CBSE Sample Paper (2018-19)

Class-10 Mathematics

Time allowed: 3Hours

Max. Marks: 80

General Instructions:

i. All the questions are compulsory.
ii. The questions paper consists of 30 questions divided into 4 sections A, B, C and D.
iii. Section A comprises 6 questions of 1 mark each. Section B comprises 6 questions of 2 marks each. Section C comprises 10 questions of 3 marks each. Section D comprises 8 questions of 4 marks each.
iv. There is no overall choice. However, an internal choice has been provided in two questions of 1 mark each, two questions of 2 marks each, four questions of 3 marks each and three questions of 4 marks each. You have to attempt only one of the alternatives in all such questions.
v. Use of calculators is not permitted.

Section - A

1. Find the value of a, for which point $P\left(\frac{a}{3}, 2\right)$ is the mid-point of the line segment joining the points Q(-5, 4) and R(-1,0).
2. Find the value of k, for which one root of the quadratic equation kx^2 -14x+8 = 0 is 2.

OR

Find the value(s) of k for which the equation x^2 + 5kx + 16 = 0 has real and equal roots.

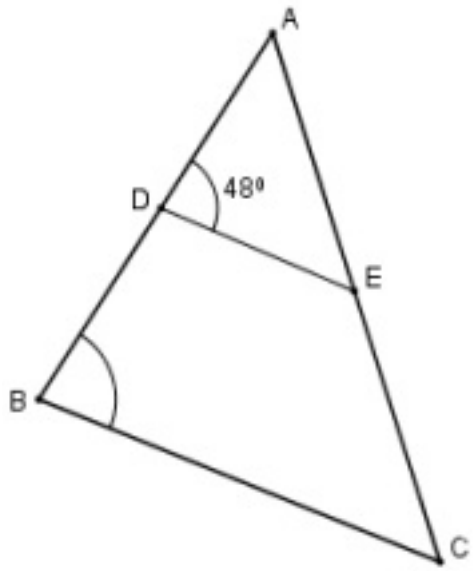
3. Write the value of $\cot^2\theta - \frac{1}{\sin^2\theta}$.

OR

If $\sin\theta = \cos\theta$, then find the value of $2\tan\theta + \cos^2\theta$.

4. If nth term of an A.P. is (2n + 1), what is the sum of its first three terms?

5. In figure if AD = 6cm, DB = 9cm, AE = 8cm and EC = 12cm and $\angle ADE = 48^\circ$. Find $\angle ABC$



6. After how many decimal places will the decimal expansion of $\frac{23}{2^4 \times 5^3}$ terminate?

Section - B

7. The HCF and LCM of two numbers are 9 and 360 respectively. If one number is 45, find the other number.

OR

Show that $7 - \sqrt{5}$ is irrational, give that $\sqrt{5}$ is irrational.

8. Find the 20th term from the last term of the AP 3, 8, 13, ..., 253

OR

If 7 times the 7th term of an A.P is equal to 11 times its 11th term, find its 18th term.

9. Find the coordinates of the point P which divides the join of A(-2, 5) and B(3, -5) in the ratio 2:3
10. A card is drawn at random from a well shuffled deck of 52 cards. Find the probability of getting neither a red card nor a queen.
11. Two dice are thrown at the same time and the product of numbers appearing on them is noted. Find the probability that the product is a prime number.
12. For what value of p will the following pair of linear equations have infinitely many solutions

(p - 3)x + 3y = p

px + py = 12

Section-C

13. Use Euclid's Division Algorithm to find the HCF of 726 and 275.
14. Find the zeroes of the following polynomial:
    $5\sqrt{5}x^2 + 30x + 8\sqrt{5}$
15. Places A and B are 80 km apart from each other on a highway. A car starts from A and another from B at the same time. If they move in same direction they meet in 8 hours and if they move towards each other they meet in 1 hour 20 minutes. Find the speed of cars.
16. The points A(1,-2) , B(2,3), C (k,2) and D(-4,-3) are the vertices of a parallelogram. Find the value of k.

