

ROLL NUMBER				
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SET	A
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**INDIAN SCHOOL MUSCAT  
HALF YEARLY EXAMINATION 2022  
MATHEMATICS (041)**



CLASS: X  
DATE: 18.09.22

TIME ALLOTTED: 3 HRS.  
MAXIMUM MARKS:80

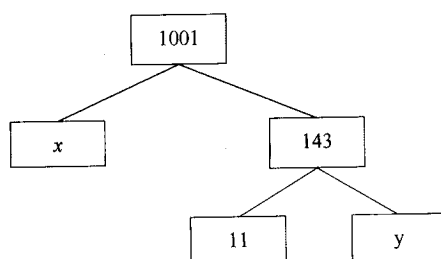
**GENERAL INSTRUCTIONS:**

- All questions must be attempted, however there are internal options given for 2mks, 3mks and 5mks questions.
- SECTION A has 20 questions of 1mark each.
- SECTION B has 8 questions of 2 marks each.
- SECTION C has 4 questions of 3 marks each.
- SECTION D has 3 case-based questions of 4 marks each.
- SECTION E has 4 questions of 5 marks each.
- Write your paper neatly without use of white ink.

**SECTION: A (20 x 1=20)**

**Choose the correct answer for each of the following:**

1. The value of  $x$  and  $y$  in the given figure are



- (a) 7,13                      (b) 13,7                      (c) 9,12                      (d) 12,9
2. For which value(s) of  $p$ , will the lines represented by the following pair of linear equations be parallel

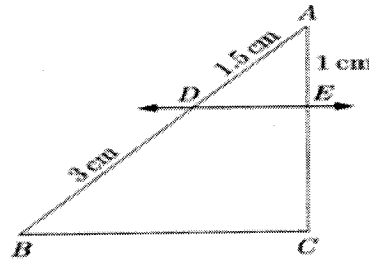
$$3x - y - 5 = 0$$

$$6x - 2y - p = 0$$

- (a) All are real values except 10                      (b) 10                      (c)  $\frac{5}{2}$                       (d)  $\frac{1}{2}$

3. In the given figure,  $DE \parallel BC$ . The value of  $EC$  is

(a) 1.5 cm (b) 3 cm  
(c) 2 cm (d) 1 cm



4. If  $\frac{1}{2}$  is the root of the equation  $x^2 + kx - \frac{5}{4} = 0$ , then the value of  $k$  is

(a) 2 (b) -2 (c)  $\frac{1}{4}$  (d)  $\frac{1}{2}$

5. If  $\cos A = \frac{4}{5}$ , then the value of  $\tan A$  is

(a)  $\frac{3}{5}$  (b)  $\frac{3}{4}$  (c)  $\frac{4}{3}$  (d)  $\frac{5}{3}$

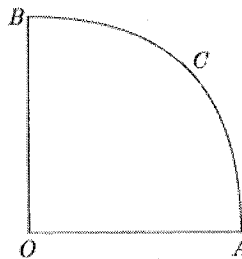
6. The area of circle that can be inscribed in a square of side 6cm is

(a)  $36\pi \text{ cm}^2$  (b)  $18\pi \text{ cm}^2$  (c)  $12\pi \text{ cm}^2$  (d)  $9\pi \text{ cm}^2$

7. The quadratic equation  $x^2 - 4x - 3\sqrt{2} = 0$  has

(a) Two distinct real roots (b) two equal real roots  
(c) no real roots (d) more than two real roots

8. In the given figure, OACB is quadrant of circle of radius 7cm. The perimeter of the quadrant is



(a) 11 cm (b) 18 cm (c) 25 cm (d) 36 cm

9. The pair of equations  $x = a$  and  $y = b$  graphically represents lines which are

(a) parallel (b) intersecting at (a, b) (c) coincident (d) intersecting at (a, b)

