PRELIMINARY INTERVIEW BOARD

TERRITORIAL ARMY COMMISSION : DECEMBER 2022

PAPER–1: REASONING & ELEMENTARY MATHEMATICS

A1

Max Time : 2 Hours **(Please Read The Instructions Carefully)** **Max Marks : 100**

Roll No……..

INSTRUCTIONS

1. Paper–1 has two parts: Part I & Part II
   (a) Part I : Reasoning (50 marks)
   (b) Part II: Elementary Mathematics (50 marks)
2. Each section carries 50 objectives type of questions.
3. There will be four possible answers to every question. Candidates are required to fill correct answer in the OMR sheet with Black ball pen.
4. For each correct answer, 1 mark will be granted and 0.5 mark will be deducted for every wrong answer.
5. If a candidate gives more than one answer, it will be treated as a wrong answer and 0.5 mark will be deducted. There will be no penalty for questions left unanswered.
6. Candidates should not mark in the question paper. They can use blank pages provided in the question paper for rough work.
7. To be eligible to qualify, candidate must obtain minimum 40% marks each in Part I & II separately and a minimum of 50% aggregate in total.

PART–1 : REASONING

Directions In this type you are provided with substitutes for various mathematical symbols or numerals, followed by a question involving calculation of an expression or choosing the correct / incorrect equation. You are required to put in the real signs or numerals in the given equation and then solve the question.

Q1. If ÷ means x, x means +, + means -, - means ÷, then what is the value of 16 x 3 + 5 -2 ÷ 4= ?
(a) 9 (b) 10 (c) 19 (d) None of these

Q2. If x means +, + means ÷, - means x, then 8 x 7 – 8 ÷ 2 =?
(a) 1 (b) $7\frac{2}{5}$ (c) $8\frac{3}{5}$ (d) 44

Q3. If P means x, R means +, T means ÷ and S means -, then 18 T 3 P 9 S 8 R 6 =?
(a) $\frac{2}{3}$ (b) 46 (c) 58 (d) None of these

Directions In each of the following questions, clues are given regarding comparisons among set of persons, things, direction, age, time, numbers etc. You are required to analyse the whole information and answer the given question accordingly

Q4. Kunal walks 10 kms towards North. From there, he walks 6 kms towards South Then he walks 3 kms towards East. How far and in which direction is he, with reference to his starting point?
(a) 5 kms West (b) 5 kms North-East (c) 7 kms East (d) 7 kms West

Q5. A rat runs 20 feet towards East and turns to right, runs 10 feet and turns to right, runs 9 feet and turns to left runs 5 feet and then again turns to left runs 12 feet and finally turns to left and runs 6 feet. Now which direction is the rat facing?
(a) East (b) West (c) North (d) South

Q6. Kashish goes 30m North, then turns right and walks 40m, then again turns right and walks 20 m, then again turns right and walks 40m. How many metres is he from his original position?
(a) 0 (b) 10 (c) 20 (d) 40

Q7. A man walks 1 km towards East and then he turns to South and walks 5 km. Again he turns to East and walks 2 km, after this he turns to North and walks 9 km. Now, how far is he from his starting point?
(a) 3 km (b) 4 km (c) 5 km (d) 7 km

Q8. From his house, Lokesh went 15 km to the North. Then he turned West covered 10km. Then, he turned South and covered 5km. Finally, turning to East, he and covered 10 km, In which direction is he from his house?
(a) East (b) West (c) North (d) South

Q9. Rasik walks 20m North. Then he turns right and walks 30m. Then he turns right and walks 35m. Then he turns left and walks 15m. Then he again turns left and walks 15 m. In which direction and how many metres away is he from his original position?
(a) 15 metres West (b) 30 metres East (c) 30 metres West (d) 45 metres East

Q10. The door of Aditya's house faces the East. From the back side of his house, he walks straight 50 metres, then turns to the right and walks 50 metres again. Finally, he turns towards left and stops after walking 25 metres. Now, Aditya is in which direction from the starting point?
(a) South East (b) North East (c) South West (d) North West

Q11. Of the five villages P, Q, R, S and T situated close to each other, P is to the west of Q, R is to the south of P, T is to the north of Q and S is to the east of T. Then, R is in which direction with respect to S?
(a) North West (b) South East (c) South West (d) North East

Directions Evaluate the correct answers.

Q12. A student got twice as many sums wrong as he got right. If he attempted 48 sums in all, how many did he solve correctly?
(a) 12 (b) 16 (c) 24 (d) 18

Q13. The number of boys in a class is three times the number of girls. Which one of the following numbers cannot represent the total number of children in the class?
(a) 48 (b) 44 (c) 42 (d) 40

Q14. A motorist knows four different routes from Delhi to Ambala, From Ambala to Chandigarh he knows three different routes and from Chandigarh to Shimla he knows two different routes. How many routes does he know from Delhi to Shimla?
(a) 4 (b) 8 (c) 12 (d) 24

Q15. In a class there are 18 boys who are over 160 cm tall. If these constitute three-fourths of the boys and the total number of boys is two-thirds of the total number students in the class, what is the number of girls in the class?
(a) 6 (b) 12 (c) 18 (d) 24

Q16. Between two vases in your study table are displayed your five favourite Hindi books. If you decide to arrange the five books in every possible combination and moved just one book every minute, how long would it take you?
(a) 1 hour (b) 2 hours (c) 3 hours (d) 4 hours

Q17. In a cricket match, five batsmen A, B, C, D and E scored an average of 36 runs and B and C scored 107 between them. How many runs did E score? Scored 5 more than E; E scored 98 fewer than A; B scored as many as D and E combined
(a) 62 (b) 45 (c) 28 (d) 20

Q18. Robin says, "If Jai gives me Rs 40, he will have half as much as Atul, but if Atul gives me Rs 40, then the three of us will have the same amount." What is the total amount of money that Robin, Jai and Atul have between them?
(a) Rs 240 (b) Rs 320 (c) Rs 360 (d) Rs 420