OR

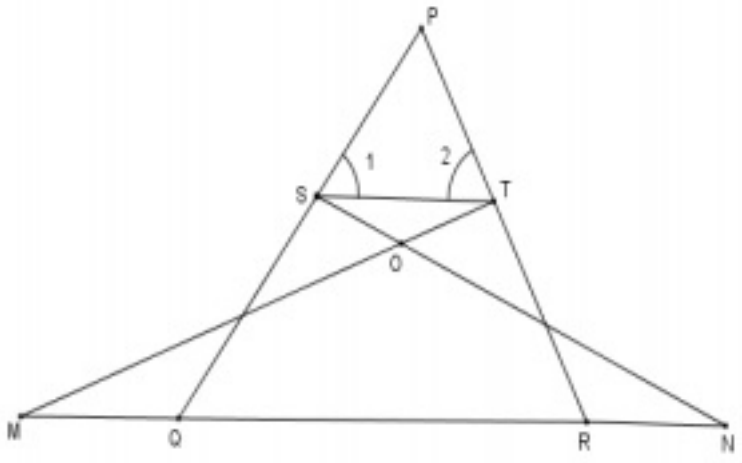
Find the value of k for which the points (3k - 1, k - 2), (k, k - 7) and (k - 1, k - 2) are collinear.

17. Prove that $\cot\theta - \tan\theta = \frac{2\cos^2\theta - 1}{\sin\theta\cos\theta}$

OR

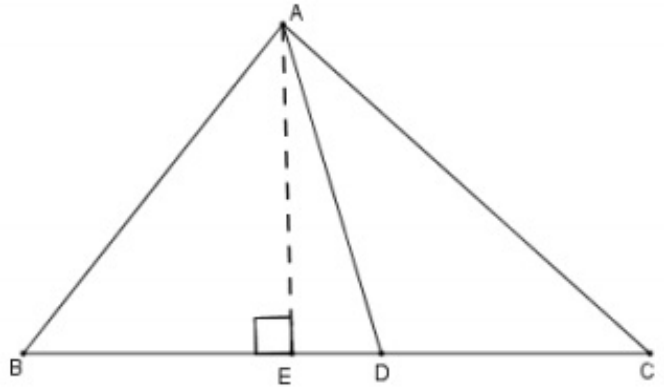
Prove that $\sin\theta(1 + \tan\theta) + \cos\theta(1 + \cos\theta) = \sec\theta + \operatorname{cosec}\theta$

18. The radii of two concentric circles are 13 cm and 8 cm. AB is a diameter of the bigger circle and BD is a tangent to the smaller circle touching it at D and intersecting the larger circle at P on producing. Find the length of AP.
19. In figure $\angle 1 = \angle 2$ and $\Delta NSQ \cong \Delta MTR$, then prove that $\Delta PTS \sim \Delta PRQ$



OR

In ΔABC, if AD is the median, then show that $AB^2 + AC^2 = 2(AD^2 + BD^2)$



20. Find the area of the minor segment of a circle of radius 42cm, if length of the corresponding arc is 44cm.
21. Water is flowing at the rate of 15 km per hour through a pipe of diameter 14cm into a rectangular tank which is 50 m long and 44 m wide. Find the time in which the level of water in the tank will rise by 21 cm.

OR

A solid sphere of radius 3 cm is melted and then recast into small spherical balls each of diameter 0.6cm. Find the number of balls.

22. The table shows the daily expenditure on grocery of 25 households in a locality. Find the modal daily expenditure on grocery by a suitable method.

Daily Expenditure (In Rs.)	100-150	150-200	200-250	250-300	300-350
No of households	4	5	12	2	2

Section - D

23. A train takes 2 hours less for a journey of 300km if its speed is increased by 5 km/h from its usual speed. Find the usual speed of the train.

OR

Solve for x : $\frac{1}{(a+b+x)} = \frac{1}{a} + \frac{1}{b} + \frac{1}{x}, [a \neq 0, b \neq 0, x \neq 0, x \neq -(a+b)]$

24. An AP consists of 50 terms of which 3rd term is 12 and the last term is 106. Find the 29th term.

25. Prove that in a right angled triangle square of the hypotenuse is equal to sum of the squares of other two sides.
26. Draw a ΔABC with sides 6cm, 8cm and 9 cm and then construct a triangle similar to ΔABC whose sides are $\frac{3}{5}$ of the corresponding sides of ΔABC.
27. A man on the top of a vertical observation tower observes a car moving at a uniform speed coming directly towards it. If it takes 12 minutes for the angle of depression to change from 30^o to 45^o , how long will the car take to reach the observation tower from this point?

