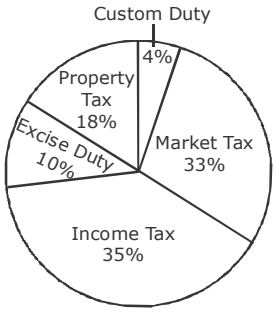
Directions : 101 to 103, The income of a state under different heads is given in the following pie-chart. Study the chart and answer the question.



101. If the total income in a year be ₹ 733 crores then the income (in ₹crores) from 'Income tax' and 'Excise duty' is:-
a. ₹ 329.80 b. ₹ 329.85
c. ₹ 331.50 d. ₹ 331.45

sol. b.

$$\frac{45 \times 733}{100} = 329.85\,\text{cr}$$

102. If the income from the market tax in a year be ₹ 165 crores then the total income from other sources is (in ₹ crores):-
a. ₹ 365 b. ₹ 325
c. ₹ 335 d. ₹ 345

sol. c.

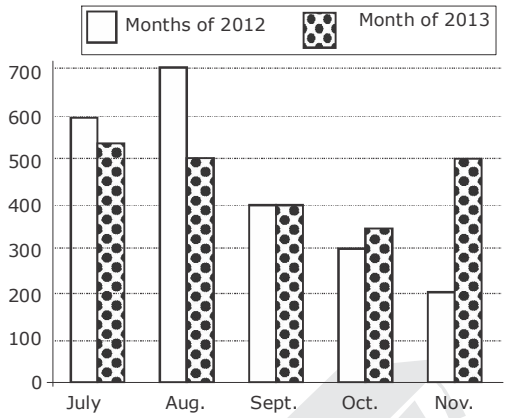
$$\frac{165 \times 67}{33} = 5 \times 67 = 335$$

103. The central angle of the sector representing income tax is:
a. 126° b. 119°
c. 150° d. 135°

sol. a.

$$\frac{35 \times 360^\circ}{100} = 126^\circ$$

Directions : 104 to 107 Study the following bar-diagram and answer the questions.



104. The average electric consumption by the family during these 5 months in 2013 is
a. 400 units b. 440 units
c. 450 units d. 470 units

sol. (c,d)

$$\frac{550 + 500 + 400 + 350 + 500}{5} = \frac{2300}{5} = 460$$

105. The maximum difference in the units consumption between these two years has been found in the month of:-
a. July b. August
c. November d. October

sol. c.

Maximum difference is of 300 units in the month of November.

106. The total units consumption in the year 2013 during these 5 months, in respect of the same in the previous year has been.
a. decreased by 2.27 %
b. increased by 2.22%
c. found unaltered
d. increased by 2.27%

sol. e.

Total use in 2013 = 2300
Total use in 2012 = 600+700+400+300+200
= 2200

$$\%\ \text{increase} = \frac{2300 - 2200}{2200} \times 100$$

= 4.54 %

107. In how many months in 2012, the consumption of electric units was more the average units consumption in that year.
a. 3 b. 5
c. 4 d. 2

sol. d.

Aug in 2012 = $\frac{2200}{5} = 440$

$\therefore$ comsuption was more the than average in months of July & August.

108. A dealer buys an article listed at ₹ 100 and gets successive discounts of 10% and 20%. He spends 10% of the Cost Price on transportation. At what price should he sell the article to earn a profit of 15%?
a. ₹ 91.20 b. ₹ 90.80
c. ₹ 92.00 d. ₹ 91.08

sol. d.

(9) x (.8) x (1.1) x (1.15) x 100 = 91.08

109. A and B together can do a piece of work in 30 days. B and C together can do it in 20 days. A starts the work and works on it for 5 days, the B takes up and works for 15 days. Finally C finishes the work in 18 days. The number of days in which C alone can do the work when doing it separately is:
a. 60 Days b. 120 Days
c. 24 Days d. 40 Days

sol. c.

