

# Fast Track to Success: Success Maths PMR (Form 3)

## Paper 2 Questions (Fully-Worked Solutions)

### Chapter 5: Indices

$$\begin{aligned}
 1 \quad & 4^{2x-1} = (2^2)(2^3) \\
 & 2^{2(2x-1)} = 2^{x+3} \\
 & 2(2x-1) = x+3 \\
 & 4x-2 = x+3 \\
 & 4x-x = 3+2 \\
 & 3x = 5 \\
 & x = \frac{5}{3}
 \end{aligned}$$

$$\begin{aligned}
 2 \quad & 2^3 \times 12^{\frac{1}{2}} \times 3^{\frac{5}{2}} \\
 & = 2^3 \times (2^2 \times 3)^{\frac{1}{2}} \times 3^{\frac{5}{2}} \\
 & = 2^3 \times 2 \times 3^{\frac{1}{2}} \times 3^{\frac{5}{2}} \\
 & = 2^{3+1} \times 3^{\frac{1}{2} + \frac{5}{2}} \\
 & = 2^4 \times 3^3 \\
 & = 16 \times 27 \\
 & = 432
 \end{aligned}$$

$$\begin{aligned}
 3 \quad & \frac{m^5 \times m^2}{m^{-3}} = \frac{m^{5+2}}{m^{-3}} \\
 & = m^{7-(-3)} \\
 & = m^{10}
 \end{aligned}$$

$$\begin{aligned}
 4 \quad (a) \quad & 6^{\frac{2}{3}} \div 6^{\frac{5}{3}} \\
 & = 6^{\frac{2}{3} - \frac{5}{3}} \\
 & = 6^{-1} \\
 & = \frac{1}{6} \\
 (b) \quad & (pq^5)^2 \times p^3 \\
 & = p^2q^{10} \times p^3 \\
 & = p^{2+3}q^{10} \\
 & = p^5q^{10}
 \end{aligned}$$

$$\begin{aligned}
 5 \quad (a) \quad & 3p - 18pq = 3p(1 - 6q) \\
 (b) \quad & 3e^2 - 108 = 3(e^2 - 36) \\
 & = 3(e^2 - 6^2) \\
 & = 3(e - 6)(e + 6)
 \end{aligned}$$

$$\begin{aligned}
 6 \quad & 20 - 5m^2 = 5(4 - m^2) \\
 & = 5(2^2 - m^2) \\
 & = 5(2 + m)(2 - m)
 \end{aligned}$$

$$\begin{aligned}
 7 \quad (a) \quad & 3x + 9 = 3(x + 3) \\
 (b) \quad & 32 - 2\gamma^2 \\
 & = 2(16 - \gamma^2) \\
 & = 2(4^2 - \gamma^2) \\
 & = 2(4 + \gamma)(4 - \gamma)
 \end{aligned}$$

$$\begin{aligned}
 8 \quad & \frac{5}{3m} - \frac{\left(1 - \frac{1}{3}p\right)}{mp} \\
 & = \frac{5p - 3\left(1 - \frac{1}{3}p\right)}{3mp} \\
 & = \frac{5p - 3 + p}{3mp} \\
 & = \frac{6p - 3}{3mp} \\
 & = \frac{3(2p - 1)}{3mp} \\
 & = \frac{2p - 1}{mp}
 \end{aligned}$$

### Chapter 6: Algebraic Expressions (III)

$$\begin{aligned}
 1 \quad & (2x - 3)^2 - (5x + 4) \\
 & = 4x^2 - 12x + 9 - 5x - 4 \\
 & = 4x^2 - 17x + 5
 \end{aligned}$$

$$\begin{aligned}
 2 \quad & (a - 2b)^2 + b(2a - 3b) \\
 & = (a^2 - 4ab + 4b^2) + (2ab - 3b^2) \\
 & = a^2 - 2ab + b^2 \\
 & = (a - b)(a - b) \\
 & = (a - b)^2
 \end{aligned}$$

$$\begin{aligned}
 3 \quad (a) \quad & p(7 + q) = 7p + pq \\
 (b) \quad & (5m - n)^2 = (5m - n)(5m - n) \\
 & = 25m^2 - 10mn + n^2
 \end{aligned}$$

