PRELIMINARY INTERVIEW BOARD

TERRITORIAL ARMY COMMISSION : 28 JULY 2019

PAPER-1: REASONING & ELEMENTARY MATHEMATICS

A1

Max Time : 2 Hours **Max Marks : 100**

Roll No……..

(Please Read The Instructions Carefully)

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 0.33 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 0.33 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, a candidate must obtain minimum 40% marks each in Part I & II separately and a minimum of 50% aggregate in total.

PART-1 : REASONING

Direction In each of the following question a number of series is given with one term missing. Choose the correct alternative that will continue the same pattern.

Q1. 2, 3, 5, 7, 11, ___, 17
(a) 12 **(b) 13** (c) 14 (d) 15

Explanation

The given series consists of prime numbers starting from 2. The prime number after 11 is 13. So, 13 is the missing number.

Q2. 23, 48, 99, 203, 413 ___
(a) 927 **(b) 837** (c) 937 (d) 437

Explanation

The pattern is × 2 + 2 (prime number), × 2 + 3 (next prime number), × 2 + 5 (next prime number), × 2 + 7 (next prime number), × 2 + 11 (next prime number), So the series is 23 × 2 + 2 = 48, 48 × 2 + 3 = 99, 99 × 2 + 5 = 203, 203 × 2 + 7 = 413, 413 × 2 + 11 = 837 *. So the answer is 837*

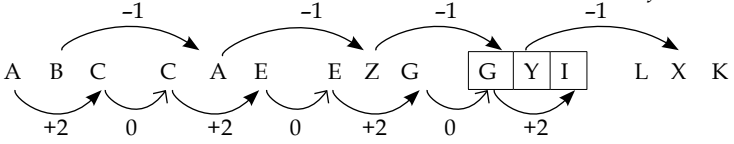
Q3. 225, 336, 447, 558, ___ 7710
(a) 690 (b) 660 (c) 689 **(d) 669**

Explanation

The first two digits of the number in the given series are 22, 33, 44, 55, ……, 77. The third digit of the number from the series 5, 6, 7, 8, …, 10. So, the first two digits of the missing number are 66 and the third digit is 9. Hence the missing number is 669.

Q4. ABC, CAE, EZG, ___, LXK
(a) HUL (b) FAH **(c) GYI** (d) FYH

Explanation - *Pattern follows as*



Q5. ___ ___ G ___ C ___ G K ___ P G ___
(a) K C P C P K **(b) C P K P C K** (c) P K C P K P (d) C P P K C P

Explanation

The series is divided into group of four letters.

		G	
C		G	K
	P	G	

Direction Choose the correct alternative which shows the same relationship.

Q6. Menu : Food : : Catalogue : ?
(a) Rack (b) Newspaper (c) Library (**d) Books**

Explanation

Menu lists all the food items in a restaurant. Similarly, catalogue is a list of all the books in a library.

Q7. 42 : 56 : : 110 : ?
(a) 182 **(b) 132** (c) 136 (d) 156

Explanation

Clearly the relationship is 6 × 7 = 42 : 7 × 8 = 56 :: 10 × 11 = 110 : 11 × 12 = $\boxed{132}$

Direction Choose the odd one out in question 8 to 11.

Q8. Find the odd one out.
Arrow, Axe, Knife, Sword
(a) Arrow (b) Axe (c) Knife (d) Sword

Explanation

All except Arrow are used while holding in hand.

Q9. Find the odd one out.
Bake, Peel, Fry, Boil
(a) Bake **(b) Peel** (c) Fry (d) Boil

Explanation

All except peel are forms of cooking.

Q10. Find the odd one out.
MONDAY, TUESDAY, FRIDAY, SUNDAY
(a) MONDAY **(b) TUESDAY** (c) FRIDAY (d) SUNDAY

Explanation

All except Tuesday contain 6 letters.

Q11. Find the odd one out.
Ear, Lung, Eye, Heart, Kidney
(a) Ear (b) Lung (c) Eye **(d) Heart**

Explanation

All except Heart are present in the human body in a pair

Q12. If $\sqrt{AFI}$: 13 : : $\sqrt{DDA}$: ?
(a) 12 (b) 22 **(c) 21** (d) 24

Explanation

$\sqrt{AFI}$: 13 :: $\sqrt{DDA}$: ?
↓↓↓ ↓↓↓
$\sqrt{169}$: 13 :: $\sqrt{441}$: $\boxed{21}$ *Thus the code for DDA is 441 = 21 × 21.*

Q13. If white is called blue, blue is called red, red is called yellow, yellow is called green, green is called black, black is called violet and violet is called orange, what would be the colour of human blood?
(a) Red (b) Green **(c) Yellow** (d) Violet

Explanation

Human blood colour is 'red', but 'red' is called 'yellow'. So, human blood is 'yellow'.

Q14. In a certain code language, '324' means 'Light is bright', '629' means 'Girl is beautiful' and '4758' means 'I prefer bright colours', which digit means 'Light' in the language?
(a) **3** (b) 2 (c) 4 (d) 7

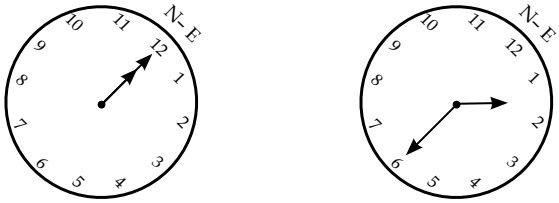
Explanation

As 3=light, 2=is, 4=bright, 6=girl, 2=is, 9=beautiful, So, light=3.

Q15. A clock is so placed that at 12 noon its minute hand points toward North-east. In which direction does its hour hand point at 1.30 PM?
(a) North (b) South **(c) East** (d) West

Explanation

Clearly, the positions of the minute and hour hands at 12 noon and 1:30 p.m. are as shown in the diagram. So, as shown, the hour hand at 1:30 p.m. points towards the East.



Q16. In a class of 60, the number of girls are twice that of boys. Kamal ranked seventeenth from the top. If there are nine girls ahead of Kamal, how many boys are behind him in rank?
(a) 3 (b) 7 **(c) 12** (d) 23

Explanation

In a class of 60, the number of girls are twice that of boys. Clearly there are 20 boys and 40 girls.
Kamal rank is 17th, so the number of boys ranked ahead of Kamal if there are 9 girls ahead of him = (17 – 9) = 8
the number of boys behind him in rank are = (20 – 8) = 12

Q17. In a row of girls facing North, Reena is 10th to the left of Pallavi, who is 21st from the right end. If Malini who is 17th from left end, is fourth to the right of Reena, how many girls are there in the row?
(a) 37 **(b) 43** (c) 44 (d) 16

Explanation

Pallavi is 21st from right and Reena is 10th to the left of Pallavi.
So, Reena is 31st from right.
Malini is 4th to the right of Reena.
So, Malini is 27th from the right.
Also, Malini is 17th from the left.
Therefore number of girls in the row = (26 + Malini + 16) = 43

Q18. A is father of C and D is the son of B. E is the brother of A, C is the sister of D, how is B related to E ?
(a) Daughter (b) Brother-in-law (c) Husband **(d) Sister-in-law**

Explanation

A is father of C and C is sister of D. So, A is father of D. But D is son of B. So, B must be mother of C and D and wife of A. Now as E is brother of A. So, B will be Sister-in-Law (Bhabhi) of E.

Q19. B is the husband of P. Q is the only grandson of E, who is the wife of D and mother-in-law of P. How is B related to D?
(a) Nephew (b) Cousin (c) Son-in-law **(d) Son**

Explanation

B is the husband of P and E is mother-in-law of P. So, B is the son of E. Also, E is wife of D. Thus, B is the son of D

Q20. Pointing to Kapil, Shilpa said, "His mother's brother is the father of my son Ashish." How is Kapil related to Shilpa?
(a) Sister-in-law **(b) Nephew** (c) Niece (d) Aunt

Explanation

Father of shilpa's son is Shilpa's husband. So, Kapil is the son of Shipa's husband's sister. Thus, Kapil is Shilpa's nephew

Q21. A family has a man, his wife, their four sons and their wives. The family of every son also has 3 sons and one daughter. Find out the total number of male members in the whole family?
(a) 4 (b) 8 (c) 12 **(d) 17**

Explanation

Man himself = 1, his 4 sons = 4, all four son's have 3 sons each (3 x 4) =12. So total male members are (1 + 4 + 12) = 17.

