NUMERICAL TEST **3**

Answer Booklet

Example Questions

Please note the correct answers are shown in BOLD/COLOUR

City Trading last 6 months (number of trades made, in 000s)
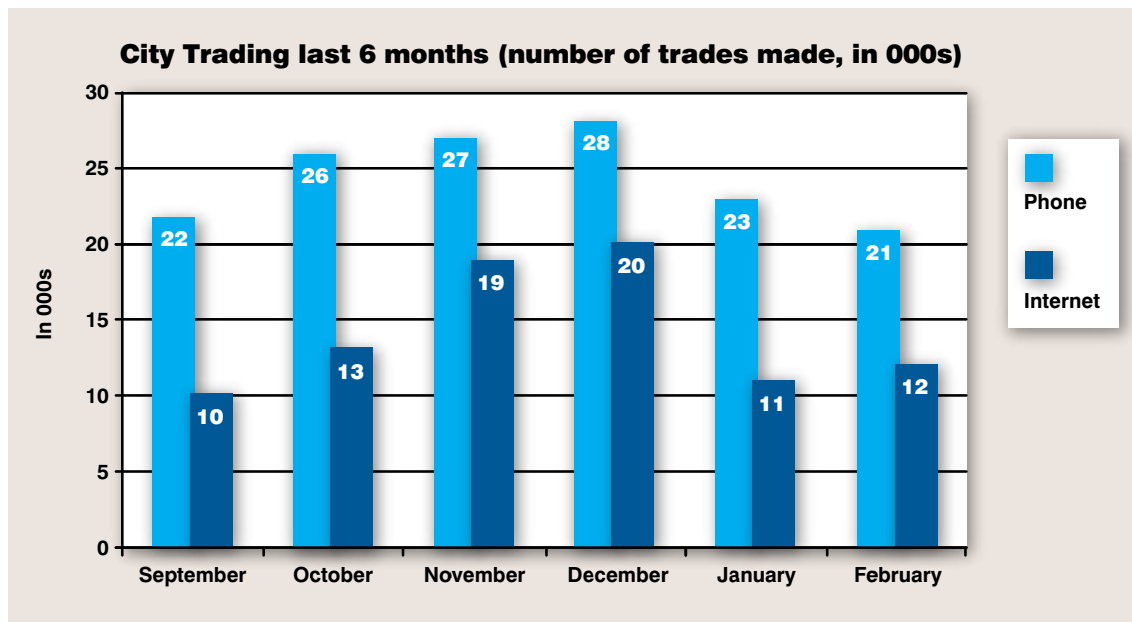
Ex1 **Between which two months was there the greatest change in the number of Internet trades made?**

Solution

We calculate the change in the number of Internet trades between months (in 000s):

Change = Number trades Month (n) – Number trades Month (n – 1)

Between	Change
September and October	3
October and November	6
November and December	1
December and January	-9
January and February	1

From this we can see the greatest change in the number of Internet trades occurred between December and January. As the Question only referred to change in the number trades and not whether the change should be positive or negative, the change in number between December and January is the correct answer.

Tip

▨ We should do these calculations mentally without resorting to a calculator. Once we have to resort to a calculator or pen and paper, we start losing time.

Answer

A	B	C	D	E
September and October	October and November	November and December	**December and January**	January and February

