

SSC SOLVED PAPER 2017 (SET 1)

GENERAL INTELLIGENCE & REASONING

Direction: In the below question one/two statements are given followed by two/three conclusions I, II and III. You have to consider the statements to be true even if they seem to be at variance with commonly known facts. You are to decide which of the given conclusions can definitely be drawn from the given statements.

1. Statements:

- I. All gloves are things.
- II. Some gloves are warm.

Conclusions:

- I. All gloves are warm.
- II. All warm are things.
- III. Some warm are things.
- (a) Only conclusion III follows
- (b) Only conclusion I follows
- (c) Only conclusion II follows
- (d) None follows

2. If $42 + 74 = 66$ and $35 + 17 = 64$, what is $57 + 21$?

- (a) 68
- (b) 36
- (c) 72
- (d) 44

Directions: In question nos. **3 & 4**, select the related letters /word /number from the given alternatives..

3. Baboon : Infant :: Beaver : ?

- (a) Kitten
- (b) Kid
- (c) Joey
- (d) Fawn

4. TALENT : VYNCPR :: NORMAL : ?

- (a) PMYKBK
- (b) PMTKCJ
- (c) PMTLBJ
- (d) PNTKDK

Directions: In question nos. **5 to 6**, a series is given, with one term missing. Choose the correct alternative from the given ones that will complete the series.

5. ac, abd, eg, efh, ik, ? .

- (a) ikl
- (b) ijI
- (c) jkm
- (d) jkn

6. ACE, GIK, MOQ, SUW, ?, ?.

- (a) XZB, DFH
- (b) YZB, DFH
- (c) XZA, CEG
- (d) YAC, EGI

7. Which one set of letters when sequentially placed at the gaps in the given letter series will complete it?

a _bab_aab_bcaa_abc

- (a) bbab
- (b) bcab
- (c) abac
- (d) acab

Directions: In the below question, find the odd word/ number from the given alternatives.

8. (a) French Beans (b) Gourd
(c) Pumpkin (d) Jackfruit

Direction: In the below one/two statements are given, followed by two/three conclusions. You have to consider the statements to be true, even if they seem at variance with commonly known facts. You are to decide which of the given conclusions can definitely be drawn from the given statements.

9. Statements :

- 1. Some constellations are stars.
- 2. All stars are galaxies.

Conclusions :

- I. All constellations are galaxies.
- II. Some constellations are galaxies.
- III. All galaxies are constellations.
- (a) Only conclusion I follows
- (b) Only conclusion II follows
- (c) Only conclusions I and II follow
- (d) Only conclusions I and III follow

10. Arun is older than Bhanu. Charu is older than Divya. Esha is older than Charu but younger than Bhanu. Who is the eldest among them?

- (a) Arun
- (b) Charu
- (c) Esha
- (d) Divya

Direction: In the below question, select the related letters/ word /number from the given alternatives.

11. Sick : Dog :: Busy : ?

- (a) Toad
- (b) Crocodile
- (c) Cuckoo
- (d) Bee

Direction: In the below question, find the odd word/ number from the given alternatives.

12. (a) 325 (b) 118
(c) 272 (d) 253

Direction : In the below question one/two statements are given followed by two/three conclusions I, II and III. You have to consider the statements to be true even if they seem to be at variance with commonly known facts. You are to decide which of the given conclusions can definitely be drawn from the given statements.

13. Statement:

People succeed when they work hard.

Conclusions:

- I. Only hard work leads to success.
- II. Honesty does not lead to success.

- (a) Only conclusion I follows
- (b) Only conclusion II follows
- (c) Both conclusions I and II follow
- (d) Neither conclusion I nor II follows

Direction: In the below question which one set of letters when sequentially placed at the gaps in the given letter series shall complete it?

14. a_bcabb_abc_aa_c

- (a) baab
- (b) bccb
- (c) abac
- (d) accb

Direction: In the below question, find the odd word/number from the given alternatives.

- 15. (a) Man (b) Whale**
(c) Hen (d) Seal

16. How many triangles are there in the following figure?



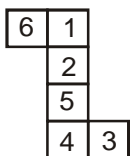
- (a) 16
- (b) 15
- (c) 14
- (d) 13

Direction: In the below question, find the odd word/number from the given alternatives.

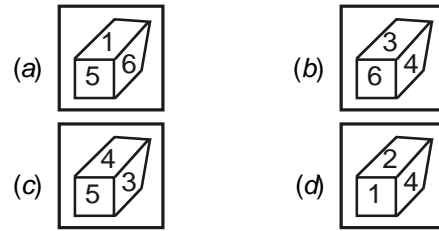
- 17. (a) Solar energy**
(b) Biomass
(c) Fossil fuel
(d) Radiant energy

18. An unfolded cube is shown in figure. All the faces of the cube are numbered from 1 to 6. Select one figure which will result in a given cube when folded?

Question figure:



Answer figures:



Direction: In the below question, find the odd word/number / number-pair from the given alternatives.

19. 1, 9, 52, 94, 18, 57, 961

- (a) 18
- (b) 961
- (c) 57
- (d) 52

Directions: In question nos. **20** to **21** from the given alternatives select the word which cannot be formed using the letters of the given word.

20. TREMENDOUS

- (a) TREES
- (b) MENTOR
- (c) TROUSER
- (d) RESEND

21. CARNIVOROUS

- (a) SAVIOUR
- (b) RACCOON
- (c) RANCOR
- (d) CAVERN

Direction: In the below question, find the odd word/number / number-pair from the given alternatives.

- 22. (a) Alfalfa (b) Aloe Vera**
(c) Bonsai (d) Lavender

23. A and B started walking from a point 'X'. A walked 4 km towards North, then turned left walked for 4 km. B walked $4\sqrt{2}$ km towards South-west. In which direction is A with respect to B?

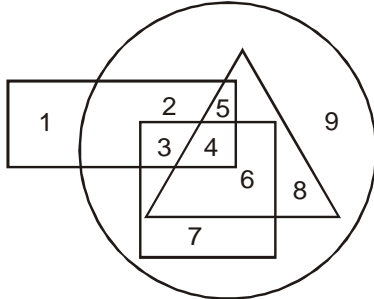
- (a) North-west
- (b) North-east
- (c) South
- (d) North

Direction: In the below question, select the missing number from the given responses.

- 24. 16 24 18**
8 32 27
32 18 ?

- (a) 12
- (b) 24
- (c) 26
- (d) 16

Direction: In the below question in the given diagram, circle represents students playing cricket, square represents students playing football, triangle represents students playing tennis and rectangle represents students playing hockey. Different regions in the diagram are numbered 1 to 11.



25. Which region represents students playing cricket and hockey but not tennis nor football ?

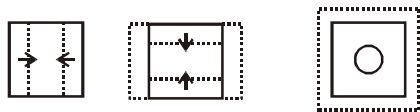
- (a) 1
- (b) 2
- (c) 3
- (d) 5

26. A man walks 6 km towards North. Then turns 135° anticlockwise and walks for 10 km. Then he turns 45° anticlockwise and walks for 8 km and finally turned 90° clockwise and walks for 7 km. In what direction is Aman now?

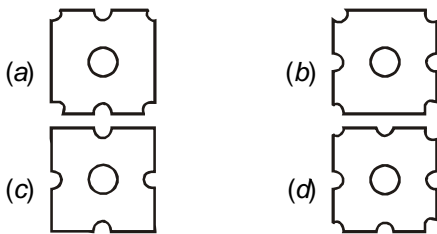
- (a) North-west
- (b) North-east
- (c) South-west
- (d) South-east

27. A piece of paper is folded and cut as shown below in the question figures. From the given answer figures, indicate how it will appear when opened.

Question figures:



Answer figures:

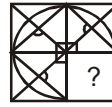


28. If PLANET is written as THEJIP, how SQUARE will be written in that code?

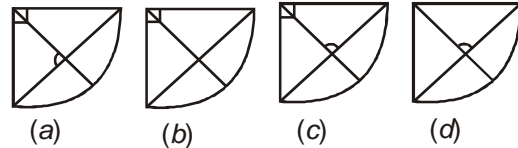
- (a) OUQWVA
- (b) WMYENI
- (c) OUQENI
- (d) WMYWVA

Direction: In the below question, which answer figure will complete the pattern in the question figure?

29. Question figure :

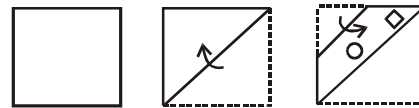


Answer figures :

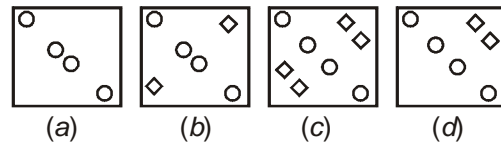


30. A piece of paper is folded and cut as shown below in the question figures. From the given answer figures, indicate how it will appear when opened.

