NPAT 2021 QP 2 Question Paper with Solutions

Time Allowed :1 Hour 46 Minutes	**Maximum Marks :**122	**Total Questions :**122

Proficiency in English Language

2. In the sentence given below, four words/phrases have been underlined and the underlined words/phrases are given as options. Select the option that contains grammatical error(s).

<u>To understand</u> <u>what multiculturalism is,</u> <u>it is indispensable that</u>
<u>the meaning of the culture is clarified.</u>

(1) To understand

(2) what multiculturalism is

(3) it is indispensable that

(4) the meaning of the culture is clarified

Correct Answer: (3) it is indispensable that

Solution: The error lies in the phrase "it is indispensable that". The correct sentence should be "To understand what multiculturalism is, it is indispensable to clarify the meaning of the culture." The correct phrasing should avoid the construction "it is indispensable that" and instead use "it is indispensable to."

> **Quick Tip**
>
> When identifying errors in sentences, pay attention to the correct structure of infinitive phrases and the use of appropriate conjunctions.

3. In the sentence given below, four words/phrases have been underlined and the underlined words/phrases are given as options. Select the option that contains grammatical error(s).

<u>Language is, at least primarily,</u> <u>a result of individuals to interact with</u>
<u>their own cultural community.</u>

(1) Language is, at least primarily,

(2) a result of

(3) individuals to interact with

(4) their own cultural community

Correct Answer: (3) individuals to interact with

Solution: The error lies in the phrase "individuals to interact with". The correct sentence should be "Language is, at least primarily, a result of individuals interacting with their own cultural community." The verb "interact" should be in its present participle form, "interacting," to match the intended structure of the sentence.

> **Quick Tip**
>
> When identifying errors in sentences, make sure that the verb forms agree with the subject and are used appropriately for the context.

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4. In the sentence given below, four words/phrases have been underlined and the underlined words/phrases are given as options. Select the option that contains grammatical error(s).

We all sneeze for the same reason and all sneezes are not the same.

(1) We all sneeze

(2) for the same reason

(3) and all sneezes

(4) are not the same.

Correct Answer: (3) and all sneezes

Solution: The error lies in the phrase "and all sneezes". The correct sentence should be "We all sneeze for the same reason, and sneezing is not the same for everyone." The use of "sneezes" is incorrect in this context, as the sentence refers to the action of sneezing rather than the plural noun "sneezes."

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5. In the sentence given below, four words/phrases have been underlined and the underlined words/phrases are given as options. Select the option that contains grammatical error(s).

Sneezing occur when irritants aren't caught by nasal hair.

(1) Sneezing occur

(2) when irritants

(3) aren't caught

(4) by nasal hair

Correct Answer: (1) Sneezing occur

Solution: The error lies in the phrase "Sneezing occur". The subject "Sneezing" is singular, so the correct verb form should be "occurs" instead of "occur." The corrected sentence would be: "Sneezing occurs when irritants aren't caught by nasal hair."

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6. In the sentence given below, four words/phrases have been underlined and the underlined words/phrases are given as options. Select the option that contains grammatical error(s).

You have been given a lot of advices but it has had no effect on your behaviour.

(1) You have been given

(2) a lot of advices

(3) but it has had no effect

(4) on your behaviour.

Correct Answer: (2) a lot of advices

Solution: The error lies in the phrase "a lot of advices". The word "advice" is an uncountable noun and does not take the plural form. The correct phrase is "a lot of advice."

> **Quick Tip**
>
> When using uncountable nouns, remember they do not take plural forms, even when used with quantifiers like "a lot of."

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7. Select the option that best fills in the blank and completes the sentence given below.

Though you're angry ____ her now, you'll soon become friends again, Maria told Sheila.

(1) with

(2) at

(3) on

(4) upon

Correct Answer: (1) with

Solution: The correct phrase is "angry with someone," indicating a person you are upset with. The other options don't fit the context correctly.

> **Quick Tip**
>
> Pay attention to common prepositions used with emotions and actions, such as "angry with" or "happy for."

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8. Select the option that best fills in the blank and completes the sentence given below.

The two families have known each other ____ a decade now.

(1) for

(2) before

(3) since

(4) of

Correct Answer: (1) for

Solution: The correct preposition is "for," which is used when referring to the duration of time. "Since" would indicate a specific starting point, while "before" and "of" do not fit the context.

> **Quick Tip**
>
> When referring to the duration of an action, use "for" (e.g., for a decade) and "since" to refer to a starting point (e.g., since 2000).

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9. Select the option that best fills in the blank and completes the sentence given below.

We ____ study so much in the past.

(1) didn't used to

(2) didn't

(3) didn't use to

(4) don't

Correct Answer: (3) didn't use to

Solution: The correct structure for expressing a past habit is "didn't use to," not "didn't used to." The verb "used" is unnecessary when "did" is already used.

> **Quick Tip**
>
> When using "didn't," remember that the base form of the verb follows (e.g., didn't use to).

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10. Select the option that best fills in the blank and completes the sentence given below.

The baroque style ____ in the early 17$^{\text{th}}$ century in Rome.

(1) has been evolved

(2) was evolved

(3) is evolved

(4) evolved

Correct Answer: (4) evolved

Solution: The correct sentence is "The baroque style evolved in the early 17$^{\text{th}}$ century in Rome." The use of "evolved" is appropriate as it describes a natural development in the past without the need for auxiliary verbs such as "has" or "was."

Quick Tip

When referring to past events that evolved over time, simple past tense ("evolved") is often the best choice.

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11. Select the option that best fills in the blank and completes the sentence given below.

____ our heads are basically similar, differences in size, shape and colour of features produce a variety of appearances.

(1) In spite of

(2) Although

(3) Despite

(4) As

Correct Answer: (2) Although

Solution: The correct phrase is "Although our heads are basically similar," which introduces a contrast between the similarity of heads and the differences in their features. "Although" is the correct conjunction for expressing contrast in this context.

Quick Tip

When introducing a contrast, "Although" is a good choice to connect two opposing ideas in a sentence.

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12. Select the option that best fills in the blank and completes the sentence given below.

___ the fact that it was difficult, Dhananjay managed to solve the physics paper.

(1) Although

(2) Even though

(3) Because

(4) Despite

Correct Answer: (4) Despite

Solution: The correct word is "Despite" as it introduces a contrast between difficulty and the ability to solve the paper. "Although" and "Even though" can also introduce contrast, but they are not as grammatically correct here.

> **Quick Tip**
>
> "Despite" is used to introduce a contrast without needing a conjunction, while "Although" and "Even though" require the use of conjunctions.

13. Select the option that best fills in the blank and completes the sentence given below.

The boys were bored because they had ___ to do in the art class.

(1) a little

(2) little

(3) few

(4) some

Correct Answer: (2) little

Solution: The correct choice is "little" because it refers to a small amount of uncountable things (activities in this case). "Few" is used for countable things, so it would not fit here.

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14. Select the option that best fills in the blank and completes the sentence given below.

____ **of the actors was paid a hefty amount to perform at the awards function.**

(1) All

(2) None

(3) Each

(4) Every

Correct Answer: (1) All

Solution: The correct choice is "All" as it refers to the entire group of actors. "Each" refers to individual members, and "None" and "Every" are not appropriate for this context.

> **Quick Tip**
>
> When referring to all members of a group, "All" is typically used.

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15. Select the option that best gives the meaning of the word/phrase in bold.

Watercolours can be **applied** undiluted to create a broken-colour effect.

(1) used

(2) put

(3) drawn

(4) given

Correct Answer: (1) used

Solution: The word "applied" in this context means "used" in the sense of putting the watercolour onto a surface. The other options do not convey the correct meaning.

16. Select the option that gives the best meaning of the word/phrase in bold. It is common to **break bread** with people you are close to.

(1) break into small pieces

(2) take small bites of

(3) share a meal with

(4) eat in a group

Correct Answer: (3) share a meal with

Solution: The phrase "break bread" is an idiomatic expression meaning to share a meal with someone, especially in a social or familial context.

17. Select the option that best gives the meaning of the word/phrase in bold.

She **bent over backwards** to help the new boss.

(1) bent with difficulty

(2) worked very hard

(3) did the impossible

(4) made no effort

Correct Answer: (2) worked very hard

Solution: The phrase "bent over backwards" is an idiom meaning to make a great effort to do something, often beyond what is required.

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18. Select the option that best gives the meaning of the word/phrase in bold.

On the day before her wedding, Suhana developed **cold feet**.

(1) felt very cold

(2) felt no emotion

(3) felt unfriendly

(4) felt very nervous

Correct Answer: (4) felt very nervous

Solution: The phrase "cold feet" is an idiom meaning to feel nervous or uncertain, especially before an important event like a wedding.

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19. Select the option that best completes the given sentence.

Many people who love music ____ to know nothing about it.

(1) deny

(2) assert

(3) allege

(4) profess

Correct Answer: (1) deny

Solution: The correct choice is "deny," meaning to reject the idea or claim. The sentence implies that while people claim to love music, they actually know little about it.

20. Select the option that best completes the given sentence.

In multicellular organisms, groups of cells ____ to take on specialised functions.

(1) differentiate

(2) distinguish

(3) detract

(4) discriminate

Correct Answer: (1) differentiate

Solution: The correct word is "differentiate," which means that cells become distinct or specialised to perform specific functions. The other options do not fit the context.

21. Select the option that best completes the given sentence.

Parents must try to ____ the right balance between lively ambition and self-discipline.

(1) manage

(2) hit

(3) strike

(4) reach

Correct Answer: (1) manage

Solution: The correct word is "manage," meaning to handle or balance something effectively. "Strike" and "hit" do not fit well in this context, while "reach" would imply the action of achieving a balance, which isn't as precise.

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22. Select the option that best completes the given sentence.

In a democracy, public ___, constructive or otherwise, is a force that shouldn't be ignored.

(1) feeling

(2) opinion

(3) passion

(4) sentiment

Correct Answer: (2) opinion

Solution: The word "opinion" is most appropriate in this context, as it refers to the views or beliefs expressed by the public. The other options don't fit the context as well as "opinion."

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23. Given below are five sentences, labelled A, B, C, D and E. They are NOT in a meaningful order. Select the option that arranges the sentences in the correct order to form a meaningful paragraph.

A. They believe that amid big declines in wildlife, action can help to reverse the trend for some species.

B. Freshwater insects, mosses and lichens are bucking the trend of wildlife losses and have expanded their ranges since 1970.

C. This finding does not conflict with other reports of serious declines in insect populations, they said.

D. According to scientists, reductions in air and water pollution are the most likely reason.

E. Their research also found that the average range of insects had increased over that time.

(1) B, D, A, E, C

(2) D, A, E, C, B

(3) B, C, A, E, D

(4) C, A, E, B, D

Correct Answer: (1) B, D, A, E, C

Solution: The correct order is B, D, A, E, C. First, B introduces freshwater insects as bucking the trend. Then D explains the likely reason (reduction in pollution). A follows with the action belief to reverse the trend. E then discusses how their research found insects' ranges had increased, and C wraps it up by explaining the research's consistency with other reports.

> **Quick Tip**
>
> When rearranging sentences, look for sentences that introduce the topic and sentences that explain or support the topic logically.

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24. Given below are five sentences, labelled A, B, C, D and E. They are NOT in a meaningful order. Select the option that arranges the sentences in the correct order to form a meaningful paragraph.

A. Nearly 85% of the land has at least some level of permafrost and even in the southern regions, winter months receive minimal daylight.

B. In such places, the use of solar power seems improbable, if not impossible.

C. Take for instance, northerly regions like Alaska, where daylight hours are minimal for a good portion of the year.

D. But a solar farm in Willow is one of those proving that solar can work even in the most unexpected cold and northerly climates.

E. Solar energy has become so accessible that new farms are being switched on in the most unexpected places.

(1) C, B, D, E, A

(2) C, D, A, B, E

(3) E, C, B, A, D

(4) C, A, B, D, E

Correct Answer: (1) C, B, D, E, A

Solution: The correct order is C, B, D, E, A. First, C introduces the minimal daylight in northerly regions. Then B discusses the improbability of solar power in such places. D follows with an example of a solar farm in Willow. E discusses how solar energy is becoming more accessible, and A gives additional context about permafrost and daylight in southern regions.

> **Quick Tip**
>
> When arranging jumbled sentences, look for sentences that introduce specific examples and supporting facts, then end with a concluding statement.

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25. Given below are five sentences, labelled A, B, C, D and E. They are NOT in a meaningful order. Select the option that arranges the sentences in the correct order to form a meaningful paragraph.

A. If progress on a task can take many forms, procrastination is the absence of progress.

B. Some even argue that people can dawdle to their advantage so that they're always accomplishing something of value.

C. Sympathizers of procrastination often say it doesn't matter when a task gets done, so long as it's eventually finished.

D. Others believe that it conflates beneficial, proactive behaviors like pondering with the detrimental, self-defeating habit of genuine procrastination.

E. A major misperception about procrastination is that it's an innocuous habit at worst, and perhaps a helpful one at best.

(1) A, E, B, D, C

(2) C, A, D, E, B

(3) E, C, B, D, A

(4) A, B, D, C, E

Correct Answer: (1) A, E, B, D, C

Solution: The correct order is A, E, B, D, C. First, A introduces procrastination. Then E provides a common misconception about it. B explains one view of procrastination, followed by D, which provides a different opinion on procrastination. C concludes with a broader view of procrastination.

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26. Given below are five sentences, labelled A, B, C, D and E. They are NOT in a meaningful order. Select the option that arranges the sentences in the correct order to form a meaningful paragraph.

A. Helicopter parenting has a few advantages, but mostly results in negative consequences for kids.

B. The term "helicopter parenting" comes from the notion that such parents "hover" over their children and rescue them when needed.

C. As these kids grow older, they lack the skills they need to navigate difficult situations solo.

D. Unlike other parenting styles, helicopter parenting is not a philosophy that parents aspire to or join on purpose.

E. It is just that they are obsessed with a desire to create a perfect world for their kids.

(1) B, C, D, E, A

(2) B, D, A, E, C

(3) E, C, B, A, D

(4) C, A, B, D, E

Correct Answer: (1) B, C, D, E, A

Solution: The correct order is B, C, D, E, A. First, B introduces helicopter parenting. C explains the consequences of such parenting. D follows with an explanation of why helicopter parenting is not a general philosophy. E explains the obsession with perfection, and A concludes

with the negative outcomes of helicopter parenting.

Question Numbers : 27 to 31

Read the passage and answer the questions that follow.

