



basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

MATHEMATICAL LITERACY P2

FEBRUARY/MARCH 2016

MARKS: 150

TIME: 3 hours

This question paper consists of 12 pages, 4 annexures and 1 answer sheet.

INSTRUCTIONS AND INFORMATION

1. This question paper consists of FIVE questions. Answer ALL the questions.
2.
 - 2.1 Use the ANNEXURES to answer the following questions:
 - ANNEXURE A for QUESTION 1.1
 - ANNEXURE B for QUESTION 1.3
 - ANNEXURE C for QUESTION 3.1
 - ANNEXURE D for QUESTION 4.1 and QUESTION 4.2
 - 2.2 Answer QUESTION 3.3.3 on the ANSWER SHEET attached.
 - 2.3 Write your centre number and examination number in the spaces on the ANSWER SHEET. Hand in the ANSWER SHEET with your ANSWER BOOK.
3. Number the answers correctly according to the numbering system used in this question paper.
4. Start EACH question on a NEW page.
5. You may use an approved calculator (non-programmable and non-graphical), unless stated otherwise.
6. Show ALL calculations clearly.
7. Round off ALL final answers appropriately according to the given context, unless stated otherwise.
8. Indicate units of measurement, where applicable.
9. Maps and diagrams are NOT drawn to scale, unless stated otherwise.
10. Write neatly and legibly.

QUESTION 1

1.1

In recent years households in South Africa have experienced a large increase in electricity costs. Mr Chan would like to replace his electric stove with a gas stove. He received quotations from The Alternative Heat Company (Option 1) and TG Gas Stove Specialist (Option 2), as shown in ANNEXURE A. Some information has been omitted.

Use ANNEXURE A to answer the questions that follow.

1.1.1 Calculate the total quotation amount for Option 1. (5)

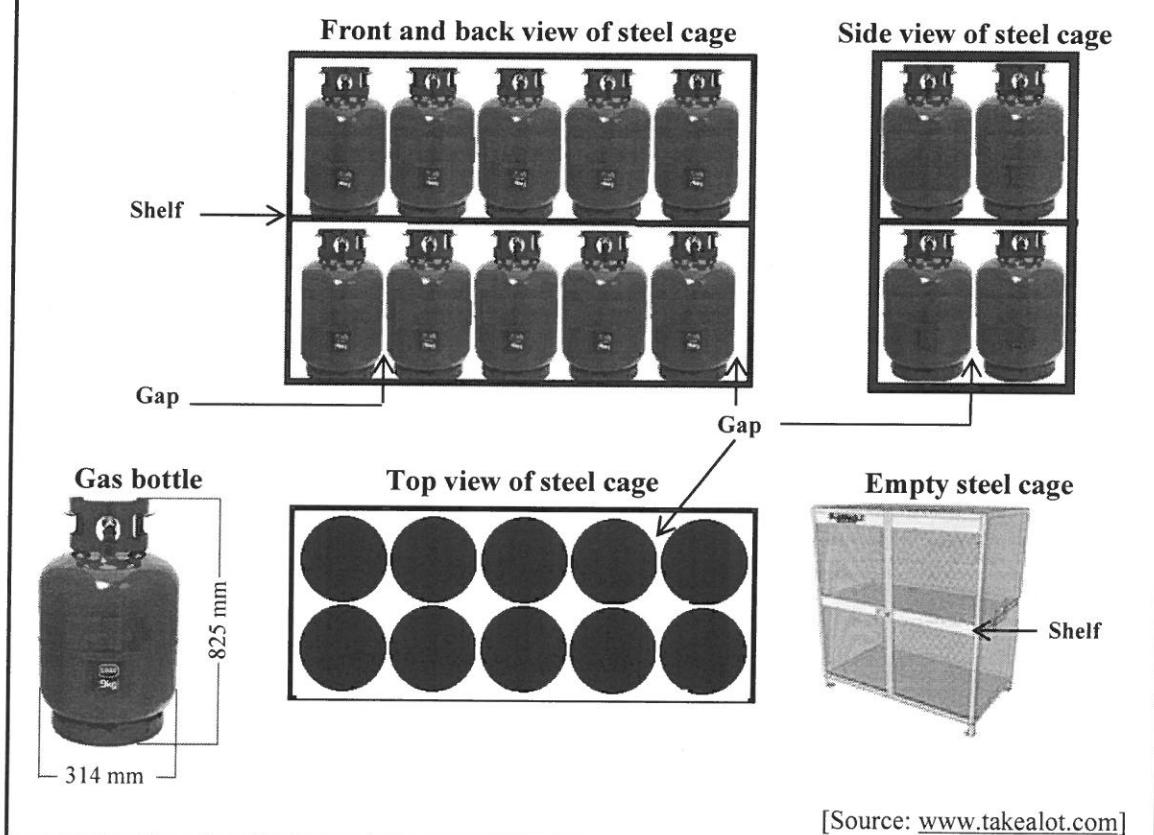
1.1.2 Mr Chan estimates that the difference in total cost between the two options is less than R1 000,00.

