ANSWERS

EXERCISE 1.1

1. (i) 1 is the multiplicative identity (ii) Commutativity
(iii) Multiplicative inverse

2. Rational number

EXERCISE 2.1

1. $x = 18$ **2.** $t = -1$ **3.** $x = -2$ **4.** $z = \frac{3}{2}$ **5.** $x = 5$ **6.** $x = 0$

7. $x = 40$ **8.** $x = 10$ **9.** $y = \frac{7}{3}$ **10.** $m = \frac{4}{5}$

EXERCISE 2.2

1. $x = \frac{27}{10}$ **2.** $n = 36$ **3.** $x = -5$ **4.** $x = 8$ **5.** $t = 2$

6. $m = \frac{7}{5}$ **7.** $t = -2$ **8.** $y = \frac{2}{3}$ **9.** $z = 2$ **10.** $f = 0.6$

EXERCISE 3.1

1. (a) 1, 2, 5, 6, 7 (b) 1, 2, 5, 6, 7 (c) 1, 2
(d) 2 (e) 1

2. A polygon with equal sides and equal angles.
(i) Equilateral triangle (ii) Square (iii) Regular hexagon

EXERCISE 3.2

1. (a) $360° - 250° = 110°$ (b) $360° - 310° = 50°$

2. (i) $\frac{360°}{9} = 40°$ (ii) $\frac{360°}{15} = 24°$

3. $\frac{360}{24} = 15$ (sides) **4.** Number of sides = 24

5. (a) No; (Since 22 is not a divisor of 360)
(b) No; (because each exterior angle is $180° - 22° = 158°$, which is not a divisor of 360°).

6. (a) The equilateral triangle being a regular polygon of 3 sides has the least measure of an interior angle = 60°.
(b) By (a), we can see that the greatest exterior angle is 120°.

EXERCISE 3.3

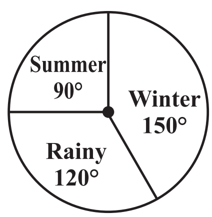
1. (i) BC(Opposite sides are equal) (ii) ∠DAB (Opposite angles are equal)
 (iii) OA (Diagonals bisect each other)
 (iv) 180° (Interior opposite angles, since $\overline{AB} \parallel \overline{DC}$)
2. (i) $x = 80°$; $y = 100°$; $z = 80°$ (ii) $x = 130°$; $y = 130°$; $z = 130°$
 (iii) $x = 90°$; $y = 60°$; $z = 60°$ (iv) $x = 100°$; $y = 80°$; $z = 80°$
 (v) $y = 112°$; $x = 28°$; $z = 28°$
3. (i) Can be, but need not be.
 (ii) No; (in a parallelogram, opposite sides are equal; but here, AD ≠ BC).
 (iii) No; (in a parallelogram, opposite angles are equal; but here, ∠A ≠ ∠C).
4. A kite, for example 5. 108°; 72°; 6. Each is a right angle.
7. $x = 110°$; $y = 40°$; $z = 30°$
8. (i) $x = 6$; $y = 9$ (ii) $x = 3$; $y = 13$; 9. $x = 50°$
10. $\overline{NM} \parallel \overline{KL}$ (sum of interior opposite angles is 180°). So, KLMN is a trapezium.
11. 60° 12. ∠P = 50°; ∠S = 90°

EXERCISE 3.4

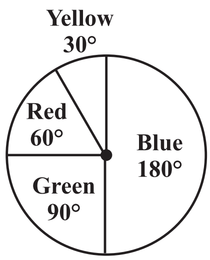
1. (b), (c), (f), (g), (h) are true; others are false.
2. (a) Rhombus; square. (b) Square; rectangle
3. (i) A square is 4 – sided; so it is a quadrilateral.
 (ii) A square has its opposite sides parallel; so it is a parallelogram.
 (iii) A square is a parallelogram with all the 4 sides equal; so it is a rhombus.
 (iv) A square is a parallelogram with each angle a right angle; so it is a rectangle.
4. (i) Parallelogram; rhombus; square; rectangle.
 (ii) Rhombus; square (iii) Square; rectangle
5. Both of its diagonals lie in its interior.
6. $\overline{AD} \parallel \overline{BC}$; $\overline{AB} \parallel \overline{DC}$. So, in parallelogram ABCD, the mid-point of diagonal $\overline{AC}$ is O.

