

Form 4 Chapter 10
Index Numbers
Fully-Worked Solutions

UPS KILL 10.1

$$1 \ I_{2020/2010} = \frac{475\ 000}{380\ 000} \times 100 = 125$$

$$2 \ I_{2020/2018} = \frac{9.20}{8.00} \times 100 = 115$$

$$3 \ I_{2019/2017} = 130$$

$$\frac{Q_{2019}}{Q_{2017}} \times 100 = 130$$

$$\frac{Q_{2019}}{5.00} \times 100 = 130$$

$$Q_{2019} = \frac{130 \times 5.00}{100}$$

$$Q_{2019} = \text{RM}6.50$$

$$4 \ I_{2019/2018} = 105$$

$$\frac{20.00}{Q_{2018}} \times 100 = 105$$

$$Q_{2018} = \frac{20.00 \times 100}{105}$$

$$Q_{2018} = \text{RM}19.05$$

$$5 \ I_{2017/2014} = 115$$

$$\frac{Q_{2017}}{Q_{2014}} \times 100 = 115$$

$$\frac{Q_{2014}}{Q_{2017}} = \frac{100}{115}$$

$$I_{2020/2014} = 140$$

$$\frac{Q_{2020}}{Q_{2014}} \times 100 = 140$$

$$\frac{Q_{2020}}{Q_{2014}} = \frac{140}{100}$$

$$I_{2020/2017}$$

$$= \frac{Q_{2020}}{Q_{2017}} \times 100$$

$$= \frac{Q_{2020}}{Q_{2014}} \times \frac{Q_{2014}}{Q_{2017}} \times 100$$

$$= \frac{140}{100} \times \frac{100}{115} \times 100$$

$$= 121.74$$

$$6 \ I_{2017/2014} = 120$$

$$\frac{Q_{2017}}{Q_{2014}} \times 100 = 120$$

$$\frac{Q_{2017}}{Q_{2014}} = \frac{120}{100}$$

$$I_{2020/2017} = 150$$

$$\frac{Q_{2020}}{Q_{2017}} \times 100 = 150$$

$$\frac{Q_{2020}}{Q_{2017}} = \frac{150}{100}$$

$$I_{2020/2014}$$

$$= \frac{Q_{2020}}{Q_{2014}} \times 100$$

$$= \frac{Q_{2020}}{Q_{2017}} \times \frac{Q_{2017}}{Q_{2014}} \times 100$$

$$= \frac{150}{100} \times \frac{120}{100} \times 100$$

$$= 180$$

UPS KILL 10.2b

$$1 \ \bar{I} = \frac{\sum IW}{\sum W}$$

$$\bar{I} = \frac{(110 \times 4) + (100 \times 1) + (105 \times 2) + (120 \times 3)}{4 + 1 + 2 + 3}$$

$$\bar{I} = \frac{1\ 110}{10}$$

$$\bar{I} = 111$$

$$2 \ \bar{I} = \frac{(105 \times 4) + (120 \times 1) + (115 \times 2) + (110 \times 3)}{4 + 1 + 2 + 3}$$

$$\bar{I} = \frac{1\ 100}{10}$$

$$\bar{I} = 110$$

$$3 \ \bar{I}_{2019/2015} = 142$$

$$\frac{110q + (140 \times 6) + (150 \times 8) + (180 \times 2)}{q + 6 + 8 + 2} = 142$$

$$\frac{110q + 2\ 400}{q + 16} = 142$$

$$110q + 2\ 400 = 142q + 2\ 272$$

$$32q = 128$$

$$q = 4$$

4 $\bar{I}_{2020/2018} = 140.25$

$$\frac{(130 \times 5) + (150 \times 6) + 7n + (120 \times 2)}{5 + 6 + 7 + 2} = 140.25$$

$$\frac{1790 + 7n}{20} = 140.25$$

$$1790 + 7n = 2850$$

$$7n = 1015$$

$$n = 145$$

5

$I_{2019/2017}$	W
124	4
110	1
140	3
105	2

$$\bar{I} = \frac{(124 \times 4) + (110 \times 1) + (140 \times 3) + (105 \times 2)}{4 + 1 + 3 + 2}$$

$$\bar{I} = \frac{1236}{10}$$

$$\bar{I} = 123.6$$

6

$I_{2018/2015}$	W
180	150
170	60
160	40

$$\bar{I}_{2018/2015} = \frac{(180 \times 150) + (170 \times 60) + (160 \times 40)}{150 + 60 + 40}$$

$$= \frac{43600}{250}$$

$$= 174.4$$

7 (a)

