MBA PRO 2024

QUANTITATIVE APTITUDE

DPP: 03

Triangles 3

Q1 In $\triangle ABC, AB = 20cm, BC = 25cm$, and $CA = 30\ cm$, then the length (in cm) of inradius of $\triangle ABC$ lies between.

(A) 2 and 4
(B) 4 and 6
(C) 8 and 10
(D) 6 and 8

Q2 In a right-angled triangle $\triangle XYZ, XM, YN$ and ZO are internal angle bisectors of $\angle X, \angle Y$ and $\angle Z$, respectively. If $\angle XYZ = 90^\circ$, and length of sides XZ and XY are $52cm$ and $20cm$ respectively, then what is the length (in cm.) of inradius of the $\triangle XYZ$?

(A) $12cm$
(B) $8cm$
(C) $16cm$
(D) $6cm$

Q3 The sides of a triangle 24,32 and $16cm$. Find the ratio of circumradius and inradius of the triangle.

(A) $15 : 7$
(B) $25 : 16$
(C) $16 : 5$
(D) $64 : 15\sqrt{3}$

Q4 Circumradius and in radius of a right-angle triangle are $8cm$ and $4cm$ respectively. what is the area of the triangle?

(A) 100 sq. cm
(B) 84 sq. cm
(C) $80sq. cm$
(D) $96sq \cdot cm$

Q5 The ratio of lengths of sides of triangle is $3 : 2 : 4$. The length of inradius of triangle is $3\sqrt{15}\,cm$. Find the semi-perimeter of triangle.

(A) $81cm$
(B) $18cm$
(C) $27cm$
(D) $4.5cm$

Q6 In a $\triangle ABC, AB : BC : CA = 9 : 40 : 41$ respectively, and the length of altitude BD on CA is is $\frac{720}{41}cm$. Find the length (in cm) of the segment that joins the circumenter and the orthocenter?

(A) 20
(B) 41
(C) 82
(D) 40

Q7 The sides of a triangle are $15cm, 112cm$, and 113 cm. The length of the radius of circle circumscribing the triangle lies between:

(A) $45cm$ and $50cm$
(B) $40cm$ and $45cm$
(C) $55cm$ and $60cm$
(D) $60cm$ and $65cm$

Q8 For a triangle with perimeter $40cm$ and area 60 cm^2, if the sum of the lengths of the circumradius and the inradius of the triangle is $11.5cm$, find the product of the lengths of its sides.

(A) $2040cm^3$
(B) $2280cm^3$
(C) $2520cm^3$
(D) $2760cm^3$

Q9 In a $\triangle ABC$, circumradius $(R) = 9\sqrt{2}cm, \angle A = 45^\circ$ and $\angle C = 105^\circ$. Find the respective ratio of a to b. (a, b, c are the sides of the triangle opposite to $\angle A$, $\angle B$ and $\angle C$ respectively)

(A) $2 : 1$

(B) $\sqrt{2}:1$
(C) $1:2$
(D) $1:\sqrt{2}$

Q10 If O is the circumcenter of a triangle PQR and $\angle QOR = 110^\circ, \angle OPR = 25^\circ$, then the measure of $\angle PRQ$ is -

(A) 75° (B) 60°
(C) 55° (D) 80°

Q11 In a $\triangle PQR$, sides PQ and PR are extended up to A and B respectively. Bisectors of $\angle AQR$ and $\angle BRQ$ meet at point O. I is the incenter of $\triangle QOR$, then what is the value of $\angle QIR$ if $\angle P = 52^\circ$?

(A) 128°
(B) 112°
(C) 122°
(D) 117°

Q12 In a $\triangle PQR, I$ is the incentre and $\angle PRQ$ is 24° more than $\angle PQR$ and $\angle QIR = 122^\circ$, then what is the value of $\angle QRI$?

(A) 45° (B) 35°
(C) 55° (D) 65°

Q13 In a $\triangle ABC, I$ is the incenter and $\angle BIC = 125^\circ$ and $\angle ABC$ is 20% more than the $\angle ACB$. Find the measure of $\frac{(\angle BAC - \angle BCA + \angle ABC)}{2}$.

(A) 40° (B) 30°
(C) 50° (D) 20°

Q14 In $\triangle PQR, RT$ and PS are perpendicular on PQ and QR respectively. PS and RT intersect at M. The bisector of $\angle MPR$ and $\angle MRP$ intersect at O. If $\angle POR = 145^\circ$, then find the measure of $\angle PQR$.

(A) 80° (B) 70°
(C) 75° (D) 60°

Q15 In $\triangle ABC, \angle B$ is less than $\angle C$. AD is the bisector of $\angle A$ and $AT \perp BC$. If $\angle ADT = 68^\circ$ and $\angle B = 19^\circ$, then what is the measure of $\angle C$?

(A) 61° (B) 63°
(C) 59° (D) 65°

Q16 Find the area of a right-angle triangle if the radius of its circumcircle is $12.5cm$ and the altitude drawn from a vertex to the hypotenuse is $7cm$.

