Question 1.

The 25th term of an arithmatic sequence is 140 and the 27th term is 166 . What is the common difference? What is the 35th term?

Answer:-

Given 25th term = 140 and 27th term is 166.

But $x_{27}-x_{25}=2d$ ie., 2d = 166 – 140 = 26

$$d = \frac{26}{2} = 13.$$

35th term = $x_{25}+10d$

= $140+(10\times 13)=140+130=270$.

OR

Given 25th term = 140 and 27th term is 166.

a + 24d = 140 and a + 26d = 166.

Solve this equations for a and d

Then we get d = 13 and a = - 172

$\therefore$ 35th term = a + 34d

= - 172 + 34 $\times$ 13

= - 172 + 442

= 270.

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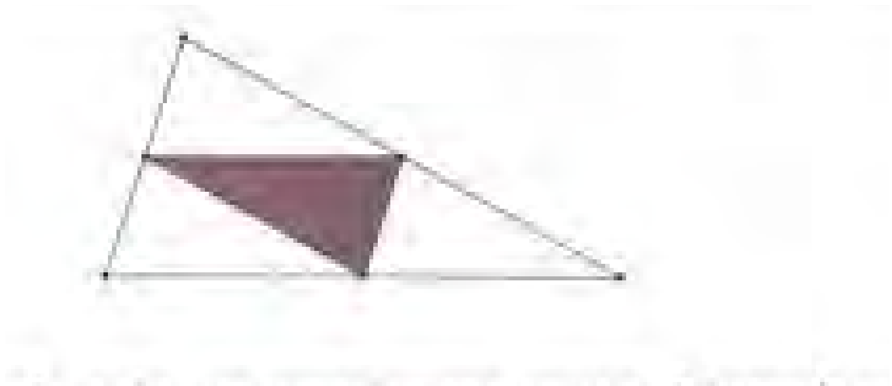
Question 2.



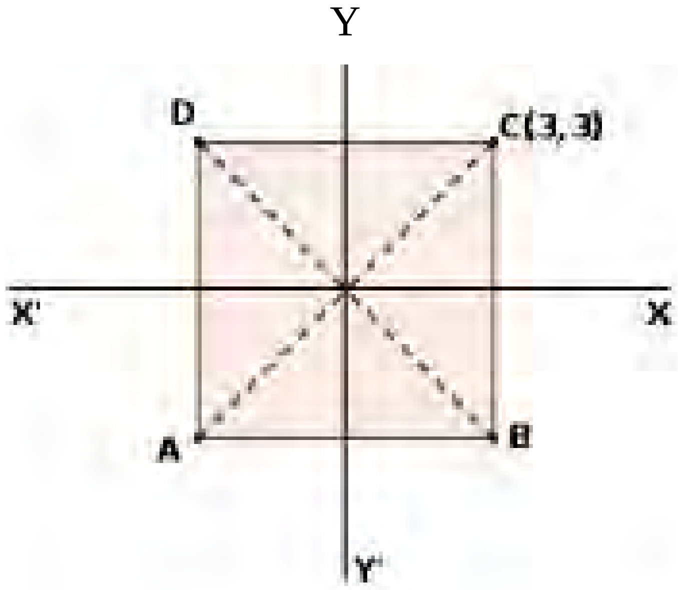
In th figure , the shaded triangle is drawn by joining by the mid point of the sides of large triangle calculate the probability of a dot on the larger triangle to be within the shaded triangle.

Answer:-

In the figure, successively joind the mid points of the lager triangle sides being made four equal triangles and its area also be equal. In the figure, shaded area of the triangle be the one fourth area of the larger triangle .

Hence the probability of the dot in the shaded triangle be $\frac{1}{4}$.

Question 3



In the figure , the sides of the square are parallel to the axes and the origin is the mid point. Coordinates of one vertex of the square is (3, 3) . Write the coordinates of two other vertices

Answer:-

From the figure , coordinates of B = (3, - 3)
coordinates of A = (- 3, - 3) and
coordinates of D = (- 3, 3) .

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Question 4.

The age of 10 members of a club are 20, 25, 22, 32, 42, 27, 35, 27, 35 and 30. Find the median age.

Answer:-

Given ages = 20, 25, 22, 32, 42, 27, 35, 27, 35 and 30..

Arrange data in assenting order = 20, 22, 25, 27, 27, 30, 32, 35, 35 and 42.

$$Median=\frac{27+30}{2}=28.5$$

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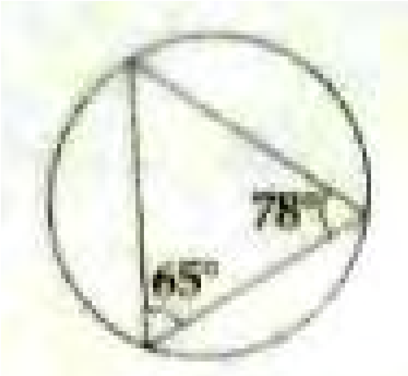
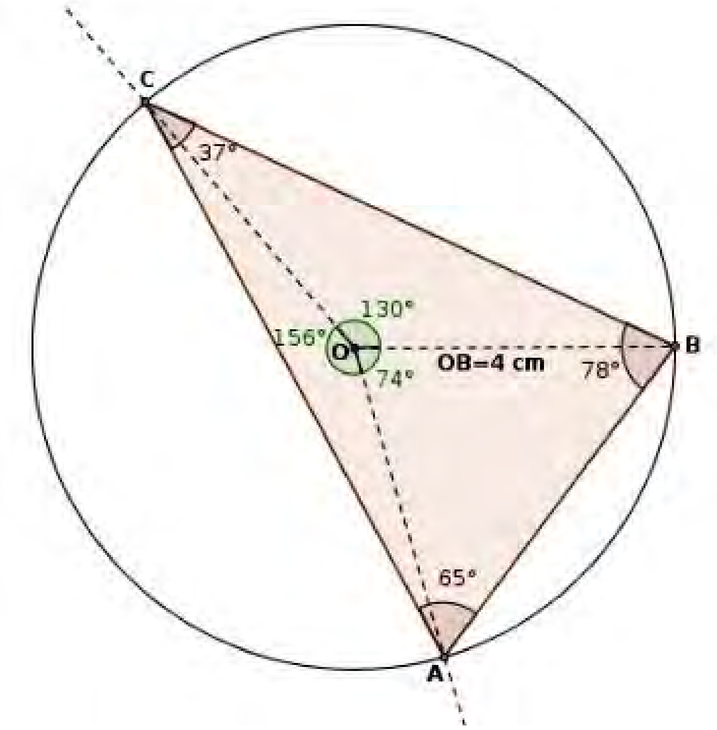
Question 5.