Verify, showing ALL calculations, whether Mr Chan's estimation is valid. (5)

1.1.3 Give ONE reason why Mr Chan may choose the more expensive option. (2)

1.2

A certified gas dealer sells 9 kg gas bottles. These cylindrical bottles are stored outside the shop in a steel cage, as shown below. There is a gap of 10 mm on either side of each gas bottle when placed on the shelf in the steel cage.



1.2.1 Calculate the maximum number of gas bottles that can fit into ONE steel cage. (2)

1.2.2 A company sells rectangular metal sheets with dimensions 3,4 m by 2,1 m.

Determine, showing ALL calculations, the maximum number of shelves for the steel cage that could be cut from ONE metal sheet. (8)

1.3

A certified gas dealer who is 48 years old earned a taxable income of R0,742 million during the 2014/2015 tax year and contributed to a registered medical aid scheme for herself and four dependants. She projected that her taxable income would remain the same during the 2015/2016 tax year.

Study the tax table and the medical aid credits in ANNEXURE B to answer the questions that follow.

1.3.1 Explain the impact of the tax rebate and the medical aid credits on the tax payable. (4)

1.3.2 The dealer calculated that her annual tax due to SARS (South African Revenue Service) would increase by only R150,00 from the 2014/2015 tax year to the 2015/2016 tax year.

Verify, showing ALL calculations, whether her calculation is valid. (8)
[34]

QUESTION 2

- 2.1 From 1 July 2014 to 28 July 2014 workers in the metal and engineering industry went on strike, demanding a 15% increase in wages as from 1 July 2014. Employers applied the no work, no pay principle.

TABLE 2 below shows the monthly gross wage offer before the strike and the final wage settlement for two wage rates, A and H.

TABLE 2: Wage offers before the strike and the final, improved offers for two wage rates

GROSS MONTHLY WAGE JUNE 2014		GROSS MONTHLY WAGE DUE TO STRIKE	
WAGE A	WAGE H	WAGE A	WAGE H
R11 000	R6 000

	EMPLOYER'S OFFER BEFORE STRIKE (PERCENTAGE INCREASE)		IMPROVED WAGE OFFER DUE TO STRIKE (PERCENTAGE INCREASE)
July 2014	7,0%	8,0%	8,0% 10,0%
July 2015	CPI	CPI + 1%	7,5% 10,0%
July 2016	CPI	CPI + 1%	7,0% 10,0%

[Source: www.solidariteit.co.za]

For the purposes of comparison, the consumer price index (CPI) of 6,5% for both 2015 and 2016 will be used.