OR

The angle of elevation of a cloud from a point 60 m above the surface of the water of a lake is 300 and the angle of depression of its shadow from the same point in water of lake is 600. Find the height of the cloud from the surface of water.

28. The median of the following data is 525. Find the values of x and y if the total frequency is 100.

Class Interval	Frequency
0-100	2
100 - 200	5
200 - 300	x
300 - 400	12
400 - 500	17
500 - 600	20
600 - 700	Y
700 - 800	9
800 - 900	7
900 - 1000	4

OR

The following data indicates the marks of 53 students in Mathematics.

Marks	Number of students
0 - 10	5
10 - 20	3
20 - 30	4
30 - 40	3
40 - 50	4
50 - 60	4
60 - 70	7
70 - 80	9
80 - 90	7
90 - 100	8

Draw less than type give for the data above and hence find the median.

29. The radii of circular ends of a bucket of height 24 cm are 15 cm and 5 cm. Find the area of its curved surface.
30. If $\sec\theta + \tan\theta = p$, then find the value of $\text{cosec}\theta$.

CBSE Sample Paper (2018-19)

Class-10 Mathematics

Solutions

1. $\left(\frac{-5+(-1)}{2}, \frac{4+0}{2}\right) = \left(\frac{a}{3}, 2\right)$
   $\frac{a}{3} = \frac{-6}{2} \Rightarrow a = -9$
2. 4K - 28 + 8 = 0
   K = 5

OR

For roots to be real and equal, b^2 - 4ac = 0
$\Rightarrow (5k)^2 - 4 \times 1 \times 16 = 0$
$k = \pm\frac{8}{5}$

3. $\cot^2\theta - \frac{1}{\sin^2\theta} = \cot^2\theta - \cos ec^2\theta$
   = -1

OR

$\sin\theta = \cos\theta \ \theta = 45^\circ$
$\therefore 2\tan\theta + \cos^2\theta = 2 + \frac{1}{2} = \frac{5}{2}$

4. a_1 = 3, a_3 = 7
   $s_3 = \frac{3}{2}(3+7) = 15$
5. $\frac{AD}{DB} = \frac{AE}{EC}$ $DE \parallel BC$
   $\Rightarrow \angle ADE = \angle ABC = 48^\circ$
6. 4 places
7. HCF $\times$ LCM = Product of two numbers
   $9 \times 360 = 45 \times 2^{nd}$ number
   2^{nd} number = 72

OR

Let us assume, to the contrary that $7 - \sqrt{5}$ is irrational
$7 - \sqrt{5} = \frac{p}{q}$, Where p & q are co-prime and $q \neq 0$

