

## Change of Subjects

1. If  $\frac{1}{p} = \frac{1}{q} - \frac{1}{\sqrt{r}}$ , then  $r$  is equal to

- A.  $\left(\frac{pq}{p+q}\right)^2$ .
- B.  $\left(\frac{pq}{p-q}\right)^2$ .
- C.  $\left(\frac{p-q}{pq}\right)^2$ .
- D.  $\sqrt{\frac{q-p}{pq}}$ .
- E.  $\sqrt{\frac{pq}{p-q}}$ .

[1972-CE-MATHS B1-14]

2. If  $\frac{p}{mc} = \frac{v}{\sqrt{c^2-v^2}}$ , then  $v =$

- A.  $\pm \frac{pc}{mc+p}$ .
- B.  $\pm \frac{pc}{mc-p}$ .
- C.  $\pm \frac{pc}{\sqrt{m^2c^2-p^2}}$ .
- D.  $\pm \frac{pc}{\sqrt{m^2c^2+p^2}}$ .
- E.  $\pm \frac{p^2c^2}{m^2c^2+p^2}$ .

[1977-CE-MATHS 2-10]

3. If  $y = \frac{a \pm \sqrt{bx-c}}{2}$ , then  $x =$

- A.  $\frac{4y^2-a^2}{b} + c$ .
- B.  $\frac{4y^2-a^2+c}{b}$ .
- C.  $\frac{4(y-a)^2+c}{b}$ .
- D.  $\frac{(2y-a)^2-c}{b}$ .
- E.  $\frac{(2y-a)^2+c}{b}$ .

[SP-CE-MATHS 2-9]

4. If  $d = \frac{-1 \pm \sqrt{1-4ac}}{2a}$ , then  $c =$

- A.  $4a^2d^2$ .
- B.  $-ad^2$ .
- C.  $ad^2 - d$ .
- D.  $-ad^2 + d$ .
- E.  $-ad^2 - d$ .

[1978-CE-MATHS 2-17]

5. If  $x = \frac{ab}{a-b}$ , then  $a =$

- A.  $\frac{x-b}{bx}$ .
- B.  $\frac{bx}{x-b}$ .
- C.  $\frac{bx}{b-x}$ .
- D.  $\frac{bx}{b+x}$ .
- E.  $\frac{b}{x-b}$ .

[1979-CE-MATHS 2-4]

6. If  $P(1+k)^n = Q$ , then  $k =$

- A.  $(\frac{Q}{P})^{\frac{1}{n}} - 1$ .
- B.  $(\frac{P}{Q})^{-n} - 1$ .
- C.  $(\frac{Q}{P})^{-n} - 1$ .
- D.  $1 - (\frac{Q}{P})^{-n}$ .
- E.  $1 - (\frac{Q}{P})^{\frac{1}{n}}$ .

[1979-CE-MATHS 2-25]

7. If  $x = \frac{y+(n-1)z}{n+1}$ , then  $n =$

- A.  $\frac{x-y+z}{z}$ .
- B.  $\frac{x+y-z}{z}$ .
- C.  $\frac{y-x-z}{x+z}$ .
- D.  $\frac{y-x-z}{x-z}$ .
- E.  $\frac{y+x-z}{x-z}$ .

[1980-CE-MATHS 2-7]

8. If  $x = \frac{-bx+ay-c}{a+by}$ , then  $y =$

- A.  $\frac{ax+bx+c}{a-bx}$ .
- B.  $-\frac{ax+bx+c}{a-bx}$ .
- C.  $\frac{ax+bx+c}{a+bx}$ .
- D.  $-\frac{ax+bx+c}{a+bx}$ .
- E.  $\frac{ax-bx-c}{a-bx}$ .

[1981-CE-MATHS 2-3]

9. If  $H = K + \frac{M}{4\pi(r^2 + \ell^2)^n}$  and  $r > 0$ , then  $r =$

- A.  $\left\{ \left[ \frac{M}{4\pi(H-K)} \right]^{-n} - \ell^2 \right\}^{\frac{1}{2}}$   
 B.  $\left[ \frac{M}{4\pi(H-K)} \right]^{-\frac{n}{2}} - \ell$ .  
 C.  $\left\{ \left[ \frac{M}{4\pi(H-K)} \right]^{\frac{1}{n}} - \ell^2 \right\}^{\frac{1}{2}}$ .  
 D.  $\left[ \frac{M}{4\pi(H-K)} \right]^{\frac{1}{2n}} - \ell$ .  
 E.  $\left\{ \left[ \frac{4\pi}{M(H-K)} \right]^{\frac{1}{n}} - \ell^2 \right\}^{\frac{1}{2}}$ .

[1981-CE-MATHS 2-6]

10. If  $x = \frac{1}{\frac{1}{y} + \frac{2}{z}}$ , then  $y =$

- A.  $\frac{2x}{z}$ .  
 B.  $\frac{z}{xz - z}$ .  
 C.  $\frac{z - 2x}{xz}$ .  
 D.  $\frac{xz}{2x + z}$ .  
 E.  $\frac{xz}{z - 2x}$ .

[1982-CE-MATHS 2-4]

11. If  $10^{kx+a} = P$ , then  $x =$

- A.  $\frac{1}{k}(10^{P-a})$ .  
 B.  $\log_{10} \frac{P-a}{k}$ .  
 C.  $\frac{1}{k} \log_{10} P - a$ .  
 D.  $\frac{1}{k}(\log_{10} P - a)$ .  
 E.  $\frac{1}{k}(\log_{10} P + a)$ .

[1982-CE-MATHS 2-5]

12. If  $x = \frac{y^2}{\sqrt{a^2 + bz}}$ , then  $z =$

- A.  $\frac{1}{b}(\frac{y^4}{x^2} - a^2)$ .  
 B.  $\frac{1}{b}(\frac{x^2}{y^4} - a^2)$ .  
 C.  $\frac{1}{b}(a^2 - \frac{x^2}{y^4})$ .

D.  $\frac{1}{b}(a^2 - \frac{y^4}{x^2})$ .  
 E.  $\frac{1}{b}(a^2 - \frac{x^2}{y^2})$ .

[1983-CE-MATHS 2-3]

13. If  $a = \frac{2b(2y-x)}{x-3y}$ , then  $y =$

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

[1984-CE-MATHS 2-2]

14. If  $\frac{ab}{ka+b} = \frac{1}{k}$ , then  $b =$

- A.  $\frac{a}{a-k}$ .  
 B.  $\frac{ka}{ka-1}$ .  
 C.  $\frac{ka}{1-ka}$ .  
 D.  $\frac{k^2a}{a-k}$ .  
 E.  $\frac{k^2a}{k-a}$ .

[1985-CE-MATHS 2-3]

15. If  $a - \sqrt{b^2 + c^2} = d$ , then  $c =$

- A.  $d - a + b$ .  
 B.  $a - d - b$ .  
 C.  $\pm \sqrt{d^2 - a^2 + b^2}$ .  
 D.  $\pm \sqrt{a^2 - d^2 - b^2}$ .  
 E.  $\pm \sqrt{(a-d)^2 - b^2}$ .

[1985-CE-MATHS 2-5]

16. If  $1 - \frac{x+y}{y-x} = a$  ( $a \neq 0$ ), then  $y =$

- A.  $x$ .  
 B.  $\frac{x}{a}(a-2)$ .  
 C.  $\frac{x}{a}(a-1)$ .  
 D.  $\frac{x}{a}(2-a)$ .  
 E.  $\frac{x}{a}(1-a)$ .

[1986-CE-MATHS 2-3]

17. If  $a = \frac{b+3cd}{b-3cd}$ , then  $c =$

- A.  $\frac{a}{6d}$ .
- B.  $\frac{b}{3d}$ .
- C.  $\frac{b(a-1)}{6d}$ .
- D.  $\frac{b(a+1)}{a-1}$ .
- E.  $\frac{b(a-1)}{3d(a+1)}$ .

[1987-CE-MATHS 2-3]

18. If  $x = \frac{1+y}{1-y}$ , then  $y =$

- A.  $\frac{x-1}{x}$ .
- B.  $\frac{1+x}{1-x}$ .
- C.  $\frac{x+1}{x-1}$ .
- D.  $\frac{x-1}{x+1}$ .
- E.  $\frac{1-x}{1+x}$ .

[1988-CE-MATHS 2-2]

19. If  $x = \frac{ab+1}{a-b}$ , then  $b =$

- A.  $\frac{ax-1}{a+x}$ .
- B.  $\frac{ax-1}{a-x}$ .
- C.  $\frac{1-ax}{a+x}$ .
- D.  $\frac{1-ax}{a-x}$ .
- E.  $\frac{ax+1}{a-x}$ .

[1990-CE-MATHS 2-3]

20. If  $y = \sqrt{\frac{1+mx}{1-mx}}$ , then  $x =$

- A.  $\frac{m(y-1)}{y+1}$ .
- B.  $\frac{y-1}{m(y+1)}$ .
- C.  $\frac{1-y^2}{m(1+y^2)}$ .
- D.  $\frac{m(y^2-1)}{y^2+1}$ .
- E.  $\frac{y^2-1}{m(y^2+1)}$ .

[1991-CE-MATHS 2-4]

21. If  $a = 1 - \frac{1}{1-b}$ , then  $b =$

- A.  $1 - \frac{1}{1-a}$ .
- B.  $1 - \frac{1}{1+a}$ .
- C.  $1 + \frac{1}{1-a}$ .
- D.  $1 + \frac{1}{1+a}$ .
- E.  $-1 + \frac{1}{1-a}$ .

[1992-CE-MATHS 2-2]

22. If  $s = \frac{n}{2}[2a + (n-1)d]$ , then  $d =$

- A.  $\frac{2(s-an)}{n(n-1)}$ .
- B.  $\frac{2(s-an)}{n-1}$ .
- C.  $\frac{s}{n(n-1)}$ .
- D.  $\frac{as-n}{a(n-1)}$ .
- E.  $\frac{4(s-an)}{n(n-1)}$ .

[1993-CE-MATHS 2-2]

23. If  $y = \frac{2x-1}{x+2}$ , then  $x =$

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

[1994-CE-MATHS 2-2]

24. If  $\frac{x+y}{xy} = 1$ , then  $y =$

- A.  $\frac{1-x}{x}$ .
- B.  $\frac{x-1}{x}$ .
- C.  $\frac{x}{1-x}$ .
- D.  $\frac{x}{x-1}$ .
- E.  $\frac{1-x}{1+x}$ .

