

Fully-Worked Solutions

FORM 4

CHAPTER 10 Index Numbers

Self Test 1

$$1 \quad x = \frac{1.56}{1.20} \times 100$$

$$= 130$$

$$\frac{2.76}{y} \times 100 = 115$$

$$y = \frac{2.76 \times 100}{115}$$

$$= 2.40$$

$$\frac{z}{0.72} \times 100 = 125$$

$$z = \frac{125 \times 0.72}{100}$$

$$= 0.90$$

$$2 \quad (a) \quad I_{2020/2019} = 95, I_{2021/2019} = 92$$

$$\frac{Q_{2020}}{Q_{2019}} \times 100 = 95 \qquad \frac{Q_{2021}}{Q_{2019}} \times 100 = 92$$

$$I_{2019/2021} = \frac{Q_{2019}}{Q_{2021}} \times 100$$

$$= \frac{100}{92} \times 100$$

$$= 108.7$$

$$I_{2020/2021} = \frac{Q_{2020}}{Q_{2021}} \times 100$$

$$= \frac{Q_{2020}}{Q_{2019}} \times \frac{Q_{2019}}{Q_{2021}} \times 100$$

$$= \frac{95}{100} \times \frac{100}{92} \times 100$$

$$= 103.26$$

$$(b) \quad \frac{Q_{2021}}{Q_{2020}} \times 100 = 110 \qquad \frac{Q_{2022}}{Q_{2020}} \times 100 = 99$$

$$\frac{9.95}{Q_{2020}} = \frac{110}{100} \qquad \frac{Q_{2022}}{9.045} = \frac{99}{100}$$

$$Q_{2020} = 9.045 \qquad Q_{2022} = 8.95$$

Price of the shampoo in the year 2022 was RM8.95.

$$3 \quad (a) \quad \frac{Q_{2020}}{Q_{2018}} \times 100 = \frac{1\,250}{1\,000} \times 100$$

$$= 125$$

$$(b) \quad \frac{1\,600}{1\,250} \times 100 = 128$$

The membership fee in the year 2022 increased by 28% compared to the year 2020.

Self Test 2

$$1 \quad (a) \quad x = \frac{260}{250} \times 100 = 104$$

$$\frac{y}{240} \times 100 = 110$$

$$y = \frac{110 \times 240}{100}$$

$$= 264$$

$$\frac{252}{z} \times 100 = 120$$

$$z = \frac{252 \times 100}{120}$$

$$= 210$$

$$(b) \quad \text{Composite index} = \frac{104(60) + 110(42) + 120(18)}{60 + 42 + 18}$$

$$= \frac{13\,020}{120}$$

$$= 108.5$$

$$2 \quad (a) \quad \text{Total weightage} = 70$$

$$x + 13 + 8 + 7 + 30 = 70$$

$$x + 58 = 70$$

$$x = 12$$

$$(b) \quad \frac{Q_{2020}}{2\,400} \times 100 = 107$$

$$Q_{2020} = \text{RM}2\,568$$

$$(c) \quad \text{Composite index} = \frac{106(12) + 107(13) + 102(8) + 7y + 106(30)}{70}$$

$$107 = \frac{6\,659 + 7y}{70}$$

$$7y = 831$$

$$y = 118.7$$

$$3 \quad (a) \quad I_A = \frac{63}{60} \times 100 = 105$$

$$I_B = \frac{42}{35} \times 100 = 120$$

$$I_C = \frac{30}{24} \times 100 = 125$$

$$(b) \quad (i) \quad \text{Composite index} = 117$$

$$\frac{105(6) + 120(4) + 125(3) + I_D(2)}{15} = 117$$

$$1\,485 + 2I_D = 1\,755$$

$$2I_D = 270$$

$$I_D = 135$$

$$(ii) \quad \frac{54}{x} \times 100 = 135$$

$$x = \frac{54 \times 100}{135}$$

$$= 40$$

SPM Practice

Paper 2

$$1 \quad (a) \quad (i) \quad \text{Index of } D = 150$$

$$\frac{P_{2021}}{45} \times 100 = 150$$

$$P_{2021} = \text{RM}67.50$$

$$(ii) \quad I_{2021/2019} = \frac{P_{2021}}{P_{2020}} \times \frac{P_{2020}}{P_{2019}} \times 100$$

$$= \frac{105}{100} \times \frac{96}{100} \times 100$$

$$= 100.8$$

$$(b) \quad (i) \quad y = 100 - 25 - 45 - 10 - 15 = 5$$

$$\frac{105(25) + 45(x) + 115y + 150(10) + 160(15)}{100} = 133$$

$$45x + 6\,525 + 115y = 13\,300$$

$$45x + 6\,525 + 115(5) = 13\,300$$

$$45x = 6\,200$$

$$x = 137.8$$

$$(ii) \frac{P}{38} \times 100 = 133$$

$$P = \frac{133 \times 38}{100}$$

$$= \text{RM}50.54$$

2 Angle $A = 360^\circ - 80^\circ - 30^\circ - 15^\circ$
 $= 235^\circ$

(a) Composite index

$$= \frac{100(235) + 101(80) + 128(15) + 95(30)}{360}$$

$$= \frac{36\,350}{360}$$

$$= 100.97$$

(b) $\frac{5\,800}{P} \times 100 = 100.97$

$$P = \frac{5\,800 \times 100}{100.97}$$

$$= \text{RM}5\,744.28$$

(c) (i) $I_{2022/2021} = 105$ (increased by 5%)

