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DIRECTIONS *for questions 1 to 6:* The passage given below is divided into two extracts. Read both extracts and answer the questions that follow.

Extract 1:

You're almost unfathomably lucky to exist, in almost every conceivable way. You and me are nothing but impurities in an otherwise beautifully simple universe.

We're lucky life began on Earth at all and that something as complex as humans evolved. It was improbable that your parents met each other and conceived you at just the right instant, and their parents and so on back to time immemorial. This is science's way of reminding you to be grateful for what you have.

But your existence wasn't just predicated on luck of your ancestors, but on an almost absurdly finely tuned universe. Had the universe opted to turn up the strength of the electromagnetic force by even a small factor, poof! Suddenly stars wouldn't be able to produce any heavy elements, much less the giant wet rock we're standing on. Worse, if the universe were only minutely denser than the one we inhabit, it would have collapsed before it began.

Worse still, the laws of physics themselves seem to be working against us. Ours isn't just a randomly hostile universe, it's very hostile to our existence.

My physicist colleagues and I like to pretend that the laws of physics are orderly and elegant. Indeed, I just published an entire book, *The Universe in the Rearview Mirror*, about the beautiful symmetries of the universe. Programs like *Nova* or *Slate*'s own Bad Astronomy tend to focus on the knowable structure of how everything fits together. A thing is symmetrical if there is something you can do to it so that after you have finished doing it, it looks the same as before. Which sounds innocuous enough until you realize that if the entire universe were made symmetric, then all of the good features (e.g., you) are decidedly asymmetric lumps that ruin the otherwise perfect beauty of the cosmos.

But it would be a mistake to be comforted by the symmetries of the universe. In truth, they are our worst enemies. Everything we know about rational, predictable arrangements dictates that we shouldn't be here at all. Even the simplest assumptions about our place in the universe seem to lead inexorably to devastating results.

The symmetry of the universe would bake us in no time at all, but an asymmetry rescues us. Kepler recognized that for the sky to be dark at all, the universe must be "enclosed and circumscribed by a wall or a vault."

That vault is the beginning of time.

Extract 2:

The beginning of time introduces yet another obstacle to our existence. Protons and neutrons started to coalesce a millionth of a second after the first instant of time. Matter tended to pop into and out of existence, and with it, a mysterious-sounding substance known as antimatter. If there's one thing we know about antimatter, it's that if you meet your antimatter twin, you should never, ever shake hands. Doing so will utterly destroy you both.

But antimatter has a somewhat unwarranted reputation for violence. Antimatter is the mirror image of ordinary matter (hence the symmetry). A positron, the antimatter version of an electron, has the same mass as the ordinary version and it spins at the same rate. However, the positron has a positive charge and the electron has a negative one.

Every type of particle has an antimatter version and the story is the same: same mass, same everything, but opposite charges. Even stranger, the laws of physics don't much care whether we make ourselves a universe filled with ordinary matter or antimatter. The laws seem to be almost exactly the same.

We're even able to make antiatoms in a lab. Antihydrogen, antihelium, you name it (actually, only those two). The chemistry, the effects of gravity, and anything else we can measure all seem to be the same as they are with ordinary matter. If some divine being were to turn every particle in the universe into its antimatter version, we'd be none the wiser. Maybe she just did.

We're able to make antimatter in a lab, and our sun makes it all the time. But there's always a byproduct – matter. In every experiment and observation, matter and antimatter get created (or annihilated) in perfect concert. That is, every experiment except for one: us.

Matter and antimatter *should* have completely annihilated one another in the first nanoseconds after the Big Bang. You should not even exist. But you do, and there's lots more matter where you came from.

We live in a universe that seems to be made of matter. Every star, every galaxy, except for the odd cosmic ray or ephemeral particle in the atmosphere, it's matter all the time. If the perfect symmetry between matter and antimatter remained perfect, you wouldn't be here to think about it.

Sometime very, *very* early on in the universe (roughly 10-35 seconds after the beginning, if you can wrap your mind around a number that small), there was a small break, and about a billion and one particles of matter were produced for every billion antiparticles. As for how that happened, we honestly can't say, because nobody's been able to reproduce it in a lab.

Q1. What does the author mean when he says "We're lucky life began ....." in Extract 1?

- a) It was very difficult to find a life partner for our parents.
- b) We are born on earth because of complex biological mechanisms.
- c) It was very unlikely for complex biological systems to form.
- d) Although we are impure, we exist in a beautiful universe.

Q2. Why does the author mention *"The Universe in the Rearview Mirror"* and *"Nova or Slate*'s own Bad Astronomy" in Extract 1?

- a) To describe that the universe is very orderly and symmetrical.
- b) To draw a contrast between how the universe actually exists and how it is interpreted in the book.
- c) To advertise the book and to highlight the importance of programs employed by astronomers.
- d) To admire the beauty of the universe.

Q3. Which of the following cannot be clearly inferred from Extract 1?

a) The universe is so precisely defined that even the slightest change in any of the factors would not have led to our existence.

b) There are numerous disastrous activities taking place in the universe.

c) Difference in density and electromagnetic force would have altered the universe by a great degree.

d) The “giant wet rock” refers to the earth.

Q4. Which of the following cannot be inferred about an electron and a positron from a reading of Extract 2?

[Identify all that apply and enter the corresponding numbers in the input box given below. You must enter your answer in increasing order only. For example, if you think that (1) and (2) apply, then enter 12 (but not 21) in the input box].

(1) They are same in all respects.

(2) They are same in all respects except for one point.

(3) If a positron and an electron meet, both will destroy each other.

(4) The mass, the spin and the effects of gravity are the same for an electron and for a positron.

(5) Conventionally, we can say that the positron and electron are antimatter and matter respectively.

Q5. Which of the following is true about antimatter from Extract 2?

a) If the amounts of antimatter had remained exactly equal to the amount of matter at the beginning of the universe, then the universe today would be made of antimatter and not ordinary matter.

b) At exactly 10^{-35} seconds after the beginning of the universe, there was more antimatter than matter produced in the universe.

c) Scientists have attempted to make all antiatoms in the lab even though they know that doing so will destroy the matter on earth.

d) Scientists are able to make antimatter in the lab and it is a very common phenomenon in the sun.

Q6. How is the discrepancy that we exist and are not destroyed explained in the passage?

a) The properties of antimatter ensure that we are not destroyed and the fact that scientists have been unsuccessful in making antimatter versions of ourselves help in explaining our existence.

b) We exist because the difference between matter and antimatter is very small and we are not destroyed because our antimatter does not exist.

c) The asymmetry between matter and antimatter in terms of number at the beginning of the universe might help explain the said discrepancy.

d) We cannot say whether we are matter or antimatter here on earth and hence we exist. We are not destroyed because we haven't shaken hands with our antimatter twin.

DIRECTIONS *for questions 7 to 9:* The passage given below is followed by a set of three questions. Choose the best answer to each question.

"**W**hile nobody can deny that Facebook has altered the landscape of social interaction, particularly among young people, we are just now starting to see solid psychological research demonstrating both the positives and the negatives," said Larry D. Rosen, PhD, professor of psychology at California State University, Dominguez Hills. In a plenary talk entitled, "Poke Me: How Social Networks Can Both Help and Harm Our Kids," Rosen discussed potential adverse effects.

