SENIOR SECONDARY INTERVENTION PROGRAMME 2013

GRADE 12

MATHEMATICAL LITERACY

LEARNER NOTES

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LEARNER NOTES

SESSION 1: TOPIC 1: PERSONAL AND BUSINESS FINANCE PART I

Learner Note: Interest calculations can be tricky. Just remember your formulae and take careful note of the period for which you are to calculate the interest.

SECTION A: TYPICAL EXAM QUESTIONS

QUESTION 1

Peter invests R2000 at 7% simple interest per annum paid quarterly for a period of five and a half years.

1.1 Convert the interest rate into a quarterly rate.   (2)

1.2 Work out the number of interest intervals for the investment.   (2)

1.3 Calculate the value of the investment at the end of the five and a half years.   (4)

1.4 Calculate the interest value over the whole period.   (2)

[10]

QUESTION 2

2.1 Paul invests R5 000,00 for seven years at 8,5% interest compounded annually.

    a. Draw up a table that shows the value of the investment after each year as well
      as the interest earned up to the end of each year.   (4)
    b. Using the table, give the value of the investment at the end of four years.   (1)
    c. Use the table to calculate by how much the interest has increased from the
      sixth to the seventh year.   (2)
    d. Why does the interest increase from year to year?   (3)

[10]

2.2 Compare the following two scenarios:

        A: R1500,00 invested for three years at 8% simple interest

        B: R1500,00 invested for three years at 7,5% compound interest

    a. Which of the investments gives a higher return at the end of the period?   (9)

    b. Explain why a smaller interest rate, which is compounded could yield more
      than a higher simple interest rate over the same period.   (3)

[12]

SECTION B: ADDITIONAL CONTENT NOTES

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1. **INTRODUCTION**

   Whenever a person buys something on credit, they are charged interest. Interest is a fee that is added to the actual value of a product for the convenience of receiving cash from an institution. There are two types of interest; **simple and compound**.

2. **INTEREST RATES:**

   Whenever a person buys something on credit, they are charged interest. Interest is a fee that is added to the actual value of a product for the convenience of receiving cash from an institution. This means if you borrow money from a bank, you will have to pay the **actual value** of the loan **plus an interest fee**.

   There are two types of interest; **simple and compound**:
   - **Simple interest** is calculated only on the actual, initial value of the amount borrowed.
   - **Compound interest** is calculated on the actual, initial value plus interest on the interest at a specific point in time.

2.1. **SIMPLE INTEREST:**

   Simple interest is visually interpreted as **straight-line growth**. This means that for each equally spaced payment interval, the interest is accrued at the same. The value of the interest is calculated using the original amount invested or borrowed.

   The **formula** for calculating **simple interest** is:
   $$A = P (1 + r . n)$$
   $$= P + P . r . n$$

   Where,
   - ✳ A is the **total value** of the investment or loan at the **end of the period**
   - ✳ P is the **initial amount** invested or borrowed
   - ✳ r is the **interest rate** for the payment interval
   - ✳ n is the **number of payment intervals** over the total period of the loan or investment

   If we wish to calculate only the **interest amount accrued** over the entire period, we use the following formula where SI = Simple interest: **SI = P.r.n**

   Note: This formula does not include the money invested/borrowed. It is only the value of the interest.

Interest is not only calculated on a yearly basis; it may also be calculated on a quarterly, monthly, half-yearly or daily basis. If the payment interval changes, we have to adjust the formula. Only two things will change: the **interest rate** and the **payment interval**.

E.g.

If Peter invests R1,000.00 at 8% simple interest per annum (per year). The **interest calculation** for the **first year** of this investment is as follows:

SI = P.r.n

SI = 1000 x 0,08 x 1

| **SI = R80,00** |

Note: Simple Interest = initial loan amount x interest rate x number of payment intervals; this equals R80.00 interest that will be charged (for the first year)

Should he invest the R1,000.00 at 8% **simple interest per annum for 10 years**, then the calculation is as follows:

SI = P.r.n

SI = 1000 x 0.08 x 10

| **SI = R800,00** |

The total value of the ten-year investment is:
        A = P (1+r.n) = 1000 (1 + 0.08 x 10) = R1,800.00.

Note: End value of investment = initial loan amount (1 + interest rate x number of payment intervals) = R1 800.00 (end value of the investment)

E.g.

If Peter invests R1 000,00 at 8% simple interest per annum **paid quarterly** (each quarter year). We adjust the values in the formula as follows:

1 year = 4 quarters
8% per year = 8/4 = 2/1 = 2% per quarter (8% divided by 4 = 2%)
SI = P.r.n
SI = 1000 x 0.02 x 4
SI = R80.00 per year (interest earned)

Should he invest the R1 000,00 at 8% simple interest per annum paid quarterly, **then the interest after ten years should be calculated as follows:**

SI = P.r.n

SI = 1000 x 0.02 x 40

| **SI = R800.00** |

> **Note:** End value of investment = initial loan amount (1 + interest rate x number of payment intervals) = R1 800.00 (end value of the investment)

2.2. COMPOUND INTEREST

Compound interest **differs** from simple interest in such a way that we no longer have the same interest amount every period. We have an interest amount that **increases** every period. The reason for this is that we no longer earn interest only on the initial amount invested but on the interest earned in each of the previous periods as well. This means that the **investment amount**, which we use to calculate periodic interest, **constantly changes**.

The formula for compound interest differs from the simple interest formula in such a way that the period is no longer multiplied by the interest rate. It now becomes the **exponent.** Thus the compound interest formula calculates the total value of the loan or investment. The formula is set up as follows:

$$A = P (1 + r)^n$$

Where,
* A is the total value of the **investment or loan at the end** of the period
* P is the **initial amount** invested or borrowed
* r is the **interest rate** for the payment interval
* n is the number of payment **intervals** over the **total period** of the loan or investment

To isolate the interest amount, we must subtract the initial investment amount from the total value of the investment. Thus we use the following formula to calculate the interest value:

$$CI = A - P$$

> **Note: It is not possible to calculate the interest amount without having first calculated (worked out) the total value of the investment.**

2.2.1. Interest Charged Annually
E.g.
Mike invests R5,000.00 at 10% interest **compounded** annually.
The interest calculation for the **first year** of the investment is as follows:

$$A = P (1 + r)^n$$
$A = 5000(1 + 0.10)^1$
A = R5,500

The interest amount:
CI = A – P
CI = 5500 – 5000
CI = R500

The **interest in the second year** is based on the **initial investment value as well as the interest earned in the previous periods**. The calculation is as follows:

$A = P (1 + r)^n$
$A = 5000(1 + 0.10)^2$
$\underline{A = R6{,}050}$

The interest amount:
CI = A – P
CI = 6050 – 5000
$\underline{CI = R1{,}050}$

Since the interest in the first year was R500.00, it follows that the interest earned in the second year was R550.00.

> **Note: Similar to simple interest, compound interest can also be calculated on a quarterly, monthly or daily basis.**

2.2.2 Interest Charged Quarterly, Monthly or Daily
E.g.
Compare the following three scenarios (A, B and C).

A: Mike invests R5,000.00 at 8% interest compounded annually for a period of 5 years. Since the interest is compounded annually (yearly), we use the interest rate and the number of periods as they have been given. This means that the r in our formula is 8% and the n is 5.

   The calculation looks as follows:
$A = P (1 + r)^n$
$A = 5000(1 + 0.08)^5$
$A = R7{,}346.64$

   The interest amount:
CI = A – P
CI = 7346,64 – 5000
CI = R2,346.64

B: Mike invests R5,000.00 at 8% interest per annum compounded quarterly for a period of 5 years. Before we use the formula, we have to adapt the interest rate to the period it is being compounded in.

   1 year = 8%
1 quarter = 2%
1 year has four quarters, so 5 years has 20 quarters
This means that the r in our formula becomes 2% and the n becomes 20.

The calculation looks as follows:

$A = P (1 + r)^n$

$A = 5000(1 + 0.02)^{20}$

$A = R7,429.74$

The interest amount:

$CI = A – P$

$CI = 7429,74 – 5000$

$CI = R2,429.74$

C: Mike invests R5,000.00 at 8% interest per annum compounded monthly for a period of 5 years. Before we use the formula, we have to adapt the interest rate to the period it is being compounded in.

1 year = 8%

1 month = 0,7%

1 year has twelve months, so 5 years has 60 months

This means that the r in our formula is 0,7% and the n becomes 60.

The calculation looks as follows:

$A = P (1 + r)^n$

$A = 5000(1 + 0.007)^{60}$

$A = R7,598.68$

The interest amount:

$CI = A – P$

$CI = 7598,68 – 5000$

$CI = R2,598.68$

> **ANSWER:** This means that option C is the best. Mike is investing not borrowing, so he would like to have the highest return possible.

3.   PRACTICAL EXAMPLES

3.1. BUYING A CAR

When you buy a car, you are required to make financial decisions before the bank grants you a loan. You must decide if you are going to buy the car cash or whether you are going to pay it off. Most banks offer the following terms: 12 months, 24 months, 36 months, 48 months or 60 months. (A car is considered to be a medium term liability, so the bank will not finance it over a period extending five years.)

The interest rate is mostly dependent on the prime-lending rate. This is linked to the interest rate at which banks borrow their money from the South African Reserve Bank. The banks add a percentage to the prime-lending rate to cover their own finance costs.

In September 2006, the prime-lending rate was 11,5%. Most first time buyers had to pay 'prime + 2'. This means that the interest rate for a car loan was 13,5% per annum.

E.g.
Complete the following table to illustrate the repayment values for a car that costs R100,000.00 over different periods. The interest rate is 13,5% compounded monthly.

