SSC CGL Problems On Triangles

Instructions

For the following questions answer them individually

Question 1

In a △ ABC, D and E are two points on sides AB and AC such that DE is parallel to BC and AD : DB = 2 : 1. If AE = 8 cm, then find the length of AC.

A 12 cm

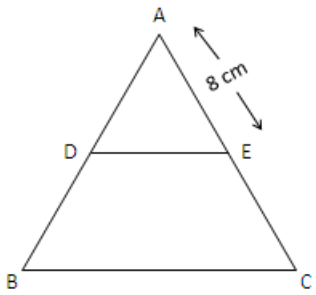
B 10 cm

C 16 cm

D 20 cm

Answer: A

Explanation:



$\frac{AD}{DB} = \frac{AE}{EC}$

Here, $\frac{AD}{DB} = \frac{2}{1}$ and AE = 8 cm

$\Rightarrow \frac{2}{1} = \frac{8}{EC}$

$\Rightarrow EC = 4cm$

Here, AC = AE+EC = 4+8 = 12 cm

Question 2

In a △ ABC, Points D and E are on sides AB and AC such that DE is parallel to BC and AD : DB = 3 : 1 and AE = 18 cm. Then find AC.

A 26 cm

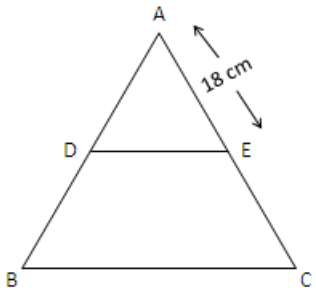
B 24 cm

C 28 cm

D 32 cm

Answer: B

Explanation:



Given, DE is parallel to BC.

$$\frac{AD}{DB} = \frac{AE}{EC}$$

Here, $\frac{AD}{DB} = \frac{3}{1}$

AE= 18 cm

$$\frac{3}{1} = \frac{18}{EC}$$

⇒ EC = 6 cm

AC = AE+EC = 6+18 = 24 cm

Question 3

In a △ ABC, points D and E are on the sides of AB and AC respectively such that DE is parallel to BC and AD : AB = 2 : 5 and AE = 4 cm. Then find AC.

A 10 cm

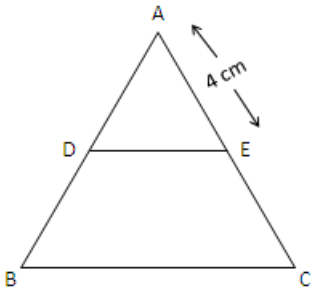
B 14 cm

C 12 cm

D 9 cm

Answer: B

Explanation:



Given, DE is parallel to BC.

$$\frac{AD}{DB} = \frac{AE}{EC}$$

Here, $\frac{AD}{DB} = \frac{2}{5}$

AE= 4 cm

$$\frac{2}{5} = \frac{4}{EC}$$

⇒ EC = 10 cm

AC = AE+EC = 4+10 = 14 cm

Question 4

The coordinates of the vertices of a right-angled triangle are A (6, 2), B(8, 0) and C (2, -2). The coordinates of the orthocentre of triangle PQR are

A (2, -2)

B (2, 1)

C (6, 2)

D (8, 0)

Answer: C

Explanation:
Given that the coordinates of a right-angled triangle are A (6, 2), B(8, 0) and C (2, -2).
We know that the distance between two points(a, b) &(c, d) is
D = $\sqrt{(a-c)^2+(b-d)^2}$
AB = $2\sqrt{2}$ units; BC = $2\sqrt{10}$; AC = $4\sqrt{2}$
Now, $AB^2 + AC^2 = BC^2$
Therefore, angle A is right angled.
Since it is a right angled triangle, the 2 sides adjacent to the right angle will be altitudes. The third altitude must meet at the vertex at which these 2 sides meet.
Hence, the vertex that contains the right angle is the orthocentre. From the points given, we can clearly see that (6, 2) is the orthocentre. Option C is the right answer,

Question 5

find the area of an equilateral triangle if the height of the triangle is 24 cm.

A $192\sqrt{3}cm^2$

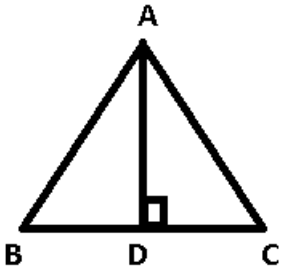
B $175\sqrt{3}cm^2$

C $178\sqrt{3}cm^2$

D $164\sqrt{3}cm^2$

Answer: A

Explanation:
Given,
AD = 24 cm and ABC is an equilateral triangle



In an equilateral triangle all the angles are equal to 60°

In △ADC

=> $tan\angle ACD = \frac{AD}{DC}$

=> $tan60^\circ = \frac{24}{DC}$

=> DC = $\frac{24}{\sqrt{3}} = 8\sqrt{3}$

=> BC = 2*DC = $16\sqrt{3}$

Area of $\triangle$ ABC = $\frac{\sqrt{3}}{4} * side^2$

= $\frac{\sqrt{3}}{4} * (16\sqrt{3})^2$

= $192\sqrt{3}cm^2$

Question 6

Three sides of a triangular meadow are of length 28 m, 45 m and 53 m long respectively. Find the cost of sowing seeds(in rupees per sq.m) in the meadow at the rate of 12 rupees per sq.m.

