MAHARASHTRA BOARD CLASS 9
MATHS PART 2 ANSWERS

Answers & Explanations

Q1.A. Choose the correct alternative.

1.

Ans. B

Let α and β 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,

$\beta = \frac{2}{5}\alpha \quad .... (2)$

Using (1), we get

$\beta = \frac{2}{5}(90° - \beta \ )$

$\Rightarrow 5\beta = 180° - 2\beta \quad \Rightarrow 5\beta + 2\beta = 180°$

$\Rightarrow 7\beta = 180°$

$\therefore \beta = \frac{180°}{7} = 25.72°$

Putting $\beta = 25.7°$ in (1), we get

$\alpha \ = 90° - 25.7° \ = 64.3°$.

Hence, smaller angle $= 25.72°$.

2.

Ans. C

Given: $\angle A = 60°, \angle B = 85°, \angle C = 115°$

To find: $\angle D$

As we know that, the sum of all 4 angles of quadrilateral triangle is $360°$.

$\angle A + \angle B + \angle C + \angle D = 360°$

$60° + 85° + 115° + \angle D = 360°$

$\angle D = 360° - 260°$

$\angle D = 100°$

3.

Ans. A

Area of the circle $= 625\pi\ cm^2$

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

$\Rightarrow \pi r^2 = 625\pi$

$\Rightarrow r^2 = 625 \ \Rightarrow r^2 = 25^2$

$\Rightarrow r = 25\ cm$

$\therefore$ The length of the longest chord of the circle $= Diameter = 2r = 2 \times 25 = 50\ cm$

Hence, the length of the longest chord of the circle is $50\ cm$.

4.

Ans. C

Given, the points $P(-5,-6), Q(-3,-11), R(-13,-12)$, and $S(-17,-5)$ are all negative points.
All points of the form $(-a,-a)$ lie in Quadrant III.

5.

Ans. B

Let r be the radius of sphere.

Given, volume of sphere $= \frac{864}{3}\pi\, cm^3$

$\therefore$ Volume of sphere $= \frac{4}{3}\pi r^3$

$\Rightarrow \frac{4}{3}\pi r^3 = \frac{864}{3}\pi$

$\Rightarrow r^3 = 216 = 6^3$

$\Rightarrow r = 6\, cm$

Hence, radius of sphere is 6 cm.

B. Do any five activities of the following.

1.

Ans. Given, $\angle A - \angle B = 35°$ and $\angle B - \angle C = 20°$

$\Rightarrow \angle A = 35° + \angle B$ and $\angle C = \angle B - 20° \quad \ldots(i)$

We know that, $\angle A + \angle B + \angle C = 180° \quad \ldots(ii)$

Using (i), we get

$35° + \angle B + \angle B + \angle B - 20° = 180°$

$\Rightarrow 3\angle B = 180° - 15° = 165°$

$\Rightarrow \angle B = \frac{165°}{3} = 55°$

Hence, $\angle B = 55°$.

2.

Ans. Let each base angle of isosceles triangle $= x$

$\therefore$ Angle at vertex $= (x + 18°)$

We know that

$\therefore (x + 18°) + x + x = 180°$

$\Rightarrow 3x = 162°$

$\Rightarrow x = \frac{162°}{3} = 54°$

Hence, angle at each base is $54°$.

3.

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

Here, $a = 6\sqrt{2}\, cm, b = 8\, cm$

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

$= \frac{1}{4} \times 8 \times \sqrt{4(6\sqrt{2})^2 - 8^2}$

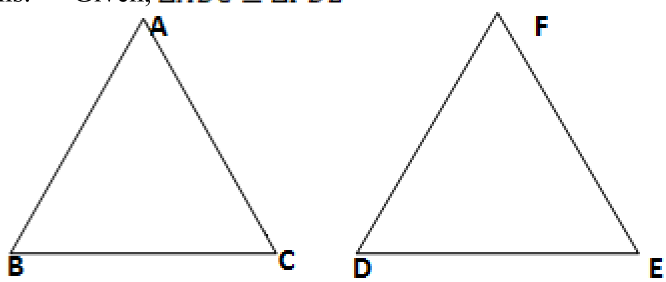
$= 2\sqrt{288 - 64} = 2 \times 4\sqrt{14}$
$= 8\sqrt{14}\, cm^2$
Hence, area of an isosceles triangle is $8\sqrt{14}\, cm^2$.

