MATHEMATICS

Q1. If $x + \dfrac{1}{x} = r_3$ **then** $x^3 + \dfrac{1}{x_3}$ **is**

    (a)   3
    (b) $3r_3$
    (c) r_3
    (d)   0

Ans.
$$x^3 + \frac{1}{x_3} = \left(x + \frac{1}{x}\right)^3 - 3\left(x + \frac{1}{x}\right)$$
$$= \left(\sqrt{3}\right)^3 - 3\sqrt{3} = \left(\sqrt{3}\right)^3 - \left(\sqrt{3}\right)^3$$
$$= 0$$

Q2. **One third of a number is greater then one fourth of its successor by 1, find the number**

    (a)   15
    (b)   20
    (c)   5
    (d)   25

Ans. Number = x, Successor = x + 1

$\dfrac{1}{3}$ rd of the successor number = $\dfrac{x}{3}$

$\dfrac{1}{4}$ *th* of the successor number = $\dfrac{x+1}{4}$

As per question $\dfrac{x}{3} = \dfrac{x+1}{4} + 1$

X = 15

Q3. **If** $2^x = 8^{y+1}$ **&** $9y = 3^{x-9}$ **then y in**

    (a)   6
    (b)   3
    (c)   4
    (d)   9

Ans. $2^x = (2)^{3(y+1)}$

X = 3y + 1   (i)

$(3)^{2y} + 3^{(x-9)}$

2y = x − 9 or x = 2y + 9   (ii)

from equation (i) & (ii) 3y + 3 = 3y + 9

3y − 2y = 9 − 3 = 6

= 6

Q4. The sum of two numbers is 24 & the sum of their reciprocal is $\frac{1}{5}$, find their product

    (a) 80　　　　　　　　　　　　　　　　　(b) 100

    (c) 60　　　　　　　　　　　　　　　　　(d) 40

Ans.　$x + y = 24$　　　　　　　　　　　　　(i)

    $\frac{x}{y} = \frac{1}{5}$ or $y = 5x$　　　　　　　　　(ii)

    from equation (i) $x + 5x = 24$ or $x = 4$

    & $y = 5x = 5x = 5 \times 4 = 20$

    Their product is $= 20 \times 4 = 80$

Q5.　$\left(1 - \frac{1}{2}\right)\left(1 - \frac{1}{3}\right)\left(1 - \frac{1}{4}\right) K \, K \, K \, K \left(1 - \frac{1}{n}\right) = ?$

    (a) $\frac{1}{n}$　　　　　　　　　　　　　　(b) $\frac{2x - 1}{n}$

    (c) $n\left(\frac{n+1}{n}\right)$　　　　　　　　　　(d) None of these

Ans.　(a)

Q6. In two similar triangle ABC & PQR, if their corresponding altitudes AD & PS are in ratio of 4:9, find the ratio of the Area of $\triangle$ ABC to that of $\triangle$ PQR.

    (a)　16:81

    (b)　32:92

    (c)　33:94

    (d)　None of these

Ans.　(a) Now from fig. $\dfrac{Area\, of\, ABC}{Area\, of\, PQR} = \dfrac{AD^2}{PS^2} = \dfrac{4^2}{9^2} = \dfrac{16}{81}$

Q7. Five year hence, father's age will be 3 times then the age of his son. Five years ago, father was 7 times as old as his son. Find their present age ?

    (a)　10, 40

    (b)　5, 50

    (c)　3, 30

    (d)　None of these

Ans.　Let father, age $= x$ & son's age $= y$

    as per the problem $x = 7y$ ….(i) & after 5 year

    F.A $=$ (Present ag(e) $+ 5 = (x + 5) + 5 = x + 10$

    S.A $=$ (Present ag(e) $+ 5 = (y + 5) = y + 10$

    as per the question $x + 10 = 3 (y + 10)$　　　　　　(i)

    $= x - 3y = 20$　　　　　　　　　　　　　　　　(ii)

    from equation (i) and (ii) on solving

    $x = 40$ & $y = 10$.

Q8. If α & β be the root of the equation $x^2 - px + 9$

(a) $p^2 - 2q$ (b) $p^2 + 2q$

(c) $p^2 - q^2$ (d) None of these

Ans. $\alpha + \beta = \dfrac{p}{1} = p$

$\alpha\beta = \dfrac{9}{1} = 9$

$\alpha^2\beta^2 = (\alpha + \beta)^2 - 2\,\alpha\beta$
$= (-p)^2 - 2q$
$= p^2 - 2q$

Q9. The value of $\left(\dfrac{x^a}{x^b}\right)^{a+b} \times \left(\dfrac{x^b}{x^c}\right)^{b+c} \left(\dfrac{x^c}{x^a}\right)^{c+a} = ?$

