Quadratic Equations

1. If $x(x+1) = 2(x+1)$, then x is equal to

A. 1 only
B. 1 or 2
C. 1 or -2
D. -1 or 2
E. -1 or -2

[SP-CE-MATHS A2-35]

2. The solution of the equation $(x-a) = (x-a)(x-b)$ is

A. $x = a$ only
B. $x = b$ only
C. $x = b+1$ only
D. $x = a$ or $x = b$
E. $x = a$ or $x = b+1$

[1978-CE-MATHS 2-33]

3. It is given that $x(2x+3) = x(3x-4)$. $x = ?$

A. 0 only
B. 7 only
C. 0 or 7
D. $-\frac{3}{2}$ or $\frac{4}{3}$ only
E. 0, $-\frac{3}{2}$ or $\frac{4}{3}$

[1981-CE-MATHS 2-9]

4. If $x + \frac{1}{x} = 2 + \frac{1}{2}$, then $x =$

A. 2 only.
B. -2 only.
C. $\frac{1}{2}$ only.
D. -2 or 2.
E. $\frac{1}{2}$ or 2.

[1983-CE-MATHS 2-33]

5. If $(x-2)(x-3) = (a-2)(a-3)$, solve for x.

A. $x = 0$ or 5
B. $x = 2$ or 3
C. $x = a$ or 2
D. $x = a$ or 3
E. $x = a$ or $5-a$

[1991-CE-MATHS 2-39]

6. Solve $(x-1)(x-3) = x-3$.

A. $x = 1$
B. $x = 2$
C. $x = 0$ or 3
D. $x = 1$ or 3
E. $x = 2$ or 3

[1998-CE-MATHS 2-10]

7. Solve $x(x-6) = x$.

A. $x = 6$
B. $x = 7$
C. $x = 0$ or $x = 6$
D. $x = 0$ or $x = 7$

[2004-CE-MATHS 2-7]

8. Solve $3x^2 = 21x$.

A. $x = 3$
B. $x = 7$
C. $x = 0$ or $x = 3$
D. $x = 0$ or $x = 7$

[2006-CE-MATHS 2-8]

Other Equations

9. What is / are the root(s) of the equation $\sqrt{5x+1} - \sqrt{x} = 1$?

A. $x = 0$ only
B. $x = \frac{1}{4}$ only
C. $x = 4$ only
D. $x = 0$ or $x = \frac{1}{4}$
E. $x = 0$ or $x = 4$

[1978-CE-MATHS A2-50]

10. What are the roots of the equation $(x-3)^2(x+1) = -(x+1)^2(x-3)$?

A. 1 only
B. 1, -3 only
C. -1, 3 only
D. 1, -1, -3
E. 1, -1, 3

[1982-CE-MATHS 2-7]

11. What is/are the root(s) of $\sqrt{5-x} = x-3$?

A. 4 only
B. 1 and 4 only
C. -1 and -4 only
D. -4 and 4 only
E. -4, -1, 1 and 4

[1984-CE-MATHS 2-7]

12. For what value(s) of x does the equality $\frac{(x+1)(x-2)}{x-2} = x+1$ hold?

A. -1 only
B. 2 only
C. Any value
D. Any value except -1
E. Any value except 2

[1992-CE-MATHS 2-3]

Coefficients of Equations

13. If $3 \in \{x \in \mathbf{R} : 2x^2 - x + k = 0\}$, then $k =$

A. -24 .
B. -21 .
C. -15 .
D. -12 .
E. -6 .

[SP-CE-MATHS 2-48]

Practical Problems

14. $\$M$ is to be divided between Tom and Mary. Tom gets $\$x$, which is c times what Mary gets. Find x in terms of c and M.

A. $\dfrac{M}{c+1}$
B. $\dfrac{cM}{c+1}$
C. $\dfrac{cM}{c-1}$
D. $\dfrac{c+1}{cM}$
E. $\dfrac{(c+1)M}{c}$

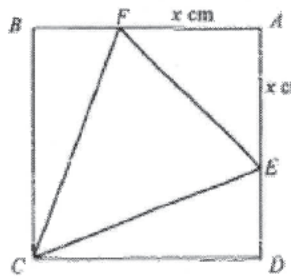
[1977-CE-MATHS 2-6]

15. If the price of an orange rises by \$1, then 5 fewer oranges could be bought for \$100. Which of the following equations gives the original price $\$x$ of an orange?

A. $\dfrac{100}{x+1} = 5$
B. $\dfrac{100}{x+1} - \dfrac{100}{x} = 5$
C. $\dfrac{100}{x} - \dfrac{100}{x+1} = 5$
D. $\dfrac{100}{x-1} - \dfrac{100}{x} = 5$
E. $\dfrac{100}{x} - \dfrac{100}{x-1} = 5$

[1992-CE-MATHS 2-43]

16. In the figure, $ABCD$ is a square of side 10 cm. If $AE = AF$ and the area of ΔCEF is 20 cm^2, which of the following equations can be used to find AF?



