

Mathematics Assessment: Term 1 and 2

Examiner: Mrs J Hayman

Grade 9

150 marks

Calculators may be used.

Question 1

1) Look at the following list of numbers:

$$\sqrt{7}; \frac{\pi}{8}; \sqrt{-16}; 5; \frac{\pi}{0}; \frac{0}{\pi}; \frac{140}{35}$$

Write down all numbers which are

- 1.1. Irrational (1)
1.2. Integers (1)
1.3. Non-Real (1) [3]

Question 2

2) Determine the highest common factor (HCF) and the lowest common multiple (LCM) of 126, 72 and 216. [3]

Question 3

3)

- 3.1. A book is bought at R50 and sold at R80. What is the percentage profit? (2)
3.2.
3.2.1. Mike has R1000. If he invests it at 15% interest for 3 years, compounded annually, how much money will he receive? (2)
3.2.2. If he wants it to get back R3000 after 3 years, compounded annually at an interest rate of 15%, how much will he need to invest initially? (2) [6]

Question 4

4) Simplify without a calculator:

4.1.

$$\sqrt[3]{\frac{125}{27}} + \left(\sqrt{\frac{4}{9}} + 1\right)$$

Silly Sally! She thinks the solution is $\frac{10}{3}$. It isn't... Show a correct method to get to the solution and make Silly Sally savvy again! (3)

4.2.

$$1\frac{1}{6} + 7\frac{1}{3} \div 11$$

For this problem, Sally thought the answer was $\frac{11}{6}$. Is she correct, or is Sally being silly again? Simplify and show all the steps in your method. (3)

4.3.

$$0.05 \times (2.2 - 1.8)$$

Sally thought the solution to this decimal problem was 200, but something just didn't feel right about it. Show her how you would simplify it. (3)

4.4.

$$\frac{2.8 \times 10^{-17} - 3 \times 10^{-18}}{2 \times 10^{-6} + 3 \times 10^{-6}}$$

Sally says the answer is 5×10^{-18} . Is she savvy with scientific notation? Show all your steps. (3)

[12]

Question 5

5) Expand and simplify as far as possible:

5.1.

$$0.2xy(0.1x^2 - 0.3xy)$$

(3)

5.2.

$$2 - \frac{y-4}{4} - \frac{1}{8}(y+1)$$

(3)

5.3.

$$\left(\frac{-4a^{-1}b}{-12a^{-2}b^{-3}} \right)^2$$

(3)

5.4.

$$\frac{2^x \cdot 4^{x+2}}{8^{x+3}}$$

(3)

5.5.

$$\frac{6a^2b - 9ab^2}{12a^3b^2 - 18a^2b^3}$$

(3)

5.6.

$$(2p^2 - 3)(p - 5) - (p + 3)^2$$

(3)

5.7.

$$\frac{16y^4 - 1}{4y^2 - 1} \div \frac{4y^2 + 1}{1}$$

(3) [21]

Question 6

6) Factorise fully:

6.1.

$$3p^3 + 2p^2$$

(1)

6.2.

$$x^2 + 6x - 27$$

(2)

6.3.

$$x^2 + 2x - 15$$

(2)

6.4.

$$x^3 - 3x^2 - 9x + 27$$

(3)

6.5.

$$\frac{4}{3}t^2 + \frac{2}{3}t^3 - \frac{1}{3}$$

(2) [10]

Question 7

7) Solve the following equations:

7.1.

$$2 \cdot 7^{2x} - 98 = 0$$

(2)

7.2.

$$5 \cdot 3^{1-y} = 45$$

(2)

7.3.

$$4y^2 - 32 = 0$$

(2)

7.4.

$$x^2 + 2x - 35 = 0$$

(3)

7.5.

$$2a^2 + 2a = 4$$

(3)

7.6.

$$(2x - 3)\left(\frac{x - 1}{2} - \frac{x - 2}{3}\right) = 0$$

(3)

7.7.

$$\frac{b + 1}{3} - \frac{b - 1}{5} + \frac{1}{15} = 0$$

(3) [18]

Question 8

8) Use the table below to answer this question.