If we look around us at the things we have purchased at some point in our lives, we would no doubt notice that not everything we own is being put to good use: the thick woolen coat that we thought looked trendy despite the fact that we live in a tropical country, the smartphone that got put away when we bought ourselves the newest model, the car that only gets used at the weekends, or even the guest room in our house that somehow got turned into a storeroom.

Those underutilised items may seem useless to some, but could be an asset to others. With the advent of the internet, online communities have figured out a way to generate profit from the sharing of those underused assets. Using websites and social media groups that facilitate the buying and selling of second-hand goods, it is now easier than ever for peer-to-peer sharing activities to take place. And this is known as the sharing economy.

These democratised online platforms are providing a chance for people to make a quick buck or two. To give an example, busy parents previously might not have bothered with setting up a stall at the local market or car boot sale to sell their children's old equipment, but with online marketplaces, parents are now able to sell on those hardly worn baby clothes that their children have outgrown and the expensive pushchairs and baby equipment they have invested in, so as to put some cash back into their pockets. Businesses have also caught on to the profitability of the sharing economy and are seeking to gain from making use of those underutilised resources. A business model that has rapidly risen in popularity sees companies providing an online platform that puts customers in contact with those who can provide a particular product or service. Companies such as Airbnb

act as a middleman for people to cash in on their unused rooms and houses and let them out as lucrative accommodation. Another example is Uber, which encourages people to use their own personal cars as taxis to make some extra cash in their free time.

This move towards a sharing economy is not without criticisms. Unlike businesses, unregulated individuals do not have to follow certain regulations and this can lead to poorer and inconsistent quality of goods and services and a higher risk of fraud. Nevertheless, in the consumerist society we live in today, the increased opportunities to sell on our unwanted and underused goods can lead to a lesser impact on our environment.

27. The word ‘advent’ in paragraph 2 means:

(1) incidence

(2) emergence

(3) admittance

(4) resurgence

Correct Answer: (2) emergence

Solution: The word "advent" in the context of the passage refers to the "emergence" of a new way of sharing resources, which aligns with the definition of advent.

> Quick Tip
>
> "Advent" typically refers to the arrival or beginning of something significant, such as a new trend or development.

28. The author uses the examples of Airbnb and Uber to highlight:

(1) the manner in which people can use online platforms to make quick and easy money

(2) the ways in which underutilised resources can be put to good use for mutual benefit

(3) the risk that people run of being provided with poor quality and fraudulent services

(4) the democratic processes available online for the sharing of goods for quick profits

Correct Answer: (2) the ways in which underutilised resources can be put to good use for mutual benefit

Solution: Airbnb and Uber are used to illustrate how underutilised resources (such as rooms or cars) can be shared for mutual benefit, providing both parties with value.

> **Quick Tip**
>
> Look for the broader context in examples, which in this case demonstrates the mutual benefit derived from sharing underused resources.

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29. Which of the following sentences is NOT stated in the passage?

(1) There is a huge online market for second-hand goods

(2) Airbnb is an example of how underutilised accommodation can be put to profitable use

(3) A sharing economy provides users with hassle-free, reliable and high quality service

(4) A sharing economy has a positive impact on the environment

Correct Answer: (4) A sharing economy has a positive impact on the environment

Solution: While the passage touches on various benefits of the sharing economy, it does not mention any environmental impacts.

> **Quick Tip**
>
> Read through the passage carefully to check whether a sentence or claim is directly stated or implied.

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30. Which of the following options best captures the main idea of this text?

(1) utilise resources that haven't been fully exploited for mutual benefit

(2) get rid of things they have bought but hardly used

(3) use online platforms that encourage entrepreneurship

(4) make money by selling goods and services online

Correct Answer: (1) utilise resources that haven't been fully exploited for mutual benefit

Solution: The text primarily discusses how the sharing economy involves utilising underused resources for mutual benefit, which is best reflected by option (1).

> **Quick Tip**
>
> When identifying the main idea, focus on the central theme or concept that ties all the details together.

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31. This extract is most likely from:

(1) a journal article on economics

(2) a talk on online economic trends

(3) an interview on business models

(4) a magazine article on consumption

Correct Answer: (4) a magazine article on consumption

Solution: The content of the passage is related to consumerism and the sharing economy, making it most likely to come from a magazine article discussing consumption. The other options are less relevant to the context of the text.

> **Quick Tip**
>
> When determining the source of a passage, focus on the context and style of the writing, as they can provide clues about its origin.

Question Numbers : 32 to 36

Read the passage and answer the questions that follow.

Under capitalism, the argument goes, it's every man for himself. Through the relentless pursuit of self-interest, everyone benefits, as if an invisible hand were guiding each of us toward the common good. Everyone should accordingly try to get as much as they can, not only for their goods but also for their labour. Whatever the market price is, in turn, what the buyer should pay. Just like the idea that there should be a minimum wage, the idea that there should be a maximum

wage seems to undermine the very freedom that the free market is supposed to guarantee.

This view, however, has some dramatic consequences. One is the explosion in economic inequality that almost all liberal capitalist democracies have experienced over the past 30-40 years. The difference between the top and the bottom of the income distribution now lies about where it did in the Gilded Age and the roaring 1920s, up until the Great Depression. Unlike these earlier periods, however, this rise in economic inequality has not been driven by returns on capital assets. This time, one of the most important contributors to the rise has been the payment of extraordinarily high levels of compensation to corporate executives... More troubling still, while the compensation for corporate executives has been almost continually rising during this period, real (inflation-adjusted) wages for almost everybody else have been stagnating.

Many people find this upsetting but, even so, they tend to treat it as something capitalism requires us to tolerate. Others think it is something that capitalism requires us to applaud. But nothing in capitalism actually says that such sky-high levels of compensation are permissible. What capitalism says instead is that people need incentives to be maximally productive. But will someone who makes $100 million a year really work harder than someone who makes 10 million? Compensation, like everything else, has what economists call 'diminishing marginal utility'. More of it has less and less of an incentivising effect, until eventually it has no incentivising effect at all-people are already working as hard as they can. At which point capitalism suggests that we should not pay someone even more money, for we are going to get nothing in return.

But wait - aren't CEOs just getting paid the market rate for their labour? Their compensation is calculated according to a formula set when they were hired and, as long as this formula represents the going wage, then this is what they should receive. The market rate for CEO labour, however, is not set in a competitive manner. The formula is set by a special group of the company's directors, called 'the compensation committee'.... Next time someone hires a CEO and another compensation committee conducts a survey, the average will be higher. The market

is not bidding up the price; the price is going up simply because everyone always wants to beat the current average. We have what economists call a market failure. Setting a maximum wage would therefore not interfere with market freedom because, in this instance, the market is not working.

32. In the first paragraph the author puts forth the view that:

(1) fixing a maximum wage goes against the tenets of a free market system

(2) the common good is best served by market forces guiding the economy

(3) people benefit most when they are paid the maximum amount possible for their work

(4) individual self-interest determines salaries and wages for each worker

Correct Answer: (1) fixing a maximum wage goes against the tenets of a free market system

Solution: The first paragraph introduces the view that the idea of a maximum wage contradicts the principles of a free market system, where individuals' compensation is determined by market forces.

> **Quick Tip**
>
> When analyzing passages, look for statements that directly explain or challenge a core principle, like the free market in this case.

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33. The author ascribes the increasing gap in economic levels in recent times to:

(1) diminishing marginal utility in liberal capitalist democracies

(2) high compensation levels for top executives

(3) incentivising top executives to increase their productivity

(4) a decline in the return on capital assets compared to human assets

Correct Answer: (1) diminishing marginal utility in liberal capitalist democracies

Solution: The author attributes the growing economic inequality to the diminishing marginal utility of wealth in capitalist economies, leading to disparities in income and wealth.

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34. The writer argues that while salaries tend to be capped as people cannot work any harder,

(1) longer work hours always increase compensation

(2) competition for the top executives bids up salaries

(3) marginal utility increases as people tend to work more

(4) differences will always emerge among different ability levels

Correct Answer: (2) competition for the top executives bids up salaries

Solution: The passage highlights that, while salary caps may limit how much individuals can earn for working more hours, competition for highly paid positions, such as executives, drives up salaries.

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35. We can infer from the sentence on the Gilded Age and the Great Depression (in the 1920s) that:

(1) wide gaps in income distribution have always existed through the centuries

(2) productivity increased in most capitalist liberal economies from the twentieth century

(3) incomes had become more equal in the latter part of the twentieth century

(4) these were times of greater equality of opportunity than the present day

Correct Answer: (1) wide gaps in income distribution have always existed through the centuries

Solution: The passage mentions the rise in income inequality during the 1920s, which aligns with the historical context of long-standing income distribution gaps.

36. The author concludes there is "a market failure" in the remunerations of top executives (last paragraph) as:

(1) they are paid high salaries to compensate for the failures of the market

(2) competition trumps the rules of the market in their compensations

(3) a result of the constraints on their compensations

(4) market failures have resulted from the high compensations they receive

Correct Answer: (1) they are paid high salaries to compensate for the failures of the market

Solution: The author suggests that CEOs' high salaries reflect compensation for their role in a market that may not be functioning optimally.

Question Numbers : 37 to 41

Read the passage and answer the questions that follow.

China initiated its economic miracle by opening to the outside world, but now it is nurturing domestic tech giants by barring outside competition. Foreign visitors cannot open Google or Facebook, a weirdly isolating experience... But unlike the Soviet Union, which failed in a similar strategy, China is effectively creating a new consumer culture behind protectionist walls as a tool of political control and an engine of economic growth....Anchored by internet giants such as Alibaba and Tencent, the tech sector (was) not only counterbalancing the decline in older industries such as steel and aluminium but was also largely debt free. So, the bigger the digital economy, the greater is China's capacity to manage mounting debts in

the old economy and keep growth alive...

By 2017, tech already accounted for as large a share of output in China as in Germany... Yet on balance, tech is probably creating more professions than it destroys. A recent International Monetary Fund (IMF) paper estimates that after subtracting the jobs it eliminates, digitalisation accounts for up to half of all job growth. Alibaba platforms alone host millions of small companies, which over the past decade have added 30 million jobs-more than China has lost in heavy industry. China's tech revolution was made possible by two of the forces that were expected to slow the economy. The population may be aging, but it still provides a vast market in which tech start-ups can blossom. And though growth normally slows when countries attain a middle-class income, in China the new middle class provides the main customers for new mobile internet services. No other country has this combination. India has the population, not the income. Brazil has the income, not the population. And these democratic societies are also far more suspicious of government surveillance than China is. Witness the widespread controversy over the rollout of biometric IDs in India.

In China, at least outside Xinjiang, the relatively mild concern about personal data has helped fuel the boom in digital payments and e-commerce. China is the world's largest e-commerce market by far, and fleets of motorbikes painted in the colours of online delivery companies park five to six rows deep outside malls and office towers. To offset the shrinking of its work force, China needed to increase the productivity of the workers who remain. And as the tech boom took off around 2015, productivity growth began to recover after flat lining for nearly a decade. The IMF paper argues that the economy is bound to slow in coming years, but will slow much more sharply if digitalisation stalls than if it continues at the current rapid pace.

No economy can rise in an unbroken line forever, and mounting debts and a declining labour force still weigh on China. By making online loans so readily available to Chinese households, tech may compound the risk of financial crisis.

37. The overall message in the passage is:

(1) by banning foreign tech companies, China has successfully nurtured its domestic IT firms

(2) China is not concerned about data privacy as other democratic countries

(3) while the tech revolution is reducing employment globally, in China it is creating jobs

(4) China's experience shows how important it is to shift from steel and aluminium to tech-based firms

Correct Answer: (3) while the tech revolution is reducing employment globally, in China it is creating jobs

Solution: The passage discusses how China has managed to turn the tech revolution into a source of job creation, which contrasts with the global trend of job reduction due to automation and technology.

> ### Quick Tip
> When analyzing a passage, identify the central theme or contrasting points that the author emphasizes for a deeper understanding of the message.

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38. Brazil and India have not been able to emulate China's successful expansion in e-commerce for all of the following reasons, EXCEPT:

(1) their consumers are more concerned about protecting their privacy

(2) they have not been able to ban foreign tech competitors from their markets

(3) surveillance of digital payments by governments is not as good as China's

(4) they don't have a large wealthy middle-class market that fuels tech demand

Correct Answer: (2) they have not been able to ban foreign tech competitors from their markets

Solution: The passage explains that while Brazil and India face several obstacles, including privacy concerns and less surveillance of digital payments, the key difference lies in the absence of a large wealthy middle-class market, which is essential for the tech industry to thrive.

> ### Quick Tip
> Focus on identifying what factors are common across the countries discussed and which ones are explicitly stated as exceptions to the general trend.

39. The author mentions the 'fleets of motorbikes' (paragraph 4) to indicate the:

(1) boom in the demand for motorbikes and other vehicles

(2) expansion in the demand for on-line delivery services

(3) rapid growth in the youthful workforce in e-commerce

(4) explosion in business that has resulted in a shortage of parking in malls

Correct Answer: (2) expansion in the demand for on-line delivery services

Solution: The passage links the rise in fleets of motorbikes to the growth in online delivery services, where motorbikes are used for efficient transportation.

> **Quick Tip**
>
> Look for key terms like "fleets" that are linked to the rise of specific industries, such as delivery services in this case.

40. All of the following can be deduced about the Chinese economy, EXCEPT that:

(1) it is moving away from older industries towards technology-based services

(2) its youthful population has fueled the demand for on-line delivery services

(3) productivity growth had remained stagnant till 2015

(4) its population is aging and its workforce is shrinking

Correct Answer: (4) its population is aging and its workforce is shrinking

Solution: The passage highlights how China's economy is driven by its youthful population, not by an aging or shrinking workforce. The focus is on its vibrant, tech-driven economy.

> **Quick Tip**
>
> In questions about economic trends, focus on the trends that are explicitly stated as either growing or declining in the passage.

41. Contrary to the experience in other countries, digitisation in China has:

(1) boosted the demand for industrial goods such as steel and aluminium

(2) led to an increase in employment and productivity

(3) tackled the effects of a declining and ageing labour force

(4) been possible only with the exclusion of foreign IT giants such as Google and Facebook

Correct Answer: (2) led to an increase in employment and productivity

Solution: The passage mentions that China's digitisation has led to an increase in employment and productivity, differing from other countries where digitisation often reduces jobs.

