KARNATAKA SECONDARY EDUCATION EXAMINATION BOARD

MODEL KEY ANSWERS

1. **Answer: (B) 13**
2. **Answer : (C)** $\frac{5}{2X7}$
   Explanation: since the denominator has not in the form of $2^m x 5^n$.
3. **Answer :** (A) X-Y=5
4. **Answer: (D)x^2-4x+5**.
5. **Answer: (C) (3, 2)**
6. **Answer: (B) 6cm.**
7. **Option (a)** 40^0.
8. **Option (b)** $\prod r(r+l)$ **cm²**
9. 1
10. If a pair of linear equations is consistent, then the lines are intersecting or coincident i.e they will have **at least one solution or infinitely many solutions**.
11. Degree is 4.
12. Δ>0, then Roots are real and distinct.
13. Volume $V=\frac{\pi}{3}h(r_1^2+r_2^2+r_1r_2)$
14. 0.25
15. $\frac{8}{11}$
16. 5 units
17. Consider the given equation.
    2x+y=7 …….. (1)
    x−y=2 ……… (2)
    On adding both equation (1) and (2), we get
    3x=9
    x=3
    Now, put the value of x in equation (1), we get
    6+y=7
    y=1
    Hence, the value of x is 3 and y is 1
18.
    Solution:
    7, 11, 15, ……… here a=7, d=4 we have to find a_{30}=a+29d
    =7+29x4
    =7+116

= 123

19. Solution

Here a= 1, b=4 & c=5

We have x= $\frac{-b\pm\sqrt{b^2-4ac}}{2a} = \frac{-4\pm\sqrt{4^2-4x1x(5)}}{2x1} = \frac{-4\pm\sqrt{16-20}}{2} = \frac{-4\pm\sqrt{-4}}{2}$

x=$\frac{-4+\sqrt{-4}}{2}$ or x=$\frac{-4-\sqrt{-4}}{2}$

OR

Given equation is $2x^2+x-4=0$

By using completing the square method, $x^2+\frac{1}{2}x-\frac{4}{2}=0$

$(x+\frac{1}{2})^2-(\frac{1}{4})^2-(\frac{4}{2})=0$

$(x+\frac{1}{4})^2-(\frac{1}{16})-(\frac{4}{2})=0$

$(x+\frac{1}{4})^2=\frac{33}{16}$

$(x+\frac{1}{4})=\sqrt{\frac{33}{16}}$

$x=-\frac{1}{4}\pm\sqrt{\frac{33}{16}}$

$x=-\frac{1}{4}\pm\frac{\sqrt{33}}{4}$

$x=-\frac{1}{4}+\frac{\sqrt{33}}{4}$ or $x=-\frac{1}{4}-\frac{\sqrt{33}}{4}$

20. Let us assume that 5+√3 is a rational number with p and q as co-prime integer and q ≠ 0

⇒ 5+√3 = p / q

⇒ √3 = p / q - 5

⇒ √3 = p / q - 5

⇒ p / q – 5 is a rational number

However, √3 is in irrational number

This leads to a contradiction that 5+√3 is a rational number wrong

Hence 5+√3 is an irrational number.

OR

Let the three numbers are 12, 15, 21

By prime factorization

12 = 2 x 2 x 3

15 = 3 x 5

21 = 3 x 7

∴ HCF of 12, 15 and 21 = 3

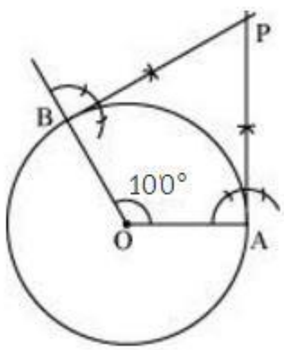
and LCM = 2 x 2 x 3 x 5 x 7 = 420.

21. Solution:

We have $\sin P = \frac{RQ}{PR} = \frac{1}{\sqrt{2}}$

$\text{Sin}(90\text{-}R) = \text{Cos}R = \frac{QR}{PR} = \frac{1}{\sqrt{2}}$

22. Solution:



23. Possible outcomes are, (6+5+4) = 15 balls

i)not green (6+5)= 11

The probability of not green balls is = $\frac{11}{15}$

ii)red (6)= 6

The probability of red balls is = $\frac{6}{15}$

24. Solution: To prove : $BC^2=4AD^2$.

By Pythagoras theorem for triangle ABC,

$BC^2=AC^2+AB^2$ -------→ (1)

In triangle ABD & triangle ADC

$AB^2= AD^2+BD^2$ & $AC^2= AD^2+DC^2$ By adding these we get

$AB^2+ AC^2 =AD^2+BD^2 + AD^2+DC^2$

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

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

According to corollary, AD=BD.DC ---→ AD=BD.BD = BD^2.

$AB^2+ AC^2 = 2AD^2+2\ AD^2$ ----→ (2)

Put equation (2) in (1) we get $BC^2=4AD^2$.

