$\therefore$ $P(A) = \frac{3}{6} = \frac{1}{2}$

(ii) Let B be the event of getting the number on the dice lying between 2 and 5. The numbers lying between 2 and 5 are 3 and 4. So, the number of favourable outcomes is 2.

$\therefore$ $P(B) = \frac{2}{6} = \frac{1}{3}$

(iii) Let C be the event that getting the number on the dice is even. Here 2, 4 and 6 are even numbers. So, number of favourable outcomes is 3.

$\therefore$ $P(C) = \frac{3}{6} = \frac{1}{2}$

Example 10 : Gopi buys a toy for his son, if it is non-defective. Shopkeeper takes out one toy at random from a box of 10 toys containing 3 defective toys and other good ones. Find the probability that **(i)** Gopi buy the toy, **(ii)** Gopi does not buy the toy.

Solution : Here there are 10 toys in the box, out of which 3 are defective, so 7 of them are non-defective toys.

(i) Let A be the event that Gopi buys the toy. This means that the toy is not defective. So, the number of favourable outcomes of this event is 7. So, $P(A) = \frac{7}{10} = 0.7$

(ii) Let B be the event that Gopi does not buy the toy. This means that the toy is defective. So, number of favourable outcomes is 3.

So, $P(B) = \frac{3}{10} = 0.3$.

Note that the event C is also called 'not A'.

$\therefore$ $P(B) = P(\overline{A}) = 1 - P(A) = 1 - 0.7 = 0.3$

EXERCISE 16

1. 15 defective ballpens are accidentally mixed with 135 good ones. It is not possible to just look at a ballpen and say whether it is defective or not. One ballpen is picked up at random from it. Find the probability that the ballpen selected is a good one.
2. A box contains 5 green, 8 yellow and 7 brown balls. One ball is taken out from a box at random. What is the probability that the ball taken out is (i) yellow ? (ii) brown ? (ii) neither green nor brown ? (iv) not brown ?
3. A bag contains orange flavoured candies only. Rahi takes out one candy without looking into the bag. What is the probability that she takes out (i) the orange flavoured candy ? (ii) a lemon flavoured candy ?
4. A box contain 100 cards marked with numbers 1 to 100. If one card is drawn from the box, find the probability that it bears (i) single digit number, (ii) two-digit numbers (iii) three-digit number (iv) a number divisible by 8 (v) a multiple of 9, (vi) a multiple of 5.
5. A carton consist of 100 trousers of which 73 are good, 12 have minor defects and 15 have major defects. Kanu, a trader, will only accept the trousers which are good, but Radha, another trader, will only reject the trousers which have major defects. One trouser is drawn at random from the carton. What is the probability that,

   (i) it is acceptable to Kanu ? (ii) it is acceptable to Radha ?

7. Length of the rectangle is 15 units and breadth of the rectangle is 10 units.

8. Cost of food per day is ₹ 80; fixed charge per day ₹ 200. 9. $\frac{4}{7}$

10. (1) c (2) c (3) c (4) b (5) c (6) d (7) c (8) b (9) c (10) c
(11) c (12) b

Exercise 4.1

1. (1), (2), (3), (4), (6) and (7) are quadratic equations; (5) is not a quadratic equation.

2. (1), (3), (4) Yes; (2) No.

3. (3) 5 (4) −2 4. (1) $-\frac{4}{3}, \frac{4}{3}$ (2) 3, 11 (3) $-\frac{3}{2}, -\frac{2}{3}$ (4) $\frac{1}{15}$, 1 (5) $\sqrt{5}, -\frac{1}{\sqrt{5}}$
(6) $\frac{3}{2}, \frac{2}{3}$

Exercise 4.2

1. (1) 25, real, rational, distinct (2) 1, real, distinct (3) 1 real, rational, distinct
(4) −12, no real roots (5) −3, no real roots (6) 147, real, distinct

3. (1) 2, $\frac{2}{9}$ (2) 0, 3

5. (1) $-5-\sqrt{19}, -5+\sqrt{19}$ (2) $\frac{-5+\sqrt{29}}{2}, \frac{-5-\sqrt{29}}{2}$ (3) $\frac{3+\sqrt{17}}{2}, \frac{3-\sqrt{17}}{2}$ (4) $\sqrt{6}, 2\sqrt{6}$
(5) $\frac{-5\sqrt{2}+\sqrt{26}}{6}, \frac{-5\sqrt{2}-\sqrt{26}}{6}$ (6) −3, 3

Exercise 4.3

1. 13, 14 2. 10 cm 3. D = −48 < 0, So, Statements are incorrect. 4. 40
5. 10 cm 6. 5 *km/hour* 7. 20,840 m^2 8. 6

Exercise 4

1. (1) $-2\sqrt{3}, 2\sqrt{3}$ (2) −5, 12 (3) 7, 8 (4) $-\frac{5}{2}, \frac{5}{2}$ (5) 2, 3