Q19. In a caravan in addition to 50 hens, there are 45 goats and 8 camels with some shepherds. If the total number of feet be 224 more than the number of heads in the caravan, the number of shephards is
(a) 5 (b) 8 (c) 10 (d) 15

Q20. In an examination, a student scores 4 marks for every correct answer and loses 1 mark for every wrong answer. If he attempts all 75 questions and secures 125 marks, the number of questions he attempts correctly, is
(a) 35 (b) 40 (c) 42 (d) 46

Directions In the following questions, arrange the given words in a meaningful sequence and then choose the most appropriate sequence from amongst the alternatives provided below each question:

Q21. 1. Elephant 2. Cat 3. Mosquito 4. Tiger 5. Whale
(a) 1, 3, 5, 4, 2 (b) 2, 5, 1, 4, 3 (c) 3, 2, 4, 1, 5 (d) 5, 3, 1, 2, 4

Q22. 1. Butterfly 2. Cocoon 3. Egg 4. Pupa
(a) 1, 3, 4, 2 (b) 1, 4, 3, 2 (c) 2, 4, 1, 3 (d) 3, 4, 2, 1

Directions Evaluate the correct answers.

Q23. Nitin's age was equal to square of some number last year and the following year it would be cube of a number. If again Nitin's age has to be equal to the cube of some number, then for how long he will have to wait?
(a) 10 years (b) 38 years (c) 39 years (d) 64 years

Q24. Who among Siddhartha, Nikunj, Vipul & Mukul is the youngest?
I. Vipul is younger than Mukul but older than Siddhartha and Nikunj.
II. Mukul is the oldest.
III. Siddhartha is the older than Nikunj.
(a) Only I (b) Only I and II (c) Only II and III (d) Only I and III 4

Q25. What is Suman's rank from the top in a class of forty students?
I. Suman is 3 ranks below Deepak from the top..
II. Deepak's ranks from the bottom is 23.
III.Suman is 3 ranks above Deepak from the bottom
(a) Any two of the three (b) Only I & II (c) Only II & III (d) Only II & either I or II

Directions in each of the following questions, select the related word from the give alternatives-

Q26. Misogamy: Marriage :: Misogyny : ?
(a) Children (b) Husband (c) Relations (d) Women

Q27. Novice: Learner :: Harbinger : ?
(a) Messenger (b) Thief (c) Pickpocket (d) Robber

Q28. Sikkim : Gangtok :: Manipur: ?
(a) Dispur (b) Aizwal (c) Shillong (d) Imphal

Q29. USA: Congress :: Iran: ?
(a) Althing (b) Storting (c) Majlis (d) Cortes

Q30. Sepia: Cuttlefish :: Merino:?
(a) Camel (b) Goat (c) Sheep (d) Liama

Directions in each of the following questions, there is a certain relationship between two given numbers on one side of and one number is given on another side of the same: while another number is to be found from the given alternatives.

Q31. 121 : 12 : : 25: ?
(a) 1 (b) 2 (c) 6 (d) 7

Q32. 14 : 9 : : 26: ?
(a) 12 (b) 13 (c) 15 (d) 31

Q33. 9 : 8 : : 16: ?
(a) 27 (b) 18 (c) 17 (d) 14

Q34. 20 : 11 : : 102 :?
(a) 49 (b) 52 (c) 61 (d) 98

Directions In each of the following questions four words have been given out, out of which three are alike in some manner and the fourth one is different. Choose out the odd one.

Q35. (a) Othello (b) King Lear (c) Oliver Twist (d) Macbeth

Q36. (a) Tsangpo (b) Hazaribagh (c) Kanha (d) Bandipur

Q37. (a) Censure (b) Admonish (c) Rebuke (d) Retrieve

Q38. (a) Usage (b) Usual (c) Unite (d)Urine

Directions In these questions the letters in a word are replaced by certain other letters according to a specific rule to form its code. You are required to detect the coding pattern/rule and answer the questions accordingly

Q39. If in a certain language, NATURE is coded as MASUQE, how is FAMINE coded in that code?
(a) FBMJND (b) FZMHND (c) GANIOE (d) EALIME

Q40. If HEATER is written as KBDQHO, how will you encode COOLER?
(a) ALRIHV (b) FLRIHO (c) FLIRHO (d) FRLIHO

Q41. In a certain code, MUNICIPALITY is written as INMUAPCIYTLI, how is JUDICIAL written in that code?
(a) UJDILACI (b) IDUJLACI (c) IDJULAIC (d) IDJULACI

Directions In these type of questions generally a set, group or series of numerals given and you are required to trace out the numerals following certain given conditions

Q42. A class of boys stands in a single line. One boy is nineteenth in order from both the ends. How many boys are there in the class?
(a) 27 (b) 37 (c) 38 (d) 39

Q43. In a class of 60, where girls are twice in number than that of boys, Rajesh ranked seventeenth from the top. If there are 9 girls ahead of Rajesh, how many boys are after Rajesh in rank?
(a) 3 (b) 7 (c) 12 (d) 23

Q44. Manoj and Sachin are ranked seventh and eleventh respectively from the top in a class of 31 students. What will be their respective ranks from the bottom in the class?
(a) 20^{th} and 24^{th} (b) 27^{th} and 29^{th} (c) 25^{th} and 21^{th} (d) 26^{th} and 22^{th}

Q45. Rajan is sixth from the left end and Vinay is tenth from the right end in a row of boys. If there are eight boys between Rajan and Vinay, how many boys are there in the row?
(a) 23 (b) 24 (c) 25 (d) 26

Q46. Rohit is 17th from the left end of a row of 29 boys and Karan is 17th from the right end in the same row. How many boys are there between them in the row?
(a) 3 (b) 5 (c) 6 (d) None of these

Q47. In a class of 35 students, Kunal is placed seventh from the bottom whereas Sonali is placed ninth from the top. Pulkit is placed exactly in between the two. What is Kunal's position from Pulkit?
(a) 9 (b) 10 (c) 11 (d) 13

Directions In these type of questions some particular objects are assigned code names, then a question is asked that is to be answered in the code language.

