QUESTION PAPER CODE 30/2/1

EXPECTED ANSWER/VALUE POINTS

SECTION – A

Question numbers 1 to 10 are multiple choice questions of 1 mark each.

You have to select the correct choice :

Q.No.		Marks
1.	The sum of exponents of prime factors in the prime-factorisation of 196 is **(a)** 3 **(b)** 4 **(c)** 5 **(d)** 2 **Ans:** (b) 4	1
2.	Euclid's division Lemma states that for two positive integers a and b, there exists unique integer q and r satisfying a = bq + r, and **(a)** $0 < r < b$ **(b)** $0 < r \le b$ **(c)** $0 \le r < b$ **(d)** $0 \le r \le b$ **Ans:** (c) $0 \le r < b$	1
3.	The zeroes of the polynomial $x^2 - 3x - m(m + 3)$ are **(a)** $m, m + 3$ **(b)** $-m, m + 3$ **(c)** $m, -(m + 3)$ **(d)** $-m, -(m + 3)$ **Ans:** (b) $-m, m + 3$	1
4.	The value of k for which the system of linear equations $x + 2y = 3$, $5x + ky + 7 = 0$ is inconsistent is **(a)** $-\frac{14}{3}$ **(b)** $\frac{2}{5}$ **(c)** 5 **(d)** 10 **Ans:** (d) 10	1
5.	The roots of the quadratic equation $x^2 - 0.04 = 0$ are **(a)** ± 0.2 **(b)** ± 0.02 **(c)** 0.4 **(d)** 2 **Ans:** (a) ± 0.2	1
6.	The common difference of the A.P. $\frac{1}{p}, \frac{1-p}{p}, \frac{1-2p}{p}, \ldots$ is **(a)** 1 **(b)** $\frac{1}{p}$ **(c)** -1 **(d)** $-\frac{1}{p}$ **Ans:** (c) -1	1
7.	The n^{th} term of the A.P. a, 3a, 5a, …… is **(a)** na **(b)** $(2n - 1)a$ **(c)** $(2n + 1)a$ **(d)** 2na **Ans:** (b) $(2n - 1)a$	1
8.	The point P on x-axis equidistant from the points A(–1, 0) and B(5, 0) is **(a)** (2, 0) **(b)** (0, 2) **(c)** (3, 0) **(d)** (2, 2) **Ans:** (a) (2, 0)	1
9.	The co-ordinates of the point which is reflection of point (–3, 5) in x-axis are **(a)** (3, 5) **(b)** (3, –5) **(c)** (–3, –5) **(d)** (–3, 5) **Ans:** (c) (–3, –5)	1

10. If the point P (6, 2) divides the line segment joining A(6, 5) and B(4, y) in the ratio 3 : 1, then the value of y is

(a) 4 **(b)** 3 **(c)** 2 **(d)** 1

Ans: 1 mark be awarded to everyone **1**

In Q. Nos. 11 to 15, fill in the blanks. Each question is of 1 mark.

11. In fig. 1, MN || BC and AM : MB = 1 : 2, then $\frac{ar(\Delta AMN)}{ar(\Delta ABC)}$ = _________.

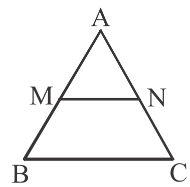


Fig. 1

Ans: $\frac{1}{9}$ **1**

12. In given Fig. 2, the length PB = _________ cm.

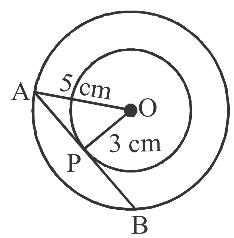


Fig. 2

Ans: 4 **1**

13. In ΔABC, AB = $6\sqrt{3}$ cm, AC = 12 cm and BC = 6 cm, then $\angle B$ = _________.

Ans: 90° **1**

OR

Two triangles are similar if their corresponding sides are _________.

Ans: proportional **1**

14. The value of (tan 1° tan 2° …… tan 89°) is equal to _________.

Ans: 1 **1**

15. In Fig. 3, the angles of depressions from the observing positions O_1 and O_2 respectively of the object A are ______________ , _______________.

