponding authors in **Group II**

**Group I**
P. The Autobiography of an Idea
Q. Letters to a Young Architect
R. A pattern Language
S. Architecture: Forms, Space and Order

**Group II**
1. Christopher Charles Benninger
2. Sunil Khilnani
3. Francis D.K Ching
4. Louis H. Sullivan
5. Christopher Alexander

a) P-3, Q-1, R-5, S-4
b) P-4, Q-2, R-1, S-3
c) P-3, q-2, R-1, S-4
d) P-4, Q-1, R-5, S-3

**Answer: D**

**32.** Assuming that the population growth trend in the given table will continue, the population (in person) for year 2031 will be _____

| S.No. | Year | Population in person |
|-------|------|----------------------|
| 1 | 1981 | 1,30,440 |
| 2 | 1991 | 1,69,572 |
| 3 | 2001 | 2,20,444 |
| 4 | 2011 | 2,86,577 |

**Answer: 484315**

**Explanation:** By observation; population growth rate each decade is 30%

So, assuming same growth trend; population for 2021 = 1.3*286577 = 372550

Population of 2031 =1.3 * 372550 = 484315

**33.** A population of 2500 person requires a minimum area of 3000m$^2$ for primary school. For the population in four different sectors given in the table below, the Sector having maximum shortage of school area per person is _____

| S.No. | Population | No. of existing Schools | Existing Area of each school in m$^2$ |
|-------|-----------|-------------------------|---------------------------------------|

| 1 | 20000 | 5 | 2000 |
|---|---|---|---|
| 2 | 15000 | 4 | 4500 |
| 3 | 12500 | 2 | 2500 |
| 4 | 10000 | 4 | 1500 |

**Answer: 3**

**Explanation:** Rate of area requirement = 3000/2500 = 1.2 sqm per person

In Sector 1; School area available = (5*2000)/20000 = 0.5 sqm per person

In Sector 2; School area available = (4*4500)/15000 = 1.2 sqm per person

In Sector 3; School area available = (2*2500)/12500 = 0.4 sqm per person

In Sector 4; School area available = (4*1500)/10000 = 0.6 sqm per person

Sector 3 has the highest shortage

**34.** Top floor of a 25 storey building is using a flush valve system with a minimum fixture pressure of 1.0kg/cm$^3$. If the static pressure increases b 0.3 kg/cm2 per meter length and friction loss is zero, then height of bottom of the water tank from the top, fixture (in meter, rounded off to two decimal places) is _____

**Answer: Will be updated ASAP**

**35.** The numbers of married couples in a household along with number of rooms (for a household) are given in the table. Assuming each married couple needs one separate room, the total number of additional rooms required for them is _____

| Number of married couples in a household | Number of households with | | |
|---|---|---|---|
| | 1 Room | 2 Room | 3 Room |
| 0 | 2500 | 450 | 100 |
| 1 | 4700 | 3000 | 2000 |
| 2 | 3600 | 5500 | 1100 |
| 3 | 432 | 750 | 400 |

**Answer: 5214**

**Explanation:** The following households **marked red** do not require additional rooms as the number of couples is either equal to or less than the number of rooms available:

| Number of married couples in a household | Number of households with | | |
|---|---|---|---|
| | 1 Room | 2 Room | 3 Room |
| 0 | 2500 | 450 | 100 |
| 1 | 4700 | 3000 | 2000 |
| 2 | 3600 | 5500 | 1100 |
| 3 | 432 | 750 | 400 |

Households marked in light green require one additional room per household and households marked in dark green require two additional rooms per household.

Total additional rooms required = 3600 + (2*432) + 750 = 5214

**36.** Match the terminologies of Musell colour wheel in Group I with their corresponding descriptions in Group II

|  | **Group I** | **Group II** |
|---|---|---|
|  | P. Hue | 1. Addition of black to the base clour |
|  | Q. Chroma | 2. Radial colour variation |
|  | R. Value | 3. Addition of white to the base colour |
|  | S. Tint | 4. Colour variation through angular difference |
|  |  | 5. Vertical colour variatttion |

a) P-2, Q-4, R-5, S-1
b) P-4, Q-2, R-5, S-3
c) P-4, Q-2, R-3, S-1
d) P-2, Q-4, R-1, S-3

