

QUESTION PAPER CODE 30/2/2
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.	<p>The value of k for which the system of linear equations $x + 2y = 3$, $5x + ky + 7 = 0$ is inconsistent is</p> <p>(a) $-\frac{14}{3}$ (b) $\frac{2}{5}$ (c) 5 (d) 10</p> <p>Ans: (d) 10</p>	1
2.	<p>The zeroes of the polynomial $x^2 - 3x - m(m + 3)$ are</p> <p>(a) m, m + 3 (b) -m, m + 3 (c) m, -(m + 3) (d) -m, -(m + 3)</p> <p>Ans: (b) -m, m + 3</p>	1
3.	<p>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</p> <p>(a) $0 < r < b$ (b) $0 < r \leq b$ (c) $0 \leq r < b$ (d) $0 \leq r \leq b$</p> <p>Ans: (c) $0 \leq r < b$</p>	1
4.	<p>The sum of exponents of prime factors in the prime-factorisation of 196 is</p> <p>(a) 3 (b) 4 (c) 5 (d) 2</p> <p>Ans: (b) 4</p>	1
5.	<p>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</p> <p>(a) 4 (b) 3 (c) 2 (d) 1</p> <p>Ans: 1 mark be awarded to everyone</p>	1
6.	<p>The co-ordinates of the point which is reflection of point (-3, 5) in x-axis are</p> <p>(a) (3, 5) (b) (3, -5) (c) (-3, -5) (d) (-3, 5)</p> <p>Ans: (c) (-3, -5)</p>	1
7.	<p>The point P on x-axis equidistant from the points A(-1, 0) and B(5, 0) is</p> <p>(a) (2, 0) (b) (0, 2) (c) (3, 0) (d) (2, 2)</p> <p>Ans: (a) (2, 0)</p>	1
8.	<p>The n^{th} term of the A.P. a, 3a, 5a, is</p> <p>(a) na (b) (2n - 1)a (c) (2n + 1) a (d) 2na</p> <p>Ans: (b) (2n - 1)a</p>	1
9.	<p>The common difference of the A.P. $\frac{1}{p}, \frac{1-p}{p}, \frac{1-2p}{p}, \dots$ is</p> <p>(a) 1 (b) $\frac{1}{p}$ (c) -1 (d) $-\frac{1}{p}$</p> <p>Ans: (c) -1</p>	1

10. 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

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 _____, _____.

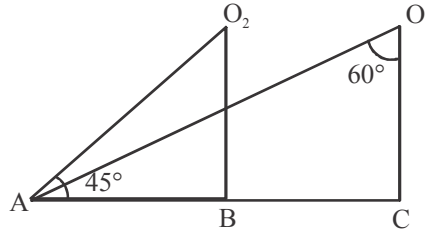


Fig. 1

Ans: $30^\circ, 45^\circ$

12. In Fig. 2, $MN \parallel BC$ and $AM : MB = 1 : 2$, then $\frac{\text{ar}(\Delta AMN)}{\text{ar}(\Delta ABC)} = \underline{\hspace{2cm}}$.

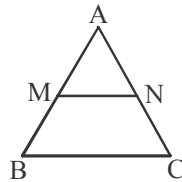


Fig. 2

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

13. In given Fig. 3, the length $PB = \underline{\hspace{2cm}}$ cm.

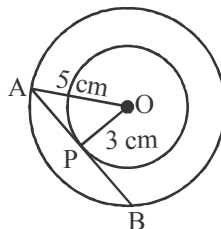


Fig. 3

Ans: 4

14. In ΔABC , $AB = 6\sqrt{3}$ cm, $AC = 12$ cm and $BC = 6$ cm, then $\angle B = \underline{\hspace{2cm}}$.

Ans: 90°

OR

Two triangles are similar if their corresponding sides are _____.