Draw a circle with radius 4 cm. Draw a triangle with two of its angles 65^0 and 78^0 and all vertices on the circle.

Answer:-



Construction :-

Draw a circle radius OB = 4cm. Make an angle $\angle BOC = 130^0$ ($2\angle B = 2 \times 65 = 130$) and $\angle AOC = 156^0$ and marks B and A respectively. Joint AB, BC, CA is the required construction.

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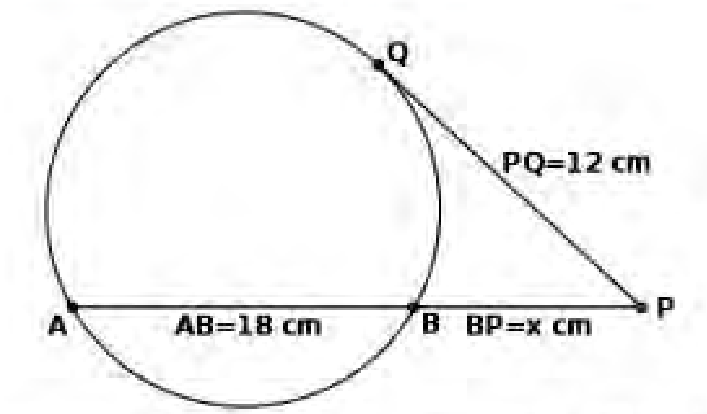
Question 6.



Answer:-

Consider BP = x cm

$\therefore$ AP = AB + BP

$\Rightarrow 18 + x$

AP $\times$ BP $= PQ^2$

$\Rightarrow (18 + x)\, x = 12^2$.

$\Rightarrow 18x + x^2 = 144$

$\Rightarrow x^2 + 18x - 144 = 0$

$\Rightarrow (x - 6)(x + 24) = 0$

ie., x = 6 or x = - 24 ; - 24 is rejected because – 24 is not become the measurement of a line.

Hence x = 6

BP = 6cm.

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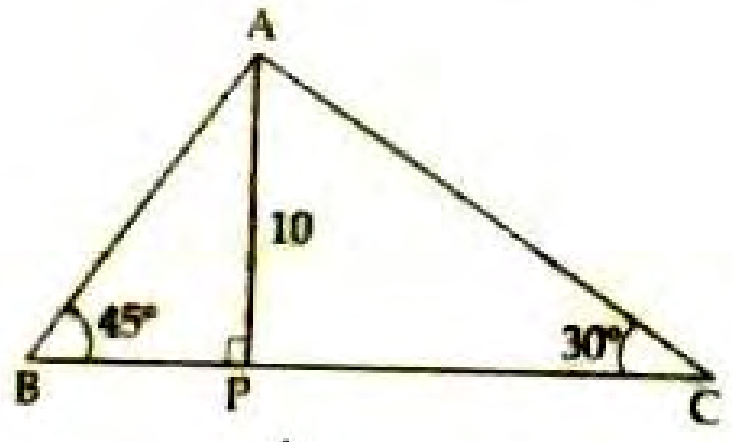
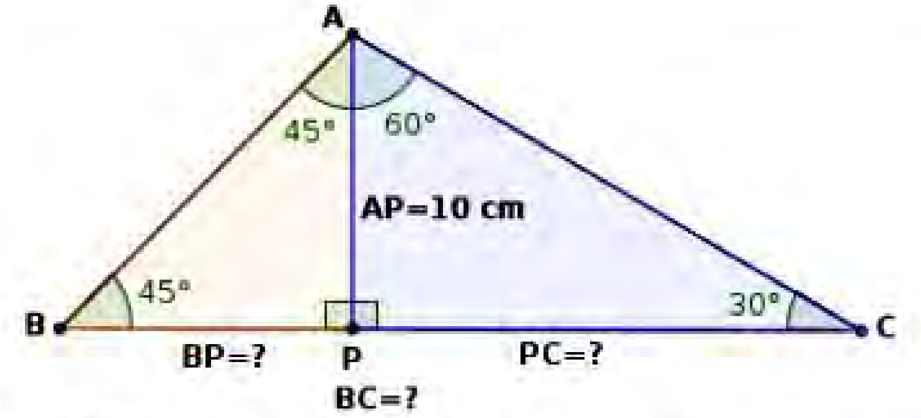
Question 7.



In triangle ABC , the length of AP is 10cm. What is the length of BP ? What is the length of PC? Calculate the length of BC?

Answer:-



In the given figure we can understand that triangle APB be an lossless triangle. So the base angle $\angle B = \angle A = 45^0$ each.

$\therefore$ AP = BP = 10cm (Given AP = 10cm)

ie., BP = 10cm

In the figure right angled triangle APL , $\angle C = 30^0$.

ie., $\tan 30^0 = \dfrac{AP}{PC}$

$\Rightarrow \dfrac{1}{\sqrt{3}} = \dfrac{10}{PC} \quad (\tan 30^0 = \dfrac{1}{\sqrt{3}} \quad)$

Hence PC = $10\sqrt{3}$

From the figure, BC = BP + PC

$= 10 + 10\sqrt{3}$ cm.

