Graduate Admission Test (GAT)

Model exams

Introduction

The Graduate Admission Test (GAT) is an aptitude test designed to evaluate verbal, quantitative, and analytical reasoning skills as indicators of potential success in graduate programs. GAT results assist in identifying candidates eligible for admission to graduate programs in both public and private universities nationwide. The test is divided into three sections, each focusing on a specific reasoning ability. The verbal reasoning section assesses comprehension of written material, analysis of complex ideas, inference drawing, and argument evaluation. The quantitative reasoning section measures the ability to interpret numerical data, solve math problems, and apply quantitative concepts. The analytical reasoning section evaluates logical analysis, pattern recognition, and conclusion drawing based on provided information.

Administration of GAT

The administration of the GAT is a joint effort involving the Ministry of Education (MoE), Addis Ababa University (AAU), the Institute of Educational Research (IER) - Testing Center, Ethio-telecom, and public universities. The test is delivered digitally through AAU's testing portal at gat.aau.edu.et, using MoE's private network infrastructure. This digital format offers multiple benefits, such as improved efficiency, simplified test management, and automated scoring. Test takers are required to complete the exam in designated computer labs at public universities to ensure standardized conditions for all participants.

Contents of the GAT

The Graduate Admission Test (GAT) consists of three sections: Verbal Reasoning (60 questions), Quantitative Reasoning (163 questions), and Analytical Reasoning (38 questions). Each section lasts one hour, requiring a total of three hours to complete the test. Students with visual impairments will only take the Verbal Reasoning section. Before beginning the actual exam, you must complete a short survey questionnaire, as the system will not allow you to start the test without finishing the survey.

PART -I-

Verbal Reasoning Section

Part I: Reading Comprehension (1)

Directions: Read the passage below very carefully and answer questions 1 - 12 based on the information in the passage. You are to choose the one best answer, (A), (B), (C) or (D) to each question.

[1]Medical waste has been a growing concern because of recent incidents of public exposure to discarded blood vials, needles (sharps), empty prescription bottles, and syringes. Medical waste can typically include general refuse, human blood and blood products, cultures and stocks of infectious agents, laboratory animal carcasses, contaminated bedding material, and pathological wastes.

[2]Wastes are generally collected by gravity chutes, carts, or pneumatic tubes, each of which has its own advantages and disadvantages. Chutes are limited to vertical transport, and there is some risk of exhausting contaminants into hallways if a door is left open during use. Another disadvantage of gravity chutes is that the waste container may get jammed while dropping, or **it** may be broken upon hitting the bottom. Carts are primarily for horizontal transport of bagged or containerized wastes. The main risk here is that bags may be broken or torn during transport, potentially exposing the worker to the wastes. Using automated carts can reduce the potential for exposure. Pneumatic tubes offer the best performance for waste transport in a large facility. Advantages include high-speed movement, movement in any direction, and minimal intermediate storage of untreated wastes. However, some objects cannot be conveyed pneumatically.

[3]Off-site disposal of regulated medical wastes remains a viable option for smaller hospitals (those with less than 150 beds). Some preliminary on-site processing, such as compaction or hydropulping, may be necessary prior to sending the waste off site. Compaction reduces the total volume of solid wastes, often reducing trans portation and disposal costs, but it does not change the hazardous characteristics of the waste. Compaction may not be economical if transportation and disposal costs are based on weight rather than volume.

[4]Hydropulping involves grinding the waste in the presence of an oxidizing fluid, such as hypochlorite solution. The liquid is separated from the pulp and discharged directly into the sewer unless local limits require additional pretreatment prior to discharge. The pulp can often be disposed of at a landfill. One advantage is that waste can be rendered innocuous and reduced in size within the same system. Disadvantages are the added operating burden, difficulty of controlling fugitive emissions, and the difficulty of conducting microbiological tests to determine whether all organic matters and infectious organisms have been destroyed from the waste.

[5]On-site disposal is a feasible alternative for hospitals generating two tons or more per day of total solid waste. Common treatment techniques include steam sterilization and incineration. Although other options are available, incineration is currently the preferred method for on-site treatment of hospital waste.

[6]Steam sterilization is limited in the types of medical waste it can treat, but is appropriate for laboratory cultures and/or substances contaminated with infectious organisms. The waste is subjected to steam in a sealed, pressurized chamber. The liquid that may form is drained off to the sewer or sent for processing. The unit is then reopened after a vapor release to the atmosphere, and the solid waste is removed for further processing or disposal. One advantage of steam sterilization is that it has been used for many years in hospitals to sterilize instruments and containers and to treat small quantities of waste. However, since sterilization does not change the appearance of the waste, there could be a problem in gaining acceptance of the waste for landfilling.

[7]A properly designed, maintained, and operated incinerator achieves a relatively high level of organism destruction. Incineration reduces the weight and volume of the waste as much as 95% and is especially appropriate for pathological wastes and sharps. The most common incineration system for medical waste is the controlled-air type. The principal advantage of this type of incinerator is low particulate emissions. Rotary-kiln and grate-type units have been used, but use of grate-type units has been discontinued because of high air emissions. The rotary kiln also puts out high emissions, and the costs have been prohibitive for smaller units.

(Source: *Five hundred and one reading comprehension questions*)

1. Which of the following organizational schemes is most prevalent in the passage?

A. chronological order

B. comparison-contrast

C. order by topic

D. hierarchical order

B. Throughout, the passage compares and contrasts the various methods of medical waste disposal.

2. One disadvantage of the compaction method of waste disposal is that it

A. cannot reduce transportation costs.

B. reduces the volume of solid waste material.

C. does not allow hospitals to confirm that organic matter has been eliminated.

D. does not reduce the weight of solid waste material.

D. See the last sentence of paragraph 3. Compaction may well reduce transportation costs (choice **a**) according to paragraph 3. That it reduces the volume of waste (choice **b**) is an

advantage, not a disadvantage. Compaction is not designed to eliminate organic matter, so confirming that it has been eliminated (choice **c**) is not an issue.

3. For hospitals that dispose of waste on their own premises, the optimum treatment method is

A. incineration

B. compaction

C. sterilization

D. hydropulping

A. See the last sentence of paragraph 5, which states that *incineration is . . . the preferred method for on-site treatment*.1

4. According to the passage, which of the following could be safely disposed of in a landfill but might not be accepted by landfill facilities?

A. hydropulped material

B. sterilized waste

C. incinerated waste

D. laboratory cultures

B. See the last sentence of paragraph 6, which points out that steam sterilization does not change the appearance of the waste, thus perhaps raising questions at a landfill.

5. The two processes mentioned in the passage that involve the formation of liquid are

A. compaction and hydropulping

B. incineration and compaction

C. hydropulping and sterilization

D. sterilization and incineration

C. Paragraph 4 states that liquid is separated from pulp in the hydropulping process. Paragraph 6 says that liquid may form during the sterilization process.

6. According to the passage, two effective methods for treating waste caused by infectious matter are

A. steam sterilization and incineration.

B. hydropulping and steam sterilization.

C. incineration and compaction.

D. hydropulping and incineration.

A. This response relies on an understanding of pathological wastes, which are wastes generated by infectious materials. Paragraph 7 points out that incineration is especially appropriate for pathological wastes. Previously, paragraph 6 had said that steam sterilization is appropriate for substances contaminated with infectious organisms.

7. Hospitals can minimize employee contact with dangerous waste by switching from

A. a manual cart to a gravity chute.
B. an automated cart to a hydropulping machine.
C. a gravity chute to a manual cart.
D. a manual cart to an automated cart.

D. The second paragraph says that the main risk of pushing carts is potential exposure from torn bags but that automated carts can reduce that potential.

8. The process that transforms waste from hazardous to harmless *and* diminishes waste volume is

A. sterilization.
B. hydropulping.
C. oxidizing.
D. compacting.

B. See the next to last sentence of paragraph 4. Sterilization does not change the appearance of waste. Although compacting does change the volume of the waste, it is not appropriate for eliminating hazardous materials.

9. The underlined word *exhausting*, as it is used in the second paragraph of the passage, most nearly means{

A. debilitating.
B. disregarding.
C. detonating.
D. discharging.

B. See the second sentence of paragraph 2: *...there is some risk of exhausting contaminants into hallways*, meaning waste might be discharged.

10. Budgetary constraints have precluded some small hospitals from purchasing

A. pneumatic tubes.
B. rotary kilns.
C. sterilization equipment.
D. controlled-air kilns.

B. See the last sentence of the passage, which states that *the costs have been prohibitive for smaller units* when using rotary kilns.

11. The underlined phrase ***fugitive emissions*** in the fourth paragraph most nearly means

A. contaminants that are extremely toxic.
B. contaminants that are illegally discharged.
C. contaminants that escape the disposal process.
D. contaminants that come from microbiological testing.

C. Although the contaminants may sometimes be extremely toxic (choice **a**), the word *fugitive* here is the key to the meaning. The words *fugitive emissions* are used in the context of the disposal process of hydropulping. To be a fugitive means to run away or to escape, so the logical choice, given this context, is choice **c**. There is nothing anywhere in the passage about criminal activity, so choice **b** is not a likely answer. Choice **d** is wrong because the microbiological testing of which the passage speaks pertains to ensuring that all waste is disposed of.

12. What does ' it ' (paragraph 2 line 4) refer to?{

A. Gravity chutes
B. Waste container
C. Carts
D. Chutes

B. "it" refers to the **waste container** within a gravity chute.

Part II: Analogies

Direction: In each of the questions, a related pair of words or phrases is followed by four lettered pairs of words or phrases. Select the lettered pair that best expresses a relationship similar to that expressed in the original pair.

13. **Child: Human**

A. bird: robin
B. dog: pet
C. cow: milk
D. kitten: cat

D. A child is a young human being. Similarly, a kitten is a young cat.

14. **Continent: World**

A. teacher: classroom
B. class: school
C. cogent: powerful
D. apple: fruit

B. World is made up of continents, as school is made up of classes.

15. **Warm: hot; _____: hilarious**

A. humid
B. raucous
C. summer
D. amusing

D. To come up with the correct answer, you must first figure out the relationship. This is an analogy of degrees. Warm is less intense than hot, therefore what answer choice is something that is less intense than hilarious? The right answer is 'amusing', based on the relationship of amusing being less intense than hilarious.

16. **Student: Dormitory**

A. curtain: stage
B. prisoner: jail
C. skull: brain
D. shirt: clothing

B. A dormitory is a building that houses or contains students. Similarly, a jail is a building that houses or contains prisoners.

17. **Essay: Short Story**

A. symphony: concerto
B. biography: novel
C. comedy: burlesque
D. monologue: drama

B. An essay and a short story are both prose works, nonfiction and fiction. Similarly, a biography and a novel are both prose works; nonfiction and fiction, but they are longer works.

18. **Knife: Cut**

A. Winter: Summer
B. Sword: Sharp
C. Run: Fast
D. Drill: Hole

D. Object and Function RELATIONSHIP. The function of Knife is to Cut. Similarly, the function of a Drill is to make Hole.

19. **Fish: Trout**

A. Hair: Black
B. Bird: Aviary

C. Tiger: Carnivorous
D. Mammal: Cow

D. Class and Member relationship. Trout is a member of class Fish. Similarly, Cow is a member of class Mammal.

20. **Race: Fatigue**

A. Fasting: Hunger
B. Round: Boxing
C. Flower: Color
D. Hiking: Gangrene

A. Cause and Effect relationships. Race causes Fatigue, as Fasting causes Hunger.

21. **Industrious: Hardworking**

A. Sky: Blue
B. Muddy: Unclear
C. Book: Reading
D. Pond: Lake

B. Synonyms relationships. Industrious is the synonym of Hardworking, as Muddy is the synonym of Unclear.

22. **Cool: Frozen**

A. Sharp: Cut
B. Warm: Hot
C. Hassock: Stool
D. Freedom: Liberty

B. Intensity relationships. Cool and Frozen differ in intensity; similarly, Warm and Hot differ in intensity.

Part III: Verbal Antonyms

Directions: Each question below consists of a word followed by a few words/phrases. Choose the word/phrase that is most opposite in meaning to the word.

23. **Scholar: Ignorant**

A. Hardworking: Lazy
B. Knife: Sword
C. Courage: Bold

D. Luxury: Wealth

A. Antonyms relationships. Ignorant is the antonym of Scholar, as Lazy is the antonym of Hardworking.

24. **Mandatory**

A. dispassionate
B. obligatory
C. voluntary
D. inveterate

D. Mandatory means obligatory, ordered. Dispassionate means impartial. Inveterate means deep-seated.

25. **Redundant**

A. verbose
B. irrelevant
C. excessive
D. insufficient

D. Redundant means superfluous, extra, unneeded. Verbose means using too many words. Prosaic means dull or ordinary. Insufficient means not enough.

26. **Empathy**

A. compassion
B. lack of feeling for others
C. lack of religious certainty
D. lack of credit

B. Empathy means feeling for others, sympathy.

27. **Ubiquitous**

A. obsequious
B. cantankerous
C. rare
D. omnivorous

C. Ubiquitous means omnipresent, everywhere. Obsequious means excessively or sickeningly respectful. Cantankerous means bad-tempered. Rare means seldom found or occurring. Omnivorous means feeding on both plants and animal flesh.

28. **Mitigate**

A. Enhance

B. Ignore

C. Worsen

D. maintain

C. 'Mitigate' means to make something less severe, while 'worsen' means to make something more severe.}

Part IV: Grammar

29. **'Can Billy come out and play?'**
'No, he _____ his mother do the chores right now.'

A. is always helping
B. helps
C. does help
D. is helping

D. "is helping" uses the present continuous tense. This tense is specifically used to describe actions that are in progress at the time of speaking. It accurately reflects the situation: Billy is in the middle of helping his mother with chores "right now."