$$\text{Daily wage rate} = \text{Monthly wage} \times 12 \div 365$$

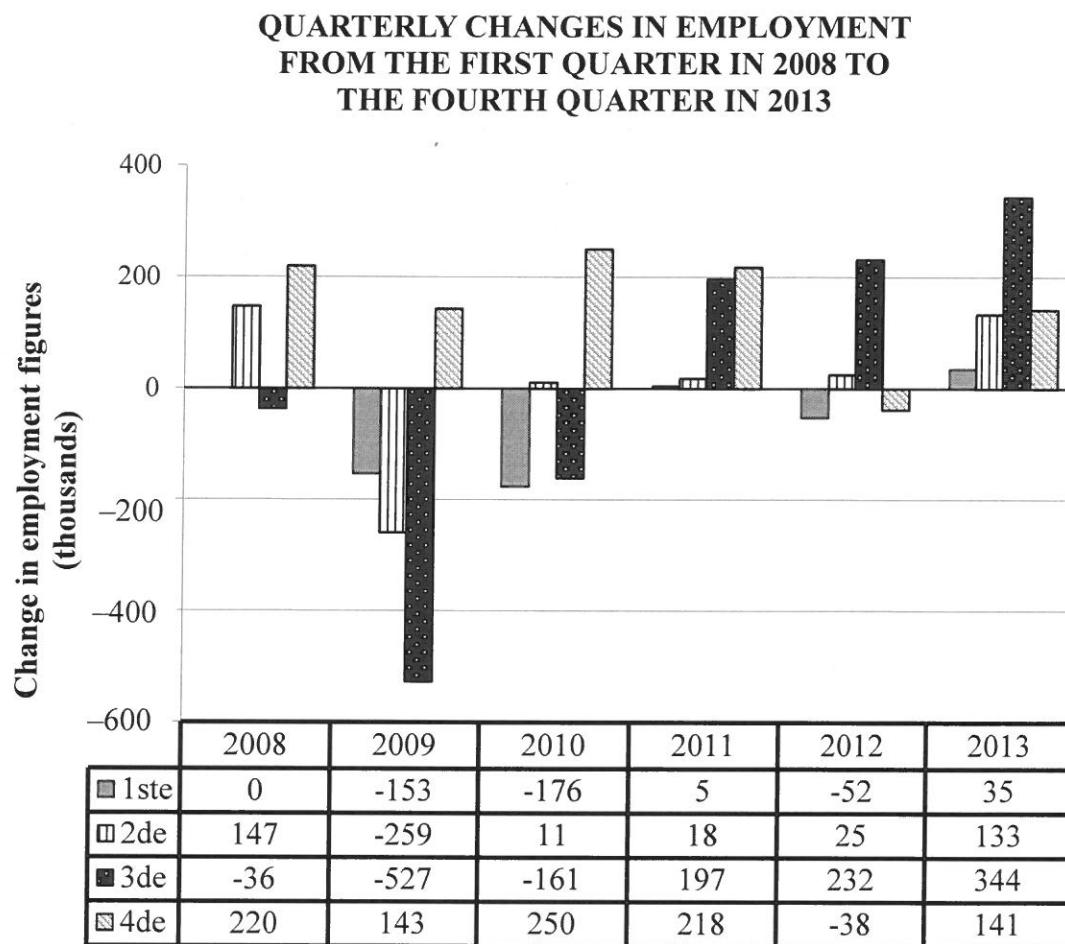
- 2.1.1 It was calculated that a worker on Wage Rate A lost a total of R10 834,85 in wages during the strike.

- (a) Show, with calculations, how this loss was calculated. (6)
- (b) Hence, state ONE other negative financial implication of a prolonged strike for a worker. (2)

- 2.1.2 Verify, showing ALL calculations, whether a worker on Wage Rate H would be able to make up the loss of income (due to the no work, no pay principle) by the end of June 2015, using the improved wage offer, without working overtime or having an extra job. (6)

2.2

The bar graph and corresponding table below represent quarterly changes in South African employment figures from the first quarter in 2008 to the fourth quarter in 2013.



[Source: Stats SA: *Quarterly Labour Force Survey, Quarter 4, 2013*]

Use the graph and the table above to answer the questions that follow.

- 2.2.1 Interpret the employment change data for the first quarter in 2008. (2)
- 2.2.2 Identify the year during which the greatest number of job losses occurred AND calculate the total number of jobs lost in that year. (5)
- 2.2.3 During this period there was only one year during which there was an increase in employment for each quarter for that year.
Identify the year AND calculate the mean quarterly increase in employment numbers for that year. (4)
- 2.2.4 Determine the number of people employed at the end of March 2013, if 15 million people were employed at the end of December 2013. (3)

[28]

QUESTION 3

3.1

Pablo, a Mexican student, is studying in the United Kingdom (UK). He plans to meet his family in Las Vegas, USA, to attend a boxing match. He will travel by air from London Heathrow Airport (LHR) to McCarran International Airport (LAS).

ANNEXURE C is a diagram showing the seating plan of a Boeing 767-300. An aisle is the passage between rows of seats.

Use ANNEXURE C to answer the questions that follow.

3.1.1 Determine the total number of Economy Plus seats. (2)

3.1.2 Determine the simplified ratio of the number of Business Class seats to Economy Class seats. (3)

3.1.3 Give a detailed description of the route a passenger in seat 2K will take to walk to a friend in seat 38B if he does not want to disturb other passengers by passing through the rows in the full aircraft. (5)

3.1.4 One of the Business Class passengers ordered coffee.

Determine the probability (as a percentage) that this passenger did NOT have an aisle seat. (3)

3.1.5 Give ONE reason why the price of a First Class aeroplane ticket is much higher than the price of an Economy Class aeroplane ticket. (2)

3.2

The flight distance between the two airports is 5 222,086 miles. Pablo's flight departed from LHR to LAS at 17:14. When he arrived at LAS the next day, the time in LHR was 04:11.

