

Intermediate Level

## Management Accounting – Performance Management

# 8

# *IMPM*

26 May 2004

Wednesday afternoon

### INSTRUCTIONS TO CANDIDATES

Read this page before you look at the questions

You are allowed three hours to answer this question paper.

Answer the ONE question in Section A (this has 10 sub-questions and is on pages 2 – 8).

Answer the ONE question in Section B (this is on pages 10 and 11).

Answer ONE question ONLY from Section C (these questions are on pages 12 – 15).

Answer ONE question ONLY from Section D (these questions are on pages 16 and 17).

Maths Tables and Formulae are provided on pages 19 – 21.

Write your full examination number, paper number and the examination subject title in the spaces provided on the front of the examination answer book. Also write your contact ID and name in the space provided in the right hand margin and seal to close.

Write your full examination number on the special answer sheet for Section A which is on page 3 of this question paper booklet.

Detach the sheet from the booklet and insert it into the examination answer book before you hand it to the invigilator.

Tick the appropriate boxes on the front of the answer book to indicate which questions you have answered.

TURN OVER

SECTION A – 20 MARKS

ANSWER ALL TEN SUB-QUESTIONS – 2 MARKS EACH

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Each of the sub-questions numbered from **1.1** to **1.10** inclusive, given below, has only ONE correct answer.

**Required:**

On the SPECIAL ANSWER SHEET opposite, place a circle “O” around the letter that gives the correct answer to each sub-question.

If you wish to change your mind about an answer, block out your first answer completely and then circle another letter. You will not receive marks if more than one letter is circled.

Please note that you will not receive marks for any workings to these sub-questions.

***You must detach the special answer sheet from the question paper and attach it to the inside front cover of your answer book before you hand it to the invigilators at the end of the examination.***

**Question One**

- 1.1** GA is the Project Manager of X Ltd where he earns an annual salary of \$60,000. He has just identified an unexpected opportunity to undertake an extra project that he could supervise within his existing workload. The project would take one month to complete.

The project would also need a Marketing Manager, but the Marketing Manager of X Ltd, who earns an annual salary of \$36,000, is extremely busy and she does not have any spare time. However, it would be possible to hire a temporary manager for \$3,700 to cover her regular duties for the duration of the project. Alternatively, a marketing consultant could be hired for the project for \$4,500.

The total relevant cost of the Project Manager and a Marketing Manager for the extra project would be

- A** \$3,700                      **B** \$4,500                      **C** \$8,000                      **D** \$9,500
- 

*Section A continues on page 5*

**Management Accounting  
Performance Management**

MAY 2004 EXAMINATION

SPECIAL ANSWER SHEET FOR SECTION A

Write your full examination number below:

Centre Code:				
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Venue Code:			
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Desk Number:				
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<b>1.1</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>
<b>1.2</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>
<b>1.3</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>
<b>1.4</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>
<b>1.5</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>
<b>1.6</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>
<b>1.7</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>
<b>1.8</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>
<b>1.9</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>
<b>1.10</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>

**You must detach the special answer sheet from the question paper and attach it to the inside front cover of your answer book before you hand it in to the invigilators at the end of the examination.**

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- 1.2 A company provides three services that use the same machine, M1. The budgeted details per service are as follows:

	<i>Service X</i>	<i>Service Y</i>	<i>Service Z</i>
	<i>£ per unit</i>	<i>£ per unit</i>	<i>£ per unit</i>
Selling price	12	14	24
Variable costs	6	4	13
Fixed cost	<u>2</u>	<u>5</u>	<u>8</u>
Profit	<u>4</u>	<u>5</u>	<u>3</u>
Number of M1 machine hours	2	3	6

The fixed costs are general fixed costs that have been absorbed by the services by their direct labour content.