A 7560

B 6860

C 7960

D 7860

Answer: A

Explanation:

Given the sides of triangle are 28 m, 45 m and 53 m

Since, $28^2 + 45^2 = 784 + 2025 = 2809 = 53^2$

=> The given sides are of right angled triangle as,

$c^2 + b^2 = a^2$where a, b, c are the sides of the triangle.

=> Area of triangular field = $\frac{1}{2} \times 28 \times 45 = 630m^2$

=> Cost of sowing seeds = $12 \times 630 = Rs.7560 rupees/m^2$

Question 7

In a triangle PQR, internal angular bisectors of $\angle Q$ and $\angle R$ intersect at a point O. If $\angle P$=110° then what is the value of $\angle QOR$?

A 125°

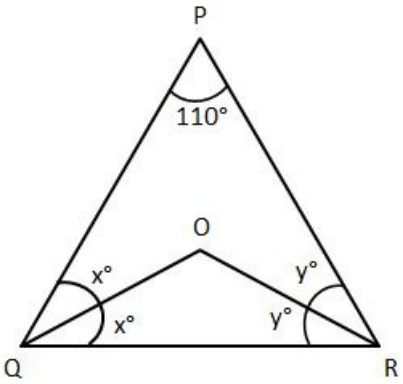
B 135°

C 145°

D 115°

Answer: C

Explanation:



Let $\angle Q$=2x and $\angle R$=2y
Sum of angles in a triangle=180
2x+2y+110=180
2x+2y=70
x+y=35
Similarly in the triangle QOR we have $\angle OQR + \angle QRO + \angle QOR$=180
x+y+$\angle QOR = 180°$
35+$\angle QOR = 180°$
$\angle QOR = 145°$

Question 8

In a triangle XYZ, XA is the angle bisector onto YZ. If the semiperimeter of the triangle is 12 and XY=12 ,YZ=6 then what is the ratio of YA:AZ ?

A 2:3

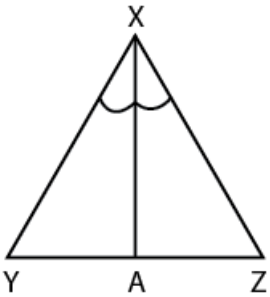
B 2:1

C 1:2

D 3:2

Answer: B

Explanation:



In triangle XYZ we have s=12
(x+y+z)/2 =12
x+y+z=24
12+6+y=24
y=6
Angle bisector divides the opposite side in the ratio of other sides i.e
XY/XZ=YA/AZ
YA/AZ=12/6
YA/AZ=2:1

Question 9

In a triangle ABC, AX is the angle bisector onto BC. If the semiperimeter of the triangle is 9 and AB=4 ,BC=6 then what is the ratio of BX:XC ?

A 2:3

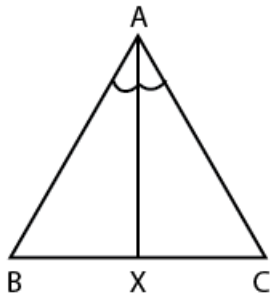
B 2:1

C 1:2

D 3:2

Answer: C

Explanation:



In triangle ABC we have s=9
(a+b+c)/2 =9
a+b+c=18
4+6+b=18
b=8
Angle bisector divides the opposite side in the ratio of other sides i.e
AB/AC=BX/XC
BX/XC=4/8
BX/XC=1:2

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Question 10

In an equilateral triangle,if h-R=15 cm where h=height of the triangle and R=circumradius then what is the area of the triangle ?

A $275\sqrt{3}$

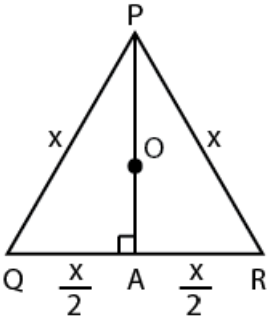
B $225\sqrt{3}$

C $500\sqrt{3}$

D $675\sqrt{3}$

Answer: D

Explanation:



In an equilateral triangle,all the points such as orthocentre,centroid,circumcenter coincide.
Let the triangle be PQR and the circumcentre be O. let median intersect QR at A

Centroid divides median in the ratio 2:1.PA=h,OA=R
OA=15 cm
Therefore (PO:OA)=2:1
PO:15=2:1
PO=30
PA=PO+OP
PA=30+15
PA=45
PA is also the altitude using it side of the triangle can be calculated.
$\sqrt{3} * s/2$=45

s=$30\sqrt{3}$
Area of an equilateral triangle=$\sqrt{3}(s^2)/4$
=$675\sqrt{3}$

Question 11

In an equilateral triangle,if h-R=5 cm where h=height of the triangle and R=circumradius then what is the area of the triangle ?