30. **I'm going to the airport to get Jane. _____ at three o'clock, so I'd better hurry.**

A. Her plane arriving
B. Her plane arrives
C. Is her plane arriving
D. Her plane does arrive

B. The simple present tense is commonly used to express scheduled events or timetables, especially those involving transportation like planes, trains, and buses. "Her plane arrives" treats the arrival as a scheduled event, similar to saying "The train leaves at 5 pm."

31. **'Do you know the tall man with the red hair?'**
'Yes, he's the man _____ brother built our house.'

A. that
B. which
C. whose
D. who

C. "Whose" indicates possession**:** The sentence is establishing a relationship of possession between the "man" and "brother." Specifically, it's saying the brother belongs to the man. "Whose" is the possessive relative pronoun, and it's used to show that something belongs to someone. In this case, the brother belongs to the man.

32. **'Can I go to the match with John?'**
'No, and the reason _____ you can't is because you haven't done the washing-up.'

A. which
B. why
C. when
D. where

B. The statement seeks Explanation: The phrase "the reason why" directly introduces an explanation. It signals that what follows will clarify the cause or justification for the denial. The speaker is essentially saying, "The explanation for *why* you can't go is..."

33. **Feeding a big family healthy meal _____ more and more expensive.**

A. get
B. is getting
C. gets
D.getting

B. "is getting" indicates a continuous change over time. The sentence implies that the cost of feeding a big family healthy meal is not a static value, but rather something that is increasing progressively. This progressive action is best captured by the present continuous tense ("is getting").

34. **If I _____ money, I would purchase it now.**

A. has
B. have
C. had
D. have had

C. It's a Second Conditional Sentence: This sentence structure describes a hypothetical or unreal situation in the present or future. The second conditional uses the following structure: "If + past simple, would + base form of the verb." In this case: "If I **had** money" (past simple) - "I **would purchase** it now" (would + base verb)

35. **She is looking for an accommodation _____ in flat or shared house.**

A. Both
B. Until
C. Neither
D. either

D. **"Either"** indicates a choice between two options. In this case, the two options are "flat" and "shared house." The sentence is stating that she is open to or considering one of those two options.}

36. **Maryam, accompanied by her brother, _____ at the party.**

A. is
B. are
C. was
D. were

C. Subject-verb agreement: The key is to identify the true subject of the sentence. The phrase "accompanied by her brother" is a prepositional phrase that modifies Maryam. The actual subject is "Maryam," which is singular.

37. **The newly imposed rules sound very _____.**

A. interesting
B. interestingly
C. interested
D. interest

A. "Interesting" is an adjective: The sentence structure "The newly imposed rules sound very _____" requires an adjective to describe the rules. Adjectives modify nouns (in this case, "rules").

38. **The passive equivalent of the sentences, "we gave the police some information" is__.**

A. Some information is given to the police.
B. The police were given some information.
C. Some information was given to the police.
D. B' and 'C'

D. Passive voice shifts the focus from the doer of the action (the subject) to the receiver of the action (the object). In the original sentence, "we" are the doers, and "some information" and "the police" are the receivers.

A. Some information is given to the police. This is grammatically correct, but it is in the present tense. The original sentence is in the past tense, so this is not a perfect match.

B. The police were given some information. This is a correct passive transformation in the past tense.

C. Some information was given to the police. This is also a correct passive transformation in the past tense.

D. 'B' and 'C' Since both B and C are correct, and both are valid passive versions of the original sentence, this is the best answer since the verb "gave" has two objects: "some information" (direct object) and "the police" (indirect object). In passive voice, either object can become the subject of the passive sentence.

39. **Belay would have bought a new car if he had been a rich man. This means_____.**

A. Belay wasn't a rich man, so he didn't buy a new car
B. Belay was a rich man, so he bought a new car
C. Belay was a rich, but he didn't buy a new car
D. Even if Belay was poor man, he bought a new car

A. This sentence uses a conditional statement in the past unreal tense. It implies that the condition (being rich) was not met, and therefore the consequence (buying a new car) did not happen.

40. **Select the alternative which will improve the bracketed part of the sentence. In case no improvement is needed, select "no improvement". "**We sat on the floor to eat dinner and he (appreciate) the fresh food my mother served."

A. had appreciated
B. appreciated
C. will appreciate
D. no improvement

B. When two or more sentences connected with any conjunction, the tense is likely similar. Accordingly, in the above statement, the first sentence use simple past tense 'sat', it is expected to maintain parallelism in the next by using simple past of 'appreciate'- 'appreciated.'

41. **The question below consists of a set of labelled sentences. Out of the four options given, select the most logical order of the sentences to form a coherent paragraph.**

Life is never meant to

A-country like Ethiopia
B-be easy, especially if you
C- live in a developing

A. BAC
B. ACB
C. BCA
D. ABC

C. Life is never meant to be easy especially if you live in a developing country like Ethiopia.

Part V: Vocabulary

Fill in the blanks with suitable answer from the given options.

42. I passed all my exams, so my parents are very _____of me.

A. proud
B. calm
C. ashamed
D. cheerful

A. Proud means feeling deep pleasure or satisfaction as a result of one's own achievements.

43. I've got lots of _____ but I think Aunt Paula and Uncle Joe are my favorites.

A. enemies
B. partners
C. classmates
D. relatives

D. 'Relatives' because of clues like *aunt* and *uncle* which show blood relationship to the speaker.

44. Kindly ask her to play the piano, she is a _____ pianist.

A. voracious
B. vacuous
C. volatile
D. virtuoso

D. Virtuoso means highly skilled

45. He was _____ from all charges leveled against him.

A. Liberated
B. Exonerated
C. Apprehended
D. judged

B. Exonerated means to free from blame

46. **Select the one which best expresses the meaning of the word "**hybrid"

A. Homogeneous
B. Composite
C. Pure

D. Love

B. **“**hybrid” means produced by crossbreeding. A composite of mixed origin.

47. **In the following question, a word has been written in four different ways out of which only one is correctly spelt. Select the correctly spelt word.**

A. Commiety
B. Committee
C. Comittee
D. Committe

B. Committee is the correct spelling.

48. **Select the alternative which is the best substitute of the words/sentence “c**oncerned with beauty or the appreciation of beauty.”

A. Foul
B. Aesthetic
C. Hideous
D. Gross

B. "Aesthetic" is the only option that aligns with the definition of "concerned with beauty or the appreciation of beauty." Because **Aesthetic is a** term directly relates to the philosophical study of beauty and taste. It describes things that are pleasing to the senses and concerned with the appreciation of beauty. **Foul** means highly unpleasant or disgusting, the opposite of beautiful. **Hideous** means extremely ugly or repulsive, also the opposite of beautiful. **Gross** means repulsive or disgusting, again, the opposite of beautiful.

Part V: Reading Comprehension (2)

Direction: Read the passage. Then answer the questions below.

Have you ever heard someone use the phrase “once in a blue moon?” People use this expression to describe something that they do not do very often. For example, someone might say that he tries to avoid eating sweets because they are unhealthy, but will eat chocolate “once in a blue moon.” Or someone who does not usually like to go to the beach might say “I visit the shore once in a blue moon.” While many people use this phrase, not everyone knows the meaning behind it.

The first thing to know is that the moon itself is never actually blue. This is just an expression. The phrase “blue moon” actually has to do with the shape of the moon, not the color.

As the moon travels around the earth, it appears to change shape. We associate certain names with certain shapes of the moon. For example, when we can see a small part of the moon, it is called a crescent moon. A crescent is a shape that looks like the tip of a fingernail. When we cannot see the moon at all, it is called a new moon. When we can see the entire moon, it is called a full moon. Usually, there is only one full moon every month. Sometimes, however, there will be two full moons in one month. When this happens, the second full moon is called a "blue moon."

Over the next 20 years, there will only be 15 blue moons. As you can see, a blue moon is a very rare event. This fact has led people to use the expression "once in a blue moon" to describe other very rare events in their lives.

49. Which of the following would be a good example of someone doing something "once in a blue moon"?

A. Mary likes to go to the mountains every weekend. Mary goes to the mountains once in a blue moon.
B. Tom rarely remembers to take out the trash. Tom takes out the trash once in a blue moon.
C. Cindy hates to wash the dishes. Nevertheless, she does it every day. Cindy washes the dishes once in a blue moon.
D. Ming sometimes forgets to do his homework. Ming forgets to do his homework once in a blue moon.

B. In the first and last paragraphs, we learn that the phrase "once in a blue moon" describes very rare events. If Tom rarely remembers to take out the trash, then it makes sense to say he takes out the trash "once in a blue moon." Therefore **(B)** is correct. **(A)** is incorrect because Mary goes to the mountains every weekend. This happens more often than the blue moon. **(C)** is incorrect because Cindy washes the dishes every day. This happens more often than the blue moon. **(D)** is incorrect because Ming sometimes forgets to do his homework. This happens more often than the blue moon.

50. When does a blue moon happen in nature?

A. when there are two full moons in one month
B. when the moon has a blue color
C. when we cannot see the moon at all
D. when we can only see a small part of the moon

A. In the third paragraph, the author tells us that when there are two full moons in one month, the second moon will be called a "blue moon." Choice **(A)** is correct. The passage does not provide information to support choices **(B)**, **(C)**, and **(D)**. Therefore they are incorrect.

51. Using the passage as a guide, it can be understood that which of the following sentences does not contain an **expression**?

A. Thomas has lost his mind.
B. An apple a day keeps the doctor away.
C. I'll mow the grass after I finish my homework.
D. It's never a bad time to start something new.

C. In paragraph 1 the author introduces the phrase "once in a blue moon." Then the author tells us that "People use this expression to describe something that they do not do very often." This lets us know that the phrase "once in a blue moon" is an expression. In paragraph 2 the author writes, "The first thing to know is that the moon itself is never actually blue. This is just an expression." This lets us know that an expression contains information or facts that are not actually true. The sentence in **(C)** does not contain any facts that are not actually true. Therefore it is the correct choice. **(A)** is incorrect because a person cannot actually lose his or her mind. **(B)** is incorrect because eating an apple a day does not necessarily keep someone from having to visit the doctor. **(D)** is incorrect because there are some times in which it is indeed a bad idea to start something new. For example, it's a bad idea to learn how to fly a kite in a lightning storm.

52. As described in paragraph 3, what is another example of something that has a **crescent** shape?

A. your thumb
B. a distant star
C. the letter "C"
D. the letter "H"

C. crescent *(noun):* the figure of the moon in its first or last quarter, resembling the segment of a ring thinning to points at the ends. In paragraph 3, the author says that "a crescent is a shape that looks like the tip of a fingernail." Of all the choices, the letter "C" is the one most similar to this shape. Therefore **(C)** is correct. The passage does not provide information to support choices **(A)**, **(B)**, and **(D)**; therefore, they are incorrect.

53. In the final paragraph, the author states: "Over the next 20 years, there will only be 15 blue moons." This means that over the next 20 years, a blue moon will happen

A. once a year

B. less than once a year

C. more than once a year

D. not enough information is provided

B. This question involves some math. If a blue moon will happen 15 times over the next 20 years, this is the same as saying it will happen 15 out of 20 times, or 15/20. Since 15/20 is less than one, we know that the blue moon will happen less than one time per year. This means **(B)** is correct. The passage does not provide information to support choices **(A)**, **(C)**, and **(D)**. Therefore they are incorrect.

54. As used in the final paragraph, which is the best antonym for **rare**?

A. common

B. strange

C. colorful

D. infrequent

A. Rare *(adjective):* something that does not happen very often.

The question asks us to find the best antonym. Antonyms are words that have opposite meanings. In the last paragraph, the author describes a blue moon as a "very rare event." In this paragraph and the rest of the passage, blue moons are described as events that do not happen very often. Therefore, *common*, a word that means happening very often, is the best opposite of *rare*. Choice **(A)** is correct. The passage does not provide information to support choices **(B)**, **(C)**, and **(D)**. Therefore they are incorrect.

55. In the final paragraph the author writes, "As you can see, a blue moon is a very rare event." The purpose of this statement is to

A. answer an earlier question

B. provide an example

C. support an upcoming conclusion

D. challenge a previous statement

C. To answer this question correctly, it helps to use context. In the final paragraph the author writes, "As you can see, a blue moon is a very rare event. This fact has led people to use the expression "once in a blue moon" to describe other very rare events in their lives." The key phrase here is "This fact has led people to." This is meant to show that the fact that a blue moon is a very rare event lends support to the conclusion that the expression "once in a blue moon" to describe other very rare events in their lives. This means choice **(C)** is correct. The passage does not provide information to support choices **(A)**, **(B)**, and **(D)**. Therefore they are incorrect.

Part: Summary Completion

Complete the following summary with suitable answers

When you can measure (56) _____ you are speaking about, and express it (57) _____ numbers, you know something (58) _____ it; when you cannot measure it, when you cannot (59) _____ it in numbers, your knowledge is of a meager and unsatisfactory kind; it may be the beginning of knowledge, but you have (60)_____, in your thoughts, advanced to the stage of science.

56. _____
A. when
B. what
C. where
D. whom

B. "what" is the most appropriate because it refers to the subject or object of the measurement. "What you are speaking about" directly addresses the thing being quantified. The other options don't fit grammatically or logically: "when," "where," and "whom" don't make sense as the direct object of "measure."}

57._____
A. in
B. to
C. from
D. with

A. "in" is the correct preposition to use when indicating that something is being represented within a numerical format. "Express it in numbers" is the standard phrase.

58._____
A. for
B. within
C. about
D. nearly

C. "about": This is the standard preposition to indicate knowledge concerning a topic. "Know something about it" is a common and correct phrase.