$= \sqrt{5} = \frac{7q-p}{q}$

$\frac{7q-p}{q}$ is rational $= \sqrt{5}$ is rational which is a contradiction

Hence $7 - \sqrt{5}$ is irrational

8. 20^{th} term from the end = l - (n - 1)d

$= 253 - 19 \times 5$

= 158

OR

$7a_7 = 11a_{11} \Rightarrow 7(a + 6d) = 11(a + 10d)$

$\Rightarrow a + 17d = 0 \therefore a_{18} = 0$

9. $X = \frac{6-6}{5} = 0$

$Y = \frac{-10+15}{5} = 1$

10. Probability of either a red card or a queen

$= \frac{26+2}{52} = \frac{28}{52}$

P(neither red car nor a queen) $= 1 - \frac{28}{52}$

$= \frac{24}{52}$ or $\frac{7}{13}$

11. Total number of outcomes = 36

Favourable outcomes are (1,2), (2,1), (1,3), (3,1), (1,5), (5,1) i.e. 6

Required probability $= \frac{6}{36}$ or $\frac{1}{6}$

12. For infinitely many solutions

$\frac{p-3}{p} = \frac{3}{p} = \frac{-p}{-12}$

$\Rightarrow p^2 - 3p = 3p$ or $12 \times 3 = p^2$

$\Rightarrow p^2 - 6p = 0$ or $p = \pm 6$

p = 0, 6

$\Rightarrow$ p = 6

13. By Euclid's Division lemma

$726 = 275 \times 2 + 176$

$275 = 176 \times 1 + 99$

$176 = 99 \times 1 + 77$

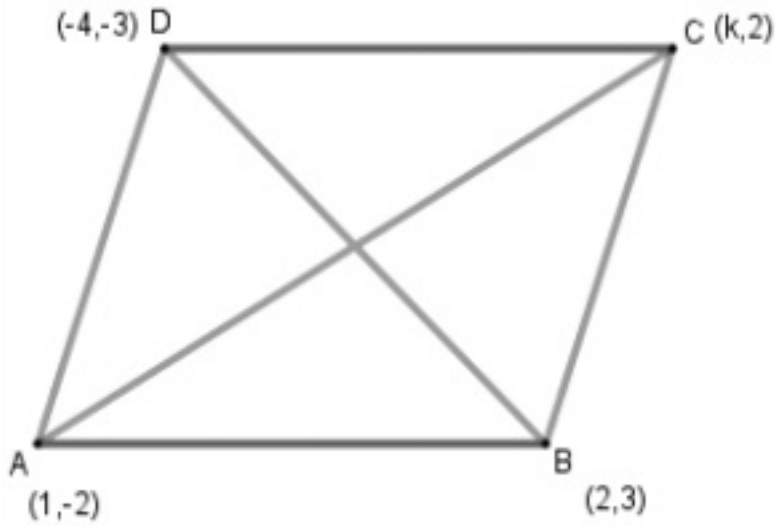
$99 = 77 \times 1 + 22$

$77 = 22 \times 3 + 11$

$22 = 11 \times 2 + 0$

HCF = 11

14. $5\sqrt{5}x^2 + 30x + 8\sqrt{5}$
$= 5\sqrt{5}x^2 + 20x + 10x + 8\sqrt{5}$
$= 5x(\sqrt{5}x + 4) + 2\sqrt{5}(\sqrt{5}x + 4)$
$= \left(\sqrt{5}x + 4\right)\left(5x + 2\sqrt{5}\right)$
Zeroes are $\frac{-4}{\sqrt{5}} = \frac{\{4\sqrt{5}\}}{5}$ and $\frac{-2\sqrt{5}}{5}$
15. Let the speed of car at A be x km/h
And the speed of car at B be y km/h
Case1: 8x - 8y = 80
x - y = 10
Case2: $\frac{4}{3}X + \frac{4}{3}Y = 80$
x + y = 60
on solving x= 35 and y = 25
Hence, speed of cars at A and B are 35 km/h and 25 km/h respectively.
16.



Diagonals of parallelogram bisect each other
$\Rightarrow$ midpoint of AC = midpoint of BD
$\Rightarrow \left(\frac{1+k}{2}, \frac{-2+2}{2}\right) = \left(\frac{-4+2}{2}, \frac{-3+3}{2}\right)$
$\Rightarrow \frac{1+k}{2} = \frac{-2}{2}$
$\Rightarrow$ K = -3

OR

For collinearity of the points, area of the triangle formed by given Points is zero.

$\Rightarrow \frac{1}{2}\{(3k-1)(k-7+k+2)+k(-k-2-k+2)+(k-1)(k-2-k+7)\}=0$

$\Rightarrow$ {(3k - 1) (2k - 5) -2k2 + 5k - 5} = 0

$\Rightarrow 4k^2 - 12k = 0$

$\Rightarrow k = 0, 3$

17. LHS $= \cot\theta - \tan\theta$

$= \frac{\cos\theta}{\sin\theta} - \frac{\sin\theta}{\cos\theta}$

$= \frac{\cos^2\theta - \sin^2\theta}{\sin\theta - \cos\theta}$

$= \frac{\cos^2\theta - \sin^2\theta}{\sin\theta\cos\theta} = \frac{2\cos^2\theta - 1}{\sin\theta\cos\theta} = RHS$

