PRACTICE SET-4

1. What is the value of $\sin^3 60° \cot 30° - 2\sec^2 45° + 3\cos 60° \tan 45° - \tan^2 60°$?

   (a) $\dfrac{35}{8}$ (b) $-\dfrac{35}{8}$

   (c) $-\dfrac{11}{8}$ (d) $\dfrac{11}{8}$

2. If $\tan\theta = -\dfrac{1}{\sqrt{7}}$, then $\dfrac{\csc^2\theta - \sec^2\theta}{\csc^2\theta + \sec^2\theta} = ?$

   (a) $-\dfrac{3}{4}$ (b) $-\dfrac{2}{3}$

   (c) $\dfrac{2}{3}$ (d) $\dfrac{3}{4}$

3. If $7\sin^2 x + 3\cos^2 x = 4$, $0 < x < 90°$, then the value of $\tan x$ is

   (a) $\sqrt{3}$ (b) 1

   (c) $\dfrac{\sqrt{3}}{2}$ (d) $\dfrac{1}{\sqrt{3}}$

4. The angle of elevation of a tower at a point is 45°. After going 40 m towards the foot of the tower, the angle of elevation of the tower becomes 60°, Find the height of the tower.

   (a) $\dfrac{40\sqrt{3}}{\sqrt{3}+1}$ m   (b) $40\sqrt{3}$ m

   (c) $\dfrac{40\sqrt{3}}{\sqrt{3}-1}$ m   (d) None of these

5. If a regular hexagon is inscribed in a cricle of radius r, find the perimeter of the hexagon.

   (a) $5r$ (b) $6r$

   (c) $8r$ (d) $9r$

6. The external bisector of ∠B and ∠C of ΔABC (where AB and AC extended to E and F respectively) meet at point P. If ∠BAC = 100°, then the measure of ∠BPC is

   (a) 50°   (b) 80°

   (c) 40°   (d) 100°

7. The sum of the H.C.F . and L.C.M. of two number is 680 and the L.C.M. is 84 times the H.C.F. If one of the numbers is 56, the other is :

   (a) 84   (b) 12

   (c) 8   (d) 96

8. A number when divided by 119 leaves remainder 19. If the same number is divided by 17, the remainder will be

   (a) 12   (b) 10

   (c) 7   (d) 2

9. If $x = 2^{\frac{1}{3}} + 2^{-\frac{1}{3}}$, then the value of $2x^3 - 6x$ will be

   (a) 5   (b) 6

   (c) 8   (d) 10

10. If 10 men or 20 boys can make 260 mats in 20 days, then how many mats will be made by 8 men and 4 boys in 20 days?

    (a) 260   (b) 240

    (c) 280   (d) 520

11. A cuboidal water tank contains 216 litres of water. Its depth is $\dfrac{1}{3}$ of its length and breadth is $\dfrac{1}{2}$ of $\dfrac{1}{3}$ of the difference between length and depth. The length of the tank is :

    (a) 72 dm   (b) 18 dm

    (c) 6 dm   (d) 2 cm

12. Triangle PQR circumscribes a circle with centre O and radius r cm such that ∠PQR = 90°. If PQ = 3 cm, QR = 4 cm, then the value of r is :

    (a) 2   (b) 1.5

    (c) 2.5   (d) 1

13. An article was sold at 16% gain. Had it been sold for ₹ 200 more, the gain would have been 20%. Then the cost price of the article is :

    (a) ₹ 5000   (b) ₹ 4800

    (c) ₹ 4500   (d) ₹ 5200

14. The marked price of a T.V. is ₹ 16,000. After two successive discounts it is sold for ₹ 11,400. If the first discount is 5%, then the rate of second discount isf

    (a) 15%   (b) 20%

    (c) 30%   (d) 25%

15. If the numerator of a fraction is increased by 25% and the denominater is doubled, the fraction thus obtained is 5/9, What is the original fraction?

    (a) 2/3   (b) 4/9

    (c) 8/9   (d) None of these

16. If A : B = 3 : 4, B : C = 5 : 7 and C : D = 8 : 9, then, the ratio A : D is :

    (a) 3 : 7   (b) 7 : 3

    (c) 21 : 10   (d) 10 : 21

17. A, B and C can complete a work in 10, 12 and 15 days respectively. They started the work together. But A left the work before 5 days of its completion. B also left the work 2 days after A left. In how many days was the work completed ?