A $50\sqrt{3}$

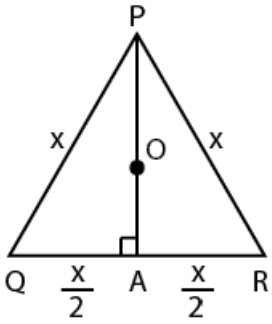
B $100\sqrt{3}$

C $75\sqrt{3}$

D $25\sqrt{3}$

Answer: C

Explanation:



In an equilateral triangle,all the points such as orthocentre,centroid,circumcenter coincide.
Let the triangle be PQR and the circumcentre be O. let median intersect QR at A
Centroid divides median in the ratio 2:1
OA=5 cm
Therefore (PO:OA)=2:1
PO:5=2:1
PO=10
PA=PO+OP
PA=10+5
PA=15
PA is also the altitude using it side of the triangle can be calculated.

$\sqrt{3} * s/2$=15

s=$10\sqrt{3}$

Area of an equilateral triangle=$\sqrt{3}(s^2)/4$

=$75\sqrt{3}$

Question 12

In an equilateral triangle PQR, PA is the altitude. O is the orthocentre and PO=12 the find the value of PA.

A 14

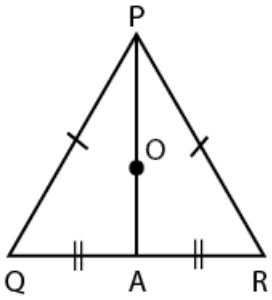
B 20

C 16

D 18

Answer: D

Explanation:



In an equilateral triangle,all the points such as orthocentre,centroid,circumcenter coincide.
So O is also the centroid.
Centroid divides median in the ratio 2:1
Therefore (PO:OA)=2:1
12:OA=2:1
OA=6
PA=PO+PA
PA=12+6
PA=18

Question 13

In an equilateral triangle XYZ, XA is the altitude. O is the orthocentre and XO=8 the find the value of XA.

A 12

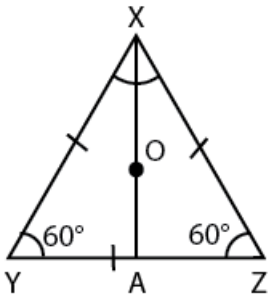
B 10

C 16

D 14

Answer: A

Explanation:



In an equilateral triangle,all the points such as orthocentre,centroid,circumcenter coincide.
So O is also the centroid.
Centroid divides median in the ratio 2:1
Therefore (XO:OA)=2:1
8:OA=2:1
OA=4
XA=XO+OA
XA=8+4
XA=12

Question 14

In a triangle XYZ, I is the incentre and $\angle XYZ = 40$ and $\angle YZX = 60$. What is the value of $\angle YIZ$=?

A 120

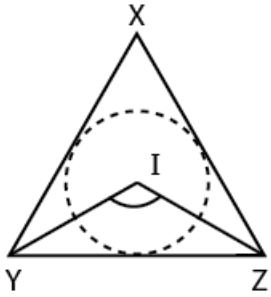
B 130

C 80

D 100

Answer: B

Explanation:



In a triangle XYZ,
$\angle X + \angle Y + \angle Z$=180
Given $\angle Y$=40 $\angle Z$=60
Therefore $\angle X$=180-(40+60)
=80
As I is the incentre we have $\angle YIZ$=90+($\angle X$/2)
=90+40
=130

Question 15

In a triangle PQR, I is the incentre and $\angle PQR = 70$ and $\angle PRQ = 40$. What is the value of $\angle QIR$=?

A 70

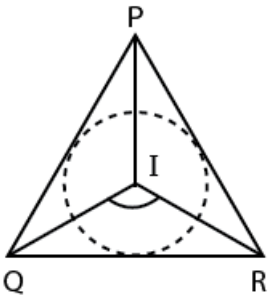
B 135

C 115

D 125

Answer: D

Explanation:



In a triangle PQR,
$\angle P + \angle Q + \angle R$=180
Given $\angle Q$=70 $\angle R$=40
Therefore $\angle P$=180-(40+70)
=70
As I is the incentre we have $\angle QIR$=90+($\angle P$/2)
=90+35
=125

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Question 16

Find the value of ∠CAB if Internal bisectors of ∠A and ∠B of ΔABC intersect at O and ∠COB = 124°.