Q22. In certain Code DELHI is coded as 73541 and CALCUTTA as 82589662, how can CALICUT be coded ?
(a) 5279431 (b) 5978213 **(c) 8251896** (d) 8543691

Explanation

The alphabets are coded as follows : D=7, E=3, L=5, H=4, I=1, C=8, A=2, U=9, T=6, Thus, the code for CALICUT is 8251896.

Q23. If ACNE can be coded as 3-7-29-11, then BOIL will be coded as ?
(a) 5-29-19-27 (b) 5-29-19-25 (c) 5-31-21-25 **(d) 5-31-19-25**

Explanation

Every letter's position of alphabetical order is multiplied by two then added by one.
For example- A= 1 × 2 + 1 = 3, C = 3 × 2 + 1 = 7, N = 14 × 2 + 1 = 29, E = 5 × 2 + 1 = 11.
In the same way. B = 2 × 2 + 1 = 5, O = 15 × 2 + 1 = 31, I = 9 × 2 + 1 = 19, L =12 × 2 + 1 = 25.

Q24. A, B, C, D and E are five friends. A is shorter than B but taller than E. C is the tallest. D is shorter than B and taller than A. Who has two persons taller and two persons shorter than him/ her ?
(a) A (b) B (c) C **(d) D**

Explanation

Final ranking of height in descending order is as C > B > D > A > F. So D has two persons taller and two persons shorter than him.

Q25. If × means –, + means ÷ , - means × and ÷ means + than
15 - 2 ÷ 900 + 90 × 100 = ?
(a) 190 (b) 180 (c) 90 **(d) -60**

Explanation

Using the correct symbols we get expression given below
15 × 2 + 900 ÷ 90 – 100 = – 60

Q26. If 'a' means 'plus', 'b' means 'minus', 'c' means 'multiplied by' and 'd' means 'divided by' then
18 c 14 a 6 b 16 d 4 = ?
(a) 63 **(b) 254** (c) 288 (d) 1208

Explanation

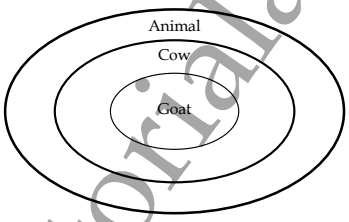
Using the correct symbols we get expression given below
18 × 14 + 6 - 16 ÷ 4 = 254

Direction Consider the given statements to be true and decide which of the given conclusion/assumptions can definitely be drawn from the given statement.

Q27. Statements
(a) All goats are cows. (b) All cows are animals.

Conclusion
(I) All goats are animals. (II) All animals are goats.
(a) **Only conclusion I follows.** (b) Only conclusion II follows.
(c) Both conclusion I and II follows. (d) Neither conclusion I nor II follows.

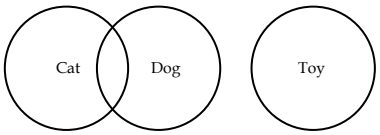
Explanation



Q28. Statements
(a) Some cats are dogs. (b) No dog is a toy.

Conclusion
(I) Some dogs are cats. (II) Some toys are cats.
(III) Some cats are not toys. (IV) All toys are cats.
(a) Only conclusion I and III follows. (b) Only conclusion II and III follows.
(c) Only conclusion I and II follows. (d) Only conclusion I follows.

Explanation



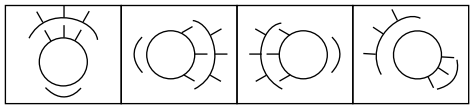
Q29. 1.12.91 is the first Sunday. Which is the fourth Tuesday of December 91?
(a) 17.12.91 **(b) 24.12.91** (c) 26.12.91 (d) 31.12.91

Explanation

1.12.91 is the first Sunday of December 91. So, 3.12.91 is the first Tuesday of the month. Clearly, 10.12.91, 17.12.91, 24.12.91 and 31.12.91 are also Tuesdays. So, 24.12.91 is the fourth Tuesday.

Direction Each of the following problems (Q30 and 32), contains 4 figures marked (a), (b), (c), (d). Find the odd figure.

Q30.

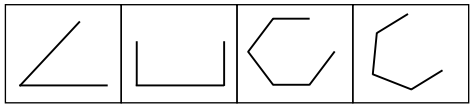


(a) (b) (c) **(d)**

Explanation

All lines out side the circle are in the same direction except figure (d).

Q31.

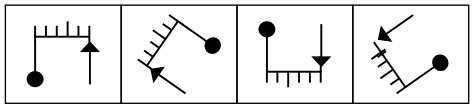


(a) **(b)** (c) (d)

Explanation

Only one line is required to complete the figures (a), (b), (c), i.e. triangle rectangle pentagon and but two lines are required to complete the figure (d) i.e. hexagon

Q32.



(a) (b) (c) **(d)**

Explanation

From arrow side fourth line is bigger than rest of the lines except in figure (a)

Direction Each of the problems (Q 33 to 36), contains four figures marked as (A), (B), (C), (D) and answer figures marked as (a), (b), (c) and (d). Select a figure from amongst the answer figures which will continue in the same series as given in the problem figure.

Q33. Find out the next figure

(A) (B) (C) (D) (a) **(b)** (c) (d)

Explanation

Black and white dots are replacing each other and mark in the figures is rotating clock wise.

Q34. Find out the next figure

(A) (B) (C) (D) (a) (b) (c) **(d)**

Explanation

Arrow is moving clock wise and pin one is moving an anticlock wise.

Q35. Find out the next figure

(A) (B) (C) (D) (a) (b) (c) **(d)**

Explanation

Horizontal rectangle is moving and clockwise and vertical rectangle is moving anticlock wise.

Q36. What number must be added to 6, 16 and 8 to get an average of 13?

(a) **22** (b) 25 (c) 20 (d) 18

Explanation

To get an average of 13, total of four numbers must be 13 x 4 = 52. Now total is 6 + 16 + 8 = 30. So, 52 – 30 = 22 must be added to 6, 16, and 8 to get an average of 13

Q37. 10 cats caught 10 rats in 10 seconds. How many cats are required to catch 100 rats in 100 seconds?

(a) 100 **(b) 10** (c) 20 (d) 50

Explanation

10 cats caught 10 rats in 10 seconds. It means one cat can catch one rat in 10 seconds.
In 100 seconds one cat can catch 10 rats. So in 100 seconds 10 cats can catch 100 rats

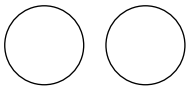
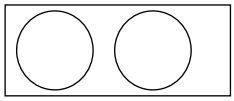
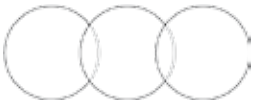
Q38. Find the pair where relationship does not exist?

(a) Spoon, Water (b) Glass, Juice (c) Cup, Tea (d) **Knife, Fruit**

Explanation

In all other pairs, we need first one when we have second one but we do not need spoon if we need to have water.

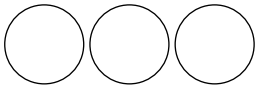
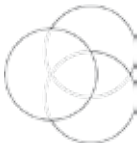
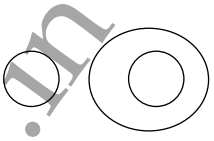
Q39. Which diagram depicts the correct relationship between Army, Navy and Air Force?

(a)  (b)  **(c)**  (d) 

Explanation

Army, Navy and Air Force are different forces but having many common ventures.

Q40. Which diagram depicts the correct relationship?
Godavari, Brahamputra, Majauli

(a)  (b)  (c)  **(d)** 

Explanation

Godavari and Brahamputra are two different rivers but Majuli is the river island of the river Brahmaputra.

Direction.

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26

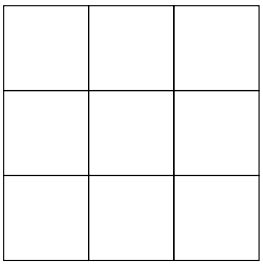
Q41. Find the letters?
COMPUTER : FQPRXVHT : : LANGUAGE : ?
(a) OXPIXDIG (b) OCQICYIG **(c) OCQIXCJG** (d) OCIXCIG

Explanation

Every odd number letter of the word is moved three steps forward to obtain the corresponding letter of the code and every even number letter of the word is moved two steps forward to obtain the corresponding letter of the code.
L + 3 = O, A + 2 = C, N + 3 = Q, G + 2 = I, U + 3 = X, A + 2 = C, G + 3 = J, E + 2 = G.