OR

LHS $= \sin\theta(1+\tan\theta) + \cos\theta(1+\cot\theta)$

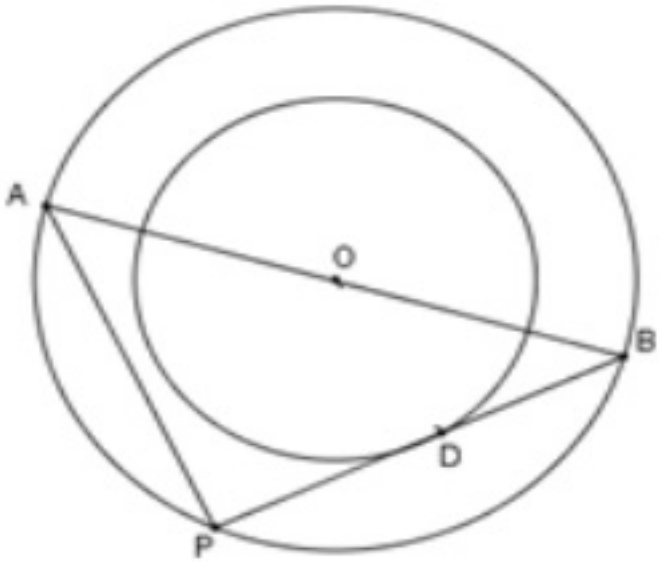
$= \sin\theta\left(1+\frac{\sin\theta}{\cos\theta}\right) + \cos\theta\left(1+\frac{\cos\theta}{\sin\theta}\right)$

$= \sin\theta\left(\frac{\cos\theta+\sin\theta}{\cos\theta}\right) + \cos\theta\left(\frac{\sin\theta+\cos\theta}{\sin\theta}\right)$

$= (\cos\theta+\sin\theta)\left(\frac{\sin^2\theta+\cos^2\theta}{\cos\theta\sin\theta}\right)$

$= \frac{\cos\theta+\sin\theta}{\cos\theta\sin\theta} = \cos ec\theta + \sec\theta = RHS$

18.



$\angle APB = 90^\circ$ (angle in semi-circle)

$\angle ODB = 90^\circ$ (radius is perpendicular to tangent)

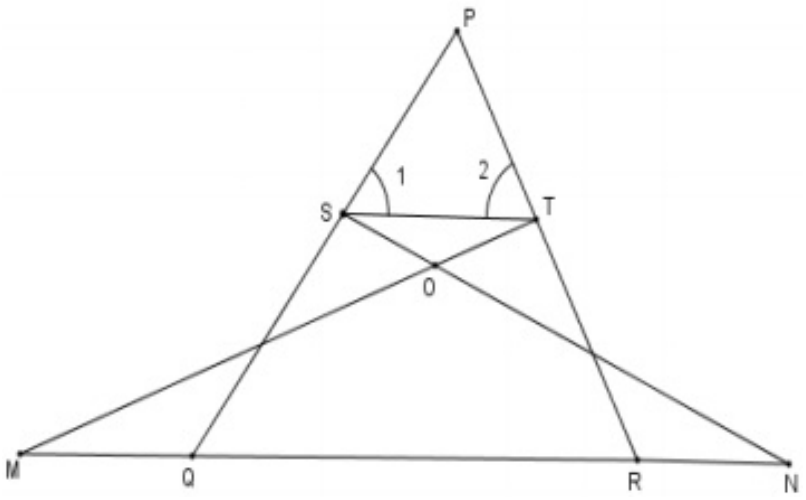
$\Delta ABP \sim \Delta OBD$

$\Rightarrow \frac{AB}{OB} = \frac{AP}{OD}$

$\Rightarrow \frac{26}{13} = \frac{AP}{8}$

$\Rightarrow AP = 16cm$

19.



$\angle 1 = \angle 2$

$\Rightarrow$ PT = PS ..... (i)

$\Delta NSQ \cong \Delta MTR$

$\Rightarrow \angle NQS = \angle MRT$

$\Rightarrow \angle PQR = \angle PRQ$

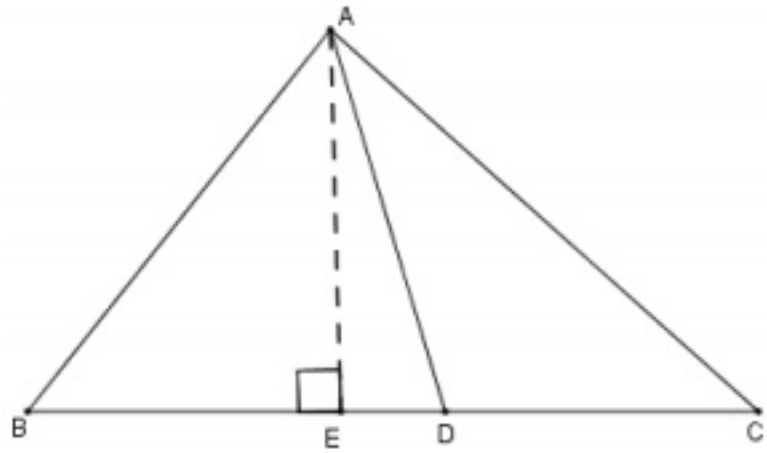
$\Rightarrow PR = PQ$ ..... (ii)

From (i) and (ii)

$\frac{PT}{PR} = \frac{PS}{PQ}$

Also, $\angle TPS = \angle RPQ$ (common)$\Rightarrow \Delta PTS \sim \Delta PRQ$

OR



AD is median, So BD = DC.