10. Given that  $\sin \alpha = \frac{\sqrt{3}}{2}$  and  $\cos \beta = 0$ , then the value of  $\beta - \alpha$  is

(a)  $0^\circ$  (b)  $90^\circ$  (c)  $60^\circ$  (d)  $30^\circ$

**State True or False. (4 x 1 = 4)**

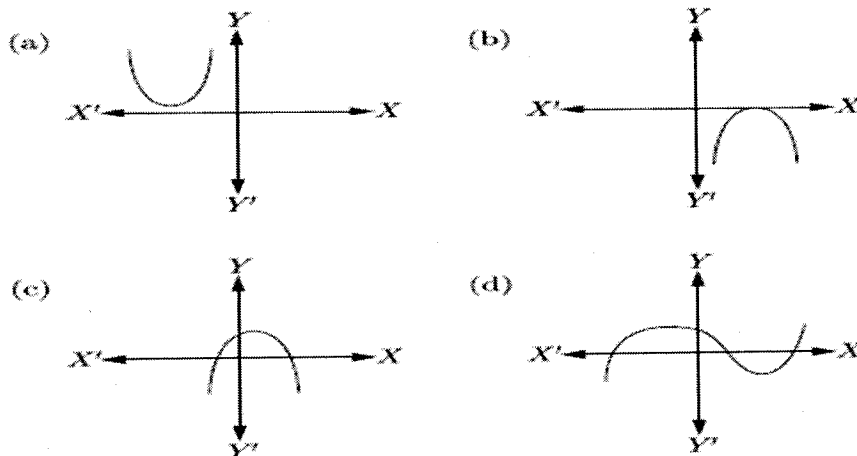
11. Two numbers can have 15 as HCF and 175 as LCM.  
12. All isosceles triangle are similar.

13. The value of  $\sin^2 60^\circ - 2 \tan 45^\circ - \cos^2 30^\circ$  is -2.
14. The radius of a circle whose circumference is equal to the sum of the circumferences of the two circles of diameters 36 cm and 20 cm is 56 cm.

**Fill in the blanks: (4 x 1 = 4)**

15. The positive root of  $\sqrt{3x^2 + 6} = 9$  is \_\_\_\_.
16. If  $\tan(A + B) = \sqrt{3}$  and  $\tan(A - B) = \frac{1}{\sqrt{3}}$ ,  $A > B$ , then the value of A is \_\_\_\_.
17. If the lines given by  $3x + 2ky = 2$  and  $2x + 5y + 1 = 0$  are parallel, then the value of k is \_\_\_\_.
18. The length of the minute hand of clock is 14 cm. The area swept by the minute hand in 15 minute is \_\_\_\_.

**With reference to the following graph answer Q19 and Q20: (2 x 1 = 2)**



19. Which graph from the above does not represent a quadratic polynomial?
20. Which graph from the above has two equal zeroes?

**SECTION B: (8 x 2 = 16)**

21. Prove that :  $2 + 5\sqrt{3}$  is an irrational number, given that  $\sqrt{3}$  is an irrational number.

**OR**

Three bells rings at intervals of 9, 12, 15 minutes respectively. If they initially rung together, after what time will they next ring together?

22. Solve the following system of linear equations by substitution method:

$$2x - y = 2$$

$$x + 3y = 15$$

23. Form a quadratic polynomial  $p(x)$  with 3 and  $-\frac{2}{5}$  as sum and product of zeroes, respectively.
24. If 2 is a root of the equation  $x^2 + kx + 12 = 0$  and the equation  $x^2 + kx + q = 0$  has equal

roots, find the value of  $q$ .

**OR**

Find the roots of the quadratic equation  $\sqrt{2}x^2 + 7x + 5\sqrt{2} = 0$ .

25. If  $\tan(3x + 30^\circ) = 1$  then find the value of  $x$ .

26. The perimeter of a sector of a circle with radius 6.5 cm is 31 cm, then find the area of the sector.

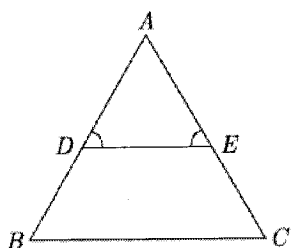
**OR**

A chord of a circle of radius 10 cm subtends a right angle at the center.

find the area of the minor segment. ( $\pi = 3.14$ )

27. If  $\sqrt{3}\sin\theta - \cos\theta = 0$  and  $0^\circ < \theta < 90^\circ$ , find the value of  $\theta$ .

28. In figure  $\angle D = \angle E$  and  $\frac{AD}{DB} = \frac{AE}{EC}$ , prove that  $\triangle BAC$  is an isosceles triangle.



**SECTION C: (4 x 3 = 12)**

29. Find HCF and LCM of 404 and 96 and verify that  $\text{HCF} \times \text{LCM} = \text{product of the two given numbers}$

30. Solve the equation for  $x$ :  $\frac{4}{x} - 3 = \frac{5}{2x + 3}$ ;  $x \neq 0, -\frac{3}{2}$

**OR**

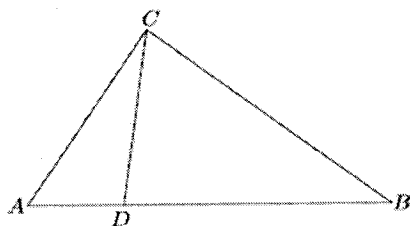
Solve for  $x$ :  $x^2 + 6x - (a^2 + 2a - 8) = 0$ .

31. If  $\tan A + \cot A = 2$ , then find the value of  $\tan^2 A + \cot^2 A$ .

**OR**

Prove that:  $\frac{\cos A}{1 - \tan A} + \frac{\sin A}{1 - \cot A} = \sin A + \cos A$

32. In the given figure, if  $\angle ACB = \angle CDA$ ,  $AC = 6$  cm and  $AD = 3$  cm, then find the length of  $AB$ .



