Total No. of Printed Pages—16

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MATHEMATICS

(Old Course)

(FOR CANDIDATES WITH INTERNAL ASSESSMENT)

Full Marks : 80
Pass Marks : 24

(FOR CANDIDATES WITHOUT INTERNAL ASSESSMENT)

Full Marks : 100
Pass Marks : 30

Time : 3 hours

(FOR ALL CATEGORIES OF CANDIDATES)

General Instructions :

(i) This question paper comprises of 32 questions divided into six Sections A, B, C, D, E and F.

(ii) Marks allocated to every question are indicated against each.

(iii) Question Nos. **1** to **30** (Section—A to Section—E) are to be answered by **all Candidates**.

(iv) Question Nos. **31** and **32** (Section—F) are to be answered by **Candidates without Internal Assessment marks.**

(v) In Question Nos. **1** to **8** of Section—A and Question No. **31** Subnos. *(a)* to *(e)* of Section—F, there are four options marked (A), (B), (C), (D). Only one of these options is correct. The letter indicating the correct answer should be written in capital in the answer book.

(vi) In question on construction, the drawing should be neat and exactly as per the given measurements.

(vii) Questions which are meant for Visually Handicapped (Blind) Students, should be answered by them only.

(viii) Use of Calculator/Mobile Phone is not permitted.

SECTION—A

(*Marks* : 10)

(Question Nos. ***1*** *to* ***10*** *carry 1 mark each)*

1. A polynomial of degree 2 is called a

(A) linear polynomial

(B) cubic polynomial

(C) biquadratic polynomial

(D) quadratic polynomial

2. The prime factors of 156 are

(A) $2 \times 3^2 \times 13$

(B) $2^2 \times 3 \times 13$

(C) $2 \times 3 \times 13^2$

(D) $2^2 \times 3^2 \times 13$

3. The solutions of the equation $2x^2 = 9x$ are

(A) $0, \frac{2}{9}$

(B) $0, \frac{-2}{9}$

(C) $0, \frac{9}{2}$

(D) $0, -\frac{9}{2}$

4. If $\sin\theta = \frac{a}{\sqrt{a^2 + b^2}}$, then $\tan\theta$ is equal to

(A) $\frac{a}{b}$

(B) $\frac{b}{a}$

(C) $\frac{b}{\sqrt{a^2 + b^2}}$

(D) $\frac{\sqrt{a^2 + b^2}}{a}$

5. The fourth term of an AP, whose first term $(a) = x$ and common difference $(d) = x + 3$ is

(A) $x + 3$

(B) $3x + 6$

(C) $4x + 9$

(D) $2x + 3$

6. The distance between the origin and the point $(-4, 3)$ is

(A) 5 units

(B) $\sqrt{5}$ units

(C) 1 units

(D) -7 units

7. The total surface area of a right circular cylinder of radius of base r units and height h units is

(A) $2\pi rh$ square units

(B) $2\pi r(r + h)$ square units

(C) $\pi r\sqrt{r^2 + h^2}$ square units

(D) $\pi h(R + r)(R - r)$ square units

8. If all the sides of a parallelogram touch a circle, then the parallelogram is a

(A) rectangle

(B) trapezium

(C) rhombus

(D) All of the above

9. Fill in the blanks : ½+½=1

(a) A line which intersects a circle at two points is called a _____ of the circle.

(b) If two triangles are equiangular, then their corresponding sides are _____.

10. Define unimodal of grouped data.

SECTION—B

(*Marks* : 12)

(Question Nos. ***11*** *to* ***16*** *carry 2 marks each)*

11. Find the sum and product of the zeros of quadratic polynomial $4\sqrt{3}x^2 + 5x - 2\sqrt{3}$.

12. Find the value of P for which the given quadratic equation $3x^2 - 10x - P = 0$ has real roots.

Or

Write the first four terms of the sequence whose nth term (t_n) is $2n^2 - 3n + 1$.

13. For $A = 30°$, verify that

$$\frac{\cos^2 A}{\sin A} + \sin A = \operatorname{cosec} A$$

14. Prove that

$$\frac{\cot(90° - \theta) \cdot \sin(90° - \theta)}{\cos(90° - \theta)} = 1$$

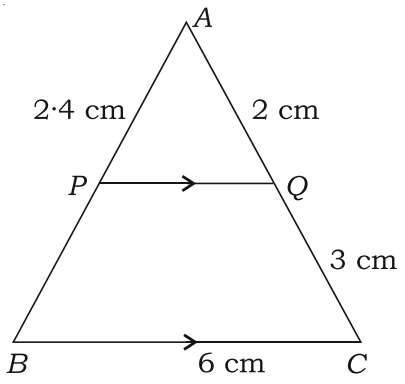
Or

Prove that

$$\frac{\cos^3 \theta + \sin^3 \theta}{\cos \theta + \sin \theta} + \frac{\cos^3 \theta - \sin^3 \theta}{\cos \theta - \sin \theta} = 2$$

15. Find the length of the tangent drawn from a point whose distance from the centre of a circle of radius 8 cm is 17 cm.