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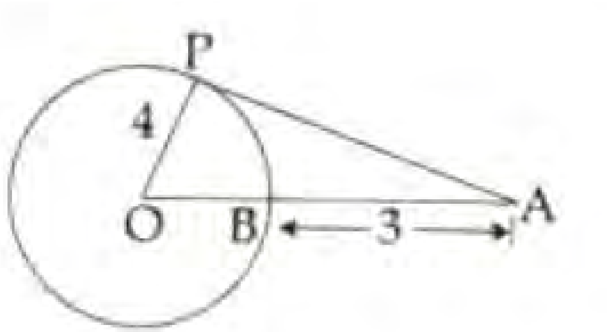
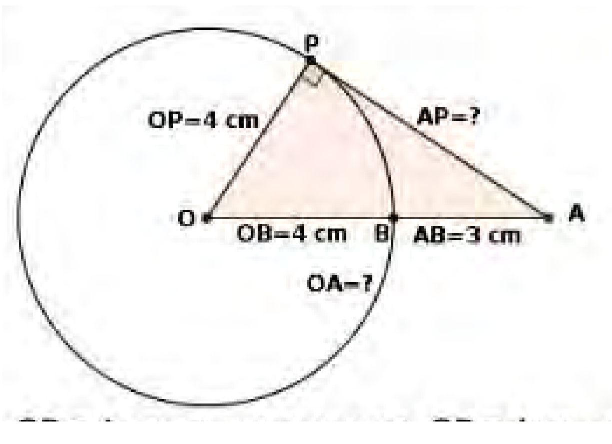
Question 8.



AP is the tangent to the circle with center at O and radius 4cm. AB = 3cm. Find the length of OA and the length of the tangent AP.

Answer:-



From the figure OP = 4cm (given radius)

ie., OP = OB = 4cm
OA = OB + AB
= 4 + 3 = 7cm (see the figure)
Δ APO be right angled triangle, right angle at P (tangent theorem)
By Pythagoras,
$AP^2 - OA^2 = 7^2 - 4^2$
$= 49 - 16 = 33$
$\therefore$ AP = $\sqrt{33}$ cm.
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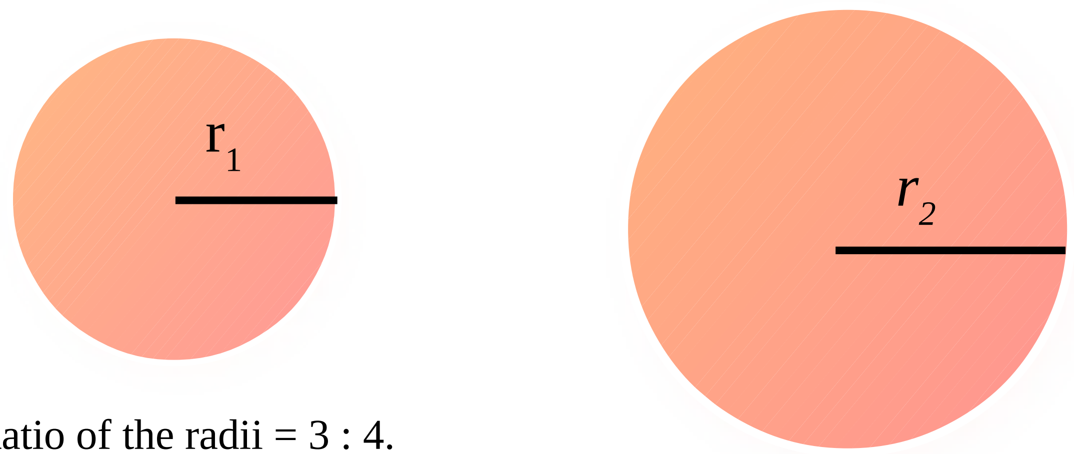
Question.9.

The radius of two spherical tanks are in the ratio 3 : 4. The volume of the first tank is 540 litres. Find the volume of the second tank.

Answer:-



Ratio of the radii = 3 : 4.
ie., $r_1 : r_2$ = 3x : 4x.
Volume of the first tank (v_1) = 540.
Let the volume of the Second tank be v_2

Volume of the first tank $(v_1) = \frac{4}{3}\pi r^3 = \frac{4}{3}\pi \times 3x \times 3x \times 3x$

Volume of the Second tank be $v_2 = \frac{4}{3}\pi \times 4x \times 4x \times 4x$.

$$\frac{V_1}{V_2} = \frac{\frac{4}{3}\pi \times 3x \times 3x \times 3x}{\frac{4}{3}\pi \times 4x \times 4x \times 4x} = \frac{27x^3}{64x^3}$$

$\Rightarrow \frac{V_1}{V_2} = \frac{27}{64} \quad \Rightarrow \frac{540}{V_2} = \frac{27}{64}$

$\therefore V_2 = \frac{540 \times 64}{27} = 1280$ Liters.

$\therefore$ The volume of the second tank be 1280 Liters.

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Question10.

Write $P(x) = x^2 - 9x + 20$ as a product of two first degree polynomials. Write also the solutions of the equation $P(x) = 0$.

Answer:-

Given P(x) = $x^2 - 9x + 20$

Product of two first degree polynomial **= (x – 5)(x – 4)**

Solution of the polynomial , Given P(x) = 0

ie., (x – 5)(x – 4) = 0 (Using zero factor theorem)

Either x – 5 = 0 or x – 4 = 0.

ie., x = 5 or x = 4.

Hence the solution be 5 or 4.

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Question 11.

Find the slope of line joining (2, 4) and (4, 7). Write the coordinate of another point on the line. Check whether (5, 8) is on this line.

Answer:-

Given points = (2, 4) and (4, 7)

Slop = $\frac{y_2 - y_1}{x_2 - x_1} = \frac{7-4}{4-2} = \frac{3}{2}$

Another point on the line may be consider , the mid point of the line

So, the mid point of the line = $\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$

$= \left(\frac{4+2}{2}, \frac{7+4}{2}\right) = \left(\frac{6}{2}, \frac{11}{2}\right) = \left(3, \frac{11}{2}\right)$

Consider the point (2, 4) and (5, 8) and find the slop .

Slop = $\frac{y_2 - y_1}{x_2 - x_1} = \frac{8-4}{5-4} = \frac{4}{1} = 4$.

Hear the slops are not equal .Hence the point is not on the line

($\frac{3}{2} \neq 4$)

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Question12.

Sum of the first five terms of an arithemetic sequence is 45. What is the third term ?

The common difference of the sequence is 4. Write the first two terms. Write another arithemetic sequence having the sum of the first five term 45.

Answer:-

Given the sum of the first five term of an AP = 45.