59._____
A. tell
B. ask

C. say
D. express

D . "express": This word directly aligns with the previous phrase "express it in numbers." It maintains the consistency of the idea being conveyed. "Tell," "ask," and "say" don't carry the same meaning of quantifying or representing something numerically.}

60._____
A. immature
B. scarcely
C.arrogantly
D.lack

B. "scarcely": This word conveys the idea that you have barely or only just reached the stage of science. The quote is about how measurement is essential to truly knowing something, so without it, your knowledge is weak. "immature" is close, but scarcely is more accurate to the tone of the quote. "Arrogantly" and "lack" are not contextually appropriate.}

Answers

1. **B.** Throughout, the passage compares and contrasts the various methods of medical waste disposal.

2. **D.** See the last sentence of paragraph 3. Compaction may well reduce transportation costs (choice **a**) according to paragraph 3. That it reduces the volume of waste (choice **b**) is an advantage, not a disadvantage. Compaction is not designed to eliminate organic matter, so confirming that it has been eliminated (choice **c**) is not an issue.

3. **A.** See the last sentence of paragraph 5, which states that *incineration is . . . the preferred method for on-site treatment*.1

4. **B.** See the last sentence of paragraph 6, which points out that steam sterilization does not change the appearance of the waste, thus perhaps raising questions at a landfill.

5. **C.** Paragraph 4 states that liquid is separated from pulp in the hydropulping process. Paragraph-6 says that liquid may form during the sterilization process.

6. **A.** This response relies on an understanding of pathological wastes, which are wastes generated by infectious materials. Paragraph 7 points out that incineration is especially

appropriate for pathological wastes. Previously, paragraph 6 had said that steam sterilization is appropriate for substances contaminated with infectious organisms.

7. **D.** The second paragraph says that the main risk of pushing carts is potential exposure from torn bags but that automated carts can reduce that potential.

8. **B.** See the next to last sentence of paragraph 4. Sterilization does not change the appearance of waste. Although compacting does change the volume of the waste, it is not appropriate for eliminating hazardous materials.

9. **B.** See the second sentence of paragraph 2: *...there is some risk of exhausting contaminants into hallways*, meaning waste might be discharged.

10. **B.** See the last sentence of the passage, which states that *the costs have been prohibitive for smaller units* when using rotary kilns.

11. **C.** Although the contaminants may sometimes be extremely toxic (choice **a**), the word *fugitive* here is the key to the meaning. The words *fugitive emissions* are used in the context of the disposal process of hydropulping. To be a fugitive means to run away or to escape, so the logical choice, given this context, is choice **c**. There is nothing anywhere in the passage about criminal activity, so choice **b** is not a likely answer. Choice **d** is wrong because the microbiological testing of which the passage speaks pertains to ensuring that all waste is disposed of.

12. **B.** "it" refers to the **waste container** within a gravity chute.

Part II: Analogies

13. **D**. A child is a young human being. Similarly, a kitten is a young cat.

14. **B**. World is made up of continents, as school is made up of classes.

15. **D**. To come up with the correct answer, you must first figure out the relationship. This is an analogy of degrees. Warm is less intense than hot, therefore what answer choice is something that is less intense than hilarious? The right answer is ‘amusing’, based on the relationship of amusing being less intense than hilarious.

16. **B**. A dormitory is a building that houses or contains students. Similarly, a jail is a building that houses or contains prisoners.

17. **B**. An essay and a short story are both prose works, nonfiction and fiction. Similarly, a biography and a novel are both prose works; nonfiction and fiction, but they are longer works.

18. **D.** Object and Function RELATIONSHIP. The function of Knife is to Cut. Similarly, the function of a Drill is to make Hole.

19. **D.** Class and Member relationship. Trout is a member of class Fish. Similarly, Cow is a member of class Mammal.

20. **A**. Cause and Effect relationships. Race causes Fatigue, as Fasting causes Hunger.

21. **B**. Synonyms relationships. Industrious is the synonym of Hardworking, as Muddy is the synonym of Unclear.

22. **B**. Intensity relationships. Cool and Frozen differ in intensity; similarly, Warm and Hot differ in intensity.

Part III: Verbal Antonyms

23. **A**. Antonyms relationships. Ignorant is the antonym of Scholar, as Lazy is the antonym of Hardworking.

24. C. Mandatory means obligatory, ordered. Dispassionate means impartial. Inveterate means deep-seated.

25. **D.** Redundant means superfluous, extra, unneeded. Verbose means using too many words. Prosaic means dull or ordinary. Insufficient means not enough.

26. **B**. Empathy means feeling for others, sympathy.

27. **C.** Ubiquitous means omnipresent, everywhere. Obsequious means excessively or sickeningly respectful. Cantankerous means bad-tempered. Rare means seldom found or occurring. Omnivorous means feeding on both plants and animal flesh.

28. **C.** 'Mitigate' means to make something less severe, while 'worsen' means to make something more severe.}

Part IV: Grammar

29. **D.** "is helping" uses the present continuous tense. This tense is specifically used to describe actions that are in progress at the time of speaking. It accurately reflects the situation: Billy is in the middle of helping his mother with chores "right now."

30. **B.** The simple present tense is commonly used to express scheduled events or timetables, especially those involving transportation like planes, trains, and buses. "Her plane arrives" treats the arrival as a scheduled event, similar to saying "The train leaves at 5 pm."

31. **C. "Whose"** indicates possession**:** The sentence is establishing a relationship of possession between the "man" and "brother." Specifically, it's saying the brother belongs to the man. "Whose" is the possessive relative pronoun, and it's used to show that something belongs to someone. In this case, the brother belongs to the man.

32. **B.** The statement seeks Explanation: The phrase "the reason why" directly introduces an explanation. It signals that what follows will clarify the cause or justification for the denial. The speaker is essentially saying, "The explanation for *why* you can't go is..."

33. **B. "is getting" indicates a continuous change over time.** The sentence implies that the cost of feeding a big family healthy meal is not a static value, but rather something that is increasing progressively. This progressive action is best captured by the present continuous tense ("is getting").

34. **C. It's a Second Conditional Sentence:** This sentence structure describes a hypothetical or unreal situation in the present or future. The second conditional uses the following structure: "If + past simple, would + base form of the verb." In this case: "If I **had** money" (past simple) - "I **would purchase** it now" (would + base verb)

35. **D. "Either"** indicates a choice between two options. In this case, the two options are "flat" and "shared house." The sentence is stating that she is open to or considering one of those two options.}

36. **C.** Subject-verb agreement: The key is to identify the true subject of the sentence. The phrase "accompanied by her brother" is a prepositional phrase that modifies Maryam. The actual subject is "Maryam," which is singular.

37. **A. "Interesting" is an adjective:** The sentence structure "The newly imposed rules sound very _____" requires an adjective to describe the rules. Adjectives modify nouns (in this case, "rules").

38. **D.** Passive voice shifts the focus from the doer of the action (the subject) to the receiver of the action (the object). In the original sentence, "we" are the doers, and "some information" and "the police" are the receivers.

A. Some information is given to the police. This is grammatically correct, but it is in the present tense. The original sentence is in the past tense, so this is not a perfect match.

B. The police were given some information. This is a correct passive transformation in the past tense.

C. Some information was given to the police. This is also a correct passive transformation in the past tense.

D. 'B' and 'C' Since both B and C are correct, and both are valid passive versions of the original sentence, this is the best answer since the verb "gave" has two objects: "some information" (direct object) and "the police" (indirect object). In passive voice, either object can become the subject of the passive sentence.

39. **A.** This sentence uses a conditional statement in the past unreal tense. It implies that the condition (being rich) was not met, and therefore the consequence (buying a new car) did not happen.

40. **B.** When two or more sentences connected with any conjunction, the tense is likely similar. Accordingly, in the above statement, the first sentence use simple past tense 'sat', it is expected to maintain parallelism in the next by using simple past of 'appreciate'- 'appreciated.'

41. **C**. Life is never meant to be easy especially if you live in a developing country like Ethiopia.

Part V: Vocabulary

Fill in the blanks with suitable answer from the given options.

42. **A.** Proud means feeling deep pleasure or satisfaction as a result of one's own achievements.

43. **D.** 'Relatives' because of clues like *aunt* and *uncle* which show blood relationship to the speaker.

44. **D.** Virtuoso means highly skilled

45. **B.** Exonerated means to free from blame

46. **B "**hybrid" means produced by crossbreeding. A composite of mixed origin.

47. **B.** Committee is the correct spelling.

48. **B.** "Aesthetic" is the only option that aligns with the definition of "concerned with beauty or the appreciation of beauty." Because **Aesthetic is a** term directly relates to the philosophical study of beauty and taste. It describes things that are pleasing to the senses and concerned with the appreciation of beauty. **Foul** means highly unpleasant or disgusting, the opposite of beautiful.

Hideous means extremely ugly or repulsive, also the opposite of beautiful. **Gross** means repulsive or disgusting, again, the opposite of beautiful.

Part V: Reading Comprehension (2)

49. **B.** In the first and last paragraphs, we learn that the phrase "once in a blue moon" describes very rare events. If Tom rarely remembers to take out the trash, then it makes sense to say he takes out the trash "once in a blue moon." Therefore **(B)** is correct. **(A)** is incorrect because Mary goes to the mountains every weekend. This happens more often than the blue moon. **(C)** is incorrect because Cindy washes the dishes every day. This happens more often than the blue moon. **(D)** is incorrect because Ming sometimes forgets to do his homework. This happens more often than the blue moon.

50. **A.** In the third paragraph, the author tells us that when there are two full moons in one month, the second moon will be called a "blue moon." Choice **(A)** is correct. The passage does not provide information to support choices **(B)**, **(C)**, and **(D)**. Therefore they are incorrect.

51. **C.** In paragraph 1 the author introduces the phrase "once in a blue moon." Then the author tells us that "People use this expression to describe something that they do not do very often." This lets us know that the phrase "once in a blue moon" is an expression. In paragraph 2 the author writes, "The first thing to know is that the moon itself is never actually blue. This is just an expression." This lets us know that an expression contains information or facts that are not actually true. The sentence in **(C)** does not contain any facts that are not actually true. Therefore it is the correct choice. **(A)** is incorrect because a person cannot actually lose his or her mind. **(B)** is incorrect because eating an apple a day does not necessarily keep someone from having to visit the doctor. **(D)** is incorrect because there are some times in which it is indeed a bad idea to start something new. For example, it's a bad idea to learn how to fly a kite in a lightning storm.

52. **C.** **crescent** *(noun):* the figure of the moon in its first or last quarter, resembling the segment of a ring thinning to points at the ends. In paragraph 3, the author says that "a crescent is a shape that looks like the tip of a fingernail." Of all the choices, the letter "C" is the one most similar to this shape. Therefore **(C)** is correct. The passage does not provide information to support choices **(A)**, **(B)**, and **(D)**; therefore, they are incorrect.

53. **B.** This question involves some math. If a blue moon will happen 15 times over the next 20 years, this is the same as saying it will happen 15 out of 20 times, or 15/20. Since 15/20 is less than one, we know that the blue moon will happen less than one time per year. This means **(B)** is correct. The passage does not provide information to support choices **(A)**, **(C)**, and **(D)**. Therefore they are incorrect.

54. **A. Rare** *(adjective):* something that does not happen very often.

The question asks us to find the best antonym. Antonyms are words that have opposite meanings. In the last paragraph, the author describes a blue moon as a "very rare event." In this paragraph and the rest of the passage, blue moons are described as events that do not happen very often. Therefore, *common*, a word that means happening very often, is the best opposite of *rare*. Choice **(A)** is correct. The passage does not provide information to support choices **(B)**, **(C)**, and **(D)**. Therefore they are incorrect.

55. **C.** To answer this question correctly, it helps to use context. In the final paragraph the author writes, "As you can see, a blue moon is a very rare event. This fact has led people to use the expression "once in a blue moon" to describe other very rare events in their lives." The key phrase here is "This fact has led people to." This is meant to show that the fact that a blue moon is a very rare event lends support to the conclusion that the expression "once in a blue moon" to describe other very rare events in their lives. This means choice **(C)** is correct. The passage does not provide information to support choices **(A)**, **(B)**, and **(D)**. Therefore they are incorrect.

Part: Summary Completion

56. **B. "what"** is the most appropriate because it refers to the subject or object of the measurement. "What you are speaking about" directly addresses the thing being quantified. The other options don't fit grammatically or logically: "when," "where," and "whom" don't make sense as the direct object of "measure."}

57. **A. "in"** is the correct preposition to use when indicating that something is being represented within a numerical format. "Express it in numbers" is the standard phrase.

58. **C. "about"**: This is the standard preposition to indicate knowledge concerning a topic. "Know something about it" is a common and correct phrase.

59 **D . "express"**: This word directly aligns with the previous phrase "express it in numbers." It maintains the consistency of the idea being conveyed. "Tell," "ask," and "say" don't carry the same meaning of quantifying or representing something numerically.}

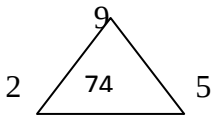
60. **B. "scarcely"**: This word conveys the idea that you have barely or only just reached the stage of science. The quote is about how measurement is essential to truly knowing something, so without it, your knowledge is weak. "immature" is close, but scarcely is more accurate to the tone of the quote. "Arrogantly" and "lack" are not contextually appropriate.}

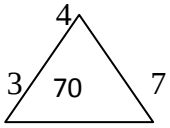
Part II: Quantitative Reasoning

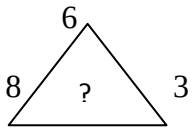
Part II. Quantitative Reasoning National GAT Solved Questions with Answers

GAT Quantitative Reasoning: These are different types of quantitative reasoning online multiple choice questions on the GAT. The quantitative reasoning section of the GAT consists of logic, arithmetic, algebra, geometry, basic statistics , probability and applications. Answers(solutions) with their justifications to the quantitativereasoning multiple choice questionsare given after the sample questions. Link to GAT quantitativereasoning PDF multiple choice questions with answers is given below.