(a) 1   (b) 0

(c) x^{abc} (d) None of these

Ans. $x^{(a-(b)(a+(b))} \times x^{(b-(c)(b+(c))} \times x^{(c-(a)(c+(a))}$
$(x)\,a^2 - b^2 + b^2 - c^2 + c^2 - a^2 = x^0 = 1$

Q10. IF $x + y = 12$, the maximum value of the product of xy is

(a) 26   (b) 36

(c) 30   (d) None of these

Ans. (b)

Q11. Divide 50 into two parts x & y so that the sum of their reciprocals is $\dfrac{1}{12}$ and the parts are

(a) 30, 20   (b) 20, 30

(c) 20, 40   (d) 40, 20

Ans. As per question $x + y = 50$ (i)

$$\frac{1}{x} + \frac{1}{y} = \frac{1}{12}$$

or $\dfrac{x+y}{xy} = \dfrac{1}{12}$

$xy = 12\,(x + Y)$

         $= 12 \times 50 = 600$ (ii)

         $= \sqrt{2500 - 2400}$

or $x - y = \sqrt{(x+y)^2 - 4xy}$

         $= 50^2 - 4 \times 600$

         $= \sqrt{2500 - 2400}$

         $= \sqrt{100} = 10$

Solving $x + y = 50$

         $x - y = 10$

         $2x = 60$ or $x = 30$ & $y = 20$

Q12. **A man buys mangoes paying one variety Rs. 320 to 240 & another variety of 640 to 400. He mixes & sells them at16 mangoes for Rs. 30. Find the percentage of profit?**

C.P of 240 mangoes = Rs. 320

C.P of 640 mangoes = Rs. 640

C.P of 640 mangoes = Rs. 960

(on variety)

S.P pf 16 mangoes = Rs. 30

S.P pf 640 mangoes = $\dfrac{30}{16} \times 640 = 1200/-$

Profit = 1200 – 960 = 240

So percentage of profit = $\dfrac{240}{960} \times 100 = 25\ V$

Q13. **Two taps A & B take 20 minutes & 30 minutes to fill a cistern independently. The cistern can filled in 40 minutes with the taps A & B & the waste pipe are open altogether. If the taps are closed, calculate the time taken by the discharging outlet to empty the full cistern.**

(a) 10 minutes
(b) 15 minutes
(c) 20 minutes
(d) None of these

Ans. Let the volume of cistern = V

Volume of water filled by tap A in 1 minute =

Volume of water filled by tap B in 1 minute =

Taps (A + (B) together can fill in 1minute =

When the discharging outlet is open these taps can fill water in one minute =

The outlined empties the cistern in 1 minute =

So the time taken by the outlet to discharging the whole water volume v is =

Q14. **The price of sugar has decreased by 20%, by what% are the consumption of the sugar be increased in a house so that there is no decrease in the expenditure on the sugar**

Ans. Let the sugar consumption was x kg

Total expenditure of sugar = wx

Decrease in price = 25%

So new cost of sugar = x

Now, let w1kg of sugar is consumed for the same total expenditure in wx. This wx = w1x

% increase in consumption =

Q15. **Ram Babu deposits Rs. 280. Consisting of one rupee 50 paise & 10 paise coins which are in the ratio of 3:4:20. The number of 10 paise coins is**

(a) 400   (b) 300

(c) 200   (d) None of these

Ans. Consider rupee, 50 paise & 10 paise respectively are 3:

Hence, the value of 10 paise coins is =

So the 10 paise coins are =

Q16. A man borrows Rs. 2500 at 10% pa simple interest. He lends it in the same year & at the same time at 15% pa for 2 years compound annually. Find the C.I ?

Q17. The area of a square inscribed inside a circle of a radius is
(a) $2r^2$ 　　　　　　　　　　　　　　　(b) r^2
(c) $1r^2$ 　　　　　　　　　　　　　　　(d) None of these

Ans. Let AB = x
& OA = r & diagional AC = 2r
$\therefore$ Area of square = a^2
A square is a rhombus of equal diagional
So $x^2 =$

Q18. The least number of square slab of side 1.25 which can be fitted in a varendah of 25×20 m is
(a) 320 　　　　　　　　　　　　　　　(b) 340
(c) 280 　　　　　　　　　　　　　　　(d) 200

Ans. The minimum number of slabs

Q19. While going for Station A to Station B a train traveled at a speed 100 km/h & 150 km/h during return. The average speed of train
(a) 120
(b) 180
(c) 130
(d) 140

Q20. While going for station A to station B a train travelled at a speed 100 km/hr and 150 km/hr during return. The average speed of train
(a) 120
(b) 180
(c) 130
(d) 140

