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IIT-JEE | MEDICAL | GATE AEROSPACE

GENERAL APTITUDE AND QUESTION BANK



GATE AEROSPACE

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Third Edition

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General Aptitude Syllabus (GA)

(COMMON TO ALL PAPERS)

Verbal Ability: English grammar, sentence completion, verbal analogies, word groups, instructions, critical reasoning and verbal deduction.

Numerical Ability: Numerical computation, numerical estimation, numerical reasoning and data interpretation.

MARKS DISTRIBUTION

Subject	No of Questions	Topics	Total Marks
General Aptitude	1M:5 2M:5	<ul style="list-style-type: none">• Verbal Ability• Numerical Ability	15

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General Aptitude

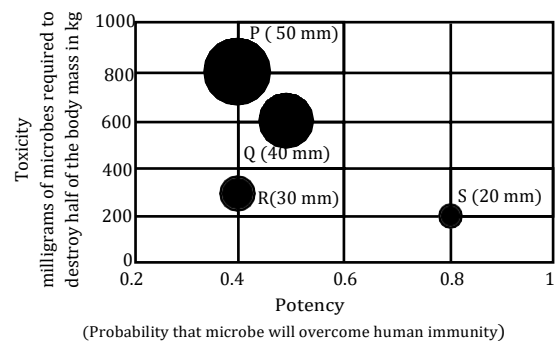
- Which of the following options is closest in meaning to the word Circuitous?
(A) cyclic (C) confusing
(B) Indirect (D) crooked
- The question below consists of a pair of related words followed by four pairs of words. Select the pair that best expresses the relation in the original pair.
Unemployed: Worker
(A) fallow: land
(B) unaware: sleeper
(C) wit: jester
(D) renovated: house
- Choose the most appropriate word from the options given below to complete the following sentence:
If we manage to _____ our natural resource, we would leave a better planet for our children.
(A) uphold (C) cherish
(B) restrain (D) conserve
- Choose the most appropriate word from the options given below to complete the following sentence:
His rather casual remarks on _____ his lack of seriousness about the politics subject.
(A) masked (C) betrayed
(B) belied (D) suppressed
- 25 persons are in a room. 15 of them play hockey, 17 of them play football and 10 of them play both hockey and football. Then the number of persons playing neither hockey nor football is:
(A) 2 (C) 13
(B) 17 (D) 3
- Hari (H), Gita (G), Irfan (I) and Saira (S) are siblings (i.e. brothers and sisters). All were born on 1st January. The age difference between any two successive siblings (that is born one after another) is less than 3 years. Given the following facts:
a. Hari's age + Gita's age > Irfan's age + Saira's age.
b. The age difference between Gita and Saira is 1 year. However Gita is not the oldest and Saira is not the youngest.
c. There are no twins.
In what order were they born (oldest first)?
(A) HSI G (C) IGSH
(B) SGHI (D) IHSG
- 5 skilled workers can build a wall in 20 days; 8 semi-skilled workers can build a wall in 25 days; 10 unskilled workers can build a wall in 30 days. If a team has 2 skilled, 6 semi- skilled and 5 unskilled workers, how long will it take to build the wall?
(A) 20 days (C) 16 days
(B) 18 days (D) 15 days
- Modern warfare has changed from large scale clashes of armies to suppression of civilian populations. Chemical agents that do their work silently appear to be suited to such warfare; and regretfully, there exist people in military establishments who think that chemical agents are useful tools for their cause.
Which of the following statements best sums up the meaning of the above passage:
(A) Modern warfare has resulted in civil strife.
(B) Chemical agents are useful in modern warfare.
(C) Use of chemical agents in warfare would be undesirable.
(D) People in military establishments like to use chemical agents in war.1

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9. Given digits 2,2,3,3,3,4,4,4,4 how many distinct 4 digit numbers greater than 3000 can be formed?
(A) 50 (C) 52
(B) 51 (D) 54
10. If $137 + 276 = 435$ how much is $731 + 672$?
(A) 534 (C) 1623
(B) 1403 (D) 1513
11. If $\log(P) = (1/2) \log(Q) (1/3) \log(R)$, then which of the following options is TRUE?
(A) $P^2 = Q^3 R^2$ (C) $Q^2 = R^3 P$
(B) $Q^2 = PR$ (D) $R = P^2 Q^2$
12. Which of the following options is the closest in the meaning to the word below:
Inexplicable
(A) Incomprehensible (C) Inextricable
(B) Indelible (D) Infallible
13. Choose the word from the options given below that is most nearly opposite in meaning to the given word:
Amalgamate
(A) merge (C) collect
(B) split (D) separate
14. Choose the most appropriate word from the options given below to complete the following sentence. If you are trying to make a strong impression on your audience, you cannot do so by being understated, tentative or
(A) hyperbolic (C) argumentative
(B) restrained (D) indifferent
15. Choose the most appropriate word(s) from the options given below to complete the following sentence.
I contemplated Singapore for my vacation but decided against it.
(A) to visit (C) visiting
(B) having to visit (D) for a visit

16. P, Q, R and S are four types of dangerous microbes recently found in a human habitat. The area of each circle with its diameter printed in brackets represents the growth of a single microbe surviving human immunity system within 24 hours of entering the body. The danger to human beings varies proportionately with the toxicity, potency and growth attributed to a microbe shown in the figure



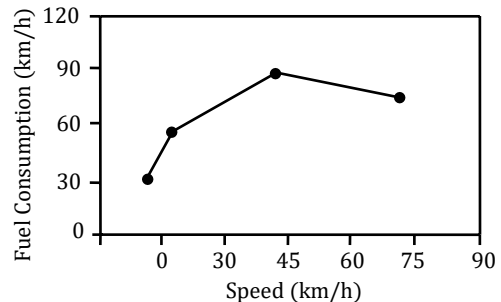
A pharmaceutical company is contemplating the development of a vaccine against the most dangerous microbe. Which microbe should the company target in its first attempt?