$\frac{1}{A}+\frac{1}{B}=\frac{1}{30}$ and $\frac{1}{B}+\frac{1}{C}=\frac{1}{20}$

Now, $\frac{5}{A}+\frac{15}{B}+\frac{18}{C}=1$

$\Rightarrow \left(\frac{5}{A}+\frac{5}{B}\right)+\left(\frac{10}{B}+\frac{10}{C}\right)+\frac{8}{C}=1$

$\Rightarrow \frac{5}{30}+\frac{10}{20}+\frac{8}{C}=1$

$\Rightarrow \frac{8}{C}=1-\frac{1}{6}-\frac{1}{2}=\frac{1}{3}$

$\Rightarrow \frac{1}{C}=\frac{1}{24}$

$\therefore$ c alone can complete the work in 24 days.

110. If $x=\frac{\sqrt{5}-\sqrt{3}}{\sqrt{5}+\sqrt{3}}$ and $y=\frac{\sqrt{5}+\sqrt{3}}{\sqrt{5}-\sqrt{3}}$ then the value of $\frac{x^2+xy+y^2}{x^2-xy+y^2}=?$

a. $\frac{69}{67}$ b. $\frac{65}{63}$
c. $\frac{67}{65}$ d. $\frac{63}{61}$

sol. d.

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

$=\frac{\left(\sqrt{5}-\sqrt{3}\right)^2+\left(\sqrt{5}+\sqrt{3}\right)^2}{\left(\sqrt{5}\right)^2-\left(\sqrt{3}\right)^2}=\frac{2(5+3)}{5-3}=8$

and xy = 1

So, $\frac{x^2+xy+y^2}{x^2-xy+y^2}=\frac{(x+y)^2-xy}{(x+y)^2-3xy}=\frac{8^2-1}{8^2-3}=\frac{63}{61}$

OR

$x=\frac{\sqrt{5}-\sqrt{3}}{\sqrt{5}+\sqrt{3}}=\frac{5+3-2\sqrt{15}}{2}=4-\sqrt{15}$

similarly, $y=\frac{\sqrt{5}+\sqrt{3}}{\sqrt{5}-\sqrt{3}}=4+\sqrt{15}$

Now, $\frac{x^2+xy+y^2}{x^2-xy+y^2}=\frac{2(16+15)+1}{2(16+15)-1}=\frac{63}{61}$

111. The value of $\sqrt{\frac{0.324\times0.081\times4.624}{1.5625\times0.289\times72.9\times64}}$
a. 24 b. 0.024
c. 2.4 d. 0.24

sol. b.

$\sqrt{\frac{0.324\times0.081\times4.624}{1.5625\times0.0289\times72.9\times64}}$

$=\sqrt{\frac{324\times81\times4624}{15625\times289\times729\times64}}$

$=\frac{18\times9\times68}{125\times17\times27\times8}=\frac{3}{125}=\frac{24}{1000}=0.024$

112. A dealer sold a bicycle at a profit of 10%. Had he brought the bicycle at 10% of less price and sold it at a price ₹ 60 more, he would have gained 25%. The cost price of the bicycle was.
a. ₹ 2600 b. ₹ 2400
c. ₹ 2200 d. ₹ 2000

sol. b.

Let initial cost price be 100 x.
Now, 1.25 $\times$ 90x = 110x + 60
$\Rightarrow$ 2.5 x = 60 $\Rightarrow$ x = 24 $\Rightarrow$ 100x = 2400

113. If two numbers are in the ratio 2 : 3 and the ratio becomes 3 : 4 when 8 is added to both the numbers, then the sum of the two numbers is:-

a. 10 b. 100

c. 80 d. 40

sol. d.

Let the number be 2x & 3x

$4(2x+b) = 3(3x+8) \Rightarrow x = 8$

$\Rightarrow 5x = 40$

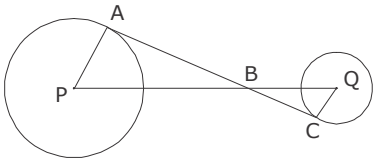
114. AC is a transverse common tangent to two circles with centres P and Q and radii 6cm and 3cm at the point A and C respectively. If AC cuts PQ at the point B and AB = 8cm then the length of PQ is-

a. 13 cm b. 15 cm

c. 10 cm d. 12 cm

sol. b.

