QUESTION PAPER CODE 30/2/3

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 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
2.	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
3.	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
4.	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
5.	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
6.	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
7.	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
8.	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
9.	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

10. 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**

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

11. In Fig. 1, the angles of depressions from the observing positions O_1 and O_2 respectively of the object A are _____ , _____.

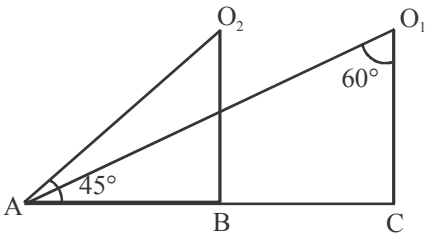


Fig. 1

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

12. 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**

13. In given Fig. 2, the length PB = _____ cm.

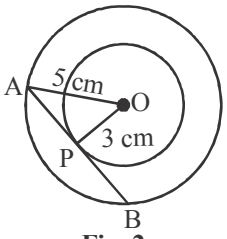


Fig. 2

Ans: 4 — **1**

14. In Fig. 3, MN || BC and AM : MB = 1 : 2, then $\frac{ar(\Delta AMN)}{ar(\Delta ABC)}$ = _____.

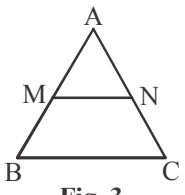


Fig. 3

Ans: $\frac{1}{9}$ — **1**

15. The value of sin 32° cos 58° + cos 32° sin 58° is

Ans: 1 — **1**

OR

The value of $\frac{\tan 35°}{\tan 55°} + \frac{\cot 78°}{\tan 12°}$ is _____.

Ans: 2 **1**

Q. Nos. 16 to 20 are short answer type questions of 1 mark each.

16. 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**

$P(\text{Prime Number}) = \frac{3}{6}$ or $\frac{1}{2}$ **1/2**

17. 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: $P(52 \text{ sunday}) = \frac{5}{7}$ **1**

18. If $\sin A + \sin^2 A = 1$, then find the value of the expression $(\cos^2 A + \cos^4 A)$.

Ans: $\left.\begin{aligned} \sin A &= 1 - \sin^2 A \\ \sin A &= \cos^2 A \end{aligned}\right\}$ **1/2**

$\cos^2 A + \cos^4 A = \sin A + \sin^2 A = 1$ **1/2**

19. Find the area of the sector of a circle of radius 6 cm whose central angle is 30°. (Take $\pi = 3.14$)

Ans: Area $= 3.14 \times (6)^2 \times \frac{30°}{360°}$ **1/2**

$= 9.42 \text{ cm}^2$ **1/2**

20. Find the class marks of the classes 20 – 50 and 35 – 60.

Ans: $\frac{20+50}{2} = 35$ **1/2**

$\frac{35+60}{2} = 47.5$ **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. 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**

23. In Fig. 4, ABC and DBC are two triangles on the same base BC. If AD intersects BC at O, show that

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

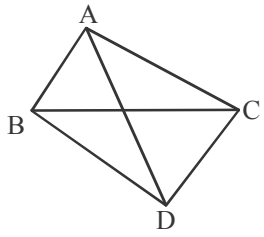
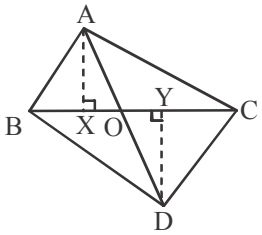


Fig. 4

Ans:



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

$\Delta AOX \sim \Delta DOY$

$\frac{AX}{DY} = \frac{AO}{DO}$ …(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**

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

OR

In Fig. 5, if $AD \perp BC$, then prove that $AB^2 + CD^2 = BD^2 + AC^2$.