Common difference = 4

Third term

Sum = middle term $\times$ number of terms

ie., $x_3 \times 5 = 45$

$\therefore \quad x_2 = \frac{45}{5} = 9$

Second term = third term – common difference

= 9 – 4 = 5

First term = Second term – common difference.

= 5 – 4 = 1.

The first two terms = 1 and 5.

If the sum of the first five term of an AP is 45, then the third term should be 9 but the common difference may be changed . In this condition we can make many AP's.

Hence The AP = 5, 7, 9, 11, 13, …..

or = 3, 6, 9, 12, 15, …….

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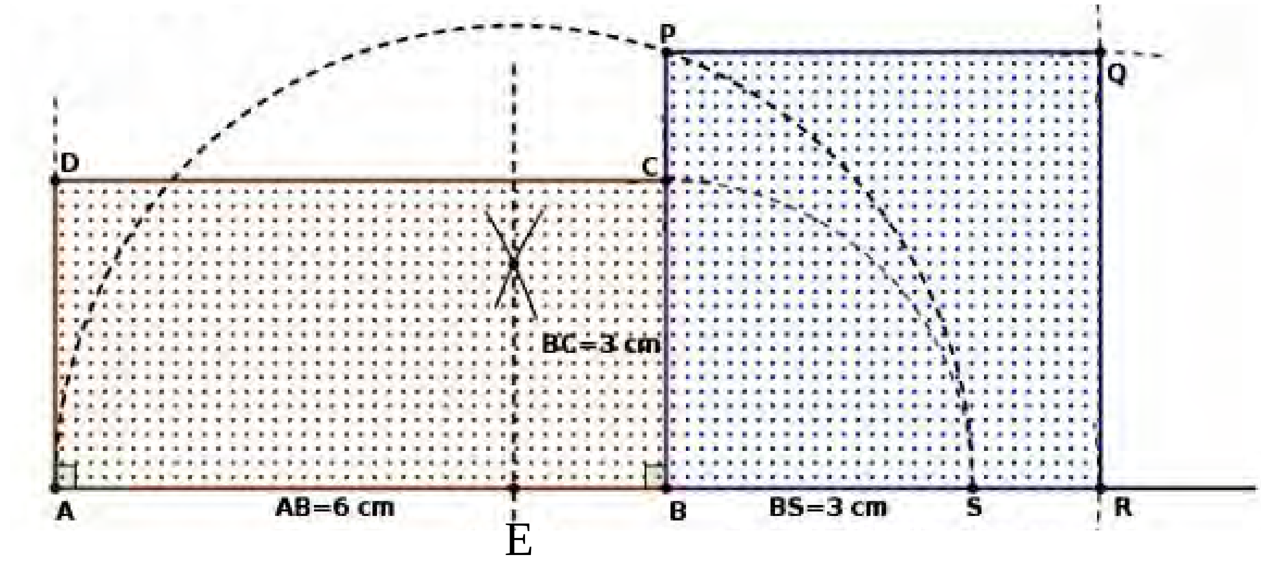
Question13.

Draw rectangle of area 18cm^2 . Draw a square of the same area.

Answer:-



Given area = 18 cm^2 .

So sides be 6cm and 3cm.

Construction

Draw a rectangle ABCD length be 5cm and breadth be 3cm.To extant the line AB and mark S as BS= 3cm. Draw a perpendicular bisector of AS and mark E on AS. Draw a semi circle , center be E and radius is AE. BC extant and meet the semi circle at P. Construct a square Sides are BP = PQ = QR = BR. BPQRB be the required square.

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Question 14.

From all two digit numbers with each digit 1, 2, 3, 4 or 5 one number is chosen :

(a) What is the probability of both digits being the same ?

(b) What is the probability of the sum of the digits being 8 ?

(c) What is the probability that it is a multiple of 5 ?

Answer:-

Digits = 1, 2, 3, 4 or 5.

Two digits numbers which will formed by 1, 2, 3, 4 and 5 are 11, 12, 13, 14, 15, 21, 22, 23, 24, 25,31, 32, 33, 34, 35, 41, 42, 43, 44, 45, 51, 52, 53, 54, 55.

Total number of two digits number = 25, N = 25

a) Both digits being the same = 11, 22, 33, 44, 55, F = 5.

Probability (P) = $\frac{F}{N} = \frac{5}{25} = \frac{1}{5}$

b) The sun of digits being 8 = 35, 44, 53, F = 3 , N = 25

Probability (P) = $\dfrac{F}{N} = \dfrac{3}{25}$.

c) Multiples of 5 = 15, 25, 35,45, 55. F = 5 ., N = 25.

Probability (P) = $\dfrac{F}{N} = \dfrac{5}{25} = \dfrac{1}{5}$.

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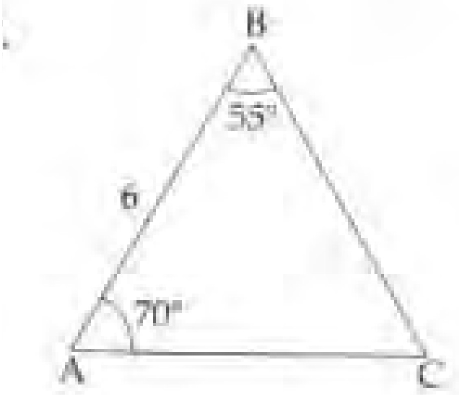
Question 15.



In triangle ABC, length of AB = 6 cm, $\angle A = 70^\circ$, $\angle B = 55^\circ$.

