CBSE SAMPLE PAPER
Class IX Mathematics
Paper 1 (Answers)

Answers & Explanations

Section A

1. Solution:

We have, $\frac{81}{36}x^2 - \frac{y^2}{25}$

$= \left(\frac{9}{6}x\right)^2 - \left(\frac{y}{5}\right)^2$

$= \left(\frac{9}{6}x + \frac{y}{5}\right)\left(\frac{9}{6}x - \frac{y}{5}\right)$ $[\because a^2 - b^2 = (a+b)(a-b)]$

Hence, $\frac{81}{36}x^2 - \frac{y^2}{25} = \left(\frac{9}{6}x + \frac{y}{5}\right)\left(\frac{9}{6}x - \frac{y}{5}\right)$

2. Solution:

Let $P(x) = x^2 + 9x - 5 + k$

$\because x - 1 = 0 \Rightarrow x = 1$

$\therefore P(1) = 0$

$P(1) = 1^2 + 9 \cdot 1 - 5 + k$

$\Rightarrow 1 + 9 - 5 + k = 0$

$\Rightarrow k + 5 = 0$

$\Rightarrow k = -5$

Hence, $k = -5$.

3. Solution:

We have, $\frac{9^{\frac{2}{3}}}{9^{\frac{1}{5}}}$

$= \frac{9^{\frac{2}{3}}}{9^{\frac{1}{5}}} = 9^{\frac{2}{3}-\frac{1}{5}}$ $\left[\because \frac{a^m}{a^n} = a^{m-n}\right]$

$= 9^{\frac{10-3}{15}}$

$= 9^{\frac{7}{15}}$

Hence, $\frac{9^{\frac{2}{3}}}{9^{\frac{1}{5}}} = 9^{\frac{7}{15}}$.

OR

Solution

$(343)^m = \frac{49}{7^m}$

$(343)^m = \frac{7^2}{7^m}$

$(7^3)^m = 7^{2-m}$

As bases are equal, we can equate the powers

$3m = 2 - m$

$4m = 2$

$m = \frac{1}{2}$

4. Solution:

Given, $P(4,6)$ and $Q(-5,-7)$

∴ Abscissa of $P = 4$ and abscissa of $Q = -5$

∴ (Abscissa of P) $-$ (abscissa of Q) $= 4 - (-5) = 4 + 5 = 9$

Hence, (abscissa of P) $-$ (abscissa of Q) $= 9$.

5. Solution:

Given $a = 25\ cm, b = 20\ cm, c = 15\ cm$

∴ Area of the triangle = $\sqrt{s(s-a)(s-b)(s-c)}$

To find s:

$s = \frac{1}{2}(a + b + c)$

$s = \frac{25+20+15}{2} = \frac{60}{2} = 30$

∴ Area of the triangle = $\sqrt{30(30-25)(30-20)(30-15)}$

$$= \sqrt{30 \times 5 \times 10 \times 15} = \sqrt{22500} = 150\ cm^2$$

Hence, the area of the triangle $= 150\ cm^2$.

OR

Solution:

Given, interval $= 100 - 110.$

Here, lower limit $= 100$ and upper limit $= 110$

$\therefore$ Class mark $= \frac{\text{upper limit+lower limit}}{2}$

$= \frac{110+100}{2} = \frac{210}{2} = 105$

Hence, the class mark of the interval $100 - 110$ is 105.

6. Solution:

Here, length $(l) = 20\ m$, breadth $(b) = 20\ m$ and height $(h) = 10\ m$.

$\therefore$ Length of the diagonal in the cuboid $=$ Length of the longest rod

$= \sqrt{l^2 + b^2 + h^2}$

$= \sqrt{20^2 + 20^2 + 10^2}$

$= \sqrt{400 + 400 + 100}$

$= \sqrt{900}$

$= 30\ m$

Hence, the length of the longest rod $= 30\ m$

Section B

7. Solution:

Let $x = 0.\overline{78}$

Then, $x = 0.7878\ \ldots\ldots\ (1)$

Multiplying 100 on both sides in equation (1), we get

$100x = 78.7878 \ \ldots\ldots \ (2)$

On subtracting equation (1) from (2), we get

$100x - x = 78.7878 - 0.7878$

$\Rightarrow 99x = 78$

$\Rightarrow x = \frac{78}{99} = \frac{26}{33}$

Hence, $0.\overline{78} = \frac{26}{33}$.