8.1. Fill in the blanks:

x	-1	0	1	2	3	4	x
y	(a)	4	1	-2	(b)	-8	

(2)

8.2. Determine the rule connecting x and y .

(2)

8.3. Find y if $x = 15$.

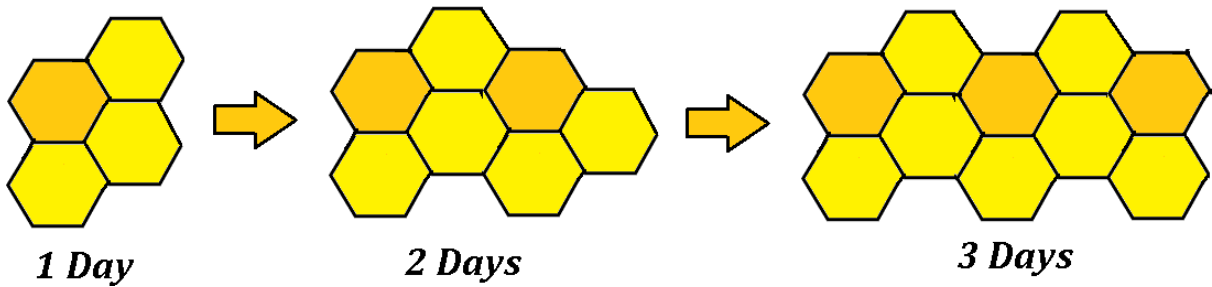
(1)

8.4. Find x if $y = 3$.

(1) [6]

Question 9

9) A beehive is made from hexagonal chambers. The pattern below shows how the bees add chambers over time.



9.1. How many hexagonal chambers on days 4, 5 and 6?

(3)

9.2. How many hexagonal chambers after n days?

(3)

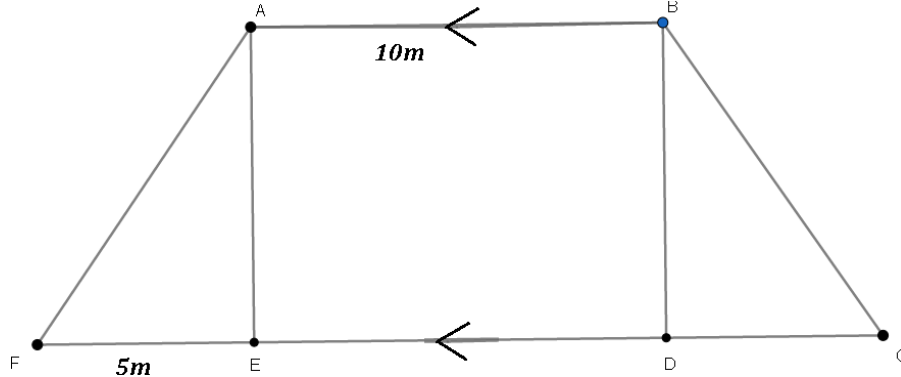
9.3. How many hexagonal chambers after 2 months (assume 1month=30days)?

(2) [8]

Question 10

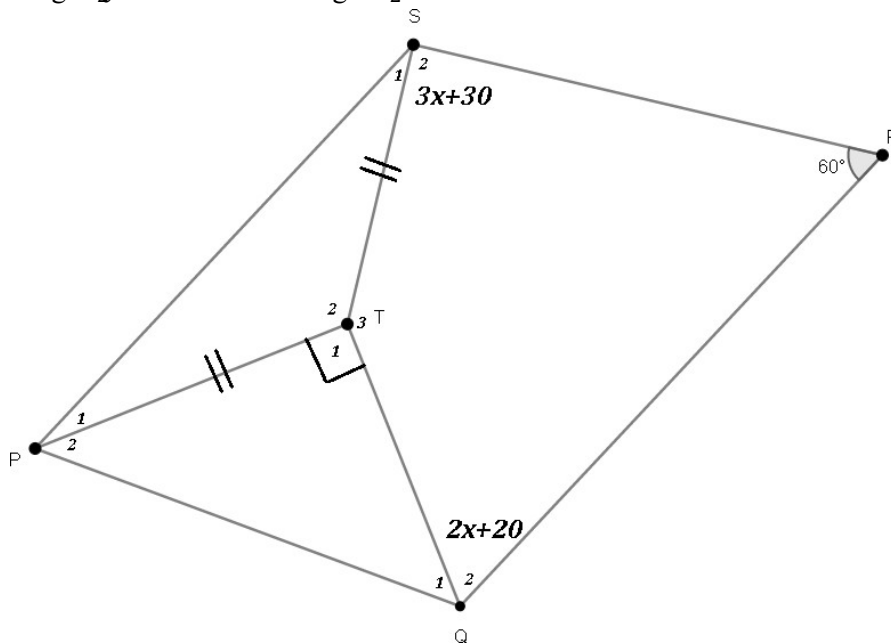
10) For all geometry, remember to give a reason for any statement you make!