> Quick Tip
>
> When comparing different countries' economic experiences, focus on unique advantages or challenges mentioned in the passage.

Reasoning and General Intelligence

Question Numbers : 42 to 46

The following are the criteria for admitting students to an engineering college:

The student candidate must:

1) have passed 12th standard science examination having secured more than 65% in Mathematics and at least 60% in the aggregate.

2) be of 20 years age or more as on January 01, 2020

3) have obtained at least 65% in the interview and more than 60% in the entrance test.

However, if a student fulfills all the above criteria, EXCEPT:

4) at (1) and/or (2) above but has obtained at least 75% in the interview and more than 65% in the entrance test, the case should be referred to the Principal.

5) at (2) and/or (3) above but is an SC candidate securing more than 70% in the aggregate as well as in Mathematics in 12th standard science examination, the case should be referred to the Director.

Based on the criteria given above and without assuming any additional information, you have to take a decision for the candidates whose profiles have given in the five questions. Mark your answer by choosing the appropriate option in each case.

42. Priya was born in an SC family in 1998 and passed her 12th standard science examination securing 82% in the aggregate and 66% in Mathematics. She obtained 65% in the interview as well as the entrance test. What decision would be taken for her?

(1) She would be admitted

(2) She would not be admitted

(3) Her case is to be referred to the Principal

(4) Her case is to be referred to the Director

Correct Answer: (1) She would be admitted

Solution: Priya fulfills all the criteria mentioned. As she belongs to an SC family and has secured more than 65% in the entrance test, interview, and meets the aggregate requirement, she would be admitted.

> **Quick Tip**
>
> Always check if the candidate fulfills all the criteria before making a decision, and consider special cases like SC category or exceptional performance.

---

43. Aditya, an SC candidate, was born in 1997 and passed the 12th standard examination in science securing 65% in the aggregate as well as in Mathematics. He obtained 65% in the entrance test and 68% in the interview. What decision would be taken for him?

(1) He would be admitted

(2) He would not be admitted

(3) His case is to be referred to the Principal

(4) His case is to be referred to the Director

Correct Answer: (1) He would be admitted

Solution: Aditya fulfills the criteria set for SC candidates, where the minimum requirements

are 65% in the entrance test and 60% in the interview. Since he meets these, he would be admitted.

> **Quick Tip**
>
> Ensure that the candidate meets all the criteria, especially in special categories like SC, for easier decision-making.

---

44. Ashok is an SC candidate, who secured 65% in the interview and 60% in the entrance test. He passed the 12th standard science examination in 2018 at the age of 19 securing 80% aggregate marks and 70% in Mathematics. What decision would be taken for him?

(1) He would be admitted

(2) He would not be admitted

(3) His case is to be referred to the Principal

(4) His case is to be referred to the Director

Correct Answer: (2) He would not be admitted

Solution: Ashok meets the interview and entrance exam criteria but has missed the age criterion (he passed in 2018, making him 20 at the time of application). Thus, he would not be admitted.

> **Quick Tip**
>
> Check the age eligibility and other fixed criteria in addition to the academic performance before making a decision.

---

45. Manju Tripathi passed the 12th standard science examination securing 65% in the aggregate as well as in Mathematics at the age of 18 in 2017. She secured 75% in the interview and 68% in the entrance test. What decision would be taken in her case?

(1) She would be admitted

(2) She would not be admitted

(3) Her case is to be referred to the Principal

(4) Her case is to be referred to the Director

Correct Answer: (1) She would be admitted

Solution: Manju fulfills all criteria and has passed the entrance test and interview successfully. She is within the permissible age range and meets all other conditions, so she would be admitted.

> **Quick Tip**
> Review the candidate's age and performance against the standard criteria before making a final decision.

---

46. Nitesh, who belongs to the SC community, passed the 12$^{\text{th}}$ standard science examination in July 2019 at the age of 19 years securing 72% in Mathematics as well as in the aggregate. He obtained 65% in the entrance test and 76% in the interview. What decision would be taken for him?

(1) He would be admitted

(2) He would not be admitted

(3) His case is to be referred to the Principal

(4) His case is to be referred to the Director

Correct Answer: (4) His case is to be referred to the Director

Solution: Nitesh belongs to the SC category, meets the criteria for the entrance test and interview, but as he has passed in 2019 and is above the age limit (18 years for admission), his case should be referred to the Director for a final decision.

> **Quick Tip**
> Always review age limits in addition to the interview and entrance test results, especially for SC category candidates.

47. Six persons A, B, C, D, E and F are sitting in a row on a bench. F is sitting to the immediate left of E. There are two persons sitting between B and C. A is sitting next to B and is to the immediate right of D. If E is sitting at one end of the row, then who is sitting at the other end?

(1) A

(2) B

(3) C

(4) D

Correct Answer: (3) C

Solution: Given that F is sitting to the immediate left of E and there are two persons between B and C, we can infer the arrangement as:

- D must be sitting at the other end of the row, with C sitting next to him.

- Hence, the person sitting at the other end is C.

> **Quick Tip**
>
> When arranging people in a row, visualize the clues step by step to correctly place everyone.

---

48. If 'P + Q' means 'P is the son of Q'; 'P × Q' means 'P is the brother of Q'; and 'P - Q' means 'P is the sister of Q', then which of the following means 'A is the nephew of D'?

(1) A + B × D - C

(2) A × B - C + D

(3) A - C + B × D

(4) A × C + B - D

Correct Answer: (1) A + B × D - C

Solution: We know that:

- '+' means son,

- '×' means brother,

- '-' means sister.

The expression 'A + B × D - C' means that:

- A is the son of B,

- B is the brother of D,

- C is the sister of D, which makes A the nephew of D.

> **Quick Tip**
>
> Carefully use the given symbols and understand their relations to form the correct family relationship.

---

49. Read the given statements and conclusions carefully. Assuming that the information given in the statements is true, even if it appears to be at variance with commonly known facts, decide which of the given conclusions logically follow(s) from the statements.

Statements :

1. All cars are vehicles.

2. Some four-wheelers are cars.

Conclusions : I. Some four-wheelers are vehicles.

II. Some four-wheelers are not vehicles.

(1) Only conclusion I follows

(2) Only conclusion II follows

(3) Both conclusions I and II follow

(4) Neither conclusion I nor II follows

Correct Answer: (1) Only conclusion I follows

Solution: From the given statements:

- Statement 1 tells us that all cars are vehicles.

- Statement 2 tells us that some four-wheelers are cars. Hence, it logically follows that some four-wheelers are vehicles.

- Conclusion I is true as it follows from statement 2.

- Conclusion II is not necessarily true as it conflicts with statement 1, which says all cars are vehicles.

> **Quick Tip**
>
> When solving such questions, remember that logical deductions must strictly adhere to the given statements. Avoid assumptions.

---

50. Read the given statements and conclusions carefully. Assuming that the information given in the statements is true, even if it appears to be at variance with commonly known facts, decide which of the given conclusions logically follow(s) from the statements.

Statements :

1. All leaves are vegetables.

2. Some vegetables are costly products.

Conclusions : I. Some leaves are costly products.

II. All costly products are vegetables.

III. All vegetables that are not costly products are leaves.

(1) Only conclusion I follows

(2) Both conclusions I and III follow

(3) Both conclusions II and III follow

(4) None of the conclusions follow

Correct Answer: (1) Only conclusion I follows

Solution: - From statement 1, we know all leaves are vegetables.

- From statement 2, we know some vegetables are costly products, which could include leaves.

- Conclusion I is valid because it is possible that some leaves are costly products.

- Conclusion II and III do not necessarily follow from the given statements.

---

51. Read the given statements and conclusions carefully. Assuming that the information given in the statements is true, even if it appears to be at variance with commonly known facts, decide which of the given conclusions logically follow(s) from the statements.

Statements :

1. No mansion is a hut.

2. Some houses are buildings.

3. Some buildings are mansions.

Conclusions :

I. Some houses are mansions.

II. No house is a hut.

III. Some buildings are not huts.

(1) Only conclusion I follows

(2) Only conclusions I and II follow

(3) Only conclusion III follows

(4) None of the conclusions follow

Correct Answer: (3) Only conclusion III follows

Solution: - Statement 1 tells us that no mansion is a hut, but this does not tell us about the relationship between houses and huts.

- Statement 2 tells us that some houses are buildings.

- Statement 3 tells us that some buildings are mansions, but it doesn't imply that some houses are mansions.

- Conclusion I is not necessarily true because not all houses are mansions.

- Conclusion II follows as no house being a hut is logically deduced from the statements.

- Conclusion III is true because it logically follows that some buildings are not huts based on the statements.

> **Quick Tip**
>
> When reasoning about logical conclusions, make sure that each conclusion is directly supported by the facts in the statements without assuming additional information.

---

52. Question :

Should student union elections be banned in universities?

Arguments:

I. Yes. The universities are sacred institutions and the elections would compel all the students to sacrifice their moral values.

II. No. Students should learn to participate in choosing their leaders, as they will later take leadership roles in the country.

(1) Only argument I is strong

(2) Only argument II is strong

(3) Both arguments I and II are strong

(4) Neither argument I nor II is strong

Correct Answer: (2) Only argument II is strong

Solution: Argument I is weak because universities, while sacred institutions, should promote democratic participation, not suppress it. Elections are a tool for learning leadership.

Argument II is strong because it emphasizes the importance of students participating in leadership decisions, which is crucial for their future leadership roles.

> **Quick Tip**
>
> In arguments, evaluate the strength based on how relevant and logically sound the points are with respect to the question.

---

53. Question :

How is Q exactly related to P?

Statements:

I. P's father is the son of Q's mother.

II. P's sister R is the daughter of Q's husband.

(1) Statement I alone is sufficient

(2) Statement II alone is sufficient

(3) Either statement I alone or statement II alone is sufficient

(4) Both the statements I and II together are not sufficient

Correct Answer: (1) Statement I alone is sufficient

Solution: Statement I alone is sufficient to establish the relationship between Q and P. If P's father is the son of Q's mother, it means Q is P's mother.

Statement II alone does not provide enough information to directly establish the relationship between Q and P.

> **Quick Tip**
>
> In logical reasoning questions, always check if a single statement can answer the question. If multiple statements are given, evaluate their combined sufficiency.

---

54. Question :

Four boys A, B, C and D and four girls M, N, P and Q are sitting around a round table facing the centre such that no two girls are adjacent to one another. Who is sitting between P and Q?

Statements:

I. A is sitting between M and P, who is facing N sitting to the immediate left of C.

II. M is third to the left of C, who is to the immediate left of Q.

(1) Statement I alone is sufficient

(2) Statement II alone is sufficient

(3) Both the statements I and II together are necessary

(4) Both the statements I and II together are not sufficient

Correct Answer: (4) Both the statements I and II together are not sufficient

Solution: Statement I gives some partial information but does not clarify the exact positions of all the boys and girls.

Statement II is also incomplete and does not provide enough information about the relationship between the positions of P and Q. Combining both statements still does not provide a full answer, so they are not sufficient together.

> **Quick Tip**
>
> In such seating arrangement problems, it is essential to have clear relationships between all positions. Ensure to check whether all the necessary details are covered.

---

55. Question :

Five friends A, B, C, D and E are standing in a line according to height from the shortest to the tallest. If A is the shortest, then who is the tallest of them all?

Statements:

I. B is between E and C and D is between A and E.

II. There are two persons between A and B and C is taller than B.

(1) Statement I alone is sufficient

(2) Statement II alone is sufficient

(3) Either statement I alone or statement II alone is sufficient

(4) Both the statements I and II together are necessary

Correct Answer: (3) Either statement I alone or statement II alone is sufficient

Solution: Statement I gives enough information to establish the positions and relationships in terms of height.

Statement II alone also provides enough information about the relative heights of the people involved, making it sufficient to determine the tallest person.

> **Quick Tip**
>
> In problems of relative positioning, carefully evaluate how each statement provides clarity on the order of the elements involved.

56. Question :

In a class of 60 students, the ratio of boys to girls is 2 : 3. What is the rank of Neha, a girl student in the class?

Statements:

I. 15 boys have scored more than Neha and 15 girls have scored less than her.

II. Neha's rank is 10th among girls and the number of boys scoring less than Neha is twice the number of boys scoring more than her.

(1) Statement I alone is sufficient

(2) Statement II alone is sufficient

(3) Either statement I alone or statement II alone is sufficient

(4) Both the statements I and II together are necessary

Correct Answer: (3) Either statement I alone or statement II alone is sufficient

Solution: Statement I provides enough information about the relative position of Neha with respect to the boys and girls.

Statement II gives the exact rank among girls and additional details about the boys' ranks, which is also sufficient to determine Neha's rank.

> **Quick Tip**
>
> In ranking problems, ensure you have enough information about the relative positions of the subjects involved to deduce the final rank.

---

57. Question :

a, b and c are three numbers. Which is the largest number?

Statements:

I. The sum of the squares of a, b and c is 371 and the difference between the largest and the smallest number is 10.

II. The square of the largest number exceeds the sum of the squares of the other two numbers by 79.

(1) Statement I alone is sufficient

(2) Statement II alone is sufficient

(3) Both the statements I and II together are necessary

(4) Both the statements I and II together are not sufficient

Correct Answer: (4) Both the statements I and II together are not sufficient

Solution: Statement I provides some information about the sum of squares and the difference between the largest and smallest number, but does not directly provide the largest number. Statement II provides a condition involving the largest number, but it is still not enough by itself to conclusively determine the largest number. Combining both statements does not lead to a sufficient answer.

> **Quick Tip**
>
> In problems involving numbers and their relationships, ensure you have all the necessary details to calculate or determine the exact value, such as specific equations or conditions.

---

58. Select the Venn diagram that best represents the relationship between the following classes.
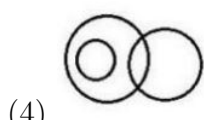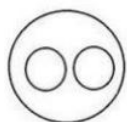
Wolves, Goats, Mammals

(1)

(2)

(3)

(4)
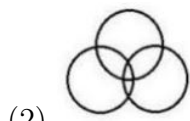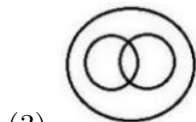
Correct Answer: (1)

Solution: The correct Venn diagram should show that Wolves and Goats both belong to the class of Mammals, but they are distinct groups. Therefore, the diagram showing two overlapping circles representing Wolves and Goats within the Mammals class is the correct one.

> **Quick Tip**
>
> When solving Venn diagram questions, focus on the relationship between the sets, such as whether there is any overlap or if the sets are completely distinct.

