I. Computer Based Learning (CBL) refers to any teaching methodology that makes use of computers for information transmission. At an elementary school level, computer applications can be used to display multimedia lesson plans. A survey was done on 1000 elementary and secondary schools of Assam and they were classified by the number of computers they had.

Number of Computers	1 – 10	11 – 20	21 – 50	51 – 100	101 and more
Number of Schools	250	200	290	180	80

One school is chosen at random.

Based on the given information, solve the following questions:

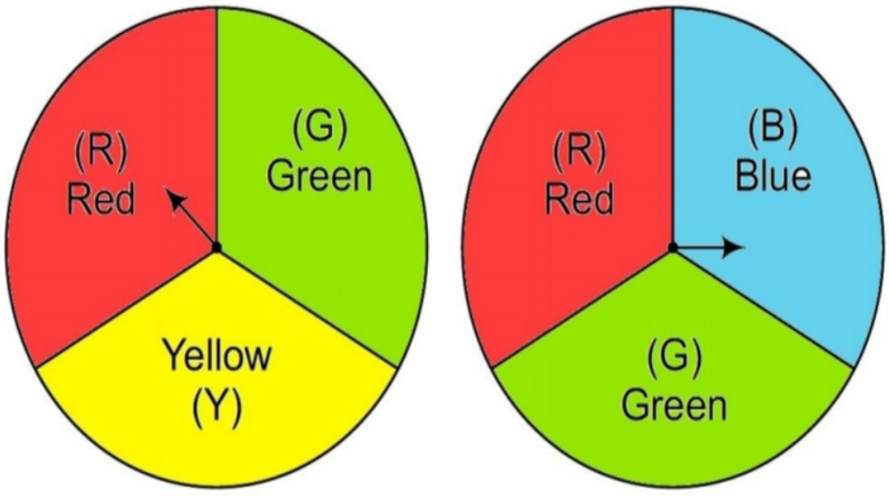
(a) Find the probability that the school chosen at random has more than 100 computers.

(b) Find the probability that the school chosen at random has 50 or fewer computers.

(c) Find the probability that the school chosen at random has no more than 20 computers.

(d) Find the probability that the school chosen at random has 10 or less than 10 computers.

II A middle school decided to run the following spinner game as a fund-raiser on Christmas
Making Purple: Spin each spinner once. Blue and red make purple. So, if one spinner shows Red (R) and another Blue (B), then you 'win'. One such outcome is written as 'RB'.

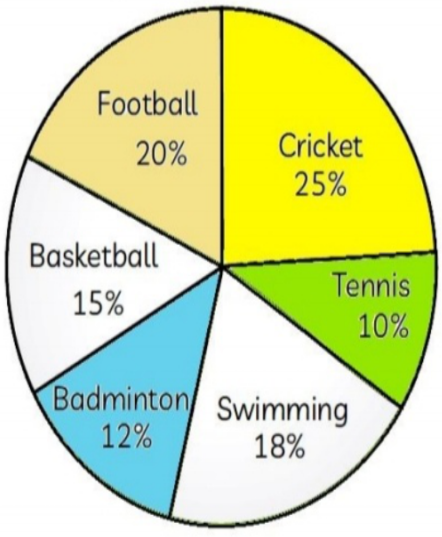


I II

Based on the given information, solve the following questions:
(a) List all possible outcomes of the game.
(b) Find the probability of 'Making Purple'.
(c) For each win, a participant gets ₹ 10, but if he/she loses, he/she has to pay ₹ 5 to the school. If 99 participants played, calculate how much fund could the school have collected.

(d) If the same amount of ₹ 5 has been decided for winning or losing the game, then how much fund had been collected by school? (Number of participants = 99)

A school offers several sports to its students such as cricket, football, basketball, tennis, badminton and swimming. Based on past records, the sports teacher prepared a pie chart as shown below showing preference of students towards a particular sport.



(a) Find the probability of favourite sport being either swimming or badminton.
(b) Find the probability of favourite sport being neither football nor cricket.
(c) Find the probability of favourite sport being basketball, tennis or cricket.

IV. Two friends are travelling in a bus. They were feeling bored, so they started playing a game with a pair of dice that one of them had. Each of them started rolling the pair of dice one by one, stating one condition before rolling. If the person gets the numbers according to the condition stated by him, he wins and get a score.