	CASH	12 MONTHS	24 MONTHS	36 MONTHS	48 MONTHS	60 MONTHS
Value of the car	100 000	100 000	100 000	100 000	100 000	100 000
Number of interest intervals	0	12	24	36	48	60
Interest rate per period	(13,5/12)%	(13,5/12)%	(13,5/12)%	(13,5/12)%	(13,5/12)%	(13,5/12)%
Apply the formula	$(1+0,011)^0$ $= 1$	$(1+0,011)^{12}$ $= 1,1403$	$(1+0,011)^{24}$ $= 1,3003$	$(1+0,011)^{36}$ $= 1,4827$	$(1+0,011)^{48}$ $= 1,6907$	$(1+0,011)^{60}$ $= 1,9278$
Total loan value A=	R100 000	R114 030	R130 030	R148 270	R169 070	R192 780

1. Calculate the value of the interest you pay for each payment option.

    CASH: A – P = 100 000 – 100 000 = 0
                          No interest has to be paid
    12 MONTHS: A – P = 114 030 – 100 000 = 14 030
                          R14 030 must be paid as interest
    24 MONTHS: A – P = 130 030 – 100 000 = 30 030
                          R30 030 must be paid as interest
    36 MONTHS: A – P = 148 270 – 100 000 = 48 270
                          R48 270 must be paid as interest
    48 MONTHS: A – P = 169 070 – 100 000 = 69 070
                          R69 070 must be paid as interest
    60 MONTHS: A – P = 192 780 – 100 000 = 92 780
                          R92 780 must be paid as interest

2. What is the monthly payment for the car if a loan has been taken over <u>60 months</u>?
   The total amount to be repaid is <u>R192,780</u>.
   There are 60 payments.
   So: $192780 \div 60 = 3213$
   This means that the monthly payment will be <u>R3,213.00</u> per month.

> **!**
>
> **Note:** As you can see, if R3,213.00 is saved up per month before you bought the car in the example, you would have had to save for $100000 \div 3213 = 31.12$, i.e. 32 months, to afford the car. You would have saved 28 months worth of payments. Essentially this means that on a 60-month loan you will pay interest for 28 of the 60 months.

3.2. BUYING A HOUSE

Since all loans have different terms and conditions, it might be wise to look at a home loan as well. Owning a house is often considered a long-term liability. This means that most people do not have the means to pay cash for a house; they are required to pay it off.

 Banks allow for an interest amount of less than the prime rate because the amounts are large and the term is much longer than that for a car (often 20-25 years).

We have seen that for a medium term liability, the interest is worked out over the entire period before it is broken up into monthly repayments. A home loan works differently.

Every month interest is worked out for that month. The repayment is then subtracted from the total and a new interest amount is worked out for the next month. The payment is usually higher than the interest amount, which means that part of the capital amount will also be paid. The interest calculated for the next month is calculated on the amount of capital outstanding after the previous payment. The following example illustrates this concept.

E.g.
Bill buys a house for R500,000.00 at an interest rate of 9,5 per year payable monthly. Bill estimates that he can afford to pay an instalment of R6,000.00 per month to pay off the loan.

The interest rate is 9,5% per year which means that we have to work out one twelfth of that per month. 9,5/12 = 0,79%. So the interest rate per month is 0,79%.

Month 1:   The interest part of Bill's first monthly payment is P.r.n
500000 x 0,0079 x 1 = 3950
Bill pays R6 000,00, so the capital he pays toward the loan is
6000 – 3950 = 2050.
The value of the loan at the end of that month is (500000 – 2050)
R497,950.00

Month 2:   We have to consider the value of the loan at the end of the last interest period to work out the new interest value (P is now R497 950,00 in stead of R500,000.00)
497950 x 0,0079 x 1 = 3933,81
Bill pays R6,000.00, so the capital he pays toward the loan is
6000 – 3933,81 = 2066,19
The value of the loan at the end of this month is (497950 – 2066,19)
R495,883.81

Can you see that he pays more of the capital off in the second month compared to the first month?

Note: If the repayment value does not change, the amount of capital repaid each month increases throughout the period of the loan.

SECTION C: HOMEWORK

QUESTION 1

Use the formula for compound interest as we know it: $A = P(1 + \dfrac{r}{100})^n$ and convert it into a formula, which calculates interest compounded quarterly. (Hint! The interest rate needs to be divided and the term needs to be multiplied by the same number.)

(4)

QUESTION 2

Janet borrows money from the bank. She borrows R12 000,00. Calculate the value of the loan after 5 years if the interest rate is

a.	4% per annum compounded monthly.	(5)
b.	4,5% per annum compounded yearly.	(3)
c.	5% simple interest.	(3)
d.	12% compounded once every 30 months.	(3)

[14]

QUESTION 3

Maria is twenty-five years old. She has just started a job and earns a good salary. Her parents have told her that investing at an early age will ensure financial stability in her old age. She decides to put R1 500,00 per month into a pension fund that has a yearly interest rate of 12% per year.

Use the annuity formula: $A = R\dfrac{(1+r)^n - 1}{r}$

a.   If the average retirement age is 60, what will the value of her annuity be if she continually makes the same payment for the next 35 years?

(5)

b.   How much money will Maria pay into the annuity?

(2)

c.   What is the percentage gain over the total period of time?

(2)

d.   Maria has her heart set on buying a holiday house when she retires. It will probably cost R600 000,00 by the time she retires. Will she be able to afford it?

(1)

Use the payments formula: $R = \dfrac{Ar}{(1+r)^n - 1}$

e.   What would Maria's periodic payments have to be at the same interest rate if she wants to retire with a lump sum of R850 000,00.

(5)

[15]

SECTION D: SOLUTIONS AND HINTS TO SECTION A

QUESTION 1

1.1   There are 4 quarters per year: $7 \div 4 = 1,75\% = 0,0175$ ✓✓

1.2   There are 4 payments per year: 5,5 – 4 = 22 interest intervals ✓✓

1.3 $A = P(1+r)^n$ ✓

$A = 2000(1+0,0175)^{22}$ ✓✓✓

$A = R2929,46$

1.4   A – P = interest amount

$A - P = 2929,46 - 2000 = R929,46$ ✓✓   **[10]**

QUESTION 2

2.1

Formula to use A = 5000(1 + 0,085)

a.   The table: ✓✓✓✓

Year (n)	0	1	2	3	4	5	6	7
Investment	5000	5425	5886,12	6386,45	6929,29	7518,28	8157,34	8850,71
Interest	0	425	886,12	1386,45	1929,29	2518,28	3157,34	3850,71

b.   R6929,29 ✓

c.   3850,71 – 3157,34 = R693,37 ✓✓

d.   The interest is compounded and increases from period to period because in each period it is calculated not only on the principle value, but on the interest from the previous periods as well. ✓✓✓   **[10]**

2.2   a.   Option A: $A = 1500(1 + 0,083 \times 3)$ ✓✓✓

                             $A = R1860,00$ ✓

            Option B: $A = 1500(1 + 0,0075)3$ ✓✓✓

                             $A = R1863,45$ ✓

            This means that option B has the higher return. ✓

   b.   As interest is added every year, option B adds interest to the interest whereas option A only adds the interest on the initial amount. ✓✓✓   **[12]**

TOPIC 2: TAX, INFLATION, INTEREST, EXCHANGE RATES, CURRENCY FLUCTUATIONS

Learner Note: This section can be confusing. BUT these marks are easy if you know the calculations to work out VAT etc. Know how to formulate your answer, and be aware of important concepts. Pay careful attention to what is being asked.

SECTION A: TYPICAL EXAM QUESTIONS

QUESTION 1

Adam earns R160 000,00 per year (per annum).

1.1	Which tax bracket does Adam fall into?	(1)
1.2	How much tax does Adam have to pay per year?	(3)
1.3	How much tax does Adam have to pay per month?	(2)
		[6]

QUESTION 2

On 25 June 2007 XYZ-Trading sells some items to Mr Jackson, a regular customer. He is going on a tour of South Africa and is buying supplies for the trip. This is his 26th purchase from XYZ-Trading. On his tour, Mr Jackson will also rent some property and has asked that the rent be added to the invoice for his purchases.

- ❖ 1 sleeping bag – R255,90
- ❖ 1 large raft – R895,99
- ❖ 1 barrel of petrol – R563,95
- ❖ 1 bag of maize meal – R29,90
- ❖ 1 dozen eggs – R13,50
- ❖ 1 litre of cooking oil – R12,45
- ❖ 2,5 kg of meat – R234,55
- ❖ 5 nights rental of a hut in the mountains – R3190,00
- ❖ 6 litres of long life milk – R36,50
- ❖ 1 road map – R69,95
- ❖ 1 gas cooker – R285,90

All prices above are given excluding VAT. The address for XYZ-Trading is 4 Northlock Road, Kennely, 2294. Their VAT No is 739167409. Mr Jackson lives at 12 Mendel Street, Benoni, 2391.

    1.1 List all items that have a Zero-rating for VAT.   (5)

    1.2 List all items that need to have VAT added.   (5)

    1.3 Which is the VAT exempt item?   (1)

    1.4 Calculate the total amount excluding VAT payable by Mr Jackson.   (2)

    1.5 Calculate the total VAT due by Mr Jackson.   (3)

    1.6 What is the invoice value?   (2)

    1.7 VAT is part of the money that the government spends on various services for the public. Name three services that benefit Mr Jackson on his tour around the country.

                                                                (2)

                                                                 [20]

SECTION B: ADDITIONAL CONTENT NOTES

1. TAX

Have you ever wondered why people have to pay tax?

The government tries to supply its citizens with many items such as infrastructure (roads, electricity, water, etc), health care, an education system, security and safety. The money needed for these projects comes from the people themselves. We pay for these services by paying taxes.

There are various types of taxes: VAT, income tax, sin tax, capital gains tax. All these are combined to create government revenue, otherwise referred to as government income. The government then distributes this money to pay for various projects such as those listed above. At the beginning of every year the government declares, in its 'Budget Speech', where they are allocating the funds. This allocation is called government expenditure.