A. $x^2 + 10(10-x) + 20 = 100$
B. $x^2 + 20(10-x) + 20 = 100$
C. $\frac{1}{2}x^2 + 10x + 20 = 100$
D. $\frac{1}{2}x^2 + 10(10-x) + 20 = 100$
E. $\frac{1}{2}x^2 + \dfrac{10(10-x)}{2} + 20 = 100$

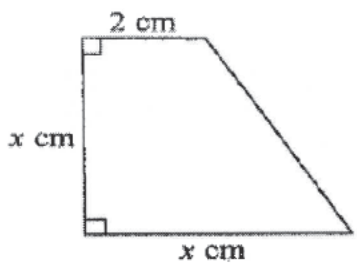
[1998-CE-MATHS 2-11]

17. A piece of wire of length 36 cm is cut into two parts. One part, x cm long, is bent into a square and the other part is bent into a circle. If the length of a side of the square is equal to the radius of the circle, which of the following equations can be used to find x?

A. $x = \dfrac{36-4x}{2\pi}$
B. $x = \dfrac{36-x}{2\pi}$
C. $\dfrac{x}{4} = \dfrac{36-4x}{2\pi}$
D. $\dfrac{x}{4} = \dfrac{36-x}{\pi}$
E. $\dfrac{x}{4} = \dfrac{36-x}{2\pi}$

[2001-CE-MATHS 2-13]

18. In the figure, the area of the trapezium is 12 cm^2. Which of the following equations can be used to find x?



A. $x(x+2) = 12$
B. $x(x+2) = 24$
C. $x^2 - x(x-2) = 12$
D. $x^2 - x(x-2) = 24$

[2005-CE-MATHS 2-5]

19. Let x be the smaller one of two consecutive integers. If the sum of the squares of the two integers is less than three times the product of the two integers by 1, then

A. $x^2 + (x+1)^2 = 3x(x+1) - 1$.
B. $x^2 + (x+1)^2 = 3x(x+1) + 1$.
C. $3(x^2 + (x+1)^2) = x(x+1) - 1$.
D. $3(x^2 + (x+1)^2) = x(x+1) + 1$.

[2007-CE-MATHS 2-4]

20. Let x be the larger one of two consecutive odd numbers. If the sum of the squares of the two odd numbers is less than four times the product of the two odd numbers by 2, then

A. $x^2 + (x-1)^2 = 4x(x-1) + 2$.
B. $x^2 + (x-1)^2 = 4x(x-1) - 2$.
C. $x^2 + (x-2)^2 = 4x(x-2) + 2$.
D. $x^2 + (x-2)^2 = 4x(x-2) - 2$.

[2010-CE-MATHS 2-7]

HKDSE Problems

21. Let a be a constant. Solve the equation $(x-a)(x-a-1) = (x-a)$.

A. $x = a+1$
B. $x = a+2$
C. $x = a$ or $x = a+1$
D. $x = a$ or $x = a+2$

[SP-DSE-MATHS 2-6]

22. Let k be a constant. Solve the equation $(x-k)^2 = 4k^2$.

A. $x = 3k$
B. $x = 5k$
C. $x = -k$ or $x = 3k$
D. $x = -3k$ or $x = 5k$

[2013-DSE-MATHS 2-6]

Nature of Quadratic Roots

1. The equation $x^2 + kx + k = 0$ has equal roots (k being a constant). $k =$

   A. 4 only.
   B. −4 only.
   C. 0 or 4.
   D. 0 or −4.
   E. 4 or −4.

   [1984-CE-MATHS 2-10]

2. If the equation $x^2 - 6x + k = 0$ has real roots, find all possible values of k.

   A. $k \geq 9$
   B. $k \geq -9$
   C. $k = 9$
   D. $k \leq 9$
   E. $k \leq -9$

   [1998-CE-MATHS 2-9]

3. Which of the following equations has / have equal roots?

   (1) $x^2 = x$
   (2) $x^2 + 2x + 1 = 0$
   (3) $(x+3)^2 = 1$

   A. (2) only
   B. (3) only
   C. (1) and (2) only
   D. (1) and (3) only

   [2002-CE-MATHS 2-7]

4. If the equation $x^2 - 4x + k = 1$ has no real roots, then the range of values of k is

   A. $k > 4$.
   B. $k \geq 4$.
   C. $k > 5$.
   D. $k \geq 5$.

   [2003-CE-MATHS 2-5]

5. If the equation $4x^2 + kx + 9 = 0$ has equal positive roots, then $k =$

   A. −6 .
   B. 6 .
   C. −12 .
   D. 12 .

   [2004-CE-MATHS 2-6]

6. If the quadratic equation $kx^2 + 6x + (6 - k) = 0$ has equal roots, then $k =$

   A. −6 .
   B. −3 .
   C. 3 .
   D. 6 .

   [2005-CE-MATHS 2-8]

7. Find the range of values of k such that the quadratic equation $x^2 + 2x - k = 2$ has two distinct real roots.

   A. $k > -3$
   B. $k \geq -3$
   C. $k > -1$
   D. $k \geq -1$

   [2006-CE-MATHS 2-9]

8. If the quadratic equation $x^2 + bx + 4b = 0$ has equal roots, then $b =$

   A. 4 .
   B. 16 .
   C. 0 or 4 .
   D. 0 or 16 .

   [2009-CE-MATHS 2-8]

9. Let k be a constant. Find the range of values of k such that the quadratic equation $x^2 + 6x + k = 3$ has no real roots.