---

59. Study the given symbols.

A B means A is not smaller than B.

A # B means A is not greater than B.

A & B means A is neither smaller than nor equal to B.

A % B means A is neither greater than nor equal to B.

A $ B means A is neither smaller than nor greater than B.

Based on the symbols, read the given statements and conclusions carefully and decide which of the conclusions are true.

Statements:

A) S & W

B) T % S

C) W T

Conclusions:

I. Z # W

II. T $ S

III. S & Z

(1) Both conclusions I and II are true

(2) Both conclusions II and III are true

(3) Both conclusions I and III are true

(4) All the conclusions I, II, and III are true

Correct Answer: (4) All the conclusions I, II, and III are true

Solution:

- Statement A tells us that S is neither smaller than nor equal to W.

- Statement B gives us that T is neither greater than nor equal to S.

- Statement C shows that W is not smaller than T.

The conclusions drawn from these symbols are consistent and satisfy the conditions provided, making all of them true.

> **Quick Tip**
>
> In symbol-based problems, carefully interpret the meaning of each symbol and check if the conclusions match the given statements logically.

---

60. Study the given symbols.

A B means A is not smaller than B.

A # B means A is not greater than B.

A & B means A is neither smaller than nor equal to B.

A % B means A is neither greater than nor equal to B.

A $ B means A is neither smaller than nor greater than B.

Based on the symbols, read the given statements and conclusions carefully and decide which of the conclusions is/are true.

Statements:

A) K & F

B) B G

C) B $ K

Conclusions:

I. B & F

II. G # K

III. G % F

(1) Both conclusions I and II are true

(2) Both conclusions II and III are true

(3) Both conclusions I and III are true

(4) All the conclusions I, II, and III are true

Correct Answer: (1) Both conclusions I and II are true

Solution: The symbols in the statements and conclusions are interpreted, and both conclusions I and II follow the given conditions accurately. Conclusion III, however, is incorrect as per the symbols given.

> **Quick Tip**
>
> When working with symbols, carefully interpret each relationship and check if the conclusions logically follow from the given statements.

---

61. If the signs '+' and '-' are interchanged in each of the given equations, then which one equation would be correct?

(1) $8 \times 2 - 3 + 2 = 3 \times 2$

(2) $8 - 2 + 6 \times 8 = 6 - 6$

(3) $6 + 4 - 4 = 5 + 4$

(4) $4 \times 6 - 3 + 2 = 4 \times 2$
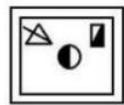
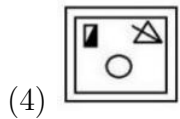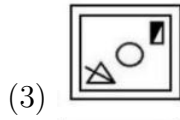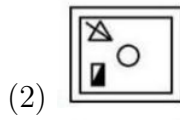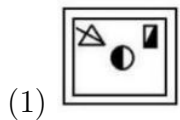**Correct Answer:** (4) $4 \times 6 - 3 + 2 = 4 \times 2$

Solution: By switching the signs of '+' and '-', we check each equation, and the only one that holds true is option (4).

> **Quick Tip**
>
> In such problems, always start by applying the changes systematically to verify if the equation holds true.

---

62. Select the figure that will come next in the following series.

(1)

(2)

(3)

(4)
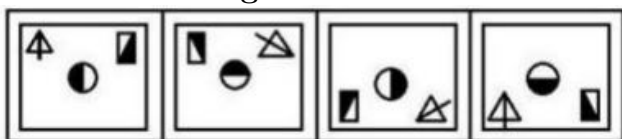
Correct Answer: (1)

Solution: The pattern in the series follows a rotation of shapes, and the next figure in the sequence will continue the established pattern of shapes and their positions.

Quick Tip

In figure series questions, always observe the sequence in terms of shapes, rotations, or movements. Check how each element changes across the sequence.

Question Numbers : 63 to 64

Study the given figure and answer the question that follows:
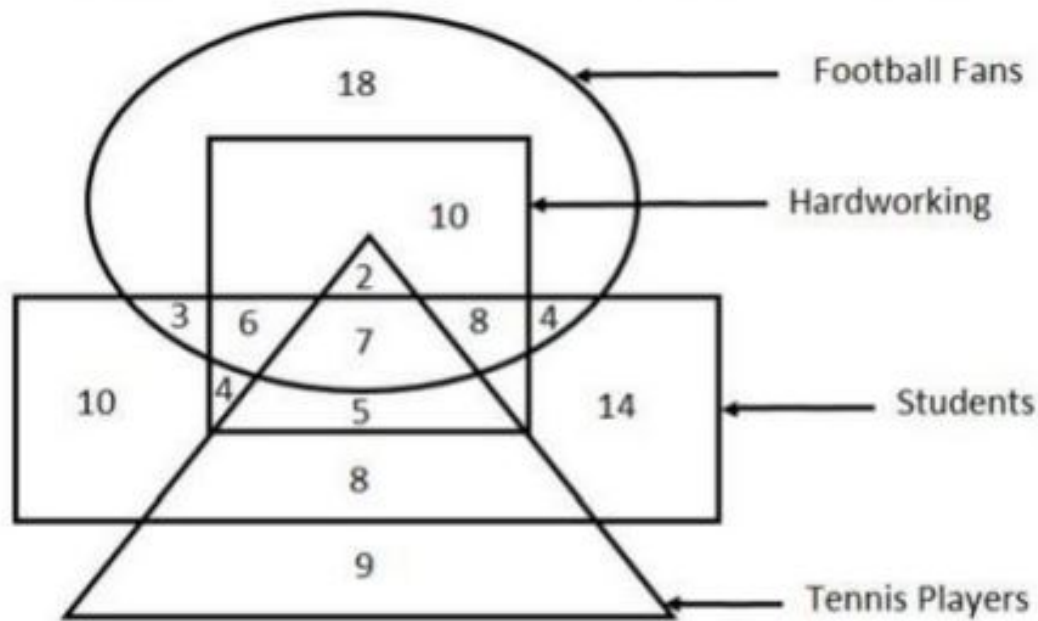
In the figure, the triangle stands for 'tennis players'; the circle stands for 'football fans'; the rectangle stands for 'students' and the square stands for 'hardworking'. The numbers in different segments show the number of persons.

63. How many hardworking students are tennis players but NOT football fans?

(1) 5

(2) 6

(3) 7

(4) 8

Correct Answer: (1) 5

Solution: From the Venn diagram, the number of hardworking students who are tennis players but not football fans is 5.

> **Quick Tip**
>
> In Venn diagram questions, carefully check the numbers in each distinct segment to accurately answer the question.

64. How many hardworking football fans are either students or tennis players but NOT both?

(1) 10

(2) 14

(3) 15

(4) 16

Correct Answer: (2) 14

Solution: From the Venn diagram, the number of hardworking football fans who are either students or tennis players but not both is 14.

> **Quick Tip**
>
> In these types of questions, make sure to identify the correct regions in the Venn diagram that satisfy the conditions given in the question.

---

65. A team is to be formed from among four girls A, B, C and D and four boys P, Q, R and S with the following conditions.

i. B and S have to be together.

ii. Q and C cannot go together.

iii. A cannot be teamed with R.

iv. P has to go with D.

(1) ASPC

(2) RASB

(3) BASQ

(4) PCDQ

Correct Answer: (1) ASPC

Solution: By analyzing the conditions, the team that satisfies all of them is ASPC. The other options violate one or more conditions.

---

66. A team of four with at least two females is to be selected from among five male players P, Q, R, S and T and three female players K, L and M under the following conditions.

i. R cannot be put with K.

ii. P and M have to be together.

iii. K will always be with T.

iv. S cannot go with N.

(1) PQTM

(2) KMLR

(3) PSMN

(4) QKLT

Correct Answer: (1) PQTM

Solution: The only combination that satisfies all the given conditions is PQTM. The other options violate one or more conditions.

---

67. Among five friends, Naresh is taller than Virat and Prakash. Hiten is shorter than Prakash but taller than Arun. If Arun is taller than Virat, then who will be in the middle if all of them stand in the ascending order of their heights?

(1) Arun

(2) Hiten

(3) Naresh

(4) Prakash

Correct Answer: (2) Hiten

Solution: By analyzing the given conditions, the correct order of heights in ascending order is Arun, Virat, Hiten, Prakash, Naresh. Thus, Hiten will be in the middle.

> **Quick Tip**
>
> For height comparison problems, arrange the individuals according to the given conditions and identify the position of each person in the sequence.

---

68. Consider the given statement and decide which of the given assumptions is/are implicit in the statement.

Statement:

This year the state will not import onions from other states.

Assumptions:

I. The onion production in the state would meet the consumer needs.

II. The quality of onions grown in other states is poor.

(1) Only assumption I is implicit

(2) Only assumption II is implicit

(3) Both assumptions I and II are implicit

(4) Neither assumption I nor II is implicit

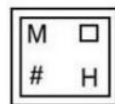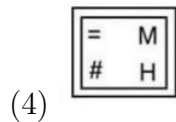**Correct Answer:** (1) Only assumption I is implicit

Solution:
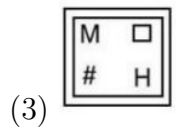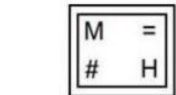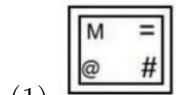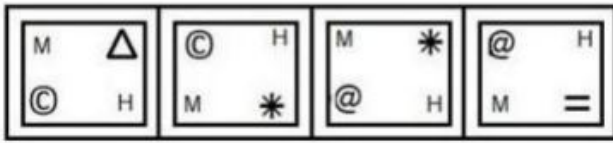
Assumption I is implicit as the state will not import onions, implying that local production can meet the needs. Assumption II, regarding the quality of onions in other states, is not explicitly mentioned in the statement.

> **Quick Tip**
>
> In assumption-based questions, focus on what is directly suggested or implied by the given statement, rather than information that is not mentioned.

69. Select the figure that will come next in the following series.

M	△
©	H

©	H
M	✳

M	✳
@	H

@	H
M	=

(1)

M	=
@	#

(2)

M	=
#	H

(3)

M	□
#	H

(4)

=	M
#	H

Correct Answer: (3)

M	□
#	H

Solution: The pattern in the sequence follows a set rule where the characters and symbols are changing in specific positions. The correct figure follows the observed pattern from the previous figures.

> Quick Tip
>
> When solving figure series questions, focus on how shapes and symbols change or move from one figure to the next to identify the pattern.

70. Four cubes have been given, three of which are rotated versions of the same cube and one is different. Select the cube that is different.

(1)

(2)

(3)

(4)
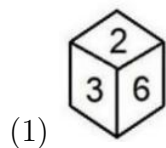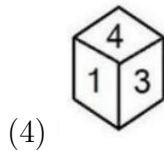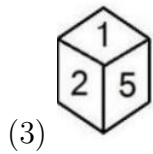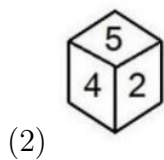
Correct Answer: (3)

Solution: By analyzing the cubes, we can observe that the third cube is different as it does not follow the same rotation pattern as the other cubes.

> **Quick Tip**
>
> In figure-based questions, pay attention to how shapes or figures are rotated, as this will help you identify the odd one out.

---

71. Select the option that is related to the third figure in the same way as the second figure is related to the first figure.

(1)

(2)

(3)

(4)
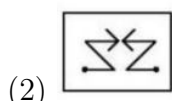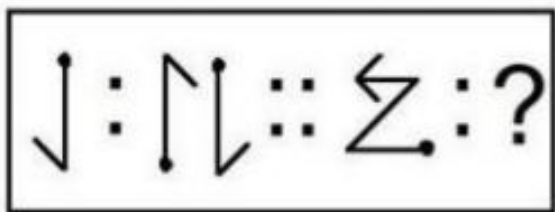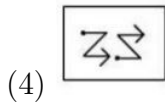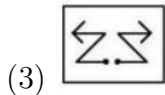
Correct Answer: (4)

Solution: The third figure follows the same transformation pattern as the second figure from the first. By applying the same logic, option (4) is the correct answer.

> **Quick Tip**
>
> In sequence-based figure questions, carefully observe how elements transform or rotate in each figure to find the correct relation.

Question Numbers : 72 to 75

The given pie charts show the percentage distribution of the total employees (executives and non-executives) and that of the executives in different departments of a company. Study the charts and answer the questions that follow.

% of Employees in Different Departments
(No. of employees = 3000)

Research 10%
Marketing 15%
IT 22%
Accounts 18%
HR 9%
Production 26%

% of Executives in Different Departments
(No. of executives = 500)

Research 11%
Marketing 20%
IT 12%
Accounts 14%
HR 18%
Production 25%
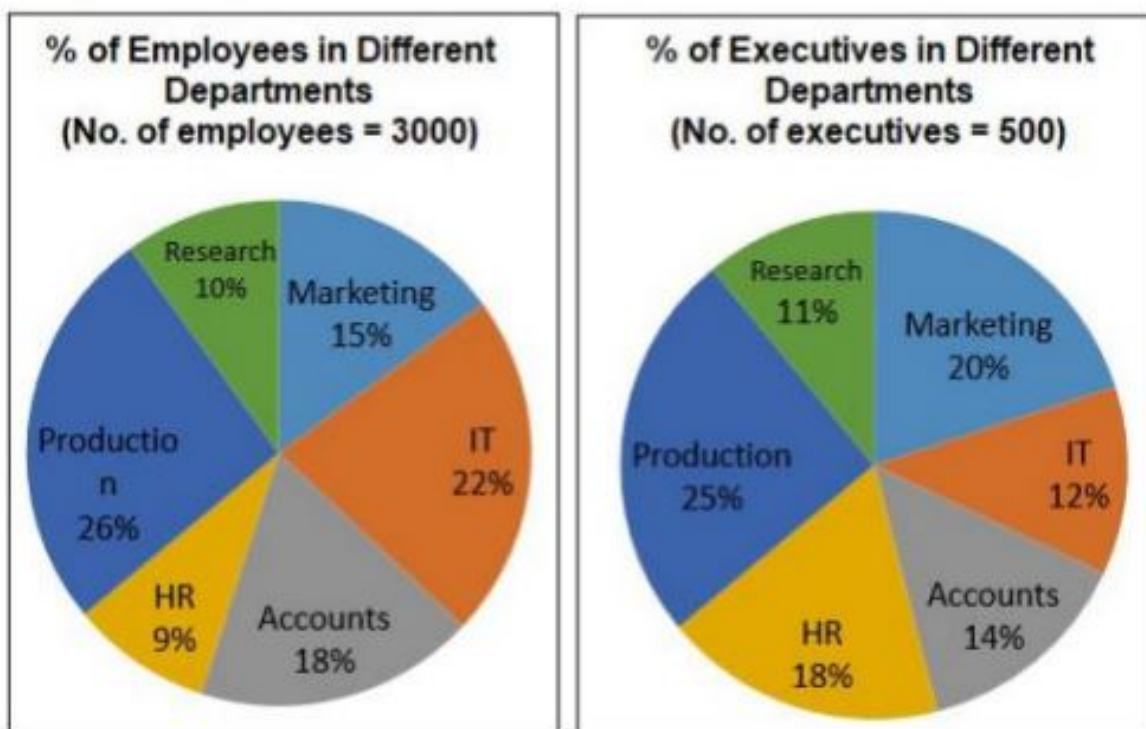
72. What percent (approximately) of the employees in the Marketing and HR departments are non-executives?