Direction Study the figure and answer Q no. 42 and 43.

Q42. How many maximum squares are in the following figure?

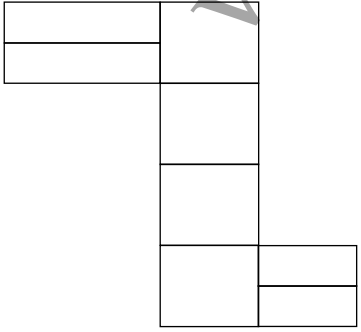


(a) 9 (b) 10 (c) 13 **(d) 14**

Explanation

14 Squares

Q43. Count the number of rectangles in the figure.

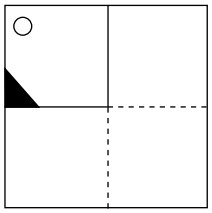


(a) 8 (b) 17 **(c) 18** (d) 19

Explanation

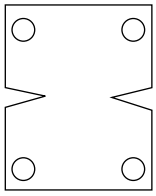
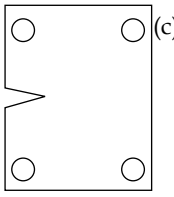
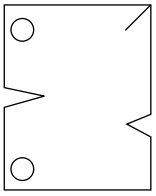
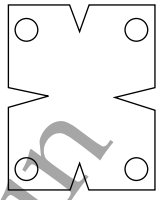
18 Rectangles

Q44. A square sheet is folded along dotted lines and holes/ cuts are made as shown. ○ is hole ◣ is cut. Choose the diagram that depicts how would paper look when unfolded completely?



Depicts Hole ○

Depicts Cut ◣

(a)  (b)  (c)  (d) 

Explanation

A square sheet is folded along dotted lines and holes/ cuts are made as shown. is hole is cut. Choose the diagram that depicts how would paper look when unfolded completely?

Q45. Fill up the missing number.

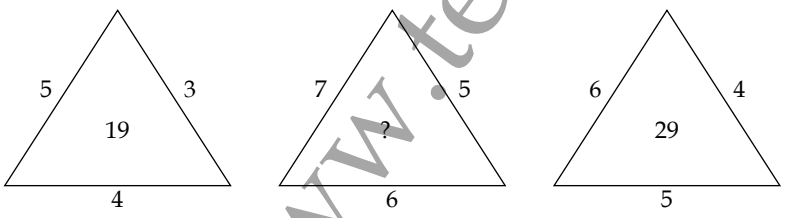
1	2	3
11	7	5
120	45	?

(a) 15 **(b) 16** (c) 17 (d) 18

Explanation

We could see the pattern as when we go to the first column as 1, 11, 120,
We observe that: 112 – 12 means 121 – 1 = 120
Similarly now we consider the second column and observe the same pattern as 2, 7, 45,
72 – 22 means 49 – 4 = 45
Now we consider the third column 3, 5, ?
Hence, the value in the missing place is calculated as:
55 – 32 means 25 – 9 = 16
Hence, the missing number is: 16

Q46. Find the missing number.



(a) 25 (b) 37 **(c) 41** (d) 47

Explanation

The rule is 3 × 5 + 4 = 19; 5 × 7 + 6 = 41; 4 × 6 + 5 = 29

∴ the missing number is 41. Hence, the answer is (c)

Q47. Find the missing number

12	6	3
16	8	4
128	?	2

(a) 64 (b) 130 **(c) 16** (d) 256

Explanation

12/2 = 6 6/2 = 3
16/2 = 8 8/2 = 4
128/8 = 16 16/8 = 2

Q48. Fill up the missing letter and number.

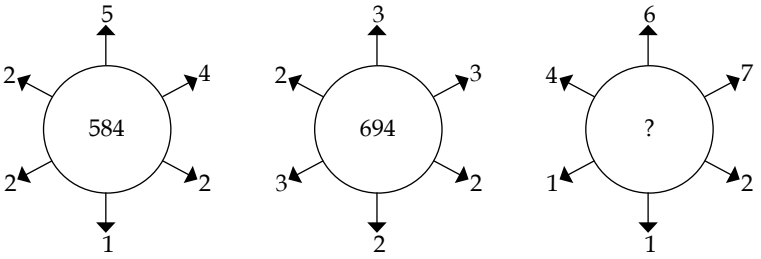
A2	C4	E6
G3	I5	?
M5	O9	Q14

(a) L10 (b) K15 (c) J15 **(d) K8**

Explanation

How the number is obtained 2 + 4 = 6, 3 + 5 = 8, (8 should be in the box) 5 + 9 = 14.
Alternates of alphabet are taken A _ C _ E _ G _ I _ K _ M _ O _ Q (K is to be in the box)
So answer is K8

Q49. Fill up the missing number.



(a) 937 (b) 824 (c) 769 **(d) 678**

Explanation

In the first figure: 5 × 1 = 5; 4 × 2 = 8; 2 × 2 = 4
In the second figure: 2 × 3 = 6; 3 × 3 = 9; 2 × 2 = 4
∴ In the third figure: 6 × 1 = 6; 7 × 1 = 7; 4 × 2 = 8
∴ the answer is 678 i.e. (d).

Q50. From a meaningful word and answer as per given code.

D O R E K B A Y
1 2 3 4 5 6 7 8

(a) 5 4 3 6 7 8 2 1 (b) 5 4 8 2 6 7 3 1 **(c) 5 4 8 6 2 7 3 1** (d) 5 4 8 6 2 7 1 3

Explanation

D O R E K B A Y
1 2 3 4 5 6 7 8
So 5 4 8 6 2 7 3 1 is K E Y B O A R D

PART-II : ELEMENTARY MATHEMATICS

Q51. Insert two rational numbers between 3/5 and 2/3.

(a) $\frac{21}{10}, \frac{10}{15}$ (b) $\frac{15}{20}, \frac{11}{12}$ **(c)** $\frac{\mathbf{19}}{\mathbf{30}}, \frac{\mathbf{37}}{\mathbf{60}}$ (d) $\frac{41}{20}, \frac{16}{25}$

Explanation

$\frac{3}{5}$ **and** $\frac{2}{3}$

$\frac{\frac{3}{5} + \frac{2}{3}}{2} = \frac{\frac{9+10}{15}}{2} = \frac{19}{30}$ *[Rational Number a and b* $= = \frac{a+b}{2}$*]*

$\frac{\frac{3}{5} + \frac{19}{30}}{2} = \frac{\frac{18+19}{30}}{2} = \frac{37}{60}$

Q52. The rational number lying between $\sqrt{2}$ and $\sqrt{3}$ is

(a) $\frac{49}{28}$ **(b)** $\frac{\mathbf{56}}{\mathbf{35}}$ (c) $\frac{63}{45}$ (d) $\frac{85}{66}$

Explanation

$\sqrt{2} = 1.414$ $\sqrt{3} = 1.732$

$\frac{49}{28} = 1.75$ $\frac{56}{35} = 1.6$

$\frac{63}{45} = 1.4$ $\frac{85}{66} = 1.287$

$\frac{56}{35} = 1.6$ *lies between* $\sqrt{2}$ *and* $\sqrt{3}$

Q53. Find the value of :-

$$\frac{5.49 \times 5.49 \times 5.49 - 1.49 \times 1.49 \times 1.49}{5.49 \times 5.49 + 5.49 \times 1.49 + 1.49 \times 1.49}$$

(a) 2 **(b) 4** (c) 6 (d) 8

Explanation

$$\frac{5.49 \times 5.49 \times 5.49 - 1.49 \times 1.49 \times 1.49}{5.49 \times 5.49 + 5.49 \times 1.49 + 1.49 \times 1.49}$$

$\frac{a^3 - b^3}{a^2 + b^2 + ab} = a - b$

Here $a = 5.49$ $b = 1.49$

So $a - b = 5.49 - 1.49 = 4$

Q54. The numbers X, X + 2, x + 4 are all prime numbers. What is the value of x ?