Q48. If Orange' is called 'butter', 'butter' is called 'soap', 'soap' is called 'ink', 'ink' is called honey' and 'honey' is called 'orange' which of the following is used for washing clothes?
(a) Honey (b) Butter (c) Orange (d) Ink

Q49. If 'rain' is 'water', 'water' is 'road', 'road' is 'cloud', 'cloud' is 'sky', 'sky' is 'sea' and 'sea' is 'path', where do aeroplanes' fly?
(a) Road (b) Sea (c) Cloud (d) Water

Q50. If blue means 'green', 'green' means 'white', 'white' means 'yellow', 'yellow' means 'black', 'black' means 'red' and 'red' means 'brown', then what is the colour of milk?
(a) Black (b) Brown (c) Blue (d) Green

PART–II : ELEMENTARY MATHEMATICS

Q51. A man cycle at the rate of 15.6 km/h. How many metres does he cover in 2 minutes?

(a) 31.2 m. (b) 260 m. (c) 520 m. (d) 5200 m.

Q52. Renu rides at the rate of 10 km/h but stops for 10 minutes to take rest at the end of every 15 km. How many hours will she take to cover 100 km?

(a) 10 (b) 11 (c) 12 (d) 17

Q53. A number consists of two digits; whose sum is 10. If 18 is subtracted from the number, digits of the number are reversed, what is the product?

(a) 15 (b) 18 (c) 24 (d) 32

Q54. The value of $x^2 - 4x + 11$ can never be less than?

(a) 7 (b) 8 (c) 11 (d) 22

Q55. The difference of maximum values of the expressions $(6 + 5x - x^2)$ and $(y - 6 - y^2)$ for any real values of x and y is?

(a) 16 (b) 17 (c) 18 (d) 19

Q56. The value of $(\sec^2 60^\circ - 1)$ is?

(a) 2 (b) 3 (c) 4 (d) 5

Q57. If $\tan x = 3 \cot x$ then the value of x is?

(a) 45° (b) 30° (c) 60° (d) 15°

Q58. The value of $(\sin 79^\circ \cos 11^\circ + \cos 79^\circ \sin 11^\circ)$?

(a) 1 (b) 0 (c) $\frac{1}{\sqrt{2}}$ (d) $\frac{1}{2}$

Q59. The value of $\cos 20^\circ + \cos 60^\circ + ... + \cos 160^\circ + \cos 180^\circ$?

(a) 0 (b) 1 (c) –1 (d) 2

Q60. The value of $(\cos 70^\circ \cos 10^\circ + \sin 70^\circ \sin 10^\circ)$?

(a) $\frac{1}{2}$ (b) $\cos 80^\circ$ (c) $\sin 80^\circ$ (d) $\frac{\sqrt{3}}{2}$

Q61. If $\sin x = \frac{1}{3}$ then the value of $\sin 3x$ is ?

(a) $\frac{11}{23}$ (b) $\frac{13}{27}$ (c) $\frac{19}{27}$ (d) $\frac{23}{27}$

Q62. A ladder 25 m long is leaning against a wall which is perpendicular to the level ground. The bottom of the ladder is 7 m from the base of the wall. If the top of the ladder slips down 4 m, how much will the bottom of the ladder slip?

(a) 7 m. (b) 8 m. (c) 10 m. (d) 15 m.

Q63. Two poles of heights 6 m. and 11m. stand vertically upright on a plane ground. If the distance between their feet is 12 m. what is the distance between their tops ?

(a) 13 m. (b) 11 m. (c) 12 m. (d) 14 m.

Q64. The angles of elevation of the top of tower from two points situated at distance 36m. and 64m from its base and in the same straight line with it are complimentary. What is the height of the tower?

(a) 50 m. (b) 48 m. (c) 25 m. (d) 24 m.

Q65. A chord AB ofa circle of radius 20 cm. makes a right angle at the centre of the circle. What is the area of the minor segment in cm^2?

(a) 31.4 cm^2 (b) 57 cm^2 (c) 62.8 cm^2 (d) 114 cm^2

Q66. If a wire of length 36 cm is bent in the form of a semi-circle, then what is the radius of the semi-circle?

(a) 9 cm (b) 8 cm (c) 7 cm (d) 6 cm

Q67. If the outer and inner diameters of a stone parapet around a well are 112 cm and 70 cm. respectively, then what is the area of the parapet?

(a) 264 sq cm (b) 3003 sq cm (c) 6006 sq cm (d) 24024 sq cm

Q68. If the area of a rectangle whose length is 5 units more than twice its width is 75 sq units, then what is the width?

(a) 3 units (b) 5 units (c) 7 units (d) 10 units

Q69. Three cubes of metal whose edges are 6 cm, 8 cm and 10 cm respectively are melted and a single cube is formed. What is the length of the edge of the newly formed cube ?

(a) 10 cm (b) 12 cm (c) 16 cm (d) 22 cm

Q70. The ratio of the surface areas of two hemispheres is 4 : 1. What is the ratio of their volumes?

(a) 8 : 1 (b) 4 : 1 (c) 3 : 1 (d) 2 : 1

Q71. a, b, c are non-zero integers such that (ab) divides (cd). If a and c are co-prime, then which one of the following is correct?

(a) a is a factor of c (b) a is a factor of b (c) a is a factor of d (d) d is a factor of a

Q72. The arithmetic mean of a set of 10 numbers is 20. If each number is first multiplied by 2 and then increased by 5, then what is the means of new number?

(a) 20 (b) 25 (c) 40 (d) 45

Q73. In a divisible operation, the dividend is five times the quotient and twice the remainder. If the remainder is 15, then what is the dividend?

(a) 175 (b) 185 (c) 195 (d) 250

Q74. What is the total number of three digit numbers with the unit digit 7 and divisible by 11?

(a) 6 (b) 7 (c) 8 (d) 9

Q75. Which one of the following is a prime number?

(a) 161 (b) 171 (c) 173 (d) 221

Q76. Greatest number which can divide 1354, 1886 and 2762 leaving the same remainder 10 in each case is ?