Question figures :



Answer figures :

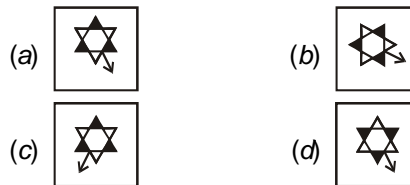


31. If a mirror is placed on the line MN, then which of the answer figures is the right image of the given figure?

Question figure:

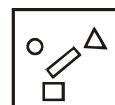


Answer figures:

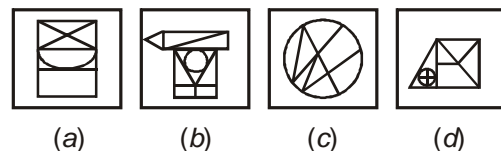


32. Which answer figure includes all the components given in the question figure?

Question figure :

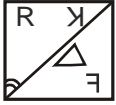


Answer figures :

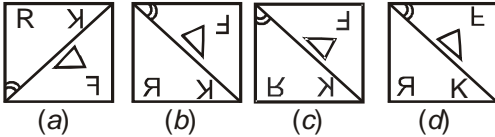


33. Choose the correct water-image of the question figure from given answer figures.

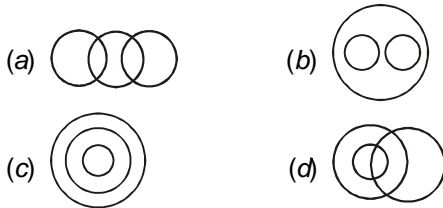
Question figure :



Answer figures :



34. Ram is the son of Geeta, who is the daughter of Dinesh. Suresh is the only son of Dinesh. How is Suresh related to Ram?
- (a) Cousin (b) Uncle
(c) Father (d) Brother
35. Which of the following diagrams best depicts the relationship between venomous, snakes and reptiles?



36. Ravi and Rakesh start from their office and walk in opposite direction. Ravi travelled 8 km, then turned right and travelled for 6 km. Rakesh travelled 6 km, then turned right and travelled for 8 km. How far are they now from each other?
- (a) 14 km (b) 28 km
(c) $20\text{ km } 14\sqrt{2}$ (d) km
37. Certain numbers have symbols as given below.

0 1 2 3 4 5 6 7 8 9

+ * ? \$] # [& ^ @

What is the number indicated by these symbols?

&] ^ * [

- (a) 3 4 8 9 1
(b) 9 6 8 0 5
(c) 7 6 8 1 4
(d) 7 4 8 1 6

Direction: In the below question, a series is given, with one term missing. Choose the correct alternative from the given ones that will complete the series.

38. W 5 K, T 12 M, Q 20 O, N 29 Q, ___?___ .
- (a) L 45 R (b) K 39 S
(c) K 37 S (d) K 43 R

39. If each of the letters in the English alphabet is assigned an odd numerical value by giving A = 1, B = 3 and so on, what would be the total value of the letters for the word WATCH when similarly coded?

- (a) 105 (b) 55
(c) 84 (d) 96

Direction: In question nos. 40 to 41, select the missing number from the given responses.

40. 7, 15, 30, 59, 116, ___?___

- (a) 197 (b) 189
(c) 223 (d) 229

41.

13	21	54
5	12	7
28	?	67

- (a) 13 (b) 9
(c) 11 (d) 15

42. If the word SAMSUNG is coded as 14-6-8-24-16-19-2, how would you write LIBERTY?

- (a) 17-4-7-26-23-15-4
(b) 7-14-23-10-13-25-20
(c) 7-4-23-26-13-15-20
(d) 17-14-7-10-23-25-4

Direction: In the below question, a series is given, with one term missing. Choose the correct alternative from the given ones that will complete the series.

43. 72, 46, 521, 612, 343, ___?___ .

- (a) 678 (b) 545
(c) 215 (d) 154

44. Ankit told his wife Reena that Uma is his mother and Rohit is the son of his only sister. How is Uma related to Rohit?

- (a) Aunt (b) Sister
(c) Mother (d) Grandmother

Direction: In the below question, a series is given, with one term missing. Choose the correct alternative from the given ones that will complete the series.

45. 7, 13, 25, 49, 97, ___?___ .

- (a) 194 (b) 184
(c) 188 (d) 193

46. A man and his wife have four sons and three daughters. All four sons are married and have five children each. Find the total number of members in the family.

- (a) 33 (b) 25
(c) 28 (d) 29

47. BX, EU, HR, KO, ___?___, QI, ___?___ .

- (a) NL and TF (b) ML and TE
(c) NK and TF (d) MK and TE

48. If $462 * 3 = 18$ and $564 * 2 = 12$, then $617 * 4 = ?$

- (a) 13 (b) 14
(c) 20 (d) 16

49. A word is represented by only one set of numbers as given in anyone of the alternatives. The sets of numbers given in the alternatives are represented by two classes of alphabets as in two matrices given below. The columns and rows of **Matrix I** are numbered from 0 to 4 and that of **Matrix II** are numbered from 5 to 9. A letter from these matrices can be represented first by its row and next by its column, e.g., 'S' can be represented by 24, 41, etc., and 'A' can be represented by 55, 78, etc. Similarly, you have to identify the set for the word GLOW.

Matrix I						Matrix II					
	0	1	2	3	4		5	6	7	8	9
0	S	F	O	L	T	5	A	I	G	N	W
1	O	L	S	T	F	6	I	W	A	G	N
2	L	T	F	O	S	7	G	N	W	A	I
3	F	O	T	S	L	8	W	G	N	I	A
4	T	S	L	F	O	9	N	A	I	W	G

- (a) 57, 02, 78, 66 (b) 03, 42, 56, 99
(c) 75, 34, 69, 44 (d) 68, 34, 23, 98

Direction: In the below question, a series is given, with one term missing. Choose the correct alternative from the given ones that will complete the series.

50. BGL, FKP, JOT, ____?____.

- (a) MSY (b) NSX
(c) NRX (d) MRY

GENERAL AWARENESS

1. The higher the wind speed and the longer the fetch or distance of open water across which the wind blows and waves travel the _____ waves and the _____ energy they possess.

- (a) larger, more (b) larger, less
(c) smaller, more (d) smaller, less

2. Pine, fir, spruce, cedar, larch and cypren are the famous timber-yielding plants of which several also occur widely in the hilly regions of India. All there belongs to

- (a) angiosperms (b) gymnosperms
(c) monocotyledons (d) dicotyledons

3. Which county did Ravi Shastri play for?

- (a) Glov cestershire
(b) Leicestershire
(c) Glamorgan
(d) Lancashire

4. 'Natya-shastra' the main source of India's classical dances was written by

- (a) Nara Muni (b) Bharat Muni
(c) Abhinor Gupt (d) Tander Muni

5. Name of place where Olympics 2016 held?

- (a) Rio (b) Geneva
(c) Helsinkey (d) Tokyo

6. Capital of Lakshadweep is

- (a) Daman (b) Kavaratti
(c) Chandigarh (d) Silvaasa

7. India's largest surang is

- (a) Rohtang (b) Jawahar Tunnel
(c) Pir Panjal (d) Notuwari Tunnel

8. Hemis festival is celebrated in :

- (a) Ladakh (b) Daman
(c) Port blair (d) None of these

9. In constitution, "human rights" is taken from which country?

- (a) USA (b) UK
(c) Russia (d) Denmark

10. Kapaas is which type of crop?

- (a) Khareef (b) Ravi
(c) Non-commerical (d) None of these

11. Central Arid Zone Research Institute is located in _____

- (a) Rajasthan (b) Gujarat
(c) Bihar (d) Orissa

12. The five days multinational Aman-17 naval exercises was held in which country?

- (a) Afghanistan (b) Indonesia
(c) Nepal (d) Pakistan

13. Bhutan is still under _____

- (a) Monarchy (b) Non-monarchy
(c) Non-constitutional (d) None of these

14. Bajra is which type of crop ?

- (a) Khareef (b) Ravi
(c) Non-commercial (d) None of these

15. In blood which cells are high in quantity ?

- (a) RBC (b) WBC
(c) Lymphocytes (d) None of these

16. Prabhavati Gupta is daughter of

- (a) Samundra Gupta (b) Ashoka
(c) Chandra Gupta (d) None of these

17. Formula for GDP is given by _____
 (a) depreciation (b) nnp-depreciation
 (c) nnp+depreciation (d) none of these
18. China is a _____ state.
 (a) Democratic (b) Fascist
 (c) Nazist (d) None of these
19. Recently which country's citizens decide Brexit ?
 (a) Portugal (b) UK
 (c) Russia (d) France
20. In emergency time which fundamental right runs?
 (a) Right to equality
 (b) Constitutional remedies
 (c) Right to freedom
 (d) None of these
21. In our solar system there are 9 planets and they have how many moons?
 (a) 81 (b) 79
 (c) 78 (d) 83+
22. Who is the Iron man of India ?
 (a) Subhash Chandra Bose
 (b) Sardar Vallabhbhai Patel
 (c) Nathuram Godse
 (d) None of these
23. Satyen Bose has shown his excellence in which of the following categories?
 (a) Stage acting
 (b) Motion pictures
 (c) Drawing and painting
 (d) Classical dance
24. Which of the following dances is a solo dance?
 (a) Ottan Thullal (b) Kuchipudi
 (c) Yakshagana (d) Odissi
25. Time taken by sun rays to reach earth is _____ minutes
 (a) 7.2 minutes (b) 8.33 minutes
 (c) 6.3 minutes (d) 7.1 minutes
26. Among the biotic components of the ecosystem, the producer system is
 (a) Sea (b) Rivers
 (c) Green Plants (d) Animals
27. Which instrument is used to measure altitudes in aircraft's ?
 (a) Audiometer (b) Ammeter
 (c) Altimeter (d) Anemometer
28. The chemical used as a fixer in photography is
 (a) sodium thiosulphate
 (b) sodium sulphate
 (c) borax
 (d) ammonium sulphate
29. Which of the following groups contains graphical file extensions?
 (a) JPG, CPX, GCM
 (b) GIF, TCF, WMF
 (c) TCP, JPG, BMP
 (d) JPG, GIF, BMP
30. In which of the following Indian States/UTs, India's first heliport has been inaugurated recently?
 (a) Tamil Nadu (b) Maharashtra
 (c) New Delhi (d) Chandigarh
31. The best indicator of economic development of any country is
 (a) Its agriculture
 (b) Its transport
 (c) Its gross production
 (d) Its per capita income
32. Which two Indus sites found in Afghanistan ?
 (a) Lothal and Daimabad
 (b) Shatughai and Dainabad
 (c) Shatughai and Mundigaaq
 (d) Mundigaaq and Daimabad
33. Which of the following group of gases contribute to the 'Green House Effect' ?
 (a) Carbon tetrafluoride and Nitrous oxide
 (b) Carbon monoxide and Sulphur dioxide
 (c) Ammonia and Ozone
 (d) Carbon dioxide and Methane
34. Which instrument is used to measure the power of electric circuit ?
 (a) Voltmeter (b) Wattmeter
 (c) Wavemeter (d) Viscometer
35. The oxide of Nitrogen used in medicine as anaesthetic is
 (a) Nitrogen pentoxide
 (b) Nitrous oxide
 (c) Nitric oxide
 (d) Nitrogen dioxide
36. MICR is exclusively used in _____
 (a) Libraries (b) Super markets
 (c) Stock markets (d) Banking Industry