**Answer: B**

**37.** Match the software tools in Group I with their primary applications in Group II

|  | **Group I** | **Group II** |
|---|---|---|
|  | P. ETabs | 1. Acoustic analysis |
|  | Q. Carto | 2. Structural analysis |
|  | R. eQuest | 3. Statistical analysis |
|  | S. SPSS | 4. energy simulation |
|  |  | 5. Geo-spatial analysis |

a) P-4, Q-5, R-1, S-3
b) P-4, Q-1, R-2, S-3
c) P-2, Q-4, R-5, S-1
d) P-2, Q-5, R-4, S-3

**Answer: D**

**38.** Plan and section of an isolated foundation is given below. The volume of concrete up to Ground Level (GL) (in m³, rounded off to two decimal places) is _____
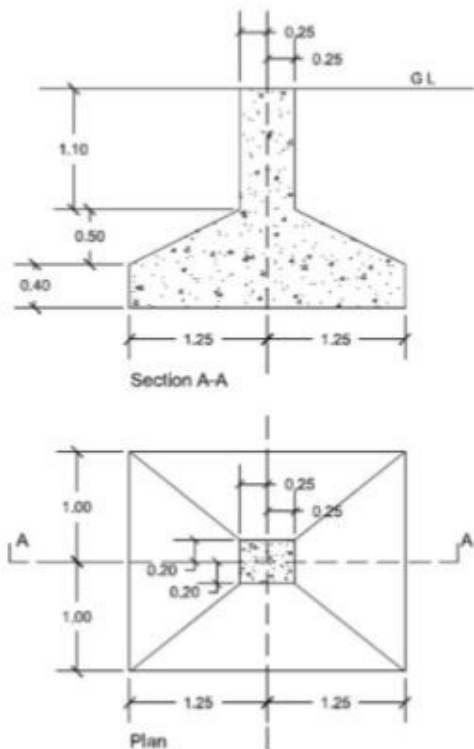


**Answer: 3.253**

**Explanation:** Volume of footing base (cuboidal) = l*b*h = 2.5*2*0.4 = 2 cu. m

Volume of footing base (Frustum portion) = h/3 (A1 + A2 + √(A1*A2))

Here, A1 = 2.5*2 = 5 and A2 = 0.5*0.4 = 0.2

Volume of frustum = 0.5/3 (6.2) = 1.033 cu. m

Volume of vertical potion (Cuboidal) = l*b*h = 0.5*0.4*1.1 = 0.22 cu. m

Total volume of concrete required = Volume of both cuboids + volume of frustum = 2 + 1.033 + 0.22 = 3.253 cu. m

**39.** A developer would like to select a residential plot of 3000m2 group housing in a city. Different options with varying development controls are given. In every group housing plot, 15% of Floor Area Ratio (FAR) over and above the maximum permissible FAR has to be utilized for Economically Weaker Section (EWS) units. The maximum build-up area (in m2)available from the options given below is _____

| Area | Ground Coverage (%) | FAR |
| --- | --- | --- |

| 1 | 30 | 1.5 |
|---|----|-----|
| 2 | 20 | 2.0 |
| 3 | 40 | 2.0 |
| 4 | 15 | 3.0 |

**Answer: 10350**

**40.** Match the brick masonry bond type in Group I with the corresponding illustration in Group II



Group I                          Group II

(P) Rat Trap                     (1)

(Q) English                      (2)

(R) Flemish                      (3)

(S) Stretcher                    (4)

                                 (5)

   a)  P-4, Q-1, R-2, S-3
   b)  P-4, Q-1, R-2, S-5
   c)  P-2, Q-1, R-4, S-5
   d)  P-2, Q-5, R-1, S-3

**Answer: B**

**41.** The activity duration, early start, early finish, late start and late finish of the three activities 'P', 'Q', and 'R' are shown in the following figure. The independent float of activity 'Q' is ___
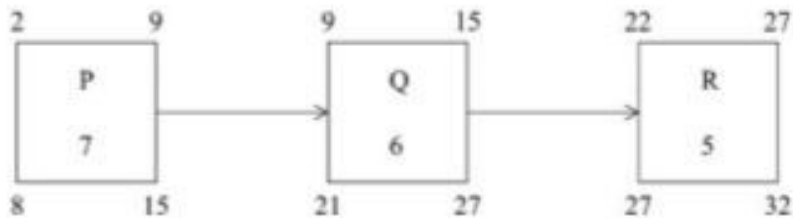