1. $(49 \div 7 + 5 - 4 \times 6) + (18 \times 6 - 5) =$ -------
   A. 91
   B. 81
   C. 71
   D. 101
2. Identify the next number in the sequence 3,8,18,38,78,…
   A. 138
   B. 156
   C. 148
   D. 158
3. Find the missing number in the following triangle ?







   A. 126
   B. 127
   C. 130
   D. 120
4. For real numbers a and b , $a^2 + (b-3)^2 = 0$. Then the value of $a + b =$ ____?
   A. 4
   B. 2
   C. 3
   D. 5
5. Define $a \otimes b = lcm(a,b) + \gcd(a,b)$ and $a \oplus b = a^b + b^a$. What is the value of $(1 \oplus 2) \otimes (3 \oplus 4)$?
   A. 286
   B. 145
   C. 572

D. 436

6. A point of the form $(-a, a)$ always lies on which of the following line?
   A. $x + y = 0$
   B. $y - x = 0$
   C. $y = -a$
   D. $x = a$

7. A school is planning to increase the number of students from 40 to 60 per class. How much is the percentage?
   A. 20%
   B. 40%
   C. 50%
   D. 60%

8. A father wants to divide birr 480 to his two children A and B in the ratio 11:13. How much money child A and child B get respectively?
   A. 110 and 130
   B. 220 and 260
   C. 200 and 280
   D. 210 and 230

9. A retail store buys a shoe for 90 birr and sells at 50% profit. What is the selling price of the shoe?
   A. 120
   B. 115
   C. 135
   D. 125

10. A bus is carring 60 passengers of which 40 are females. What is the ratio of male to female passenger?
   A. 2:3
   B. 3:2
   C. 2:1
   D. 1:2

11. If the sum of two integers is 36 and their difference is 14, then the largest integer is
   A. 11
   B. 14
   C. 36
   D. 25

12. Let the product of two natural numbers is 24 and their least common multiple is 12. What is their highest common factor?
   A. 3
   B. 2
   C. 1

D. 5

13. Which number completes the sequence: $2, 6, 12, 20, 30$?
    A. 36
    B. 40
    C. 42
    D. 50
14. If a person walks 8 km to the north, then 6 km to the east, how far is he from the starting point?
    A. 8 km
    B. 10 km
    C. 12 km
    D. 14 km

15. If the sum of two natural numbers is 28 and their difference is 4, then what is the smallest number?
    A. 12
    B. 14
    C. 16
    D. 18
16. In a class, the ratio of boys to girls is 3:5. If there are 24 boys, then how many girls are there?
    A. 64
    B. 40
    C. 24
    D. 30
17. In the above question 16, what is the total number of students in a class?
    A. 64
    B. 40
    C. 24
    D. 30
18. A mother is 4 times asold as her child. In 8 years, the mother will be twice as old as her child. How old is the mother now?
    A. 4
    B. 8
    C. 16
    D. 10

19. If 3 workers can complete a task in 12 days, how many days will it take for 6 workers to complete the same task, assuming they work at the same rate?
    A. 4
    B. 6

C. 8
D. 9

20. What is 25% of 80?
    A. 10
    B. 15
    C. 20
    D. 25
21. In a group of 30 people, 18 have an engineering degree, 12 have a management degree, and 7 have both. How many people have neither degree?
    A. 5
    B. 7
    C. 8
    D. 10
22. What is the least common multiple of 12 and 15?
    A. 45
    B. 30
    C. 60
    D. 90
23. If p is a direct proportional to$q$, and if $q = 12$ when $p = 10$, then what is the value of p when $q = 18$?
    A. 13
    B. 11
    C. 15
    D. 14

24. A man can wash his car in 12 minutes, while his son Alemu takes twice as long as him to do the same job. If they work together, how many minutes with the job takes for them?
    A. 6
    B. 7
    C. 10
    D. 8
25. Find the number of divisors of 1420?
    A. 12
    B. 13
    C. 14
    D. 15
26. Divide 50 in two parts such that the sum of the reciprocal is $\frac{1}{12}$. What are the numbers?
    A. 20,30
    B. 24,26
    C. 28,22

D. 36,14

27. Let the difference of the square of two consecutive even numbers is 84. What is the sum of these two numbers?
    A. 20
    B. 22
    C. 30
    D. 42
28. If the 10^{th} term of an Arithmetic progression is 84 and its common difference is 8, then what is the first term?
    A. 10
    B. 13
    C. 12
    D. 14
29. The difference between the squares of two consecutive odd integers is always divisible by which number?
    A. 6
    B. 7
    C. 5
    D. 8
30. A container contains 50 liters of milk. From those container 5 liters of milk was taken out and replaced by water in three times. How much milk is now contained by the container?
    A. 35.23
    B. 36.45
    C. 30.34
    D. 34.45
31. How many numbers between 100 and 200 divisible by three?
    A. 40
    B. 35
    C. 33
    D. 30
32. If x,y,z are in Arithmetic progression, then $(x + 2y - z)(2y + z - x)(z + x - y) =$ _____
    A. 2xyz
    B. 4xyz
    C. xyz
    D. 3xyz
33. Let N be a two digit number and the product of its digits is 8. If we add 18 to the number the numbers on the digits will be reversed. What is the number?
    A. 24
    B. 42
    C. 36

D. 40

34. Find the sum of the series $1+\frac{1}{3}+\frac{1}{3^2}+\frac{1}{3^3}+\cdots$

A. $\frac{2}{3}$
B. $\frac{4}{3}$
C. $\frac{3}{4}$
D. $\frac{3}{2}$

35. If $2a+b=x$ and $-2a+b=y$, then which of the following expression is equal to ab?

A. $\frac{x+y}{2}$
B. $\frac{x-y}{4}$
C. $\frac{x^2+y^2}{8}$
D. $\frac{x^2-y^2}{8}$

36. If $x^2=15$, then $(x+2)(x-2)$ is

A. 10
B. 15
C. 11
D. 4

37. If $3a+6b=11$ and $2a+7b=9$, then $\frac{5a+13b}{5}$ is

A. 20
B. 18
C. 9
D. 4

38. If $x^3=27$, then what is the value x?

A. 1
B. 3
C. 9
D. -27

40. If $4\frac{1}{6}\%\ x=45$, then what is the value of x?

A. 1.08
B. 216
C. 10.8
D. 1080

41. If $\log x=2$, then what is the value of x?

A. 10
B. 20

C. 100
D. 80

42. What is the sum of the roots of the equation $x^2 - 7x + 10 = 0$?
A. 5
B. 7
C. 10
D. 17

43. What is the simplification of $\sqrt{98} - \sqrt{50}$?
A. $4\sqrt{3}$
B. $2\sqrt{2}$
C. $4\sqrt{2}$
D. $2\sqrt{3}$

44. If $a + b = 24$, then the maximum value of ab is
A. 120
B. 124
C. 144
D. 240

45. If $\sqrt{x} - \sqrt{y} = 2$ and $\sqrt{x} + \sqrt{y} = 14$, then $\sqrt{xy}$ is
A. 46
B. 28
C. $\sqrt{48}$
D. 48

46. If $a + \frac{1}{1+\frac{1}{2+\frac{1}{3}}} = 3$ then what is the value of a?
A. $\frac{8}{21}$
B. $\frac{23}{10}$
C. $\frac{10}{3}$
D. $\frac{3}{8}$

47. The value of $16^{\log_4 5}$ is ____
A. 24
B. 25
C. 32
D. 20

48. If $\log_{\sqrt{8}} x = 3\frac{1}{3}$, then what is the value of x?
A. 24

B. 64
C. 32
D. 42

49. If $(\frac{9}{4})^{x}(\frac{8}{27})^{x-1} = \frac{2}{3}$ then x = _____.
A. 1
B. 2
C. 3
D. 4

50. The angles of a triangle are in the ratio 9:7:4. What is the measure of the largest angle?
A. 36°
B. 9°
C. 63°
D. 81°

51. A triangle has sides of lengths 7, 10 and 5. What type of triangle is it?
A. Equilateral
B. Isosceles
C. Scalene
D. Right-angled

52. What is the area of a circle with radius of 6cm?
A. $36\pi cm^2$
B. $12\pi cm^2$
C. $72\pi cm^2$
D. $18\pi cm^2$

53. The perimeter of a rectangle is 48 cm and its length is twice its width. What is the width of the rectangle?
A. 8 cm
B. 12 cm
C. 16 cm
D. 18 cm

54. What is the volume of a cube with side length of 4 cm?
A. $16\ cm^3$
B. $32\ cm^3$
C. $64\ cm^3$
D. $128\ cm^3$

55. A right circular cone has a base radius of 3 cm and height of 4 cm. What is its volume?
A. $12\pi cm^3$
B. $16\pi cm^3$
C. $18\pi cm^3$
D. $36\pi cm^3$

56. If a car travels 180 miles in 3 hours, then what is its average speed?

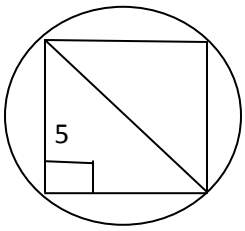
A. 30 mph
B. 50 mph
C. 60 mph
D. 90 mph

57. If the area of a square side x is 5, then what is the area of a square side $3x$?

A. 15
B. 45
C. 95
D. 75

58. A 5 by 12 rectangle is inscribed in a circle. What is the radius of the circle?

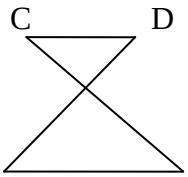
A. 13
B. 6.5
C. 8.5
D. 7



59. In the figure below , If $\overline{AB}//\overline{CD}$ and $AO = 2OD$ then the area of triangle OAB is bigger than the area of triangle OCD by a factor of ----

A. 3 B. 4

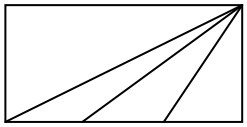
C. 1 D. 6



60. In the figure below, $< ABC = \frac{\Pi}{2}$ and $AD = DE = EB$. What is the ratio of the area of triangle ADC to that of triangle CDB?

A. 1:2 C. 1:1

B. 1;3 D. 1:4



61. Of all the triangles that can be inscribed in a semicircle of radius r with the diameter as one side, what is the area of the biggest triangle ?

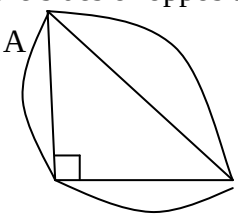
A r O r B

A. $\sqrt{2}r^2$ C. r^2

B. $\sqrt{3}r^2$ D. $2r^2$

C

62. In the figure below $< ABC = \frac{\pi}{2}$, I ,II and III are areas of semicircles on the sides of opposite angles B, A and C respectively. Which of the following is always true.



A. $II^2 + III^2 = I^2$ C. $II + III < I$

B. $II^2 + III^2 > I^2$ D. $II + III = I$

B II C

63. In two triangles, ratio of the areas is 4:3 and ratio of their height is 3:4. Find the ratio of their bases.
    A. 9:16
    B. 16:9
    C. 12:9
    D. 9:12
64. The surface area of the cube is $726\ cm^2$. Find the volume of the cube?
    A. 1314 cm^3
    B. 1331 cm^3
    C. 1741 cm^3
    D. 726 cm^3
65. A cone, a hemisphere and cylinder stand on equal bases and have the same height. Find the ratio of their volumes?
    A. 1:2:5
    B. 1:3:2
    C. 1:2:3
    D. 3:2:1

Question (65- 66)

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

66. What is the value of $A \cup B$?
    A) $\{4, 5,6,8\}$
    B) $\{1, 4,5,6,7,8,9\}$
    C) $\{2,4,5,6,7,8,9\}$
    D) $\{1,3,4,5,6,7,8,9\}$
67. What is the value of $B \cap C$?

A) {4, 5,6,8}

B) {4, 5,8}

C) {4}

D) {4,6,8}

Quantitative reasoning II (Basic Statistics)

68. A data set has a mean of 62. If each data point is decreased by a constant value of 7, what will the new mean be?
    A. 52
    B. 53
    C. 55
    D. 50
69. Suppose that you are asked ten of your classmates about their weight. On the basis of this information, you computed the average and stated the average weight of all students in your college is 60 kg is an example of:
    A) Descriptive Statistics
    B) Inferential Statistics
    C) Population
    D) None of the above
70. Which of the following is a qualitative variable:

    A) Ages of people living in a personal care home

    B) Number of students joining university every year

    C) Marital status of employees in a company

    D) Height of students measured in centimeter

71. Which of the following is classified as ratio scale of measurement?

    A) Economic status classified as low, middle or upper

    B) Sex of person

    C) Eye color of individual

    D) Number of students in a class

72. Questionnaire method is used to collect:
    A) Primary data
    B) Secondary data
    C) A and B
    D) None of the above
73. Which of the following is different from the other?
    A) Histogram

B) Frequency polygon

C) Bar chart

D) Ogive curve

74. The average age of 8 boys is 15 years. If the ages of two of the boys are 16 and 20, what is the average age of the other 6?
    A) 14
    B) 15
    C) 18
    D) 20

75. The mean salary paid to 10 employees of an establishment was found to be 200. Later on after disbursement of the salary it was discovered that the salary of one employee was wrongly entered as 180 instead of 240. What is the correct average salary of workers?
    A) 194
    B) 200
    C) 206
    D) 210

76. In a class there are 40 females and 60 males. If females averaged 25 in an examination and boys averaged 35, then what is the mean for the entire class?
    A) 50
    B) 31
    C) 30
    D) 28

77. A student obtained results 60, 75, 63, 59, and 55 in English, Biology, Mathematics, Physics and Chemistry examinations respectively. Find the students weighted mean if weights 1, 2, 1, 3, 3 respectively are allotted to the subjects.
    A) 62.4
    B) 61.5
    C) 59
    D) 63

78. In how many way of arrangement of the letters of the word ‘APPLE’ are there?
    A) 600
    B) 240
    C) 120
    D) 60

79. The standard deviation of 5,5,5,5,5,5 will be _____

A) 1
B) 0
C) 5
D) None

80. If two unbiased coins are tossed simultaneously the probability of getting at least one heads is:

A) $\frac{1}{2}$
B) $\frac{2}{3}$
C) $\frac{1}{4}$
D) $\frac{3}{4}$

81. If a variable takes the values: x+4, x-7, x-5, x-3, x-2, x+1, x-1, and x+6, where x is any real number, then what is the median of the value:

A) x-3/2
B) x-5/2
C) x+3/2
D) x+5/2

82. A single letter is selected at random from the word 'MATHEMATICS'. What is the probability that the chosen letter is a vowel?