37. Who was the father of Operation Flood ?
 (a) Dr. Norman Borlaug (b) Dr. M.S. Swaminathan
 (c) Dr. Verghese Kurien (d) Dr. William Gande
38. With whose permission did the English set up their first factory in Surat?
 (a) Akbar (b) Jahangir
 (c) Shahjahan (d) Aurangzeb
39. What is movement of cell against concentration gradient is called
 (a) osmosis (b) active transport
 (c) diffusion (d) passive transport
40. What is unit of Viscosity ?
 (a) coulomb
 (b) newton second per square meter
 (c) watt per meter per degree celcius
 (d) joule per kilogram per Kelvin
41. The most electronegative element among the following is
 (a) sodium (b) bromine
 (c) fluorine (d) oxygen
42. The head quarters of world trade organisation is in
 (a) Montreal (b) Geneva
 (c) New jersey (d) Seattle
43. Which one the following kingdoms was founded by Raja Odeyar ?
 (a) Tanjore (b) Jinji
 (c) Mysore (d) Madura
44. Milk is poor source of
 (a) Calcium (b) Iron
 (c) Copper (d) Sodium
45. Energy posses by a body in motion is called
 (a) Kinetic Energy
 (b) Potential Energy
 (c) Both of Above
 (d) None of Above
46. The metal that is used as a catalyst in the hydrogenation of oils is ?
 (a) Pb
 (b) Ni
 (c) Cu
 (d) Pt
47. Imperial Bank of India was old name of ?
 (a) State Bank of India
 (b) United Bank of India
 (c) Central Bank of India
 (d) Punjab National Bank
48. Which is not a type of protein ?
 (a) Simple Protein
 (b) Complex Protein
 (c) Conjugated Protein
 (d) Derived Protein
49. If lift is going up with acceleration, the apparent weight of a body is
 (a) may be more or less than true weight
 (b) equal to the true weight
 (c) less than the true weight
 (d) more than the true weight
50. Which have maximum number of isotopes ?
 (a) Bromine (b) Aluminium
 (c) Polonium (d) Carbon

ANSWERS

General Intelligence & Reasoning

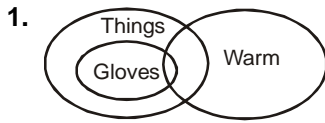
- | | | | | | | | | | |
|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| 1. (a) | 2. (b) | 3. (a) | 4. (b) | 5. (b) | 6. (d) | 7. (d) | 8. (d) | 9. (b) | 10. (a) |
| 11. (d) | 12. (c) | 13. (d) | 14. (d) | 15. (c) | 16. (c) | 17. (c) | 18. (c) | 19. (c) | 20. (c) |
| 21. (d) | 22. (c) | 23. (d) | 24. (a) | 25. (b) | 26. (c) | 27. (d) | 28. (d) | 29. (c) | 30. (d) |
| 31. (a) | 32. (b) | 33. (c) | 34. (b) | 35. (d) | 36. (d) | 37. (d) | 38. (b) | 39. (a) | 40. (d) |
| 41. (c) | 42. (b) | 43. (c) | 44. (d) | 45. (d) | 46. (a) | 47. (a) | 48. (c) | 49. (d) | 50. (b) |

General Awareness

- | | | | | | | | | | |
|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| 1. (a) | 2. (b) | 3. (c) | 4. (b) | 5. (a) | 6. (b) | 7. (c) | 8. (a) | 9. (a) | 10. (a) |
| 11. (a) | 12. (d) | 13. (a) | 14. (a) | 15. (c) | 16. (c) | 17. (b) | 18. (b) | 19. (b) | 20. (b) |
| 21. (d) | 22. (b) | 23. (b) | 24. (a) | 25. (b) | 26. (c) | 27. (c) | 28. (a) | 29. (d) | 30. (c) |
| 31. (d) | 32. (c) | 33. (d) | 34. (b) | 35. (a) | 36. (d) | 37. (c) | 38. (b) | 39. (b) | 40. (b) |
| 41. (c) | 42. (b) | 43. (c) | 44. (b) | 45. (a) | 46. (b) | 47. (a) | 48. (b) | 49. (d) | 50. (c) |

EXPLANATIONS

General Intelligence & Reasoning



As is clear from the Venn diagram, only conclusion (III) follows. Hence, option (a) is the correct answer.

2. As $(4 + 2) \times (7 + 4) = 66$ and $(3 + 5) \times (1 + 7) = 64$
Similarly, $(5 + 7) \times (2 + 1) = \underline{36}$.

3. The young one of a baboon is called an infant while the young one of a beaver is called a kitten. Hence, option (A) is the correct answer.

(20)	(1)	(12)	(5)	(14)	(20)
T	A	L	E	N	T
+2↓	-2↓	+2↓	-2↓	+2↓	-2↓
V	Y	N	C	P	R
(22)	(25)	(14)	(3)	(16)	(18)

Similarly,

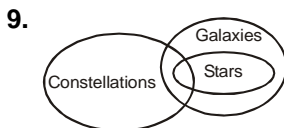
(14)	(15)	(18)	(13)	(1)	(12)
N	O	R	M	A	L
+2↓	-2↓	+2↓	-2↓	+2↓	-2↓
P	M	T	K	C	J
(16)	(13)	(20)	(11)	(3)	(10)

5. The series in numerical form can be written as 1-3, 1-2-4, 5-7, 5-6-8, 9-11. So, the next term in the series will be 9-10-12, i.e., ij1.

6. The series is A(1) C(3) E(5), G(7) I(9) K(11), and so on. So, the required terms will be Y(25) A(1) C(3), E(5) G(7) I(9).

7. The series is a,ab,abc,a,ab,abc,...

8. Gourd, Pumpkin and French Beans grow on vines while Jackfruit grows on trees. Hence, option (d) is the answer.



As shown in the diagram, only conclusion II follows. Hence, option (b) is the correct answer.

10. The sequence will be

Arun > Bhanu > Esha > Charu > Divya
Hence, Arun is the eldest.

11. This analogy is about the idioms which are used to draw comparisons. The idioms are as sick as a dog and as busy as a bee. Hence, option (d) is the correct answer.

12. Sum of the digits of 272 is 11. While in rest of the three options, sum of the digits of the numbers is 10.

13. The given statement shows a cause and effect relationship. It says that when people work hard, they succeed. Neither does the statement say anything about hard work being the only way to succeed nor does it say anything about any other way that will or will not lead to success. Therefore, we can say that none of the conclusions follow. Hence, option (d) is the correct answer.

14. The series is aabc, abbc, abcc,....

15. Animals in options (a), (b) and (d) are mammals while hen is a bird. Hence, option (c) is the correct answer.

17. Fossil fuel is the answer since it is a non renewable source of energy, while energy resources in options (a), (b) and (d) are renewable energy sources.

18. 1 and 5 are opposite but in option (a) they are adjacent. Similarly, 3 and 6 are opposite but in option (b) they are adjacent. Similarly, 2 and 4 are opposite but in option (d) they are adjacent. Hence, option (c) is correct.

19. Reversing the digits of the numbers in series, we get 1, 9, 25, 49, 81, 75, 169

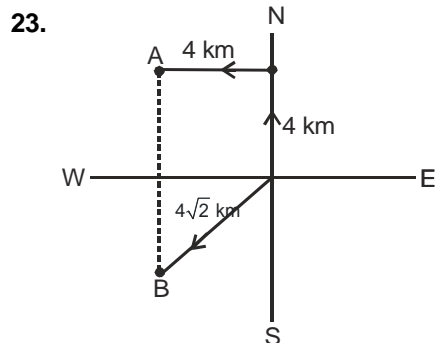
All numbers are squares of odd consecutive numbers except 75.

Hence, answer is 57.