$\left.\begin{aligned} AB^2 &= AE^2 + BE^2 \\ AC^2 &= AE^2 + EC^2 \end{aligned}\right\}$

Adding both,

$AB^2 + AC^2 = 2AE^2 + BE^2 + CE^2$

$= 2(AD^2 - ED^2)+(BD - ED)^2 + (DC + ED)^2$

$= 2AD^2 - 2ED^2 + BD^2 + ED^2 - 2BD.ED + DC^2 + ED^2 + 2CD.ED$

$= 2AD^2 + BD^2 + CD^2$

$= 2(AD^2 + BD^2)$

20. r = 42cm

$\frac{2\pi r\theta}{360^\circ} = 44$

$\theta = \frac{44\times360\times7}{2\times22\times42} = 60^\circ$

Area of minor segment = area of sector - area of corresponding triangle

$= \frac{\pi r^2\theta}{360^\circ} - \frac{\sqrt{3}}{4}r^2$

$= r^2\left[\frac{22}{7}\times\frac{60}{360} - \frac{\sqrt{3}}{4}\right]$

$= 42\times42\left[\frac{11}{21} - \frac{\sqrt{3}}{4}\right]$

$= 42\times42\times\left[\frac{44-21\sqrt{3}}{84}\right]$

$= 21\left(44 - 21\sqrt{3}\right)cm^2$

21. Volume of water flowing through pipe in 1 hour

$= \frac{22}{7}\times15\times1000\times\frac{7}{100}\times\frac{7}{100}$

$= 231m^3$

Volume of rectangular tank $50\times44\times\frac{21}{100}$

$= 22\times21m^3$

Time taken to flow $231m^3$ of water = 1hours

$\therefore$ Time taken to flow $22\times21m^3$ of water $= \frac{1}{231}\times22\times21 = 2hours$

OR

Number of balls $= \frac{volume\ of\ solid\ sphere}{volume\ of\ 1\ \ spherical\ ball}$

$= \frac{\frac{4}{3}\times\pi\times3\times3\times3}{\frac{4}{3}\times\pi\times0.3\times0.3\times0.3}$