    (a) 4   (b) 5

    (c) 7   (d) 8

18. The areas of a square and a rectangle are equal. The length of the rectangle is greater than the length of a side of the square by 5 cm and the breadth is less than the length of the side of the square by 3 cm. The perimeter of the rectangle is :
(a) 17 cm   (b) 26 cm
(c) 30 cm   (d) 34 cm

19. A began business with ₹ 45000 and was joined after wards by ₹ 54000. After how many months did B join if the profits at the end of the year were divide in ratio 2 : 1 ?
(a) 4   (b) 5
(c) 6   (d) 7

20. A man gets ₹ 13 more by selling an article at a profit of $12\frac{1}{2}\%$ than selling it at a loss of $12\frac{1}{2}\%$. The cost price of the article is :
(a) ₹ 25.50   (b) ₹ 38
(c) ₹ 52   (d) ₹ 65

21. If 50% of $(x - y)$ = 30% of $(x + y)$, then what per cent of x is y ?
(a) 25%   (b) $33\frac{1}{3}\%$
(c) 40%   (d) 400%

22. The population of a town is 8000. If the males increased by 6 % and the females by 10 %, the population will be 8600. Find the number of females in the town.
(a) 1,000   (b) 2,000
(c) 3,000   (d) 5,000

23. A sum of ₹ 1500 is lent out in two parts in such a way that the simple interest on one part at 10% per annum for 5 years is equal to that on another part at 12.5% per annum for 4 years. The sum lent out at 12.5% is :
(a) ₹ 500   (b) ₹ 1000
(c) ₹ 750   (d) ₹ 1250

24. The average weight of 15 students in a class increses by 1.5 kg when one of the students weighting 40 kg is replaced by a new student. What is the weight (in kg) of the new student ?
(a) 64.5   (b) 56
(c) 60   (d) 62.5

25. The average of 30 results is 20 and the average of other 20 results is 30. what is the average of all the results ?
(a) 24   (b) 48
(c) 25   (d) 50

26. A car can cover a certain distance in $4\frac{1}{2}$ hours. If the speed is increased by 5 km/hour, it would take $\frac{1}{2}$ hour less to cover the same distance. Find the slower speed of the car.
(a) 50 km / hour   (b) 40 km / hour
(c) 45 km / hour   (d) 60 km / hour

27. A solid wooden toy is in the shape of a right circular cone mounted on a hemisphere. If the radius of the hemisphere is 4.2 cm and the total height of the toy is 10.2 cm, find the volume of the wooden toy (nearly)

(a) 104 cm^3 (b) 162 cm^3
(c) 427 cm^3 (d) 266 cm^3

28. The greatest among
$\sqrt{7} - \sqrt{5},\ \sqrt{5} - \sqrt{3},\ \sqrt{9} - \sqrt{7}.\sqrt{11} - \sqrt{9}$ is
(a) $\sqrt{7} - \sqrt{5}$ (b) $\sqrt{5} - \sqrt{3}$
(c) $\sqrt{9} - \sqrt{7}$ (d) $\sqrt{11} - \sqrt{9}$

29. If $x = 3 + \sqrt{8}$, then $x^2 + \frac{1}{x^2}$ is equal to
(a) 38   (b) 36
(c) 34   (d) 30

30. From four corners of a square sheet of side 4 cm, four pieces, each in the shape of arc of a circle with radius 2 cm, arc cut out. The area of the remaining portion is :
(a) $(8 - \pi)$ sq.cm.   (b) $(16 - 4\pi)$ sq.cm
(c) $(16 - 8\pi)$ sq.cm.   (d) $(4 - 2\pi)$ sq.cm

31 The area of a circle inscribed in a square of area 2 m^2 is
(a) $\frac{\pi}{4}$m^2 (b) $\frac{\pi}{2}$m^2
(c) πm^2 (d) 2πm^2

32. If $x = a - b$, $y = b - c$, $z = c - a$. then the numerical value of the algebraic expression $x^3 + y^3 + z^3 - 3xyz$ will be
(a) $a + b + c$ (b) 0
(c) $4(a + b + c)$ (d) $3\ abc$

33. If $x : y = 2 : 1$, then $(x^2 - y^2) : (x^2 + y^2)$ is
(a) 3 : 5   (b) 5 : 3
(c) 4 : 5   (d) 5 : 6

34. The sides of a triangle are in the ratio 3 : 4 : 6. The triangle is :
(a) acute angled
(b) right angled
(c) obtuse angled
(d) either acute angled or right angled

35. If ABC is a quarter circle and a circle is inscribed in it and if $AB = 1$ cm, find the radius of smaller circle.
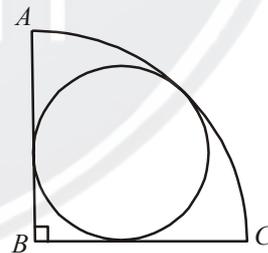
(a) $(\sqrt{2} - 1)$ cm   (b) $\left(\sqrt{2} - \frac{1}{2}\right)$ cm
(c) $\frac{(\sqrt{2} + 1)}{2}$ (d) $(1 - 2\sqrt{2})$ cm

36. The value of $\left(\frac{2 + \sqrt{3}}{2 - \sqrt{3}} + \frac{2 - \sqrt{3}}{2 + \sqrt{3}} + \frac{\sqrt{3} - 1}{\sqrt{3} + 1}\right)$ is
(a) $2 - \sqrt{3}$ (b) $2 + \sqrt{3}$
(c) $16 - \sqrt{3}$ (d) $40 - \sqrt{3}$

37. The simplified value of $\sqrt{5+\sqrt{11+\sqrt{19+\sqrt{29+\sqrt{49}}}}}$ is

   (a) 3   (b) 2
   (c) 4   (d) 6

38. A tree breaks due to storm and the broken part bends so that the top of the tree touches the ground making an angle 30° with it. The distance between the feet of the tree to the point where to touches the ground in 8 m. Find the height of the tree.