25.

$$p(x)=x^3-3x^2+5x-3$$
$$q(x)=x^2-2$$

$$\begin{array}{r|l}
 & \quad\; x-3 \\ \hline
x^2-2 & x^3-3x^2+5x-3 \\
 & x^3 \qquad\; -2x \\
 & - \qquad\;\; + \\ \hline
 & \quad -3x^2+7x-3 \\
 & \quad -3x^2 \qquad +6 \\
 & \quad + \qquad\quad - \\ \hline
 & \qquad\qquad 7x-9 \\ \hline
\end{array}$$

26. Solution: Let breadth of rectangle be b and length be l
area of rectangle will be l*b and perimeter is 2(l+ b)
according to given condition 2(l+b) = 32 and l x b = 60
l x b = 60
therefore l = 60/b
2(l + b) = 32
l + b = 16
60/b + b = 16
b^2+60/b = 16
b^2+60 = 16b
b^2−16b+60 = 0
b^2−10b-6b+60=0
b(b-10)-6(b-10)=0
b=10 or b=6
if b=6, then l=10
so length and breadth of the rectangle is 10m and 6m respectively.

OR

Given: distance = 360km
Condition (1)let speed be ‘x’ and time be t hours
s=d/t
x=360/t

t=360/x -----------.(1)

Condition (2) let speed be 'x+10' and time be t-3 hours

t-3=360/x+10 ---------.(2)

from (1) and (2)

$\frac{360}{x}$- $\frac{360}{x+10}$= 3 $\quad after\ convertion\ this, we\ get$

x^2+10x-1200=0

x=30

speed of the bus is 30km/hr

27. Solution :

We have to find mean

C.I	f	x	fx
0-20	12	10	120
20-40	14	30	420
40-60	8	50	400
60-80	6	70	420
80-100	10	90	900
	N=50		2260

Mean = $\frac{\sum fx}{N}$ = $\frac{\sum 2260}{50}$ = 45.5

OR

C.I	f	fc
0-10	5	5
10-20	8	13
20-30	20	33
30-40	15	48
40-50	7	55
50-60	5	60
	N=60	

Data is $\frac{N}{2}$=30, LRL=20, f=20, fc=13 and h=10

Median = LRL+$\left\{\frac{\frac{N}{2}-fc}{f}\right\}$xh

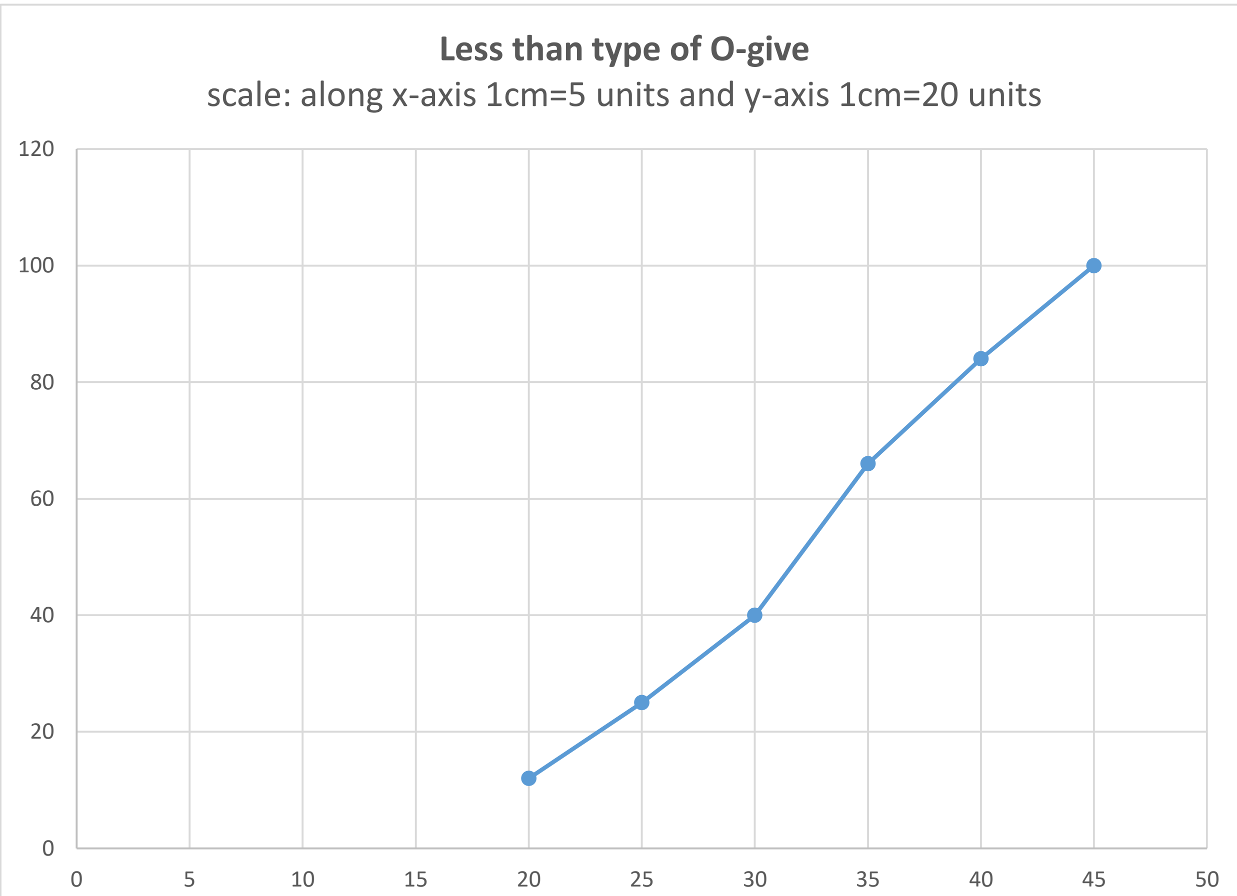
=20+$\left\{\frac{30-13}{20}\right\}$x10