Based on the above information, answer the following questions.

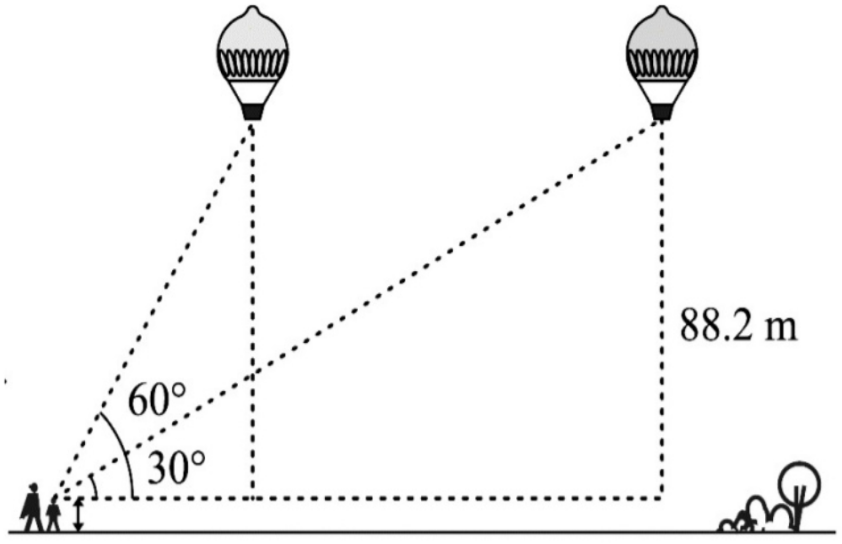
(i) (a) First friend says, "a doublet". What is the probability of his winning? (1)

(b) Second friend says, ''sum less than 9''. What is the probability of his winning? (1)

(ii) (a) First one says, "6 will come up either time." What is the probability of his winning? (1)

(b) Second one says, "sum is an even number". What is the probability of his losing? (1)

V. A 1.2 m tall girl spots a balloon moving with the wind in a horizontal line at a height of 88.2 m from the ground. The angle of elevation of the balloon from the eyes of the girl at any instant is 60°. After 30 seconds, the angle of elevation reduces to 30° (see the below figure).



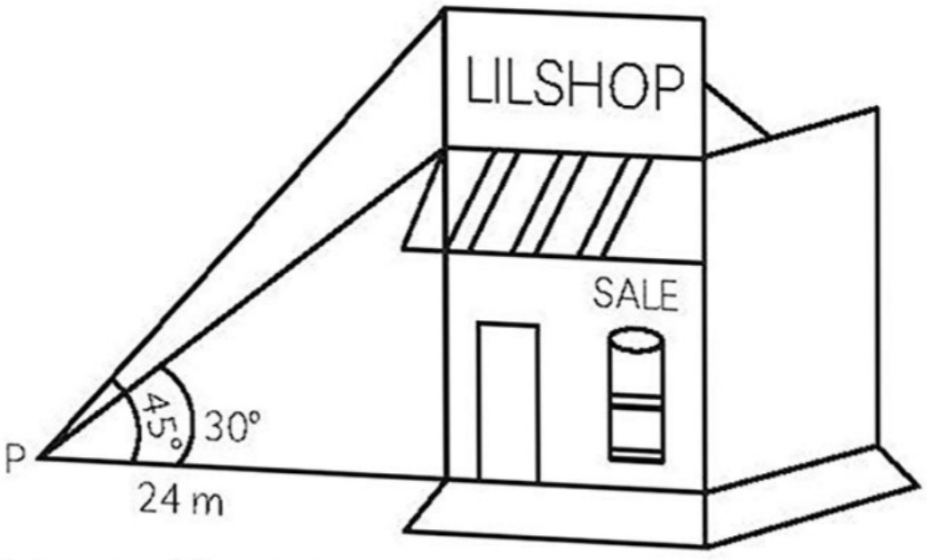
Based on the above information, answer the following questions. (Take $\sqrt{3} = 1.732$)

(i) Find the distance travelled by the balloon during the interval. (2)

(ii) Find the speed of the balloon. (2)

(iii) If the elevation of the sun at a given time is 30°, then find the length of the shadow cast by a tower of 150 feet height at that time. (2)

VI From a point P on the ground level, the angle of elevation of the roof of the building is 30° and the angle of elevation of the top of the sign board is 45°. The point P is at a distance of 24 m from the base of the building.