[1995-CE-MATHS 2-2]

25. If  $A = 2\pi r^2 + 2\pi rh$ , then  $h =$
- $A - r$ .
  - $\frac{A}{r}$ .
  - $\frac{A}{2\pi r} - r$ .
  - $r - \frac{A}{2\pi r}$ .
  - $\frac{A}{2\pi r} - 2\pi r^2$ .

[1996-CE-MATHS 2-4]

26. If  $\frac{a+x}{b+x} = \frac{c}{d}$  ( $c \neq d$ ), then  $x =$
- $\frac{c}{d} - \frac{a}{b}$ .
  - $\frac{a-b}{c-d}$ .
  - $\frac{b-a}{c-d}$ .
  - $\frac{ad-bc}{c-d}$ .
  - $\frac{bc-ad}{c-d}$ .

[1997-CE-MATHS 2-3]

27. If  $x = \frac{y(z-3)}{3z}$ , then  $z =$
- $\frac{3}{3x-y}$ .
  - $\frac{-3}{3x-y}$ .
  - $\frac{3y}{3x-y}$ .
  - $\frac{-3y}{3x-y}$ .
  - $\frac{3x-y}{3y}$ .

[1998-CE-MATHS 2-1]

28. If  $a = \frac{1+b}{1-b}$ , then  $b =$
- $\frac{a-1}{2}$ .
  - $\frac{a-1}{2a}$ .
  - $\frac{a+1}{a-1}$ .
  - $\frac{a-1}{a+1}$ .
  - $\frac{1-a}{a+1}$ .

[1999-CE-MATHS 2-3]

29. If  $A = \frac{h}{2}(a+b)$ , then  $b =$
- $2A - ah$ .
  - $\frac{2}{h}(A-a)$ .
  - $\frac{2A-a}{h}$ .
  - $a - \frac{2A}{h}$ .
  - $\frac{2A}{h} - a$ .

[2000-CE-MATHS 2-1]

30. If  $a = 2 - \frac{1}{1+b}$ , then  $b =$
- $\frac{1-a}{a-2}$ .
  - $\frac{a-1}{a-2}$ .
  - $\frac{a+1}{a-2}$ .
  - $\frac{-a-3}{a-2}$ .
  - $\frac{1-a}{a}$ .

[2001-CE-MATHS 2-1]

31. If  $\frac{x}{1+x} = \frac{a}{1-a}$ , then  $x =$
- $a$ .
  - $\frac{2a}{1-a}$ .
  - $\frac{a}{1+2a}$ .
  - $\frac{a}{1-2a}$ .

[2002-CE-MATHS 2-1]

32. If  $a = \frac{b-1}{b-2}$ , then  $b =$
- $\frac{2a-1}{a-1}$ .
  - $\frac{2a-1}{a+1}$ .
  - $\frac{1}{a-1}$ .
  - $\frac{1}{a+1}$ .

[2003-CE-MATHS 2-3]

33. If  $x = \frac{y - 2x}{2y}$ , then  $y =$

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

[2004-CE-MATHS 2-2]

34. If  $a = 1 - 2b$ , then  $b =$

- A.  $\frac{a - 1}{2}$ .
- B.  $\frac{a + 1}{2}$ .
- C.  $\frac{-1 - a}{2}$ .
- D.  $\frac{1 - a}{2}$ .

[2005-CE-MATHS 2-2]

35. If  $2x - 5y = 7$ , then  $y =$

- A.  $\frac{5}{2x - 7}$ .
- B.  $\frac{5}{2x + 7}$ .
- C.  $\frac{2x - 7}{5}$ .
- D.  $\frac{2x + 7}{5}$ .

[2006-CE-MATHS 2-2]

36. If  $m = 7 - 3n$ , then  $n =$

- A.  $\frac{7 - m}{3}$ .
- B.  $\frac{7 + m}{3}$ .
- C.  $\frac{3}{7 - m}$ .
- D.  $\frac{3}{7 + m}$ .

[2008-CE-MATHS 2-2]

37. If  $P = \frac{VT}{R} - 2$ , then  $T =$

- A.  $\frac{P}{V} + 2R$ .
- B.  $\frac{RP + 2}{V}$ .
- C.  $R\left(\frac{P}{V} + 2\right)$ .
- D.  $\frac{R(P+2)}{V}$ .

[2009-CE-MATHS 2-2]

38. If  $x = \frac{3a}{a + 2b}$ , then  $a =$

- A.  $\frac{2b}{3 - x}$ .
- B.  $\frac{2b}{x - 3}$ .
- C.  $\frac{2bx}{3 - x}$ .
- D.  $\frac{2bx}{x - 3}$ .

[2010-CE-MATHS 2-1]

39. If  $\frac{2 + a}{a} = \frac{2 - x}{x}$ , then  $x =$

- A.  $\frac{a}{1 + a}$ .
- B.  $\frac{2a}{1 + a}$ .
- C.  $\frac{a}{2 + a}$ .
- D.  $\frac{2a}{2 + a}$ .

[2011-CE-MATHS 2-2]

### Manipulation of Formula

40. If  $x^2 + y^2 = m$  and  $x - y = n$ , then  $xy =$

- A.  $\frac{1}{2}(m - n^2)$ .
- B.  $m - n^2$ .
- C.  $\frac{1}{2}(n^2 - m)$ .
- D.  $n^2 - \frac{m}{2}$ .
- E.  $m - \frac{n}{2}$ .

[1977-CE-MATHS 2-16]

41. If  $x^2 + x + 1 = 4$ , then  $-x^2 - x + 1 =$

- A. 0.
- B. -2.
- C. -3.
- D. -4.
- E. -5.

[SP-CE-MATHS 2-1]

42. If  $2a = 3b$ , then  $\frac{2a^2}{3b^2} =$
- $\frac{9}{4}$ .
  - $\frac{3}{2}$ .
  - 1.
  - $\frac{2}{3}$ .
  - $\frac{8}{27}$ .

[SP-CE-MATHS 2-3]

43. If  $x + y = a$  and  $xy = b$ , then  $(x - y)^2 =$
- $a^2 - 4b$ .
  - $a^2 - 2b$ .
  - $a^2 - b$ .
  - $a^2 + 2b$ .
  - $a^2 + b^2$ .

[SP-CE-MATHS 2-11]

44. If  $x + y = 2a$  and  $x - y = 2b$ , then  $x^2 + y^2 =$
- $4ab$ .
  - $a^2 - b^2$ .
  - $2(a^2 - b^2)$ .
  - $2(a^2 + b^2)$ .
  - $4(a^2 + b^2)$ .

[1978-CE-MATHS 2-18]

45. If  $4p = 9q$ , then  $\frac{4p^2}{9q^2} =$
- 1.
  - $\frac{4}{9}$ .
  - $\frac{9}{4}$ .
  - $\left(\frac{9}{4}\right)^2$ .
  - $\left(\frac{4}{9}\right)^3$ .

[1980-CE-MATHS 2-3]

46. If  $\frac{1}{x} = a + b$  and  $\frac{1}{y} = a - b$ , then  $x + y =$
- $\frac{2}{a}$ .
  - $\frac{a^2 - b^2}{a}$ .
  - $-\frac{a^2 - b^2}{b}$ .
  - $\frac{2a}{a^2 - b^2}$ .
  - $\frac{-2b}{a^2 - b^2}$ .

[1980-CE-MATHS 2-6]

47. If the value of  $y^2 + 3y + 7$  is 2, what is the value of  $2y^2 + 6y - 3$ ?
- 13
  - 7
  - 7
  - 14
  - it cannot be found from the information given

[1980-CE-MATHS 2-29]

48. If  $\frac{1}{x} - \frac{1}{y} = \frac{1}{z}$ , and  $x = \frac{1}{2}$ ,  $z = \frac{1}{3}$ , then  $y =$
- 1.
  - 1.
  - 5.
  - 6.
  - $\frac{1}{6}$ .

[1987-CE-MATHS 2-2]

49. If  $x^2 + y^2 = 5$  and  $x + y = 3$ , then  $x - y =$
- 1.
  - 1.
  - 1 or -1.
  - 1 or -5.
  - 1 to 5.

[1987-CE-MATHS 2-38]

50. If  $\frac{x + 3y}{2x + y} = 2$ , find  $\frac{3x + y}{x + 2y}$ .
- 2
  - 3
  - $\frac{1}{2}$
  - $\frac{1}{3}$
  - $\frac{6}{7}$

[1989-CE-MATHS 2-40]

51. If  $9a^2 - b^2 = 0$  and  $ab < 0$ , then  $\frac{a - b}{a + b} =$
- 2.
  - $-\frac{1}{2}$ .
  - 0.
  - $\frac{1}{2}$ .
  - 2.

[2000-CE-MATHS 2-34]

52. If  $\frac{x+3y}{2x-y} = \frac{2}{3}$ , then  $\frac{x-y}{x+y} =$

- A.  $-\frac{5}{6}$ .
- B.  $-\frac{3}{5}$ .
- C.  $\frac{3}{5}$ .
- D.  $\frac{3}{4}$ .
- E.  $\frac{5}{6}$ .

[2001-CE-MATHS 2-28]

53. If  $2x = 3y = 4z$ , then  $\frac{x+y-z}{x-y+z} =$

- A.  $\frac{1}{5}$ .
- B.  $\frac{1}{3}$ .
- C.  $\frac{5}{3}$ .
- D.  $\frac{7}{5}$ .

[2002-CE-MATHS 2-13]

### HKDSE Problems

54. If  $5 - 3m = 2n$ , then  $m =$

- A.  $n$ .
- B.  $\frac{2n-5}{3}$ .
- C.  $\frac{-2n+5}{3}$ .
- D.  $\frac{-2n+15}{3}$ .

[SP-DSE-MATHS 2-2]

55. If  $3a + 1 = 3(b-2)$ , then  $b =$

- A.  $a + 1$ .
- B.  $a + 3$ .
- C.  $a + \frac{7}{3}$ .
- D.  $a - \frac{5}{3}$ .

[PP-DSE-MATHS 2-2]

56. If  $\frac{y-1}{c} = \frac{y+1}{d}$ , then  $y =$

- A.  $\frac{c-d}{c+d}$ .
- B.  $\frac{d-c}{c+d}$ .
- C.  $\frac{c+d}{c-d}$ .
- D.  $\frac{c+d}{d-c}$ .

[2013-DSE-MATHS 2-2]

57. If  $\frac{a}{x} + \frac{b}{y} = 3$ , then  $x =$

- A.  $\frac{ay}{3y-b}$ .
- B.  $\frac{ay}{b-3y}$ .
- C.  $\frac{by}{3y-a}$ .
- D.  $\frac{by}{a-3y}$ .