=20+8.5

Median = 28.5

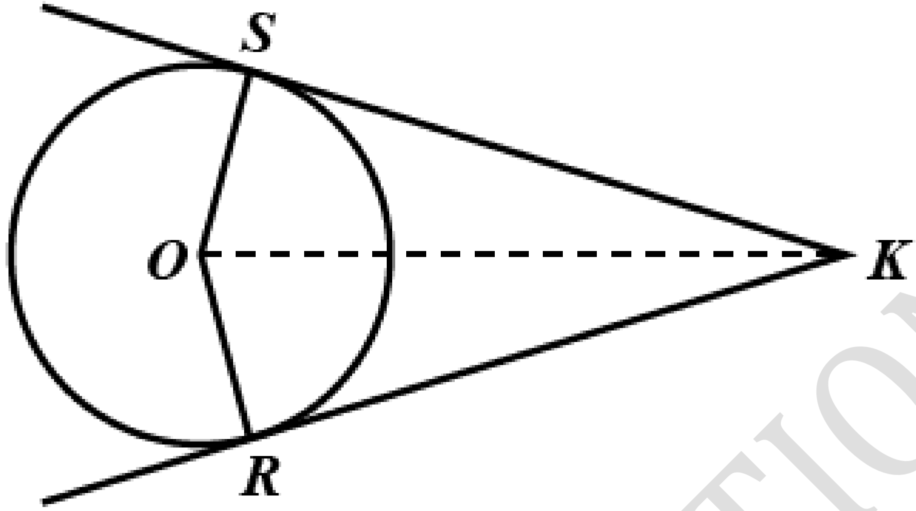
28. Solution:

C.I	Frequency	Coordinates
<20	12	(20, 12)
<25	25	(25, 25)
<30	40	(30, 40)
<35	66	(35, 66)
<40	84	(40, 84)
<45	100	(45, 100)



29.

Solution:



To prove that: SK=RK

Proof:

Normal and tangent at a point on the circle are perpendicular to each other.

$\angle OSK = \angle ORK = 90o$

Using Pythagoras Theorem,

$OK^2 = OS^2 + SK^2$............(i)

$OK^2 = OR^2 + RK^2$............(ii)

Subtracting (ii) from (i),

$OK^2 - OK^2 = OS^2 + SK^2 - OR^2 - RK^2$

$\Rightarrow SK^2 = RK^2$ $\because OS = OR$

SK=RK

30.

$$\text{LHS} = (\operatorname{cosec} A - \sin A)(\sec A - \cos A)$$

$$= \left(\operatorname{cosec} A - \frac{1}{\operatorname{cosec} A}\right)\left(\sec A - \frac{1}{\sec A}\right)$$

$$= \left(\frac{\operatorname{cosec}^2 A - 1}{\operatorname{cosec} A}\right)\left(\frac{\sec^2 A - 1}{\sec A}\right)$$

$$= \frac{\cot^2 A}{\operatorname{cosec} A} \times \frac{\tan^2 A}{\sec A}$$

$$= \frac{\sin A}{\tan^2 A} \times \cos A \tan^2 A = \sin A \cos A$$

$$\text{RHS} = \frac{1}{\tan A + \cot A} = \frac{1}{\frac{\sin A}{\cos A} + \frac{\cos A}{\sin A}}$$

OR

$$\frac{\sin 30° + \tan 45° - \operatorname{cosec} 60°}{\sec 30° + \cos 60° + \cot 45°}$$