(A) $43.75cm^2$
(B) $87.5cm^2$
(C) $175cm^2$
(D) $168cm^2$

Q17 In $\triangle PQR, PQ = x$ and $PR = y$. Find the value of $x^2 + y^2$ if the length of side QR is half the length of the median from P to QR, where the length of QR is 3 units.

(A) 76.5 units (B) 78 sq. units
(C) 74 sq. units (D) 72 sq. units

Q18 In $\triangle JKL, JK = 6m, KL = 8m$ and $JL = 11m$. If the median JM intersect KL at point M then find the value of JM.

(A) $\left(\frac{5\sqrt{10}}{2}\right) m$
(B) $\left(\frac{5}{\sqrt{2}}\right) m$
(C) $\left[\frac{5\sqrt{5}}{2}\right] m$
(D) $(5\sqrt{5})m$

Q19 Given that $\triangle XYZ \sim \triangle PQR, XZ = 15cm, PR = 24$ cm, XT is the median in $\triangle XYZ$, where T is a point on YZ and PS is the median in $\triangle PQR$, where S is a point on QR. Find XT: PS

(A) $8:5$ (B) $3:8$
(C) $8:3$ (D) $5:8$

Q20

In $\triangle ABC$, the length of medians CD and BE are 27 cm and $33cm$ respectively. Find the area of $\triangle ABC$, if $BC = 20cm$.

(A) $120\sqrt{2}$ sq.cm

(B) $180\sqrt{2} sq \cdot cm$

(C) $240\sqrt{2}$ sq.cm

(D) $360\sqrt{2}$ sq.cm

Q21 In a $\triangle ABC, OD, OE$ and OF are perpendicular bisector of three sides of the triangle i.e. AC, AB and BC respectively. If $\angle CAB = 92^\circ$ and $\angle ACB = 66^\circ$, then what is value (in degree) of $(\angle COB - \angle AOB)$?

(A) 56° (B) 64°

(C) 52° (D) 62°

Q22 In an equilateral triangle ABC, AD, BE and CF are medians and meet at point O. If perimeter of triangle ABC is $72cm$, then what is the length of $OD(AD$ is perpendicular to $BC)$?

(A) $3\sqrt{3}cm$

(B) $2\sqrt{3}cm$

(C) $4\sqrt{3}cm$

(D) $6\sqrt{3}cm$

Q23 In $\triangle XYZ$, medians YM and ZN are perpendicular to each other and intersects at point O. If $YM = 18\ cm$, and $ZN = 10cm$, then find the area of $\triangle XYZ$.

(A) 120 sq. cm

(B) 100 sq. cm

(C) 144 sq. cm

(D) $108 sq \cdot cm$

Q24 In $\triangle ABC$, the medians AD, BE and CF meet at O. What is the ratio of the area of $\triangle ABD$ to the area of $\triangle AOE$?

(A) $2:1$ (B) $3:1$

(C) $5:2$ (D) $3:2$

Q25 In a $\triangle ABC, AD$ is the median that cuts BC at D. If $\angle ADC = 110^\circ$ and $2AD = BC$, then which of the following is definitely TRUE?

(A) $\triangle ABC$ is an isosceles triangle

(B) $\triangle ABC$ is an obtuse-angle triangle

(C) $\triangle ABC$ is a right-angle triangle

(D) $\triangle ABC$ is an acute-angle triangle

Q26 In a $\triangle PQR$, PS and QT are medians and QT is perpendicular to PS and $PS = 6cm$ and $QT = 9cm$, then what is the difference between PR and QR? (Take $\sqrt{10} = 3.2$)

(A) $2.8cm$ (B) $3.2cm$

(C) $2.4cm$ (D) $3cm$

Q27 In a $\triangle ABC, D$ is a point on side BC such that $AB \times CD = AC \times BD$. If $\angle ADB = 70^\circ$, and $\angle DBA = 60^\circ$, then find the measure of $\angle ACB$.

(A) 30° (B) 20°

(C) 25° (D) 35°

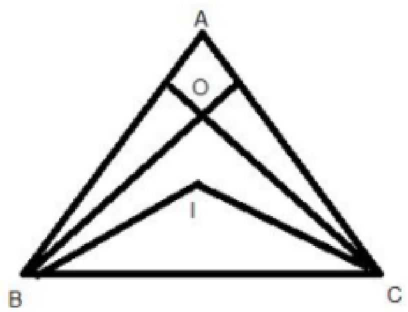
Q28 The area of a triangle ABC is $\frac{135\sqrt{3}}{4}$ sq.cm and $AB : BC : CA = 3 : 7 : 5$. If AD is the angle bisector of angle BAC and D is the point on side BC. Find the length of BD to the nearest whole number.

(A) 6 (B) 9

(C) 8 (D) 7

Q29 In the following figure, O is the orthocenter, and I is the incenter of $\triangle ABC \cdot \angle BAC = X^\circ$ and $(\angle BOC - \angle BIC) = 15^\circ$. Find the measure of

$\left(\frac{X}{2}\right)^{\circ}$.