OR

A 6 m high tree cast a 4m long shadow. At the same time, a flag pole cast a shadow 50 m long. How long is the flag pole?

**SECTION D: (3 x 4 =12)**  
**CASE BASED STUDY QUESTIONS**

33. "Tania is very intelligent in maths. She always try to relate the concept of maths in daily life. One day she plans to cross a river and want to know how far it is to the other side.

She takes measurement on her side of the river and make the drawing as shown.

- (i) Which similarity criterion is used in solving the above problem?

Consider the following statement:

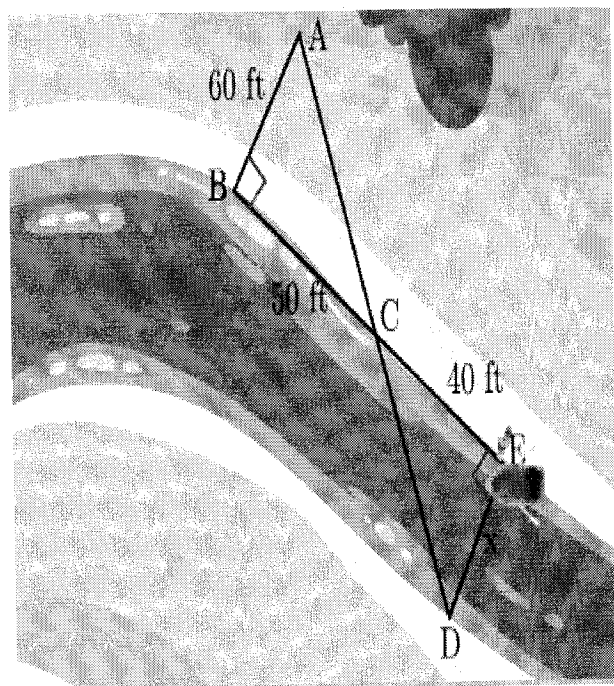
$$S_1: \angle ACB = \angle DCE$$

$$S_2: \angle BAC = \angle CDE$$

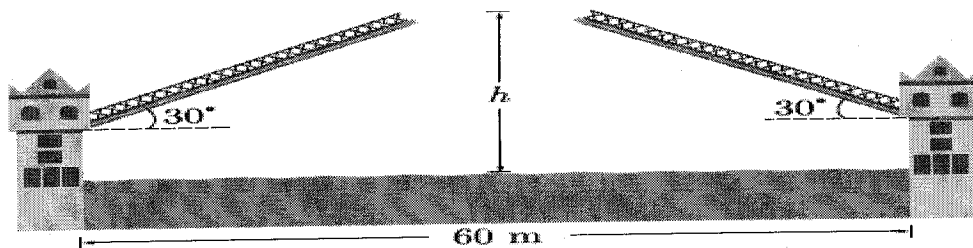
- (ii) Which of the above statement is/are correct?

(a)  $S_1$  and  $S_2$  both (b)  $S_1$  (c)  $S_2$  (d) None

- (iii) What is the distance 'x' across the river?



34. A drawbridge is a bridge that can be moved in order to stop or allow passage across it. Modern drawbridge are often built across large, busy waterway. They can be lifted to allow large ships to pass or lowered land vehicles or pedestrians to cross. A drawbridge is 60 metre long when stretched across a river. As shown in the figure, the two equal sections of the bridge can be rotated upward through an angle of  $30^\circ$ .



(i) If the water level is 5 metre below the closed bridge, find the height  $h$  between the end of a section and the water level when the bridge is fully open.

(ii) How far apart are the ends of the two sections when the bridge is fully opened, as shown in the figure?

35. **Luxury Cruise:** As India's first domestic cruise liner, Angriya has made many voyages on the Mumbai Goa sea route, along the pristine Konkan coast. It has given India and Indians a sense of pride and happiness, while introducing the travelers to coral diversity and royal sea fort along the way. Last year we enjoyed our summer vacation at Angriya Cruise. From Mumbai to Goa, with the current trip took 70 hr. After a few days of fun in the sun, the ship leaves for Mumbai, against the current with the return trip taking 82 hr. The distance from Goa to Mumbai is 1435 km.



- (i) Find the speed of the current.  
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#### SECTION E: (4 x 5 =20)

36. Sum of the areas of two squares is  $400 \text{ cm}^2$ . If the difference of their perimeters is 16 cm, find the sides of the squares.

OR

The denominator of a fraction is two more than its numerator. If the sum of the fraction and its reciprocal is  $\frac{34}{15}$ , find the fraction.

37. From the top of tower, 100 m high, a man observes two cars on the opposite sides of the tower with the angles of depression  $30^\circ$  and  $45^\circ$  respectively. Find the distance between the cars.

