# NUMERICAL TEST 2

# **Answer Booklet**

## **Example Questions**

Please note the correct answers are shown in **BOLD/COLOUR** 



# 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	r trades Month	(n) –	Number	trades	Month	(n – 1	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				
Α	В	С	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				
Α	В	C	D	E
25%	31%	34%	37%	43%

Photocopier service & running costs (assume 52 weeks per year, 13 weeks per quarter)						
Photocopier	Expected average	Actual spend (\$)	Actual spend (\$)			
	service & running cost	(Jan – March	(April – June			
	per week (\$)	qaurter)	qaurter)			
PHTCPR01	120	1,872	1,968			
PHTCPR02	125	1,975	1,425			
PHTCPR03	130	1,924	2,340			
PHTCPR04	160	2,400	2,112			
PHTCPR05	140	2,716	2,772			
PHTCPR06	175	3,605	2,730			

# By how much have the actual service and running costs for Photocopier PHTCPR06 exceeded those for Photocopier PHTCPR05 so far this year?

#### Solution

We need to calculate the actual running costs for Photocopier PHTCPR06 and PHTCPR05. We then subtract the value calculated for Photocopier PHTCPR05 from the value calculated for Photocopier PHTCPR06:

Va	lue Exceeded	= = =	<ul> <li>Actual Spend PHTCPR06 - Actual Spend Pl</li> <li>(3,605 + 2,730) - (2,716 + 2,772)</li> <li>3,605 + 2,730 - 2,716 - 2,772</li> <li>\$847</li> </ul>			end PH	TCPR05	
Answer								
A	B		C		D	E		
\$847	\$876		\$898		\$913	\$925		

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# On which photocopier is there the least amount of budget left to spend this year?

#### Solution

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We calculate the expected spend for the year per photocopier and subtract from this value the Actual Spend for that photocopier. The photocopier with the smallest difference will be the answer:

Photocopier	Expected spend	Actual Spend (to July)	Difference
PHTCPR01	6240	3840	2400
PHTCPR02	6500	3400	3100
PHTCPR03	6760	4264	2496
PHTCPR04	8320	4512	3808
PHTCPR05	7280	5488	1792
PHTCPR06	9100	6335	2765

#### Difference = (Average cost per week $\times$ 52) – Actual Spend

From this table we can see that Answer E, photocopier PHTCPR05 is the correct answer.

#### Tip:

Looking at the answers provided for Question 2 we can see PHTCPR06 is not a possible answer so we know we don't need to consider this photocopier in our calculations.

An alternative way for calculating the answer is:

For each of the remaining 5 photocopiers we compare the actual average weekly spend (to July) with the expected average weekly spend (for the year).

The photocopier with the greatest proportionate change between expected and actual average weekly spend will be the photocopier for which the actual spend has so far been the greatest, which would then be the photocopier with the least amount of budget left.

Example: For photocopier PHTCPR06,

Expected average weekly cost	=	\$140		
Actual average weekly cost	=	\$211.08		
Proportionate change	=	211.08 ÷ 140	=	1.51

#### Answer

Α	B	C	D	E
Photocopier	Photocopier	Photocopier	Photocopier	Photocopier
PHTCPR01	PHTCPR02	PHTCPR03	PHTCPR04	PHTCPR05

#### By what proportion should the service and running costs for Photocopier PHTCPR05 be increased next year if the actual spend recorded between January and June is a true reflection of service and running costs?

#### Solution

We calculate the percentage difference between the actual spend (to June) and the expected average spend (to June) for Photocopier PHTCPR05:

Percentage difference =  $[((2,716 + 2,772) - (140 \times 26)) \div (140 \times 26)] \times 100\%$ = 50.8%

This is the increase we are looking for.



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By how much is the annual spend on Photocopier PHTCPR01 likely to exceed that of Photocopier PHTCPR02 if the current spend recorded between January and June is a true reflection of actual service and running costs?

#### Solution

We calculate the difference in actual spend between the two photocopiers for the first six months. If the current spend is a true reflection, the spend in the next 6 months will be the same, so we double the difference calculated to get the answer:

Difference in actual spend =  $[(1,872 + 1,968) - (1,975 + 1,425)] \times 2$ = \$880





#### Note on Question 5 – Question 8

If we consider \$100 million as 100% the Total Fund Value will then be 160% or 1.6 times the percentage value. Thus the Total Fund Value of the UK holding will be  $1.6 \times 10 = 16$ , which is \$16 million. This ratio (1.6 per percentage point) can be used to speed up the calculations.