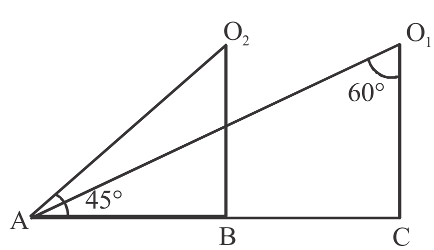
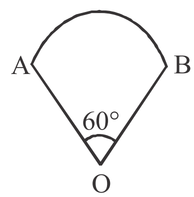


Fig. 3

Ans: 30°, 45° $\frac{1}{2}+\frac{1}{2}$

	Q. Nos. 16 to 20 are short answer type questions of 1 mark each.	
16.	If sin A + $\sin^2$ A = 1, then find the value of the expression ($\cos^2$ A + $\cos^4$ A).	
	Ans: $\left.\begin{array}{l}\sin A = 1 - \sin^2 A \\ \sin A = \cos^2 A\end{array}\right\}$	1/2
	$\cos^2 A + \cos^4 A = \sin A + \sin^2 A = 1$	1/2
17.	In Fig. 4 is a sector of circle of radius 10.5 cm. Find the perimeter of the sector. $\left(\text{Take } \pi = \frac{22}{7}\right)$	
	 **Fig. 4**	
	Ans: Perimeter $= 2r + \frac{\pi r \theta}{180°}$	
	$= 2 \times 10.5 + \frac{22}{7} \times 10.5 \times \frac{60°}{180°}$	1/2
	$= 21 + 11 = 32$ cm	1/2
18.	If a number x is chosen at random from the numbers –3, –2, –1, 0, 1, 2, 3, then find the probability of $x^2 < 4$.	
	Ans: Number of Favourable outcomes = 3 i.e., {–1, 0, 1} $\therefore$ $P(x^2 < 4) = \frac{3}{7}$	1/2+1/2
	OR	
	What is the probability that a randomly taken leap year has 52 Sundays ?	
	Ans: P(52 sundays) = $\frac{5}{7}$	1
19.	Find the class-marks of the classes 10-25 and 35-55.	
	Ans: Class Marks $\frac{10+25}{2} = 17.5; \frac{35+55}{2} = 45$	1/2+1/2
20.	A die is thrown once. What is the probability of getting a prime number.	
	Ans: Number of prime numbers = 3 i.e. ; {2, 3, 5}	1/2
	P(Prime Number) = $\frac{3}{6}$ or $\frac{1}{2}$	1/2

SECTION – B

Q. Nos. 21 to 26 carry 2 marks each

21. A teacher asked 10 of his students to write a polynomial in one variable on a paper and then to handover the paper. The following were the answers given by the students:

$2x + 3,\ 3x^2 + 7x + 2,\ 4x^3 + 3x^2 + 2,\ x^3 + \sqrt{3x} + 7,\ 7x + \sqrt{7},\ 5x^3 - 7x + 2,$

$2x^2 + 3 - \frac{5}{x},\ 5x - \frac{1}{2},\ ax^3 + bx^2 + cx + d,\ x + \frac{1}{x}.$

Answer the following questions :

(i) How many of the above ten, are not polynomials ?

(ii) How many of the above ten, are quadratic polynomials ?

Ans: (i) 3 — **1**

(ii) 1 — **1**

22. In Fig. 5, ABC and DBC are two triangles on the same base BC. If AD intersects BC at O, show that

$$\frac{ar(\Delta ABC)}{ar(\Delta DBC)} = \frac{AO}{DO}$$

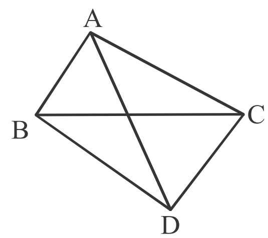
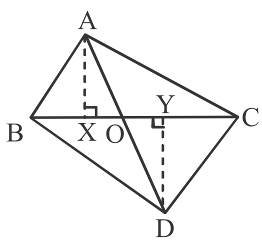