If M1 hours are scarce, the most and least profitable services are:

	<i>Most profitable</i>	<i>Least profitable</i>
<b>A</b>	Y	Z
<b>B</b>	Z	X
<b>C</b>	Y	X
<b>D</b>	X	Z

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*Section A continues on the next page*

TURN OVER

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The following data are to be used to answer questions 1.3 and 1.4 below

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The following extract from a standard cost card shows the materials to be used in producing 100 litres of an agricultural fertiliser:

Material H	30 litres	@ \$4.00 per litre
Material J	50 litres	@ \$3.50 per litre
Material K	<u>40 litres</u>	@ \$6.50 per litre
	<u>120</u>	

During April 5,400 litres of the agricultural fertiliser were produced using the following materials:

Material H	1,860 litres
Material J	2,450 litres
Material K	<u>2,740 litres</u>
	<u>7,050</u>

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**1.3** The total material mix variance to be reported for April is nearest to

**A** \$2,636 (A).      **B** \$1,219 (A).      **C** \$1,219 (F).      **D** \$2,636 (F).

---

**1.4** The total material yield variance to be reported for April is nearest to

**A** \$2,636 (A).      **B** \$1,219 (A).      **C** \$1,219 (F).      **D** \$2,636 (F).

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**1.5** In a processing company, the information that is needed to determine the financial viability of further processing a product before resale is:

- (i) the product's sale value immediately after further processing;
- (ii) the product's sale value before further processing;
- (iii) the incremental fixed costs of the further processing;
- (iv) the variable costs of further processing;
- (v) the common fixed costs absorbed into the further process;
- (vi) the cost of the product prior to further processing.

- A** (i), (ii) and (iv) only.
  - B** (i), (ii), (v) and (vi) only.
  - C** (i), (ii), (iii) and (iv) only.
  - D** All of the above.
-

- 1.6** Q plc operates a process that converts a mix of chemicals into paint. A normal process loss equal to 15% of material input is expected in the process. The following data relates to April:

Opening work in process	4,050 litres, complete as to materials but only 60% converted
Materials input	45,600 litres
Output	39,460 litres
Closing work in process	7,630 litres, complete as to materials but only 35% converted

The total number of equivalent material units to be used to calculate the cost per unit using a FIFO basis of valuation is

- A** 36,760.      **B** 38,760.      **C** 40,810.      **D** 42,810.
- 

- 1.7** A passenger transport company has developed the following formula to forecast the fuel cost to be included in its monthly budget:

$$Y = 10M - 0.4P + 5,000$$

where Y is the total fuel cost (\$) per month

M is the number of miles travelled per month

P is the number of passengers carried per month

The budgeted and actual miles travelled and passengers carried for April were as follows:

	<i>Budget</i>	<i>Actual</i>
Miles travelled	10,000	9,450
Passengers	6,000	6,050

The actual total cost of the fuel for April was \$99,035.

The total fuel cost variance to be reported for April is

- A** \$3,565 (F).      **B** \$1,955 (F).      **C** \$1,955 (A).      **D** \$3,565 (A).
- 

- 1.8** M plc prepared the following flexible budget for April:

Activity (% of capacity)	75%	85%	90%
Total costs	\$33,500	\$35,500	\$36,500

Budgeted capacity for the month was 60,000 machine hours.

If the actual activity in April was 50,000 machine hours, the budget cost allowance for April (to the nearest \$1,000) would have been

- A** \$18,000.      **B** \$20,000.      **C** \$35,000.      **D** \$38,000.
- 

*Section A continues on the next page*

TURN OVER

**1.9** K plc produces three products whose contribution to sales ratios are as follows:

	<i>Contribution / Sales ratio</i>	<i>Selling price per unit</i>
Product K	40%	\$30
Product L	30%	\$20
Product M	60%	\$10

It has budgeted to sell these items in equal quantities in order to achieve its monthly sales target of \$60,000.