A) $\frac{3}{10}$
B) $\frac{3}{11}$
C) $\frac{4}{11}$
D) $\frac{4}{10}$

83. From a class of 12 girls and 18 boys, two students are chosen randomly. What is the probability that both of them are girls?

A) $\frac{1}{15}$

B) $\frac{22}{145}$

C) $\frac{13}{15}$

D) $\frac{1}{18}$

84. The mean of 20 numbers is zero. Of them, at the most, how many numbers may be greater than zero?

A) 0

B) 1

C) 10

D) 19

85. If a coin is tossed four times, what is the probability that two heads and two tails will be the result?

A) $\frac{1}{8}$

B) $\frac{2}{8}$

C) $\frac{7}{8}$

D) $\frac{3}{8}$

86. There are 8 teams in a certain league and each team plays each of the other teams exactly once. If each game is played by 2 teams, what is the total number of games played?

A) 56

B) 28

C) 15

D) 6

87. In how many different ways can 5 people sit in 3 chairs?

A) 10

B) 6

C) 16

D) 60

88. How many 6−digit numbers can be formed using the digits 1, 2, 3,2,4,2 and 4?

A) 60

B) 36

C) 420

D) 360

For question 88-90 refer the following data:

Value	1	2	3	6	8
Frequency	2	4	2	1	1

89. What is the mean of the data:

A) 2

B) 3

C) 4

D) 3.5

90. What is the median of the data:

A) 1

B) 2.5

C) 2

D) 3

91. What is the mode of the data:

A) 3

B) 2

C) 1

D) 6

For question 91-95 refer the following data:

The numbers of hours worked (per week) by 400 graduated students are shown below:

Number of hours	Frequency

1-10	20
11-20	80
21-30	200
31-40	100

92. The class width for this distribution is:

A) 9

B) 10

C) 39

D) Varies from class to class

93. The number of students working 20 hours or less is:

A) 80

B) 100

C) 180

D) 300

94. The relative frequency of students working 10 hours or less is:

A) 20

B) 100

C) 0.95

D) 0.05

95. The percentage of students working 20 hours or less is:

A) 20%

B) 25%

C) 75%

D) 80%

96. The percentage of students who work at least 11 hours per week is:

A) 50%

B) 5%

C) 95%

D) 100%

97. If the range and relative range of a series are 4 and 0.25 respectively, then the value of largest and smallest observations, respectively are:

A) 16 and 12

B) 10 and 6

C) 20 and 16

D) 12 and 6

98. One hundred randomly selected university of Gondar students in 2016 E.C were asked whether or not they ever visited the Gondar. The following table gives a two-way classification of the responses.

	Have visited (V)	Have never visited (NV)	Total
Male (M)	15	36	51
Female (F)	10	39	49
Total	25	75	100

If one student is selected at random from 100 students, the probability that this student has never visited Gondar is:

A) 0.15

B) 0.25

C) 0.55

D) 0.75

99. Based on question 29, the probability that the selected student is a male given that the student has never visited Gondar is:

A) 0.375

B) 0.25

C) 0.48

D) 0.65

100. A researcher divided subjects into two groups according to gender and the selected members from each group for his/her sample. The sampling method used was:

A) Cluster sampling

B) Simple random sampling

C) Stratified sampling

D) None of the above

101. Which of the following is different from the other:

A) Quota sampling

B) Convenience sampling

C) Judgment sampling

D) Systematic sampling

102. The instructor of a course decided to add one point to everyone's score. The effect of this would be:

A) The mean would increase by 1

B) The standard deviation would increase by 1.

C) The variance would increase by 1.

D) Both the standard deviation and variance would increase by 1.

103. A tutoring service specializes in preparing students for entrance equivalent test. Among all the students seeking help from the service, 55% need help in Mathematics, 35% need help in English, and 25% need help in both Mathematics and English. What is the percentage of students who need help in Mathematics, but not English?

A) 0.65

B) 0.30

C) 0.10

D) 0.80

104. When a single fair die is rolled once, what is the probability of getting an even number or a number less than 4?

A) 2/3

B) 5/6

C) 1/6

D) 1/2

105. If event A and event B are the conditional events and if P(A/B)=1/3 and P(AnB)=1/6, then what is the P(B)?

A) 1/2

B) 1/3

C) 1

D) 0

106. Let A and B two independent events with an experiment and if P(B) = 0.40 and P(A) = 0.50, then what is the probability of event A or B?

A) 0.20

B) 0.90

C) 0.70

D) 0.10

107. In a class there are 15 boys and 10 girls, two students are selected at random. What is the probability of selecting one bay and one girl, if boy is selected first?

A) 3/5

B) 5/12

C) 1/4

D) 2/5

108. Let A and B two mutually exclusive events with an experiment and if P(B) = 0.28 and P(A') = 0.47, then what is the probability of event A or B?

A) 0.78

B) 0.81

C) 0.79

D) 0.84

109. Two balls are to be drawn from a bag containing 8 white and 3 blue balls. What is the probability that they will both be blue?

A) 3/55

B) 1/5

C) 11/15

D) 14/45

110. Two unbiased dice are tossed. The probability that the sum score is prime number is?

A) 1/6

B) 5/12

C) 1/2

D) 7/9

111. A box contains 20 electric bulbs, out of which 4 are defective. If two bulbs are chosen at random from the box. The probability that at least one of these is defective is:

A) 12/19

B) 21/95

C) 7/19

D) 4/19

112. Four persons are chosen at random from a group of 3 men, 2 women and 4 children. What is the probability that exactly two of them are children is:

A) 10/21

B) 1/12

C) 1/5

D) 1/9

Part III: Analytical Reasoning

Part III. Analytical Reasoning National GAT Solved Questions with Answers

Analytical reasoning multiple choice questions with answers for GAT preparation. The analytical reasoning section of the GAT consists of the questions like, **deductive and inductive logic, critical thinking and writing skills.** In other words, there will be some statements bearing some information and you need to deduce and infer other relevant information. Link to GAT analytical reasoning multiple choice questions PDF questions with answers is given below.

1. If $X \subseteq Y, Y \subseteq X$ and $Z \subseteq Y$, then which of the following is true?
   A. $Z \subseteq X$
   B. $X = Z$
   C. $Y = Z$
   D. $X \subseteq Z$
2. In a certain code, if CAT is written as 3120, how could DOG be written?
   A. 4156
   B. 4175
   C. 4167
   D. 4157

A family consists of six members: E, F, G, H, I and J. E is married to F. G is the son of E. H is the brother of G. I is the sister of G. J is the father of E. Based on the information provided, answer the following questions 2-3:

3. Find the missing number in the sequence:
   2, 6, 12, 20, ?, 42
   A. 20
   B. 30
   C. 22
   D. 32
4. How is F related to J?
   A. Son
   B. Daughter-in-law
   C. Sister
   D. Wife
5. How is I related to H?

A. Mother

B. Sister

C. Daughter

D. Wife

6. If E is the brother of F, F is the sister of G, and G is the father of H, how is H related to E?

    A. Son

    B. Daughter

    C. Nephew/Niece

    D. Cousin

7. Find the odd one out: 3, 5, 9, 13, 17.

    A. 3
    B. 9
    C. 13
    D. 7

8. Statements: All apples are fruits. Some fruits are sweet.

    Conclusion:

    I) All apples are sweet

    II) Some sweet things are apples.

    A. Only conclusion I follows

    B. Only conclusion II follows

    C. Both I and II follow

    D. Neither I nor II follow

9. A man walks 10 km towards north; turns left, and walk 5 km, then turns right and walks 10 km. In which direction is he from his starting point?

    A. North-East

    B. South-East

    C. South-West

    D. North-West

10. If all roses are flowers, and some flowers fade quickly, which of the following statements is true?

    A. Some roses fade quickly

    B. All flowers fade quickly

C. No rose fades quickly

D. None of these

11. In a Venn diagram, the number of elements that belong to both Set E and Set F is represented by:

    A. Union of E and F

    B. Intersection of E and F

    C. Difference of E and F

    D. Symmetric difference of E and F

12. Six friends are sitting in a circle and facing the center. E is between F and G, H is to the immediate left of G, I is between J and F. Who is to the immediate left of E?

    A. F

    B. G

    C. H

    D. F or G

13. Find the next pattern: 1A, 2B, 3C, 4D, __?

    A. 5D

    B. 5E

    C. 6E

    D. 5F

14. If the minute hand of a clock is on 6 and the hour hand is between 2 and 3, what is the time?

    A. 2:30

    B. 3:30

    C. 2:15

    D. 3:15

15. Which of the following is an assumption for the argument: "People who exercise regularly are healthier than those who do not"?

    A. Regular exercise causes good health

    B. Healthy people exercise regularly

    C. Exercise is the only factor for good health

D. Unhealthy people do not exercise

16. You have five tasks to complete, but you only have time to do four. Which task should you prioritize?
    A. The task with the earliest deadline
    B. The task that is the most important
    C. The task that is easiest to complete
    D. The task that is most interesting to you
17. If you rearrange the letters of "IMARONA," you get the name of:
    A. A fruit
    B. A color
    C. A country
    D. A city
18. What comes next in the sequence? AB, BC, CD, __?
    A. DE
    B. EF
    C. DF
    D. FG
19. A father is twice as old as his son. Five years ago, the father was three times as old as his son. What are their current ages son and father respectively?
    A. 5 and 10
    B. 15 and 30
    C. 10 and 20
    D. 12 and 24
20. Four years ago, E was twice as old as F. If E is 40 years old now, how old is F?
    A. 25
    B. 22
    C. 21
    D. 18
21. A box contains 3 red balls, 2 blue balls, and 5 green balls. If you randomly pick one ball, what is the probability that it is red?
    A. 1/5
    B. 3/10
    C. ½
    D. 3/8

22. In a certain code, "CAT" is written as "DBU". How is "DOG" written in that code?
    A. EPH
    B. EPJ
    C. EOH
    D. EPI
23. If in a certain language, "LOVE" is coded as "MPSF", how is "HATE" coded?
    A. JBQF
    B. IBUE
    C. IBQF
    D. JBUE

24. In a certain code language, "COMPUTER" is written as "DPNQVSF". How would the word "ENGINEER" be written in that same code language?
    A. FOHFFOFS
    B. FOHJJFFS
    C. FOFJFFFS
    D. FOFJFFQT

25. If some E is F and all F are G, which of the following conclusions is true?
    A. Some E is G
    B. All E are G
    C. Some G is E
    D. All G are E

26. A man is facing east. He turns 90 degrees clockwise and then 180 degrees anticlockwise.

    Which direction is he facing now?

    A. North

    B. South

    C. East

    D. West

27. In a class of 40 students, 30 students study Math, 25 studies Science, and 20 studies both

    Math and Science. How many students study only Math?

    A. 15

    B. 25

    C. 10

    D. 20
28. Which of the following is the odd one out?

    A. Apple

    B. Banana

C. Carrot

D. Cherry

29. If the first two statements are true, is the final statement true?

- All cats are mammals.
- Some mammals are not dogs.
- Therefore, some cats are not dogs.

A. Yes

B. No

C. Cannot be determined

D. None of the above

30. A clock shows the time as 3:15. What is the angle between the hour and minute hands?

A. 30 degrees

B. 7.5 degrees

C. 45 degrees

D. 37.5 degrees

31. If some books are pens and some pens are not pencils, which of the following conclusions is true?

A. Some books are pencils
B. Some pens are books
C. All pens are books
D. Some books are not pencils

32. Which of the following is different from the other?
A) Histogram
B) Frequency polygon
C) Bar chart
D) Ogive curve

Questions (33 – 39)

In a survey of 25 students, it was found that 15 had taken mathematics, 12 had taken physicsand 11 had taken chemistry, 5 had taken mathematics and chemistry, 9 had takenmathematics and physics, 4 had taken physics and chemistry and 3 had taken all the threecourses.

33. Number of students who had taken only Mathematics:
A) 2
B) 4
C) 5
D) 3

34. Number of students who had taken only Chemistry
    A) 2
    B) 4
    C) 3
    D) 5
35. Number of students who had taken only Physics
    A) 2
    B) 4
    C) 5
    D) 3
36. Find how many students had taken one course only.
    A) 10
    B) 23
    C) 11
    D) 38
37. At least one of the three courses
    A) 23
    B) 26
    C) 27
    D) 24
38. None of the course
    A) 6
    B) 1
    C) 3
    D) 2
39. Find the number of students that had taken exactly two of the three courses.
    A) 9
    B) 10
    C) 11
    D) 12

Answers with justifications

1. ANSWER: A

SOLUTION: $(49 \div 7 + 5 - 4 \times 6) + (18 \times 6 - 5) = (7 + 5 - 24) + (108 - 5) = (12 - 24) + 103 = -12 + 103 = 91.$

2. ANSWER: D

SOLUTION: Let 3,8,18,38,78, … be a sequence. The pattern between each term is as follows: 5,10,20,40,80,… . so the next term will be 78+80 = 158.

3. ANSWER: B

SOLUTION: $(9 \times 2 \times 5) - (9 + 2 + 5) = 90 - 16 = 74$

$(4 \times 3 \times 7) - (4 + 3 + 7) = 84 - 14 = 70$

$(6 \times 8 \times 3) - (6 + 8 + 3) = 144 - 17 = 127$. So the missing part is 127.