16. In the given figure, $PQ \parallel BC$, $AP = 2{\cdot}4$ cm, $AQ = 2$ cm, $QC = 3$ cm and $BC = 6$ cm. Find AB.



[For Visually Handicapped (Blind) Students only, instead of Question No. 16 given in Page No. 6]

16. Define similar triangles. 2

SECTION—C

(*Marks* : 18)

(Question Nos. ***17*** *to* ***22*** *carry 3 marks each)*

17. Find the LCM and HCF of 29260 and 1482 by applying the prime factorization method.

18. In a flower bed, there are 23 rose plants in the first row, 21 in the second, 19 in the third and so on. There are 5 rose plants in the last row. How many rows are there in the flower bed?

Or

Find a fraction that becomes $\frac{1}{2}$ when its numerator and denominator are both increased by 1. It becomes $\frac{1}{4}$ when its numerator and denominator are both diminished by 1.

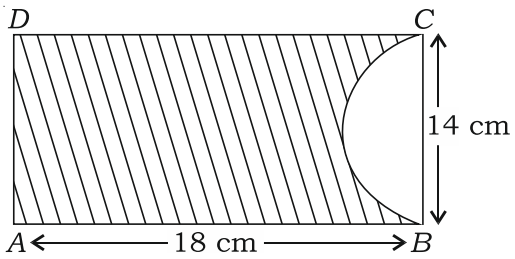
19. Find the coordinate of the point which divides the line segment joining the points $A(1, 3)$ and $B(2, 7)$ in the ratio 3 : 4.

20. If $x\cos\theta - y\sin\theta = a$ and $x\sin\theta + y\cos\theta = b$, then prove that $x^2 + y^2 = a^2 + b^2$.

Or

Prove that $\tan^2\theta + \cot^2\theta + 2 = \sec^2\theta \cdot \text{cosec}^2\theta$.

21. A paper is in the form of a rectangle *ABCD* in which *AB* = 18 cm and *BC* = 14 cm. A semicircular portion with *BC* as diameter is cut off. Find the area of the remaining paper. (Use $\pi = \frac{22}{7}$)



Or

The perimeter of a certain sector of a circle of radius 5·7 m is 27·2 m. Find the area of the sector.

22. The four faces of a regular tetrahedron are marked *A*, *B*, *C* and *D* and it is thrown twice.

(a) Write down all the possible outcomes.

(b) How many outcomes are there in all?

(c) How many outcomes are there with both the letters are same?

SECTION—D

(*Marks* : 16)

(Question Nos. ***23*** *to* ***26*** *carry 4 marks each)*

23. The sum of the ages of a man and his son is 45 years. Five years ago, the product of their ages was four times the man's age at that time. Find their present ages.

24. Find the value of P for which the points $(-1, 3)$, $(2, P)$ and $(5, -1)$ are collinear.

Or

Show that the join of the points (a, a), $(-a, -a)$ and $(-a\sqrt{3}, a\sqrt{3})$ form an equilateral triangle.

25. The shadow of a tower is three times as long as the shadow of tower when the sun's rays met the ground at an angle of 60°. Find the angle of elevation of the sun at the time of the longer shadow.

Or

The shadow of a vertical pole is $\frac{1}{\sqrt{3}}$ of its height. Find the sun's altitude.

[For Visually Handicapped (Blind) Students only, instead of Question No. 25 given above]

25. *(a)* What is the angle of elevation? 2

(b) $\sin A = \cos(90° - A)$ (State *True* or *False*) 1

(c) $\cot^2 \theta + 1 =$ _____. (Fill in the blank) 1

26. Using ruler and compass only, construct a circle and a diameter of the circle and also construct tangents at both the end points of the diameter. (Only traces of construction are required)

[For Visually Handicapped (Blind) Students only, instead of Question No. 26 given above]

26. *(a)* Define tangent of a circle. 1

(b) The diameter of a circle is a chord which passes through the centre of the circle.
(State *True* or *False*) 1

(c) The tangent at any point of a circle is _____ to the radius through the point of contact.
(Fill in the blank) 1

(d) The sum of all angles of a triangle is (three right angles/two right angles).
(Choose the correct option) 1

SECTION—E

(*Marks* : 24)

(Question Nos. ***27*** *to* ***30*** *carry 6 marks each)*

27. Solve the following system of linear equations graphically :

$$x + 2y = 7$$
$$2x - y = 4$$

Shade the area bounded by these two lines and the y-axis. (Plot at least three points for each graph)

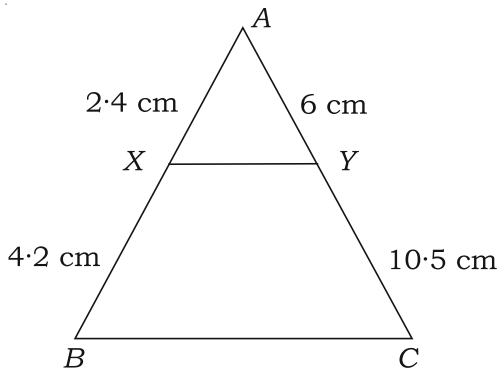
[For Visually Handicapped (Blind) Students only, instead of Question No. 27 given in Page No. 10]

27. Solve the following system of linear equations : 6

$$3x - 4y = -6$$
$$3x + y = 9$$

28. Prove that if a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, then the other two sides are divided in the same ratio.