**Answer: 1**

**Explanation:** In AON network, Independent float is given by; (Early Start of next activity) – (Late Finish of predecessor) – (Duration = 22 – 15 – 6 = 1 day

42. In the plot shown below, 'S1' and 'S2' are two non –directional point sources, having a sound intensity level of 95dB and 60dB, respectively, at a distance of 1m from each point source. Considering free field conditions, the effective sound intensity level at the receiver location 'R' (in dB, rounded off to two decimals places) is _____
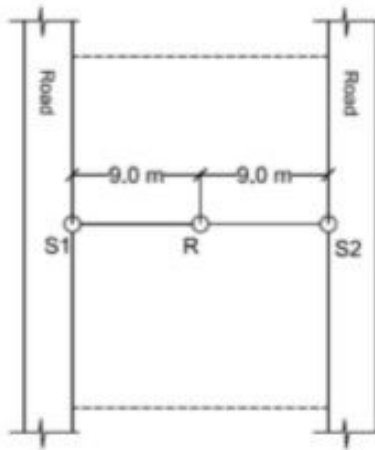


**Answer: 75.92**

**Explanation:** For source 1, 95 dB at 1 meter distance = intensity of 10^-2.5 W/ sqm

Applying inverse square law; intensity due to source 1 at 9 meter distance will be (10^-2.5)/81

Similarly; intensity due to source 2 at 9 meter distance will be (10^-6)/81

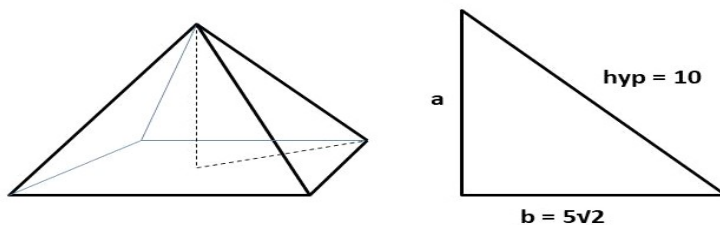Total intensity at midpoint, R = [(10^-2.5) + (10^-6)]/81 = 0.0000390528 W/ sqm

SIL at point R = 10 log (I/Iref) = 75.9165 dB

43. A square based regular pyramid has all sides equal to 10 units. Its height (in the same units, rounded off to two decimal places) is _____

**Answer: 7.07**

**Explanation:** All the sides of given pyramid are 10 units



Diagonal of base = 10√2

---

Base of marked triangle in diagram will be half of diagonal of square base = 5√2

Applying Pythagoras theorem; Sq(a) = 100 – Sq (b) = 100 – 50 = 50

So, a = √50 = 7.07 units

**44.** Match the structural system in **Group I** with their potential causes of failure in **Group II**

| **Group I** | **Group II** |
|---|---|
| P. Flat Slab | 1. Thrust |
| Q. Long Column | 2. Flutter |
| R. Arch | 3. Punching Shear |
| S. Tensile Fabric | 4. Buckling |
| | 5. Moment |

a) P-3, Q-4, R-1, S-2
b) P-1, Q-3, R-5, S-2
c) P-3, Q-5, R-4, S-1
d) P-2, Q-4, R-1, S-3

**Answer: A**

**45.** In a single phase alternate current circuit, an electric lamp is rated 100 watts. If 220 volts is impressed on it and power factor is 0.85, the energy (in watt hour, rounded off to one decimal place) deliver in an hour is _____

**Answer: 117.65**

**Explanation:** Power factor = Real power/ Apparent Power

⇨ Apparent power = Real power/PF = 100/0.85 = 117.65 Watts
⇨ Energy in 1 hour = 117.65 W * 1 hr = 117.65 Watt.hr

**46.** Match the plant forms in Group I with the botanical names in Group II, as per 'A Handbook of Landscape", CPWD 2013, Government of India

| **Group I** | **Group II** |
|---|---|
| P. Columnar | 1. Pinus roxburghii |
| Q. Globular | 2. Ipomoes grandiflora |
| R. Weeping | 3. Juniperus chinensis |
| S. Pyramidal | 4. Salix babylonica |
| | 5. Mimusops elengi |

a) P-3, Q-4, R-2, S-2
b) P-1, Q-3, R-4, S-5
c) P-1, Q-5, R-2, S-3
d) P-3, Q-5, R-4, S-1