Teens who use Facebook more often show more narcissistic tendencies while young adults who have a strong Facebook presence show more signs of other psychological disorders, including antisocial behaviors, mania and aggressive tendencies. Daily overuse of media and technology has a negative effect on the health of all children, preteens and teenagers by making them more prone to anxiety, depression, and other psychological disorders, as well as by making them more susceptible to future health problems. Facebook can be distracting and can negatively impact learning.

Rosen said new research has also found positive influences linked to social networking. Young adults who spend more time on Facebook are better at showing "virtual empathy" to their online friends. Online social networking can help introverted adolescents learn how to socialize behind the safety of various screens, ranging from a two-inch smartphone to a 17-inch laptop. Social networking can provide tools for teaching in compelling ways that engage young students.

For parents, Rosen offered guidance. "If you feel that you have to use some sort of computer program to surreptitiously monitor your child's social networking, you are wasting your time. Your child will find a workaround in a matter of minutes," he said. "You have to start talking about appropriate technology use early and often and build trust, so that when there is a problem, whether it is being bullied or seeing a disturbing image, your child will talk to you about it."

He encouraged parents to assess their child's activities on social networking sites, and discuss removing inappropriate content or connections to people who appear problematic. Parents also need to pay attention to the online trends and the latest technologies, websites and applications children are using, he said.

"Communication is the crux of parenting. You need to talk to your kids, or rather, listen to them," Rosen said. "The ratio of parent listen to parent talk should be at least five-to-one. Talk one minute and listen for five."

Q7. What does Rosen suggest about parents in the passage?

- a) Parents do not trust their kids and are fond of advising them but are not keen in listening to them.
- b) Some parents make an effort to keep a watch directly on their kids.
- c) Parents are not smart enough to monitor their kids secretly.
- d) Most parents do not realize the importance of communicating with their kids.

Q8. All of the following could parallel as examples to strengthen Rosen's assertion about the advantages of facebook or social media as mentioned in the passage EXCEPT?

- a) A timid school girl made new friends on facebook and interacted with them online in her spare time.
- b) A student weak in maths secures good grades due to online help from a teaching app and becomes interested in watching educational videos on the latest developments in technology.

c) A girl expresses concern for the poor health of an online friend.

d) A pianist becomes famous overnight by posting his latest composition on facebook.

Q9. Which of the following can be understood from the passage?

a) The central idea of the passage is that social media presents risks and benefits to children but parents should communicate with their children and build their understanding on what is appropriate.

b) Rosen's contention in para 2 that social networking has adverse effects on children can be weakened by a survey finding in which an overwhelming majority of children support the idea of networking with others on social media.

c) Social media makes children develop a mechanical outlook towards life and turns them into robots.

d) Rosen's advice to parents can be summed up thus: Parents need to educate themselves and shed their illusions and wake up to the reality of social networking. They should keep abreast with the developments related to the latest technologies that are taking place online

DIRECTIONS *for questions 10 to 15:* The passage given below is followed by a set of six questions. Choose the best answer to each question.

A collective sigh of relief went around India on Tuesday after the weather office predicted above-normal rains this summer. Back-to-back deficient monsoons over the past two years have resulted in the worst weather outcome for the country in three decades. One more drought might have had unpredictable and nasty consequences.

But even as investors lap up the cheery forecast – tractor maker Escorts saw its shares jump almost 11% – Indian firms' water worries might just be beginning.

The main culprit is energy generation. India's thermal power plants already guzzle 22 billion cubic meters of water a year, according to New Delhi-based think tank Centre for Science and Environment. While that's a drop in the ocean compared with irrigation, which accounts for 85% of annual water use, the trouble is that food production's growing slowly while electricity generation has surged 37% over the past five years.

Worryingly, the bulk of that power is thermal, and there's more of it coming. Notwithstanding its push to have 100 gigawatts of solar power by 2022, the government still wants to build nearly 175 gigawatts of thermal power stations in the same period, more than doubling existing capacity. Finding the coal to run those plants is no longer the big hurdle it was a couple of years ago. Coal India has cranked up production, and inventories held by power producers are at a record high.

The bigger resource crunch is water. The water needed in ash-handling systems and cooling plants could easily create acute local shortages, which would in turn lead to power plants being turned off and electricity prices spiking. A foretaste of what may lie ahead came last month when state-run NTPC Ltd, India's largest power producer, was forced to shut down its Farakka thermal plant in eastern India.

India's more industrialized western states might be even more problematic. Maharashtra, which has more thermal power capacity than any other state, is thinking of forcing electricity producers to use sewage water, *Bloomberg News*' Archana Chaudhary reported this week. It's quite a desperate situation: The state is under such pressure that it even decided to forego the revenue from holding some of this year's Indian Premier League cricket matches because the pitches take a lot of water to maintain.

So far, investor interest in India's fickle monsoons has been all about divining the implications for farm income and food production. The former weighs on GDP growth, and is an important consideration in determining sales of everything from tractors to gold jewellery and Unilever's skin-whitening cream. But the correlation between rainfall and food inflation has been very low over the past 15 years, *Nomura* says.

That broken link between water and price levels might be a temporary reprieve. India is in the unenviable position of making a big bet on coal-fired power plants just as climate change raises the threat of once highly improbable events – such as three or more successive years of poor precipitation. If a big chunk of the country's power capacity has to be idled for lack of water, the economy might get a bigger stagflationary supply shock than it would from a drop in food production.

Although power producer NTPC's shares are rallying hard, this year's rosy monsoon forecast doesn't eliminate the water crisis facing Indian firms. It merely delays it.

Q10. What is the primary reason for the author to say that "the main culprit is energy generation"?

- a) Thermal power plants consume the maximum amount of water in India.
- b) The low efficiency of thermal power plants results in very high water consumption for electricity generation.
- c) Thermal power generation, which already consumes large quantity of water, is poised to grow at a high pace which will further increase the water consumption.
- d) The quantity of water used for thermal power generation is more than that used for irrigation.

Q11. Which of the following can be inferred to be the most probable reason for the shut down at the Farakka thermal plant?

- a) It was running into losses as it held excess coal as inventory.
- b) It was shut down because the solar power plants in that region generated ample electricity.
- c) It was adversely affecting the local environment.
- d) It could not be supplied with enough water for generating electricity.

Q12. Which of the following steps was undertaken by the state of Maharashtra to address the issue of water shortage?

- a) It did not allow hosting the Indian Premier League cricket matches.
- b) It compelled electricity producers to use sewage water in the power plants.
- c) It shut down the Farakka power plant.
- d) It did not allow sport stadiums to use water for the maintenance of the grounds.

Q13. Which of the following will be true if the government's plans for solar power generation and thermal power generation in India are realized by 2022?

- a) Power generation from solar power plants would be higher than that from thermal power plants.
- b) Power generation capacity of thermal power plants would be higher than that of solar power plants.

c) Solar power generation would have grown at a faster pace than thermal power generation.

d) Thermal power plants can generate more than 350 gigawatts of electricity whereas solar power plants can generate around 100 gigawatts of electricity.

Q14. How do monsoons in India affect the sales of skin whitening creams, as can be understood from the passage?

a) Monsoons affect the income generated from farms which impacts the GDP growth which in turn determines the sales of skin whitening creams.

b) Monsoons play a major role in food production which, in turn, plays a role in the sales of skin whitening creams.

c) Monsoons impact the farm income which influences the sales of everything including skin whitening cream.

d) Monsoons directly impact the GDP growth of the country which in turn plays a role in determining the sales of skin whitening creams.