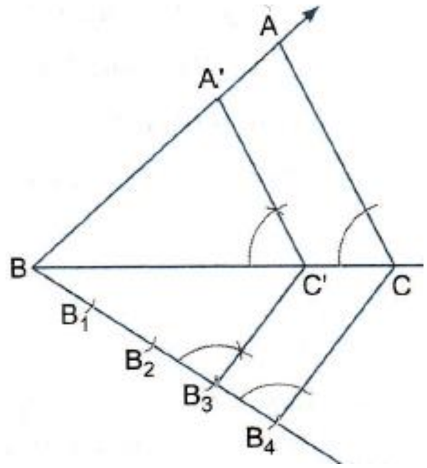
$$= \frac{\frac{1}{2} + 1 - \frac{2}{\sqrt{3}}}{\frac{2}{\sqrt{3}} + \frac{1}{2} + 1} = \frac{\frac{\sqrt{3} + 2\sqrt{3} - 4}{2\sqrt{3}}}{\frac{4 + \sqrt{3} + 2\sqrt{3}}{2\sqrt{3}}}$$

$$= \frac{\sqrt{3} + 2\sqrt{3} - 4}{4 + \sqrt{3} + 2\sqrt{3}} = \frac{3\sqrt{3} - 4}{4 + 3\sqrt{3}} \times \frac{4 - 3\sqrt{3}}{4 - 3\sqrt{3}}$$

$$= \frac{12\sqrt{3} - 27 - 16 + 12\sqrt{3}}{-11} = \frac{24\sqrt{3} - 43}{-11}$$

$$= \mathbf{\frac{43 - 24\sqrt{3}}{11}}.$$

31.



32. Solution:

Length of the arc is given= 11cm

$\frac{\theta}{360}$x2∏r=11

$\frac{1}{4}$x2x$\frac{22}{7}$x r=11 then $r = 7cm$

Given OP=4cm and we have OB=7cm

Then area of the shaded region = area of quadrant – area of triangle OPB

= $\frac{1}{4}$ x ∏r2 - $\frac{1}{2}$x Base x height

= $\frac{77}{2}$ - $\frac{1}{2}$x 7 x 7

= 38.5- 14

= 24.5cm^2.

33. Given points are (-1, 7) (4, -3) in the ratio of 2:3

By section formula (x, y) = $\left[\frac{mx2+nx1}{m+n}, \frac{my2+ny1}{m+n}\right]$

= $\left[\frac{2x4+3(-1)}{2+3}, \frac{2(-3)+3x7}{2+3}\right]$

= $\left[\frac{5}{5}, \frac{15}{5}\right]$

= (1, 3)

OR

Area of the triangle is A=$\frac{1}{2}$ {x1(y2 − y3) + x2(y3 − y1) + x3(y1 − y2)}

= $\frac{1}{2}$ {7(1 − 4) + 5(4 − (−2)) + 1(−2 − 1)}

= $\frac{1}{2}$ (30-24)

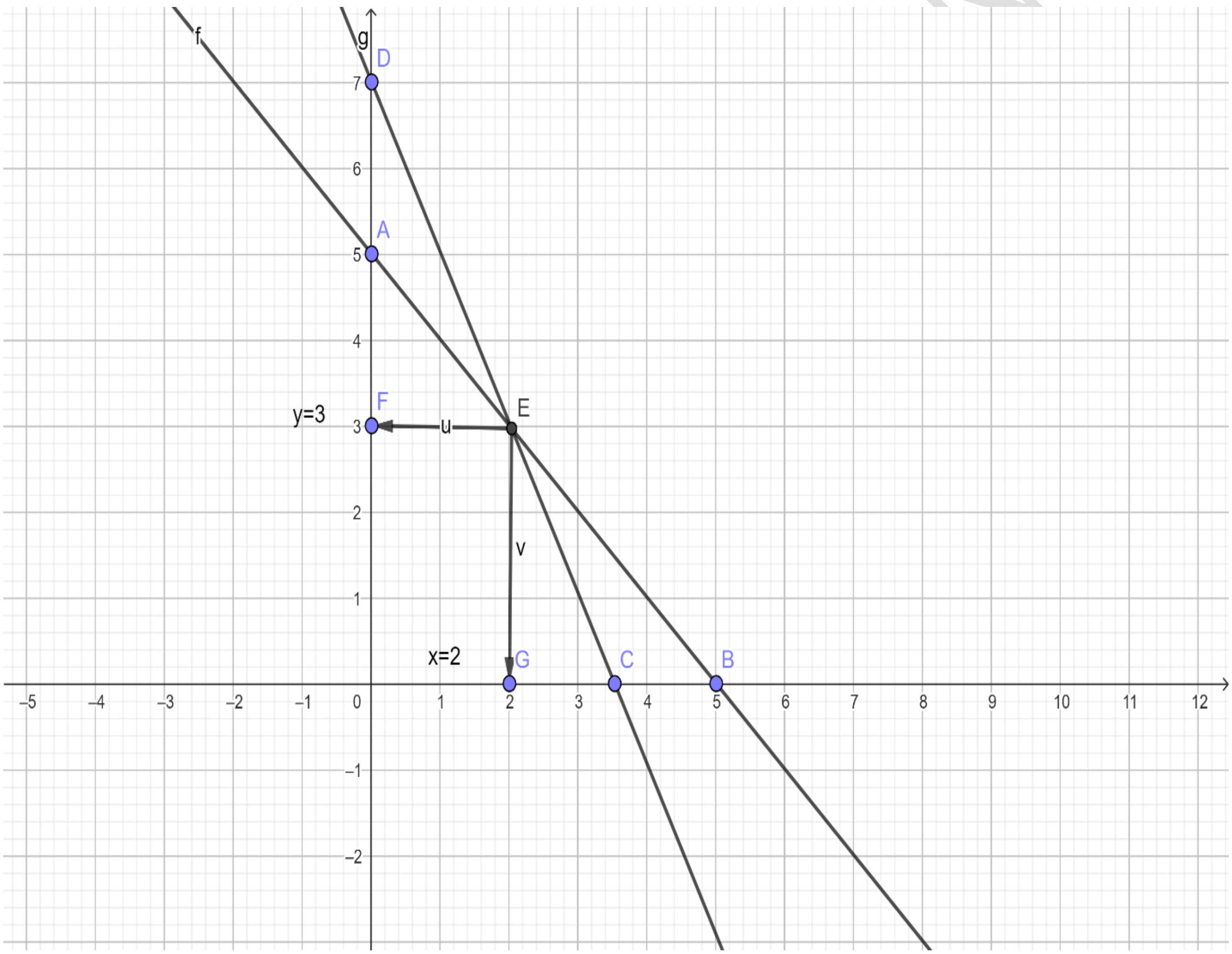
= 3 sq units.