   (a) 8 m   (b) $8\sqrt{3}$ m
   (c) 24 m   (d) 12 m

39. The least fraction to be subtracted from the expression

   $$\dfrac{3\frac{1}{4}-\frac{4}{5}\,of\,\frac{5}{6}}{4\frac{1}{3}\div\frac{1}{5}-\left(\frac{3}{10}+21\frac{1}{5}\right)}$$ to make it an integer.

   (a) $\dfrac{1}{2}$ (b) $\dfrac{5}{6}$

   (c) $\dfrac{1}{4}$ (d) $\dfrac{3}{10}$

40. Two solid cylinders of radii 4 cm and 5 cm and lengths 6 cm and 4 cm respectively are recast into cylindrical disc of thickness 1 cm. The radius of the disc is

   (a) 7 cm   (b) 14 cm
   (c) 21 cm   (d) 28 cm

41. ABC is an equilateral triangle of side 2 cm. With A, B, C as centres and radius 1 cm, three arcs are drawn. The area of the region within the triangle bounded by the three arcs is

   (a) $\left(3\sqrt{3}-\dfrac{\pi}{2}\right)cm^2$ (b) $\left(\sqrt{3}-\dfrac{3\pi}{2}\right)cm^2$

   (c) $\left(\sqrt{3}-\dfrac{\pi}{2}\right)cm^2$ (d) $\left(\dfrac{\pi}{2}-\sqrt{3}\right)cm^2$

DIRECTIONS (Qs. 42-45) : *Study the following graph carefully and answer the questions given below.*

Total Number of Boys and Girls in Various Colleges Number in Thousands
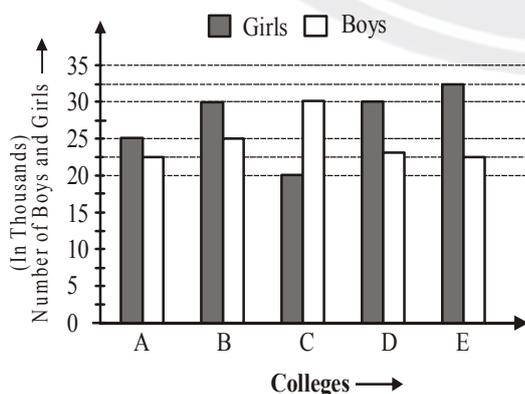
42. What is the average number of girls from all the colleges together ?
   (a) 25000   (b) 27500
   (c) 27000   (d) 25500

43. The total number of girls from colleges D and E together are approximately what per cent of the total number of girls from colleges A, B and C together ?
   (a) 83%   (b) 75%
   (c) 70%   (d) 88%

44. What is the difference between the total number of girls and the total number of boys from all the colleges together?
   (a) 13500   (b) 14000
   (c) 15500   (d) None of these

45. What is the respective ratio of the number of boys from college D to the number of boys from college B ?
   (a) 10 : 9   (b) 8 : 9
   (c) 9 : 10   (d) 9 : 8

DIRECTIONS (Qs. 46-49) : *Study the following graph and answer the questions. Number on the top of a bar is the number of TVs.*

Demand and Production of Colour T.Vs of Five Companies for January 2006
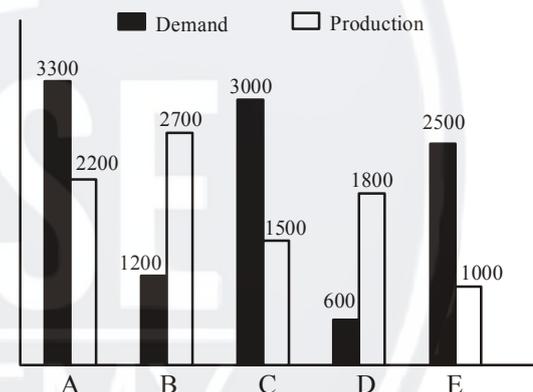

46. What is the ratio of the companies having more demand than production to the companies having more production than demand ?
   (a) 2 : 3   (b) 4 : 1
   (c) 2 : 2   (d) 3 : 2

47. What is the difference between average demand and average production of the five companies taken together?
   (a) 1400   (b) 400
   (c) 280   (d) 138

48. Demand of company D is approximately what per cent of demand of company E ?
   (a) 12%   (b) 20%
   (c) 24%   (d) 30%

49. What is the ratio of average demand to average production of comapanies B and D ?
   (a) 1 : 5   (b) 2 : 5
   (c) 3 : 5   (d) 4 : 5

