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MATHEMATICS

SAMPLE EXAMINATION PAPER – PAPER 2

QUESTION 1

1.1 P(−1; 3), Q(7; 1) and R(x; 2) are points in a Cartesian plane. Calculate the value of x if:

1.1.1 QR = $\sqrt{2}$. (3)

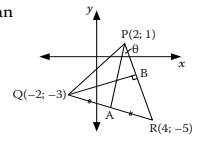
1.1.2 R is the midpoint of PQ. (2)

1.1.3 the gradient of QR is $\frac{1}{2}$. (3)

1.1.4 PQR is a right-angled triangle with hypotenuse PQ. (6)

QUESTION 2

2.1 P(2; 1), Q(−2; −3) and R(4; −5) are the vertices of PQR in a Cartesian plane. PA is a line such that QA = AR, and QB ⊥ PR.



2.1.1 Calculate the coordinates of A. (2)

2.1.2 Calculate the length of PA. Leave the answer in surd form. (3)

2.1.3 Determine the gradient of PR. (2)

2.1.4 Calculate the value of θ, the angle of inclination of PR, rounded off to one decimal digit. (4)

2.1.5 Find the equation of the straight line QC, which is parallel to PR. (3)

2.1.6 Determine the equation of QB. (3)

2.1.7 Find the x- and y-intercepts of QB. (2)

[19]

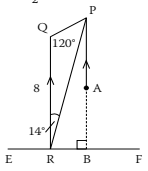
QUESTION 5

5.1.1 Draw a neat sketch of sin (2x + 90°) and $\frac{1}{2}$ cos x on the same system of axes for $x \in$ (–270°; 0°). (4)

5.1.2 Calculate, correct to two decimal places, the values of x for which sin (2x + 90°) = $\frac{1}{2}$ cos x. (7)

5.1.3 Use your sketch to find the values of x (–270°; 0°) for which sin (2x + 90°) < $\frac{1}{2}$ cos x. (3)

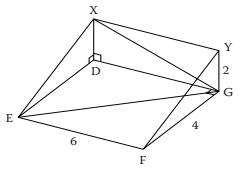
5.2 In the diagram, a crane PQR lifts a load A. QR and PA are perpendicular to the ground, EF, such that APQR forms a vertical plane. The height of the crane QR is 8 m. At a given moment, the angle between the axis of the crane QR and the arm of the crane QP is 120°. The angle between QR and PR is 14°.



5.2.1 Show that PR = 9,63 m when rounded off to two decimal digits. (4)

5.2.2 If the length of PA = 5 m, determine the height of the load A above the ground, rounded off to one decimal digit. (4)

5.3 A steel framework in the form of a right triangular prism needs to be built. The base DEFG of the framework is one of the rectangular faces of the prism. One other rectangular face XDGY is perpendicular to the base. EF = 6 m, FG = 4 m and YG = 2 m.



5.3.1 Calculate the lengths of XE and EG, leaving the answers in surd form. (2)

5.3.2 Determine, correct to one decimal digit, the size of $\hat{XEG}$. (5)

5.3.3 Hence, find the area of XEG correct to the nearest integer. (2)

[31]

MEMORANDUM

QUESTION 1

1.1.1 QR = $\sqrt{2}$ ∴ $\sqrt{(x_R - x_Q)^2 + (y_R - y_Q)^2} = \sqrt{2}$

∴ $(x - 7)^2 + (2 - 1)^2 = 2$

∴ $x^2 - 14x + 48 = 0$

∴ $(x - 6)(x - 8) = 0$

∴ $x = 6$ or $x = 8$

1.1.2 x-coordinate of midpoint: $x = \frac{7-1}{2} = \frac{6}{2} = 3$

1.1.3 $m_{QR} = \frac{y_R - y_Q}{x_R - x_Q} = \frac{1}{2}$ ∴ $\frac{2-1}{x-7} = \frac{1}{2}$ ∴ $x - 7 = 2$ ∴ $x = 9$

1.1.4 $PR^2 + QR^2 = PQ^2$ (Pythagoras)

∴ $(2 - 3)^2 + [x - (-1)]^2 + (2 - 1)^2 + (x - 7)^2 = (1 - 3)^2 + [7 - (-1)]^2$

∴ $1 + x^2 + 2x + 1 + 1 + x^2 - 14x + 49 = 4 + 64$

∴ $2x^2 - 12x - 16 = 0$

∴ $x^2 - 6x - 8 = 0$

∴ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{6 \pm \sqrt{36 + 32}}{2}$

∴ $x = -1{,}123$ or $x = 7{,}123$

∴ $y^2 + 10y + 25 + x^2 - 20x + 100 = 500$

∴ $y^2 + 10y + x^2 - 20x = 375$ (1)