(a) **3** (b) 2 (c) 11 (d) 17

Explanation

Let the least value price be x.

Then the next value is x + 20, and the next value is x + 40 and on and on up to 7 values.

It's nothing but an arithmetic progression with sum 700.

$x + x + 20 + x + 40 + \ldots x + 120 = 700$

$7x + (20 + 40 + \ldots + 120) = 700$

$7x + 20\,(1 + 2 + 3 + \ldots + 6) = 700$

$7x + 20\,(21) = 700$

$7x = 280$

$\Rightarrow x = \frac{\cancel{280}^{40}}{\cancel{7}_{1}} = 40$

Q55. How many factors of $2^5 \times 3^6$ are perfect squares?

(a) 9 **(b) 12** (c) 18 (d) 4

Explanation

$2^5 \times 3^6$

- 2^0 3^0
- 2^1 3^1
- 2^2 3^2
- 2^3 3^3
- 2^4 3^4
- 2^5 3^5
- 3^6

[Even powers of 2 can be selected in 3 ways and in the same way even powers of 3 can be selected in 4 ways]

$= 3 \times 4 = 12$

Q56. If $\sqrt[3]{\frac{x}{27}} = \frac{5}{3}$ than value of x is

(a) **125** (b) 25 (c) 27 (d) 9

Explanation

$\sqrt[3]{\frac{x}{27}} = \frac{5}{3}$

Cubing both side $\left(\sqrt[3]{\frac{x}{27}}\right)^3 = \left(\frac{5}{3}\right)^3$

$\frac{x}{27} = \frac{125}{27}$ $x = 125$

Q57. If sum of five consecutive integers is 'S', then largest of these integers in terms of S will be :-

(a) $\frac{S-10}{5}$ (b) $\frac{S+4}{4}$ (c) $\frac{S+5}{4}$ **(d)** $\frac{\mathbf{S+10}}{\mathbf{5}}$

Explanation

Let five consecutive integers be x, x + 1, x + 2, x + 3, x + 4

$x + x + 1 + x + 2 + x + 3 + x + 4 = S$

$5x + 10 = S$

$5x = S - 10$

$x = \frac{S-10}{5}$

Largest number $= x + 4 = \frac{S-10}{5} + 4$

$= \frac{S-10+20}{5} = \frac{S+10}{5}$

Q58. A number is an much greater than 36 as is less than 86. Find the number.

(a) **61** (b) 71 (c) 81 (d) 51

Explanation

$36 + x$	=	$86 - x$
$2x$	=	$86 - 36$
$2x$	=	50
x	=	25

The number $= 36 + x = 36 + 25 = 61$

Q59. The LCM of two numbers is 90 times their HCF. The sum of LCM and HCF is 1456. If one of the number is 160, then what is the other number?

(a) 120 (b) 136 **(c) 144** (d) 184

Explanation

LCM	=	$90 \times HCF$
Let HCF	=	x
LCM	=	$90 \times x = 90x$
LCM + HCF	=	*1456*
$90x + x$	=	*1456*
$91x$	=	*1456*
x	=	$\frac{1456}{91}$ 112 16 7

$x = 16$

$LCM = 90x = 90 \times 16 = 1440$

$HCF = x = 16$

$One\ number = 160$

$Let\ other\ number = y$

$Product\ of\ two\ numbers = HCF \times LCM$

$160 \times y = 16 \times 1440$

$y = \frac{\cancel{16} \times 144\cancel{0}}{\cancel{160}} = 144$

Q60. Find the square root of

$$\frac{0.324 \times 0.64 \times 129.6}{0.729 \times 1.024 \times 36}$$

(a) 4 (b) 3 (c) 2 **(d) 1**

Explanation

$$\sqrt{\frac{0.324 \times 0.64 \times 129.6}{0.729 \times 1.024 \times 36}}$$

$$\sqrt{\frac{324 \times 64 \times 1296}{\cancel{1000000}} \times \frac{\cancel{1000000}}{729 \times 1024 \times 36}}$$

$$\sqrt{\frac{\cancel{324} \times \cancel{64} \times \cancel{1296}}{729 \times \cancel{1024} \times \cancel{36}}} = 1$$

Q61. The duplicate ratio of $2\sqrt{2} : 3\sqrt{5}$ is?

(a) 4 : 9 **(b) 8 : 45** (c) 2 : 3 (d) 6 : 45

Explanation

The duplicate ratio of $2\sqrt{2} : 3\sqrt{5}$

$\left(2\sqrt{2}\right)^2 : \left(3\sqrt{5}\right)^2$

[Duplicate ratio of $a : b = a^2 : b^2$*]*

$= 8 : 45$

Q62. Find out the value of x if $\log_x 4 + \log_x 16 + \log_x 64 = 12$

(a) 1 **(b) 2** (c) 7 (d) 54

Explanation

$\log_x 4 + \log_x 16 + \log_x 64 = 12$

$\log_x 2^2 + \log_x 2^4 + \log_x 2^6 = 12$

$[\log a^m = m \log a]$

$2\log_x 2 + 4\log_x 2 + 6\log_x 2 = 12$

$= 12\log_x 2 = 12$

$\log_x 2 = \frac{12}{12}$

$\log_x 2 = 1$

$\log_x 2 = \log_x x$ $[\log_a a = 1]$

$2 = x$

$x = 2$

Q63. If $(a - b) : (a + b) = 1 : 5$?
Then what is $(a^2 - b^2) : (a^2 + b^2)$ equal to

(a) 6 : 13 (b) 4 : 13 **(c) 5 : 13** (d) 8 : 13

Explanation

$a - b : a + b = 1 : 5$

$\frac{a - b}{a + b} = \frac{1}{5}$

$5a - 5b = a + b$ *[By cross multiplication]*

$5a - a = b + 5b$

$4a = 6b$

$\frac{a}{b} = \frac{\cancel{6}^{3}}{\cancel{4}_{2}}$

$\frac{a}{b} = \frac{3}{2}$

$\frac{a^2 - b^2}{a^2 + b^2} = \frac{3^2 - 2^2}{3^2 + 2^2} = \frac{9 - 4}{9 + 4} = \frac{5}{13} = 5 : 13$

Q64. Find the value of x and y in the equation

$$\frac{3x - y + 1}{3} = \frac{2x + y + 2}{5} = \frac{3x + 2y + 1}{6}$$

(a) x = 2, y = 1 **(b) x = 1, y = 1** (c) x = –1, y = –1 (d) x = 2, y = 1

Explanation

$\frac{3x - y + 1}{3} = \frac{2x + y + 2}{5} = \frac{3x + 2y + 1}{6}$ ...(1)

Taking first two members of (1)

$\frac{3x - y + 1}{3} = \frac{2x + y + 2}{5}$

$5 (3x - y + 1) = 3 (2x + y + 2)$

$15x - 5y + 5 = 6x + 3y + 6$

$15x - 5y + 5 - 6x - 3y - 6 = 0$

$9x - 8y - 1 = 0$ ...(2)

Taking last two members of (1)

$\frac{2x + y + 2}{5} = \frac{3x + 2y + 1}{6}$

$6 (2x + y + 2) = 5 (3x + 2y + 1)$

$12x + 6y + 12 = 15x + 10y + 5$

$0 = 15x + 10y + 5 - 12x - 6y - 12$

$3x + 4y - 7 = 0$ ... (3)

Multiplycation (3) by (2)

$6x + 8y - 14 = 0$

adding (1) & (2)

$$\begin{array}{rrrr} 9x - 8y - 1 & = & 0 \\ 6x + 8y - 14 & = & 0 \\ \hline 15x \quad -15 & = & 0 \end{array}$$

$15x = 15$

$x = 1$

Put x = 1 in (2)

$9 \times 1 - 8y - 1 = 0$

$9 - 1 = 8y$

$8y = 8$

$y = \frac{\cancel{8}^{1}}{\cancel{8}_{1}}$ $y = 1$

Q65. Three traffic lights change after 36 seconds, 42 seconds and 72 seconds respectively. If they are switched on now, after how much time will they blink together ?