- (A) P (C) R
(B) Q (D) S
17. Few school curricula include a unit on how to deal with bereavement and grief, and yet all the students at some point in their lives suffer from losses through death and parting.
Based on the above passage which topic would not be included in a unit on bereavement?
(A) How to write a letter of condolence
(B) What emotional stages are passed through in the healing process
(C) What the leading causes of death are
(D) How to give support to a grieving friend
18. A container originally contains 10 litres of pure spirit. From this container 1 litre of spirit is replaced with 1 litre of water. Subsequently, 1 litre of the mixture is

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- again replaced with 1 litre of water and this process is repeated one more time. How much spirit is now left in the container?
- (A) 7.58 litres (C) 7 litres
(B) 7.84 litres (D) 7.29 litres
19. A transporter receives the same number of orders each day. Currently, he has some pending orders (backlog) to be shipped. If he uses 7 trucks, then at the end of the 4th day he can clear all the order. Alternatively, if he uses only 3 trucks, then all the orders are cleared at the end of the 10th day. What is the minimum number of trucks required so that there will be no pending order at the end of the 5th day?
- (A) 4 (C) 6
(B) 5 (D) 7
20. The variable cost (V) of manufacturing a product varies according to the equation $V = 4q$, where q is the quantity produced. The fixed cost (F) of production of same product reduces with q according to the equation $F = 100/q$. How many units should be produced to minimize the total cost (V+F)?
- (A) 5 (C) 7
(B) 4 (D) 6
21. There are two candidates P and Q in an election. During the campaign, 40% of the voters promised to vote for P, and rest for Q. However, on the day of election 15% of the voters went back on their promise to vote for P and instead voted for Q. 25% of the voters went back on their promise to vote for Q and instead voted for P. Suppose, P lost by 2 votes, then what was the total number of voters?
- (A) 100 (C) 90
(B) 110 (D) 95
22. Choose the most appropriate word from the options given below to complete the following sentence:
It was her view that the country's problems had been by foreign technocrats, so that to invite them to come back would be counter-productive.
(A) Identified (C) Texacerbated
(B) Ascertained (D) Analysed
23. Choose the word from the options given below that is most nearly opposite in meaning to the given word:
Frequency
(A) periodicity (C) gradualness
(B) rarity (D) persistency
24. Choose the most appropriate word from the options given below to complete the following sentence: Under ethical guidelines recently adopted by the Indian Medical Association, human genes are to be manipulated only to correct diseases for which unsatisfactory.
(A) Similar (C) Uncommon
(B) Most (D) Available
25. The question below consists of a pair of related words followed by four pairs of words. Select the pair that best expresses the relation in the original pair:
Gladiator: Arena
(A) dancer: stage
(B) commuter: train
(C) teacher: classroom
(D) lawyer: courtroom
26. The fuel consumed by a motorcycle during a journey while travelling at various speeds is indicated in the graph below.



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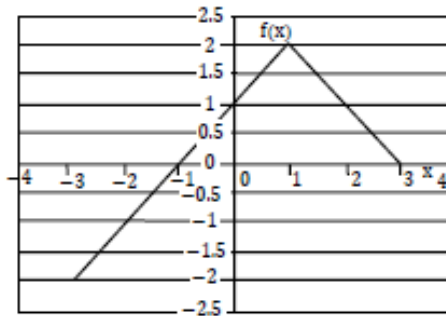
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301. The man who is now Municipal Commissioner worked as _____
(A) the security guard at a university
(B) a security guard at the university
(C) a security guard at university
(D) the security guard at the university
302. Nobody knows how the Indian cricket team is going to cope with the difficult and seamer-friendly wickets in Australia. Choose the option which is closest in meaning to the underlined phrase in the above sentence.
(A) put up with (C) put down to
(B) put in with (D) put up against
303. Find the odd one in the following group of words. mock, deride, praise, jeer
(A) mock (C) praise
(B) deride (D) jeer
304. Pick the odd one from the following options.
(A) CADBE (C) XWYZ
(B) JHKIL (D) ONPMQ
305. In a quadratic function, the value of the product of the roots (α, β) is 4. Find the value of $\frac{\alpha^n + \beta^n}{\alpha^{-n} + \beta^{-n}}$
(A) n^4 (C) 2^{2n-1}
(B) 4^n (D) 4^{n-1}
306. Among 150 faculty members in an institute, 55 are connected with each other through Facebook® and 85 are connected through WhatsApp®. 30 faculty members do not have Facebook® or WhatsApp® accounts. The number of faculty members connected only through Facebook® accounts is _____.
(A) 35 (C) 65
(B) 45 (D) 90
307. Computers were invented for performing only high-end useful computations. However, it is no understatement that they have taken over our world today. The internet, for example, is ubiquitous. Many believe that the internet itself is an unintended consequence of the original invention. With the advent of mobile computing on our phones, a whole new dimension is now enabled. One is left wondering if all these developments are good or, more importantly, required. Which of the statement(s) below is/are logically valid and can be inferred from the above paragraph?
(i) The author believes that computers are not good for us.
(ii) Mobile computers and the internet are both intended inventions
(A) (i) only
(B) (ii) only
(C) Both (i) and (ii)
(D) Neither (i) nor (ii)
308. All hill-stations have a lake. Ooty has two lakes.
Which of the statement(s) below is/are logically valid and can be inferred from the above sentences?
(i) Ooty is not a hill-station.
(ii) No hill-station can have more than one lake.
(A) (i) only
(B) (ii) only
(C) Both (i) and (ii)
(D) Neither (i) nor (ii)
309. In a 2×4 rectangle grid shown below, each cell is a rectangle. How many rectangles can be observed in the grid?
- | | | | |
|--|--|--|--|
| | | | |
| | | | |
- (A) 21 (C) 30
(B) 27 (D) 36

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310.



