



SSC - CGL 2016

QUANTITATIVE APTITUDE - SOLUTION

- (c); By using option correct ans should be multiple of 25 and 50 both. The condition of increasing the no. of packs by 3 is 150.
 - (c); $\frac{0.0015 \times 10^m}{0.03 \times 10^k} = 5 \times 10^7$
 $5 \times 10^{m-4+k+2} = 5 \times 10^7$
 $m - 4 + k + 2 = 7$
 $m - k = 9$
 - (a); Sandhu has ordered for 25 boxes and three different type of sweets. So min. 9 boxes of sweets will have the same type of sweets.
 - (c); If Y and Y² are ending with the same unit's digit, then it can be 0, 1, 5, 6 but it is given that none of the digits is equal to zero. So the unit's digit can be only 1, 5, 6. Next, unit's digit of the square of the no. written in reverse order is 6. So, ten's place digit of the actual no. should be either 4 or 6.
 So, actual no. could be 41, 45, 46, 61, 65, 66.
 Now, the square is less than 3000. So only possibilities are 41, 45, 46.
 - (a); Time taken by them to complete one revolution = $\frac{11}{4}, \frac{11}{5.5}$ and $\frac{11}{8}$
 LCM of $\frac{11}{4}, \frac{2}{1}$ and $\frac{11}{8} = 22$ hrs.
 - (c); (5W + 2M)'s 1 day work = (1W + 1M)'s 4 day's work.
 $5W + 2M = 4W + 4M$
 $\frac{W}{M} = \frac{2}{1}$
 - (d); No. of days = $\frac{1}{\frac{1}{7 \times 12} + \frac{1}{14 \times 15}} = 15 \frac{3}{11}$ days.
 - (b); The cistern is to be filled in 12 min. second pipe can fill only $\frac{12}{24} = \frac{1}{2}$ of the cistern in total time.
 This means the other half of the tank will be filled in 10 min.
 - (b); Pipe A fills $\frac{1}{30}$ th of the tank and pipe B fill $\frac{1}{15}$ th of the tank in 1min.
 Pipe C drains 12 liter in a min \Rightarrow in 30 min. it drains $12 \times 30 = 360$ liters of water.
 So, if X is the total capacity of Tank.
 Full tank + input in 30 min. = output in 30 min.
 $X + \left(\frac{X}{30} + \frac{X}{15}\right) \times 30 = 360$
 $X = 90$
 - (c); $10B \times 10 = 12G \times 10$
 $5B = 6G.$
 $(15B + 6G)X = 10B \times 10$
 $20B.X = 10B \times 10$
 $X = 5$ days.
 - (a); Here, Asha comes 1st, Bindu comes 2nd and Kavita comes 3rd in the contest.
 $(200 - 40).X = 200(50 - 40)$
 $X = \frac{25}{2}$ meter
- Hence, Bindu can beat Kavita by $\frac{25}{2}$ meter or 2 sec. It implies that Kavita can run $\frac{25}{2}$ meter in 2 sec.
 \therefore Kavita can run 200meter in = $\frac{2}{25} \times 200 = 32$ sec.
 \therefore Bindu takes $(32 - 2) = 30$ sec.
 and Asha takes $\frac{30}{200} \times (200 - 40) = 24$ sec.
- (d); P & Q have walked together a distance = $2 \times AB = 2 \times 39 = 78$ km
 The ratio of the speeds of P and Q is 3 : 3.5
 The distance travelled by P = AC
 $= \frac{6}{6+7} \times 78 = 36$ km
 - (a); Still water's speed = $\frac{d}{2} \left[\frac{1}{20} + \frac{1}{15} \right]$
 $= \frac{7}{60} \times 60 = 7$ km/hr.
 Speed of current = $\frac{d}{2} \left[\frac{1}{15} - \frac{1}{20} \right]$
 $= \frac{1}{60} \times 60 = 1$ km/h
 So, Sum of swimmer speed in still water & speed of current = $7 + 1 = 8$ km/hr.
 - (b); The weight of boxes are.
 1st box = 200 kg
 3rd box = $200 + \frac{25}{100} \times 200 = 250$ kg
 2nd box = $250 + \frac{20}{100} \times 250 = 300$ kg
 4th box = 350 kg
 5th box = 500 kg
 Total weight of the heaviest four boxes. = $250 + 300 + 350 + 500 = 1400$ kg
 Total weight of the lightest four boxes = $200 + 250 + 300 + 350 = 1100$ kg
 Hence. He difference between the heavier 4 and the lighter 4 is 300 kg. Hence, the difference in Average is 75 kg.
 - (d); Average of Asha = $80 \times 4 - 84 \times 3 = 68$ year
 Therefore, age of Atrye = $68 + 3 = 71$ years
 Age of Seema = $80 \times 4 - 79 \times 4 + 71 = 75$ year.
 - (a) Let Bilal Singh Salary = y
 Money left = $y - \left[\frac{1}{4}y + \frac{1}{3}y + \frac{1}{6}y \right]$
 $= \frac{y}{4}$
 Money spend on clothes = $\frac{1}{10} \times \frac{1}{4}y = \frac{1}{40}y$
 Money left = $\frac{y}{4} - \frac{y}{40} = \frac{9y}{40}$
 According to question
 $\frac{9y}{40} = 13500$
 $y = 60000$
 Difference = $20000 - 15000 = 5000$
 - (d); Fare ratio $\rightarrow 10 : 8 : 3$
 Passenger ratio $\rightarrow 3 : 4 : 10$
 $30xy + 32xy + 30xy = 161000$