Conversion table:

MILES	YARDS	KILOMETRES	METRES
1	1 760	1,609	1 609
0,6215	1 093,84	1	1 000

1 knot = 1,852 km/h

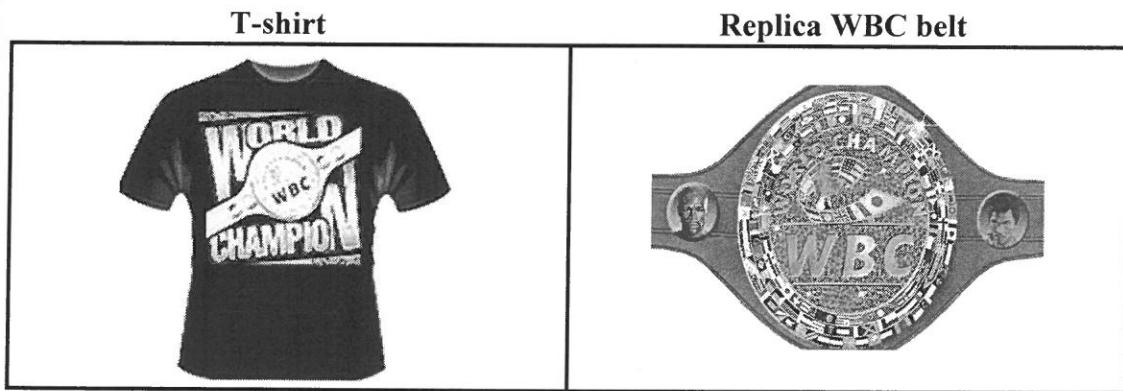
Calculate the average speed, in knots, at which the aircraft travelled.

The conversion table and the following formula may be used:

$$\text{Distance travelled (in km)} = \text{average speed (in km/h)} \times \text{time (in hours)} \quad (6)$$

3.3

The World Boxing Council (WBC) manufactures and sells replica WBC championship belts and special personalised signed T-shirts. To manufacture the T-shirts, they have a start-up cost of US\$15 000 and a production cost of US\$105 per T-shirt.



The WBC sells the T-shirts at \$175,00 each and the belts at \$250,00 each.

The production cost for the replica WBC belt is given by the following formula:

$$\text{Total production cost of belts (in US\$)} = 27\ 000 + 75 \times \text{number of belts}$$

TABLE 3 below shows the total production cost and total income for selling WBC belts (in US dollars).

TABLE 3: Total production cost and total income for selling WBC belts (in US dollars)

	NUMBER OF BELTS					
	0	100	400	A	800	1 000
Total production cost	27 000	34 500	57 000	79 500	B	102 000
Total income	0	25 000	C	175 000	200 000	250 000

[Source: www.wbcboxingusa.com]

- 3.3.1 Calculate the missing values **A**, **B** and **C**. (5)
- 3.3.2 Determine the total income if the WBC sells 800 belts and 1 000 T-shirts. (3)
- 3.3.3 The straight-line graphs for the total production cost of and total income from selling belts, as well as the income from selling the T-shirts, are drawn on the ANSWER SHEET.
- (a) On the same system of axes provided on the ANSWER SHEET, draw another line graph that represents the total production cost for manufacturing the T-shirts. (6)
- (b) Indicate the profit reading made from the manufacture and sale of 600 T-shirts on your graph. (2)

[37]

QUESTION 4

4.1

In South Africa there are ordinary schools and special schools. Special schools are for learners with special needs. Ordinary schools are divided into public schools and independent schools.

The government generally funds ordinary schools, and some schools levy school fees.

In February 2015 a newspaper published data relating to the number of learners, teachers and schools per province in South Africa. Refer to TABLE 4 and TABLE 5 in ANNEXURE D.

TABLE 4 shows data from 2014 relating to the number of learners, teachers and schools in the ordinary school sector per province.

TABLE 5 shows data from 2012 to 2014 relating to the number of learners and teachers in the ordinary school sector per province.

Use ANNEXURE D to answer the questions that follow.

- 4.1.1 Showing ALL calculations, identify the province in which approximately 46% of the total number of learners attended independent schools. (3)
- 4.1.2 A teacher from an ordinary public school is randomly selected to attend a national conference in 2014.
Determine the probability that this teacher will be a teacher from the Eastern Cape. (2)
- 4.1.3 Calculate the missing value **A** if the mean number of learners per province in public schools is 1 346 335. (5)
- 4.1.4 After reading the data in TABLE 4, a teacher stated:
'In South Africa, the teacher-to-learner ratio of independent schools is better than that of public schools.'
Verify, showing ALL calculations, whether this teacher's statement is valid. (6)
- 4.1.5 The number of learners in ordinary schools increased from 2012 to 2014. Give ONE possible reason for this annual increase. (2)

4.2

When allocating the amount that will be used for the funding of schools in each province, the Minister of Education allocates R530 per child per month based on the previous year's enrolment data.