$$\begin{aligned}
 4 \quad (a) \quad & 10ab - 5a^2 \\
 & = 5a(2b - a) \\
 (b) \quad & x^2 - 5(x + 2) - (5 - 7x) \\
 & = x^2 - 5x - 10 - 5 + 7x \\
 & = x^2 + 2x - 15 \\
 & = (x - 3)(x + 5)
 \end{aligned}$$

$$\begin{aligned}
 9 \quad & \frac{2}{5m} - \frac{m + 5}{15m^2} = \frac{6m - m - 5}{15m^2} \\
 & = \frac{5m - 5}{15m^2} \\
 & = \frac{5(m - 1)}{3 \cdot 5m^2} \\
 & = \frac{m - 1}{3m^2}
 \end{aligned}$$

$$\begin{aligned}
 10 \quad & \frac{1}{4m} - \frac{4 - v}{12mv} = \frac{3v - 4 + v}{12mv} \\
 & = \frac{4v - 4}{12mv} \\
 & = \frac{4(v - 1)}{3 \cdot 4mv} \\
 & = \frac{v - 1}{3mv}
 \end{aligned}$$

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### Chapter 7: Algebraic Formulae

$$1 \quad \frac{3(p-1)}{k} = 7$$

$$3(p-1) = 7k$$

$$p-1 = \frac{7k}{3}$$

$$p = \frac{7k}{3} + 1$$

$$p = \frac{7k+3}{3}$$

$$2 \quad \frac{6y-1}{y+2p} = 4$$

$$6y-1 = 4y+8p$$

$$2y = 8p+1$$

$$y = \frac{8p+1}{2}$$

$$y = \frac{1}{2}(8p+1)$$

$$3 \quad F = \frac{8n-nk}{3}$$

$$3F = n(8-k)$$

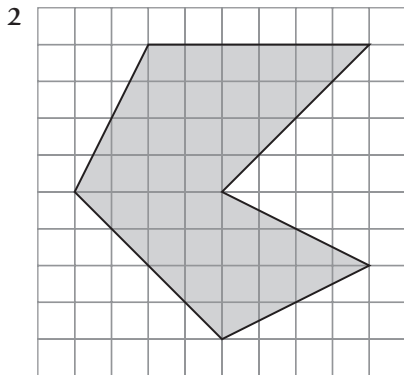
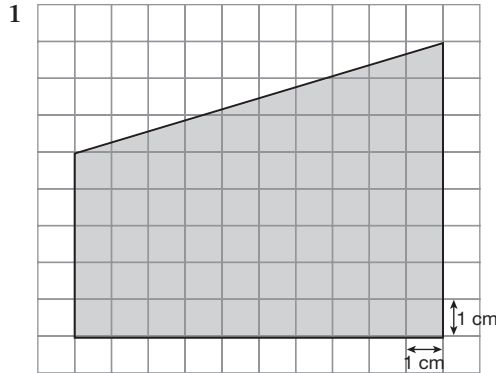
$$n = \frac{3F}{8-k}$$

$$4 \quad p^2 + 3 = q$$

$$p^2 = q - 3$$

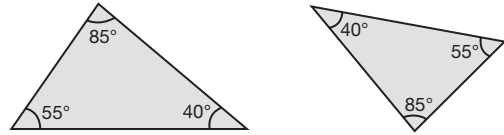
$$p = \sqrt{q-3}$$

### Chapter 9: Scale Drawings



### Chapter 10: Transformation (II)

2



- (a) The corresponding angle to  $\angle HFG$  is  $\angle RPQ$ .  
 (b) The corresponding side to  $FG$  is  $PQ$ .