(a) **8 min 24 sec** (b) 8 min 4 sec (c) 8 min 44 sec (d) 8 min 54 sec

Explanation

Three traffic lights will blink together after

= LCM of 36 sec, 42sec and 72 sec

2	36 – 42 – 72
2	18 – 21 – 36
2	9 – 21 – 18
3	9 – 21 – 9
3	3 – 7 – 3
7	1 – 7 – 1
	1 – 1 – 1

LCM = 2 × 2 × 2 × 3 × 3 × 3 × 7 × 1 × 1 = 504 sec = 8 min 24 sec.

= 504 sec = $\frac{504}{60}$ min = 8 min 24 sec

Q66. The age of x is six times that of y. After 4 years, x is 4 times elder of y. What is the present age of y ?
(a) 4 years (b) 5 years **(c) 6 years** (d) 7 years

Explanation

Let the present age of Raj be 3x years

And the present age of Vipin = 2x years

According to question

$\because (3x - 4) = (2x - 4) + 6$

$\Rightarrow 3x - 4 = 2x - 4 + 6$

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

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

$\therefore x = 6$

$\therefore$ *Present age of Vipin* $= 2x$

$= 2 \times 6 = 12$ *years*

Q67. One year ago ratio of age of Rohit and Sahil was 6 : 7, their ratio four years from now will be 7 : 8. How old is Sahil ?
(a) 40 (b) 39 (c) 37 **(d) 36**

Explanation

Let age of Rohit and Sahil one year age were = 6x and 7x

Then their present ages will be 6x + 1 and 7x + 1

Their ages after 4 yrs

$= 6x + 1 + 4, 7x + 1 + 4$

$= 6x + 5, 7x + 5$

A.T.Q.

$\frac{6x + 5}{7x + 5} = \frac{7}{8}$

$8(6x + 5) = 7(7x + 5)$

$48x + 40 = 49x + 35$

$40 - 35 = 49x - 48x$

$5 = x$

$x = 5$

Present age of Sahil $= 7x + 1$

$= 7 \times 5 + 1 = 35 + 1 = 36$

Q68. A fraction becomes 2/3 if 1 is added to both its numerator and denominator. Same faction become 1/2 if 1 subtracted both from its numerator; and denominator. The fraction is
(a) 4/7 **(b) 3/4** (c) 3/5 (d) 8/9

Explanation

Let numerator = x and denominator = y

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

A.T.Q.

$\frac{x + 1}{y + 1} = \frac{2}{3}$

$3x + 3 = 2y + 2$

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

$\frac{x - 1}{y - 1} = \frac{1}{2}$

$2x - 2 = y - 1$

$2x - y = 1$ ... (2)

Multiple (2) by 2

$4x - 2y = 2$ ... (3)

Sub (1) from (3)

$$\begin{array}{rcl} 4x - 2y & = & 2 \\ 3x - 2y & = & -1 \\ - \quad + & & + \\ \hline x & = & 3 \end{array}$$

$2x - y = 1$

$5 = y$

$y = 5 \Rightarrow$ *Fraction* $= \frac{x}{y} = \frac{3}{5}$

Q69. A man sold two houses for ₹ 29,700,each. On one he incurred loss of 10%, while on other he gained 10%. The transaction gives:-

(a) Profit (b) Neither profit nor loss **(c) Loss** (d) Insufficient data

Explanation

Let CP of first house = x

Loss % = 10%

$Loss = 10\% \text{ of } x = \frac{1\cancel{0}}{10\cancel{0}} \times x = \frac{x}{10}$

SP = CP – Loss

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

$= \frac{10x - x}{10} = \frac{9x}{10}$

$\frac{9x}{10} = 29700$

$x = 29700 \times \frac{10}{\cancel{9}} = \cancel{33000}\ 3300$

Let CP of second house = y

Profit % = 10%

$Profit = 10\% \text{ of } y = \frac{1\cancel{0}}{10\cancel{0}} \times y = \frac{y}{10}$

SP = CP + Profit

$= y + \frac{y}{10}$

$= \frac{10y + y}{10} = \frac{11y}{10}$

$\frac{11y}{10} = 29700$

$y = 29700 \times \frac{10}{\cancel{11}} = \cancel{27000}\ 2700$

Total CP = x + y

= 33000 + 27000 = 60000

Total SP = 29700 + 29700 = 59400

CP > SP

So it will be a loss.

Q70. The income of A & B are in the ratio of 4 : 3 and their annual expenses are in the ratio of 3 : 2. If each saves ₹ 60,000. Find A's income?

(a) **₹ 2,40,000** (b) ₹ 72,000 (c) ₹ 19,200 (d) ₹ 48,000

Explanation

Let incomes of A and B be 4x and 3x

$\frac{4x - 60000}{3x - 60000} = \frac{3}{2}$

8x – 120000 = 9x – 180000 [By cross multiplication]

x = 60000

A's income = 4x = 4 × 60000

=240000

Q71. How long will it take for a boy to run around a square field of area 25 hectare at the speed of 10 km/h?

(a) **12 min** (b) 14 min (c) 10 min (d) 8 min

Explanation

Area of sq. field = 25 hectare

= 250000 m^2 [1 hectare = 10000 m^2]

$side^2$ = 250000 m^2

$side^2$ = (500 m)^2

side = 500m.

Perimeter of Sq field = 4 × side $\Rightarrow$ = 4 × 500

= 2000 m = 2km

Speed = 10km/hr.

Time = $\frac{Dis}{Speed}$

= $\frac{2000}{10} = 200$

= $\frac{2}{10} = \frac{1}{5}$ *hr.* = $\frac{1}{5} \times 60 = 12$ *minutes* *[1 hour = 60 minutes]*

Q72. If the price of the cooking gas rises by 15%, by what %, should family reduce its consumption so as not to exceed the budget on cooking?

(a) $12\frac{1}{23}\%$ **(b)** $\mathbf{13\frac{1}{23}\%}$ (c) $14\frac{1}{24}\%$ (d) None of the above

Explanation

Let price of working gas earlier = 100

New price = 100 + 15 = 115

% reduction is consumptions

= $\frac{15}{100 + 15} \times 100$

= $\frac{15}{115} \times 100 = \frac{300}{23} = 13\frac{1}{23}\%$

Q73. Population of a city in 2004 was 10,00,000. If in 2005, there is an increment of 15% in 2006 there is a decrease of 35% and in 2007, there is an increase of 45%. Then find out the population of the city at the end of year 2007?

(a) 10,80,000 (b) 10,83,875 **(c) 10,84,874** (d) 11,75,045

Explanation

Populations of city in 2004 = *10,00,000*

in 2005 in increment % = *15%*

in 2006 in increment % = *35%*

in 2007 in increment % = *45%*

Population at the end of 2007 =

$1000000\left(1+\frac{15}{100}\right)\left(1-\frac{35}{100}\right)\left(1+\frac{45}{100}\right)$

= $1000000 \times \frac{115}{100} \times \frac{65}{100} \times \frac{145}{100} = 1083875$

Q74. A sum of money becomes 3 times in 5 years at simple interest. In how many years will the same sum become 6 times at the same rate of simple interest?

(a) 10 years (b) 12 years **(c) 12.5 years** (d) 10.5 years

Explanation:

Let principal be P

Time = 5yrs

Amount = 3 P

S.P. = Amount – Principal

= 3P – P = 2P

$\frac{P \times R \times T}{100} = 2P$

$\frac{P \times R \times 5}{100} = 2P$

$\frac{5R}{100} = \frac{2P}{P}$

$R = 2 \times \frac{100}{5} = 40$

R = 40%

Let after t yrs it become 6 times

Amount = 6P

S.P. = Amount – Principal

= 6P – P

$\frac{P \times R \times T}{100} = 5P$

$\frac{P \times 40 \times T}{100} = 5P$

$T = \frac{5\cancel{P} \times \cancel{100}^{25}}{\cancel{P} \times \cancel{40}_{8_2}} = 12.5 \text{ years}$

Q75. A sum of money on compound interest amount to ₹ 9680 in 2 years and ₹ 10648 in 3 years. What is the rate of interest per annum?