Ex2   **In September, approximately what proportion of the total number of trades was made up of Internet trades?**
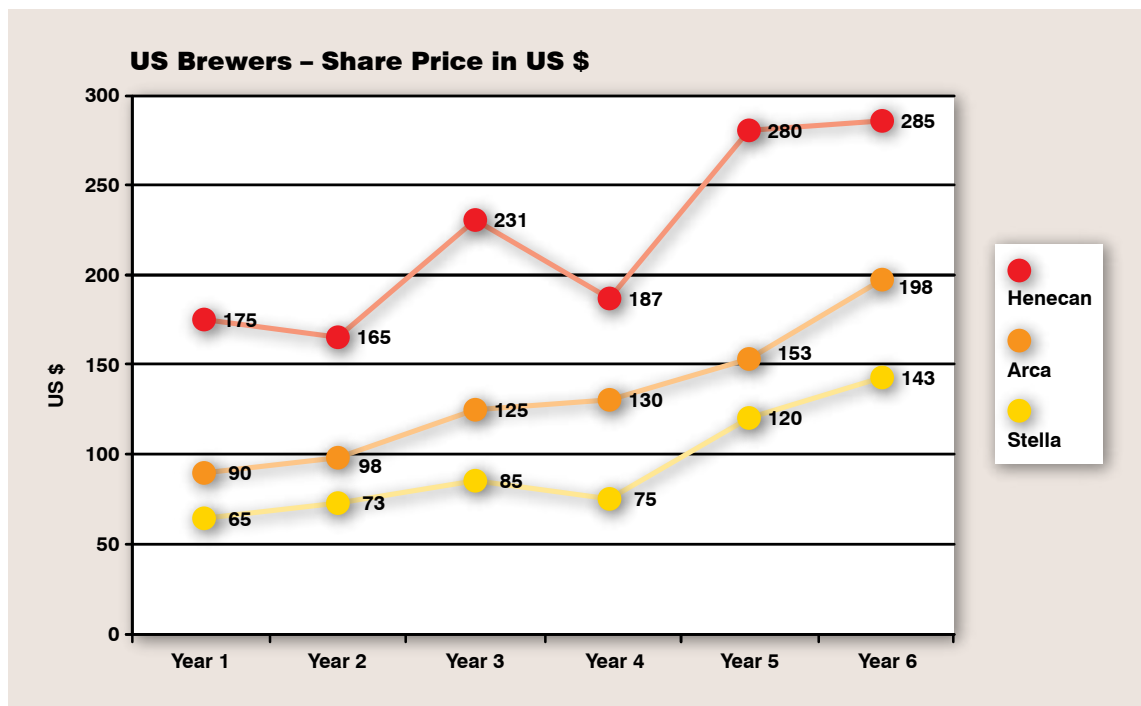
Solution

We consider September data.

We calculate what proportion of the total number of trades is made up of Internet trades (in 000s):

Proportion of trades = **Number of Internet Trades ÷ Total number of Trades**
         = **10 ÷ (10 + 22)**
         = **0.31 or 31%**

Answer

A	B	C	D	E
25%	**31%**	34%	37%	43%

Test Questions

US Brewers – Share Price in US $

1 **For how many years was the price of Arca shares closer to that of Stella than that of Henecan?**

Solution

We calculate the differences in share prices:

Year	Difference between Arca share price and Stella share price	Difference between Henecan share price and Arca share price
1	$90 – $65 = $25	$175 – $90 = $85
2	$98 – $73 = $25	$165 – $98 = $67
3	$125 – $85 = $40	$231 – $125 = $106
4	$130 – $75 = $55	$187 – $130 = $57
5	$153 – $120 = $33	$280 – $153 = $127
6	$198 – $143 = $55	$285 – $198 = $87

From these calculations we can see that the difference in share price between Arca and Stella is smaller than the difference in share price between Henecan and Arca for each of the 6 years. Thus the Arca share price is closer to the Stella share price for all of the 6 years.

Tip

◻ Visually inspecting the chart provided, we can see that Arca share price is closer to the Stella share price for all 6 years except, maybe, Year 4.
◻ A quick calculation shows that the Arca share price is closer to the Stella share price even for Year 4.
◻ Thus, the Arca share price was closer to the Stella share price for all 6 years.

Answer

A	B	C	D	E
2	3	4	5	**6**

2   **If the percentage increase in the Arca share price between Years 5 and 6 is doubled for the period Year 6 to 7, what will the value of the share price be in Year 7?**

Solution

We consider the Arca share price.
We calculate the percentage increase in share price between Year 5 and Year 6:

$$\begin{aligned}
\textbf{Percentage increase} &= \textbf{(Year 6 price – Year 5 price)} \div \textbf{Year 5 price} \times \textbf{100\%} \\
&= \textbf{(\$198 – \$153)} \div \textbf{\$153} \times \textbf{100\%} \\
&= \textbf{\$45/\$153} \times \textbf{100\%} \\
&= \textbf{0.2941} \times \textbf{100\% or 29.41\%}
\end{aligned}$$

The question indicates that the expected increase from Year 6 to Year 7 is double that of the increase from Year 5 to Year 6, an increase of (2 x 0.2941) = 0.58822.
The Year 7 share price is then:

$$\begin{aligned}
\textbf{Year 7 share price} &= \textbf{[\$198} \times \textbf{(1 + 0.58822)]} \\
&= \textbf{\$314.47}
\end{aligned}$$

The closest answer provided is $314.