EXERCISE 4.1

1. (i) 200 (ii) Light music (iii) Classical - 100, Semi classical - 200, Light - 400, Folk - 300
2. (i) Winter (ii) Winter - 150°, Rainy - 120°, Summer - 90° (iii)

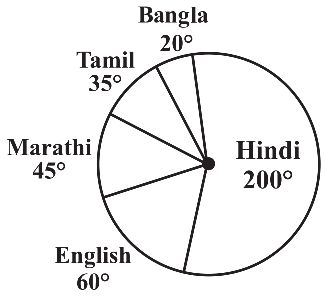


3.



4. (i) Hindi (ii) 30 marks (iii) Yes

5.



EXERCISE 4.2

1. (a) Outcomes → A, B, C, D

(b) HT, HH, TH, TT (Here HT means Head on first coin and Tail on the second coin and so on).

2. Outcomes of an event of getting

(i) (a) 2, 3, 5 (b) 1, 4, 6

(ii) (a) 6 (b) 1, 2, 3, 4, 5

3. (a) $\frac{1}{5}$ (b) $\frac{1}{13}$ (c) $\frac{4}{7}$

4. (i) $\frac{1}{10}$ (ii) $\frac{1}{2}$ (iii) $\frac{2}{5}$ (iv) $\frac{9}{10}$

5. Probability of getting a green sector = $\frac{3}{5}$; probability of getting a non-blue sector = $\frac{4}{5}$

6. Probability of getting a prime number = $\frac{1}{2}$; probability of getting a number which is not prime = $\frac{1}{2}$

Probability of getting a number greater than 5 = $\frac{1}{6}$

Probability of getting a number not greater than 5 = $\frac{5}{6}$

EXERCISE 5.1

1. (i) 1 (ii) 4 (iii) 1 (iv) 9 (v) 6 (vi) 9

(vii) 4 (viii) 0 (ix) 6 (x) 5

2. These numbers end with

(i) 7 (ii) 3 (iii) 8 (iv) 2 (v) 0 (vi) 2

(vii) 0 (viii) 0

3. (i), (iii)

4. 10000200001, 100000020000001

5. 1020304030201, 101010101^2

6. 20, 6, 42, 43

7. (i) 25 (ii) 100 (iii) 144

8. (i) 1 + 3 + 5 + 7 + 9 + 11 + 13

(ii) 1 + 3 + 5 + 7 + 9 + 11 + 13 + 15 + 17 + 19 + 21

9. (i) 24 (ii) 50 (iii) 198

EXERCISE 5.2

1. (i) 1024 (ii) 1225 (iii) 7396 (iv) 8649 (v) 5041 (vi) 2116
2. (i) 6,8,10 (ii) 14,48,50 (iii) 16,63,65 (iv) 18,80,82

EXERCISE 5.3

1. (i) 1, 9 (ii) 4, 6 (iii) 1, 9 (iv) 5
2. (i), (ii), (iii)
3. 10, 13
4. (i) 27 (ii) 20 (iii) 42 (iv) 64 (v) 88 (vi) 98
   (vii) 77 (viii) 96 (ix) 23 (x) 90
5. (i) 7; 42 (ii) 5; 30 (iii) 7, 84 (iv) 3; 78 (v) 2; 54 (vi) 3; 48
6. (i) 7; 6 (ii) 13; 15 (iii) 11; 6 (vi) 5; 23 (v) 7; 20 (vi) 5; 18
7. 49
8. 45 rows; 45 plants in each row
9. 900
10. 3600

EXERCISE 5.4

1. (i) 48 (ii) 67 (iii) 59 (iv) 23 (v) 57 (vi) 37
   (vii) 76 (viii) 89 (ix) 24 (x) 32 (xi) 56 (xii) 30
2. (i) 1 (ii) 2 (iii) 2 (iv) 3 (v) 3
3. (i) 1.6 (ii) 2.7 (iii) 7.2 (iv) 6.5 (v) 5.6
4. (i) 2; 20 (ii) 53; 44 (iii) 1; 57 (iv) 41; 28 (v) 31; 63
5. (i) 4; 23 (ii) 14; 42 (iii) 4; 16 (iv) 24; 43 (v) 149; 81
6. 21 m
7. (a) 10 cm (b) 12 cm
8. 24 plants
9. 16 children