[2016-DSE-MATHS 2-2]

58. If  $\frac{a+4b}{2a} = 2 + \frac{b}{a}$ , then  $a =$

- A.  $\frac{2b}{3}$ .
- B.  $\frac{3b}{2}$ .
- C.  $\frac{5b}{6}$ .
- D.  $\frac{6b}{5}$ .

[2017-DSE-MATHS 2-3]

59. If  $\frac{\alpha}{1-x} = \frac{\beta}{x}$ , then  $x =$

- A.  $\frac{\alpha}{\alpha-\beta}$
- B.  $\frac{\alpha}{\alpha+\beta}$
- C.  $\frac{\beta}{\alpha-\beta}$
- D.  $\frac{\beta}{\alpha+\beta}$

[2018-DSE-MATHS 2-2]

60. If  $h = 3 - \frac{5}{k+4}$ , then  $k =$

- A.  $\frac{4h-7}{3-h}$
- B.  $\frac{4h-17}{3-h}$
- C.  $\frac{4h-7}{3+h}$
- D.  $\frac{4h-17}{3+h}$

[2019-DSE-MATHS 2-5]

61. If  $a(a + b) = 2(b - a)$ , then  $b =$

- A.  $\frac{a^2+a}{2+a}$
- B.  $\frac{a^2-2a}{2+a}$
- C.  $\frac{a^2+2a}{2+a}$
- D.  $\frac{a^2-a}{2+a}$

[2020-DSE-MATHS 2-2]

**Basic Concepts**

1. Which of the following is an identity / are identities?

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

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

[1986-CE-MATHS 2-4]

2. Which of the following is an identity / are identities?

(1)  $\frac{1}{x} - 1 = \frac{1-x}{x}$   
 (2)  $(ax+b)(x-b) = ax^2 - b^2$   
 (3)  $2x^2 - 3x + 1 = 0$

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

[1988-CE-MATHS 2-7]

3. Which of the following is / are an identity / identities?

(1)  $(x+2)(x-2) = x^2 - 4$   
 (2)  $(x+2)(x-2) = 0$   
 (3)  $(x+2)^3 = x^3 + 8$

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

[1994-CE-MATHS 2-7]

4. Which of the following is/are an identity/ identities?

(1)  $x^2 = 4$   
 (2)  $(2x+3)^2 = 4x^2 + 12x + 9$   
 (3)  $(x+1)^2 = x^2 + 1$

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

[1997-CE-MATHS 2-7]

5. Which of the following is an identity / are identities?

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

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

[2001-CE-MATHS 2-11]

6. Which of the following is an identity / are identities?

(1)  $x^2 - 4 = 0$   
 (2)  $x^2 - 4 = (x-2)^2$   
 (3)  $x^2 - 4 = (x+2)(x-2)$

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

[2006-CE-MATHS 2-6]

**Determination of Values**

7.  $-3x^2 - 3x \equiv -3(x+a)^2 + b$  is an identity in  $x$ . What are the values of the constants  $a$  and  $b$ ?

- A.  $a = 1, b = 0$   
 B.  $a = \frac{1}{2}, b = \frac{3}{4}$   
 C.  $a = \frac{1}{2}, b = -\frac{3}{4}$   
 D.  $a = -\frac{1}{2}, b = \frac{3}{4}$   
 E.  $a = -\frac{1}{2}, b = -\frac{3}{4}$

[1981-CE-MATHS 2-32]

8. Given the identity  $\frac{2}{x-1} + \frac{x+1}{(x-1)^2} + \frac{a}{(1-x)^2} \equiv \frac{bx-2}{(x-1)^2}$ , find the values of the constants  $a$  and  $b$ .

- A.  $a = 1, b = 3$   
 B.  $a = 3, b = 1$   
 C.  $a = 1, b = -3$   
 D.  $a = 3, b = -1$   
 E.  $a = -1, b = 3$

[1986-CE-MATHS 2-5]

9. If  $p(x^2 - x) + q(x^2 + x) \equiv 4x^2 + 8x$ , find  $p$  and  $q$ .

- A.  $p = 4, q = 8$
- B.  $p = -8, q = 4$
- C.  $p = -2, q = 6$
- D.  $p = 2, q = 6$
- E.  $p = 6, q = -2$

[1991-CE-MATHS 2-36]

10. If  $3x^2 + ax - 5 \equiv (bx - 1)(2 - x) - 3$ , then

- A.  $a = -5, b = -3$
- B.  $a = -5, b = 3$
- C.  $a = -3, b = -5$
- D.  $a = 5, b = -3$
- E.  $a = 3, b = 5$

[1993-CE-MATHS 2-5]

11. If  $3x^2 + 6x + 1 \equiv 3(x + b)^2 + c$ , then  $c =$

- A.  $-8$
- B.  $-2$
- C.  $0$
- D.  $\frac{1}{3}$
- E.  $1$

[1995-CE-MATHS 2-10]

12. If  $\frac{2}{x^2 - 1} \equiv \frac{a}{x+1} + \frac{b}{x-1}$ , find  $a$  and  $b$ .

- A.  $a = 2, b = 1$
- B.  $a = 1, b = 2$
- C.  $a = 1, b = 1$
- D.  $a = 1, b = -1$
- E.  $a = -1, b = 1$

[1996-CE-MATHS 2-8]

13. If  $(x + 3)^2 - (x + 1)(x - 3) \equiv P(x + 1) + Q$ , find  $P$  and  $Q$ .

- A.  $P = 2, Q = 4$
- B.  $P = 2, Q = 10$
- C.  $P = 4, Q = 2$
- D.  $P = 4, Q = 8$
- E.  $P = 8, Q = 4$

[1998-CE-MATHS 2-5]

14. If  $(3x - 1)(x - a) \equiv 3x^2 + bx - 2$ , then

- A.  $a = 2, b = -1$
- B.  $a = 2, b = -7$
- C.  $a = -2, b = 5$
- D.  $a = -2, b = -5$
- E.  $a = -2, b = -7$

[1999-CE-MATHS 2-6]

15. If  $3x^2 + ax + 7 \equiv 3(x - 2)^2 + b$ , then

- A.  $a = -12, b = -5$
- B.  $a = -12, b = 7$
- C.  $a = -4, b = 3$
- D.  $a = 0, b = -5$
- E.  $a = 0, b = 19$

[2000-CE-MATHS 2-10]

16. If  $(x + 1)^2 + P(x + 1) \equiv x^2 + Q$ , then

- A.  $P = -2, Q = -1$
- B.  $P = -2, Q = 1$
- C.  $P = 2, Q = -1$
- D.  $P = 2, Q = 1$

[2002-CE-MATHS 2-6]

17. If  $(2x + 3)(x - a) \equiv 2x^2 + b(x + 1)$ , then

- A.  $a = -3$  and  $b = 9$
- B.  $a = \frac{-1}{3}$  and  $b = \frac{11}{3}$
- C.  $a = \frac{1}{3}$  and  $b = \frac{7}{3}$
- D.  $a = 3$  and  $b = -9$

[2003-CE-MATHS 2-6]

18. If  $a(2x - x^2) + b(2x^2 - x) \equiv -5x^2 + 4x$ , then  $a =$

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

[2004-CE-MATHS 2-10]

19. If  $x^2 + 2ax + 8 \equiv (x + a)^2 + b$ , then  $b =$

- A.  $8$
- B.  $a^2 + 8$
- C.  $a^2 - 8$
- D.  $8 - a^2$

[2005-CE-MATHS 2-10]

20. If  $a$  and  $b$  are constants such that  $a(x^2 - x) + b(x^2 + x) \equiv 2x^2 + 4x$ , then  $a =$

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

[2009-CE-MATHS 2-5]

21. If  $h$  and  $k$  are constants such that  $hx + (x - 3)^2 \equiv x^2 + 10x + k$ , then

- A.  $h = 10$  and  $k = -9$
- B.  $h = 10$  and  $k = 9$
- C.  $h = 16$  and  $k = -9$
- D.  $h = 16$  and  $k = 9$

[2010-CE-MATHS 2-5]

**HKDSE Problems**

22. Let  $p$  and  $q$  be constants. If  $x^2 + p(x+5) + q \equiv (x-2)(x+5)$ , then  $q =$

- A. -25.
- B. -10.
- C. 3.
- D. 5.

[SP-DSE-MATHS 2-4]

23. Let  $m$  and  $n$  be constants. If  $m(x-3)^2 + n(x+1)^2 \equiv x^2 - 38x + 41$ , then  $m =$

- A. -4.
- B. -1.
- C. 3.
- D. 5.

[PP-DSE-MATHS 2-4]

24. If  $p$  and  $q$  are constants such that  $x^2 + p \equiv (x+2)(x+q) + 10$ , then  $p =$

- A. -4.
- B. -2.
- C. 6.
- D. 10.

[2012-DSE-MATHS 2-3]

25. If  $a$ ,  $b$  and  $c$  are non-zero constants such that  $x(x+3a) + a \equiv x^2 + 2(bx+c)$ , then  $a:b:c =$

- A. 2 : 3 : 1 .
- B. 2 : 3 : 4 .
- C. 3 : 2 : 6 .
- D. 6 : 4 : 3 .

[2013-DSE-MATHS 2-8]

26. If  $p$  and  $q$  are constants such that  $px(x-1) + x^2 \equiv qx(x-2) + 4x$ , then  $p =$

- A. 1.
- B. 2.
- C. 3.
- D. 4.

[2014-DSE-MATHS 2-3]

27. If  $m$  and  $n$  are constants such that  $x^2 + mx + n \equiv (x+4)(x-m) + 6$ , then  $n =$

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

[2015-DSE-MATHS 2-5]

28. If  $m$  and  $n$  are constants such that  $4x^2 + m(x+1) + 28 = mx(x+3) + n(x-4)$ , then  $n =$

- A. -8.
- B. -7.
- C. 4.
- D. 16.

[2017-DSE-MATHS 2-8]

29. If  $\alpha$  and  $\beta$  are constants such that  $(x-8)(x+\alpha) - 6 \equiv (x-9)^2 + \beta$ , then  $\beta =$

- A. -26
- B. -10
- C. -7
- D. -6

[2019-DSE-MATHS 2-4]

30. If  $h$  and  $k$  are constants such that  $(x+h)(x+6) \equiv (x+4)^2 + k$ , then  $k =$

- A. -28
- B. -16
- C. -4
- D. 2

[2020-DSE-MATHS 2-7]

**Expansion**

1.  $(x - 1)^2 - (x + 1)^2 =$

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

[1977-CE-MATHS 2-2]

2.  $(x - \frac{1}{x})^2 - (x + \frac{1}{x})^2 =$

- A. -4 .  
 B. 0 .  
 C. 4 .  
 D.  $-\frac{2}{x^2}$  .  
 E.  $2(x^2 + \frac{1}{x^2})$  .

