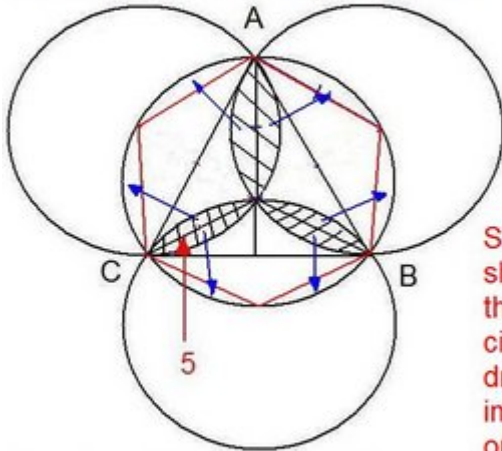


The figure below is made up of 4 identical circles and an equilateral triangle touching the points A, B and C on the circles. Given that the area of the triangle is  $33 \text{ cm}^2$ , and the diameter of the circles is 10 cm, find the area of the shaded part. (Take  $\pi = 3.14$ ) [5]



Shift out each shaded segment to the side of the inner circle. Each triangle drawn is the mirror image of the smaller one inside the given triangle.

So shaded area = 1 Circle - 2 Triangles

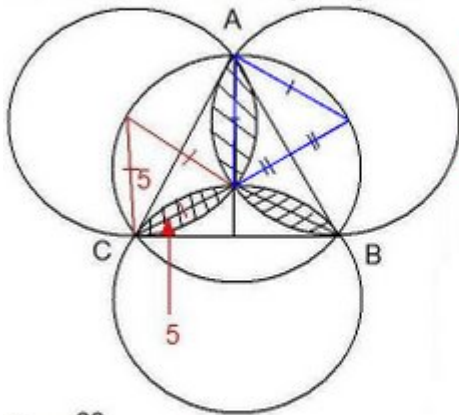
$$1 \text{ circle} = 3.14 \times 5 \times 5 = 78.5$$

$$2 \text{ Triangles} \rightarrow 2 \times 33 = 66$$

$$\text{Shaded part} = 78.5 - 66 = 12.5 \text{ cm}^2$$

The area of the shaded part is  $12.5 \text{ cm}^2$

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$$\frac{1}{2} \text{ Blue Triangle} = \frac{1}{6} \text{ Triangle}$$

$$6 \times \frac{60}{360} = 1$$

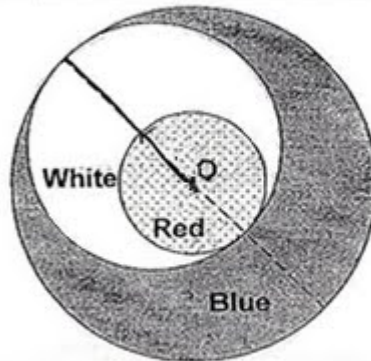
$$1 \text{ Circle} \rightarrow 3.14 \times 5 \times 5 = 78.5$$

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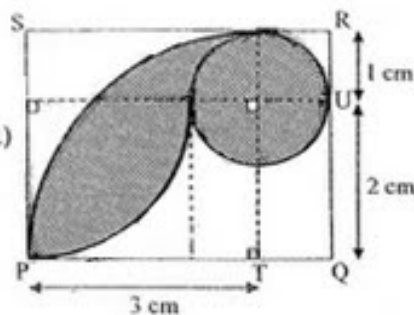
The figure below consists of three circles. The smallest circle has centre O and radius 4 cm. The biggest circle has centre O and radius 10 cm. The diameter of the biggest circle also cuts through the centre of the medium-sized circle. The medium-sized circle touches the other two circles as shown. The three regions formed are coloured red, white and blue as shown.



- Find the radius of the medium-sized circle.
- Find the area of the white region. Use calculator to obtain the value of  $\pi$ . (Give your answer correct to 2 decimal places.)
- Express the area of the red region as a fraction of the area of the blue region.

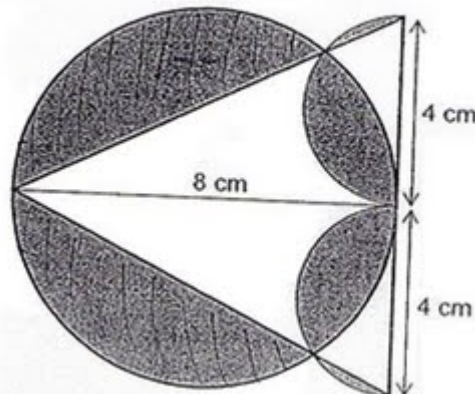
The shaded figure below is formed by a semicircle and quarter circles. It lies within the rectangle PQRS in which RU = 1 cm, UQ = 2 cm and PT = 3 cm.

- Find the perimeter of the shaded region.  
(Give your answer in terms of  $\pi$ .)
- Find the area of the shaded region.  
(Give your answer correct to 2 decimal places.)

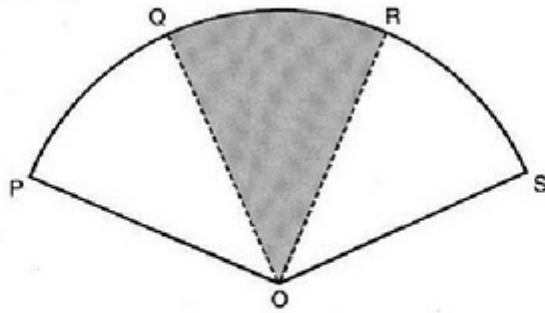


The figure below is made up of a circle, a triangle and two identical semi-circles. The diameter of the circle is 8 cm and the diameter of the semi-circle is 4 cm. Find the area of the shaded regions.