(A) 15° (B) 25°
(C) 30° (D) 36°

Q30 In a $\triangle ABC, O$ is the orthocenter, $\angle ABC=60^{\circ}$, $\angle ACB=70^{\circ}$ and $EO \| BC$ where E is a point on side AB. Find the reflex angle EOC.

(A) 180°
(B) 210°
(C) 190°
(D) 175°

Answer Key

Q1	(D)
Q2	(B)
Q3	(C)
Q4	(C)
Q5	(A)
Q6	(B)
Q7	(C)
Q8	(A)
Q9	(B)
Q10	(B)
Q11	(C)
Q12	(B)
Q13	(A)
Q14	(B)
Q15	(B)
Q16	(B)
Q17	(A)
Q18	(A)
Q19	(D)
Q20	(D)
Q21	(C)
Q22	(C)
Q23	(A)
Q24	(B)
Q25	(C)
Q26	(A)
Q27	(B)
Q28	(C)
Q29	(B)
Q30	(B)

Hints & Solutions

Q1 Text Solution:

Topic - Triangles

Semi-perimeter of $\triangle ABC$ (s)

$$= \frac{(20+25+30)}{2} = \frac{75}{2}cm$$

$$\text{Area } = \sqrt{s(s-AB)(s-BC)(s-AC)}$$

$$= \sqrt{\frac{75}{2} \times \frac{35}{2} \times \frac{25}{2} \times \frac{15}{2}}$$

$$= \frac{375}{4}\sqrt{7} \text{ sq.cm}$$

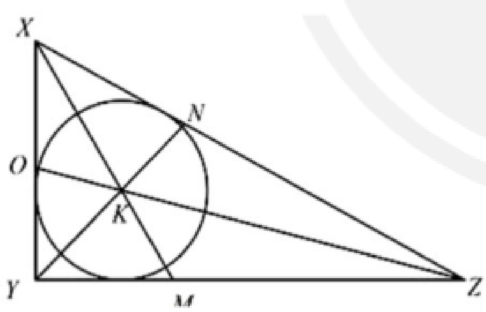
$$\text{Length of inradius } = \frac{\text{area}}{\text{semi} - \text{perimeter}}$$

$$= \frac{375}{4}\sqrt{7} \times \left(\frac{2}{75}\right) = 2.5 \times \sqrt{7} = 2.5$$

$$\times 2.6 = 6.5cm$$

Hence, option d is correct.

Q2 Text Solution:



Since, XM, YN and ZO are angle bisectors of $\angle X$, $\angle Y$ and $\angle Z$, respectively, thus, K is incentre of the $\triangle XYZ$.

By Pythagoras theorem,

$$YZ = \sqrt{(52^2 - 20^2)} = \sqrt{(2704 - 400)}$$

$$= \sqrt{2304}$$

$$= 48cm$$

Hence, inradius

$$= \frac{(XY + YZ - XZ)}{2} = \frac{(20 + 48 - 52)}{2}$$

$$= 8cm$$

Hence, option b is correct.

Q3 Text Solution:

As we know circumradius of a triangle $= \frac{ABC}{4\Delta}$

Area of the triangle $= \sqrt{(36 \times 4 \times 12 \times 20)}$

$$6 \times 4 \times 2\sqrt{15} = 48\sqrt{15}$$

$$\text{Circumradius } = \frac{24 \times 32 \times 16}{4 \times 48\sqrt{15}} = \frac{64}{\sqrt{15}}$$

$$\text{Inradius}$$

$$= \frac{\text{Area of the triangle}}{\text{Semi perimeter of the triangle}}$$

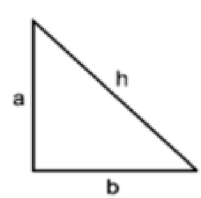
$$= \frac{48\sqrt{15}}{36}$$

$$= \frac{4\sqrt{15}}{3}$$

$$\text{Required ratio } = \frac{64}{\sqrt{15}} : \frac{4\sqrt{15}}{3} = 16 : 5$$

Hence, option c is correct.

Q4 Text Solution:



$$\frac{a+b-h}{2}=4(\text{ Inradius })$$
$$\frac{h}{2}=8$$
$$h=16$$
$$a+b=24$$
$$a^2+b^2+2ab=24^2$$
$$a^2+b^2=h^2=16^2$$
$$\text{Eq. (i) } - eq\text{ (ii)}$$
$$2ab=24^2-16^2$$
$$\frac{1}{2}ab=80\text{ sq.cm}$$

Hence, option c is correct.

Q5 Text Solution:

Let the length of sides are $3ycm, 2ycm$ and $4ycm$ respectively.

Semi-perimeter of triangle (S)

$$=\frac{(3y+2y+4y)}{2}=\left(\frac{9y}{2}\right)cm$$

Area of triangle

$$=\sqrt{\left(\frac{9y}{2}\right)\left(\left(\frac{9y}{2}\right)-3y\right)\left(\left(\frac{9y}{2}\right)-2y\right)\left(\left(\frac{9y}{2}-4y\right)\right)}$$

$$=\sqrt{\frac{9y}{2}\times\frac{3y}{2}\times\frac{5y}{2}\times\frac{y}{2}}$$
$$=\frac{y^2}{4}\times 3\sqrt{15}\text{ sq.cm}$$

We know that,

Area $= r\times S$ [r is inradius]

$$\frac{y^2}{4}\times 3\sqrt{15}=3\sqrt{15}\times\left(\frac{9y}{2}\right)$$
$$y=18$$

Therefore,

Semi- perimeter of triangle $=9\times\frac{18}{2}=81cm$

Hence, option a is correct.

