

$$1.1. \quad \frac{\sqrt{2x-3}}{x-2}$$

1.1.1. Non real when

$$2x-3 < 0 \quad \checkmark$$

$$2x < 3$$

$$\underline{x < \frac{3}{2} \quad \checkmark} \quad \textcircled{2}$$

1.1.2. Undefined when

$$x-2=0$$

$$\underline{x = 2 \quad \checkmark} \quad \textcircled{1}$$

1.2.  $2x-3$  must be a perfect square

$$\therefore \underline{x = 6 \quad \checkmark} \quad \textcircled{1}$$

$$2(6) - 3 = 9$$

2.1.

$$100x = 356, 5656 \dots$$

$$x = 3, 5656 \dots$$

$$99x = 353 \quad \checkmark$$

$$\underline{x = \frac{353}{99} \quad \checkmark} \quad \textcircled{3}$$

ans only 0/3

2.2.

$$\begin{array}{ccc} 5^3 & 157 & 6^3 \\ \sqrt[3]{5^3} & \sqrt[3]{157} & \sqrt[3]{6^3} \quad \checkmark \\ 5 & 3/157 & 6 \quad \checkmark \end{array}$$

$$\therefore \underline{5 \text{ and } 6} \quad \textcircled{2}$$

$$5^3 = 125 \quad 6^3 = 216$$

ans only 0/2

$$\begin{aligned}
 3.1. \quad & 3x^{\frac{1}{2}}(4x^{-\frac{1}{2}} + 2x^{\frac{3}{2}}) \\
 &= 12x^0 + 6x^2 \\
 &= \underline{12 + 6x^2} \quad \textcircled{2}
 \end{aligned}$$

$$\begin{aligned}
 3.2. \quad & 4(3x-5y)^2 - (4x-y)(x+y) + (2x+y)(2x-y) \\
 &= 4(3x-5y)(3x-5y) - (4x-y)(x+y) + (2x+y)(2x-y) \\
 &= 4(9x^2 - 30xy + 25y^2) - (4x^2 + 3xy - y^2) + (4x^2 - y^2) \\
 &= 36x^2 - 120xy + 100y^2 - 4x^2 - 3xy + y^2 + 4x^2 - y^2 \\
 &= \underline{36x^2 - 123xy + 100y^2} \quad \textcircled{4}
 \end{aligned}$$

$$\begin{aligned}
 4.1. \quad & 2p^2q^2 + 2pq - 8p^3q^3 \\
 &= 2pq(pq + 1 - 4p^2q^2) \quad \checkmark \\
 &= 2pq(-4p^2q^2 + pq + 1) \\
 &= 2pq[-(4p^2q^2 - pq - 1)] \\
 &= \underline{-2pq(4p^2q^2 - pq - 1)} \quad \textcircled{1}
 \end{aligned}$$

$$\begin{aligned}
 4.2. \quad & 3x^2 - 15x - 18 \\
 &= 3(x^2 - 5x - 6) \quad \checkmark \\
 &= \underline{3(x-6)(x+1)} \quad \textcircled{2}
 \end{aligned}$$

$$\begin{aligned}
 4.3. \quad & 8a^3 - 1 \\
 &= \underline{(2a-1)(4a^2 + 2a + 1)} \quad \textcircled{2}
 \end{aligned}$$

$$\begin{aligned}
 4.4. \quad & (x^2+1)^2 - 7(x^2+1) + 10 \\
 & k = x^2 + 1 \\
 & \therefore k^2 - 7k + 10 \\
 &= (k-5)(k-2) \\
 &= (x^2+1-5)(x^2+1-2) \\
 &= (x^2-4)(x^2-1) \quad \checkmark \\
 &= \underline{(x-2)(x+2)(x-1)(x+1)} \quad \textcircled{3}
 \end{aligned}$$

$$\begin{aligned}
 5.1. \quad & \frac{2}{3x} - \frac{3}{2x} + 1 \\
 &= \frac{2 \cdot 2 - 3 \cdot 3 + 1 \cdot 6x}{6x} \\
 &= \frac{4 - 9 + 6x}{6x} \\
 &= \frac{6x - 5}{6x} \quad \text{③} \\
 &= \frac{6x}{6x} - \frac{5}{6x} \\
 &= 1 - \frac{5}{6x}
 \end{aligned}$$