34. Given equations are x+y=5 and 2x+y=7

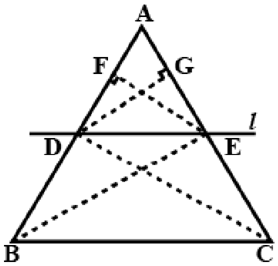
x	0	5
y	5	0

2x+y=7

x	0	3.5
y	7	0



35. Basic Proportionality Theorem states that, "if a line is parallel to a side of a triangle which intersects the other sides into two distinct points, then the line divides those sides of the triangle in proportion".



Let **ABC** be the triangle.
The line **l** parallel to **BC** intersect **AB** at **D** and **AC** at **E**.
To prove: $\frac{DB}{AD}=\frac{CB}{AE}$
Join **BE,CD**
Draw **EF⊥AB**, **DG⊥CA**
Since **EF⊥AB**,
EF is the height of triangles **ADE** and **DBE**
Area of **△ADE=1/2×** base **×** height=**1/2xAD×EF**
Area of **△DBE=1/2×DB×EF**

$\frac{areaof\,\Delta DBE}{areaof\Delta ADE}=\frac{1/2\times DB\times EF}{1/2xAD\times EF}\times=\frac{DB}{AD}$ ....(1)

Similarly,

$\frac{areaof\,\Delta DBE}{areaof\Delta ADE}=\frac{1/2\times CB\times EF}{1/2xAE\times EF}\times=\frac{CB}{AE}$ ....(2)

But **ΔDBE** and **ΔDCE** are the same base **DE** and between the same parallel straight line **BC** and **DE**.
Area of **ΔDBE**= area of **ΔDCE** ....(3)
From (1), (2) and (3), we have

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

Hence proved.

36. Solution:

In triangle ABC,

Tan**θ**=$\frac{AB}{BC}$

Tan60=$\frac{AB}{BC}$

$\sqrt{3}=\frac{AB}{BC}$

$AB=\sqrt{3}$BC-------→(1)

In triangle ABP, Tan**θ**=$\frac{AB}{BP}$

Tan30=$\frac{AB}{BP}$

$$\frac{1}{\sqrt{3}} = \frac{AB}{BP} \Longrightarrow AB = \frac{BP}{\sqrt{3}} \text{--------}\to(2)$$

From (1) and (2)

3BC=BP

From figure, CP=BP-BC

CP=3BC-BC

CP=2BC

Hence the proof

37. We know $S_n - S_{n-1} = a_n$

$222-187 = a_n$

$35 = a_n$

$S_n = \frac{n}{2}(a+an)$

$222 = \frac{n}{2}(2+35)$ (a=2 and an=35 we found)

444=nx37

n=12

an=a+(n-1)d

35=2+11d

33=11d

d=3

then A.P is 2, 5, 8……..