4. ANSWER: C

SOLUTION: We know that $a^2 + b^2 = 0$ then $a = b = 0$. For $a^2 + (b-3)^2 = 0, a^2 = 0$ and $(b-3)^2 = 0$. Thus $a = 0$ and $b = 3$. Hence a+b = 0+3 = 3.

5. ANSWER: D

SOLUTION: using the given definition $a \otimes b = lcm(a,b) + \gcd(a,b)$ and $a \oplus b = a^b + b^a$. Thus $(1 \oplus 2) \otimes (3 \oplus 4) = (1^2 + 2^1) \otimes (3^4 + 4^3) = (1+2) \otimes (81+64) = (3 \otimes 145) = lcm(3,145) + \gcd(3,145) = 435 + 1 = 436$.

6. **ANSWER:** A

SOLUTION: $x + y = 0$ implies that $y = -x$. Thus, one the negative of the other.

7. ANSWER: C

SOLUTION: When increasing the number of students by 20 in each class, $\frac{20}{40} \times 100\% = 50\%$.

8. ANSWER: B

SOLUTION: Let x be the money that has been assigned. Then $11x + 13x = 480$ and hence $x = 20$. Thus children A has $20 \times 11 = 220$ birr and children B has $20 \times 13 = 260$ birr.

9. ANSWER: C

SOLUTION: Selling price = buying price + profit. Thus Selling price = 90 birr + 45 birr = 135 birr.

10. ANSWER: D

SOLUTION: Number males = total number passengers – number females. Thus Number males = 60-40 = 20. So, the ratio is 1:2.

11. ANSWER: D

SOLUTION: Let a and b be integers. Then $a + b = 36$ and $a - b = 14$. By the adding the two equations, we get $2a = 50$ and hence $a = 25$. Similarly, $b = 11$. So, the largest integer is 25.

12. ANSWER: B

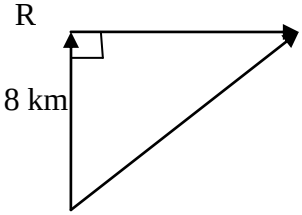
SOLUTION: Let x and y be natural numbers. Since $\text{LCM}(x,y) * \text{HCF}(x,y) = xy$, and $\text{LCM}(x,y) = 12$ and $xy = 24$. Then $\text{HCF}(x,y) = 2$.

13. ANSWER: C

SOLUTION: The given sequence is given by $2, 6, 12, 20, 30$. The difference between each term is as follows 4,6,8,10. This patterns shows that the next term will be obtained by adding the term before it plus 2. In our case, the 6^{th} term is the 5^{th} + 10 +2; that is, 6^{th} term = 30 + 10 + 2 = 42, where 10 is the difference between 5^{th} term and 4^{th} term.

14. ANSWER: B

SOLUTION: Q 6 km R



P

Since we are given that $PQ = 8$ km and $QR = 6$ km. Then find PR? By using the Pythagoras Theorem, $PR = \sqrt{PQ^2 + QR^2} = \sqrt{(8)^2 + (6)^2} = \sqrt{64 + 36} = \sqrt{100} = 10$ km.

15. ANSWER: A

SOLUTION: Let x and y be natural numbers. Then $x + y = 28$ and $x - y = 4$. If we add the two equations, then we get $2x = 32$ and hence $x = 16$. By the substituting the value of x, then $y = 12$. So, the smallest number is 12.

16. ANSWER: B

SOLUTION: Let x be the numbers in a class. Then $3x$ is boys in a class, which is 24 and so, $x = 8$. Thus, the number of girl students in a class is $5x$ and hence the number of girl students in a class is 40.

17. ANSWER: A

SOLUTION: In the above question, the number of boy students is 24 and girl students is 40. Then the total number of students in a class is 64.

18. ANSWER: C

SOLUTION: Let m represent a mother age and c represent an age of child. Then $m = 4c$ and $m + 8 = 2(c + 8)$. Then $4c + 8 = 2c + 16$ and $c = 4$. Thus $m = 16$.

19. **Answer: B**
Justification: Total work required = 3×12 =36 worker-days.
If 6 workers do the job:36 ÷ 6=6 days.
Thus, the answer is **6 days**.

20. ANSWER: C

SOLUTION: 25% of 80 is $\frac{25}{100} \times 80 = 20$.

21. ANSWER: B

SOLUTION: Let E be people have an engineering degree and M have a management degree. Then the number of people have only engineering degree 11, only management degree 5, since 7 people have both degrees. So, 30-(11+7+5)= 7, which is the number of people have no degree.

22. ANSWER: C

Solution: By using prime factorization, $12 = 2^2 \times 3$ and $15 = 3 \times 5$. Then LCM of 12 and 15 is given by $2^2 \times 3 \times 5 = 60$.

23. ANSWER: C

Solution:$p = \frac{18 \times 10}{12} = 15$

24. ANSWER: D

SOLUTION: The wash rate of man is $\frac{1}{12}$ and wash rate of Alemu is $\frac{1}{24}$. Then $\frac{1}{12} + \frac{1}{24} = \frac{2+1}{24} = \frac{3}{24} = \frac{1}{8}$. So, if they work together, then they will complete within 8 minutes.

25. ANSWER: A

SOLUTION:$1420 = 2 \times 2 \times 5 \times 71$. Then number of divisors $= (2+1)(1+1)(1+1) = 3 \times 2 \times 2 = 12$.

26. ANSWER: A

SOLUTION: Let one part is x and another part would be $50 - x$. Then

$$\frac{1}{x} + \frac{1}{50-x} = \frac{1}{12} \Rightarrow \frac{50}{x(50-x)} = \frac{1}{12}$$

$$\Rightarrow x(50-x) = 600$$

$$\Rightarrow x^2 - 50x + 600 = 0$$

$$\Longrightarrow x(x-30)-20(x-30)=0$$

$$\Longrightarrow (x-30)(x-20)=0$$

$\Longrightarrow x=30$ or $x=20$.

27. ANSWER: D

SOLUTION: Let x and y be two consecutive even numbers. Without lose of generality we can assume that y comes next to x. i.e. y = x+2.Now $y^2-x^2=(x+2)^2-x^2=84$. This implies 4x+4 = 84, x = 20. So y = 22. Therefore x+y = 20+22 = 42

28. ANSWER: C

SOLUTION: The n^{th} term of an Arithmetic progression with common difference d is given by $A_n = A_1+ (n-1)d$. So in our case n =10, $A_{10} = A_1+ (10-1)8 = A_1+ (9)8$. This gives us $A_1 = 84 – 72 = 12$

29. ANSWER: D

SOLUTION: let the two consecutive odd numbers be 2n+1 and 2n+3 respectively. This implies $(2n+3)^2-(2n+1)^2=(2n+3+2n+1)(2n+3-2n-1)=(4n+4)(2)=8(n+1)$. Therefore it is divisible by 8.

30. ANSWER: B

SOLUTION: The amount of mixture remain after n operation $x(1-\frac{y}{x})^n$, where x is initial quantity, y is amount taken out at a time and n is the number of operation taken place. So using this the amount of milk remain at the container after 3 operation = $50(1-\frac{5}{50})^3=50(.9)^3=36.45$

31. ANSWER: C

SOLUTION: The first number divisible by 3 is 102 and the last number divisible by 3 is 198. Hence total numbers divisible by 3 between 100 and 200 $=\frac{198-102}{3}+1=33$

32. ANSWER: B

SOLUTION: Since x,y,z be in Arithmetic progression, $y=\frac{x+z}{2}$ and $2y=x+z$

Now $(x+2y-z)(2y+z-x)(z+x-y)=(x+x+z-z)(x+z+z-x)(2y-y)=(2x)(2z)(y)=4xyz$

33. ANSWER: A

SOLUTION: 2x4 = 8 and 24+18 = 42 which reverses numbers on 24. Hence N = 24.

34. ANSWER: D

SOLUTION: In Geometric series if r< 1 then $s = \frac{G_1}{1-r}$, where G_1 is the first term and r is the common ratio. So in our case since $r = \frac{1}{3} < 1$, $S = \frac{G_1}{1-r} = \frac{1}{1-\frac{1}{3}} = \frac{3}{2}$.

35. ANSWER: D

SOLUTION: If we addthe equations$2a + b = x$ and $-2a + b = y$, then we get $2b = x + y$ and hence $b = \frac{x+y}{2}$. If we substitute the value of b in either of the above equations, we get that $a = \frac{x-y}{4}$. So, $ab = \left(\frac{x+y}{2}\right)\left(\frac{x-y}{4}\right) = \frac{x^2-y^2}{8}$.

36. ANSWER: C

SOLUTION: $(x + 2)(x - 2) = x^2 - 4$. But we are given $x^2 = 15$, then $(x + 2)(x - 2) = x^2 - 4 = 15 - 4 = 11$.

37. ANSWER: D

SOLUTION: If we add two equations $3a + 6b = 11$ and $2a + 7b = 9$, then we get that $5a + 13b = 20$ and hence $\frac{5a+13b}{5} = 4$.

38. ANSWER: B

SOLUTION: $x^3 = 27 = 3^3$. So that $x = 3$.

39. ANSWER: C

SOLUTION: Since logarithm is the inverse of exponential; that is, $\log_a x = y$ if and only if $x = a^y$. Again, since $\log x = \log_{10} x$(common logarithm). Thus $\log x = 2 \Leftrightarrow x = 10^2 = 100$.

40. ANSWER: D

SOLUTION: $4\frac{1}{6}\%\, x = 45 \Leftrightarrow \frac{25}{6}\frac{1}{100}x = 45$

$$\Leftrightarrow \frac{1}{24}x = 45$$

$$\Leftrightarrow x = 1080.$$

41. ANSWER: B

SOLUTION: $x^2 - 7x + 10 = x^2 — 2x - 5x + 10 = x(x-2) - 5(x-2) \Rightarrow (x-2)(x-5=0$. Thus $x=2, 5$ and hence $2+5=7$.

42. ANSWER: B

Solution: $\sqrt{98} - \sqrt{50} = \sqrt{2 \times 49} - \sqrt{2 \times 25} = 7\sqrt{2} - 5\sqrt{2} = 2\sqrt{2}$.

43. ANSWER: C

SOLUTION: When the value of a and b are equal, ab attains its maximum value. So the value of a and b are 12. Thus, the maximum value of ab is 144.

44. ANSWER: D

SOLUTION: When we add both equations and simplify it we get $\sqrt{x} = 8$ and $\sqrt{y} = 6$. So, $\sqrt{xy} = 48$.

45. ANSWER: B

SOLUTION: After simplifying from down to up we get $a + \frac{7}{10} = 3$ and $a = \frac{23}{10}$

46. ANSWER: B

SOLUTION: $16^{\log_4 5} = (4^2)^{\log_4 5} = 4^{2\log_4 5} = 4^{\log_4 5^2} = 5^2 = 25$.

47. ANSWER: C

SOLUTION: $\log_{\sqrt{8}} x = 3\frac{1}{3} = \frac{10}{3} \Rightarrow x = \sqrt{8}^{10/3} = (2^{3/2})^{10/3} = 2^5 = 32$.

48. ANSWER: D

SOLUTION: $(\frac{9}{4})^x (\frac{8}{27})^{x-1} = \frac{2}{3} \Rightarrow (\frac{3}{2})^{2x} (\frac{2}{3})^{3x-3} = \frac{2}{3}$

$$\Rightarrow (\frac{2}{3})^{-2x+3x-3} = \frac{2}{3}$$

$$\Rightarrow (\frac{2}{3})^{x-3} = \frac{2}{3}$$

$$\Rightarrow x - 3 = 1$$

$\Rightarrow x = 4$.

49. ANSWER: D

SOLUTION: Let α be one of the angle of triangle and the sum of the angle of the triangle is180°. Then $9\alpha + 7\alpha + 4\alpha = 180^{\circ}$ and hence $20\alpha = 180^{\circ}$. Thus, $\alpha = 9^{\circ}$. So the measure of the largest angle = $9(\alpha) = 9(9^{\circ}) = 81^{\circ}$

50. ANSWER: C

SOLUTION: If all the length of the sides of the triangle are equal, then the triangle is equilateral. If the length of the two sides of the triangle are equal, then the triangle is isosceles.If all the length of the sides of the triangle are not equal, then the triangle is scalene. Thus in our case, the length of the sides of the triangle are not equal, then the triangle is **scalene**.

51. ANSWER: A

SOLUTION: Since the area of a circle with radius r is given by πr^2 and r = 6 cm. So, the area of a circle is $36\pi cm^2$.

52. ANSWER: A

SOLUTION: Since the perimeter of a rectangle with length l and width w is given by $2l + 2w = 48$ cm and $l = 2w$. Then, $2(2w) + 2w = 4w + 2w = 6w = 48$ cm. So, $w = 8$ cm.

53. ANSWER: A

SOLUTION: Since the volume of a cube with side length l is given by l^3 and $l = 4$ cm. Thus the volume of a cube is $6\ cm^3$.

54. ANSWER: A

SOLUTION: Since the volume of a right circular cone has a base radius r and height h is given by $\frac{\pi hr^2}{3}$, and $h = 4$ cm and $r = 3$ cm. So the volume of a right circular cone is $12\pi cm^2$.

55. ANSWER: C

SOLUTION: Since the average speed is given by distance travel over time take and $d = 180$ miles and $t = 3$ hours. Then average speed is $\frac{180\ miles}{3hrs} = 60$ mile per hour.

56. ANSWER: B

Solution: A= $x^2 = 5 \Longrightarrow x = \sqrt{5}$. Then $A = (3x)^2 = 9x^2 = 9(\sqrt{5})^2 = 45$.

