Form 4 Chapter 10
Index Numbers
Fully-Worked Solutions

UPSKILL 10.1

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

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

3 $I_{2019/2017} = 130$

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

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

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

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

4 $I_{2019/2018} = 105$

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

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

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

5 $I_{2017/2014} = 115$

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

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

$I_{2020/2014} = 140$

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

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

$I_{2020/2017}$

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

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

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

$= 121.74$

6 $I_{2017/2014} = 120$

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

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

$I_{2020/2017} = 150$

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

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

$I_{2020/2014}$

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

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

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

$= 180$

UPSKILL 10.2

1 $\bar{I} = \dfrac{\sum I_i w_i}{\sum w_i}$

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

$\bar{I} = \dfrac{1\,110}{10}$

$\bar{I} = 111$

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

$\bar{I} = \dfrac{1\,100}{10}$

$\bar{I} = 110$

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

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

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

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

$32q = 128$

$q = 4$

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

$$\frac{(130\times5)+(150\times6)+7n+(120\times2)}{5+6+7+2} = 140.25$$

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

$$1790+7n = 2850$$

$$7n = 1\,015$$

$$n = 145$$

5

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

$$\bar{I} = \frac{(124\times4)+(110\times1)+(140\times3)+(105\times2)}{4+1+3+2}$$

$$\bar{I} = \frac{1\,236}{10}$$

$$\bar{I} = 123.6$$

6

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

$$\bar{I}_{2018/2015} = \frac{(180\times150)+(170\times60)+(160\times40)}{150+60+40}$$

$$= \frac{43\,600}{250}$$

$$= 174.4$$

7 (a)

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

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

$$= \frac{(110\times30)+(115\times150)+(100\times80)+(105\times100)}{360}$$

$$= \frac{39\,050}{360}$$

$$= 108.47$$

8

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

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

$$\frac{115x+2\,500+120(80-x)}{100} = 119.5$$

$$\frac{115x+2\,500+9\,600-120x}{100} = 119.5$$

$$-5x+12\,100 = 119\,50$$

$$x = 30$$

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

$$= \frac{(110\times3)+(130\times1)+(120\times2)+(140\times2)}{3+1+2+2}$$

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

$$= 122.5$$

(b) $\frac{Q_{2019}}{Q_{2016}}\times100 = \bar{I}_{2019/2016}$

$$\frac{Q_{2019}}{200}\times100 = 122.5$$

$$Q_{2019} = \text{RM}245$$

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

$$= \frac{(140\times3)+(120\times4)+(110\times2)+(115\times1)}{3+4+2+1}$$

$$= \frac{1\,235}{10}$$

$$= 123.5$$

(b) $\frac{Q_{2018}}{Q_{2014}}\times100 = \bar{I}_{2018/2014}$

$$\frac{Q_{2018}}{2\,800}\times100 = 123.5$$

$$Q_{2018} = \text{RM}3\,458$$

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.

$$h - m = 12$$

$$h = m + 12 \quad \ldots (1)$$

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

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

$$100h = 115m \quad \ldots (2)$$

Substitute (1) into (2) :

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

$$100m + 1\,200 = 115m$$

$$15m = 1\,200$$

$$m = 80$$

From (1) :

$$h = m + 12$$

$$h = 80 + 12 = 92$$

(i) The price in 2016 is RM80.
(ii) The price in 2018 is RM92.

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

$$\frac{7\,000 + 25k + 1\,725 + 1\,250}{100} = 129.75$$

$$9\,975 + 25k = 12\,975$$

$$k = 120$$

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

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

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

$$= \frac{\sum I_i w_i}{\sum w_i}$$

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

$$= \frac{9\,050}{71}$$

$$= 127.46$$

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

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

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

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

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

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

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

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

From (2)

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

$$= 109.84$$

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

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

$m = 115$

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

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

P_{2018} = RM14.40

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

$\frac{\sum I_i w_i}{\sum w_i} = 112$

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

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

$570 + 110h = 560 + 112h$

$2h = 10$

$h = 5$

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

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

Q_{2016} = RM80

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

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

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

$= \text{RM}18$

(b) $\bar{I}_{2019/2017} = 104$

$\frac{\sum I_i w_i}{\sum w_i} = 104$

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

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

$920 + m = 1040$

$m = 120$

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

(c) (i) $\bar{I}_{2020/2017}$

$= \frac{100 + 10}{100} \times 104 = 114.4$

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

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

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

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

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

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

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

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

$= \frac{(120 \times 160) + (150 \times 130) + (110 \times 70)}{360}$

$= 128\frac{8}{9}$

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

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

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

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

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

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

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

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

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

6 (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) $\bar{I}_{2018/2016} = \frac{\sum I_i w_i}{\sum w_i}$

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

$= 112.8$

(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) (112.8) (?)