(a) 5% **(b) 10%** (c) 15% (d) 20%

Explanation:

Let principal be P

$P\left(1+\frac{R}{100}\right)^2 = 9680$ ... (1)

$P\left(1+\frac{R}{100}\right)^3 = 10648$ ... (2)

Divide (1) and (2)

$\frac{P\left(1+\frac{R}{100}\right)^3}{P\left(1+\frac{R}{100}\right)^2} = \frac{\cancel{10648}^{11}}{\cancel{9680}_{10}}$

$1+\frac{R}{100} = \frac{11}{10}$

$\frac{R}{100} = \frac{1}{10}$

$R = \frac{1}{\cancel{10}} \times 10\cancel{0} = 10\%$

Q76. Two numbers are less than third number by 30% and 37% respectively. The percentage by which second number is less than first is

(a) **10%** (b) 70% (c) 4% (d) 3%

Explanation

Let third number = x

First number $= \frac{70}{100}x$

Second number $= \frac{63}{100}x$

Difference of first and second number

$= \frac{70}{100}x - \frac{63}{100}x = \frac{7}{100}x$

% by which second number is less than the first

$= \frac{\frac{7x}{100}}{\frac{70}{100}x} \times 100$

$= \frac{\cancel{7x}}{\cancel{100}} \times \frac{\cancel{100}}{\cancel{70x}_{10}} \times 10\cancel{0} = 10\%$

Q77. In a town of 3600 people, 8/9th population is men, 10% are married. Find the % of unmarried women?

(a) 24% **(b) 20%** (c) 25% (d) 30%

Explanation

Population of men = 360°C

No. of men $= \frac{8}{\cancel{9}} \text{ of } \cancel{3600}^{400} = 3200$

% married men = 10%

No. of married men = 10% of 3200

$$= \frac{10}{\cancel{100}} \times \cancel{3200} = 320$$

No. of married women = 320

Total no. of women = 3600 – 3200 = 400

No. of unmarried women = 400 – 320 = 80

$$\% \text{ of unmarried women} = \frac{\cancel{80}^{20}}{\cancel{400}_{1}} \times \cancel{100} = 20\%$$

Q78. Boating at 6/7th of regular speed in a lake, the tourist got late by 30 min? How much time will it take when boating is at usual speed?

(a) 2 hr **(b) 3 hr** (c) 1.5 hr (d) None

Explanation

Let distance be d and speed be s

$$\text{Time} = \frac{d}{s}$$

Time taken if he boats by $\frac{6}{7}$ *of regular speed*

$$= \frac{d}{\frac{6}{7}s}$$

A.T.Q.

$$\frac{d}{\frac{6}{7}s} - \frac{d}{s} = 30$$

$$\frac{7d}{6s} - \frac{d}{s} = 30$$

$$\frac{d}{s}\left(\frac{7-6}{6}\right) = 30$$

$$\frac{d}{s} \times \frac{1}{6} = 30$$

$$\frac{d}{s} = 30 \times 6$$

$$\frac{d}{s} = 180 \text{ minutes}$$

$$\frac{180 \text{ min.}}{60 \text{ min.}} = 3 \text{ hrs.}$$

Q79. A rectangle field of length 242 m has an area of 4840 m2. What will be the cost of fencing its perimeter if cost of fencing is 50 paise/meter?

(a) ₹ **262** (b) ₹ 270 (c) ₹ 320 (d) ₹ 258

Explanation

Length of rectangular field = 242m

Let breadth = b m.

Area = 4840 m²

l × b = 4840 m²

242 × b = 4840 m

$$b = \frac{\cancel{4840}^{20}}{\cancel{242}}$$

b = 20 m

Perimeter = 2 (l + b)

= 2 (242 + 20)

= 2 × 262 = 524m.

If cost of fencing on 1m = 50 paise

Then cost of fencing on 524 m= $\frac{1}{2}$ ₹

$$= \frac{1}{\cancel{2}_{1}} \times \cancel{524}^{262} = ₹\ 262$$

Q80. The area of four walls of a room is 660 m² and length is twice the width, ht being 11 m. Find area of ceiling?

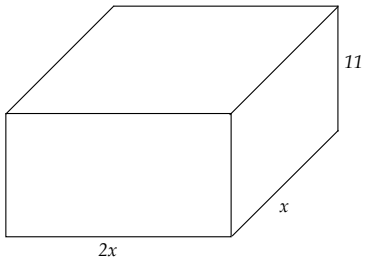
(a) **200** (b) 190 (c) 210 (d) 220

Explanation

Let breadth = x

length = 2x

height = 11 m.



Area of four walls (C.S.A) = 2 (l + b) × h

= 2 (2x + x) × 11

= 2 × 3x × 11 = 66x

66x = 660

$x = \frac{\cancel{660}^{10}}{\cancel{66}} x = 10$

Area of ceiling = l × b

= 2x × x = 2x²

= 2 × x × x = 2 × 10 × 10 = 200 m²

Q81. Ratio of two complementary angles is 1 : 5. What is the difference between them?

(a) **60°** (b) 90° (c) 120° (d) 160°

Explanation

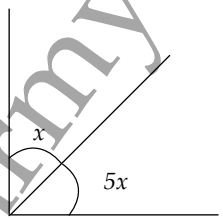
Let two angles be x and 5x

5x + x = 90° [sum of complementary angles is 90°]

6x = 90°

$x = \frac{\cancel{90°}^{15°}}{\cancel{6}}$

x =15° ⇒ Difference = 5x – x = 4x ⇒ = 4 × 15° = 60°



Q82. If a man travels with a speed of 2/5 times of his original speed and he reached his office 15 minutes late to the fixed time, then the time taken with his original speed will be?

(a) **10 min** (b) 15 min (c) 20 min (d) 25 min

Explanation

Let speed of man = x km/h

New speed $= \frac{2}{5}x$ *km/h*

Let Distance = d

Time $= \frac{Distance}{Speed}$

According to condition

$\frac{d}{\frac{2}{5}x} - \frac{d}{x} = 15$

$\frac{d}{x} \times \frac{5}{2} - \frac{d}{x} = 15$

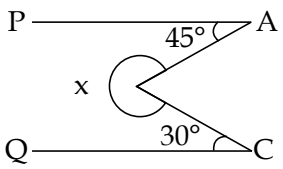
$\frac{d}{x}\left(\frac{5}{2} - 1\right) = 15$

$\frac{d}{x} \times \frac{3}{2} = 15$

$\frac{d}{x} = \cancel{15}^{5} \times \frac{2}{\cancel{3}}$ $\Rightarrow \frac{d}{x} = 10$

Time taken when he goes with his original speed = 10 minutes

Q83. Find the value of x in the given figure where PA is parallel to QC



(a) 75° (b) 185° **(c) 285°** (d) 245°

Explanation

Draw DE || PA || QC

PA || DE and AE is transliteration

45° + ∠1 = 180° (co interior angle)

∠1 = 180° – 45°

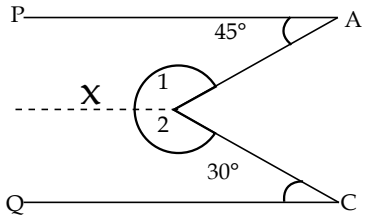
∠1 = 135°

DE || *QC and CE is transverses*

∠2 + 30° = 180° (co interior angle)

∠2 = 150°

$x = \angle 1 + \angle 2 = 135° + 150° \Rightarrow x = 285°$



Q84. The speed of boat upstream and speed of boat down stream are 7km/h and 13km/h respectively. What is the speed of stream and speed of boat in still water?

(a) **10 km/h and 3km/h** (b) 15 km/h and 9km/h (c) 20 km/h and 6km/h (d) 40 km/h and 12km/h

Explanation

Let speed of boat in still water = x km/h

Speed of stream = y km/h

Speed of boat downstream = (x + y) km/h

Speed of boat upstream = (x – y) km/h

$x + y = 13$ ... *(1)*

$x - y = 7$ ... *(2)*

adding (1) & (2)

$$\begin{array}{rcl} x + y & = & 13 \\ x - y & = & 7 \\ \hline 2x & = & 20 \end{array}$$

$x = \frac{20}{2}$

$x + y = 13$

$10 + y = 13$

$y = 13 - 10 = 3$ *km/h*

Q85. Ajay can do a piece of work in 10 days and Harshal can do same work in 12 days. They started working together but Ajay left the work 2 days before completion of work, then time taken to complete the work?