OR

Solution:

We have, $x = 9 - 4\sqrt{5}$

$\frac{1}{x} = \frac{1}{9-4\sqrt{5}} = \frac{1}{9-4\sqrt{5}} \times \frac{9+4\sqrt{5}}{9+4\sqrt{5}}$

$= \frac{9+4\sqrt{5}}{81-80} = 9 + 4\sqrt{5}$

$\therefore\ x + \frac{1}{x} = \left(9 - 4\sqrt{5}\right) + \left(9 + 4\sqrt{5}\right) = 18$

Hence, $x + \frac{1}{x} = 18$.

8. Solution:

Let a, b be the equal and unequal sides of the isosceles triangle.

Here, $a = 3\sqrt{2}\ cm,\ b = 8\ cm$

$\therefore$ Area of an isosceles triangle $= \frac{1}{4} \times b \cdot \sqrt{4a^2 - b^2}$

$= \frac{1}{4} \times 8 \cdot \sqrt{4(3\sqrt{2})^2 - 8^2}$

$= 2 \cdot \sqrt{72 - 64} = 2 \cdot \sqrt{8}$

$= 2 \times 2\sqrt{2}\ cm^2$

$= 4\sqrt{2}\ cm^2$

Hence, area of an isosceles triangle is $4\sqrt{2}\ cm^2$.

9. Solution:

The first nine prime numbers are 2, 3, 5, 7, 11, 13, 17, 19 and 23.

$\therefore$ Mean $= \frac{Sum\ of\ observations}{Number\ of\ observations}$

$= \frac{2+3+5+7+11+13+17+19+23}{9}$

$= \frac{100}{9} = 11.11$

Hence, the mean of the first nine prime numbers is 11.11.

10. Solution:

Let P(x) be the polynomial $x^{997} + x^{886} + x^{775} + x^{654} + x^{113} + 1$. If (x+1) is a factor of P(x), then P(x) should be divisible by $(x + 1)$.

By remainder theorem,

If P(x) is divisible by (x-a), then P(a) = 0

So, in this case we need to prove that P(-1) = 0 to show that x+1 is a factor of P(x)

$P(-1) = (-1)^{997} + (-1)^{886} + (-1)^{775} + (-1)^{654} + (-1)^{113} + 1$

A negative number raised to an odd number will result in a negative number

A negative number raised to an even number will result in a positive number

$$P(-1) = -1 + 1 + (-1) + 1 + (-1) + 1 = 0$$

As we have proved that P(-1) = 0, so

Yes, (x+1) is a factor of $x^{997} + x^{886} + x^{775} + x^{654} + x^{113} + 1$

11. Solution:

Let $(x - 20°)$ *and* $x°$ be the first and second angle respectively.

We know that sum of supplementary angle is equal to 180°.

$\therefore (x - 20°) + x = 180°$

$\Rightarrow 2x - 20° = 180°$

$\Rightarrow 2x = 200°$

$\Rightarrow x = \frac{200°}{2} = 100°$

$x - 20° = 100° - 20° = 80°$

$\therefore$ Larger angle $= 100°$ and smaller angle $= 80°$

Hence, the larger angle is $100°$.

OR

Solution:

Let $3x, 5x, 6x$ and $10x$ be the angles of a quadrilateral.

$\therefore 3x + 5x + 6x + 10x = 360°$

$\Rightarrow 24x = 360°$

$\Rightarrow x = \frac{360°}{24} = 15°$

$\therefore$ Smallest angle $= 3 \times 15° = 45°$

12. Solution:

Area of the circle $= 841\pi\ cm^2$

Let r be the radius of the circle.

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

$\Rightarrow \pi r^2 = 841\pi$

$\Rightarrow r^2 = 841 \Rightarrow r^2 = 29^2$

$\Rightarrow r = 29\ cm$

We know that, the length of the longest chord of the circle is diameter.