$\Delta ABP \sim \Delta CBQ$, AP = 6, CQ = 3, AB = 8



$\therefore \frac{Ap}{CQ} = \frac{AB}{CB} \Rightarrow CB = \frac{8\times 3}{6} = 4cm$

using pythagorus th^m PB = $\sqrt{6^2+8^2} = 10$ cm

and BQ = 5

So, PQ = 5 + 10 = 15 cm

115. A circular swimming pool is surrounded by a concrete wall 4m wide. If the area of the concrete wall surrounding the pool 11/25 that of the pool, then the radius (in m) of the pool is:

a. 8 b. 16

c. 20 d. 30

sol. c.

$\frac{11}{25}\pi r^2 = \pi (r+4)^2 - \pi r^2$

$11r^2 = 25(8r + 16) \Rightarrow 11r^2 - 200r - 400 = 0$

$\Rightarrow r = 20$

116. The percentage of metals in a mine of lead are is 60%. Now the percentage of silver is $\frac{3}{4}\%$ of metals and the rest is lead. If the mass of are extracted from this mine is 8000kg. the mass (in kg) of lead is:

a. 4763 b. 4764

c. 4762 d. 4761

sol. b.

0.6 x 0.9925 x 8000 = 4,764

117. A shopkeeper allows a discount of 10% on the marked price of a camera. Marked price of the camera, which costs him ‘600, to make a profit of 20% should be:-

a. ₹ 650 b. ₹ 800

c. ₹ 750 d. ₹ 700

sol. b.

120% of cp = 90% of MP

$\therefore MP = \frac{120}{90}\times 600 = 800$

118. If $4a - \frac{4}{a} + 3 = 0$ then the value of

$a^3 - \frac{1}{a^3} + 3 = ?$

a. $\frac{21}{16}$ b. $\frac{7}{16}$

c. $\frac{3}{16}$ d. $\frac{21}{64}$

sol. d.

$4a - \frac{4}{a} + 3 = 0 \Rightarrow a - \frac{1}{a} = \frac{-3}{4}$

$a^3 - \frac{1}{a^3} + 3 = \left(a - \frac{1}{a}\right)^3 + 3\left(a - \frac{1}{a}\right) + 3$

$= \left(-\frac{3}{4}\right)^3 + 3\left(\frac{-3}{4}\right) + 3 = -\frac{27}{64} - \frac{9}{4} + 3 = \frac{21}{64}$

119. Given that $\Delta ABC \sim \Delta PQR$, if

$\frac{\text{area}\,\Delta(PQR)}{\text{area}(\Delta ABC)} = \frac{256}{441}$ and PR = 12 cm, then Ac is equal to?

a. 15.75 cm b. $12\sqrt{2}$ cm

c. 15.5 cm d. 16 cm

sol. a.

For similar Δs the ratio of area is square of ratio of sides.

$\therefore \frac{PR}{AC} = \sqrt{\frac{256}{441}} \Rightarrow AC = \frac{21\times 12}{16} = 15.75$

120. A train leaves station A at 5 AM and reaches station B at 9 AM on the same day. Another train leaves station B at 7 AM and reaches station A at 10:30 AM on the same day. The time at which the two trains cross one another is:

a. 7.56 AM b 8.26 AM
c. 7.36 AM d. 8 AM

sol. a.

Ratio of speed of train A & B is 7:8.

Let their speeds be 7 & 8 units.

At 7 AM, the train A will need 2 more Hours to reach upto B it train A travels alone.

Time required is both trains start moving

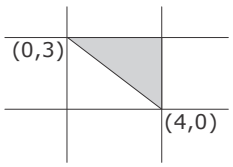
$= \frac{2\times 7}{15}\text{hrs} = \frac{120\times 7}{15}\text{mins}$

$= 56$ mins

$\therefore$ Trains will meet at 7:56 Am.

121. The area of the triangle formed by the graphs of the equations x = 4, y = 3 and 3x + 4y = 12 is
a. 4 sq. unit b. 6 sq. unit
c. 12 sq. unit d. 3 sq. unit

sol. b.



Area of shaded portion $= \frac{4\times 3}{2} = 6$

122. If $\tan A + \cot A = 2$, then the value of $\tan^{10} A + \cot^{10} A$ is
a. 2 b. 4
c. 1 d. 2^{10}

sol. a.