In mathematical literacy we learn how to calculate the value of VAT charged for a particular item, the income tax an employee has to pay and a variety of other tax calculations.

1.1   VAT – VALUE ADDED TAX

According to the website www.inventir.com the definition for VAT is as follows:

VAT – Value Added Tax: An indirect tax on consumption that is assessed on the increased value of goods at each point in the chain of production and distribution, from the raw material stage to final consumption. The tax on processors or merchants is levied on the amount by which they increase the value of the items they purchase and resell. (www.invertir.com**)**

In simpler terms this means that during the process of production of a consumer good each production process adds some value to that product. A percentage of the value that is added is taxed, i.e. payable to the government, at the moment when the product is bought and sold again. In South Africa we pay 14% VAT on most consumer goods. This process ensures that everyone in the country contributes to the infrastructure they make use of on a daily basis.

To determine the portion of VAT for a specific product we use percentage calculations.

E.g.

Julie wants to buy a TV. The shop she is at, has listed prices that are exclusive of VAT. The TV she likes costs R1350,00.

1. What amount of VAT will she have to pay?

Remember that the VAT rate in South Africa is 14%. This means that we have to add 14% to the listed price of the television.

14% of R1350,00 is calculated as follows: $\dfrac{14}{100} \times 1350 = 189$

Therefore, Julie will have to pay R189,00 VAT on top of the listed price.

2. What will Julie have to pay in total?

There are two ways of calculating the final amount:

A: If we know the price without VAT and the VAT amount, we can simply add the two together, so: $1350 + 189 = 1539$
Julie has to pay R1539,00 including VAT.

B: If we have not yet worked out the VAT amount, we can calculate the final value as follows:
1350 is 100%. If we add 14%, we need to work out 114% of the listed price. Thus we calculate: $\dfrac{114}{100} \times 1350 = 1539$
Julie has to pay R1539,00 including VAT.

The table below is a useful tool that you can use to solve percentage calculations.

Rand	Percentage
1 350,00	100%
13,50	1%
189,00	14%
1 539,00	114%

Remember that the price of a product excluding VAT is always 100%. Divide by 100 to get the value of 1%. To find the VAT value, multiply the Rand value of 1% by 14. The total price including VAT will then be the Rand value of the 100% plus the Rand value of the 14%. (Alternatively: multiply the 1% by 114 to get the price including VAT)

E.g.
Jenny makes plans to buy a washing machine. Her father has offered to pay the VAT, if she pays the rest of the amount. She finds a washing machine with a sales price of R2500,00 including VAT.

1. **What is the VAT value that Jenny's father will pay?**
2. **What was the price before VAT was added?**

Rand	Percentage
2500,00	114%
21,93	1%
307,02	14%
2192,98	100%

1. The total price is R2500,00. This includes 14% VAT. This means that the R2500,00 consists of 100% + 14% (the value of the washing machine without VAT = 100%). To get the Rand value of 1% we divide by 114. Multiply this by 14 to get the value of the VAT for the washing machine. **The VAT value is R307,02**

2. To calculate the price of the washing machine without VAT, multiply the Rand value of 1% by 100. **The price Jenny has to contribute, i.e. the price excluding VAT is R2192,98.**

1.2. VAT INVOICES

A company that is registered at the South African Revenue Service for VAT, must make sure they comply with the correct formats of their documents.

Zero-rated VAT: Zero-rating implies that VAT at 0% is levied on supplies made by the vendor. VAT incurred on goods or services acquired by the vendor for purposes of making those supplies are claimable as input tax.
The following goods and services are subject to VAT at the zero-rate:

Goods

Goods exported from South Africa where the vendor is liable for the transport of the goods to the foreign country Brown bread

- ❖ Brown wheaten meal
- ❖ Maize meal
- ❖ Samp
- ❖ Mealie rice
- ❖ Dried mealies
- ❖ Dried beans
- ❖ Rice
- ❖ Lentils
- ❖ Fruit and vegetables
- ❖ Pilchards and sardinella in tins or cans
- ❖ Milk, cultured milk and milk powder
- ❖ Cooking oil
- ❖ Eggs
- ❖ Edible legumes and pulse of leguminous plants
- ❖ Dairy powder blends
- ❖ Petrol, diesel and illuminating paraffin
- ❖ Certain agricultural goods supplied to qualifying VAT registered farmers
- ❖ Certain gold coins issued by the S.A. Reserve Bank, including Kruger Rands

Services (including but not limited to)

- ❖ International transport and related services
- ❖ Payments by public / local authorities to welfare organisations
- ❖ Services supplied outside South Africa.

VAT Exemption: Some products or services may not be taxed. This means that there is no VAT charge for them otherwise referred to as VAT exempt.

Below is a list of VAT exempt products and services.

- ❖ Passenger service by rail or road
- ❖ Financial services
- ❖ Supply by a charitable organisation of any donated goods
- ❖ Rentals on residential property
- ❖ The sale or rental of land outside SA
- ❖ Share block and body corporate levies - but not home owners' associations
- ❖ Educational services
- ❖ Union membership fees
- ❖ Service of caring for children by a crèche or an after-school care centre (after-care)

E.g.

Below is a municipality invoice for Gregory Malomola.

1. tax invoice				
account number: 400200321				
Gregory Malomola 20 Marion Place Carrod Road 2192	Account for March 2007	Invoice Number J00000307		Date: 04 April 2007
ITEM	**UNITS**		**VAT**	**COST**
Electricity	435		26.19	187.05
Electricity Grant	-45.99		-2.77	-19.78
Water Services	11		3.57	25.53
Assessment Rates	Domestic			195.59
Sewer	1		14.08	100.55
Refuse removal	1		6,21	44.34
		Subtotal	**47.28**	**533.28**
		VAT		**47.28**
		TOTAL DUE:		**580.56**
Jessburg Municipality VAT No: 29810784 P O Box 5200 Jessburg 8700				

1. Why is there no VAT charge for the assessment rates?

Assessment rates are charges for owning residential property. This is a VAT exempt item on the invoice.

2. Why is there a negative charge on the invoice?

The municipalities allow each household a certain amount of free electricity. This is because the government is trying to supply at least some affordable electricity services to the population. The electricity grant is the amount that one does not have to pay for, so it is subtracted from the amount used for that month. Please note the VAT for that amount of electricity is also subtracted.

1.3. INCOME TAX

Every person in South Africa who is employed and earns a certain minimum amount, has to pay tax on his or her income. The tax on income is calculated as a percentage of the income.

The table below gives us a guideline as per the South African Revenue Service. (For more information on Taxation in South Africa visit: www.sars.gov.za). The Minister of Finance determines South African Tax when he delivers his budget speech in mid February each year. The tables below cover changes made in February 2006.

FIG –South African Revenue Services Pamphlet

Taxable income (R)	Rates of tax (R)
1 - 80 000	18% of each R1
80 001 - 130000	14 400 + 25% of the amount above 80 000
130 001 - 180 000	26 900 + 30% of the amount above 130 000
180 001 - 230 000	41 900 + 35% of the amount above 180 000
230 001 - 300 000	59 400 + 38% of the amount above 230 000
300 001 and above	86 000 + 40% of the amount above 300 000

Rebates (Individuals only)	2005/06
Under 65 years	R6 300
65 years and older	R4 500

Tax thresholds	2005/06
Under 65 years	R35 000
65 years and older	R60 000

Standard Income Tax on Employees (SITE): Level: R60 000

The table states that anyone under the age of 65 who earns more than R35 000,00 per year is liable for income tax. The same applies to individuals who are over the age of 65 and earn more than R60 000,00 per year.The first row of the taxable income is calculated as a straight percentage. Every other row is calculated by adding a lump sum to the percentage above the given amount.

A rebate applies to any individual who receives a yearly income above the tax threshold. This amount is given back to the employee.

1.4. GOVERNMENT EXPENDITURE

The government carries the responsibility of spending the revenue on those important items its citizens need. The government revenue is made up of income from VAT, income tax and other taxes paid by the citizens of this country.

Every year the Finance Minister delivers what is called the Budget Speech to inform the citizens of this country how the government plans to distribute their revenues. This means that the government carries an enormous social responsibility to look out for the well being of their people.

2.   INFLATION

As said before, the CPI is taken every month. The average of these twelve values is then calculated and once we have that, we compare it to the previous year's average CPI.

$$\%\inf lation = (CPI_m - CPI_n) \div CPI_n \cdot 100$$

Where m is the most current year and n is the year furthest in the past.
E.g.
The average CPI for 2002 was 116,5. the average CPI for 2001 was 106.6.
The inflation rate for 2002 = (116,5 – 106,6) ÷ 106,6 x 100 = 9,3%

3.   EXCHANGE RATES AND FOREIGN EXCHANGE

Have you ever wanted to travel overseas? In order to travel, you need to have the currency of each country that you want to stay in. Since you don't live in that country you may not know what it costs to buy a cup of coffee. Have you exchanged enough of your rands to, e.g. dollars?

Exchange Rate
An exchange rate is the price of one nation's currency in terms of another nation's currency. This means that it is a measure of the strength of one currency against another.

The newspaper reports every day on the state of our currency in regards to other currencies. They may report that the 'rand is R8,55 to the dollar'. This means that for every dollar you want to 'buy' you have to pay R8,55.