50. What is the ratio of demand and production of comapany E to demand and production of company C ?
   (a) 1 : 1   (b) 1 : 2
   (c) 2 : 1   (d) 7 : 9

SOLUTIONS

1. (b) $\sin^3 60° \cot 30° - 2\sec^2 45°$
    $+ 3\cos 60° \tan 45° - \tan^2 60°$

    $= \left(\dfrac{\sqrt{3}}{2}\right)^3 \cdot \sqrt{3} - 2.(\sqrt{2})^2 + 3.\dfrac{1}{2}.1 - (\sqrt{3})^2$

    $= \dfrac{3\sqrt{3}}{8} \times \sqrt{3} - 2\times 2 + \dfrac{3}{2} - 3 = \dfrac{9}{8} - 4 + \dfrac{3}{2} - 3$

    $= \dfrac{9 - 32 + 12 - 24}{8} = \dfrac{21 - 56}{8} = -\dfrac{35}{8}$

2. (d) $\tan \theta = \dfrac{BC}{AB} = \dfrac{1}{\sqrt{7}}$
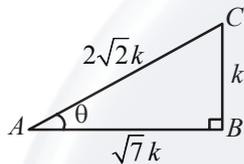
    $AC^2 = AB^2 + BC^2 = 7k^2 + k^2 = 8k^2$

    $\therefore AC = \sqrt{8k^2} = 2\sqrt{2}k$

    $\sec \theta = \dfrac{AC}{AB} = \dfrac{2\sqrt{2}k}{\sqrt{7}k} = \dfrac{2\sqrt{2}}{\sqrt{7}}$,

    $\mathrm{cosec}\,\theta = \dfrac{AB}{BC} = \dfrac{2\sqrt{2}k}{\sqrt{k}} = 2\sqrt{2}$

    $\therefore \dfrac{\mathrm{cosec}^2\theta - \sec^2\theta}{\mathrm{cosec}^2\theta + \sec^2\theta}$

    $= \dfrac{(2\sqrt{2})^2 - \left[\dfrac{2\sqrt{2}}{\sqrt{7}}\right]^2}{(2\sqrt{2})^2 + \left[\dfrac{2\sqrt{2}}{\sqrt{7}}\right]^2} = \left[\dfrac{8 - \dfrac{8}{7}}{8 + \dfrac{8}{7}}\right] = \dfrac{48}{64} = \dfrac{3}{4}$

3. (d) $7\sin^2 x + 3\cos^2 x = 4$
    or $7\sin^2 x + 3(1 - \sin^2 x) = 4$
    or $4\sin^2 x + 3 = 4$

    or $\sin^2 x = \dfrac{1}{4} \Rightarrow \sin x = \dfrac{1}{2} = \sin 30°$
    or $x = 30°$

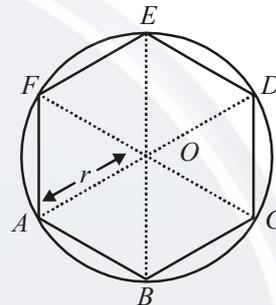 $\therefore \tan x = \tan 30° = \dfrac{1}{\sqrt{3}}$

4. (c)
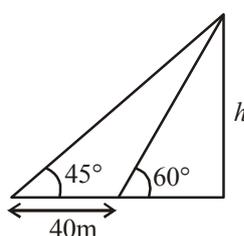
    Here, $h = ?$, $x = 40$
    $\theta_1 = 60°$, $\theta_2 = 45°$

    $\therefore h = \dfrac{40}{\cot 45° - \cot 60°} = \dfrac{40}{1 - \dfrac{1}{\sqrt{3}}} = \dfrac{40\sqrt{3}}{\sqrt{3} - 1}$
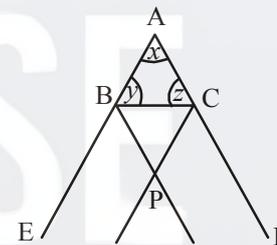
    $\therefore h = \dfrac{40\sqrt{3}}{\sqrt{3} - 1}$ m

5. (b) Here, $OA = OB = AB = r$

    $\therefore$ Perimeter of hexagon $= 6 \times AB = 6r$

6. (c)

    In $\triangle ABC$,
    $\angle A = x$, $\angle B = y$; $\angle C = z$
    In $\triangle PBC$,
    $\angle PBC + \angle PCB + \angle BPC = 180°$

    $\Rightarrow \dfrac{1}{2}\angle EBC + \dfrac{1}{2}\angle FCB + \angle BPC = 180°$

    $\angle EBC + \angle FCB + 2\angle BPC = 360°$
    $\Rightarrow (180° - y) + (180° - z) + 2\angle BPC = 360°$
    $\Rightarrow 360° - (y + z) + 2\angle BPC = 360°$
    $\Rightarrow 2\angle BPC = y + z$
    $\Rightarrow 2\angle BPC = 180° - x = 180° - \angle BAC$