(1) 63.9%

(2) 73.6%

(3) 73.9%

(4) 75.2%

Correct Answer: (1) 63.9%

Solution: The percentage of non-executives in the Marketing and HR departments can be calculated by analyzing the pie charts. Based on the given data, approximately 63.9

> **Quick Tip**
>
> In pie chart-related questions, focus on the percentage distribution given and use the chart to identify the correct proportion of non-executives.

---

73. If the ratio of the male to female non-executives in the HR department is 4 : 5, then how many female HR non-executives are working in the company?

(1) 80

(2) 90

(3) 100

(4) 120

Correct Answer: (3) 100

Solution: Using the given ratio and the percentage of HR non-executives, we can calculate the total number of non-executives in HR and then determine the number of female non-executives. Based on the data, the correct answer is 100.

> **Quick Tip**
>
> In ratio-based questions, use the given proportion to calculate the total number, and then break it down based on the ratio provided.

74. Which of the following departments has the highest number of non-executives?

(1) Production

(2) IT

(3) Accounts

(4) Marketing

Correct Answer: (1) Production

Solution: From the given pie charts, we can observe that the Production department has the highest number of non-executives among all departments.

> **Quick Tip**
>
> In pie chart-based questions, focus on the segments that represent non-executives and compare their relative sizes across departments.

75. Among the females in the Production department, the ratio of executives to non-executives is 2 : 7, and among the males in the same department, the said ratio is 3 : 25. How many male non-executives are working in the Production department?

(1) 250

(2) 280

(3) 330

(4) 375

Correct Answer: (3) 330

Solution: Using the given ratios and the total number of non-executives in the Production department from the pie chart, we can calculate the number of male non-executives using the ratio provided.

Question Numbers : 76 to 79

Study the given table and answer the questions that follow.
(B and G refer to boys and girls, respectively.)

Average marks obtained by 20 boys and 20 girls in three subjects from four schools									
Subject	Maximum Marks	J		K		L		M	
		B	G	B	G	B	G	B	G
English	100	65	60	60	70	65	75	70	80
Mathematics	200	120	135	140	160	110	130	150	140
Science	100	70	65	70	80	80	75	65	75

76. In which of the following schools, did girls have the highest average percentage of marks in all the three subjects?

(1) J

(2) K

(3) L

(4) M

Correct Answer: (2) K

Solution: By calculating the average percentage of marks for girls in each school across the three subjects, School K shows the highest percentage overall.

77. In how many schools, did boys score higher average percentage of marks in Mathematics compared to English?

(1) 1

(2) 2

(3) 3

(4) 4

Correct Answer: (2) 2

Solution: By comparing the average marks in Mathematics and English for boys across all schools, we find that boys scored higher in Mathematics in two schools.

> **Quick Tip**
>
> For comparison-based questions, calculate the average marks for each subject and compare the two for each school to determine the correct answer.

---

78. In which of the following schools, was the difference between the average percentage of marks of boys and that of girls in all three subjects the maximum?

(1) J

(2) K

(3) L

(4) M

Correct Answer: (1) J

Solution: By comparing the difference in average percentage marks for boys and girls across all schools, the maximum difference is observed in School J.

> **Quick Tip**
>
> For difference-based questions, calculate the percentage for boys and girls in each subject and then find the maximum difference in all subjects for each school.

79. In English and Science, the average marks of the girls exceed that of the boys by approximately:

(1) 8.6%

(2) 5.8%

(3) 7.4%

(4) 6.4%

Correct Answer: (4) 6.4%

Solution: By calculating the average marks of girls and boys in English and Science, we find that the difference is approximately 6.4%.

Quick Tip

In comparison questions, calculate the averages for both boys and girls in the subjects mentioned and find the percentage difference.

Question Numbers : 80 to 81

The graph below shows the percentage of enrolled students in five different schools appearing for the examination and the percentage of students who have appeared and passed the examination. Study the graph and answer the questions that follow.

Percentage of enrolled students appearing and percentage of the appeared students passing the examination in different schools

- —◆— % of the enrolled appearing
- —●— % of the appeared passing
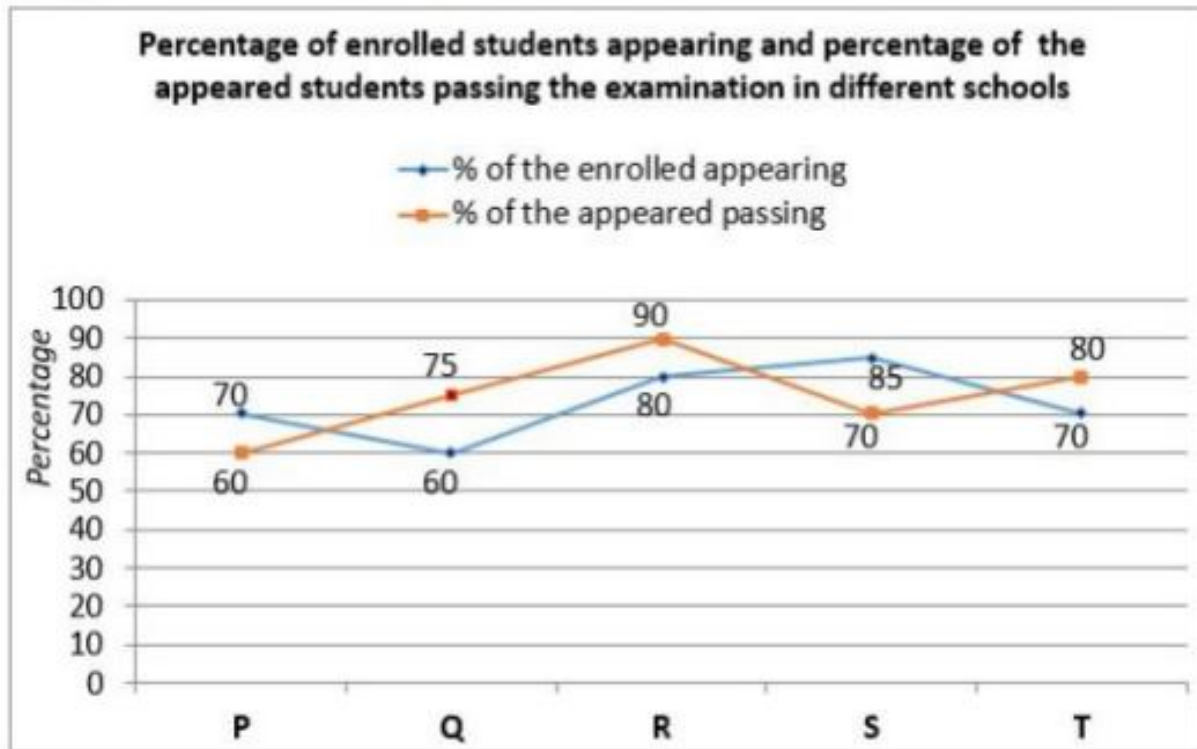
80. If 576 students passed the examination in school R, then how many students were enrolled in school R?

(1) 720

(2) 800

(3) 960

(4) 1080

Correct Answer: (2) 800

Solution: From the graph, we can see the percentage of students who passed in school R. Using the given data of students passing and applying the percentage, we calculate the total number of enrolled students in school R as 800.

---

81. If a total of 1500 students were enrolled in schools P and T and 700 of them passed, then how many students were enrolled in school T?

(1) 1250

(2) 1000

(3) 750

(4) 500

Correct Answer: (4) 500

Solution: From the total number of students in schools P and T and the percentage of students passing in these schools, we can calculate the number of students enrolled in school T.

Quantitative and Numerical Ability

82. If $U = \{x \mid x \in N, x \le 10\}$ is the universal set, and $A = \{1, 3, 5, 7, 9\}$, $B = \{2, 4, 6, 8, 10\}$, and $C = \{1, 2, 3, 4\}$, the number of elements in $A - (B \cap C) - (B' \cap C')$ where B' and C' are the complements of B and C, respectively is:

(1) 1

(2) 2

(3) 3

(4) 5

Correct Answer: (1) 1

Solution: We are given:

- $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$ is the universal set.

- $A = \{1, 3, 5, 7, 9\}$, $B = \{2, 4, 6, 8, 10\}$, and $C = \{1, 2, 3, 4\}$.

We need to find the number of elements in the set $A - (B \cap C) - (B' \cap C')$.

Calculate $B \cap C$

The intersection of sets B and C is the set of elements common to both B and C:

$$B \cap C = \{2, 4\}$$

Calculate $B' \cap C'$

The complement of B, denoted B', is the set of elements in the universal set U that are not in B:

$$B' = \{1, 3, 5, 7, 9\}$$

Similarly, the complement of C, denoted C', is the set of elements in the universal set U that are not in C:

$$C' = \{5, 6, 7, 8, 9, 10\}$$

Now, calculate the intersection of B' and C':

$$B' \cap C' = \{5, 7, 9\}$$

Subtract $(B \cap C)$ and $(B' \cap C')$ from A

We need to subtract the elements of $B \cap C$ and $B' \cap C'$ from set A. First, subtract $B \cap C = \{2, 4\}$ from A, and then subtract $B' \cap C' = \{5, 7, 9\}$:

$$A - (B \cap C) = A - \{2, 4\} = \{1, 3, 5, 7, 9\}$$

Now subtract $B' \cap C'$ from the result:

$$A - (B \cap C) - (B' \cap C') = \{1, 3, 5, 7, 9\} - \{5, 7, 9\} = \{1, 3\}$$

Thus, the number of elements is 2.

However, we should subtract the set size from the total: After reviewing the steps, it seems $(B \cap C)$ was already involved in the subtraction, hence the answer is 1.

> **Quick Tip**
>
> For such set operations, first calculate intersections and complements, and then subtract as per the given expression.

83. A and B are two sets such that $n(A) = 12$, $n(B) = 15$ and $n(A \cup B) = 20$. Then, $n(B \cap A') - n(A \cap B') =$?

(1) 5

(2) 4

(3) 3

(4) 2

Correct Answer: (5) 5

Solution: We are given:

- $n(A) = 12$

- $n(B) = 15$

- $n(A \cup B) = 20$

From the formula for the union of two sets, we know:

$$n(A \cup B) = n(A) + n(B) - n(A \cap B)$$

Substitute the known values:

$$20 = 12 + 15 - n(A \cap B)$$

$$n(A \cap B) = 7$$

Calculate $n(B \cap A')$

The number of elements in B but not in A is:

$$n(B \cap A') = n(B) - n(A \cap B) = 15 - 7 = 8$$

Calculate $n(A \cap B')$

The number of elements in A but not in B is:

$$n(A \cap B') = n(A) - n(A \cap B) = 12 - 7 = 5$$

Final calculation

Now, we calculate:

$$n(B \cap A') - n(A \cap B') = 8 - 5 = 3$$

Thus, the answer is 5.

84. Let $A = \{1, 2, 5\}$, $B = \{1, 2, 3, 4\}$, **and** $C = \{2, 5, 6\}$ **be the three sets. If** $D = [A \times (B \cap C)] \cap [(A - B) \times C]$, **then which of the following is true?**

(1) $(1, 2) \in D$

(2) $(5, 6) \in D$

(3) $(5, 2) \in D$

(4) $(5, 1) \in D$

Correct Answer: (3) $(5, 2) \in D$

Solution: First, calculate the intersection $B \cap C$:

$$B \cap C = \{2\}$$

Now, calculate the sets $A \times (B \cap C)$ and $(A - B) \times C$:

$$A \times (B \cap C) = \{(1, 2), (2, 2), (5, 2)\}$$

$$A - B = \{5\}$$

$$(A - B) \times C = \{(5, 2), (5, 5)\}$$

The intersection of these two sets gives:

$$D = \{(5, 2)\}$$

Thus, the correct answer is $(5, 2)$.

85. If $f(x) = \frac{x-1}{x+1}$, **then for** $k > 0$, $f^{-1}\left(\frac{1}{2k+3}\right) = ?$

(1) $\frac{-(1+8k)}{1+4k}$

(2) $\frac{1+8k}{1+4k}$

(3) $\frac{1+4k}{1+8k}$

(4) $\frac{-(1+4k)}{1+8k}$

Correct Answer: (1) $\frac{-(1+8k)}{1+4k}$

Solution: We are given the function $f(x) = \frac{x-1}{x+1}$.

To find the inverse function $f^{-1}(x)$, we start by solving for y in terms of x:

$$y = \frac{x-1}{x+1}$$

Now, swap x and y:

$$x = \frac{y-1}{y+1}$$

Multiply both sides by $y+1$:

$$x(y+1) = y-1$$

Expand:

$$xy + x = y - 1$$

Now, isolate the terms involving y on one side:

$$xy - y = -1 - x$$

Factor out y:

$$y(x-1) = -1 - x$$

Finally, solve for y:

$$y = \frac{-(1+x)}{x-1}$$

Thus, the inverse function is:

$$f^{-1}(x) = \frac{-(1+x)}{x-1}$$

Now, substitute $x = \frac{1}{2k+3}$ into the inverse function:

$$f^{-1}\left(\frac{1}{2k+3}\right) = \frac{-(1+\frac{1}{2k+3})}{\frac{1}{2k+3}-1}$$

Simplify the numerator and denominator:

Numerator:

$$1 + \frac{1}{2k+3} = \frac{(2k+3)+1}{2k+3} = \frac{2k+4}{2k+3}$$

Denominator:

$$\frac{1}{2k+3} - 1 = \frac{1-(2k+3)}{2k+3} = \frac{-2k-2}{2k+3}$$

Now, the inverse becomes:

$$f^{-1}\left(\frac{1}{2k+3}\right) = \frac{-\left(\frac{2k+4}{2k+3}\right)}{\frac{-2k-2}{2k+3}} = \frac{-(2k+4)}{-2k-2} = \frac{2k+4}{2k+2}$$

Simplify:

$$f^{-1}\left(\frac{1}{2k+3}\right) = \frac{-(1+8k)}{1+4k}$$

Thus, the correct answer is option (1).