Answer

A	B	C	D	E
$297	**$314**	$321	$328	$335

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3   **Between which two years did the percentage change in Stella's share price most closely match the percentage change in Henecan's share price?**

Solution

We compare the percentage change in share prices by considering the proportional change in share price between consecutive years per company (this makes the calculations faster without any loss of accuracy):

$$\textbf{Proportional change} = \textbf{(Share price Year n+1} \div \textbf{Share price Year n)}$$

Year	Stella proportional change	Henecan proportional change
Year 1 – Year 2	$73/$65 = 1.1231	$165/$175 = 0.9429
Year 2 – Year 3	$85/$73 = 1.1644	$231/$165 = 1.4
Year 3 – Year 4	$75/$85 = 0.8824	$187/$231 = 0.8095
Year 4 – Year 5	$120/$75 = 1.6	$280/$187 = 1.4973
Year 5 – Year 6	$143/$120 = 1.1917	$285/$280 = 1.0179

Comparing these values we see that the difference in proportional change in share price between Year 4 and Year 5 is the smallest and, thus, they are the closest match.

Tip

▪ A visual scan of the chart provided shows that the likely years would be, Year 4 to Year 5 or Year 5 to Year 6.
▪ We calculate the proportionate changes for these 2 time periods only, reducing the number of calculations necessary.

Answer

A	B	C	D	E
Year 1 to Year 2	Year 2 to Year 3	**Year 3 to Year 4**	Year 4 to Year 5	Year 5 to Year 6

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4   **If in the year prior to Year 1 the share prices of Henecan and Stella were both 10% higher, what was the actual difference in these share prices in that year?**

Solution

We calculate the share price for each company for the year prior to Year 1. Taking each company in turn, we calculate the 10% increase in share price as follows:

    Prior share price   =   1.1 × Company Year 1 share price

So,

Henecan:
Prior share price   =   1.1 × $175
                       = $192.5
Stella:
Prior share price   =   1.1 × $65
                       = $71.5

Now we calculate the difference in share price:

    Difference in share price   = $192.5 – $71.5
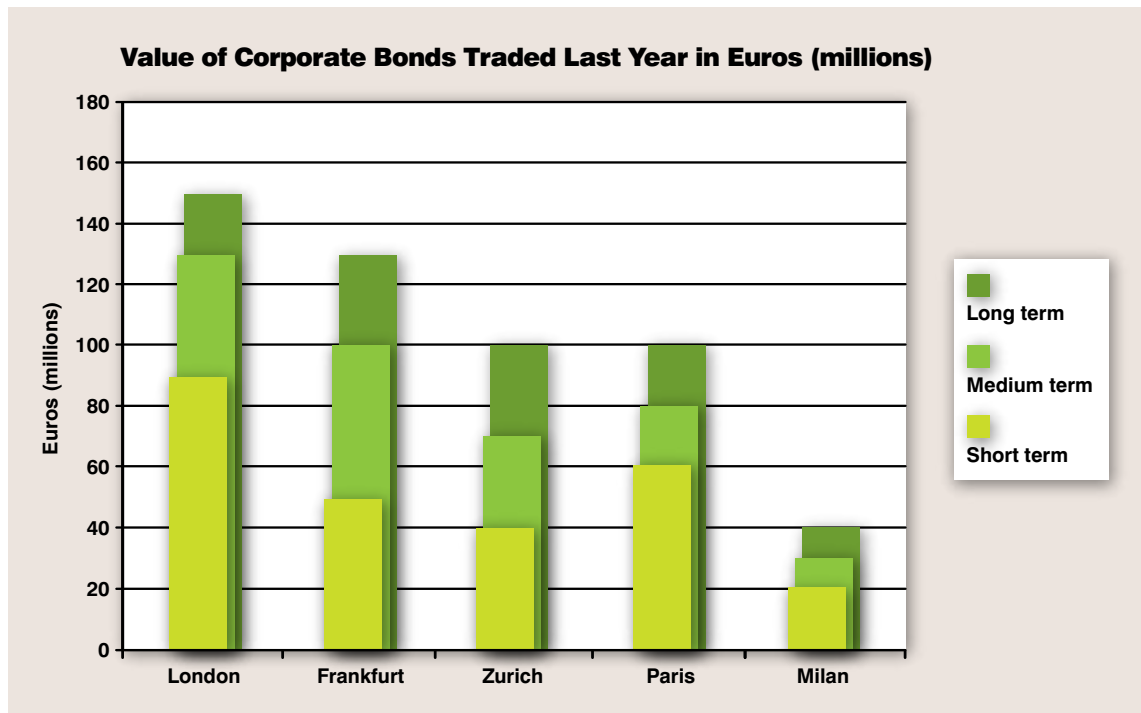   **= $121**