2. (1) $12-4\sqrt{10}, 12+4\sqrt{10}$ (2) $-4, \frac{5}{3}$ (3) 5 (4) −20, 15 (5) −18, 13

3. 13, 7 4. 40 *km/hour* 5. 25 *km/hour* 6. 15 *km/hour* 7. $\frac{5}{3}$

8. 80 *km/hour*, 100 *km/hour* 9. 23 years 10. 38 years 11. 23 years 12. 25 13. 30

14. 11, 13 15. 14, 16 16. 24 17. 30 *Rs/kg* 18. 60 *Rs/ltr* 19. ₹ 60, 60 % 20. ₹ 40

21. 54 cm^2 22. 36 *cm*

23. (1) b (2) a (3) d (4) c (5) a (6) c (7) d (8) b

Exercise 5.1

1. (1) 3, 5, 7, 9, 11,... $T_n = 2n + 1$ (2) −3, −5, −7, −9, −11,... $T_n = -2n - 1$
(3) 100, 93, 86, 79, 72,... $T_n = -7n + 107$ (4) −100, −93, −86, −79, −72,..., $T_n = 7n - 107$
(5) 1000, 900, 800, 700, 600,... $T_n = -100n + 1100$

2. (1) Not an A.P. (2) Not an A.P. (3) Not an A.P. (4) A.P., $T_n = 10n - 5$
(5) A.P., $T_n = 5n + 12$ (6) A.P., $T_n = -2n + 103$ (7) A.P., $T_n = -3n + 204$
(8) A.P., $T_n = 5n$ (9) Not an A.P.

Exercise 15.1

1. 148.5 **2.** 332 **3.** 25.857 **4.** 66.346 **5.** 18.675 **6.** 580.33 **7.** 350

8. $f_1 = 30, f_2 = 8$ **9.** 41.71 **10.** $f_1 = 9, f_2 = 20$

Exercise 15.2

1. 21.45 **2.** 256.25 **3.** 606.76 **4.** 33.49 **5.** 94.29 **6.** 95.69

Exercise 15.3

1. 15.5 **2.** 13.67 **3.** 288.09 **4.** 12.55 **5.** $a = 150, b = 48$ **6.** $a = 34, b = 46$

7. 36.25

Exercise 15

1. 57.0875 **2.** 145.2 **3.** $x = 14, y = 40$ **4.** 53.799 **5.** 56.875 **6.** $a = 43, b = 27$

7. 3342.1 **8.** 46.25 **9.** $x = 9, y = 15$

10. (1) a (2) c (3) d (4) b (5) c (6) b (7) d (8) a (9) c (10) b
(11) c

Exercise 16

1. 0.9 **2.** (i) $\frac{2}{5}$ (ii) $\frac{7}{20}$ (iii) $\frac{2}{5}$ (iv) $\frac{13}{20}$ **3.** (i) 1 (ii) 0

4. (i) 0.09 (ii) 0.9 (iii) 0.01 (iv) 1.14 (v) 0.11 (vi) 0.2

5. (i) 0.73 (ii) 0.85 **6.** (i) $\frac{1}{25}$ (ii) $\frac{11}{50}$ (iii) $\frac{15}{50}$ (iv) $\frac{17}{50}$ (v) $\frac{4}{25}$ **7.** (1) $\frac{1}{6}$ (2) $\frac{5}{12}$ (3) $\frac{3}{4}$ (4) 0

8. (1) $\frac{1}{2}$ (2) $\frac{3}{8}$ (3) $\frac{1}{2}$ (4) $\frac{1}{2}$ **9.** (1) $\frac{1}{12}$ (2) $\frac{1}{4}$ (3) $\frac{1}{2}$ (4) $\frac{1}{2}$ (5) $\frac{1}{3}$

10. (1) b (2) d (3) a (4) d (5) d (6) c (7) d (8) c (9) c (10) c

Circling the Square

Another problem tackled by Baudhayana is that of finding a circle whose area is the same as that of a square (the reverse of squaring the circle). His sutra i.58 gives this construction:

Draw half its diagonal about the centre towards the East-West line; then describe a circle together with a third part of that which lies outside the square.

Explanation :

- Draw the half-diagonal of the square, which is larger than the half-side by $x = \frac{a}{2}\sqrt{2} - \frac{a}{2}$.
- Then draw a circle with radius $\frac{a}{2} + \frac{x}{3}$ or $\frac{a}{2} + \frac{a}{6}(\sqrt{2} - 1)$, which equals $\frac{a}{6}(2 + \sqrt{2})$.
- Now $(2 + \sqrt{2})^2 \approx 11.66 \approx \frac{36.6}{\pi}$ so the area $\pi r^2 \approx \frac{a^2}{6^2} \times \frac{36.6}{\pi} \approx a^2$.