   A. $k < 9$
   B. $k > 9$
   C. $k < 12$
   D. $k > 12$

   [2010-CE-MATHS 2-10]

HKDSE Problems

10. Find the range of values of k such that the quadratic equation $x^2 - 6x = 2 - k$ has no real roots.

    A. $k < -7$
    B. $k > -7$
    C. $k < 11$
    D. $k > 11$

    [SP-DSE-MATHS 2-7]

11. Let k be a constant. If the quadratic equation $3x^2 + 2kx - k = 0$ has equal roots, then $k =$

    A. −3 .
    B. 3 .
    C. −3 or 0 .
    D. 0 or 3 .

    [PP-DSE-MATHS 2-6]

12. Let a be a constant. If the quadratic equation $x^2 + ax + a = 1$ has equal roots, then $a =$

    A. −1 .
    B. 2 .
    C. 0 or −4 .
    D. 0 or 4 .

    [2014-DSE-MATHS 2-4]

13. If k is a constant such that the quadratic equation $x^2 + kx + 8k + 36 = 0$ has equal roots, then $k =$

A. -6 .
B. 12 .
C. -4 or 36 .
D. -18 or 2 .

[2016-DSE-MATHS 2-8]

Relations between Quadratic Roots

1. If α and β are the roots of equation $x^2 + 3x + 7 = 0$, then $\frac{1}{\alpha} + \frac{1}{\beta} =$

 A. $\frac{10}{21}$.
 B. $\frac{3}{7}$.
 C. $\frac{7}{3}$.
 D. $-\frac{3}{7}$.
 E. $-\frac{7}{3}$.

[1978-CE-MATHS 2-12]

2. One of the roots of the quadratic equation $3x^2 + kx + 2 = 0$ is 2. The other root is

 A. 1 .
 B. $\frac{2}{3}$.
 C. $\frac{1}{3}$.
 D. $-\frac{1}{3}$.
 E. $-\frac{2}{3}$.

[1978-CE-MATHS 2-32]

3. $6x^2 + kx + 6 = 0$ is a quadratic equation in which k is a constant. Its roots α and β are positive. $\log_{10}\alpha + \log_{10}\beta =$

 A. 0 .
 B. 1 .
 C. $\log_{10} 6$.
 D. $\log_{10} (-k)$.
 E. $\log_{10} (-\frac{k}{6})$.

[1981-CE-MATHS 2-31]

4. If α and β are the roots of $2x^2 - 3x - 4 = 0$, then $\alpha^2 + 3\alpha\beta + \beta^2 =$

 A. $\frac{1}{4}$.
 B. $4\frac{1}{4}$.
 C. 5 .
 D. $8\frac{1}{4}$.
 E. 13 .

[1983-CE-MATHS 2-7]

5. If α and β are the roots of $3x^2 - x - 1 = 0$, then $\frac{1}{\alpha^2} + \frac{1}{\beta^2} =$

 A. 7 .
 B. 3 .
 C. 1 .
 D. -1 .
 E. -5 .

[1984-CE-MATHS 2-5]

6. If α and β are the roots of $x^2 + 2x - 4 = 0$, then $2^\alpha \cdot 2^\beta =$

 A. $\frac{1}{16}$.
 B. $\frac{1}{4}$.
 C. 2 .
 D. 4 .
 E. 16 .

[1985-CE-MATHS 2-9]

7. If α and β are the roots of the equation $2x^2 + x + 3 = 0$, find the value of $\alpha - \frac{\alpha^2}{\alpha + \beta}$.

 A. -3
 B. -2
 C. 2
 D. 3
 E. It cannot be determined.

[1986-CE-MATHS 2-6]

8. If α and β are the two roots of $x^2 - 8x - 4 = 0$, then the value of $\frac{1}{\alpha} + \frac{1}{\beta}$ is

 A. -2 .
 B. $-\frac{1}{2}$.
 C. $-\frac{1}{4}$.
 D. $\frac{1}{2}$.
 E. 2 .

[1988-CE-MATHS 2-4]

9. If p and q are the roots of the equation $x^2 - x + 3 = 0$, then $(2^{p-2})(2^{q-2}) =$

 A. $\frac{1}{32}$.
 B. $\frac{1}{8}$.
 C. $\frac{1}{2}$.
 D. 8 .
 E. 32 .

[1990-CE-MATHS 2-8]

10. If α and β are the roots of the quadratic equation $x^2 - 3x - 1 = 0$, find the value of $\frac{1}{\alpha} + \frac{1}{\beta}$.