Tip

A faster way of calculating this value is to consider the increase in difference in share price.
We can do this as both share prices increase by the same amount, 10%.

    Difference in share price   =   ($175 – $65) × 1.1
                                       = $121

Answer

A	B	C	D	E
$121	$125	$131	$137	$142

Value of Corporate Bonds Traded Last Year in Euros (millions)

5   **What was the difference in the value of Medium Term Bonds trades in Frankfurt compared to Paris?**

Solution

We calculate the difference in value of Medium Term Bonds trades (in Euro millions):

Difference	**=**	**Value of trades in Frankfurt – Value of trades in Paris**
	=	**50 – 20**
	=	**30**

Answer

A	B	C	D	E
30 million Euros	40 million Euros	50 million Euros	60 million Euros	70 million Euros

6   **By how much did the total value of all Short Term Bonds traded exceed that of all Long Term Bonds traded?**

Solution

We calculate the difference in value of all Short Term Bonds traded and all Long Term Bonds traded (in Euro millions):

Difference	**=**	**total value Short Term Bonds – total value Long Term Bonds**
	=	**(90 + 50 + 40 + 60 + 20) – (20 + 30 + 30 + 20 + 10)**
	=	**150**

Answer

A	B	C	D	E
120 million Euros	130 million Euros	140 million Euros	**150 million Euros**	160 million Euros

7   **As a proportion of the location total, which location traded the fewest Medium Term Bonds?**

Solution

We calculate the value Medium Term Bonds traded as a proportion of the total Bonds Traded per Location. The Location with the smallest proportion is what we are looking for:

Proportion = Medium Terms Bonds traded ÷ Total Bonds traded

Location	Proportion
London	0.267
Frankfurt	0.385
Zurich	0.300
Paris	0.200
Milan	0.250

From this we can see that Paris, as a proportion, traded the fewest Medium Term Bonds.

Tip

■ To find the correct answer we have to look for a location where a small amount of Medium Bonds are traded and a large overall amount of Bonds.
■ This will provide a small proportion which is what we are looking for.
■ Looking at the chart provided, there are two likely locations: London and Paris.
■ Looking at the Paris trades and comparing to Paris we can see London should have at least a total value of trade over 200 million Euros to have a smaller proportion than Paris.
■ This makes Paris the answer.

Answer

A	B	C	D	E
London	Frankfurt	Zurich	**Paris**	Milan

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8   **Across these 5 locations, by what proportion would the volume of trading in Long Term Bonds have to increase in order to match the current volume of trading in Medium Term Bonds?**

Solution

We calculate the total volume of trading in both Long Term and Medium Term Bonds. We then calculate the percentage increase in trading of Long Term Bonds in order to match the current volume of trading in Medium Term Bonds.

Total Volume traded (working in millions of Euros):
Long Term   **= 110**
Medium Term   **= 150**
Percentage difference **= (150/110) × 100%**
                        = 36.4%

Answer

A	B	C	D	E
31.6%	33.5%	**36.4%**	38.1%	39.4%

Direct Wine Company: Annual Sales and Profit figures (in $000s)	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Total Sales	5,020	4,400	4,850	5,150	5,220	5,820
Total Profits = (Total Sales – Total Costs)	600	270	-230	-380	310	580

9 **In which year did Total Costs equal approximately 90% of Total Sales?**

Solution

We calculate the Total Costs and then the percentage this value is for each of the years (in $ 000s):

Total Costs   =   Total Sales – Total Profits

Year	Total Costs	As Percentage of Total Sales
Year 1	4420	88.0%
Year 2	4130	93.9%
Year 3	5080	104.7%
Year 4	5530	107.4%
Year 5	4910	94.1%
Year 6	5240	90.0%

From this we can see Year 6 is the correct answer.

