QUADRATIC EQUATIONS

COMPETENCY BASED QUESTIONS

EXPECTED LEARNING OUTCOMES

a) Students acquire the skill of framing quadratic equation for the given daily life situation.
b) Students analyse the situation and frame the quadratic equation.
c) Examine and break the information into parts by identifying motives or causes.
d) Solve problems to new situations by applying acquired knowledge.

CORE CONCEPT: Application of knowledge of quadratic equations in solving daily life problems.

ASSERTION REASON

DIRECTION: In the following questions a statement of **Assertion (A)** is followed by a statement of **Reason (R)**. Choose the correct option.
(A) Both Assertion (A) and Reason(R) are true and Reason(R) is the correct explanation of Assertion (A).

(B) Both Assertion (A) and Reason(R) are true but Reason(R) is not the correct explanation of Assertion (A).

(C) Assertion (A) is true but Reason(R) is false.

(D) Assertion (A) is false but Reason(R) is true

Q1. **Assertion (A):** Every quadratic equation has exactly one root.
Reason (R): Every quadratic equation has almost two roots.

Q2. Assertion (A): The quadratic equation $12x^2 + 4\sqrt{3}\,x + 1 = 0$ has equal roots

Reason (R): A quadratic equation has real roots if $b^2 - 4ac > 0$

Q3. Assertion (A): $5x^2 - 4\sqrt{5x} + 5 = 0$ have two real and equal roots.
Reason (R): The quadratic equation $ax^2 - bx + c = 0$ have two real roots, if $D = 0$.

Q4. Assertion (A):$2\sqrt{5}$ is the root of the quadratic equation $x^2 - 4\sqrt{5}x + 5 = 0$.
Reason (R): The root of the quadratic equation does not satisfy it.

MULTIPLE CHOICE QUESTION

Q5. Which of these is a quadratic equation having one of its roots as zero

i. $3x^2 - x^3 = 0$ ii. $2x^2 - x = 0$ iii. $x^2 - 1 = 0$

a) Only i b) Only ii c)Only I and ii d) Only ii and iii

CASE STUDY

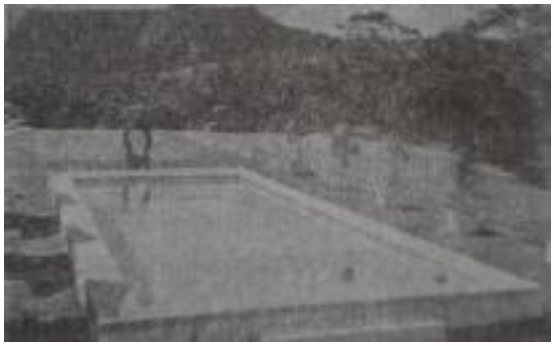
Q6. Two friends Kamala and Seema were going to their village during vacation. Kamala was travelling by bus and Seema was travelling by car.Bus travels at a speed of $'x'km/hr$ while car travels 10 *km/hr* faster than the bus. Kamala takes 3 hours more than Seema to complete the journey of 600 *km*.

i) What will be the distance covered by Seema's car in 4 hours (in terms of $'x'$)?
ii) Write a quadratic equation which describes the speed of the bus.
iii) What is the speed of the bus?
(OR)
How much time Seema took to travel 600 *km*?

Q7. One day, I asked the son of my close friend about his age. The child replied in a different way. He said," One year ago, my dad was 8 times as old as me and now his age (in years) is equal to the square of my age".

Represent the above information in the form of a quadratic equation.

Q8. In the picture given below, one can see a rectangular in-ground swimming pool installed by a family in their backyard. There is a concrete sidewalk around the pool of width x m. The outside edges of the sidewalk measures 7m and 12m. The area of the pool is 36 Sq.m.

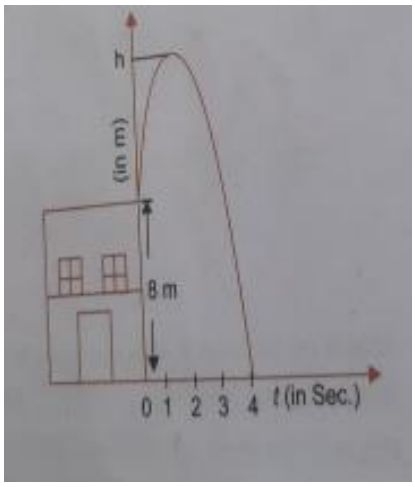


(a) Based on the information given above, form a quadratic equation in terms of x.

(b) Find the width of the sidewalk around the pool.

Q9. Sukriti throws a ball upwards, from a rooftop which is 8m high from ground level.

The ball reaches to some maximum height and then returns and hits the ground. If height of the ball at time t (in sec) is represented by h(m), then equation of its path is given as $h = -t^2 + 2t + 8$



Based on the above information, answer the following

(i) The maximum height achieved by ball is

a) 7m b) 8m c) 9m d)10m

(ii) The polynomial represented by above graph is

a) Linear polynomial b) Quadratic polynomial

c) constant polynomial d) cubic polynomial

(iii) Time taken by ball to reach maximum height is

a) 2 Sec b) 4 Sec c) 1 Sec d) 2 min

(iv) Number of zeroes of the polynomial whose graph is given is, ____

a) 1 b) 2 c) 0 d) 3

(v) Zeroes of the polynomial are _____

a) 4 b) -2,4 c) 2,4 d) 0,4

OTHER QUESTIONS

Q10. The sum of the squares of two positive integers is 208. If the square of the larger number is 18 times the smaller number, find the number.