Using the above, do the following :



In the above ΔABC, if a line intersects AB at X and AC at Y, and if $AX = 2{\cdot}4$ cm, $XB = 4{\cdot}2$ cm, $AY = 6$ cm, $YC = 10{\cdot}5$ cm, then find whether XY is parallel to BC or not.

[For Visually Handicapped (Blind) Students only, instead of Question No. 28 given above]

28. *(a)* Define isosceles triangle. 1

(b) Define scalene triangle. 1

(c) The sum of any two sides of a triangle must be less than the third side.

(State *True* or *False*) 1

(d) State Pythagoras theorem. 2

(e) How many tangents can be drawn to a circle from a point outside the circle? 1

29. A right-angled triangle, whose sides forming the right angle are 15 cm and 20 cm, is made to revolve about its hypotenuse. Find the volume of the double cone so formed. (Use $\pi = 3{\cdot}14$)

Or

Find the volume and total surface area of the hemisphere of radius 3·5 cm. (Use $\pi = \frac{22}{7}$)

30. Find the value of f if the mean of the following distribution is 21 :

Class interval	0–8	8–16	16–24	24–32	32–40
Frequency	5	9	10	$f+2$	8

Or

Calculate the mode of the following frequency distribution :

Marks	above 25	above 35	above 45	above 55	above 65	above 75	above 85
No. of students	52	47	37	17	8	2	0

SECTION—F

(*Marks* : 20)

[For Candidates without Internal Assessment]

31. Answer the following as directed (any *eight*) : 1×8=8

(a) A natural number which has exactly two factors i.e., 1 and the number itself is known as

(A) even number

(B) rational number

(C) prime number

(D) irrational number

(Choose the correct option)

(b) Which of the following is a polynomial?

(A) $x^5 - \frac{3}{x} + \frac{1}{3}x^2 - 4$

(B) $\sqrt{7}x^4 - \sqrt{x} + 2x - \frac{1}{3}$

(C) $x^2 + \frac{1}{x^2}$

(D) $1 + 5x - 2x^2 - \frac{1}{6}x^3$

(Choose the correct option)

(c) The discriminant of the quadratic equation $k^2x^2 + kx + 1 = 0$ is

(A) $3k^2$

(B) $-3k^2$

(C) $5k^2$

(D) $-5k^2$

(Choose the correct option)

(d) The perimeter of a circle of radius r is given by

(A) $2\pi r$

(B) πr^2

(C) πr

(D) $2\pi r^2$

(Choose the correct option)

(e) The point (0, –2) lies on the

(A) x-axis

(B) y-axis

(C) 1st quadrant

(D) 2nd quadrant

(Choose the correct option)

(f) A _____ of a circle is the figure bounded by a chord and an arc of the circle cut off by the chord.

(Fill in the blank)

(g) Probability is the science that measures _____.

(Fill in the blank)

(h) If $A = 30°$ and $B = 60°$, then find the value of $\sin(A + B)$.

(i) What is an ogive?

(j) Find the volume of the cuboid 1 cm thick, 2 cm wide and 3 cm long.

(k) The _____ of the sun is simply the angle of elevation of the sun.

(Fill in the blank)

(l) Find the perimeter of an equilateral triangle whose side is 10 cm.

(m) Find the value of $\frac{\cot 40°}{\tan 50°}$.

(n) Find t_8 in the A.P. 4, 1, –2, ...

32. Answer any *six* from the following : 2×6=12

(a) Find a quadratic polynomial whose sum and product of its zeros are respectively 2 and –8.

(b) Solve $x^2 + 5x + 6 = 0$ by factorization method.

(c) Find the common difference of the A.P. 119, 136, 153, 170, ... and write the next two terms.

(d) Divide the polynomial $p(x) = 6x^2 + x - 15$ by $g(x) = 2x - 3$ and find the quotient and remainder.

(e) Find the distance between the points (4, 7) and (–4, –7).

(f) Find the mean of the first ten whole numbers.

(g) Prove that $2\cos^2 30° - 1 = \cos 60°$.

(h) A coin is tossed twice. List all the possible outcomes using *H* for head and *T* for tail.

(i) The lengths of the diagonals of a rhombus are 24 cm and 10 cm. Find each side of the rhombus.

(j) Find the centroid of the triangle whose vertices are (4, –8), (–9, 7) and (8, 13).

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