**Answer: D**

**47.** Match the graphical representations in **Group I** with corresponding elements in **Group II**

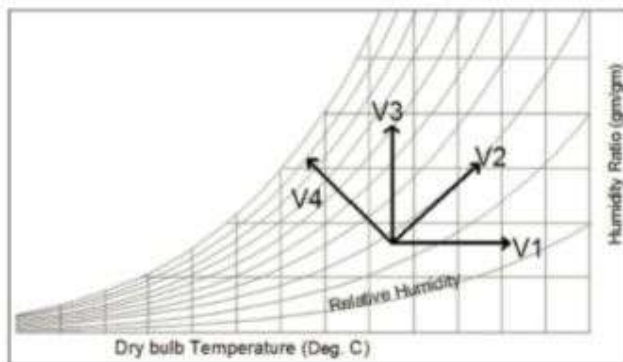| Group I | Group II |
|---------|----------|
| (P)  | (1) Pathway |
| (Q)  | (2) Node |
| (R)  | (3) District |
| (S)  | (4) Edge |
|  | (5) Landmark |

a) P-1, Q-2, R-3, S-5
b) P-2, Q-3, R-4, S-5
c) P-2, Q-1, R-4, S-5
d) P-4, Q-1, R-3, S-2

**Answer: C**

**48.** Based on the psychometric chart given blow, match the vector in Group I with respective process in Group II



|  Group I | Group II |
|----------|----------|
| P. V1 | 1. Heating and humidification |

Q. V2          2. Cooling and humidification
R. V3          3. Heating and dehumidification
S. V4          4. Sensible heating
               5. Humidification

a) P-4, Q-1, R-5, S-2
b) P-3, Q-1, R-5, S-2
c) P-5, Q-3, R-4, S-1
d) P-4, Q-3, R-1, S-5

**Answer: A**

**Explanation:** In psychrometric chart, along X-axis DBT increases from left to right and along Y-axis humidity ratio increases from bottom to top.

So, V1 is heating (only DBT increases), V2 is heating and humidification (both DBT and humidity ratio increases), V3 is humidification (only humidity ratio increases) and V4 is cooling and humidification (DBT decreases and humidity ratio increases)

**49.** In a residential complex, the central play area is to be covered as a detention pond for storm water management. For a 24 hour rainfall event of 100mm, 100% storm water of central play area and 70% storm water run-off from rest of the complex is to be held at the detention pond. Area distribution in the residential complex is given in the table.

| Type | Area($m^2$) | Runoff coefficient |
|---|---|---|
| Apartment Blocks | 1250 | 0.80 |
| Central Play Area | 150 | 0.60 |
| Other Permeable Areas | 200 | 0.70 |
| Other Impermeable Areas | 400 | 0.90 |

The required depth of detention pond (in mm) is _____

**Answer: 760**

**Explanation:** Volume of run-off from central play area = 150*0.6*0.1 = 9 cu.m (100% of it is held at detention pond)

Volume of run-off from rest of complex = (1250*0.8*0.1) + (200*0.7*0.1) + (400*0.9*0.1) = 150 cum (70% of it is held at detention pond) = 105 cu.m

Total volume of water in detention pond = 105 + 9 = 114 cu. m

Depth of detention pond = Volume/Area = 114/150 = 0.76 = 760 mm (Area of detention pond is area of central play area)

**50.** A room measures 5m x 10m x 3m (LxBxH). Consider the following conditions,

Total solar radiation incident on the roof surface = 800 W/m$^2$

Outdoor air temperature = 40$^o$C

Outside film coefficient of the roof surface = 18W/m$^2$

The outdoor mean radiant temperature is equal to outdoor air temperature

The minimum reduction required in solar absorptance of the roof (rounded off to two decimal places) to achieve 20 degree reduction in sol-air temperature is _____

**Answer- will be updated ASAP**

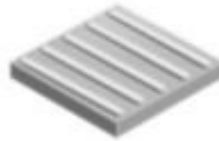**51.** Match the names of tactile paving in **Group I** with their pattern is **Group II**



a)  P-3, Q-5, R-4, S-1
b)  P-3, Q-2, R-4, S-1
c)  P-4, Q-2, R-3, S-1
d)  P-2, Q-5, R-1, S-4