Q15. Which of the following is mentioned by the author as a possible reason for back-to-back deficient monsoons?

a) Water consumption by thermal power plants

b) Government policies

c) Irrigation

d) Climate change

DIRECTIONS *for questions 16 to 18:* The passage given below is followed by a set of three questions. Choose the best answer to each question.

Something odd is happening in the Netherlands.

Government documents recently obtained by Dutch newspaper *The Telegraaf* reveal five prisons are closing down in the Netherlands just three years after the government announced 19 others were closing.

Crime has been going down each year since 2004, and nobody can figure out exactly why. In the Netherlands, the incarceration rate is just 69 per 100,000 people. This stands in stark contrast to the US, where the rate is 716 per 100,000 – the highest in the world. The US recidivism rate – that is, how often people who've been to prison end up going back – is 52%, according to 2013 data. The Netherlands' is closer to 40% and has been declining for over a decade.

The success of the Dutch model may lead one to the conclusion that the country's success results from measured steps toward prisoner rehabilitation. But there's little evidence suggesting prisons are rehabilitating criminals. Nor are any federal policies necessarily responsible for keeping people out of trouble.

Frank Weerman, a Dutch sociologist at the Netherlands Institute for the Study of Crime and Law Enforcement, says the decrease in heroin addiction rates through the 1990s might contribute to the low crime rates. He also credits the increased safety measures to secure stores and homes.

However, Weerman still hedges.

"I am not sure what exactly is the contribution of all this to the decline in prisoners in the Netherlands, but it probably has played a role," he says.

To be sure, crime rates in the Netherlands are going down. That's why the prisons are closing in the first place: It's become too expensive to keep them in operation when they're only running at partial capacity.

A 2010 study of one major Dutch prison found that offering basic rights, like healthcare and personal space, kept the prison running safely and smoothly. Guards also had electronic devices that monitored prisoner activity via ankle bracelets.

Better prisoner monitoring after the fact may help explain some of the success in reducing crime.

A 2008 study, for example, found that cutting short Dutch prisoners' sentences to let them reenter the workforce with ankle monitors reduced the recidivism rate by up to half compared to traditional incarceration. Instead of wasting away in a jail cell, eating up federal funds, criminals were given the opportunity to contribute to society.

So it's possible that the Dutch prison system might succeed, in other words, precisely because people don't spend much time locked up. It may also be the programs offered to prisoners *after they've been let go* that give them the real leg up on the American system. In the US, many people who fall into the cycle of crime end up absorbing that behavior as part of their identity, so they eventually lose the drive to escape the cycle altogether.

Q16. Which of the following is not mentioned in the passage as a probable reason for the reduction in the crime rate in the Netherlands since 2004?

- a) The decline in the heroin addiction during the 1990s.
- b) Offering basic rights like healthcare and personal space to prisoners.
- c) Better security systems in homes and stores.
- d) Allowing prisoners to work by shortening their sentences.

Q17. Which of the following can be inferred from the passage to be a possible reason for the recidivism rate in Netherlands being lower than that in the US?

- a) In the Netherlands, the prisoners are monitored using ankle bracelets, even as they are serving their sentences in prison, to inculcate good behaviour patterns in them, which is not the case in the US.
- b) Unlike in the US, in the Netherlands, the prisoners are provided an opportunity to contribute to society by shortening their sentences.
- c) Prisoners in the Netherlands are provided basic rights while those in the US are not.
- d) Heroin addiction in the US is significantly more than that in the Netherlands.

Q18. Which of the following statements, if true, will support Weerman’s hypothesis about the relation between heroin addiction and incidence of crime?

- a) Even though heroin addiction has decreased during 1990s, it has increased since 2004.

b) While the heroin addiction decreased during 1990s, the crime rate increased during the same period.

c) Most of the crimes in the Netherlands have been crimes related to heroin peddling.

d) In the Netherlands, strict measures have been in place since the 1990s to prevent heroin consumption.

DIRECTIONS *for questions 1 to 3:* Read each of the following paragraphs and answer the question given below.

Q19. Tourism is an important industry in New Zealand, directly contributing NZ$7.3 billion (or 3.7%) of the country's GDP in 2013, as well as directly supporting 110,800 full-time equivalent jobs (nearly 6% of New Zealand's workforce). New Zealand is internationally seen as a top holiday destination, evidenced by awards like being voted Most Favourite Destination by the readers of the Condé Nast Traveler magazine (specialising in luxury travels) in 2008 (though it slipped to second place in 2009), and was also named the best overseas holiday destination in a 2007 The Daily Telegraph poll, the United Kingdom's largest such poll. Since the start of a 2000 advertising campaign by Tourism New Zealand, there has been a 61% increase in the number of Britons coming to New Zealand.
Tourism New Zealand, the country's official tourism agency, is actively promoting the country as a destination worldwide. Recent activities include a NZ$7 million campaign in China, concentrating on Shanghai, and cooperating to produce a New Zealand tourism layer for Google Earth, the first country to receive such a treatment.

Which of the following is the assumption behind the tourism promotion activity in New Zealand?

a) The Daily Telegraph received a lot of ads from New Zealand based campaigns.

b) New Zealand has consistently being voted as the most favourite tourism destination.

c) Tourism New Zealand has played a pivotal role in branding New Zealand as a tourist destination.

d) Tourism in New Zealand has immense scope for increase.

DIRECTIONS *for questions 1 to 3:* Read each of the following paragraphs and answer the question given below.
Q20. Coffee is actually very healthy. Studies show that coffee drinkers have a much lower risk of several serious diseases. Coffee has a very important natural drug called caffeine that makes you more active and improves your health. Drinking two cups of coffee before exercise reduces post-workout muscle pain by over 50 percent – more relief than a pain reliever medicine like aspirin can provide, says a study.

Which of the following, if true, would weaken the above argument?

a) Coffee contains several important nutrients, including riboflavin, pantothenic acid, manganese, potassium, magnesium and niacin.

b) Caffeine produces side effects like sleep disturbances or heart palpitations.

c) A pain reliever, like aspirin provides less relief from post-workout muscle pain as compared to caffeine.

d) Several studies show that caffeine can increase fat burning in the body and boost the metabolic rate.

DIRECTIONS *for questions 1 to 3:* Read each of the following paragraphs and answer the question given below.

Q21. The nervous system is very sensitive to all forms of mercury. Exposure to high levels of any types of mercury can permanently damage the brain, kidneys, and developing foetus. Effects on brain functions may result in irritability, shyness, tremors, changes in vision or hearing and memory problems. High exposure to mercury vapour may cause chest pain, shortness of breath, and a build up of fluids in the lungs (pulmonary oedema) that can be fatal.
Mercury can be absorbed through the skin. Workers in the industries that use or produce mercury and its compounds (mercury mines and refineries, chemical manufacturing, dental/ health fields, metal smelters) are at risk of exposure. Workers in fossil fuel power plants and in cement manufacturing may be exposed to mercury compounds if they are exposed to gaseous process emissions. Consumers can be exposed to mercury and its compounds by exposure to air from production and processing facilities using mercury and its compounds, and by eating fish or shellfish contaminated with methyl mercury. People can also be exposed to mercury from dental work and medical treatments.