Choose the correct expression for $f(x)$ given in the graph

- (A) $f(x) = 1 - |x - 1|$
 (B) $f(x) = 1 + |x - 1|$
 (C) $f(x) = 2 - |x - 1|$
 (D) $f(x) = 2 + |x - 1|$

311. If I were you I _____ that laptop. It's much too expensive.

- (A) Won't buy (C) Wouldn't buy
 (B) Shan't buy (D) Would buy

312. He turned a deaf ear to my request. What does the underlined phrasal verb mean?

- (A) Ignored (C) Twisted
 (B) Appreciated (D) Returned

313. Choose the most appropriate set of words from the options given below to complete the following sentence.

_____ is a will, _____ is a way.

- (A) Wear, there, their
 (B) Were, their, there
 (C) Where, there, there
 (D) Where, their, their

314. $(x\% \text{ of } y) + (y\% \text{ of } x)$ is equivalent to.

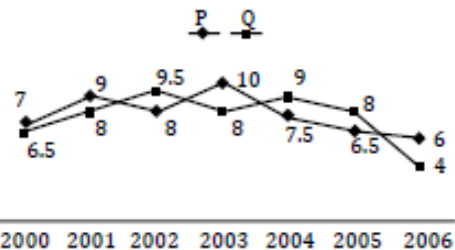
- (A) 2% of xy (C) $xy\%$ of 100
 (B) 2% of $(xy/100)$ (D) 100% of xy

315. The sum of the digits of a two digit number is 12. If the new number formed by reversing the digits is greater than the

original number by 54, find the original number.

- (A) 39 (C) 66
 (B) 57 (D) 93

316. Two finance companies, P and Q, declared fixed annual rates of interest on the amounts invested with them. The rates of interest offered by these companies may differ from year to year. Year-wise annual rates of interest offered by these companies are shown by the line graph provided below.



If the amounts invested in the companies, P and Q, in 2006 are in the ratio 8:9, then the amounts received after one year as interests from companies P and Q would be in the ratio:

- (A) 2:3 (C) 6:7
 (B) 3:4 (D) 4:3

317. Today, we consider Ashoka as a great ruler because of the copious evidence he left behind in the form of stone carved edicts. Historians tend to correlate greatness of a king at his time with the availability of evidence today.

Which of the following can be logically inferred from the above sentences?

- (A) Emperors who do not leave significant sculpted evidence are completely forgotten.
 (B) Ashoka produced stone carved edicts to ensure that later historians will respect him.
 (C) Statues of kings are a reminder of their greatness.
 (D) king's greatness, as we know him today, is interpreted by historians.

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318. Fact 1: Humans are mammals.
Fact 2: Some humans are engineers.
Fact 3: Engineers build houses.
If the above statements are facts, which of the following can be logically inferred?
I. All mammals build houses.
II. Engineers are mammals.
III. Some humans are not engineers.
(A) II only (C) I, II and III
(B) III only (D) I only
319. A square pyramid has a base perimeter x , and the slant height is half of the perimeter. What is the lateral surface area of the pyramid?
(A) x^2 (C) $0.50 x^2$
(B) $0.75 x^2$ (D) $0.25 x^2$
320. Ananth takes 6 hours and Bharath takes 4 hours to read a book. Both started reading copies of the book at the same time. After how many hours is the number of pages to be read by Ananth, twice that to be read by Bharath? Assume Ananth and Bharath read all the pages with constant pace.
(A) 1 (C) 3
(B) 2 (D) 4
321. The chairman requested the aggrieved shareholders to _____ him.
(A) bare with (C) bear with
(B) bore with (D) bare
322. Identify the correct spelling out of the given options:
(A) Managable (C) Mangaeble
(B) Manageable (D) Managible
323. Pick the odd one out in the following:
13, 23, 33, 43, 53
(A) 23 (C) 43
(B) 33 (D) 53
324. R2D2 is a robot. R2D2 can repair aeroplanes. No other robot can repair aeroplanes.
Which of the following can be logically inferred from the above statements?
(A) R2D2 is a robot which can only repair aeroplanes
(B) R2D2 is the only robot which can repair aeroplanes
(C) R2D2 is a robot which can repair only aeroplanes
(D) Only R2D2 is a robot
325. If $|9y - 6| = 3$, then $y^2 - 4y/3$ is _____
(A) 0 (C) $-1/3$
(B) $+1/3$ (D) Undefined
326. A poll of students appearing for masters in engineering indicated that 60% of the students believed that mechanical engineering is a profession unsuitable for women. A research study on women with masters or higher degrees in mechanical engineering found that 99% of such women were successful in their professions.
Which of the following can be logically inferred from the above paragraph?
(A) Many students have misconceptions regarding various engineering disciplines
(B) Men with advanced degrees in mechanical engineering believe women are well suited to be mechanical engineers
(C) Mechanical engineering is a profession well suited for women with masters or higher degrees in mechanical engineering
(D) The number of women pursuing higher degrees in mechanical engineering is small
327. Sourya committee had proposed the establishment of Sourya Institutes of Technology (SITs) in line with Indian Institutes of Technology (IITs) to cater to

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the technological and industrial needs of a developing country.

Which of the following can be logically inferred from the above sentence?

