

Examination Paper, Solutions and Examiner's Report

Paper:

**Certificate in Financial
Fundamentals for Business**

Economics & Statistical Analysis

October 2011

QUESTION 1

Supply is the quantity of a good that sellers are willing and able to sell at any given price. The supply of goods is influenced by a number of factors.

Required:

Explain the factors that influence the supply of goods, illustrating your explanation with appropriate diagrams.

(7 marks)

QUESTION 2

Perfect competition is one of the four main types of market structure.

Required:

State the key characteristics of a perfectly competitive market and explain the significance of a perfectly competitive market from the perspective both of the individual producer firm and the industry as a whole.

(5 marks)

QUESTION 3

There are a number of different ways that inflation can be measured. This is because there is no one number that appropriately captures all relevant inflation information for all participants and all purposes. The result is that there are many inflation measures which have been designed for different purposes.

Required:

Name and describe five different ways that inflation may be measured.

(5 marks)

QUESTION 4

a) Define aggregate demand.

(2 marks)

b) Explain the implications for national income if a closed economy has a marginal propensity to consume of 0.6.

(4 marks)

(Total 6 marks)

QUESTION 5

a) Calculate the mode of the transaction sizes in the grouped frequency distribution set out below.

(1 mark)

Transaction size £m	f
5.0 – 5.8	15
5.8 – 6.6	18
6.6 – 7.4	27
7.4 – 8.2	39
8.2 – 9.0	33
9.0 – 9.8	5
Total	137

b) Comment on the skew of the transaction size distribution.

(1 mark)

c) Calculate the mean deviation of the transaction size data.

(3 marks)

(Total 5 marks)

QUESTION 6

You work for a retail business which has many outlets operating throughout the UK. The business is currently looking to invest in new technology but would only want to install the new technology in the outlets that are processing more than 1,300 transactions per week, irrespective of the value of those transactions.

Data has been collected from all the outlets and you have concluded that, on average, a typical outlet will make 1,200 transactions per week with a standard deviation of 245. You have also noted that the numbers of transactions appear to be normally distributed.

Required:

- a) Identify the key characteristics of a normal distribution. (4 marks)
- b) What percentage of outlets is likely to process 1,300 or more transactions per week? (3 marks)
- c) If the technology budget is increased, then the top 40% of the outlets, by number of transactions processed, would be able to have the new technology installed. Calculate the number of transactions that an outlet would now have to make in order to be eligible for the new technology.

(3 marks)

(Total 10 marks)

QUESTION 7

You have arranged a test to check whether the staff of a recently acquired company are sufficiently numerate or require further training. Based on experience from previous acquisitions there is an 80% chance that each individual member of staff from the acquired company will pass the test. There are 12 staff members in the acquired company.

Required:

- a) From the 12 staff members of the acquired company, how many combinations are there of seven staff members passing the test?
(1 mark)
- b) What is the probability that exactly six will pass the test?
(2 marks)
- c) If the first six to attempt the test pass, what is the probability that the other six will pass the test?
(2 marks)
- (Total 5 marks)**

QUESTION 8

Correlation and the concept of decompositional analysis are important to econometrics.

Required:

- a) Explain correlation and the significance of correlation to statistical forecasting.
(4 marks)
- b) State and define the two models, including the components, used with decompositional analysis.
(3 marks)
- (Total 7 marks)**