Which of the following can be inferred to be a valid course of action based on the information given in the above passage?

(a) One should evacuate residential areas which are proximate to factories processing mercury or its compounds and move to mercury free localities.

(b) Dental amalgams and silver fillings having high mercury content should be immediately banned and should not be administered by dentists to patients.

(c) Workers in factories that use mercury or its compounds in their production should be given adequate protection clothing including masks.

(d) Some of us are genetically better adapted to detoxify mercury than others, leading to variable effects within the population.

- a) Only c
- b) b and d
- c) a, b and c
- d) c and d

DIRECTIONS *for questions 4 to 6:* In each of the following questions, there are sentences or fragments of sentences that form a paragraph. Identify the sentence(s) or fragments of sentence(s) that is/ are **correct** in terms of grammar and usage, including spelling, punctuation and logical consistency. Enter the number corresponding to the sentence(s) or fragments of sentence(s) in the input box provided below the question. [Note: Enter your answer in increasing order only. For example, if you think that the fragments (2) and (4) are **correct**, then enter 24 (but not 42) in the input box.]
Q22. (1) On 3 December 1976, just weeks before the general election and two days before Bob Marley

(2) was to play the Smile Jamaica concert to ease political tensions, seven men from West Kingston

(3) storm his house with machine guns. Marley survived and went on to perform at the free concert.

(4) But the next day he left the country and didn't return for two years. Inspired by this near-myth event, *A Brief History of Seven Killings*

(5) take the form of an imagined oral biography, traversing strange landscapes and shady characters, as motivations are examined – and questions asked.

DIRECTIONS *for questions 4 to 6:* In each of the following questions, there are sentences or fragments of sentences that form a paragraph. Identify the sentence(s) or fragments of sentence(s) that is/ are **correct** in terms of grammar and usage, including spelling, punctuation and logical consistency. Enter the number corresponding to the sentence(s) or fragments of sentence(s) in the input box provided below the question. [Note: Enter your answer in increasing order only. For example, if you think that the fragments (2) and (4) are **correct**, then enter 24 (but not 42) in the input box.]

Q23. (1) In 1966, the World Meteorological Organization proposed the term 'climatic change' to encompass with

(2) all forms of climatic variability on time-scales longer than 10 years, whether the cause was natural and anthropogenic.

(3) Change was considered given and 'climatic' was used as an adjective to describe this kind of change.

(4) When it was realized that human activities had a potential to alter the climate drastically, the term 'climate change' replaced 'climatic change'

(5) as the dominant term to reflect an anthropogenic cause.

DIRECTIONS *for questions 4 to 6:* In each of the following questions, there are sentences or fragments of sentences that form a paragraph. Identify the sentence(s) or fragments of sentence(s) that is/ are **correct** in terms of grammar and usage, including spelling, punctuation and logical consistency. Enter the number corresponding to the sentence(s) or fragments of sentence(s) in the input box provided below the question. [Note: Enter your answer in increasing order only. For example, if you think that the fragments (2) and (4) are **correct**, then enter 24 (but not 42) in the input box.]

Q24. (1) In Palo Alto, California, there is a factory that has been making spacecraft from the year Sputnik was launched,

(2) and before anyone in Palo Alto has heard of Silicon Valley. SSL, previously known as Space Systems/Loral, has built more than 100 communications satellites.

(3) They are all based on the same structure: a cylinder 1.2 metres across enclosed in a square box.

(4) The more the satellite has to do, the taller the box it is built on, the longer its solar panels and the larger and complex

(5) the array of antennae and reflectors through which it sends data to it's earthbound clients.

DIRECTIONS *for questions 7 and 8:* Five sentences each with a blank are given in each of the following questions. Four words are also given below the sentences. The blank in each sentence can be filled by one or more of the four words given. Each word can go into any number of sentences. Note that the sentence can change contexts depending on the use of different words which can be appropriate. **Identify the number of sentences each word can go into and enter, in the input box given below the question, the maximum**

number of sentences that any word can fit in. For example, if you think that a word goes into a maximum of two sentences, then enter 2 in the input box given below the question.
Q25. (i) No help was within _____.

(ii) You must _____ out further to attain your objective.

(iii) These are the steps by which you _____ the entrance.

(iv) Despite his best efforts, he failed to _____ the demands of his job.

(v) He was never a great writer, not by any _____ of the imagination.

(A) meet

(B) reach

(C) sight

(D) stretch

DIRECTIONS *for questions 7 and 8:* Five sentences each with a blank are given in each of the following questions. Four words are also given below the sentences. The blank in each sentence can be filled by one or more of the four words given. Each word can go into any number of sentences. Note that the sentence can change contexts depending on the use of different words which can be appropriate. **Identify the number of sentences each word can go into and enter, in the input box given below the question, the maximum number of sentences that any word can fit in**. For example, if you think that a word goes into a maximum of two sentences, then enter 2 in the input box given below the question.
Q26. (i) Would compulsory voting _____ the cause of democracy or undermine it?

(ii) I assure you that your secret will go no _____; it is safe with me.

(iii) The slum-dwellers' situation grew _____ complicated when the politicians intervened.

(iv) The passengers decided to protest any _____ delay in their departure.

(v) The atmosphere in a cemetery is usually _____.
(A) subvert

(B) grave

(C) further

(D) more

DIRECTIONS *for question 9:* Four sentences (each with a blank) are given in the following question. Four words in italics are also given for each sentence in brackets. The blank in each sentence can be filled by one or more of the four words given for each sentence. Note that the sentence can change contexts depending on the use of different words which can be appropriate. **Identify the number of words that can fill each sentence and then enter those numbers sequentially in the input box given below the question.** For example, if you think that sentences i, ii, iii and iv can be filled by 3 words, 2 words, 1 word and 4 words respectively, then enter your answer as 3214 in the input box given below the question.

Q27. (i) Greenhouse gases like carbon dioxide quickly _____ in the earth's atmosphere but gas clouds and nebulae don't. *(disburse, disperse, immerse, dissipate)*

(ii) His _____ to the post of CEO came after a long, patient wait. *(ascent, adjutant, assent, extant)*

(iii) Raising our voices and challenging his decisions would _____ that we are resisting his authority. *(imply, infer, indicate, mean)*

(iv) He was a _____ old man because his children had abandoned him but this did not cause him to resort to pejorative talk. *(mordant, bitter, astringent, pungent)*

DIRECTIONS *for questions 10 to 12:* Six sentences (labelled 1, 2, 3, 4, 5 and 6) are given in each of the following questions. Five of them can be put together to form a meaningful and coherent short paragraph and **one sentence is the odd one out**. Decide on the proper logical order for the sentences and key in the sequence of **five** numbers as your answer, even as you **omit the contextually unrelated sentence**.
Q28. (1) These so-called "Lazarus" comets may represent a long-lost population of the icy space travellers and may alter scientists' understanding of their origins.

(2) The scientists conclude that a sizable population of Lazarus comets had long since died and if all their orbits were nudged closer to the sun's rays, it could release the ice trapped deep within the comets, bringing them back to life.

(3) These chunks of ice and rock, typically a few kilometers across, have long held human imaginations as "falling stars."

(4) Comets are amongst the smallest objects in the Solar System, typically a few km across and are thought to have helped bring water to our planet.

(5) Colombian scientists have discovered a graveyard of comets in the main asteroid belt between Mars and Jupiter and say that some of the interred are coming back to life.