4.

Ans. Given, altitude of the equilateral triangle $(h) = 11\, cm$
Let a be the side of the equilateral triangle.
$\therefore$ Altitude of an equilateral triangle $= \frac{\sqrt{3}}{2} \times side(a)$
$\Rightarrow \frac{\sqrt{3}}{2} \times a = 11$
$\Rightarrow a = \frac{22}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$
$\Rightarrow a = \frac{22\sqrt{3}}{3} cm$
Hence, the side of the equilateral triangle$= \frac{22\sqrt{3}}{3} cm$

5.

Ans. Given, $\Delta ABC \cong \Delta FDE$



$AB = FD = 4\, cm, \angle B = 50°, \angle A = 75°$
$\therefore \angle C = 180° - (50° + 75°)$
$= 180° - 125° = 55°$
So, we must have $\angle E = 55°$ $[\because \angle E = \angle C]$
Hence, $\angle E = 55°$.

6.

Ans. (i) In $(4,0)$, we have the ordinate 0.
$\therefore (4,0)$ lies on the x-axis.
(i) In $(0, -6)$, we have the abscissa 0.
$\therefore (0, -6)$ lies on the y-axis.

Q.2.Solve any four of the following.

1.

Ans. AOB will be a straight line, if $\angle AOC + \angle BOC = 180°$
$\therefore (3x + 10°) + (5x - 22°) = 180°$
$\Rightarrow 3x + 10° + 5x - 22° = 180°$
$\Rightarrow 8x - 12° = 180°$
$\Rightarrow 8x = 180° + 12° = 192°$
$\Rightarrow x = \frac{192°}{8} = 24°$
Hence, $x = 24°$.

2.

Ans. Given

$\Delta ABC \sim \Delta DEF$

$Area\ of\ \Delta ABC = 196\ cm^2$

$AP = 14.0\ cm$

$DQ = 12\ cm.$

$Area\ of\ (\Delta DEF) = ?$

Let AP and DQ be the corresponding medians of ΔABC and ΔDEF .

We know that the ratio of the areas of two similar triangles is equal to the ratio of the squares of their corresponding medians.

$\therefore \frac{\text{area of}(\Delta ABC)}{\text{area of}(\Delta DEF)} = \frac{AP^2}{DQ^2}$

$\Rightarrow \left(\frac{AP}{DQ}\right)^2 = \frac{\text{area of}(\Delta ABC)}{\text{area of}(\Delta DEF)} = \frac{196}{\text{area of}(\Delta DEF)} = \left(\frac{14}{12}\right)^2 = \frac{196}{144}$

$\Rightarrow \text{ area of }(\Delta DEF) = \frac{196 \times 144}{196} = 144\ \text{cm}^2$

Hence, the area of the second triangle= $144\ \text{cm}^2$.

3.

Ans. Let $7x$, $5x$, $8x$ and $10x$ be angles of a quadrilateral.

$\therefore 7x + 5x + 8x + 10x = 360°$

$\Rightarrow 30x = 360°$

$\Rightarrow x = \frac{360°}{30} = 12°$

$\therefore$ Largest angle $= 10 \times 12° = 120$

4.

Ans. Given:

$sin^2 45 + cos^2 45 = sin^2 60 + cos^2 60$

Solution:

To prove $L.H.S = R.H.S$

L.H.S:

$sin^2 45 + cos^2 45 = \left(\frac{1}{\sqrt{2}}\right)^2 + \left(\frac{1}{\sqrt{2}}\right)^2 = \frac{1}{2} + \frac{1}{2} = 1$

$\therefore sin^2 45 + cos^2 45 \Rightarrow 1$

R.H.S: $sin^2 60 + cos^2 60 = \left(\frac{\sqrt{3}}{2}\right)^2 + \left(\frac{1}{2}\right)^2 = \frac{3}{4} + \frac{1}{4} = 1$

$\therefore sin^2 60 + cos^2 60 \Rightarrow 1$

i.e. $L.H.S = R.H.S$

Hence, proved

5.