$PM^2 = 500$

∴ $y^2 - 10y + 25 + x^2 + 20x + 100 = 500$

∴ $y^2 - 10y + x^2 + 20x = 375$ (2)

(1) − (2):

$20y - 40x = 0$

∴ $y = 2x$ (3)

(1) + (2):

$2y^2 + 50 + 2x^2 + 200 = 1\,000$

∴ $y^2 + x^2 = 375$ (4)

Substitute (3) into (4):

$4x^2 + x^2 = 375$

∴ $5x^2 = 375$

∴ $x^2 = 75$

∴ $x = \pm \sqrt{75} = \pm 8{,}66$

∴ $y = \pm 17{,}32$

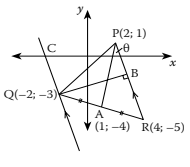
∴ the coordinates of P are (8,66; 17,32) or (−8,66; −17,32)

QUESTION 2

2.1.1 A $\left(\frac{x_Q + x_R}{2}; \frac{y_Q + y_R}{2}\right) = \left(\frac{-2+4}{2}; \frac{-3-5}{2}\right) = \left(\frac{2}{2}; \frac{-8}{2}\right)$

= A (1; −4)

2.1.2 PA = $\sqrt{(x_P - x_A)^2 + (y_P - y_A)^2} = \sqrt{(2-1)^2 + (1+4)^2} = \sqrt{1^2 + 5^2} = \sqrt{26}$



2.1.3 $m_{PR} = \frac{y_R - y_P}{x_R - x_P} = \frac{-5-1}{4-2} = -3$

2.1.4 tan θ = −3 ⇒ θ = −71,57° or θ = 180° − 71,57° = 108,43°

2.1.5 $m_{QC} = -3$ and $(y - y_Q) = m_{QC}(x - x_Q)$ and

∴ $y + 3 = -3(x + 2)$ ∴ $y = -3x - 9$

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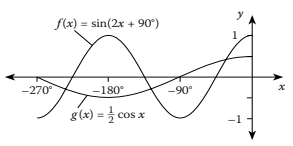
MATHEMATICS

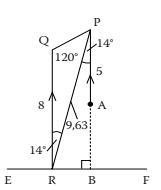
2.1.6 $m_{QB} = \frac{1}{3}$ (QB ⊥ PR)
$\therefore (y - y_Q) = m_{QB}(x - x_Q)$
$\therefore y + 3 = \frac{1}{3}(x + 2)$ $\therefore y = \frac{1}{3}x - 2\frac{1}{3}$
2.1.7 y-intercept: $(0, -2\frac{1}{3})$ and $\frac{1}{3}x - \frac{7}{3} = 0$ $\therefore$ x-intercept: (7; 0)

QUESTION 5

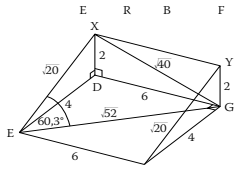
5.1.1 See graph on the right.



5.1.2 $\sin(2x + 90°) = \frac{1}{2}\cos x$
$\therefore \cos(90° - 2x - 90°) = \frac{1}{2}\cos x$
$\therefore \cos(-2x) = \frac{1}{2}\cos x$
$\therefore \cos 2x = \frac{1}{2}\cos x$
$\therefore 2\cos 2x = \cos x$
$\therefore 2(2\cos^2 x - 1) = \cos x$
$\therefore 4\cos^2 x - \cos x - 2 = 0$
$\therefore \cos x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{1 \pm \sqrt{1 + 32}}{8}$
$\therefore \cos x = 0{,}84307033$ or $\cos x = -0{,}59307033$
$\therefore x = \pm 32{,}53° + 360°n$ or $x = \pm 126{,}38° + 360°n$; $n \in \mathbb{Z}$
5.1.3 $x < -233{,}62°$ or $-126{,}38° < x < -32{,}53°$
5.2.1 $\hat{QPR} = 180° - (120° + 14°) = 46°$ (∠s of △PQR)
$\therefore \frac{PR}{\sin Q} = \frac{QR}{\sin \hat{QPR}}$
$\therefore \frac{PR}{\sin 120°} = \frac{8}{\sin 46°}$
$\therefore PR = \frac{8 \sin 120°}{\sin 46°} = 9{,}63$ m
5.2.2 Construct AB ⊥ EF and let AB = x cm:



$\hat{RPA} = 14°$ (alt. ∠s; QP || PA)
In △ PRB: $\frac{PB}{PR} = \cos 14°$
$\therefore \frac{x + 5}{9{,}63} = \cos 14°$
$\therefore x + 5 = 9{,}63 \cos 14° = 9{,}34$
$\therefore x = 4{,}3$
The load is 4,3 m above the ground.
5.3.1 See figure on the right.