20. Option (c) is the answer since the given word has a single 'R' while TROUSER uses 'R' twice.

21. Option (d) is the correct answer since the given word does not have 'E', while CAVERN has an 'E' in it.

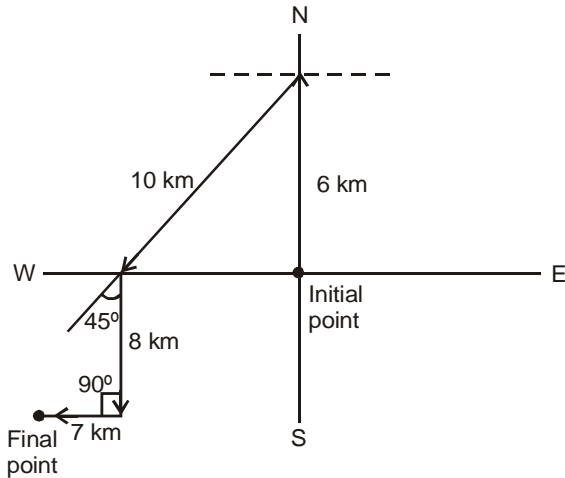
22. Out of the given options, only bonsai is not a plant. Bonsai is a Japanese art form using miniature trees grown in containers. Hence, option (c) is the correct answer.



Hence, A is in North with respect to B.

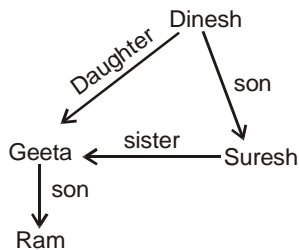
24. In column 1,
 $8 \times 32 = 256 = 16^2$
 In column 2,
 $32 \times 18 = 576 = 24^2$
 Similarly, in column 3,
 $27 \times ? = 18^2 \Rightarrow ? = 12.$

26.

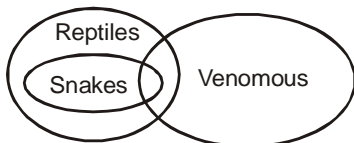


28. P(16) $\xrightarrow{+4}$ T(20)
 L(12) $\xrightarrow{-4}$ H(8)
 A(1) $\xrightarrow{+4}$ E(5)
 N(14) $\xrightarrow{-4}$ J(10)
 E(5) $\xrightarrow{+4}$ I(9)
 T(20) $\xrightarrow{-4}$ P(16)
 Similarly,
 S(19) $\xrightarrow{+4}$ W(23)
 Q(17) $\xrightarrow{-4}$ M(13)
 U(21) $\xrightarrow{+4}$ Y(25)
 A(1) $\xrightarrow{-4}$ W(23)
 R(18) $\xrightarrow{+4}$ V(22)
 E(5) $\xrightarrow{-4}$ A(1)

34.

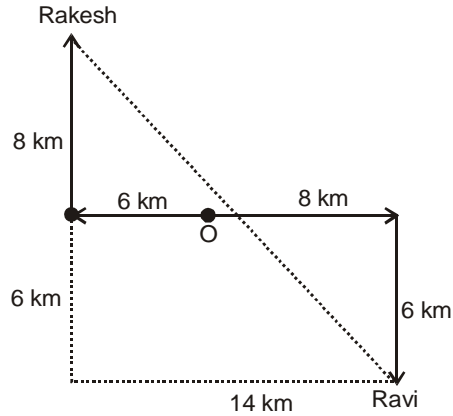


35.



All snakes are reptiles. Some snakes are venomous and some reptiles other than snakes are also venomous. Similarly, some creatures that are not reptiles are also venomous. Hence, option (d) is the correct answer.

36.

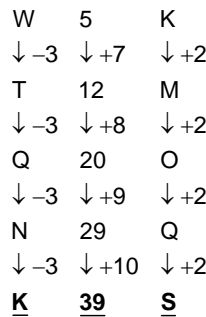


Let O be the initial position of Ravi and Rakesh.
 Distance between Ravi and Rakesh

$$= \sqrt{14^2 + 14^2} = 14\sqrt{2} \text{ km.}$$

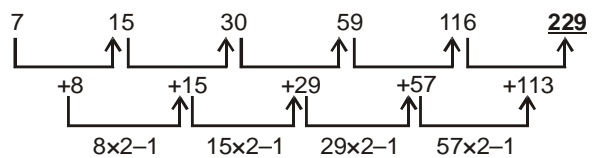
37. The number indicated by these symbols is 7 4 8 1 6.

38.

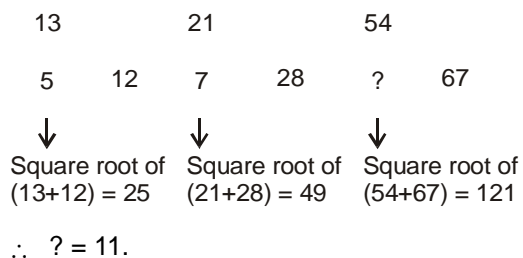


39. WATCH = 45 + 1 + 39 + 5 + 15 = 105.

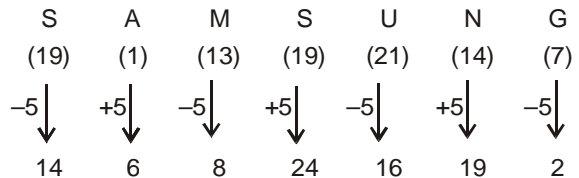
40.



41.



42.



Similarly,

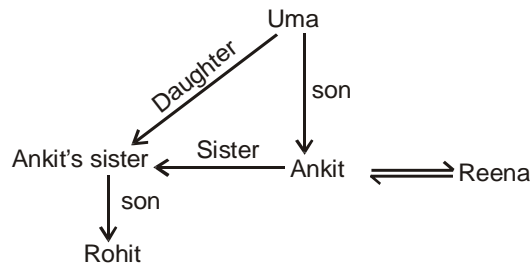
L	I	B	E	R	T	Y
(12)	(9)	(2)	(5)	(18)	(20)	(25)
-5↓	+5↓	-5↓	+5↓	-5↓	+5↓	-5↓
7	14	23	10	13	25	20

43. By reversing the digits of each term, the series will be:

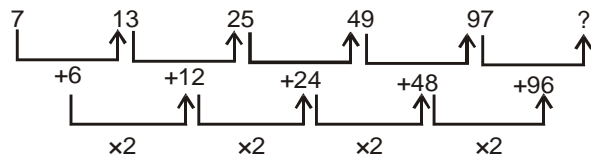
27, 64, 125, 216, 343.

The series is formed by the cubes of consecutive numbers starting from 3. Hence, the next term in the series will be $8^3 = 512$ and by reversing the digits of the same, we get 215 as the next term in the series.

44.



45.



$\therefore ? = 97 + 96 = 193.$

46. Total members = $2 + 3 + 4 \times 2 + 4 \times 5 = 33.$

47. B X
 ↓ +3 ↓ -3
 E U
 ↓ +3 ↓ -3
 H R
 ↓ +3 ↓ -3
 K O
 ↓ +3 ↓ -3
N L
 ↓ +3 ↓ -3
 Q I
 ↓ +3 ↓ -3
T F

48. $462 * 3 \Rightarrow 462 \times 3 = 1386 \rightarrow 1 + 3 + 8 + 6 = 18$
 $564 * 2 \Rightarrow 564 \times 2 = 1128 \rightarrow 1 + 1 + 2 + 8 = 12$
 Similarly, $617 * 4 \Rightarrow 617 \times 4 = 2468 \rightarrow 2 + 4 + 6 + 8 = 20.$

49. From matrix,

G – 57, 68, 75, 86, 99

L – 03, 11, 20, 34, 42

O – 02, 10, 23, 31, 44

W – 59, 66, 77, 85, 98

From options,

GLOW $\rightarrow 68, 34, 23, 98.$

50. B G L
 ↓ +4 ↓ +4 ↓ +4
 F K P
 ↓ +4 ↓ +4 ↓ +4
 J O T
 ↓ +4 ↓ +4 ↓ +4
N S X

Civil

- The largest value of stability number is
(a) 0.261 (b) 0.5
(c) 1.0 (d) 2.0
- Consider the following statements regarding 'setting of cement':
 - Low-heat cement sets faster than OPC.
 - Final setting time decides the strength of cement.
 - Initial setting time of Portland Pozzollona is 30 minutes.
 - Air-induced setting is observed when stored under damp conditions.
 - Addition of gypsum retards the setting time.

Which of the above statements are correct?

- (a) 1, 2 and 3 (b) 2, 3 and 4
(c) 3, 4 and 5 (d) 2, 3 and 5
- Extracts from the head-discharge characteristics of two centrifugal pumps are tabulated with respective subscripts 1 and 2; manometric head h_m is given in metres; and discharge Q is given in lps:

Q	12	14	16	18	20
h_{m_1}	50.2	50.8	51.3	50.0	30.0
h_{m_2}	42.4	38.8	35.7	32.0	25.0

The pumps are connected in series against a static head of 80 m; the estimate of the total of head

losses is $\frac{Q^2}{120}$ m. What is the delivered discharge?

- (a) 15.80 lps
(b) 16.35 lps
(c) 17.35 lps
(d) 17.75 lps
- For sand of uniform spherical particles, the ratio of void ratios in the loosest and the densest states is
(a) 2.6
(b) 3.5
(c) 4.6
(d) 3.0
 - Consider the following statements regarding 'strength of cement':
 - Strength test on cement is made on cubes of cement-sand mix.
 - Water to be used for the paste is 0.25P, where P is the water needed for normal consistency.
 - The normal consistency is determined on Le Chatelier's apparatus.

- Cubes are cast in two layers in leak-proof moulds further compacted in each layer by vibration on a machine.

Which of the above statements are correct?