(a) 64 (b) 124 (c) 156 (d) 260

Q77. The greatest number by which, if 1657 and 2037 are divided the remainders will be 6 and 5 respectively is?

(a) 65 (b) 127 (c) 156 (d) 260

Q78. LCM of two numbers is 14 times their HCF. The sum of the LCM and HCF is 600. If one of the numbers is 280, then the other is?

(a) 40 (b) 60 (c) 80 (d) 100

Q79. 16.7 + 12.38 - ? = 10.09 ?

(a) 16.98 (b) 17.89 (c) 18.99 (d) 20.09

Q80. .000033 + .11 = ?

(a) .003 (b) .03 (c) .0003 (d) .3

Q81. $\sqrt{1.21} - \sqrt{.01} = ?$

(a) .99 (b) 1 (c) $\sqrt{1.2}$ (d) .82

Q82. If $\sqrt{3} = 1.732$, then the value of $\frac{1}{\sqrt{3}}$ is ?

(a) 0.617 (b) 0.313 (c) 0.577 (d) 0.173

Q83. A person sold an article for ₹ 3600 and got a profit of 20%. Had he sold the article for ₹ 3150, how much profit would he have got?

(a) 4% (b) 5% (c) 6% (d) 10%

Q84. A fruit seller has a certain number of mangoes of which 5% are rotten. He sells 75% of the remainder and is left with 95 mangoes. How many mangoes did he have originally?

(a) 500 (b) 450 (c) 400 (d) 350

Q85. 10 years ago Ram was 5 times as old as Shyam but 20 years later from now he will only be twice as old as Shyam. How many years old is Shyam?

(a) 20 years (b) 30 years (c) 40 years (d) 50 years

Q86. In a class, the number of boys is more than the number of girls by 12% of the total students. What is the ratio of the number of boys to that of the girls?

(a) 11 : 14 (b) 14 : 11 (c) 28 : 25 (d) 25 : 28

Q87. The ratio of the ages of A and B is 2 : 5 and the ratio of the ages of B and C is 3 : 4. What is the ratio of the ages of A, B and C ?

(a) 6 : 15 : 20 (b) 8 : 5 : 3 (c) 6 : 5 : 4 (d) 2 : 15 : 14

Q88. The population of a state increased from 100 million to 169 million in two decades. What is the average increase in population per decade?

(a) 20% (b) 34.5% (c) 69% (d)30%

Q89. Nine numbers are written in ascending order. The middle number is the average of the nine numbers. The average of the five larger numbers is 68 and that of five smaller numbers is 44. What is the sum of all nine numbers ?

(a) 450 (b) 501 (c) 504 (d) 540

Q90. If the mean age of combined group of boys and girls is 18 years and the mean age of boys is 20 and that of girls is 16, then what is the percentage of boys in the group ?

(a) 60 (b) 50 (c) 45 (d) 40

Q91. Harish and Kewal start a business jointly. If Harish invests Rs 7000 for 9 months and Kewal invests Rs 12000 for 7 months, then out of a total profit of Rs 2730, Harish gets.

(a) Rs 1170 (b) Rs 916 (c) Rs 1560 (d) Rs 2047.50

Q92. A. B and C enter into a partnership with a capital in which A's contribution is Rs 10000. If out of a total profit of Rs 1000, A gets Rs 500 and B gets Rs 300, then C's capital is: ?

(a) Rs 4000 (b) Rs 5000 (c) Rs 6000 (d) Rs 9000

Q93. A bicycle is sold at a gain of 16%. If it had been sold for Rs 60 more, 20% would have been gained. The cost price of the bicycle is:

(a) Rs 1050 (b) Rs 1200 (c) Rs 1500 (d) Rs 1800

Q94. By selling 45 oranges for Rs 80, a man loses 20%. How many should he sell for Rs 48 so as to gain 20% in the transaction?

(a) 25 (b) 18 (c) 15 (d) 20

Q95. A train 280m long is moving at a speed of 60km/h. What is the time taken by the train to cross a platform 220m long?

(a) 45 sec (b) 40 sec (c) 35 sec (d) 30 sec

Q96. A wheel of radius 2.1m of a vehicle makes 75 revolutions in 1 min. What is the speed of the vehicle?

(a) 78 km/h (b) 59.4 km/h (c) 37.4 km/h (d) 35.4 km/h

Q97. Two trains are moving in the same direction at 1.5 km/minute and 60 km/hour respectively. A man in the faster train observes that it takes 27 seconds to cross the slower train. The length of the slower train is:

(a) 225 m (b) 230 m (c) 240 m (d) 250 m

Q98. If 6 men and 8 boys can do a piece of work in 10 days while 26 men and 48 boys can do the same in 2 days, what is the time taken by 15 men and 20 boys in doing the same type of work?

(a) 4 days (b) 5 days (c) 6 days (d) 7 days

Q99. 45 people take 18 days to dig a pond. If the pond would have to be dug in 15 days, then the number of people to be employed will be?

(a) 50 (b) 54 (c) 60 (d) 72

Q100. A is twice as fast as B and B is thrice as fast as C. The journey covered by C in 42 minutes will be covered by A in?

(a) 14 min (b) 7 min (c) 28 min (d) 54 min

PART–II : ELEMENTARY MATHEMATICS

ANSWER PRACTICE TEST PAPER - 1

51. (c) 520 m.

Explanation:

Speed $= 15.6\ km \times h$

$= \frac{\cancel{15.6}^{26}}{\cancel{18}_{3}} \times \frac{5}{} = \frac{13}{3} m/s$

time $= 2\ min = 2 \times 60 = 120s$

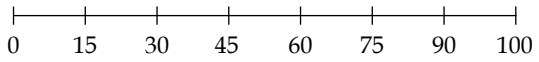
distance $= speed \times time$

$= \frac{13}{\cancel{3}_{1}} \times \frac{\cancel{120}^{4}}{} = 520\ m.$

52. (b) 11 hours

Explanation:

No. of hours she spend in riding only $= \frac{\cancel{100}}{\cancel{10}} = 10\ hours$



Time she spent in taking rest $= 6 \times 10 = 60\ minutes = 1\ hour$

Total time spent $= 10 + 1 = 11\ hours$

53. (c) 24

Explanation:

Let ones digit $= x$

ten digit $= 10 - x$

Two digit number $= 10\ (10 - x) + x$

$= 100 - 10x + x$

$= 100 - 9x$.