### Chapter 12: Linear Inequalities

$$4 \quad 5 - 3x < 4 - x$$

$$-3x + x < 4 - 5$$

$$-2x < -1$$

$$x > \frac{1}{2}$$

5 (a)  $m - 5 < 2$   
 $m < 2 + 5$   
 $m < 7$

(b)  $7 + 4n \geq 10 - 2n$   
 $4n + 2n \geq 10 - 7$   
 $6n \geq 3$   
 $n \geq \frac{1}{2}$

6 (a)  $2 + x \leq 7$   
 $x \leq 5$

(b)  $\frac{x}{3} - 4 \leq 1$        $9 - x < 0$   
 $\therefore x > 9$   
 $\frac{x}{3} \leq 5$   
 $x \leq 15$



$$\therefore 9 < x \leq 15$$

$$\Rightarrow x = 10, 11, 12, 13, 14, 15$$

7  $\frac{x}{3} \leq 1$        $1 - 2x < 7$   
 $x \leq 3$        $-2x < 6$   
 $x > -3$

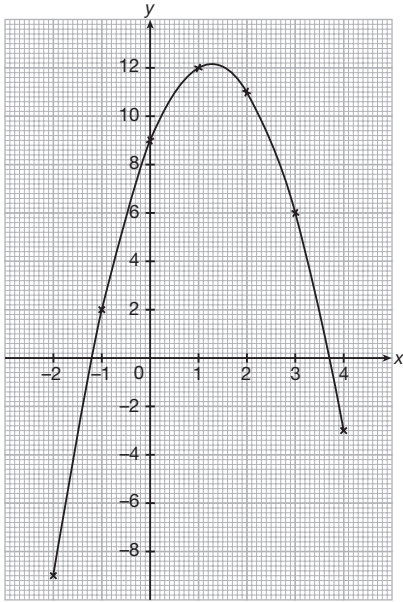


$$\therefore -3 < x \leq 3$$

$$\Rightarrow x = -2, -1, 0, 1, 2, 3$$

## Chapter 13: Graphs of Functions

7



## Chapter 15: Trigonometry

$$1 \quad \tan x^\circ = \frac{AB}{BM}$$

$$BC = \sqrt{17^2 - 8^2} \\ = 15 \text{ cm}$$

$$BM = \frac{15}{2}$$

$$\tan x^\circ = \frac{8}{\left(\frac{15}{2}\right)} = \frac{16}{15}$$

$$2 \quad \cos \angle PRQ = \frac{5}{7}$$

$$\therefore \cos x^\circ = -\frac{5}{7}$$

$$3 \quad \tan x^\circ = \frac{3}{4}$$

$$= \frac{BC}{AB}$$

$$= \frac{6}{AB}$$

$$\Rightarrow \frac{3}{4} = \frac{6}{AB}$$

$$AB = 8 \text{ cm} \\ AC = \sqrt{8^2 + 6^2} = 10 \text{ cm}$$

$$\sin y^\circ = \frac{8}{17} = \frac{DE}{AE}$$

$$AD = \sqrt{17^2 - 8^2} \\ = 15 \text{ cm}$$

$$\therefore CD = AD - AC \\ = 15 - 10 \\ = 5 \text{ cm}$$

$$4 \quad (a) \quad \tan x^\circ = \frac{3}{4} = \frac{AD}{BD} \\ \Rightarrow \frac{3}{4} = \frac{9}{BD} \\ BD = 12 \text{ cm}$$

$$\cos x^\circ = \frac{BD}{AB}$$

$$AB = \sqrt{12^2 + 9^2} = 15 \text{ cm}$$

$$\Rightarrow \cos x^\circ = \frac{12}{15} = \frac{4}{5}$$

$$(b) \quad \sin y^\circ = \frac{4}{7} = \frac{BD}{CD} \\ \Rightarrow \frac{4}{7} = \frac{12}{CD} \\ CD = 21 \text{ cm}$$

$$5 \quad (a) \quad \cos x^\circ = \frac{5}{13} = \frac{LM}{26}$$

$$\Rightarrow \frac{5}{13} = \frac{LM}{26}$$

$$LM = 10 \text{ cm}$$

$$KM = \sqrt{26^2 - 10^2} = 24 \text{ cm}$$

$$\therefore \tan x^\circ = \frac{KM}{LM} = \frac{24}{10} = \frac{12}{5}$$

$$(b) \quad \sin y^\circ = \frac{8}{17} = \frac{16}{PN}$$

$$\Rightarrow PN = 34 \text{ cm}$$

$$PM = \sqrt{34^2 - 16^2} \\ = 30 \text{ cm}$$

$$\Rightarrow KMP = KM + PM \\ = 24 + 30 \\ = 54 \text{ cm}$$