Ans: proportional

15. The value of $\sin 23^\circ \cos 67^\circ + \cos 23^\circ \sin 67^\circ$ is _____.

Ans: 1

1

$\frac{1}{2} + \frac{1}{2}$

1

1

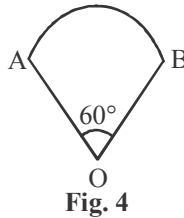
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1

1

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

16. In Fig. 4 is a sector of circle of radius 10.5 cm. Find the perimeter of the sector. (Take $\pi = \frac{22}{7}$)



Ans: Perimeter = $2r + \frac{\pi r \theta}{180^\circ}$

$$= 2 \times 10.5 + \frac{22}{7} \times 10.5 \times \frac{60^\circ}{180^\circ}$$

$$= 21 + 11 = 32 \text{ cm}$$

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: $P(52 \text{ sundays}) = \frac{5}{7}$

1

18. 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

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

1/2

19. If $\tan A = \cot B$, then find the value of $(A + B)$.

Ans: $\tan A = \tan (90^\circ - B)$

1/2

$$\therefore A + B = 90^\circ$$

1/2

20. Find the class marks of the classes 15 – 35 and 45 – 60.

Ans: $\frac{15 + 35}{2} = 25$

1/2

$$\frac{45 + 60}{2} = 52.5$$

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
 (ii) 1

1
1

22. 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: $l = 12$ $f_0 = 9$ $f_1 = 17$ $f_2 = 12$ $h = 4$

$$\text{Mode} = 12 + \frac{17 - 9}{34 - 9 - 12} \times 4 = 14.46 \text{ cm (Approx)}$$

1/2
1 + 1/2

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

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

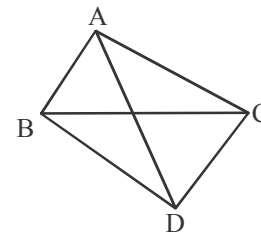
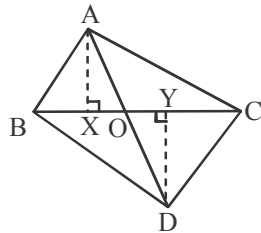


Fig. 5

Ans:



Draw $AX \perp BC$, $DY \perp BC$

$\triangle AOX \sim \triangle DOY$

$$\frac{AX}{DY} = \frac{AO}{DO} \dots (i)$$

$$\frac{\text{ar}(\triangle ABC)}{\text{ar}(\triangle DBC)} = \frac{\frac{1}{2} \times BC \times AX}{\frac{1}{2} \times BC \times DY}$$

$$\frac{AX}{DY} = \frac{AO}{DO} \text{ (From (1))}$$

OR

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

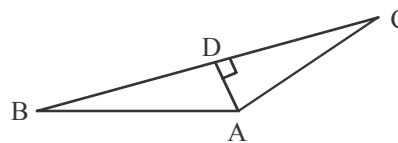


Fig. 6

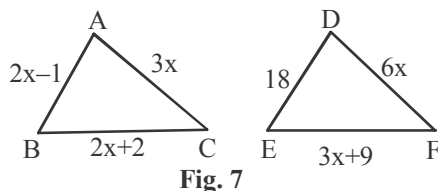
1/2
1/2
1/2
1/2

	<p>Ans: In rt $\triangle ABD$ $AB^2 = BD^2 + AD^2 \dots (i)$</p> <p>In rt $\triangle ADC$ $CD^2 = AC^2 - AD^2 \dots (ii)$</p> <p>Adding (i) & (ii)</p> $AB^2 + CD^2 = BD^2 + AC^2$	<p>1/2</p> <p>1/2</p> <p>1</p>
24.	<p>Prove that $1 + \frac{\cot^2 \alpha}{1 + \operatorname{cosec} \alpha} = \operatorname{cosec} \alpha$</p> <p>Ans: L.H.S = $1 + \frac{\operatorname{cosec}^2 \alpha - 1}{1 + \operatorname{cosec} \alpha}$</p> $= 1 + \frac{(\operatorname{cosec} \alpha - 1)(\operatorname{cosec} \alpha + 1)}{\operatorname{cosec} \alpha + 1}$ $= \operatorname{cosec} \alpha = \text{R.H.S}$ <p style="text-align: center;">OR</p> <p>Show that $\tan^4 \theta + \tan^2 \theta = \sec^4 \theta - \sec^2 \theta$</p> <p>Ans: L.H.S = $\tan^4 \theta + \tan^2 \theta$</p> $= \tan^2 \theta (\tan^2 \theta + 1)$ $= (\sec^2 \theta - 1) (\sec^2 \theta) = \sec^4 \theta - \sec^2 \theta = \text{R.H.S}$	<p>1/2</p> <p>1</p> <p>1/2</p> <p>1/2</p> <p>1</p> <p>1+1/2</p>
25.	<p>A child has a die whose six faces show the letters as shown below :</p> <p>A A B C C C</p> <p>The die is thrown once. What is the probability of getting (i) A, (ii) D ?</p> <p>Ans: (i) $P(A) = \frac{2}{6}$ or $\frac{1}{3}$ (ii) $P(D) = \frac{3}{6}$ or $\frac{1}{2}$</p>	<p>1+1</p>
26.	<p>A solid is in the shape of a cone mounted on a hemisphere of same base radius. If the curved surface areas of the hemispherical part and the conical part are equal, then find the ratio of the radius and the height of the conical part.</p> <p>Ans: CSA of conical part = CSA of hemispherical part</p> $\pi r l = 2\pi r^2$ $\sqrt{r^2 + h^2} = 2r$ $h^2 = 3r^2$ $\frac{r}{h} = \frac{1}{\sqrt{3}} \Rightarrow \text{ratio is } 1 : \sqrt{3}$	<p>1/2</p> <p>1/2</p> <p>1/2</p> <p>1/2</p>