Q6 Text Solution:

$$AB:BC:CA=9:40:41$$

Let $AB=9Xcm, BC=40Xcm$, and $CA=41Xcm$ We know that triangle ABC is a right-angled triangle since $CA^2=AB^2+BC^2$

$$(41X)^2=(9X)^2+(40X)^2$$

Length of altitude $=\frac{720}{41}$

$$\frac{(AB\times BC)}{AC}=\frac{720}{41}$$
$$\frac{(9X\times 40X)}{41X}=\frac{720}{41}$$
$$360X=720$$
$$X=2$$

So, $AB=18cm, BC=80cm$, and $CA=82cm$

In a right-angle triangle, the distance between orthocenter and circumcenter is equal to the circumradius.

$$\text{Circumradius }=\frac{\text{hypotenuse}}{2}=\frac{82}{2}$$
$$=41cm$$

Hence, option b is correct.

Q7 Text Solution:

Given sides form a right triangle as,

$$113^2 = 112^2 + 15^2$$

Area of triangle $= \frac{1}{2} \times$ base $\times$ height

$= \frac{1}{2} \times 112 \times 15$

$$= 15 \times 56 = 840$$

We know that,

Area of triangle $= \frac{\text{products of sides}}{4R}$ [where R is the circumradius]

$$840 = \frac{(15 \times 112 \times 113)}{4 \times R}$$
$$R = \frac{113}{2}$$
$$R = 56.5cm$$

Hence, option c is correct.

Q8 Text Solution:

Given, area of triangle $= A = 60cm^2$

Semi-perimeter $= s = \frac{40}{2} = 20cm$

$\because$ Length of inradius $= \frac{\text{Area of triangle}}{\text{Semi} - \text{perimeter}}$

$\Rightarrow$ Length of inradius $= \frac{60}{20} = 3cm$

$\Rightarrow$ Length of circumradius $= 11.5 - 3 = 8.5cm$

Now,

The length of circumradius

$$= \frac{\text{Product of sides}}{(4 \times \text{ Area of triangle })}$$

$\Rightarrow$ Product of sides of triangle $= 4\times$ Length of circumradius $\times$ Area of triangle

$\therefore$ Product of sides of triangle $= 4 \times 8.5 \times 60$

$= 2040cm^3$.

Hence, option a is correct.

Q9 Text Solution:

We know that in $\triangle ABC$

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C} = 2R$$

In $\triangle ABC$,

$$\angle B = 180 - (45 + 105)$$
$$\angle B = 180 - 150$$
$$\angle B = 30^\circ$$

Now,

$$\frac{a}{\sin A} = 2R$$
So, $a = 2R \sin A$

Similarly,

$$\frac{b}{\sin B} = 2R$$

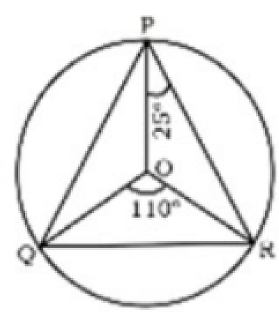
$b = 2R \sin B$

Required ratio $\frac{(2R \sin A)}{(2R \sin B)} = \frac{\sin A}{\sin B} = \frac{\sin 45^\circ}{\sin 30^\circ}$

$$= \frac{\left(\frac{1}{\sqrt{2}}\right)}{\left(\frac{1}{2}\right)} = \frac{2}{\sqrt{2}} = \frac{\sqrt{2}}{1}$$

Hence, option b is correct.

Q10 Text Solution:



Given, $\angle QOR = 110^\circ$

$$\angle OPR = 25^\circ$$

' O ' is the circumcenter, then

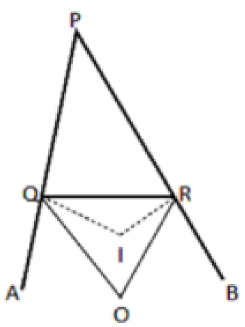
$$OP = OR = OQ$$
$$\angle OPR = \angle ORP = 25^\circ$$

In $\triangle OQR$

$$\angle OQR + \angle ORQ + \angle QOR = 180^\circ$$
$$2\angle ORQ = 180^\circ - 110^\circ (OQ = OR)$$
$$2\angle ORQ = 70^\circ$$
$$\angle ORQ = 35^\circ$$
$$\angle PRQ = \angle PRO + \angle ORQ = 60^\circ$$

Hence, option b is correct.