= 1000

22. 200-250 is the modal class

$Mode = l + \frac{f_1-f_0}{2f_1-f_2}\times h$

$= 200 + \frac{12-5}{24-58-2} \times 50$

= 200 + 20.59 = Rs 220.59

23. Let the usual speed of the train be x km/h

$\frac{300}{x} - \frac{300}{x+5} = 2$

$\Rightarrow x^2 + 5x - 750 = 0$

$\Rightarrow (x + 30)(x - 25) = 0$

$\Rightarrow x = -30, 25$

$\therefore$ usual Speed of the train = 25km/h

OR

$\frac{1}{(a+b+x)} - \frac{1}{x} = \frac{1}{a} + \frac{1}{b}$

$\Rightarrow -ab = x^2 + (a + b)x$

$\Rightarrow x^2 + ax + bx + ab = 0$

$\Rightarrow (x + a) (x + b) = 0$

$\Rightarrow x = -a, -b$

24. n = 50, a_3 and a_{50} = 106

a + 2d = 12

a + 49d = 106

on solving, d = 2 and a = 8

a_{29} = a + 28d

$= 8 + 28 \times 2 = 64$

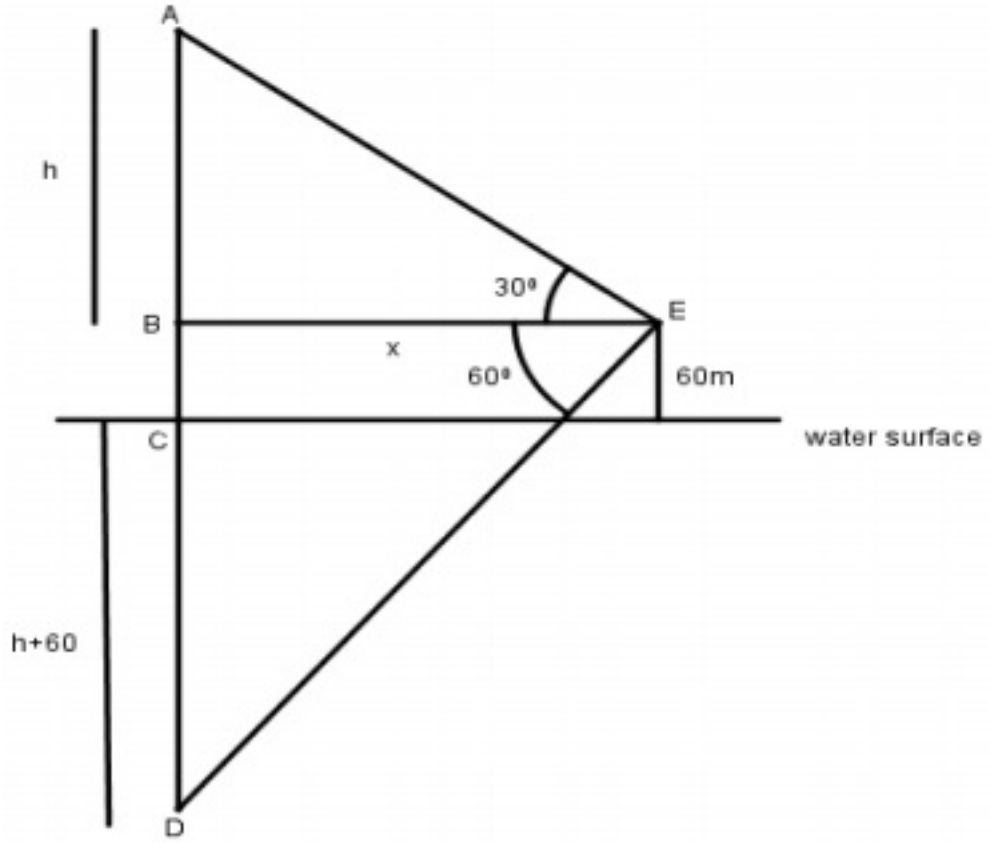
25. Correct given, To prove, figure and construction

Correct proof'

26. Correct construction of ΔABC

Correct construction of similar triangle

27.