Ans. Given, $\cos^2\theta - \sin^2\theta = \frac{1}{7}$

$\cos^2\theta + \sin^2\theta = 1$ (Property)

$\therefore \cos^4\theta - \sin^4\theta = (\cos^2\theta)^2 - (\sin^2\theta)^2$

$\Rightarrow \cos^4\theta - \sin^4\theta = (\cos^2\theta + \sin^2\theta)(\cos^2\theta - \sin^2\theta)$ $(\because \cos^2\theta + \sin^2\theta = 1)$

$= 1 \times \frac{1}{7} = \frac{1}{7}$

Hence, $\cos^4\theta - \sin^4\theta = \frac{1}{7}$.

6.

Ans. Given:

Area of a trapezium is $900\ cm^2$

One of its parallel sides is $108\ cm$

The height of the parallel side is $12\ cm$
To find:
The length of the other parallel side (x)
Solution:
The formula for the area of a trapezium
is
$= \frac{1}{2} \times (sum\ of\ the\ two\ parallel\ sides) \times (height\ of\ the\ parallel\ side)$

$900 = \frac{1}{2}(108 + x)(12)$
$1800 = 1296 + 12x$
$12x = 1800 - 1296$
$12x = 504$
$x = 42$

Q.3.Solve any three of the following.

1.

Ans. $\angle POR + \angle ROQ = 180°$ (Linear pairs of lines)
Given, $\angle POR : \angle ROQ = 6 : 9$
Therefore, $\angle POR = \frac{6}{15} \times 180°$
$= 6 \times 12° = 72°$
Similarly, $\angle ROQ = \frac{9}{15} \times 180$
$= 9 \times 12° = 108°$
Now, $\angle POS = \angle ROQ\ ° = 108°$ (Vertically opposite)
and $\angle SOQ = \angle POR = 72°$ (Vertically opposite)
Hence, $\angle SOQ = 72°$.

2.

Ans. Let a be the side of the equilateral triangle.
∴ The perimeter of the equilateral triangle $= 3a$

$\Rightarrow 3a = \frac{27\sqrt{3}}{4}$

$\Rightarrow a = \frac{9\sqrt{3}}{4}\ cm$

∴ Area of the equilateral triangle $= \frac{\sqrt{3}}{4} a^2$ square units

$= \frac{\sqrt{3}}{4}\left(\frac{9\sqrt{3}}{4}\right)^2 = \frac{\sqrt{3}}{4} \times \frac{81 \times 3}{16}$

$= \frac{243\sqrt{3}}{64}\ cm^2$

Hence, area of the equilateral triangle $= \frac{243\sqrt{3}}{64} cm^2$.

3.

Ans. Let the radius of the circle be r.

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

Let the radius of the new circle be $(r - x)$.

$\therefore$ Area of the new circle $= \pi(r - x)^2$

Then, $\frac{\pi(r-x)^2}{\pi r^2} = \frac{1}{2}$

$\Rightarrow \frac{(r-x)^2}{r^2} = \frac{1}{2} \Rightarrow 2(r - x)^2 = r^2$

$\Rightarrow (r)^2 - \{\sqrt{2}(r - x)\}^2 = 0$

$\Rightarrow \{r - \sqrt{2}(r - x)\}\{r + \sqrt{2}(r - x)\} = 0$

$\Rightarrow r - \sqrt{2}(r - x) = 0 \qquad (\because r + \sqrt{2}(r - x) \neq 0)$

$\Rightarrow r = \sqrt{2}r - \sqrt{2}x$

$\therefore r = \frac{\sqrt{2}x}{\sqrt{2}-1}$

Hence, the radius of the circle, $r = \frac{\sqrt{2}x}{\sqrt{2}-1}$.

4.