$I_{2018/2016}$	W
110	30
115	150
100	80
105	100

(b) $\bar{I}_{2018/2016}$

$$= \frac{(110 \times 30) + (115 \times 150) + (100 \times 80) + (105 \times 100)}{360}$$

$$= \frac{39050}{360}$$

$$= 108.47$$

8

$I_{2020/2018}$	W
115	x
125	20
120	$80 - x$

$$\bar{I}_{2020/2018} = 119.5$$

$$\frac{115x + 2500 + 120(80 - x)}{100} = 119.5$$

$$\frac{115x + 2500 + 9600 - 120x}{100} = 119.5$$

$$-5x + 12100 = 11950$$

$$x = 30$$

9 (a) $\bar{I}_{2019/2016}$

$$= \frac{(110 \times 3) + (130 \times 1) + (120 \times 2) + (140 \times 2)}{3 + 1 + 2 + 2}$$

$$= \frac{980}{8}$$

$$= 122.5$$

(b) $\frac{Q_{2019}}{Q_{2016}} \times 100 = \bar{I}_{2019/2016}$

$$\frac{Q_{2019}}{200} \times 100 = 122.5$$

$$Q_{2016} = \text{RM}245$$

10 (a) $\bar{I}_{2018/2014}$

$$= \frac{(140 \times 3) + (120 \times 4) + (110 \times 2) + (115 \times 1)}{3 + 4 + 2 + 1}$$

$$= \frac{1235}{10}$$

$$= 123.5$$

(b) $\frac{Q_{2018}}{Q_{2014}} \times 100 = \bar{I}_{2018/2014}$

$$\frac{Q_{2018}}{2800} \times 100 = 123.5$$

$$Q_{2018} = \text{RM}3458$$

11 (a) Item B

$$\frac{Q_{2020}}{Q_{2018}} \times 100 = 110$$

$$\frac{x}{20} \times 100 = 110$$

$$x = 22$$

Item D

$$\frac{28.75}{y} \times 100 = 115$$

$$y = 25$$

(b) Item A

$$\frac{Q_{2018}}{Q_{2016}} \times 100 = 108$$

$$\frac{Q_{2018}}{Q_{2016}} = \frac{108}{100}$$

From the table,

$$\frac{Q_{2020}}{Q_{2018}} \times 100 = 120$$

$$\frac{Q_{2020}}{Q_{2018}} = \frac{120}{100}$$

$$I_{2020/2016}$$

$$= \frac{Q_{2020}}{Q_{2016}} \times 100$$

$$= \frac{Q_{2020}}{Q_{2018}} \times \frac{Q_{2018}}{Q_{2016}} \times 100$$

$$= \frac{120}{100} \times \frac{108}{100} \times 100$$

$$= 129.6$$

(c) $\bar{I}_{2020/2018} = 117.75$

$$\frac{120(50) + (110 \times 40) + 125m + 115(60)}{50 + 40 + m + 60} = 117.75$$

$$\frac{17\,300 + 125m}{150 + m} = 117.75$$

$$17\,300 + 125m = 17\,662.5 + 117.75m$$

$$7.25m = 362.5$$

$$m = 50$$

(d) 2018 $\xrightarrow{+17.75\%}$ 2020 $\xrightarrow{+10\%}$ 2022
(100) (117.75) ?