(6) As a Lazarus comet travels around the sun, the heat and light vaporize some of the water ice trapped inside, causing the signature tail of glowing gas and dust to form behind it.

DIRECTIONS *for questions 10 to 12:* Six sentences (labelled 1, 2, 3, 4, 5 and 6) are given in each of the following questions. Five of them can be put together to form a meaningful and coherent short paragraph and **one sentence is the odd one out**. Decide on the proper logical order for the sentences and key in the sequence of **five** numbers as your answer, even as you **omit the contextually unrelated sentence**.
Q29. (1) Another attraction of China besides the legendary Terracotta Army found buried in the pits nearby Qin Shi Huang's mausoleum is the Silk Route of China.

(2) The figures, dating from approximately the late third century BCE, were discovered in 1974 by local farmers in Lintong District, Xi'an, Shaanxi province.

(3) The Terracotta Army (literally: "Soldier-and-horse funerary statues") is a collection of terracotta sculptures depicting the armies of Qin Shi Huang, the first Emperor of China.

(4) In 1976, two other vaults were discovered close to the first one and it is now estimated that the three vaults held more than 8,000 soldiers, 130 chariots with 520 horses and 150 cavalry horses.

(5) It is a form of funerary art buried with the emperor in 210–209 BCE and whose purpose was to protect the necropolis and assist the emperor to rule another empire in his afterlife.

(6) Peasants digging a well uncovered an underground vault of earth and timber and subsequent excavation revealed thousands of terracotta figures, life-size warriors and their horses all in battle formation – a whole army which would follow its emperor into immortality.

DIRECTIONS *for questions 10 to 12:* Six sentences (labelled 1, 2, 3, 4, 5 and 6) are given in each of the following questions. Five of them can be put together to form a meaningful and coherent short paragraph and **one sentence is the odd one out**. Decide on the proper logical order for the sentences and key in the sequence of **five** numbers as your answer, even as you **omit the contextually unrelated sentence**.

Q30. (1) Omission and simplification help us to understand -- but help us, in many cases, to understand the wrong thing.

(2) However elegant and memorable, brevity can never, in the nature of things, do justice to all the facts of a complex situation.

(3) The subject of freedom and its enemies is enormous, and what I have written is certainly too short to do it full justice.

(4) The soul of wit may become the very body of untruth.

(5) For our comprehension may be only of the abbreviator's neatly formulated notions, not of the vast, ramifying reality from which these notions have been so arbitrarily abstracted.

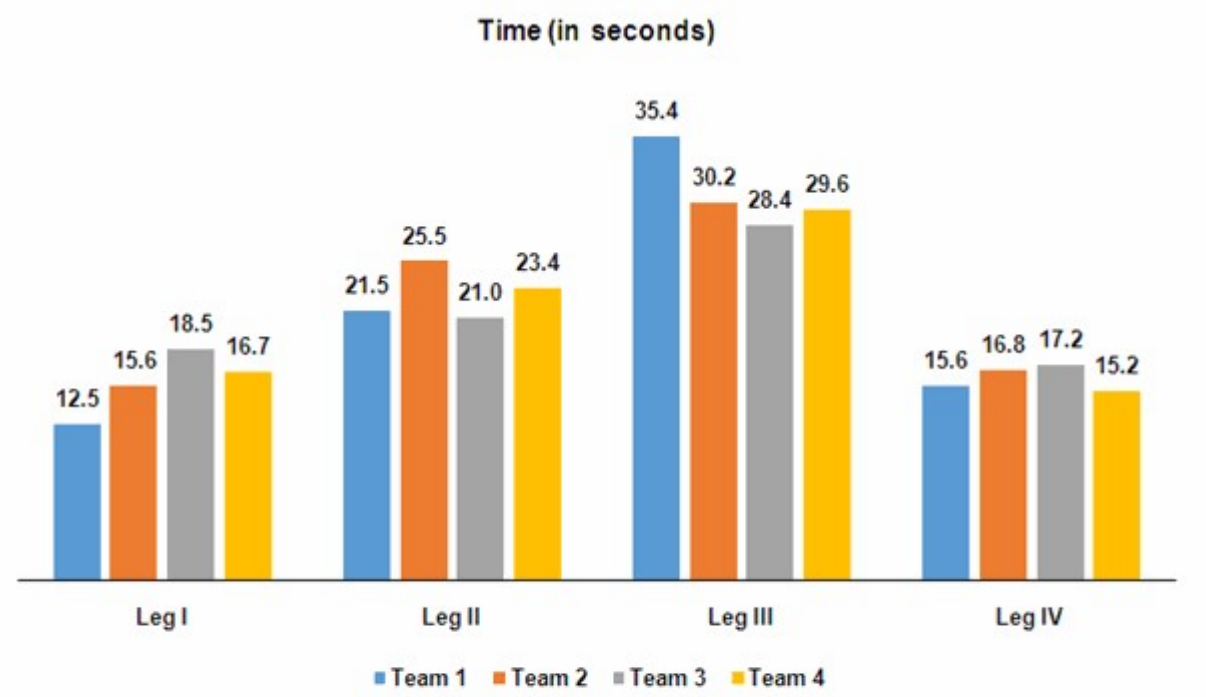
(6) On such a theme one can be brief only by omission and simplification.

DILR

DIRECTIONS *for questions 1 to 5:* Answer these questions on the basis of the information given below.

A team in a relay race comprises four sprinters and each sprinter runs a pre-determined distance, called a leg of the race, carrying a baton which he must pass on to the next sprinter, who will then run the next leg of the race. There are four legs – Leg I, Leg II, Leg III, Leg IV – in each relay race, not necessarily of the same length. The four sprinters in each team are referred to as the First Sprinter, Second Sprinter, Third Sprinter and the Fourth Sprinter, according to the leg of the race that they cover. The team which covers the four legs of the race, in this manner, in the lowest time is declared the winner. Assume that the time taken by any sprinter to pass on the baton to the next sprinter is negligible.

Four teams, Team 1, Team 2, Team 3 and Team 4, participated in a certain relay race. The following bar graph gives the time for which the sprinters of each team held the baton during each leg of the race and the table provides the length (in m) of each leg of the race:



Leg	Leg I	Leg II	Leg III	Leg IV
Length (in m)	50	150	200	100

Q1. DIRECTIONS *for questions 1 to 3:* Select the correct alternative from the given choices.

Which team won the race?

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

Q2. DIRECTIONS *for questions 1 to 3:* Select the correct alternative from the given choices.

The average speed of which sprinter in Team 3 was the highest?

- a) First Sprinter
- b) Second Sprinter
- c) Third Sprinter
- d) Fourth Sprinter

Q3. DIRECTIONS *for questions 1 to 3:* Select the correct alternative from the given choices.

The average speed of which of the following sprinters was the highest?

- a) Third Sprinter of Team 1
- b) Second Sprinter of Team 2
- c) Fourth Sprinter of Team 2
- d) First Sprinter of Team 4

Q4. DIRECTIONS *for questions 4 and 5:* Type in your answer in the input box provided below the question.