EXERCISE 6.1

1. (ii) and (iv)
2. (i) 3 (ii) 2 (iii) 3 (iv) 5 (v) 10
3. (i) 3 (ii) 2 (iii) 5 (iv) 3 (v) 11
4. 20 cuboids

EXERCISE 6.2

1. (i) 4 (ii) 8 (iii) 22 (iv) 30 (v) 25 (vi) 24
   (vii) 48 (viii) 36 (ix) 56
2. (i) False (ii) True (iii) False (iv) False (v) False (vi) False
   (vii) True

EXERCISE 7.1

1. (a) 1 : 2 (b) 1 : 2000 (c) 1 : 10

2. (a) 75% (b) $66\frac{2}{3}\%$ **3.** 28% students **4.** 25 matches **5.** ₹ 2400

6. 10%, cricket → 30 lakh; football → 15 lakh; other games → 5 lakh

EXERCISE 7.2

1. ₹ 2,835 **2.** ₹ 14,560

3. ₹ 2,000 **4.** ₹ 5,000 **5.** ₹ 1,050

EXERCISE 7.3

1. (i) About 48,980 (ii) 59,535 **2.** 5,31,616 (approx)

3. ₹ 38,640

EXERCISE 8.1

1. (i) 0 (ii) $ab + bc + ac$ (iii) $-p^2q^2 + 4pq + 9$

(iv) $2(l^2 + m^2 + n^2 + lm + mn + nl)$

2. (a) $8a - 2ab + 2b - 15$ (b) $2xy - 7yz + 5zx + 10xyz$

(c) $p^2q - 7pq^2 + 8pq - 18q + 5p + 28$

EXERCISE 8.2

1. (i) $28p$ (ii) $-28p^2$ (iii) $-28p^2q$ (iv) $-12p^4$ (v) 0

2. pq; $50\ mn$; $100\ x^2y^2$; $12x^3$; $12mn^2p$

3.

First monomial → Second monomial ↓	$2x$	$-5y$	$3x^2$	$-4xy$	$7x^2y$	$-9x^2y^2$
$2x$	$4x^2$	$-10xy$	$6x^3$	$-8x^2y$	$14x^3y$	$-18x^3y^2$
$-5y$	$-10xy$	$25y^2$	$-15x^2y$	$20xy^2$	$-35x^2y^2$	$45x^2y^3$
$3x^2$	$6x^3$	$-15x^2y$	$9x^4$	$-12x^3y$	$21x^4y$	$-27x^4y^2$
$-4xy$	$-8x^2y$	$20xy^2$	$-12x^3y$	$16x^2y^2$	$-28x^3y^2$	$36x^3y^3$
$7x^2y$	$14x^3y$	$-35x^2y^2$	$21x^4y$	$-28x^3y^2$	$49x^4y^2$	$-63x^4y^3$
$-9x^2y^2$	$-18x^3y^2$	$45x^2y^3$	$-27x^4y^2$	$36x^3y^3$	$-63x^4y^3$	$81x^4y^4$

4. (i) $105a^7$ (ii) $64pqr$ (iii) $4x^4y^4$ (iv) $6abc$

5. (i) $x^2y^2z^2$ (ii) $-a^6$ (iii) $1024y^6$ (iv) $36a^2b^2c^2$ (v) $-m^3n^2p$

EXERCISE 8.3

1. (i) $4pq + 4pr$ (ii) $a^2b - ab^2$ (iii) $7a^3b^2 + 7a^2b^3$
(iv) $4a^3 - 36a$ (v) 0

2. (i) $ab + ac + ad$ (ii) $5x^2y + 5xy^2 - 25xy$
(iii) $6p^3 - 7p^2 + 5p$ (iv) $4p^4q^2 - 4p^2q^4$
(v) $a^2bc + ab^2c + abc^2$

3. (i) $8a^{50}$ (ii) $-\frac{3}{5}x^3y^3$ (iii) $-4p^4q^4$ (iv) x^{10}

4. (a) $12x^2 - 15x + 3$; (i) 66 (ii) $\frac{-3}{2}$
(b) $a^3 + a^2 + a + 5$; (i) 5 (ii) 8 (iii) 4

5. (a) $p^2 + q^2 + r^2 - pq - qr - pr$ (b) $-2x^2 - 2y^2 - 4xy + 2yz + 2zx$
(c) $5l^2 + 25ln$ (d) $-3a^2 - 2b^2 + 4c^2 - ab + 6bc - 7ac$