(use  $\sqrt{3} = 1.73$ )

38. Let ABC be a triangle, D and E be two points on side AB such that  $AD = BE$ . If  $DP \parallel BC$  and  $EQ \parallel AC$ , then prove  $PQ \parallel AB$ .

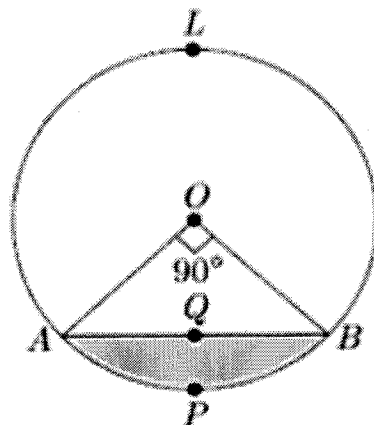
39. In the given figure, a chord AB of the circle with

centre O and radius 10 cm, that subtends a right angle at the centre of the circle. Find

(i) length of the minor arc

(ii) area of minor sector

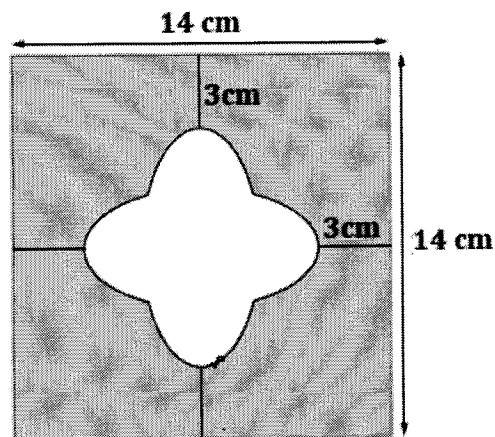
(iii) area of major segment. use ( $\pi = 3.14$ )



OR

In figure, find the area of the shaded region inside the square.

( $\pi = 3.14$ )



\*\*\*\*END OF THE QUESTION PAPER\*\*\*\*





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SET	B
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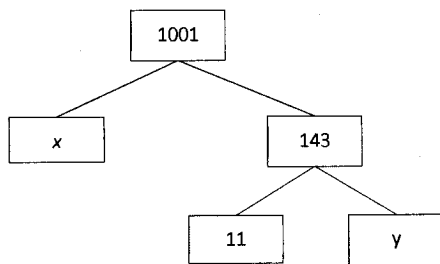
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**SECTION: A (20 x 1=20)**

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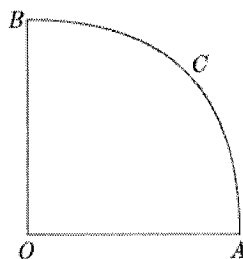
1. If  $\frac{1}{2}$  is the root of the equation  $x^2 + kx - \frac{5}{4} = 0$ , then the value of k is  
 (a) 2                      (b) -2                      (c)  $\frac{1}{4}$                       (d)  $\frac{1}{2}$
2. If  $\cos A = \frac{4}{5}$ , then the value of  $\tan A$  is  
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3. The quadratic equation  $x^2 - 4x - 3\sqrt{2} = 0$  has  
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4. For which value(s) of  $p$ , will the lines represented by the following pair of linear equations be parallel  
 $3x - y - 5 = 0$   
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 (a) All are real values except 10                      (b) 10                      (c)  $\frac{5}{2}$                       (d)  $\frac{1}{2}$