SECTION – C

Question numbers 27 to 34 carry 3 marks each.

27. In Fig. 7, if $\triangle ABC \sim \triangle DEF$ and their sides of lengths (in cm) are marked along them, then find the lengths of sides of each triangle.



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

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

$$x = 5$$

AB = 9 cm	DE = 18 cm
BC = 12 cm	EF = 24 cm
CA = 15 cm	FD = 30 cm

1

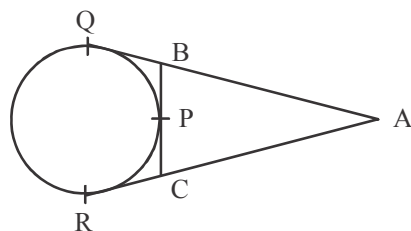
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1/2+1/2

28. 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

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

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

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

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

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

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

1/2

1/2

1

1

29. The area of a circular playground 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

$$\pi r^2 = 22176 \text{ cm}^2$$

$$r = 84 \text{ cm}$$

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

1

1

$$\text{Cost of fencing} = \frac{50}{100} \times 528 = ₹ 264$$

1

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

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 1/2

Here, $D = 5049$

$$x = \frac{-121 \pm \sqrt{5049}}{22}$$

1/2

31. 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: $A \frac{1}{(3, 4)} \frac{1}{(x, y)} \frac{1}{(k, 6)} B$

$$x = \frac{3+k}{2} \quad y = 5$$

1/2+1/2

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

1

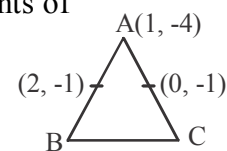
$$\Rightarrow k = 7$$

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

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

1+1

32. If in an A.P., the sum of first m terms is n and the sum of its first n terms is m , then prove that the sum of its first $(m + n)$ terms is $-(m + n)$.

Ans: $S_m = n$ and $S_n = m$

$$2a + (m-1)d = \frac{2n}{m} \dots(i) \quad 2a + (n-1)d = \frac{2m}{n} \dots (ii)$$

Solving (i) & (ii), $a = \frac{m^2 + n^2 + mn - n - m}{mn}$ & $d = \frac{-2(n-m)}{mn}$

$$S_{m+n} = \frac{m+n}{2} \left[\frac{2 \times m^2 + n^2 + mn - n - m}{mn} \right] + (m+n-1) \left\{ \frac{-2(n+m)}{mn} \right\}$$

$$= (-1)(m+n)$$

OR

Find the sum of all 11 terms of an A.P. whose middle term is 30.

Ans: Middle term = $\left(\frac{11+1}{2}\right)^{\text{th}}$ term = $a_6 = 30$

$$S_{11} = \frac{11}{2} [2a + 10d]$$

$$= 11(a + 5d)$$

$$= 11 a_6 = 11 \times 30 = 330$$

33. A fast train takes 3 hours less than a slow train for a journey of 600 km. If the speed of the slow train is 10 km/h less than that of the fast train, find the speed of each train.

Ans: Let the speeds of fast train & slow train be x km/hr & $(x - 10)$ km/hr respectively.

A.T.Q.

$$\frac{600}{x-10} - \frac{600}{x} = 3$$

$$x^2 - 10x - 2000 = 0$$

$$(x - 50)(x + 40) = 0$$

$$x = 50 \text{ or } -40$$

Speed is always positive, So, $x = 50$

\therefore Speed of fast train & slow train are 50 km/hr & 40 km/hr respectively.