OR

Given $a_{12}=37$, n=12 according to problem, $a_6+a_7=41$

a+11d=37 ---→(1) 2a+11d=41---→(2)

subtract above equations we get a=4 and d=3

A.P is 4, 7, 10………

$Sn = \frac{n}{2}(2a+(n-1)d)$

$S_{12}=6\ (2x4+(11)3)$

$S_{12}=246.$

38. Given : Cylinder r=6cm, h=14cm

Sphere r=2.1cm

We have to find Volume of the memento, then enter volume is given by

V=Volume of cylinder + volume of sphere

$= \prod r^2h + \frac{4}{3}\prod r^3.$

$= \prod(\ r^2h + r^3)$

$= \frac{22}{7}(36x14+9.261)$

$= \frac{22}{7}(513.261)$

$= \frac{11291.742}{7}$

Required metal is = $1613.106cm^3$

Surface area of the sphere = $4\prod r^2$.

$= 4x\frac{22}{7}x\ 2.1x2.1$

$= 55.44$

Cost is 0.1x55.44 = **₹5.5**

ಕರ್ನಾಟಕ ಶಾಲಾ ಪರೀಕ್ಷೆ ಮತ್ತು ಮೌಲ್ಯನಿರ್ಣಯ ಮಂಡಲಿ

ಮಲ್ಲೇಶ್ವರಂ, ಬೆಂಗಳೂರು–560003

KARNATAKA SCHOOL EXAMINATION AND ASSESSMENT BOARD

Malleshwaram, Bengaluru-560003

S.S.L.C. MODEL QUESTION PAPER 2022-23

Subject : MATHEMATICS

Medium : English

Time : 3 hours 15 minutes **Subject Code : 81E**

Max. Marks : 80

CCE-RF

Regular Fresh

General Instructions to the Candidate :

1. This question paper consists of objective and subjective types of 38 questions.

2. This question paper has been sealed by reverse jacket. You have to cut on the right side to open the paper at the time of commencement of the examination. Check whether all the pages of the question paper are intact.

3. Follow the instructions given against both the objective and subjective types of questions.

4. Figures in the right hand margin indicate maximum marks for the questions.

5. The maximum time to answer the paper is given at the top of the question paper. It includes 15 minutes for reading the question paper.

I. Four alternatives are given for each of the following questions/ incomplete statements. Choose the correct alternative and write the complete answer along with its letter of alphabet.

[8 x 1 = 8]

1. If the n^{th} term of an arithmetic progression is $a_n = 3n+1$, then the 4^{th} term of the progression is

   (A) 10 (B) 13 (C) 11 (D) 12

2. The rational number having a non-terminating and repeating decimal expansion in the following is

   (A) $\frac{1}{5^2}$ (B) $\frac{7}{2^2 \times 5}$ (C) $\frac{5}{2 \times 7}$ (D) $\frac{1}{2^3}$

3. In a class, "the number of boys (x) is 5 more than the number of girls (y)." The linear equation form of this statement is

   (A) $x - y = 5$ (B) $x = 5y$

   (C) $y - x = 5$ (D) $x + y = 5$

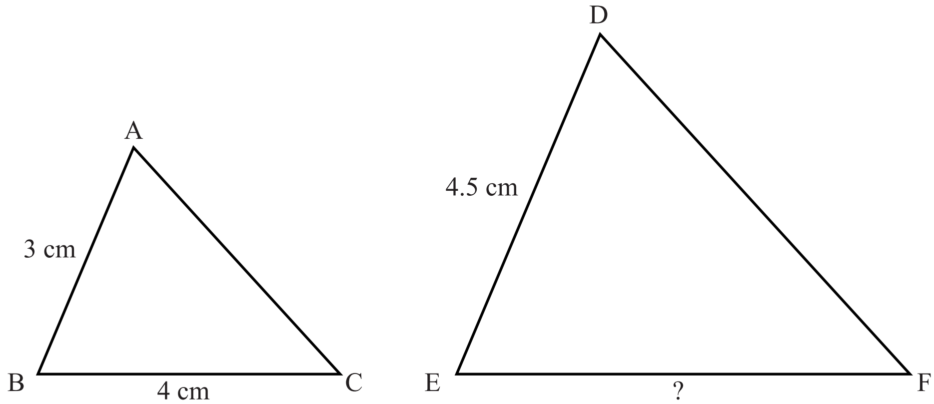
4. The quadratic polynomial whose sum and product of zeroes are 4 and 5 respectively is