- (a) 1 and 2 (b) 2 and 3
(c) 1 and 4 (d) 3 and 4
- The unit of payment for road side brick edging is in
(a) cubic meter
(b) meter
(c) running meter
(d) kg
 - If damping ratio is 0.10 and damping coefficient is 225 kN sec/m, then critical damping coefficient in kN sec/m will be
(a) 22.5 (b) 225
(c) 2250 (d) 22500
 - Which of the following ingredients refer to binding materials of mortar?
 - Cement
 - Lime
 - Sand
 - Ashes

Select the correct answer using the code given below.

- (a) 1 and 4
(b) 3 and 4
(c) 1 and 2
(d) 2 and 3
- While estimating for plastering, usually no deduction is made for
(a) ends of beams
(b) small openings upto 0.5 sq m
(c) ends of rafters
(d) all of these
 - For a given soil sample,
 C_c = coefficient of gradation
 C_u = coefficient of uniformity
 D_{10} = effective size
 D_{30} = diameter through which 30 per cent of the total soil mass is passing
If C_c is 1.0 and C_u is 4.0, then value of D_{30}/D_{10} would be
(a) 2.00
(b) 1.75
(c) 1.50
(d) 1.25

Direction (Q. 11) : Each of the items consists of two statements, one labelled as 'Statement (I)' and the other as 'Statement (II)'. You are to examine these two statements and select the answers to these items using the code given below :

Codes :

- (a) Both statement (I) and Statement (II) are individually true and statement (II) is the correct explanation of Statement (I)
- (b) Both Statement (I) and Statement (II) are individually true but statement (II) is **not** the correct explanation of Statement (I)
- (c) Statement (I) is true but Statement (II) is false
- (d) Statement (I) is false but Statement (II) is true

11. Statement (I) :

Bricks are soaked in water before using in brick masonry for removing dirt and dust.

Statement (II) :

Bricks are soaked in water before using in brick masonry so that bricks do not absorb moisture from the bonding cement mortar.

- 12.** Ratio of cost of labour to the total cost of the building is
- (a) 1 : 10
 - (b) 1 : 4
 - (c) 1 : 1
 - (d) 6 : 10

- 13.** The relationship between water content ($w\%$) and number of blows (N) in soils, as obtained from Casagrande's liquid limit device, is given by

$$w = 20 - \log_{10} N$$

The liquid limit of the soil is

- (a) 15.6%
- (b) 16.6%
- (c) 17.6%
- (d) 18.6%

Direction (Q. 14) : Each of the items consists of two statements, one labelled as 'Statement (I)' and the other as 'Statement (II)'. You are to examine these two statements and select the answers to these items using the code given below :

Codes :

- (a) Both statement (I) and Statement (II) are individually true and statement (II) is the correct explanation of Statement (I)
- (b) Both Statement (I) and Statement (II) are individually true but statement (II) is **not** the correct explanation of Statement (I)
- (c) Statement (I) is true but Statement (II) is false
- (d) Statement (I) is false but Statement (II) is true

14. Statement (I) :

Preparing mortar by using masonry cement improves workability as well as the finish during plastering.

Statement (II) :

Masonry cement is easy to handle.

- 15.** Thickness of 25 gauge sheet is

- (a) less than 1 mm
- (b) 1 mm
- (c) between 1 mm and 1.5 mm
- (d) 2 mm

- 16.** When the degree of consolidation is 50%, the time factor is about

- (a) 0.2
- (b) 0.5
- (c) 1.0
- (d) 2.0

Direction (Q. 17) : Each of the items consists of two statements, one labelled as 'Statement (I)' and the other as 'Statement (II)'. You are to examine these two statements and select the answers to these items using the code given below :

Codes :

- (a) Both statement (I) and Statement (II) are individually true and statement (II) is the correct explanation of Statement (I)
- (b) Both Statement (I) and Statement (II) are individually true but statement (II) is **not** the correct explanation of Statement (I)
- (c) Statement (I) is true but Statement (II) is false
- (d) Statement (I) is false but Statement (II) is true

17. Statement (I) :

Grading of concrete is based on 28-day strength.

Statement (II) :

Concrete does not gain any further strength after 28-day curing.

- 18.** In a detailed estimate the provision for contingencies is, usually

- (a) 1 per cent
- (b) 3 to 5 per cent
- (c) 10 per cent
- (d) 12 to 15 per cent

- 19.** The stress distribution at a depth beneath a loaded area is determined using Newmark's influence chart which indicate an influence value of 0.005. The number of the segments covered by the loaded area in the chart is 20 and the intensity of loading on the area is 10 T/m². The intensity of stress distribution at that depth is

- (a) 1 T/m²
- (b) 2 T/m²
- (c) 5 T/m²
- (d) 10 T/m²

Direction (Q. 20) : Each of the items consists of two statements, one labelled as 'Statement (I)' and the other as 'Statement (II)'. You are to examine these two statements and select the answers to these items using the code given below :

Codes :

- (a) Both statement (I) and Statement (II) are individually true and statement (II) is the correct explanation of Statement (I)
- (b) Both Statement (I) and Statement (II) are individually true but statement (II) is **not** the correct explanation of Statement (I)
- (c) Statement (I) is true but Statement (II) is false
- (d) Statement (I) is false but Statement (II) is true

20. Statement (I) :

Addition of admixture improves the workability of concrete.

Statement (II) :

Addition of admixture increases the strength of concrete.

21. Generally the provision for supervision is

- (a) 1 per cent
- (b) 2 to 3 per cent
- (c) 3 to 5 per cent
- (d) 5 to 10 per cent

22. If in a flownet diagram, length of the flow line in the last square is 2 m, total head loss is 18 m and the number of potential drops is 12, then value of exit gradient is

- (a) 0.33
- (b) 0.75
- (c) 1.33
- (d) 3.00

23. Which compound of cement is responsible for strength of cement?

- (a) Magnesium oxide
- (b) Silica
- (c) Alumina
- (d) Calcium sulphate

24. In specification of earth work in foundation trenches, drains etc. lift ordinarily specified is

- (a) 30 m
- (b) 5 m
- (c) 3 m
- (d) 1.5 m

25. Under load, the void ratio of a submerged saturated clay decreases from 1.00 to 0.92. What will be the ultimate settlement of the 2 m thick clay due to consolidation?

- (a) 20 mm
- (b) 40 mm
- (c) 80 mm
- (d) 160 mm

26. Which type of cement is recommended in large mass concrete works such as a dam?

- (a) Ordinary Portland
- (b) High Alumina
- (c) Low-heat Portland
- (d) Portland Pozzollona

27. The useful part of liveable area of a building is called

- (a) carpet area
- (b) circulation area
- (c) horizontal circulation area
- (d) plinth area

28. The two criteria for the determination of allowable bearing capacity of a foundation are

- (a) tensile failure and compression failure.
- (b) tensile failure and settlement.
- (c) bond failure and shear failure.
- (d) shear failure and settlement.

29. Consider the following statements regarding 'setting of cement' :

1. Low-heat cement sets faster than OPC.
2. Final setting time decides the strength of cement.
3. Initial setting time of Portland Pozzollona is 30 minutes.
4. Air-induced setting is observed when stored under damp conditions.
5. Addition of gypsum retards the setting time.

Which of the above statements are correct?

- (a) 1, 2 and 3
- (b) 2, 3 and 4
- (c) 3, 4 and 5
- (d) 2, 3 and 5

30. In analysis of rates, contractor profit is taken at the rate of

- (a) 1%
- (b) 5%
- (c) 10%
- (d) 20%

31. If the effective stress strength parameters of a soil are $c' = 10$ kPa and $\phi' = 30^\circ$, the shear strength on a plane within the saturated soil mass at a point where total normal stress is 300 kPa, and pore water pressure is 150 kPa, will be

- (a) 90.5 kPa
- (b) 96.6 kPa
- (c) 101.5 kPa
- (d) 105.5 kPa

32. When power shovels are operated under different site conditions (in terms of material handled), what is the correct sequence in the increasing order of the output for the following materials?

1. Well-blasted rock
2. Hard and tough clay

3. Poorly blasted rock
4. Moist loam or sand

Select the correct answer using the code given below:

Codes :