The level of monthly fixed costs at which K plc would break even is

- A** impossible to calculate without further information.
  - B** \$24,000.
  - C** \$26,000.
  - D** \$36,000.
- 

**1.10** H Limited uses a combination of regression analysis and time series analysis to predict its future sales volumes. An analysis of past data has shown that the underlying trend of the company's sales is well represented by the formula:

$$Y = 100X + 2,400$$

where Y is the total sales units for a period; and

X is the quarterly period number

The seasonal variation index values based on the same past data is:

Quarter 1	105%
Quarter 2	96%
Quarter 3	90%
Quarter 4	109%

The increase in budgeted sales volumes between quarter 3 and quarter 4 next year, which are periods 17 and 18, will be

- A** 100 units.
  - B** 119 units.
  - C** 432 units.
  - D** 888 units.
- 

*(Total = 20 marks)*

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*End of section A*



*Section B is on the next two pages*

TURN OVER

SECTION B – 30 MARKS

ANSWER THIS QUESTION, showing supporting calculations where appropriate

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**Question Two**

QBD plc produces souvenirs for international airline operators. The company uses a standard absorption costing system. The standard cost card for one of QBD plc's souvenirs is as follows:

		£
Materials	1.5 kg	6.00
Labour	1.6 hours	8.00
Overheads:		
Variable	1.6 hours	4.00
Fixed	1.6 hours	<u>12.00</u>
Total cost		<u>30.00</u>
Selling price		40.00

Production and sales information for April:

	<i>Budget</i>	<i>Actual</i>
Production	5,000 units	6,000 units
Sales	5,000 units	4,300 units
Sales revenue	£200,000	£164,800

The resources used and actual costs for April were as follows:

		£
Materials	10,300 kgs	38,720
Labour	11,420 hours	71,200
Overhead:		
Variable		29,650
Fixed		83,800

The 11,420 labour hours include 2,270 hours of idle time. This was caused by an unexpected machine breakdown.

All of the materials purchased were used during the month.

*Question Two's requirements are on the next page*

**Required:**

- (a) Calculate the budgeted profit/loss for April. (2 marks)
- (b) Calculate the actual profit/loss for April. (6 marks)
- (c) Prepare a statement that reconciles the budgeted and actual profits/losses for April 2004 in as much detail as is possible. (15 marks)
- (d) Calculate the actual profit/loss that would be reported by QBD plc if it used marginal costing. (2 marks)
- (e) Explain with relevant calculations how the reconciliation statement that you prepared would have been different if QBD plc used standard marginal costing instead of standard absorption costing. (5 marks)
- (Total = 30 marks)
- 

*Section C starts on the next page*

TURN OVER

SECTION C – 25 MARKS

ANSWER ONE QUESTION ONLY [EITHER question three OR question four, BUT NOT BOTH], showing supporting calculations where appropriate