   (A) $p(x) = x^2-4x-5$ (B) $p(x) = x+4x-5$

   (C) $p(x) = x^2-5x+4$ (D) $p(x) = x^2-4x+5$

5. The coordinates of the midpoint of the line segment joining the points (4, 3) and (2, 1) is

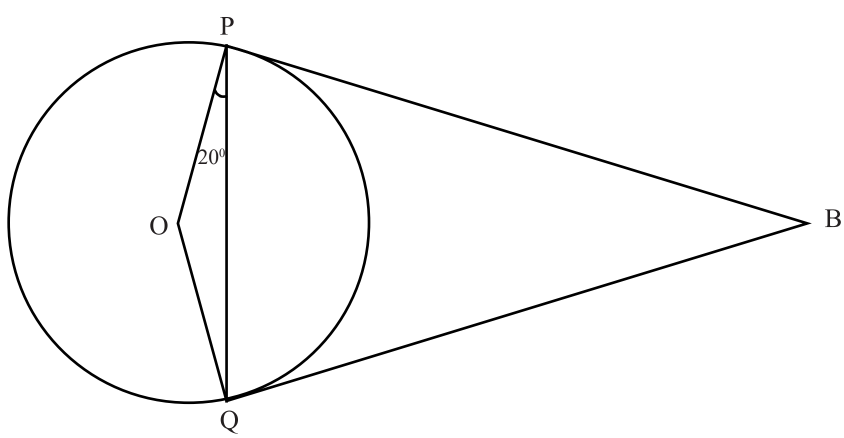
   (A) (2, 3) (B) (2, 2) (C) (3, 2) (D) (1, 1)

6. 

In the figure $\triangle ABC \sim \triangle DEF$. If AB=3cm, BC= 4cm and DE = 4.5cm, then the measure of EF is

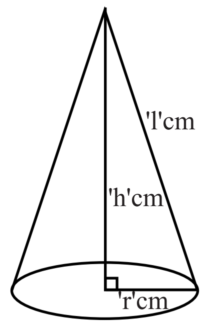
(A) 8 cm (B) 6 cm (C) 7 cm (D) 6.5 cm

7. In the figure, BP and BQ are the tangents to the circle with centre 'O'. If $\angle OPQ = 20°$, then the measure of $\angle PBQ$ is



(A) 40° (B) 160° (C) 140° (D) 20°

8. The total surface area of the solid given in the figure is



(A) $A = \pi rl\ cm^2$ (B) $A = 2\pi rh\ cm^2$

(C) $A = \pi r(r+l)\ cm^2$ (D) $A = \pi r^2 l\ cm^2$

II. Answer the following questions **[8 x 1 = 8]**

9. Find the HCF of 7 and 11.

10. How many solutions do the pair of linear equations has, if the lines represented by them are coincident?

11. Write the degree of the polynomial $p(x) = x^2+2x^3-5x^4+6$?

12. Find the discriminant of the quadratic equation $x^2-2x-3=0$.

13. Write the formula to find the volume of the frustum of a cone, if the radii of its circular bases are 'r_1' and 'r_2' and its height is 'h'.

14. If the probability of raining on a particular day is 0.75, then find the probability of not raining on the same day.

15. If the ratio of the areas of two similar triangles is 64 : 121, then find the ratio of their corresponding sides.

16. Find the distance between the origin and the point (3, 4).

III. Answer the following questions. **[8x2=16]**

17. Solve the given pair of linear equations.

$2x+y = 7$

$x-y = 2$

18. Find the 30^{th} term of the arithmetic progression 7, 11, 15 .... using formula.

19. Find the roots of the quadratic equation $x^2+4x+5=0$, using the 'quadratic formula'.

OR

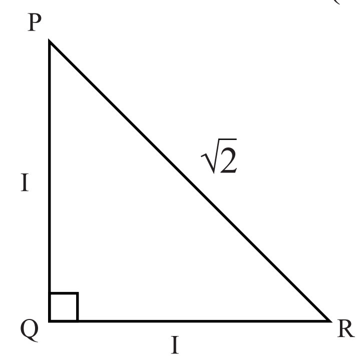
Find the roots of the quadratic equation $2x^2+x-4=0$ by the method of completing the square.

20. Prove that $5+\sqrt{3}$ is an irrational number.

OR

Find the LCM of 12, 15 and 21 by the method of prime factorization.

21. In the figure, write the value of sinP and sin (90°-R).



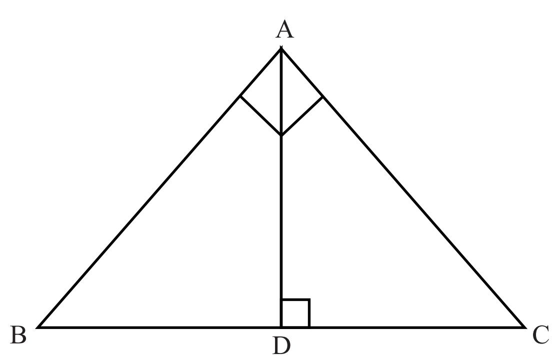
22. Construct a pair of tangents to the circle of radius 3.5cm, which are inclined to each other at an angle of 80°.

23. There are 6 red, 5 blue and 4 green balls in a box. A ball is drawn at random from the box. What is the probability that the ball drawn is

(i) not green

(ii) red

24. In the figure, ABC is a right angled triangle and $\angle BAC = 90°$. If $AD \perp BC$ and BD=DC then prove that $BC^2 = 4AD^2$.



IV. Answer the following questions **[9x3=27]**

25. Divide the polynomial $p(x) = x^3-3x^2+5x-3$ by the polynomial $g(x) = x^2-2$ and find the quotient q(x) and remainder r(x).