    $\therefore \angle BPC = 90° - \dfrac{1}{2}\angle BAC$

    $= 90° - 50° = 40°$

7. (d) Let HCF be h and LCM be l.
    Then, $l = 84\,h$ and $l + h = 680$
    $\Rightarrow 84h + h = 680$

    $\Rightarrow h = \dfrac{680}{85} = 8$

    $\therefore l = 680 - 8 = 672$

    $\therefore$ Other number $= \dfrac{672 \times 8}{56} = 96$

8. (d) When we divide the number by 119, remainder = 19
∵ 119 is exactly divisible by 17
∴ the required remainder = remainder obtained by dividing 19 by 17 = 2

9. (a) $x = 2^{1/3} + 2^{-1/3}$
On cubing both sides, we get
$x^3 = 2 + 2^{-1} + 3(2^{1/3} + 2^{-1/3})$
$\Rightarrow x^3 = \dfrac{4+1}{2} + 3x$
$\Rightarrow 2x^3 = 5 + 6x$
$\Rightarrow 2x^3 - 6x = 5$

10. (a) 10 men = 20 boys
∴ 1 man = 2 boys
∴ 8 men + 4 boys
= (16 + 4) boys = 20 boys
Hence, 8 men and 4 boys will make 260 mats in 20 days.

11. (b) Let the length of the tank be x cm.
∴ Depth = $\dfrac{x}{3}$
Breadth = $\dfrac{1}{2} \times \dfrac{1}{3} \times \left(x - \dfrac{x}{3}\right) = \dfrac{x}{9}$
Now, $x \times \dfrac{x}{3} \times \dfrac{x}{9} = 216 \times 1000$
$\Rightarrow x^3 = 27 \times 216 \times 1000$
$\Rightarrow x = (27 \times 216 \times 1000)^{1/3}$
$\Rightarrow x = 3 \times 6 \times 10$
= 180 cm = 18 dm

12. (d)
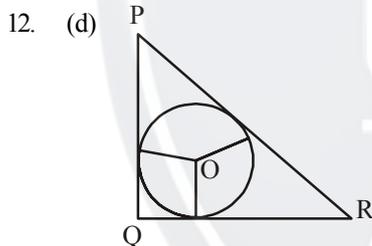
$PR^2 = PQ^2 + QR^2$
$3^2 + 4^2 = 25$
∴ PR = $\sqrt{25}$ = 5 cm
r = $\dfrac{\text{Area of triangle}}{\text{Semi}-\text{ perimeter of triangle}}$
$\dfrac{\dfrac{1}{2} \times 3 \times 4}{\dfrac{3+4+5}{2}} = \dfrac{6}{6} = 1$ cm

13. (a) If the C.P. of article be ₹ x then
$x \times \dfrac{116}{100} + 200 = \dfrac{x \times 120}{100}$
$\Rightarrow x \times \dfrac{4}{100} = 200$
$\Rightarrow x = \dfrac{200 \times 100}{4} = ₹\ 5000$

14. (d) After a discount of 5%
SP = $\dfrac{95 \times 16000}{100} = ₹\ 15200$
Let the second discount be x%.
x% of 15200 = (15200 – 11400)
$\Rightarrow \dfrac{x \times 15200}{100} = 3800$
$\Rightarrow x = \dfrac{3800 \times 100}{15200} = 25$
∴ Second discount = 25%

15. (c) Let the original fraction be $\dfrac{x}{y}$, Then,
$\dfrac{\dfrac{125x}{100}}{2y} = \dfrac{5}{9} \Rightarrow \dfrac{125x}{100 \times 2y} = \dfrac{5}{9} \Rightarrow \dfrac{x}{y} = \dfrac{5 \times 100 \times 2}{125 \times 9} = \dfrac{8}{9}$

16. (d) $\dfrac{A}{B} \times \dfrac{B}{C} \times \dfrac{C}{D} = \dfrac{3}{4} \times \dfrac{5}{7} \times \dfrac{8}{9}$
$\Rightarrow \dfrac{A}{D} = \dfrac{10}{21}$

17. (c) Let the work be completed in x days
According to the question,
$\dfrac{x-5}{10} + \dfrac{x-3}{12} + \dfrac{x}{15} = 1$
$\Rightarrow \dfrac{6x-30+5x-15+4x}{60} = 1$
$\Rightarrow 15x - 45 = 60$
$\Rightarrow 15x - 105 \Rightarrow x = \dfrac{105}{15} = 7$
Hence, the work will be completed in 7 days.

18. (d) Let the side of square be x cm.
∴ Length of rectangle
= $(x + 5)$ cm
Breadth of rectangle
$(x - 3)$ cm
As given,
$(x + 5)(x - 3) = x^2$
$\Rightarrow x^2 + 5x - 3x - 15 = x^2$
$\Rightarrow 2x = 15$
∴ Perimeter of rectangle
= $2(x + 5 + x - 3)$
= $2(2x + 2)$
= $2(15 + 2) = 34$ cm

19. (d) Let B remained in business for x months.
Ratio of equavalent capitals
= $45000 \times 12 : 54000 \times x$
= $10 : x$
∴ $\dfrac{10}{x} = \dfrac{2}{1}$
$\Rightarrow 2x = 10 \Rightarrow x = 5$
Clearly, B joined after $(12 - 5) = 7$ months.