Formula Sheet

(a) Mean Deviation

$$MD = \frac{\sum |x - \bar{x}|}{n}$$

(b) Standard Deviation

$$SD = \sqrt{\frac{\sum (x - \bar{x})^2}{n}}$$

(c) Binomial Distribution

$$P(x) = \frac{n!}{x!(n-x)!} p^x (1-p)^{n-x}$$

(d) Poisson Distribution

$$P(x) = \frac{\lambda^x e^{-\lambda}}{x!}$$

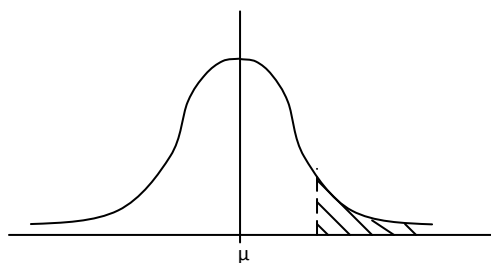
(e) Pearson co-efficient of skew

$$\frac{3(\text{mean} - \text{median})}{\sigma}$$

Statistical tables

$Z = \frac{X - \mu}{\sigma}$	0	1	2	3	4	5	6	7	8	9
0.0	0.5000	0.4960	0.4920	0.4880	0.4840	0.4801	0.4751	0.4721	0.4681	0.4641
0.1	0.4602	0.4562	0.4522	0.4483	0.4443	0.4404	0.4364	0.4325	0.4236	0.4247
0.2	0.4207	0.4168	0.4129	0.4090	0.4052	0.4013	0.3974	0.3936	0.3897	0.3859
0.3	0.3821	0.3783	0.3745	0.3707	0.3669	0.3632	0.3594	0.3557	0.3520	0.3483
0.4	0.3446	0.3409	0.3372	0.3336	0.3300	0.3264	0.3228	0.3192	0.3156	0.3121
0.5	0.3085	0.3050	0.3015	0.2981	0.2946	0.2912	0.2877	0.2843	0.2810	0.2776
0.6	0.2743	0.2709	0.2676	0.2643	0.2611	0.2578	0.2546	0.2514	0.2483	0.2451
0.7	0.2420	0.2398	0.2358	0.2327	0.2296	0.2266	0.2236	0.2206	0.2177	0.2148
0.8	0.2119	0.2090	0.2061	0.2033	0.2005	0.1977	0.1949	0.1922	0.1894	0.1867
0.9	0.1841	0.1814	0.1788	0.1762	0.1736	0.1711	0.1685	0.1660	0.1635	0.1611
1.0	0.1587	0.1562	0.1539	0.1515	0.1492	0.1469	0.1446	0.1423	0.1410	0.1379
1.1	0.1357	0.1335	0.1314	0.1292	0.1271	0.1251	0.1230	0.1210	0.1190	0.1170
1.2	0.1151	0.1131	0.1112	0.1093	0.1075	0.1056	0.1038	0.1020	0.1003	0.0985
1.3	0.0968	0.0951	0.0934	0.0918	0.0901	0.0885	0.0869	0.0853	0.0838	0.0823
1.4	0.0808	0.0778	0.0778	0.0764	0.0749	0.0735	0.0721	0.0708	0.0694	0.0681
1.5	0.0668	0.0655	0.0643	0.0630	0.0618	0.0606	0.0594	0.0582	0.0571	0.0559
1.6	0.0548	0.0537	0.0526	0.0516	0.0505	0.0495	0.0485	0.0475	0.0465	0.0455
1.7	0.0446	0.0436	0.0427	0.0418	0.0409	0.0401	0.0392	0.0384	0.0375	0.0367
1.8	0.0359	0.0351	0.0344	0.0336	0.0329	0.0322	0.0314	0.0307	0.0301	0.0294
1.9	0.0287	0.0281	0.0274	0.0268	0.0262	0.0256	0.0250	0.0244	0.0239	0.0233
2.0	0.02275	0.02222	0.02169	0.01228	0.02068	0.02018	0.01970	0.01923	0.01876	0.01831
2.1	0.01786	0.01743	0.01700	0.01659	0.01618	0.01578	0.01539	0.01500	0.01463	0.01426
2.2	0.01390	0.01355	0.01321	0.01287	0.01255	0.01222	0.01191	0.01160	0.01130	0.01101
2.3	0.01072	0.01044	0.01017	0.00990	0.00964	0.00939	0.00914	0.00889	0.00866	0.00842
2.4	0.00820	0.00748	0.00776	0.00755	0.00734	0.00714	0.00695	0.00676	0.00657	0.00639
2.5	0.00621	0.00604	0.00587	0.00570	0.00554	0.00539	0.00523	0.00508	0.00494	0.00480
2.6	0.00466	0.00453	0.00440	0.00427	0.00415	0.00402	0.00391	0.00379	0.00368	0.00357
2.7	0.00347	0.00336	0.00325	0.00317	0.00307	0.00298	0.00289	0.00280	0.00272	0.00264
2.8	0.00256	0.00248	0.00240	0.00233	0.00226	0.00219	0.00212	0.00205	0.00199	0.00193
2.9	0.00187	0.00181	0.00175	0.00169	0.00164	0.00159	0.00154	0.00149	0.00144	0.00139