$$\begin{aligned}
 5.2. \quad & \frac{x^2-4}{x} \times \frac{x}{2x^2+8} \div \frac{4x-2x^2}{x} \\
 &= \frac{(x-2)(x+2)}{x} \times \frac{x}{2(x^2+4)} \times \frac{x}{2x(2-x)} \\
 &= \frac{(x-2)(x+2)}{1} \times \frac{1}{2(x^2+4)} \times \frac{1}{-2(x-2)} \\
 &= \frac{(x+2)}{-4(x^2+4)} \quad \text{cf + sw. ar.} \quad \text{⑤}
 \end{aligned}$$

$$\begin{aligned}
 6.1. \quad & \frac{2^{1+n} \cdot 2^{3n-2}}{2^{4n+1}} \\
 &= \frac{2^{4n-1}}{2^{4n+1}} \\
 &= 2^{4n-1-(4n+1)} \\
 &= 2^{4n-1-4n-1} \\
 &= 2^{-2} \\
 &= \frac{1}{2^2} \\
 &= \frac{1}{4} \quad \text{②}
 \end{aligned}$$

$$\begin{aligned}
 6.2. \quad & \frac{12^{n+1} \cdot 9^{2n-1}}{36^n \cdot 8^{1-n}} \\
 &= \frac{(2^2 \cdot 3)^{n+1} \cdot (3^2)^{2n-1}}{(2^2 \cdot 3^2)^n \cdot (2^3)^{1-n}} \quad \checkmark \text{pb} \\
 &= \frac{2^{2n+2} \cdot 3^{4n+2}}{2^{2n} \cdot 3^{2n} \cdot 2^{3-3n}} \quad \checkmark \text{remove ( )} \\
 &= \frac{2^{2n+2} \cdot 3^{5n-1}}{2^{-n+3} \cdot 3^{2n}} \\
 &= 2^{2n+2-(-n+3)} \cdot 3^{5n-1-(2n)} \\
 &= 2^{2n+2+n-3} \cdot 3^{5n-1-2n} \\
 &= 2^{3n-1} \cdot 3^{3n-1} \quad \checkmark \\
 &= 2^{3n} \cdot 2^{-1} \cdot 3^{3n} \cdot 3^{-1} \\
 &= 2^{3n} \cdot \frac{1}{2} \cdot 3^{3n} \cdot \frac{1}{3} \\
 &= \frac{1}{6} \cdot 2^{3n} \cdot 3^{3n}
 \end{aligned}$$

$$\begin{aligned}
 6.3. \quad & \frac{5 \cdot 2^x - 4 \cdot 2^{x-2}}{2^x - 2^{x-1}} \\
 &= \frac{5 \cdot 2^x - 4 \cdot 2^x \cdot 2^{-2}}{2^x - 2^x \cdot 2^{-1}} \\
 &= \frac{2^x (5 - 4 \cdot 2^{-2})}{2^x (1 - 2^{-1})} \\
 &= \frac{5 - 4 \cdot \frac{1}{2^2}}{1 - \frac{1}{2}} \\
 &= \frac{5 - 4 \cdot \frac{1}{4}}{1 - \frac{1}{2}} \\
 &= \frac{5 - 1}{\frac{1}{2}} \\
 &= \frac{4}{\frac{1}{2}} \\
 &= 4 \times \frac{2}{1} \\
 &= 8
 \end{aligned}$$

4

$$\begin{aligned}
 7.1.1. \quad & 2^x = \frac{1}{32} \\
 &= \frac{1}{2^5} \\
 &= 2^{-5} \\
 \therefore x &= -5 \\
 &\text{--- use logs } \frac{0}{2} \\
 &\text{ans only } \frac{0}{2}
 \end{aligned}$$

2

$$\begin{aligned}
 7.1.2. \quad & 3^{2x} - 7 \cdot 3^x - 18 = 0 \\
 & k = 3^x \\
 & k^2 - 7k - 18 = 0 \\
 & (k+2)(k-9) = 0 \\
 \therefore k &= -2 \text{ or } k=9 \\
 3^x &= -2 \quad \text{no soln} \\
 3^x &= 9 \\
 &= 3^2 \\
 x &= 2
 \end{aligned}$$

