AG-TMC-04-B-TS-13-20-21

Target Mathematics by Dr. Agyat Gupta

Maximum Marks: 80

Time Allowed: 3 hours

General Instructions:

i. This question paper contains two parts A and B.

ii. Both Part A and Part B have internal choices.

Part – A consists 20 questions

i. Questions 1-16 carry 1 mark each. Internal choice is provided in 5 questions.

ii. Questions 17-20 are based on the case study. Each case study has 5 case-based sub-parts. An examinee is to attempt any 4 out of 5 sub-parts.

Part – B consists 16 questions

i. Question No 21 to 26 are Very short answer type questions of 2 mark each,

ii. Question No 27 to 33 are Short Answer Type questions of 3 marks each

iii. Question No 34 to 36 are Long Answer Type questions of 5 marks each.

iv. Internal choice is provided in 2 questions of 2 marks, 2 questions of 3 marks and 1 question of 5 marks.

Part-A

1. State whether $\frac{125}{441}$ will have terminating decimal expansion or a non-terminating repeating decimal expansion.

OR

Find HCF × LCM for the numbers 100 and 190.

2. Is it quadratic equation ?

$3x^2 - 2\sqrt{x} + 8 = 0$

3. For what value of k, the following system of equations represent parallel lines?

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$kx - 3y + 6 = 0, 4x - 6y + 15 = 0$

4. How many tangents can a circle have?

5. Show that the progression 8, 11, 14, 17, 20, ... is an A.P. Find its first term and the common difference.
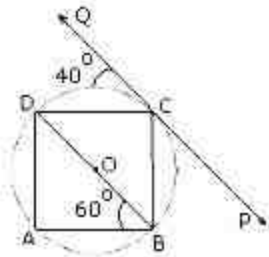
<div align="center">OR</div>

Determine the 25th term of an AP whose 9th term is -6 and common difference is $\frac{5}{4}$.

6. If $\frac{4}{2}$, a, 2 are in AP, find the value of a.

7. Form a quadratic equation whose roots are 2 and 3.

<div align="center">OR</div>

Determine the nature of the roots of quadratic equation: $x^2 - x + 2 = 0$

8. In the given figure, ABCD is a cyclic quadrilateral and PQ is a tangent to the circle at C. If BD is a diameter, $\angle OCQ = 40^\circ$ and $\angle ABD = 60^\circ$, find $\angle BCP$

9. At which point a tangent is perpendicular to the radius?

<div align="center">OR</div>

What term will you use for a line which intersect a circle at two distinct points?

10. If the altitude of two similar triangles are in the ratio 2 : 3, what is the ratio of their areas?

11. The nth term of an AP is 7 - 4n. Find its common difference.

12. Prove that: $\sin 60^\circ = \frac{2 \tan 30^\circ}{1 + \tan^2 30^\circ} = \frac{\sqrt{3}}{2}$

13. What happens to value of $\tan \theta$ when θ increases from 0° to 90°?

14. If the radii of two right circular cylinders are in the ratio 2 : 3 and their heights are in the ratio 5 : 3, what will be the ratio of their volumes?

15. Show that $(a - b)^2$, $(a^2 + b^2)$ and $(a + b)^2$ are in AP.

16. Red queens and black jacks are removed from a pack of 52 playing cards. A card is drawn at random from the remaining cards, after reshuffling them. Find the probability that the

drawn card is

  i. a king,

  ii. of red colour,

  iii. a face card,

  iv. a queen.

17. **CARTESIAN- PLANE:**

Using Cartesian Coordinates we mark a point on a graph by **how far along** and **how far up** it is.

The left-right (**horizontal**) direction is commonly called X-axis.

The up-down (**vertical**) direction is commonly called Y-axis.

When we include negative values, the x and y axes divide the space up into 4 pieces.