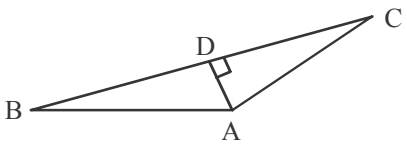


Fig. 5

Ans: In rt ΔABD $AB^2 = BD^2 + AD^2$ … (i) **1/2**

In rt ΔADC $CD^2 = AC^2 - AD^2$ … (ii) **1/2**

Adding (i) & (ii)

$AB^2 + CD^2 = BD^2 + AC^2$ **1**

24. Prove that $1+\frac{\cot^2\alpha}{1+\operatorname{cosec}\alpha}=\operatorname{cosec}\alpha$

Ans: L.H.S = $1+\frac{\operatorname{cosec}^2\alpha-1}{1+\operatorname{cosec}\alpha}$ **1/2**

$=1+\frac{(\operatorname{cosec}\alpha-1)(\operatorname{cosec}\alpha+1)}{\operatorname{cosec}\alpha+1}$ **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**

25. Find the mode of the following frequency distribution :

Class	15-20	20-25	25-30	30-35	35-40	40-45
Frequency	3	8	9	10	3	2

Ans: Modal class = 30-35, $l = 30$, $f_0 = 9$, $f_1 = 10$, $f_2 = 3$, $h = 5$ **1/2**

Mode = $30+\left(\frac{10-9}{2\times10-9-3}\right)\times5$ **1**

= 30.625 or 30.62 or 30.63 **1/2**

26. From a solid right circular cylinder of height 14 cm and base radius 6 cm, a right circular cone of same height and same base radius is removed. Find the volume of the remaining solid.

Ans: Volume of remaining solid = $\pi(6)^2\times14-\frac{1}{3}\pi(6)^2\times14$ **1**

$=336\ \pi\ \text{cm}^3$ or $1056\ \text{cm}^3$ **1**

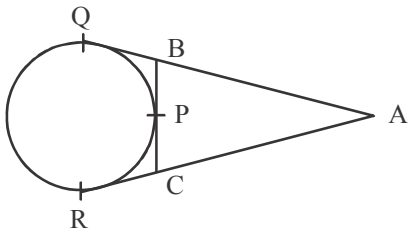
SECTION – C

Question numbers 27 to 34 carry 3 marks each.

27. 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]

28. 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**

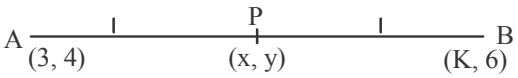
$r = 84$ cm

Circumference $= 2\pi r = 2 \times \frac{22}{7} \times 84 = 528$ cm — **1**

Cost of fencing $= \frac{50}{100} \times 528 = ₹\,264$ — **1**

29. 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:



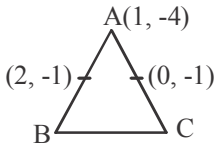
$x = \frac{3+k}{2}$ $\quad y = 5$ — **1/2+1/2**

$x + y - 10 = 0 \Rightarrow \frac{3+k}{2} + 5 - 10 = 0$ — **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 $= \frac{1}{2}|1(2-2) + 3(2+4) - 1(-4-2)| = 12$ sq.units — **1+1**

30. In Fig. 6, if $\Delta ABC \sim \Delta DEF$ and their sides of lengths (in cm) are marked along them, then find the lengths of sides of each triangle.

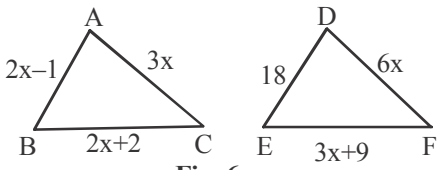


Fig. 6

Ans: As $\Delta ABC \sim \Delta DEF$

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

31. 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**

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

OR

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

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**

32. Which term of the A.P. $20, 19\frac{1}{4}, 18\frac{1}{2}, 17\frac{3}{4}\ldots$ is the first negative term.

Ans: $a = 20$ & $d = 19\frac{1}{4} - 20 = -\frac{3}{4}$ **1/2**

$a_n < 0$ **1/2**

$20+(n-1)\left(-\frac{3}{4}\right) < 0$ **1**

$n > 27\frac{2}{3}$ **1/2**

$\therefore$ 28^{th} term of the given A. P. is first negative term **1/2**

OR

Find the middle term of the A.P. 7, 13, 19, …., 247.