$$\bar{I}_{2022/2018} = \frac{100 + 10}{100} \times 117.75 = 129.53$$

12 (a) Sum of weightages = 13

$$3 + 2 + 5 + k + 1 = 13$$

$$k = 2$$

$$\bar{I}_{2020/2019} = 117$$

$$\frac{330 + 2h + 650 + 210 + 115}{13} = 117$$

$$1\,305 + 2h = 1\,521$$

$$h = 108$$

(b) Rice

$$\frac{Q_{2019}}{Q_{2018}} \times 100 = 120$$

$$\frac{Q_{2019}}{Q_{2018}} = \frac{120}{100}$$

$$\frac{Q_{2020}}{Q_{2019}} \times 100 = 130$$

$$\frac{Q_{2020}}{Q_{2019}} = \frac{130}{100}$$

$$I_{2020/2018}$$

$$= \frac{Q_{2020}}{Q_{2018}} \times 100$$

$$= \frac{Q_{2020}}{Q_{2019}} \times \frac{Q_{2019}}{Q_{2018}} \times 100$$

$$= \frac{130}{100} \times \frac{120}{100} \times 100$$

$$= 156$$

$$I_{2020/2018} = 156$$

$$\frac{Q_{2020}}{12.50} \times 100 = 156$$

$$Q_{2020} = \text{RM}19.50$$

(c) (i) 2019 $\xrightarrow{+17\%}$ 2020 $\xrightarrow{+17\%}$ 2021
(100) (117) ?

$$\bar{I}_{2021/2019} = \frac{100 + 17}{100} \times 117 = 136.89$$

(ii) $\frac{Q_{2021}}{1\,600} \times 100 = 136.89$

$$Q_{2021} = \text{RM}2\,190.24$$

13 (a) *Milk powder*

$$\frac{Q_{2018}}{Q_{2016}} \times 100 = 140$$

$$\frac{Q_{2018}}{250} \times 100 = 140$$

$$Q_{2018} = \text{RM}350$$

(b) *Dress*

Let the prices in 2016 and 2018 are m and h respectively.

$$h - m = 12$$

$$h = m + 12 \dots (1)$$

$$\frac{Q_{2018}}{Q_{2016}} \times 100 = 115$$

$$\frac{h}{m} \times 100 = 115$$

$$100h = 115m \dots (2)$$

Substitute (1) into (2) :

$$100(m + 12) = 115m$$

$$100m + 1200 = 115m$$

$$15m = 1200$$

$$m = 80$$

From (1) :

$$h = m + 12$$

$$h = 80 + 12 = 92$$

(i) The price in 2016 is RM80.

(ii) The price in 2018 is RM92.

(c) $\bar{I}_{2018/2016} = 129.75$

$$\frac{7000 + 25k + 1725 + 1250}{100} = 129.75$$

$$9975 + 25k = 12975$$

$$k = 120$$

(d) 2016 $\xrightarrow{+29.75\%}$ 2018 $\xrightarrow{+10\%}$ 2020
(100) (129.75) ?

$$\bar{I}_{2020/2016} = \frac{100+10}{100} \times 129.75 = 142.73$$

Summative Practice 10

- 1 (a) (i) If the price of material B increases 20% from 2015 to 2017, then
 $x = 100 + 20 = 120$

$$(ii) \frac{Q_{2017}}{Q_{2015}} \times 100 = 120$$

$$\frac{1.80}{y} \times 100 = 120$$

$$y = \frac{1.80 \times 100}{120}$$

$$y = 1.50$$

$$(b) \bar{I}_{2017/2015}$$

$$= \frac{\sum IW}{\sum W}$$

$$= \frac{(130 \times 50) + (120 \times 20) + (150 \times 1)}{50 + 20 + 1}$$

$$= \frac{9050}{71}$$

$$= 127.46$$

$$(c) (i) \bar{I}_{2017/2015} = 127.46$$

$$\frac{Q_{2017}}{Q_{2015}} \times 100 = 127.46$$

$$\frac{Q_{2015}}{Q_{2017}} = \frac{100}{127.46} \dots (1)$$

$$\bar{I}_{2017/2013} = 100 + 40 = 140$$

$$\frac{Q_{2017}}{Q_{2013}} \times 100 = 140$$

$$\frac{Q_{2017}}{Q_{2013}} = \frac{140}{100} \dots (2)$$

$$\bar{I}_{2015/2013} = \frac{Q_{2015}}{Q_{2013}} \times 100$$

$$= \frac{Q_{2015}}{Q_{2017}} \times \frac{Q_{2017}}{Q_{2013}} \times 100$$

$$= \frac{100}{127.46} \times \frac{140}{100} \times 100$$

$$= 109.84$$

From (2)