(a) Find $\angle C$

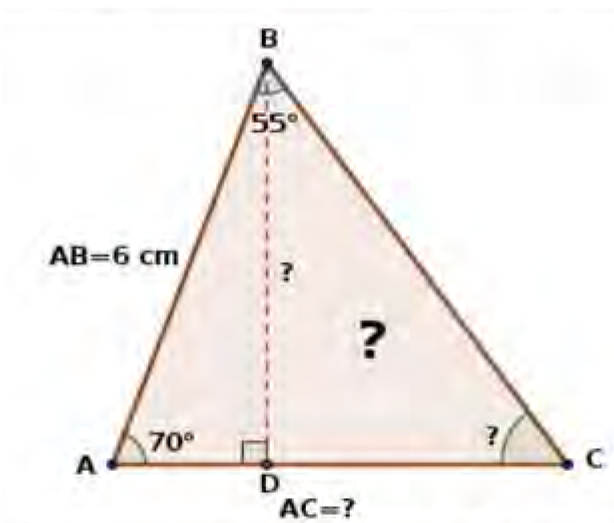
(b) Find AC

(c) Find the area of triangle ABC

($\sin 70^\circ = 0.93$)

Answer:-

Given AB = 6cm. , $\angle A = 70^0$, $\angle B = 55^0$



a) $\angle C = 180 - (70 + 55) = 180 - 125 = 55^0$.
b) ΔABC is an isosceles triangle
$\therefore AB = AC = 6$ cm
c) Area of the triangle = $\frac{1}{2} \times AC \times AB \times \sin 70^0$.
(ΔADB is right angled triangle. Sin 70 is the included angle of sides AB and AC.)
$\therefore$ Area of the triangle ¿ $\frac{1}{2} \times 6 \times 6 \times 0.93 = 16.74$ cm^2 .
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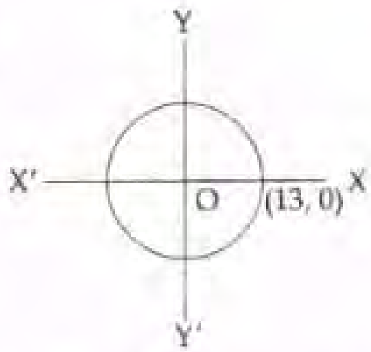
Question 16.



The centre of the circle shown is the origin and the radius is 13.
(a) Check whether each of the points (12, 5), (10, 6) is inside, outside or on the circle.
(b) Write the coordinates of two other points on the circle.

Answer:-
Given radius = 13. Given points = (12, 5) , (10, 6) . Orgin = (0, 0) .
Distance b/w (0, 0) . and (12, 5)
a) Distance = $\sqrt{x^2+y^2}$ = $\sqrt{12^2+5^2}$ = $\sqrt{144+25}$ = $\sqrt{169}$ = 13.Which is equal to the radius. So the point (12, 5) be on the circle.
Distance b/w (0, 0) . and (10, 6)
Distance = $\sqrt{x^2+y^2}$ = $\sqrt{10^2+6^2}$ = $\sqrt{100+36}$ = $\sqrt{136}$. Which is less than the radius 13. So the point (10, 6) be in side the circle.
b) To find other coordinates on the circle be $\sqrt{x^2+y^2}$ = 13
(0, 13), (- 13, 0) ctx.
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Question.17

Calculate the area and perimetre of a triangle of sides 30 centimetre, 28 centimetre and 26 centimetre. Also calculate the radius of the incircle.

Answer:-

Given sides of the triangl (a, b, c) = 30cm , 28cm, 26cm

The perimeter of the triangle = a + b+ c = 30 + 28 + 26 **= 84 cm.**

Area of the triangle (Using Hero's formula)

$= (2 \times 4-1,2 \times 3-1)$., Where s = $\frac{a+b+c}{2}$

s = $\frac{a+b+c}{2} = (2 \times 8-7,2 \times 8-5) = 42.$

ie., **Area** $= \sqrt{42(42-30)(42-28)(42-26)} = \frac{a+b+c}{2}$

$= \frac{a+b+c}{2}$ = **336 cm² .**

Radius of the semi circle (r) $= (2 \times 2-1,2 \times 4-1)$ (Formula)

$= \frac{a+b+c}{2}$ = **4 cm**.

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Question. 18.

A square pyramid of base edge 10 centimetres and height 12 centimetres is to be made of paper.

(a) Calculate the slant height of the pyramid.

(b) What is the area of the paper needed to make square pyramid ?

Answer.

Given base edge (a) = 10cm . Height (h) = 12cm.

a) Slant height (l) = $\sqrt{h^2+\left(\frac{a}{2}\right)^2} = \sqrt{12^2+\left(\frac{10}{2}\right)^2} = \sqrt{144+25}$

$= \sqrt{169}$ = 13 cm.

b) Paper needed to make the square pyramid = TSA of the pyramid .

$\therefore$ TSA = a^2+2al = $10^2+2\times10\times13$ = 100 + 260 = 360cm^2 .

Hence, paper needed to make the square pyramid = 360cm^2 .

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Question. 19.

$P(x)=ax^3+bx^2+cx+d$

(a) Find $P(-1)$.

(b) If $x+1$ is a factor of $P(x)$ then prove that $a+c=b+d$.

(c) Write a third degree polynomial having $(x+1)$ as a factor.

Answer:-

Given P(x) = $\frac{a+b+c}{2}$

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

$= (2\times4-1, 2\times3-1)$

b) Given (x + 1) is a factor of P(x) . That means P(x) = 0.

ie., $-a+b-c+d$ = 0

$\therefore$ a + c = b + d. Hence proved.

c) Third degree polynomial having (x + 1) as factor

= $(2\times8-7, 2\times8-5)$ or $(2\times2-1, 2\times4-1)$ or $\frac{a+b+c}{2}$. etc.

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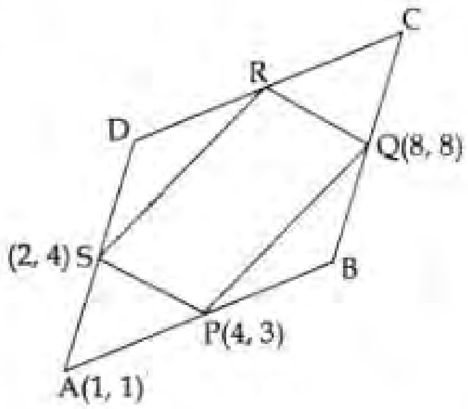
Question. 20.



In the picture, mid points of the sides of the quadrilateral ABCD are joined to draw PQRS.

(a) Find Coordinates of R.

(b) Write Coordinates of all vertices of quadrilateral ABCD.

Answer:-

If joining the mid points of a quadrilateral will give a parallelogram .

The coordinates of R = (2+8 – 4, 4+8 – 3) = (6, 9)

b) The coordinates of A = (1, 1) .