$\therefore$ The length of the longest chord of the circle $= 2r = 2 \times 29 = 58\ cm$

Section C

13. Solution:

We have, $\frac{\sqrt{11}-1}{\sqrt{11}+1}$

$= \frac{\sqrt{11}-1}{\sqrt{11}+1} \times \frac{\sqrt{11}-1}{\sqrt{11}-1}$

$= \frac{(\sqrt{11}-1)^2}{\sqrt{11^2}-1^2}$

$= \frac{(\sqrt{11})^2+1^2-2\cdot\sqrt{11}\cdot 1}{11-1}$ $[\because (a-b)^2 = a^2+b^2-2ab \ and \ a^2-b^2 = (a+b)(a-b)]$

$= \frac{11+1-2\cdot\sqrt{11}}{10}$

$= \frac{12-2\cdot\sqrt{11}}{10}$

$= \frac{12}{10} - \frac{2\cdot\sqrt{11}}{10}$

$= \frac{6}{5} - \frac{\sqrt{11}}{5}$

$\therefore \frac{6}{5} - \frac{\sqrt{11}}{5} = a - b\sqrt{11}$

$\Rightarrow a = \frac{6}{5}$ and $b\sqrt{11} = \frac{\sqrt{11}}{5}$

Hence, $a = \frac{6}{5}$ and $b = \frac{1}{5}$

14. Solution:

We have, $x^4 + \frac{1}{x^4} = 34$

Adding 2 on both sides, we get

$x^4 + \frac{1}{x^4} + 2 = 34 + 2 = 36$

$\Rightarrow (x^2)^2 + (\frac{1}{x^2})^2 \ + 2 \cdot x \cdot \frac{1}{x} = 36$

$\Rightarrow (x^2 + \frac{1}{x^2})^2 = 6^2$

$\therefore x^2 + \frac{1}{x^2} = 6 \ldots\ldots (1)$

Again adding 2 on both sides in (1), we get

$x^2 + \frac{1}{x^2} + 2 = 6 + 2 = 8$

$\Rightarrow \left(x + \frac{1}{x}\right)^2 = \sqrt{8}^2$

$\therefore x + \frac{1}{x} = \sqrt{8}$

Hence, $x + \frac{1}{x} = \sqrt{8}$

15. Solution:

Let $\alpha\ and\ \beta$ be the two complementary angles.

We know that sum of complementary angle is equal to 90°.

$\because \alpha + \beta = 90°$

$\therefore \alpha = 90° - \beta \ \ ....(1)$

According to question,

$\beta = \frac{1}{3}\alpha \quad ....(2)$

Using (1), we get

$\beta = \frac{1}{3}(90° - \beta)$

$\Rightarrow 3\beta = 90° - \beta \Rightarrow 4\beta = 90°$

$\Rightarrow \beta = \frac{90°}{4} = 22.5°$

Putting $\beta = 22.5°$ in (1), we get

$\alpha = 90° - 22.5° = 67.5°$

Hence, larger angle $= 67.5°$

OR

Solution:

$\angle POR + \angle ROQ = 180°$ (Linear pairs of lines)

Given, $\angle POR : \angle ROQ = 5:15$

Therefore, $\angle POR = \frac{5}{20} \times 180° = 45°$

Similarly, $\angle ROQ = \frac{15}{20} \times 180° = 135°$

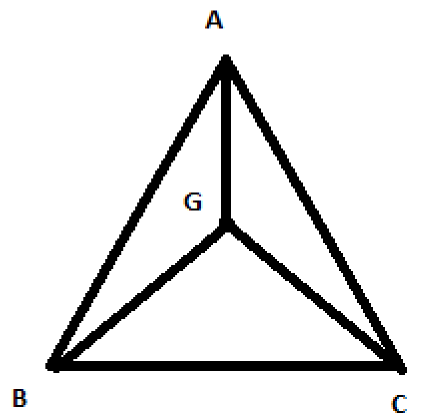
Now, $\angle POS = \angle ROQ° = 135°$ (Vertically opposite)

and $\angle SOQ = \angle POR = 45°$ (Vertically opposite)

16. Solution:

Given, area of the ΔBGC is 28 square units

G is the centroid.