Use ANNEXURE D to answer the questions that follow.

4.2.1 Calculate the funding amount for the 2015/2016 budget that is allocated to the Free State based on the learner enrolment data. (3)

4.2.2 Determine the annual percentage change in the learner enrolment of the province with the highest learner enrolment figure between 2013 and 2014. (3)

4.3

A company would like to build a three-dimensional (3D) model of a 21st century classroom. This must be a scaled model of an actual classroom that they have built at a school.

3D VIEW OF ACTUAL CLASSROOM

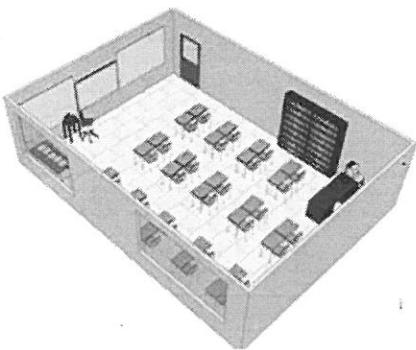


TABLE USED FOR SCALED MODEL



The actual dimensions of the classroom are:

length = 7,5 m; width = 6,5 m and height = 3 m

The 3D scale model of the classroom must fit on a rectangular table top with the following dimensions:

length = 1,75 m and width = 1 m

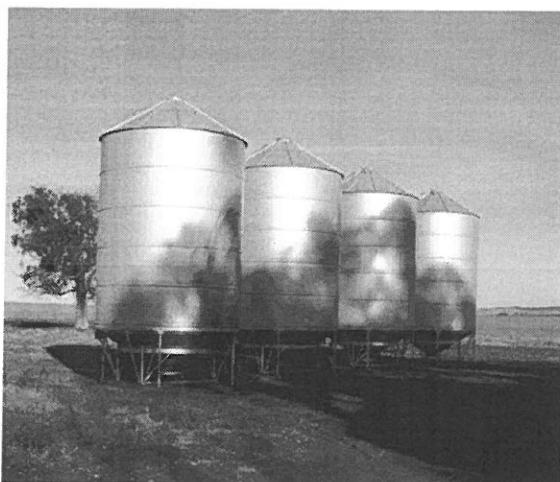
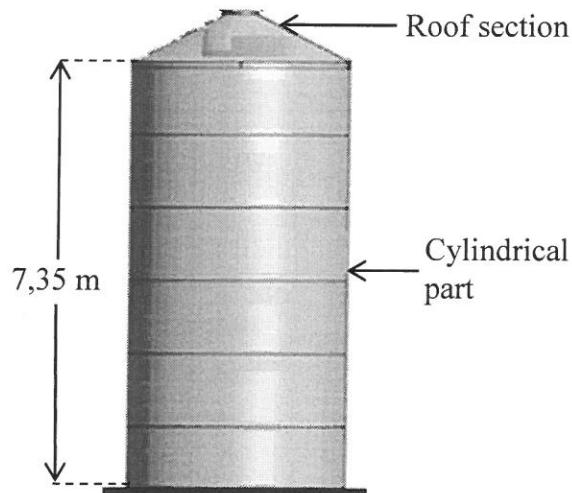
Only half of the table top area may be used for the scaled model.

Verify, showing ALL calculations, whether a scale of 1 : 8 will be suitable for the scaled model. (5)

[29]

QUESTION 5

- 5.1 Mrs Dundee, an Australian farmer, has four silos on her farm in which she stores fertiliser, as shown in the photograph and diagram below. The silos are cylindrical with a roof section. Fertiliser is only stored in the cylindrical part of the silos.

PHOTOGRAPH OF FOUR SILOS**DIAGRAM OF ONE SILO**[Source: www.cicrobulk.co.za]

The following formula and conversion rates may be used:

Volume of a cylinder = $\pi \times (\text{radius})^2 \times \text{height}$; using $\pi = 3,142$

1 m³ = 1 000 ℥

1,3 kg = 1 litre

1 gallon = 3,7 litres

- 5.1.1 Calculate the diameter of a silo if the volume of the cylindrical part is 60 m^3 . (5)

- 5.1.2 Calculate the total maximum capacity (in gallons) of the four silos. (4)

- 5.1.3 After fertilising all her main fields, Mrs Dundee wants to use the remaining fertiliser for a wheat field, which is 1 055 acres in size.