On the basis of the above information, answer the following questions:

(i) Find the height of the building (without the sign board). (2)

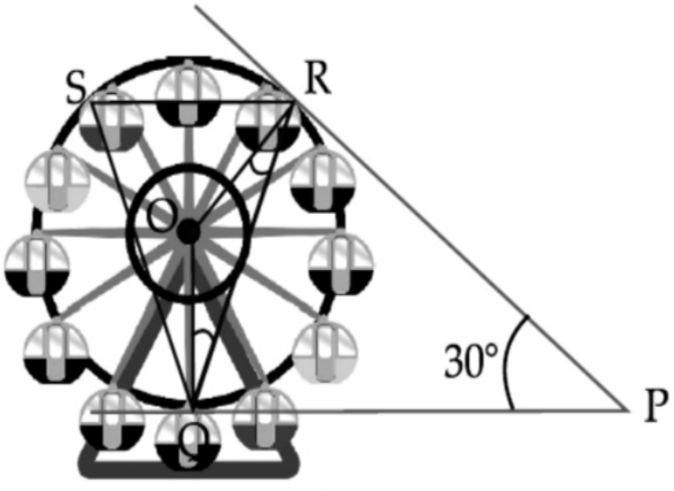
(ii) Find the height of the building (with the sign board) (2)

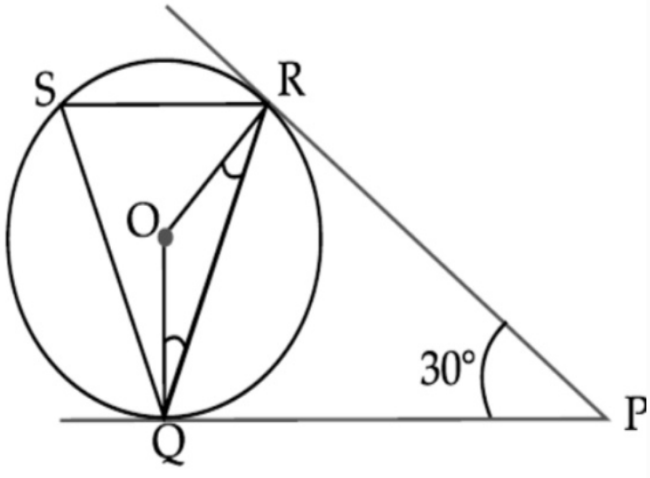
(iii) Find the height of the sign board. (1)

(iv) Find the distance of the point P from the top of the sign board. (1)

VII A Ferris wheel (or a big wheel in the United Kingdom) is an amusement ride consisting of a rotating upright wheel with multiple passenger carrying components (commonly referred to as passenger cars, cabins, tubs, capsules, gondolas, or pods) attached to the rim in such a way that as the wheel turns, they are kept upright, usually by gravity.

After taking a ride in Ferris wheel, Monika came out from the crowd and was observing her friends who were enjoying the ride. She was curious about the different angles and measures that the wheel will form. She forms the figure as given below.



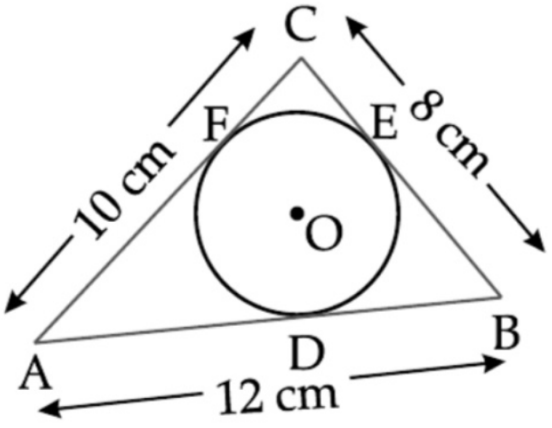


(a) In the given figure, find ∠ROQ. (2)

(b) Find the measure of ∠RQP. (2)

(c) Find measure of ∠RSQ. Also, find the sum of ∠ORP and ∠OQP. (2)

Varun has been selected by his School to design logo for Sports Day T-shirts for students and staff. The logo is designed in different geometry and different colours according to the theme. In given figure, a circle with centre O is inscribed in a ΔABC, such that it touches the sides AB, BC and CA at points D, E and F respectively. The lengths of sides AB, BC and CA are 12 cm, 8 cm and 10 cm respectively.