We know that,

Area of the $\Delta BGC = \frac{1}{3} \times$ area of the ΔABC

$\therefore$ Area of the $\Delta ABC = 3 \times$ area of the ΔBGC

$= 3 \times 28$ square units

$= 84$ square units

Hence, area of the $\Delta ABC = 84$ square units.

17. Solution:

Let a be the side of the equilateral triangle.

$\therefore$ Altitude of an equilateral triangle $= \frac{\sqrt{3}}{2} \times a$

$= \frac{\sqrt{3}}{2} \times 6\sqrt{3}\, cm$

$= \sqrt{3} \times 3\sqrt{3}\, cm$

$= 3 \times 3\ cm$

$= 9\ cm$

Hence, the altitude of an equilateral triangle $= 9\ cm$.

18. Solution:

Volume of sphere = Volume of wire

Let r_s, r_w be the radius of sphere and wire respectively.

Let h be the length of the wire.

Given, radius of the sphere $(r_s) = 7\ cm$ and radius of the wire $(r_w) = 0.3\ cm$

∴ Volume of sphere $= \frac{4}{3}\pi r_s^3 = \frac{4}{3}\pi 7^3\ cm^3$

Volume of wire$= \pi r_w^2 h = \pi(0.3)^2 h$

According to question,

Volume of sphere = Volume of wire

$\Rightarrow \frac{4}{3}\pi 7^3 = \pi(0.3)^2 h$

$\Rightarrow h\ = \frac{\frac{4}{3}\times 343}{0.09} = 5081.48\, m$

Hence, the length of the wire is $5081.48\ m$.

19. Solution:

Let the length of the first diagonal be x cm and the second diagonal is $5x$ cm respectively.

According to question,

$x + 5x = 180$

$\Rightarrow 6x = 180 \quad \Rightarrow x = 30\ cm$

$\therefore 5x = 5 \times 30 = 150\ cm$

Area of rhombus $= \frac{1}{2} \times first\ diagonal \times second\ diagonal$

$= \frac{1}{2} \times x \times 5x$ square units

$= \frac{1}{2} \times 30 \times 150$ square units

$= 2250\ cm^2$

Hence, area of rhombus $= 2250\ cm^2$

OR

Solution:

Let each base angle of isosceles triangle $= x$

$\therefore$ Angle at vertex $= (x + 15°)$

We know that

$\therefore (x + 15°) + x + x = 180°$

$\Rightarrow 3x = 180° - 15° = 165°$

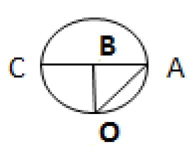
$\Rightarrow x = 55°$

Hence, angle at each base is $55°$.

20. Solution:

According to question,

OBA is a right-angled triangle



Given, $AC = 18.0\ cm$

OB$= \frac{AC}{2} = 9.0\ cm$

$\therefore OA$ is a hypotenuse.

We know that, hypotenuse is always greater than other two sides.

Hence, the radius of this circle is always greater than $9.0\ cm$.

21. **Solution:**

As we know that, in a cyclic quadrilateral, the internal opposite angle is equal to the external angle.

Given, internal opposite angle $= 51°$

$\therefore$ External angle = internal opposite angle = 51°

Hence, the external angle of a cyclic quadrilateral is equal to $51°$.