26. The area and perimeter of a rectangular field are $60m^2$ and 32m respectively. Find the length and breadth of the field.

OR

A bus travels 360 km distance with uniform speed. If the speed of the bus had been 10km/h more, it would have taken 3 hours less for the same journey. Find the speed of the bus.

27. Find the 'mean' for the following grouped data.

Class-Interval	Frequency
0-20	12
20-40	14
40-60	8
60-80	6
80-100	10

OR

Find the 'median' for the following grouped data

Class-Interval	Frequency
0-10	5
10-20	8
20-30	20
30-40	15
40-50	7
50-60	5

28. A life insurance agent found the following data for distribution of age of 100 policy holders. Draw 'less than type' ogive for the given data.

Age (In years)	Number of policy holders (cumulative frequency)
Less than 20	12
Less than 25	25
Less than 30	40
Less than 35	66
Less than 40	84
Less than 45	100

29. Prove that "the lengths of tangents drawn from an external point to a circle are equal".

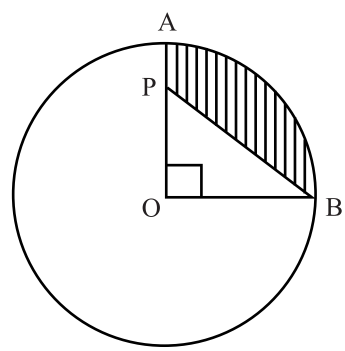
30. Prove that $(\text{cosec}A - \sin A)(\sec A - \cos A) = \dfrac{1}{\tan A + \cot A}$

OR

Find the value of $\dfrac{\sin 30^\circ + \tan 45^\circ - \text{cosec}\, 60^\circ}{\sec 30^\circ + \cos 60^\circ + \cot 45^\circ}$

31. Construct a triangle of sides 6cm, 8cm and 10cm. Then construct another triangle whose sides are $\frac{3}{4}$ times the corresponding sides of the given triangle.

32. In the figure, the length of the arc AB of the circle with centre 'O' is. 11cm. If OP=4cm then find the area of the shaded region.



33. Find the coordinates of the point which divides the line segment joining the points (-1,7) and (4,-3) in the ratio 2:3.

OR

Find the area of the triangle whose vertices are (7, -2), (5, 1) and (1, 4)

V. Answer the following questions. **[4x4=16]**

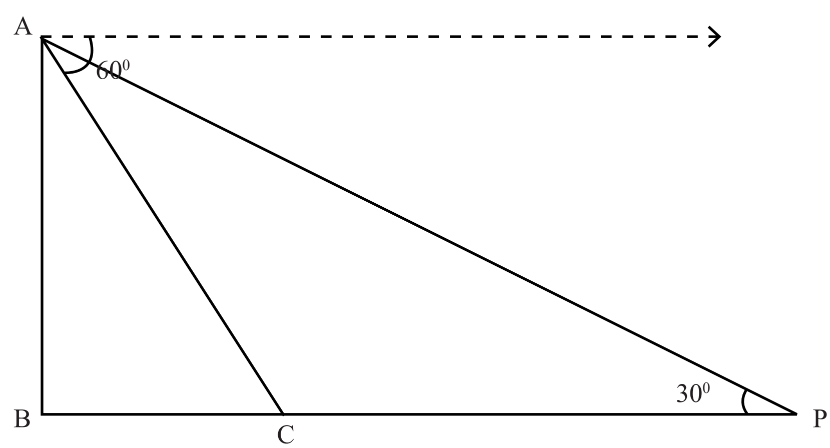
34. Find the solution of the given pair of linear equations by graphical method.

$x + y = 5$

$2x + y = 7$

35. State and prove 'Basic Proportionality Theorem' (Thales Theorem).

36. As observed from the top of a building standing vertically on the ground, the angle of depression of a point 'C' on the ground is 60°. From the foot (B) of the building when moved through point 'C' in a straight line and observe the top of the building, from point 'P', if the angle of elevation has to be 30^{O} (as shown in the figure) then show that the distance moved from 'C' to 'P' is twice the distance BC.



37. The sum of first 'n' terms of an arithmetic progression is 222 and sum of its first (n-1) terms is 187. If the first term of the progression is 2, then find the arithmetic progression.

OR

The last term of an arithmetic progression consisting of 12 terms is 37. If the sum of the two middle terms of the progression is 41, then find the arithmetic progression and also the sum of the terms of the arithmetic progression.

VI. Answer the following question. **[1x5=5]**

38. A metal memento has to be prepared by placing a solid sphere on a solid cylinder as shown in the figure. Find quantity of the metal required to prepare this memento, such that the radius of the cylinder is 6cm and its height is 14cm and the radius of the sphere is 2.1cm. And also calculate the cost of painting the surface of the sphere with golden colour at the rate of 10 paise per cm^2.