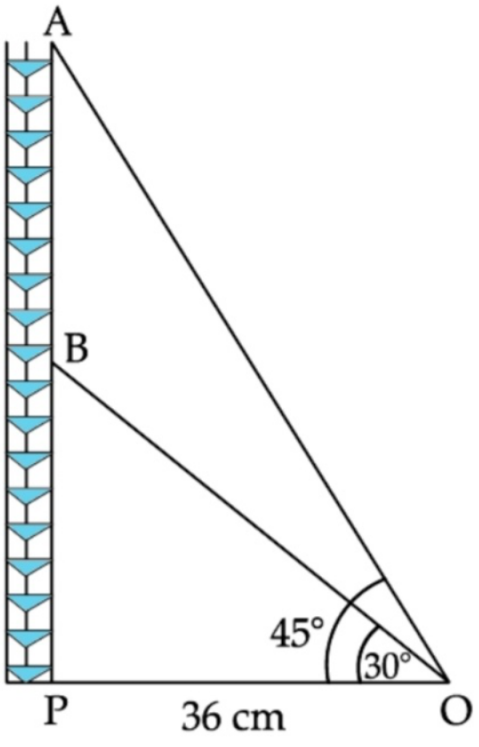
(a) Find the length of AD and BE. (2)

(b) If the radius of the circle is 4 cm, find the area of ΔOAB.

(c) Find the perimeter of ΔABC. (1)

(d) Find the length of CF. (1)

15 Radio towers are used for transmitting a range of communication services including radio and television. The tower will either act as an antenna itself or support one or more antennas on its structure. On a similar concept, a radio station tower was built in two Sections A and B. Tower is supported by wires from a point O.



Distance between the base of the tower and point O is 36 cm. From point O, the angle of elevation of the top of the Section B is 30° and the angle of elevation of the top of Section A is 45°.

Based on the above information, answer the following questions:

(i) Find the length of the wire from the point O to the top of section B.

(ii) Find the distance AB.

(iii) Find the area of ΔOPB.

(iv) Find the height of the Section A from the base of the tower.

X. In the month of April to June 2022, the exports of passenger cars from India increased by 26% in the corresponding quarter of 2021–22, as per a report. A car manufacturing company planned to produce 1800 cars in 4th year and 2600 cars in 8th year. Assuming that the production increases uniformly by a fixed number every year.

Based on the above information answer the following questions.

(i) Find the production in the 1st year. (1)

(ii) Find the production in the 12th year. (1)

(iii) Find the total production in first 10 years. (2)

(iv) In how many years will the total production reach 31200 cars? (2)

H.W-19 (answers)

I $P(E) = \frac{\text{no. of favorable outcomes}}{\text{Total no. of outcomes}}$

(a) $P(\text{more than 100 computers}) = \frac{80}{1000} = \underline{0.08}$

(b) $P(\text{less than or equal to 50 computers}) = \frac{250+200+290}{1000}$

$= \frac{740}{1000} = \underline{0.74}$

(c) $P(\text{not more than 20 computers}) = \frac{250+200}{1000} = \frac{450}{1000} = \underline{0.45}$

(d) $P(\leq 10 \text{ computers}) = \frac{250}{1000} = \underline{0.25}$

II (a) $S = \{RR, RB, RG, GR, GB, GG, YR, YB, YG\}$

$P(E) = \frac{\text{no. of favorable outcomes}}{\text{Total no. of outcomes}}$

(b) favorable outcomes $= \{RB\}$

$P(\text{making purple}) = \frac{1}{9}$

(c) Total no. of participants $= 99$

$P(\text{winning}) = \frac{1}{9}$

$\therefore$ No. of participants can win $= \frac{1}{9} \times 99 = 11$ participants

No. of participants can lose $= 99 - 11 = 88$

$\therefore$ Fund collected $= 88 \times 5 - 11 \times 10$

$= 440 - 110 = \underline{\text{Rs } 330}$

(d) Fund collected $= 88 \times 5 - 11 \times 5$

$= 440 - 55 = \underline{\text{Rs } 385}$

III $P(E) = \frac{\text{no. of favourable outcomes}}{\text{Total no. of outcomes}}$.