OR

Solution:

$\sqrt{15+10\sqrt{2}}+\sqrt{15-10\sqrt{2}}$

Square the given expression to remove the outer square root

Using the formula $(a+b)^2 = a^2 + 2ab + b^2$

$$\left(\sqrt{15+10\sqrt{2}}+\sqrt{15-10\sqrt{2}}\right)^2$$

$$= \left(\sqrt{15+10\sqrt{2}}\right)^2 + 2\sqrt{15+10\sqrt{2}}\sqrt{15-10\sqrt{2}} + \left(\sqrt{15-10\sqrt{2}}\right)^2$$

$$= 15+10\sqrt{2} + 2\sqrt{15+10\sqrt{2}}\sqrt{15-10\sqrt{2}} + 15-10\sqrt{2}$$

Sum of the first and the third terms simplifies to

$$2\sqrt{15+10\sqrt{2}}\sqrt{15-10\sqrt{2}} + 30$$

By Law of exponents in multiplication

$$2\sqrt{(15+10\sqrt{2})(15-10\sqrt{2})} + 30$$

Using the formula $a^2 - b^2 = (a+b)(a-b)$

$$2\sqrt{15^2 - \left(10\sqrt{2}\right)^2} + 30 = 2\sqrt{225 - 200} + 30 = 2\sqrt{25} + 30 = 2(5) + 30 = 40$$

We need to take square root of 40 as we have squared in the first step

So, answer is $\sqrt{40} = 2\sqrt{10}$

22. Solution:

The cumulative frequency, is given below:

Class	Frequency(f_i)	Cumulative Frequency
3	6	6
6	12	18
9	9	27
12	14	41
15	24	64
18	11	76
	$\sum f_i = 76$	

$\therefore N = 76$, which is even.

$\Rightarrow \frac{N}{2} = \frac{76}{2} = 38$

$\Rightarrow \frac{N}{2} + 1 = \frac{76}{2} + 1 = 38 + 1 = 39$

Median $= \frac{1}{2}\left\{\left(Value\ of\ 38^{th} term\right) + \left(Value\ of\ 39^{th} term\right)\right\}$

$= \frac{1}{2}\{12 + 12\}$

$= \frac{1}{2}\{24\}$

$= 12$

Hence, median$= 12$.

OR

Solution:

All possible outcomes are $6, 7, 8, \ldots\ldots., 50$.

Total number of all possible outcomes $= 45$

Favourable outcomes are 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47.

Number of all favourable outcomes $= 12$

Let E be the event of getting a prime number.

$\therefore P(E) = \frac{\text{Number of all favourable outcomes}}{\text{Total number of all possible outcomes}} = \frac{12}{45} = \frac{4}{15}$

Hence, the probability of getting a prime number $= \frac{4}{15}$

Section D

23. Solution:

Given, $x = \frac{\sqrt{7}+\sqrt{6}}{\sqrt{7}-\sqrt{6}}$ and $y = \frac{\sqrt{7}-\sqrt{6}}{\sqrt{7}+\sqrt{6}}$

$x = \frac{\sqrt{7}+\sqrt{6}}{\sqrt{7}-\sqrt{6}} \times \frac{\sqrt{7}+\sqrt{6}}{\sqrt{7}+\sqrt{6}}$

$x = \frac{(\sqrt{7}+\sqrt{6})^2}{\sqrt{7}^2-\sqrt{6}^2} = \frac{7+6+2\cdot\sqrt{7}\cdot\sqrt{6}}{1} = 13 + 2\sqrt{42}$

$y = \frac{\sqrt{7}-\sqrt{6}}{\sqrt{7}+\sqrt{6}} \times \frac{\sqrt{7}-\sqrt{6}}{\sqrt{7}-\sqrt{6}}$

$y = \frac{(\sqrt{7}-\sqrt{6})^2}{\sqrt{7}^2-\sqrt{6}^2} = \frac{7+6-2\cdot\sqrt{7}\cdot\sqrt{6}}{1} = 13 - 2\sqrt{42}$

$\therefore x + y = 13 + 2\sqrt{42} + 13 - 2\sqrt{42} = 26$

$\therefore x + y = 26$

24. Solution:

Given $P(x) = 2x^3 - 5x^2 + 3x + 7$

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

By remainder theorem, we know that when $P(x)$ is divided by $(2x + 1)$, the remainder is $P\left(-\frac{1}{2}\right)$.