Tail areas of the normal distribution



Tail Area	10%	5%	2.5%	2%	1%	0.1%	0.01%	0.001%
$\frac{X - \mu}{\sigma}$	1.2816	1.6449	1.9600	2.0537	2.3263	3.0902	3.7190	4.2549

SUGGESTED SOLUTIONS OCTOBER 2011

Economics & Statistical Analysis

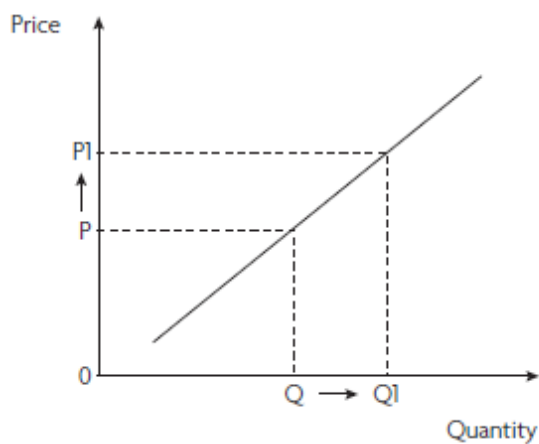
QUESTION 1

Factors influencing supply

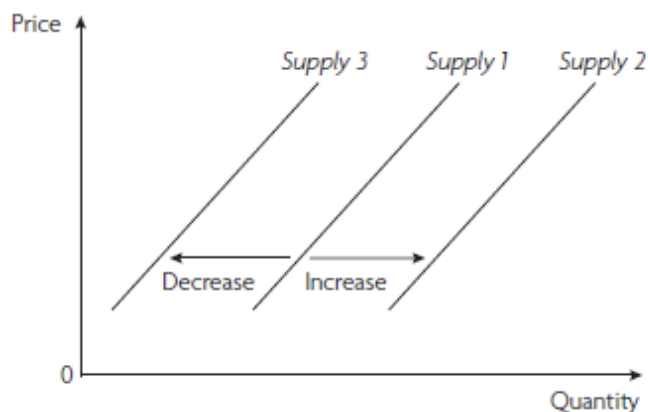
The supply of goods is influenced by a number of factors.

Price

The price of the good has a direct effect on the quantity supplied. More specifically, we can say that as the price of the good changes, there is a movement along the supply curve.



Other factors cause the supply curve itself to shift, either to the left or to the right as illustrated below.



Technology

An improvement in technology shifts the supply curve to the right, given that for any price, the quantity which a supplier can produce will increase. The technological improvement will result in greater output for a given level of inputs.

Input costs

If the price of inputs increases, then supply will be reduced at each price. If on the other hand, cheaper raw materials can be sourced or cheaper labour is available, then supply will expand and the supply curve shifts to the right.

Government regulation

The imposition of tighter government regulations will have the effect of reducing supply, so the supply curve shifts to the left. For example, if new health and safety legislation is introduced, this may increase costs for the supplier or make it less efficient to produce. Supply will therefore contract at each price level.

Other

Other factors such as natural disasters, industrial disruption and changes in the weather can cause the supply curve to shift.

QUESTION 2

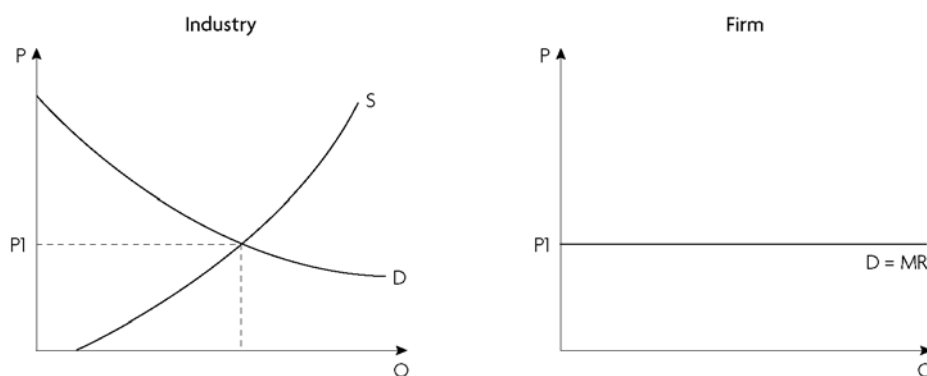
- The product being sold is homogenous
- Each buyer and seller is small relative to the market as a whole
- Free entry and exit in the long run
- Perfect information

Individual firm

Each buyer and seller is small relative to the market, no one individual buyer or seller can influence the price of a product. From the perspective of the individual firm, the price is therefore set – the firm is a ‘price-taker’.