Correct figure

Let the speed of car be x m/minutes

In ΔABC,

$\frac{h}{y} = \tan 45^\circ$

$\Rightarrow$ h = y

In ΔABD,

$\frac{h}{y+12x} = \tan 30^\circ$

$\Rightarrow h\sqrt{3} = y + 12x$

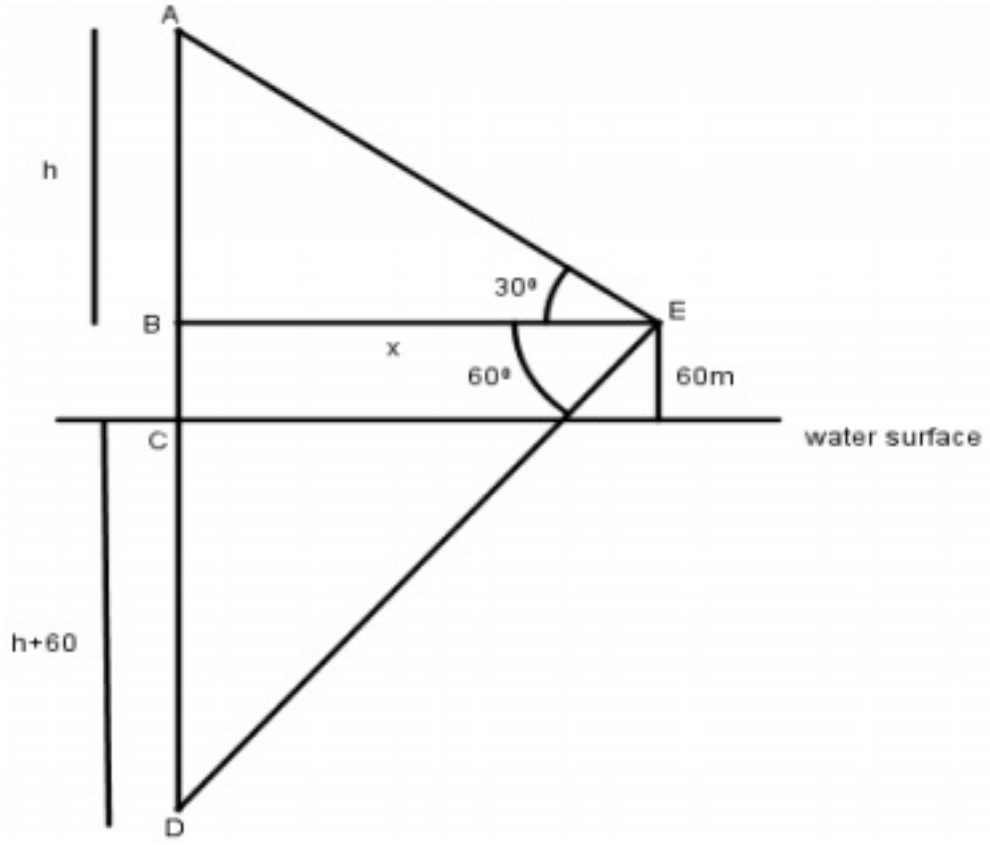
$y\sqrt{3} - y = 12x$

$\Rightarrow y = \frac{12x}{\sqrt{3}-1} = \frac{12x(\sqrt{3}+1)}{2}$

$y = 6x\left(\sqrt{3}+1\right)$

Time taken from C to B $= 6\left(\sqrt{3}+1\right)$ minutes

OR



Correct figure

In ΔABE,

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

$\Rightarrow x = h\sqrt{3}$

In ΔBDE,

$\frac{h+60+60}{x} = \tan 60^\circ$

$h + 120 = x\sqrt{3}$

$h + 120 = h\sqrt{3} \times \sqrt{3}$

2h = 120

h = 60

$\therefore$ height of cloud from surface of water = (60 + 60)m = 120m

28.

Class Interval	Frequency	cf
0-100	2	2
100-200	5	7
200-300	x	7+x
300-400	12	19+x

400-500	17	36+x
500-600	20	56+x
600-700	y	56+x+y1
700-800	9	65+x+ y
800-900	7	72+x+y
900-100	4	76 + x + y

N = 100 $\Rightarrow$ 76 + x + y = 100

$\Rightarrow$ x + y = 24 ..... (i)

Median = 525 $\Rightarrow$ 500 - 600 is median class

60-80 is the median class

Median $= l + \frac{\frac{n}{2} - cf}{f} \times h$

$\Rightarrow 500 + \left(\frac{50+36-x}{20}\right) \times 100 = 525$

$\Rightarrow (14 - x) \times 5 = 25$

$\Rightarrow$ x = 9

$\Rightarrow$ from (1), y = 5.96

OR

Marks	Number of students	cf
0-10	5	5
10-20	3	8
20-30	4	12
30-40	3	15
40-50	3	18
50-60	4	22
60-70	7	29
70-80	9	38

80-90	7	45
90-100	8	53

Correct table

Drawing correct Ogive

median=64

29. r_1 = 15cm, r_2 = 5cm

h = 24cm

$l = \sqrt{h^2 + (r_1 - r_2)^2}$

$= \sqrt{24^2 + 10^2} = 26cm$

Curved surface area of bucket $= \pi(r_1 + r_2)l$

$= \frac{22}{7} \times (15 + 5) \times 26$

$= \frac{22 \times 20 \times 26}{7}$

$= \frac{11440}{7} cm^2$ or 1634.3cm^2

30. $\sec\theta + \tan\theta = p$

$\frac{1}{\cos\theta} + \frac{\sin\theta}{\cos\theta} = p$

$1 + \sin\theta = p\cos\theta$

$= p\sqrt{1 - \sin^2\theta}$

$(1 + \sin\theta)^2 = p^2(1 - \sin^2\theta)$

$1 + \sin^2\theta + 2\sin\theta = p^2(1 - \sin^2) = 0$

D = 4 - 4(1 + p2)(1 - p2)

= 4 - 4(1 - p^4) = 4p^4

$\text{Sin}\,\theta = \frac{-2 \pm \sqrt{4p^4}}{2(1+p^2)} = \frac{-1 \pm p^2}{(1+p^2)}$

$= \frac{p^2-1}{p^2+1}, -1$

$\therefore \text{Cos}\,ec\theta = \frac{p^2+1}{p^2-1}, -1$