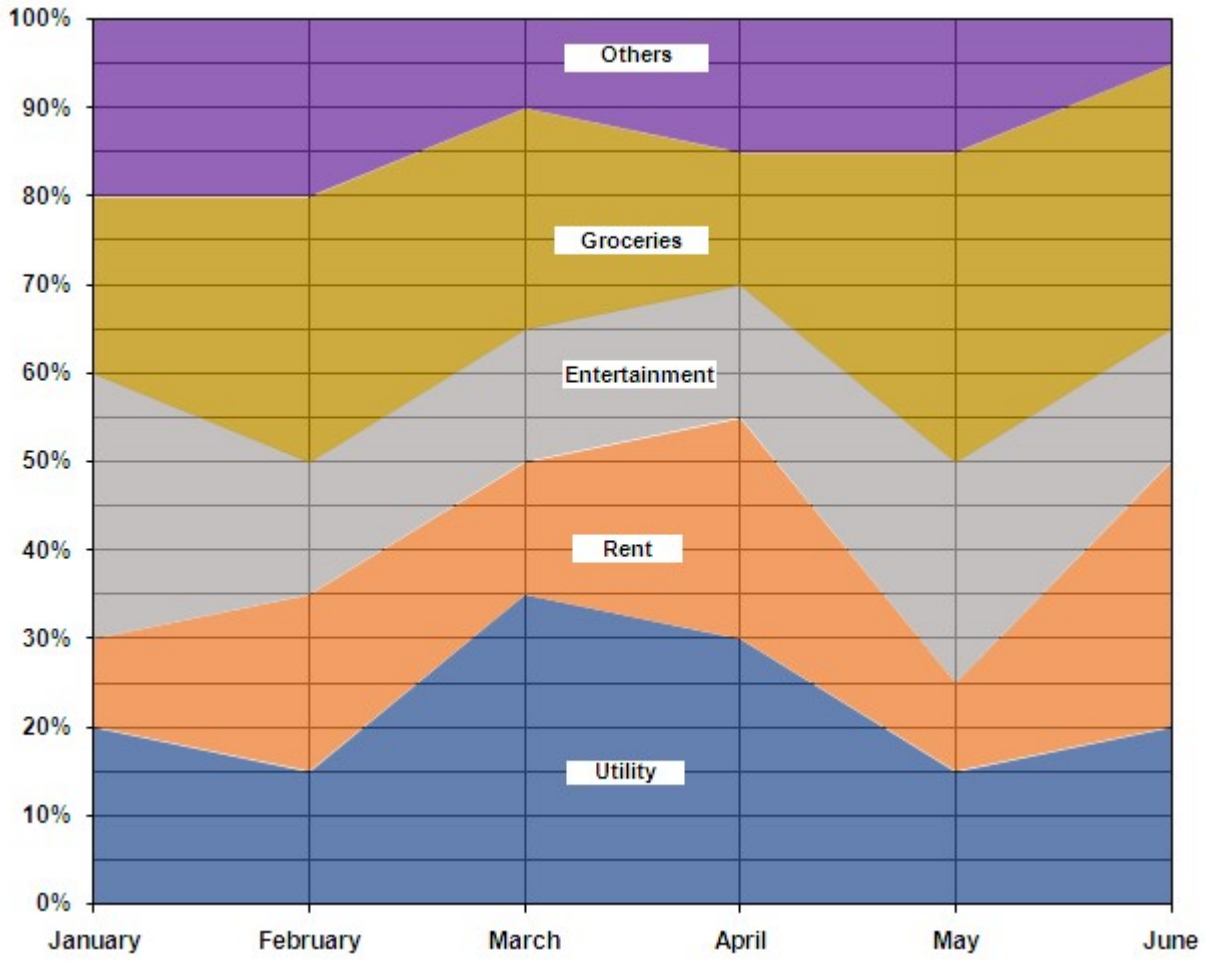
The average speed of how many sprinters across the four teams was greater than 6 m/s?

Q5. DIRECTIONS *for questions 4 and 5:* Type in your answer in the input box provided below the question.

How many teams managed to pass on the baton to their Fourth Sprinter within the first 70 seconds of the race?

DIRECTIONS *for questions 6 to 10:* Answer these questions on the basis of the information given below.

Mr. Sharma categorizes his monthly expenses into exactly five categories – Utility, Rent, Entertainment, Groceries and Others. The chart below presents the percentage breakup of the monthly expenses by category of Mr. Sharma for five months, from January to May. It is known that the amount that he categorizes as Rent remains constant for any month.



Q6. DIRECTIONS *for questions 6 to 8:* Select the correct alternative from the given choices.

For how many months from February to June were the expenses on Entertainment in a month greater than those in the previous month?

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

Q7. DIRECTIONS *for questions 6 to 8:* Select the correct alternative from the given choices.

In which month were the total monthly expenses of Mr. Sharma the lowest?

- a) January
- b) February
- c) April
- d) June

Q8. DIRECTIONS *for questions 6 to 8:* Select the correct alternative from the given choices.

What is the highest percentage increase in the expenses on Groceries in any month as compared to the previous month?

- a) 50%
- b) 133.3%
- c) 483.3%
- d) 545.5%

Q9. DIRECTIONS *for question 9:* Type in your answer in the input box provided below the question.

If the expenses on Utilities in April were Rs.6000, what were the expenses (in Rs.) on Groceries in May?

Q10. DIRECTIONS *for question 10:* Select the correct alternative from the given choices.

In which month was the expense on Utility the lowest?

- a) February
- b) April
- c) June
- d) Cannot be determined

DIRECTIONS *for questions 11 to 15:* Answer these questions on the basis of the information given below.

The manufacturing process of Transmission Shafts in a factory comprises five stages – Stage I, Stage II, Stage III, Stage IV and Stage V – in that order. At the beginning of each day, the processing of all the shafts scheduled for each stage will begin and at the end of the day, each shaft is inspected and is moved to the next stage (scheduled to be processed on the next day), only if it satisfies the quality requirements. If a shaft does not satisfy the quality requirements, the shaft remains in the same stage (i.e., it is rescheduled for the same stage) for the next day. The shafts which satisfy the quality requirements at the end of Stage V are said to be completed. Further, at the beginning of each day, a certain number of new shafts are scheduled for Stage I.

Rahul, the operations manager in this factory, was examining the number of shafts processed in each stage during each of five consecutive days – Day 1 to Day 5. He observed that at the end of each day, the number of shafts that were moved from one stage to the next as a percentage of the number of shafts in the former stage was the same for all the five stages (i.e., at the end of a day, if x% of the shafts from Stage I were moved to Stage II, then the percentage of shafts that were moved at the end of that day from Stage II to Stage III, from Stage III to Stage IV, and so on, were also x% each). The following table provides the number of shafts processed on each of the five days:

Stage	Day 1	Day 2	Day 3	Day 4	Day 5
Stage I	1600	1780	1368	884	721
Stage II	2000	1920	1864	1616	1067
Stage III	1600	1680	1776	1820	1667
Stage IV	1800	1760	1728	1752	1803
Stage V	1400	1480	1592	1660	1729

Q11. DIRECTIONS *for question 11:* Select the correct alternative from the given choices.

At the end of which of the following days was the percentage of shafts moved from one stage to the next the highest?

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

Q12. DIRECTIONS *for questions 12 and 13:* Type in your answer in the input box provided below the question.

What is the maximum number of shafts moved from Stage I to Stage II at the end of any day?

Q13. DIRECTIONS *for questions 12 and 13:* Type in your answer in the input box provided below the question.

What is the total number of new shafts added to Stage I from Day 2 to Day 5?