Number obtained on reverring the digits $= 10x + 10 - x$

$= 9x + 10$

According to condition

$100 - 9x - 18 = 9x + 10$

$82 - 10 = 9x + 9x$

$72 = 18x$

$x = \frac{\cancel{72}^{4}}{\cancel{18}_{1}}$

Ones digit $= x = 4$

Tens digit $= 10 - x = 10 - 4 = 6$

Product $= 4 \times 6 = 24$

54. (a) 7

Explanation: $x^2 - 4x + 11$

$a = 1\ b = -4$

The minimum value occurs

at $-\frac{b}{2a} = \frac{-(-4)}{2 \times 1} = \frac{4}{2} = 2$

Therefore, the expression

$x^2 - 4x + 11$ *is minimum at* $x=2$

So the minimum value is $(2^2 - 4 \times 2 + 11) = 11 - 4 = 7$

55. (c) 18

Explanation:

$6 + 5x - x^2 = (x^2 - 5x - 6)$

$- \left(x^2 - 5x + \frac{25}{4} - 6 - \frac{25}{4}\right)$

$= \frac{49}{4} - \left(x - \frac{5}{2}\right)^2$

Maximum value of expression $6 = 5x - x^2 = \frac{49}{4}$

$y - 6 - y^2 = -(y^2 - y + 6) = -\left(y^2 - y + \frac{1}{4} + 6 - \frac{1}{4}\right)$

$= -\frac{23}{4} - \left(y - \frac{1}{2}\right)^2$

Maximum value of expression $y - 6 - y = \frac{-23}{4}$

Therefore the difference between the maximum values

$\frac{49}{4} - \left(-\frac{23}{4}\right) = \frac{\cancel{72}^{18}}{\cancel{4}_{1}} = 18$

56. (b) 3

Explanation:

$\sec^2 60^o - 1$ $[\sec^2\theta - \tan^2\theta = 1]$

$\tan^2 60^o$

$= \sqrt{3}^{\,2}$

$= 3$

57. (c) 60^o

Explanation:

$\tan x = 3 \cot x$

$\tan x = \frac{3}{\tan x}$

$\tan^2 x = 3$

$\tan^{\cancel{2}} x = \sqrt{3}^{\,\cancel{2}}$

$\tan x = \tan 60^o$

$x = 60^o$

58. (a) *1*

Explanation:
$\sin 79^o \cos 11^o + \cos 79^o \sin 11^o$

$\sin 79^o \cos (90^o - 79^o) + \cos 79^o \sin (90^o - 79^o)$

$\sin 79^o . \sin 79^o + \cos 79^o . \cos 79^o$

$\sin^2 79^o + \cos^2 79^o = 1$

59. (c) *- 1*

Explanation:

$\cos 20^o + \cos 40^o + \cos 60^o + ... + \cos 160^o + \cos 180^o$

$\cos 20^o + \cos 40^o + \cos 60^o + \cos 80^o + \cos 100^o + \cos 120^o + \cos 140^o + \cos 160^o + \cos 180^o$

$= \cos 20^o + \cos 40^o + \cos 60^o + \cos 80^o + \cos (180^o - 80^o) + \cos (180^o - 40^o) + \cos (180^o - 20^o) + \cos 180^o$

$= \cancel{\cos 20^o} + \cancel{\cos 40^o} + \cancel{\cos 60^o} + \cancel{\cos 80^o}$

$\cancel{- \cos 80^o} \cancel{- \cos 60^o} \cancel{- \cos 40^o} \cancel{- \cos 20^o} + \cos 180^o$

$= -1$

60. (a) $\frac{1}{2}$

Explanation:

$\cos 70^o \cos 10^o + \sin 70^o \sin 10^o$

$\cos (70^o - 10^o)$ [$\cos A \cos B + \sin A \sin B = \cos(A - B)$]

$= \cos 60^o = \frac{1}{2}$

61. (d) $\frac{23}{27}$

Explanation:

$= \sin x = \frac{1}{3}$

$\sin 3x = 3 \sin x - 4 \sin^3 x$

$3 \times \frac{1}{3} - 4\left(\frac{1}{3}\right)^3$

$1 - \frac{4}{27}$

$\frac{27 - 4}{27} = \frac{23}{27}$

62. (b) 8 m

Explanation:

Let height at which ladder is placed

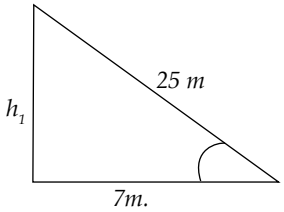
$= h^2 = 25^2 - 7^2$

$= 625 - 49$

$= 576$

$h^2 = 24^2$

$h = 24$



$h_1 = 24 - 4 = 20$

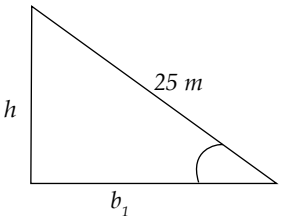
$b_1^2 = 25^2 - 20^2$

$= 625 - 400$

$= 225$

$b_1^2 = 15^2$

$b_1 = 15$



bottom of ladder is slipped by = 15 – 7 = 8m

63. (a) 13 m

Explanation:

Let AB and CD are two poles.

CE = 11 - 6 = 5 m.

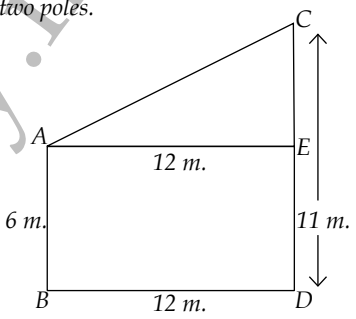
BD = AE = 12 m.