Based on the proposal,

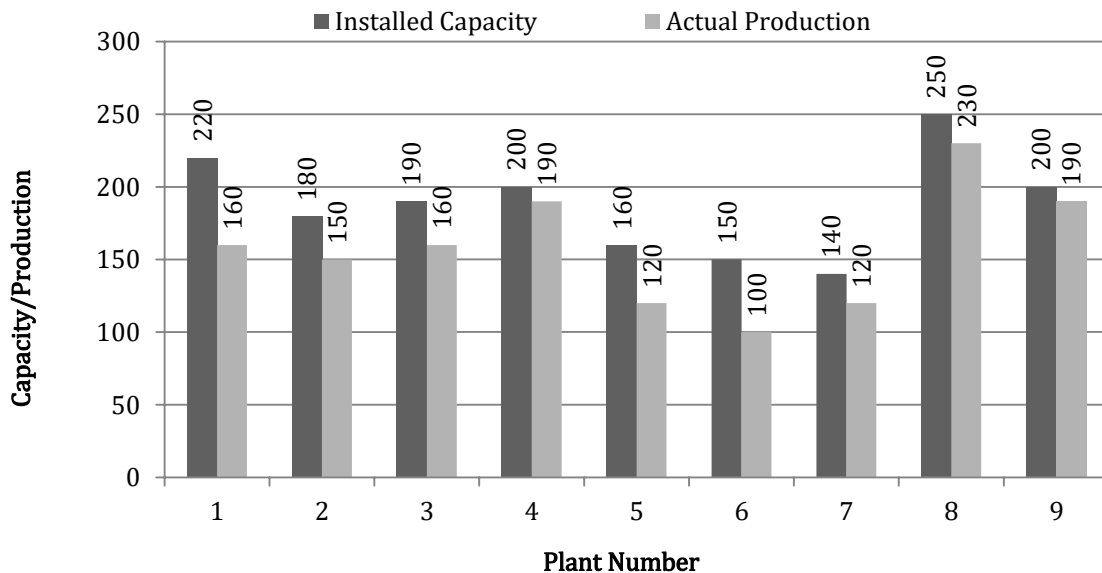
- (i) In the initial years, SIT students will get degrees from IIT.
 - (ii) SITs will have a distinct national objective.
 - (iii) SIT like institutions can only be established in consultation with IIT.
 - (iv) SITs will serve technological needs of a developing country.
- (A) (iii) and (iv) only
(B) (i) and (iv) only
(C) (ii) and (iv) only
(D) (ii) and (iii) only

328. Shaquille O' Neal is a 60 % career free throw shooter, meaning that he successfully makes 60 free throws out of 100 attempts on average. What is the probability that he will successfully make exactly 6 free throws in 10 attempts?

- (A) 0.2508 (C) 0.2934
(B) 0.2816 (D) 0.6000

329. The numeral in the units position of $211^{870} + 146^{127} \times 3^{424}$ is _____

330. The following graph represents the installed capacity for cement production (in tonnes) and the actual production (in tonnes) of nine cement plants of a cement company. Capacity utilization of a plant is defined as ratio of actual production of cement to installed capacity. A plant with installed capacity of at least 200 tonnes is called a large plant and a plant with lesser capacity is called a small plant. The difference between total production of large plants and small plants, in tonnes is _____



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Answer Keys & Explanations

1. **[Ans. B]**
Circuitous: Deviating from a straight course \Rightarrow Indirect
(A) Cyclic: Recurring in cycle
(B) Indirect: Not leading by straight line
(C) Confusing: Lacking clarity
(D) Crooked: For shapes (irregular in shape)
2. **[Ans. A]**
Unemployed: Worked \Rightarrow Here one is opposite to other.
(A) Fallow: Land \Rightarrow Fallow means undeveloped land
(B) Unaware: Sleeper \Rightarrow Both are same unaware or asleep
(C) Wit: Jester \Rightarrow Wit means ability to make jokes and jester is a joker
(D) Renovated: House \Rightarrow Renovate means to make better and house can be renovated
3. **[Ans. D]**
(A) Uphold: cause to remain \Rightarrow not appropriate
(B) Restrain: keep under control \Rightarrow not appropriate
(C) Cherish: be fond of \Rightarrow not related
(D) Conserve: Keep in safely and protect from harm, decay, loss, or destruction \Rightarrow most appropriate
4. **[Ans. C]**
(A) Masked: Hide under a false appearance \Rightarrow opposite
(B) Belied: Be in contradiction with \Rightarrow not appropriate
(C) Betrayed: Reveal unintentionally \Rightarrow most appropriate
(D) Suppressed: To put down by force or authority \Rightarrow irrelevant
5. **[Ans. D]**
Using the set theory formula
 $n(A)$: Number of people who play hockey = 15
 $n(B)$: Number of people who play football = 17
 $n(A \cap B)$: Persons who play both hockey and football = 10
 $n(A \cup B)$: Persons who play either hockey or football or both
Using the formula
$$n(A \cup B) = n(A) + n(B) - n(A \cap B)$$
$$n(A \cup B) = 15 + 17 - 10 = 22$$
Thus people who play neither hockey nor football
6. **[Ans. B]**
Suppose: Hari's age: H, Gita's age: G, Saira's age: S, Irfan's age: I
 - $H + G > 1 + S$
 - Using Statement (2) both $G - S = 1$ or $S - G = 1$: G can't be oldest and S can't be youngest
 - There are no twins thus using statement 2 either GS or SG possible.