The individual firm produces only a small quantity relative to the market as a whole and is able to sell everything they produce. Therefore, the demand curve for the individual firm is a horizontal line at the market price.

Show demand curves for the firm and the demand curve for the industry.



Although firms in a perfectly competitive market may be able to make supernormal profits in the short run, in the long run Price = average total cost.

Industry

For the industry, equilibrium will be reached when there is no incentive for firms to increase output or for new firms to enter. This will occur where price is at the minimum long run average cost and each firm earns only a normal profit.

QUESTION 3

Inflation

There are a number of different ways that inflation may be measured, some of which are detailed below.

Harmonised Index of Consumer Prices (HICP)

This was constructed in 1997 as a result of the requirement, in the Maastricht Treaty, for an inflation rate that was **comparable Europe wide**. This particular measure considers inflation on a monthly basis in the European Monetary Union as a whole and individually measures inflation in each member state.

Consumer Prices Index (CPI)

This UK inflation target is based on the HICP. CPI is a measurement of the **average change from month to month in the prices of consumer goods and services**.

Retail Prices Index (RPI)

The UK inflation target used to be based on this index. It remains the best known of the UK inflation measures. **It is often referred to as a shopping basket containing 650 goods and services, selected as being representative of life in the UK. It differs from CPI in the particular households and the range of goods it includes.** RPI has been recorded since 1947 and measures the average change from month to month in the prices of goods and services purchased by most households in the UK. Data is published every month and there are several variations in existence.

Producer Price Index (PPI)

The PPI measures the **price changes of goods bought and sold by UK manufacturers** and is produced monthly.

Corporate Services Price Index (CSPI)

This measures the **prices charged for services produced by UK businesses to other UK businesses and government**. It is produced four times a year and industry specific data is also available.

QUESTION 4

a) $AD = \text{budget deficit} + \text{investment} + \text{consumer spending} + \text{balance of trade surplus}$

b) Marginal propensity to consume (MPC) is the amount of each additional £ of income injected into the economy that will be consumed by households. If households in a closed economy have an MPC of 0.6 this means that it will consume 60p and save 40p of each additional £ received.

The implications for national income are that for each additional £ injected into the economy, aggregate demand will increase by a **multiple** of that amount.

The multiplier effect can be shown as the following equation:

$$1/(1-MPC)$$

If an additional £100 were to be injected into a closed economy with a MPC to 0.6, then this would had an effect on AD of $100/0.4 = £250$

Consequently a government seeking to boost the AD of an economy must judge the size of the injection having regard to the MPC.

QUESTION 5

a)

The **modal class** is 7.4 -8.2.

$$\text{Lower class} = 39 - 27 = 12$$

$$\text{Upper class} = 39 - 33 = 6$$

$$\text{Mode} = 7.4 + 0.8 \times 12 / (12+6) = 7.4 + 0.533 = 7.933\text{m}$$

b) The distribution is negatively skewed. Negative skew has arisen because there are a larger number of transactions towards the higher end of the range. Consequently a larger number of values fall to the right of the mean and the mode is also expected to fall to the right of the mean.

c) Mean deviation: $= \frac{\sum f |x_m - \bar{x}|}{\sum f}$ for a grouped frequency distribution.

x	f	x_m	fx_m	$ x_m - \bar{x} $	$f x_m - \bar{x} $
5.0 – 5.8	15	5.4	81.0	2.0	30.0
5.8 – 6.6	18	6.2	111.6	1.2	21.6
6.6 – 7.4	27	7.0	189.0	0.4	10.8
7.4 – 8.2	39	7.8	304.2	0.4	15.6
8.2 – 9.0	33	8.6	283.8	1.2	39.6
9.0 – 9.8	5	9.4	47.0	2.0	10.0
	137		1,016.6		127.6

$$\bar{x} = \frac{\text{£}1,016.6\text{m}}{137} = \text{£}7.4$$

Mean deviation = $127.6 / 137 = 0.93$

QUESTION 6

a) Characteristics of a normal distribution:

- It peaks at a single value, the mean defines where the peak of the curve occurs
- It is symmetrical, with mean, median and mode equal
- It approaches the horizontal axis on either side of the mean
- It is a bell shaped curve and the area under the curve is equal to 1 or 100%
- The variance defines the dispersion or spread of the curve
- It exhibits the additive property
- 68% of all events fall within one standard deviation of the mean and about 95.5% of all events fall with two standard deviations from the mean

b) Proportion of outlets with 1,300 or more transactions:

- $P (X > 1,300)$
- $Z = (1,300 - 1,200) / 245 = 0.4082$
- $P (Z > 0.4082) = 0.3409$ from the tables
- We can therefore estimate that 34.1% of the outlets process at least 1,300 transactions per week

c) If budget can extend to 40% of outlets what number of transactions must the outlets make to be included?

- $P (X > x) = 0.40$
- $P (Z > 0.25) = 0.40$ (from normal table)
- $Z = (X - 1,200) / 245 = 0.25$ (approximately)
- Re-arranging $X = 1,200 + (0.25 * 245) = 1,261$
- We can therefore estimate that outlets that process 1,261 or more transactions per week will be eligible for the installation of the new technology

QUESTION 7

a) $\frac{12!}{7!(12-7)!} = 792$

Can be shown as ${}^{12}C_7 = 792$

b) $\frac{12!}{6!(12-5)!} = 924 \times 0.8^6(0.2)^6 = 0.015502$ or 1.55%

c) $1 \times 0.8^6(0.2)^{6-6} = 0.2621$ or 26.21%

QUESTION 8

a) **Correlation** measures the extent of the linear relationship between two variables i.e. it tells us whether a linear equation is a suitable way to forecast.

Correlation, denoted by 'r' is always between -1 and 1.

A value of r equal to 0 indicates no correlation,

+1 indicates perfectly positive correlation, -1 indicates perfectly negative correlation.

If r is positive the correlation is said to be positive and when shown as a scatter diagram the line slopes upward from left to right. If r is negative the correlation is said to be negative and the line would slope downward.

Statistical forecasting can be based on a trend line extrapolated from historical data. Where there is strong correlation between the dependent and independent variables then there is a better expectation that the forecast will be accurate.

b) The two models used in decompositional analysis are the additive and the multiplicative model.

Additive model is $X_t = T_t + S_t + C_t + E_t$

Multiplicative model is $X_t = T_t \times S_t \times C_t \times E_t$

Where the elements of the decompositional analysis are:

X_t = the observed value at time t

T_t = the trend component at time t

S_t = the seasonal component at time t

C_t = the cyclical component at time t

E_t = the error or random component at time t

Examiner's Report

Economic and Statistical Analysis October 2011

General

The standard of scripts was mixed. Of the 85 candidates who sat the exam, 50 were awarded a pass giving a pass rate of 59%.

The paper consisted of eight compulsory questions worth a total of 50 marks. The first four questions covered microeconomics and macroeconomics and were worth 23 marks in total. The next four questions were on business statistics and econometrics totalling 27 marks.

Average marks per question deteriorated towards the end of the paper, perhaps indicating that many candidates had not managed their time well in the exam.

Question 1 Factors influencing supply 7 marks

This question was on the whole reasonably well answered. It defined supply and required candidates to explain the factors that influence the supply of good using appropriate diagrams to illustrate their answer. Most candidates were able to provide a reasonable explanation of factors and draw both a movement along a supply curve and a shift in the curve. Many candidates discussed factors that influence demand rather than supply and although they may have scored some marks they did not score highly as they had missed the key factors affecting supply directly. Some candidates did not use any diagrams in their answer despite being specifically asked to.

The average mark achieved for question one was 4.0 out of 7.

Question 2 Perfect competition 5 marks

This question stated that perfect competition was one of the four main types of market structure and asked candidates to state its key characteristics, explaining its significance to both an individual firm and the industry.

The first part of the question was generally very well completed with most candidates scoring well for stating the key characteristics of a perfectly competitive market. Many candidates fell short when looking at the significance to the individual firm compared to the industry as a whole. This demonstrated only a basic understanding of market structures and not the level that was required to gain a pass in this question.

The average mark achieved for question two was 2.9 out of 5.