[SP-CE-MATHS 2-5]

3.  $(-x + x^2)^2 =$

- A.  $-x^2 + x^4$  .  
 B.  $x^2 + x^4$  .  
 C.  $-x^2 + 2x^3 + x^4$  .  
 D.  $-x^2 + 2x^3 - x^4$  .  
 E.  $x^2 - 2x^3 + x^4$  .

[SP-CE-MATHS A2-33]

4. Simplify  $(x^2 - \sqrt{3}x + 1)(x^2 + \sqrt{3}x + 1)$  .

- A.  $x^4 + 1$   
 B.  $x^4 - x^2 + 1$   
 C.  $x^4 + x^2 + 1$   
 D.  $x^4 - 3x^2 - 2\sqrt{3}x - 1$   
 E.  $x^4 + \sqrt{3}x^3 - 2\sqrt{3}x^2 + \sqrt{3}x + 1$

[1993-CE-MATHS 2-3]

5.  $(2x^2 - 3x + 1)(2 - 3x) =$

- A.  $6x^3 - 5x^2 - 3x + 2$  .  
 B.  $6x^3 - 13x^2 - 9x - 2$  .  
 C.  $-6x^3 + 13x^2 - 9x + 2$  .  
 D.  $-6x^3 - 5x^2 - 3x + 2$  .  
 E.  $-6x^3 - 5x^2 - 9x + 2$  .

[2001-CE-MATHS 2-2]

6.  $(2x - 3)(x^2 + 3x - 2) =$

- A.  $2x^3 + 3x^2 + 5x - 6$  .  
 B.  $2x^3 + 3x^2 + 5x + 6$  .  
 C.  $2x^3 + 3x^2 - 13x - 6$  .  
 D.  $2x^3 + 3x^2 - 13x + 6$  .

[2005-CE-MATHS 2-4]

7.  $(x + x)(y + y + y) =$

- A.  $6xy$  .  
 B.  $2x + 3y$  .  
 C.  $x^2y^3$  .  
 D.  $6x^2y^3$  .

[2007-CE-MATHS 2-3]

8.  $(2x^2 - 3x + 1) - 2(x^2 + 2x - 1) =$

- A.  $x - 1$  .  
 B.  $-7x + 3$  .  
 C.  $4x^2 + x - 1$  .  
 D.  $4x^2 - 7x + 3$  .

[2008-CE-MATHS 2-4]

9.  $(3x - 5)(2x^2 + 5x - 3) =$

- A.  $6x^3 + 5x^2 - 34x + 15$  .  
 B.  $6x^3 - 5x^2 + 34x + 15$  .  
 C.  $6x^3 + 25x^2 + 16x + 15$  .  
 D.  $6x^3 - 25x^2 - 16x + 15$  .

[2009-CE-MATHS 2-4]

10.  $(x - 2y)(x + 2y - 2) =$

- A.  $x^2 + 2y^2 + 2x + 4y$  .  
 B.  $x^2 + 2y^2 - 2x + 4y$  .  
 C.  $x^2 - 4y^2 + 2x + 4y$  .  
 D.  $x^2 - 4y^2 - 2x + 4y$  .

[2011-CE-MATHS 2-3]

**Factorisation**

11. If  $x^2 + 5x - 6 = (x - \alpha)(x - \beta)$  and  $\alpha > \beta$ , then  $\alpha =$

- A. -1 .  
 B. 1 .  
 C. 2 .  
 D. 3 .  
 E. 6 .

[SP-CE-MATHS 2-4]

12. Which one of the following is a factor of  $8a^3 + b^3$  ?

- A.  $2a - b$   
 B.  $4a^2 + b^2$   
 C.  $4a^2 - 2ab + b^2$   
 D.  $4a^2 + 2ab + b^2$   
 E.  $4a^2 + 4ab + b^2$

[SP-CE-MATHS A2-34]

13.  $a^2 - b^2 - c^2 + 2bc =$

- A.  $(a - b - c)^2$ .  
 B.  $(a + b - c)^2$ .  
 C.  $(a + b + c)(a - b - c)$ .  
 D.  $(a + b - c)(a - b + c)$ .  
 E.  $(a + b - c)(a - b + c)$ .

[1978-CE-MATHS 2-15]

14.  $2ab - a^2 - b^2 =$

- A.  $(a - b)^2$ .  
 B.  $(-a - b)^2$ .  
 C.  $(-a + b)^2$ .  
 D.  $-(a + b)^2$ .  
 E.  $-(a - b)^2$ .

[1980-CE-MATHS 2-1]

15. Which of the following expressions **cannot** be factorized?

- A.  $x^3 - 125$   
 B.  $4x^2 - 9y^2$   
 C.  $x^3 + 125$   
 D.  $4x^2 + 9y^2$   
 E.  $3x^2 + 6xy + 3y^2$

[1988-CE-MATHS 2-33]

16.  $a^3 + 8a^{-3} =$

- A.  $(a - \frac{2}{a})(a^2 + 2 + \frac{4}{a^2})$ .  
 B.  $(a - \frac{1}{2a})(a^2 + 1 + \frac{1}{4a^2})$ .  
 C.  $(a + \frac{1}{2a})(a^2 - \frac{1}{2} + \frac{1}{4a^2})$ .  
 D.  $(a + \frac{2}{a})(a^2 - 4 + \frac{4}{a^2})$ .  
 E.  $(a + \frac{2}{a})(a^2 - 2 + \frac{4}{a^2})$ .

[1990-CE-MATHS 2-7]

17. Which of the following is a factor of  $4(a + b)^2 - 9(a - b)^2$ ?

- A.  $5b - a$   
 B.  $5a + b$   
 C.  $-a - b$   
 D.  $13b - 5a$   
 E.  $13a - 5b$

[1992-CE-MATHS 2-6]

18. In factorizing the expression  $a^4 + a^2b^2 + b^4$ , we find that

- A.  $(a^2 - b^2)$  is a factor.  
 B.  $(a^2 + b^2)$  is a factor.  
 C.  $(a^2 - ab - b^2)$  is a factor.  
 D.  $(a^2 - ab + b^2)$  is a factor.  
 E. it cannot be factorized.

[1993-CE-MATHS 2-39]

19. Factorize  $a^2 - 2ab + b^2 - a + b$ .

- A.  $(a - b)(a - b - 1)$   
 B.  $(a - b)(a - b + 1)$   
 C.  $(a - b)(a + b - 1)$   
 D.  $(a + b)(a - b + 1)$   
 E.  $(a - b - 1)^2$

[1994-CE-MATHS 2-35]

20. Factorize  $2a^{n+1} - 7a^n - 30a^{n-1}$ .

- A.  $(a^n - 6)(2a + 5)$   
 B.  $a^n(a + 6)(2a - 5)$   
 C.  $a^n(a - 6)(2a + 5)$   
 D.  $a^{n-1}(a + 6)(2a - 5)$   
 E.  $a^{n-1}(a - 6)(2a + 5)$

[1995-CE-MATHS 2-36]

21. Which of the following expressions has/have  $b - c$  as a factor?

- (1)  $ab - ac$   
 (2)  $a(b - c) - b + c$   
 (3)  $a(b - c) - b - c$

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

[1996-CE-MATHS 2-6]

22.  $9 - a^2 - b^2 + 2ab =$

- A.  $(3 - a - b)(3 - a + b)$ .  
 B.  $(3 - a - b)(3 + a - b)$ .  
 C.  $(3 - a - b)(3 + a + b)$ .  
 D.  $(3 - a + b)(3 + a - b)$ .  
 E.  $(3 - a + b)(3 + a + b)$ .

[1997-CE-MATHS 2-4]

23. Factorize  $x^2 - y^2 + 2x + 1$ .

- A.  $(x + y + 1)(x + y - 1)$   
 B.  $(x + y + 1)(x - y + 1)$   
 C.  $(x + y - 1)(x - y + 1)$   
 D.  $(x + y - 1)(x - y - 1)$   
 E.  $(x - y + 1)(x - y - 1)$

[1998-CE-MATHS 2-8]

24.  $x^2 - y^2 - x + y =$

- A.  $(x-y)(x-y-1)$ .  
 B.  $(x-y)(x+y-1)$ .  
 C.  $(x-y)(x+y+1)$ .  
 D.  $(x+y)(x-y-1)$ .  
 E.  $(x+y)(x-y+1)$ .

[1999-CE-MATHS 2-2]

25. Factorize  $x^2 - x - xy + y$ .

- A.  $(x-y)(x-1)$ .  
 B.  $(x-y)(x+1)$ .  
 C.  $(x+y)(x-1)$ .  
 D.  $(1-x)(x+y)$ .  
 E.  $(1+x)(y-x)$ .

[2000-CE-MATHS 2-2]

26. Which of the following is a factor of  $2(a-b)^2 - a^2 + b^2$ ?

- A.  $a - 3b$   
 B.  $a - 2b$   
 C.  $a + b$   
 D.  $a + 3b$   
 E.  $3a - b$

[2001-CE-MATHS 2-22]

27.  $x^3 - \frac{27}{x^3} =$

- A.  $(x + \frac{3}{x})(x^2 - 6 + \frac{9}{x^2})$ .  
 B.  $(x + \frac{3}{x})(x^2 - 3 + \frac{9}{x^2})$ .  
 C.  $(x - \frac{3}{x})(x^2 + 6 + \frac{9}{x^2})$ .  
 D.  $(x - \frac{3}{x})(x^2 + 3 + \frac{9}{x^2})$ .

[2003-CE-MATHS 2-39]

28.  $pr + qr - ps - qs =$

- A.  $(p+q)(r-s)$ .  
 B.  $(p+q)(s-r)$ .  
 C.  $(p-q)(r-s)$ .  
 D.  $(p-q)(s-r)$ .

[2006-CE-MATHS 2-4]

29. Which of the following must have  $x + y$  as a factor?

- (1)  $x^2 - y^2$   
 (2)  $x^2 + y^2$   
 (3)  $x(x+y) - x - y$

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

[2008-CE-MATHS 2-5]

30.  $ab + ac - a^2 - bc =$

- A.  $(a-b)(b+c)$ .  
 B.  $(a-b)(c-a)$ .  
 C.  $(a-c)(b+c)$ .  
 D.  $(a+b)(c-a)$ .