(a) P(either swimming or badminton) $= \frac{18+12}{100} = \frac{30}{100} = \underline{0.3}$

(b) P(either football or cricket) $= \frac{20+25}{100} = \frac{45}{100} = 0.45$

P(neither football nor cricket) $= 1 - 0.45 = \underline{0.55}$

(c) P(basketball, tennis or cricket) $= \frac{15+10+25}{100}$

$= \frac{50}{100} = \underline{0.5}$

IV $P(E) = \frac{\text{no. of favourable outcomes}}{\text{Total no. of outcomes}}$

Total no. of outcomes $= 6^2 = 36$

(i) P(getting a doublet) $= \frac{6}{36} = \underline{\frac{1}{6}}$ → favourable outcomes are $\{(1,1), (2,2), (3,3), (4,4), (5,5), (6,6)\}$

(ii) favourable outcomes $= \{(1,1), (1,2), (1,3), (1,4), (1,5), (1,6), (2,1), (2,2), (2,3), (2,4), (2,5), (2,6), (3,1), (3,2), (3,3), (3,4), (3,5), (4,1), (4,2), (4,3), (4,4), (5,1), (5,2), (5,3), (6,1), (6,2)\}$

$\therefore P(\text{sum} < 9) = \frac{26}{36} = \underline{\frac{13}{18}}$

(iii) Favourable outcomes $= \{(1,6), (2,6), (3,6), (4,6), (5,6), (6,1), (6,2), (6,3), (6,4), (6,5), (6,6)\}$

P(6 will come up either time) $= \underline{\frac{11}{36}}$

(iv) Favourable outcomes $= \{(1,1), (1,3), (1,5), (2,2), (2,4), (2,6), (3,1), (3,3), (3,5), (4,2), (4,4), (4,6), (5,1), (5,3), (5,5), (6,2), (6,4), (6,6)\}$

$P(\text{Sum is an even number}) = \frac{18}{36} = \frac{1}{2}$

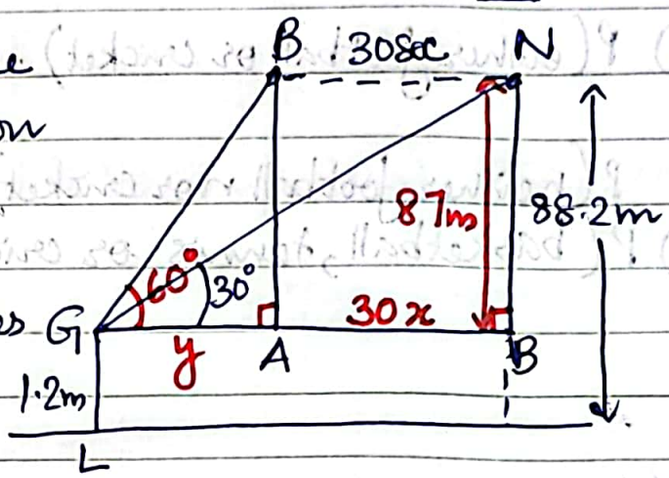
$\therefore P(\text{losing}) = 1 - P(\text{winning}) = 1 - \frac{1}{2} = \frac{1}{2}$

V Distance = speed x time

Let the speed of the balloon be x m/s.

$AB = BN = x \times 30$

$= 30x$ metres



In rt. ΔBAG,

$\tan 60° = \frac{BA}{GA}$

$\Rightarrow \sqrt{3} = \frac{87}{y}$

$\Rightarrow \boxed{y = \frac{87}{\sqrt{3}}}$

In rt. ΔNGB, $\tan 30° = \frac{NB}{GB}$

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{87}{y+30x}$

$\Rightarrow y + 30x = 87\sqrt{3}$

$\Rightarrow \frac{87}{\sqrt{3}} + 30x = 87\sqrt{3}$

$\Rightarrow 87 + 30\sqrt{3}x = 87 \times 3$

$\Rightarrow 30\sqrt{3}x = 261 - 87$

$\Rightarrow 30\sqrt{3}x = 174$

$x = \frac{174 \times \sqrt{3}}{30\sqrt{3} \times \sqrt{3}} = \frac{58}{\frac{174\sqrt{3}}{30 \times 3}}$

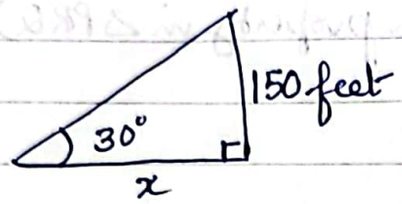
$= \frac{58\sqrt{3}}{30}$ m/s

(i) Distance travelled by the balloon

$= 30x = 30 \times \frac{58\sqrt{3}}{30} = 58\sqrt{3} = 58 \times 1.732 = 100.456$ m (approx.)