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

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

$= 124.08$

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} = RM8.05

(c) (i) $\bar{I} = \frac{\sum I_i w_i}{\sum w_i}$
$115.5 = \frac{(125 \times 3) + (115 \times 2) + 5y}{3 + 2 + 5}$
$1155 = 5y + 605$
$y = 110$

(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} = RM80

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

(ii) $\frac{y}{4.50} \times 100 = 130$
$y = 5.85$

(iii) $\frac{5.70}{z} \times 100 = 114$
$z = 5.00$

(b) $\bar{I} = 114.6$
$\frac{\sum I_i w_i}{\sum w_i} = 114.6$
$\frac{(70 \times 1) + (120 \times 3) + (130 \times 2) + 114h}{1 + 3 + 2 + h} = 114.6$
$\frac{690 + 114h}{6 + h} = 114.6$
$690 + 114h = 687.6 + 114.6h$
$0.6h = 2.4$
$h = 4$

(c) $\frac{Q_{2019}}{Q_{2018}} \times 100 = 114.6$
$\frac{Q_{2019}}{1500} \times 100 = 114.6$
Q_{2019} = RM1 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

$$\bar{I} = \frac{\sum I_i w_i}{\sum w_i}$$
$$= \frac{(150\times 200) + (120\times 135) + (112.5\times 15) + (125\times 10)}{360}$$
$$= 136.49$$

(c) (i) $\bar{I}_{2020/2015} = \frac{140}{100}\times \bar{I}_{2015}$
$$= \frac{140}{100}\times 136.49$$
$$= 191.09$$

(ii) $\bar{I}_{2020/2015} = \frac{Q_{2020}}{Q_{2015}}\times 100$
$$191.09 = \frac{Q_{2020}}{7.50}\times 100$$
$$Q_{2020} = \frac{191.09\times 7.50}{100}$$
$$= \text{RM}14.33$$

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) $\bar{I} = \frac{\sum I_i w_i}{\sum w_i}$
$$= \frac{(125\times 40) + (110\times 90) + (150\times 65) + (90\times 100) + (140\times 65)}{360}$$
$$= 118.75$$

(c) $\bar{I}_{2020/2015}$
$$= \frac{100+15}{100}\times 118.75$$
$$= 136.5625$$

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

$$\frac{P_{2020}}{\text{RM}16}\times 100 = 136.5625$$
$$\therefore P_{2020} = \text{RM}21.85$$

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*,
$$I_{2020/2018} = 125$$
$$\frac{Q_{2020}}{Q_{2018}}\times 100 = 125$$
$$\frac{m}{k}\times 100 = 125$$
$$100m = 125k$$
$$4m = 5k \ \ldots (1)$$

$$Q_{2020} = 20 + Q_{2018}$$
$$m = 20 + k \ \ldots (2)$$

Substitute (2) into (1) :
$$4(20 + k) = 5k$$
$$80 + 4k = 5k$$
$$k = 80$$

From (2) :
$$m = 20 + 80 = 100$$

(c) (i) $\bar{I} = 132$
$$\frac{Q_{2020}}{Q_{2018}}\times 100 = 132$$
$$\frac{1716}{Q_{2018}}\times 100 = 132$$
$$Q_{2018} = \text{RM}1\ 300$$