Example: The Rand-Dollar exchange rate is given as R6,32 to the dollar. This means that we can buy one US dollar for six South African rand and thirty-two cents.
1$ = R6,32
To see how many dollars we can buy with one rand, we have to divide both sides of the above equation by 6,32.
0,16$ = R1,00
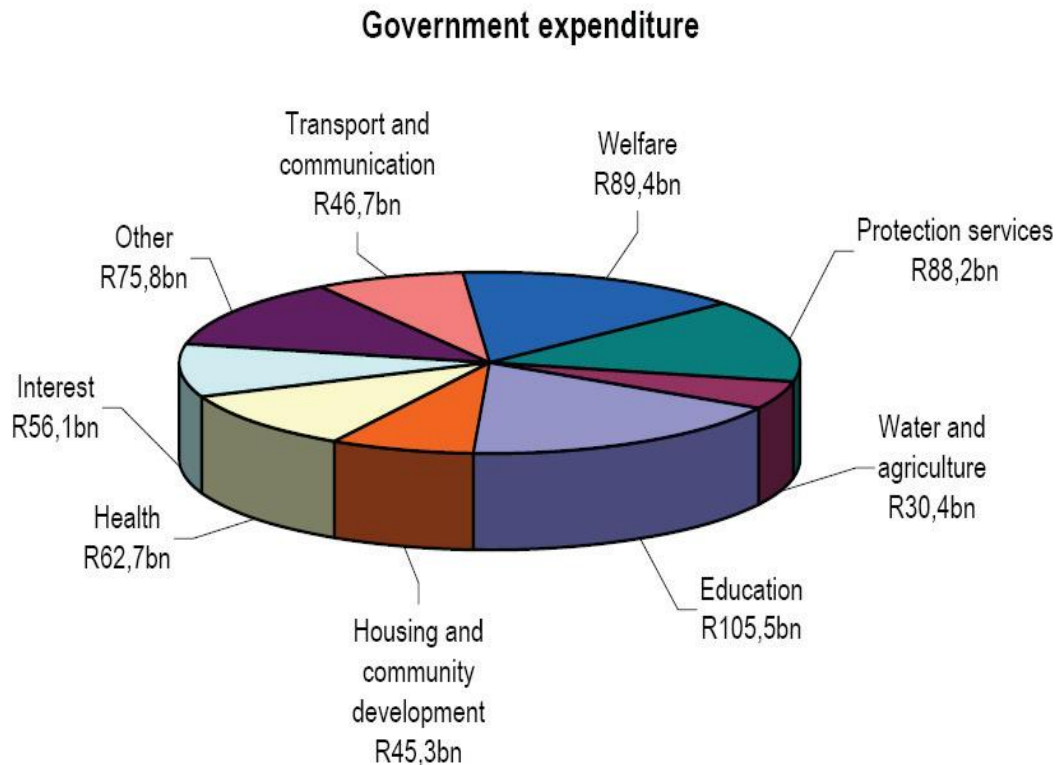**Thus one South African rand buys 16 American cents.**

SECTION C: HOMEWORK

QUESTION 1

The pie chart below was published on: http://www.finance.gov.za.
It gave South African citizens a broad indication of how the government planned to spend their revenue on certain sectors in the period 2007/2008.

Government expenditure

http://www.finance.gov.za

Please Note: R56,1 bn is 56,1 billion Rand, i.e. R56 100 000 000,00.

1.1   What is the total amount the government intends on spending?   (2)

1.2   The previous year the government expenditure amounted to a total of R472,7bn and the breakdown was given as in the table below.
     Calculate how many billion Rand were allocated to the education sector.   (2)

TABLE 1Adapted from www.finance.com

Government expenditure 2006/2007	
Education	17,8%
Housing and community development	6,8%
Health	10,5%
Interest	10%
Other	12%
Transport and communication	6,7%
Welfare	15,5%
Protection Services	15,3%
Water and Agriculture	5,3%

1.3. Compare the government expenditures of 2006/2007 to those of 2007/2008.

     1.3.1   In which sector is the highest percentage difference?   (2)

     1.3.2   Where the percentages have increased, what would the impact be?   (2)

     1.3.3   Where the percentages have decreased, what would the impact be?   (2)

                                                            [10]

QUESTION 2

Thomas has just come back from a trip overseas. Four weeks before he departs for America, the exchange rate is R7,14 to the dollar. One week before he departs the exchange rate is R7,52 to the dollar.

2.1   Thomas exchanged R8 500,00 four weeks before he left, how many dollars did he receive?

                                                                      (3)

2.2   If Thomas exchanged the same amount of rands one week before departure, how many dollars would he have?

                                                                        (3)

2.3   How much money would he gain by exchanging his money early?

                                                                             (2)

2.4   If Thomas buys a pair of pants for $43,95, how many rands would he spend? Calculate for both exchange rates.

                                                                                 (4)

2.5   Describe what happens to the cost of foreign goods when the exchange rate strengthens against the dollar?

                                                                             (2)

                                                            [14]

SECTION D: SOLUTIONS AND HINTS TO SECTION A

QUESTION 1

1.1 According to the above table he falls into row three of the taxable income:
130 001 – 180 000 : 26 900 + 30% of the amount above R130 000
(1M for calculation)   ✓   (1)

1.2 From 0 – 80 000 the income is taxed at 18%.

$$\frac{18}{100} \times 80000 = 14400 ✓$$

From 80 001 – 130 000 the income is taxed at 25%.

$$\frac{25}{100} \times (130000 - 80000) = 0,25 \times 50000 = 12500$$

$$14400 + 12500 = 26900 \quad \textbf{This is the bulk value in row three}$$

The rest of the income tax is the portion is taxed at 30%:

$$\frac{30}{100} \times 30000 = 9000 ✓$$

The total tax payable per year is:

$$26900 + 9000 = R35900 ✓$$

(3M for calculating tax per year)   (3)

1.3 The tax payable per month is:

$$35900 \div 12 = R2991,67$$

(2M calculating tax per month) ✓✓   (2)

[6]

QUESTION 2

2.1 Zero-rated items:
1 barrel of petrol✓
1 bag of maize meal✓
1 dozen eggs✓
1 litre of cooking oil✓
6 litres of long life milk✓

2.2 VAT items:
1 sleeping bag✓
1 large raft✓
2,5kg of meat✓
1 road map✓
1 gas cooker✓

(5x2) (10)

2.3   VAT exempt item
        5 nights rental of a hut in the mountains✓   (1)

2.4   The total value excluding VAT
        $255{,}90 + 895{,}99 + 563{,}95 + 29{,}90 + 13{,}50 + 12{,}45 + 234{,}55$ ✓✓   (2)
        $+ 3190{,}00 + 36{,}50 + 69{,}95 + 285{,}90 = 5588{,}59$

2.5   VAT

        $(255{,}90 + 895{,}99 + 234{,}55 + 69{,}95 + 285{,}90) \cdot \dfrac{14}{100} = (1742{,}29) \cdot 0{,}14 = 243{,}92$ ✓✓✓

        (3)

2.6   Invoice value:
        $(5588{,}59 + 243{,}92) = R5832{,}51$ ✓✓   (2)

2.7   Mr Jackson uses the road, maybe even National Parks. The police maintain
        safety on the roads he travels,and a government hospital could take care of
        him in case of an emergency. ✓✓   (2)

        [20]

SESSION 2: TOPIC 1: LENGTH, DISTANCE, PERIMETERS AND AREAS OF POLYGONS

!	**Learner Note**: It is important to KNOW YOUR FORMULAE. This section is based solely on knowledge of formulae and this could mean the difference between the right and wrong final answer. It is important to know the first step. Learn the formulae off by heart.

SECTION A: TYPICAL EXAM QUESTIONS

Here are some helpful tables:

** Remember 1000cm = 1m

When you know length & distance	Multiply by	To find
millimetres	0,04	inches (in)
centimetres	0,4	inches (in)
metres	1.1	yards (yd)
square centimetres	0,16	square inches (sq. in)
square metres	1.2	square yards (sq. yd)

IMPERIAL	METRIC
MEASUREMENTS OF LENGTH	
1 inch	= 2,54 cm
0,39 inches	= 1 cm
12 inches = 1 foot	= 30,48 cm
36 inches = 1 yard	= 91,44 cm
3 feet = 1 yard	= 91,44 cm
39,37 inches	= 1 metre
1760 yards = 1 mile	=1,6km
0,625 miles	= 1 km
5 miles	= 8km
0,54 nautical miles (at sea)	= 1 km

QUESTION 1

1.1.   Answer the following referring to the above conversion tables and what you remember about conversions within the metric system

a)   1 km = _____ m
        A. 1
        B. 50
        C. 1000
        D.   1 000 000

b)   20 inches = _____ cm
        A. 50,08
        B. 7,87
        C. 20
        D. 40

c)   3 metres = _____ feet
        A. 3
        B. 9,84
        C. 118,11
        D.   39,37

d)   250 miles = _____ km
        A.   563,3
        B.   400
        C.   156,25
        D.   750

e)   Convert   7,5 nautical miles to km.
        A.   4,05
        B.   8,04
        C.   7,5
        D.   13,89

                                                                                    (5)

1.2.   Belinda has moved from the USA to South Africa and brought her washing machine, refrigerator and dishwasher with her. The dimensions on the box are given in imperial units and the space in her kitchen is given in SI (metric) units.