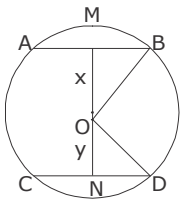
$\tan A + \cot A = 2$

$\Rightarrow \tan A = \cot A = 1$

$\Rightarrow \tan^{10} A + \cot^{10} A = 1 + 1 = 2$

123. AB and CD are two parallel chords of circle lying on the opposite side of the centre and the distance between them is 17cm. The length of AB and CD are 10cm and 24 cm respectively. The radius (in cm) of the circle is:-
a. 18 b. 15
c. 13 d. 9

sol. c.



$x + y = 17$

$r^2 = x^2 + 5^2$.....(1)

$r^2 = y^2 + 12^2$.....(2)

Subtracting (2) from (1), we get

$0 = x^2 - y^2 + 5^2 - 12^2$

$\Rightarrow (x + y)(x - y) = (12 + 5)(12 - 5)$

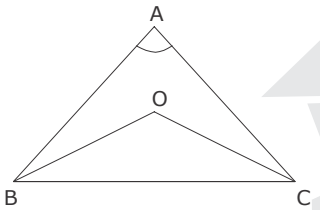
$\Rightarrow x - y = 7$

So $x = 12$ & $y = 5$

$\therefore r = \sqrt{12^2 + 5^2} = 13$

124. The internal hisectors of the $\angle B$ and $\angle C$ of the ΔABC, intersect at O. If $\angle A = 100°$, then the measure of $\angle BOC$ is:-
a. 120° b. 130°
c. 140° d. 110°

sol. c.



$\angle BOC = 90° + \frac{1}{2}\angle A = 90° + 50° = 140°$

125. Two pipes A and B can fill a tank with water in 30 minutes and 45 minutes respectively. The water pipe C can empty the tank in 36 minutes. First A and B are opened. After 12 minutes C is opened. Total time (in minutes) in which the tank will be filled up is:-
a. 36 b. 12
c. 24 d. 30

sol. c.

$\frac{12}{30} + \frac{12}{45} + \left(\frac{1}{30} + \frac{1}{45} - \frac{1}{36}\right)x = 1$

$\Rightarrow \frac{72}{180} + \frac{48}{180} + \left(\frac{6}{180} + \frac{4}{180} - \frac{5}{180}\right)x = \frac{180}{180}$

$\Rightarrow x\left(\frac{5}{180}\right) = \frac{60}{180} \Rightarrow x = \frac{60}{5} = 12\,\text{min}$

Total time = 12 + 12 = 24min

126. If x = z = 225 and y = 226 then the value of $x^3 + y^3 + z^3 - 3xyz$
a. 765 b. 676
c. 674 d. 576

sol. b.

$x^3 + y^3 + z^3 - 3xyz$

$= \frac{1}{2}(x+y+z)[(x-y)^2 + (y-z)^2 + (z-x)^2]$

$= 338 \times 2 = 676$

127. If A, B and C can complete a work in 6 days, If A can work twice faster than B and thrice faster than C, then the number of days C alone can complete the work is:

a. 22 Days b. 33 Days

c. 11 Days d. 44 Days

sol. b.

$\frac{1}{A} + \frac{1}{B} + \frac{1}{C} = \frac{1}{6}$

$\Rightarrow \frac{3}{C} + \frac{3}{2C} + \frac{1}{C} = \frac{1}{6}$

$\Rightarrow \frac{1}{C}\left[3 + \frac{3}{2} + 1\right] = \frac{1}{C} \cdot \frac{11}{2} = \frac{1}{6}$

$\Rightarrow C = 33$ days

OR

$A+B+C = \frac{11}{2}C$

$\frac{11}{2}$ C's 6 days work = C's $\frac{11}{2} \times 6 = 33$ days work

128. If $x^2 + y^2 + z^2 = 2(x + z - 1)$, then the value of $x^3 + y^3 + z^3 = ?$

a. 2 b. 1

c. -1 d. 0

sol. a.