[2010-CE-MATHS 2-4]

**HKDSE Problems**

31.  $a^2 - b^2 + 2b - 1 =$

- A.  $(a-b-1)(a+b-1)$ .  
 B.  $(a-b-1)(a+b+1)$ .  
 C.  $(a-b+1)(a+b-1)$ .  
 D.  $(a-b+1)(a-b-1)$ .

[SP-DSE-MATHS 2-3]

32.  $x^3(2x+x) =$

- A.  $3x^4$ .  
 B.  $2x^5$ .  
 C.  $3x^5$ .  
 D.  $2x^6$ .

[PP-DSE-MATHS 2-1]

33.  $p^2 - q^2 - p - q =$

- A.  $(p+q)(p-q-1)$ .  
 B.  $(p+q)(p+q-1)$ .  
 C.  $(p-q)(p-q+1)$ .  
 D.  $(p-q)(p+q-1)$ .

[PP-DSE-MATHS 2-3]

34.  $(4x+y)^2 - (4x-y)^2 =$

- A. 0.  
 B.  $2y^2$ .  
 C.  $8xy$ .  
 D.  $16xy$ .

[2012-DSE-MATHS 2-2]

35.  $h\ell - k\ell + hm - km - hn + kn =$

- A.  $(h+k)(\ell-m+n)$ .  
 B.  $(h+k)(\ell+m-n)$ .  
 C.  $(h-k)(\ell-m+n)$ .  
 D.  $(h-k)(\ell+m-n)$ .

[2013-DSE-MATHS 2-3]

36.  $u^2 - v^2 - 5u + 5v =$

- A.  $(u-v)(u+v-5)$ .  
 B.  $(u-v)(u+v+5)$ .  
 C.  $(u+v)(u-v-5)$ .  
 D.  $(u+v)(u-v+5)$ .

[2014-DSE-MATHS 2-2]

37.  $(x + 1)(x^2 + x + 1) =$

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

[2015-DSE-MATHS 2-1]

38.  $16 - (2x - 3y)^2 =$

- A.  $(4 - 2x - 3y)(4 + 2x + 3y)$ .
- B.  $(4 - 2x - 3y)(4 + 2x - 3y)$ .
- C.  $(4 - 2x + 3y)(4 + 2x + 3y)$ .
- D.  $(4 - 2x + 3y)(4 + 2x - 3y)$ .

[2016-DSE-MATHS 2-3]

39.  $3m^2 - 5mn + 2n^2 + m - n =$

- A.  $(m - n)(3m - 2n + 1)$ .
- B.  $(m - n)(3m + 2n + 1)$ .
- C.  $(m + n)(3m - 2n - 1)$ .
- D.  $(m + n)(3m + 2n - 1)$ .

[2017-DSE-MATHS 2-1]

40.  $h^2 - 6h - 4k^2 - 12k =$

- A.  $(h - 2k)(h - 2k + 6)$
- B.  $(h - 2k)(h + 2k + 6)$
- C.  $(h + 2k)(h - 2k - 6)$
- D.  $(h + 2k)(h + 2k - 6)$

[2018-DSE-MATHS 2-3]

41.  $(a - b)(a^2 + ab - b^2) =$

- A.  $(a - b)^3$
- B.  $a^3 - b^3$
- C.  $a^3 - 2ab^2 + b^3$
- D.  $a^3 - 2a^2b + 2ab^2 + b^3$

[2019-DSE-MATHS 2-1]

42.  $(3a + 2b)(4a - 5b) - a(6a + 4b) =$

- A.  $(3a + 2b)(2a - 5b)$
- B.  $(3a + 2b)(6a - 5b)$
- C.  $(3a - 2b)(2a + 5b)$
- D.  $(3a - 2b)(6a + 5b)$

[2020-DSE-MATHS 2-4]

**Remainder Theorem**

1. What is the remainder if  $ax^{25} - x^2 + x + 7$  is divided by  $x + 1$ ?

- A.  $a + 5$
- B.  $a + 7$
- C.  $5 - a$
- D.  $7 - a$
- E.  $9 - a$

[SP-CE-MATHS A2-39]

2. When  $f(x)$  is divided by  $(2x + 1)$ , the remainder is

- A.  $f(2)$ .
- B.  $f(1)$ .
- C.  $f(-1)$ .
- D.  $f(\frac{1}{2})$ .
- E.  $f(-\frac{1}{2})$ .

[1983-CE-MATHS 2-6]

3. When the expression  $x^2 + px + q$  is divided by  $x + 1$ , the remainder is 4. Find the value of  $2p - 2q + 1$ .

- A.  $-3$
- B.  $-5$
- C.  $-7$
- D.  $-9$
- E. It cannot be determined.

[1987-CE-MATHS 2-8]

4. Let  $f(x) = ax^2 + bx + c$ . When  $f(x)$  is divided by  $(x - 1)$ , the remainder is 10. When  $f(x)$  is divided by  $(x + 1)$ , the remainder is 6. Find the value of  $b$ .

- A.  $-4$
- B.  $-2$
- C.  $2$
- D.  $4$
- E. It cannot be found.

[1988-CE-MATHS 2-5]

5. Let  $f(x) = ax^2 - 5$  and  $g(x) = 27x^3 - 18x + 4$ . If both expressions leave the same remainder when divided by  $3x + 1$ , then  $a =$

- A.  $-74$ .
- B.  $0$ .
- C.  $36$ .
- D.  $76$ .
- E.  $126$ .

[1989-CE-MATHS 2-6]

6.  $P(x)$  is a polynomial. When  $P(x)$  is divided by  $(5x - 2)$ , the remainder is  $R$ . When  $P(x)$  is divided by  $(2 - 5x)$ , then the remainder is

- A.  $R$ .
- B.  $-R$ .
- C.  $\frac{2}{5}R$ .
- D.  $\frac{2}{5}$ .
- E.  $-\frac{2}{5}$ .

[1994-CE-MATHS 2-37]

7. Find the remainder when  $x^3 - x^2 + 1$  is divided by  $2x + 1$ .

- A.  $-11$
- B.  $\frac{5}{8}$
- C.  $\frac{7}{8}$
- D.  $\frac{9}{8}$
- E.  $5$ .

[1996-CE-MATHS 2-5]

8. Let  $f(x) = (2x - 1)(x + 1) + 2x + 1$ . Find the remainder when  $f(x)$  is divided by  $2x + 1$ .

- A.  $-1$
- B.  $-\frac{1}{2}$
- C.  $0$
- D.  $1$
- E.  $2$

[2001-CE-MATHS 2-3]

9. The remainder when  $x^2 + ax + b$  is divided by  $x + 2$  is  $-4$ . The remainder when  $ax^2 + bx + 1$  is divided by  $x - 2$  is 9. The value of  $a$  is

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

[2002-CE-MATHS 2-38]

10. Let  $k$  be a positive integer. When  $x^{2k+1} + kx + k$  is divided by  $x + 1$ , the remainder is

- A.  $-1$ .
- B.  $1$ .
- C.  $2k - 1$ .
- D.  $2k + 1$ .

[2005-CE-MATHS 2-40]

11. Let  $k$  be a non-zero constant. When  $x^3 + kx^2 + 2kx + 3k$  is divided by  $x + k$ , the remainder is  $k$ . Find  $k$ .

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

[2006-CE-MATHS 2-40]

12. When  $x^{2009} + x^{2008} + x^{2007} + \dots + x$  is divided by  $x + 1$ , the remainder is

- A. -1.
- B. 0.
- C. 1.
- D. 2009.

[2009-CE-MATHS 2-41]

### Factor Theorem

13. If  $f(x) = ax^2 + bx + c$  and  $f\left(\frac{-3}{5}\right) = 0$ , then which of the following is a factor of  $ax^2 + bx + c$ ?

- A.  $x + 3$
- B.  $3x + 5$
- C.  $3x - 5$
- D.  $5x + 3$
- E.  $5x - 3$

[1978-CE-MATHS A2-49]

14. If  $x + 2$  is a factor of  $x^2 + ax + b$ , then  $2a - b + 3 =$

- A. -7.
- B. -1.
- C. 0.
- D. 1.
- E. 7.

[1984-CE-MATHS 2-4]

15. Let  $a$  and  $b$  be constants. If  $3x^3 - ax^2 + 5x - 3b$  is divisible by  $x + 3$ , then  $3a + b = ?$

- A. -32
- B. -22
- C. 22
- D. 32
- E. it cannot be determined

[1985-CE-MATHS 2-7]

16. Let  $F(x) = 2x^3 + 3x^2 - 11x - 6$ . Given that  $F(2) = 0$  and  $F(-3) = 0$ , then  $F(x)$  can be factorized as

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

[1986-CE-MATHS 2-34]

17. Which one of the following is a factor of  $x^3 - 4x^2 + x + 6$ ?

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

[1991-CE-MATHS 2-3]

18. If a polynomial  $f(x)$  is divisible by  $x - 1$ , then  $f(x - 1)$  is divisible by

- A.  $x - 2$ .
- B.  $x + 2$ .
- C.  $x - 1$ .
- D.  $x + 1$ .
- E.  $x$ .

[1992-CE-MATHS 2-41]

19. If  $f(x) = x^{99} + 99x + k$  is divisible by  $x + 1$ , then  $k =$

- A. -100.
- B. -98.
- C. 98.
- D. 100.
- E. 198.

[1995-CE-MATHS 2-3]

20. If  $2x^2 + x + m$  is divisible by  $x - 2$ , then it is also divisible by

- A.  $x + 3$ .
- B.  $2x - 3$ .
- C.  $2x + 3$ .
- D.  $2x - 5$ .
- E.  $2x + 5$ .

[1997-CE-MATHS 2-6]

21. Let  $f(x) = 2x^3 - x^2 - 7x + 6$ . It is known that  $f(-2) = 0$  and  $f(1) = 0$ .  $f(x)$  can be factorized as

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

[1998-CE-MATHS 2-6]

22. Let  $f(x) = x^3 - 2x^2 - 5x + 6$ . It is known that  $f(1) = 0$ .  $f(x)$  can be factorized as

- A.  $(x-1)^2(x+6)$ .
- B.  $(x-1)(x+1)(x+6)$ .
- C.  $(x-1)(x-2)(x+3)$ .
- D.  $(x-1)(x+2)(x-3)$ .
- E.  $(x+1)(x-2)(x-3)$ .