       Convert all imperial units to SI units to see if the appliances will fit in the spaces provided.   (7)

Learner note: Use 1 inch = 2,54 cm

APPLIANCE	DIMENSIONS -IMPERIAL (USA)	SPACE AVAILABLE SA
Washing machine : length	3 feet 7 inches	90 cm
depth	34 inches	90 cm
height	39 inches	1 m
Refrigerator : length	39 inches	1 m
depth	2 feet 8 inches	90 cm
height	69 inches	1,8 m
Dishwasher : length	35 inches	1,1 m
depth	35 inches	90 cm
height	39 inches	1 m

[12]

QUESTION 2

> **Learner Note:** Remember the formula: $s = \dfrac{d}{t}$

Answer the following **using the distance table:**

2.1

a) How many kilometres would you travel if you went from Durban to Underberg?
    A. 100km
    B. 344km
    C. 99km
    D.   304km

b) Which is the quicker route from Durban to Kokstad, via Pietermaritzburg or via Port Shepstone?
    A. Via Port Shepstone
    B. Via Pietermaritzburg

c) Which city **on the table** is closest to Howick?
    A. Kokstad
    B. Hluhluwe
    C. Mooi River
    D. Pietermaritzburg

d) Which city **on the table** is furthest away from Howick?
  A. Ulundi
    B. Vryheid
    C. Dundee
    D. Richards Bay

(4)

2.2. Elizabeth went for a cycle ride.The distance-time graph shows her ride.
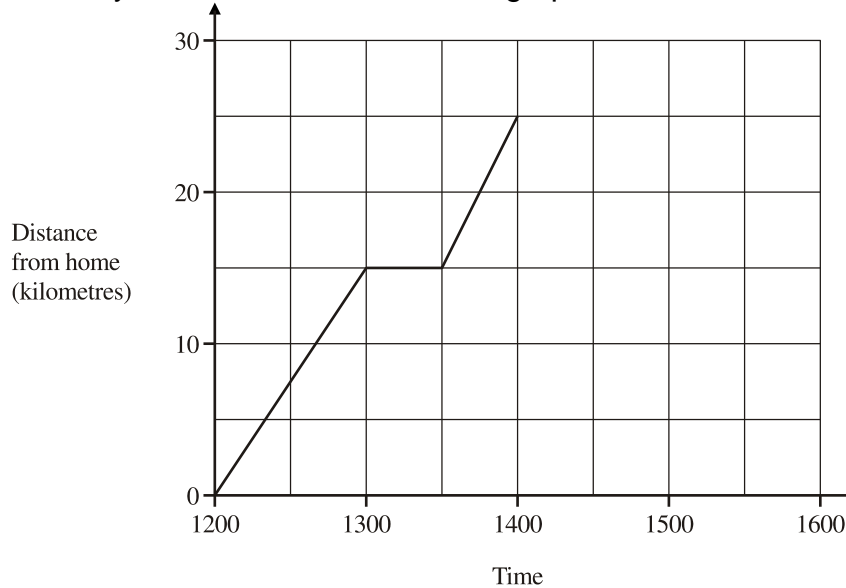
She set off from home at 12:00 and had a flat tyre at 14:00.
During her ride, she stopped for a rest.

a) At what time did she stop for a rest?   (1)

b) At what speed did she travel after her rest? Give your answer in km/h.   (2)

Speed = distance ÷ time

c) What total distance did she travel before she got a flat tyre?   (1)
                                                                                 [8]

QUESTION 3

3.1. Determine the perimeter of a soccer field if the length is 100m and the
      breadth is 50m.   (2)

3.2. What is the perimeter of the building if the breadth is 20m and the length is
      2362,2 inches.   (3)

3.3.   Look at the building plan below and calculate the following:
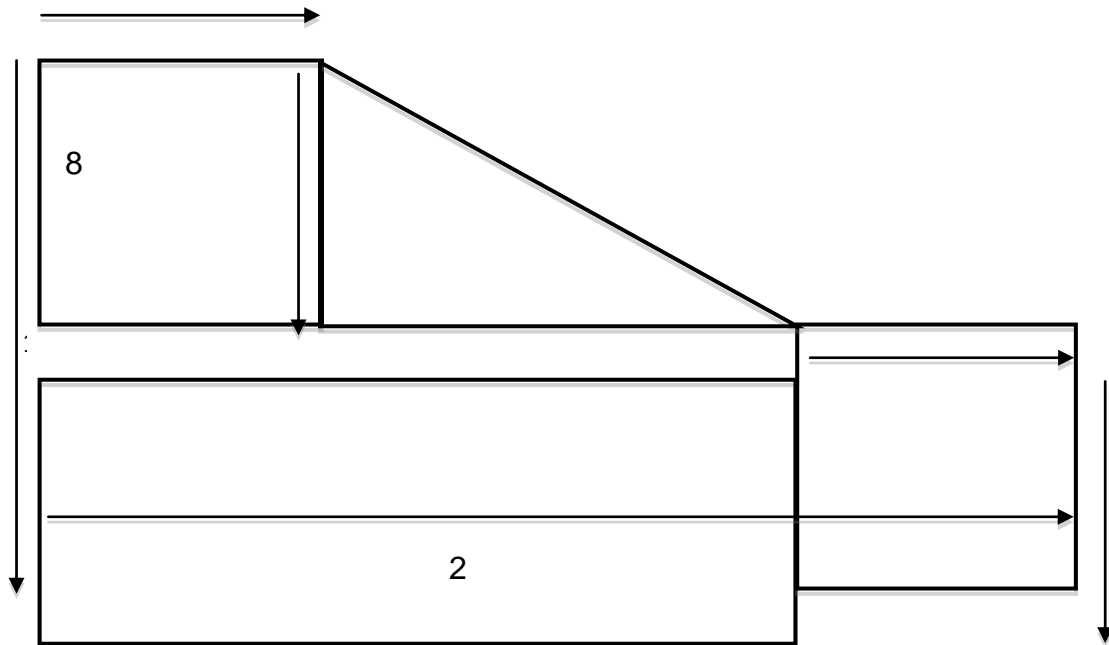
a) Calculate the perimeter of A   (2)
b) Calculate the perimeter of B   (2)
c) Calculate the total perimeter   (2)
                                                                                               [11]

QUESTION 4

4.1. Calculate the area of the polygon if a = 3cm and s = 2cm   (3)

4.2. Take no note of what "a" is equal to in 4.1, calculate **a** if P = 24m; A = $60m^2$; s = 3
                                                                                               (3)
                                                                                               [6]

Remember: **Perimeter = *sn***
A = $\dfrac{aP}{2}$ **Area = $\dfrac{\text{apothem x Perimeter}}{2}$**

SECTION B: ADDITIONAL CONTENT

1. **INTRODUCTION**

   In this lesson you will learn how to work with a distance table and how to convert units of measurement between different measuring systems. You will learn to estimate with accuracy and how to use conversions in everyday life.

2. **LENGTH**

   It is important to have a feel for the length and measurements around you. For example, how wide or tall or long things are; how far you live from certain points, etc.

3. **DISTANCE**

   Unit 6 Work with length and measurement

   A. USING A DISTANCE TABLE

The distance table above gives you an indication of travel distances between various cities in South Africa.

> ***Note:** Generally, when distance is used, so too is time and speed. In examinations these three usually go hand in hand. The time is given in in hours and distance is given in km so, if necessary, you will need to convert these variables. The formula to use if given any of the two variables is:
>
> $$s = \frac{d}{t}$$
>
> Where: s = speed
>   d = distance
>   t = time

For example:
If Thandi traveled for 3 hours on Saturday at a speed of 60km/hr. What distance did she cover?

Use the formula: $s = \dfrac{d}{t}$

Therefore: $60 = \dfrac{d}{3}$

You will need to change the variables to work out d. You wil therefore use: **d = st**

$$d = 60 \times 3$$
d = 180km traveled

4.   PERIMETERS

When calculating perimeter, you are calculating the distance around the object, for example, the distance around a soccer field or building. If you walk around the soccer field measuring with a measuring tape, you would be calculating the perimeter. Where all the sides of the object are of different lengths, you simply add them together. The following formula is used where the two lengths are the same and the two breadths/widths are the same.

The formula to calculate perimeter is: **2L + 2B = P**

Where: L = Length
        B = Breadth
        P = Perimeter

The formula to calculate a square, where all sides are the same is:

4s = P

s = Length of sides
P = Perimeter

5.   AREAS OF POLYGONS

When calculating area, you are determining the amount of "space" an object takes, for example, the amount of space the surface of a soccer field would take up.

The formula to determine Area is:

A = L x B

A = Area
L = Length
B = Breadth

The formula, however, differs with regards to polygons. In order to calculte the area of polygons, you can divide a regular polygon into congruent isoseles triangles by drawing from the centre of the polygon to each vertex. The centre of the polygon is the centre of the circumscribed circle. The apothem of the polygon is the distance from the centre of the polygon to the side at a right angle.

The area of the polygon is given by the formula.

A = Area
a = apothem
s = length of each side
n = number of sides
P = Perimeter

Perimeter = *sn*
A = $\dfrac{aP}{2}$ **Area = $\dfrac{\text{apothem x Perimeter}}{2}$**
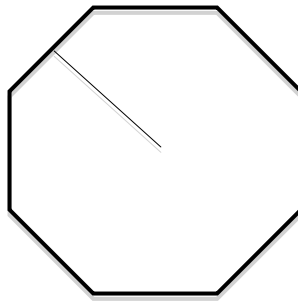
SECTION C: HOMEWORK

QUESTION 1

a)   Convert 3,5 metres to centimetres.   (1)
b)   Express 650 millilitres in litres.   (1)
                                                                          [2]

QUESTION 2

A trailer is 180 cm in length 1,2 m in width and 80 cm in height. (1000cm = 1m)

What is the perimeter of the trailer?
        P = 2(l +b)   [2]