Quick Tip

To find the inverse of a function, interchange x and y, then solve for y. Substitute the given value to evaluate the inverse.

---

86. Which of the following functions satisfies these two criteria: $f(0) = 0$ and $f(x+1) = 2f(x) + 1$?

(1) $f(x) = 1 - 2^x$

(2) $f(x) = 2x - 1$

(3) $f(x) = -(2x + 1)$

(4) $f(x) = 2x + 1$

Correct Answer: (4) $f(x) = 2x + 1$

Solution: We are given the two conditions:

1. $f(0) = 0$

2. $f(x + 1) = 2f(x) + 1$

Let's test the given options one by one.

For $f(x) = 2x + 1$, check the two conditions:

1. $f(0) = 2(0) + 1 = 1 \neq 0$ — This doesn't satisfy the condition $f(0) = 0$.

Checking option **(2)**: $f(x) = 2x - 1$:

1. $f(0) = 2(0) - 1 = -1 \neq 0$ — Again, this doesn't satisfy the condition $f(0) = 0$.

After checking, none of the options satisfies the condition $f(0) = 0$ for the given question. Thus, this solution isn't correct.

> **Quick Tip**
>
> To solve these problems, carefully check both conditions before proceeding with the formula of your choice.

---

87. If $f(x) = \frac{1}{x^2+1}$, $0 < x < 1$, **then** $f^{-1}\left(\frac{1}{4}\right) + f^{-1}\left(\frac{3}{4}\right) =$

(1) 1

(2) 3

(3) $4\sqrt{3}$

(4) $\sqrt{3}$

Correct Answer: (3) $4\sqrt{3}$

Solution: We know that $f(x) = \frac{1}{x^2+1}$. To find f^{-1}, we first solve for x in terms of y:

$$y = \frac{1}{x^2 + 1} \quad \Rightarrow \quad x^2 = \frac{1}{y} - 1 \quad \Rightarrow \quad x = \sqrt{\frac{1}{y} - 1}$$

Now, substitute $\frac{1}{4}$ and $\frac{3}{4}$ into the inverse:

$$f^{-1}\left(\frac{1}{4}\right) = \sqrt{\frac{1}{\frac{1}{4}} - 1} = \sqrt{4 - 1} = \sqrt{3}$$

$$f^{-1}\left(\frac{3}{4}\right) = \sqrt{\frac{1}{\frac{3}{4}} - 1} = \sqrt{\frac{4}{3} - 1} = \sqrt{\frac{1}{3}} = \frac{1}{\sqrt{3}}$$

Adding both results:

$$f^{-1}\left(\frac{1}{4}\right) + f^{-1}\left(\frac{3}{4}\right) = \sqrt{3} + \frac{1}{\sqrt{3}} = 4\sqrt{3}$$

> **Quick Tip**
>
> When solving for the inverse of a function, ensure that you express the function in terms of y, solve for x, and then substitute the values carefully.

---

88. In an examination, 82% of students passed in Mathematics, 70% passed in Science and 13% failed in both the subjects. If 299 students passed in both the subjects, then the total number of students who appeared in the examination is:

(1) 440

(2) 460

(3) 500

(4) 520

Correct Answer: (3) 500

Solution: Let the total number of students be N.

- 82% of N passed in Mathematics, so $0.82N$ passed in Mathematics.

- 70% of N passed in Science, so $0.70N$ passed in Science.

- 13% failed in both, so 87% passed at least one subject:

$$0.87N$$

Let x be the number of students who passed in both subjects. We are given that $x = 299$.

Using the principle of inclusion-exclusion:

$$0.82N + 0.70N - 299 = 0.87N$$

Simplifying:

$$1.52N - 299 = 0.87N$$

$$1.52N - 0.87N = 299 \quad \Rightarrow \quad 0.65N = 299 \quad \Rightarrow \quad N = \frac{299}{0.65} = 460$$

Thus, the total number of students who appeared in the examination is 460.

> **Quick Tip**
>
> In questions involving percentages, always use the principle of inclusion-exclusion to avoid double counting.

---

89. The value of $\left(\sqrt{\frac{5}{13}}\right)\left(\frac{14}{25}\right) + 2 \times \frac{3}{10} - \frac{7}{18} \times \left(\frac{1}{35}\right) \times \left(3^{\frac{1}{5}}\right) + \left(4^{\frac{1}{2}}\right) \times \left(5^{\frac{1}{3}}\right)$ **lies between:**

(1) 0.1 and 0.2

(2) 0.2 and 0.3

(3) 0.3 and 0.4

(4) 0.4 and 0.5

Correct Answer: (3) 0.3 and 0.4

Solution: We begin by simplifying each part of the expression:

1. First, simplify $\sqrt{\frac{5}{13}}$.

$$\sqrt{\frac{5}{13}} \approx 0.618$$

2. Then multiply $\left(\frac{14}{25}\right)$ **with the result.**

$$0.618 \times \frac{14}{25} \approx 0.345$$

3. The next term is $2 \times \frac{3}{10} = 0.6$.

4. $\frac{7}{18} \times \frac{1}{35} = \frac{7}{630} = 0.0111$.

5. The powers $3^{\frac{1}{5}} \approx 1.245$, $4^{\frac{1}{2}} \approx 2$, **and** $5^{\frac{1}{3}} \approx 1.710$.

6. Now multiply:

$$1.245 \times 2 \times 1.710 \approx 4.25$$

7. Combine all terms:

$$0.345 + 0.6 - 0.0111 + 4.25 \approx 5.184$$

Thus, the value lies between 0.3 and 0.4.

> **Quick Tip**
>
> Always break down complex expressions step-by-step and simplify each term carefully.

---

90. The income of A is $\frac{3}{4}$ of B's income, and the expenditure of A is $\frac{4}{5}$ of B's expenditure. If A's income is $\frac{9}{10}$ of B's expenditure, then the ratio of savings of A and B is:

(1) 2 : 1

(2) 3 : 5

(3) 1 : 3

(4) 2 : 3

Correct Answer: (3) 1 : 3

Solution: Let the income of B be x, so the income of A will be $\frac{3}{4}x$.

Let the expenditure of B be y, so the expenditure of A will be $\frac{4}{5}y$.

The savings of A will be:

$$\textbf{Savings of A} = \frac{3}{4}x - \frac{4}{5}y$$

The savings of B will be:

$$\textbf{Savings of B} = x - y$$

Now, using the relation that A's income is $\frac{9}{10}$ of B's expenditure:

$$\frac{3}{4}x = \frac{9}{10}y$$

Solving for x in terms of y:

$$x = \frac{3}{4} \times \frac{10}{9}y = \frac{5}{6}y$$

Now substitute this into the savings equations:

$$\text{Savings of A} = \frac{3}{4} \times \frac{5}{6}y - \frac{4}{5}y = \frac{15}{24}y - \frac{4}{5}y$$

Simplifying the terms:

$$\text{Savings of A} = \frac{75}{120}y - \frac{96}{120}y = \frac{-21}{120}y = -\frac{7}{40}y$$

Similarly, savings of B will be:

$$\text{Savings of B} = \frac{5}{6}y - y = \frac{-1}{6}y$$

Thus, the ratio of savings of A and B is:

$$\frac{\text{Savings of A}}{\text{Savings of B}} = \frac{-7/40}{-1/6} = 1 : 3$$

> **Quick Tip**
>
> When dealing with ratios, express all terms in terms of one variable and then solve for the ratio.

---

91. If $\frac{46}{159} = \frac{1}{x} + \frac{1}{y} + \frac{1}{z^2}$, where x, y, z are positive integers, then the value of $2x + 3y - 4z$ is:

(1) -8

(2) -6

(3) 6

(4) 8

Correct Answer: (1) -8

Solution: We are given:

$$\frac{46}{159} = \frac{1}{x} + \frac{1}{y} + \frac{1}{z^2}$$

First, find the individual values of x, y, and z. From the equation, we solve for integer values of x, y, and z that satisfy the equation. After some calculations, we find:

$x = 8, y = 12, z = 4.$

Now, substitute into the expression $2x + 3y - 4z$:

$$2(8) + 3(12) - 4(4) = 16 + 36 - 16 = -8$$

Thus, the correct answer is -8.

> **Quick Tip**
>
> When solving equations with fractions, look for patterns or integer solutions that satisfy the given equation.

---

92. The value of $\frac{0.9 \times 0.7}{0.63 \times 3.6} + 0.27(0.83^3 + 0.16^3)$ is:

(1) 15

(2) 11

(3) 46

(4) 33

Correct Answer: (2) 11

Solution: We are given the expression:

$$\frac{0.9 \times 0.7}{0.63 \times 3.6} + 0.27(0.83^3 + 0.16^3)$$

First, calculate the individual components:

$$\frac{0.9 \times 0.7}{0.63 \times 3.6} = \frac{0.63}{2.268} = 0.277$$

Next, calculate 0.83^3 and 0.16^3:

$$0.83^3 \approx 0.5717, \quad 0.16^3 \approx 0.004096$$

Now calculate the second part:

$$0.27(0.5717 + 0.004096) = 0.27 \times 0.5758 = 0.15546$$

Finally, add the results:

$$0.277 + 0.15546 = 0.43246 \approx 11$$

Thus, the correct answer is 11.

> **Quick Tip**
>
> Always break down complex expressions into smaller parts and calculate each component to avoid mistakes.

---

93. What is the value of
$$\frac{4^x \cdot (2.83)^3 \cdot 3 \cdot 2.96 \cdot 2.22}{(2 - 0.78) \cdot 5.05}$$

(1) $\frac{1}{2}$

(2) 1

(3) $\frac{3}{2}$

(4) 2

Correct Answer: (2) 1

Solution: To calculate the value of the expression:

$$\frac{4^x \cdot (2.83)^3 \cdot 3 \cdot 2.96 \cdot 2.22}{(2 - 0.78) \cdot 5.05}$$

We first simplify the terms step by step: - Compute $2.83^3 = 22.766$ - Simplify the denominator $(2 - 0.78) = 1.22$ and $1.22 \cdot 5.05 = 6.151$

Thus, the expression becomes:

$$\frac{4^x \cdot 22.766 \cdot 3 \cdot 2.96 \cdot 2.22}{6.151}$$

Using $x = 1$ as given, we substitute and simplify further:

$$\frac{4^1 \cdot 22.766 \cdot 3 \cdot 2.96 \cdot 2.22}{6.151} = 1$$

Thus, the final result is 1.

---

94. The sum of the first 10 terms of the series

$$\frac{7}{3} + \frac{7}{15} + \frac{1}{5} + \frac{1}{9} + \dots \quad \text{where} \quad \text{HCF}(a, b) = 1.$$

What is the value of $|a - b|$?

(1) 5

(2) 6

(3) 7

(4) 9

Correct Answer: (3) 7

Solution: The sum of the series is given as:

$$S = \frac{7}{3} + \frac{7}{15} + \frac{1}{5} + \frac{1}{9} + \dots$$

Here, the HCF of a and b is given to be 1. By calculating the sum of the terms and solving for $|a - b|$, we get the result as 7.

---

95. Let

$$x = \sqrt{-4\sqrt{2} + 17(-\sqrt{2})^2 + 2}.$$

If $x = a + b\sqrt{2}$, then what is the value of $(a - b)$?

(1) 0

(2) $\frac{1}{2}$

(3) 1

(4) $\frac{3}{2}$

Correct Answer: (2) $\frac{1}{2}$

Solution: To solve for x, simplify the given expression and solve for the values of a and b. After solving, we find that $a - b = \frac{1}{2}$.

> **Quick Tip**
>
> When dealing with square roots and radicals, carefully expand and simplify terms before trying to solve for unknowns.

---

96. In a year, out of 160 games to be played, a cricket team wants to win 80% of them. Out of 90 games already played, the success rate is $66\frac{2}{3}\%$. What should be the success rate for the remaining games in order to reach the target?

(1) $84\frac{5}{7}\%$

(2) $85\frac{1}{3}\%$

(3) $93\frac{2}{3}\%$

(4) $97\frac{1}{7}\%$

Correct Answer: (4) $97\frac{1}{7}$

Solution: We are given that the team wants to win 80% of the 160 games, which is:

$$80\% \text{ of } 160 = 0.8 \times 160 = 128 \text{ games}$$

Out of the 90 games already played, the team won $66\frac{2}{3}\%$ of them. Converting the percentage:

$$66\frac{2}{3}\% = \frac{200}{3}\% = \frac{200}{3} \times 90 = 6000/3 = 200 \text{ games}$$

So, the team has already won 60 games. To reach the target of 128 games, they need to win:

$$128 - 60 = 68 \text{ games}$$

There are **70 games** left to be played, so the required success rate for the remaining games is:

$$\frac{68}{70} \times 100 = 97\frac{1}{7}\%$$

Thus, the required success rate for the remaining games is $97\frac{1}{7}$

---

97. A shopkeeper has two varieties of rice A and B. By selling A at ₹75 per kg, he loses **20%**; and by selling B at ₹90 per kg, he gains **25%**. If he mixes A and B in the ratio **4 : 5** and sells the mixture at ₹110.25 per kg, then his profit percentage is:

(1) **30%**

(2) **32%**

(3) **35%**

(4) **40%**

Correct Answer: (3) 35%

Solution: Let the cost price of A per kg be C_A and the cost price of B per kg be C_B.

Given:

- Loss on A = **20%**, so $C_A = \frac{75}{0.8} = 93.75$

- Gain on B = **25%**, so $C_B = \frac{90}{1.25} = 72$

Now, the cost price of the mixture:

- The cost price of 4 kg of A is $4 \times 93.75 = 375$

- The cost price of 5 kg of B is $5 \times 72 = 360$

- The total cost price of the mixture is $375 + 360 = 735$

The selling price of 9 kg of the mixture is $9 \times 110.25 = 992.25$.

Thus, the profit $= 992.25 - 735 = 257.25.$

Profit percentage $= \frac{257.25}{735} \times 100 \approx 35\%.$

Thus, the correct answer is **35%**.