$(x^2 - 2x + 1) + y^2 + (z^2 - 2z + 1) = 0$

$\Rightarrow (x - 1)^2 + y^2 + (z - 1)^2 = 0$

$\Rightarrow x = 1, y = 0, z = 1$

$(\because a^2 + b^2 + c^2 = 0 \Rightarrow a = b = c = 0)$

$x^3 + y^3 + z^3 = 2$

129. If $\text{Sec}\Theta + \text{Tan}\Theta = 2 + \sqrt{5}$, then the value of $\text{Sin}\Theta$ is $(0° \le \Theta \le 90°)$

a. $\frac{\sqrt{3}}{2}$ b. $\frac{1}{\sqrt{5}}$

c. $\frac{2}{\sqrt{5}}$ d. $\frac{4}{5}$

sol. c.

$\text{Sec}\Theta + \text{Tan}\Theta = 2 + \sqrt{5}$

$\Rightarrow \text{Sec}\Theta - \text{Tan}\Theta = \frac{1}{2 + \sqrt{5}} = \sqrt{5} - 2$

Adding both $2\,\text{Sec}\Theta = 2\sqrt{5} \Rightarrow \text{Sec}\Theta = \sqrt{5}$

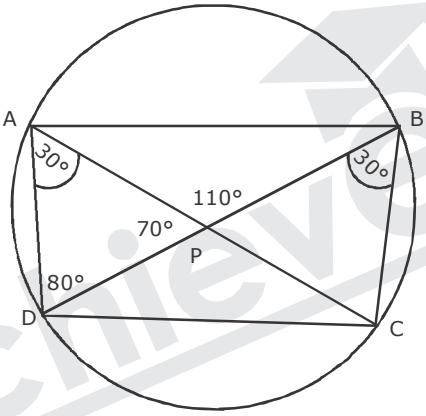
$\Rightarrow \text{Sin}\Theta = \frac{2}{\sqrt{5}}$

130. ABCD is a cyclic quadrilateral. Diagnals AC and BD meets at P. if $\angle APB = 110°$ and $\angle CBD = 30°$, then $\angle ADB$ measures.

a. 30° b. 80°

c. 55° d. 70°

Sol. b.



131. Ram deposited a certain sum of money in a company at 12% per annum simple interest for 4 years and deposited equal amount in fixed deposit in a bank for 5 years at 15% per annum simple interest. If the difference in the interest from two sources is ₹ 1350 then the sum deposited in each case is:

a. ₹ 4000 b. ₹ 6500

c. ₹ 3000 d. ₹ 5000

sol. d

75% - 48% = 1350

$\Rightarrow 27\% = 1350 \Rightarrow 100\% = \frac{1350}{27} \times 100$

= 5000

132. If $x^2 + x = 5$ then the value of

$(x + 3)^3 + \frac{1}{(x + 3)^3}$

a. 120 b. 110

c. 130 d. 140

sol. b.

Let $y = x + 3 \Rightarrow x = y - 3$

Now, $x^2 + x = 5 \Rightarrow (y-3)^2 + y - 3 = 5$

$\Rightarrow y^2 - 5y + 1 = 0 \Rightarrow y^2 + 1 = 5y$

$\Rightarrow \quad y + \frac{1}{y} = 5$

Now, $y^3 + \frac{1}{y^3} = 125 - 3 \times 5 = 110$

133. The value of the following is

Cos24°+Cos55°+Cos125°+Cos204°+Cos300°

a. $\frac{1}{2}$ b. $-\frac{1}{2}$

c. 2 d. 1

sol. a.

cos24° + cos55° + cos(180° + 55°) +

cos(180° + 24°) + cos (360°-60°)

= cos24°+cos55°-cos55° -cos 24°+cos 60°

= cos 60° = 1/2

134. If the discount of 10% is given on the marked price of a radio, the gain is 20%. If the discount is increased to 20%, the gain is:

a. $7\frac{5}{8}\%$ b. 5%

c. $6\frac{1}{4}\%$ d. $6\frac{2}{3}\%$

sol. d.

9 MP = 1.2 CP $\Rightarrow$ .8 MP = $\frac{1.2 \times 0.8}{0.9}$CP

% profit $= \left[\frac{1.2 \times 0.8}{.9} - 1\right] \times 100 = \frac{20}{3}$

$= 6\frac{2}{3}\%$

135. A conical iron piece having diameter 28 cm and height 30 cm is today immersed into the water of a cylindrical vessel, resulting in the rise of water level by 6.4cm. The diameter, in cm of the vessel is:

a. 32 b. 3.5

c. $\frac{35}{2}$ c. 35

sol. d.