57. **ANSWER: B**

SOLUTION: By using Pythagoras theorem, $5^2 + 12^2 = 25 + 144 = 169$ and hence the diameter of the circle is 13. So, the radius of the circle is$\frac{13}{2} = 6.5$.

58. ANSWER: B

SOLUTION: Let$OD = x$, $\overline{CD}//\overline{AB}$. Thus $< COD =< AOB \; and \; < DCO =< ABO$. Triangles OCD and OBA are symmetric triangles. Hence $\frac{Area\ of\ triangle\ \ OAB}{Area\ of\ triangle\ \ OCD} = (\frac{2}{1})^2 = 4.$

59. ANSWER: A

SOLUTION: Area of triangle ADC = area of triangle ABC – Area of triangle DBC = $\frac{1}{2}h(3x - 2x) = \frac{1}{2}hx$. Area of triangle CDB = $\frac{1}{2}(2x)h = hx$. Thus $\frac{Area\ of\ triangle\ \ ADC}{Area\ of\ triangle\ \ CDB} = \frac{\frac{1}{2}hx}{hx} = \frac{\frac{1}{2}}{1} = 1:2.$

60. ANSWER: C

SOLUTION: Area of triangle ABC = $\frac{1}{2}AB.OC = \frac{1}{2}(2r)(r) = r^2$.

61. ANSWER: D

SOLUTION: Let length of $\overline{AB}$ is k and length of $\overline{BC}$ is h. Since triangle ABC is a right angled triangle using Pythagoras theorem, $AC = \sqrt{h^2 + k^2}$. Then,

Area of I =$\frac{\pi}{2}(\frac{\sqrt{h^2+k^2}}{2})^2 = \frac{\pi}{2}(\frac{h^2+k^2}{4})$

Area of II = $\frac{\pi}{2}(\frac{h}{2})^2 = \frac{\pi}{2}(\frac{h^2}{4})$

Area of III = $\frac{\pi}{2}(\frac{k}{2})^2 = \frac{\pi}{2}(\frac{k^2}{4})$

Area of II + Area of III = $\frac{\pi}{2}\left(\frac{h^2}{4} + \frac{k^2}{4}\right)$ = Area of I.

62. ANSWER: B

SOLUTION: Let the base of the two triangles be x and y and their height be $3h$ and $4h$ respectively. Then $\frac{\left(\frac{1}{2}\right)x(3h)}{\left(\frac{1}{2}\right)y(4h)} = \frac{4}{3} \Longrightarrow \frac{x}{y} = \left(\frac{4}{3}\right)\left(\frac{4}{3}\right) = \frac{16}{9}$.

63. ANSWER: B

SOLUTION: In a cube volume $V = l^3$ and surface area $S = 6l^2$. Since $S = 6l^2$, then $l = (\frac{S}{6})^{\frac{1}{2}}$. Thus $V = l^3 = (\frac{S}{6})^{\frac{3}{2}} = (\frac{726}{6})^{\frac{3}{2}} = 1331.$

64. ANSWER: C

SOLUTION: Let r be the radius of each. Then the ratio of volume $=$ Cone:Hemisphere: Cylinder $= \frac{1}{3}\pi r^3 : \frac{2}{3}\pi r^3 : \pi r^2 \times r = 1:2:3$.

65. Answer D

Solution: The union of two sets A and B is a set which contains elements which belongs to either of the two sets.

66. Answer B

Solution: The intersection of two sets A and B is a set which contains elements which belongs to both sets A and B

Quantitative reasoning II (Basic Statistics)

67. ANSWER: C

SOLUTION: Let m be the mean of data. If each data is decreased by a constant k, then the new mean will be given by the old mean m, $m - k$. So, new mean is 62-7 = 55.

68. Answer B

Justification: Since it generalizes from sample (ten classmates) to the entire class (all students), the answer is inferential statistics.

69. Answer C

Justification: Based on information contained, variable can be classified as quantitative (numerical) and qualitative (categorical), so from the given alternatives, choice C is the correct answer, the others are quantitative type of variables.

70. Answer D

Justification: Based on the properties of order, distance and fixed zero there are four types of measurement scale. Ratio scale of measurement includes, the property of order, distance and fixed zero, from the given alternatives choice D is the correct answer.

71. Answer A

Justification: There are two ways of collecting **primary data,** these are:

i. Questionnaire and Interview: in this case based on the materials we use to collect the data on the survey we have three methods.

A. PAPI= Paper Assisted Personal Interview

B. CAPI= Computer Assisted Personal Interview

C. TAPI= Telephone Assisted Personal Interview

ii. Experimental and observation

72. Answer C

Justification: diagrams are appropriate for presenting discrete as well as qualitative data types whereas graphs are appropriate presenting for continues data types.

73. Answer A

Solution: The total age of the 6 boys can be calculated as $\frac{x}{8} = 15$, or x = 8*15 = 120.

From 120, remove 14 and 16, and the remaining total age of the other four boys is 90.

$\frac{90}{6} = 14.$

74. Answer C

Solution: Corrected mean = wrong mean + (corrected value – wrong value)/n

= 200 + (240 – 180)/10 = 200 + 6 = 206

75. Answer C

Solution: Let $n_1 = 40$, $\bar{x}_1 = 25$ and $n_2 = 60$, $\bar{x}_2 = 35$

$$\bar{X}_c = \frac{\bar{X}_1 n_1 + \bar{X}_2 n_2}{n_1 + n_2} = \frac{\sum_{i=1}^{2} \bar{X}_i n_i}{\sum_{i=1}^{2} n_i}$$

$$\Rightarrow \bar{X}_c = \frac{40(25) + 60(35)}{40 + 60} = \frac{3100}{100} = 31$$

76. Answer B

Solution: $\bar{X}_w$ = (60*1 +75*2 + 63*1 + 59*3 + 55*3)/ (1+2+1+3+3) = 615/10 = 61.5.

77. Answer D

Solution: n = 5, 1 = A, 2 = P, 1 = L, 1 = E, thus the total arrangements can be done by using permutation:

$$\frac{5!}{1!2!1!} = \frac{5*4*3*2!}{1!2!1!} = 5*4*3 = 60$$

78. Answer B

Solution: Since the given numbers are constant, the standard deviation is 0.

79. Answer D

Solution: If two unbiased coins are tossed simultaneously, then the sample space will be S.
S:{HH,HT,TH,TT}

n(S)=4

E: At least one head is obtained

{HH,HT,TH}

n(E)=3

Hence, $P(\text{at least one head}) = \frac{n(E)}{n(S)} = \frac{3}{4} = \frac{3}{4}$

80. Answer A

Solution: First arrange the data in ascending order: $x-7, x-5, x-3, x-2, x-1, x+1, x+4, x+6$. Then $median = \frac{1}{2}\left(x_{\frac{n}{2}} - x_{\frac{n}{2}+1}\right) = \frac{1}{2}(x-2+x-1) = \frac{1}{2}(2x-3) = x-\frac{3}{2}$.

81. Answer C

Solution: Total number of letters in the word 'MATHEMATICS' = 11
Number of vowels in the word = A, E, A, I = 4

∴ The probability of getting a vowel = Number of favorable outcomes/Total number of possible outcomes $= \frac{4}{11}$

82. Answer B

Solution: Number of ways of selecting 2 students from 30 students = $\binom{30}{2}$ ways

$$= \frac{30!}{28!2!} = \frac{(30*29)}{2} = (15*29) \text{ ways}$$

Number of ways of selecting 2 girls from 12 girls = $\binom{12}{2}$ ways

$$= \frac{12!}{10!2!} = \frac{(12*11)}{2} = (6*11) \text{ ways}$$

Thus, probability that both selected students are girls

$$= \frac{(6*11)}{(15*29)} = \frac{22}{145}$$

83. Answer D

Solution: Average of 20 number = 0. Therefore, sum of 20 numbers(0 x 20) = 0. It is quite possible that 19 of these numbers may be positive and if their sum is a then 20^{th} number is (-a).

84. Answer D

Solution: Probability of head = probability of Tails $= \frac{1}{2}$

Probability of 2 heads and two tails:

And, if we have 2 heads, obviously there will be 2 tails,

So, by binomial probability distribution, required probability is:

$$= \binom{4}{2}\left(\frac{1}{2}\right)^2\left(\frac{1}{2}\right)^2 = 6\left(\frac{1}{2}\right)^4 = \frac{6}{16} = \frac{3}{8}$$

85. Answer B

Solution: By using combination rule:

$$= \binom{8}{2} = \frac{8!}{6!2!} = \frac{8*7*6!}{6!2!} = \frac{8*7}{2} = 28$$

Or we can also solve this question by picking any one team, naming it as team 1 and the rest as 2 to 8. Since none of the team can play the game with itself, so team 1 will be playing only seven games. Now, we will come to team 2 and as team 2 has already played a game with team 1, so only six games will be left. Thus, continuing in the same manner, we can find the total number of matches by adding the matches played by each team.

7+6+5+4+3+2+1=28

Hence, the total number of games played is 28.

86. Answer D

Solution: This can be done by permutation rule:

The total number of ways can be calculated as:

Total ways = $\left({}_5P_3\right)$

Calculating each part: $\left({}_5P_3\right) = \frac{5!}{(5-3)!} = \frac{5*4*3*2!}{2!} = 60$

Therefore, there are 60 different ways for 5 people to sit in 3 chairs.

87. Answer A

Solution: There are 6 digits 1, 2, 3, 2, 4, 2, 4 in which 2 occurs 3 times, 4 occurs 2 times.

Number of 6 digit numbers = $\frac{6!}{3!2!} = 60$

Hence, the required number of 6 digit numbers= 60.

For question 20-22 refer the following data:

Value	1	2	3	6	8
Frequency	2	4	2	1	1

88. Answer B

Solution:

$$\text{Mean} = \frac{\sum f_i x_i}{\sum f_i} = \frac{(1*2) + (2*4) + (6*1) + (8*1)}{(2+4+2+1+1)} = \frac{(2+8+6+6+6+8)}{10} = \frac{30}{10} = 3$$

89. Answer C

Solution: 1st arrange the data is ascending order, 1, 1, 2, 2, 2, 2, 3, 3, 6, 8.

Thus, median = 2.

90. Answer D

Solution: Mode is the most frequented value, thus mode = 2.

For question 23-27 refer the following data:

The numbers of hours worked (per week) by 400 graduated students are shown below:

Number of hours	Frequency
1-10	20
11-20	80
21-30	200

31-40	100

91. **Answer B**

Solution: Width $= UCB_i - LCB_i = 10.5 - 0.5 = 10$

92. **Answer B**

Solution: 20 + 80 = 100

93. **Answer D**

Solution: $r = \frac{f}{n} = \frac{20}{400} = 0.05$

94. **Answer B**

Solution: Percentage (<= 20) = 100/400 = 0.25 = 25

95. **Answer C**

Solution: Percentage (at least 11) = (80+200+100)/400 = 0.95 = 95%.

96. **Answer B**

Solution: Range = 4

Relative range = 0.25

R = largest values - smallest value = 4 => L = 4+S (1)

RR = (L –S)/(L+S) = R/(L+S) = 4/(L+S) = 0.25 (2)

Thus, from (1) 4/(4+S+S) = 0.25

Thus S = 6 and L = 10.

97. **Answer D**

Solution: 75/100 = 0.75

98. **Answer C**

Solution: Identify the relevant values from the table:

Total males with never visited: 36

Total females with never visited: 39

Total never visited: 75 (36 + 39)

Thus, $P(\text{Male/Never visited}) = \frac{\text{Number of male with non visited}}{\text{Total number of never visited}} = \frac{36}{75} = 0.48$

99. Answer C

Justification: Since the subjects are heterogonous and we are divided into subgroups (homogenous) the applied sampling technique is stratified random sampling techniques.

100. Answer D

Justification: Systematic sampling is a type of probability sampling techniques, whereas the remaining is non-probability sampling techniques.

101. Answer A

Justification: When we add a number to each value, the mean is changed but the variance and standard deviation is remains the same.

102. Answer B

Solution: Let P (M) = 0.55, P(E) = 0.35, P(MnE) = 0.25, the required is P (MnE')

P (M n E') = P (M) n P (1-E) = P (M) – P(MnE) = 0.55 – 0.25 = 0.30

103. Answer C

Solution: The probability never be negative, so the correct answer is C.

104. Answer B

Solution: S = (1, 2 3 4 5 6)

A = getting even number =(2, 4, 6)

B = getting less than 4 = (1, 2, 3, 4)

A and B = (2,4)

P(AUB) = P(A)+P(B)P(AnB) = 3/6 + 4/6 – 2/6 = (7-2)/6 = 5/6

105. Answer A

Solution: $P(A/B) = \frac{P(A \cap B)}{P(B)} \Rightarrow P(B) = \frac{P(A \cap B)}{P(A/B)} = \frac{1/6}{1/3} = \frac{3}{6} = \frac{1}{2}$

106. Answer C

Solution: $P(A \cup B) = P(A) + P(B) - P(A \cap B) = 0.50 + 0.40 - 0.20 = 0.70$

107. Answer C

Solution: Probability of selection of a boy = 15/25

Probability of selection of a girl after a boy has already been selected = 10/24

Probability of selection of a boy and a girl = 15/25 * 10/24=1/4

108. Answer B

Solution:

109. Answer A

Solution: The probability that all will be blue is = $\frac{\binom{3}{2}}{\binom{11}{2}} = \frac{3}{55}$

110. Answer B

Solution: From the total sample space the, event that sum is a prim number:

$\{(1,1),\ (1,2),(1,4),(1,6),(2,1),(2,3),(2,5),(3,2),(3,4),((4,1),(4,3),(5,2),(5,6),(6,1),(6,5)\}$

Total events favorable for prim number = 15. Total number of sample space is 36.