$$xy = 1750$$

$$\text{Second class revenue} = 32 \times 1750 = 56000$$

18. (a); No. of classes - HCF of 391 and 323 = 17

19. (d); Let x and y be the mass of 1st alloy and 2nd alloy.

$$\text{Copper in the 1st alloy} = \frac{9}{10}x$$

$$\text{Silver in the 1st alloy} = \frac{7}{100}x$$

$$\text{Gold in the 1st alloy} = \frac{3}{100}x$$

for silver, we have

$$\frac{\left(\frac{7}{100}x\right)}{x+y} \times 100 = 5$$

$$\Rightarrow \frac{x}{y} = \frac{5}{2}$$

Applying allegation -

$$\frac{y}{x} = \frac{5}{85-c}$$

$$\frac{2}{5} = \frac{5}{85-c}$$

$$c = 72.5$$

20. (b); $2y + 20 : 3y + 20 : 5y + 20 = 4 : 5 : 7$

$$y = 10$$

So, 20, 30 and 50 giving a total of 100 students in the three classes.

21. (b); C.P. of 56 kg rice =

$$\text{Rs.}(26 \times 20 + 30 \times 36) = \text{Rs.}(520 + 1080) = \text{Rs.}1600.$$

$$\text{S.P. of 56 kg rice} = \text{Rs.}(56 \times 30) = \text{Rs.}1680.$$

$$\text{Gain} = 80/1600 \times 100\% = 5\%.$$

22. (b) C.P. $\times 1.2 = 25$

$$\text{CP} = 20.833$$

$$\text{At a selling price of 22.5 the profit percent} = \frac{22.5 - 20.833}{20.833} \times 100$$

$$= \frac{1.667}{20.833} \times 100 = 8\%$$

23. (a) Let C.P. be Rs. x .

$$\text{Then, } (1920 - x)100/x = (x - 1280) \cdot 100/x$$

$$1920 - x = x - 1280$$

$$2x = 3200$$

$$x = 1600$$

$$\text{Required S.P.} = 125\% \text{ of Rs. } 1600 = \text{Rs.}(125 \times 1600)/100 = \text{Rs.}2000$$

24. (d); Total interest given is same, this means the total of rate percent is same

$$6 \times t = 5 \times (t + 1)$$

$$t = 5$$

$$P = \frac{100A}{100 + RT}; \text{ Amount} = 2600, \text{ time} = 5, \text{ rate of interest} = 6\%$$

$$P = \frac{2600 \times 100}{100 + 6 \times 5} = 2000$$

25. (a); If he invests y at 5% and $(1500 - y)$ at 7%,

We get the equation

$$5\% \text{ of } y + 7\% \text{ of } (1500 - y) = 91$$

$$y = 700$$

26. (c); Average score of the class = $\frac{0.35 \times 60 + 0.1 \times 33 + 0.3 \times 13}{0.75} = 37.6$

27. (d); Consider the following sequence

$$100 \rightarrow 150 \rightarrow 75 \text{ (year 1)} \rightarrow 112.5 \rightarrow 56.25 \text{ (year 2)} \rightarrow$$

$$84.375 \rightarrow 42.1875$$

$$\text{Now } 42.1875 = 16875 / -$$

$$1 \rightarrow 400 / -$$

$$\text{So, the donation in the 2nd year} = (56.25 \times 400) = 22500$$

28. (a); Present ages of the six members = $17 \times 6 = 102$

$$\text{Present age of the five members} = 5 \times (17 + 3) = 100 \text{ years}$$

$$\text{Age of baby} = 102 - 100 = 2 \text{ year}$$

29. (a); With the help of option $p/q < 1 \Rightarrow q > p$, thus reciprocal, q/p

Always has a value greater than 1 because the numerator will always be a larger positive integer than denominator must be greater than 1.