- (a) 1-2-3-4 (b) 1-4-3-2
(c) 4-2-3-1 (d) 4-3-1-2
- 33.** Original cost of property minus depreciation is
(a) book value (b) salvage value
(c) rateable (d) obsolescence value
- 34.** The Hardy Cross method of hydraulic analysis of pipe networks, besides satisfying the continuity and energy principles, must also satisfy the condition that
(a) algebraic sum of the head losses around any closed loop is zero
(b) flow into any junction equals the outflow from it.
(c) flow in each pipe has head loss according to Darcy-Weisbach or any other pipe head loss equation
(d) momentum principle is followed.
- 35.** A double draining clay layer, 6m thick, settles by 30mm in three years under the influence of a certain load. Its final consolidation settlement has been estimated to be 120mm. If a thin layer of sand having negligible thickness is introduced at a depth of 1.5m below the top surface, then final consolidation settlement of clay layer will be
(a) 60 mm (b) 120 mm
(c) 240 mm (d) None of these
- 36.** Which is the most common cause of acidity in water ?
(a) Carbon monoxide (b) Nitrogen
(c) Hydrogen (d) Carbon dioxide
- 37.** If physical quantities involved in a fluid flow phenomenon are discharge Q , diameter D , acceleration due to gravity g , dynamic viscosity μ and density ρ , then number of π parameters needed to express the function $F(Q, D, g, \mu, \rho) = 0$ are
(a) 2 (b) 3
(c) 4 (d) 5
- 38.** In a Mohr's diagram, a point above Mohr's envelope indicates
(a) imaginary condition
(b) safe condition
(c) imminent failure condition
(d) condition of maximum obliquity
- 39.** Tool used for quarrying of stones is
(a) Dipper (b) Spalling hammer
(c) Jumper (d) Priming needle
- 40.** When a particular discharge is flowing in a horizontal pipe, a mercury-water U-tube manometer connected to the entrance and throat of a venturimeter fitted in the pipe recorded a deflection of 25 cm. If same discharge flowed through the same pipe kept at an inclination of 45° to the horizontal, then corresponding deflection by the U-tube manometer will be
(a) $25\sqrt{2}$ cm (b) $25/\sqrt{2}$ cm
(c) $22/2$ cm (d) 25 cm
- 41.** An unit volume of a mass of saturated soil is subjected to horizontal seepage. The saturated unit weight is 22 kN/m^3 and the hydraulic gradient is 0.3. The resultant body force on the soil mass is
(a) 1.98 kN (b) 6.6 kN
(c) 11.49 kN (d) 22.97 kN
- 42.** If total hardness and alkalinity of a water sample are 200 mg/l as CaCO_3 and 260 mg/l as CaCO_3 respectively, what are the values of carbonate hardness and non-carbonate hardness ?
(a) 200 mg/l and zero
(b) Zero and 60 mg/l
(c) Zero and 200 mg/l
(d) 60 mg/l and zero
- 43.** A ship's model of scale 1 : 100 had a wave resistance of 1 kg at its design speed. The corresponding wave resistance in prototype will be
(a) 100 kg (b) 10000 kg
(c) 1000000 kg (d) 1000 kg
- 44.** The maximum average depth due to one day storm over an area of 100 km^2 is 10 cm. Depth-Area-Duration (DAD) curves indicate that for the same area of 100 km^2 maximum average depth for a 3 hour storm will be
(a) 10 cm
(b) more than 10 cm
(c) less than 10 cm
(d) none of these
- 45.** In the context of collecting undisturbed soil samples of high quality using a spoon sampler, following statements are made.
I. Area ratio should be less than 10%
II. Clearance ratio should be less than 1%

With reference to above statements, which of the following applies ?

- (a) Both the statements are true
 (b) Statement II is true but I is false
 (c) Statement I is true but II is false
 (d) Both the statements are false
- 46.** The increase in metacentric height
1. increases stability
 2. decreases stability
 3. increases comfort for passengers
 4. decreases comfort for passengers
- The correct answer is
- (a) (1) and (3) (b) (1) and (4)
 (c) (2) and (3) (d) (2) and (4)
- 47.** If 4 hr unit hydrograph of a basin can be approximated as a triangle with a base period 48 h and a peak ordinate of 200 m³/s, then area of basin will be
- (a) 1728 km² (b) 3456 km²
 (c) 864 km² (d) 5184 km²
- 48.** A soil sample is having a specific gravity of 2.60 and a void ratio of 0.78. The water content in percentage required to fully saturate the soil at that void ratio would be
- (a) 10 (b) 30
 (c) 50 (d) 70
- 49.** Which one of the following velocity fields represents a possible fluid flow ?
- (a) $u = x; v = y$ (b) $u = x^2; v = y^2$
 (c) $u = xy; v = x^2y^2$ (d) $u = x; v = -y$
- 50.** The direct runoff hydrograph of a basin can be approximated as a triangle with a base period of 80 h and a peak flow of 200 m³/s occurring at 16th hour. If area of the basin is 1440 km², then depth of runoff indicated by the hydrograph will be
- (a) 1 cm (b) 10 cm
 (c) 2 cm (d) 12 cm
- 51.** A loose uniform sand with rounded grains has effective grain size of 0.05 cm. Coefficient of permeability of the sand is
- (a) 0.25 cm/sec (b) 0.50 cm/sec
 (c) 1.00 cm/sec (d) 1.25 cm/sec
- 52.** The critical state of flow through a channel section may be defined as the state of flow at which
- (a) specific energy is maximum for a given discharge
 (b) specific force is maximum for a given discharge
 (c) discharge is maximum for a given specific force
 (d) discharge is minimum for a given specific energy.
- 53.** When a 2 hour unit hydrograph is available, other unit hydrograph of following duration may be easily prepared except
- (a) 4 hours (b) 5 hours
 (c) 1 hour (d) 8 hours
- 54.** The amount of irrigation water required to meet the evapotranspiration needs of the crop during its full growth is called
- (a) effective rainfall
 (b) consumptive
 (c) consumptive irrigation requirement
 (d) net irrigation requirement
- 55.** If flow net of a coffer dam foundation had 6 numbers of flow channels and 16 numbers of equipotential drops, with the head of water lost during seepage being 6 m through the foundation having $k = 4 \times 10^{-5}$ m/minute, the seepage loss (in m³/day) per metre length of the dam will be
- (a) 2.16×10^{-3} (b) 6.48×10^{-3}
 (c) 12.96×10^{-2} (d) 25.92×10^{-2}
- 56.** The equation $\tau = -\frac{dp}{dl} \frac{r}{2}$ for flow through circular tubes, where τ is shear stress at distance r from centre, is applicable for
- (a) laminar flow only
 (b) turbulent flow only
 (c) critical flow
 (d) both laminar and turbulent flows.
- 57.** A balancing reservoir is one which
- (a) balances the peak and minimum flows
 (b) balances the distribution
 (c) balances the flow rates of supply and demand
 (d) stores water for emergencies
- 58.** In a saturated soil deposit having a density of 22 kN/m³, the effective normal stress on a horizontal plane at 5 m depth will be
- (a) 22 kN/m² (b) 50 kN/m²
 (c) 60 kN/m² (d) 110 kN/m²
- 59.** Which of the following does not fall in the category of displacement method ?
- (a) Method of consistent deformation
 (b) Equilibrium method
 (c) Moment distribution method
 (d) Stiffness method

60. The unit cohesion of a saturated clay is 1 kg/cm^2 . The net ultimate bearing capacity of a square footing in this clay will be approximately
- (a) 2 t/m^2 (b) 10 t/m^2
(c) 15 t/m^2 (d) 40 t/m^2
61. Size of a venturimeter is specified by
- (a) pipe diameter
(b) throat diameter
(c) angle of diverging section
(d) both pipe diameter as well as throat diameter.
62. A saturated clay layer with single drainage face takes 4 years to attain 50% degree of consolidation. If clay layer had double drainage, then time to attain 50% degree of consolidation is
- (a) 8 year (b) 4 year
(c) 2 year (d) 1 year
63. A fluid is a substance that
- (a) is essentially incompressible
(b) has a viscosity that always decreases with temperature
(c) can not remain at rest when subjected to a shearing stress
(d) can not be subjected to shear forces.
64. *Specific yield* for an unconfined aquifer is
- (a) greater than porosity
(b) less than porosity
(c) equal to porosity
(d) unrelated to porosity
65. Castigliano's theorem fall under the category of
- (a) displacement method
(b) equilibrium method
(c) force method
(d) stiffness method
66. Soil are arranged in face to face orientation. This type of soil structure is
- (a) dispersed
(b) cohesive matrix
(c) honey comb
(d) flocculent
67. In which treatment unit is "Schmutz decke" formed ?
- (a) Sedimentation tank
(b) Rapid sand filter
(c) Coagulation tank
(d) Slow sand filter
68. Under the same conditions, which of the following shapes of water surface will give the highest rate of evaporations ?
- (a) Flat water surface
(b) Convex water surface
(c) Concave water surface
(d) Independent of shape of water surface.
69. If in a soil sample piping phenomenon occurs, then what is the most prominent condition to be satisfied?
- (a) Soil is fine grained
(b) Hydraulic gradient is close to unity
(c) Void ratio is more than 2.0
(d) Specific gravity of soil solids is more than 2.8
70. Compatibility conditions are essentially required to solve
- (a) substitute frame (b) complex truss
(c) redundant frame (d) compound truss
71. The maximum bending moment at the left quarter point of a simple beam due to crossing of UDL of length shorter than the span in the direction left to right; would occur after the load had just crossed the section by
- (a) one-fourth of its length
(b) half of its length
(c) three-fourth of its length
(d) its full length
72. The correct order of capillary rise in increasing order in different types of soils is
- (a) fine sand, clay, silt, colloids
(b) silt, fine sands, clay, colloids
(c) fine sand, clay, colloids, silt
(d) fine sand, silt, clay, colloids
73. Which of the following is the critical combination of stresses for interior and edge regions in a cement concrete pavements during summer mid day?
- (a) $L_s - W_s + F_s$ (b) $L_s + W_s + F_s$
(c) $L_s + W_s - F_s$ (d) $L_s - W_s - F_s$
- where,
- L_s = load stress,
 W_s = warping stress,
 F_s = frictional stress
74. Moment distribution method is best suited for
- (a) indeterminate pin jointed truss
(b) rigid frames
(c) space frames
(d) trussed beam

75. Due to some point load anywhere on a fixed beam, the maximum free bending moment is M . The sum of fixed end moment is

- (a) M (b) $1.5 M$
(c) $2.0 M$ (d) $3.0 M$

76. Taylors stability number curves are used for the analysis of stability of slopes. The angle of shearing resistance used in the chart is the