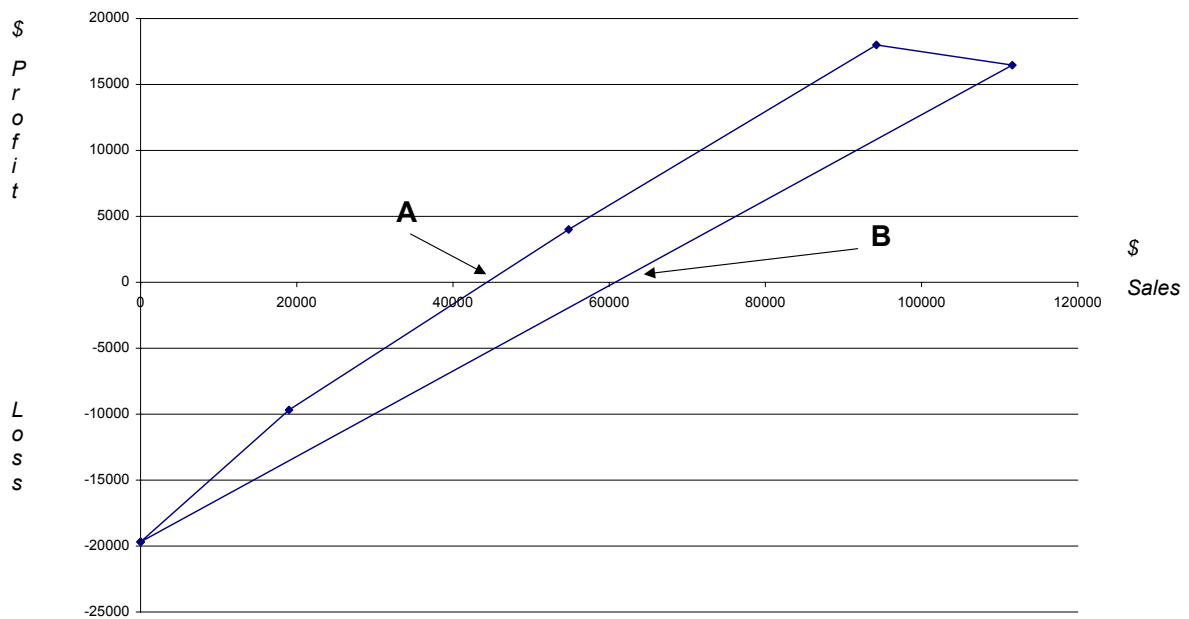
**Question Three**

RDF Limited offers four services to television companies. The number of services provided is measured in service units and details of RDF Limited's draft budget for its year ending 30 June 2005 are as follows:

	Service K	Service L	Service M	Service N
Number of service units	1,000	2,300	1,450	1,970
Selling price per unit (\$)	18	16	12	20
Variable cost per unit (\$)	8	10	13	13
Fixed cost per unit (\$)	2	3	2	4

The budgeted level of activity shown in the table above has been based on fully meeting the forecasted market demand for each type of service.

The following chart has been prepared based on the draft budget above:



*[Question Three continues on the next page]*

**Required:**

- (a) Explain the meaning of the values shown as points A and B on the chart.  
[Note: calculations are *not* required.]

(4 marks)

- (b) Further investigation into the nature of the fixed costs has shown that some of those shown in the original budget are incurred as a direct result of providing specific services as follows:

	\$
Service K	4,400
Service L	3,700
Service M	nil
Service N	2,650

The remaining budgeted fixed costs are general fixed costs that will be incurred regardless of the type and number of services provided.

RDF Limited entered into a three-year contract in June 2002 which requires it to provide 500 units of service M per year or suffer significant financial penalties. These services are included in the budgeted demand.

**Required:**

- (i) Evaluate the financial viability of each of the four services currently provided.

(6 marks)

- (ii) Recommend the operating plan that will maximise profit for the year ended 30 June 2005. Explain the assumptions that led to your decision and other factors that should be considered.

(5 marks)

- (iii) Present in good style a budget profit statement based on your recommendation in answer to (b) (ii).

(5 marks)

- (iv) Calculate the overall breakeven sales value for the operating plan you have recommended in answer to (b) (ii), stating clearly the assumptions made in your calculations.

(5 marks)

(Total = 25 marks)

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*Section C continues on the next page*

TURN OVER

#### Question Four

ST plc produces three types of processed foods for a leading food retailer. The company has three processing departments (Preparation, Cooking and Packaging). After recognising that the overheads incurred in these departments varied in relation to the activities performed, the company switched from a traditional absorption costing system to a budgetary control system that is based on activity based costing.

The foods are processed in batches. The budgeted output for April was as follows:

	<i>Output</i>
Food A	100 batches
Food B	30 batches
Food C	200 batches

The number of activities and processing hours budgeted to process a batch of foods in each of the departments are as follows:

	<i>Food A</i>	<i>Food B</i>	<i>Food C</i>
	<i>Activities per batch:</i>	<i>Activities per batch:</i>	<i>Activities per batch:</i>
Preparation	5	9	12
Cooking	2	1	4
Packaging	15	2	6
Processing time	10 hours	375 hours	80 hours

The budgeted departmental overhead costs for April were:

	<i>Overheads</i>
	<i>\$</i>
Preparation	100,000
Cooking	350,000
Packaging	50,000

#### **Required:**

(a) For food A ONLY, calculate the budgeted overhead cost per batch:

- (i) using traditional absorption costing, based on a factory-wide absorption rate per processing hour; and
- (ii) using activity based costing.