20. (c) Let the C.P of article be ₹ x.
According to the question,

$\left(100+\dfrac{25}{2}\right)\%$ of $x - \left(100-\dfrac{25}{2}\right)\%$ of $x = 13$

$\Rightarrow \quad \dfrac{x}{100}\left(100+\dfrac{25}{2}-100+\dfrac{25}{2}\right) = 13$

$\Rightarrow \quad \dfrac{x}{100}\times 25 = 13$

$\Rightarrow \quad x = 13 \times 4 = 52$

21. (a) $\dfrac{30}{100}(x+y) = \dfrac{50}{100}(x-y)$

$\Rightarrow \quad 30x + 30y = 50x - 50y$

$\Rightarrow \quad 80y = 20x$

$\Rightarrow \quad y = \dfrac{20}{80}x = \dfrac{1}{4}x$

$\Rightarrow \quad y$ is 25% of x.

22. (c) Let the population of females be x.
Then 110 % of x + 106 % of (8000 − x) = 8600
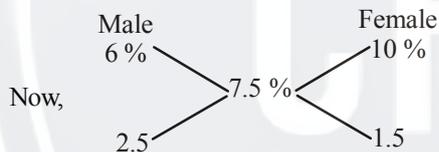
or, $\dfrac{110x}{100} + \dfrac{106(8000-x)}{100} = 8600$

or, $x(110-106) = 8600 \times 100 - 8000 \times 106$

$\therefore x = \dfrac{8600\times100 - 8000\times106}{110-106} = \dfrac{12,000}{4} = 3,000$

By Method of Alligation

Average % of increase $= \dfrac{600}{8000} \times 100 = \dfrac{15}{2} = 7.5\%$

```
          Male                    Female
          6 %                     10 %
                    7.5 %
Now,
          2.5                     1.5
```

$\therefore$ Male : Female $= 2.5 : 1.5 = 5 : 3$

$\therefore$ The population of females $= \dfrac{8000}{5+3} \times 3 = 3000$

23. (c) Let the sum lent out at 12.5% be ₹ x
Sum lent out at 10%
= 1500 − x

Now, $\dfrac{(1500-x)\times10\times5}{100}$

$= \dfrac{x\times12.5\times4}{100}$

$\Rightarrow \quad 50(1500-x) = 50x$

$\Rightarrow \quad 2x = 1500$

$\Rightarrow \quad x = \dfrac{1500}{2} = ₹750$

24. (d) Weight of the new student
= (40 + 15 × 1.5) kg
= (40 + 22.5) kg
= 62.5 kg

25. (a) Required average

$= \dfrac{20\times30 + 20\times30}{30+20} = \dfrac{600+600}{50} = \dfrac{1200}{50} = 24$

26. (b) Let the initial speed of the car be x kmph and the distane be y km.

$\therefore \quad y = \dfrac{9}{2}x$ ....(i)

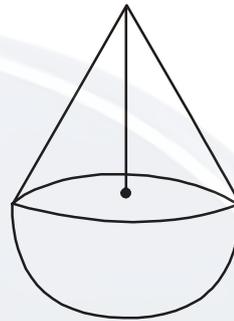and, y = 4 (x + 5) ....(ii)

$\therefore \quad \dfrac{9}{2}x = 4(x+5)$

$\Rightarrow \quad 9x = 8x + 40$

$\Rightarrow \quad x = 40$ kmph

27. (d)

Radius of cone = 4.2 cm
Height of cone = 10.2 − 4.2 = 6 cm
Volume of the toy
Volume of cone + Volume of hemisphere

$= \dfrac{1}{3}\pi(4.2)^2 \times 6 + \dfrac{2}{3}\pi(4.2)^3 = \dfrac{1}{3}\pi(4.2)^2 (6 + 2\times4.2)$

$= \dfrac{1}{3}\times\dfrac{22}{7} \times 4.2 \times 4.2 \times 14.4 = 266$ cu.cm.

28. (b) $\dfrac{1}{\sqrt{7}-\sqrt{5}}$

$= \dfrac{\sqrt{7}+\sqrt{5}}{(\sqrt{7}-\sqrt{5})(\sqrt{7}+\sqrt{5})} = \dfrac{\sqrt{7}+\sqrt{5}}{7-5} = \dfrac{\sqrt{7}+\sqrt{5}}{2}$,

$\dfrac{1}{\sqrt{5}-\sqrt{3}} = \dfrac{\sqrt{5}+\sqrt{3}}{(\sqrt{5}-\sqrt{3})(\sqrt{5}+\sqrt{3})}$

$= \dfrac{\sqrt{5}+\sqrt{3}}{5-3} = \dfrac{\sqrt{5}+\sqrt{3}}{2}$

Similarly,

$\dfrac{1}{\sqrt{9}-\sqrt{7}} = \dfrac{\sqrt{9}+\sqrt{7}}{2}$

$\dfrac{1}{\sqrt{11}-\sqrt{9}} = \dfrac{\sqrt{11}+\sqrt{9}}{2}$

Clearly, $\dfrac{\sqrt{5}+\sqrt{3}}{2}$ is the smallest.