30. (c); $\sqrt{(5)(45)} \otimes 60 = \sqrt{15 \times 15 \times 4} = 30$

31. (b); Let 100 total question

$$\text{Total correct} = 100 \text{ marks}$$

$$\frac{1}{10} \times 100 \rightarrow 10 \text{ Ques} \rightarrow \frac{1}{10} \text{ Negative marking}$$

$$\frac{1}{5} \times 100 \rightarrow 20 \text{ Ques} \rightarrow \frac{1}{5} \text{ Negative marking}$$

$$\text{Rest means } 70 \text{ Ques} \rightarrow \frac{1}{2} \text{ Negative marking.}$$

$$\text{Total} = -40 \text{ marks}$$

$$\text{So, Difference} = 100 - (-40) = 140$$

32. (c); Difference = $13 \frac{7}{66} - 4 \frac{5}{66}$

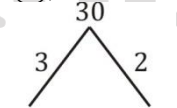
$$= 9 \frac{1}{33}$$

$$\text{SUM} = 13 \frac{7}{66} + 4 \frac{5}{66} = 17 \frac{2}{11}$$

$$\text{req. ans.} = 17 \frac{2}{11} - 9 \frac{1}{33} = 8 \frac{5}{33}$$

33. (c); If all prime no. are used, the difference must be even but difference given is odd. This means the even prime no. is used. So, 2, 3, 5 must be used so, the surface area = 62 sq. cm.

34. (b); Total work = 30



$$A \quad B$$

$$10 \quad 15$$

$$\text{Three days work} = 3 \times 5 = 15$$

$$\text{Remaining work} = \frac{15}{3} = 5 \text{ days}$$

$$\text{So, Total work} = 5 + 3 = 8 \text{ days.}$$

35. (a);

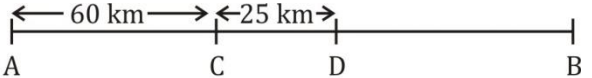
$$\text{Time} \rightarrow 4 : 5$$

$$\text{Work} \rightarrow 5 : 4$$

$$\text{So, A's share} = \frac{5}{9} \times 4500 = 2500$$

$$\text{B's share} = \frac{4}{9} \times 4500 = 2000$$

36. (b) When accident takes place at C, then after the accident distance covered = CB.



When accident takes place at D, then after the accident distance covered = DB

$$\Rightarrow \text{CB} - \text{DB} = 25 \text{ km} = \text{CD}$$

$$\text{And } 1/3 \text{ of usual times to cover CD} = 10 \times 3 = 30 \text{ min}$$

$$\text{In 30 min, Aman covers CD} = 25 \text{ km.}$$

$$\text{Speed} = \frac{25}{30} \times 60 = 50 \text{ km/hr}$$

$$\text{Now } 1/3 \text{ of usual time to cover CB} = 40 \text{ min}$$

$$\text{Usual time to cover CB} = 40 \times 3 = 120 \text{ min.} = 2 \text{ hour}$$

\therefore Distance CB = Speed \times time = $50 \times 2 = 100$ km.
 Total distance, AB = AC + CB = $60 + 100 = 160$ km.
 Hence required speed = 50 km/hr.

37. (b); Average speed of Seema = $\frac{y}{\frac{10-y}{6}} = \frac{y}{4}$ km/hr

Average speed of Sapna = $\frac{y}{12-8} = \frac{y}{4}$ km/hr

They meet x hrs after Seema starts. Sapna as she starts 2 hrs late, meet after $(x - 2)$ hrs from start.

So, distance travelled by Sapna = $\frac{y(x-2)}{4}$ km

So, $\frac{yx}{4} + \frac{y(x-2)}{4} = y$

$x = 3$ hrs.

So, They meet at = 6 a.m. + 3 hrs. = 9 a.m.

38. (d); 10 person can finish work = $\frac{25 \times 20}{10} = 50$ days

15 person leave the work & work done in 37.5 day

only $\frac{37.5}{50} = \frac{3}{4}$ part of the work. Hence all persons must

work till $\left(1 - \frac{3}{4}\right) = \frac{1}{4}$ of the work finished

\Rightarrow 25 person $\frac{1}{4}$ work in $\frac{20}{4} = 5$ days.

So, 15 person should leave the work after 5 days.

39. (d); Loser's time - winner's time = beat time + start time

\Rightarrow Bindu's time - Asha's time = $10 + 0$

$\Rightarrow \frac{\text{Bindu's distance}}{\text{Bindu's speed}} - \frac{\text{Asha's distance}}{\text{Asha's speed}} = 10$

$\Rightarrow \frac{100-4}{\text{Bindu's speed}} - \frac{100}{2} = 10$

Bindu's speed = 1.6 m/sec

40. (a); $\frac{4}{5}$ of total time in train = 2 hours

Total time in train = $\frac{5}{2}$ hours.