$\frac{\pi D^2 H}{4} = \frac{1}{3} \cdot \frac{1}{4} \pi d^2 h$

$\Rightarrow D^2 = \frac{1}{3}\frac{d^2 h}{H} = \frac{1}{3} \times \frac{28 \times 28 \times 30}{6.4}$

$D^2 = \frac{28 \times 28 \times 100}{64} = \frac{28 \times 10}{8} = 35\text{cm}$

136. O is the incentre of ΔPQR and $\angle QPR = 50°$, then the measure of $\angle QOR$ is:

a. 125° b. 115°

c. 100° d. 130°

Sol. b.

$\angle QOR = 90° + 25° = 115°$

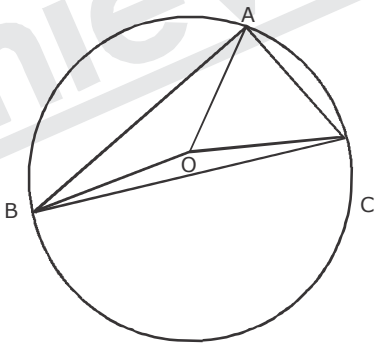
137. O is the circumcentre of ΔABC.

If $\angle BAC = 85°$, $\angle BCA = 75°$, the $\angle OAC$ is equal to:

a. 50° b. 60°

c. 70° d. 40°

Sol. c.



$\angle BAC = 85°$, $\angle BCA = 75°$

$\therefore \angle BOC = 2 \times 85° = 170°$ and

$\angle AOB = 2 \times 75° = 150°$

$\Rightarrow \angle AOC = 40° \Rightarrow \angle OAC = \frac{140°}{2} = 70°$

138. A librarian purchased 50 story-books for his library. But he saw that he could get 14 more books by spending ₹76 more and the average price per book would be reduced by ₹1. The average price (in₹) of each book he bought, was:

a. 25 b. 10

c. 15 d. 20

sol. b.

50x + 76 = 64 (x - 1)

$\Rightarrow$ 14x = 76 + 64 $\Rightarrow$ x = 10

139. If the area of the base, height and volume of a right prism be $(3\sqrt{3}/2)p^2$, $100\sqrt{3}$ cm and 7200 cm^3 respectively, then the value of P will be?

a. $\sqrt{3}$ b. 4

c. $\frac{3}{2}$ d. $\frac{2}{\sqrt{3}}$

sol. b.

$$AH = V \Rightarrow \frac{3\sqrt{3}}{2} \times 100\sqrt{3}P^2 = 7200$$

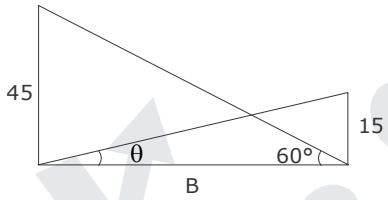
$$\Rightarrow P^2 = 16 \Rightarrow P = 4$$

140. Two towers A and B have lengths 45m and 15m respectively. The angle of elevation from the bottom of the B tower to the top of the A tower is 60°. if the angle of elevation from the bottom of A tower to the top of the B tower is Θ then value of $\sin\Theta$ is:

a. $\frac{1}{2}$ b. $\frac{2}{\sqrt{3}}$

c. $\frac{\sqrt{3}}{2}$ d. $\frac{1}{\sqrt{2}}$

sol. a.



$$\tan 60° = \frac{45}{B} \text{ and}$$

$$\tan\theta = \frac{15}{B} = \frac{45}{3B} = \frac{\tan 60°}{3} = \frac{1}{\sqrt{3}}$$

$$\Rightarrow \theta = 30° \Rightarrow \sin\theta = \frac{1}{2}$$

141. The value of the following is

$3(\sin^4\theta + \cos^4\theta) + 2(\sin^6\theta + \cos^6\theta)$

$+ 12\sin^2\theta\cos^2\theta$

a. 0 b. 2

c. 3 d. 5

Sol. d.