Q14. DIRECTIONS *for questions 14 and 15:* Select the correct alternative from the given choices.

Which of the following values is the highest?

- a) The number of shafts moved from Stage I to Stage II at the end of Day 4.
- b) The number of shafts moved from Stage III to Stage IV at the end of Day 2.
- c) The number of shafts moved from Stage I to Stage II at the end of Day 3.
- d) The number of shafts moved from Stage IV to Stage V at the end of Day 2.

Q15. DIRECTIONS *for questions 14 and 15:* Select the correct alternative from the given choices.

What is the maximum number of units completed at the end of any day?

- a) 1245

- b) 1165
- c) 1105
- d) 1305

DIRECTIONS *for questions 1 to 5:* Answer these questions on the basis of the information given below.

Six people – Raman, Rohan, Raghav, Ramesh, Rafi and Ram – are playing a game of cards, sitting around a circular table in six equally spaced chairs. Each person has exactly one card with him and the cards that they have are of four types – Red High card, Red Low card, Black High card and Black Low card. It is known that exactly three persons have a Red card and exactly three persons have a Black card. Further, exactly three persons have a High card and exactly three persons have a Low card. The following information is known about their seating arrangement and the cards that they have:

(i) Raman, who does not have a Red card, is sitting opposite Raghav.

(ii) Exactly two Red cards are High cards and Rohan does not have a high card.

(iii) Ramesh is sitting to the left of Ram and neither of them have a High card.

(iv) The person sitting adjacent to Ram has a High card which is not Black.

(v) None of the persons sitting adjacent to Rafi has a Red card but the person sitting opposite him has a Red card.

Q16. DIRECTIONS *for questions 1 to 5:* Select the correct alternative from the given choices.

Which of the following cards does Rafi have?

- a) Black Low card
- b) Red Low card
- c) Black High card
- d) Red High card

Q17. DIRECTIONS *for questions 1 to 5:* Select the correct alternative from the given choices.

Which of the following pairs of people are sitting opposite each other AND have the same type of card?

- a) Raman and Raghav
- b) Rafi and Ramesh
- c) Rohan and Ramesh
- d) Ram and Rohan

Q18. DIRECTIONS *for questions 1 to 5:* Select the correct alternative from the given choices.

The cards with the persons sitting adjacent to which of the following person are of the same colour?

- a) Raman
- b) Ramesh
- c) Ram
- d) Rohan

Q19. DIRECTIONS *for questions 1 to 5:* Select the correct alternative from the given choices.

Who among the following has a type of card which no one else has?

- a) Rafi
- b) Raman
- c) Rohan
- d) Raghav

Q20. DIRECTIONS *for questions 1 to 5:* Select the correct alternative from the given choices.

Who among the following has a Red Low card?

- a) Ram
- b) Raghav
- c) Rafi
- d) Rohan

DIRECTIONS *for questions 6 to 10:* Answer these questions on the basis of the information given below.

A cube of side 4 cm is painted blue on all its faces. This cube is then cut into eight equal cubes, each of side 2 cm. All the unpainted faces of each of the 2 cm cubes are then painted green. Each of these 2 cm cubes is further cut into eight equal unit cubes, each of side 1 cm. Finally, all the unpainted faces of each of the 1 cm cubes are painted red.

Q21. DIRECTIONS *for questions 6 to 9:* Type in your answer in the input box provided below the question.

How many unit cubes have their faces painted with exactly two different colours?

Q22. DIRECTIONS *for questions 6 to 9:* Type in your answer in the input box provided below the question.

How many unit cubes have at least one set of three faces which share a corner painted with the same colour?

Q23. DIRECTIONS *for questions 6 to 9:* Type in your answer in the input box provided below the question.

What is the total number of faces that will be painted green across all the unit cubes?

Q24. DIRECTIONS *for questions 6 to 9:* Type in your answer in the input box provided below the question.

How many unit cubes will have exactly one of their faces painted green? \

Q25. DIRECTIONS *for question 10:* Select the correct alternative from the given choices.

How many cubes of side 2 cm can be formed using all the unit cubes such that all the visible faces of the cubes of side 2 cm, thus formed, are green?

- a) 0
- b) 1
- c) 2
- d) 4

DIRECTIONS for questions 11 to 15: Answer these questions on the basis of the information given below.

Eight persons – Adam, David, Graham, John, Kim, Roger, Steven and Trevor – were marooned on an island. On the very first day, they decided to go in search of food and before the end of the day, each person found an orchard of a different fruit among Apple, Banana, Cherry, Date, Fig, Grape, Kiwi and Mango. The eight people together decided that they will trade with each other the fruits from the orchards that they found. However, they also decided that, on each day, starting from the first day, each person must trade the fruits only from his orchard in exchange for the fruits from the orchard of exactly one other person.

During the first two days, none of the eight persons traded with the same person twice. Further, in these two days, neither did any person run out of fruit from his orchard nor did any person completely consume the fruits that he had received in exchange. The following information is known about the fruits with each person at the end of the first and the second days:

(i) Graham, who did not trade with Kim on either day, traded with the person who found the Grape orchard on the second day.

(ii) David, who found the Cherry orchard, did not trade with the person who found the Banana orchard on the first day.

(iii) Neither John nor Kim had Mangoes with them at the end of the second day.

(iv) The person who found the Apple orchard traded with the person who found the Fig orchard on the first day but did not trade with the person who found the Date orchard on the second day.

(v) Steven, who had Dates, Figs and Mangoes with him at the end of the second day, traded with neither John nor Kim on either day.

(vi) Roger, who found the Mango orchard, traded with the person who found the Date orchard and the person who found the Apple orchard on the two days, in that order.

Q26. DIRECTIONS *for questions 11 to 15:* Select the correct alternative from the given choices.

Who traded with Graham on the first day?

- a) David
- b) John

- c) Steven
- d) Trevor

Q27. DIRECTIONS *for questions 11 to 15:* Select the correct alternative from the given choices.

Who among the following had Bananas with him at the end of the second day?

- a) Graham
- b) Trevor
- c) John
- d) Adam

Q28. DIRECTIONS *for questions 11 to 15:* Select the correct alternative from the given choices.

If Adam traded with Steven on one of the two days, which of the following fruits did Trevor have at the end of the second day?

- a) Kiwi
- b) Date
- c) Cherry
- d) Mango

Q29. DIRECTIONS *for questions 11 to 15:* Select the correct alternative from the given choices.

Who found the Grape orchard?

- a) Graham
- b) John
- c) Kim
- d) Cannot be determined

Q30. DIRECTIONS *for questions 11 to 15:* Select the correct alternative from the given choices.

Which of the following pairs of people have no fruits in common among the fruits that they have at the end of the second day?

- a) Adam, Trevor
- b) John, Graham
- c) David, Adam
- d) Graham, Kim

QA

Q1. Sindhu drew the co-ordinate axes on a large graph paper, with the centre as the origin, and then folded the paper, with one straight fold, in such a way that the point (0, 6) coincides with the point (4, 2). If the point (12, 8) coincides with the point *(m, n)*, find the value of (*n* – *m.*)

Q2. Each of five friends, A, B, C, D and E, have a certain amount with them, such that 25% of the amount with A, 37.5% of that with B, 50% of that with C, 75% of that with D and 87.5% of that with E are all equal. If the amount (in Rs.) with each of them is a whole number, then what is the minimum possible total amount (in Rs.) with them?