Q11. A two-digit number is seven times the sum of its digits and is also equal to 12 less than three times the product of its digits. Find the number.

Q12. Seven years ago Shruthi's age was five times the age of Keerthi's age.Three years hence, Keerthi's age will be two-fifthof Shruthi's age. Find their present age.

Q13. A bus travels at a certain average speed for a distance of 63 *km* and then travels a distance of 72 *km* at an average speed of 6*km/h* more than its original speed. If it takes 3 hours to complete the total journey, what is the original average speed?

Q14. In a flight of 600 km, an aircraft was slowed down due to bad weather. Its average speed for the trip was reduced by 200 km/h and the time of flight increased by 30 minutes. Find the duration of flight.

ANSWER KEY

Q1. D)

Q2. B)

Q3. C)

Q4. D)

Q5. B)

Q6. i) 4(x + 10) km
ii) x^2+10 x – 2000 = 0
iii) 40km/h
OR
12 hours

Q7. Let the present age of son be 'x' years

Then the present age of his dad is x^2years

1 year ago: Age of his dad is (x^2 – 1) years and son is

(x – 1) years Given: x^2 – 1 = 8 (x – 1)

x^2 – 1 = 8x – 8 and

x^2 – 8x + 7 = 0 is the required quadratic equation.

Q8. a) Let the length of the pool = (12 – 2x) m and

Breadth of the pool = (7 – 2x) m

Given: Area of the pool = 36 sqm

(12 – 2x)(7 – 2x) = 36

$4x^2$ – 38x + 48 = 0 or $2x^2$ – 19x + 24 = 0 is the required quadratic equation.

b) $2x^2$ – 19x + 24 = 0

Factorizing (2x – 3) (x – 8) =0

(2x – 3) =0 or (x – 8) =0

x = $^3/_2$ or x = 8

If x = 8 is not admissible as dimensions cannot be negative

Therefore, the width of the sidewalk is $\frac{3}{2}$.

Q9. (i) (b) 8 m

(ii) (b) Quadratic polynomial

(iii) (a) 2 Sec

(iv) (a) 2

(v) (b) -2,4

Q10. Let the smaller number be x.

Square of larger number = 18x

Sum of squares of two numbers =208

x^2+ 18x = 208

x^2 + 18x – 208 = 0

x^2 + 26x - 8x – 208 = 0

(x + 26) (x – 8) = 0

X = 8, x = -26, but numbers are positive.

Therefore x = 8

Larger number = 18 x = 18 × 8 = 144

= $\sqrt{144}$ = 12

Hence, the numbers are 8 and 12.

Q11. Let the digits in the ten's and unit's place be x and y.

The required number = 10x + y

Then, 10x + y = 7(x + y)

3x = 6y

X = 2y ….(1)

Also, 10x + y = 3xy – 12

10 × 2y + y = 3 × 2y × y – 12

$6y^2$ – 21y -12 = 0

$2y^2$ – 7y - 4 = 0

$2y^2$ – 8y + y - 4 = 0

(y – 4) (2y + 1) = 0

y = $\frac{-1}{2}$ and y = 4

A digit can't be negative.

Therefore y = 4 and x = 2y = 8

The required number is 84.

Q12. Let the present ages of Shruthi and Keerthi be x and y.

Seven years ago

Shruthi's age = (x – 7) years

Keerthi's age = (y -7) years

(x – 7) = $5(y-7)^2$

X = $5y^2$ – 70y + 252 ……(1)

Three years hence,

Shruthi's age = (x + 3) years

Keerthi's age = (y + 3) years

(y + 3) = $\frac{2}{5}$(x + 3)

X = $\frac{5y+9}{2}$ …….(2)

From 1 and 2

$5y^2$ – 70y + 252 = $\frac{5y+9}{2}$

$10y^2$ – 145y + 495 = 0
$2y^2$ – 29y +99 = 0
$2y^2$ – 18y – 11y +99 = 0
2y (y – 9) – 11(y – 9) = 0
(y – 9) (2y – 11) = 0
Y = 9 or y = $\frac{11}{2}$
y = $\frac{11}{2}$ is not possible
Therefore, y = 9 and x = 27
Shruthi's present age = 27years
Keerthi's present age = 9 years

Q13. Let original speed of bus = x km/hr
Distance = 63 km
T1 = $\frac{distance}{speed}$ = $\frac{63}{x}$ hrs
For 72 km, T2 = $\frac{72}{(x+6)}$ hrs
Total time for journey is 3 hrs
$\frac{63}{x}$ + $\frac{72}{(x+6)}$= 3
63(x + 6) + 72x = 3x (x+6)
x^2- 39 x – 126 = 0
(x – 42) (x + 3) = 0
X = 42 km/hr
Therefore, original average speed = 42 km/hr

Q14. Let the original speed of the aircraft = x km/hr
Time taken = $\frac{600}{x}$ *h*
New speed =(x – 200)km/h
Time =$\frac{600}{(x-200)}$h
$\frac{600}{(x-200)} - \frac{600}{x}$ =$\frac{1}{2}$
$\frac{120000}{x(x-200)}$ = $\frac{1}{2}$
x^2- 200 x – 240000 = 0
x^2- 600 x + 400x – 240000 = 0
(x – 600)(x + 400) = 0
X = 600, original speed of aircraft = 600km/h, duration of flight = $\frac{600}{400}$ = $\frac{3}{2}$*hrs.*