Q11 Text Solution:



Since, O is the excentre of $\triangle PQR$,

$$\angle QOR = 90^\circ - \angle \frac{P}{2} = 90^\circ - 26^\circ = 64^\circ$$

I is the incenter of $\triangle QOR$, then

$$\angle QIR = 90^\circ + \frac{\angle QOR}{2} = 90^\circ + 32^\circ$$
$$= 122^\circ$$

Hence, option c is correct.

Q12 Text Solution:

$$\angle QIR = 90^\circ + \left(\frac{\angle QPR}{2}\right)$$
$$\angle QPR = 2 \times (122^\circ - 90^\circ) = 64^\circ$$

Let $\angle PQR = x^\circ$ and $\angle PRQ = (x + 24^\circ)$

Now,

$$64^\circ + x^\circ + (x + 24)^\circ = 180^\circ$$
$$x^\circ = 46^\circ$$
$$\angle QRI = \frac{\angle PRQ}{2} = \frac{(x + 24^\circ)}{2} = 35^\circ$$

Hence, option b is correct.

Q13 Text Solution:

I is the incenter and $\angle BIC = 125^\circ$

So, $\angle BIC = 90 + \frac{\angle BAC}{2}$

$$125 = 90 + \frac{\angle BAC}{2}$$
$$\angle BAC = 2 \times 35 = 70^\circ$$

Let the measure of $\angle ACB = Y^\circ$. So, the measure of $\angle ABC = 1.2Y^\circ$.

So,

$$1.2Y + Y + 70 = 180$$
$$2.2Y = 110$$
$$Y = 50^\circ$$

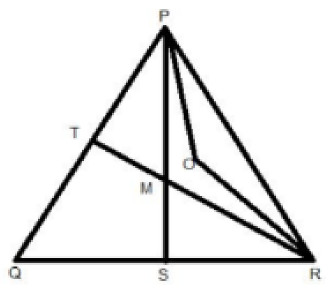
So, $\angle ABC = 60^\circ$ and $\angle ACB = 50^\circ$.

The measure of

$$\frac{(\angle BAC - \angle BCA + \angle ABC)}{2} = \frac{1}{2}$$
$$\times (70 - 50 + 60) = 40^\circ$$

Hence, option a is correct.

Q14 Text Solution:



Given $\angle POR = 145^\circ$

O is the incenter of $\triangle PMR$.

$So, \angle POR = 90 + \frac{\angle PMR}{2}$

$$145 = 90 + \frac{\angle PMR}{2}$$
$$\angle PMR = 110^\circ$$
$$\angle PMR = \angle TMS = 110^\circ \text{ (V.O.A)}$$

In quadrilateral QSMT,

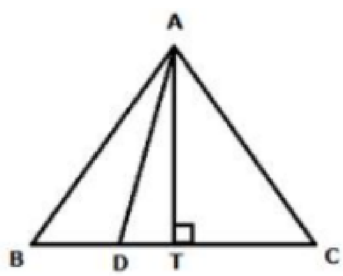
$$\angle TQS + 90 + 110 + 90 = 360$$
$$\angle TQS + 110 = 180$$
$$\angle TQS = 180 - 110 = 70^\circ.$$

Hence, option b is correct.

Q15 Text Solution:

Here, $\angle B$ is less than $\angle C$. and, $\angle ADT = 68^\circ$ and $\angle B = 19^\circ$.

According to the question:



$$\text{Here, } \angle ATD = \angle ATB = 90^\circ$$
$$\angle ADT + \angle ATD + \angle DAT = 180^\circ$$
$$68^\circ + 90^\circ + \angle DAT = 180^\circ$$
$$\angle DAT = 22^\circ$$
$$Now, \angle B + \angle BAT + \angle ATB = 180^\circ$$
$$19^\circ + \angle BAT + 90^\circ = 180^\circ$$
$$\angle BAT = 71^\circ$$

Then,

$\angle BAD = \angle DAC = \angle BAT - \angle DAT = 71^\circ - 22^\circ = 49^\circ$

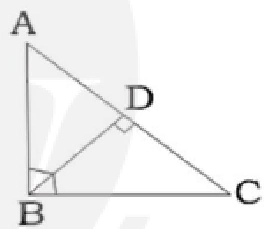
So, $\angle BAC = 2\angle BAD = 2 \times 49^\circ = 98^\circ$

Now, $\angle BAC + \angle B + \angle C = 180^\circ$

$$98^\circ + 19^\circ + \angle C = 180^\circ$$
$$\angle C = 63^\circ$$

Hence, option b is correct.