5. The value of  $x$  and  $y$  in the given figure are

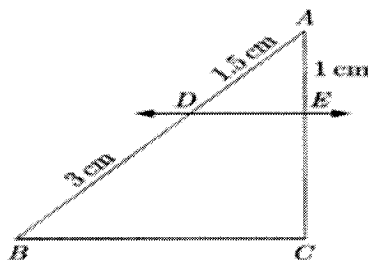


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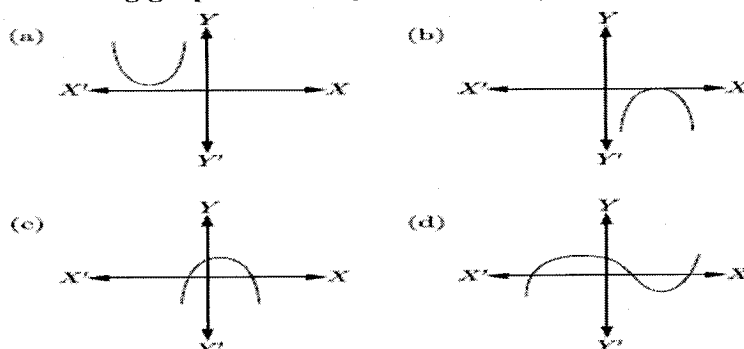
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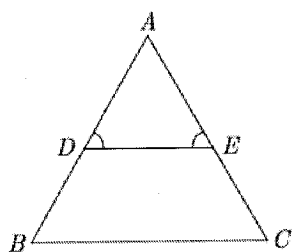
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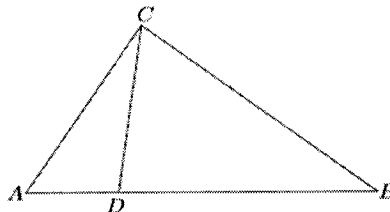
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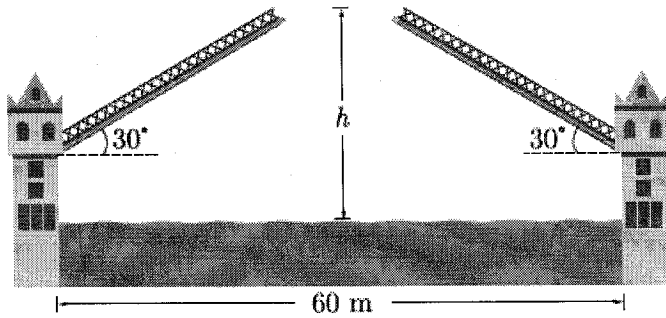
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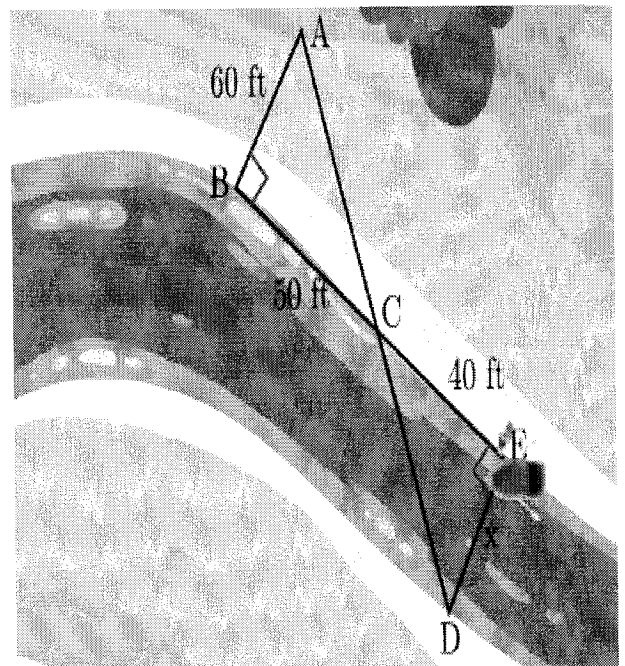
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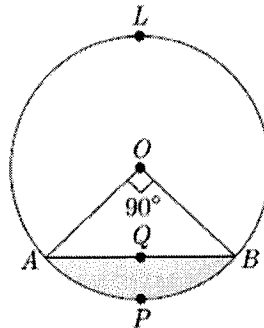
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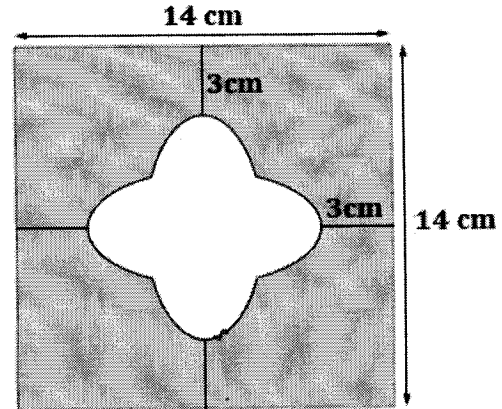


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- (i) length of the minor arc  
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**OR**

In figure,  
find the area of the shaded region ( $\pi = 3.14$ )



38. Sum of the areas of two squares is  $400 \text{ cm}^2$ . If the difference of their perimeters is 16 cm, find the sides of the squares.

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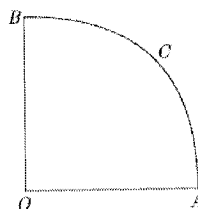
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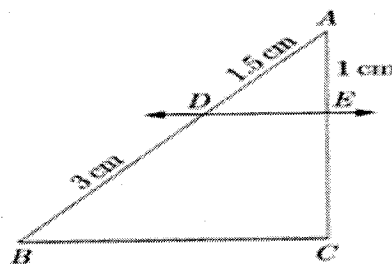
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a) Two distinct real roots (b) two equal real roots (c) no real roots (d) more than two real roots
2. The pair of equations  $x = a$  and  $y = b$  graphically represents lines which are  
a) parallel (b) intersecting at (b, a) (c) coincident (d) intersecting at (a, b)
3. In the given figure, OACB is quadrant of circle of radius 7cm. The perimeter of the quadrant is