[2000-CE-MATHS 2-9]

23. Let  $f(x) = x^3 + 2x^2 + ax + b$ . If  $f(x)$  is divisible by  $x+1$  and  $x-2$ ,  $f(x)$  can be factorized as

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

[2001-CE-MATHS 2-48]

24. If  $f(x) = x^3 - 7x + 6$  is divisible by  $x^2 - 3x + k$ , then  $k =$

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

[2004-CE-MATHS 2-40]

25. Let  $f(x)$  be a polynomial. If  $f(x)$  is divisible by  $x-1$ , which of the following must be a factor of  $f(2x+1)$ ?

- A.  $x$
- B.  $x-3$
- C.  $2x-1$
- D.  $2x+1$

[2007-CE-MATHS 2-40]

26. Let  $k$  be a constant. If  $x^3 + 5x^2 + 3kx - k$  is divisible by  $x-1$ , find the value of  $k$ .

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

[2010-CE-MATHS 2-41]

### Miscellaneous

27. Let  $f(x) = 3x^3 - 4x + k$ . If  $f(x)$  is divisible by  $x-k$ , find the remainder when  $f(x)$  is divided by  $x+k$ .

- A.  $2k$
- B.  $k$
- C.  $0$
- D.  $-k$
- E.  $-k-1$

[1990-CE-MATHS 2-34]

28. The expression  $x^2 - 2x + k$  is divisible by  $(x+1)$ . Find the remainder when it is divided by  $(x+3)$ .

- A.  $1$
- B.  $4$
- C.  $12$
- D.  $16$
- E.  $18$

[1993-CE-MATHS 2-9]

29. It is given that  $F(x) = x^3 - 4x^2 + ax + b$ .  $F(x)$  is divisible by  $x-1$ . When it is divided by  $x+1$ , the remainder is 12. Find  $a$  and  $b$ .

- A.  $a = 5, b = 10$
- B.  $a = 1, b = 2$
- C.  $a = -3, b = 6$
- D.  $a = -4, b = 7$
- E.  $a = -7, b = 10$

[1999-CE-MATHS 2-38]

30. Let  $f(x) = x^3 + 2x^2 + k$ , where  $k$  is a constant. If  $f(-1) = 0$ , find the remainder when  $f(x)$  is divided by  $x-1$ .

- A.  $-1$
- B.  $0$
- C.  $2$
- D.  $6$

[2003-CE-MATHS 2-2]

31. Let  $f(x) = 2x^2 + ax - 3$ , where  $a$  is a constant. If  $f(x)$  is divisible by  $2x+1$ , find the remainder when  $f(x)$  is divided by  $x-a$ .

- A.  $-52$
- B.  $22$
- C.  $46$
- D.  $72$

[2011-CE-MATHS 2-40]

**HKDSE Problems**

32. Let  $f(x) = x^3 + 2x^2 - 7x + 3$ . When  $f(x)$  is divided by  $x + 2$ , the remainder is

- A. 3.
- B. 5.
- C. 17.
- D. 33.

[SP-DSE-MATHS 2-5]

33. Let  $f(x) = x^4 - x^3 + x^2 - x + 1$ . When  $f(x)$  is divided by  $x + 2$ , the remainder is

- A. -2.
- B. 0.
- C. 11.
- D. 31.

[PP-DSE-MATHS 2-5]

34. If  $k$  is a constant such that  $x^3 + 4x^2 + kx - 12$  is divisible by  $x + 3$ , then  $k =$

- A. -25.
- B. -1.
- C. 1.
- D. 17.

[2012-DSE-MATHS 2-4]

35. Let  $f(x) = x^{13} - 2x + k$ , where  $k$  is a constant. If  $f(x)$  is divisible by  $x + 1$ , find the remainder when  $f(x)$  is divided by  $x - 1$ .

- A. 0
- B. -1
- C. 2
- D. -2

[2013-DSE-MATHS 2-9]

36. Let  $f(x) = 4x^3 + kx + 3$ , where  $k$  is a constant. If  $f(x)$  is divisible by  $2x + 1$ , find the remainder when  $f(x)$  is divided by  $x + 1$ .

- A. -7
- B. -6
- C. 0
- D. 5

[2016-DSE-MATHS 2-6]

37. Let  $p(x) = 2x^2 - 11x + c$ , where  $c$  is a constant. If  $p(x)$  is divisible by  $x - 7$ , find the remainder when  $p(x)$  is divided by  $2x + 1$ .

- A. -26
- B. -15
- C. 15
- D. 26

[2017-DSE-MATHS 2-7]

38. Let  $g(x) = x^6 + ax^7 + b$ , where  $a$  and  $b$  are constants. If  $g(x)$  is divisible by  $x - 1$ , find the remainder when  $g(x)$  is divided by  $x + 1$ .

- A. 0
- B.  $2a$
- C.  $-2a$
- D.  $-2a + 2$

[2018-DSE-MATHS 2-8]

39. Let  $k$  be a constant such that  $2x^4 + kx^3 - 4x - 16$  is divisible by  $2x + k$ . Find  $k$ .

- A. -2
- B. 2
- C. 4
- D. 8

[2019-DSE-MATHS 2-9]

40. Let  $g(x) = ax^5 + 4ax^2 - 24$ , where  $a$  is a constant. If  $x + 2$  is a factor of  $g(x)$ , then  $g(2) =$

- A. -96
- B. 0
- C. 3
- D. 48

[2020-DSE-MATHS 2-6]

## H.C.F. &amp; L.C.M.

1.  $8abc^3$  is the H.C.F. of  $24ab^2c^3$  and

- A.  $12a^2bc^4$ .
- B.  $30a^2bc^3$ .
- C.  $32a^2bc^5$ .
- D.  $40ab^2c^3$ .
- E.  $48a^3bc^5$ .

[1978-CE-MATHS 2-11]

2. The H.C.F. and L.C.M. of three expressions are  $a^2b^2c$  and  $a^4b^6c^4$  respectively. Two of the expressions are  $a^2b^3c^4$  and  $a^3b^2c^2$ . The third expression is

- A.  $a^3b^3c$ .
- B.  $a^3b^6c^4$ .
- C.  $a^4b^2c$ .
- D.  $a^4b^6c$ .
- E.  $a^4b^6c^2$ .

[1981-CE-MATHS 2-33]

3. The L.C.M. of  $12a^2b$  and  $18ab^3c$  is

- A.  $6ab$ .
- B.  $6a^2b^3c$ .
- C.  $36ab$ .
- D.  $36a^2b^3c$ .
- E.  $216a^3b^4c$ .

[1986-CE-MATHS 2-31]

4.  $8abc^3$  is the H.C.F. of  $24ab^2c^3$  and

- A.  $12a^2bc^4$ .
- B.  $30a^2bc^3$ .
- C.  $32a^2bc^5$ .
- D.  $40ab^2c^3$ .
- E.  $48a^3bc^5$ .

[1988-CE-MATHS 2-40]

5. The H.C.F. and L.C.M. of three expressions are  $xyz^2$  and  $x^3y^5z^4$  respectively. If two of the expressions are  $x^2y^3z^3$  and  $x^3yz^2$ , find the third expression.

- A.  $x^2y^3z^3$
- B.  $x^2y^5z^3$
- C.  $xy^3z^3$
- D.  $xy^5z^4$
- E.  $xy^3z^4$

[1990-CE-MATHS 2-37]

6. The L.C.M. of  $x$ ,  $2x^2$ ,  $3x^3$ ,  $4x^4$ ,  $5x^5$  is

- A.  $x$ .
- B.  $5x^5$ .
- C.  $60x^5$ .
- D.  $120x^5$ .
- E.  $120x^{15}$ .

[1991-CE-MATHS 2-6]

7. The L.C.M. of  $P$  and  $Q$  is  $12ab^3c^2$ . The L.C.M. of  $X$ ,  $Y$  and  $Z$  is  $30a^2b^3c$ . What is the L.C.M. of  $P$ ,  $Q$ ,  $X$ ,  $Y$  and  $Z$ ?

- A.  $360a^3b^6c^3$
- B.  $60a^2b^3c^2$
- C.  $60ab^3c^2$
- D.  $6a^2b^3c$
- E.  $6ab^3c$

[1992-CE-MATHS 2-40]

8. Find the H.C.F. and L.C.M. of  $ab^2c$  and  $abc^3$ .

H.C.F.	L.C.M.
A. $a$	$a^2b^3c^4$
B. $abc$	$ab^2c^3$
C. $abc$	$a^2b^3c^4$
D. $ab^2c^3$	$abc$
E. $a^2b^3c^4$	$abc$

[1993-CE-MATHS 2-11]

9. Find the L.C.M. of  $4x^2yz$  and  $6xy^3$ .

- A.  $2xy$
- B.  $12x^2y^3$
- C.  $12x^2y^3z$
- D.  $24x^2y^3z$
- E.  $24x^3y^4z$

[1996-CE-MATHS 2-3]

10. The L.C.M. of  $210xy^2$  and  $30x^2yz$  is

- A.  $30xy$ .
- B.  $70xyz$ .
- C.  $210x^2y^2z$ .
- D.  $630x^3y^3z$ .

[2003-CE-MATHS 2-38]

## H.C.F. &amp; L.C.M. with Factorisation

11. The H.C.F. of  $a^3 - 1$  and  $a^4 - 1$  is

- A. 1.
- B.  $a + 1$ .
- C.  $a - 1$ .
- D.  $a^2 + 1$ .
- E.  $a^2 - 1$ .

[1983-CE-MATHS 2-5]

12. The L.C.M. of  $2a^2 - 2b^2$  and  $a^3 - 2a^2b + ab^2$  is

- A.  $a - b$ .
- B.  $a(a - b)(a + b)$ .
- C.  $2a(a - b)(a + b)$ .
- D.  $2a(a - b)^2(a + b)$ .
- E.  $2a(a - b)^3(a + b)$ .

[1985-CE-MATHS 2-6]

13. Find the H.C.F. of  $(2x - 1)(x^2 - 6x + 9)$  and  $(x^2 - 3x)(4x^2 - 1)$ .

- A.  $(x - 3)$
- B.  $(2x - 1)$
- C.  $(x - 3)(2x - 1)$
- D.  $x(x - 3)^2(2x - 1)(2x + 1)$
- E. there is no H.C.F.

[1987-CE-MATHS 2-40]

14. The L.C.M. of  $(x - 1)^2$ ,  $x^2 - 1$  and  $x^3 - 1$  is

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

[1994-CE-MATHS 2-3]

15. The L.C.M. of  $x^3 - x$  and  $x^4 - 1$  is

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

[1995-CE-MATHS 2-6]

16. The L.C.M. of  $2 - b$ ,  $4 - b^2$  and  $8 - b^3$  is

- A.  $(2 - b)(2 + b)(4 - 4b + b^2)$ .
- B.  $(2 - b)(2 + b)(4 + 4b + b^2)$ .
- C.  $(2 - b)(2 + b)(4 - 2b + b^2)$ .
- D.  $(2 - b)(2 + b)(4 + 2b + b^2)$ .

