

Subject: Mathematics (Basic)

Subject Code: 241

Time: 3 Hours

Max. Marks: 80

**General Instructions:**

1. This Question Paper has 5 Sections A, B, C, D, and E.
2. Section A has 20 Multiple Choice Questions (MCQs) carrying 1 mark each.
3. Section B has 5 Short Answer-I (SA-I) type questions carrying 2 marks each.
4. Section C has 6 Short Answer-II (SA-II) type questions carrying 3 marks each.
5. Section D has 4 Long Answer (LA) type questions carrying 5 marks each.
6. Section E has 3 Case-based integrated units of assessment (4 marks each) with sub-parts of the values of 1, 2 and 1 marks each respectively.
7. All Questions are compulsory. However, an internal choice in 2 Questions of 2 marks, 2 Questions of 3 marks and 2 Questions of 5 marks has been provided. An internal choice has been provided in the 2 marks questions of Section E.
8. Draw neat figures wherever required. Take  $\pi = 22/7$  wherever required if not stated.

**Section A**

Section A consists of 20 questions of 1 mark each.

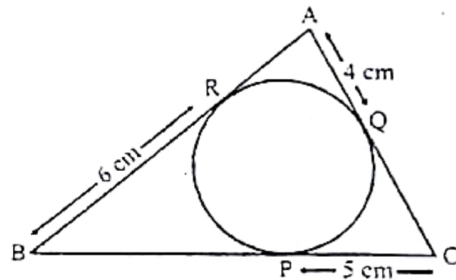
- 1 The sum of the exponents of prime factors in the prime factorisation of 1080 is 1  
(a) 4 (b) 7 (c) 3 (d) 5
- 2 In a group of 21 people, 14 cannot swim. If one person is selected at random, 1  
then the probability that he/she can swim is  
(a)  $\frac{1}{3}$  (b)  $\frac{2}{3}$  (c)  $\frac{1}{7}$  (d)  $\frac{1}{21}$
- 3 The quadratic equation  $2x^2 - 6x + 7 = 0$  has 1  
(a) two distinct real roots (b) two equal roots  
(c) no real roots (d) more than two roots
- 4 At some time of the day, the length of the shadow of a tower is equal to its height. 1  
Then the Sun's elevation at that time is  
(a)  $30^\circ$  (b)  $60^\circ$  (c)  $90^\circ$  (d)  $45^\circ$
- 5 A ticket is drawn randomly from a bag containing tickets numbered 1 to 30. The 1  
probability that the selected ticket has a number which is an odd multiple of 3 is  
(a)  $\frac{5}{31}$  (b)  $\frac{1}{5}$  (c)  $\frac{3}{10}$  (d)  $\frac{1}{6}$

- 6 A quadratic polynomial whose sum of the zeroes is 2 and the product is 1 is given by 1  
 (a)  $x^2 - 2x + 1$  (b)  $x^2 + 2x + 1$   
 (c)  $x^2 + 2x - 1$  (d)  $x^2 - 2x - 1$

- 7 The mean and mode of a frequency distribution are 28 and 16 respectively. The median is 1  
 (a) 22 (b) 24 (c) 23.5 (d) 24.5

- 8 In the given figure, the perimeter of  $\triangle ABC$  is 1

- (a) 30 cm (b) 45 cm  
 (c) 15 cm (d) 60 cm



- 9 The value of  $k$  for which the system of equations  $2x + ky = 12$  and  $x + 3y - 4 = 0$  are inconsistent is 1

- (a)  $\frac{21}{4}$  (b)  $\frac{1}{6}$  (c)  $\frac{4}{21}$  (d) 6

- 10 The value of  $(1 + \operatorname{cosec}^2 30^\circ)(1 - \tan 45^\circ)$  is 1

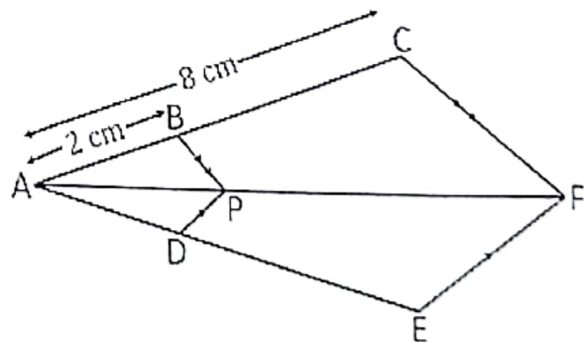
- (a) 0 (b) 3 (c)  $\frac{1}{2}$  (d)  $\frac{3}{2}$