EXERCISE 8.4

1. (i) $8x^2 + 14x - 15$ (ii) $3y^2 - 28y + 32$ (iii) $6.25l^2 - 0.25m^2$
(iv) $ax + 5a + 3bx + 15b$ (v) $6p^2q^2 + 5pq^3 - 6q^4$ (vi) $3a^4 + 10a^2b^2 - 8b^4$

2. (i) $15 - x - 2x^2$ (ii) $7x^2 + 48xy - 7y^2$ (iii) $a^3 + a^2b^2 + ab + b^3$
(iv) $2p^3 + p^2q - 2pq^2 - q^3$

3. (i) $x^3 + 5x^2 - 5x$ (ii) $a^2b^3 + 3a^2 + 5b^3 + 20$ (iii) $t^3 - st + s^2t^2 - s^3$
(iv) $4ac$ (v) $3x^2 + 4xy - y^2$ (vi) $x^3 + y^3$
(vii) $2.25x^2 - 16y^2$ (viii) $a^2 + b^2 - c^2 + 2ab$

EXERCISE 9.1

1. 0.88 m^2 **2.** 7 cm **3.** 660 m^2 **4.** 252 m^2

5. 45 cm^2 **6.** 24 cm^2, 6 cm **7.** ₹ 810 **8.** 140 m

9. 119 m^2 **10.** Area using Jyoti's way $= 2 \times \frac{1}{2} \times \frac{15}{2} \times (30 + 15)\ m^2 = 337.5\ m^2$,

Area using Kavita's way $= \frac{1}{2} \times 15 \times 15 + 15 \times 15 = 337.5\ m^2$

11. 80 cm^2, 96 cm^2, 80 cm^2, 96 cm^2

EXERCISE 9.2

1. (a) **2.** 144 m **3.** 10 cm **4.** 11 m^2

5. 5 cans

6. Similarity $\rightarrow$ Both have same heights. Difference $\rightarrow$ one is a cylinder, the other is a cube. The cube has larger lateral surface area

7. 440 m^2 **8.** 322 cm **9.** 1980 m^2 **10.** 704 cm^2

EXERCISE 9.3

1. (a) Volume (b) Surface area (c) Volume
2. Volume of cylinder B is greater; Surface area of cylinder B is greater.
3. 5 cm
4. 450
5. 1 m
6. 49500 L
7. (i) 4 times (ii) 8 times
8. 30 hours

EXERCISE 10.1

1. (i) $\frac{1}{9}$ (ii) $\frac{1}{16}$ (iii) 32
2. (i) $\frac{1}{(-4)^3}$ (ii) $\frac{1}{2^6}$ (iii) $(5)^4$ (iv) $\frac{1}{(3)^2}$ (v) $\frac{1}{(-14)^3}$
3. (i) 5 (ii) $\frac{1}{2}$ (iii) 29 (iv) 1 (v) $\frac{81}{16}$
4. (i) 250 (ii) $\frac{1}{60}$
5. $m = 2$
6. (i) -1 (ii) $\frac{512}{125}$
7. (i) $\frac{625t^4}{2}$ (ii) 5^5

EXERCISE 10.2

1. (i) 8.5×10^{-12} (ii) 9.42×10^{-12} (iii) 6.02×10^{15}
   (iv) 8.37×10^{-9} (v) 3.186×10^{10}
2. (i) 0.00000302 (ii) 45000 (iii) 0.00000003
   (iv) 1000100000 (v) 5800000000000 (vi) 3614920
3. (i) 1×10^{-6} (ii) 1.6×10^{-19} (iii) 5×10^{-7}
   (iv) 1.275×10^{-5} (v) 7×10^{-2}
4. 1.0008×10^2

EXERCISE 11.1

1. No
2.

Parts of red pigment	1	4	7	12	20
Parts of base	8	32	56	96	160

3. 24 parts
4. 700 bottles
5. 10^{-4} cm; 2 cm
6. 21 m
7. (i) 2.25×10^7 crystals (ii) 5.4×10^6 crystals
8. 4 cm
9. (i) 6 m (ii) 8 m 75 cm
10. 168 km