Fig. 5

Ans:



Draw $AX \perp BC$, $DY \perp BC$ — **1/2**

$\Delta AOX \sim \Delta DOY$

$$\frac{AX}{DY} = \frac{AO}{DO} \quad \ldots(i)$$ — **1/2**

$$\frac{ar(\Delta ABC)}{ar(\Delta DBC)} = \frac{\frac{1}{2}\times BC\times AX}{\frac{1}{2}\times BC\times DY}$$ — **1/2**

$$\frac{AX}{DY} = \frac{AO}{DO} \quad \text{(From (1))}$$ — **1/2**

OR

In Fig. 6, if $AD \perp BC$, then prove that $AB^2 + CD^2 = BD^2 + AC^2$.

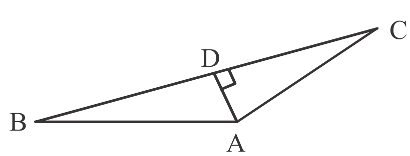


Fig. 6

Ans: In rt ΔABD $\quad AB^2 = BD^2 + AD^2 \quad \ldots$ (i) — **1/2**

In rt ΔADC $\quad CD^2 = AC^2 - AD^2 \quad \ldots$ (ii) — **1/2**

Adding (i) & (ii)

$AB^2 + CD^2 = BD^2 + AC^2$ — **1**

23.	Prove that $1+\frac{\cot^2\alpha}{1+\text{cosec}\,\alpha}=\text{cosec}\,\alpha$	
	Ans: L.H.S = $1+\frac{\text{cosec}^2\alpha-1}{1+\text{cosec}\,\alpha}$	1/2
	$=1+\frac{(\text{cosec}\,\alpha-1)(\text{cosec}\,\alpha+1)}{\text{cosec}\,\alpha+1}$	1
	= cosec α = R.H.S	1/2
	OR	
	Show that $\tan^4\theta+\tan^2\theta=\sec^4\theta-\sec^2\theta$	
	Ans: L.H.S = $\tan^4\theta+\tan^2\theta$	
	$=\tan^2\theta(\tan^2\theta+1)$	1/2
	$=(\sec^2\theta-1)(\sec^2\theta)=\sec^4\theta-\sec^2\theta$ = R.H.S	1+1/2
24.	The volume of a right circular cylinder with its height equal to the radius is $25\frac{1}{7}$ cm³. Find the height of the cylinder. $\left(\text{Use }\pi=\frac{22}{7}\right)$	
	Ans: Let height and radius of cylinder = x cm	1/2
	$V=\frac{176}{7}\text{cm}^3$	
	$\frac{22}{7}\times x^2\times x=\frac{176}{7}$	1/2
	$x^3=8\ \Rightarrow x=2$	1/2
	∴ height of cylinder = 2 cm	1/2
25.	A child has a die whose six faces show the letters as shown below :	
	[A] [B] [C] [D] [E] [A]	
	The die is thrown once. What is the probability of getting (i) A, (ii) D ?	
	Ans: (i) $P(A)=\frac{2}{6}$ or $\frac{1}{3}$ (ii) $P(D)=\frac{1}{6}$	1+1
26.	Compute the mode for the following frequency distribution :	

Size of items (in cm)	0 – 4	4 – 8	8 – 12	12 – 16	16 – 20	20 – 24	24 – 28
Frequency	5	7	9	17	12	10	6

Ans: $l=12\quad f_0=9\quad f_1=17\quad f_2=12\quad h=4$ — 1/2

$\text{Mode}=12+\frac{17-9}{34-9-12}\times4=14.46$ cm (Approx) — $1+\frac{1}{2}$

SECTION – C

Question numbers 27 to 34 carry 3 marks each.