The capacity readings of the four silos are as follows:

- Silo 1: 15% full
- Silo 2: $\frac{1}{4}$ full
- Silos 3 and 4: empty

Verify, showing ALL calculations, whether she will have enough fertiliser left in her silos for the wheat field if the spread rate is 22,65 kg of fertiliser per acre. (6)

5.2 TABLE 6 below shows the total monthly rainfall in millimetres for Sydney (Australia) for 2012 to 2015.

TABLE 6: Total monthly rainfall (in millimetres) for Sydney from 2012 to 2015

Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
2012	53,8	18,8	191,6	206,2	135,6	93,8	282,2	52,2	71,6	37,4	148,4	78,4
2013	138,8	111,0	269,8	187,0	37,2	244,2	56,2	19,0	23,8	29,4	52,0	45,2
2014	137,8	165,4	65,5	199,8	110,2	316,4	32,6	14,8	35,8	42,2	192,8	31,0
2015	17,4	58,2	102,6	121,0	27,4	68,0	16,4	215,2	50,4	86,6	16,0	118,0

[Adapted from www.au.gov]

Australia is a country in the Southern Hemisphere where seasons are approximately three months long and summer starts in December.

Analyse the mean rainfall during the **winter months** for Sydney AND predict the chance that the mean rainfall for the winter months in 2016 will be higher than 100 mm. Show ALL calculations.

(7)
[22]

TOTAL: 150

QUESTION 1.1.1 TO QUESTION 1.1.3

OPTION 1

QUOTATION				
The Alternative Heat Company 375 Nelson Drive Upington 1826		DATE INVOICE NUMBER	23/04/2015 # 1431 B	
Issued to: Mr RS Chan 23 Third Avenue Upington		CUSTOMER ID	Won 283	
DESCRIPTION	QUANTITY	PRICE EXCLUDING 14% VAT	AMOUNT IN RAND	
Defy DHG 121 gas stove	1	R2 893,86	R2 893,86	
Empty 9 kg gas bottle	1	R394,74	R394,74	
Refill 9 kg gas bottle	9 kg	R20,00 (per kg)	...	
Internal installation (parts and gas certificate included)	1	R2 719,30	R2 719,30	
Gas piping	2 m	R15,35 per metre	...	
		SUBTOTAL	...	
		14% VAT	...	
		TOTAL AMOUNT	...	

THIS QUOTATION IS VALID FOR 14 DAYS FROM THE ISSUE DATE.

OPTION 2

[Source: www.vertex42.com]

NOTE: Installation of gas stove takes three hours.

ANNEXURE B**QUESTION 1.3****TABLE 1: SARS tax rates plus medical aid credits for two tax years ending 29 February 2016 and 28 February 2015**

Statutory rates for personal income tax for individuals:

YEAR OF ASSESSMENT ENDING 29 FEBRUARY 2016

TAXABLE ANNUAL INCOME (R)	RATES OF TAX (R)
0–181 900	18% of taxable income
181 901–284 100	32 742 + 26% of taxable income above 181 900
284 101–393 200	59 314 + 31% of taxable income above 284 100
393 201–550 100	93 135 + 36% of taxable income above 393 200
550 101–701 300	149 619 + 39% of taxable income above 550 100
701 301 and above	208 587 + 41% of taxable income above 701 300

YEAR OF ASSESSMENT ENDING 28 FEBRUARY 2015

TAXABLE ANNUAL INCOME (R)	RATES OF TAX (R)
0–174 550	18% of taxable income
174 551–272 700	31 419 + 25% of taxable income above 174 550
272 701–377 450	55 957 + 30% of taxable income above 272 700
377 451–528 800	87 382 + 35% of taxable income above 377 450
528 001–673 100	140 074 + 38% of taxable income above 528 000
673 001 and above	195 212 + 40% of taxable income above 673 100

TAX REBATES

	2016	2015
Primary rebate	R13 257	R12 726
Secondary rebate (for persons 65 years and older) in addition to primary rebate	R7 407	R7 110
Tertiary rebate (for persons 75 years and older) in addition to primary and secondary rebate	R2 466	R2 367