EXERCISE 11.2

1. (i), (iv), (v)
2. $4 \rightarrow 25,000$; $5 \rightarrow 20,000$; $8 \rightarrow 12,500$; $10 \rightarrow 10,000$; $20 \rightarrow 5,000$
Amount given to a winner is inversely proportional to the number of winners.
3. $8 \rightarrow 45°$, $10 \rightarrow 36°$, $12 \rightarrow 30°$ (i) Yes (ii) 24° (iii) 9
4. 6 **5.** 4 **6.** 3 days **7.** 15 boxes
8. 49 machines **9.** $1\frac{1}{2}$ hours **10.** (i) 6 days (ii) 6 persons **11.** 40 minutes

EXERCISE 12.1

1. (i) 12 (ii) $2y$ (iii) $14pq$ (iv) 1 (v) $6ab$ (vi) $4x$
(vii) 10 (viii) x^2y^2
2. (i) $7(x-6)$ (ii) $6(p-2q)$ (iii) $7a(a+2)$ (iv) $4z(-4+5z^2)$
(v) $10\,lm(2l+3a)$ (vi) $5xy(x-3y)$ (vii) $5(2a^2-3b^2+4c^2)$
(viii) $4a(-a+b-c)$ (ix) $xyz(x+y+z)$ (x) $xy(ax+by+cz)$
3. (i) $(x+8)(x+y)$ (ii) $(3x+1)(5y-2)$ (iii) $(a+b)(x-y)$
(iv) $(5p+3)(3q+5)$ (v) $(z-7)(1-xy)$

EXERCISE 12.2

1. (i) $(a+4)^2$ (ii) $(p-5)^2$ (iii) $(5m+3)^2$ (iv) $(7y+6z)^2$
(v) $4(x-1)^2$ (vi) $(11b-4c)^2$ (vii) $(l-m)^2$ (viii) $(a^2+b^2)^2$
2. (i) $(2p-3q)(2p+3q)$ (ii) $7(3a-4b)(3a+4b)$ (iii) $(7x-6)(7x+6)$
(iv) $16x^3(x-3)(x+3)$ (v) $4lm$ (vi) $(3xy-4)(3xy+4)$
(vii) $(x-y-z)(x-y+z)$ (viii) $(5a-2b+7c)(5a+2b-7c)$
3. (i) $x(ax+b)$ (ii) $7(p^2+3q^2)$ (iii) $2x(x^2+y^2+z^2)$
(iv) $(m^2+n^2)(a+b)$ (v) $(l+1)(m+1)$ (vi) $(y+9)(y+z)$
(vii) $(5y+2z)(y-4)$ (viii) $(2a+1)(5b+2)$ (ix) $(3x-2)(2y-3)$
4. (i) $(a-b)(a+b)(a^2+b^2)$ (ii) $(p-3)(p+3)(p^2+9)$
(iii) $(x-y-z)(x+y+z)[x^2+(y+z)^2]$ (iv) $z(2x-z)(2x^2-2xz+z^2)$
(v) $(a-b)^2(a+b)^2$
5. (i) $(p+2)(p+4)$ (ii) $(q-3)(q-7)$ (iii) $(p+8)(p-2)$

EXERCISE 12.3

1. (i) $\frac{x^3}{2}$ (ii) $-4y$ (iii) $6pqr$ (iv) $\frac{2}{3}x^2y$ (v) $-2a^2b^4$
2. (i) $\frac{1}{3}(5x-6)$ (ii) $3y^4-4y^2+5$ (iii) $2(x+y+z)$
(iv) $\frac{1}{2}(x^2+2x+3)$ (v) q^3-p^3

3. (i) $2x - 5$ (ii) 5 (iii) $6y$ (iv) xy (v) $10abc$

4. (i) $5(3x + 5)$ (ii) $2y(x + 5)$ (iii) $\frac{1}{2}r(p+q)$ (iv) $4(y^2 + 5y + 3)$

(v) $(x + 2)(x + 3)$

5. (i) $y + 2$ (ii) $m - 16$ (iii) $5(p - 4)$ (iv) $2z(z - 2)$ (v) $\frac{5}{2}q(p-q)$

(vi) $3(3x - 4y)$ (vii) $3y(5y - 7)$

EXERCISE 13.1

1. (a) 36.5° C (b) 12 noon (c) 1 p.m, 2 p.m.

(d) 36.5° C; The point between 1 p.m. and 2 p.m. on the *x*-axis is equidistant from the two points showing 1 p.m. and 2 p.m., so it will represent 1.30 p.m. Similarly, the point on the *y*-axis, between 36° C and 37° C will represent 36.5° C.