QUESTION 3

3.1.   From the plans below, calculate the perimeter, in feet, of the doubles tennis court.
(2)

3.2.   Calculate the area of the tennis court in feet.
(3)
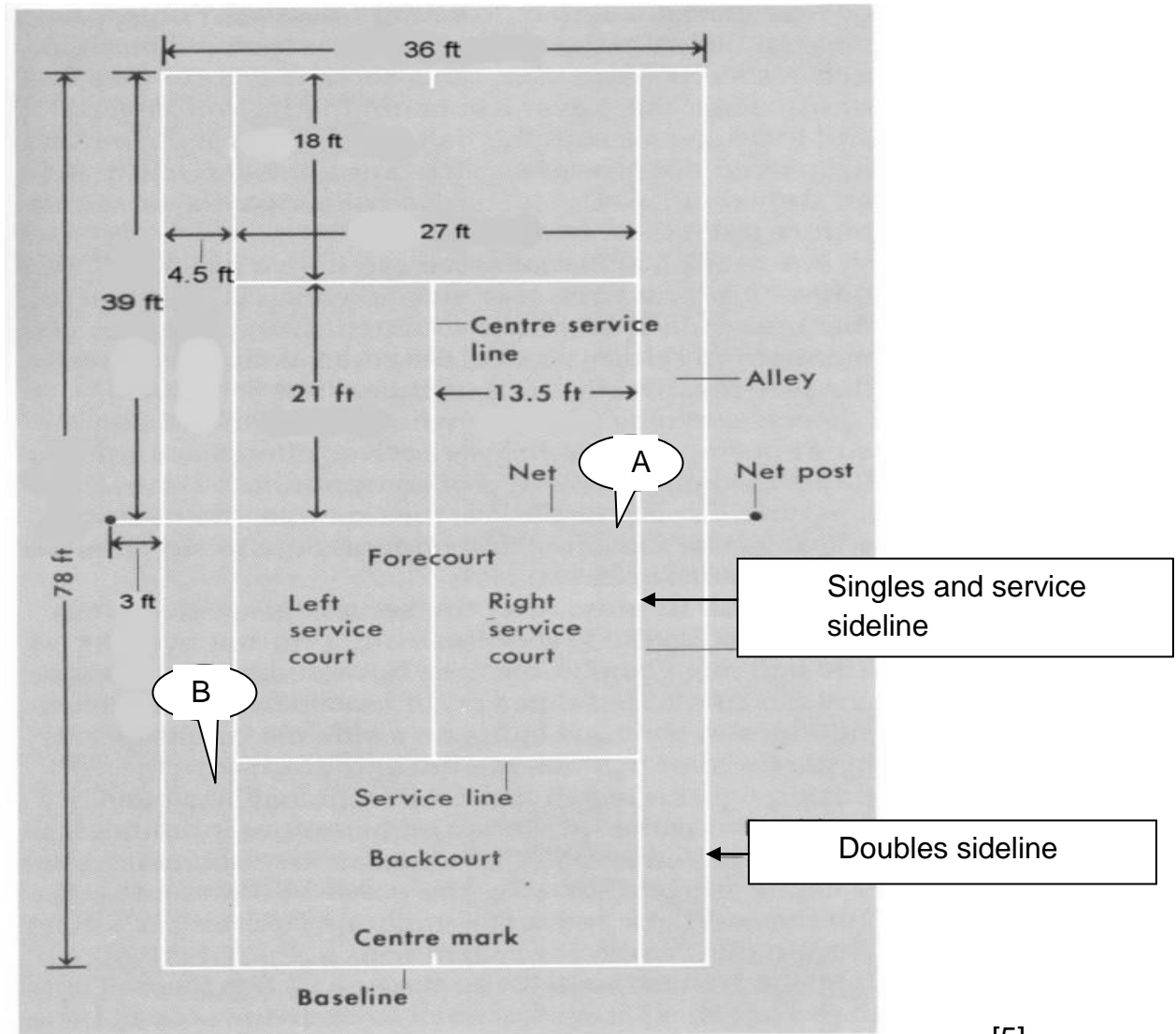
[5]

QUESTION 4

Calculate the area of the polygon if a = 6cm and s = 5cm   [3]

QUESTION 5

Calculate the perimeter of a square if one of the sides is 4km long.   [3]

SECTION D: SOLUTIONS AND HINTS TO SECTION A

QUESTION 1

1.1.
   a)   C. There are 1000 m in a km.✓   (1)
         (To convert to a larger unit, move the decimal place to the left
         divide by 10 each time)
         (To convert to a smaller unit, move the decimal place to the right
         multiply by 10 each time)

   b)   A.   50,08✓   (1)
         1 inch = 2,54 cm
         So 20 inches = 20 X 2,54 cm
                  = 50,08 cm

   c)   B. 9,84✓   (1)
         1 m = 39,37 inches
         so 3m = 39,37 X 3inches
               = 118,11 inches
         but 1 foot = 12 inches
         so 3m = 118,11 ÷ 12 = 9,84 feet

   d)   B. 400✓   (1)
         0,625 miles = 1 km
         1 mile = 1 ÷ 0,625 km
              = 1,6 km
         so 250 miles = 250 X 1,6
                  = 400 km

   e)   D. 13,89✓   (1)
         0,54 nautical miles = 1 km
         1 nautical mile = 1 ÷ 0,54 km
                 = 1,8518...km
         so 7,5 nautical miles = 7,5 X 1,85
                  = 13,89 km   [5]

1.2. Washing machine height = 109,22 cm. Therefore will not fit✓

     Refrigerator length = 99,06 cm OK✓
                  depth = 81,28 cm   OK✓
                  height = 175,26 cm Will just fit✓

     Dishwasher   length = 88,9 cm OK✓
                  depth = 88,9 cm OK✓
                  height = 99,06 cm OK Will fit✓   (7)
                                            [12]

QUESTION 2

2.1.
    a)   C. 199km ✓   (1)

    b)   A. via Port Shepstone 255km ✓
                        (via Pietermaritzburg is 268 km)   (1)

    c)   D. Pietermaritzburg 18km ✓   (1)

    d)   A. Ulundi 330 km ✓   (1)
                                                                           [4]

2.2.
    a)   13:00 ✓   (1)
    b)   10km ÷ ½ hour ✓
                    = 20 km/h   ✓   (2)
    c)   25km ✓   (1)
                                                                          [4]
                                                                           [8]

QUESTION 3

3.1.   P = 2L + 2
              P = 2(100) + 2(50)   (1M for correct calculation)
              P = 200 + 100
              P = 300m   (1M for correct answer)   (2)

3.2.   P = 2L + 2B
              L = 2362,2 ÷ 39,37inches = 60m (1M for conversion from inches to meters)
              Therefore: P = 2(60) + 2(20)
                           P = 120 + 40   (1M correct calculation)
                           P = 160m   (1M correct answer)   (3)

3.3.
    a)   A: P = 2L + 2B
                   P = 2(8) + 2(4)   (1M correct calculation)
                   P = 24m   (1M correct answer)   (2)

    b)   B: P = side 1 + side 2 + side 3
                   P = 8 + 12 + side 3   (1M correct calculation)
                   Side 3 = 24 - 8 - 8 = 8m   (Calculation of side 3; take bottom side
                                             Subtract the two square sides of 8 and 8)
                 Therefore: P = 8 + 12 + 8
                           P = 28m   (1M correct answer)   (2)

    c)   Total Perimeter: P = 16 + 8 + 12 + 8 + 8 + 24 ✓ (1M adding all sides
                                                    together)
                      P = 76m   (1M correct answer)   (2)
                                                                          [11]

QUESTION 4

4.1 $A = \dfrac{aP}{2}$ (1M correct calculation)

$P = sn = 2 \times 8 = 16cm$ (1M calculation of perimeter)

Therefore: $A = \dfrac{3 \times 16}{2}$

$A = 24cm^2$ (1M correct answer)   (3)

4.2. $A = \dfrac{aP}{2}$

$60 = \dfrac{a \times 24}{2}$ (1M correct calculation)

$2 \times 60 = a \times 24$

$\dfrac{120}{24} = a$ (1M correct changing of variables to calculate a)

Therefore: **$a = 5cm$**   (1M correct answer)   (3)

[6]

TOPIC 2: SURFACE AREA AND VOLUME

> **Learner Note:** Make sure you learn the formulae and know how to do the calculations. Ensure that you understand the difference between surface area and volume. The concepts are confusing so ensure that you know what is being asked, and that you know the difference between surface area and volume.

SECTION A: TYPICAL EXAM QUESTIONS

QUESTION 1

1.1. Calculate the areas of the following shapes:

a.)

60m

125m

b)

5cm

60km

c)

10m

20m

d)

50km

45km
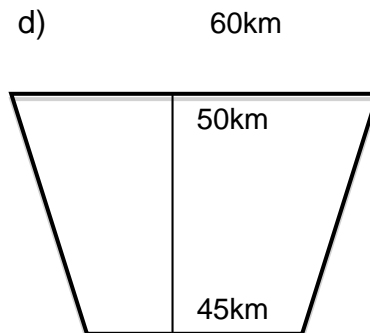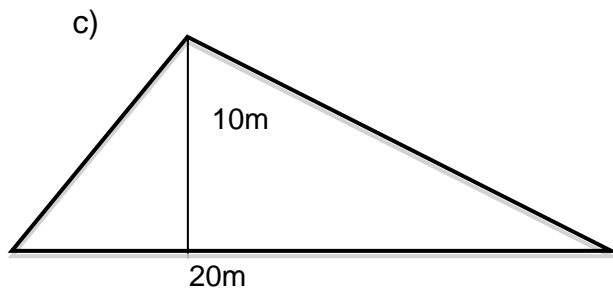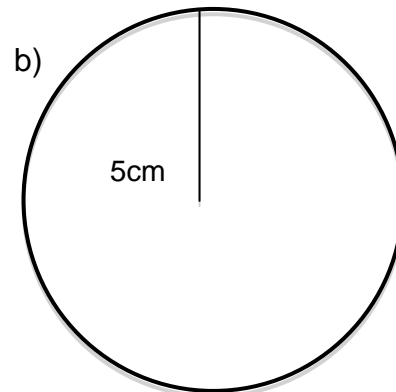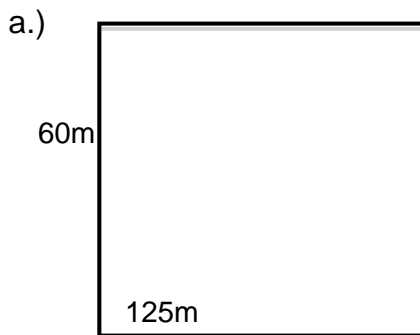
(8)