Read the following passage and answer the questions that follow using the above information:

In a classroom, four student Sita, Gita, Rita and Anita are sitting at A(3, 4), B(6, 7), C(9, 4), D(6, 1) respectively. Then a new student Anjali joins the class.
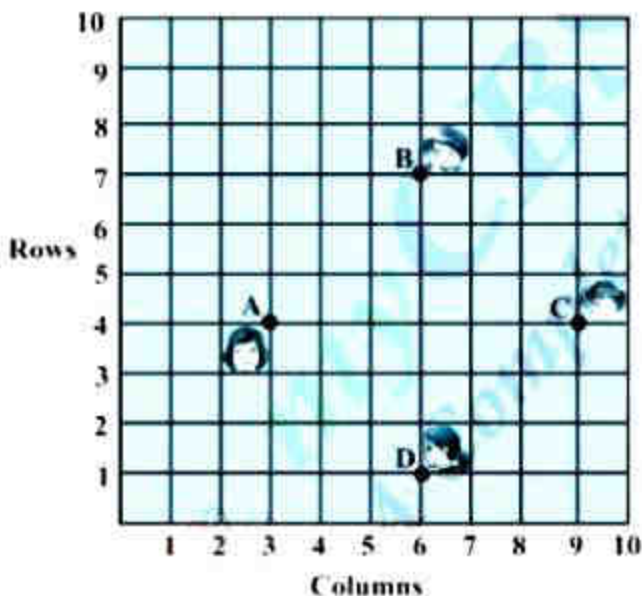
  i. Teacher tells Anjali to sit in the middle of the four students. Find the coordinates of the position where she can sit.

    a. (2, 4)

    b. (4, 4)

    c. (6, 4)

    d. (6, 5)

  ii. The distance between Sita and Anita is

a. $3\sqrt{3}$ units

b. $3\sqrt{2}$ units

c. $2\sqrt{3}$ units

d. $3\sqrt{5}$ units

iii. Which two students are equidistant from Gita?
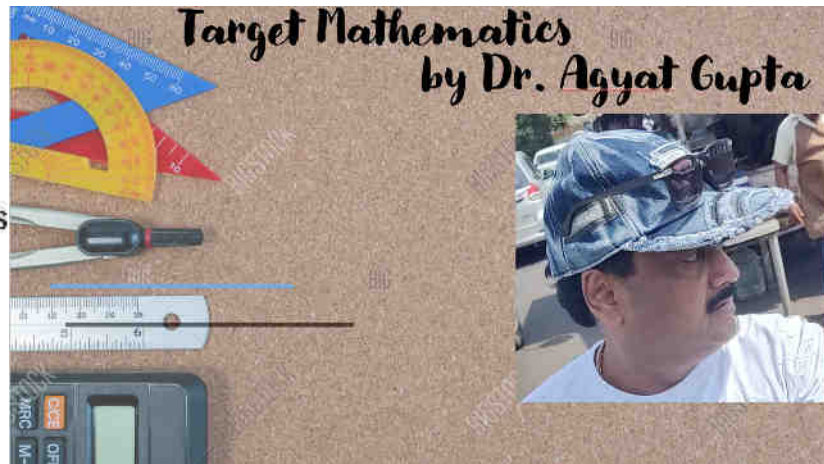
   a. Anjali and Anita

   b. Anita and Rita

   c. Sita and Anita

   d. Sita and Rita

iv. The geometrical figure formed after joining the points ABCD is
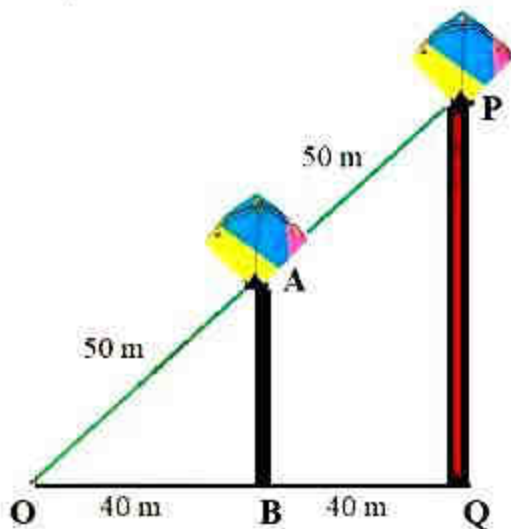
   a. Square

   b. Rectangle

   c. Parallelogram

   d. Rhombus

v. The distance between Sita and Rita is

   a. 4 units

   b. 6 units

   c. $3\sqrt{2}$ units

   d. $2\sqrt{3}$ units

18.