XE = YF (△XED ≡ △YFG)
and $YF^2 = YG^2 + FG^2 = 2^2 + 4^2 = 20$ (Pythagoras)
$\therefore YF = \sqrt{20}$
and $EG^2 = EF^2 + FG^2 = 6^2 + 4^2 = 52$ (Pythagoras)
$\therefore EG = \sqrt{52}$
5.3.2 $XG^2 = XD^2 + DG^2 = 2^2 + 6^2 = 40$
$\Rightarrow XG = \sqrt{40}$
$XG^2 = EX^2 + EG^2 - 2\,EX \times EG \cos \hat{XEG}$
$\therefore 40 = 20 + 52 - 2\sqrt{20}\sqrt{52}\cos \hat{XEG}$
$\therefore \cos \hat{XEG} = \frac{32}{2\sqrt{20}\sqrt{52}}$
$= 0{,}496$
$\therefore \hat{XEG} = 60{,}3°$
5.3.3 Area of △ XEG $= \frac{1}{2} \times XE \times EG \times \sin \hat{XEG} = 14\ m^2$

MATHEMATICAL LITERACY

Mock exam: Paper 1

Question 2

2.1 Express 70 km in 4 hours as a rate in metres per second (m/s). (3)
2.2 A 300 ml bottle of sauce costs R10,53 and a 500 ml is R22.
Which is the better buy? (3)
2.3 A retailer sold a shirt for R132 of which the cost price was R110.
Calculate the percentage profit she made. (3)
2.4 Vusi has R15 000 to invest for 10 years. He has been offered two options
- Option A: 11,5% p.a. compounding annually
- Option B: 11% p.a. compounding monthly.

Use the formula $A = P(1 + i)^n$ to calculate which option is the better investment and by how much? (6)
[15]

Question 3

Gideon starts a business making and selling toy cars made of wire. The cars are of different lengths. To make each car, Gideon's costs are as follows.
- Cost of wire: R2 for each cm of the car's length.
- Cost of a set of toy tyres: R7, no matter what the length of the car is.

3.1 How much does it cost Gideon to make a car with length:
3.1.1 6 cm?
3.1.2 7 cm?
3.1.3 8 cm? (3)
3.2 Write an equation relating the length of a car (in cm) to the cost of the car in rand (R).
Take the independent variable as x and the dependent variable as y. (3)
3.3 Use your equation in question **3.2** to answer the following:
3.3.1 If it costs Gideon R25 to make a car, how long is the car?
3.3.2 Can Gideon make a car at a cost of only R7? Explain your answer. (4)
3.4 Use your equation in question **3.2**, copy and complete the table below.

Length of car (cm)	5	10	15	20	25	30
Cost of car (R)						

(3)
3.5 When Gideon sells his cars, he decides on a price by using the formula $y = 2\left(\frac{x}{5}\right)^2 + 15$, where y is the price and x is the length of the car.
Use the formula to copy and complete the table below.

Length of car (cm)	5	10	15	20	25	30
Selling price of car (R)						

(3)
3.6 Compare the tables you completed in **3.1.4** and **3.1.5**. List the cars (by their length) for which Gideon
3.6.1 makes a profit;
3.6.2 makes a loss; and
3.6.3 breaks even. (6)
[22]

Question 4

Khumbulani starts his own business "Quick Repair" for repairing electrical appliances such as kettles, irons etc. A client has to pay for labour costs as well as for spare parts.
Khumbulani calculates his labour costs according to the formula:
$C = 20 + 50t$, where t is the time in hours, and C is the cost in rand (R).

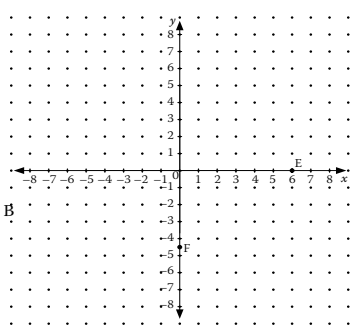
4.1 Copy and complete the table below:

Number of hours: t	1	2		$4\frac{1}{2}$
Cost in rand: C	70		145	

(2)
4.2 Draw a graph with t on the horizontal axis and C on the vertical axis.
Use a scale of 2 cm per unit on the t-axis and 1 cm per R20 on the C-axis. (6)
4.3 Is the graph a straight line? Explain. (1)
4.4 Why does the graph not start at the origin? What practical meaning does this have for a client of Quick Repair? (2)
4.5 Calculate the gradient of the graph and explain what practical meaning it has for a client of Quick Repair. (2)
4.6 Explain the effect on the graph if the constant 50 is changed to 60. (2)
[15]

Question 5

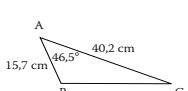
5.1 On cm^2-grid paper or graph paper, draw x- and y-axes as shown on the right. Use a scale of 1 cm per unit.