$3(1 - 2\sin^2\theta\cos^2\theta) + 2(1 - 3\sin^2\theta\cos^2\theta)$

$+ 12\sin^2\theta\cos^2\theta = 5$

142. If $x + \frac{1}{x} = 1$ then the value of $\frac{2}{x^2 - x + 2} = ?$

a. $\frac{2}{3}$ b. 4

c. 2 d. 1

sol. c.

$$x + \frac{1}{x} = 1 ; x^2 + 1 = x$$

$$x^2 - x + 1 = 0$$

$$\therefore \frac{2}{x^2 - x + 2} = \frac{2}{x^2 - x + 1 + 1} = \frac{2}{0 + 1} = 2$$

143. The simplified value of

$$\left\{\left(1+\frac{1}{10+\frac{1}{10}}\right)\left(1+\frac{1}{10+\frac{1}{10}}\right) - \left(1-\frac{1}{10+\frac{1}{10}}\right)\left(1-\frac{1}{10+\frac{1}{10}}\right)\right\} :$$

$$\left\{\left(1+\frac{1}{10+\frac{1}{10}}\right)\left(1-\frac{1}{10+\frac{1}{10}}\right)\right\}$$

a. $\frac{100}{101}$ b. $\frac{20}{101}$

c. $\frac{90}{101}$ d. 2

Sol. The question is wrong.no option is matched.

$$\text{Let } x = \left(\frac{1}{10+\frac{1}{10}}\right) \Rightarrow x = \left(\frac{10}{101}\right)$$

$$\text{Now, } \frac{(1+x)(1+x) - (1-x)(1-x)}{(1-x^2)} = \frac{4x}{1-x^2}$$

$$= \frac{4\left(\frac{10}{101}\right)}{\left(\frac{111\times 91}{101\times 101}\right)} = \frac{40\times 101}{111\times 91}$$

144. If a + b - c = 14 then the value of

$2b^2c^2 + 2c^2a^2 + 2a^2b^2 - a^4 - b^4 - c^4$

a. 7 b. 0

c. 28 d. 14

Sol.

The question is wrong.

The question should be :

If a + b + c = 0 then the value of

$2b^2c^2 + 2c^2a^2 + 2a^2b^2 - a^4 - b^4 - c^4$

a. 7 **b. 0**

c. 28 **d. 14**

Ans: $a + b + c = 0$

$\Rightarrow (a + b + c)^2 = 0$

$\Rightarrow a^2 + b^2 + c^2 = -2(ab + bc + ca)$

Again squaring,

$(a^2 + b^2 + c^2)^2 = 4(ab + bc + ca)^2$

$\Rightarrow a^4 + b^4 + c^4 + 2a^2b^2 + 2b^2c^2 + 2c^2a^2$

$= 4\{a^2b^2 + b^2c^2 + c^2a^2 + 2abc(a+ b+ c)\}$

$\Rightarrow a^4 + b^4 + c^4 + 2a^2b^2 + 2b^2c^2 + 2c^2a^2$

$= 4(a^2b^2 + b^2c^2 + c^2a^2)$ $\because a + b + c = 0$

$\Rightarrow a^4 + b^4 + c^4 = 2a^2b^2 + 2b^2c^2 + 2c^2a^2$

$\Rightarrow 2a^2b^2 + 2b^2c^2 + 2c^2a^2 - a^4 - b^4 - c^4 = 0$

145. Average weight of 3 men A, B, C is 84 kg. Another man D joins the group and the average now becomes 80 kg. If another man E whose weight is 3 kg more than that of D replaces A then the average weight of B,C,D and E becomes 79 kg. The weight of A in Kg is:

a. 72 b. 75

c. 80 d. 70

sol. b.

A+B+C= 3 x 84 = 252 kg

A+B + C+ D = 4 x 80 = 320 kg

$\therefore$ D = 320-252 = 65 kg

$\therefore$ E = 68+3 = 71 kg

now, $\frac{320 - A + 71}{4} = 79$

$\therefore A = 75$ kg

146. The speed of a boat in still water is 6 Km/hr and the speed of the stream is 1.5 km/hr. A man rows to a place at a distance of 32.5 km and comes back to the starting point. The total time taken by him is:-

a. 8 hours b. 10 hours

c. 4 hours d. 6 hours

sol. a.