$\therefore \dfrac{1}{\sqrt{5}-\sqrt{3}}$ is the smallest.

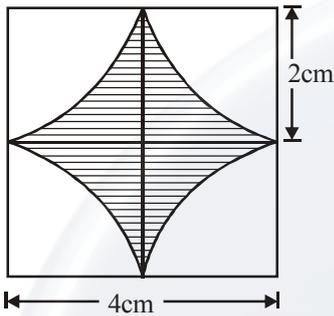$\therefore \sqrt{5}-\sqrt{3}$ is the greatest.

29. (c) $x = 3 + \sqrt{8}$

$$\therefore \frac{1}{x} = \frac{1}{3+\sqrt{8}} = \frac{3-\sqrt{8}}{(3+\sqrt{8})(3-\sqrt{8})}$$

$$= \frac{3-\sqrt{8}}{9-8} = 3-\sqrt{8}$$

Now, $x^2 + \dfrac{1}{x^2} = \left(x+\dfrac{1}{x}\right)^2 - 2$

$$= (3+\sqrt{8}+3-\sqrt{8})^2 - 2 = 36 - 2 = 34$$

30. (b)

Area of sectors $= \pi r^2$
$= 4\pi$ sq. cm
Area of square $= 4 \times 4 = 16$ sq.cm.
Area of the remaining portion
$(16 - 4\pi)$ sq.cm

31. (b) Side of square $= \sqrt{2}$ metre
Radius of in-circle

$$\frac{\sqrt{2}}{2} = \frac{1}{\sqrt{2}} \text{ metre}$$

Area of the circle $= \pi r^2$

$$= \pi \times \frac{1}{2} = \frac{\pi}{2} \text{ sq. metre.}$$

32. (b) $x + y + z = a - b + b - c + c - a = 0$
$\therefore x^3 + y^3 + z^3 - 3xyz = 0$

33. (a) Here, $\dfrac{x}{y} = \dfrac{2}{1} \Rightarrow \dfrac{x^2}{y^2} = \dfrac{4}{1}$

$$\therefore \frac{x^2 - y^2}{x^2 + y^2} = \frac{\dfrac{x^2}{y^2} - 1}{\dfrac{x^2}{y^2} + 1} = \frac{4-1}{4+1} = \frac{3}{5}$$
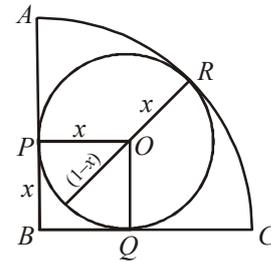
34. (c) Let the sides of the triangle be $3x$, $4x$ and $6x$ units.
Clearly, $(3x)^2 + (4x)^2 < (6x)^2$
$\therefore$ The triangle will be obtuse angled.

35. (a) Let the radius of the smaller circle be x cm, then
$OP = OQ = PB = x$ cm
and $OB = (1 - x)$ cm　　[$\therefore BR = 1$ cm]
In $\triangle POB$, $(1 - x)^2 = x^2 + x^2$
$\Rightarrow x^2 + 2x - 1 = 0$

$$\Rightarrow x = \frac{-2 \pm \sqrt{4-4(-1)}}{2} = \frac{-2 \pm 2\sqrt{2}}{2} = -1 \pm \sqrt{2}$$

$\therefore x = (\sqrt{2} - 1)$ cm or $-(\sqrt{2} + 1)$ cm

36. (c) $\dfrac{2+\sqrt{3}}{2-\sqrt{3}} + \dfrac{2-\sqrt{3}}{2+\sqrt{3}} + \dfrac{\sqrt{3}-1}{\sqrt{3}+1}$

$$= \frac{(2+\sqrt{3})}{(2-\sqrt{3})} \times \frac{(2+\sqrt{3})}{(2+\sqrt{3})} + \frac{(2-\sqrt{3})}{(2+\sqrt{3})} + \frac{(2-\sqrt{3})}{(2-\sqrt{3})}$$

$$\times \frac{(\sqrt{3}-1)(\sqrt{3}-1)}{(\sqrt{3}+1)(\sqrt{3}-1)}$$

$$= \frac{(2+\sqrt{3})^2}{4-3} + \frac{(2-\sqrt{3})^2}{4-3} + \frac{(\sqrt{3}-1)^2}{3-1}$$