From (1)

$$(ii) \bar{I}_{2015/2013} = 109.84$$

$$\frac{Q_{2015}}{Q_{2013}} \times 100 = 109.84$$

$$\frac{Q_{2015}}{4.00} \times 100 = 109.84$$

$$Q_{2015} = \frac{109.84 \times 4.00}{100}$$

$$Q_{2015} = \text{RM}4.3936$$

Hence, the maximum number of packets of fish pastes that can be produced with an allocation of RM500 in 2015

$$= \frac{\text{RM}500}{\text{RM}4.3936}$$

$$= 113.8$$

$$= 113 \text{ packets}$$

The maximum number of packets of fish pastes that can be produced is 113 and not 114.

$$2 \text{ (a) } \frac{x}{20} \times 100 = 110$$

$$x = 22$$

$$\frac{28.75}{y} \times 100 = 115$$

$$y = 25$$

(b) Shampoo A

$$\frac{Q_{2016}}{Q_{2014}} \times 100 = 108$$

$$\frac{Q_{2016}}{Q_{2014}} = \frac{108}{100}$$

From the table,

$$\frac{Q_{2018}}{Q_{2016}} \times 100 = 120$$

$$\frac{Q_{2018}}{Q_{2016}} = \frac{120}{100}$$

$I_{2018/2014}$

$$= \frac{Q_{2018}}{Q_{2014}} \times 100$$

$$= \frac{Q_{2018}}{Q_{2016}} \times \frac{Q_{2016}}{Q_{2014}} \times 100$$

$$= \frac{120}{100} \times \frac{108}{100} \times 100$$

$$= 129.6$$

(c) $\bar{I}_{2018/2016} = 117.75$

$$\frac{120 \times 50 + 110 \times 40 + 125m + 115 \times 60}{50 + 40 + m + 60} = 117.75$$

$$\frac{17\,300 + 125m}{150 + m} = 117.75$$

$$17\,300 + 125m = 17\,662.5 + 117.75m$$

$$7.25m = 362.5$$

$$m = 50$$

(d) 2016 $\xrightarrow{+17.75\%}$ 2018 $\xrightarrow{+10\%}$ 2020
(100) (117.75) ?