(A) HSIG: not possible as there is I between S and G which is not possible using statement (3)
(B) SGHI: SG order is possible. $S > G > H > I$ and $G + H > S + I$ (possible)
Because if $\{S = G + 1$; and $G = H + 1$ and $H = I + 2$ then $G + (I + 2) > (G + 1) + I\}$
(C) IGSH: according to this $I > G$ and $S > H$ thus adding these both inequalities we get $I + S > G + H$ which is opposite of statement (2) thus not possible
(D) IHSG: according to this $I > H$ and $S > G$ thus adding both inequalities $I + S > H + G$ which is opposite of statement (2) thus not possible

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7. [Ans. D]

Per day work or rate of 5 skilled workers

$$= \frac{1}{20}$$

⇒ Per day work or rate of one skill worker

$$= \frac{1}{5 \times 20} = \frac{1}{100}$$

Similarly per day work or rate of 8

$$\text{semiskilled workers} = \frac{1}{25}$$

⇒ Per day work or rate of one semi-skill

$$\text{worker} = \frac{1}{8 \times 25} = \frac{1}{200}$$

And per day work or rate of 10 unskilled

$$\text{workers} = \frac{1}{30}$$

⇒ Per day work or rate of one semi-skill

$$\text{worker} = \frac{1}{10 \times 30} = \frac{1}{300}$$

Thus total per day work of 2 skilled, 6 semiskilled and 5 unskilled workers

$$= \frac{2}{100} + \frac{6}{200} + \frac{5}{300} = \frac{12 + 18 + 10}{600}$$
$$= \frac{40}{600} = \frac{1}{15}$$

Thus time to complete the work is 15 days

8. [Ans. D]

- (A) Modern warfare has resulted in civil strife: There is no direct consequence of warfare given, so it is not appropriate
- (B) Chemical agents are useful in modern warfare: Passage does not say whether chemical agents are useful or not, so not appropriate
- (C) Use of chemical agents in warfare would be undesirable: Given that people in military think these are useful, undesirable is wrong
- (D) People in military establishments like to use chemical agents in war: Correct choice as last statement tells that military people think that chemical agents are useful tools for their cause (work silently in warfare)

9. [Ans. B]

As the number is greater than 3000. So thousand's place can be there 3 or 4.

Let's consider the following two cases

Case I: When thousand's place is 3. 3 a b c

If there is no restriction on number of two's, three's and four's. Then each of a, b, c can be filled with 2 or 3 or 4 each in 3 ways.

So $3 \times 3 \times 3 = 27$ numbers are there. Out of which 3222, 3333 are invalid as 2 can be used twice and three thrice only so number of such valid numbers beginning with 3 are $27 - 2 = 25$.

Case II: When thousand's place is 4. 4 a b c

Without restriction on number of 2's, 3's and 4's a, b, c (as explained in case I) can be filled in 27 ways.

Out of these 27 numbers, 4 2 2 2 is only invalid as two have to be used twice only.

So valid number are $27 - 1 = 26$

Total numbers from Case I and Case II $25 + 26$

10. [Ans. C]

$$137 + 276 = 435$$

This is an octahedral addition thus

$$731 + 672 (8) = 1623$$

11. [Ans. B]

$$\log P = \frac{1}{2} \log Q = \frac{1}{3} \log R = K$$

$$P = b^k, Q = b^{2k}, R = b^{3k}$$

$$\therefore \text{Now, } Q^2 = b^{4k} b^k = PR$$

12. [Ans. A]

Inexplicable means not explicable; that cannot be explained, understood, or accounted for. So the best synonym here is incomprehensible.

13. [Ans. D]

Amalgamate means combine or unite to form one organization or structure. So best option here is split. Separate on the other hand, although a close synonym, it is too general to be the best antonym in the given question while Merge is the synonym; Collect is not related.

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248. [Ans. B]

Let y as tail occurred in third toss and z as two tails in third toss which can be {TTH, THT, HTT} $y = \{TTH, TTT\}$

Both y and z are dependent.

249. [Ans. C]

250. [Ans. C]

Executive



Therefore concluding diagram can be

It can be manager that is manager can be executive also.

Some executives are also leader that is not a manger.

251. [Ans. A]

The sentence is stating the highest peak in the world. Since it is a specific thing, we need to use the definite article 'the' before it. Also the sentence is using the superlative degree and so we say 'the highest peak in the world' making option 1 the correct answer. There cannot be many highest peaks in the world and so options 3 and 4 are incorrect.

252. [Ans. B]

The context of the sentence is asking a person who has been deprived of something because of a theft. The word to be used to fill the blank is 'lose' which means to be deprived of something. 'Loose' means something that is not fitted. 'Louse' is the singular form of the word 'lice' that is a parasite that lives in the skin of mammals and birds. 'Loss' is a noun that means the process of losing someone or something. Eg: He suffered tremendous loss in his business.

253. [Ans. A]

The sentence is looking for a contrast as it is joined by the conjunction 'despite'.

The best pair of words that can fit the context of the sentence is 'effectiveness...prescribed'. Though the medicine is 'effective' in treating diabetes, it is not being 'prescribed' widely. new medicine cannot have a 'prescription' or 'availability' for treating a disease. 'Proscribed' means forbidden by law. In case we use 'acceptance...proscribed' the sentence will not make any sense because it will mean that though the medicine is accepted widely, it is not forbidden by law.

254. [Ans. A]

Let T = total no of fruits = 5692000

R = Ripe fruits; U = Unripe fruits

A = Apple; O = Oranges

$$\text{Given } U = 15\% \text{ of } T : \frac{15}{100} \times 5692000 \\ = 853800$$

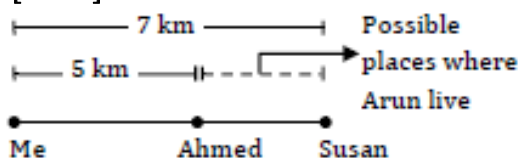
$$R = T - U = 4838200$$

$$A(U) = 45\% \text{ of } U : \frac{45}{100} \times 853800 \\ = 384210$$

$$A(R) = (100 - 66)\% \text{ of } R : \frac{34}{100} \times 4838200 \\ = 1644988$$

$$\therefore A(U) + A(R) = 2029198$$

255. [Ans. C]



In question it is given that Ahmed is 5 km away and Susan is 7 km away from where I live. Further it is given that Arun is farther away than Ahmed from where I live and not as far as Susan. That means Arun must be living at distance more than 5 km but less than 7 km from my house which is according to given options can be 6.02 km.