The coordinates of B = $\left(2\times 4-1, 2\times 3-1\right)$ = (7, 5)

The coordinates of C = $\left(2\times 8-7, 2\times 8-5\right)$ = 9, 11)

The coordinates of D = $\left(2\times 2-1, 2\times 4-1\right)$ = (3, 7)

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Question:- 21

21. Some households in a locality are sorted according to their electricity usage in the table below.

Usage of electricity (Unit)	No. of households
80 - 100	8
100 - 120	12
120 - 140	10
140 - 160	9
160 - 180	6

(a) If the household using the least unit of electricity is numbered as one and the second least as two and so on, what is assumed to be usage of electricity of the 21st household.

(b) Calculate the median usage of electricity ?

Answer:-

Consumption (Units)	No.of househopds	Consumption (Units)	Cumulative frequency
80 -100	8	Less than 100	8
100 - 120	12	Less than 120	20
120 -140	10	Less than 140	30
140 -160	9	Less than 160	39
160 -180	6	Less than 180	45

a) The consumption of 10 houses from 21^{st} to 30^{th} house will be 120 – 140 units. The 20 unites between 120 and 140will have10 subdivisions and the use of electricity will be ths center of each subdivision. The consumption in the **21^{st} house will be 121**, between 120 and 122.

b)Median consumption = 23^{rd} consumption of house.

= 21^{st} consumption of the house + 2×2

= 121 + 4 = **125. Units**.

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Question 22.

(a) Find the least and heighest three digit number which leave a remainder 1 on division by 9.

(b) How many three digit numbers are there, which leave a remainder one on division by 9 ?

(c) Find the sum of all such numbers.

Answer:-

The smallest three digit number dividing by 9, the reminder comes up 1 = 99 + 1 = 100.

The largest three digit number dividing by 9 = 999 – 8 = 991.

b) n = $\frac{x_n - f}{d} + 1$ = $\frac{991-100}{9} + 1$ = $\frac{891}{9}$ + 1 = 99 + 1 = 100.

c) Sum = $\frac{n}{2}[f + x_n]$ = $\frac{100}{2}[100+991]$ = 50 $\times$ 1091 = 54550

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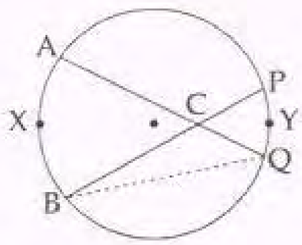
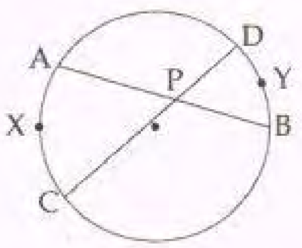
Question 23.



In the circle shown, the chords AQ and BP passes through C.

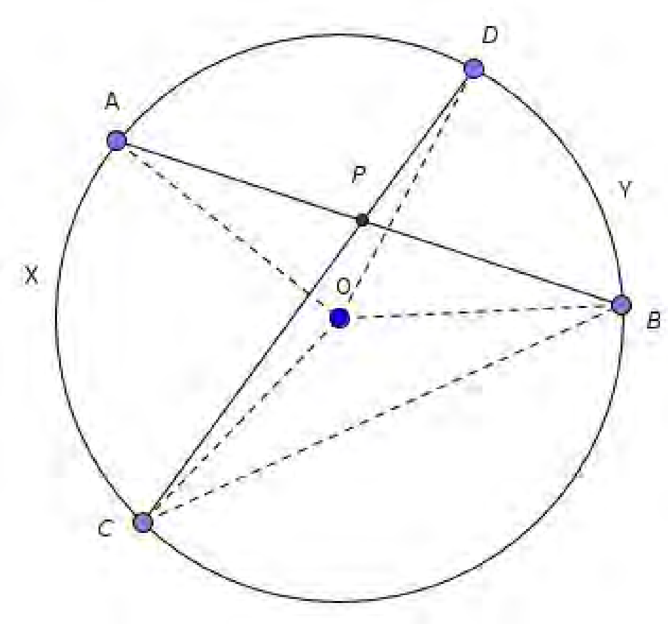
(a) The central angle of arc AXB is 100° calculate $\angle Q$. The central angle of arc PYQ is 60°. Find all angles of the triangle BQC.

(b)



In the picture, prove that $\angle APC$ is half the sum of the central angle of arc AXC and arc BYD.

Answer:-



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Center angle of the arc AXB $=100^0$

$\angle Q = \frac{1}{2} \times \angle AOB$

$= \frac{1}{2} \times 100 = 50^0$. (Center angle relation, arc and opposite arc relation)

Center angle of arc QYP $= 60^0$.

ie., $\angle B = \frac{60}{2} = 30^0$

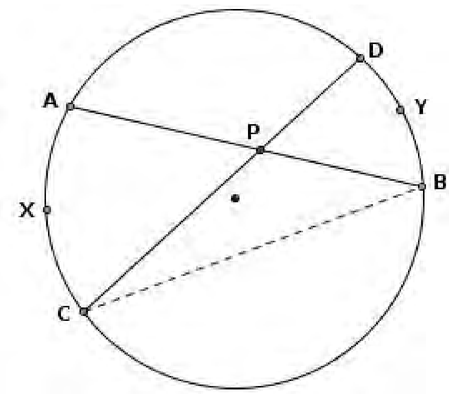
$\angle BCQ = 180 - (\angle Q + \angle B)$

$= 180 - (50 + 30)$

$= 180 - 80 = 100^0$.

The angles of the ΔBQC , $\angle B = 30^0$, $\angle Q = 50^0$, $\angle C = 100^0$.

b)



Join C and B .
In ΔPBC , the exterior angle
∠APC = ∠B + ∠C (sum of the interior opposite angles)
∠APC = ½ [Center angle of the arc AXC + Center angle of the arc BYD]
Henc the ∠APC is the half sum of the center angles of the arc AXC and BYD.

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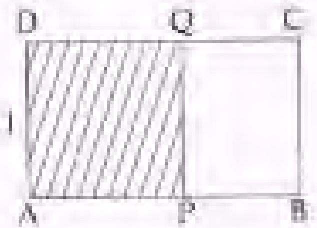
Question. 24.