Total time in Air = $4 - \frac{5}{2} = \frac{3}{2}$ hr.

By the given data, if 360 km is covered by Air, then time = $4 - 2 = 2$ hours

Then, $\frac{3}{2}$ hrs is spent in air.

Distance covered = $\frac{360}{2} \times \frac{3}{2} = 270$ km

Hence distance covered by train = 90 km

41. (b); Water-scooter be y km/hr.

$10 = \frac{55}{60} \times \frac{(y)^2 - (2)^2}{2y}$

$11y^2 - 240y - 44 = 0$

$y = \frac{-2}{11}$ or 22 km/h

42. (a); No. of senior level employees = y

$\Rightarrow \frac{125 \times 5500 + 14000 \times y}{125 + y} = 8687.5$

$y = 75$

$\left(\frac{4}{5}\right)$ of total employees = $125 + 75 = 200$

Hence the no. of total = $\frac{5}{4} \times 200 = 250$

43. (b); The value satisfies all the conditions $\Rightarrow 66, 67, 68$

$= \frac{66+67+68}{3} = \frac{201}{3} = 67$ kg

44. (d); Area of semicircle = $\frac{1}{2} \pi r^2$

Area of sector = $\frac{\theta}{360} \times \pi r^2$

$\frac{\frac{\theta}{360} \times \pi r^2}{\frac{1}{2} \times \pi r^2} = \frac{1}{10}$

$\theta = \frac{1}{10} \times 180 = 18^\circ$

45. (b); $20 \times 3x + 30 \times 2x + 36x = 780$

$x = 5$

So, required amount = $2(15 \times 3 \times 5 + 21 \times 2 \times 5 + 30 \times 5)$
 $= 1170$

46. (c); Asha buy x fruit cakes. Then no. of cakes bought by Atul = $x + 9$

Atul bought y egg cakes. Then no. of egg cakes bought by Asha = $y + 18$

$\frac{x+y+9}{x+y+18} = \frac{12}{21} = \frac{4}{7}$

$x + y = 3$

$x \& y \neq 0$

When $x = 1, y = 2$

And if, $y = 1, x = 2$

Let the price of fruit cake be a /units and price of egg cake be b / units.

$10a + 2b = a + 20b$

$9a = 18b$

$a : b = 2 : 1$

47. (b); $(x - 3)$ is factor, satisfying $(3x^2 - 9x^2 + kx - 12)$ so, put $x = 3$.

$k = 4$

Now, $3x^3 - 9x^2 + 4x - 12 = 3x^2(x - 3) + 4(x - 3)$
 $= (3x^2 + 4)(x - 3)$

48. (b); Mass of oil in each of the two quantities by y and $(y + 2)$ Kg.

$\frac{96}{y} - \frac{96}{(y+2)} = 4$

$y = 6$ or -8

$y = 6$ kg

& $y + 2 = 8$ kg

49. (c); Let x be the weight of the cut off piece.

$\frac{6-x}{x} = \frac{x}{12-x}$

$x = 4$ kg

1st alloy: 2 kg of Ist alloy and 4 kg of IInd alloy.

2nd alloy: 4 kg of Ist alloy and 8 kg of IInd alloy.

So, ratios are equal to 1 : 2 in each case.

50. (a) Cost of trip \times Price of petrol.

So, C.P. = 100

New cost = 80

Profit = 20%, his revenue = 120

When he takes 4 passengers instead of 3. His revenue would go upto 160 and his profit would become 100% (Cost \rightarrow 80 & revenue \rightarrow 160)

51. (b) 10% reduction \rightarrow 11.11% increase consumption.

But increase in consumption = 6.2 kg.

Hence, initial consumption = $6.2 \text{ kg} \times 9 = 55.8$ kg.

The initial price = $\frac{279}{55.8} = 5$ per kg.

Hence, reduced price = $\frac{279}{55.8+6.2} = 4.50$ per kg.

52. (c) C.P. per 100 banana = $600 + 15\%$ of $600 = 690/-$
 S.P. at 20% profit = $1.2 \times 690 = 828/-$

53. (d); When the sum becomes 1.44 in two years.

Means in one year it become 1.2 times. Then rate of interest is 20% p.a. The second part of the problem is that @ 20% p.a. The sum of money will double itself in how many years.

As total interest needed 100% at giving rate 20%, it will take 5 year.

54. (a); No. of days Jan 1 to Aug. 8 = 30 + 28 + 31 + 30 + 31 + 30 + 31 + 8 = 219.