(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*

$$\bar{I} = 132$$

$$\frac{(120\times1)+(160\times3)+(125\times4)+110p}{1+3+4+p} = 132$$

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

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

$$44 = 22p$$

$$p = 2$$

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

$$= \frac{Q_{2018}}{Q_{2016}}\times100$$

For material *X*,

$$p = \frac{1.75}{1.40}\times100 = 125$$

For material *W*,

$$\frac{q}{2}\times100 = 140$$

$$q = \frac{140\times2}{100}$$

$$q = 2.80$$

For material *Z*,

$$\frac{2.40}{r}\times100 = 80$$

$$r = \frac{2.40\times100}{80}$$

$$r = 3.00$$

(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

$$\bar{I}_{2018/2016}$$

$$= \frac{\sum I_i w_i}{\sum w_i}$$

$$= \frac{(125\times31)+(150\times8)+(140\times15)+(80\times18)}{31+8+15+18}$$

$$= \frac{8615}{72}$$

$$= 119.65$$

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

$$\frac{P_{2018}}{P_{2016}}\times100 = 119.65$$

$$\frac{\text{RM}38}{Q_{2016}}\times100 = 119.65$$

$$Q_{2016} = \frac{\text{RM}38\times100}{119.65}$$

$$= \text{RM}31.76$$

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

(100) (119.65) (?)

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

$$= \frac{100+19.65}{100}\times119.65$$

$$= 143.16$$

SPM Spot

1 (a) $\frac{z}{50}\times100 = 120$

$$z = \frac{120\times50}{100}$$

$$z = 60$$

(b) $\frac{y}{x}\times100 = 125$

$$y = \frac{125x}{100}$$

$$y = 1.25x \quad \ldots (1)$$

$$y - x = 15$$

$$y = x + 15 \quad \ldots (2)$$

Substitute (2) into (1) :

$$x + 15 = 1.25x$$

$$0.25x = 15$$

$$x = 60$$

Substitute $x = 60$ into (2) :

$$y = 60 + 15 = 75$$

(c) (i) $\bar{I}_{2022/2020} = 130$

$$\frac{\text{RM}260}{Q_{2020}}\times100 = 130$$

$$Q_{2020} = \frac{\text{RM}260\times100}{130}$$

$$= \text{RM}200$$

(ii)

Material	Price in the year (RM)		$I_{2022/2020}$	W
	2020	2022		
K	40	44	110	h
L	25	40	160	3
M	60	75	125	4
N	50	60	120	1

$$\bar{I}_{2022/2020} = 130$$
$$\frac{110h + (160\times 3) + (125\times 4) + (120\times 1)}{h+3+4+1} = 130$$
$$\frac{110h + 1\,100}{h+8} = 130$$
$$110h + 1\,100 = 130h + 1\,040$$
$$20h = 60$$
$$h = 3$$

2 (a) (i) $\frac{z}{7.5}\times 100 = 130$

$$z = \frac{130\times 7.5}{100}$$
$$z = 9.75$$

(ii) $\frac{Q_{2021}}{Q_{2019}}\times 100 = 140$

$$\frac{y}{x}\times 100 = 140$$
$$y = \frac{140x}{100}$$
$$y = 1.4x \ \ldots (1)$$

$$Q_{2021} - Q_{2019} = 3$$
$$y - x = 3 \ \ldots (2)$$

Substitute (1) into (2) :

$$1.4x - x = 3$$
$$0.4x = 3$$
$$x = \frac{3}{0.4}$$
$$x = 7.50$$

From (1) :

$$y = 1.4(7.50) = 10.50$$

(b)

$\frac{4.40}{4.00}\times 100 = 110$

$\frac{6.00}{3.75}\times 100 = 160$

$$\bar{I}_{2021/2019} = 132$$
$$\frac{(130\times 5) + (140\times p) + (160\times q) + (110\times 3)}{5+p+q+3} = 132$$
$$\frac{980 + 140p + 160q}{p+q+8} = 132$$
$$980 + 140p + 160q = 132(p+q+8)$$
$$980 + 140p + 160q - 132p - 132q - 1\,056 = 0$$
$$8p + 28q = 76$$
$$2p + 7q = 19$$
$$2p = 19 - 7q$$
$$p = \frac{19-7q}{2}$$

(c) $\bar{I}_{2019} \xrightarrow{+32\%} \bar{I}_{2021} \xrightarrow{+20\%} \bar{I}_{2023}$

(100)	(132)	(158.4)
(RM20)	(RM26.40)	(RM31.68)

$1.32\times \text{RM}20 = \text{RM}26.40$

$1.20\times \text{RM}26.40 = \text{RM}31.68$

Hence, the selling price of a strip of the gastric pills in the year 2023

$= \frac{115}{100}\times 31.68 = \text{RM}36.43$