Q16 Text Solution:



In right angle triangle

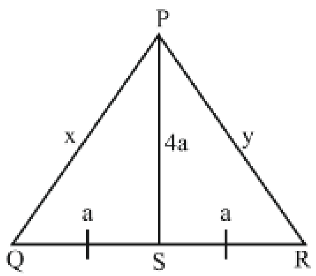
Circumradius $= \frac{1}{2} \times$ hypotenuse

$$AC = H = 2 \times 12.5 = 25.$$
$$BD = 7$$

Area of triangle $= \frac{1}{2} \times BD \times AC = 87.5cm^2$

Hence, option b is correct

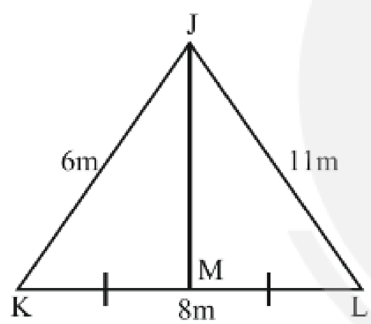
Q17 Text Solution:



Let $QS = a$ units
then $SR = a$ units
and $PS = 2 \times (a + a) = 4a$
By using Apollonius theorem,

$$PQ^2 + PR^2 = 2 \times \left(PS^2 + QS^2\right)^2$$
$$x^2 + y^2 = 2 \times \left((4a)^2 + (a)^2\right)$$
$$\Rightarrow x^2 + y^2 \Rightarrow 34a^2$$
$$\text{if } 2a = 3 \text{ then } a = \frac{3}{2}$$
$$x^2 + y^2 = 34 \times \frac{3}{2} \times \frac{3}{2} = \frac{153}{2} = 76.5 \text{ units}$$

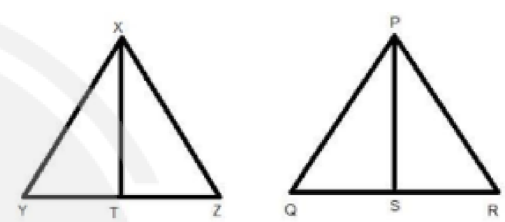
Q18 Text Solution:



One can solve this question by using Apollonius theorem,

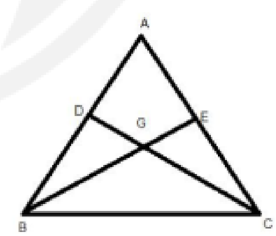
$$JK^2 + JL^2 = 2 \times \left(JM^2 + \left(\frac{KL}{2}\right)^2\right)$$
$$JK^2 + JL^2 = 2 \times \left(JM^2 + 16\right)$$
$$6^2 + 11^2 = 2 \times \left(JM^2 + 16\right)$$
$$36 + 121 = 2 \times JM^2 + 32$$
$$36 + 121 - 32 = 2 \times JM^2$$
$$JM^2 = \frac{125}{2}$$
$$JM = \frac{5\sqrt{5}}{\sqrt{2}}$$
$$JM = \frac{5\sqrt{10}}{2}$$

Q19 Text Solution:



As both the triangles are similar, the ratio of corresponding medians will be equal to the ratio of the corresponding sides.
Therefore, the ratio of corresponding medians = $\frac{15}{24} = \frac{5}{8}$

Q20 Text Solution:



Let the medians BE and CD intersect each other at centroid G.
We know that centroid divides medians in ratio $2:1$.
Therefore, $CG = 27 \times \frac{2}{3} = 18cm$
And $BG = 33 \times \frac{2}{3} = 22cm$
Given $BC = 20cm$
Semi-perimeter of $\triangle BGC$

$$= \frac{(22 + 18 + 20)}{2} = 30cm$$

Area of $\triangle BGC$

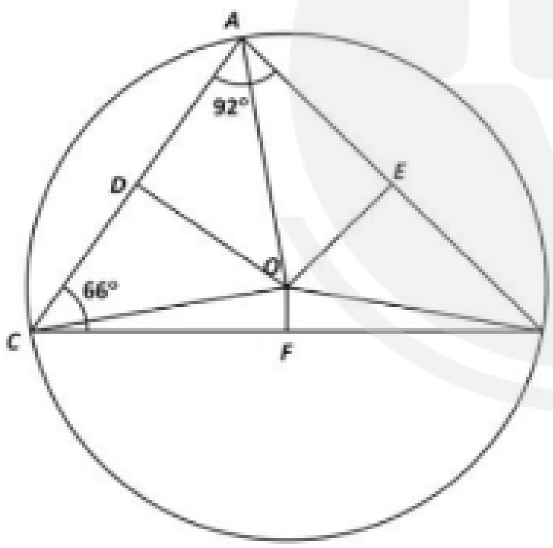
$$= \sqrt{30 \times 8 \times 12 \times 10}$$
$$= \sqrt{10 \times 3 \times 4 \times 2 \times 4 \times 3 \times 10}$$
$$= 120\sqrt{2} \text{ sq.cm}$$

Area of $\triangle ABC = 3\times$ area of $\triangle BGC = 3 \times 120\sqrt{2} = 360\sqrt{2}$ sq. cm

Hence, option d is correct.

Q21 Text Solution:

The three perpendicular bisectors of the sides of a triangle meet in a single point, called the circumcenter and angle subtended at the centre by an are is twice to that at the circumference.



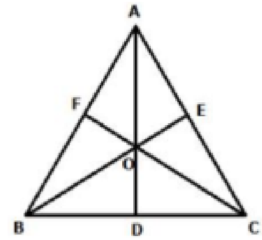
So, $\angle COB = 2 \times \angle CAB = 2 \times 92 = 184^\circ$

And, $\angle AOB = 2 \times \angle ACB = 2 \times 66 = 132^\circ$

Hence, value of $(\angle COB - \angle AOB) = 184 - 132 = 52^\circ$

Hence, option c is correct.