- 11cm      (b) 18cm      (c) 25cm      (d) 36cm

4. In the given figure,  $DE \parallel BC$ . The value of EC is

- (a) 1.5 cm                      (b) 3 cm  
(c) 2 cm                        (d) 1 cm



5. If  $\frac{1}{2}$  is the root of the equation  $x^2 + kx - \frac{5}{4} = 0$ , then the value of  $k$  is

- 2                      (b) -2                      (c)  $\frac{1}{4}$                       (d)  $\frac{1}{2}$

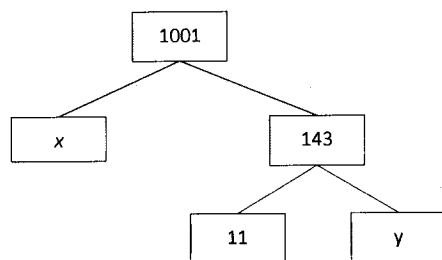
6. Given that  $\sin \alpha = \frac{\sqrt{3}}{2}$  and  $\cos \beta = 0$ , then the value of  $\beta - \alpha$  is

- (a)  $0^\circ$                       (b)  $90^\circ$                       (c)  $60^\circ$                       (d)  $30^\circ$

7. If  $\cos A = \frac{4}{5}$ , then the value of  $\tan A$  is

- (a)  $\frac{3}{5}$                       (b)  $\frac{3}{4}$                       (c)  $\frac{4}{3}$                       (d)  $\frac{5}{3}$

8. The value of  $x$  and  $y$  in the given figure are



- (a) 7,13                      (b) 13,7                      (c) 9,12                      (d) 12,9

9. The area of circle that can be inscribed in a square of side 6cm is

- (a)  $36\pi \text{ cm}^2$                       (b)  $18\pi \text{ cm}^2$                       (c)  $12\pi \text{ cm}^2$                       (d)  $9\pi \text{ cm}^2$

10. For which value(s) of  $p$ , will the lines represented by the following pair of linear equations be parallel

$$3x - y - 5 = 0$$

$$6x - 2y - p = 0$$

- (a) All are real values except 10                      (b) 10                      (c)  $\frac{5}{2}$                       (d)  $\frac{1}{2}$

**State True or False. (4 x 1 = 4)**

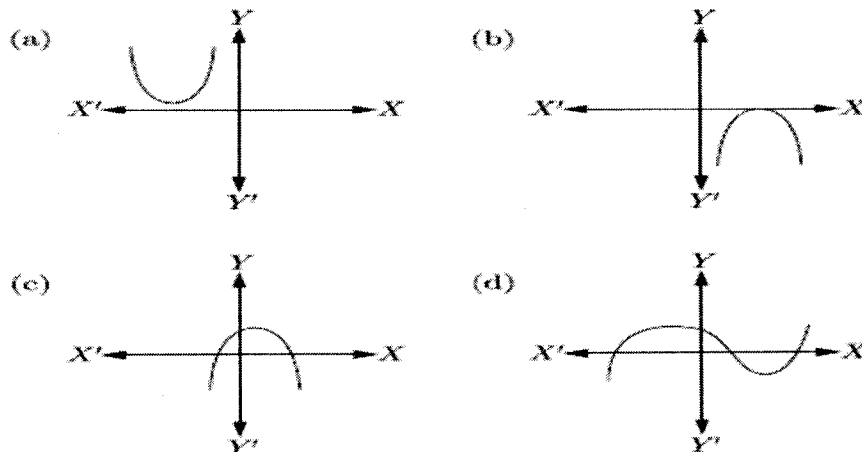
- 11 The value of  $\sin^2 60^\circ - 2 \tan 45^\circ - \cos^2 30^\circ$  is -2.  
12 The radius of a circle whose circumference is equal to the sum of the circumferences of the two circles diameters 36 cm and 20 cm is 56 cm.  
13 All isosceles triangles are similar.

- 14 Two numbers can have 15 as HCF and 175 as LCM.

**Fill in the blanks: (4 x 1 = 4)**

- 15 If  $\tan(A + B) = \sqrt{3}$  and  $\tan(A - B) = \frac{1}{\sqrt{3}}$ ,  $A > B$ , then the value of A is \_\_\_\_.
- 16 The length of the minute hand of clock is 14 cm. The area swept by the minute hand in 15 minute is \_\_\_\_.
- 17 If the lines given by  $3x + 2ky = 2$  and  $2x + 5y + 1 = 0$  are parallel, then the value of k is \_\_\_\_.
- 18 The positive root of  $\sqrt{3x^2 + 6} = 9$  is \_\_\_\_

**With reference to the following graph answer Q19 and Q20: (2 x 1 = 2)**



19. Which graph from the above does not represent a quadratic polynomial?
20. Which graph from the above has two equal zeroes?