27. If 2x + y = 23 and 4x – y = 19, find the value of (5y – 2x) and $\left(\frac{y}{x} - 2\right)$

Ans: 2x + y = 23 , 4x – y = 19

Solving, we get x = 7, y = 9 — **1+1**

$5y - 2x = 31, \quad \frac{y}{x} - 2 = \frac{-5}{7}$ — **1/2+1/2**

OR

Solve for x : $\frac{1}{x+4} - \frac{1}{x+7} = \frac{11}{30}$, x # –4, 7

Ans: $\frac{1}{x+4} - \frac{1}{x-7} = \frac{11}{30} \Rightarrow \frac{-11}{(x+4)(x-7)} = \frac{11}{30}$ — **1**

$\Rightarrow x^2 - 3x + 2 = 0$ — **1**

$\Rightarrow (x-2)(x-1) = 0$ — **1/2**

$\Rightarrow x = 2, 1$ — **1/2**

The Following solution should also be accepted

$\frac{1}{x+4} - \frac{1}{x+7} = \frac{11}{30} \Rightarrow \frac{x+7-x-4}{(x+4)(x-7)} = \frac{11}{30}$ — **1**

$\Rightarrow 11x^2 + 121x + 218 = 0$ — **$1\frac{1}{2}$**

Here, D = 5049

$x = \frac{-121 \pm \sqrt{5049}}{22}$ — **1/2**

28. Show that the sum of all terms of an A.P. whose first term is a, the second term is b and the last term is c is equal to $\frac{(a+c)(b+c-2a)}{2(b-a)}$

Ans: Here d = b – a — **1/2**

Let c be the n^{th} term

$\therefore$ c = a + (n – 1) (b – a) — **1/2**

$\Rightarrow n = \frac{c+b-2a}{b-a}$ — **1**

$\Rightarrow S_n = \frac{c+b-2a}{2(b-a)}(a+c)$ — **1**

OR

Solve the equation : 1 + 4 + 7 + 10 + … + x = 287.

Ans: Let sum of n terms = 287

$\frac{n}{2}[2\times1+(n-1)3] = 287$ **1/2**

$3n^2 - n - 574 = 0$ **1/2**

$(3n + 41)(n - 14) = 0$ **1/2**

$n = 14 \left(\text{Reject } n = \frac{-41}{3}\right)$ **1/2**

$x = a_{14} = 1 + 13 \times 3 = 40$ **1**

29. In a flight of 600 km, an aircraft was slowed down due to bad weather. The average speed of the trip was reduced by 200 km/hr and the time of flight increased by 30 minutes. Find the duration of flight.

Ans: Let actual speed = x km/hr

A.T.Q

$\frac{600}{x-200} - \frac{600}{x} = \frac{1}{2}$ **1**

$x^2 - 200x - 240000 = 0$

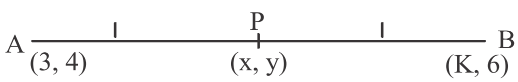
$(x - 600)(x + 400) = 0$ **1**

$x = 600$ ($x = -400$ Rejected) **1/2**

Duration of flight $= \frac{600}{600} = 1$ hr **1/2**

30. If the mid-point of the line segment joining the points A(3, 4) and B(k, 6) is P (x, y) and x + y – 10 = 0, find the value of k.

Ans:



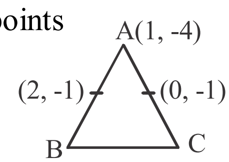
$x = \frac{3+k}{2}$ $y = 5$ **1/2+1/2**

$x + y - 10 = 0 \Rightarrow \frac{3+k}{2} + 5 - 10 = 0$ **1**

$\Rightarrow k = 7$ **1**

OR

Find the area of triangle ABC with A (1, –4) and the mid-points of sides through A being (2, –1) and (0, –1).



Ans: B(3, 2), C(–1, 2) **1/2+1/2**

Area $= \frac{1}{2}\left|1(2-2)+3(2+4)-1(-4-2)\right| = 12$ sq.units **1+1**

31. In Fig. 7, if ΔABC ~ ΔDEF and their sides of lengths (in cm) are marked along them, then find the lengths of sides of each triangle.