(e) 9 a.m. to 10 a.m., 10 a.m. to 11 a.m., 2 p.m. to 3 p.m.

2. (a) (i) ₹ 4 crore (ii) ₹ 8 crore

(b) (i) ₹ 7 crore (ii) ₹ 8.5 crore (approx.)

(c) ₹ 4 crore (d) 2005

3. (a) (i) 7 cm (ii) 9 cm

(b) (i) 7 cm (ii) 10 cm

(c) 2 cm (d) 3 cm (e) Second week (f) First week

(g) At the end of the 2nd week

4. (a) Tue, Fri, Sun (b) 35° C (c) 15° C (d) Thurs

6. (a) 4 units = 1 hour (b) $3\frac{1}{2}$ hours (c) 22 km

(d) Yes; This is indicated by the horizontal part of the graph (10 a.m. - 10.30 a.m.)

(e) Between 8 a.m. and 9 a.m.

7. (iii) is not possible

EXERCISE 13.2

1. (b) (i) 20 km (ii) 7.30 a.m. (c) (i) Yes (ii) ₹ 200 (iii) ₹ 3500

2. (i) Yes (ii) No

JUST FOR FUN

1. **More about Pythagorean triplets**

   We have seen one way of writing pythagorean triplets as $2m, m^2 - 1, m^2 + 1$.

   A pythagorean triplet a, b, c means $a^2 + b^2 = c^2$. If we use two natural numbers m and $n(m > n)$, and take $a = m^2 - n^2$, $b = 2mn$, $c = m^2 + n^2$, then we can see that $c^2 = a^2 + b^2$.

   Thus for different values of m and n with $m > n$ we can generate natural numbers a, b, c such that they form Pythagorean triplets.

   For example: Take, $m = 2, n = 1$.

   Then, $a = m^2 - n^2 = 3$, $b = 2mn = 4$, $c = m^2 + n^2 = 5$, is a Pythagorean triplet. (Check it!)

   For, $m = 3, n = 2$, we get,

   $a = 5, b = 12, c = 13$ which is again a Pythagorean triplet.

   Take some more values for m and n and generate more such triplets.

2. When water freezes its volume increases by 4%. What volume of water is required to make 221 cm^3 of ice?
3. If price of tea increased by 20%, by what per cent must the consumption be reduced to keep the expense the same?
4. Ceremony Awards began in 1958. There were 28 categories to win an award. In 1993, there were 81 categories.
   (i) The awards given in 1958 is what per cent of the awards given in 1993?
   (ii) The awards given in 1993 is what per cent of the awards given in 1958?
5. Out of a swarm of bees, one fifth settled on a blossom of *Kadamba*, one third on a flower of *Silindhiri,* and three times the difference between these two numbers flew to the bloom of *Kutaja*. Only ten bees were then left from the swarm. What was the number of bees in the swarm? (Note, *Kadamba, Silindhiri* and *Kutaja* are flowering trees. The problem is from the ancient Indian text on algebra.)
6. In computing the area of a square, Shekhar used the formula for area of a square, while his friend Maroof used the formula for the perimeter of a square. Interestingly their answers were numerically same. Tell me the number of units of the side of the square they worked on.
7. The area of a square is numerically less than six times its side. List some squares in which this happens.
8. Is it possible to have a right circular cylinder to have volume numerically equal to its curved surface area? If yes state when.
9. Leela invited some friends for tea on her birthday. Her mother placed some plates and some *puris* on a table to be served. If Leela places 4 *puris* in each plate 1 plate would be left empty. But if she places 3 *puris* in each plate 1 *puri* would be left. Find the number of plates and number of *puris* on the table.
10. Is there a number which is equal to its cube but not equal to its square? If yes find it.
11. Arrange the numbers from 1 to 20 in a row such that the sum of any two adjacent numbers is a perfect square.

Answers

2. $212\frac{1}{2}$ cm^3

3. $16\frac{2}{3}\%$

4. (i) 34.5% (ii) 289%

5. 150

6. 4 units

7. Sides = 1, 2, 3, 4, 5 units

8. Yes, when radius = 2 units

9. Number of *puris* = 16, number of plates = 5

10. – 1

11. One of the ways is, 1, 3, 6, 19, 17, 8 (1 + 3 = 4, 3 + 6 = 9 etc.). Try some other ways.

NOTES