- 11 The area of the circle that can be inscribed in a square of side 6 cm is 1

- (a)  $9\pi$  sq. cm (b)  $36\pi$  sq. cm (c)  $18\pi$  sq. cm (d)  $12\pi$  sq. cm

- 12 In the given figure, if  $PB \parallel CF$  and  $DP \parallel EF$ , then  $\frac{AD}{DE}$  is equal to 1

- (a)  $\frac{3}{4}$  (b)  $\frac{3}{6}$   
 (c)  $\frac{1}{4}$  (d)  $\frac{1}{3}$



- 13 The value of  $5\tan^2\theta - 5\sec^2\theta$  is 1

- (a) 5 (b) -5 (c) 0 (d) 1

- 14 If the common difference of an AP is 3, then  $a_{20} - a_{15}$  is 1

- (a) 15 (b) 5 (c) 3 (d) 20

- 15 The distance between the points  $A(0, 6)$  and  $B(0, -2)$  is 1

- (a) 6 units (b) 8 units (c) 4 units (d) 2 units

- 16  $\Delta ABC$  is an acute angled triangle. DE is drawn parallel to BC. Which of the following is always true? 1
- i)  $\Delta ABC \sim \Delta ADE$       ii)  $\frac{AD}{BD} = \frac{AE}{EC}$       iii)  $DE = \frac{BC}{2}$

- (a) only (i)      (b) (i) and (ii) only  
 (c) (i), (ii) and (iii)      (d) (ii) and (iii) only

- 17 If  $(p+1), 3p, (4p+2)$  are in arithmetic progression, then the value of p will be 1
- (a) 1      (b) 2      (c) 3      (d) 4

- 18 The length of the tangent from an external point A to a point P on a circle with centre O is 1
- (a) always greater than OA      (b) equal to OA  
 (c) always less than OA      (d) cannot be estimated

**Direction for questions 19 & 20:** In question numbers 19 and 20, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct option. 1

- 19 **Assertion (A):** The equation  $x^2 + 3x + 1 = (x - 2)^2$  is a quadratic equation. 1

**Reason (R):** Any equation of the form  $ax^2 + bx + c = 0$  where  $a \neq 0$ , is called a quadratic equation.

- (a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).  
 (b) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).  
 (c) Assertion (A) is true but Reason (R) is false.  
 (d) Assertion (A) is false but Reason (R) is true.

- 20 **Assertion (A):** A solid hemisphere of radius 7 cm is to be painted outside on the surface. The total cost of painting it at ₹ 5 per  $\text{cm}^2$  is ₹ 2310. 1

**Reason (R):** The total surface area hemisphere is  $3\pi r^2$ .

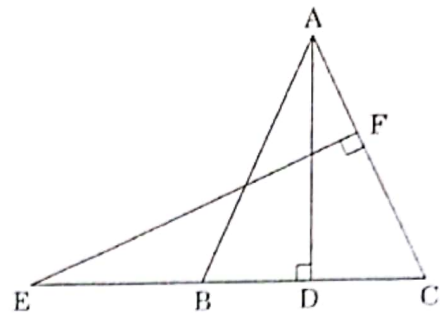
- (a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).  
 (b) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).  
 (c) Assertion (A) is true but Reason (R) is false.  
 (d) Assertion (A) is false but Reason (R) is true.

## Section B

Section B consists of 5 questions of 2 marks each.

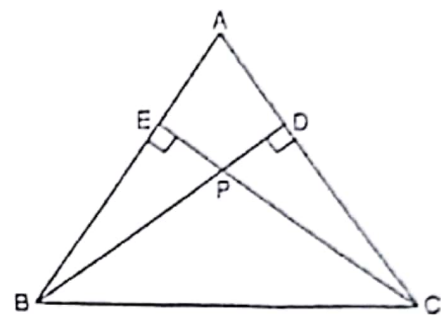
- 21 Given that  $\sqrt{7}$  is irrational, prove that  $5+2\sqrt{7}$  is an irrational number. 2

- 22 In the figure, E is a point on side CB produced of an isosceles triangle ABC, with side  $AB = AC$ .  
If  $AD \perp BC$  and  $EF \perp AC$ , prove that  $\triangle ABD \sim \triangle ECF$ .