$AC^2 = 12^2 + 5^2$

$= 144 + 25$

$= 169$

$AC = 13$

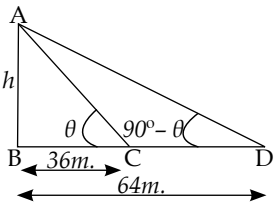


Distance between their tops = 13m.

64. (b) 48 m.

Explanation:

Let angles of elevation at C and D be θ and 90º– θ



In ΔABC

$\tan \theta = \frac{h}{36}$ *(1)*

In ΔABD

$\frac{AB}{BD} = \tan (90^o - \theta)$

$\frac{h}{64} = \cot \theta$ *(2)*

Multiply (1) and (2)

$\frac{h}{36} \times \frac{h}{64} = \tan \theta \times \cot \theta$

$\frac{h^2}{6^2 \times 8^2} = \cancel{\tan \theta} \times \frac{1}{\cancel{\tan \theta}}$

$h^2 = 48^2$

$h = 48$

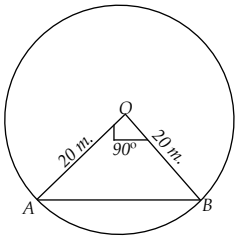
65. (d) 114 cm^2

Explanation:

In ΔAOB

$\angle O = 90^o$

OA = OB = 20 m.



In ΔOAB

$AB^2 = OA^2 + OB^2$

$AB^2 = 20^2 + 20^2$

$AB^2 = 2 \times 20^2$

$AB^2 = (20\sqrt{2})^2$

Area of sector $= \frac{1}{4} \times \pi \times 20^2$

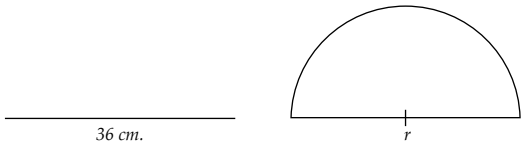
$\frac{1}{\cancel{4}} \times \frac{314}{1\cancel{00}} \times \cancel{20} \times \cancel{20} = 314\ cm^2$

Area of $\Delta = \frac{1}{\cancel{2}} \times 20 \times \cancel{20}^{10} = 200\ cm^2$

Area of minor segment $= 314\ cm^2 - 200\ cm^2$

$= 114\ cm^2$

66. (c) *7 cm*



Explanation:

$\pi r + 2r = 36$

$r(\pi + 2) = 36$

$r\left(\frac{22}{7} + 2\right) = 36$

$r\left(\frac{22+14}{7}\right) = 36$

$r \times \frac{36}{7} = 36$

$r = \cancel{36} \times \frac{7}{\cancel{36}} = 7$

67. (c) *6006 cm²*

Explanation:

$r = \frac{70}{2} = 35$

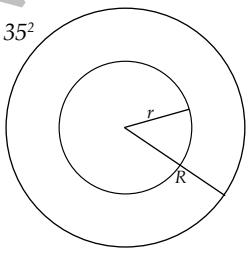
$R = \frac{112}{2} = 56$

Area of parapet $= \pi \times 56^2 - \pi \times 35^2$

$\pi(56^2 - 35^2)$

$\frac{22}{7} \times (56 + 35)(56 - 35)$

$\frac{22}{\cancel{7}_{1}} \times 91 \times \cancel{21}^{3} = 6006\ cm^2$



68. (b) 5

Explanation:

Let width $= x$

length $= 2x + 5$

Area $= 75$

$(2x + 5) \times x = 75$

$2x^2 + 5x - 75 = 0$

$2x^2 + 15x - 10x - 75 = 0$

$x(2x + 15) - 5(2x + 15) = 0$

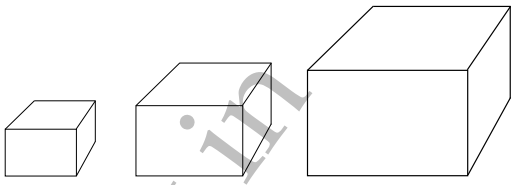
$(x - 5)(2x + 15) = 0$

$x - 5 = 0$

$x = 5$

69. (b) 12 m

Explanation:



6 cm. *8 cm.* *10 cm.*

Let side of new cube be x

$x^3 = 6^3 + 8^3 + 10^3$

$x^3 = 216 + 512 + 1000$

$x^3 = 1728$

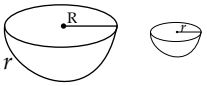
$x^{\cancel{3}} = 12^{\cancel{3}}$

$x = 12$

70. (a) 8

Explanation:

Let radii f two hemisphere be R and r



$\frac{\cancel{4\pi} R^2}{\cancel{4\pi} r^2} = \frac{4}{1}$

$\left(\frac{R}{r}\right)^2 = \left(\frac{2}{1}\right)^2$

Volume will be $\frac{2}{3}\pi R^3$ *and* $\frac{2}{3}\pi r^3$

Ratio of Volumes

$\frac{\frac{2}{\cancel{3}}\pi R^3}{\frac{2}{\cancel{3}}\pi r^3} = \left(\frac{R}{r}\right)^3 = \left(\frac{2}{1}\right)^3 = \frac{8}{1}$

71. (c) $\frac{cd}{ab}$

Explanation:

HCF of a and c will be 1 as they're clearly a is factor of d

72. (d) 45

Explanation:

Sum of 10 numbers $= 10 \times 20 = 200$

When each number is multiply by 2 and 5 is added to each then sum of numbers

$= 400 + 5 \times 10$

$= 450$

Mean of new number $= \frac{45\cancel{0}}{1\cancel{0}} = 45$

73. (c) 195

Explanation:

$p = qd + r$

$r = 15$

$p = 2 \times 15 = 30p = 5q$

$30 = 5q$

$\frac{\cancel{30}^{6}}{\cancel{5}_{1}} = q$

$q = 6$

$p = qd + r$

$= 30 \times 6 + 15$

$= 180 + 15 = 195$

74. (c) 8

Explanation:

Three digit numbers with unit digit 7 and divisible by 11

xy7 = Three digit numbers with unit digit 7

x, y are digits from 0 - 9 but $x \neq 0$ as xy7 is three digit number

xy7 is divisible by 11 So

$x - y + 7 = 0$

$x - y + 7 = 0$

$x + 7 = y$

x = 1 or 2

$x - 4 = y$

x = 4, 5, 6, 7, 8, 9

$x - y + 7 = 22$

$x - y = 15$

Not possible as x -y difference of digit

So possible numbers :

187, 247, 407, 517, 627, 737, 847, 957.