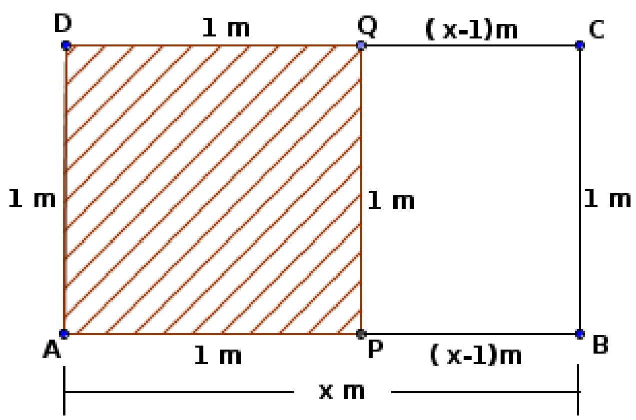


From the rectangle ABCD of breadth 1 metre, the largest possible square APQD is cut off. The remaining rectangle is PBCQ

(a) Taking the length of ABCD as x, write the length and breadth of PBCQ.

(b) The ratio of length and breadth of the rectangles ABCD and PBCQ are same. Find length of AB.

Answer:-



a) Let the length of the rectangle ABCD be x m.
length of the rectangle PBCQ = 1 m
Breadth = x – 1 m.

b) Given that the ratio of length and breadth of the recangle ABCD and PBCQ are same.

ie., x : 1 = 1 : x – 1 (The product of means is equal to the product of extreme)

ie., x(x – 1) = 1

$x^2 - x = 1 \Rightarrow x^2 - x - 1 = 0$ is a quadratic equation and find the solution

$$\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{1 \pm \sqrt{5}}{2}$$

x = $\frac{1+\sqrt{5}}{2}$ - ve value rejected.

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Question.25

A man standing on the top of a light house sees a ship approaching the seashore at an angle of depression of 22°. After the ship has travelled 100 metres more. Towards the sea shore, he sees it at an angle of depression of 31°. The ship stops there.

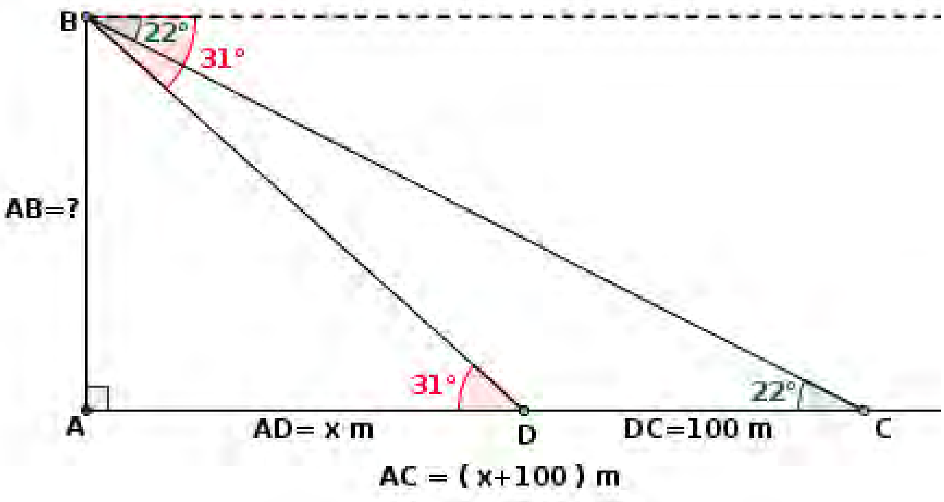
(a) Draw a rough-sketch.

(b) How far is the ship from the light house.

(c) Find the height of light house.

$\tan 22° = 0.4$, $\tan 31° = 0.6$

Answer:- a)



c) Height of the light house = $\dfrac{a\tan A\,.\tan B}{\tan A-\tan b}$ = $\dfrac{100\times\tan 31\times\tan 22}{\tan 31-\tan 22}$

= $\dfrac{100\times0.6\times0.4}{0.6-0.4}$ = $\dfrac{24}{0.2}$ = 120m.

b) How far is the ship from the light house

$\tan 31 = \dfrac{AD}{AB} \Rightarrow AB=\dfrac{AD}{\tan 31} \Rightarrow AB=\dfrac{120}{0.6} = 200$m.

The ship from the light house = 200 m.

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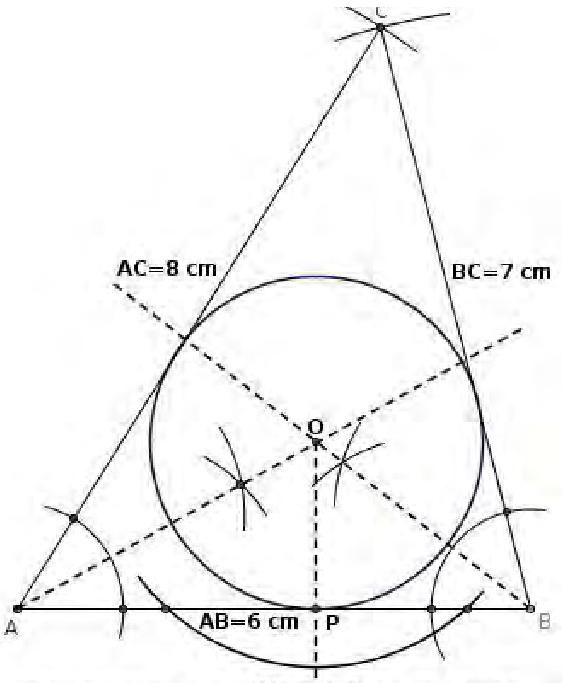
Question:- 26.

Draw a triangle of sides 6 centimetre, 7 centimetre and 8 centimetre. Draw a circle which touches all sides of the triangle and measure its radius.

Answer:-



Construction:

Construct the triangle in the given measurement.
Draw any two angle bisector and intersect it at a point O . Draw the circle OP as the radius .

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Question:- 27.

A cone is made from sector of radius 10 centimetre and central angle 216°.