**Answer: B**

**52.** Match the name of architects in **Group I** with the buildings designed by them in **Group II**

| Group I | Group II |
|---|---|
| P. Brinda Somaya | 1. Museum of Tribal Heritage, Bhopal |
| Q. Sheila Sai Prakash | 2. St. Thomas Cathedral, Mumbai |
| R. Revathy Kamath | 3. Bait-ur-Rauf Mosque, Dhaka |
| S. Marina Tabassum | 4. Indian Naval Academy, Kerala |
| | 5. Cholamandal Artists' Village, Chennai |

a) P-3, Q-1, R-4, S-2
b) P-2, Q-1, R-4, S-5
c) P-2, Q-5, R-1, S-3
d) P-4, Q-5, R-1, S-3

**Answer: C**

**53.** Match the characteristics in **Group I** with the types of settlements in **Group II** as given in URDPFI Guidelines 2015, Government of India

| Group I | Group II |
|---|---|
| P. Zones of transition from rural to urban land uses located between the outer limits of urban and regional centres and rural environment | 1. Contour- Magnets |
| Q. Towns having potential for investment and development: identified on the basis of their inter-aerial relationship with the regional nodal centre | 2. Satellite Towns |
| R. Settlements that are growing sub-nodal centres but located out of the direct functionally linked areas of the growth node/nodal centre in the region | 3. Peri-Urban Areas |
| S. Located near or within reasonable distance, well connected by transportation route of the growth node or metropolitan city and dependent on growth node largely for employment | 4. Priority Towns |
| | 5. Statutory Towns |

a) P-3, Q-4, R-1, S-2
b) P-3, Q-5, R-2, S-4
c) P-4, Q-3, R-1, S-5
d) P-3, Q-5, R-1, S-4

**Answer: A**

**54.** A simply supported RCC beam of cross section 0.4m x 0.6m covers a span of 8m. It is subjected to a uniformly distributed load of 30kN/m. If the unit weight of concrete is 24kN/m$^3$, tensile stress (in N/mm$^2$, rounded off to two decimal places) at the bottom of the beam at mid-span is _____

**Answer: 11.92**

**Explanation:** Given UDL is 30 kN/m

Total self-weight of beam = Volume * Density = (0.4*0.6*8) * 24 = 46.08

UDL due to self-weight = total weight/span = 46.08/8 = 5.76 kN/m

Total load as UDL = 30 + 5.76 = 35.76 kN/m

BM at mid-span = Max. BM = $wl^2/8$ = (35.76*8*8)/8 = 286.08 kNm

Applying flexure equation;

M/I = σ/y

M = 286.08; I = $bD^3/12$ = 0.0072; y = D/2 = 0.3

Tensile stress at bottom of beam at mid-span, σ = (286.08*0.3)/0.0072 = 11920 kN/sqm = 11.92 N/sqmm

**55.** A basement wall resists lateral pressure exerted by soil and water. The soil pressure amounts to 4.5kN/m$^2$ for every metre of depth below Ground Level (GL). The sub-sol water level is 1.0m below GL and hydrostatic pressure of water is 9.8kN/m$^2$ for every meter of depth below GL. The total lateral pressure (in kN/m$^2$, rounded off to one decimal place) exerted on the wall 2m below GL is _____
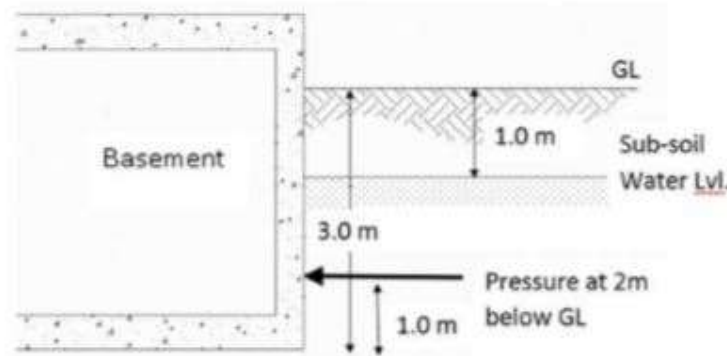


**Answer: 18.8**

**Explanation:** Pressure at given point, due to soil = 4.5*2 = 9 kN/sqm

Pressure at given point, due to water = 9.8*1 = 9.8 kN/sqm

Total lateral pressure = 9 + 9.8 = 18.8 kN/sqm

(The question is technical incorrect. Because the soil pressure should be different for dry soil and saturated soil)