(a) $\mathbf{6\frac{6}{11}}$ **days** (b) $5\frac{3}{10}$ days (c) $4\frac{3}{2}$ days (d) $7\frac{2}{5}$ days

Explanation

No. of days taken by Ajay = 10 days

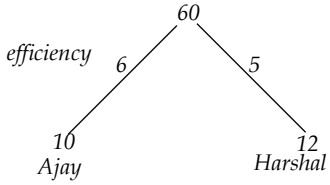
No. of days taken by Harshal = 12 days

Unit of work done in last 2 days by Harshal = 2 × 5 = 10

Unit of work done = 60 – 10 = 50

No. of days taken together $= \frac{50}{6+5} = \frac{50}{11} = 4\frac{6}{11}$

Total days $= 4\frac{6}{11} + 2 = 6\frac{6}{11}$



Q86. If 3 men or 4 women can plough a field in 43 days, how long 7 men and 5 women take to plough it?

(a) 3 days (b) 7 days **(c) 12 days** (d) 15 days

Explanation

According to Question

3 M = 4 W

$\frac{M}{W} = \frac{4}{3}$

Ratio of efficiency of Man and woman = 4 : 3

Work done by 1 man in 1 day = 3 unit

Total units of work = 43 × 3 × 4

No. of days taken by 7 men and 5 women

$= \frac{43 \times 3 \times 4}{7 \times 4 + 5 \times 3}$

$= \frac{43 \times 3 \times 4}{28 + 15} = \frac{\cancel{43}^{1} \times 3 \times 4}{\cancel{43}_{1}} = 12$ *days*

Q87. A can do a piece of work in 70 days and B is 40% more efficient than A. The number of days taken by B to do the same work will be?

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

Explanation

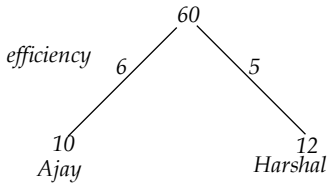
Efficiency of A = 100

Efficiency of B = 100 + 40 = 140

A : B = $\frac{100}{5} : \frac{140}{7}$ = 5 : 7

Total work = 5 × 70 = 350

No. of days taken by B = $\frac{350}{7} = 50$



$\left[\frac{\text{Total work}}{\text{Efficiency of B}} = \text{No. of days taken by B}\right]$

Q88. A wooden box measures 10 cm by 6 cm by 5 cm. Thickness of wood is 2 cm. Find the volume of wood required to make the box.

(a) 206 cm^3 (b) 207 cm^3 (c) 204 cm^3 **(d) 288 cm^3**

Explanation

Outer length = 10 cm

Outer breadth = 6 cm

Outer height = 5 cm

Outer volume = l × b × h

= 10 cm × 6 cm × 5 cm = 300 cm^3

Inner length = 10 – (2 + 2) = 10 – 4 = 6

Inner breadth = 6 – (2 + 2) = 6 – 4 = 2

Inner height = 5 – (2 + 2) = 5 – 4 = 1

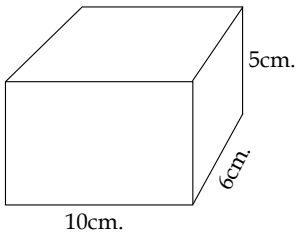
Inner volume = l × b × h

= 6 cm × 2 cm × 1 cm = 12 cm^3

Volume of wood = Outer volume – Inner volume

= 300 cm^3 – 12 cm^3

= 288 cm^3



Q89. What is the value of $\frac{\tan A - \sin A}{\sin^3 A}$

(a) $\frac{\sec A}{1-\cos A}$ (b) $\frac{\sec A}{1+\cos^2 A}$ **(c) $\frac{\sec A}{1+\cos A}$** (d) None of these

Explanation

$\frac{\tan A - \sin A}{\sin^3 A}$

$\frac{\frac{\sin A}{\cos A} - \sin A}{\sin^3 A}$

$\frac{\sin A (\sec A - 1)}{\sin^3 A}$

$\frac{\sin A (1 - \cos A)}{\cos A \sin^2 A}$

$= \frac{1 - \cos A}{\cos A \sin^2 A}$

$= \frac{1 - \cos A}{\cos A (1 - \cos^2 A)}$ $[\sin^2\theta = 1 - \cos^2\theta]$

$= \frac{\cancel{1 - \cos A}}{\cos A \cancel{(1 - \cos A)}(1 + \cos A)}$

$= \frac{1}{\cos A (1 + \cos A)} = \frac{\sec A}{1 + \cos A}$

Q90. The length of a pendulum is 60 cm. The angle through which it swings when its tip describes an arc of length 16.5 cm will be

(a) 15° 30' **(b) 15° 45'** (c) 16° 15' (d) 16° 45'

Explanation

Length of pendulum (radius) = 60 cm

Length of arc (l)=16.5 cm.

$l = r\theta$

$16.5 = 60 \times \theta$

$\frac{16.5}{60} = \theta$

$\theta = \frac{165}{60 \times 10} = \frac{11}{40}$

$= \frac{11}{40} \times \frac{180}{\pi} \quad \Rightarrow \left(1 \text{ radian} = \frac{180}{40}\right)$

$= \frac{11}{40} \times 180 \times \frac{7}{22} \quad \Rightarrow = \frac{63}{4} = 15° 45'$

Q91. Find the value of .

$$\frac{\sin\theta}{\cos(90° + \theta)} + \frac{\sin\theta}{\sin(180° + \theta)} + \frac{\tan(90° + \theta)}{\cot\theta}$$

(a) 0 (b) –1 **(c) –3** (d) 2

Explanation

$$\frac{\sin\theta}{\cos(90° + \theta)} + \frac{\sin\theta}{\sin(180° + \theta)} + \frac{\tan(90° + \theta)}{\cot\theta}$$

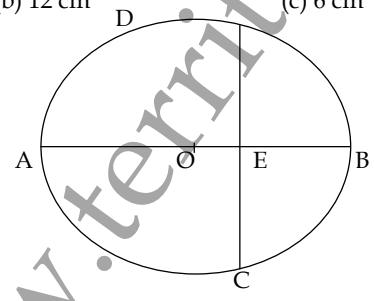
$$\begin{bmatrix} \cos(90° - \theta) = \sin\theta \\ \sin(90° - \theta) = \cos\theta \\ \tan(90° - \theta) = \cot\theta \end{bmatrix}$$

$$\frac{\sin\theta}{-\sin\theta} + \frac{\sin\theta}{-\sin\theta} - \frac{\cot\theta}{\cot\theta}$$

$-1 - 1 - 1 = -3$

Q92. In the given figure, O is the centre of a circle and diameter AB bisects and chord CD at a point E such that CE = ED = 8 cm and EB = 4 cm. The radius of circle is

(a) **10 cm** (b) 12 cm (c) 6 cm (d) 8 cm



Explanation

$AE \times EB = DE \times EC$

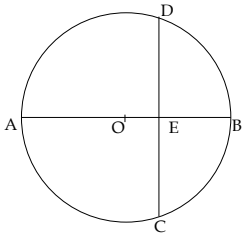
$AE \times 4 = 8 \times 8$

$AE = \frac{8 \times 8}{4}$

$AE = 16$

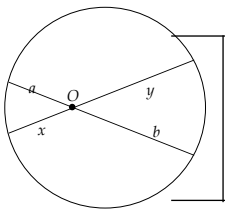
$AE = 16$

$EB = 4$



In a circle if two chords intersect at a point them

$a \times b = x \times y$



$AB = 16 + 4$

$= 20cm$

$AO = \frac{AB}{2} = \frac{20}{2} = 10 \text{ cm}$

Q93. In a triangle ABC, if cos A = cos B × cos C, What is the value of tan A – tan B – tan C .