**(6 marks)**

(b) Comment briefly on the advantages of using an activity based costing approach to determining the cost of each type of processed food compared to traditional absorption costing approaches. You should make reference to your answers to requirement (a) where appropriate.

**(4 marks)**

***[Question Four continues on the next page]***

(c) The actual output for April was:

	<i>Output</i>
Food A	120 batches
Food B	45 batches
Food C	167 batches

***Required:***

Prepare a flexed budget for April using an activity based costing approach. Your statement must show the total budgeted overhead for each department and the total budgeted overhead absorbed by each food.

*(10 marks)*

(d) Discuss the advantages that ST plc should see from the activity based control system compared to the traditional absorption costing that it used previously.

*(5 marks)*

*(Total = 25 marks)*

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*End of Section C*

*Section D is on the next two pages*

TURN OVER

## SECTION D – 25 MARKS

ANSWER ONE QUESTION ONLY [EITHER question five OR question six, BUT NOT BOTH]

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### Question Five

Z Limited produces signs and labels for a number of businesses. Some of the signs are produced on vinyl and then fixed to vehicles and display panels whereas others are produced on metal and fixed to machinery and equipment to indicate how they are to be operated safely.

Presently Z Limited holds stocks of raw materials (vinyls, metals and inks) and controls the level of stock using a stock control system that involves the setting and monitoring of minimum, maximum and re-order stock levels for each stock item. There are also some specialist materials that are bought from suppliers as required.

Z Limited uses a number of suppliers, some of whom are based overseas. The Purchasing Manager of Z Limited is responsible for negotiating prices and contracts with suppliers for all of the materials used by the company. The performance of the manager is monitored as part of Z Limited's responsibility accounting system.

The Managing Director has recently returned from a conference on best practice where one of the speakers mentioned the use of Just In Time (JIT). The Managing Director seeks your advice, and has asked you to prepare a report that can be discussed at the next Board meeting.

#### **Required:**

- (a) Prepare a report, addressed to the Board of Directors of Z Limited, that
- (i) describes the key features of a JIT system both for purchasing of raw materials and for their conversion into finished items for customers;  
(3 marks)
  - (ii) identifies the advantages and disadvantages of operating a JIT system;  
(4 marks)
  - (iii) explains the changes in working practices that would be necessary for a JIT system to succeed.  
(6 marks)
- (Total for requirement (a) = 13 marks)**
- 

(b) For some time the managers of Z Limited have complained that the responsibility accounting system is unfair. Managers are given targets that have been set by the Board of Directors and are expected to achieve the targets regardless of the level of actual activity and any changes that may have occurred since the targets were set.

#### **Required:**

- (i) Explain the meaning of responsibility accounting.  
(3 marks)
  - (ii) Discuss the implications of the scenario described in (b) and describe the changes that could be made to improve acceptance by managers of the responsibility accounting system.  
(9 marks)
- (Total = 25 marks)**
-



### Question Six

W Limited was formed five years ago by its current Managing Director to provide specialised holidays and tours. The company has grown rapidly over those years and now has offices in three different parts of the world and employs over 100 staff.

All of the managers are required to attend the company's annual conference. At the conference, the Managing Director presents the company's annual plan and gives each of the managers their financial targets for the forthcoming year.

A number of the managers are becoming dissatisfied with this approach to planning and budgeting within the company.

One manager commented "Just because we achieved a certain level of sales last year shouldn't mean that the target simply increases by 10%. We should be considering what's happening in the market place and planning accordingly".

"I agree", said another manager, "these days we shouldn't be bound by financial targets. Anyway, there are a number of quality issues that we ought to consider so that we can improve our business for the future."

The managers decided to have a meeting with you as the company's Management Accountant. They asked for your help in providing a report that can be discussed at the next Management Team meeting which outlines their concerns over the present budgeting system and explains alternative techniques that could be used.