So, $\frac{219}{365} = \frac{3}{5}$ of an year at 7% to get 42 work from choice now. Taking 1000/-, we calculate Interest = $\frac{100 \times 7 \times 3}{10 \times 5} = 42$

55. (c); Hydrogen = 300 gm
 $\frac{5}{6}$ of water Vapour = 300 gm
 water vapour = 0.36 kg

56. (a); Let the total no. of employees = y

Female employees = $\frac{3y}{5}$

Male employees = $\frac{2y}{5}$

No. of male employees who earn more than 25000 = $\frac{3}{4} \times \frac{2y}{5} = \frac{3y}{10}$

Total no. of employees who earn more than 25000 = $\frac{9y}{20}$

No. of female employees who earn more than 25000 = $\frac{3y}{20}$

Fraction of woman employees who earn 25000 per month or less.

$$= \frac{\frac{3y}{20}}{\frac{3y}{5}} = \frac{3}{4}$$

57. (a); Average speed = 45 km/hr

Average. Speed of complete trip = $\frac{300}{\frac{10}{3} + \frac{25}{6}} = 40$ km/hr

So, the average speed exceeds average ratio overall by 5 km/hr.

58. (b); Volume of pyramid = $\frac{1}{3} \times \text{base} \times \text{height}$

Base is a square, with diagonal (d) = 10m

Base area = $\frac{100}{2} = 50$

Volume of pyramid = $\frac{1}{3} \times 100/2 \times 10 = 166\frac{2}{3}$ m³

Lateral (curved) surface base (a) = $\frac{1}{2} \times \text{base perimeter} \times \text{slant height}$

Side of square base (a) = $d/\sqrt{2} = 10/\sqrt{2}$ m

And base perimeter = 4a

Slant height = $\sqrt{10^2 + \left(\frac{5}{\sqrt{2}}\right)^2} = \frac{15}{\sqrt{2}}$ m

Lateral surface = $\frac{1}{2} \times 4 \times \frac{10}{\sqrt{2}} \times \frac{15}{\sqrt{2}} = 150$ m²

59. (b); $\left(\frac{\sqrt{3}}{2}\right)^3 \cdot (\sqrt{3}) - 2(\sqrt{2})^2 + 3\left(\frac{1}{2}\right)(1) - (\sqrt{3})^2 = \frac{-35}{8}$

60. (d); $\cos^2 \alpha + \sin^2 \alpha = 1$

$\frac{\cos^4 \alpha}{\cos^2 \beta} + \frac{\sin^4 \alpha}{\sin^2 \beta} = 1$, is possible only when $\alpha = \beta$

61. (b); $\tan \theta = \frac{h}{MB}$ (i)

$\tan(90 - \theta) = \frac{2h}{AM}$

or $\cot \theta = \frac{2h}{AM}$ (ii)

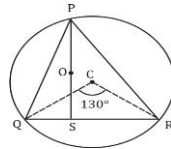
On multiplication-

$$\tan \theta \cdot \cot \theta = \frac{h \cdot 2h}{(MB)(AM)}$$

$$1 = \frac{2 \cdot h^2}{\left(\frac{y}{2}\right)^2}$$

$$h = \frac{y}{2\sqrt{2}}$$

62. (b); In ΔPQR ,



$$\angle QPR = \frac{1}{2} \angle QCR = \frac{1}{2} \times 130^\circ = 65^\circ$$

$$\angle PQR = \angle PQS = 60^\circ$$

$$\angle PRS = \angle PRQ = 180^\circ - 65^\circ - 60^\circ = 55^\circ$$

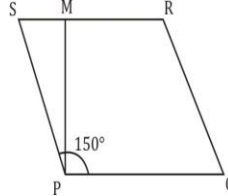
$$\angle PSR = 90^\circ$$

$$\angle RPS = 180^\circ - 90^\circ - \angle PRS = 35^\circ$$

63. (c); $\angle BOD = \frac{1}{2} \times \angle BOC = \frac{1}{2} \times 120^\circ = 60^\circ$

64. (a); $\angle SPQ = 150^\circ$ and PM = 20 cm

In parallelogram PQRS,



$$\angle RSP + \angle SPQ = 180^\circ$$

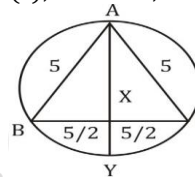
$$\angle RSP = 180^\circ - 150^\circ = 30^\circ$$

$$\theta = 30^\circ$$

$$\text{In } \Delta PSM, \sin 30^\circ = \frac{PM}{SP}$$

$$\frac{1}{2} = \frac{20}{SP} \Rightarrow SP = 40 \text{ cm}$$

65. (c); In ΔABC ,



$$BX = \frac{5}{2} \text{ cm}, CX = \frac{5}{2} \text{ cm}$$

$$\text{And } AX = \frac{\sqrt{3}}{2} \text{ cm} \times 5 = \frac{5\sqrt{3}}{2} \text{ cm}$$

\therefore AY and BC are two chords of circle.

