

# EXERCISE BOOK

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Topic: \_\_\_\_\_ Teacher: \_\_\_\_\_



# UKMT SMC 2014

1) C ✓

$$\frac{3}{4} \cdot \frac{4}{5} = 15 \quad 98 \times 102$$

2) B ✓

$$12x = 300 \quad = 48 \times 100$$

3) D ✓

$$6x = 150 \quad 3x = 75 \quad + 98 \times 7$$

4) A ✓

$$\begin{array}{r} 16 \\ \times 4 \\ \hline 64 \\ + 120 \\ \hline 480 \end{array} \quad 2100 - 2014 = 86 \quad 595 + 115 + 146$$

5) A ✗ C

$$\begin{array}{r} 12 \\ \times 4 \\ \hline 48 \\ + 38 \\ \hline 188 \end{array} \quad \begin{array}{r} 368 \\ \times 86 \\ \hline 25205 \\ + 10040 \\ \hline 31448 \end{array} = 4996$$

6) B ✓

$$\begin{array}{r} 12 \\ \times 3 \\ \hline 36 \\ + 12 \\ \hline 48 \end{array} \quad \begin{array}{r} 16 \\ + 12 \\ + 12 \\ \hline 40 \end{array} \quad \begin{array}{r} 1000 \\ - 2014 \\ = 798 \\ + 1000 \\ \hline 1798 \end{array} \quad \begin{array}{r} 365 \\ \hline 7 \end{array}$$

7) B ✓

$$\begin{array}{r} 57 \\ + 12 \\ \hline 69 \end{array} \quad \begin{array}{r} 12 \\ \times 6 \\ \hline 72 \\ + 6 \\ \hline 78 \end{array} \quad \begin{array}{r} 57 \\ \times 7 \\ \hline 399 \\ + 57 \\ \hline 456 \end{array} \quad \begin{array}{r} 052 \\ \hline 7 \end{array}$$

8) C ✓

$$\begin{array}{r} 16 \\ \times 6 \\ \hline 96 \\ + 16 \\ \hline 112 \\ + 12 \\ \hline 124 \\ + 12 \\ \hline 136 \end{array} \quad T = 1 \quad \begin{array}{r} 136 \\ \hline 4 \\ \hline 34 \\ + 1 \\ \hline 35 \\ \hline 1 \end{array} \quad \begin{array}{r} 52 \\ + 1 \\ \hline 53 \end{array}$$

9) D ✓

$$\begin{array}{r} 11111111 \\ \times 5 \\ \hline 55555555 \end{array} \quad 5 + 1 + 1 + 1 = 10 \quad 2014 = 1014 + 911 = 2000$$

10) C ✓

$$\begin{array}{r} 11111111 \\ \times 6 \\ \hline 66666666 \end{array} \quad \begin{array}{r} 66666666 \\ \hline 3 \\ \hline 18 \end{array} \quad 280 \quad \begin{array}{r} 560 \\ \hline 5 \end{array}$$

11) E

$$ab = 170 \quad 2^4 = 32 \times n \quad 840$$

12) D ✓

$$2(a+b) = 76 \quad = 64 \times 2 \quad \begin{array}{r} 712 \\ \hline 128 \end{array}$$

13) A ✓

$$a+b = 23 \quad \begin{array}{r} 128 \\ \hline 128 \end{array} \quad \begin{array}{r} 2311 \\ = 128 \times 2^4 \end{array}$$

14) E

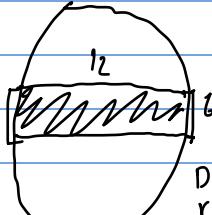
$$23b - b^2 = 120 \quad \begin{array}{r} 14 \\ 14 \\ \hline 1 \\ 1 \\ \hline 1 \end{array} \quad \begin{array}{r} 236 \\ = 256 \times 8 \end{array}$$

15) C ✓

$$b^2 - 23b + 120 = 0 \quad \begin{array}{r} 140 \\ 140 \\ \hline 1 \\ 1 \\ \hline 1 \end{array} \quad \begin{array}{r} 512 \\ = 512 \times 4 \end{array}$$

16) A

$$(b-15)(b-8) \quad \begin{array}{r} 140 \\ 140 \\ \hline 1 \\ 1 \\ \hline 1 \end{array} \quad \begin{array}{r} 1024 \\ = 1024 \times 2^2 \end{array}$$



$$\begin{array}{r} \sqrt{15^2 + 8^2} \\ = \sqrt{225 + 64} \\ = \sqrt{289} \\ = 17 \end{array} \quad \begin{array}{r} 130 \\ 260 \\ 770 \\ 1200 \\ \hline 2100 \end{array} \quad \begin{array}{r} 2200 \\ 2404 \\ 2100 \\ \hline 2404 \end{array}$$

$$\begin{array}{r} 1690 \\ 390 \\ \hline 2080 \end{array} \quad \begin{array}{r} 1690 \\ 2054 \\ \hline 2067 \end{array}$$

$$y = \sqrt{36 - x^2}$$

$$x^2 + y^2 = 36$$

$$x = 6\sqrt{1 - \frac{y^2}{36}}$$

$$\frac{3x + y}{3x - y} = -1$$

$$\frac{3x - y}{3x + y} = 1$$

$$\frac{3x + y}{3x - y} = ?$$

$$\frac{3x - y}{3x + y} = ?$$

$$3L = 2L + 1M$$

$$L = 1M$$

$$M = 2L$$

$$K = 4L$$

$$K = 3L$$

$$K = 2M$$

$$M = L + 1$$

$$K = 2L + 1M$$

$$L = 1M$$

17) C

Length:

Rec. Inside:

$$\text{Area} = \pi \int_{-6}^6 \sqrt{36 - x^2} dx \quad \text{Area} = 6 \cdot 6\sqrt{3}$$

$$3x - y = x - 3y$$

$$= 36\sqrt{3}$$

$$I = \frac{x + 3y}{3x - y}$$

$$= 2L$$

18) D

2 segments,

and both

$$\int_{-6}^6 \sqrt{36 - 36\sin^2\theta} d\theta \quad x = 6\sin\theta$$

$$d\theta = 6(\cos\theta)d\theta \quad \theta = \arcsin\left(\frac{x}{6}\right)$$

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

19) E

are split by x-axis

so it should be H.

20) A

$$\int_{-6}^6 |3\cos\theta| \text{ d}x \quad x \rightarrow 6\text{ d}x$$

$$\theta \rightarrow \frac{\pi}{2}$$

$$(3x + ry)(x - 3y)$$

$$= (x + 3y)(3x - y)$$

$$9x^2 - y^2 = 3x^2 + 3y^2 + 10xy$$

21) B

$$\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} |14\sin\theta| \text{ d}\theta \quad x \rightarrow 14\sin\theta$$

$$\theta \rightarrow \frac{\pi}{2}$$

$$6x^2 - 4y^2 - 10xy = 0$$

22) A

$$\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} |14\sin(2\theta)| \text{ d}\theta \quad x \rightarrow 14\sin(2\theta)$$

$$\begin{array}{|c|c|c|c|} \hline & 1 & 2 & \\ \hline & 3 & 4 & \\ \hline & 5 & 6 & \\ \hline \end{array}$$

23) E

$$\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} |14\sin(2\theta)| \text{ d}\theta$$

$$\int_a^b f(x) dx = \int_a^b f(a+b-x) dx$$

24) A

$$= 2 \int_{\frac{\pi}{2}}^{\frac{\pi}{2}} \frac{\cos(2\theta) + 1}{x} d\theta = \frac{e^{i\theta}}{x}$$

$$\begin{array}{|c|c|c|c|} \hline & 1 & 2 & \\ \hline & 3 & 4 & \\ \hline & 5 & 6 & \\ \hline \end{array}$$

25) B

$$= \frac{1}{2} \int_{\frac{\pi}{2}}^{\frac{\pi}{2}} [\sin(2\theta) + \theta] d\theta$$

$$\frac{\pi}{2} + \frac{\pi}{2} = \frac{12\pi}{2} + \frac{12\pi}{4} = \frac{12\pi}{4}$$

$$\begin{aligned} \text{Marks} &= (12 \times m) - 1 + 2h \\ &= mp + 2m \\ &= \boxed{\frac{72}{12h}} \end{aligned}$$

$$= \frac{1}{2} \int_{\frac{\pi}{2}}^{\frac{\pi}{2}} \left[ \frac{1}{2} \sin(2\theta) + \frac{\pi}{2} \right] d\theta$$

$$\int_a^b f(x) dx = \int_a^b f(a+b-x) dx$$

$$= \frac{1}{2} \left[ \frac{1}{2} \sin(2\theta) - \frac{\pi}{2} \right] \Big|_{\frac{\pi}{2}}^{\frac{\pi}{2}}$$

$$\int_{\frac{\pi}{2}}^{\frac{\pi}{2}} \cos^2\theta d\theta = \int_{\frac{\pi}{2}}^{\frac{\pi}{2}} \cos(2\theta) + \sin^2\theta d\theta$$

$$= \frac{1}{2} \left[ \frac{\pi}{2} - \frac{\pi}{4} \right]$$

$$\int_{\frac{\pi}{2}}^{\frac{\pi}{2}} \cos^2\theta d\theta = \int_{\frac{\pi}{2}}^{\frac{\pi}{2}} \cos(2\theta) + 1 - \cos^2\theta d\theta$$

$$= 12\pi - 18\sqrt{3}$$

$$\cos(2\theta) = \cos^2\theta - \sin^2\theta$$

$$\Rightarrow \text{Total Area} = 12\pi - 18\sqrt{3}$$

$$\cos^2\theta = \cos(2\theta) + \sin^2\theta$$

$$36\sqrt{3} + 12\pi - 18\sqrt{3}$$

$$2\cos^2\theta = \cos(2\theta) + 1$$

$$= 12\pi + 18\sqrt{3}$$

$$\cos^2\theta = \frac{\cos(2\theta) + 1}{2}$$

$$\frac{\pi}{2} - \frac{\pi}{4} = \frac{3\pi}{4} - \frac{\pi}{4}$$

$$= \frac{\pi}{4}$$

$$\sin\left(\frac{2\pi}{3}\right) = \sin\left(\frac{\pi}{3}\right)$$

$$= \frac{\sqrt{3}}{2}$$

## Solutions

5)