$= 4 + 3 + 4\sqrt{3} + 4 + 3 - 4$

$$\sqrt{3} + \frac{3+1-2\sqrt{3}}{2}$$

$= 14 + 2 - \sqrt{3} = 16 - \sqrt{3}$

37. (a) Expression

$$= \sqrt{5+\sqrt{11+\sqrt{19+\sqrt{29+7}}}} = \sqrt{5+\sqrt{11+\sqrt{19+6}}}$$

$$= \sqrt{5+\sqrt{11+5}} = \sqrt{5+4} = \sqrt{9} = 3$$

38. (b) In $\triangle ABC$, $\tan 30° = \dfrac{AB}{BC}$

$$\frac{1}{\sqrt{3}} = \frac{AB}{8} \quad AB = \frac{8}{\sqrt{3}} \text{ m}$$

Again, $\cos 30° = \dfrac{BC}{AC}$

$$\frac{\sqrt{3}}{2} = \frac{8}{AC}$$

$$AC = \frac{16}{\sqrt{3}}$$

$DB = AB + AD$
$= AB + AC$ 　　　　($\because AD = AC$)

$$= \frac{8}{\sqrt{3}} + \frac{16}{\sqrt{3}} = \frac{24}{\sqrt{3}} = 8\sqrt{3} \text{ m}$$

39. (a) Experssion

$$= \frac{\dfrac{13}{4} - \dfrac{4}{5} \times \dfrac{5}{6}}{\dfrac{13}{3} \times 5 - \left(\dfrac{3}{10} + \dfrac{106}{5}\right)} = \frac{\dfrac{13}{4} - \dfrac{2}{3}}{\dfrac{65}{3} - \dfrac{3}{10} - \dfrac{106}{5}}$$

$$= \frac{\dfrac{39-8}{12}}{\dfrac{650-9-636}{30}} = \frac{31}{12} \times \frac{30}{5} = \frac{31}{2} = 15\frac{1}{2}$$

∴ Required answer

$$= 15\frac{1}{2} - 15 = \frac{1}{2}$$

40. (b) Sum of the volumes of two cylinders

$$= \pi r_1^2 h_1 + \pi r_2^2 h_2$$

$$= \frac{22}{7}(4 \times 4 \times 6 + 5 \times 5 \times 4)$$

$$= \frac{22}{7}(96+100) = \frac{22}{7} \times 196 = 616 \text{ cm}^3$$
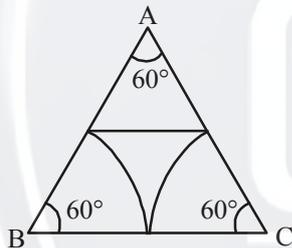
Let the radius of the disc be r cm.

∴ $\pi r^2 \times 1 = 616$

$\Rightarrow \quad \dfrac{22}{7} \times r^2 = 616$

$\Rightarrow \quad r^2 = \dfrac{616 \times 7}{22} = 196$

$\Rightarrow \quad r = \sqrt{196} = 14$ cm

41. (c)

Each angle of the triangle = 60°

Required area of the three sectors $= 3 \times \dfrac{60}{360} \times \pi(1)^2$

$$= \frac{\pi}{2} \text{ cm}^2$$

Area of region bounded by 3 arcs $= \left(\sqrt{3} - \dfrac{\pi}{2}\right) \text{cm}^2$

42. (b) Total number of girls
= (25 + 30 + 20 + 30 + 32.5) thousands
= 137.5 × 1000 = 137500

Average number of girls = $\dfrac{137500}{5}$ = 27500

43. (a) Total number of girls in colleges *D* and *E*
= (30 + 32.5) thousands
= (62.5 × 1000) = 62500
Total number of girls in colleges A,B and C
= (25 + 30 + 20) thousands
(75 × 1000) = 75000

Required percentage $= \left(\dfrac{62500}{75000} \times 100\right) = 83.3\%$

⊔ 83%

44. (d) Total number of boys
= (22.5 + 25 + 30 + 22.5 + 22.5) thousands
= (122.5 × 1000) = 122500
Total number of girls = 137500.
Required difference = (137500 − 122500) = 15000.

45. (c) Required ratio = (22.5 × 1000) : (25 × 1000)
= 225 : 250 = 9 : 10

46. (d) Companies with more demand than production are A, C and E, Companies with more production than demand are B and D.
∴ Required ratio = 3 : 2

47. (c) Average demand

$$= \frac{3300 + 1200 + 3000 + 600 + 2500}{5}$$

$$= \frac{10600}{5} = 2120$$

Average production

$$= \frac{2200 + 2700 + 1500 + 1800 + 1000}{5}$$

$$= \frac{9200}{5} = 1840$$

∴ Required difference
= 2120 − 1840 = 280

48. (c) Required percentage $= \dfrac{600}{2500} \times 100 = 24$

49. (b) Average demand of companies B and D

$$= \frac{1200 + 600}{2} = \frac{1800}{2} = 900$$

Average production of companies B and D

$$= \frac{2700 + 1800}{2} = 2250$$

∴ Required ratio = 900 : 2250 = 2 : 5

50. (d) Required ratio, $\dfrac{2500 + 1000}{3000 + 1500} = \dfrac{7}{9}$