(ii) Speed of the balloon = $x = \frac{58\sqrt{3}}{30} = \frac{58 \times 1.732}{30} = \frac{100.456}{30} = 3.34 \text{ m/s}$ (approx.)

(iii)

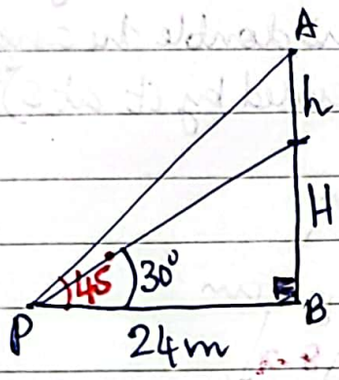


$\tan 30^\circ = \frac{150}{x}$

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{150}{x}$

$x = 150\sqrt{3} = 150 \times 1.732 = 259.8 \text{ feet}$

VI



(i) $\tan 30^\circ = \frac{H}{24}$

$\frac{1}{\sqrt{3}} = \frac{H}{24}$

$H = \frac{24 \times \sqrt{3}}{\sqrt{3} \times \sqrt{3}} = 8\sqrt{3}$

$= 8 \times 1.732$

$= 13.856 \text{ m}$ (approx.)

(ii) $\tan 45^\circ = \frac{AB}{PB}$

$\Rightarrow 1 = \frac{AB}{PB}$

$\therefore AB = PB = 24 \text{ m}$

(iii) $AB = h + H = 24$

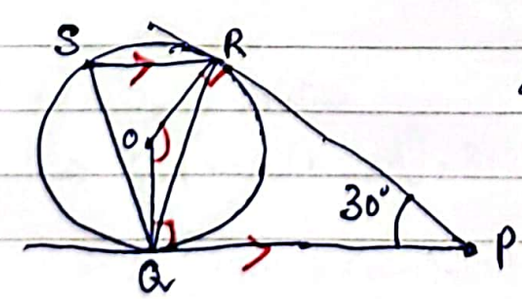
$h = 24 - 13.856 = 10.144 \text{ m}$ (approx.)

(iv) $\sin 45^\circ = \frac{AB}{PA}$

$\Rightarrow \frac{1}{\sqrt{2}} = \frac{24}{PA}$

$\therefore PA = 24\sqrt{2} = 24 \times 1.414 = 33.936 \text{ m}$ (approx.)

VII



$\angle ORP = \angle OQP = 90^\circ$ (radius ⊥ tangent through the point of contact)

Using angle sum property in quad. ORPQ,

$\angle ROQ = 360^\circ - (90^\circ + 30^\circ + 90^\circ)$

$= 360 - 2$

$= 150^\circ$

(b) Since $PR = PQ$ (tangents drawn from external point P)

$\Rightarrow \angle PQR = \angle PRQ$ (angles opposite to equal sides)

$= \frac{180^\circ - 30^\circ}{2}$ (angle sum property in $\triangle PRQ$)

$= \frac{150^\circ}{2} = \underline{\underline{75^\circ}}$

(c) $\angle RSQ = \frac{1}{2}\angle ROQ = \frac{1}{2} \times 150^\circ = \underline{\underline{75^\circ}}$ (angle subtended by chord QR at O is double the angle subtended by it at S)

$\angle ORP + \angle OQP = 90^\circ + 90^\circ = \underline{\underline{180^\circ}}$

VIII (a) Since tangents drawn from an external point are equal in lengths,

$CF = CE = x\,cm$ (say)