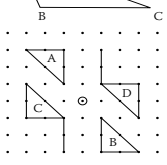
5.1.1 Plot the points A(−4; 6), B(6; 6), C(6; −2) and D(−4; −2) (2)
5.1.2 Write down the coordinates of points E and F. (1)
5.1.3 What kind of shape is ABCD? (1)
5.1.4 Calculate the perimeter of ABCD. (2)
5.1.5 Calculate the distance from the origin O to B (Hint: Use the Theorem of Pythagoras) (3)
5.1.6 Taking the positive y-axis as the North direction from O, find the bearings of B and F as seen from O. (2)
5.1.7 Use a scale of 1 : 100 000 to convert the distance OF to km. (1)
5.2 A badminton court has to be marked off on the floor of a community hall using white plastic tape. The dimensions of the border lines are given in feet as shown in the drawing alongside.
5.2.1 Convert the dimensions to metres if 1 ft = 0,303 m. (1)
5.2.2 Estimate the length of tape required to mark the court by rounding off lengths to whole metres. Compensate for inaccuracies due to rounding. (3)

Question 6

6.1 In ΔABC on the right, calculate:

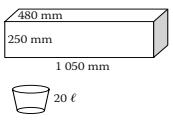


6.1.1 BC using the cosine rule (3)
6.1.2 $\hat{C}$ using the sine rule (3)
6.2 The geometric figure on the right is one of the patterns on a blanket decorated by a Ndebele artist.



6.2.1 What rotation transformation of triangle A will produce triangle B? (1)
6.2.2 Describe how figure D can be obtained from figure C by only using reflection in horizontal and/or vertical axes. (2)
6.2.3 What kind of symmetry does the whole pattern have? (1)

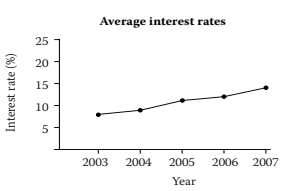
6.3 The workers on a fruit farm each carry a basket in which they put the apples they pick from the trees in harvest time. When a basket is full, the worker empties it into a tray and returns to carry on picking apples and to repeat the process of emptying every full basket into a tray. The inside dimensions of such a rectangular tray are shown on the right.



6.3.1 Convert the dimensions of the tray to centimetres and calculate the capacity of the tray in litres. (3)
6.3.2 Suppose the capacity of a picking basket is about 20 ℓ and that it holds about 100 apples when filled to its brim. Calculate the number of full baskets that will fill a tray, and (1)
6.3.3 the approximate number of apples in a full tray. (1)
[15]

Question 8

8.1 A factory which manufactures chemicals is situated near a residential area which includes a school and a number of shops.
A survey is needed to assess how individuals' health is affected by pollution from the factory.
Describe three factors that should be taken into account when designing a representative sample for this survey. (6)
8.2 Capital Bank has been advertising the low increases in their interest rates during the last few years. The graph on the right appeared in one of their advertisements.



8.2.1 Describe the shape of the line in the graph. Does it indicate a slow, medium or sharp increase in interest rates? (2)
8.2.2 Redraw graph 1, but mark both axes with 1 cm notches. On the y-axis 1 cm represents 1%, and on the x-axis 1 cm represents one year. (6)
8.2.3 According to your graph, what is the real situation with the interest rates? (2)
[16]

Total: 150 marks

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MATHEMATICAL LITERACY

Mock exam: Paper 1

MEMORANDUM

Question 2

2.1 Express 70 km in 4 hours as a rate in metres per second (m/s):
$\frac{70 \times 1\,000}{4 \times 60 \times 60} = \frac{70\,000}{14\,400} = 4{,}9$ m/s (3)

2.2 R10,53 for 300 ml is R3,51 for 100 ml;
R22 for 500 ml is R4,40 for 100 ml.
So the best buy is 300 ml. (3)

2.3 % Profit $= \frac{(132 - 110)}{110} \times \frac{100}{1} = \frac{22}{110} \times \frac{100}{1}\% = 20\%$ (3)

2.4 Option A: $15\,000(1 + 0{,}115)^{10} = R44\,549{,}20$
Option B: $15\,000\left(1 + \frac{0{,}11}{12}\right)^{120} = R44\,837{,}24$
Option B by R288,04 (6)
[15]