Note: Information about Michal is unnecessary and just given to confuse.

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256. [Ans. C]

Percentage probability of being infected
= P(A) = 50%

Percentage probability of infected person
developing disease is having system,
= P(B) = 30%

∴ Percentage probability of infected
person not showing symptoms
= P(\bar{B}) = 70%

∴ Percentage probability of person
moving through a TB prone zone
remaining infected but not showing
symptoms

$$= P(A) \cdot P(\bar{B}) = \frac{50}{100} \times \frac{70}{100} = 35\%$$

257. [Ans. B]

The paragraph states that the subject was very confident about his good friends helping him in his times of need because he had always helped them before in their time. Thus, inference iii follows.

Since the events of the last week proved him wrong, this means that his confidence was broken and his friends had not helped him. Thus inference iv also follows.

258. [Ans. D]

According to given information the points we got are

- (A) Shiva is brother of Pavithra
- (B) Shiva and Pavithra are cousins of Leela
- (C) According to their ages Shiva > Leela > Pavithra
- (D) They all live play chess
- (E) Pavithra wins more often than Leela but information about winning cases of Shiva is not given.

So from the given options statement which is clearly true is that Pavithra is the youngest of all.

259. [Ans. C]

$$q^{-a} = \frac{1}{r}; r^{-b} = \frac{1}{s} \text{ and } s^{-c} = \frac{1}{q}$$

$$\therefore q^a = r; r^b = s \text{ and } s^c = q$$

$$\therefore a \log q = \log r \dots \dots \textcircled{1}$$

$$\text{And } b \log r = \log s \dots \dots \textcircled{2}$$

$$\text{And } c \log s = \log q \dots \dots \textcircled{3}$$

Multiplying equations $\textcircled{1}$, $\textcircled{2}$ and $\textcircled{3}$

$$abc (\log q)(\log r)(\log s) = (\log r)(\log s)(\log q)$$

$$\therefore abc = 1$$

260. [Ans. C]

Person	Days	Hours	Man hours/piece of work	Work done per hour
P				
Q	25	12	25×12	$\frac{1}{25 \times 12}$
R	50	12	50×12	$\frac{1}{25 \times 12}$
S				

After 7 days from start of project:

Q took sick leave on first 2 days

$$\therefore \text{Man hours by Q} = 5 \times 12$$

$$\therefore \text{Work done by Q} = 5 \times 12 \times \frac{1}{25 \times 12}$$

$$= \frac{1}{5} \text{ Man hours by R} = 7 \times 18$$

$$\therefore \text{Work done by R} = \frac{1}{50 \times 12} \times 7 \times 18$$

$$= \frac{21}{100}$$

∴ Ratio of work done by Q to work done by R

$$= \frac{1}{5} : \frac{21}{100} = \frac{100}{5 \times 21} = \frac{20}{21}$$

[Ans. C]

In degrees of comparison Mr. X is taller than Mr. Y is apt.

Positive degree - tall

Comparative degree - taller

Superlative degree - tallest

262. [Ans. B]

The student felicitated the teacher on teacher's day for twenty years of dedicated teaching

51.

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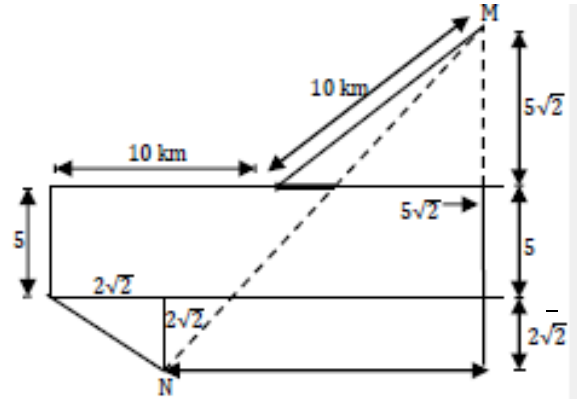
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263. [Ans. C]
‘Rest is history’ is an idiomatic expression which means ‘rest is well known’

10 : 30 was the time two and quarter hour back so time now will be 12 : 45

264. [Ans. C]
 $(9 \text{ inches})^{\frac{1}{2}} = (0.25 \text{ yards})^{\frac{1}{2}}$
Squaring on both sides
9 inches = 0.25 yards

269. [Ans. C]



265. [Ans. B]
‘M’ works with twice efficiency as E but worked for half as many days. So in this respect they will do equal work if their shifts would have been for same timings. But M’s shift is for hrs, while E’s shift for hrs. Hence E will do twice the work as M. Ratio of contribution of M : E in work, 1 : 2

See the adjoining figure for solution

$$MM' = 5\sqrt{2} + 5 \cdot 2\sqrt{2} = 5 + 7\sqrt{2}$$

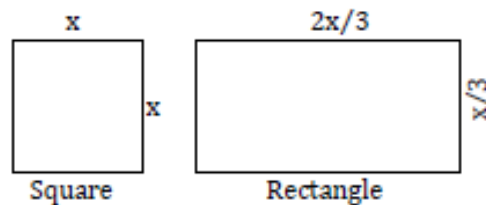
$$NM' = 10 + 5\sqrt{2} - 2\sqrt{2} = 10 + 3\sqrt{2}$$

$$MN = \sqrt{(MM')^2 + (NM')^2}$$

$$M' = \sqrt{(5 + 7\sqrt{2})^2 + (10 + 3\sqrt{2})^2} = 20.61$$

266. [Ans. D]
Read books = $n(R) = 12 + 44 + 7 + 13 = 76$
Play Sports = $n(S) = 44 + 7 + 17 + 15 = 83$
 $n(R \cap S) = 44 + 7 = 51$
 $n(R \cup S) = n(R) + n(S) - n(R \cap S)$
 $= 76 + 83 - 51 = 108$