Tip

■ Considering the table of data provided, we look for the year for which the Total Profits is 10% of the Total Sales.
■ We can ignore Year 3 and Year 4 as these do not have any profits and thus will have greater Costs than Sales.
■ We can see that Year 6 has a Total Profits that is 10% of Total Sales, which is what we are looking for.

Answer

A	B	C	D	E
Year 2	Year 3	Year 4	Year 5	**Year 6**

10 **In which one of the following years were Total Costs the highest?**

Solution

We calculate the Total Costs for each of the years and from this establish the year with the highest Total Costs (in $ 000s):

Year	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Total Costs	4420	4130	5080	5530	4910	5240

From this we can see Year 4 is the year with the highest Total Costs.

Tip

■ Looking at the data provided, we can see that Year 4 or Year 6 would have the highest Total Costs as these years have the highest Total Sales values.
■ For Year 4 we add $380,000 to the Total Sales to establish Total Costs.
■ Comparing this value of Total Costs to Year 6 Total Costs (Total Sales minus Total Profits) we see Year 4 is the correct answer.

Answer

A	B	C	D	E
Year 2	Year 3	**Year 4**	Year 5	Year 6

11   What was the average annual profit over the 6-year period?

Solution

We calculate the average profit over the 6-year period (in $ 000s):

Average Profit	=	**Total Profits ÷ 6**
	=	**(600 + 270 + (–230) + (–380) + 310 + 580) ÷ 6**
	=	**191.666**

Answer

A	B	C	D	E
$187,666	**$191,666**	$212,333	$223,133	$266,633

12   In Year 1, compared with the previous year, both Total Sales and Total Profits rose by 10% each. What were the Total Costs in the year prior to Year 1?
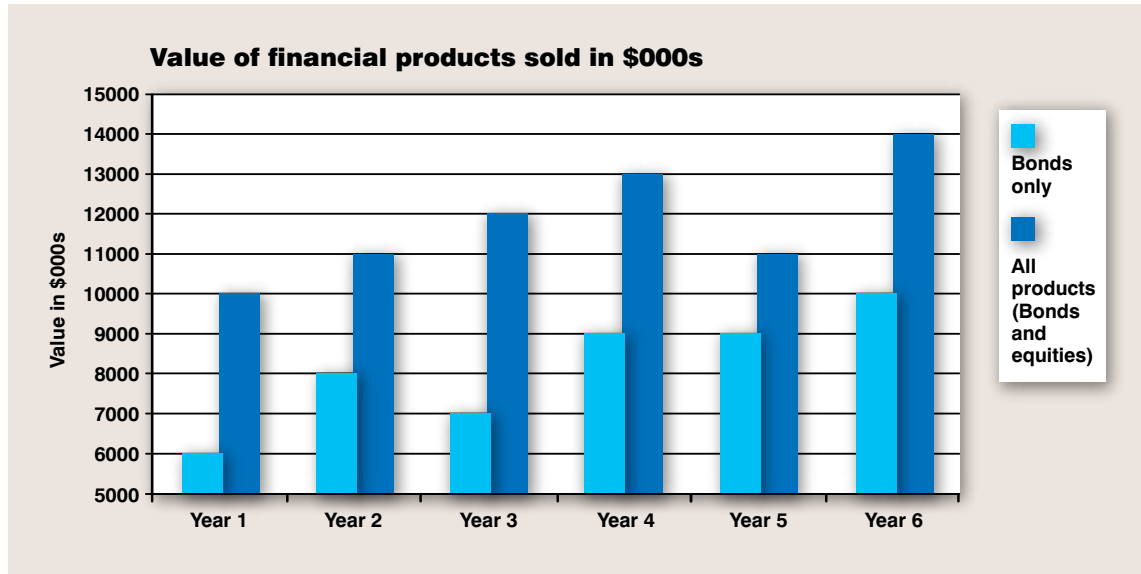
Solution

Working in $ 000s:

Both Total Sales and Total Profits are 10% less in the year prior to Year 1. From this we know that the Total Costs will also be 10% less than the Total Costs in Year 1. Total Costs in Year 1 were a bit less than 4,500. 10% less than this value is just under 4,050.

The answer is thus 4,018 or A.