Now, $P\left(-\frac{1}{2}\right) = 2\left(-\frac{1}{2}\right)^3 - 5\left(-\frac{1}{2}\right)^2 + 3\left(-\frac{1}{2}\right) + 7$

$= 2\left(-\frac{1}{8}\right) - 5\left(\frac{1}{4}\right) - \frac{3}{2} + 7$

$= -\frac{1}{4} - \frac{5}{4} - \frac{3}{2} + 7$

$= \frac{-1-5-6+28}{4}$

$= \frac{16}{4}$

$= 4$

Hence, the required remainder is 4.

25. Solution:

Given, $x + y + z = 6$ and $x^2 + y^2 + z^2 = 18$

Squaring both sides, we get

$\Rightarrow (x + y + z)^2 = 6^2$

$\Rightarrow x^2 + y^2 + z^2 + 2(xy + yz + zx) = 36$

$\Rightarrow 18 + 2(xy + yz + zx) = 36$

$\Rightarrow 2(xy + yz + zx) = 36 - 18 = 18$

$\Rightarrow xy + yz + zx = \frac{18}{2} = 9$

$\therefore x^3 + y^3 + z^3 - 3xyz = (x + y + z)(x^2 + y^2 + z^2 - (xy + yz + zx))$

$= 6(18 - 9) = 54$

Hence, $x^3 + y^3 + z^3 - 3xyz = 54$

OR

Solution

Since $t^2 - 1$ exactly divides the polynomial $P(t) = a_1t^4 + a_2t^3 + a_3t^2 + a_4t + a_5$, it means $t^2 - 1$ is a factor of P(t)

So, $(t + 1)(t - 1)$ is a factor of P(t)

Therefore $P(1) = 0$ and $P(-1) = 0$

Substituting the values in the polynomial we get

$$P(1) = a_1(1)^4 + a_2(1)^3 + a_3(1)^2 + a_4(1) + a_5 = a_1 + a_2 + a_3 + a_4 + a_5 = 0$$

$$P(-1) = a_1(-1)^4 + a_2(-1)^3 + a_3(-1)^2 + a_4(-1) + a_5 = a_1 - a_2 + a_3 - a_4 + a_5 = 0$$

Adding the above two equations, we get

$$2(a_1 + a_3 + a_5) = 0$$

$$a_1 + a_3 + a_5 = 0$$

Subtracting P(-1) from P(1)

$$2(a_2 + a_4) = 0$$

$$a_2 + a_4 = 0$$

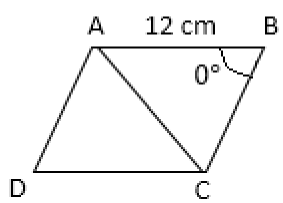
Therefore $a_1 + a_3 + a_5 = a_2 + a_4 = 0$

26. Solution:

Let a be the side of a rhombus.

Given, perimeter of the rhombus is $48\ cm$

∴ Side of the rhombus $(a) = \frac{48}{4} = 12\ cm$



∴ Area of rhombus $ABCD\ = ar(\Delta ABC) + ar(\Delta ABC)$

Area of equilateral triangle $ABC = \frac{\sqrt{3}}{4}a^2$

$= \frac{\sqrt{3}}{4} \times 12 \times 12$

$= 36\sqrt{3}\ cm^2$

Area of equilateral triangle $ADC = 36\sqrt{3}\ cm^2$

∴ Area of rhombus $ABCD\ = ar(\Delta ABC) + ar(\Delta ADC)$

$= (36\sqrt{3} + 36\sqrt{3})cm^2$

$= 72\sqrt{3}\ cm^2$

Hence, the area of the rhombus= $72\sqrt{3}\ cm^2$.

27. Solution:

Let r be the radius of cylinder.

Given, height $(h) = 30\ cm$ and volume of the cylinder $= 750\pi\, cm^3$

$\therefore Volume\ of\ the\ cylinder\ = \pi r^2 h$

$\Rightarrow \pi r^2 \times 30\ = 750\pi$

$\Rightarrow r^2 = \frac{750\pi}{30\pi} = 25$

$\Rightarrow\ r^2 = 5^2$

$\Rightarrow\ r = 5\ cm$

∴Total surface area = $2\pi r(r\ +\ h)$

$=\ 2 \times \frac{22}{7} \times 5 \times (\ 5\ +\ 30)\ cm^2$

$=\ 10 \times \frac{22}{7} \times 35\ cm^2$

$=\ 10 \times 22 \times 5\ cm^2$

$=\ 10 \times 110\ cm^2$

$=\ 1100\ cm^2$

Hence, radius $(r) = 5\ cm$ and total surface area $= 110\ cm^2$.