Ans. Let distance between station A and Station B is x

$$\frac{Total\ dis\tan ce}{total\ time\ taken}$$

Average speed =

$$\frac{2x}{\dfrac{x}{100} + \dfrac{x}{150}} = 120\ km/hr$$

Q21. The sum of length of minute hand of a clock is 14 cm. Find the area of swept by the minute hand in one minute.
(a) $10\dfrac{4}{5}$ 　　　　　　　　　　　　(b) $5\dfrac{4}{5}$

(c) $6\dfrac{4}{15}$ 　　　　　　　　　　　　(d) None of these

Ans. Angle made by minute hand at center in 600 minute = 360^0
Angle made by minute hand at center in 1 minute = 360/60
$= 6^0$
$\theta = 6^0$
r = 14 cm

$$\text{Area} = \frac{\theta}{360} \times \pi r^2 = \frac{6}{360} \times \frac{22}{7} \times 14 \times 14$$
$$= 10\frac{4}{15}$$

Q22. In fig. TAS is a tangent to the circle with center at O at a point A if $\angle OBA = 32^0$, find the value of x and y.
(a) 40^0
(b) 58^0
(c) 32^0
(d) None of these

Ans. O is the center
OA = OB (Radii)
In AOB Δ,
$\angle OAB = \angle OBA = 32^0$
A is the point of contact of tangent.
$\angle OAS = 90^0$ or $\angle OAB + \angle BAG = 90^0$
$= 32 + y = 90^0$ or $y = 58^0$

Q23. Find the mean, mode and median
133, 73, 89, 108, 94, 140, 94, 85, 100, 120

Ans. Arranging the data in increasing order,
73, 85, 89, 94, 94, 100, 108, 120, 133, 140

n = 10   So median $= \frac{n}{2} \, \& \, \frac{n}{2} + 1$

$$= \frac{n}{2} = \frac{10}{2} = 5$$

$$= \frac{n}{2} + 1 = 5 + 1 = 6$$

5th term = 94
6th term = 100

$$\text{Median} = \frac{94 + 100}{2} = \frac{194}{2} = 97$$

Q24. A hemi − spherical bowl of internal diameter 36 cm contains a liquid in a cylindrical bottles of radius 3 cm and height 6 cm. How many bottled required
(a) 72
(b) 36
(c) 54
(d) None of these

Ans. Volume of hemi – spherical bowl $= 2/3\pi r3$
$= 2/3\pi \times 183$

Volume of right circular cylinder $= \pi r^2 h = \pi 3^2 6$

Where $r = 3$ and $h = 6$

Now number of bottles required to supply the bowl

$$= \frac{2/3\pi \times 18^3}{\pi \times 3^2 \times 6} = 72$$

Q25. **The value of** $\dfrac{\cos\theta}{\sin(90+\theta)} + \dfrac{\sin\theta}{\sin(180+\theta)} + \dfrac{\cos(90+\theta)}{\tan\theta}$

Is equal to

(a) 1   (b) 2

(c) 3   (d) 4

Ans. (a)

Q26. **Which figure has the greatest area**

(a) Triangle   (b) Rectangular

(c) Hexagon   (d) Circular

Ans. (c)

Q27. $\sin^2(90 - \theta) + \cos^2(90 - \theta) = ?$

(a) 1   (b) 0

(c) $\sin^2\theta - \cos^2\theta$ (d) None of these

Ans. (a)

Q28. **If** $\cos\theta + \sin\theta = \sqrt{2}\cos\theta$, **then value of** $\cos\theta - \sin\theta = ?$

(a) $\sqrt{2}\ \sin\theta$ (b) 0

(c) $\sqrt{2}\ \cos\theta$ (d) $2\ \sin\theta$

Ans. Squaring both sides and simplifying, we get
$\cos\theta - \sin\theta = \sqrt{2}\sin\theta$

Q29. **A shop keeper buys a number of books for Rs 80. If he had to bought 4 more books for the same amount, each book would have cost him Rs 1/ – less. How many books did he buy?**

(a) 6   (b) 10

(c) 15   (d) 20

Ans. Let total number of books $= x$
Cost per book $= 80$
As per our question, we get
$(x + 4)(80/x - 1) = 80$
$80x - x + 320 - 4x = 80x$
$x^2 + 4x - 30 = 0$
$$x = \frac{-4 \pm \sqrt{16 + 1280}}{2} = -20, 16$$
So number of books $= 16$

Q30. If $\dfrac{P}{9} = 3 + \dfrac{1}{4 + \dfrac{1}{1 + \dfrac{1}{5}}}$ then find P/9.

    (a)   93/29
    (b)   47/15
    (c)   101/49
    (d)   55/47

Ans.   93/29

Q31. If (x, y) are complex numbers then $\sqrt{x^2 + y^2}$ is called its modulus. The modulli of a complex number and its conjugate

    (a)   are always equal
    (b)   are always different
    (c)   are off and on equal
    (d)   None of these.