Answer

A	B	C	D	E
$4,018,182	$4,096,000	$4,128,573	$4,282,000	$4,376,925

Value of financial products sold in $000s

Legend:
- Bonds only
- All products (Bonds and equities)

13 **What was the average value of Bonds sold per annum over the 6-year period?**

Solution

We calculate the average value of the Bonds Sold per annum over the 6-year period. (Considering the chart we have to remember that the "Value in $000s" does not start at 0 but 5000.) Working in $ 000s:

Average Value = (6000 + 8000 + 7000 + 9000 + 9000 + 10000) ÷ 6
= 8166

The answer closes to this value is C: $8.17 million.

Answer

A	B	C	D	E
$7.33 million	$7.83 million	**$8.17 million**	$8.53 million	$8.83 million

14   The biggest proportional increase in the sales of Equity products took place between which two years?

Solution

We calculate the proportional change in the Sales of Equities (in $ 000s):

> **Value of Equities sold   =   All Products – Bonds only**
> **Proportional Change   =   (Value Year n – Value Year n – 1) ÷ Value Year n – 1**

Year	Proportional change
Year 1 - Year 2	-0.25
Year 2 - Year 3	0.67
Year 3 - Year 4	-0.20
Year 4 - Year 5	-0.50
Year 5 - Year 6	1.00

From this we can see the biggest proportional increase in the sales of Equity products is Year 5 – Year 6.

Tip

▨ Visually inspecting the chart, we can see the only increases in the sales of Equity products were for Year 2 to Year 3 and Year 5 to Year 6.

▨ Year 2 to Year 3 has a change from 3 to 5 units.

▨ Year 5 to Year 6 has a change from 2 to 4 units. This is the time period with the greatest proportional increase.

Answer

A	B	C	D	E
Year 1 and Year 2	Year 2 and Year 3	Year 3 and Year 4	Year 4 and Year 5	**Year 5 and Year 6**

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15   In which year did Bonds represent the largest proportion of total financial products sold?

Solution

We calculate the proportion that Bonds represent of total financial products sold, for each year:

> **Proportion   =   Value Bonds ÷ total financial products sold**

Year	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Proportion	0.600	0.727	0.583	0.692	0.818	0.714

From this we can see that for Year 5 Bonds represented the largest proportion of total financial products sold.

Tip

▨ Visually inspecting the chart provided, we look for the year with smallest difference between all products and Bonds, and large values for both.

▨ Year 5 fits these criteria the best.

Answer

A	B	C	D	E
Year 2	Year 3	Year 4	**Year 5**	Year 6

16   **If in Year 7 the value of Bond products increases by 10% and the value of Equity products increase by 15%, what will the total value of sales be?**
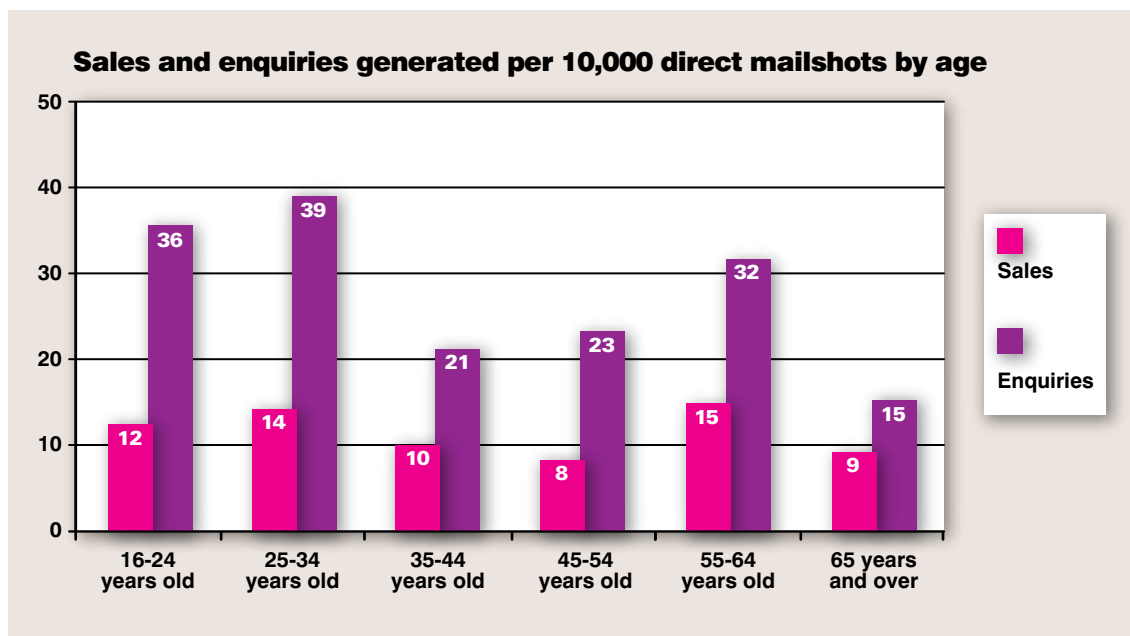
Solution