MEDICAL AID CREDITS IN RESPECT OF MONTHLY MEDICAL AID CONTRIBUTIONS

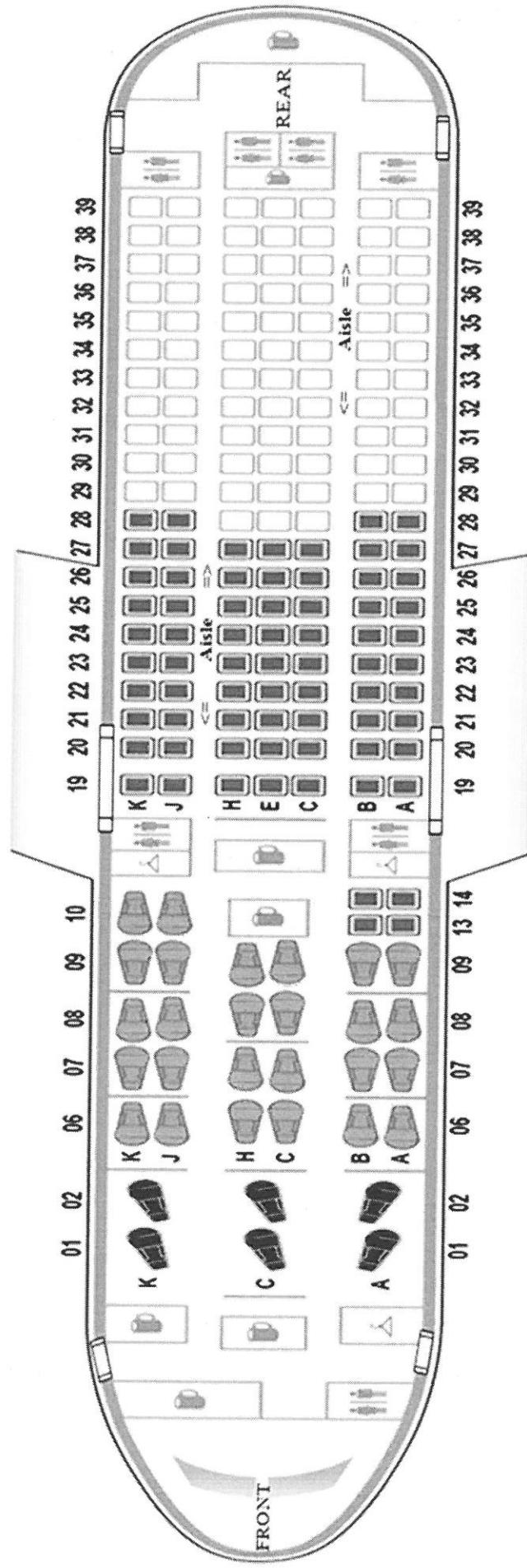
	2016	2015
Tax payer only	R270	R257
First dependant	R270	R257
Additional dependants	R181 each	R172 each

[Adapted from www.bdo.co.za]

ANNEXURE C

QUESTION 3.1

SEATING PLAN OF BOEING 767-300



KEY								
First Class seat	Business Class seat	Economy Plus seat	Economy seat	Exit	Toilet	Storage	Galley/Kitchen	

[Source: www.britishairways.com]

ANNEXURE D**TABLE 4: Number of South African learners, teachers and schools in the ordinary school sector per province during 2014**

PROVINCE	ORDINARY SCHOOL SECTOR NUMBERS					
	PUBLIC			INDEPENDENT		
	LEARNERS	TEACHERS	SCHOOLS	LEARNERS	TEACHERS	SCHOOLS
Eastern Cape	1 889 307	61 260	5 554	57 578	2 998	178
Free State	656 408	23 631	1 306	15 882	921	70
Gauteng	1 944 486	60 782	2 070	246 989	16 483	651
KwaZulu-Natal	2 831 311	90 497	5 915	70 386	5 063	236
Limpopo	A	54 704	3 929	55 069	2 552	147
Mpumalanga	1 034 151	33 613	1 762	23 637	1 387	105
Northern Cape	284 908	8 880	551	4 096	302	26
North West	784 184	25 004	1 515	16 132	1 082	55
Western Cape	1 026 744	32 237	1 458	48 652	3 694	213
TOTAL	...	390 608	24 060	538 421	34 482	1 681

TABLE 5: Total number of South African learners and teachers in the ordinary school sector per province from 2012 to 2014

PROVINCE	LEARNERS			TEACHERS		
	2012	2013	2014	2012	2013	2014
Eastern Cape	1 951 523	1 938 078	1 946 885	67 936	66 007	64 258
Free State	661 974	664 508	672 290	24 828	24 475	24 552
Gauteng	2 075 387	2 129 526	2 191 475	73 960	74 823	77 265
KwaZulu-Natal	2 877 969	2 866 570	2 901 697	94 932	96 057	95 560
Limpopo	1 715 778	1 714 832	1 720 585	57 670	57 108	57 256
Mpumalanga	1 054 783	1 052 807	1 057 788	34 664	34 936	35 000
Northern Cape	277 494	282 631	289 004	8 864	8 972	9 182
North West	775 142	788 261	800 316	25 924	26 194	26 086
Western Cape	1 038 019	1 052 435	1 075 396	36 389	36 451	35 931
TOTAL	12 428 069	12 489 648	12 655 436	425 167	425 023	425 090