Q22 Text Solution:



Here, perimeter of triangle ABC = 72 = AB + BC + AC

And, $AB = BC = AC = \frac{72}{3} = 24cm$ (sides of equilateral triangle)

Now, $BD = \frac{BC}{2} = \frac{24}{2} = 12cm$

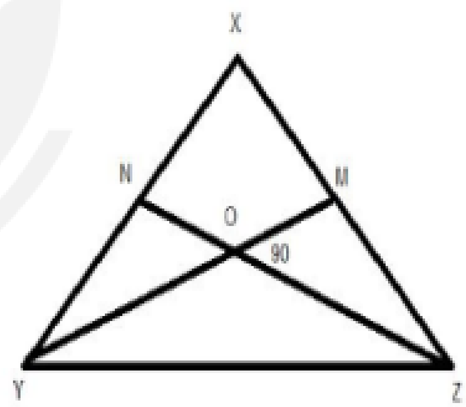
Using Pythagoras theorem, we get

$$AB^2 = AD^2 + BD^2$$
$$24^2 = AD^2 + 12^2$$
$$AD = 12\sqrt{3}cm$$

Therefore, $OD = \left(\frac{1}{3}\right) \times 12\sqrt{3} = 4\sqrt{3}cm$

Hence, option c is correct.

Q23 Text Solution:



We know that,

Area of $\triangle XYZ = 6\times$ Area of $\triangle OMZ$......(1)

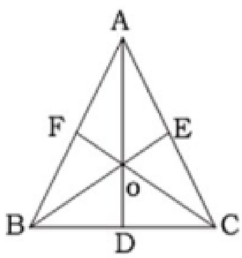
Now Given $YM = 18$ and $OY : OM = 2 : 1$

So OM

$$= 18 \times \frac{1}{3} = 6cm$$

$ZN = 10$ and $ZO : ON = 2 : 1$ So
$= 10 \times \frac{2}{3} = \frac{20}{3}$
As ZO is perpendicular to OM,
Area of
$\triangle OMZ = \frac{1}{2} \times OM \times OZ = \frac{1}{2} \times 6 \times \left(\frac{20}{3}\right)$
$= 20$ sq. cm
Hence, from eq (1) area of $\triangle XYZ = 6 \times 20$
$= 120$ sq. cm
Hence, option a is correct.

Q24 Text Solution:



Let Area of $\triangle ABC = 12$ units
We know that median divide a triangle into two triangles of equal area
So, area $\triangle ABD = \frac{1}{2} \times$ Area of $\triangle ABC$

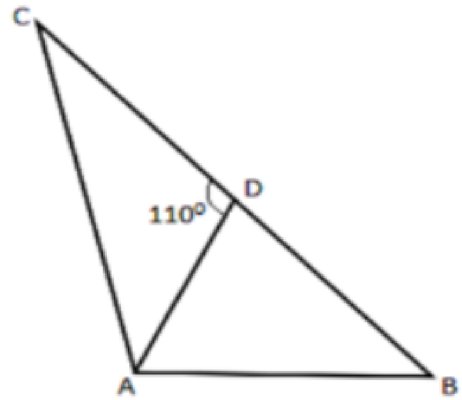
$$= \frac{1}{2} \times 12 = 6 \text{ units}$$

Also, area $\triangle BOC =$ area $\triangle AOC =$ area $\triangle BOA$

$$= \frac{1}{3} \times 12 = 4 \text{ units}$$

And area $\triangle AOE = \frac{1}{2}$ area $\triangle AOC = \frac{1}{2} \times 4 = 2$ units
So, $\frac{\text{area } \triangle ABD}{\text{arca } \triangle AOE} = \frac{6}{2} = 3 : 1$
Hence, option b is correct.

Q25 Text Solution:



$$\angle ADB = 180^\circ - \angle ADC = 70^\circ$$
$$2AD = BC = 2BD = 2CD$$
$$AD = BD = CD$$

In $\triangle ABD$:

$$\angle DAB = \angle ABD$$
$$\angle DAB + \angle ABD + \angle ADB = 180^\circ$$
$$\angle DAB = \frac{(180^\circ - 70^\circ)}{2} = 55^\circ$$

In $\triangle ACD$:

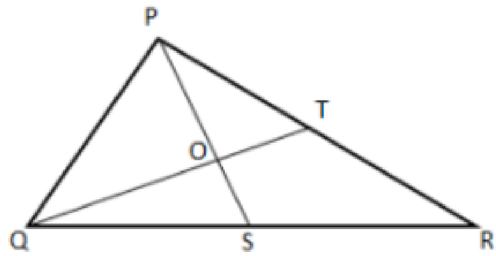
$$\angle DAC = \angle ACD$$
$$\angle DAC + \angle ACD + \angle ADC = 180^\circ$$
$$\angle DAC = \frac{(180^\circ - 110^\circ)}{2} = 35^\circ$$

Now,

$$\angle BAC = \angle DAB + \angle DAC = 55^\circ + 35^\circ$$
$$= 90^\circ$$

Hence, option c is correct.