A. -3
B. -1
C. $-\frac{1}{3}$
D. $\frac{2}{3}$
E. 3

[1993-CE-MATHS 2-12]

11. If $\alpha \neq \beta$ and $\begin{cases} 3\alpha^2 - h\alpha - b = 0 \\ 3\beta^2 - h\beta - b = 0 \end{cases}$, then $\alpha + \beta =$

A. $-\frac{b}{3}$.
B. $\frac{b}{3}$.
C. h.
D. $-\frac{h}{3}$.
E. $\frac{h}{3}$.

[1994-CE-MATHS 2-8]

12. If α, β are the roots of the equation $x^2 - 4x - 3 = 0$, then $\alpha^2 + \alpha\beta + \beta^2 =$

A. -13.
B. 5.
C. 13.
D. 16.
E. 19.

[1995-CE-MATHS 2-39]

13. If α and β are the roots of the equation $2x^2 + 4x - 3 = 0$, find $\frac{\alpha}{\beta} + \frac{\beta}{\alpha}$.

A. $-\frac{22}{3}$
B. $-\frac{16}{3}$
C. $-\frac{14}{3}$
D. $-\frac{8}{3}$
E. $\frac{2}{3}$

[1996-CE-MATHS 2-11]

14. The difference of the roots of the equation $2x^2 - 5x + k = 0$ is $\frac{7}{2}$. Find k.

A. -6
B. -3
C. $-\frac{3}{2}$
D. 3
E. $\frac{51}{16}$

[1997-CE-MATHS 2-30]

15. If a, b are distinct real numbers and $\begin{cases} a^2 + 4a + 1 = 0 \\ b^2 + 4b + 1 = 0 \end{cases}$, find $a^2 + b^2$.

A. 1
B. 9
C. 14
D. 16
E. 18

[2001-CE-MATHS 2-39]

16. Let k be a constant. If α and β are the roots of the equation $x^2 - 3x + k = 0$, then $\alpha^2 + 3\beta =$

A. $3 - k$.
B. $3 + k$.
C. $9 - k$.
D. $9 + k$.

[2003-CE-MATHS 2-41]

17. If $\alpha \neq \beta$ and $\begin{cases} \alpha^2 = 4\alpha + 3 \\ \beta^2 = 4\beta + 3 \end{cases}$, then $(\alpha + 1)(\beta + 1) =$

A. -6.
B. 0.
C. 2.
D. 8.

[2004-CE-MATHS 2-42]

18. If the sum and the product of two numbers are 34 and 120 respectively, then the difference between the two numbers is

A. 24.
B. 26.
C. 28.
D. 30.

[2008-CE-MATHS 2-41]

Quadratic Equations of Given Roots

19. If the roots of $ax^2 + bx + c = 0$ are p and q, then the roots of $4ax^2 + 2bx + c = 0$ are

A. p and q.
B. $2p$ and $2q$.
C. $4p$ and $4q$.
D. $\frac{1}{2}p$ and $\frac{1}{2}q$.
E. $\frac{1}{4}p$ and $\frac{1}{4}q$.

[1977-CE-MATHS 2-18]

20. α and β are the roots of the equation $x^2 - 5x - 7 = 0$. What is the equation whose roots are $\alpha + 1$ and $\beta + 1$?

A. $x^2 - 3x + 3 = 0$
B. $x^2 - 3x - 11 = 0$
C. $x^2 - 5x + 1 = 0$
D. $x^2 - 7x - 1 = 0$
E. $x^2 - 7x - 7 = 0$

[1982-CE-MATHS 2-6]

21. If the roots of a quadratic equation are $a + \sqrt{b}$ and $a - \sqrt{b}$, then the equation is

A. $x^2 - (a^2 - b)x + a = 0$.
B. $x^2 + (a^2 - b)x + 2a = 0$.
C. $x^2 + 2ax - a^2 + b = 0$.
D. $x^2 + 2ax + a^2 - b = 0$.
E. $x^2 - 2ax + a^2 - b = 0$.

[1988-CE-MATHS 2-8]

22. If p is a root of $ax^2 + bx + c = 0$, which of the following is a root of $a(\frac{x-3}{2})^2 + b(\frac{x-3}{2}) + c = 0$?

A. $2p + 3$
B. $2p - 3$
C. $3 - 2p$
D. $\frac{p+3}{2}$
E. $\frac{p-3}{2}$

[1989-CE-MATHS 2-44]

HKDSE Problems

23. If the roots of the quadratic equation $x^2 - kx + 3 = 0$ are α and β, then $\alpha^3 + \beta^3 =$

A. k^3.
B. $k^3 - 3k$.
C. $k^3 - 9k$.
D. $k^3 - 12k$.

[PP-DSE-MATHS 2-33]

24. If $\alpha \neq \beta$ and $\begin{cases} 3\alpha = \alpha^2 - 5 \\ 3\beta = \beta^2 - 5 \end{cases}$, then $\alpha\beta =$

A. 3.
B. -3.
C. 5.
D. -5.

[2013-DSE-MATHS 2-35]