OR

Solution:

Let h be the height of the trapezium.

Given, area of the trapezium$= 350\ cm^2$,

Sum of the parallel sides of the trapezium $= 70\ cm$

Area of the trapezium $= \frac{1}{2} \times (sum\ of parallel\ sides) \times height$

$\Rightarrow \frac{1}{2} \times 70 \times h = 350$

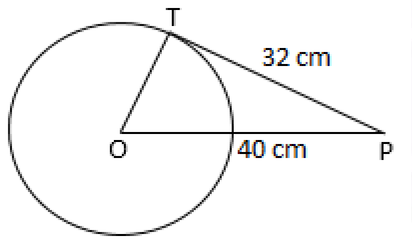
$\Rightarrow 35h = 350$

$\Rightarrow h = 10\ cm$

Hence, the height of the trapezium $= 10\ cm$.

28. Solution:

Let O be the centre of the given circle and P be a point such that $OP = 40\ cm$



Let PT be tangent such that $PT = 32\ cm$

Join OT.

Now, PT is a tangent at T and OT is the radius through T.

$\therefore OT \perp PT$

In the right ΔOTP, we have

By Pythagoras's Theorem,

$OP^2 = OT^2 + PT^2$

$OT = \sqrt{OP^2 - PT^2}$

$= \sqrt{40^2 - 32^2} = \sqrt{1600 - 1024} = \sqrt{576} = 24\ cm$

Hence, radius of the circle is $24\ cm$.

29. Solution:

Let $b\ cm$ be the unequal side of an isosceles triangle.

Here, perimeter of an isosceles triangle = 64 cm and equal sides $(a) = 20\ cm$.

∴ Perimeter of an isosceles triangle $= (2a + b)\ cm$

$\Rightarrow (2 \times 20) + b = 64$

$\Rightarrow b = 64 - 40 = 24\ cm$

∴ Area of an isosceles triangle $= \frac{1}{4} b\sqrt{4a^2 - b^2}$ square units

$= \frac{1}{4} \times 24\sqrt{4 \times 20^2 - 24^2}\ cm^2$

$= \frac{1}{4} \times 24\sqrt{4 \times 400 - 576}\ cm^2$

$= 6 \times \sqrt{1600 - 576}\ cm^2$

$= 6 \times \sqrt{1024}\ cm^2$

$= 6 \times 32\ cm^2 = 192\ cm^2$

Hence, Area of the isosceles triangle $= 192\ cm^2$.

OR

Solution:

All possible outcomes are $14, 15, 16, \ldots\ldots.$,77.

Total number of all possible outcomes $= 64$

Favourable outcomes are $14, 21, 28, 35, 42, 49, 56, 63, 70, 77$.

Number of all favourable outcomes $= 10$

Let E be the event of getting a number is divisible by 7.

$\therefore P(E) = \frac{\text{Number of all favourable outcomes}}{\text{Total number of all possible outcomes}} = \frac{10}{64} = \frac{5}{32}$

Hence, the probability of the number is divisible by 7 $= \frac{5}{32}$.

30. Solution:

We prepare the cumulative frequency, as given below:

Class	Frequency (f_i)	$f_i \times x_i$
3	6	18
5	8	40
7	15	105
9	p	9p
11	8	88
13	4	52
	$\sum f_i = 41 + p$	$\sum f_i \times x_i = 303 + 9p$

$\therefore$ Mean $= \frac{\sum f_i \times x_i}{\sum f_i}$

$= \frac{303+9p}{41+p}$

$\Rightarrow \frac{303+9p}{41+p} = 8$

$\Rightarrow 303 + 9p = 8p + 328$

$\Rightarrow p = 25$

Hence, $p = 25$