10.1. In an isosceles trapezium, the base angles are equal and the non-parallel sides are equal. In the diagram, $ABCF$ is an isosceles trapezium and $ABDE$ is a rectangle.



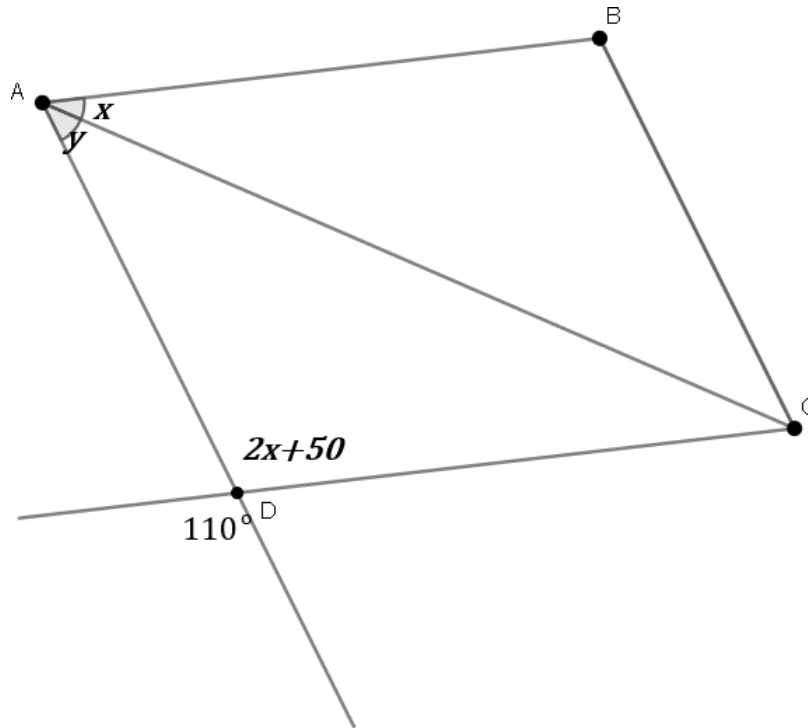
- 10.1.1. Give one word for: Triangles that are exactly the same in every way. (1)
- 10.1.2. Prove that $\triangle AEF \equiv \triangle BDC$. (3)
- 10.1.3. If $AB = 10m$ and $FE = 5m$, show that $FC = 2AB$. (3)
- 10.1.4. The trapezium represents a stage. To construct it, you need to know the area of wood required. If $AE = 7m$, find the area of the stage. (3) [10]

10.2. $PQRS$ is a parallelogram. Line PT bisects \hat{Q} . Line PT is perpendicular to Line TQ ($PT \perp TQ$). Angle $\hat{Q} = 2x + 20$ and angle $\hat{S} = 3x + 30$



- 10.2.1. Calculate the size of \hat{T} . (3)
- 10.2.2. Calculate the value of x . (3)
- 10.2.3. Prove that $\hat{S} = 90^\circ$ if $x = 20^\circ$. (1) [7]

10.3. $ABCD$ is a parallelogram.