Ans. Given, One angle= $2x + 30°$

To Find: All the four angles of the parallelogram.

Let us consider, x be the smallest angle.

One angle= $2x + 30°$

$x + 2x + 30° = 180°$

$3x = 180° - 30°$

$x = 50°$

Then, the largest angle is $\Rightarrow 2x + 30°$

$= 2(50°) + 30°$

$= 130°$

5.

Ans. We have,

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

$\Rightarrow \sin\theta\{\frac{1+\cos\theta+1-\cos\theta}{(1-\cos\theta)(1+\cos\theta)}\} = 2$

$\Rightarrow \sin\theta\{\frac{2}{(1-\cos^2\theta)}\} = 2$

$\Rightarrow \sin\theta\{\frac{2}{(\sin^2\theta)}\} = 2 \qquad (\because \sin^2\theta + \cos^2\theta = 1)$

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

$\Rightarrow \sin\theta = 1$

$\Rightarrow \theta = 90°$

Hence, $\theta = 90°$.

Q.4. Act as per given instruction. Any Two.

1.

Ans. Let a, b and c be the three sides of the triangle.

Here, $a = 5.5$ cm, $b = 11$ cm and $c = ?$

$\therefore$ Semi perimeter$= \frac{a+b+c}{2}$

$\Rightarrow \frac{5.5+11+c}{2} = 13.5$

$\Rightarrow 16.5 + c = 2 \times 13.5 = 27$

$\Rightarrow c = 27 - 16.5 = 10.5\, cm$

$\therefore$ Area of triangle (Using Heron's formula)

$= \sqrt{s(s-a)(s-b)(s-c)}$ square units

$= \sqrt{13.5(13.5-5.5)(13.5-11)(13.5-10.5)}\, cm^2$

$= \sqrt{13.5(8)(2.5)(3)}\, cm^2$

$= \sqrt{13.5 \times 60}\, cm^2$

$= \sqrt{810}\, cm^2$

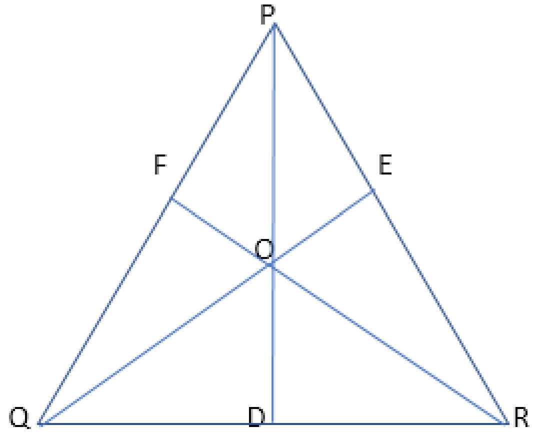
$= 28.47 cm^2$

Hence, area of triangle $= 28.47 cm^2$.

2.

Ans. Given that, PQ = QR = RP and OF = 8cm, OE = 10cm, OD = 11cm

Also, OF ⊥ PQ, OE ⊥PR, OD ⊥QR.



Let's suppose PQ = QR = RP = x

Now, $Area\ of\ \Delta PQR = Area\ of\ \Delta POQ + Area\ of\ \Delta POR + Area\ of\ \Delta QOR$

Area of a right-angled triangle $= \frac{1}{2} \times base \times height$

And area of an equilateral triangle is $\frac{\sqrt{3}}{4} a^2$

$\Rightarrow \quad \frac{\sqrt{3}}{4} a^2 = \left(\frac{1}{2} \times PQ \times OF\right) + \left(\frac{1}{2} \times PR \times OE\right) + \left(\frac{1}{2} \times QR \times OD\right)$

$\Rightarrow \quad \frac{\sqrt{3}}{4} x^2 = \left(\frac{1}{2} \times x \times 8\right) + \left(\frac{1}{2} \times x \times 10\right) + \left(\frac{1}{2} \times x \times 11\right)$