$$\therefore AX \cdot XY = BX \cdot CX$$

$$\frac{5\sqrt{3}}{2} \cdot XY = \frac{5}{2} \cdot \frac{5}{2}$$

$$XY = \frac{5}{2\sqrt{3}}$$

$$AX \cdot AY = \left(\frac{5\sqrt{3}}{2} + \frac{5}{2\sqrt{3}}\right) \times \frac{5}{2\sqrt{3}} = \frac{25}{3} \text{ cm}$$

$$3 AX \cdot AY = 25 \text{ cm}$$

66. (b); In cyclic Quadrilateral ABCD,

$$\angle A + \angle C = 180^\circ \Rightarrow \angle A = 180^\circ - \angle C \text{(i)}$$

$$\& \angle B + \angle D = 180^\circ \Rightarrow \angle B = 180^\circ - \angle D \text{(ii)}$$

It is given that,

$$\angle A + \angle B = 2(\angle C + \angle D)$$

$$\Rightarrow 180^\circ - \angle C + 180^\circ - \angle D = 2(\angle C + \angle D)$$

$$360^\circ = 3(\angle C + \angle D)$$

$$\angle C + \angle D = 120^\circ$$

$$\Rightarrow C > 30^\circ \& D < 90^\circ$$

67. (c); $(a + b)^2 + (a - b)^2 = 6^2 + 2^2$

$$a^2 + b^2 = 20$$

$$2(a^2 + b^2) = 40$$

68. (d); $a - \frac{1}{a} = \frac{-3}{2}$

$$a^3 - \frac{1}{a^3} - 3\left(a - \frac{1}{a}\right) = \frac{-27}{8}$$

$$a^3 - \frac{1}{a^3} - 3\left(\frac{-3}{2}\right) = \frac{-27}{8}$$

$$a^3 - \frac{1}{a^3} = \frac{-63}{8}$$

$$a^3 - \frac{1}{a^3} + 2 = \frac{-63}{8} + 2 = \frac{-47}{8}$$

69. (a); Radius of circle = 2 cm
so, area between the circle, shaded region = $0.86 \times 2 \times 2$
= $3\frac{3}{7} \text{ cm}^2$

$$\begin{aligned} \text{total area of shaded region} &= \frac{3}{4}\pi r^2 + 3\frac{3}{7} \\ &= \frac{3}{4} \times \frac{22}{7} \times 4 + 3\frac{3}{7} = \frac{66}{7} + \frac{24}{7} = \frac{90}{7} \\ &= 12\frac{6}{7} \text{ cm}^2 \end{aligned}$$

70. (c); $x^2 = by + cz, y^2 = cz + ax, z^2 = ax + by.$

$$\begin{aligned} &= \frac{a}{a+x} \cdot \frac{x}{x} + \frac{b}{b+y} \cdot \frac{y}{y} + \frac{c}{c+z} \cdot \frac{z}{z} \\ &= \frac{ax}{ac+by+cz} + \frac{by}{by+cz+ax} + \frac{cz}{cz+ax+by} \end{aligned}$$

Putting value of $x^2, y^2, z^2,$

$$\frac{ax+by+cz}{ax+by+cz} = 1$$

71. (a) : Area of rhombus = $\frac{1}{2} \times 2x \times 5x = 10x^2/2 = 5x^2$
And square of the shorter diagonal = $(2x)^2 = 4x^2$
 $5x^2/4x^2 = 5/4$

72. (d) : Area of quadrilateral = $\frac{1}{2} \times 19 \times (5 + 7) = 114 \text{ cm}^2$

73. (b) : $6 \times \frac{\sqrt{3}}{4} \times (\text{side})^2 = 3\sqrt{3}/2 (\text{side})^2$
 $\Rightarrow 3\sqrt{3}/2 \times 4 \times 4 = 24\sqrt{3} \text{ m}^2$

74. (b) $\tan\theta + \cot\theta = (\sin\theta/\cos\theta) + (\cos\theta/\sin\theta)$
 $= (\sin^2\theta + \cos^2\theta)/\sin\theta \cdot \cos\theta = 1/\sin\theta \cdot \cos\theta$
 $= \text{cosec}\theta \cdot \sec\theta$

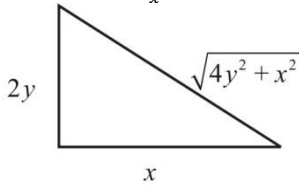
75. (b); $\text{cosec}^2\theta - 2 + \sin^2\theta = (\sin\theta - \text{cosec}\theta)^2$
Hence it is always non negative.