OR

In the figure, if  $CE \perp AB$  and  $BD \perp AC$ , prove that  $BP \times PD = EP \times PC$



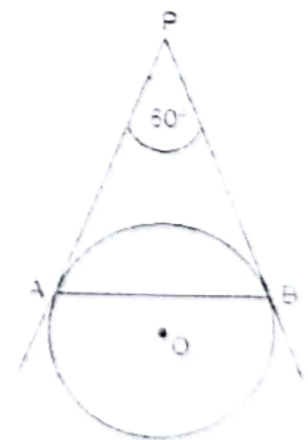
- 23 If the sum of zeroes of the quadratic polynomial  $f(x) = kx^2 + 2x + 3k$ , is equal to their product, find the value of  $k$ . 2

OR

If  $\alpha$  and  $\beta$  are the zeroes of the quadratic polynomial  $2x^2 - x + 15$ , find the value of  $\frac{1}{\alpha} + \frac{1}{\beta}$

- 24 Find a relation between  $x$  and  $y$  such that the point  $(x,y)$  is equidistant from the points  $(7,1)$  and  $(3,5)$ . 2

- 25 In the given figure AP and BP are tangents to a circle with centre O, such that  $AP = 5$  cm and  $\angle APB = 60^\circ$ . Find the length of chord AB.



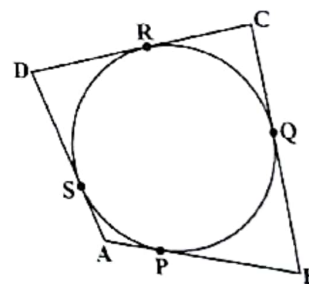
## Section C

Section C consists of 6 questions of 3 marks each.

- 26 A merchant has 120 litres and 180 litres of two kinds of oil. He wants to sell the oil by filling the two kinds of oil in tins of equal volumes. Find the greatest volume of each tin. How many tins of each kind of oil can be filled? 3
- OR
- Three bulbs Red, Green and Yellow flash at intervals of 80 seconds, 90 seconds and 110 seconds. All three flash together at 8 am. At what time will the three bulbs will flash all together again?
- 27 From a pack of 52 playing cards, Jacks, Queens and Kings of red colour are removed. From the remaining, a card is drawn at random. Find the probability that the drawn card is:  
i) a card of red colour      ii) a black king      iii) an ace 3
- 28 Find the sum of all two digit natural numbers which are divisible by 4. 3
- 29 In what ratio does the x-axis divide the line segment joining the points (4, -2) and (-4, 6). Also find the coordinates of the point of division. 3
- 30 Find the area of minor sector of a circle of radius 42 cm, if the length of the corresponding arc is 44 cm. 3
- 31 Prove that the length of tangents drawn from an external point to a circle are equal. 3

OR

In the given figure, a quadrilateral ABCD is drawn to circumscribe a circle, touching the circle at P, Q, R and S. Prove that  $AB + CD = AD + BC$ .



## Section D

Section D consists of 4 questions of 5 marks each.

- 32 If Tracy was younger by 5 years than she really is, then the square of her age (in years) would have been 11 more than five times her actual age. What is her age now? 5

OR

Find the value of  $k$  for which the roots are real and equal for the equation  $(k + 1)x^2 + 2(k + 3)x + k + 8 = 0$



- 33 The median of the following data is 50. Find the values of  $p$  and  $q$ , if the sum of all frequencies is 90. 5

| Marks Obtained     | 20 - 30 | 30 - 40 | 40 - 50 | 50 - 60 | 60 - 70 | 70 - 80 | 80 - 90 |
|--------------------|---------|---------|---------|---------|---------|---------|---------|
| Number of students | $p$     | 15      | 25      | 20      | $q$     | 8       | 10      |

- 34 A rocket is in the form of a right circular cylinder closed at the lower end and surmounted by a cone with the same radius as that of cylinder. The diameter and the height of cylinder are 6 cm and 12 cm respectively. If the slant height of the conical portion is 5 cm, then find the total surface area and volume of the rocket. (Use  $\pi = 3.14$ ) 5

OR

A rectangular metal block has a length 15 cm, breadth 10 cm and height 5 cm. From this block, a cylindrical hole of diameter 7 cm is drilled out. Find the surface area of the remaining solid.