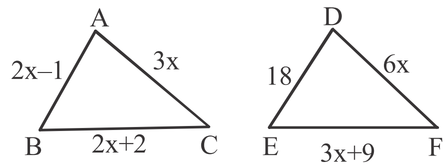


Fig. 7

Ans: As ΔABC ~ ΔDEF

$$\frac{2x-1}{18} = \frac{3x}{6x}$$ **1**

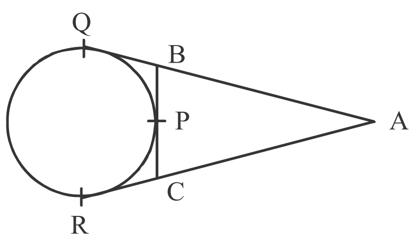
$$x = 5$$ **1**

AB = 9 cm	DE = 18 cm	
BC = 12 cm	EF = 24 cm	**1/2+1/2**
CA = 15 cm	FD = 30 cm	

32. If a circle touches the side BC of a triangle ABC at P and extended sides AB and AC at Q and R, respectively, prove that

$$AQ = \frac{1}{2}(BC + CA + AB)$$

Ans:



Correct Fig **1/2**

$$AQ = \frac{1}{2}\ (2AQ)$$ **1/2**

$$= \frac{1}{2}\ (AQ + AQ)$$

$$= \frac{1}{2}\ (AQ + AR)$$

$$= \frac{1}{2}\ (AB + BQ + AC + CR)$$ **1**

$$= \frac{1}{2}\ (AB + BC + CA)$$ **1**

$\because$ [BQ = BP, CR = CP]

33. If $\sin\theta + \cos\theta = \sqrt{2}$, prove that $\tan\theta + \cot\theta = 2$.

Ans: $\sin\theta + \cos\theta = \sqrt{2}$ **1**

$\tan\theta + 1 = \sqrt{2}\ \sec\theta$

Sq. both sides

$\tan^2\theta + 1 + 2\tan\theta = 2\sec^2\theta$

$\tan^2\theta + 1 + 2\tan\theta = 2(1 + \tan^2\theta)$ **1**

$\tan^2\theta + 1 + 2\tan\theta = 2 + 2\tan^2\theta$

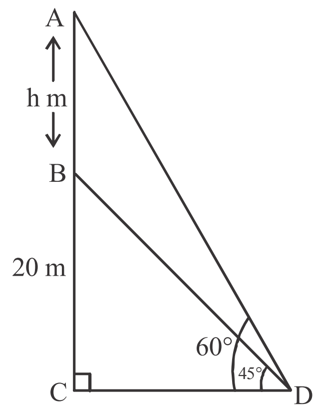
$2\tan\theta = \tan^2\theta + 1$ **1**

$2 = \tan\theta + \cot\theta$

34.	The area of a circular play ground is 22176 cm^2. Find the cost of fencing this ground at the rate of ₹ 50 per metre.	
	Ans: Let the radius of playground be r cm	
	$\pi r^2 = 22176$ cm^2	**1**
	r = 84 cm	
	Circumference $= 2\pi r = 2 \times \frac{22}{7} \times 84 = 528$ cm	**1**
	Cost of fencing $= \frac{50}{100} \times 528 =$ ₹ 264	**1**
	SECTION – D	
	Question numbers 35 to 40 carry 4 marks each.	
35.	Prove that $\sqrt{5}$ is an irrational number.	
	Ans: Let $\sqrt{5}$ be a rational number.	
	$\sqrt{5} = \frac{p}{q}$, p & q are coprimes & $q \neq 0$	**1**
	$5q^2 = p^2 \Rightarrow 5$ divides $p^2 \Rightarrow 5$ divides p also Let p = 5a, for some integer a	**1**
	$5q^2 = 25a^2 \Rightarrow q^2 = 5a^2 \Rightarrow 5$ divides $q^2 \Rightarrow 5$ divides q also	
	$\therefore$ 5 is a common factor of p, q, which is not possible as p, q are coprimes.	**1**
	Hence assumption is wrong $\sqrt{5}$ is irrational no.	**1**
36.	It can take 12 hours to fill a swimming pool using two pipes. If the pipe of larger diameter is used for four hours and the pipe of smaller diameter for 9 hours, only half of the pool can be filled. How long would it take for each pipe to fill the pool separately ?	
	Ans: Let time taken by pipe of larger diameter to fill the tank be x hr	
	Let time taken by pipe of smaller diameter to fill the tank be y hr	
	A.T.Q	
	$\frac{1}{x} + \frac{1}{y} = \frac{1}{12}, \frac{4}{x} + \frac{9}{y} = \frac{1}{2}$	**1+1**
	Solving we get x = 20 hr y = 30 hr	**1+1**
37.	Draw a circle of radius 2 cm with centre O and take a point P outside the circle such that OP = 6.5 cm. From P, draw two tangents to the circle.	
	Ans: Correct construction of circle of radius 2 cm	**1**
	Correct construction of tangents.	**3**
	OR	
	Construct a triangle with sides 5 cm, 6 cm and 7 cm and then construct another triangle whose sides are $\frac{3}{4}$ times the corresponding sides of the first triangle.	
	Ans: Correct construction of given triangle	**1**
	Construction of Similar triangle	**3**