(ii) $I_{2022/2019} = \frac{P_{2022}}{P_{2021}} \times \frac{P_{2021}}{P_{2019}} \times 100$
 $= \frac{105}{100} \times \frac{100.97}{100} \times 100$
 $= 106.02$

(d) $I_{2023/2021} = 110$

$$I_{2023/2019} = \frac{P_{2023}}{P_{2021}} \times \frac{P_{2021}}{P_{2019}} \times 100$$

$$= \frac{110}{100} \times \frac{100.97}{100} \times 100$$

$$= 111.07$$

3 (a) $I_A = \frac{87.36}{84} \times 100 = 104$

$$I_B = \frac{135.34}{134} \times 100 = 101$$

$$I_C = \frac{136.80}{136.80} \times 100 = 100$$

$$I_D = \frac{63.42}{67.50} \times 100 = 93.96$$

(b) Composite index

$$= \frac{104(40) + 101(30) + 100(10) + 93.96(20)}{100}$$

$$= \frac{10\,069.2}{100}$$

$$= 100.69$$

(c)

Product	$I_{2018/2017}$	$I_{2019/2018}$	$I_{2019/2017}$
A	104	85	$\frac{85}{100} \times \frac{104}{100} \times 100 = 88.4$
B	101	85	$\frac{85}{100} \times \frac{101}{100} \times 100 = 85.85$
C	100	85	$\frac{85}{100} \times \frac{100}{100} \times 100 = 85$
C	93.96	85	$\frac{85}{100} \times \frac{93.96}{100} \times 100 = 79.87$

Composite index in the year 2019 based on the year 2017

$$= \frac{88.4(40) + 85.85(30) + 85(10) + 79.87(20)}{100}$$

$$= 85.59$$

4 (a) Composite index in the year 2018 based on the year 2015

$$= \frac{114x + 93(3) + 100(2) + 125(3x - 2)}{x + 3 + 2 + 3x - 2}$$

$$120 = \frac{229 + 489x}{3 + 4x}$$

$$360 + 480x = 229 + 489x$$

$$9x = 131$$

$$x = 14.56$$

$$\therefore x = 15$$

(b)

Item	$I_{2020/2018}$	$I_{2018/2015}$	$I_{2020/2015}$
P	92	114	$\frac{92}{100} \times \frac{114}{100} \times 100 = 104.88$
Q	102	93	$\frac{102}{100} \times \frac{93}{100} \times 100 = 94.86$
R	100	100	100
S	110	125	$\frac{110}{100} \times \frac{125}{100} \times 100 = 137.5$

Composite index in the year 2020 based on the year 2015

$$= \frac{104.88(15) + 94.86(3) + 100(2) + 137.5(43)}{63}$$

$$= \frac{7\,970.28}{63}$$

$$= 126.51$$

5 (a) $95 = \frac{380}{x} \times 100$

$$x = \frac{380 \times 100}{95}$$

$$= 400$$

$$\frac{y}{300} \times 100 = 125$$

$$y = \frac{125 \times 300}{100}$$

$$= 375$$

$$z = \frac{960}{800} \times 100$$

$$= 120$$

$$108.6 = \frac{120(8) + 125w + 100(10) + 95(4)}{8 + w + 10 + 4}$$

$$108.6 = \frac{2\,340 + 125w}{22 + w}$$

$$2\,389.2 + 108.6w = 2\,340 + 125w$$

$$49.2 = 16.4w$$

$$w = \frac{49.2}{16.4}$$

$$= 3$$

(b)

Category	$I_{2022/2021}$	$I_{2024/2022}$	$I_{2024/2021}$	Weightage
Food	120	90	$\frac{120(90)}{100} = 108$	8
Transportation	125	$\frac{375 + 60}{375} \times 100 = 116$	$\frac{125(116)}{100} = 145$	3
Rent	100	110	$\frac{100(110)}{100} = 110$	10
Entertainment	95	100	$\frac{95(100)}{100} = 95$	4

$$\begin{aligned}\bar{I} &= \frac{108(8) + 145(3) + 110(10) + 95(4)}{8 + 3 + 10 + 4} \\ &= \frac{2\,779}{25} \\ &= 111.16\end{aligned}$$

(c) $\frac{\text{Expenditure in the year 2024}}{\text{Expenditure in the year 2021}} \times 100 = 111.16$

$$\frac{\text{Expenditure in the year 2024}}{2\,500} \times 100 = 111.16$$

$$\begin{aligned}\text{Expenditure in the year 2024} &= 111.16 \times \frac{2\,500}{100} \\ &= 2\,779\end{aligned}$$

$$\begin{aligned}\text{Savings} &= 4\,500 - 2\,779 \\ &= \text{RM1}\,721\end{aligned}$$