$\Rightarrow \quad \frac{\sqrt{3}}{4} x^2 = \frac{x}{2}(8 + 10 + 11)$

$\Rightarrow \quad \frac{\sqrt{3}}{4}x^2 = \frac{29x}{2}$

$\Rightarrow \quad x = \frac{29\times2}{\sqrt{3}}$

$\Rightarrow \quad x = \frac{58}{\sqrt{3}}$

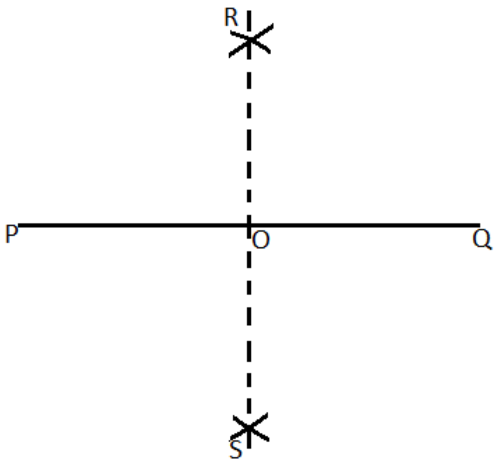
$\therefore \; Area\ of\ \Delta PQR = \frac{\sqrt{3}}{4}x^2 = \frac{\sqrt{3}}{4} \times \frac{58}{\sqrt{3}} \times \frac{58}{\sqrt{3}}$

$$= \frac{841}{\sqrt{3}} = \frac{841}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{841\sqrt{3}}{3}$$

Therefore, the area of given equilateral triangle is $\frac{841\sqrt{3}}{3}$ sq.cm

3.

Ans.



Construction:

Step 1: Draw a line $PQ = 7.6\ cm$.

Step 2: By taking P as centre and radius more than the midpoint of the line segment PQ, draw an arc one above the line segment and another one below the line segment.

Step 3: Similarly, by taking Q as center draw two arcs that cutting the previous drawn arcs and the obtained points as $R\ and\ S$ respectively.

Step 4: Join the two points R and S obtained from the arcs, which intersects the line PQ at $point\ O. R\ and\ S$ are the required perpendicular bisector.

The length of each segment is, $PO = OQ = 3.8cm$

Q.5. Solve any one sub-question from the following.

1.

Ans. Given:

$\tan B = \frac{3}{4}$

To find Trigonometric values of B:

$\tan B = \frac{3}{4}$

$\cot B = \frac{1}{\tan B} = \frac{4}{3}$

$cosec^2 B = 1 + cot^2 B = 1 + (\frac{4}{3})^2$

$= 1 + \left(\frac{16}{9}\right) = \frac{25}{9}$

$cosec\ B = \frac{5}{3}$

$cosec\ B = \frac{1}{\sin B} = \frac{5}{3} = \frac{1}{\sin B}$

$\sin B = \frac{3}{5}$

$cos^2 B = 1 - sin^2 B$

$= 1 - \frac{9}{25} = \frac{16}{25}$

$\Rightarrow \cos B = \frac{4}{5}$

$\cos B = \left(\frac{1}{\sec B}\right)$

$\cos B = \frac{4}{5}$

The other trigonometric values of B are $\cot B = \frac{4}{3}$,

$cosec\ B = \frac{5}{3}$,

$\sin B = \frac{3}{5}$,

$\cos B = \frac{4}{5}$,

$sec = \frac{5}{4}$.

2.

Ans. Let $h\ and\ r$ be the height and radius of the original cylinder respectively.

∴ Original curved surface area $= 2\pi rh$

New height $= \frac{116}{100}h = 1.16h$

and New radius $= \frac{88}{100}r = 0.88r$

∴ New curved surface area $= 2\pi(0.88r)(1.16h)$

$= (1.0208)2\pi rh$

∴ Increase in curved surface area = New curved surface area −Original curved surface area

$= (1.0208)2\pi rh - 2\pi rh = 2\pi rh(1.0208 - 1)$

$= 2\pi rh(0.0208)$

∴ Increase % $= \frac{2\pi rh(0.0208)}{2\pi rh} \times 100 = 2.08\,\%$