$$\bar{I}_{2020/2016} = \frac{100 + 10}{100} \times 117.75 = 129.525$$

$$3 \text{ (a) (i) } \frac{P_{2020}}{P_{2016}} \times 100 = m$$

$$\frac{13.80}{12.00} \times 100 = m$$

$$m = 115$$

$$(ii) \frac{P_{2018}}{P_{2016}} \times 100 = 120$$

$$\frac{P_{2018}}{12.00} \times 100 = 120$$

$$P_{2018} = \text{RM}14.40$$

$$(b) (i) \quad \bar{I}_{2018/2016} = 112$$

$$\frac{\sum IW}{\sum W} = 112$$

$$\frac{(105 \times 2) + (110h) + (120 \times 3)}{2 + h + 3} = 112$$

$$\frac{570 + 110h}{5 + h} = 112$$

$$570 + 110h = 560 + 112h$$

$$2h = 10$$

$$h = 5$$

$$(ii) \frac{Q_{2018}}{Q_{2016}} \times 100 = \bar{I}_{2018/2016}$$

$$\frac{89.60}{Q_{2011}} \times 100 = 112$$

$$Q_{2011} = \text{RM}80$$

$$(c) \frac{Q_{2018}}{Q_{2016}} \times 100 = 110$$

$$\frac{Q_{2016}}{Q_{2018}} = \frac{100}{110}$$

$$\frac{Q_{2016}}{Q_{2016}} \times 100 = 130$$

$$\frac{Q_{2020}}{Q_{2016}} = \frac{130}{100}$$

$$\frac{Q_{2020}}{Q_{2018}} \times 100$$

$$= \frac{Q_{2020}}{Q_{2016}} \times \frac{Q_{2016}}{Q_{2018}} \times 100$$

$$= \frac{130}{100} \times \frac{100}{110} \times 100$$

$$= 118.18$$

$$4 \text{ (a)} \quad \frac{Q_{2019}}{Q_{2017}} \times 100 = 90$$

$$\frac{Q_{2019}}{20} \times 100 = 90$$

$$Q_{2019} = \frac{90 \times 20}{100} \\ = \text{RM}18$$

$$(b) \quad \bar{I}_{2019/2017} = 104 \\ \frac{\sum IW}{\sum W} = 104$$

$$\frac{(110 \times 4) + (90 \times 2) + (100 \times 3) + m}{4 + 2 + 3 + 1} = 104$$

$$\frac{920 + m}{10} = 104$$

$$920 + m = 1040$$

$$m = 120$$

Hence, the price of ingredient S increases by 20% from the year 2012 to the year 2014.

$$(c) \text{ (i)} \quad \bar{I}_{2020/2017} \\ = \frac{100 + 10}{100} \times 104 = 114.4$$

$$\text{(ii)} \quad \frac{Q_{2020}}{Q_{2017}} \times 100 = 114.4$$

$$\frac{Q_{2020}}{75} \times 100 = 114.4$$

$$Q_{2020} = \frac{114.4 \times 75}{100}$$

$$Q_{2020} = \text{RM}85.80$$

$$5 \text{ (a)} \quad \frac{Q_{2018}}{Q_{2016}} \times 100 = 120$$

$$\frac{7500}{Q_{2016}} \times 100 = 120$$

$$Q_{2016} = \text{RM}6\,250$$

$$(b) \quad \bar{I}_{2018/2016} \\ = \frac{(120 \times 160) + (150 \times 130) + (110 \times 70)}{360} \\ = 128\frac{8}{9}$$

$$(c) \quad \frac{Q_{2018}}{Q_{2016}} \times 100 = \bar{I}_{2018/2016}$$

$$\frac{Q_{2018}}{32\,000} \times 100 = 128\frac{8}{9}$$

$$Q_{2018} = \text{RM}41\,244.44$$

$$(d) \quad I_{2020/2018} \text{ for diesel} = \frac{120}{100} \times 120 = 144$$

$$I_{2020/2018} \text{ for petrol} = \frac{130}{100} \times 150 = 195$$

$$I_{2020/2018} \text{ for gas} = 110$$

$$\therefore \bar{I}_{2020/2016}$$

$$= \frac{(144 \times 160) + (195 \times 130) + (110 \times 70)}{360}$$

$$= 155\frac{29}{36}$$

$$6 \text{ (a) } x = \frac{9.00}{8.00} \times 100 = 112.5$$

$$\frac{y}{3.00} \times 100 = 105$$

$$y = 3.15$$

$$\frac{4.80}{z} \times 100 = 120$$

$$z = 4.00$$

$$(b) \bar{I}_{2018/2016} = \frac{\sum Iw}{\sum w}$$

$$= \frac{(112.5 \times 20) + (105 \times 30) + (108 \times 10) + (120 \times 40)}{20 + 30 + 10 + 40}$$

$$= 112.8$$

$$(c) \frac{Q_{2018}}{Q_{2016}} \times 100 = \bar{I}_{2018/2016}$$

$$\frac{Q_{2018}}{\text{RM}43.00} \times 100 = 112.8$$

$$Q_{2018} = \text{RM}48.50$$

$$(d) \bar{I}_{2016} \xrightarrow{+12.8\%} \bar{I}_{2018} \xrightarrow{+10\%} \bar{I}_{2020}$$