25. If β is a root of the equation $4x^2 - 5x - 1 = 0$, then $7 + 10\beta - 8\beta^2 =$

A. 5.
B. 7.
C. 9.
D. 11.

[2015-DSE-MATHS 2-7]

26. Let k be a constant. If the roots of the quadratic equation $x^2 + kx - 2 = 0$ are α and β, then $\alpha^2 + \beta^2 =$

A. k^2.
B. $k^2 + 4$.
C. $k^2 - 4$.
D. $k^2 - 8$.

[2015-DSE-MATHS 2-34]

27. If $m \neq n$ and $2m^2 + 5m = 2n^2 + 5n = 14$, then $(m+2)(n+2) =$

A. -8
B. 2
C. 6
D. 16

[2018-DSE-MATHS 2-36]

Simultaneous Linear Equations

1. If $\begin{cases} 3x+4y=2 \\ 2x+3y=1 \end{cases}$, then $x+y=$

A. -3.
B. -1.
C. 0.
D. 1.
E. 3.

[1977-CE-MATHS 2-8]

2. Solve the following equations:

$$x-1=y+2=x+y-5$$

A. $x=1,\ y=-2$
B. $x=1,\ y=4$
C. $x=4,\ y=1$
D. $x=7,\ y=-2$
E. $x=7,\ y=4$

[1991-CE-MATHS 2-8]

3. If $x=3$, $y=2$ satisfy the simultaneous equations $\begin{cases} ax+by=2 \\ bx-ay=3 \end{cases}$, find the values of a and b.

A. $a=0,\ b=1$
B. $a=0,\ b=-1$
C. $a=\frac{5}{6},\ b=-\frac{1}{4}$
D. $a=-\frac{1}{13},\ b=\frac{37}{39}$
E. $a=-\frac{12}{13},\ b=\frac{5}{13}$

[1994-CE-MATHS 2-39]

4. Solve the simultaneous equations:

$$\begin{cases} 4x-\frac{y}{3}=6 \\ 2x+\frac{y}{6}=-1 \end{cases}.$$

A. $x=-\frac{1}{2},\ y=-12$
B. $x=-\frac{1}{2},\ y=12$
C. $x=\frac{1}{2},\ y=-12$
D. $x=\frac{1}{2},\ y=12$
E. $x=\frac{5}{24},\ y=-\frac{7}{2}$

[1995-CE-MATHS 2-7]

5. Solve $\begin{cases} \frac{3}{x}-y=1 \\ 2y-\frac{1}{2x}=1 \end{cases}$.

A. $x=\frac{5}{4},\ y=\frac{7}{4}$
B. $x=\frac{11}{4},\ y=\frac{1}{11}$
C. $x=\frac{11}{4},\ y=\frac{13}{22}$
D. $x=\frac{11}{6},\ y=\frac{7}{11}$
E. $x=\frac{6}{11},\ y=\frac{7}{11}$

[1997-CE-MATHS 2-8]

6. Solve the simultaneous equations:

$$\begin{cases} 2x+\frac{3}{y}=-1 \\ x-\frac{1}{y}=7 \end{cases}.$$

A. $(0,-3)$
B. $(1,-1)$
C. $(4,-\frac{1}{3})$
D. $(4,-3)$
E. $(22,-\frac{1}{15})$

[1998-CE-MATHS 2-4]

7. If $(x, y)=(-2, 1)$ is a solution of the simultaneous equations $\begin{cases} ax-by+8=0 \\ bx+ay+1=0 \end{cases}$, then $a=$

A. -3.
B. 2.
C. $\frac{9}{4}$.
D. 3.

[2002-CE-MATHS 2-8]

8. If $m+2=n-1=3m+n-46$, then $n=$

A. 15.
B. 16.
C. 17.
D. 18.

[2008-CE-MATHS 2-8]

9. If $2p+q=p-q=3$, then $q=$

A. -1.
B. 1.
C. 2.
D. 3.

[2010-CE-MATHS 2-8]

Simultaneous Quadratic Equations

10. Find the real value of x such that $\begin{cases} x^2 + x + 1 = k \\ x - 1 = \dfrac{7}{k} \end{cases}$, where k is a constant.

A. 3
B. 2
C. 1
D. -1
E. -3

[1986-CE-MATHS 2-8]

11. Let m be a constant. Find the value of x such that $\begin{cases} x^2 + x + 1 = m \\ x - 1 = \dfrac{26}{m} \end{cases}$.