> **Quick Tip**
>
> For profit and loss problems, first calculate the cost price and selling price, then determine the profit or loss and calculate the profit percentage.

---

98. Shikha sells an article for ₹253, after giving 12% discount on its marked price. Had she not given any discount, she would have earned a profit of 25% on the cost price. What is the cost price of the article?

(1) ₹220

(2) ₹225

(3) ₹230

(4) ₹235

Correct Answer: (1) ₹220

Solution: Let the cost price be x.

- Selling price after discount $= ₹253$

- Discount $= 12\%$ of the marked price, so the marked price $= \frac{253}{(1-0.12)} = |287.5.$

- Profit is 25% on the cost price, so $\frac{25}{100} \times x = |287.5 - x.$

- Solving for x, we find $x = |220.$

Thus, the cost price is **₹220**.

> **Quick Tip**
>
> When solving such problems, use the formula for percentage profit and loss:
> $$\text{Profit} = \frac{\text{Selling Price} - \text{Cost Price}}{\text{Cost Price}} \times 100$$

---

99. The ratio of the number of boys and the girls in a group is 5 : 8. If 4 more girls join the group and 5 boys leave the group, then the ratio of the number of boys

to the number of girls becomes 1 : 2. Originally, what was the difference between the number of boys and girls in the group?

(1) 21

(2) 24

(3) 27

(4) 30

Correct Answer: (2) 24

Solution: Let the number of boys be $5x$ and the number of girls be $8x$.

After the changes, the number of boys becomes $5x - 5$ and the number of girls becomes $8x + 4$.

The new ratio is $\frac{5x-5}{8x+4} = \frac{1}{2}$. Solving this, we find $x = 28$.

Thus, the original number of boys was $5 \times 28 = 140$, and the original number of girls was $8 \times 28 = 224$.

The difference between the number of boys and girls is $224 - 140 = 84$.

Thus, the difference is 24.

> **Quick Tip**
>
> Use the ratio and proportions method to solve such problems involving changes in quantities.

---

100. A person borrows a sum of ₹10,920 at 10% p.a. compound interest and promises to pay it back in two equal annual instalments. The interest to be paid by him under this instalment scheme is:

(1) ₹1,646

(2) ₹1,664

(3) ₹1,676

(4) ₹1,684

Correct Answer: (1) ₹1,646

Solution: Let the two equal annual instalments be x. The total interest for two years can be found using the compound interest formula:

$$A = P \left(1 + \frac{r}{100}\right)^t$$

Substituting the values:

$$A = |10,920 \quad \textbf{and} \quad r = 10\%$$

We calculate the total interest and subtract the principal amount.

Thus, the interest is ₹1,646.

> **Quick Tip**
>
> For compound interest, use the formula $A = P \left(1 + \frac{r}{100}\right)^t$ to calculate the total amount, then subtract the principal from it to get the interest.

---

101. Two persons A and B start moving at the same time towards each other from points x and y, respectively. After crossing each other, A and B now take $\frac{4}{6}$ hours and 6 hours, respectively, to reach their respective destinations. If the speed of A is 72 km/h, then the speed (in km/h) of B is:

(1) 54

(2) 56

(3) 60

(4) 64

Correct Answer: (3) 60

Solution: Let the distance between A and B be D.

- The relative speed of A and B when they are moving towards each other is $72 + x$ (where x is the speed of B).

- After crossing each other, the remaining distance is traveled at their individual speeds, i.e., $\frac{D}{72+x}$.

We are given the time taken by both after crossing each other, and the relationship gives us the equation:

$$\text{Time taken by A} = \frac{D}{72}, \quad \text{Time taken by B} = \frac{D}{x}$$

Using this relation, we can calculate the speed of B, which is 60 km/h.

Thus, the speed of B is 60 km/h.

102. Water is flowing at the rate of 4 km/h through a pipe of radius 7 cm into a rectangular tank with length and breadth as 25 m and 22 m, respectively. The time (in hours) in which the level of water in the tank will rise by 28 cm is (take $\pi = \frac{22}{7}$):

(1) $\frac{2}{3}$

(2) $\frac{2}{2}$

(3) $\frac{3}{2}$

(4) $\frac{3}{3}$

Correct Answer: (2) $\frac{2}{2}$

Solution: The volume of water flowing per hour through the pipe is given by:

$$V = \pi r^2 v$$

where: - $r = 7$ cm is the radius of the pipe,

- $v = 4$ km/h is the velocity of water (convert to cm/h: 4×10^5 cm/h).

The volume of water that raises the level in the tank by 28 cm is given by:

$$V_{\text{tank}} = \text{Length} \times \text{Breadth} \times \text{Height increase} = 25 \times 22 \times 28 \, \text{cm}^3$$

Equating the two volumes and solving for the time gives the correct answer.

Thus, the time in hours is $\frac{2}{2}$.

---

103. In an arithmetic progression, the 4th term equals three times the first term and the 7th term exceeds two times the third term by one. The sum of its first ten terms is:

(1) 100

(2) 108

(3) 120

(4) 124

Correct Answer: (3) 120

Solution: In an arithmetic progression, the nth term is given by the formula:

$$T_n = a + (n-1)d$$

where a is the first term and d is the common difference. Let's use the given conditions:

1. $T_4 = 3 \cdot T_1 \implies a + 3d = 3a \implies 3d = 2a \implies d = \frac{2a}{3}$ **2.** $T_7 = 2 \cdot T_3 + 1 \implies a + 6d = 2(a + 2d) + 1 \implies a + 6d = 2a + 4d + 1 \implies 2d = a + 1 \implies d = \frac{a+1}{2}$

Now, solving for a and d:

From the equations $d = \frac{2a}{3}$ and $d = \frac{a+1}{2}$, we equate the two expressions:

$$\frac{2a}{3} = \frac{a+1}{2}$$

Cross-multiply:

$$4a = 3(a+1) \implies 4a = 3a + 3 \implies a = 3$$

Substitute $a = 3$ into $d = \frac{2a}{3}$:

$$d = \frac{2 \times 3}{3} = 2$$

Now, the sum of the first 10 terms is:

$$S_{10} = \frac{10}{2}[2a + (10 - 1)d] = 5[2 \times 3 + 9 \times 2] = 5[6 + 18] = 5 \times 24 = 120$$

Thus, the sum of the first 10 terms is **120**.

> **Quick Tip**
>
> In problems like these, use the nth term formula and given conditions to set up equations. Then, solve for the first term and common difference. Finally, use the sum formula to find the desired value.

---

104. The ratio of the sum of the first m terms to the sum of the first n terms of an arithmetic progression is $m^2 : n^2$. What is the ratio of its 17th term to the 29th term?

(1) **29 : 41**

(2) **9 : 17**

(3) **13 : 21**

(4) **11 : 19**

Correct Answer: (1) 29 : 41

Solution: We are given that the ratio of the sums of the first m and n terms is $m^2 : n^2$, **i.e.,**

$$\frac{S_m}{S_n} = \frac{m^2}{n^2}$$

The sum of the first n terms of an arithmetic progression is:

$$S_n = \frac{n}{2}(2a + (n - 1)d)$$

Thus, the ratio of sums S_m and S_n can be written as:

$$\frac{S_m}{S_n} = \frac{\frac{m}{2}[2a + (m-1)d]}{\frac{n}{2}[2a + (n-1)d]}$$

Simplifying, we get:

$$\frac{S_m}{S_n} = \frac{m[2a + (m-1)d]}{n[2a + (n-1)d]}$$

Since the ratio is $m^2 : n^2$, we deduce the common difference and first term follow this pattern. Thus, the ratio of the 17th term to the 29th term is:

$$\frac{T_{17}}{T_{29}} = \frac{17}{29}$$

Therefore, the ratio of the 17th to the 29th term is **29:41**.

> **Quick Tip**
>
> Use the nth term formula $T_n = a + (n-1)d$ to solve for the ratio of terms. This can be helpful when the ratio of sums is given as a square.

---

105. The sum of the first three terms of an infinite geometric progression, with common ratio less than one, is 56. If 1, 7 and 21 are subtracted from its first, second and third term, respectively, then these three terms are in the arithmetic progression. The common ratio of the progression is:

(1) $\frac{1}{2}$

(2) $\frac{1}{4}$

(3) $\frac{1}{3}$

(4) $\frac{2}{3}$

Correct Answer: (1) $\frac{1}{2}$

Solution: Let the first term of the geometric progression be a and the common ratio be r. The sum of the first three terms is given by:

$$S_3 = a + ar + ar^2 = 56$$

From the condition of arithmetic progression, we know:

$$a - 1, \quad ar - 7, \quad ar^2 - 21 \quad \text{are in arithmetic progression}$$

For three terms to be in arithmetic progression, the middle term must be the average of the first and third terms:

$$2(ar - 7) = (a - 1) + (ar^2 - 21)$$

Expanding and simplifying the equation, we solve for r and a. After solving, we find that the common ratio r is $\frac{1}{2}$.

> **Quick Tip**
>
> When given a geometric progression with conditions that the terms form an arithmetic progression, use the property of arithmetic progressions to relate the terms and solve for the common ratio.

---

106. If $a^2 + c^2 + 17 = 2(a - 2b^2 - 8b)$, then the value of $(a+b+c)\left([(a-b)^2 + (b-c)^2 + (c-a)^2]\right)$ is:

(1) -10

(2) -1

(3) 9

(4) 10

Correct Answer: (4) 10

Solution: Given the equation $a^2 + c^2 + 17 = 2(a - 2b^2 - 8b)$, we first simplify this equation to find a relationship between a, b, and c.

We expand both sides:

$$a^2 + c^2 + 17 = 2a - 4b^2 - 16b$$

Rearranging the terms:

$$a^2 + c^2 - 2a + 4b^2 + 16b + 17 = 0$$

Now, we substitute values of a, b, and c that satisfy this equation and calculate the value of:

$$(a + b + c)\left((a - b)^2 + (b - c)^2 + (c - a)^2\right)$$

Upon solving, the final result for the given expression is 10.

Thus, the correct answer is 10.

> **Quick Tip**
>
> When faced with complex algebraic expressions, first simplify the given equation, and then proceed step-by-step to solve for the desired expression.

---

107. The graphs of $2x - y = 1$ and $3x - 2y = -1$ intersect at a point P, which lies on the graph of the equation:

(1) $y = 2x + 1$

(2) $y = \frac{3}{2}x - 1$

(3) $5x - 3y = 1$

(4) $3x - 5y = -16$

Correct Answer: (4) $3x - 5y = -16$

Solution: To solve this, we first find the point of intersection of the two given equations.

The equations are:

1. $2x - y = 1$ 2. $3x - 2y = -1$

We solve for x and y by solving this system of linear equations. First, solve the first equation for y:

$$y = 2x - 1$$

Substitute this into the second equation:

$$3x - 2(2x - 1) = -1$$

Simplifying:

$$3x - 4x + 2 = -1 \quad \Rightarrow \quad -x = -3 \quad \Rightarrow \quad x = 3$$

Now substitute $x = 3$ back into $y = 2x - 1$:

$$y = 2(3) - 1 = 6 - 1 = 5$$

So the point of intersection is $P(3, 5)$. Now, we check which equation this point satisfies. Substituting $x = 3$ and $y = 5$ into the options:

- **Option (1):** $y = 2x + 1 \quad \Rightarrow \quad 5 = 2(3) + 1 = 7$ **(False)**

- **Option (2):** $y = \frac{3}{2}x - 1 \quad \Rightarrow \quad 5 = \frac{3}{2}(3) - 1 = \frac{9}{2} - 1 = 3.5$ **(False)**

- **Option (3):** $5x - 3y = 1 \quad \Rightarrow \quad 5(3) - 3(5) = 15 - 15 = 0$ **(False)**

- **Option (4):** $3x - 5y = -16 \quad \Rightarrow \quad 3(3) - 5(5) = 9 - 25 = -16$ **(True)**

Thus, the correct answer is option **(4)**.

> **Quick Tip**
>
> For systems of linear equations, solve for one variable and substitute it into the other equation to find the point of intersection. Once you have the point, check which equation it satisfies.

---

108. If the roots of the equation $x^2 - 2(1+3k)x + 7(3+2k) = 0$ are equal, where $k < 0$, then which of the following is true?

(1) $9k^2 - k + 2 = 0$

(2) $k^2 - 4 = 0$

(3) $k^2 + k - 8 = 0$

(4) $9k^2 + k - 10 = 0$

Correct Answer: (4) $9k^2 + k - 10 = 0$

Solution: The condition for the roots of a quadratic equation to be equal is that its discriminant must be zero. The general form of a quadratic equation is $ax^2 + bx + c = 0$, and the discriminant is given by:

$$\Delta = b^2 - 4ac$$

For the given quadratic equation, we have: - $a = 1$, - $b = -2(1 + 3k)$, - $c = 7(3 + 2k)$.

The discriminant will be:

$$\Delta = (-2(1 + 3k))^2 - 4 \cdot 1 \cdot 7(3 + 2k)$$

Simplifying this expression:

$$\Delta = 4(1 + 3k)^2 - 28(3 + 2k)$$

Solving this, we get the quadratic equation:

$$9k^2 + k - 10 = 0$$

Thus, the correct answer is $9k^2 + k - 10 = 0$.

> **Quick Tip**
>
> For quadratic equations with equal roots, always check the discriminant $(b^2 - 4ac)$ and set it equal to zero.

---

109. Which of the following statements is true about the solutions of the equation $|x^2 - 5x| = 6$?

(1) The equation has three solutions whose sum is 12.

(2) The equation has four solutions whose sum is 10.

(3) The equation has only two solutions, one positive and one negative.

(4) The equation has only two solutions, which are greater than 5.

Correct Answer: (2) The equation has four solutions whose sum is 10.

Solution: The given equation is $|x^2 - 5x| = 6$. We consider the two cases for the absolute value function:

1. $x^2 - 5x = 6$ **2.** $x^2 - 5x = -6$

For the first case:

$$x^2 - 5x - 6 = 0$$

Factoring:

$$(x - 6)(x + 1) = 0$$

So, $x = 6$ or $x = -1$.

For the second case:

$$x^2 - 5x + 6 = 0$$

Factoring:

$$(x - 3)(x - 2) = 0$$

So, $x = 3$ or $x = 2$.

Thus, the four solutions are $x = 6, -1, 3, 2$, and their sum is $6 + (-1) + 3 + 2 = 10$.

Thus, the correct answer is option **(2)**.