$$(100) \qquad (112.8) \qquad (?)$$

$$\bar{I}_{2020/2016}$$

$$= \frac{100 + 10}{100} \times 112.8$$

$$= 124.08$$

7 (a) Material A

$$I_{2020/2018}$$

$$= \frac{I_{2020/2016}}{I_{2018/2016}} \times 100$$

$$= \frac{145}{125} \times 100$$

$$= 116$$

(b) Material B

$$(i) I_{2020/2016}$$

$$= \frac{Q_{2020}}{Q_{2016}} \times 100$$

$$= \frac{9.10}{7.00} \times 100$$

$$= 130$$

$$\therefore x = 130$$

$$(ii) I_{2018/2016} = \frac{Q_{2018}}{Q_{2016}} \times 100$$

$$115 = \frac{P_{2018}}{7.00} \times 100$$

$$P_{2018} = \text{RM}8.05$$

$$(c) (i) \bar{I} = \frac{\sum IW}{\sum W}$$

$$115.5 = \frac{(125 \times 3) + (115 \times 2) + 5y}{3 + 2 + 5}$$

$$1155 = 5y + 605$$

$$y = 110$$

$$(ii) \bar{I}_{2018/2016} = 115.5$$

$$\frac{Q_{2018}}{Q_{2016}} \times 100 = 115.5$$

$$\frac{92.40}{Q_{2016}} \times 100 = 115.5$$

$$Q_{2016} = \text{RM}80$$

$$8(a) \text{ (i) } x = \frac{1.75}{2.50} \times 100 = 70$$

$$\text{(ii) } \frac{y}{4.50} \times 100 = 130$$

$$y = 5.85$$

$$\text{(iii) } \frac{5.70}{z} \times 100 = 114$$

$$z = 5.00$$

$$\text{(b) } \bar{I} = 114.6$$

$$\frac{\sum IW}{\sum W} = 114.6$$

$$\frac{(70 \times 1) + (120 \times 3) + (130 \times 2) + 114h}{1 + 3 + 2 + h} = 114.6$$

$$\frac{690 + 114h}{6 + h} = 114.6$$

$$690 + 114h = 687.6 + 114.6h$$

$$0.6h = 2.4$$

$$h = 4$$

$$\text{(c) } \frac{Q_{2019}}{Q_{2018}} \times 100 = 114.6$$

$$\frac{Q_{2019}}{1500} \times 100 = 114.6$$

$$Q_{2019} = \text{RM}1\ 719$$

(d) Stationery B

$$\frac{Q_{2020}}{Q_{2018}} \times 100 = 150$$

$$\frac{Q_{2020}}{Q_{2018}} = \frac{150}{100}$$

From the table,

$$\frac{Q_{2019}}{Q_{2018}} \times 100 = 120$$

$$\frac{Q_{2018}}{Q_{2019}} = \frac{100}{120}$$

$$I_{2020/2019}$$

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

$$= \frac{Q_{2020}}{Q_{2018}} \times \frac{Q_{2018}}{Q_{2019}} \times 100$$

$$= \frac{150}{100} \times \frac{100}{120} \times 100$$

$$= 125$$

9 (a) For salt,

$$h = \frac{Q_{2017}}{Q_{2015}} \times 100$$

$$= \frac{0.90}{0.80} \times 100$$

$$= 112.5$$

For food conditioner,

$$\frac{3.75}{k} \times 100 = 125$$

$$k = \frac{3.75 \times 100}{125}$$

$$k = 3.00$$

(b)

Ingredient	I	W (Angle of sector)
Fish	150	200
Flour	120	135
Salt	112.5	15
Food conditioner	125	10

$$\bar{I} = \frac{\sum IW}{\sum W}$$

$$(150 \times 200) + (120 \times 135) +$$

$$= \frac{(112.5 \times 15) + (125 \times 10)}{360}$$

$$= 136.49$$

$$\text{(c) (i) } \bar{I}_{2020/2015} = \frac{140}{100} \times \bar{I}_{2015}$$

$$= \frac{140}{100} \times 136.49$$

$$= 191.09$$

$$\text{(ii) } \bar{I}_{2020/2015} = \frac{Q_{2020}}{Q_{2015}} \times 100$$

$$191.09 = \frac{Q_{2015}}{7.50} \times 100$$

$$Q_{2015} = \frac{191.09 \times 7.50}{100}$$

$$= \text{RM}14.33$$

10 (a)