A. 1
B. 2
C. 3
D. 4
E. 5

[1990-CE-MATHS 2-35]

12. If the simultaneous equations $\begin{cases} y = x^2 - k \\ y = x \end{cases}$ have only one solution, find k.

A. -1
B. $-\dfrac{1}{4}$
C. -4
D. $\dfrac{1}{4}$
E. 1

[1993-CE-MATHS 2-13]

13. Solve $\begin{cases} x^2 + y^2 = 13 \\ x + y = 1 \end{cases}$.

A. $\begin{cases} x = -2 \\ y = 3 \end{cases}$
B. $\begin{cases} x = -6 \\ y = 7 \end{cases}$
C. $\begin{cases} x = 2 \\ y = -1 \end{cases}$ or $\begin{cases} x = -3 \\ y = 4 \end{cases}$
D. $\begin{cases} x = -2 \\ y = 3 \end{cases}$ or $\begin{cases} x = 3 \\ y = -2 \end{cases}$
E. $\begin{cases} x = -6 \\ y = 7 \end{cases}$ or $\begin{cases} x = 7 \\ y = -6 \end{cases}$

[1996-CE-MATHS 2-10]

14. If $\begin{cases} y = x^2 + 3x - 2 \\ y = -x + 3 \end{cases}$, then

A. $x = -1$.
B. $x = -1$ or 5.
C. $x = -2$ or 1.
D. $x = -5$ or 1.
E. $x = -5$ or 8.

[1999-CE-MATHS 2-8]

15. If $\begin{cases} y = x^2 - 1 \\ y = 2x - 2 \end{cases}$, then $y =$

A. -4.
B. 0.
C. 1.
D. 0 or 8.
E. -4 or 4.

[2000-CE-MATHS 2-5]

16. If $\begin{cases} y = x^2 - 4x - 44 \\ y = -2x + 4 \end{cases}$, then $y =$

A. -32 or 52.
B. -12 or 16.
C. -12 or 96.
D. -8 or 20.
E. 12 or 24.

[2001-CE-MATHS 2-12]

17. If $\begin{cases} y = x^2 + 4 \\ y = -3x + 4 \end{cases}$, then $y =$

A. 0.
B. 13.
C. 0 or -3.
D. 4 or 13.

[2003-CE-MATHS 2-7]

18. If $\begin{cases} pq + 2q = 10 \\ 4p + q = 14 \end{cases}$, then $q =$

A. 2.
B. 3.
C. $\dfrac{-3}{2}$ or 3.
D. 2 or 20.

[2004-CE-MATHS 2-8]

19. If $\begin{cases} \beta = \alpha^2 - 3 \\ \beta = 4\alpha - 3 \end{cases}$, then $\beta =$

A. 4.
B. 13.
C. 0 or 4.
D. -3 or 13.

[2005-CE-MATHS 2-7]

20. If $p = q^2 - 12q + 6 = 2q - 7$, then $p =$

A. 1 or 13 .
B. -1 or -13 .
C. -5 or 19 .
D. -9 or -33 .

[2007-CE-MATHS 2-42]

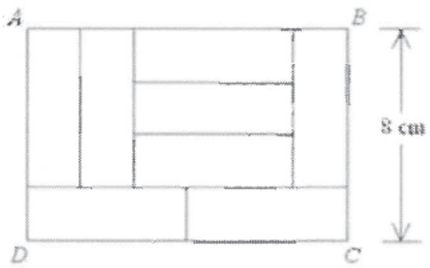
Practical Problems

21. The price of 6 oranges and 3 apples is \$42 while the price of 8 oranges and 5 apples is \$60. Find the price of an apple.

A. \$3
B. \$4
C. \$5
D. \$6

[2007-CE-MATHS 2-7]

22. In the figure, the rectangle $ABCD$ is divided into eight identical rectangles. Find the area of the rectangle $ABCD$.



A. 40 cm^2
B. 80 cm^2
C. 96 cm^2
D. 112 cm^2

[2008-CE-MATHS 2-7]

23. The price of 5 pens and 4 pencils is \$46 while the price of 2 pens and 3 pencils is \$24. Find the price of 3 pens and 2 pencils.

A. \$20
B. \$24
C. \$26
D. \$30

[2011-CE-MATHS 2-6]

HKDSE Problems

24. If $m + 2n + 6 = 2m - n = 7$, then $n =$

A. -4 .
B. -1 .
C. 3 .
D. 11 .

[2012-DSE-MATHS 2-5]

25. The price of 2 bowls and 3 cups is \$506. If the price of 5 bowls and the price of 4 cups are the same, then the price of a bowl is

A. \$88 .
B. \$92 .
C. \$110 .
D. \$115 .

[2014-DSE-MATHS 2-8]

26. If $p + 3q = 4$ and $5p + 9q = 2$, then $p =$

A. -5 .
B. -3 .
C. 3 .
D. 5 .

[2015-DSE-MATHS 2-3]

27. If $4\alpha + \beta = 7\alpha + 3\beta = 5$, then $\beta =$

A. -3 .
B. -2 .
C. 2 .
D. 3 .

[2016-DSE-MATHS 2-5]

28. If $6x - 7y = 40 = 2x + 11y$, then $y =$

A. -4
B. 2
C. 4
D. 9

[2019-DSE-MATHS 2-3]

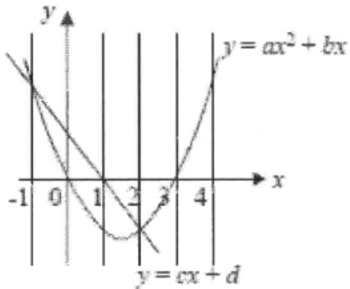
Graphical Methods

1. The graphs of $y = \frac{x^2}{2}$ and $y = x + 2$ intersect at the points (x_1, y_1) and (x_2, y_2). Which of the following equations has roots x_1 and x_2?