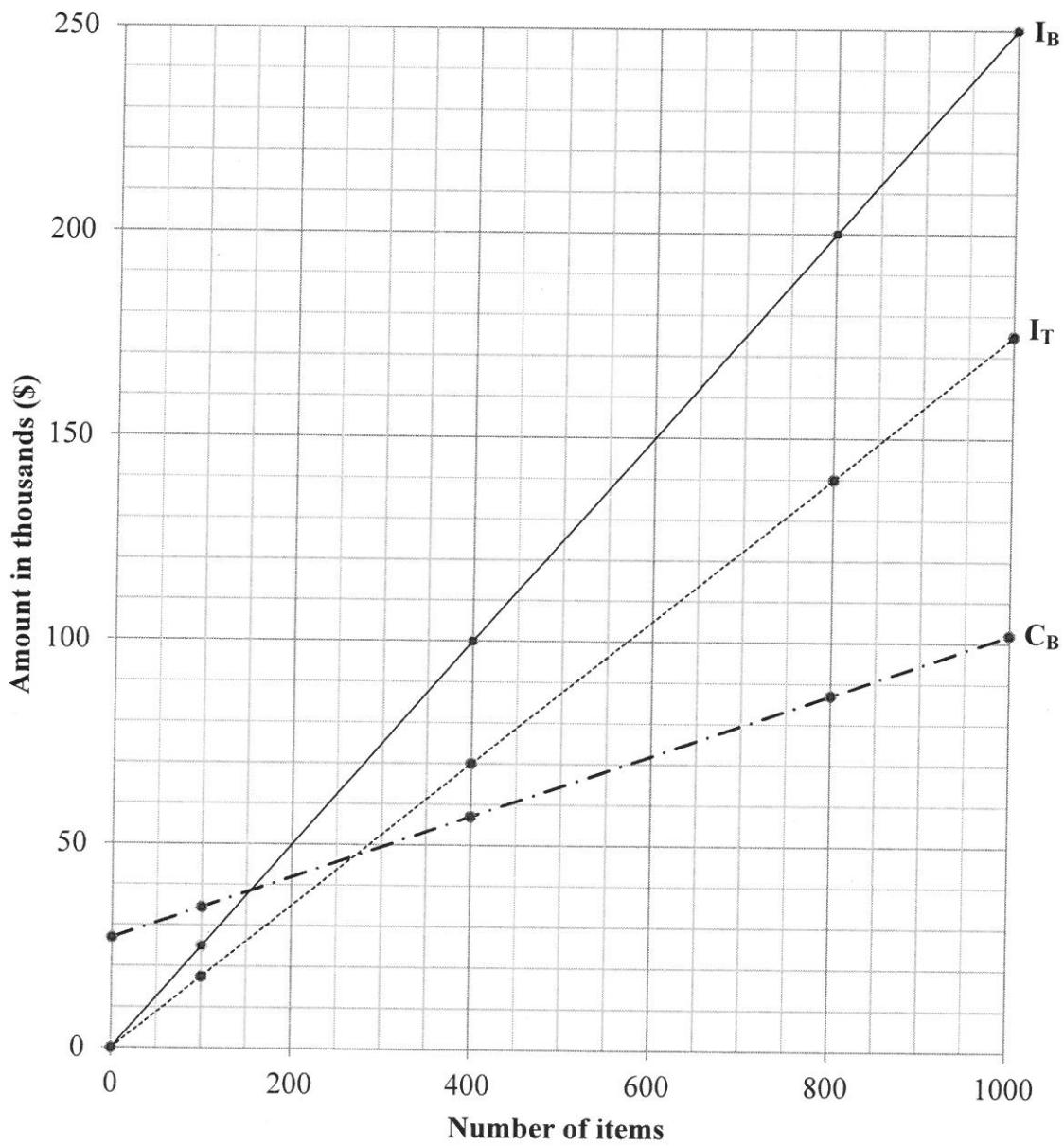
[Adapted from www.dbe.gov.za]

ANSWER SHEET**QUESTION 3.3.3****CENTRE NUMBER**

EXAMINATION NUMBER

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**TOTAL INCOME FROM AND TOTAL COST OF
MANUFACTURING AND SELLING T-SHIRTS AND BELTS**



KEY: I_B = Income from selling belts
 I_T = Income from selling T-shirts
 C_B = Cost of manufacturing belts