34. If $1 + \sin^2\theta = 3 \sin \theta \cos \theta$, prove that $\tan \theta = 1$ or $\frac{1}{2}$

Ans: $\frac{1 + \sin^2 \theta}{\cos^2 \theta} = \frac{3 \sin \theta \cdot \cos \theta}{\cos^2 \theta}$ (Dividing both sides by $\cos^2\theta$)

$$\sec^2\theta + \tan^2\theta = 3 \tan \theta$$

$$(1 + \tan^2\theta) + \tan^2\theta = 3 \tan \theta$$

$$2 \tan^2\theta - 3 \tan \theta + 1 = 0$$

$$(\tan \theta - 1)(2 \tan \theta - 1) = 0$$

$$\tan \theta = 1 \text{ or } \frac{1}{2}$$

1/2

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
	<u>40+f</u>		<u>704 + 20f</u>

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

2

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. 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.

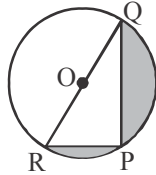


Fig. 8

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

$$\left. \begin{aligned} \text{Area of shaded portion} &= \text{Area of semi circle} - \text{ar}(\Delta PQR) \\ &= \frac{1}{2} \times \frac{22}{7} \times \left(\frac{25}{2}\right)^2 - 84 \\ &= 161.54 \text{ cm}^2 \end{aligned} \right\}$$

1 1/2

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

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

$$\text{CSA} = \pi(10 + 3)25 = 325 \pi \text{ m}^2$$

1/2+1/2

1

1+1

37. Prove that $\sqrt{5}$ is an irrational number.

Ans: Let $\sqrt{5}$ be a rational number.

$$\sqrt{5} = \frac{p}{q}, \text{ p \& q are coprimes \& } q \neq 0$$

$$5q^2 = p^2 \Rightarrow 5 \text{ divides } p^2 \Rightarrow 5 \text{ divides } p \text{ also Let } p = 5a, \text{ for some integer a}$$

$$5q^2 = 25a^2 \Rightarrow q^2 = 5a^2 \Rightarrow 5 \text{ divides } q^2 \Rightarrow 5 \text{ divides } q \text{ also}$$

\therefore 5 is a common factor of p, q, which is not possible as p, q are coprimes.

Hence assumption is wrong $\sqrt{5}$ is irrational no.

1

1

1

1

38. 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

$$\frac{1}{x} + \frac{1}{y} = \frac{1}{12}, \frac{4}{x} + \frac{9}{y} = \frac{1}{2}$$

Solving we get x = 20 hr y = 30 hr

1+1

1+1

39. Draw two tangents to a circle of radius 4 cm, which are inclined to each other at an angle of 60° .

Ans: Correct construction of circle of radius 4 cm
 Correct construction of tangents

1
3

OR

Construct a triangle ABC with sides 3 cm, 4 cm and 5 cm. Now, construct another triangle whose sides are $\frac{4}{5}$ times the corresponding sides of ΔABC .

Ans: Correct construction of triangle with sides 3 cm, 4 cm & 5 cm
 Correct construction of similar triangle

1
3

40. The angle of elevation of the top of a building from the foot of a tower is 30° and the angle of elevation of the top of a tower from the foot of the building is 60° . If the tower is 50 m high, then find the height of the building.

Ans: Correct figure
 Let the height of building be h m

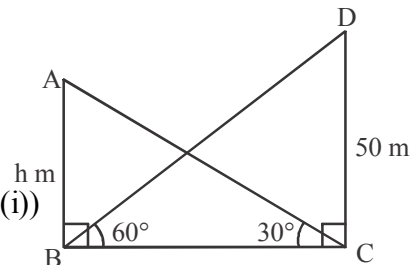
$$\text{In rt. } \Delta BCD, \tan 60^\circ = \frac{50}{BC}$$

$$\Rightarrow BC = \frac{50}{\sqrt{3}} \dots (i)$$

$$\text{In rt. } \Delta ABC, \tan 30^\circ = \frac{h}{BC}$$

$$\Rightarrow \frac{1}{\sqrt{3}} = \frac{h}{50/\sqrt{3}} \text{ (from (i))}$$

$$\therefore h = \frac{50}{3} \text{ or } 16\frac{2}{3} \text{ or } 16.67 \text{ m}$$



1

1

1