1.2   The area of a circle is given by $A = \pi r^2$. If the area of a circle is
153.94cm^2, what is the radius?   (4)

1.3   If the area in 1.2 is doubled, what would the radius be?   (3)

[15]

QUESTION 2

2.1   Calculate the length of the hypotenuse in the triangle shown below, if AB = 2m
      and BC = 6m   (3)

```
      A
     /|
    / |
   /  |
  /   |
 B----C
```
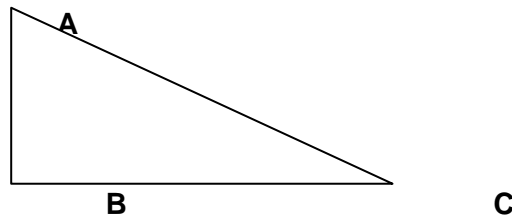
2.2   Calculate the length of side PQ if QR = 10cm and PR = 4 cm   (3)

```
P       R
|      /
|     /
|    /
|   /
|  /
| /
Q
```
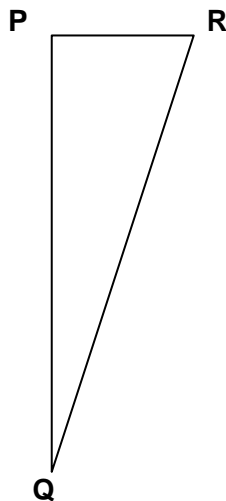
                                                                                    [6]

QUESTION 3

Calculate the surface areas of the following:

3.1   Rectangular prism

        Find the surface area of a cardboard box shown below if the length is 12m, the
        breadth is 5m and the height is 8m.
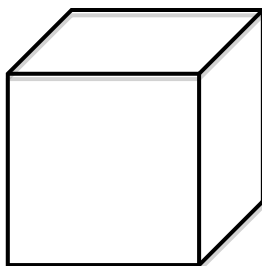
        Each side is a rectangle so we will use the formula A = Length X Breadth, 6 times
        as there are 6 sides in total   (2)

3.2   Triangular prisms

A triangular prism consists of 2 triangles (top and bottom), 2 rectangles (sides) and 1 rectangle (front)   (4)
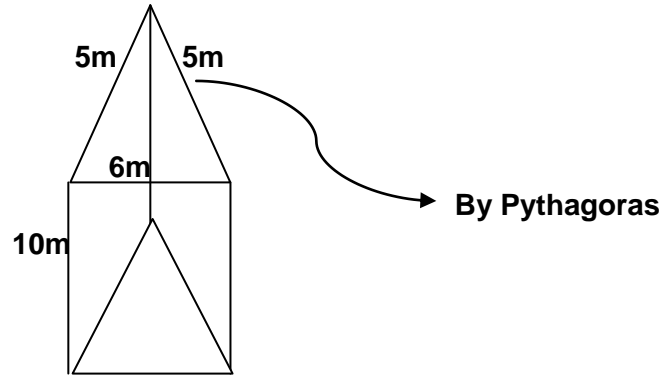
3.3   Circular prisms or Cylinders
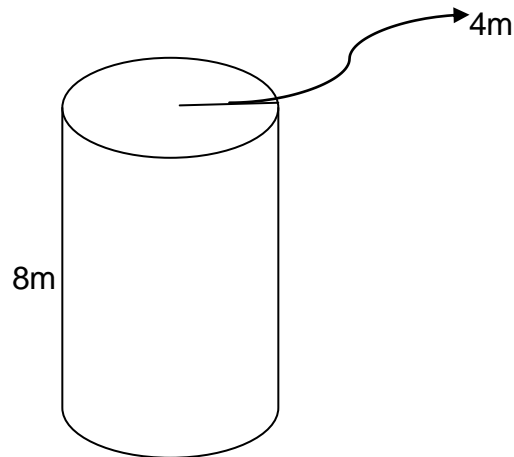
A cylinder consists of 2 circles (top and bottom) and 1 rectangle.
Imagine the paper taken off a can of beans

The length of rectangle will be circumference of the circle and the
 breadth will be the height of the cylinder   (3)

[9]

SECTION B: ADDITIONAL CONTENT NOTES

1.   INTRODUCTION

This lesson involves solving problems in 2-dimensional and 3-dimensional contexts by estimating, measuring and calculating values. This involves lengths and distances, perimeters and areas of polygons, volumes of right prisms, right circular cylinders, surface areas of right prisms, right circular cylinders,

2.   SURFACE AREA

When we consider 3 dimensional objects, surface area is the total area of the object or the area of all the faces added together. Each face is a 2 dimensional shape. Therefore, we begin by looking at the formulae for the AREA of various 2 dimensional shapes.

2.1   Basic Area Formulae

- **Area of rectangle** = length X breadth = L x B (in sketch below)

A = LB

B ⎹ rectangle ⎹

L

Example:
Area = LB (L = 8m; b = 4m)
A = 8 x 4
A = 32m^2

- **Area of parallelogram** below = base x height = bh
   A = bh

5cm

7cm
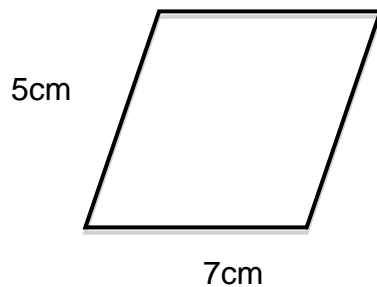
A = bh
A = 7 x 5
A = 35cm^2

- **Area of triangle** below = ½ x base x height

A = ½ bh
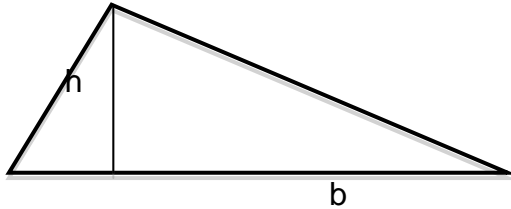
Example:

$$A = \frac{bh}{2} \qquad \text{(if h = 4m; b = 7m)}$$

$$A = \frac{4 \times 7}{2}$$

$$A = \frac{28}{2}$$

A = 14m^2

- **Area of trapezoid** below = ½ x (b1+b2) x h where b1 and b2 are the parallel sides and h is the perpendicular height between them

A = ½ x (b1+b2) x h
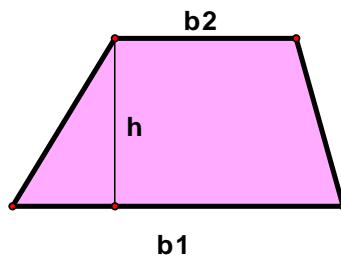
Example:
If B2 = 3cm; B1 = 4cm and h = 3.5cm
A = ½ x (b1+b2) x h
A = 0.5 x (3 + 4) x 3,5
A = 0.5 x 7 x 3,5
A = 12,25cm^2

- **Area of circle:**

height =
radius of
circle
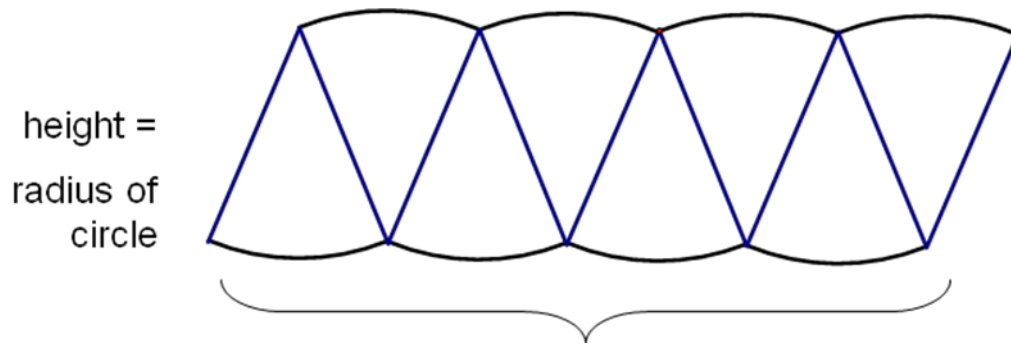
Area of Circle = ½ x circumference x radius
Area of Circle = ½ x (2 x Pi x radius) x radius
Area of Circle = Pi x radius^2

2.2   THEOREM OF PYTHAGORAS.

We use the theorem of Pythagoras mainly to calculate the height of a triangle
The theorem states that **the square on the hypotenuse (side opposite the right angle) of a right angle triangle is equal to the sum of the squares on the other 2 sides**
Illustrated below is the case that 52 **= 3^2 + 4^2**
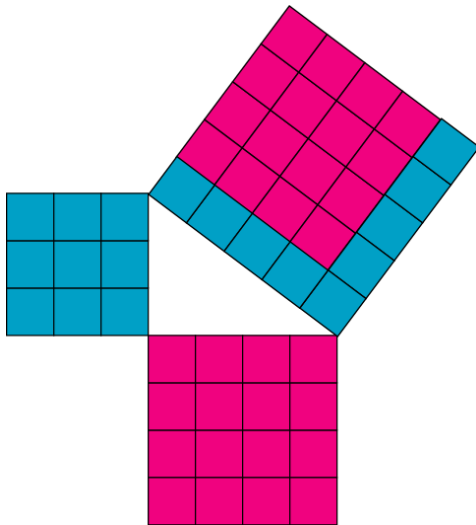
In symbols
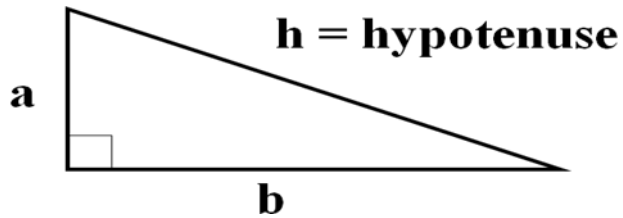
$h^2 = a^2 + b^2$