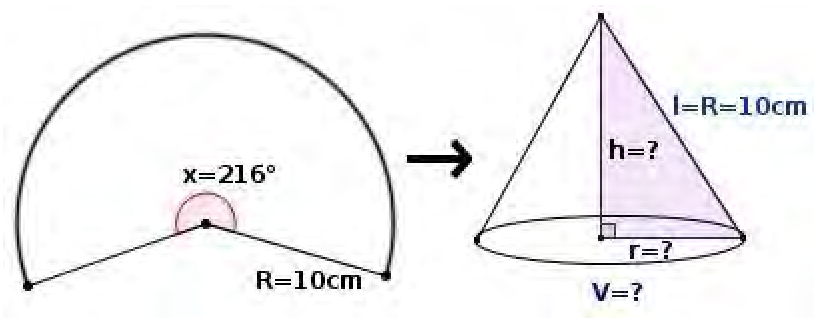
(a) What is slant height and radius of the cone ?

(b) Find the volume of the cone.

Answer:-

Given the sector radius = 10cm and the center angle be 216^0 .

a)



Slant height (l) of the cone = Radius of the sector = 10cm (given)

Let the radius of the cone be r

a) ie., $\frac{r}{l}=\frac{x^0}{360}$ (formula)

$$\Rightarrow \frac{r}{10}=\frac{216}{360} \Rightarrow r=\frac{216\times10}{360}=6 \text{ cm.}$$

Slant height = 10cm and radius = 6cm.

b) Volume of the cone = $\frac{1}{3}\pi r^2 h$

r = 6cm , h = ?

h = $\sqrt{l^2-r^2}$ $\sqrt{10^2-6^2}=\sqrt{100-36}=\sqrt{64}=8$ cm

Volume = $\frac{1}{3}\times\pi\times6^2\times8$ = 96π cm^3 . = 301.44 cm^3 .

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Question 28.

Find the length of line joining A(−2, −3) and B(4, 5). Write the equation of circle whose diametre is AB.

Answer:-

Given points A(-2 , -3) , B(4, 5)

AB = $\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$ (distance formula)

= $\sqrt{(4+2)^2+(5+3)^2}$ = $\sqrt{36+64}=\sqrt{100}=10$ (diameter)

Radius of the circle = $\frac{10}{2}$ = 5 .

Center of the circle = $\left(\frac{x_1+x_2}{2}, \frac{y_2+y_1}{2}\right)$ (mid point form)

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

Equation of the circle = $(x – a)^2 + (y – b)^2 = r^2$

$= (x – 1)^2 + (y – 1)^2 = 5^2$

$= x^2 - 2x + 1 + y^2 - 2y + 1 = 25$

$= x^2 + y^2 - 2x - 2y + 2 – 25 = 0$

$= = x^2 + y^2 - 2x - 2y – 23 = 0$.

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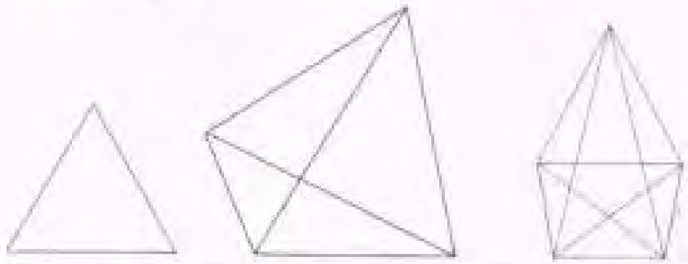
Question:29.

Score

Read the mathematical concept given below carefully and understand it. Then answer the following questions.

1x6=6



Diagonal of a polygon is a line joining two non-adjacent vertices see this tables.

Number of sides of polygon	Number of diagonals drawn from one vertex	Total Number of Diagonals
Triangle 3	0	$0 = \frac{3 \times 0}{2}$
Quadrilateral 4	1	$2 = \frac{4 \times 1}{2}$
Pentagon 5	2	$5 = \frac{5 \times 2}{2}$

From the above table, we see the relationship between the number of sides of a polygon and the number of diagonals.

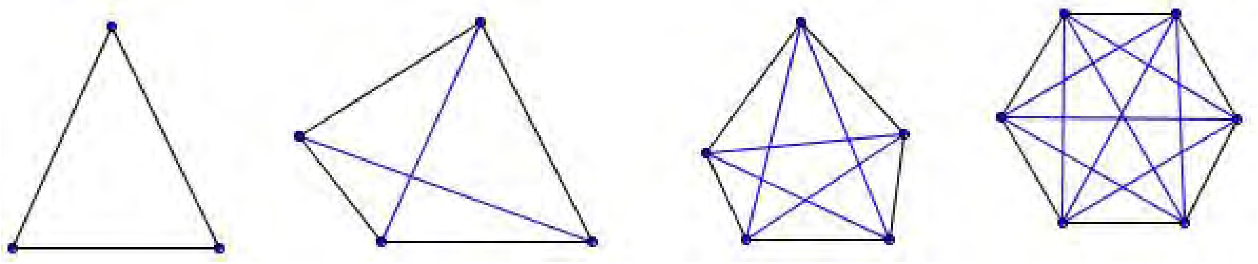
Answer the question's given below :

(a) Which polygon has the same number of sides and diagonals ?

(b) How many diagonals can be drawn from a single vertex of an 8 - sided polygon ?

(c) How many diagonals does 20 sided polygon have ?

Answer.



Polygon	No. of Sides	No. of diagonals drawn from a vertex	Total no,of diagonals
Triangle	3	0	$0=\frac{(3\times0)}{2}$
Quaddrlateral	4	1	$2=\frac{(4\times1)}{2}$
Pentagon	5	2	$5=\frac{(5\times2)}{2}$
Hexgon	6	3	$9=\frac{(6\times3)}{2}$
Polygon	n	$n-3$	$\frac{n(n-3)}{2}$

a) No.of sides = No.of diagonals = Pentagon (see yhe table)
b) 8 – 3 = 5.
c) $\frac{n(n-3)}{2}$ (formula)

$= \frac{20(20-3)}{2} = \frac{20\times17}{2}$ = 170.

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Prepared by Dr.V.S.RaveendraNath
Mobile : 9447206495 , 7012030930.