**SECTION B: (8 x 2 = 16)**

21. If 2 is a root of the equation  $x^2 + kx + 12 = 0$  and the equation  $x^2 + kx + q = 0$  has equal roots, find the value of q.

**OR**

Find the roots of the quadratic equation  $\sqrt{2}x^2 + 7x + 5\sqrt{2} = 0$ .

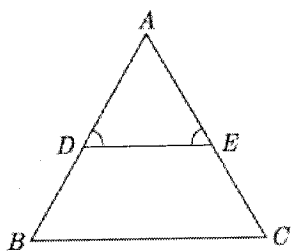
22. If  $\sqrt{3}\sin\theta - \cos\theta = 0$  and  $0^\circ < \theta < 90^\circ$ , find the value of  $\theta$ .
23. If  $\tan(3x + 30^\circ) = 1$  then find the value of x.
24. The perimeter of a sector of a circle with radius 6.5 cm is 31 cm, then find the area of the sector.

**OR**

A chord of a circle of radius 10 cm subtends a right angle at the center.  
find the area of minor segment. ( $\pi = 3.14$ )

25. Solve the following system of linear equations by substitution method:
- $$2x - y = 2$$
- $$x + 3y = 15$$

26. In figure  $\angle D = \angle E$  and  $\frac{AD}{DB} = \frac{AE}{EC}$ , prove that  $\triangle BAC$  is an isosceles triangle.



27. Form a quadratic polynomial  $p(x)$  with 3 and  $-\frac{2}{5}$  as sum and product of zeroes, respectively.
28. Prove that :  $2 + 5\sqrt{3}$  is an irrational number, given that  $\sqrt{3}$  is an irrational number.

OR

Three bells rings at intervals of 9, 12, 15 minutes respectively. If they initially rung together, after what time will they next ring together?

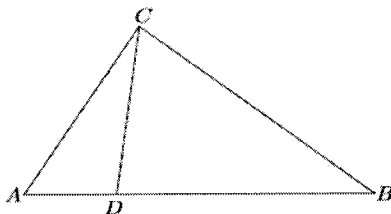
**SECTION C: (4 x 3 = 12)**

29. Solve the equation for  $x$ :  $\frac{4}{x} - 3 = \frac{5}{2x+3}; x \neq 0, -\frac{3}{2}$

OR

Solve for  $x$ :  $x^2 + 6x - (a^2 + 2a - 8) = 0$ .

30. Find HCF and LCM of 404 and 96 and verify that  $\text{HCF} \times \text{LCM} = \text{product of the two given numbers}$
31. In the given figure, if  $\angle ACB = \angle CDA$ ,  $AC = 6$  cm and  $AD = 3$  cm, then find the length of  $AB$ .



OR

A 6 m high tree cast a 4m long shadow. At the same time, a flag pole cast a shadow 50 m long. How long is the flag pole?

32. If  $\tan A + \cot A = 2$ , then find the value of  $\tan^2 A + \cot^2 A$ .

OR

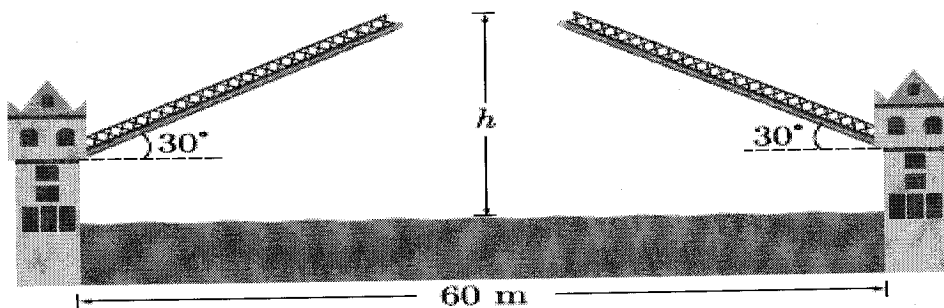
Prove that :  $\frac{\cos A}{1 - \tan A} + \frac{\sin A}{1 - \cot A} = \sin A + \cos A$

**SECTION D: (3 x 4 =12)**  
**CASE BASED STUDY QUESTIONS**

33. Luxury Cruise: As India's first domestic cruise liner, Angriya has made many voyages on the Mumbai-Goa sea route, along the pristine Konkan coast. It has given India and Indians a sense of pride and happiness, while introducing the travelers to coral diversity and royal sea fort along the way. Last year we enjoyed our summer vacation at Angriya Cruise. From Mumbai to Goa, with the current trip took 70 hr. After a few days of fun in the sun, the ship leaves for Mumbai, against the current with the return trip taking 82 hr. The distance from Goa to Mumbai is 1435 km.