75. (c) 173

Explanation:

A. $161 > 13^2$. If 161 is a prime number then this is not divisible by any of the numbers 2, 3, 5, 7 and 11 but 161 is divisible by 7.

Hence 161 is not a prime number.

B. $171 < 14^2$ .For prime number 171 is not divisible by any of the number 2, 3, 5, 7, 11, 13. But it is divisible by 3.

Hence 171 is not a prime number.

C. $173 < 14^2$ .For prime number 173 is not divisible by any of the number 2, 3, 5, 7, 11 and 13.

Hence 173 is a prime number.

D. $221 < 15^2$ .For prime number 221 is not divisible by any of the number 2, 3, 5, 7, 11 and 13. But it is divisible by 13.

Hence 221 is not a prime number.

76. (a) 64

Explanation:

1354 - 10 = 1344

1866 - 10 = 1856

2762 - 10 = 2752

Factors of

1344 = 2 × 2 × 2 × 2 × 2 × 3 × 7

1856 = 2 × 2 × 2 × 2 × 2 × 2 × 29

2752 = 2 × 2 × 2 × 2 × 2 × 2 × 43

HCF = 2^6 = 64

The number is 64 which divides 1354, 1866, 2762 leaving a remainder of 10 in each case

77. (b) 2032

Explanation:

1657 - 6 = 1651

2037 - 5 = 2032

$$\begin{array}{r|l} 1651 & 2032\ (1 \\ & 1651 \\ \hline 381 & 1651\ (4 \\ & 1524 \\ \hline 127 & 381\ (3 \\ & 381 \\ \hline & \times \end{array}$$

The greatest numbers by which 1657 and 2037 are divided the remainders will be 6 and 5 respectively is 127

78. (c) 80

Explanation:

Let HCF = x

LCM = 14x

14x + x = 600

15x = 600

$x = \frac{\cancel{600}^{40}}{\cancel{15}_{1}} = 40$

LCM = 14 × 40 = 560

Product of two number = HCF × LCM

250 × y = 40 × 560

$y = \frac{\cancel{40} \times \cancel{560}^{2}}{\cancel{280}_{1}} = 80$

79. (c) 18.99

Explanation:

Let the required number be x

16.7 + 12.38 - x = 10.09

16.7 + 12.38 - 10.09 = x

18.99

80. (c) 0.0003

Explanation:

0.000033 ÷ 0.11

$$\frac{0.000033}{0.11}$$

$$\frac{33}{1000000} \times \frac{100}{11} = 0.0003$$

81. (b) 1

Explanation:

$\sqrt{1.21} - \sqrt{0.01}$

1.1 - 0.1

1

82. (c) 0.577

Explanation:

$\sqrt{3} = 1.732$

$$\frac{1}{\sqrt{3}} = \frac{1}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$$

$$\frac{1.732}{3}$$

0.577

83. (b) 5%

Explanation:

SP = 3600

Profit % = 20%

$CP = 3600 \times \frac{100}{120} = 3000$

New SP = 3150

Profit = 3150 - 3000

= 150

$Profit\% = \frac{150}{3000} \times 100 = 5\%$

84. (c) 400

Explanation:

Let no. of mangoes be x

$No.\ of\ rotten\ mangoes = \frac{5}{100}x$

$No.\ of\ rest\ mangoes = \frac{95}{100}x$

$No.\ of\ sold\ mangoes = 75\%\ of\ \frac{95}{100}x$

$$\frac{75}{100} \times \frac{95}{100}x = \frac{7125}{10000}x$$

$$\frac{95}{100}x - \frac{7125}{10000}x = 95$$

$$\frac{95}{100}x\left(1 - \frac{75}{100}\right) = 95$$

$$\frac{95}{100}x \times \frac{25}{100} = 95$$

$$x = 95 \times \frac{100}{95} \times \frac{100}{25} = 400$$

85. (a) 20 years

Explanation:

Let the ages of Ram and Sham 10 yrs ago = 5x and x

Ages of Ram and Sham now = 5x +10, x +10

Their ages 20 years later =

5x + 10 + 20, x + 10 + 20

5x + 30, x + 30

A.T.Q.

5x + 30 = 2(x + 30)

5x + 30 = 2x + 60

5x - 2x = 60 - 30

3x = 30

$x = \frac{30}{3} = 10$

Present age of Sham = x + 10

10 + 10 = 20 years

86. (c) $\frac{28}{25}$

Explanation:

Let no. of girls = x

$No.\ of\ boys = \frac{112}{100}x \div x$

$Ratio = \frac{112}{100}x \times \frac{1}{x} = \frac{28}{25}$

87. (a) *6: 15 : 20*

Explanation:

A : B = 2 : 5 = 6 : 15

B : C = 3 : 4 = 15 : 20

A : B : C = 6 : 15 : 20

88. (d) *30%*

Explanation:

Earlier population = 100 million

Present population = 169 million

$100\left(1+\frac{R}{100}\right)^2 = 169$

$\left(1+\frac{R}{100}\right)^2 = \frac{169}{100}$

$\left(1+\frac{R}{100}\right)^2 = \left(\frac{13}{10}\right)^2$

$\frac{R}{100} = \frac{3}{10}$

$R = \frac{3}{\cancel{10}} \times \cancel{100} = 30\%$

89. (c) 504

Explanation:

Let nine number in ascending order are

$x_1, x_2, x_3, x_4, x_5, x_6, x_7, x_8, x_9$

Sum of last 5 numbers $5 \times 68 = 340$ *(1)*

Sum of first 5 numbers= $5 \times 44 = 220$ *(2)*

$x_1 + x_2 + x_3 + x_4 + x_5 + x_6 + x_7 + x_8 + x_9 = 9x_5$

Adding (1) and (2)

$x_1 + x_2 + x_3 + x_4 + 2x_5 + x_6 + x_7 + x_8 + x_9 = 560$

Subtract (3) and (4)

$x_5 = 560 - 9x_5$

$10x_5 = 560$

$x_5 = \frac{\cancel{560}}{\cancel{10}} = 56$

Sum of 9 numbers $= 9x_5$

$9 \times 56 = 504$

90. (b) 50%

Explanation:

Let number of boys be x and number of girls be y

Sum of ages of boys = 20x

Sum of ages of girls = 16y

Sum of ages of boys and girls = 18 (x +y)

$20x + 16y = 18(x+y)$

$20x + 16y = 18x + 18y$

$20x - 18x = 18y - 16y$

$2x = 2y$

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

Percentage of boys = 50%

91. (a) 1170

Explanation:

Harish : Kewal

$7000 \times 9 : 12000 \times 7$

$3 : 4$

Harish gets $\frac{3}{3+4} \times 2730$

$\frac{3}{\cancel{7}} \times \cancel{2730}^{390} = 1170$

92. (a) 4000

Explanation:

C's profit is = 1000 - (1500 + 300)

1000 - 800 = 200

A : B : C

500 : 300 : 200

If value of 5 = 10000

Then value of 1 $= \frac{\cancel{10000}^{2000}}{\cancel{5}}$

So value of 2 = 2000 × 2 = 4000

C's capital is = ₹*4000*

93. (c) 1500

Explanation:

Let CP be = ₹ *100*

SP = 116

New SP = 120

difference = 120 - 116 = ₹ *4*

If difference is ₹ *4 then CP =* ₹ *100*

Then difference ₹*60* $= \frac{100 \times \cancel{60}^{15}}{\cancel{4}}$

= ₹*1500*

94. (b) 18

Explanation:

CP of 45 oranges $= \cancel{80}^{1} \times \frac{100}{\cancel{80}_{1}} = 100$

CP of 1 oranges $= \frac{\cancel{100}^{20}}{\cancel{45}_{9}} = \frac{20}{9}$

gain % = 20%

SP of 1 oranges $= \frac{\cancel{20}}{\cancel{9}_{3}} \times \frac{\cancel{120}^{4}}{\cancel{100}} = \frac{8}{3}$

No. of oranges he sells for ₹*48* $= \frac{48}{8/3}$

$= \cancel{48}^{6} \times \frac{3}{\cancel{8}_{1}} = 18$

95. (d) 30 sec

Explanation:

Speed = 60 km/h

$= \cancel{60}^{10} \times \frac{5}{\cancel{18}_{3}} = \frac{50}{3}$ *m/s*

Time to cross a platform $= \frac{280 + 220}{50/3}$

$\cancel{500}^{10} \times \frac{3}{\cancel{50}_{1}} = 30$ *sec.*

96. (b) 59.4 km/h

Explanation:

Distance covered in 1 revolution

$2\pi r = 2 \times \frac{22}{7} \times 2.1$

$2 \times \frac{22}{\cancel{7}} \times \frac{\cancel{21}^{3}}{10} = 13.2$ *m*

Distance covered in 75 revolution

75 × 13.2

$\cancel{75}^{15} \times \frac{\cancel{132}^{66}}{\cancel{10}_{5}} = 990$*m*

$\frac{990}{1000} = 0.99$ *km*

time = 1min $= \frac{1}{60}$*h*

speed $= \frac{Distance}{time}$

$\frac{0.99}{1/60} = \frac{99}{\cancel{100}} \times \cancel{60} = 59.4$ *km/h*

97. (a) 225 m

Explanation:

Distance covered in 60 sec = 1.5 km = 1500m

distance covered in 1 sec $= \frac{\cancel{1500}^{25}}{\cancel{60}_{1}} = 25$*m*

speed = 25m/s

speed of second train = 60km/h $= \cancel{60} \times \frac{5}{\cancel{18}_{3}} = \frac{50}{3}$*m/s*

Relative speed of train $= 25 - \frac{50}{3}$

$\frac{75 - 50}{3} = \frac{25}{3}$

length of slower train $= \frac{25}{\cancel{3}_{1}} \times \cancel{27}^{9} = 225$*m*

98. (a) 4 days

Explanation:

Let 1 man's 1day's work = x

and 1 boy's 1 day's work = y

$6x + 8y = \frac{1}{10}$ *(1)*

$26x + 48y = \frac{1}{2}$ *(2)*

Performing (1) × 6 and subtract (2) we get

$(36x + 48y)\ (26x + 48y) = \frac{6}{10} - \frac{1}{2}$

$10x = \frac{1}{10}$

$x = \frac{1}{100}$

Putting $x = \frac{1}{100}$ *in (1)*

$\frac{6}{100} + 8y = \frac{1}{10}$

$8y = \frac{1}{10} - \frac{6}{100} = \frac{4}{100}$

$y = \frac{1}{200}$

(15 men's + 20 boys's) is day's work $= \frac{15}{100} + \frac{20}{200} = \frac{1}{4}$

So 15 men and 20 boys shall complete the work in 4 days

99. (b) 54

Explanation:

Given $M_1 = 45$ $D_1 = 18$

$M_2 = ?$ $D_2 = 15$

By usng formula

$M_1D_1 = M_2D_2$

$45 \times 18 = M_2 \times 15$

$\frac{\cancel{45}^{9} \times \cancel{18}^{6}}{\cancel{15}_{1}} = M_2$

$M_2 = 54$

100. (b) 4 days

Explanation:

Let C's speed be x meters/min

Let time taken by A be y min.

Then B's speed = 3x meters/min

And A' speed = 6x meters/min

Ratio of A and C = Ratio of time taken by C and A

6x : x = 42 : y

$\frac{6x}{x} = \frac{42}{y}$

y = 7 min