Question 3

3.1 Costs are:

3.1.1 $2 \times 6 + 7 = R19$ (1)

3.1.2 $2 \times 7 + 7 = R21$ (1)

3.1.3 $2 \times 8 + 7 = R23$ (1)

3.2 $y = 2x + 7$ (3)

3.3.1 Substitute $y = 25$ into $y = 2x + 7$: $25 = 2x + 7 \Rightarrow 18 = 2x \Rightarrow x = 9$
So the car is 9 cm long. (2)

3.3.2 Substitute $y = 7$ into $y = 2x + 7$: $7 = 2x + 7 \Rightarrow 0 = 2x \Rightarrow x = 0$
So the car would be 0 cm long. Thus, no car can be made for R7. (2)

3.4 (3)

Length of car (cm)	5	10	15	20	25	30
Cost of car (R)	17	27	37	47	57	67

3.5 (3)

Length of car (cm)	5	10	15	20	25	30
Selling price of car (R)	17	23	33	47	65	87

3.6.1 Profit: 30 cm 25 cm. (2)

3.6.2 Loss: 15 cm; 10 cm. (2)

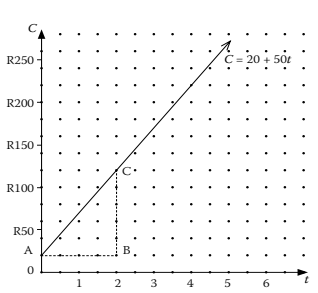
3.6.3 Break even: 5 cm; 20 cm. (2)
[22]

Question 4

4.1

Number of hours: t	1	2	$2\frac{1}{2}$	$4\frac{1}{2}$
Cost in Rand: C	70	120	145	245

(2)
(6)



4.2 See graph

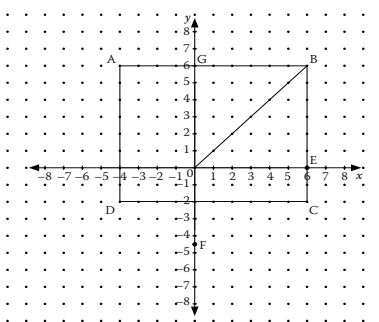
4.3 Straight line since $C = 20 + 50t$ is a linear equation. (1)

4.4 Graph not through origin because of constant term 20 in $C = 20 + 50t$.
The client has to pay a deposit of R20. (2)
(2)

4.5 Gradient $= \frac{BC}{AB} = \frac{100}{2} = 50$. The rate of labour is R50 per hour.

4.6 The graph will have a gradient of 60 which is steeper than a gradient of 50.

Question 5



5.1.1 See grid (2)

5.1.2 E(6; 0); F(0; $-4\frac{1}{2}$) (1)

5.1.3 ABCD is a rectangle. (1)

5.1.4 Perimeter = 2(10 + 8) cm = 36 cm (2)

5.1.5 OB $= \sqrt{6^2 + 6^2}$ cm
$= \sqrt{72}$ cm
$\approx 8{,}5$ cm (3)

5.1.6 Since ΔOBE is isosceles and $O\hat{E}B = 90°$;
$O\hat{B}E = 45° = G\hat{O}B$.
Thus the bearing of B from O is 045° and the bearing of F from O is 180°. (2)

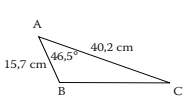
5.1.7 On the grid, distance OF = 4,5 cm.
Thus true distance is 4,5 × 100 000 cm
= 450 000 cm = 4,5 km (1)

5.2.1 Length of court = 44 ft × 0,303 = 13,33 m; breadth = 20 ft × 0,303 = 6,06 m (1)

5.2.2 Length of tape required ≈ 3 × 13 m + 3 × 6m = 39 + 18 m = 57 m. Compensate for rounding down and overlapping by adding 1 m. Thus length of tape required is 58 m. (3)

Question 6

6.1.1 $a^2 = b^2 + c^2 - 2bc \cos A$
$= (40{,}2)^2 + (15{,}7)^2 - 2(40{,}2)(15{,}7) \cos 46{,}5°$
$= 1616{,}04 + 246{,}49 - 868{,}896 = 993{,}634$
$\Rightarrow BC = a = \sqrt{993{,}634} = 31{,}52$ cm (3)



6.1.2 $\frac{\sin C}{15{,}7} = \frac{\sin 46{,}5°}{31{,}52}$
$\Rightarrow \sin C = \frac{15{,}7 . \sin 46{,}5°}{31{,}52}$
$\Rightarrow \angle C = 21{,}18°$ (3)