10.3.1. Give one word for: The point where two lines meet.

(1)

10.3.2. Calculate x .

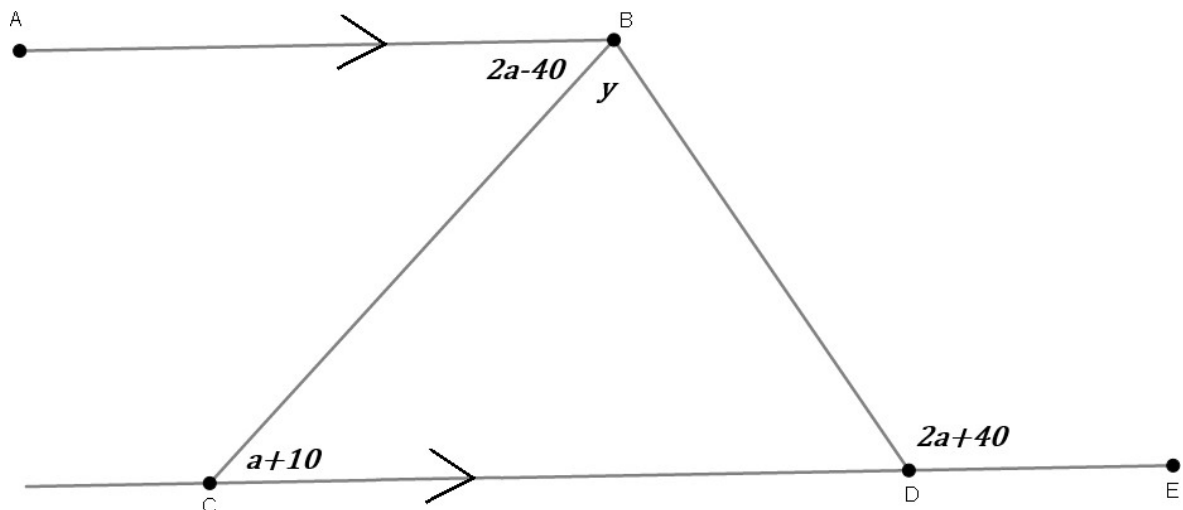
(2)

10.3.3. Calculate y .

(3)

[6]

10.4. $AB \parallel CD$



10.4.1. Give one word for: Angles that add up to 180° .

(1)

10.4.2. Express y in terms of a .

(3)

10.4.3. Find the value of a .

(3)

10.4.4. Find the value of y .

(1)

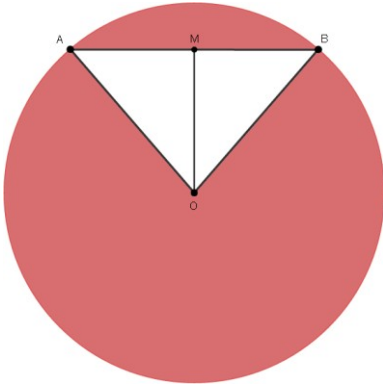
[8]

Question 11

11)11)

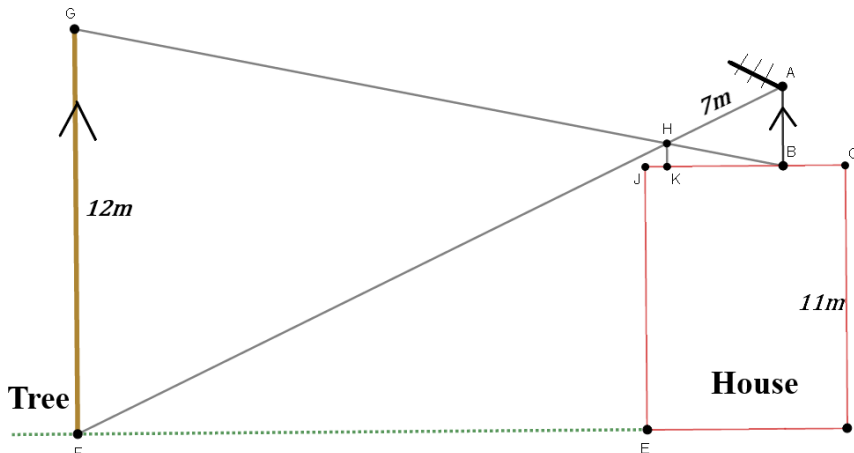
- 11.1. The length of a rectangular garden is $(3x + 2)$ and the width is $(2x - 1)$.
- 11.1.1. Determine the perimeter of the garden in terms of x . (3)
- 11.1.2. Determine the area of the garden in terms of x . (3)
- 11.1.3.** If $x = 6m$; how much fencing will be needed to enclose the perimeter of the garden? (1)
- 11.1.4. Give the ratio of [length] : [width] if $x = 6m$. (1) **[8]**

- 11.2. In the diagram below, O is the centre of the circle. $AO = 15cm$; $AM = 9cm$ and $OM = 12cm$.