$AF = AD = (10 - x)\,cm$

$BE = BD = (8 - x)\,cm$

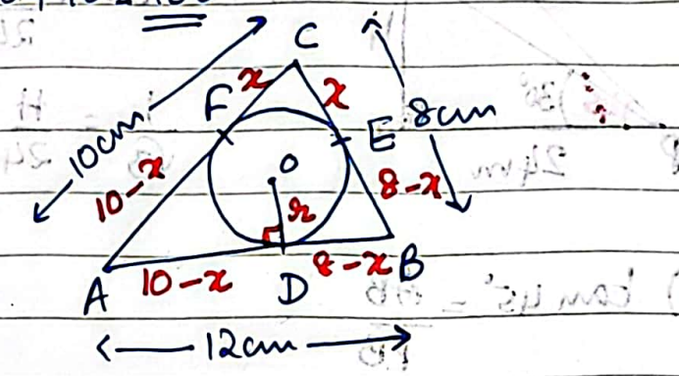
$AB = AD + BD = 12$

$\Rightarrow 10 - x + 8 - x = 12$

$18 - 2x = 12$

$2x = 6$

$x = 3\,cm$



$\therefore AD = 7\,cm$ //

$BE = 5\,cm$ //

(b) $\text{area}(\triangle OAB) = \frac{1}{2} \times AB \times r = \frac{1}{2} \times 12 \times 4 = \underline{\underline{24\,cm^2}}$

(c) Perimeter $(\triangle ABC) = AB + BC + AC = 12 + 8 + 10 = \underline{\underline{30\,cm}}$

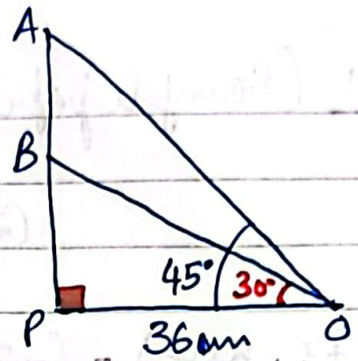
(d) $CF = x = 3\,cm$ //

IX (i) $\cos 30° = \frac{OP}{OB}$

$\Rightarrow \frac{\sqrt{3}}{2} = \frac{36}{OB}$

$OB = \frac{36 \times 2 \times \sqrt{3}}{\sqrt{3} \times \sqrt{3}}$

$= 24\sqrt{3} = 24 \times 1.732 = 41.568\,m$ (approx.)



(ii) $\tan 45° = \frac{AP}{OP}$

$\Rightarrow 1 = \frac{AP}{36}$

$\therefore AP = 36m$

$\tan 30° = \frac{BP}{OP}$

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{BP}{36}$

$\therefore BP = \frac{36}{\sqrt{3}} = 12\sqrt{3}\,m$

$\therefore AB = AP - BP = 36 - 12\sqrt{3} = 12(3-\sqrt{3}) = 12(3-1.732)$

$= 12 \times 1.268 = 15.216m$

(iii) $\text{ara}(\Delta OPB) = \frac{1}{2} \times OP \times PB = \frac{1}{2} \times 36 \times 12\sqrt{3}$

$= 216 \times 1.732 = \underline{374.112\,m^2}$

(iv) $AP = \underline{36cm}$

X $a_4 = 1800 \Rightarrow a + 3d = 1800 \rightarrow (1)$

$a_8 = 2600 \Rightarrow a + 7d = 2600 \rightarrow (2)$

$(1) - (2) \Rightarrow -4d = -800$

$d = 200$

From eq: (1),

$a + 600 = 1800$

$a = 1200$

(i) 1200 cars

(ii) $a_{12} = a + 11d = 1200 + 11 \times 200 = 1200 + 2200 = 3400$ cars

(iii) $S_{10} = \frac{n}{2}[2a + (n-1)d] = 5[2400 + 9 \times 200] = 5[2400 + 1800]$

$= 5 \times 4200 = 21000$ cars

(iv) $S_n = 31200$

$\Rightarrow \frac{n}{2}[2a + (n-1)d] = 31200$

$\Rightarrow \frac{n}{2}[2400 + (n-1)200] = 31200$

$\Rightarrow \frac{n}{2}[2400 + 200n - 200] = 31200$

$\Rightarrow n(2200 + 200n) = 62400$

$\Rightarrow 200n^2 + 2200n - 62400 = 0$

$\Rightarrow n^2 + 11n - 312 = 0$

$\Rightarrow (n+24)(n-13) = 0$

$n = 24, 13$

$\therefore$ No. of years = 13