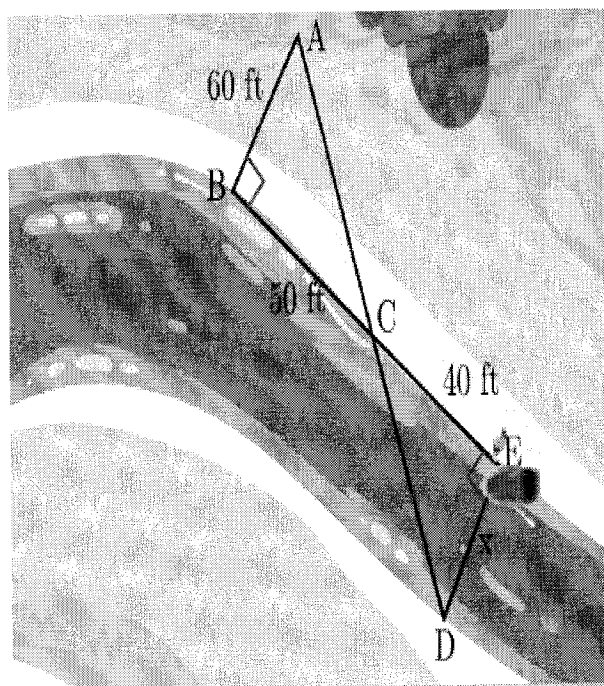


- (i) Find the speed of the current.
- (ii) Find the cruising speed of the ship.
34. A drawbridge is a bridge that can be moved in order to stop or allow passage across it. Modern drawbridge are often built across large, busy waterway. They can be lifted to allow large ships to pass or lowered land vehicles or pedestrians to cross. A drawbridge is 60 metre long when stretched across a river. As shown in the figure, the two equal sections of the bridge can be rotated upward through an angle of  $30^\circ$ .



- (i) If the water level is 5 metre below the closed bridge, find the height  $h$  between the end of a section and the water level when the bridge is fully open.
- (ii) How far apart are the ends of the two sections when the bridge is fully opened, as shown in the figure?

35. Tania is very intelligent in maths. She always tries to relate the concept of maths in daily life. One day she plans to cross a river and want to know how far it is to the other side. She takes measurement on her side of the river and make the drawing as shown.



(i) Which similarity criterion is used in solving the above problem?

Consider the following statement:

$$S_1: \angle ACB = \angle DCE$$

$$S_2: \angle BAC = \angle CDE$$

(ii) Which of the above statement is/are correct?

(a)  $S_1$  and  $S_2$  both (b)  $S_1$  (c)  $S_2$  (d) None

(iii) What is the distance 'x' across the river?

#### SECTION E: (4 x 5 = 20)

36. From the top of tower, 100 m high, a man observes two cars on the opposite sides of the tower with the angles of depression  $30^\circ$  and  $45^\circ$  respectively. Find the distance between the cars.

(use  $\sqrt{3} = 1.73$ )

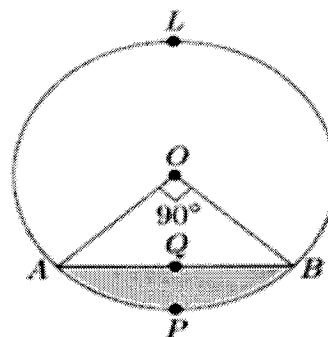
37. In the given figure, a chord AB of the circle with

centre O and radius 10 cm, that subtends a right angle at the centre of the circle. Find

(i) length of the minor arc

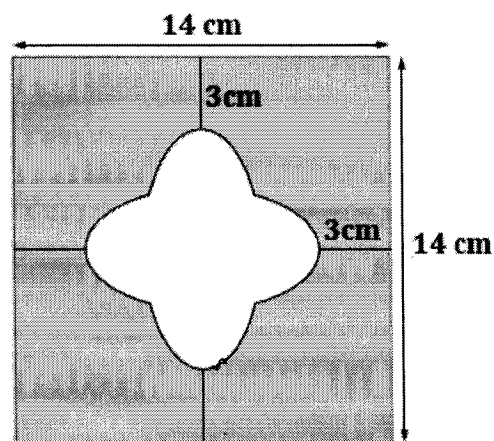
(ii) area of minor sector

(iii) area of major segment. use ( $\pi = 3.14$ )



OR

In figure, find the area of the shaded region inside the square. ( $\pi = 3.14$ )



38. Sum of the areas of two squares is  $400 \text{ cm}^2$ . If the difference of their perimeters is 16 cm, find the sides of the squares.

**OR**

The denominator of a fraction is two more than its numerator. If the sum of the fraction and its reciprocal is  $\frac{34}{15}$ , find the fraction.

39. Let ABC be a triangle, D and E be two points on side AB such that  $AD = BE$ . If  $DP \parallel BC$  and  $EQ \parallel AC$ , then prove  $PQ \parallel AB$ .

**\*\*\*\*END OF THE QUESTION PAPER\*\*\*\***