6.2.1 Rotation through 180° around point O. (1)

6.2.2 Reflect C in the horizontal axis through O and reflect this image in the vertical axis through O to produce D. (2)

6.2.3 Rotational symmetry of order 1 (just 180°). (1)

6.3.1 $V = lbh = 105$ cm × 48cm × 25 cm = 126 000 cm^3
Thus the capacity of a tray = 126 ℓ (3)

6.3.2 Number of baskets = 126 ÷ 20 = 6,3 (1)

6.3.3 Approximate number of apples = 630 in a full tray. (1)

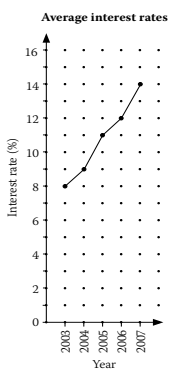
Question 8

8.1 Answers must include three of the following (or any other valid options).
The sample must include:
People who live in the suburb;
Children who go to the school in that suburb (they might not necessarily live there);
People who work in the shops (they might not necessarily live there);
Persons of all ages – ranging from young children to elderly persons;
An even spread of male and females (2 × 3 = 6)

8.2.1 The graph shows a line which is quite flat. This indicates a slow increase in interest rates. (2)

8.2.2 See graph on the right. (6)

8.2.3 The line is much steeper, which indicates that the interest rates increased quite a lot. (2)
[16]



Mock exam: Paper 2

Question 1

1.1 Ben wishes to buy a flat for R235 000. The following costs have to be budgeted for:
Once-off costs:
Deposit: 10% of price
Agent's commission: 6,5% of price
Conveyance fees: R3 850
Deposit for municipal services: R700
Cost of moving etc.: R6 500
Regular monthly costs:
Repayment of home loan: R1 875
Insurance: R638,47
Municipal rates: R486,63

1.1.1 Calculate the amounts of the deposit and the agent's commission. (2)

1.1.2 Find the totals of the once-off costs and the regular monthly costs respectively. (2)

1.2 Phumla, Natalie and Sakile each save R2 000. Each person then does the following with her money:
- Phumla lends her savings to her brother, who pays her R250 interest per year.
- Natalie puts her money into a bank account earning 10% compound interest per year.
- Sakile keeps her money in a drawer for a year, and then puts it into an account earning 10% compound interest.

1.2.1 Phumla says to Natalie: "R250 is more than 10% of R2 000. So every year I will get more interest than you." Is Phumla correct? Give a reason for your answer. (2)

1.2.2 Sakile says to Natalie: "I'll keep my money at home for a year, in case I need it, but then I'll put it in an account with the same interest rate as yours, compounded annually. So after a while my amount will catch up to yours." Is Sakile correct? Give a reason for your answer. (2)

1.2.3 Complete the table below by using a calculator. (Year 0 is the time at which all three people saved R2 000.)

Year	0	1	2	3	4	5
Phumla's amount (R)	2 000					
Natalie's amount (R)	2 000					
Sakile's amount (R)	2 000					

(6)

1.2.4 Choose the equation below which correctly relates Natalie's amount (y) to the number of years (x).
- $x = 2\,000(1{,}1)^y$
- $y = 2\,000(1{,}1)^x$
- $x = 1{,}1(2\,000)^y$
- $y = 1{,}1(2\,000)^x$ (1)

1.2.5 Using your equation, find Natalie's amount after 10 years, and after 20 years. Round the amounts to the nearest five cents. (2)

1.3 Given is a table of exchange rates between different currencies

	Rand	US $	Pound £	Jen
Rand	1	0,139	0,076	16,36

1.3.1 Lerato has R1 850, change her money into each of the country's currency as listed in the table above. (3)

1.3.2 A certain CD costs R99 in South Africa, £9,50 in Britain and $9,70 in the United States. Compare the price of the CD in rand (R). Which is the cheapest? (3)
[23]

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MATHEMATICAL LITERACY

Question 2

Babies grow at various rates inside their mothers' wombs. Data on individual babies allows us to compile tables giving the average mass of babies before birth. The following extract from a table shows the average mass of a baby (in grams) from week 8 to week 16 of a pregnancy.

Week of pregnancy	8	9	10	11	12	13	14	15	16
Mass of baby (g)	1	2	4	7	14	23	43	70	100

2.1 Look at the table above. Is there a linear relation between the duration of pregnancy and the baby's mass? Give an answer and show that it is correct. (4)

2.2 On graph paper draw a graph of the data in the table above.
You should:
- draw axes as shown using a scale of 1 cm per week on the x-axis and 1 cm per 10 g on the y-axis
- write an appropriate title for the graph
- label the x-axis and y-axis appropriately
- plot the given data points
- draw a curve to connect the data points. (10)

2.3 Describe the shape of the graph. (2)

2.4 Using the graph, estimate the baby's mass exactly halfway between weeks 11 and 12. (2)

2.5 Using the graph, estimate when the baby will have a mass of 30 g. (2)

2.6 Someone suggests that the function $y = \frac{1}{2}(x - 7)^2$ closely approximates the values of the table in 2.1. To see whether this is true, complete the table below. Then use the table to explain whether the given function is a close approximation.