As shown in the figure Harish is trying to measure the height of two towers AB and PQ. He is flying a kite He is having 100m thread with him, Harish found that when his half thread is open That time kite is just above the tower AB. Harish continues flying the kites, When his full thread is open that time kite reaches just above the tower PQ. Now answer the following questions:

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i. What is the height of the tower AB?

    a. 40m

    b. 30 m

    c. 50 m

    d. 100m

ii. What is the height of the tower PQ?

    a. 40 m

    b. 30 m

    c. 60 m

    d. 100m

iii. What is the length of the hypotenuse in the triangle OAB?

    a. 40 m

    b. 50 m

    c. 100 m

    d. 80 m

iv. What is the length of the hypotenuse in the triangle OPQ?

    a. 40 m

    b. 50 m

    c. 100 m

    d. 80 m

v. What is the length of the Base in the triangle OPQ?

    a. 40 m

    b. 50 m

    c. 100 m

    d. 80 m

19. A survey was conducted by the Education Ministry of India. The following distribution gives the state-wise teachers-students ratio in higher secondary schools of India.

Number of students per teacher	Number of states/U.T	Number of students per teacher	Number of states/U.T
15 - 20	3	35 - 40	3
20 - 25	8	40 - 45	0
25 - 30	9	45 - 50	0
30 - 35	10	50 - 55	2

i. The modal class is
   a. 40 - 45
   b. 30 - 35
   c. 50 - 55
   d. 25 - 30

ii. The mean of this data is
   a. 19.2.
   b. 22.9
   c. 39.2
   d. 29.2

iii. The mode of the data is
   a. 36.625
   b. 30.625
   c. 32.625
   d. 31.625

iv. Half of (upper-class limit + lower class limit) is
   a. Class interval
   b. Classmark
   c. Class value
   d. Class size

v. The construction of the cumulative frequency table is useful in determining the
   a. Mean
   b. Mode
   c. Median
   d. All of the above

20. An ice-cream seller used to sell different kinds and different shapes of ice-cream like

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rectangular shaped, conical shape with one end hemispherical, Rectangular shape with one end hemispherical and rectangular brick, etc. One day a child came to his shop and purchased an ice-cream which has the following shape: ice-cream cone as the union of a right circular cone and a hemisphere that has the same (circular) base as the cone. The height of the cone is 9 cm and the radius of its base is 2.5 cm.
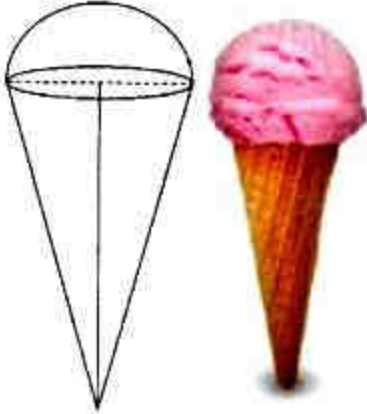
By reading the above-given information, find the following:

i. Volume of only hemispherical end of the icecream is:

   a. $\frac{1357}{42}$ cm^3

   b. $\frac{1375}{42}$ cm^3

   c. $\frac{1575}{42}$ cm^3

   d. $\frac{1373}{42}$ cm^3

ii. The volume of the ice-cream without hemispherical end is:

   a. $\frac{852}{14}$ cm^3

   b. $\frac{852}{41}$ cm^3

   c. $\frac{825}{41}$ cm^3

   d. $\frac{825}{14}$ cm^3

iii. The TSA of cone is given by:

   a. $\pi r l + 2\pi r^2$

   b. $\pi r l + 2\pi r$

   c. $\pi r l + \pi r^2$

   d. $2\pi r l + \pi r^2$

iv. The volume of the whole ice-cream is:

   a. $91\frac{2}{3}$ cm^3

   b. $91\frac{3}{2}$ cm^3

   c. $19\frac{2}{3}$ cm^3

   d. $19\frac{3}{2}$ cm^3

v. During the conversion of a solid from one shape to another the volume of the new shape will:
   a. increase
   b. decrease
   c. double
   d. remain unaltered

Part-B

21. Without actual division, show that $\frac{24}{125}$ is a terminating decimal. Express the fraction in decimal form.

22. Determine the ratio in which the line $3x + y - 9 = 0$ divides the segment joining the points $(1, 3)$ and $(2, 7)$.

OR

Find the mid-point of side BC of $\triangle ABC$, with $A(1, -4)$ and the mid-points of the sides through A being $(2, -1)$ and $(0, -1)$.