[2004-CE-MATHS 2-38]

17. The H.C.F. of  $x^2(x + 1)(x + 2)$  and  $x(x + 1)^3$  is

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

[2005-CE-MATHS 2-38]

### HKDSE Problems

18. The H.C.F. and the L.C.M. of three expressions are  $ab^2$  and  $4a^4b^5c^6$  respectively. If the first expression and the second expression are  $2a^2b^4c$  and  $4a^4b^2c^6$  respectively, then the third expression is

- A.  $ab^2$ .
- B.  $ab^5$ .
- C.  $2ab^2c$ .
- D.  $2ab^5c$ .

[2012-DSE-MATHS 2-31]

19. The L.C.M. of  $a^2 + 4a + 4$ ,  $a^2 - 4$  and  $a^3 + 8$  is

- A.  $a + 2$ .
- B.  $(a - 2)(a + 2)^2(a^2 - 2a + 4)$ .
- C.  $(a - 2)(a + 2)^2(a^2 + 2a + 4)$ .
- D.  $(a - 2)(a + 2)^4(a^2 - 2a + 4)$ .

[2013-DSE-MATHS 2-31]

20. The H.C.F. of  $3x^4y^2z$ ,  $4xy^5z$  and  $6x^2y^3$  is

- A.  $xy^2$ .
- B.  $xy^2z$ .
- C.  $12x^4y^5z$ .
- D.  $12x^7y^9z^2$ .

[2014-DSE-MATHS 2-31]

21. The L.C.M. of  $9a^2b$ ,  $12a^4b^3$  and  $15a^6$  is

- A.  $3a^2$ .
- B.  $3a^2b$ .
- C.  $180a^6b^3$ .
- D.  $180a^{12}b^4$ .

[2016-DSE-MATHS 2-31]

**Algebraic Fractions**

1.  $\frac{2}{x^2 - 1} - \frac{1}{x + 1} + \frac{1}{1 - x} =$

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

[1977-CE-MATHS 2-1]

2.  $\frac{a + b}{a - b} - \frac{a - b}{a + b} =$

- A.  $4ab$ .
- B.  $\frac{2ab}{a^2 - b^2}$ .
- C.  $\frac{4ab}{a^2 - b^2}$ .
- D.  $\frac{2b^2}{a^2 - b^2}$ .
- E.  $\frac{2(a^2 + b^2)}{a^2 - b^2}$ .

[1979-CE-MATHS 2-24]

3.  $\frac{x^{-2} - y^{-2}}{x^{-1} - y^{-1}} =$

- A.  $x^{-1} + y^{-1}$ .
- B.  $x^{-1} - y^{-1}$ .
- C.  $x^{-3} - y^{-3}$ .
- D.  $\frac{1}{x - y}$ .
- E.  $\frac{1}{x + y}$ .

[1980-CE-MATHS 2-5]

4.  $\frac{1}{x+1} + \frac{1}{x-1} + \frac{x+\frac{1}{x}}{x-\frac{1}{x}} =$

- A.  $\frac{1}{x+1}$ .
- B.  $\frac{1}{x-1}$ .
- C.  $\frac{x+1}{x-1}$ .
- D.  $\frac{1}{(x+1)(x-1)}$ .
- E.  $\frac{x^2 + 4x + 1}{(x+1)(x-1)}$ .

[1981-CE-MATHS 2-2]

5.  $\left( \frac{\frac{x}{y} + \frac{y}{x} + 2}{\frac{x}{y} - \frac{y}{x}} \right)^{-1} =$

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

[1981-CE-MATHS 2-5]

6.  $\frac{2a}{a^2 - 4b^2} + \frac{1}{2b - a} =$

- A.  $\frac{1}{a+2b}$ .
- B.  $\frac{2a-1}{(a+2b)(a-2b)}$ .
- C.  $\frac{2a+1}{(a+2b)(a-2b)}$ .
- D.  $\frac{3a+2b}{(a+2b)(a-2b)}$ .
- E.  $\frac{a+2b}{(a+2b)(a-2b)}$ .

[1982-CE-MATHS 2-1]

7.  $(a^{-2} - 3b^{-1})^{-1} =$

- A.  $\frac{3a^2 + b}{a^2b}$ .
- B.  $\frac{3a^2 - b}{a^2b}$ .
- C.  $\frac{3b - a^2}{a^2b}$ .
- D.  $\frac{a^2b}{b - 3a^2}$ .
- E.  $\frac{3a^2b}{3b - a^2}$ .

[1982-CE-MATHS 2-3]

8.  $\frac{6}{x^2 - 9} - \frac{5}{x^2 + x - 6} =$

- A.  $\frac{1}{(x-2)(x-3)}$ .
- B.  $\frac{1}{(x+2)(x+3)}$ .
- C.  $\frac{1}{(x+2)(x-3)}$ .
- D.  $\frac{1}{(x-2)(x+3)}$ .
- E.  $\frac{x-27}{(x-2)(x+3)(x-3)}$ .

[1983-CE-MATHS 2-1]

9.  $\frac{\frac{1}{a^3} + \frac{1}{b^3}}{\frac{1}{a} + \frac{1}{b}} =$

- A.  $\frac{1}{a^2} + \frac{1}{b^2}$ .
- B.  $\frac{1}{a^2} + \frac{1}{ab} + \frac{1}{b^2}$ .
- C.  $\frac{1}{a^2} - \frac{1}{ab} + \frac{1}{b^2}$ .
- D.  $a^2 - ab + b^2$ .
- E.  $a^2 + ab + b^2$ .

[1983-CE-MATHS 2-2]

10.  $\frac{4}{(x-2)(x+1)} - \frac{3}{x^2-1} =$

- A.  $\frac{1}{(x-1)^2(x+1)}$ .
- B.  $\frac{x+2}{(x-2)(x+1)(x-1)}$ .
- C.  $\frac{x+10}{(x-2)(x+1)(x-1)}$ .
- D.  $\frac{x-10}{(x-2)(x+1)(x-1)}$ .
- E.  $\frac{x^2-3x-10}{(x-2)(x+1)(x-1)^2}$ .

[1984-CE-MATHS 2-1]

11.  $\frac{2}{1+x} - \frac{1}{1-x} - \frac{4x}{x^2-1} =$

- A.  $\frac{1}{1-x}$ .
- B.  $\frac{1}{x-1}$ .
- C.  $\frac{1-7x}{x^2-1}$ .
- D.  $\frac{1-7x}{1-x^2}$ .
- E.  $\frac{3x+1}{1-x^2}$ .

[1985-CE-MATHS 2-1]

12.  $\frac{\frac{b}{a} - \frac{a}{b}}{\frac{1}{a} - \frac{1}{b}} =$

- A.  $a+b$ .
- B.  $a-b$ .
- C.  $-a+b$ .
- D.  $-a-b$ .
- E.  $\frac{1}{a} + \frac{1}{b}$ .

[1985-CE-MATHS 2-2]

13.  $(x+y)^{-1}(x^{-2}-y^{-2}) =$

- A.  $\frac{1}{x^3} - \frac{1}{y^3}$ .
- B.  $\frac{1}{x^2y} - \frac{1}{xy^2}$ .
- C.  $\frac{1}{xy^2} - \frac{1}{x^2y}$ .
- D.  $\frac{1}{x^2} - \frac{1}{y^2}$ .
- E.  $\frac{1}{x^2y} + \frac{1}{xy^2}$ .

[1985-CE-MATHS 2-4]

14.  $\frac{\frac{x^2}{3} - 3y^2}{\frac{3}{2}(x-3y)} =$

- A.  $\frac{1}{2}(x-3y)$ .
- B.  $\frac{2}{9}(x-3y)$ .
- C.  $2(x+3y)$ .
- D.  $\frac{1}{2}(x+3y)$ .
- E.  $\frac{2}{9}(x+3y)$ .

[1986-CE-MATHS 2-2]

15.  $\left(\sqrt{\frac{x}{y}} + \sqrt{\frac{y}{x}}\right)^2 =$

- A.  $\frac{(x+y)^2}{xy}$ .
- B.  $\frac{x^2+y^2}{xy}$ .
- C.  $\frac{x+y+2}{xy}$ .
- D.  $\frac{x+y}{xy}$ .
- E.  $1$ .

[1986-CE-MATHS 2-30]

16.  $\left(\frac{x+1}{x}\right)^2 - \left(\frac{x-1}{x}\right)^2 =$

- A.  $\frac{2}{x}$ .
- B.  $\frac{4}{x}$ .
- C.  $\frac{2}{x^2}$ .
- D.  $\frac{4}{x^2}$ .
- E.  $0$ .

[1987-CE-MATHS 2-1]

17.  $\frac{x^2 - 2x}{x^3 - 25x} \times \frac{x^2 - 2x - 15}{x^2 + x - 6} =$

- A.  $\frac{1}{x - 5}$ .
- B.  $\frac{x - 2}{(x + 2)(x - 5)}$ .
- C.  $\frac{1}{x + 5}$ .
- D.  $\frac{1}{x}$ .
- E.  $\frac{x - 3}{(x + 3)(x - 5)}$ .

[1988-CE-MATHS 2-3]

18.  $\frac{1}{2x - x^2} + \frac{1}{x^2 + x - 6} =$

- A.  $\frac{3}{x(2-x)(x+3)}$ .
- B.  $\frac{-3}{x(x+2)(x-3)}$ .
- C.  $\frac{6-x}{x(2-x)(x+2)(x-3)}$ .
- D.  $\frac{x-6}{x(2-x)(x+2)(x-3)}$ .
- E.  $\frac{2x+3}{x(2-x)(x+3)}$ .

[1988-CE-MATHS 2-6]

19.  $\frac{27x^3 - 8}{3x - 2} =$

- A.  $(3x - 2)^2$ .
- B.  $9x^2 - 4$ .
- C.  $9x^2 + 4$ .
- D.  $9x^2 - 6x + 4$ .
- E.  $9x^2 + 6x + 4$ .

[1989-CE-MATHS 2-2]

20.  $\frac{(1-x^2)^n + (1-x)^n}{(1-x)^{2n}} =$

- A.  $\frac{(1+x)^n + 1}{(1-x)^n}$ .
- B.  $\frac{2-x-x^2}{(1-x)^2}$ .
- C.  $\frac{(1+x)^n + 1}{(1-x)^2}$ .
- D.  $\frac{(1-x)^n + 1}{(1+x)^n}$ .
- E.  $\frac{2-x^n-x^{2n}}{1-x^{2n}}$ .