- (a) mobilised angle (b) weighted angle
(c) effective angle (d) apparent angle

77. The critical condition of loading for combination of stresses in cement concrete roads for corner region is

- (a) load stress + frictional stress
(b) load stress + warping stress
(c) load stress + warping stress + frictional stress
(d) load stress + warping stress - frictional stress

78. The horizontal thrust due to rise in temperature in a semi-circular two hinged arch of radius R is proportional to

- (a) R (b) R^2
(c) $\frac{1}{R}$ (d) $\frac{1}{R^2}$

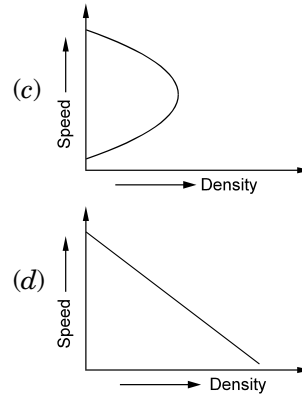
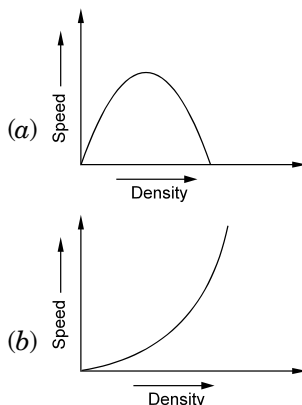
79. If azimuths of the two tangents to a circular curve of radius 100 m are due north and due east, then area bounded by the two tangents and the circular curve will be

- (a) 7857 sq m (b) 5000 sq m
(c) 3143 sq m (d) 2143 sq m

80. If unconfined compressive strength of a clay in undisturbed and remoulded state are 4.5 kg/cm^2 and 1.5 kg/cm^2 respectively, then sensitivity of clay will be

- (a) 2.0 (b) 3.0
(c) 0.5 (d) 5.0

81. Which of the following figure shows the relationship between traffic speed and traffic density?



82. If parallax difference between top and bottom of a tree is measured as 1.32 mm on a stereo-pair of photos taken at 3000 m above ground and average photo base is 66 mm, then height of the tree will be

- (a) 45.49 m (b) 60.00 m
(c) 23.51 m (d) 39.50 m

83. Negative skin friction on a pile under vertical compressive load acts

- (a) downward and increases the load carrying capacity of the pile.
(b) downward and reduces the load carrying capacity of the pile.
(c) upwards and increases the load carrying capacity of the pile.
(d) downwards and maintains the same load carrying capacity of the pile.

84. If staff intercept on a staff located at 100 m from the level for five division deviation of the bubble is 0.050 m and if length of one division of the bubble is 2 mm, then radius of curvature of the bubble tube is

- (a) 2.02 m (b) 2.20 m
(c) 20.00 m (d) 20.20 m

85. An index map used in highway project shows

- (a) proposed and existing roads and important places to be connected
(b) general topography of the area
(c) details of various alternate alignments
(d) general details of existing structures like buildings, wells etc.

86. Given that a single degree of freedom, k = stiffness co-efficient, m =mass of machine and foundation, then critical damping is best defined by the expression

- (a) $2 \pi k \sqrt{m}$ (b) $4.2 \sqrt{km}$
(c) $2 \pi k \sqrt{\frac{1}{m}}$ (d) $2 \pi \sqrt{\frac{k}{m}}$

87. The Local Sidereal Time (LST) is always
- ahead of the Local Mean Time (LMT) by about 2 hours per month
 - behind LMT by about 2 hours per month
 - ahead of LMT by about 4 hours per month
 - equal to LMT
88. Consider the following statements :
- Brickwork will have high water tightness.
 - Brickwork is preferred for monument structures.
 - Bricks resist fire better than stones.
 - Bricks of good quality shall have thin mortar bonds.
- Which of the above statements are correct?
- 1 and 2
 - 3 and 4
 - 2 and 3
 - 1 and 4
89. The shift of transition curve of radius 300 m and length 48 m is
- 0.32 m
 - 0.42 m
 - 0.52 m
 - 0.62 m
90. Pile caps are used on a group of piles to
- increase the load bearing capacity of each pile.
 - protect the piles from lateral displacement.
 - protect in case of offshore structure.
 - spread the vertical and horizontal loads to all the piles.
91. Consider the following statements :
- Noise pollution can be reduced using double-glass window panes.
 - Glass absorbs the noise.
 - The air trapped in the double-glass system acts as an insulator and reduces the noise.
 - The noise totally reflects back due to the two layers of glass.
- Which of these statements are correct?
- 1, 2, 3 and 4
 - 1, 2 and 3 only
 - 1 and 3 only
 - 2 and 4 only
92. What is the minimum sight distance required to avoid a head-on collision of two cars approaching from the opposite directions at 90 and 60 kmph? It is given that reaction time is 2.5 second, coefficient of friction is 0.7 and a brake efficiency is 50 per cent in either case.
- 153.6 m
 - 82.2 m
 - 71.4 m
 - 235.8 m
93. Noise pollution in a road-side building can be reduced by
- providing a ditch around the building and filling it with water
 - providing a steel mesh around the building
 - providing a thick bush around the building
 - planting tall trees around the building and fencing them with barbed wires
94. The collapsible soil is associated with
- dune sands
 - laterite soils
 - loess
 - black cotton soils
- Direction :** The following item consist of two statements, one labelled as the Assertion (A)' and the other as Reason (R)'. You are to examine these two statements carefully and select the answers to these items using the codes given below :
- Codes :**
- Both A and R are individually true and R is the correct explanation of A
 - Both A and R are individually true but R is **not** the correct explanation of A
 - A is true but R is false
 - A is false but R is true
95. **Assertion (A):**
- At the standard temperature, the kinematic viscosity of air is greater than that of water at the same temperature.
- Reason (R) :**
- The dynamic viscosity of air at standard temperature is lower than that of water at the same temperature.
96. What type of noise can be abated by providing lining on walls and ceiling with sound absorbing materials?
- Source noise
 - Reflection noise
 - Structural noise
 - Direct air-borne noise
97. The settlement analysis for a clay layer draining from top and bottom shows a settlement of 2.5 cm in 4 years and an ultimate settlement of 10 cm. However detailed subsurface investigation reveals that there is no drainage at the bottom. The ultimate settlement in this condition will be
- 2.5 cm
 - 5 cm
 - 10 cm
 - 20 cm

98. Which of the following pairs are correctly matched ?

- | | | |
|------------------|-------|---|
| 1. Reverberation | | Time require time to reduce noise by 60 dB |
| 2. NIPTS | | Responsible for permanent hearing loss |
| 3. Sound foci | | Formed when sound waves are reflected from convex surface |
| 4. TTS | | Responsible for temporary hearing loss |

Select the correct answer using the codes given below:

- | | |
|----------------|---------------|
| (a) 2, 3 and 4 | (b) 1,3 and 4 |
| (c) 1,2 and 4 | (d) 1,2 and 3 |

Direction (Q. 99) : Each of the items consists of two statements, one labelled as the 'Statement (I)' and the other as 'Statement (II)'. You are to examine these two statements carefully and select the answers to these items using the codes given below :

99. **Statement (I) :**

'Environment' includes abiotic and biotic parameters.

Statement (II) :

Abiotic parameters include algae, bacteria, animals; and biotic parameters are air, water and soil.

100. A soil sample tested in a triaxial compression apparatus failed when total maximum and minimum principal stresses were 100 kPa and 40 kPa, respectively. The pore pressure measured at failure was 10 kPa. The effective principal stress ratio at failure is

- (a) 2.5
 (b) 3.0
 (c) 2.75
 (d) 2.0

ANSWERS

1. (a)	2. (c)	3. (a)	4. (a)	5. (c)	6. (c)	7. (c)	8. (c)	9. (d)	10. (a)
11. (d)	12. (b)	13. (d)	14. (a)	15. (a)	16. (a)	17. (c)	18. (b)	19. (a)	20. (c)
21. (d)	22. (b)	23. (b)	24. (d)	25. (c)	26. (d)	27. (a)	28. (d)	29. (c)	30. (c)
31. (b)	32. (c)	33. (a)	34. (c)	35. (b)	36. (d)	37. (a)	38. (a)	39. (c)	40. (d)
41. (b)	42. (a)	43. (c)	44. (b)	45. (c)	46. (a)	47. (a)	48. (b)	49. (d)	50. (c)
51. (a)	52. (c)	53. (b)	54. (c)	55. (c)	56. (d)	57. (c)	58. (c)	59. (a)	60. (b)
61. (d)	62. (d)	63. (c)	64. (b)	65. (c)	66. (a)	67. (d)	68. (b)	69. (b)	70. (c)
71. (c)	72. (a)	73. (c)	74. (b)	75. (a)	76. (a)	77. (c)	78. (d)	79. (d)	80. (b)
81. (d)	82. (b)	83. (b)	84. (c)	85. (b)	86. (b)	87. (b)	88. (b)	89. (a)	90. (d)
91. (c)	92. (d)	93. (c)	94. (c)	95. (b)	96. (b)	97. (c)	98. (a)	99. (c)	100. (b)

EXPLANATIONS

1. Maximum value of stability number is 0.261 and it corresponds to a slope of 90° in purely cohesive soil ($\phi = 0$). In this case depth factor is equal to 1.
2. Setting time of low heat cement is same as OPC. Setting times are independent of strength.
3. When pumps are in connected in series, total head is sum of the manometric heads of pumps in series.

$$H = H_{m_1} + H_{m_2}$$

$$50 + 32 - h_L = H$$

$$50 + 32 - \frac{Q^2}{120} = 80 \quad [\text{Where } Q \text{ is in p.s}]$$

$$82 - \frac{Q^2}{120} = 80$$

$$\therefore \frac{Q^2}{120} = 2$$

$$Q^2 = 120 \times 2 = 240$$

$$\therefore Q = \sqrt{240} \cong 15.8 \text{ lps}$$
4. Void ratio in loosest state is 0.91 and void ratio in densest is 0.35.
5. Normal consistence is determined on vicat apparatus statement-3 is wrong. Water used for making cement paste is 0.25 p (p is normal consistency) statement-2 is also wrong.
7. Damping ratio = $\frac{\text{damping coefficient}}{\text{critical damping coefficient}}$
8. Sand and ashes can't be used as a binding material.
10. $C_c = \frac{D_{30}^2}{D_{60} D_{10}}$ and $C_u = \frac{D_{60}}{D_{10}}$

$$\therefore \frac{D_{30}}{D_{10}} = \sqrt{C_c C_u} = \sqrt{1 \times 4} = 2$$
11. Bricks are soaked in water not to remove dirt and dust. Dirt and dust can be removed by sprinkling with jets of water.