76. (d); $\tan\theta = \frac{2t}{1-t^2}$
 $\sin\theta + \cos\theta = \frac{p}{h} + \frac{b}{h} = \frac{2t+1-t^2}{1+t^2}$

77. (d); In $\Delta ABC, \tan A = \frac{BC}{AC} = \frac{u}{v}, \tan B = \frac{v}{u}$
 $u^2 + v^2 = w^2$

$$\tan A + \tan B = \frac{w^2}{uv}$$

78. (b); $\tan\theta = \frac{2y}{x}$



$$2x \cdot \sec\theta - y \cdot \text{cosec}\theta = 3$$

$$2x \cdot \frac{\sqrt{4y^2+x^2}}{x} - y \cdot \frac{\sqrt{4y^2+x^2}}{2y} = 3$$

$$x^2 + 4y^2 = 4$$

79. (a); Putting $\theta = 60^\circ$

$$\frac{\sin\theta - \cos\theta + 1}{\sin\theta + \cos\theta - 1} = \frac{\sqrt{3} + 1}{\sqrt{3} - 1} = 2\sqrt{3} \text{ only option (a) satisfied the same value.}$$

80. (c); $\tan\alpha = \frac{1}{5} \Rightarrow \cot\alpha = 5$

$$\sec\beta = \sqrt{\frac{193}{12}}$$

$$\tan\beta = \sqrt{\sec^2\beta - 1} = \frac{7}{12}$$

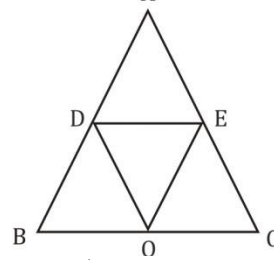
$$\cot\beta = \frac{12}{7}$$

$$\Rightarrow x = h \cdot [\cot\alpha - \cot\beta]$$

$$h = \frac{138}{5 - \frac{12}{7}} = 42 \text{ meter}$$

81. (a); $\angle B = 180 - 75^\circ - 85^\circ = 20^\circ$
 $\angle OAC = 2\angle B = 40^\circ$

82. (c); $\frac{\Delta ODE}{\Delta BOC} = \frac{DE^2}{BC^2}$



$$DE = \frac{1}{2} BC$$

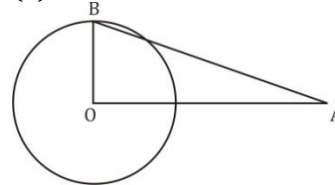
$$\text{Area of } \Delta ABC = 3 \times \text{Area of } \Delta OBC$$

$$\frac{\Delta ODE}{\Delta ABC} = \frac{\Delta ODE}{3 \times \Delta BOC} = \frac{1}{3} \cdot \frac{DE^2}{BC^2} = \frac{1}{12}$$

83. (c); Parallelogram is a rhombus $\angle AMB = 90^\circ$

84. (c); Distance between centers of two circles is equal to sum of their radii, the two circles touch externally.
So, Maximum no. of 3 common tangents can be drawn.

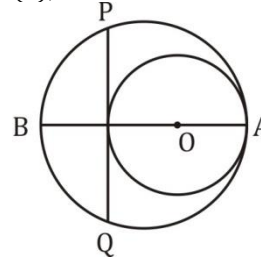
85. (d); $OB = \sqrt{OA^2 - AB^2}$



$$= \sqrt{(16.5)^2 - 6^2}$$

$$= 2.5 \text{ cm}$$

86. (d); $OA \times OB = OP \times OQ$



$$OB = AB - OA$$

$$= 12 - 8 = 4 \text{ cm}$$

$$4 \times 8 = OP^2$$

$$OP = 4\sqrt{2} \text{ cm} \Rightarrow PQ = 2 \times 4\sqrt{2} = 8\sqrt{2} \text{ cm}$$

87. (b); $x^2 = by + cz, y^2 = cz + ax, z^2 = ax + by$

$$\Rightarrow 2\left(\frac{a}{a+x} \cdot \frac{x}{x} + \frac{b}{b+y} \cdot \frac{y}{y} + \frac{c}{c+z} \cdot \frac{z}{z}\right)$$

$$\Rightarrow 2\left(\frac{ax}{ac+by+cz} + \frac{by}{by+cz+ax} + \frac{cz}{cz+ax+by}\right)$$

$$2\left(\frac{ac+by+cz}{ac+by+cz}\right) = 2$$

88. (d); $x = \frac{4ab}{a+b}$ Put, $a = 1, b = 3$ so, $x = 3$

$$\frac{x+2a}{x-2a} + \frac{x+2b}{x-2b} = \frac{3+2}{3-2} + \frac{3+6}{3-6} = 5 - 3 = 2$$

89. (d); $5a + \frac{1}{3a} = 5$

$$\frac{5}{3} \left(3a + \frac{1}{5a}\right) = 5, \text{ squaring both sides.}$$

$$9a^2 + \frac{1}{25a^2} = \frac{39}{5}$$

90. (b); $\frac{a^2}{bc} + \frac{b^2}{ca} + \frac{c^2}{ab} = \frac{a^3+b^3+c^3}{abc} = \frac{3abc}{abc} = 3$