#### ***Required:***

Prepare a report addressed to the Management Team that:

- (i) explains the need for budgets; *(4 marks)*
  
  - (ii) discusses the relevance of an incremental approach to budget setting for W Limited and suggests an alternative system; *(10 marks)*
  
  - (iii) discusses the importance of quality, and explains how the balanced scorecard approach to performance management could be used by W Limited. *(11 marks)*
- (Total = 25 marks)*
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*End of paper*

*Maths Tables and Formulae are on pages 19 – 21*

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LOGARITHMS

	0	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
10	0000	0043	0086	0128	0170						4	9	13	17	21	26	30	34	38
						0212	0253	0294	0334	0374	4	8	12	16	20	24	28	32	37
11	0414	0453	0492	0531	0569						4	8	12	15	19	23	27	31	35
						0607	0645	0682	0719	0755	4	7	11	15	19	22	26	30	33
12	0792	0828	0864	0899	0934	0969					3	7	11	14	18	21	25	28	32
							1004	1038	1072	1106	3	7	10	14	17	20	24	27	31
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14	1461	1492	1523	1553							3	6	9	12	15	18	21	24	28
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17	2304	2330	2355	2380	2405	2430					3	5	8	10	13	15	18	20	23
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18	2553	2577	2601	2625	2648						2	5	7	9	12	14	16	19	21
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19	2788	2810	2833	2856	2878						2	4	7	9	11	13	16	18	20
						2900	2923	2945	2967	2989	2	4	6	8	11	13	15	17	19
20	3010	3032	3054	3075	3096	3118	3139	3160	3181	3201	2	4	6	8	11	13	15	17	19
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22	3424	3444	3464	3483	3502	3522	3541	3560	3579	3598	2	4	6	8	10	12	14	15	17
23	3617	3636	3655	3674	3692	3711	3729	3747	3766	3784	2	4	6	7	9	11	13	15	17
24	3802	3820	3838	3856	3874	3892	3909	3927	3945	3962	2	4	5	7	9	11	12	14	16
25	3979	3997	4014	4031	4048	4065	4082	4099	4116	4133	2	3	5	7	9	10	12	14	15
26	4150	4166	4183	4200	4216	4232	4249	4265	4281	4298	2	3	5	7	8	10	11	13	15
27	4314	4330	4346	4362	4378	4393	4409	4425	4440	4456	2	3	5	6	8	9	11	13	14
28	4472	4487	4502	4518	4533	4548	4564	4579	4594	4609	2	3	5	6	8	9	11	12	14
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30	4771	4786	4800	4814	4829	4843	4857	4871	4886	4900	1	3	4	6	7	9	10	11	13
31	4914	4928	4942	4955	4969	4983	4997	5011	5024	5038	1	3	4	6	7	8	10	11	12
32	5051	5065	5079	5092	5105	5119	5132	5145	5159	5172	1	3	4	5	7	8	9	11	12
33	5185	5198	5211	5224	5237	5250	5263	5276	5289	5302	1	3	4	5	6	8	9	10	12
34	5315	5328	5340	5353	5366	5378	5391	5403	5416	5428	1	3	4	5	6	8	9	10	11
35	5441	5453	5465	5478	5490	5502	5514	5527	5539	5551	1	2	4	5	6	7	9	10	11
36	5563	5575	5587	5599	5611	5623	5635	5647	5658	5670	1	2	4	5	6	7	8	10	11
37	5682	5694	5705	5717	5729	5740	5752	5763	5775	5786	1	2	3	5	6	7	8	9	10
38	5798	5809	5821	5832	5843	5855	5866	5877	5888	5899	1	2	3	5	6	7	8	9	10
39	5911	5922	5933	5944	5955	5966	5977	5988	5999	6010	1	2	3	4	5	7	8	9	10
40	6021	6031	6042	6053	6064	6075	6085	6096	6107	6117	1	2	3	4	5	6	8	9	10
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42	6232	6243	6253	6263	6274	6284	6294	6304	6314	6325	1	2	3	4	5	6	7	8	9
43	6335	6345	6355	6365	6375	6385	6395	6405	6415	6425	1	2	3	4	5	6	7	8	9
44	6435	6444	6454	6464	6474	6484	6493	6503	6513	6522	1	2	3	4	5	6	7	8	9
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46	6628	6637	6646	6656	6665	6675	6684	6693	6702	6712	1	2	3	4	5	6	7	7	8
47	6721	6730	6739	6749	6758	6767	6776	6785	6794	6803	1	2	3	4	5	5	6	7	8
48	6812	6821	6830	6839	6848	6857	6866	6875	6884	6893	1	2	3	4	4	5	6	7	8
49	6902	6911	6920	6928	6937	6946	6955	6964	6972	6981	1	2	3	4	4	5	6	7	8