4

$$\begin{aligned}
 7.1.3 \quad & \frac{3x}{x-2} - \frac{x+1}{x+2} = \frac{2}{x^2-4} \\
 & \frac{3x}{x-2} - \frac{x+1}{x+2} = \frac{2}{(x-2)(x+2)}
 \end{aligned}$$

$$\begin{aligned}
 \text{LCD} &= (x-2)(x+2) \\
 (\therefore x &\neq \pm 2) \\
 x &\neq \pm 2
 \end{aligned}$$

$$\begin{aligned}
 3x(x+2) - (x+1)(x-2) &= 2 \\
 3x^2 + 6x - (x^2 - x - 2) &= 2 \\
 3x^2 + 6x - x^2 + x + 2 - 2 &= 0 \\
 2x^2 + 7x &= 0
 \end{aligned}$$

4

$$x(2x+7) = 0 \quad \checkmark$$

$$x = 0 \text{ or } -\frac{7}{2} \quad \checkmark$$

$$\underline{\hspace{10em}} \rightarrow \textcircled{5}$$

$$7.1.4. \quad ab^2 = 2abx - ax$$
$$= ax(2b-1) \quad \checkmark$$

$$\frac{ab^2}{a(2b-1)} = x \quad \checkmark$$

$$\frac{b^2}{2b-1} = x \quad \checkmark$$

$$\underline{\hspace{10em}} \rightarrow \textcircled{3}$$

$$7.1.5. \quad 5x+7 \geq 29-6x$$

$$11x \geq 22 \quad \checkmark$$

$$x \geq 2 \quad \checkmark$$

$$\underline{\hspace{10em}} \rightarrow \textcircled{2}$$

$$7.1.6. \quad -4 \leq \frac{2-3x}{2} < 8$$

$$\times 2: \quad -8 \leq 2-3x < 16 \quad \checkmark$$

$$-2: \quad -10 \leq -3x < 14 \quad \checkmark$$

$$\div -3: \quad \frac{10}{3} \geq x > -\frac{14}{3} \quad \checkmark$$

$$\underline{\hspace{10em}} \rightarrow \textcircled{3}$$

$$7.1.7. \quad x^{-2/3} = 10$$

$$(x^{-2/3})^{-3/2} = \pm (10)^{-3/2} \quad \checkmark$$

$$\underline{\hspace{10em}} \rightarrow \textcircled{3}$$

7.1.8.

$$6x^{5/2} - 5x^{5/4} - 6 = 0$$

$$k = x^{5/4}$$

$$6k^2 - 5k - 6 = 0 \quad \checkmark$$

$$(2k-3)(3k+2) = 0 \quad \checkmark$$

$$\therefore k = 3/2 \text{ or } -2/3 \quad \checkmark$$

$$\therefore x^{5/4} = \frac{3}{2} \quad x^{5/4} = -2/3$$

$$(x^{5/4})^{4/5} = (\frac{3}{2})^{4/5} \quad \text{no soln} \quad \checkmark$$

$$\underline{\hspace{10em}} \rightarrow \textcircled{5}$$

7.2.

$$a+3b = 5 \quad \times 1: \quad a+3b = 5$$

$$2a - b = 2 \quad \times 3: \quad 6a - 3b = 6 \quad \checkmark$$

$$\underline{\hspace{10em}} \rightarrow 7a = 11 \quad \checkmark$$

$$a = \frac{11}{7} \quad \checkmark$$

$$2(\frac{11}{7}) - b = 2$$

$$\underline{\hspace{10em}} \rightarrow \frac{8}{7} = b \quad \checkmark$$

~~OR~~

$$a+3b = 5 \quad \therefore a = 5-3b$$

$$2a - b = 2$$

$$\therefore 2(5-3b) - b = 2 \quad \checkmark$$

$$10 - 6b - b = 2$$

$$8 = 7b$$

$$\frac{8}{7} = b \quad \checkmark$$

$$\therefore a = 5 - 3(\frac{8}{7})$$

$$= \frac{11}{7} \quad \checkmark$$

$\textcircled{5}$

8.  $23; 19; 15; \dots$   
 $\checkmark$   $\checkmark$   
 $-4$   $-4$

8.1.  $11; 7$   $\checkmark$  (1)

8.2.  $a = 23$   $d = -4$

$$\begin{aligned} T_n &= a + (n-1)d \\ &= 23 + (n-1)(-4) \\ &= 23 + (-4n + 4) \\ &= 23 - 4n + 4 \\ &= -4n + 27 \end{aligned}$$

(2)

8.3.  $T_n = -4n + 27$   
 $T_{250} = -4(250) + 27 \checkmark$   
 $= -973 \checkmark$  (2)