2.3 SURFACE AREA OF RIGHT PRISMS AND RIGHT CIRCULAR CYLINDERS

A **prism** is a 3 dimensional object that has the same shape of exactly the same size on opposite sides of the object, and a constant height must exist between the identical sides.
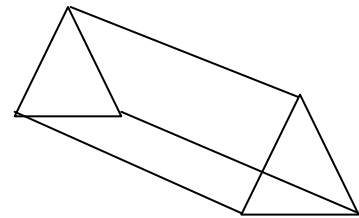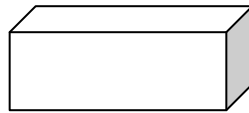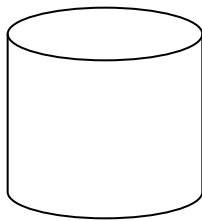
Surface Area of Prism = Total area of ALL _individual_ surfaces
The formulae to follow are:

1.   **Circular prisms or cylinders**
        2 (Area of circle) + Area of rectangle
        = 2 ($\pi r^{2)}$ + l X b

2.   **Triangular prisms**
        2 (1/2 X b X h) + 3 (l X b)

3.   **Rectangular prism**
        A = Length X Breadth, (6 times)

3   VOLUME OF RIGHT PRISMS AND CYLINDERS
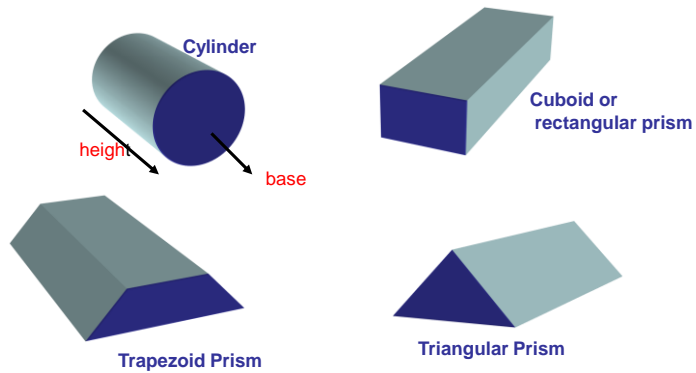
Volume of Prism = Area of base (dark blue) X height
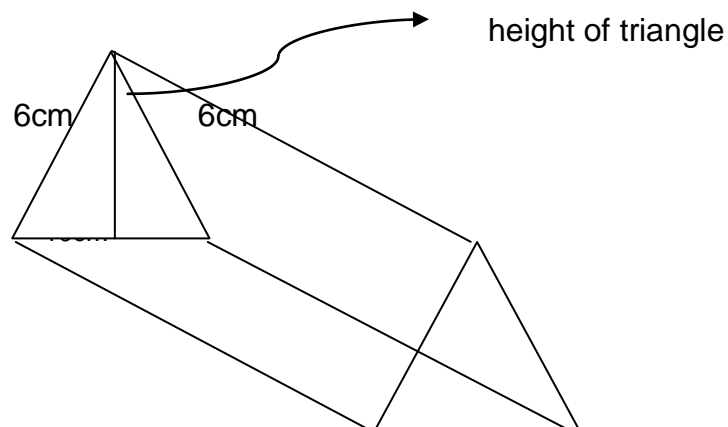
Rectangular Prism   V = length X breadth X height

Find the surface area of a cardboard box shown below if the length is 12m, the breadth is 5m and the height is 8m.

Volume = Area of base X height
          = (12X 5) X 8
          = 60 m^2 X 8 m
          = 480 m^3

Triangular Prism

height of triangle

6cm   6cm
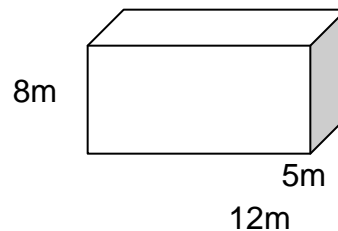
Volume = Area of base X Height
          = Area of triangle X Height
          = ½ base X height X Height
          = ½ (6) X height X 10

To find height of triangle

Use Theorem of Pythagoras

$6^2 = 3^2 + h^2$

$36 = 9 + h^2$

$27 = h^2$

$5,2 cm = h$

Volume = ½ (6) X 5,2 X 10 = 156 cm ^{3}

Cylinder $V = \pi r^2 h$

Volume = Area of base X height

= Area of circle X height

= πr^2 X height

= $\pi 4^2$ X 8

= $402,1 m^3$

4m

8m
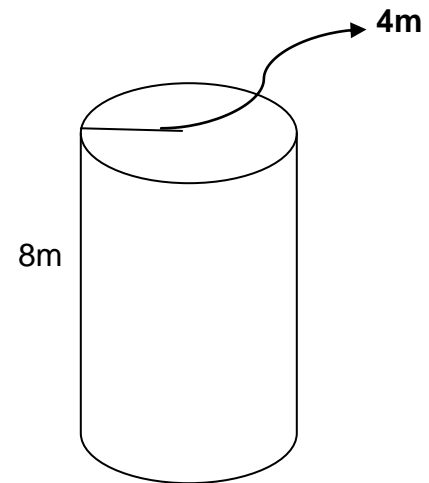
SECTION C: HOMEWORK

Kelly is busy building her new house. The length of the house is 11m and the width is 6,10m. The building is a double storey. The details below are found in her notebook.

STAGE OF WORK	LABOUR COST
1. Foundations	R5500
2. Building of walls below the top floor	R7000
3. Plastering of walls inside and outside below the top floor	R6000
4. Preparing for throwing the concrete on the top floor	R4500
5. Throwing of concrete on the top floor	R18000
6. Building of support columns	R4500
7. Roofing	R14000
8. Electrical installation	R3600
9. Building of walls on the top floor up to the roof	R9000
10. Plastering of walls inside and outside on the top floor	R11000

1.1   The length of the top floor is 11m, the width, including the balcony, is 7,60m and the thickness is 17cm.

    (i)   How wide is the balcony?   (1)

> **These formulas may be used in the questions that follow**
>
> **Volume of a rectangular prism = length × width × height**

    (ii)   Calculate the volume of the concrete used for the top floor.   (3)

    (iii)   If the maximum load of concrete that a lorry can carry is $6m^3$, how many loads of concrete were delivered to pour the top floor? Give a reason for your answer.   (4)

1.2   The balcony of the top floor is supported by cylindrical concrete columns. If the diameter of a cylindrical concrete column measures 50cm and the column is 2,4m high, how many cubic metres of concrete are needed in such a column?   (4)

1.3   Kelly measures the height of the steps in her new home and finds that the distance between two consecutive steps is the same. The 1st step is 15cm above the floor, the 2nd step 30cm and the 3rd step is 45cm above the floor. What is the height of the 17th step above the floor?   (2)

          [14]

SECTION D: SOLUTIONS TO SECTION A

QUESTION 1

1.1

    a)   A = BL
         A = 60 x 125   (1M correct calculation)
         A = 7 500m^2   (1M correct answer and unit)   (2)

    b)   A = Pi x r^2
         A = 3,14 x 5^2 (1M correct calculation)
         A = 78,5cm^2   (1M correct answer and unit)   (2)

    c)   A = $\dfrac{bh}{2}$
         A = $\dfrac{20 \times 10}{2}$ (1M correct calculation)
         A = 15m^2   (1M correct answer and unit)   (2)

    d) $A = \dfrac{h(b_1 + b_2)}{2}$

        $A = \dfrac{50(60 + 45)}{2}$ (1M correct calculation)

        $A = \dfrac{50 \times 105}{2}$

        $A = 2\ 625\text{km}^2$ (1M correct answer and unit)   (2)

1.2 $A = A = \pi r^2$

      $\pi r = 153{,}94$ (1M correct calculation)

        $r^2 = 153{,}94 \div \pi$ (1M correct change of formula to work out r^2)

        $r^2 = 49\text{cm}^2$ (1M correct calculation)

        $r = 7\text{cm}$ (1M correct answer)   (4)

1.3 $r^2 = 307{,}88 \div \pi$ (1M correct calculation)

      $r^2 = 98\text{cm}^2$ (1M correct use of Pi)

      $r = 9{,}89\text{cm}$ (1M correct answer)   (3)

      [15]

QUESTION 2

2.1. $2^2 + 6^2 = h^2$

        $4 + 36 = h^2$ (1M correct calculation)

        $40 = h^2$

        $\sqrt{40} = h$ (1M correct calculation)

        $6{,}3\text{m} = h$ (1M correct answer)   (3)

2.2. $Q^2 + 4^2 = 10^2$

        $PQ^2 + 16 = 100$ (1M correct calculation)

        $PQ^2 = 100\text{-}16$

        $PQ^2 = 84$

        $PQ = \sqrt{84}$ (1M correct calculation)

        $PQ = 9{,}2$ cm   (1M correct answer)   (3)

      [6]

QUESTION 3

3.1. Surface Area = 2 (12 X 8) + 2 (12 X 5) + 2 (8 X 5)

           = 2(96) + 2(60) + 2(40)

            = 392m^2 (2)

3.2. **By Pythagoras:**

$h^2 + 3^2 = 5^2$

$h^2 = 25 - 9$

$h^2 = 16$

$h^2 = \sqrt{16}$

$h = 4m$

  TOTAL SURFACE AREA

  = 2 (1/2 X b X h) + 3 (l X b)

  = 2 (1/2 X 6 X 10) + 2 (10 X 5) + (10 X 6)

  = 2(30) + 2(50) +60   (4)

3.3. **TOTAL SURFACE AREA**

  = 2 (Area of circle) + Area of rectangle

  = 2 (πr^2) + l X b

  = 2 (π X 4^2) + (2 π X 4 X 8)

  = 301,59 m^2 (3)

                              [9]

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