Q3. The ratio of milk and water in a mixture of the two is 3 : 1. First, the volume of the mixture is increased by 50% by adding water. Next, 25 litres of the mixture is replaced with water. If the final ratio of milk and water in the resultant mixture is 1 : 3, find the initial quantity of mixture present (in litres).

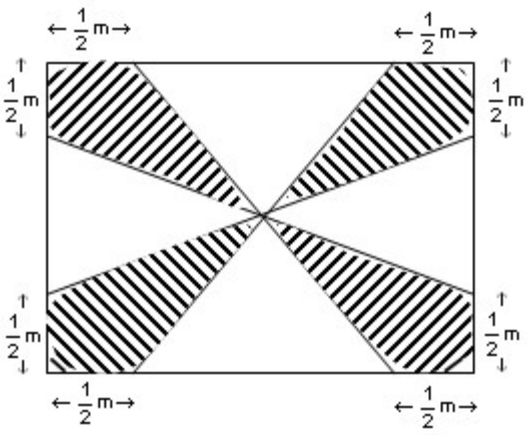
- a) $16\frac{2}{3}$
- b) $33\frac{1}{3}$
- c) 40
- d) 80

Q4. If a circle is inscribed in an isosceles trapezium, whose parallel sides measure 32 cm and 18 cm, such that the circle touches all four sides of the trapezium, find the radius (in cm) of the circle.

Q5. In an arithmetic progression, the sum of the first N terms is T and the sum of the first 2N terms is 6T. If the sum of the first 3N terms is *k*T, then find *k.*

Q6. Find the number of times the digit '3' is used in writing all three-digit numbers in the number system to the base 4.

Q7. The figure below represents the national flag of a certain country. If the shape of the flag is a rectangle of dimensions 3 m by 4 m, find the area of the shaded region (in sq. m).



- a) 2

- b) $\frac{7}{2}$
- c) 4
- d) $\frac{9}{2}$

Q8. How many distinct values of x satisfy the equation $|3x + 2| - |2x - 3| = 5$?

- a) 0
- b) 2
- c) 3
- d) More than 3

Q9. If the sum of a three-digit number and the number obtained by reversing the order of the digits is 1232, then find the tens digit of the number.

Q10. The minimum value of the expression $x^2 + y^2 - 6x - 4y + 17$ is

Q11. Two trains started simultaneously, at 11:00 am, from Asansol and Patna, moving towards Patna and Asansol respectively, and crossed each other at 3:00 pm. If the train starting from Patna reached its destination 88 minutes before the other train, when did the train starting form Asansol reach Patna?

- a) 7:20 pm
- b) 7:30 pm
- c) 7:48 pm
- d) 8:00 pm

Q12. If A can do a work in three times the time taken by B and C together to do the same work, in how much time will A, B and C together do a work, which A alone takes 20 days to complete?

- a) 4 days
- b) 5 days
- c) 2 days
- d) $6\frac{1}{3}$ days

Q13. Find the sum of the digits of the number $8^{672} \times 25^{1010}$.

Q14. If the distance between the points at which the straight line $x = n$ $(n > 0)$ intersects the curves $f(x) = \log_9(x + 6)$ and $g(x) = \log_9(x + 2)$ is $\frac{1}{4}$, find the value of n.

- a) $\sqrt{2}$

- b) $2\sqrt{3}$
- c) $3\sqrt{2}$
- d) $\sqrt{3}$

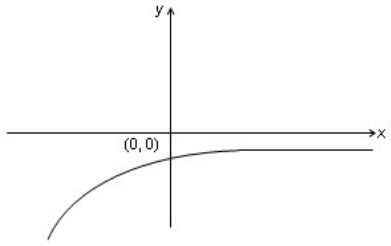
Q15. Find the number of ordered pairs *(x, y)* that satisfy the equation $x^3 + y^3 + 144xy = 110592$, where *x* and *y* are non-negative integers.

Q16. A sold an item to B at 25% profit. B then marked up the price of the item by 40% and sold it to C, offering a certain percentage discount, thereby realizing a profit of 20%. Find the percentage discount offered by B to C.

- a) $16\frac{2}{3}\%$
- b) $14\frac{2}{7}\%$
- c) $12\frac{1}{2}\%$
- d) 10%

Q17. In the front-office of a bank, there are four cash dispensing counters with a teller sitting at each of them. In how many ways can five customers stand in front of these counters, if they choose the counters at random?

Q18.



Which of the following can best describe the above graph?

- a) $y = |e^{-x}|$
- b) $y = -|\log(-x)|$
- c) $y = -e^{-x}$
- d) $y = -\log(-x)$

Q19. ABC is an isosceles triangle, where AB is equal to AC. Another triangle, EBC, is drawn such that EB intersects AC at D. If AD = BD = 8 cm, DC = 4 cm and ĐCEB = $\frac{1}{2}$ ĐCAB, find the measure of DE (in cm). Input your answer as '0' if the answer cannot be determined with the given information.

Q20. If an amount is compounded continuously at a nominal rate of interest of 12.5% per annum, then find the percentage increase in the amount in eight years. (Take *e* = 2.71828)

- a) 71.82%
- b) 171.82%
- c) 271.82%
- d) None of the above

Q21. A number divided by a certain divisor leaves a remainder of 8. When the square of the number is divided by the same divisor the remainder obtained is 6. How many possible values can the divisor assume?

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

Q22. From out of a large cone, a frustum of the cone is cut away and removed to obtain a smaller cone. If the percentage reduction in the radius of the cone is 20%, find the percentage reduction in the volume of the cone.

- a) 79.2%
- b) 80%
- c) 64%
- d) 48.8%

Q23. If a copper wire of diameter 1.5 cm and length 80 m is melted completely and recast to form a solid spherical ball of radius R cm, then find the value of R (in cm).

- a) 15
- b) 12
- c) 20
- d) 25

Q24. While adding N consecutive numbers starting from 1, Bulu, by mistake, added a number twice and arrived at a sum of 2000. Which number did he add twice?

Q25. Find the remainder when 29! is divided by 31.

Q26. Find the number of real roots of the equation $x^4 + 3x^3 + 3x^2 + 3x + 2 = 0$.

- a) 0
- b) 2
- c) 3
- d) 4

Q27. If $0 < x < \frac{1}{2}$, which of the following is the greatest?

- a) x^{-2}
- b) $x^{-\frac{3}{2}}$
- c) $\frac{1}{\sqrt{x}}$
- d) $\left(\frac{1}{x^{-2}}\right)^{-3}$

Q28. If $13^{(\log_x 872)} = 5^{(\log_{25} 961)} + 7^{(\log_{\sqrt{7}} 29)}$, then the value of x is

- a) $\sqrt{13}$.
- b) $13\sqrt{3}$.
- c) 169.
- d) 13.

Q29. A window is in the shape of a square surmounted by a semicircle, where the base diameter of the semicircle coincides with the upper side of the square. If the perimeter of the window is 16 ft, find the approximate area (in sq. ft) of the window. Take p = $\frac{22}{7}$.

- a) 17.1
- b) 8.3
- c) 29.5
- d) 11.5

Q30. If the cube root of $45 + 29\sqrt{2}$ is $a + \sqrt{b}$, then find the value of $2a^3 + 3b^2$.