91. (a); Growth rate per annum expense for,

$$\text{Year 1995 is } \frac{100}{300} \times 100\% = \frac{100}{3}\%$$

Year 1996 is 0%

$$\text{Year 1997 is } \frac{200}{400} \times 100\% = 50\%$$

$$\text{Year 1998 is } \frac{100}{600} \times 100\% = \frac{50}{3}\%$$

$$\therefore \text{Average growth per annum} = \frac{\frac{100}{3}\% + 0\% + 50\% + \frac{50}{3}\%}{4} = 25\%$$

92. (b); Sale : expense in 1994 = 400 : 300 = 4 : 3 = $\frac{4}{3} = 1.33$

$$\text{Sale : expense in 1996} = 300 : 400 = 3 : 4 = \frac{3}{4} = 0.75$$

$$\text{Sale : expense in 1996} = 500 : 600 = 5 : 6 = \frac{5}{6} = 0.83$$

$$\text{Sale : expense in 1998} = 800 : 700 = 8 : 7 = \frac{8}{7} = 1.14$$

Clearly the ratio was least in 1996.

93. (d); Average per annum increase in sales

$$= \frac{(500-400)+(300-500)+(500-300)+(800-500)}{4}$$

$$= \frac{100-200+200+300}{4} = \text{Rs. 100 crore}$$

94. (b) Profit in 1995 = 500 - 400 = Rs. 100 crore

$$\therefore \text{Profit : Capital} = 100 : 150 = 2 : 3$$

There is no profit in 1996

There is no profit in 1997

$$\text{Profit in 1998} = 800 - 700 = \text{Rs. 100 crore}$$

$$\therefore \text{profit : Capital} = 100 : 200 = 1 : 2$$

$\therefore 2 : 3 > 1 : 2$ Hence year 1995 is the correct answer.

95. (c); Sale : Capital in 1995 = 500 : 150 = 10 : 3

$$\text{Sale : Capital in 1996} = 300 : 150 = 2 : 1$$

$$\text{Sale : Capital in 1997} = 500 : 200 = 5 : 2$$

$$\text{Sale : Capital in 1998} = 800 : 200 = 4 : 1$$

Least ration is 2 : 1, which occurred in the year 1996

96. (c); See the bar diagram carefully. The difference

between two lines is narrow in the year 2000 - 01.

Hence percentage of export must be maximum in this year. e.g.

$$\text{Percentage of export in 1999 - 2000} = \frac{7.5}{15} \times 100\% = 50.000\%$$

$$\text{Percentage of export in 2000 - 2001} = \frac{10}{15} \times 100\% = 66.667\%$$

$$\text{Percentage of export in 2001 - 2002} = \frac{7.5}{17.5} \times 100\% = 42.857\%$$

$$\text{Percentage of export in 2002 - 2003} = \frac{10}{17.5} \times 100\% = 57.143\%$$

$$\text{Percentage of export in 2003 - 2004} = \frac{12.5}{25} \times 100\% = 50.000\%$$

$$\text{Percentage of export in 2004 - 2005} = \frac{22.5}{35} \times 100\% = 64.286\%$$

Hence export percentage is maximum in the year 2000 - 2001.

97. (b); Required difference = [(17.5 + 25 + 35) - (15 + 15 + 17.5)] thousand = 30000

98. (a); Total export over the given year = (7.5 + 10 + 7.5 + 10 + 12.5 + 22.5) thousand = 70,000

99. (a); Average production in given years = $\frac{15+15+17.5+17.5+25+35}{6} = \frac{125}{6}$ thousand

$$\text{Average export in given years} = \frac{70}{6} \text{ thousand}$$

$$\therefore \text{Required difference} = \frac{125}{6} - \frac{70}{6} \text{ thousand}$$

$$= \frac{55000}{6} = 9200 \text{ (approximate)}$$

100. (c); % increase in 2000-2001 from previous year

$$= \frac{10-7.5}{7.5} \times 100\% = 33.33\%$$

$$\% \text{ decrease in 2001-2002 from previous year} = \frac{10-7.5}{7.5} \times 100\% = 25.00\%$$

$$\% \text{ increase in 2002-2003 from previous year} = \frac{10-7.5}{7.5} \times 100\% = 33.33\%$$

$$\% \text{ increase in 2003 - 2004 from previous year} = \frac{12.5-10}{10} \times 100\% = 25\%$$

$$\% \text{ decrease in 2004- 2005 from previous year} = \frac{22.5-12.5}{17.5} \times 100\% = 28.5\%$$