(Take  $\pi = 3.14$ )



OPQRS is part of a circle of radius 10 cm. OPR and OQS are quarter circles. The area of the shaded part OQR is  $40 \text{ cm}^2$  and the perimeter of the shaded part OQR is 28 cm.



For each of the following, use the calculator value of  $\pi$  to find

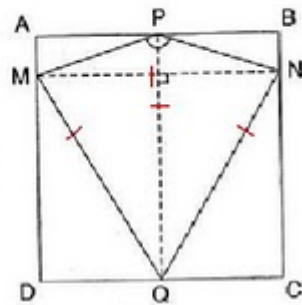
- the area of the figure OPQRS, correct to 2 decimal places,
- the perimeter of the figure OPQRS, correct to 2 decimal places.

In the diagram below, ABCD is a square and  $QM = QP = QN$ . MN is parallel to AB and it is perpendicular to PQ.

Find  $\angle MPN$ .

MNQ is an equilateral triangle

MPQ and NPQ are isosceles triangles



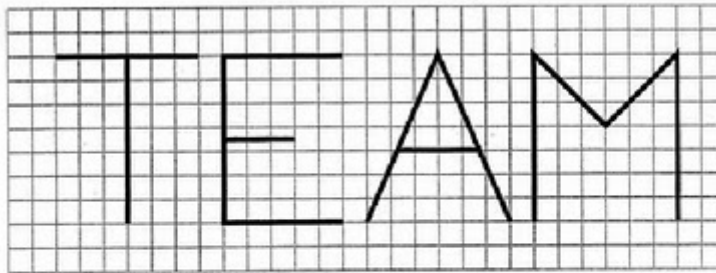
$$\begin{aligned}\angle MQN &= 180^\circ - 3 \\ &= 60^\circ\end{aligned}$$

$$\begin{aligned}\angle MQP &= 60^\circ \div 2 \\ &= 30^\circ\end{aligned}$$

$$\begin{aligned}\angle MPQ &= \frac{180^\circ - 30^\circ}{2} \\ &= 75^\circ\end{aligned}$$

$$\begin{aligned}\angle MPN &= 2 \times 75^\circ \\ &= 150^\circ\end{aligned}$$

In the diagram below, the letters T, E, A and M are drawn on a square grid. List **all** the letters which have perpendicular lines [2]



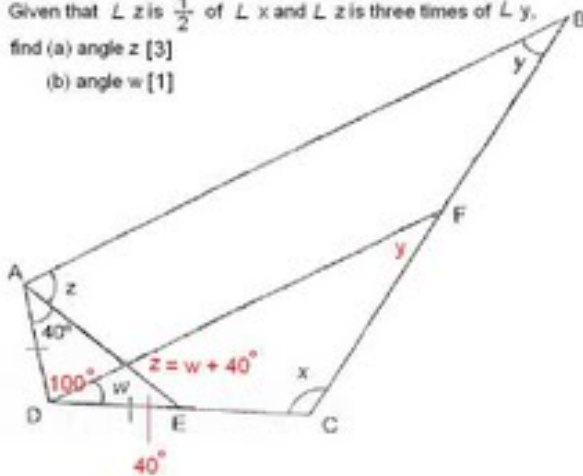
The figure below is not drawn to scale.

$\angle ADC = 100^\circ$ ,  $AD = AE$  and  $AB \parallel DF$ .

Given that  $Lz$  is  $\frac{1}{2}$  of  $Lx$  and  $Lz$  is three times of  $Ly$ ,

find (a) angle  $z$  [3]

(b) angle w [1]



$$Lz = \frac{1}{2} Lx = 3Ly$$

$$L_x = 2 \quad L_z = 6 \quad L_y$$

$$LW = LZ - 40^\circ$$

$$\angle w + \angle x + \angle y = 180^\circ$$

$$\begin{aligned}\angle z + \angle x + \angle y &= 180^\circ + 40^\circ \\ &= 220^\circ\end{aligned}$$

■ 220\*

$$3 \angle y + 6 \angle y + \angle y = 220^\circ$$

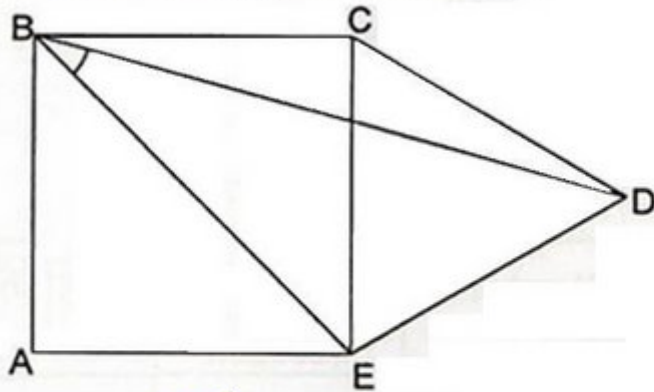
$$L_y = 220^\circ + 10 = 22^\circ$$

$$L_x = 6 \times 22^\circ = 132^\circ$$

$$\angle z = 3 \times 22^\circ = 66^\circ$$

$$\angle W = 66^\circ - 40^\circ = 26^\circ$$

In the figure below, ABCE is a square and CDE is an equilateral triangle. Find  $\angle EBD$ .



$$\angle DCE = \frac{180^\circ}{3} = 60^\circ$$

$$\angle CBD = \frac{180^\circ - 90^\circ - 60^\circ}{2} = 15^\circ$$

$$\angle EBD = 45^\circ - 15^\circ = 30^\circ$$

The figure is made up of a circle, identical semicircles and a square of side 12cm. P is the centre of the circle. What is the area of the shaded figure? Leave your answer correct to two decimal places.