[1989-CE-MATHS 2-41]

21.  $\frac{1 - \frac{x-y}{x+y}}{1 - \frac{x+y}{x-y}} =$

- A.  $\frac{y-x}{x+y}$ .
- B.  $\frac{x-y}{x+y}$ .
- C.  $\frac{x}{y}$ .
- D.  $x+y$ .
- E.  $x-y$ .

[1990-CE-MATHS 2-2]

22.  $\frac{1}{1-x^2} - \frac{1}{(1+x)^2} =$

- A.  $\frac{2}{(1-x^2)(1+x^2)}$ .
- B.  $\frac{2x^2}{(1-x^2)(1+x^2)}$ .
- C.  $\frac{2x^2}{(1-x^2)(1+x)^2}$ .
- D.  $\frac{2}{(1-x)(1+x)^2}$ .
- E.  $\frac{2x}{(1-x)(1+x)^2}$ .

[1991-CE-MATHS 2-2]

23.  $\frac{\frac{1}{x^3} + \frac{1}{y^3}}{\frac{1}{x} + \frac{1}{y}} =$

- A.  $\frac{1}{x^2} + \frac{1}{y^2}$ .
- B.  $\frac{1}{x^2} + \frac{1}{xy} + \frac{1}{y^2}$ .
- C.  $\frac{1}{x^2} + \frac{2}{xy} + \frac{1}{y^2}$ .
- D.  $\frac{1}{x^2} - \frac{2}{xy} + \frac{1}{y^2}$ .
- E.  $\frac{1}{x^2} - \frac{1}{xy} + \frac{1}{y^2}$ .

[1991-CE-MATHS 2-5]

24.  $\frac{1}{a} + \frac{1}{b} =$

- A.  $\frac{a+b}{ab}$ .
- B.  $\frac{ab}{a+b}$ .
- C.  $\frac{1}{ab}$ .
- D.  $\frac{2}{a+b}$ .
- E.  $\frac{1}{a+b}$ .

[1992-CE-MATHS 2-1]

25.  $\frac{\frac{2}{x} - \frac{1}{y}}{\frac{4y}{x} - \frac{x}{y}} =$

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

[1994-CE-MATHS 2-36]

26. Simplify  $\frac{\frac{y}{x} - 1)(1 - \frac{x}{y})}{\frac{x}{y} - \frac{y}{x}}$ .

- A.  $\frac{x - y}{x + y}$ .  
 B.  $-\frac{x - y}{x + y}$ .  
 C.  $\frac{x + y}{x - y}$ .  
 D.  $-\frac{x + y}{x - y}$ .  
 E.  $-1$ .

[1995-CE-MATHS 2-37]

27. Simplify  $\frac{1}{x-1} + \frac{1}{x+1} + \frac{3x-1}{1-x^2}$ .

- A.  $\frac{1}{1-x}$ .  
 B.  $\frac{1}{1+x}$ .  
 C.  $-\frac{1}{1+x}$ .  
 D.  $\frac{3x+1}{1-x^2}$ .  
 E.  $\frac{1-5x}{1-x^2}$ .

[1996-CE-MATHS 2-36]

28. Simplify  $\frac{4}{x^2 - 4} - \frac{3}{x^2 - x - 2}$ .

- A.  $\frac{1}{(x+1)(x+2)}$ .  
 B.  $\frac{1}{(x+1)(x-2)}$ .  
 C.  $\frac{1}{(x-1)(x-2)}$ .  
 D.  $\frac{x+10}{(x+1)(x-2)(x+2)}$ .  
 E.  $\frac{x-10}{(x-1)(x-2)(x+2)}$ .

[1997-CE-MATHS 2-28]

29.  $\frac{2}{x^2 - 1} - \frac{3}{x^2 - x - 2} =$

- A.  $\frac{-1}{(x-1)(x-2)}$ .  
 B.  $\frac{-1}{(x+1)(x-2)}$ .  
 C.  $\frac{-1}{(x+1)(x+2)}$ .  
 D.  $\frac{-1}{(x-1)(x+1)(x-2)}$ .  
 E.  $\frac{-x-7}{(x-1)(x+1)(x-2)}$ .

[1998-CE-MATHS 2-39]

30.  $\frac{2}{x^2 - 1} - \frac{x-1}{x^2 - 2x - 3} =$

- A.  $\frac{-x^2 + 2x + 5}{(x-1)(x+1)(x+3)}$ .  
 B.  $\frac{-x^2 + 2x + 7}{(x-1)(x+1)(x+3)}$ .  
 C.  $\frac{-x^2 - 5}{(x-3)(x-1)(x+1)}$ .  
 D.  $\frac{x^2 - 5}{(x-3)(x-1)(x+1)}$ .  
 E.  $\frac{-x^2 + 4x - 7}{(x-3)(x-1)(x+1)}$ .

[1999-CE-MATHS 2-40]

31. Simplify  $\frac{a}{a+b} + \frac{b}{b-a} + \frac{2ab}{a^2 - b^2}$ .

- A.  $\frac{a+b}{a-b}$ .  
 B.  $-\frac{a-b}{a+b}$ .  
 C.  $\frac{-a^2 + b^2 + 4ab}{a^2 - b^2}$ .  
 D.  $\frac{a^2 + b^2}{a^2 - b^2}$ .  
 E. 1.

[2000-CE-MATHS 2-37]

32.  $\frac{1-x}{x^2 + 4x - 5} + \frac{x-1}{x+1} =$

- A.  $\frac{x^2 + 3x - 6}{(x+1)(x+5)}$ .  
 B.  $\frac{x^2 + 5x - 4}{(x+1)(x+5)}$ .  
 C.  $\frac{(x+4)(x-1)}{(x+1)(x+5)}$ .  
 D.  $\frac{(x-1)(x-4)}{(x+1)(x-5)}$ .  
 E.  $\frac{(x-1)(x-6)}{(x+1)(x-5)}$ .

[2001-CE-MATHS 2-47]

33.  $1 - \frac{2x}{x - \frac{1}{x}} =$

- A.  $\frac{x - 3}{x - 1}$ .
- B.  $\frac{x^2 - 3}{x^2 - 1}$ .
- C.  $\frac{x^2 + 1}{x^2 - 1}$ .
- D.  $-\frac{x^2 + 1}{x^2 - 1}$ .

[2002-CE-MATHS 2-37]

34.  $\frac{10}{x^2 + x - 6} - \frac{2}{x - 2} =$

- A.  $\frac{2}{x + 3}$ .
- B.  $\frac{-2}{x + 3}$ .
- C.  $\frac{13 - 2x}{(x + 3)(x - 2)}$ .
- D.  $\frac{16 - 2x}{(x + 3)(x - 2)}$ .

[2003-CE-MATHS 2-37]

35.  $\frac{\frac{3}{x} - \frac{2}{y}}{\frac{4x}{y} - \frac{9y}{x}} =$

- A.  $\frac{1}{2x - 3y}$ .
- B.  $\frac{1}{2x + 3y}$ .
- C.  $\frac{-1}{2x - 3y}$ .
- D.  $\frac{-1}{2x + 3y}$ .

[2004-CE-MATHS 2-37]

36.  $\frac{1}{x + 1} - \frac{1}{x - 1} =$

- A.  $\frac{2}{1 - x^2}$ .
- B.  $\frac{2}{x^2 - 1}$ .
- C.  $\frac{2x}{1 - x^2}$ .
- D.  $\frac{2x}{x^2 - 1}$ .

[2006-CE-MATHS 2-3]

37.  $\frac{1}{n + 3} - \frac{1}{3 - n} =$

- A.  $\frac{6}{9 - n^2}$ .
- B.  $\frac{6}{n^2 - 9}$ .
- C.  $\frac{2n}{9 - n^2}$ .
- D.  $\frac{2n}{n^2 - 9}$ .

[2007-CE-MATHS 2-2]

38.  $\frac{-k}{1 - k} - \frac{1}{k - 1} =$

- A. 1.
- B.  $\frac{k + 1}{k - 1}$ .
- C.  $\frac{k + 1}{1 - k}$ .
- D.  $\frac{k^2 + 1}{k^2 - 1}$ .

[2008-CE-MATHS 2-3]

39.  $\frac{1}{a - 2} - \frac{2}{1 - a} =$

- A.  $\frac{3}{(a - 1)(a - 2)}$ .
- B.  $\frac{a - 3}{(a - 1)(a - 2)}$ .
- C.  $\frac{3a - 1}{(a - 1)(a - 2)}$ .
- D.  $\frac{3a - 5}{(a - 1)(a - 2)}$ .

[2009-CE-MATHS 2-3]

40.  $\frac{1}{2x - 3} + \frac{1}{2x + 3} =$

- A.  $\frac{6}{2x^2 - 3}$ .
- B.  $\frac{4x}{2x^2 - 3}$ .
- C.  $\frac{6}{4x^2 - 9}$ .
- D.  $\frac{4x}{4x^2 - 9}$ .

[2010-CE-MATHS 2-3]

**HKDSE Problems**

41.  $\frac{1}{2-x} + \frac{x-1}{(x-2)^2} =$

- A.  $\frac{-3}{(2-x)^2}$ .
- B.  $\frac{1}{(2-x)^2}$ .
- C.  $\frac{-2x+3}{(2-x)^2}$ .
- D.  $\frac{2x-3}{(2-x)^2}$ .

[SP-DSE-MATHS 2-31]

42.  $\frac{1}{x^2 - 2x + 1} - \frac{1}{x^2 + x - 2} =$

- A.  $\frac{1}{(x-1)(x+2)}$ .
- B.  $\frac{1}{(x-1)^2(x+2)}$ .
- C.  $\frac{3}{(x-1)^2(x+2)}$ .
- D.  $\frac{2x+1}{(x-1)^2(x+2)}$ .

[2015-DSE-MATHS 2-31]

43.  $\frac{1}{3x+7} - \frac{1}{3x-7} =$

- A.  $\frac{14}{49-9x^2}$
- B.  $\frac{14}{9x^2-49}$
- C.  $\frac{6x}{49-9x^2}$
- D.  $\frac{6x}{9x^2-49}$

[2018-DSE-MATHS 2-4]

44.  $\frac{5}{4k+3} - \frac{2}{4k-3} =$

- A.  $\frac{12k-21}{16k^2-9}$
- B.  $\frac{12k+9}{16k^2-9}$
- C.  $\frac{14k-21}{16k^2-9}$
- D.  $\frac{14k+9}{16k^2-9}$

[2020-DSE-MATHS 2-3]