A 36°

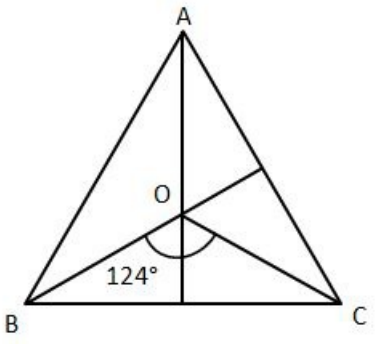
B 16°

C 96°

D 68°

Answer: D

Explanation:



Given that, ∠COB = 124°

To find : ∠RPQ = θ = ?

Solution : Let ∠CAB = $2x$ and ∠ACB = $2y$

=> ∠OBC = x and ∠OCB = y [SInce, BO & CO are angle bisectors]

In △ABC

=> θ + ∠ABC + ∠ACB = 180°

=> θ = 180° -2$(x + y)$ ---------Eq. (1)

In △BOC

=> $x + y + 124^\circ = 180^\circ$

=> $x + y = 56^\circ$

Putting value of (x+y) in eq. (1)

=> $\theta = 180 - 2 * 56 = 180 - 112 = 68^\circ$

Question 17

Find the maximum possible area$(in\ cm^2)$ of a triangle which can be formed using a thread of length 36 cm.?

A 45

B $39\sqrt{3}$

C $36\sqrt{3}$

D 36

Answer: C

Explanation:
The perimeter of the triangle is given as 36 cm.

The triangle of a fixed perimeter will have the maximum possible area when all the sides are of equal length.

So each side should be of length 12 cm for the triangle to have maximum possible area(i.e. Equilateral triangle).

In this case the area will be,

$\frac{\sqrt{3}}{4} \times a^2$

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

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

Question 18

If the angles of a triangle PQR are in the ratio 2:3:7, which among the following is a measure of an angle of the triangle PQR?

A 48°

B 55°

C 15°

D 105°

Answer: D

Explanation:
Given, the angles of a triangle PQR are in the ratio 2:3:7

Let the angles of the triangle be 2x,3x and 7x.

Sum of the angles in a triangle = 180°

2x+3x+7x = 180°

12x = 180

x = 15°

The angles are 30°, 45°, 105°

Hence, option D is the correct answer.

Question 19

A tangent of length 45 cm is drawn from a point to a circle of diameter 56 cm. Find the length(in cm) of the tangent from the center of the circle?

A 47

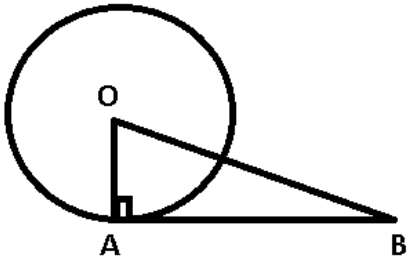
B 69

C 53

D 73

Answer: C

Explanation:



Given diameter = 56cm

radius OA = 56/2 = 28 and AB = 45cm

Now, in $\triangle$OAB right angle at A

OB = $\sqrt{(AB)^2 + (OA)^2}$

= $\sqrt{784 + 2025} = \sqrt{2809}$

= 53 cm

Question 20

$\angle P, \angle Q, \angle R$ are three angles of a triangle. If $\angle P - \angle Q = 16^\circ$, $\angle Q - \angle R = 28^\circ$, then $\angle P$, $\angle Q$ and $\angle R$ are

A $76^\circ, 60^\circ, 44^\circ$

B $80^\circ, 60^\circ, 40^\circ$

C $80^\circ, 64^\circ, 36^\circ$

D $76^\circ, 68^\circ, 38^\circ$

Answer: C

Explanation:

Given $\angle P - \angle Q = 16^\circ \rightarrow (1)$

$\angle Q - \angle R = 28^\circ \rightarrow (2)$

From equation (1), $\angle Q = \angle P - 16^\circ$

Substituting $\angle B$ value in equation (2)

$(\angle P - 16) - \angle R = 28^\circ$

$\Rightarrow \angle R = \angle P - 44^\circ$

We know that $\angle P + \angle Q + \angle R = 180^\circ$

Substituting $\angle P, \angle Q, \angle R$ values in above equation

$\angle P + (\angle P - 16^\circ) + (\angle P - 44^\circ) = 180^\circ$
$\Rightarrow 3\angle P = 240^\circ$
$\angle P = 80^\circ$
Substituting $\angle P$ value in equation (1)
$80^\circ - \angle Q = 16^\circ$
$\Rightarrow \angle Q = 64^\circ$
Substituting $\angle Q$ in equation (2)
$64^\circ - \angle R = 28^\circ$
$\Rightarrow \angle R = 36^\circ$
$\therefore \angle P = 80^\circ, \angle Q = 64^\circ, \angle R = 36^\circ$