#### 5 What is the value of the Japanese holding in the Fund?

#### Solution

We calculate the value of the holding equivalent to 18% of the Total Fund Value (working in \$ millions):

Value Japanese holding =  $18\% \times 160$  = 28.8

#### Tip

See the note above.

#### Answer

AIISWEI				
Α	В	C	D	E
\$24.0 million	\$28.8 million	\$32.8 million	\$44.8 million	\$60.8 million

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#### Which of the following combinations of holdings has a value of \$40 million?

#### Solution

We calculate what percentage of Total Fund Value amounts to \$40 million. We then see which holdings' share add up to this value:

Percentage of Fund =  $(40 \div 160) \times 100\%$ = 25% UK holding and Europe holding add up to 25%.

#### Tip

See the note above Question 5.

Answer				
Α	B	C	D	E
Emerging Markets & S. E. Asia	Emerging Markets & UK	Europe & Japan	Europe & S. E. Asia	Europe & UK

# By how much do the value of the holdings in the US and Japan exceed that of the value of all the other holdin

We need to calculate the difference in percentage between the US/Japan holdings and all the other holdings combined. We then calculate value of \$160 million equivalent to this percentage:

Difference in percentage values Value equivalent to 12% (working in \$ millions)				38 + 18 - 15 - 12% 160 × 12% 19.2	12 – 7 – 10
Tip See the note a	bove Question 5.				
Answer					
Α	В	C	D	E	
\$16.4 million	\$18.8 million	\$19.2 million	\$22,8 million	\$26.4 million	

8

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#### Last year, the value of the S. E. Asia holding was 10% less than what it is now. What was the value of the S.E. Asia holding last year?

#### Solution

We calculate the value of the S.E. Asia holding and then calculate 90% of this to reach the answer (working in \$ millions):

Value of S.E. Asia holding	=	12% × 160
	=	19.2
90% of Value	=	90% × 19.2
	=	17.28

#### Тір

See the note above Question 5.

#### Answer

A	В	C	D	E
\$17.28	\$17.45	\$17.96	\$18.48	\$19.05
million	million	million	million	million

Actuarial Table: Frequency of Driver Accidents						
Age Range	Accident	Accidents per Year		million kilometre		
	Men	Women	Men	Women		
Under 18	0.46	0.27	50	52		
18-22	0.28	0.16	24	27		
23-29	0.13	0.09	10	15		
30-39	0.09	0.07	7	14		
40-49	0.08	0.06	7	12		
50-59	0.07	0.06	8	14		
60-69	0.05	0.05	8	13		
70 & over	0.06	0.04	12	12		

# In terms of kilometres driven, for which age range is the proportional difference between the number of accidents for men and women the greatest?

#### Solution

We calculate the proportional difference between the number of accidents for men and women for each age range (in Accidents per million kilometres):

#### Proportional Difference = (Accidents Women – Accidents Men) ÷ Accidents Men

Age Range	Proportional Difference
Under 18	0.040
18-22	0.125
23-29	0.500
30-39	1.000
40-49	0.714
50-59	0.750
60-69	0.625
70 & over	0.000

From this we can see that the greatest proportional difference is for the age range 30-39.

#### Tip

From the answers provided we can ignore the proportionate differences for age ranges before 30-39.
 From the table provided for the question, a quick scan of the numbers involved should show that the range 30-39 is the answer. The easiest way to see this is to consider the equation:

#### Proportionate change = Accidents Women ÷ Accidents Men

For the numbers provided, these are all greater than 1. The proportionate difference is simply the Proportionate change minus 1.

Answer				
Α	В	C	D	E
30-39	40-49	50-59	60-69	70 & over

#### How many more accidents in a year will a group of a thousand 18-22 year old men be likely to have compared with a group of a thousand 18-22 year old women?

#### Solution

We consider the accidents per year for the age range 18-22. We first calculate the number of accidents for a group of thousand men and thousand women, and then calculate the difference:



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# In terms of accidents per year, to what extent do women aged 40-49 have fewer accidents than men aged 23-29?

#### Solution

We consider the accidents per year for women aged 40-49 and men aged 23-29. We calculate the percentage difference in accidents between men aged 23-29 and women aged 40-49, relative to the number of accidents for men aged 23-29:

Percentage difference =  $[(0.06 - 0.13) \div 0.13] \times 100$ = -53.8%

The answer provided closest to this value is C: 54% less.