   A. $x^2 - x - 2 = 0$
   B. $x^2 + x + 2 = 0$
   C. $x^2 - 2x - 4 = 0$
   D. $x^2 - 4x - 8 = 0$
   E. $2x^2 - x - 2 = 0$

   [1982-CE-MATHS 2-31]

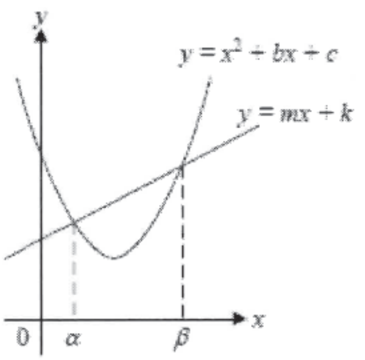
2. The diagram shows the graphs of $y = ax^2 + bx$ and $y = cx + d$. The solutions of the equation $ax^2 + bx = cx + d$ are



   A. $-1, 1$
   B. $-1, 2$
   C. $0, 1$
   D. $0, 3$
   E. $1, 3$

   [1993-CE-MATHS 2-7]

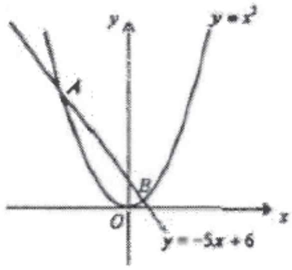
3. In the figure, the line $y = mx + k$ cuts the curve $y = x^2 + bx + c$ at $x = \alpha$ and $x = \beta$. Find the value of $\alpha\beta$.



   A. $-b$
   B. c
   C. $m - b$
   D. $k - c$
   E. $c - k$

   [1994-CE-MATHS 2-38]

4. In the figure, find the coordinates of the mid-point of AB.



   A. $(-\frac{7}{2}, \frac{35}{2})$
   B. $(-\frac{5}{2}, \frac{25}{4})$
   C. $(-\frac{5}{2}, \frac{37}{2})$
   D. $(\frac{5}{2}, \frac{13}{2})$
   E. $(\frac{7}{2}, \frac{35}{2})$

   [1997-CE-MATHS 2-31]

5. Suppose the graph of $y = x^2 - 2x - 3$ is given. In order to solve the quadratic equation $2x^2 - 6x - 3 = 0$, which of the following straight lines should be added to the given graph?

   A. $y = 4x$
   B. $y = x - \frac{3}{2}$
   C. $y = -x + \frac{3}{2}$
   D. $y = 2x - 3$
   E. $y = -2x + 3$

   [2001-CE-MATHS 2-40]

Location of Roots

6. Given that r is the only real root of $x^5 + x - 1 = 0$, which of the following ranges contains r?

   A. $-2 < r < -1$
   B. $-1 < r < 0$
   C. $0 < r < 1$
   D. $1 < r < 2$
   E. $2 < r < 3$

   [1989-CE-MATHS 2-8]

7.

x	Sign of f(x)
1.22	+
1.23	+
1.24	+
1.25	–
1.245	+

From the table, a root of the equation $f(x) = 0$ must be

A. 1.20, correct to 2 decimal places.
B. 1.24, correct to 2 decimal places.
C. 1.25, correct to 2 decimal places.
D. 1.245, correct to 3 decimal places.
E. 1.2475, correct to 4 decimal places.

[1990-CE-MATHS 2-32]

8. Which of the following intervals **must** contain a root of $2x^3 - x^2 - x - 3 = 0$?

(1) $-1 < x < 1$
(2) $0 < x < 2$
(3) $1 < x < 3$

A. (1) only
B. (2) only
C. (3) only
D. (1) and (2) only
E. (2) and (3) only

[1992-CE-MATHS 2-36]

9.

x	Sign of $f(x)$
3.56	+
3.58	–
3.57	+
3.575	+

From the table, a root of the equation $f(x) = 0$ is

A. 3.57 (correct to 3 sig. fig.).
B. 3.575 (correct to 4 sig. fig.).
C. 3.5775 (correct to 5 sig. fig.).
D. 3.5725 (correct to 4 sig. fig.).
E. 3.58 (correct to 3 sig. fig.).

[1993-CE-MATHS 2-36]

10. From the table, which of the following intervals must contain a root of $f(x) - x = 0$?

x	$f(x)$
–2	1.2
–1	0.8
0	0.7
1	0.2
2	–0.1
3	0.8

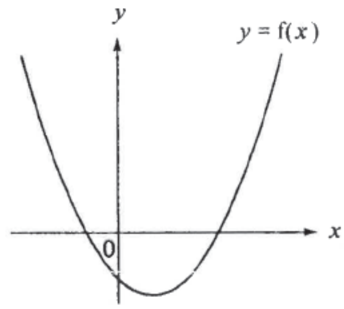
A. $-2 < x < -1$
B. $-1 < x < 0$
C. $0 < x < 1$
D. $1 < x < 2$
E. $2 < x < 3$