Week of pregnancy	8	9	10	11	12	13	14	15	16
Mass of baby (g)	1	2	4	7	14	23	43	70	100
Value of $y = \frac{1}{2}(x - 7)^2$									
Difference between baby mass and value of function									

(10)
[30]

Question 3

Read the following advertisement for Hot Stuff tyres, aimed at South African drivers.

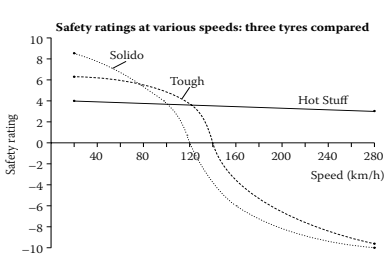
Hot Stuff tyres never get tired!

When you're driving a car, you need to be safe. So we decided to test the safety of Hot Stuff tyres against two other leading tyre manufacturers, Solido Tyres and Tough Tyres.

We asked expert drivers to test cars with each type of tyre, and to rate their safety from a level of –10 (extremely unsafe) to 10 (extremely safe). The tests took place over various speeds, from slow to very fast.

The experts found that over most speeds, Hot Stuff is the safest of all three tyres. It doesn't get "tired" at great speeds, as do the other tyres, whose safety levels become severely reduced. Instead, it keeps you just as safe as if you were driving slowly.

Our research results are shown on the right. Listen to the experts, and drive with Hot Stuff!



3.1 Which tyre has the highest safety rating, and at what speed? (2)

3.2 Which tyre has the lowest safety rating, and at what speed? (2)

3.3 At what speed are Solido and Tough equally safe? (2)

3.4 At what speed are Tough and Hot Stuff equally safe? (2)

NATIONAL CURRICULUM STATEMENT

To qualify for a National Senior Certificate at the end of Grade 12 from 2008 onwards you must offer 7 subjects from the National Curriculum Statement in your Grade 10 to 12 years. In addition, you must meet the minimum requirements for each subject as set out below.

All learners should aim to achieve much higher marks than the minimum required to obtain a National Senior Certificate. The better your marks are the better your chances of getting into higher education institutions or FET Colleges. Impress your friends, family and potential employers by getting top marks. Start today and aim high.

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7 NCS SUBJECTS
4 COMPULSORY SUBJECTS
2 Languages *(one Language at Home Language and other Language at least at 1st Additional level)*
Mathematics OR Mathematical Literacy
Life Orientation
+
3 CHOICE SUBJECTS
Any 3 other NCS subjects
MINIMUM REQUIREMENTS
Obtain at least 40% in three subjects one of which must be an official language on Home Language level.
Obtain at least 30% for three subjects
NCS RATING CODES

RATING CODE	RATING	MARKS
7	Outstanding achievement	80 – 100
6	Meritorious achievement	70 –79
5	Substantial achievement	60 – 69
4	Adequate achievement	50 – 59
3	Moderate achievement	40 – 49
2	Elementary achievement	30 – 39
1	Not achieved	0 – 29

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Mock exam: Paper 2

MEMORANDUM

Question 1

1.1.1 Deposit = 10% of R235 000 = R23 500; Agent's commission = 6,5% of R235 000 = R15 275 (2)

1.1.2 Total of once off costs = R49 825
Total of regular monthly costs = R3 000,10 (2)

1.2.1 No. Because Natalie's account provides compound interest, she receives an increasing amount of interest each year. So even though R250 is greater than 10% of the initial amount, it will be less than 10% of the amount after a number of years. (2)

1.2.2 No. Sakile and Natalie are both earning the same interest, but Sakile is one year behind Natalie. So Sakile's account will never catch up, because it will always have the same amount as Natalie's account in the previous year. (2)

1.2.3

Year	0	1	2	3	4	5
Phumla's amount (R)	2 000	2 250	2 500	2 750	3 000	3 250
Natalie's amount (R)	2 000	2 200	2 420	2 662	2 928,20	3 221,02
Sakile's amount (R)	2 000	2 000	2 200	2 420	2 662	2 928,20

(6)

1.2.4 $y = 2\,000(1{,}1)^x$ (1)

1.2.5 After 10 years: $y = 2\,000(1{,}1)^{10} \approx$ R5 187,50
After 20 years: $y = 2\,000(1{,}1)^{20} =$ R13 455 (no rounding required). (2)