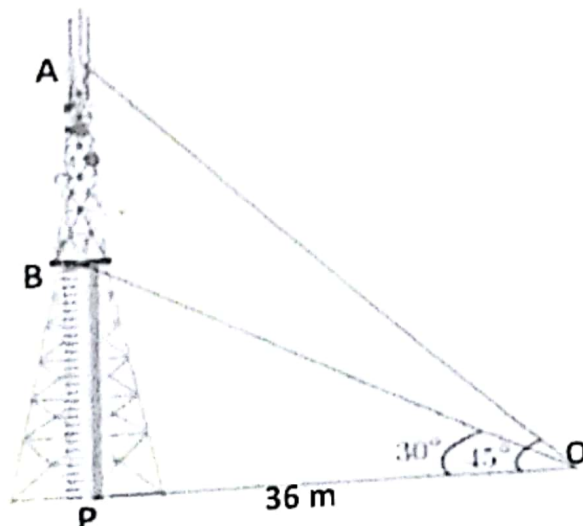
- 35 Prove that: 5

$$(\sin A + \operatorname{cosec} A)^2 + (\cos A + \sec A)^2 = 7 + \tan^2 A + \cot^2 A$$

### Section E

Section E consists of 3 questions of 4 marks each.

- 36 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. The tower is supported by wires from point O. The distance between the base of the tower P and point O is 36 m. From point O, the angle of elevation of the top of the Section B is  $30^\circ$  and the angle of elevation of the top of Section A is  $45^\circ$ . (Take  $\sqrt{3} = 1.73$ )

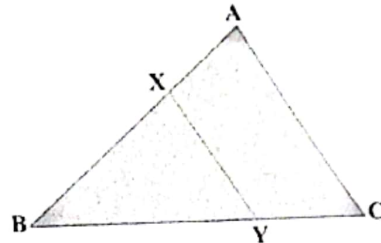


- Based on the above information, answer the following questions:
- i) Find the length of the wire from the point O to the top of Section B 1
  - ii) Find the distance AB. 2

**OR**

- Find the area of  $\Delta OPB$ . 2
- iii) If the point O is moved 24 m towards the base of the tower, find the angle of elevation to the top of Section B from O. 1

- 37 In one of the residential colonies of the city, there is a triangular park ABC. The Residential Welfare Association of the colony wishes to divide this park into two parts of equal area-one for planting trees and the other for providing a play area for children. One of the members suggested dividing the park with a fence XY which is parallel to AC.



Based on the above information, answer the following questions.

- i) Which similarity criteria will you use to prove  $\Delta BXY \sim \Delta BAC$ ? 1
- ii) If  $BX = (x + 2)m$ ,  $XA = (x - 6)m$ ,  $BY = x m$ ,  $YC = (x - 2)m$ , find the value of  $x$ . 2

**OR**

If  $BX = \frac{2}{3} AB$ ,  $XY = 18 m$  and  $YC = 11 m$ , find the length of AC and BC.

- iii) In  $\Delta ABC$ , if  $\frac{BX}{XA} = \frac{3}{4}$ ,  $BY = 5 m$  and  $BC = 14 m$ , then check whether  $XY \parallel AC$ . 1

- 38 It is common that the government revise travel fares from time to time based on various factors such as inflation (a general increase in prices and fall in purchasing value of money) on different types of vehicles like taxis, e-scooter, bicycles etc. The taxi charges in the UAE consist of a fixed charge (AED  $x$ ) together with the charge for the distance covered (AED  $y$ ).



Study the following situations and answer the questions.

**Situation 1-**Amit paid AED 27 for a journey of 5 km in a taxi and paid AED 45 for another journey of 11 km in Dubai.

**Situation 2-**Arun paid AED 32 for a journey of 10 km in a taxi and paid AED 28 for another journey of 8 km in Abudhabi

- (R) :
- STANDARD  
MATHS  
SESSION  
EXAM
- i) Form a pair of linear equations representing Amit's journey. 1
- ii) Find the fixed charge and the additional charge for the taxis in Abu Dhabi 2
- OR**
- Find the amount paid by Amit if he would have travelled a total distance of 10 km. 1
- iii) On comparing the ratios  $\frac{a_1}{a_2}$ ,  $\frac{b_1}{b_2}$  and  $\frac{c_1}{c_2}$ , find out whether the lines representing the pair of linear equations of Arun's journey, intersects at a point or parallel or coincident. 1