23. Form a quadratic polynomial whose zeroes are $\frac{3-\sqrt{3}}{5}$ and $\frac{3+\sqrt{3}}{5}$.

24. Find the third side of a right angled triangle whose hypotenuse is length p cm, one side of length q cm and $p - q = 1$.

25. Prove that $\tan^2 A - \tan^2 B = \frac{\sin^2 A - \sin^2 B}{\cos^2 A \cos^2 B}$

OR

If $\cos \theta = \frac{3}{4}$, then find the value of $9 \tan^2 \theta + 9$.

26. In Figure, CP and CQ are tangents from an external point C to a circle with centre O. AB is another tangent which touches the circle at R. If CP = 11 cm and BR = 4 cm, find the length of BC
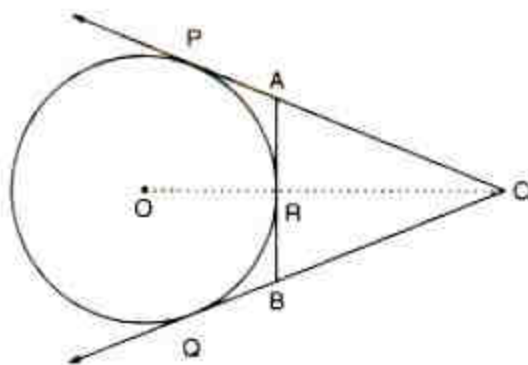

27. Prove that $(3 + 2\sqrt{5})^2$ is irrational.

28. Find the roots of the quadratic equation (if they exist) by the method of completing the square:

$2x^2 + x - 4 = 0$

OR

Determine the positive values of k for which the equations $x^2 + kx + 64 = 0$ and $x^2 - 8x + k = 0$ will both have real roots.

29. If α and β are the zeroes of the quadratic polynomial $f(x) = 6x^2 + x - 2$, then, find the value of $\frac{\alpha}{\beta} + \frac{\beta}{\alpha}$.

30. In figure, O is a point in the interior of a triangle ABC, OD ⊥ BC, OE ⊥ AC and OF ⊥ AB, show that $OA^2 + OB^2 + OC^2 - OD^2 - OE - OF^2 = AF^2 + BD^2 + CE^2$
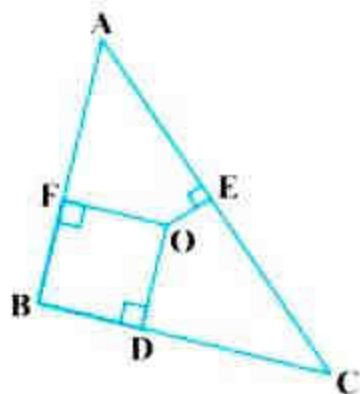
OR

In △PQR, M and N are points on sides PQ and PR respectively such that PM = 15 cm and NR = 8 cm. If PQ = 25 cm and PR = 20 cm state whether MN || QR.

31. A piggy bank contains hundred 50-p coins, fifty Rs.1 coins, twenty Rs.2 and ten Rs.5 coins. If it is equally likely that one of the coins will fall out when the bank is turned upside down, find the probability the coin falling out will be (i) a 50-p coin, (ii) of value more than Rs.1, (iii) of value less than Rs.5 (iv) a Rs.1 or Rs. 2 coin.

32. The lower window of a house is at a height of 2 m above the ground and its upper window is 4 m vertically above the lower window. At certain instant the angles of elevation of a balloon from these windows are observed to be 60° and 30° respectively. Find the height of the balloon above the ground.

33. The arithmetic mean of the following frequency distribution is 50.

Class	0 - 10	10 - 20	20 - 30	30 - 40	40 - 50

Frequency	16	p	30	32	14

Find the value of p.

34. The sum of the radii of two circles is 7 cm, and the difference of their circumferences is 8 cm. Find the circumferences of the circles.

35. Solve the following equation

$$ax + by = \frac{a+b}{2}$$

$$3x + 5y = 4$$

36. The angle of elevation of the top of a tower as observed from a point in a horizontal plane through the foot of the tower is 30°. When the observer moves towards the tower a distance of 100 m, he finds the angle of elevation of the top to be 60°. Find the height of the tower and the distance of first position from the tower.

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