8.4.  $T_n = -4n + 27$   
 $-100 = -4n + 27 \checkmark$   
 $4n = 127$   
 $n = \frac{127}{4} \checkmark$

$\checkmark$   
 No,  $-100$  is NOT  
 a term in the  
 pattern as  $n \notin \mathbb{N}$

ans only  $\frac{1}{3}$

9.  $3x-1; 2x+3; 2x-1$

$$2x+3 - (3x-1) = 2x-1 - (2x+3) \checkmark$$

$$2x+3 - 3x+1 = 2x-1 - 2x-3 \checkmark$$

$$-x+4 = -4 \checkmark$$

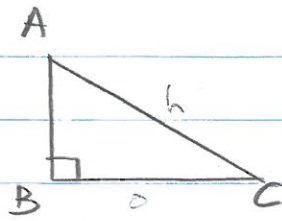
$$8 = x \checkmark$$

(3)

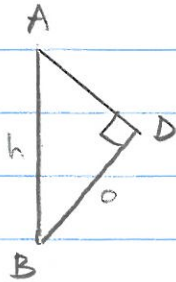
(6)

10.

$$\sin A = \frac{BC}{AC} \quad \checkmark$$



$$\sin A = \frac{BD}{AB} \quad \checkmark$$



(2)

$$11.1. \quad \hat{A} = 62,8^\circ \quad \hat{B} = 47,3^\circ$$

$$11.1.1. \quad \sin \frac{A}{3} = \sin \frac{62,8^\circ}{3} \\ = 0,36 \quad \checkmark \quad (1)$$

$$11.1.2. \quad \frac{\tan B}{2} = \frac{\tan 47,3^\circ}{2} \\ = 0,54 \quad \checkmark \quad (1)$$

$$11.1.3. \quad \cos A - 3 \\ = \cos 62,8^\circ - 3 \\ = -2,54 \quad \checkmark \quad (1)$$

$$11.1.4. \quad 3 \sin^2 B \\ = 3 \sin^2 47,3^\circ \\ = 3 \cdot (\sin 47,3^\circ)^2 \\ = 1,62 \quad \checkmark \quad (1)$$

$$11.2.1. \quad \sin \theta = 0,683 \\ \theta = \sin^{-1}(0,683) \\ = 43,08^\circ \quad \checkmark \quad (1)$$

$$11.2.2. \quad 4 \cos(3\theta - 47^\circ) = 2,88 \\ A = 3\theta - 47^\circ \\ 4 \cdot \cos A = 2,88 \\ \cos A = \frac{18}{25} \quad \checkmark \quad 0,72$$

(7)

$$A = \cos^{-1}\left(\frac{18}{25}\right)$$

$$30 - 47^\circ = \checkmark 43,94 \dots^\circ$$

$$3\theta = 90,94 \dots^\circ$$

$$\theta = 30,32^\circ \checkmark \rightarrow \text{D}$$

3

$$11.2.3. \quad 3 + 5 \tan \theta = \frac{7}{\sin 35^\circ}$$

$$= 12,204 \dots$$

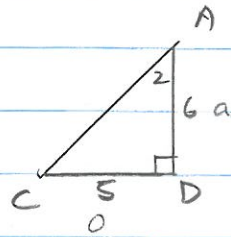
$$\therefore \tan \theta = \checkmark 1,84 \dots$$

$$\theta = \tan^{-1}(1,84 \dots^\circ)$$

$$= \checkmark 61,49^\circ \rightarrow \text{D}$$

3

12.1.

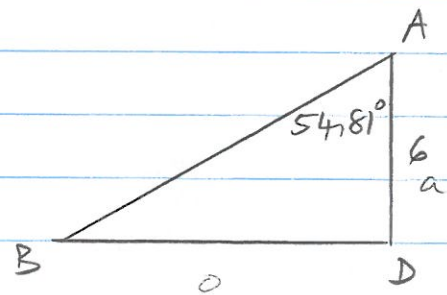


$$\tan \hat{A}_2 = \frac{5}{6} \checkmark$$

$$\hat{A}_2 = \tan^{-1}\left(\frac{5}{6}\right)$$

$$= 39,81^\circ \checkmark \rightarrow \text{D}$$

2



$$\tan 54,81^\circ = \frac{BD}{6} \checkmark$$

$$6 \cdot \tan 54,81^\circ = BD$$

$$8,50 \dots = BD \checkmark$$

$$\therefore BC = 8,50 \dots - 5$$

$$= 3,51 \rightarrow \text{D}$$

3

8