[1994-CE-MATHS 2-40]

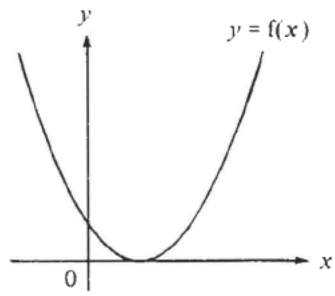
Method of Bisection (Out of Syllabus)

11. In which of the following cases the equation $f(x) = 0$ **cannot** be solved by the method of bisection?

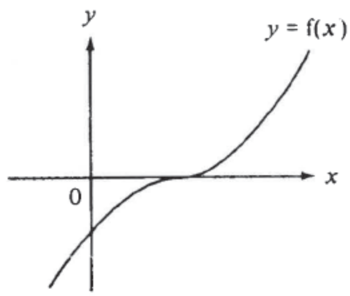
A.



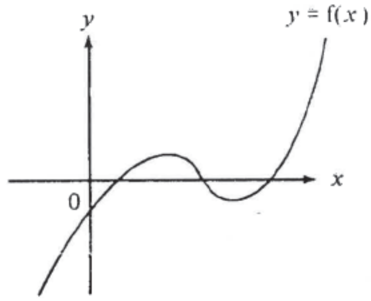
B.



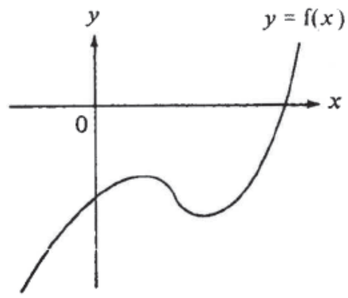
C.



D.



E.

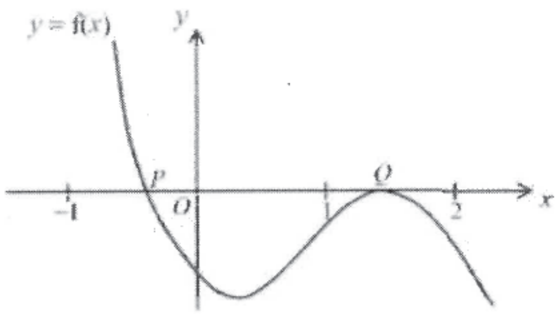


[1991-CE-MATHS 2-7]

12. The method of bisection is used to find the root of $\sin x + x - 1 = 0$ starting with the interval $[0, 2]$. After the first approximation, the interval which contains the root becomes $[0, 1]$. Find the interval which contains the root after the third approximation.

A. $[0, 0.25]$
B. $[0.25, 0.75]$
C. $[0.5, 0.75]$
D. $[0.5, 1]$
E. $[0.75, 1]$

[1999-CE-MATHS 2-41]

13. 

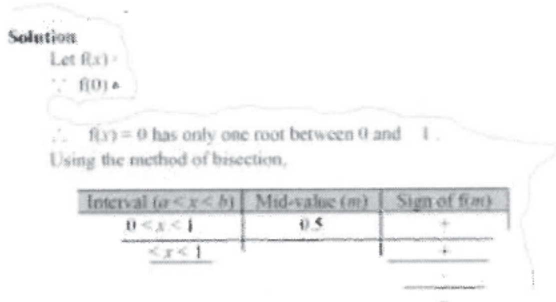
In the figure, the graph of $y = f(x)$ intersects the x-axis at P and Q only. In order to find a root of $f(x) = 0$ using the method of bisection, which of the following intervals can you start with?

(1) $-1 < x < 0$
(2) $-1 < x < 1$
(3) $1 < x < 2$

A. (1) only
B. (3) only
C. (1) and (2) only
D. (1) and (3) only
E. (1), (2) and (3)

[2000-CE-MATHS 2-41]

14. The figure shows part of a page torn off from a mathematics book. According to the information shown, which of the following is a root of the equation $f(x) = 0$?


Solution
Let f(x) =
∵ f(0) =
∴ f(x) = 0 has only one root between 0 and 1.
Using the method of bisection,

Interval ($a < x < b$)	Mid-value (m)	Sign of f(m)
$0 < x < 1$	0.5	+
$< x < 1$		+

A. 0.6 (correct to 1 decimal place)
B. 0.7 (correct to 1 decimal place)
C. 0.8 (correct to 1 decimal place)
D. 0.9 (correct to 1 decimal place)

[2002-CE-MATHS 2-41]

15. It is known that the equation $2x^3 = 12x - 9$ has only one root in the interval $-3 \le x \le -2$. The method of bisection is used to find the root starting with the interval $-3 \le x \le -2$. After the first approximation, the interval which contains the root becomes $-3 \le x \le -2.5$. Find the interval which contains the root after the third approximation.

A. $-2.625 \le x \le -2.5$
B. $-2.75 \le x \le -2.625$
C. $-2.875 \le x \le -2.75$
D. $-3 \le x \le -2.875$

[2004-CE-MATHS 2-41]