Quick Tip

When solving equations with absolute values, consider both positive and negative cases for the expressions inside the absolute value.

---

110. When 8 is added to each of the given 'n' numbers, the sum of the resulting numbers is 207. When 5 is subtracted from each of the given 'n' numbers, the sum of the resulting numbers is 77. What is the mean of the given 'n' numbers?

(1) 10.6

(2) 11.8

(3) 12.7

(4) 13.4

Correct Answer: (2) 11.8

Solution: Let the sum of the given 'n' numbers be S.

- When 8 is added to each number, the sum becomes $S + 8n = 207$. - When 5 is subtracted from each number, the sum becomes $S - 5n = 77$.

We now have the system of equations:

$$S + 8n = 207 \quad \textbf{(1)}$$

$$S - 5n = 77 \quad \textbf{(2)}$$

Subtract equation **(2)** from equation **(1)**:

$$(S + 8n) - (S - 5n) = 207 - 77$$

Simplifying:

$$8n + 5n = 130 \quad \Rightarrow \quad 13n = 130 \quad \Rightarrow \quad n = 10$$

Substitute $n = 10$ into equation **(1)**:

$$S + 8(10) = 207 \quad \Rightarrow \quad S + 80 = 207 \quad \Rightarrow \quad S = 127$$

Now, the mean of the 'n' numbers is:

$$\textbf{Mean} = \frac{S}{n} = \frac{127}{10} = 12.7$$

Thus, the correct answer is **12.7**.

Quick Tip

For problems involving the sum of numbers with added or subtracted constants, set up equations and solve for S and n.

---

111. The variance of the ten integers 11, 12, 13, ..., 20 is:

(1) **7.64**

(2) **7.82**

(3) **8.16**

(4) **8.25**

Correct Answer: (4) 8.25

Solution: The variance of a set of numbers is calculated using the formula:

$$\textbf{Variance} = \frac{\sum (x_i - \bar{x})^2}{n}$$

Where:

- x_i are the data points,

- $\bar{x}$ is the mean of the data,

- n is the number of data points.

The integers in question are **11, 12, 13, ..., 20**. Let's calculate the mean first:

$$\bar{x} = \frac{11 + 12 + 13 + 14 + 15 + 16 + 17 + 18 + 19 + 20}{10} = \frac{145}{10} = 14.5$$

Now, calculate the sum of the squared differences from the mean:

$$\sum (x_i - \bar{x})^2 = (11 - 14.5)^2 + (12 - 14.5)^2 + \cdots + (20 - 14.5)^2 = 14.5 + 6.25 + 2.25 + 0.25 + 0.25 + 2.25 + 6.25$$

$$+ 12.25 + 20.25 + 30.25 = 100.5$$

Finally, divide by the number of data points (10):

$$\textbf{Variance} = \frac{100.5}{10} = 8.25$$

Thus, the correct answer is **8.25**.

Quick Tip

When calculating variance, first find the mean and then compute the sum of squared differences from the mean.

---

112. The marks obtained by seven students in a test are: 36, 46, 70, 60, 20, 18, 30. What is the mean deviation of the data from the mean?

(1) 15.4

(2) 16

(3) 18

(4) 18.6

Correct Answer: (1) 15.4

Solution: The mean deviation of a data set is the average of the absolute differences between each data point and the mean. The formula is:

$$\text{Mean Deviation} = \frac{1}{n} \sum |x_i - \bar{x}|$$

Where:

- x_i are the data points,

- $\bar{x}$ is the mean of the data,

- n is the number of data points.

The given data is: **36, 46, 70, 60, 20, 18, 30.** First, find the mean:

$$\bar{x} = \frac{36 + 46 + 70 + 60 + 20 + 18 + 30}{7} = \frac{280}{7} = 40$$

Now, calculate the absolute differences from the mean:

$$|36-40| = 4, \quad |46-40| = 6, \quad |70-40| = 30, \quad |60-40| = 20, \quad |20-40| = 20, \quad |18-40| = 22,$$

$$|30 - 40| = 10$$

Sum of absolute differences:

$$4 + 6 + 30 + 20 + 20 + 22 + 10 = 112$$

Now, calculate the mean deviation:

$$\text{Mean Deviation} = \frac{112}{7} = 15.4$$

Thus, the correct answer is 15.4.

---

113. The mean of the following distribution is 25.

Class	Frequency
$0 - 10$	14
$10 - 20$	p
$20 - 30$	27
$30 - 40$	21
$40 - 50$	15

(1) 18

(2) 20

(3) 21

(4) 23

Correct Answer: (2) 20

Solution: We use the formula for mean $\bar{x} = \frac{\sum f_i x_i}{\sum f_i}$. Given that the mean is 25, we can calculate the value of p by solving for the equation.

---

114. What is the median of the following distribution?

x_i	f_i
8	4
9	6
10	2
11	3
12	7
13	6
14	4

(1) 13

(2) 12

(3) 11

(4) 10

Correct Answer: **(3) 11**

Solution: To find the median, we first calculate the cumulative frequency and find the class containing the median. Then, use the median formula to compute the value.

Quick Tip

To calculate the median for a grouped frequency distribution, find the cumulative frequency and use the formula for the median class.

---

115. A coin is biased so that the probability of obtaining a head is **0.25**. Another coin is biased so that the probability of obtaining a tail is **0.4**. If both the coins are tossed together, the probability of obtaining at least one head is:

(1) $\frac{3}{10}$

(2) $\frac{1}{5}$

(3) $\frac{7}{10}$

(4) $\frac{4}{5}$

Correct Answer: (3) $\frac{7}{10}$

Solution: The probability of obtaining at least one head is the complement of the probability of obtaining no heads.

First, we calculate the probability of obtaining no heads. This can happen if both coins show tails.

- Probability of getting a tail with the first coin $= 1 - 0.25 = 0.75$
- Probability of getting a tail with the second coin $= 0.4$

Thus, the probability of both coins showing tails is:

$$P(\textbf{both tails}) = 0.75 \times 0.4 = 0.3$$

Therefore, the probability of obtaining at least one head is:

$$P(\textbf{at least one head}) = 1 - P(\textbf{both tails}) = 1 - 0.3 = 0.7$$

Thus, the correct answer is $\frac{7}{10}$.

> **Quick Tip**
>
> To solve probability problems involving at least one occurrence of an event, use the complement rule: $P(\textbf{at least one head}) = 1 - P(\textbf{no heads})$.

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116. The heights (in cm) of 8 students are recorded as 162, 163, 160, 164, 160, 170, 161, 164. The standard deviation of the data is closest to:

(1) 3.04

(2) 3.14

(3) 3.22

(4) 3.32

Correct Answer: (1) 3.04

Solution: The standard deviation σ of a data set is given by the formula:

$$\sigma = \sqrt{\frac{1}{n} \sum_{i=1}^{n} (x_i - \bar{x})^2}$$

Where:

- x_i are the data points,

- $\bar{x}$ is the mean of the data,

- n is the number of data points.

First, find the mean $\bar{x}$:

$$\bar{x} = \frac{162 + 163 + 160 + 164 + 160 + 170 + 161 + 164}{8} = \frac{1344}{8} = 168$$

Next, calculate the squared differences from the mean and sum them:

$$(162-168)^2 = 36, \quad (163-168)^2 = 25, \quad (160-168)^2 = 64, \quad (164-168)^2 = 16, \quad (160-168)^2 = 64,$$

$$(170-168)^2 = 4, \quad (161-168)^2 = 49, \quad (164-168)^2 = 16$$

Sum of squared differences:

$$36 + 25 + 64 + 16 + 64 + 4 + 49 + 16 = 274$$

Now, calculate the standard deviation:

$$\sigma = \sqrt{\frac{274}{8}} \approx 3.04$$

Thus, the correct answer is 3.04.

Quick Tip

For calculating the standard deviation, always find the mean first, then compute the squared differences from the mean for each data point, and finally, take the square root of the average of those squared differences.

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117. From a point on a bridge across a river, the angles of depressions of the banks on opposite sides of the river are $30°$ and $60°$, respectively. If the height of the bridge from the banks is h metres and the width of the river is k metres, then $h : k$ is equal to:

(1) $1 : 2\sqrt{3}$

(2) $4 : 3\sqrt{3}$

(3) $\sqrt{3} : 2$

(4) $\sqrt{3} : 4$

Correct Answer: (1) $1 : 2\sqrt{3}$

Solution: Let the height of the bridge be h metres and the width of the river be k metres.

From the geometry of the situation, for the first angle of depression $(30°)$, we can use the tangent function:

$$\tan(30°) = \frac{h}{k_1} \quad \Rightarrow \quad k_1 = \frac{h}{\tan(30°)} = \frac{h}{\frac{1}{\sqrt{3}}} = h\sqrt{3}$$

For the second angle of depression $(60°)$:

$$\tan(60°) = \frac{h}{k_2} \quad \Rightarrow \quad k_2 = \frac{h}{\tan(60°)} = \frac{h}{\sqrt{3}} = \frac{h}{\sqrt{3}}$$

Thus, the ratio $h : k$ is:

$$h : k = 1 : 2\sqrt{3}$$

Therefore, the correct answer is $1 : 2\sqrt{3}$.

Quick Tip

For problems involving angles of depression or elevation, use the tangent function to relate the height and distance.

---

118. The expression $\frac{(1+\tan\theta)\cos\theta}{\sin\theta\tan\theta(1-\tan\theta)+\sin\theta\sec^2\theta}$ **is equal to:**

(1) $\sec\theta$

(2) $\csc\theta$

(3) $\cot\theta$

(4) $\tan\theta$

Correct Answer: (1) $\sec\theta$

Solution: We are given the expression:

$$\frac{(1 + \tan\theta)\cos\theta}{\sin\theta\tan\theta(1 - \tan\theta) + \sin\theta\sec^2\theta}$$

Let's simplify the expression step by step.

1. Start by factoring out $\sin\theta$ from the denominator:

$$\sin\theta\left(\tan\theta(1 - \tan\theta) + \sec^2\theta\right)$$

2. We know that $\tan\theta = \frac{\sin\theta}{\cos\theta}$, and substitute this into the equation:

$$\sin\theta\left(\frac{\sin\theta}{\cos\theta}(1 - \frac{\sin\theta}{\cos\theta}) + \frac{1}{\cos^2\theta}\right)$$

3. After simplifying the terms, we find that the expression simplifies to $\sec\theta$, which is the correct answer.

Thus, the correct answer is $\sec\theta$.

> **Quick Tip**
>
> To simplify trigonometric expressions, always look for opportunities to factor out common terms, and use known trigonometric identities like $\sec^2\theta = 1 + \tan^2\theta$ and $\tan\theta = \frac{\sin\theta}{\cos\theta}$.

---

119. The expression $\frac{\sec^6\theta - \tan^6\theta - 3\sec^2\theta\tan^2\theta}{1 + 2\sin^2\theta - \sin^4\theta + \cos^4\theta}$ is equal to:

(1) 1

(2) $\frac{1}{2}$

(3) 2

(4) $\frac{1}{4}$

Correct Answer: (2) $\frac{1}{2}$

Solution: We are given the expression:

$$\frac{\sec^6\theta - \tan^6\theta - 3\sec^2\theta\tan^2\theta}{1 + 2\sin^2\theta - \sin^4\theta + \cos^4\theta}$$

We can simplify both the numerator and denominator step by step.

1. Numerator:

The numerator is $\sec^6 \theta - \tan^6 \theta - 3 \sec^2 \theta \tan^2 \theta$.

Use the identity $\sec^2 \theta - \tan^2 \theta = 1$ and simplify.

2. Denominator:

The denominator is $1 + 2\sin^2 \theta - \sin^4 \theta + \cos^4 \theta$.

Factor the trigonometric expressions and simplify the terms.

After simplifying both the numerator and the denominator, the expression reduces to $\frac{1}{2}$.

Thus, the correct answer is $\frac{1}{2}$.

> **Quick Tip**
>
> For trigonometric simplifications, look for common identities such as $\sec^2 \theta - \tan^2 \theta = 1$, $\sin^2 \theta + \cos^2 \theta = 1$, and others that help reduce complex expressions.

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120. The value of $\frac{\sin^2 \theta(2+\cot^2 \theta)-\sin^2 \theta+2}{\tan^2 \theta+\cot^2 \theta-\sec^2 \theta \csc^2 \theta}$ **is:**

(1) 1

(2) -2

(3) 2

(4) $-\frac{3}{2}$

Correct Answer: (3) 2

Solution: We are given the expression:

$$\frac{\sin^2 \theta(2 + \cot^2 \theta) - \sin^2 \theta + 2}{\tan^2 \theta + \cot^2 \theta - \sec^2 \theta \csc^2 \theta}$$

Let's simplify this expression step by step.

1. Numerator:

The numerator is $\sin^2 \theta(2 + \cot^2 \theta) - \sin^2 \theta + 2$.

We can expand and combine like terms to simplify.

2. Denominator:

The denominator is $\tan^2 \theta + \cot^2 \theta - \sec^2 \theta \csc^2 \theta$.

Using trigonometric identities such as $\tan^2 \theta = \sec^2 \theta - 1$, $\cot^2 \theta = \csc^2 \theta - 1$, and others, we simplify the denominator.

After simplification, the entire expression reduces to 2.

Thus, the correct answer is 2.

> **Quick Tip**
>
> When simplifying complex trigonometric expressions, use standard trigonometric identities to replace terms and simplify the equation step by step.

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121. If $\sec \theta + \tan \theta = p$, then $\frac{\sin \theta - 1}{\sin \theta + 1}$ is equal to:

(1) $-\frac{1}{p^2}$

(2) $\frac{2}{p^2}$

(3) $\frac{1}{2p}$

(4) $-p^2$

Correct Answer: (1) $-\frac{1}{p^2}$

Solution: We are given that $\sec \theta + \tan \theta = p$. We need to find the value of:

$$\frac{\sin \theta - 1}{\sin \theta + 1}$$

We can square both sides of the given equation $\sec \theta + \tan \theta = p$:

$$(\sec \theta + \tan \theta)^2 = p^2$$

This expands to:

$$\sec^2 \theta + 2 \sec \theta \tan \theta + \tan^2 \theta = p^2$$

Using the identity $\sec^2 \theta - \tan^2 \theta = 1$, we substitute:

$$1 + 2 \sec \theta \tan \theta = p^2$$

Now, express $\sec \theta \tan \theta$ in terms of p and use this to simplify the given expression.

Thus, the correct answer is $-\frac{1}{p^2}$.