Probability = 15/36 = 5/12

111. Answer C

Solution: Probability of (No defective bulbs) = $\frac{\binom{16}{2}}{\binom{20}{2}} = \frac{12}{19}$

Probability of (at least one defective bulb) = $1 - \frac{12}{19} = \frac{7}{19}$

112. Answer A

Solution: Number of ways choosing 4 persons out of nine= $\binom{9}{4} = \frac{9*8*7*6*5!}{5!*4!} = 126$

Number of ways of choosing two children out of 4 and 2 persons out of (3 + 2) persons =

$\binom{4}{2} * \binom{5}{2} = 60$

Thus, the probability of (exactly two children are chosen) = 60/126 = 10/21.

Part III. Analytical Reasoning

1. ANSWER: A

JUSTIFICATION: Since $X \subseteq Y, Y \subseteq X$, then $X = Y$ and since $Z \subseteq Y$ is given. Then clearly, $Z \subseteq X$.

2. ANSWER: D

SOLUTION: By using English alphabet order; that is, A,B,C,…. In the word CAT, we have 3 letters, C,A, and T, where C have 3 value, which is the 3rd place, A have 1 value and T have 20 value. So, CAT = 3120. Similarly, DOG= 4157 (that is, D have 4 value, which is at the 4th place, O have 15 value,which is at the 15th place and G have 7 value, which is at the 7th place in English alphabet).

3. ANSWER: B**

JUSTIFICATION: use the formula n^2+n for $n \geq 1$ from natural number.

4. ANSWER: B**

JUSTIFICATION: F is the daughter-in-law of J, so the answer is **(b) Daughter-in-law**.

5. ANSWER: B

JUSTIFICATION: I is the sister of H, so the answer is **(b) Sister**.

6. ANSWER: C

JUSTIFICATION: From the given information:

- E and F are siblings.
- F and G are siblings.
- Therefore, E and G are brothers.
- Since G is the father of H, H is the child of G.

Now, the question is: **How is H related to E?**
Since H is G's child and E is G's brother, H is E's **nephew or niece** (depending on whether H is male or female).

7. ANSWER: B

JUSTIFICATION: All numbers except **9** are prime numbers.Prime numbers are those that have only two distinct positive divisors: 1 and the number itself. So, **3**, **5**, **13**, and **17** are prime numbers, while **9** is not a prime number (since 9 is divisible by 1, 3, and 9).So, the odd one out is **9**.

8. **ANSWER: D**

JUSTIFICATION: Conclusion I do not follow because we do not have enough information to say that all apples are sweet. Conclusion II does not follow because while it's possible, the statements do not explicitly confirm that some sweet things are apples.

9. **ANSWER**: D

JUSTIFICATION: The man walks 10 km towards the north. He turns left (which means west) and walks 5 km. Finally, he turns right (which means north again) and walks 10 km. So, he is 20 km north and 5 km west of the starting point. This position places him in the **northwest** direction relative to the starting point.

10. **ANSWER**: A

JUSTIFICATION: A) Some roses fade quickly: Since all roses are flowers, and some flowers fade quickly, it's possible that some of those flowers that fade quickly could be roses. However, we do not have enough information to confirm this definitively.
B) All flowers fade quickly:This is incorrect because the statement only specifies that *some* flowers fade quickly, not all.
C) No rose fades quickly: This statement is also not necessarily true based on the given information. We know some flowers fade quickly, but we don't have information about whether any of these quick-fading flowers are roses or if none are roses.

11. **ANSWER**: B

JUSTIFICATION: The intersection of two sets consists of all elements that are common to both sets.

12. **ANSWER**: D

JUSTIFICATION: Let's work through the problem step by step.

i. Arrange the friends based on the given conditions:
   - E is between F and G. Therefore, the arrangement of these three could be F-E-G or G-E-F.
   - H is to the immediate left of G. This means H is directly before G in the circle.
   - I is between J and F. So the arrangement for these three could be J-I-F or F-I-J.

ii. Start placing E, F, and G:We don't know the exact positions yet, so let's place E between F and G in both possible ways.
   - If the arrangement is F-E-G, then H must be immediately to the left of G: so H is placed in the position directly before G.
   - If the arrangement is G-E-F, then H must be immediately to the left of G: so H is placed directly before G in this arrangement too.

iii. Combine this with I, J, and F:

- In both cases, we know F's position. We need to place I and J around F. Let's use the arrangement F-E-G, with H to the left of G:
- Place H immediately to the left of G.
- I is between J and F. We need to position J and I around F.This can be visualized as follows:
- Place F-E-G-H in a circle.
- Now position I and J around F. Since I is between J and F, one valid configuration is J-I-F.
- Thus, the full arrangement in the circle is: F-E-G-H-J-I.

iv. Determine the position of E:

- In this circle, the person immediately to the left of E is For the before of E is G. So, the person immediately to the left of E is F or to the before of E is G.That is, **F** is immediately to the left of **E** (when moving counterclockwise) or **G** is immediately to the right of **E** (when moving clockwise).

13. **ANSWER**: B

14. **ANSWER**: A

JUSTIFICATION: Given that the minute hand is on 6 (which indicate 30 minutes past the hour) and the hour hand is between 2 and 3, the only option that fits this description is 2:30. This is because the hour hand would be precisely between 2 and 3 at 2:30. The other times listed do not fit with the condition of the minute hand being on 6.

15. **ANSWER**: A

JUSTIFICATION: The argument implies a causal relationship between regular exercise and better health. For the argument to hold, we must assume that regular exercise is the cause of the improved health.

16. **ANSWER**: B

JUSTIFICATION: This is generally the best approach. Prioritizing the most important task ensures that you address the most significant issues or goals first, which often aligns with long-term success.

17. **ANSWER**: C) A country (Romania)

JUSTIFICATION: Rearranging the letters of "IMARONA" gives you "ROMANIA," which is a country.

18. **ANSWER**: A

JUSTIFICATION: In the sequence **AB, BC, CD**, each pair of letters follows a pattern where each letter in the pair shifts one position forward in the alphabet:

- **AB** (A is followed by B)
- **BC** (B is followed by C)
- **CD** (C is followed by D)

Following this pattern, the next pair should be:

- **DE** (D is followed by E)

So, the next pair in the sequence is **DE.**

19. Answer: C

Justification: Let the son's age be x and the father's age be 2x.
Five years ago: $2x-5 = 3(x-5)$
Expanding: $2x-5=3x-15$
Rearrange: $2x-3x=-15+5$
$-x = -10$

$X=10$

Thus, the son is **10 years old**, and the father is **20 years old**.

20. **ANSWER**: B

JUSTIFICATION: Let's solve the problem step-by-step:

i. Determine E's age four years ago:
   - E is currently 40 years old.
   - Four years ago, E was $40 - 4 = 36$ years old.

ii. E was twice as old as F four years ago:
   - Let F's age four years ago be x
   - Since E was twice as old as F four years ago, we have: $36 = 2x$
   - Solving for x: $x = 36/2 = 18$

iii. Calculate F's current age:
   - F's age four years ago was 18 years.
   - F's current age: $18+4 = 22$.

21. **ANSWER**: B

JUSTIFICATION: To determine the probability of picking a red ball from the box, follow these steps:

i. Calculate the total number of balls:
   - Red balls: 3
   - Blue balls: 2
   - Green balls: 5

   Total number of balls = $3+2+5=10$

ii. Determine the number of favorable outcomes (red balls): Number of red balls = 3

iii. Calculate the probability of picking a red ball:

$$\text{Probability} = \frac{\text{Number of red balls}}{\text{Total number of balls}} = \frac{3}{10}.$$

22. ANSWER: A

JUSTIFICATION: C + 1 step = D, A + 1 step = B and T + 1 step = U. Then D + 1 step = E, O + 1 step = P and G + 1 step = H. So, the answer is EPH.

23. ANSWER: C

Justification: L + 1 step = M, O + 1 step = P, V - 3 step = S and E + 1 step = F. Then the code of "HATE" is H + 1 step = I, A + 1 step = B, T - 3 step = Q and E + 1 step = F. So, the answer is IBQF.

24. ANSWER: B

SOLUTION: First, observe the pattern used to encode "COMPUTER" to "DPNQVSF". By comparing the letters:

C -> D (Shift forward by 1)
O -> P (Shift forward by 1)
M -> N (Shift forward by 1)
P -> Q (Shift forward by 1)
U -> V (Shift forward by 1)
T -> S (Shift backward by 1)
E -> F (Shift forward by 1)
R -> S (Shift forward by 1)
It seems the pattern is to shift most letters forward by 1 position in the alphabet and one letter backward. Applying the same pattern to "ENGINEER":
E -> F (Shift forward by 1)
N -> O (Shift forward by 1)
G -> H (Shift forward by 1)
I -> J (Shift forward by 1)
N -> O (Shift forward by 1)
E -> F (Shift forward by 1)
E -> F (Shift forward by 1)
R -> S (Shift forward by 1)

So "ENGINEER" encoded would be "FOHJJFFS".

25. ANSWER: A

JUSTIFICATION: Since some E is F and all F are G, it follows that the E that are F are also G. Therefore, some E is G because the E that overlaps with F is part of G. So, some E is G.

26. ANSWER: A

JUSTIFICATION: Initial Direction: The man is facing east.Turn 90 degrees clockwise: From East, a 90-degree clockwise turn brings him to South. Turn 180 degrees anticlockwise: From South, a 180-degree anticlockwise turn will bring him to north.

27. ANSWER: C

JUSTIFICATION: To determine how many students study only Math, we can use the principle of inclusion and exclusion. Here's how to solve it:

i. Total number of students: 40
ii. Number of students who study Math (M):30
iii. Number of students who study Science (S): 25
iv. Number of students who study both Math and Science (M ∩ S): 20.

We want to find the number of students who study only Math. This is given by:
Number of students studying only Math = Number of students studying Mat -
Number of students studying both Math and Science = 30 -20 = 10.

28. ANSWER: C

JUSTIFICATION: Here's why: Apple, Banana, and Cherry are all fruits, while Carrot is a vegetable.

29. ANSWER: A
30. ANSWER: B

JUSTIFICATION: To find the angle between the hour and minute hands of a clock at 3:15:
Minute Hand: At 15 minutes, the minute hand is at the 3 on the clock, which corresponds to 15×6 = 90 degrees from the 12 o'clock position.
Hour Hand:At 3:00, the hour hand is exactly at 90 degrees (3 hours × 30 degrees per hour). By 3:15, the hour hand moves further. Each hour represents 30 degrees, so the hour hand moves $\frac{15}{60} \times 30 = 7.5$ degrees past the 3 o'clock mark.
Therefore, at 3:15, the hour hand is at 90 + 7.5 = 97.5 degrees from the 12 o'clock position.
Angle between the Hands: The angle between the hour and minute hands is $|97.5 - 90| = 7.5$ degrees.

31. ANSWER: D

JUSTIFICATION: Since some pens are not pencils and some books are pens, it follows that some books (those that are pens) could also be not pencils. Thus, this is a valid conclusion.

32. ANSWER: C

Justification: diagrams are appropriate for presenting discrete as well as qualitative data typeswhereas graphs are appropriate presenting for continues data types.

33. ANSWER: B

SOLUTION: Let M, C, P represent sets of students who had taken mathematics, chemistry and physics respectively. From the given information, we have:
$n(M)=15, n(C)=11, n(P)=12, n(M\cap P)=9, n(M\cap C)=5, n(C\cap P)=4, n(M\cap C\cap P)=3$
Number of students who had taken only Mathematics
$= n(M) - [n(M\cap P) + n(M\cap C) - n(M\cap C\cap P)] = 15 - [9+5-3] = 15 - 11 = 4$

34. ANSWER: D

SOLUTION: Number of students who had taken only Chemistry
$= n(C) - [n(M\cap C) + n(C\cap P) - n(M\cap C\cap P)] = 11 - [5+4-3] = 11 - 6 = 5$

35. **ANSWER: A**

SOLUTION: Number of students who had taken only Physics
$= n(P) - [n(M\cap P) + n(C\cap P) - n(M\cap C\cap P)] = 12 - [9+4-3] = 12 - 10 = 2$

36. **ANSWER: C**

SOLUTION: Total number of students who had taken only one course
= No. of students only M + No. of students only C + No. of students only P = 4 + 5 + 2 = 11.
We can present as follows by using **Venn diagram**:

M **C**

5 - 3 = 211 − (2 +3 + 1) =5

15 −(6 + 3 + 2) =44 – 3 =1

9 – 3 = 6

12 – (6 +3 + 1) =2 P

37. **ANSWER: A**

SOLUTION:number of students taken at least one of the three courses =

$n(M \cup C \cup P) = n(M) + n(C) + n(P) - n(M \cap C) - n(M \cap P) - n(C \cap P) - + n(M \cap C \cap P)$

$= 15 + 11 + 12 - 5 - 9 - 4 + 3 = 41 - 18 = 23$

38. **ANSWER: D**

SOLUTION: none of the course = total – at least one = 25 – 23 = 2.

39. ANSWER: A

SOLUTION: Total number of student=25. Therefore,

$n(M)=15, n(P)=12, n(C)=11, n(M \cap P)=9, n(M \cap C)=5, n(P \cap C)=4, n(M \cap P \cap C)=3$

Number of student who studying mathematics and physic but not chemistry:

$\Rightarrow n(M \cap P) - n(M \cap P \cap C) \Rightarrow 9 - 3 = 6$

Number of student who studying chemistry and physic but not mathematics:

$\Rightarrow n(P \cap C) - n(M \cap P \cap C) \Rightarrow 4 - 3 = 1$

Number of student who studying mathematics and chemistry but not physics

$\Rightarrow n(M \cap C) - n(M \cap P \cap C) \Rightarrow 5 - 3 = 2.$

Therefore, number of student who had taken two of the three subjects

$= n(M \cap P) + n(P \cap C) + n(M \cap C) = 6 + 1 + 2 = 9.$