Boat's upstream speed = 6-1.5=4.5 km/hr

Boat's downstream speed =6+1.5 = 7.5 km/hr

$\therefore$ Total time = $\frac{22.5}{4.5} + \frac{22.5}{7.5}$

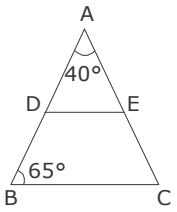
$\therefore$ 5+3 = 8 hr

147. In ΔABC, D and E are two mid points to sides AB and AC respectively. If $\angle BAC = 40^\circ$ and $\angle ABC = 65^\circ$ then $\angle CED$:

a. 105° b. 125°

c. 130° d. 75°

sol. a.



From mid point theorem DE || BC

$\therefore \angle ACB = 180 - (40 + 65) = 75^\circ$

$\angle CED = 180 - 75 = 105^\circ$

(on the same side of transverse)

148. Two alloys contain tin and iron of 1 : 2 and 2 : 3. If the two alloys are mixed in the proportion of 3 : 4 respectively (by weight), the ratio of tin and iron in the newly formed alloy is:

a. 12 : 23 b. 13 : 23

b. 10 : 21 d. 14 : 25

sol. b.

	Tin	iron
Alloy 1	$\frac{1}{3}$	$\frac{2}{3}$
Alloy 2		

From Alloy 1, $\frac{3}{7}$ is taken and

From Alloy 2, $\frac{4}{7}$ is taken

Ratio of tin and iron will be

$\frac{1}{3} \times \frac{3}{7} + \frac{2}{5} \times \frac{4}{7} : \frac{2}{3} \times \frac{3}{7} + \frac{3}{5} \times \frac{4}{7}$

$= \frac{1}{7} + \frac{8}{35} : \frac{2}{7} + \frac{12}{35}$

= 13 : 22

149. If $\frac{\text{Sec}\Theta + \text{Tan}\Theta}{\text{Sec}\Theta - \text{Tan}\Theta} = 2\frac{51}{79}$ then the value of $\text{Sin}\,\Theta$ is

a. $\frac{39}{72}$ b. $\frac{91}{144}$

c. $\frac{35}{72}$ d. $\frac{65}{144}$

sol. d.

$$\frac{\sec\theta+\tan\theta}{\sec\theta-\tan\theta}=\frac{209}{79}$$

$$\Rightarrow \frac{1+\sin\theta}{1-\sin\theta}=\frac{209}{79}$$ (dividing $\sec\theta$ in N^r & D^r)

using componendo and dividendo,we get

$$\frac{1+\sin\theta+1-\sin\theta}{1+\sin\theta-1+\sin\theta}=\frac{209+79}{209-79}$$

$$\Rightarrow \frac{2}{2\sin\theta}=\frac{288}{130}$$

$$\Rightarrow \sin\theta = \frac{130}{288}=\frac{65}{144}$$

150. If $1 + \text{Cos}^2\theta = 3\,\text{Sin}\,\theta\,\text{Cos}\,\theta$, then the integral value of $\text{Cot}\,\Theta$ is $(0<\theta<\Pi/2)$

a. 1 b. 2

c. 3 d. 0

sol. a.

$$1+\cos^2\theta = 3\sin\theta\cdot\cos\theta$$

Divide by $\sin^2\theta$, we get

$$\frac{1}{\sin^2\theta}+\frac{\cos^2\theta}{\sin^2\theta}=\frac{3\sin\theta-\cos\theta}{\sin^2\theta}$$

$\Rightarrow \text{cosec}^2\theta + \cot^2\theta = 3\cot\theta$

$\Rightarrow 1 + \cot^2\theta + \cot^2\theta - 3\cot\theta = 0$

$\Rightarrow 2\cot^2\theta - 3\cot\theta + 1 = 0$

$\Rightarrow 2\cot^2\theta + 2\cot\theta - \cot\theta - 1 = 0$

$\Rightarrow 2\cot\theta(\cot\theta - 1) - 1(\cot\theta - 1) = 0$

$\Rightarrow \cot\theta = 1$