Ans: $a = 7$ & $d = 13 - 7 = 6$ **1/2**

$247 = 7 + (n-1)6$ **1**

$n = 41$ **1/2**

Middle term $= \left(\frac{41+1}{2}\right)^{th} = 21^{st}$ term. **1/2**

$a_{21} = 7 + 20 \times 6 = 127$ **1/2**

33. Water in a canal, 6 m wide and 1.5 m deep, is flowing with a speed of 10 km/h. How much area will it irrigate in 30 minutes, if 8 cm standing water is required ?

Ans: Volume of water in canal in 1 hr $= 10000 \times 6 \times 1.5 = 90000\ m^3$ **1**

Volume of water in canal in 30 mins $= \frac{1}{2} \times 90000 = 45000\ m^3$ **1/2**

Area $= \frac{45000}{8/100}$ **1**

$= 562500\ m^2$ **1/2**

34. Show that :

$$\frac{\cos^2(45°+\theta)+\cos^2(45°-\theta)}{\tan(60°+\theta)\tan(30°-\theta)} = 1$$

Ans: L.H.S $= \frac{\cos^2(45°+\theta)+\sin^2(90°-45°+\theta)}{\tan(60°+\theta)\cdot\cot(90°-30°+\theta)}$ **1**

$= \frac{\cos^2(45°+\theta)+\sin^2(45°+\theta)}{\tan(60°+\theta)\cdot\cot(60°+\theta)}$ **1**

$= \frac{1}{1} = 1 = $ R.H.S **1**

SECTION – D

Question numbers 35 to 40 carry 4 marks each.

35. 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

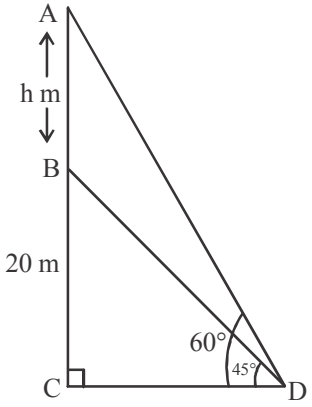
Plotting of points (40, 100) (45, 96) (50, 90) (55, 74) (60, 54) (65, 24) join to get ogive.

2

36. 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

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



corr fig. 1

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

$CD = 20$ m

1

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

$\sqrt{3} = \frac{20 + h}{20}$

1

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

1

37. 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

38. 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

39. Draw a circle of radius 3.5 cm. From a point P, 6 cm from its centre, draw two tangents to the circle.

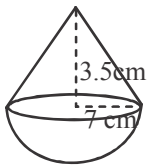
Ans: Correct construction of circle of radius 3.5 cm 1

Correct construction of tangents. 3

OR

Construct a ΔABC with AB = 6 cm, BC = 5 cm and $\angle B = 60°$.

Now construct another triangle whose sides are $\frac{2}{3}$ times the corresponding sides of ΔABC.

	Ans: Correct construction of given triangle	**1**
	Construction of Similar triangle	**3**
40.	A solid is in the shape of a hemisphere surmounted by a cone. If the radius of hemisphere and base radius of cone is 7 cm and height of cone is 3.5 cm, find the volume of the solid. $\left(\text{Take } \pi = \frac{22}{7}\right)$	
	Ans: Volume of solid $= \frac{1}{3} \times \frac{22}{7} \times (7)^2 \times 3.5 + \frac{2}{3} \times \frac{22}{7} \times (7)^3$	**2**
	$= \frac{22}{7} \times (7)^2 \times \left[\frac{3.5}{3} + \frac{2}{3} \times 7\right]$ 	**1**
	$= 898\frac{1}{3}$ or 898.33 cm^3	**1**