LOGARITHMS

	0	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
50	6990	6998	7007	7016	7024	7033	7042	7050	7059	7067	1	2	3	3	4	5	6	7	8
51	7076	7084	7093	7101	7110	7118	7126	7135	7143	7152	1	2	3	3	4	5	6	7	8
52	7160	7168	7177	7185	7193	7202	7210	7218	7226	7235	1	2	2	3	4	5	6	7	7
53	7243	7251	7259	7267	7275	7284	7292	7300	7308	7316	1	2	2	3	4	5	6	6	7
54	7324	7332	7340	7348	7356	7364	7372	7380	7388	7396	1	2	2	3	4	5	6	6	7
55	7404	7412	7419	7427	7435	7443	7451	7459	7466	7474	1	2	2	3	4	5	5	6	7
56	7482	7490	7497	7505	7513	7520	7528	7536	7543	7551	1	2	2	3	4	5	5	6	7
57	7559	7566	7574	7582	7589	7597	7604	7612	7619	7627	1	2	2	3	4	5	5	6	7
58	7634	7642	7649	7657	7664	7672	7679	7686	7694	7701	1	1	2	3	4	4	5	6	7
59	7709	7716	7723	7731	7738	7745	7752	7760	7767	7774	1	1	2	3	4	4	5	6	7
60	7782	7789	7796	7803	7810	7818	7825	7832	7839	7846	1	1	2	3	4	4	5	6	6
61	7853	7860	7868	7875	7882	7889	7896	7903	7910	7917	1	1	2	3	4	4	5	6	6
62	7924	7931	7938	7945	7952	7959	7966	7973	7980	7987	1	1	2	3	3	4	5	6	6
63	7993	8000	8007	8014	8021	8028	8035	8041	8048	8055	1	1	2	3	3	4	5	5	6
64	8062	8069	8075	8082	8089	8096	8102	8109	8116	8122	1	1	2	3	3	4	5	5	6
65	8129	8136	8142	8149	8156	8162	8169	8176	8182	8189	1	1	2	3	3	4	5	5	6
66	8195	8202	8209	8215	8222	8228	8235	8241	8248	8254	1	1	2	3	3	4	5	5	6
67	8261	8267	8274	8280	8287	8293	8299	8306	8312	8319	1	1	2	3	3	4	5	5	6
68	8325	8331	8338	8344	8351	8357	8363	8370	8376	8382	1	1	2	3	3	4	4	5	6
69	8388	8395	8401	8407	8414	8420	8426	8432	8439	8445	1	1	2	2	3	4	4	5	6
70	8451	8457	8463	8470	8476	8482	8488	8494	8500	8506	1	1	2	2	3	4	4	5	6
71	8513	8519	8525	8531	8537	8543	8549	8555	8561	8567	1	1	2	2	3	4	4	5	5
72	8573	8579	8585	8591	8597	8603	8609	8615	8621	8627	1	1	2	2	3	4	4	5	5
73	8633	8639	8645	8651	8657	8663	8669	8675	8681	8686	1	1	2	2	3	4	4	5	5
74	8692	8698	8704	8710	8716	8722	8727	8733	8739	8745	1	1	2	2	3	4	4	5	5
75	8751	8756	8762	8768	8774	8779	8785	8791	8797	8802	1	1	2	2	3	3	4	5	5
76	8808	8814	8820	8825	8831	8837	8842	8848	8854	8859	1	1	2	2	3	3	4	4	5
77	8865	8871	8876	8882	8887	8893	8899	8904	8910	8915	1	1	2	2	3	3	4	4	5
78	8921	8927	8932	8938	8943	8949	8954	8960	8965	8971	1	1	2	2	3	3	4	4	5
79	8976	8982	8987	8993	8998	9004	9009	9015	9020	9025	1	1	2	2	3	3	4	4	5