1.3.1

	Rand	US $	£ sterling	Jen
Rand	1850	257,15	140,60	30 266

(3)

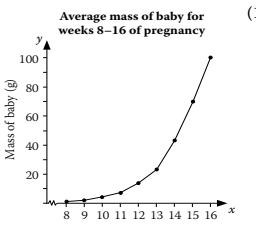
1.3.2 SA R99; Britain £9,50 = R125; USA $9,70 = R69,78.
So the USA $9,70 is the cheapest. (3)
[23]

Question 2

2.1 No. In a linear relation, the rate of change is constant. But in this relation, the baby's mass does not change at a constant rate. For example, from week 8 to week 9 the baby's mass increases by 1 g, but from week 15 to 16 it increases by 30 g. (4)

2.2 See figure (10)

2.3 The graph has a positive gradient which begins low at week 8 and then gradually becomes steeper until week 16. The curve resembles one arm of a parabola; the y-values increases more and more as x increases. (2)



2.4 Mass is about 10 g. (2)

2.5 About halfway between weeks 13 and 14. (2)

2.6

Week of pregnancy	8	9	10	11	12	13	14	15	16
Mass of baby (g)	1	2	4	7	14	23	43	70	100
Value of $y = \frac{1}{2}(x - 7)^2$	0,5	2	4,5	8	12,5	18	24,5	32	40,5
Difference between baby's mass and value of function	0,5	0	– 0,5	– 1	1,5	5	18,5	38	59,5

The difference between the given data and the function is small for weeks 8 to 12, with no more that 1,5 g difference between them. However, the difference increases from 13 weeks onwards, with the baby's mass growing faster than the formula predicts. Finally, at the 16th week, the baby weighs more than twice what the formula predicts. So the function is a good approximation from 8 to 12 weeks, but not after that. (10)
[30]

Question 3

3.1 Solido, with a rating of about 8,5 at a speed of 20 km/h. (2)

3.2 Solido, with a rating of –10 at a speed of 280 km / h. (2)

3.3 At about 76 km/h. (2)

3.4 At about 124 km/h. (2)

Mathematics Grade 12 Formula Sheet

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$A = P(1 + in)$ $\quad A = P(1 + in)$ $\quad A = P(1 + i)^n$ $\quad A = P(1 + i)^n$

$$F = \frac{x[(1 + i)^n - 1]}{i} \qquad P = \frac{x[1 - (1 + i)^{-n}]}{i}$$

$$\sum_{i=1}^{n} 1 = n \qquad \sum_{i=1}^{n} i = \frac{n(n+1)}{2} \qquad \sum_{i=1}^{n} [a + (i-1)d] = \frac{n}{2}(2a + (n-1)d$$

$$\sum_{i=1}^{n} ar^{i-1} = \frac{a(r^n - 1)}{r - 1} \qquad r \neq 1 \qquad \sum_{i=1}^{\infty} ar^{i-1} = \frac{a}{1 - r} \qquad -1 < r < 1$$

$$f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h} \qquad d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$M\left(\frac{x_1 + x_2}{2}; \frac{y_1 + y_2}{2}\right) \qquad y = mx + c \qquad y - y_1 = m(x - x_1)$$

$$m = \frac{y_2 - y_1}{x_2 - x_1} \qquad m = \tan\theta \qquad (x - a)^2 + (y - b)^2 = r^2$$

In $\triangle ABC$:

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C} \qquad a^2 = b^2 + c^2 - 2b \cdot \cos A$$

$$\text{area } \triangle ABC = \frac{1}{2}ab \cdot \sin C$$

$$\sin(\alpha + \beta) = \sin\alpha \cdot \cos\beta + \cos\alpha . \sin\beta$$

$$\sin(\alpha - \beta) = \sin\alpha \cdot \cos\beta - \cos\alpha . \sin\beta$$

$$\cos(\alpha + \beta) = \cos\alpha \cdot \cos\beta - \sin\alpha . \sin\beta$$

$$\cos(\alpha - \beta) = \cos\alpha \cdot \cos\beta + \sin\alpha . \sin\beta$$

$$\cos 2\alpha = \begin{cases} \cos^2\alpha - \sin^2\alpha \\ 1 - 2\sin^2\alpha \\ 2\cos^2\alpha - 1 \end{cases}$$

$$\sin 2\alpha = 2\sin\alpha . \cos\alpha$$

$$\bar{x} = \frac{\sum fx}{n} \qquad \sigma^2 = \frac{\sum_{i=1}^{n} (x_i - \bar{x})^2}{n}$$

$$P(A) = \frac{n(A)}{n(S)} \qquad P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$