Q26 Text Solution:



Since PS and QT are perpendicular to each other and PS and QT are median.

$$\angle QOS = \angle SOT = \angle TOP = \angle POQ = 90^\circ$$
$$QO = \frac{2QT}{3} = 6cm; OT = \frac{QT}{3} = 3cm$$
$$PO = \frac{2PS}{3} = 4cm; OS = \frac{PS}{3} = 2cm$$

In △ QOS:

$$QS^2 = OS^2 + QO^2$$
$$QS^2 = 2^2 + 6^2 = 40$$
$$QS = 2\sqrt{10} = 6.4cm$$
$$QR = 2QS = 12.8cm$$

In $\triangle POT$:

$$PT^2 = OT^2 + PO^2$$
$$PT^2 = 3^2 + 4^2 = 25$$
$$PT = 5cm$$
$$PR = 2PT = 10cm.$$

Required difference $= 12.8 - 10 = 2.8cm$

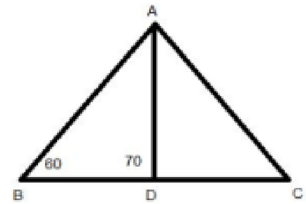
Hence, option a is correct.

Q27 Text Solution:

Given that $AB \times CD = AC \times BD$

$$\frac{AB}{AC} = \frac{BD}{CD}$$

Therefore, by angle bisector theorem AD is the bisector of $\angle BAC$.



In $\triangle BAD$,

$$\angle DAB = 180 - (60 + 70)$$
$$\angle DAB = 50^\circ$$

So, $\angle DAC = 50^\circ$

$$\angle ADC = 180 - \angle ADB = 180 - 70 = 110^\circ$$

In $\triangle ADC$,

$$\angle ACB = 180 - (\angle DAC + \angle ADC) = 180 - 110 - 50 = 20^\circ$$

Hence, option b is correct.

Q28 Text Solution:

Let $AB = 3xcm, BC = 7xcm,$ and $CA = 5xcm$

$\text{Semi} - \text{perimeter of triangle} = \frac{15x}{2}cm$

$\text{Area} = \sqrt{\left(\frac{15x}{2}\right) \times \left(\frac{9x}{2}\right) \times \left(\frac{5x}{2}\right) \times \frac{x}{2}}$

$= \frac{(135\sqrt{3})}{4}$

$\frac{15x^2}{4} \times \sqrt{3} = \frac{135\sqrt{3}}{4}$

$x^2 = 9$

& x=3

So, $AB = 9cm, BC = 21cm,$ and $CA = 15cm$

Let $BD = ycm$

By using angle bisector theorem,

$$\frac{AB}{AC}=\frac{BD}{CD}$$
$$\frac{9}{15}=\frac{y}{(21-y)}$$
$$\frac{3}{5}=\frac{y}{(21-y)}$$
$$63-3y=5y$$
$$8y=63$$
$$y=\frac{63}{8}$$

$y=8$ to the nearest whole number.

Hence, option c is correct.

Q29 Text Solution:

$$\angle BAC=X^{\circ}$$

And O, is the orthocenter. Therefore,

$$\angle BOC=180-\angle BAC=(180-X)^{\circ}$$

I is the incenter of $\triangle ABC$. Therefore,

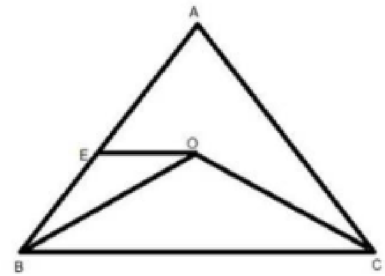
$$\angle BIC=90+\left(\frac{\angle BAC}{2}\right)=\left[90+\frac{x}{2}^{\circ}\right]$$

ATQ,

$$\angle BOC-\angle BIC=15^{\circ}$$
$$180-X-90-\left(\frac{x}{2}\right)^{\circ}=15$$
$$90-\left(\frac{3X}{2}\right)=15$$
$$\frac{3X}{2}=75$$
$$\frac{X}{2}=25^{\circ}$$

Hence, option b is correct.

Q30 Text Solution:



Given $\angle ABC=60^{\circ}$ and $\angle ACB=70^{\circ}$

Therefore,

$\angle BAC=180-(60+70)=180-130=50^{\circ}$

Since O is the orthocenter of $\triangle ABC$,

Therefore

$\angle BOC=180-\angle BAC=180-50=130^{\circ}$

Now $\angle OBC=90^{\circ}-\angle ACB$ [Orthocenter is the common intersection of the three altitudes of a triangle]

$\angle OBC=90^{\circ}-70^{\circ}=20^{\circ}$

Given $EO \mid BC$,

$\angle EOB=\angle OBC=20^{\circ}$ (Alternate interior angles)

$\angle EOC=\angle EOB+\angle BOC=20+130=150^{\circ}$

Therefore, reflex $\angle EOC=360-150=210^{\circ}$

Hence, option b is correct.