38. From a point on the ground, the angles of elevation of the bottom and the top of a tower fixed at the top of a 20 m high building are 45° and 60° respectively. Find the height of the tower.

Ans: Let height of tower = h m



corr fig. 1

In rt. ΔBCD $\tan 45° = \dfrac{BC}{CD}$

$1 = \dfrac{20}{CD}$

$CD = 20$ m **1**

In rt. ΔACD $\tan 60° = \dfrac{AC}{CD}$

$\sqrt{3} = \dfrac{20+h}{20}$ **1**

$h = 20\left(\sqrt{3}-1\right)$ m **1**

39. Find the area of the shaded region in Fig. 8, if PQ = 24 cm, PR = 7 cm and O is the centre of the circle.

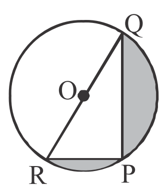


Fig. 8

Ans: $\angle P = 90°$ $RQ = \sqrt{(24)^2 + 7^2} = 25$ cm, $r = \dfrac{25}{2}$ cm **$1\frac{1}{2}$**

Area of shaded portion = Area of semi circle – ar (ΔPQR)

$= \dfrac{1}{2} \times \dfrac{22}{7} \times \left(\dfrac{25}{2}\right)^2 - 84$ **2**

$= 161.54$ cm^2 **1/2**

OR

Find the curved surface area of the frustum of a cone, the diameters of whose circular ends are 20 m and 6 m and its height is 24 m.

Ans: R = 10 m r = 3 m h = 24 m **1/2+1/2**

$l = \sqrt{(24)^2 + (10-3)^2} = 25$ m **1**

CSA = $\pi(10 + 3)25 = 325\,\pi$ m^2 **1+1**

40. The mean of the following frequency distribution is 18. The frequency f in the class interval 19 – 21 is missing. Determine f.

Class interval	11 – 13	13 – 15	15 – 17	17 – 19	19 – 21	21 – 23	23 – 25
Frequency	3	6	9	13	f	5	4

Ans:

C.I	f	x	xf
11-13	3	12	36
13-15	6	14	84
15-17	9	16	144
17-19	13	18	234
19-21	f	20	20f
21-23	5	22	110
23-25	4	24	96
	40+f		704 + 20f

2

$$\text{Mean} = \frac{\sum xf}{\sum f} \Rightarrow 18 = \frac{704+20f}{40+f} \Rightarrow f = 8$$ 2

OR

The following table gives production yield per hectare of wheat of 100 farms of a village :

Production yield	40-45	45-50	50-55	55-60	60-65	65-70
No. of farms	4	6	16	20	30	24

Change the distribution to a 'more than' type distribution and draw its ogive.

Ans:

Production yield	**Number of farms**
More than or equal to 40	100
More than or equal to 45	96
More than or equal to 50	90
More than or equal to 55	74
More than or equal to 60	54
More than or equal to 65	24

2

Plotting of points (40, 100) (45, 96) (50, 90) (55, 74) (60, 54) (65, 24) join to get ogive. 2