(a) – 1 **(b) 0** (c) 1 + tan A + tan B + tan C (d) tan A tan B tan C – 1

Explanation

$\cos A = \cos B \times \cos C$

$A + B + C = 180°$ (sum of Δ of Δ 180°)

$B + C = 180° - A$

$\sin (B + C) = \sin (180° - A)$

$\sin (B + C) = \sin A$

we are given

$\cos B \times \cos C = \cos A$

$\tan A - \tan B - \tan C$

$\tan A - (\tan B + \tan C)$

$$\tan A - \left(\frac{\sin B}{\cos B} + \frac{\sin C}{\cos C} \right)$$

$$\tan A - \left(\frac{\sin B \cos C + \sin C \cos B}{\cos B \cos C} \right)$$

$$\tan A - \frac{\sin (B + C)}{\cos B \cos C} \qquad [\sin (x + y) = \sin x \cos y \, y + \cos x \sin y]$$

$$\tan A - \frac{\sin A}{\cos A}$$

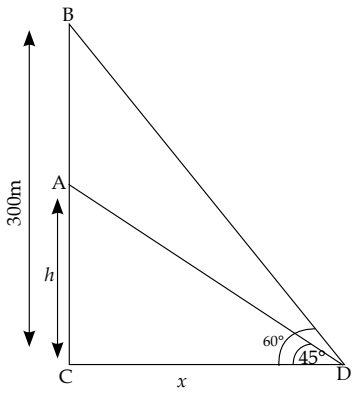
$$\left[\begin{array}{l} \sin (B + C) = \sin A \quad (Proved) \\ \cos B \cos C = \cos A \quad (Given) \end{array} \right]$$

$\tan A - \tan A = 0$

Q94. An aeroplane flying at a height of 300 m above the ground passes vertically above a plane at an instant when the angle of elevation of two planes from the same point on the ground are 60° and 45° respectively. What is the height of lower plane from ground ?

(a) 500 m **(b) 100 $\sqrt{3}$ m** (c) 500 $\sqrt{3}$ m (d) 15 ($\sqrt{3}$ + 1) m

Explanation



Let A & B be the two aeroplanes

BC = 300 m

Let AC = h meters

CD = x

In Δ ACD In Δ BCD

$\frac{AC}{CD} = \tan 45°$

$\frac{BC}{CD} = \tan 60°$

$\frac{h}{x} = 1 \qquad \frac{300}{x} = \sqrt{3}$

$h = x \quad ... (1) \qquad x = \frac{300}{\sqrt{3}}$

$$x = \frac{300}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$$

$$= \frac{\overset{100}{\cancel{300}}\sqrt{3}}{\cancel{3}} = 100\sqrt{3}$$

From (1) $h = x$

$h = 100\sqrt{3}$

height of lower ground = $100\sqrt{3}$ *m*

Q95. The mean of 20 observations is 15. On checking it was found that two observations were wrongly copied as 3 and 6. If wrong observation are replaced by correct values 8 and 4, then the correct mean is?

(a) 15 **(b) 15.15** (c) 15.35 (d) 16

Explanation

Incorrect sum of 20 observations

$15 \times 20 = 300$ [Sum = Mean × Sum of observation]

Correct Sum of observation

$= 300 - (3 + 6) + (8 + 4)$

$= 300 - 9 + 12 = 312 - 9 = 303$

$\text{Correct mean} = \frac{\text{Correct sum}}{\text{Number of observations}} \Rightarrow = \frac{303}{20} = 15.15$

Q96. Two poles of equal height are standing opposite to each other on either side of a road which is 100m wide from a point between them on ground. The angle of elevation of tops of poles are 30° and 60°. The height of each pole in metres will be?

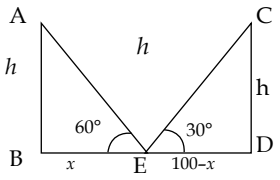
(a) **$25\sqrt{3}$** (b) $20\sqrt{3}$ (c) $28\sqrt{3}$ (d) $30\sqrt{3}$

Explanation

Let AB = CD = h meters be the height of poles

BD = 100 m

Let BE = x, then ED = 100 – x



In Δ ABE

$\frac{AB}{BE} = tam\ 60°$

$\frac{h}{x} = \sqrt{3}$

$h = \sqrt{3}\ x \quad \ldots (1)$

In Δ CDE

$\frac{CD}{DE} = tam\ 30°$

$\frac{h}{100-x} = \frac{1}{\sqrt{3}}$

$h = \frac{100-x}{\sqrt{3}} \ldots (2)$

From (1) & (2)

$\sqrt{3}\ x = \frac{100-x}{\sqrt{3}}$

$3x = 100-x$

$3x + x = 100$

$4x = 100$

$x = \frac{\cancel{100}^{25}}{\cancel{4}} = 25$

Put value of x in (1)

$h = \sqrt{3}\ x$

$= \sqrt{3} \times 25 = 25\sqrt{3}$

Q97. An electric pump can fill a tank in 3 hours. Because of a leak in tank it took 3.5 hours to fill the tank. If tank is full, how much time will it take for leak to empty it?

(a) 25 hrs (b) 19 hrs (c) 20 hrs **(d) 21 hrs**

Explanation

Time taken by electric pump to fill the tank = 3 hrs

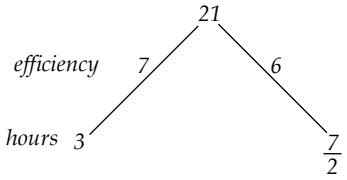
Because of leak tank took = 3.5 hrs $= \frac{7}{2}$ *hrs*

Electric pump's efficiency = 7

Pump's efficiency after leakage = 6

Leakage efficiency = 7–6 = 1

Time taken to empty it $= \frac{21}{1} = 21$ *hrs*



Q98. A spherical ball of radius 3 cm is melted and recast into three spherical balls of radius 1.5 cm and 2 cm and X cm. Find the value of X.

(a) 5 cm **(b) 2.5 cm** (c) 3 cm (d) 2.25 cm

Explanation

Radius of I ball $= 3$ *cm*

Volume of I ball $= \frac{4}{3}\pi(3)^3$

[Volume of sphere $= \frac{4}{3}\pi r^3]$

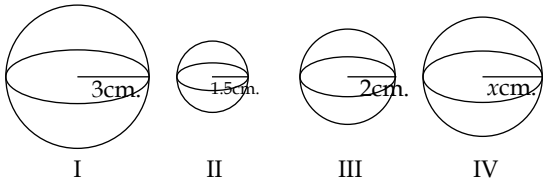
Radius of II ball $= 1.5$ *cm*

Volume of II ball $= \frac{4}{3}\pi(1.5)^3$

Radius of III ball $= 2$ *cm*

Volume of III ball $= \frac{4}{3}\pi(2)^3$

Radius of IV ball $= x$ *cm*



Volume of IV ball $= \frac{4}{3}\pi(x)^3$

ATQ:-

$\frac{4}{3}\pi(1.5)^3 + \frac{4}{3}\pi(2)^3 + \frac{4}{3}\pi(x)^3 = \frac{4}{3}\pi(3)^3$

$\frac{4}{3}\pi(1.5)^3 + 2^3 + x^3 = \frac{4}{3}\pi \times 27$

$3.375 + 8 + x^3 = 27$

$11.375 + x^3 = 27$

$x^3 = 27 - 11.375$

$x^3 = 2.5^3 \Rightarrow x = 2.5$

Q99. Circumference of the base of a 9 m high conical tent is 44 m. Find the vol of air contained in it.

(a) 430 cm^3 **(b) 462 cm^3** (c) 472 cm^3 (d) 492 cm^3

Explanation

Base of conical tent = 44

$2\pi r = 44$

$2 \times \frac{22}{7} \times r = 44$

$r = \cancel{44} \times \frac{1}{\cancel{2}} \times \frac{7}{\cancel{22}} = 7$

height = 9m

Volume $= \frac{1}{3}\pi r^2 h \Rightarrow = \frac{1}{\cancel{3}} \times \frac{22}{\cancel{7}} \times 7 \times 7 \times 7 = 462\ cm^3$

Q100. The average marks obtained by the students in a class are 43. If the average marks obtained by 25 boys are 40 and average marks obtained by the girl students are 48, then what is the number of girl students in the class?

(a) 20 (b) 25 **(c) 15** (d) 10

Explanation

Let number of girls be x.

Average marks obtained by girls = 48

Total marks of girls = Average × No. of girls

$48 \times x = 48x$

Total no. of boys = 25

Average marks obtained by boys = 40

Total marks of boys =25 × 40 = 1000

Average marks of whole class = 43

Total students = x + 25

Total marks of whole class = 43 (x + 25)

Total marks of boys and girls = 1000 + 48x

A.T.Q.

$1000 + 48x = 43(x + 25)$

$1000 + 48x = 43x + 1075$

$48x - 43x = 1075 - 1000$

$5x = 75$

$x = \frac{\cancel{75}^{15}}{\cancel{5}_1}$

No. of girls = 15

ANSWERS ARE BOLD