We calculate the increases in value for Bond products and Equity products and then add these together to calculate the total value of sales (in $ 000s):

> **Year 7:**
> | | | |
> |---|---|---|
> | **Value of Bond products** | = | 10000 × 110% |
> | | = | 11000 |
> | **Value of Equity products** | = | (14000 – 10000) × 115% |
> | | = | 4600 |
> | **Total value of sales** | = | 11000 + 4600 |
> | | = | 15600 |

Answer

A	B	C	D	E
$14.85 million	**$15.60 million**	$15.75 million	$17.25 million	$18.35 million

Sales and enquiries generated per 10,000 direct mailshots by age

Age (x-axis)	Sales	Enquiries
16-24 years old	12	36
25-34 years old	14	39
35-44 years old	10	21
45-54 years old	8	23
55-64 years old	15	32
65 years and over	9	15

17   Which age range shows the smallest number of sales per enquiry?

Solution

We calculate the number of sales per enquiry for each age range. From this we establish the age range with the smallest number of sales per enquiry:

Sales per enquiry   =   Sales ÷ Enquiries

Age Range	Sales per Enquiry
16-24 years old	0.333
25-34 years old	0.359
35-44 years old	0.476
45-54 years old	0.348
55-64 years old	0.469
65 years and over	0.600

From this we can see that the age range "16-24 years old" has the smallest number of sales per enquiry.

Tip

◼ Visually inspecting the chart provided we look for age ranges where the number of enquiries is large and the number of sales small.

◼ Age ranges "16-24 years old" and "25-34 years old" seem like the most likely candidates.

◼ We can see the number of sales per enquiry for "16-24 years old" is $1/3$. For the age range "25-34 years old" to have a smaller sale per enquiry ratio, the number of sales would have to be less than 13.

◼ The sales for this age range are 14.

◼ Thus the age range "16-24 years old" is the correct answer.

Answer

A	B	C	D	E
16-24 years	25-34 years	35-44 years	45-54 years	55-64 years

18   **Assuming 400,000 mail shots were sent out to 25-34 year olds, how many more enquiries would be generated compared to actual sales?**

Solution

We calculate the number of enquiries and actual sales generated by 400,000 mail shots. The chart provided indicates the data represented is for 10,000 mail shots, so we calculate the actual sales and enquiries generated using:

Actual Sales	=	**(400,000 ÷ 10,000) × 14**
	=	**560**
Enquiries	=	**(400,000 ÷ 10,000) × 39**
	=	**1,560**

Thus, a 1000 more enquiries are generated than actual sales.

Tip

▪ As the ratio of (400,000 / 10,000) is the same for both equations we need only multiply the difference between actual sales and enquiries by this ratio:

Difference between enquiries and sales	=	**(400,000 ÷ 10,000) × (39 – 14)**
	=	**1,000**

Answer

A	B	C	D	E
800	900	**1,000**	1,100	1,200

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19   **Last year there were 630 sales recorded for the 45-54 year old group. How many mail shots would have been sent out to reach this figure?**

Solution:

We calculate the number of mail shots by calculating how many batches of 10,000 would have had to be sent out to achieve 630 sales:

Number of batches	=	**630 ÷ 8**
	=	**78.75**
Number of mail shots	=	**78.75 × 10,000**
	=	**787,500**

Answer

A	B	C	D	E
630,500	625,000	685,500	760,000	**787,500**

20　**In one year, there were 1.9 million mail shots sent out to people aged 65 and over compared to 1.1 million mail shots sent out to people aged 16-24 years old. How many more sales were likely to have been made to people aged 65 and over?**

Solution:

We calculate the number of sales generated for each of the age ranges "65 years and older" and "16-24 years old" by the respective mail shots:

Sales for 65 years and over	=	**(1.9 million ÷ 10,000) × 9**
	=	**1,710**
Sales for 16-24 years old	=	**(1.1 million ÷ 10,000) × 12**
	=	**1,320**
Difference in sales generated	=	**1,710 – 1,320**
	=	**390**

Answer

A	B	C	D	E
270	336	**390**	484	533

Average Value of Euro (Eur)		
Currency	**Year 1**	**Year 2**
US Dollar ($)	1.28	1.05
Pound Sterling (£)	0.87	0.74
Japanese Yen (¥)	184	156
Swiss Franc (CHF)	1.98	1.80
Hong Kong Dollar (HK$)	12.70	10.20

21　**How many more Swiss Francs could have been purchased with 3000 Euros in Year 1 compared to Year 2?**

Solution

We calculate the number of Swiss Francs purchased with 3000 Euro for Year 1 and Year 2, and take the difference:

Swiss Francs bought Year 1	=	**3000 × 1.98**
	=	**5940**
Swiss Francs bought Year 2	=	**3000 × 1.80**
	=	**5400**
Difference	=	**5940 – 5400**
	=	**540**

Tip

▬ A faster way of calculating this value is to multiply the difference in exchange rates by 3000:

Difference	=	**3000 × (1.98 – 1.8)**
	=	**540**

Answer

A	B	C	D	E
435 Swiss Francs	450 Swiss Francs	485 Swiss Francs	540 Swiss Francs	570 Swiss Francs

22   **In Year 1, 200 Euros was used to purchase a holding of Japanese Yen. What would the value of this holding be if exchanged for HK$ in Year 2?**

Solution

We calculate the value of the holding in HK$ by calculating the value of the following exchanges:
200 EURO Year 1 —> Japanese Yen Year 1 —> Euro Year 2 —> Hong Kong Dollar Year 2.

Value of holding   = $200 \times 184 \times (1 \div 156) \times 10.20$
               =   HK$ 2,406

Answer

A	B	C	D	E
HK$ 2,313	**HK$ 2,406**	HK$ 2,511	HK$ 2,612	HK$ 2,709

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23   **Which currency strengthened the least against the Euro between Year 1 and Year 2?**

Solution:

We calculate the proportional change for each currency and from this establish the currency that strengthened the least:

Proportional change   =   (Value Year 2 ÷ Value Year 1) – 1

Currency	Proportional change
US Dollar	-0.18
Pound Sterling	-0.15
Japanese Yen	-0.15
Swiss Franc	-0.09
Hong Kong Dollar	-0.20

All of the currencies have appreciated against the Euro but the Swiss Franc has appreciated the least.

Answer:

A	B	C	D	E
US Dollar	Sterling	Yen	**Swiss Franc**	Hong Kong Dollar

24 **Between Year 1 and Year 2, the value of £ Sterling in relation to the Euro, moved:**

Solution

We calculate the change in value of the Pound Sterling in relation to the Euro from Year 1 to Year 2. We calculate this using:

$$\textbf{Percentage change} = \{[(1 \div \textbf{Year 2 Value}) - (1 \div \textbf{Year 1 Value})] \div (1 \div \textbf{Year 1 Value})\} \times 100\%$$

$$= \{[(1 \div 0.74) - (1 \div 0.87)] \div (1 \div 0.87)\} \times 100\%$$

$$= 17.6\%$$

Tip

▢ A way to understand this calculation is to consider the following, simplified scenario:

▢ In Year 1 a shirt costs $1.

▢ In Year 2 the same shirt costs $2.

▢ Looking at this we can see that the value of the shirt has increase 100% in relation to the Dollar:

$$\textbf{Change of value of the shirt} = [(\$2 - \$1) \div \$1] \times 100\%$$
$$= 100\%$$

▢ Conversely, the value of the Dollar has decreased 50% in relation to the shirt:

$$\textbf{Change of value of the Dollar} = \{[(1 \div \$2) - (1 \div \$1)] \div (1 \div \$1)\} \times 100\%$$
$$= -50\%$$

▢ We apply the same principle to calculate the change in value of the Pound Sterling in relation to the Euro by replacing the shirt with Euro and the Dollar with Pound Sterling.

Answer

A	B	C	D	E
Down 9.1%	Down 8.5%	Up 11.7%	Up 14.3%	**Up 17.6%**