270. [Ans. B]



Square

Rectangle

$$\text{Perimeter of rectangle} = 2 \left[\frac{x}{3} + \frac{2x}{3} \right] = 2x$$

$$\text{Perimeter of square} = 340 - 2x$$

$$\text{Length of square} = \frac{340 - 2x}{4}$$

$$\text{Total area} = \left(\frac{340 - 2x}{4} \right)^2 + \frac{2}{9}x^2 = f(x)$$

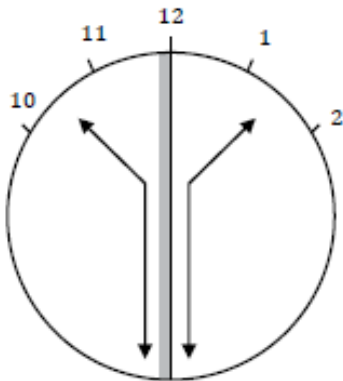
$$f'(x) = \frac{4}{9}x - \frac{2x - 340}{4} = 0$$

$$\Rightarrow \frac{4}{6}x = \frac{1}{4}(340 - 2x) \Rightarrow x = 90$$

$$\text{Length of square} = \frac{340 - 2x}{4} = 40 \text{ mm}$$

267. [Ans. A]
Until the colonial period means pre-colonial origin. Other options can't be inferred.

268. [Ans. D]



Mirror image of 1 : 20 is 10 : 30

271. [Ans. B]

272. [Ans. A]

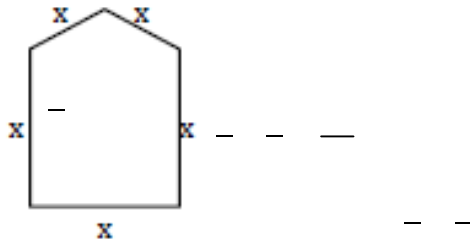
273. [Ans. D]

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274. [Ans. C]

275. [Ans. B]



$$3x + 2x = 6$$

$$5x = 6$$

$$x = \frac{6}{5}$$

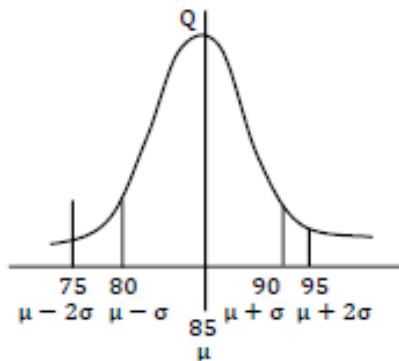
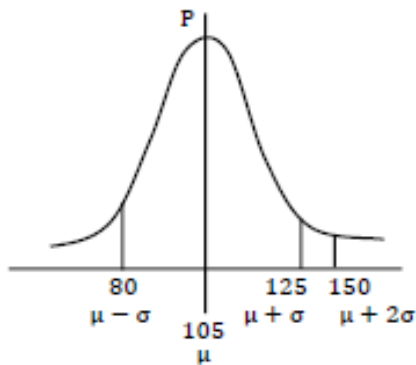
$$\text{Area of square} = \frac{6}{5} \times \frac{6}{5} = \frac{36}{25}$$

$$\begin{aligned} \text{Area of triangle} &= \frac{\sqrt{3}}{4} l^2 = \frac{\sqrt{3}}{4} \times \frac{6}{5} \times \frac{6}{5} \\ &= \frac{\sqrt{3}}{4} \cdot \frac{36}{25} \end{aligned}$$

$$\left(1 + \frac{\sqrt{3}}{4}\right) \times \frac{36}{25} = 2.06$$

276. [Ans. C]

68-95-97 rule



95% of students in P scores between 65 to 150

95% of students in Q score between 75 to 95

D is not correct

median = mean for normal distribution.

C is correct answer.

277. [Ans. C]

278. [Ans. C]

279. [Ans. A]

$$a \square x = a \Rightarrow ax + (a + x) = a$$

$$\Rightarrow x(1 + z) = 0$$

$\Rightarrow x = 0$ is the identity element

280. [Ans. C]

281. [Ans. C]

The information given to us about both apples and onions is its price. We see that an apple costs more than an onion. The best way to frame the information with respect to grammar and usage in the given options is option 3. 'More costlier' is wrong grammatically because 'costlier' is the comparative degree of comparison and hence does not require 'more' before it. Since the prices are being compared, we cannot say the price of an apple is greater than an onion. Thus option 1 is also wrong. Option 2 is incorrect without any article before 'onion'. Thus, option 3 that correctly compares the price of both the items is the correct answer.

282. [Ans. C]

'Burning' or igniting' means to give fire to something. 'Clutching' means to hold on to something. 'Flinging' means to hurl something forcefully. From the options, we see that the word closest in meaning to the word 'grasping' is clutching'.

283. [Ans. B]

'P' is grandchild of M

AIRCRAFT PROPULSION

1. An AFC stage has blade root, mean and tip velocities of 150, 200 and 250 m/s. The stage is to be designed for a stagnation temperature rise of 20 K and an axial velocity of 150 m/s, both constant from root to tip. The work done factor is 0.93. Assuming 50% reaction at mean radius calculate the stage air angles at root, mean and tip and the DOR at root and tip for a free vortex design.