# 12 How many kilometres approximately does the average 18-22 year old woman drive per year?

#### Solution

We consider woman in the age range 18-22 years. First we calculate the number of kilometres per accident. We then calculate what proportion of those kilometres will be driven in a year using the fact that only 0.16 accidents happen for women in the age group per year:

Number Proportie Answer	Number of kilometres per accident Proportion of this driven in a year		= 1,000,000 ÷ 27 = 37,037 × 0.16		37,037 km 5,926 km
Α	В	C	D	Ξ	
4,884 km	4,929 km	5,246 km	5,624 km	5,926 kr	n



#### 13 Which quarter saw the greatest range in the value of the FTSE 100?

#### Solution

We calculate the range for each of the quarters and from this establish the greatest range:

Quarter	Range
1	600
2	550
3	700
4	350
5	350
6	400

From this we see the greatest range is in Quarter 3

#### Тір

From the answers provided we see we can ignore Quarter 6.

From the graph provided we can see that the range for Quarter 3 is the largest by considering the length of the line connecting minimum and maximum values.

We can confirm this by checking the actual value difference between minimum and maximum for this Quarter and comparing it to some of the other Quarters if necessary.

Answer				
Α	В	C	D	E
Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 5

# 14 Between which two quarters was there the smallest proportional change in the median value of the FTSE 100?

#### Solution

We calculate the proportional change in median value between each quarter respectively:

<b>Proportional change</b>	=	(Median 2 – Median 1) ÷ Median 1
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Between	Proportional change
Q1-Q2	0.037
Q2-Q3	0.068
Q3-Q4	-0.105
Q4-Q5	0.075
Q5-Q6	0.035

From this we see Quarter 5 to Quarter 6 has the smallest proportional change.

#### Tip:

For the smallest proportional change we are looking for a small change and large median values.

Both Q1-Q2 and Q5-Q6 fit this requirement and both have a difference in median value of 200.

The median value of Q5 is larger than the median value of Q1 so Q5-Q6 would be our answer.

Α	В	C	D	E
Quarter 1 to	Quarter 2 to	Quarter 3 to	Quarter 4 to	Quarter 5 to
Quarter 2	Quarter 3	Quarter 4	Quarter 5	Quarter 6

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# If in Quarter 7, the minimum value of the FTSE 100 increases by 15% but the maximum value increases by 20%, what will the difference be between the minimum and maximum value for that quarter?

#### Solution

We calculate the increased minimum and maximum values for Quarter 7 from the Quarter 6 values. We then calculate the difference between the two values:

F	or Q7:					
	Increased m	aximum valu	ie =	Q6 maximu	m × 120%	
			=	6100 × 120	%	
			=	7320		
Increased minimum value				Q6 minimum $ imes$ 115%		
			=	5700 × 115%		
			=	6555		
D	ifference in Q7	minimum and	d maximu	m value:		
	Difference		=	7320 - 655	5	
			=	765		
Answei	r i i i i i i i i i i i i i i i i i i i					
A	В	C		D	E	
745	755	760		765	775	

#### 16 The median value of the FTSE 100 is expected to increase by 3% per quarter for the next 4 quarters, what will the median value be in Quarter 10?

#### Solution

We need to calculate the compound increased median value over 4 quarters from Q6 to Q10:

Increase Answer	d median value	= = =	Q6 med 5950 × 6697	lian × (1.03)⁴ 1.1255	
Α	В	C		D	E
6,656	6,683	6,697		6,714	6,725

Average Value of US Dollar (\$)					
Currency	Year 1	Year 2			
Euro (Eur)	0.78	0.64			
Pound Sterling (£)	0.53	0.45			
Japanese Yen (¥)	112.00	95.00			
Swiss Franc (CHF)	1.21	1.10			
Hong Kong Dollar (HK\$)	7.75	6.20			

#### 17 How much was a Japanese Yen worth in US dollars in Year 1?

#### Solution

Considering Year 1 we know that 1 US Dollar is worth 112 Japanese Yen. We calculate the inverse to establish how much 1 Japanese Yen is worth in terms of US Dollars:

US Dollars per Japanese Yen = 1 ÷ 112 = 0.0089

Answer						
Α	В	C	D	E		
\$0.0009	\$0.0089	\$0.011	\$0.089	\$0.105		

18

# How much more $\mathfrak{L}$ Sterling could have been purchased with 2000 US Dollars in Year 1 compared to Year 2?

#### Solution

Considering Pound Sterling, we calculate how the difference in how much £ Sterling 2000 US Dollars can purchase for Year 1 and Year 2:

Difference =  $2000 \times (Pound Sterling Year 1 - Pound Sterling Year 2)$ =  $2000 \times (0.53 - 0.45)$ = 160Answer A B C D E £ 145 £ 150 £ 155 £ 160 £ 165

#### 19 Between Year 1 and Year 2, how did the value of the Swiss Franc move in percentage terms in relation to the US dollar?