80	9031	9036	9042	9047	9053	9058	9063	9069	9074	9079	1	1	2	2	3	3	4	4	5
81	9085	9090	9096	9101	9106	9112	9117	9122	9128	9133	1	1	2	2	3	3	4	4	5
82	9138	9143	9149	9154	9159	9165	9170	9175	9180	9186	1	1	2	2	3	3	4	4	5
83	9191	9196	9201	9206	9212	9217	9222	9227	9232	9238	1	1	2	2	3	3	4	4	5
84	9243	9248	9253	9258	9263	9269	9274	9279	9284	9289	1	1	2	2	3	3	4	4	5
85	9294	9299	9304	9309	9315	9320	9325	9330	9335	9340	1	1	2	2	3	3	4	4	5
86	9345	9350	9355	9360	9365	9370	9375	9380	9385	9390	1	1	2	2	3	3	4	4	5
87	9395	9400	9405	9410	9415	9420	9425	9430	9435	9440	0	1	1	2	2	3	3	4	4
88	9445	9450	9455	9460	9465	9469	9474	9479	9484	9489	0	1	1	2	2	3	3	4	4
89	9494	9499	9504	9509	9513	9518	9523	9528	9533	9538	0	1	1	2	2	3	3	4	4
90	9542	9547	9552	9557	9562	9566	9571	9576	9581	9586	0	1	1	2	2	3	3	4	4
91	9590	9595	9600	9605	9609	9614	9619	9624	9628	9633	0	1	1	2	2	3	3	4	4
92	9638	9643	9647	9652	9657	9661	9666	9671	9675	9680	0	1	1	2	2	3	3	4	4
93	9685	9689	9694	9699	9703	9708	9713	9717	9722	9727	0	1	1	2	2	3	3	4	4
94	9731	9736	9741	9745	9750	9754	9759	9763	9768	9773	0	1	1	2	2	3	3	4	4
95	9777	9782	9786	9791	9795	9800	9805	9809	9814	9818	0	1	1	2	2	3	3	4	4
96	9823	9827	9832	9836	9841	9845	9850	9854	9859	9863	0	1	1	2	2	3	3	4	4
97	9868	9872	9877	9881	9886	9890	9894	9899	9903	9908	0	1	1	2	2	3	3	4	4
98	9912	9917	9921	9926	9930	9934	9939	9943	9948	9952	0	1	1	2	2	3	3	4	4
99	9956	9961	9965	9969	9974	9978	9983	9987	9991	9996	0	1	1	2	2	3	3	4	4

## FORMULAE

### Time Series

Additive Model:

$$\text{Series} = \text{Trend} + \text{Seasonal} + \text{Random}$$

Multiplicative Model:

$$\text{Series} = \text{Trend} * \text{Seasonal} * \text{Random}$$

### Regression Analysis

The linear regression equation of  $Y$  on  $X$  is given by:

$$Y = a + bX \quad \text{or} \quad Y - \bar{Y} = b(X - \bar{X}),$$

where

$$b = \frac{\text{Covariance}(XY)}{\text{Variance}(X)} = \frac{n \sum XY - (\sum X)(\sum Y)}{n \sum X^2 - (\sum X)^2}$$

and

$$a = \bar{Y} - b\bar{X},$$

or solve

$$\begin{aligned} \sum Y &= na + b \sum X \\ \sum XY &= a \sum X + b \sum X^2 \end{aligned}$$

Exponential  $Y = ab^x$

Geometric  $Y = aX^b$

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8

IMPM

*Management Accounting –  
Performance Management*

*Wednesday afternoon*