Ans: $\alpha_1 = 17.07^\circ (= \beta_2)$, $\beta_1 = 45.73^\circ (= \alpha_2)$ at mean radius; $\alpha_1 = 13.77^\circ$, $\beta_1 = 54.88^\circ$, $\beta_2 = 40.23^\circ$, $\alpha_2 = 39.43^\circ$ at tip; $\alpha_1 = 22.25^\circ$, $\beta_1 = 30.60^\circ$, $\beta_2 = 20.25^\circ$, $\alpha_2 = 53.85^\circ$ at root; R = 11.2 per cent at root and 67.4 per cent at tip

2. Recalculate the stage air angles for the same data as in the previous question for a stage with 50% reaction at all radii, and compare the results with the previous problem.

Ans: $\alpha_1 = 28.60^\circ (= \beta_2)$, $\beta_1 = 48.27^\circ (= \alpha_2)$ at tip; $\alpha_1 = 1.15^\circ (= \beta_2)$, $\beta_1 = 44.42^\circ (= \alpha_2)$ at root

3. The first stage for an AFC is designed for free vortex principle with no IGV. The rotational speed is 6000 rpm and the stagnation temperature rise is 20 K. The hub to tip ratio is 0.6 and the work done factor is 0.93. The isentropic efficiency is 0.89. Assuming the inlet velocity to be 140 m/s and ambient conditions are 1.01 bar and 288 K. Calculate

- The tip radius and corresponding rotor air angles if the Mach no. related to the tip is limited to 0.95.
- The mass flow rate entering the stage
- The stage stagnation pressure ratio and power required
- The rotor air angles at the root section

Ans: (a) 0.456 m, 63.95° and 56.40° , (b) 65.5 kg/s, (c) 1.233, 1317 kW, (d) 50.83° and 18.32°]

4. An axial flow compressor has an overall pressure ratio of 4.0 and mass flow of 3 kg/s. If the polytropic efficiency is 88 per cent and the stagnation

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29. In a gas turbine unit, the gases flow through the turbine is 15 kg/s and the power developed by the turbine is 12000 kW. The enthalpies of gases at the inlet and outlet are 1260 kJ/kg and 400 kJ/kg respectively, and the velocity of gases at the inlet and outlet are 50 m/s and 110 m/s respectively. Calculate :

- (i) The rate at which heat is rejected to the turbine, and
- (ii) The area of the inlet pipe given that the specific volume of the gases at the inlet is $0.45 \text{ m}^3/\text{kg}$.

Ans: – 55.2 kJ/kg, 0.135 m²

30. A turbojet engine is being used to propel an airplane. The drag is 3900 N. The coefficient of drag is 0.01835. The wing area is 21.25 m^2 . The air consumption per second of the engine is 14.5 Kg/s and the thrust developed is 8900 N. Calculate the flight velocity and effective jet velocity. Also calculate the specific thrust where the $C_p = 1.005 \text{ KJ/kgK}$. What is the density ratio at this altitude of 10000m. Take $\rho = 0.5 \text{ Kg/m}^3$ at this altitude.

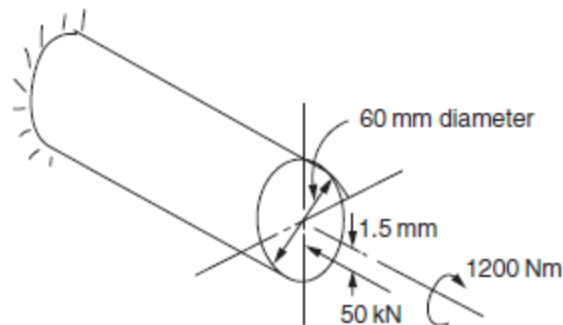
Ans: 200 m/s, 813.8 m/s, 613.8N, 0.41

AIRCRAFT STRUCTURES

1. A cantilever beam of solid, circular cross-section supports a compressive load of 50 KN applied to its free end at a point 1.5mm below a horizontal diameter in the vertical plane of symmetry together with a torque of 1200Nm. Calculate the direct and shear stresses on a plane inclined at 60° to the axis of the cantilever at a point on the lower edge of the vertical plane of symmetry.



Ans: $\sigma_n = -40.4 \text{ N/mm}^2$ (compression), $\tau = 5.0 \text{ N/mm}^2$



2. Direct stresses of 160 N/mm^2 (tension) and 120 N/mm^2 (compression) are applied at a particular point in an elastic material on two mutually perpendicular planes. The principal stress in the material is limited to 200 N/mm^2 (tension). Calculate the allowable value of shear stress at the point on the given planes. Determine also the value of the other principal stress and the maximum value of shear stress at the point.

Ans: $\tau_{xy} = 113 \text{ N/mm}^2$, $\sigma_1 = 200 \text{ N/mm}^2$ (given) $\sigma_{II} = -160 \text{ N/mm}^2$, $\tau_{max} = 180 \text{ N/mm}^2$

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29. Derive the equation for the natural frequencies of a uniform cord of length 'L' fixed at the two ends. The cord is stretched to a tension T and its mass per unit length is ρ .

Ans: $f_n = \frac{n}{2L} \sqrt{\frac{T}{\rho}}$

30. A vibrating system consists of a mass of 4.534 Kg, a spring of stiffness 35.0 N/cm, and a dashpot with a damping coefficient of 0.1243 N/cm/s. Find (a) the damping factor, (b) the logarithmic decrement, and (c) the ratio of any two consecutive amplitudes.

Ans: (a) 0.0493 (b) 0.3101 (c) 1.364

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