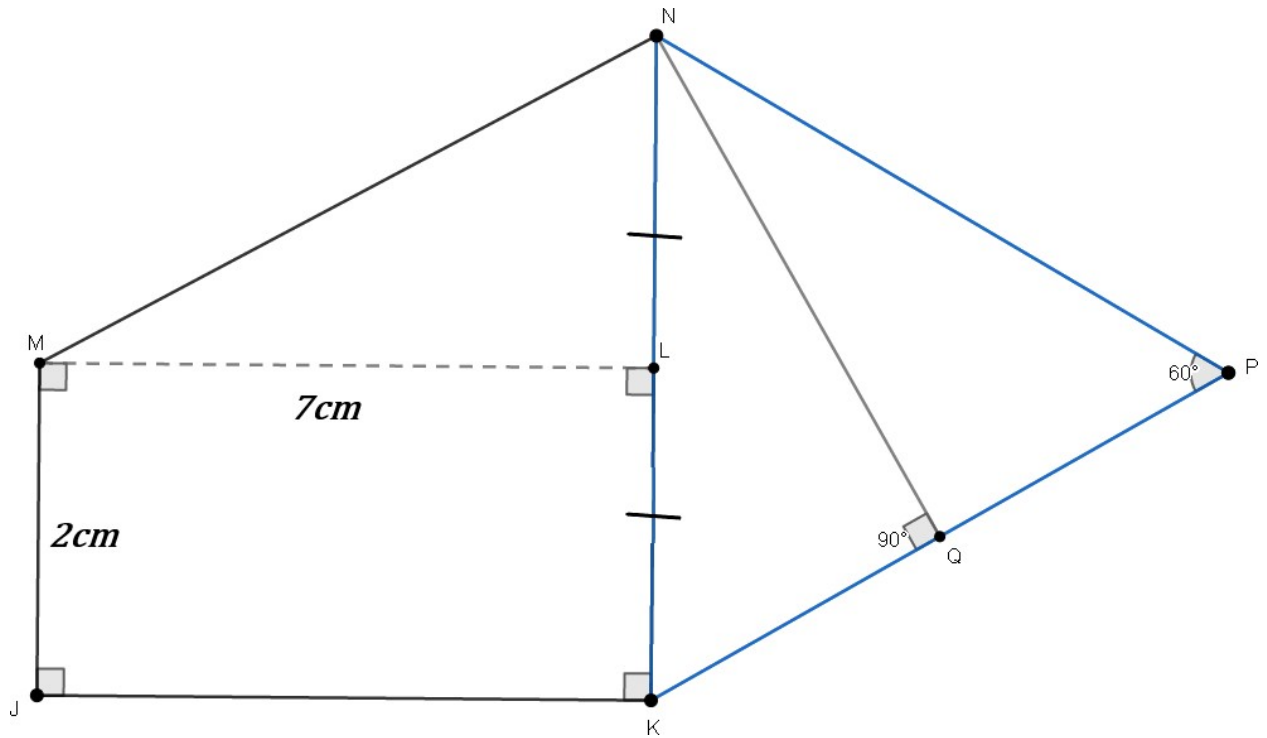
- 11.2.1. Give one word for: The perimeter of a circle. (1)
- 11.2.2. Show that $\triangle OMA$ is a right-angled triangle. (3)
- 11.2.3. Prove that OM bisects AB at M . (3)
- 11.2.4. Find the area of the shaded region. (3) **[10]**

- 11.3. Thuli wants to mount a TV antenna, AB , on the roof of her house. The top of the antenna must be $3m$ higher than the tree next to the house for her to have clear reception. $AB \parallel GF$. The height of the tree (FG) is $12m$; $CD = 11m$ and $AH = 7m$.



- 11.3.1. Prove that $\triangle AHB \parallel \triangle FHG$. (3)
- 11.3.2. Determine the length of HF . (2)
- 11.3.3.** If $EF = 13m$, calculate the length of HE to 2 decimal places. (3) **[8]**

11.4. Look at the diagram below.



11.4.1. Calculate the area.

(3)

11.4.2. Calculate the perimeter.

(3) [6]

TOTAL: [150]