Question 3 Inflation 5 marks

This question asked candidates to name and describe five ways that inflation can be measured. Many candidates scored very well in this question. Candidates who did not score well tended to only be able to name two or three different measures of inflation and could not describe them in any detail, or in some cases, at all.

The average mark achieved for question three was 2.9 out of 5.

Question 4 Aggregate demand 6 marks

This question was in two parts. The first part, for two marks, asked candidates to define aggregate demand. Most candidates were able to define this using the formula for aggregate demand. Other candidates scored less well as they only defined it as being total demand in the economy. Candidates should use the number of marks allocated to a requirement as a guide to how much detail they should give in their answer.

The second part of the question asked for an explanation of the implication on national income if a closed economy had a certain level of marginal propensity to consume.

This was not well answered by many candidates. A significant number incorrectly stated that an MPC of 0.6 would lead to a fall in national income rather than recognising the multiplier effect an injection in to the economy would have. Some candidates got the multiplier formula wrong when discussing it and many did not mention a multiplier effect at all.

The average mark achieved was 3.0 out of 6.

Question 5 Mode, skew and mean deviation 5 marks

This question was on the whole reasonably answered, but very few candidates scored maximum marks.

Part (a) for 1 mark required candidates to calculate the mode of a set of transactions in a grouped frequency distribution. Most candidates successfully calculated this.

Part (b) for 1 mark, then asked candidates to comment on the skew of the distribution. Most candidates who answered this part of the question correctly stated that it was negatively skewed and explained why.

Part (c) for 3 marks required candidates to calculate the mean deviation of the data. Most candidates who attempted this part of the question managed to calculate the mean but some of them went on to incorrectly calculate the mean deviation.

On the whole, candidates who did not score well demonstrated a lack of knowledge and question practice on grouped frequency distributions.

The average mark achieved was 2.9 out of 5.

Question 6 Normal distribution 10 marks

This question was in three parts.

Part (a) required candidates to identify the key characteristics of a normal distribution. Most candidates were able to score well out of the 4 marks available for this part of the question.

Part (b) for 3 marks, required candidates to calculate the percentage of outlets likely to process a certain number of transactions or more. Candidates who attempted this part of the requirement were able to do well generally. However, some candidates demonstrated a lack of understanding of how to use the normal distribution table and many candidates did not attempt this part of the question at all.

Part (c) for 3 marks, provided the candidates with some additional information and required them to calculate the number of transactions that would now need to be made. Again, candidates who attempted this part of the question did reasonably well but many did not attempt it at all or stated that the answer would be the same as in part (b).

Normal distribution and use of the tables to find a z value is a fundamental part of the syllabus and candidates appeared not to have spent enough time doing question practice on this area.

The average mark achieved was 5.5 out of 10.

Question 7 Binomial distribution 5 marks

This question was generally not well attempted. It was split into three parts, the first of which was to determine the number of possible combinations of a set number from a group of staff passing a test. This was for one mark and was a relatively simple calculation which could be very quickly done on a calculator. Very few candidates were able to calculate this correctly and shows a lack of understanding of this area of the notes and the shortcuts which a calculator can provide.

Part two of the question was to calculate the probability that an exact number of staff would pass a test and this was worth two marks. On the whole, candidates were much more comfortable answering this part of the question than the other two parts with most scoring full marks.

Most candidates failed to correctly calculate the answer for the third part of the question.

The candidates' attempts at this question appeared to indicate that they had practiced some basic binomial distribution questions but did not have enough breadth of understanding of the topic.

The average mark achieved was 2.2 out of 5.

Question 8 Correlation 7 marks

Many candidates did not score highly in this question despite there being a significant number of marks available. Four marks were available for explaining what correlation is and its significance to statistical forecasting. Most candidates managed to pick up a couple of marks in this part of the question but had not provided sufficient detail to gain full marks.

The second part of the question, for three marks, was to state and define the two models used with decompositional analysis, including information about their components. A very significant number of candidates were not even able to identify the two models and some who did, did not give detail about the components.

Candidates who did not attempt every question in the paper tended to have missed this particular question out. This may have been due to poor time management during the exam as it was the last question, or it may be an indication that they had not devoted sufficient study time to the econometrics chapter in the manual which is the last chapter of the ESA course.

The average mark achieved was 2.2 out of 7.