The main purpose of soaking in water is to make it saturated and to avoid absorption of moisture from cement mortar.
13. Liquid limit is the water content for 25 number of blows.

$$\therefore LL = 20 - \log_{10} 25 = 18.6$$

14. Masonry cements are workable and give fine fire finish, therefore these masonry cements are easily handled.

$$16. T_v = \frac{\pi}{4} U^2 = \frac{\pi}{4} (0.5)^2 = 0.2$$

17. Grading of cement concrete is based on 28 day strength. After 28 days there will be slow rate of gain of strength until 1 year.

$$19. \sigma_z = N \cdot I_N \cdot q \\ = 20 \times 0.005 \times 10 \\ = 1 \text{ T/m}^2$$

20. Addition of admixture increases workability but does not increase strength directly. However, increased workability causes good compaction and proper distribution of particles in the mix causes increased strength indirectly.

22. Exit gradient

$$= \frac{\text{potential drop in last field}}{\text{length of flow line of last square}} \\ = \frac{18/12}{2} = 0.75$$

23. Silica is the compound responsible for primary strength.

$$25. \Delta H = H_0 \left(\frac{\Delta e}{1 + e_0} \right) \\ = 2 \left(\frac{0.08}{1 + 1} \right) = 0.08 \text{ m} = 80 \text{ mm}$$

26. Portland pozzolana cement is in general used for mass construction. It produces low heat and less cracks with higher durability.

29. Setting time of low heat cement is same as OPC. Setting times are independent of strength.

$$31. S = c + \sigma' \tan \phi \\ = 10 + (1.50) \tan 30 = 96.6 \text{ kPa}$$

32. Power shovels are capable of excavating all classes of earth, except the solid rock with prior loosening.

34. Option (a) is due to energy principle and option (b) is due to continuity principle.

35. Final settlement will remain same, but rate of settlement will increase.

36. CO_2 reacts with water to form carbonic acid.

37. Since there are five unknown and only three variables (M, L, T), therefore

$S - 3 = 2$ number of π - parameters are needed

40. Deflection in venturimeter for measuring discharge is independent of the angle of pipe.

$$41. \text{Seepage force/unit volume} = i \cdot \gamma_w \\ = 0.3 \times 22 \\ = 6.6 \text{ kN}$$

42. Since alkalinity is more than total hardness so only carbonate hardness is present.

Carbonate hardness = 200 mg/L

Non-carbonate hardness = zero

$$43. F_r \propto L_r^3 \\ \therefore F_p = 1 \times (100)^3 = 10^6 \text{ kg}$$

44. For a given area, maximum depth increases with duration.

45. For spoon sampler

(i) area ratio should preferably not exceed 10%.

(ii) inside clearance should be between 1 to 3%

46. Increase in metacentric height reduces the time period of rolling of the body which is quite uncomfortable for passengers.

$$47. \text{Area of basin} = \frac{1}{2} \times 48 \times 3600 \times 200 = 1728 \text{ km}^2$$

$$48. e = \frac{G\omega}{S}$$

$S = 1$ (saturated soil)

49. For possible fluid flow, $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} = 0$

$$50. \text{Depth of runoff} = \frac{1}{2} \times \frac{80 \times 3600 \times 200}{1440 \times 10^6} = 2 \text{ cm}$$

$$51. k = 100 D_{10}^2 \text{ cm/sec} \\ = 100 \times (0.05)^2 \text{ cm/sec} \\ = 0.25 \text{ cm/sec}$$

52. *Others conditions for critical flow :*

Specific energy and force are minimum at a given discharge

Froude number = 1

53. Five not being multiple of 2; hence its difficult to prepare a 5 hour unit hydrograph.

54. It is equal to consumptive use-effective rainfall.

$$55. \quad q = k \times H_L \frac{N_f}{N_d}$$

$$= \frac{4 \times 10^{-5} \times 6 \times 6 \times 60 \times 24}{16} = 12.96 \times 10^{-2}$$

56. Because in deriving the equation, no assumption has been made as nature of flow.

57. Balances flow rate of supply and demand.

$$58. \quad \sigma_{\text{eff}} = \gamma_{\text{sat}} \times 5 - \gamma_w \times 5$$

$$= 110 - 50 = 60 \text{ kN/m}^2$$

$$60. \quad q_{nf} = 1.3 c \cdot N_c$$

$$= 1.3 \times 1 \times 5.7 = 10 \text{ t/m}^2$$

$$62. \quad t_{50} = \frac{T_{v(50)} d^2}{C_v} = \frac{t_{50}}{t_{50}} = \frac{d_1^2}{d^2} = \frac{1}{4}$$

$$\Rightarrow t'_{50} = \frac{4}{4} = 1 \text{ year}$$

63. Options (a) and (b) are true for a liquid but not for gases.

Option (c) is true for all fluids.

64. Specific yield + Specific retention = Porosity

Thus specific yield, evidently, is less than porosity.

66. The soil structure in the form of face to face orientation is called dispersed.

67. Biological layer formed by microbial decomposition of harmless compounds is called *schmutzdecke* or *dirty skin*. This helps in absorbing and straining out impurities. This layer is formed in slow sand filter.

68. Convex water surface will give the highest rate of evaporation.

69. For a piping phenomenon to occur, hydraulic gradient is 1.

71. Bending Moment at a section is maximum when load is so placed that section divides the load in same ratio as it divides the span.

$$72. \text{ Capillary rise } \propto \left[\frac{1}{\alpha} \right]$$

Smaller the particle size, more will be the rise.

73. Most critical combination of stress is at mid day at edge region in summer season, it is most severe.

$$\text{Stress (summer)} = \text{Load stress} + \text{Warping stress} - \text{Frictional stress}$$

$$75. \text{ Maximum free BM, } M = \frac{Wab}{l}$$

Sum of fixed end moments

$$= \frac{Wab^2}{l^2} + \frac{Wa^2b}{l^2}$$

$$= \frac{Wab}{l}$$

76. For an analysis of stability of slopes by Taylors method, angle of shearing resistance used in chart is the *mobilised angle*.

77. Critical condition of loading stress at corner is during midnight

C.C. = Load stress + Warping stress at corner

$$78. \quad H = \frac{4EI\alpha t}{\pi R^2}$$

$$\therefore H \propto \frac{1}{R^2}$$

$$79. \text{ Bounded area } = r^2 - \frac{\pi r^2}{4}$$

$$= 10000 \left(1 - \frac{\pi}{4} \right) = 2146 \text{ sq m.}$$

80. *Sensitivity* is the ratio of undisturbed shear stress to shear stress of remoulded soil sample stress.

$$\text{Sensitivity} = \frac{q_u (\text{undisturbed})}{q_u (\text{remoulded})} = \frac{4.5}{1} = 3$$

81. It is seen as velocity increases distance between vehicles increases and density decreases.

$$82. \text{ Height of the tree } = \frac{3000 \times 1.32}{66} = 60 \text{ m}$$

83. *Negative skin friction* on a body acts downward, thus increasing the load resulting in reduction of load carrying capacity of pile.

84. Radius of curvature of bubble tube is given by

$$\frac{\ln D}{S} = \frac{2 \times 5 \times 100}{1000 \times 0.05} = 20.0 \text{ m}$$

85. An index map used in highway project shows General Topography

86. *Critical damping* is directly proportional to square root of mass and stiffness coefficient in a single degree of freedom system.

- 87.** One sidereal day,
mean time = 1 solar day – 3 min. 55.91sec.
- 88.** Brick work may not give complete water tightness and in general stonework is preferred for monumental structures.
- 89.** Shift = $\frac{L_s^2}{24 R}$
- 90.** Pile caps acts as a joints which connects each pile to one another and this ensures spread of horizontal and vertical loads to all the piles.
- 91.** Glass not absorbs the noise. And the noise is not otally reflects back. Glass acts as insulator and reduce the noise.
- 92.** Sight distance to avoid head on collision
= $SD_1 + SD_2$
- 94.** Loess is collapsible soil, while black cotton soil is expansive soil.
- 95.** Kinematic viscosity of air is greater because density of air is very small as compared to water.
- 97.** Ultimate settlement does not change.
- 100.** Effective principal stress ratio at failure
- $$\frac{100 - 10}{40 - 10} = 3$$