Chemical	$I_{2019/2018}$
A	$\frac{0.75}{0.60} \times 100 = 125$
B	$\frac{1.65}{1.50} \times 100 = 110$
C	$\frac{1.20}{0.80} \times 100 = 150$
D	$\frac{1.80}{2.00} \times 100 = 90$
E	$\frac{1.40}{1.00} \times 100 = 140$

$$(b) \bar{I} = \frac{\sum IW}{\sum W}$$

$$= \frac{(125 \times 40) + (110 \times 90) + (150 \times 65)}{(90 \times 100) + (140 \times 65)}$$

$$= \frac{11875}{86} = 136.93$$

$$(c) \bar{I}_{2020/2015}$$

$$= \frac{100 + 15}{100} \times 118.75$$

$$= 136.5625$$

$$\frac{Q_{2020}}{Q_{2018}} \times 100 = 136.5625$$

$$\frac{P_{2020}}{RM16} \times 100 = 136.5625$$

$$\therefore P_{2020} = RM21.85$$

11 (a) For component Q,

$$I_{2020/2018} = 120$$

$$\frac{Q_{2020}}{Q_{2018}} \times 100 = 120$$

$$\frac{h}{50} \times 100 = 120$$

$$h = 60$$

(b) For component S,

$$I_{2020/2018} = 125$$

$$\frac{Q_{2020}}{Q_{2018}} \times 100 = 125$$

$$\frac{m}{k} \times 100 = 125$$

$$100m = 125k$$

$$4m = 5k \dots (1)$$

$$P_{2020} = 20 + P_{2018}$$

$$m = 20 + k \dots (2)$$

Substitute (2) into (1) :

$$4(20 + k) = 5k$$

$$80 + 4k = 5k$$

$$k = 80$$

From (2) :

$$m = 20 + 80 = 100$$

$$(c) (i) \bar{I} = 132$$

$$\frac{Q_{2020}}{Q_{2018}} \times 100 = 132$$

$$\frac{1716}{Q_{2018}} \times 100 = 132$$

$$Q_{2018} = RM1\ 300$$

(ii)

Component	$I_{2020/2018}$	W
Q	120	1
R	$\frac{40}{25} \times 100 = 160$	3
S	125	4
T	$\frac{44}{40} \times 100 = 110$	p

$$\bar{I} = 132$$

$$(120 \times 1) + (160 \times 3) +$$

$$\frac{(125 \times 4) + 110p}{1 + 3 + 4 + p} = 132$$

$$\frac{1100 + 110p}{8 + p} = 132$$

$$1100 + 110p = 1056 + 132p$$

$$44 = 22p$$

$$p = 2$$

12 (a) $I_{2018/2016}$

$$= \frac{Q_{2018}}{Q_{2016}} \times 100$$

For material X,

$$p = \frac{1.75}{1.40} \times 100 = 125$$

For material W,

$$\frac{q}{2} \times 100 = 140$$

$$q = \frac{140 \times 2}{100}$$

$$q = 2.80$$

For material Z,

$$\frac{2.40}{r} \times 100 = 80$$

$$r = \frac{2.40 \times 100}{80}$$

$$r = 3.00$$

(b) (i)

Material	$I_{2018/2016}$	Angle of pie chart	W
X	125	155	31
Y	150	40	8
W	140	75	15
Z	80	90	18

$$\begin{aligned} \bar{I}_{2018/2016} &= \frac{\sum IW}{\sum W} \\ &= \frac{(125 \times 31) + (150 \times 8) + (140 \times 15) + (80 \times 18)}{31 + 8 + 15 + 18} \\ &= \frac{8615}{72} \\ &= 119.65 \end{aligned}$$

(ii) $\bar{I}_{2018/2016} = 119.65$

$$\frac{P_{2018}}{P_{2016}} \times 100 = 119.65$$

$$\frac{RM38}{Q_{2016}} \times 100 = 119.65$$

$$\begin{aligned} Q_{2016} &= \frac{RM38 \times 100}{119.65} \\ &= RM31.76 \end{aligned}$$

(c) $\bar{I}_{2016} \xrightarrow{+19.65\%} \bar{I}_{2018} \xrightarrow{+19.65\%} \bar{I}_{2020}$
 (100) (119.65) (?)

$$\begin{aligned} \bar{I}_{2020/2016} &= \frac{100 + 19.65}{100} \times 119.65 \\ &= 143.16 \end{aligned}$$