#### Solution

We calculate the change in value of the Swiss Franc in relation to the US Dollar from Year 1 to Year 2. We calculate this using:

Percentage change = {[(1 ÷ Year 2 Value) – (1/Year 1 Value)] ÷ (1 ÷ Year 1 Value)} × 100%  $= \{ [(1 \div 1.10) - (1 \div 1.21)] \div (1 \div 1.21) \} \times 100\%$ = 10%

Answer E: Up 9.1% is the closest answer to this value.

#### Tip

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

```
In Year 1 a shirt costs $1.
```

Change of value of the shirt

Change of value of the Dollar

In Year 2 the same shirt costs \$2.

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

 $= [(\$2 - \$1) \div \$1] \times 100\%$ 100% =

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

$$= \{ [(1 \div \$2) - (1 \div \$1)] \div (1 \div \$1) \} \times 100\% \\ = -50\%$$

We apply the same principle to calculate the change in value of the Swiss Franc in relation to the US Dollar by replacing the shirt with a US Dollar and the Dollar with Swiss Franc.

Answer:				
Α	В	C	D	E
Down 9.1%	Down 8.3%	Down 1.7%	Up 8.3%	<b>Up 9.1%</b>

=

#### 20 In Year 1, US\$ 200 was used to purchase a holding of Euros. What would the value of this holding be if exchanged for HK\$ in Year 2?

#### Solution:

We have to calculate a series of conversions to get to the answer:

In terms of exchange values this series of conversions is:

$$200 \longrightarrow 200 \times 0.78 \longrightarrow (200 \times 0.78) \div 0.64 \longrightarrow [(200 \times 0.78) \div 0.64] \times 6.2$$

So, putting that together:

200 US Dollar (Year 1) in HK\$ (Year 2) = 
$$[(200 \times 0.78) \div 0.64] \times 6.2$$
  
= HK\$ 1,511





#### Assuming there were 1,250,000 insurance policies issued annually in Europe to cover the Manufacturing sector, how many claims would be expected per year?

#### Solution

Considering cover for the Manufacturing sector, we know that 20 claims are made in Europe per 100,000 policies. We calculate the number of 100,000 policies in 1,250,000 policies and multiply by the number of claims per year:

Number of expected claims =  $(1,250,000 \div 100,000) \times 20$ = 250



#### 22 Comparing the USA with Europe, which business sector has the most similar number of claims on a proportional basis?

#### Solution

We consider the proportional difference between claims per 100,000 for USA and Europe, for each industry:

Proportional difference = |(claims USA – claims Europe)| ÷ |(claims USA + claims Europe)|

Sector	Proportional difference
Construction	0.06
Hotels & Restaurants	0.14
Transport & Distribution	0.09
Manufacturing	0.07
Agriculture & Fishing	0.11
Other	0.29

From this we can see that Construction has the most similar number of claims

#### Tip:

We could have derived the answer by looking at the chart provided.

We are looking for a small difference in claims and a large number of total claims.

As the differences for all sectors are either 3 or 4, we can see that Construction has by far the largest number of claims (considerably more than the others).

This sector will thus give us the smallest proportional difference.

#### Answer

 A
 B
 C
 D
 E

 Construction
 Hotels & Transport & Manufacturing Restaurants
 Agriculture & Fishing

23 There are on average 6 times as many claims made per annum in the USA compared to Europe in the Transport & Distribution sector. How many more

policies are issued in the US compared to Europe in this sector?

#### **Solution:**

We consider the Transport & Distribution sector. If we assume only 15 claims have been made in Europe for this sector for the year, we can fix the number of policies sold in Europe to 100,000.

On average 6 times as many claims are made per annum in the USA compared to Europe which amounts to 90 claims (6 x 15).

From this we know that the number of policies sold in the USA is:

Number of policies sold =  $(90 \div 18) \times 100,000$ = 500,000

From this we know that 5.0 times more policies were sold in the USA compared to Europe.

Answer						
Α	В	C	D	E		
3.3 times	4 times	4.3 times	5.0 times	5.5 times		
as many	as many	as many	as many	as many		

#### 24 Last year there were 630 claims made in the USA against policies written out in the Agriculture & Fishing sector. How many policies were issued that year for that sector?

#### Solution

We consider the Agriculture & Fishing sector in the USA. We calculate the number of policies issued that year using the fact that 21 claims were made per 100,000 policies sold. This number of policies sold for 630 claims to be made is:

Number of policies sold =  $(630 \div 21) \times 100,000$ = 3,000,000

Answer:				
Α	В	C	D	E
2,670,000	3,000,000	4,330,000	5,000,000	6,300,000

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