Exam exemplar (November)

Paper 1: Algebra

Marks: 100

Instructions

- Answer all the questions.
- Show all your working.
- Work neatly and write legibly.

Question 1

Classify each of the following numbers according to all the sets to which they belong. Place a tick in the correct boxes.

Number	$\mathbb{N}$ Natural	$\mathbb{Z}$ Integer	$\mathbb{Q}$ Rational	$\mathbb{Q}'$ Irrational
$\sqrt{11}$				
$\frac{3}{4}$				
0				
$3,\dot{2}$				
$\sqrt{-6}$				

[8]

Question 2

2.1 Convert the following numbers to the forms indicated in the brackets.

2.1.1 $2\frac{17}{125}$ (a decimal number) (1)

2.1.2 12,25 (an improper fraction) (1)

2.1.3 $-3\frac{7}{8}$ (three decimal places) (1)

2.1.4 $\sqrt{7}$ (one decimal place) (1)

2.2 Express each number as a fraction in its simplest form.

2.2.1 12,88 (1)

2.2.2 $2,\dot{1}\dot{4}$ (1)

[6]

Question 3

3.1 Given the expression $3x^2 - 2x + 7$

3.1.1 What is the value of the expression if $x = -1$? (2)

3.1.2 What is the value of the expression if $x = 2a$? (2)

3.2 From the sum of $3a + b$ and $2b - 3c$, subtract $2a + 3b - 4c$. (4)

3.3 The ratio of girls to boys in a school is 5 to 9. If the total number of learners in the school is 1 218, calculate the number of boys. (2)

[10]

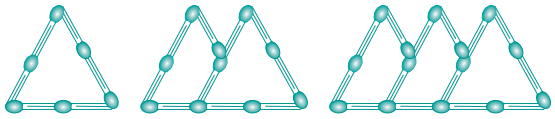
Question 4

4.1 Give the next two terms in each sequence.

4.1.1 2; −2; −6; ...; ... (2)

4.1.2 x; $2x^2$; $4x^3$; ...; ... (2)

4.2 Consider the pattern below made from matches.



Term 1 Term 2 Term 3

4.2.1 Draw Term 4. (2)

4.2.2 Copy and complete the following table:

Term number	1	2	3	4	5	25
Number of matches	6	10				

(4)

4.2.3 How many matches are there in the nth term? (2)

4.2.4 In which term will there be 402 matches? (2)

[14]

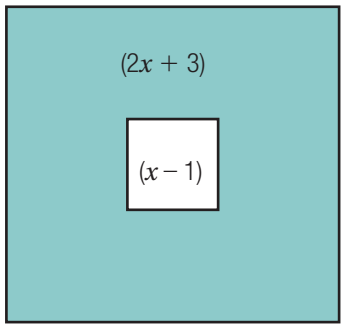
Question 5

5.1 Simplify.

5.1.1 $(2x + 1)(x + 3)$ (2)

5.1.2 $(2x - 3y)^2$ (3)

5.2. The diagram shows a larger square with a side of $2x + 3$ units and a smaller square with a side of $x - 1$ units. Determine the area of the shaded part in terms of x. Write the answer in its simplest form.



(8)

[13]

Question 6

Factorise completely.

6.1 $3x^2y - 6xy^4$ (2)

6.2 $2x^4 - 32$ (3)

6.3 $x^2 + 7x - 18$ (2)

6.4 $2x^3 + 6x^2 - 20x$ (3)

[10]

Question 7

Simplify each of the following expressions.

7.1 $\frac{2x^2 - 10x}{2x^2 - 50}$ (4)

7.2 $\frac{4p + 1}{5} - \frac{3p - 2}{4}$ (4)

[8]

Question 8

8.1 Simplify.

8.1.1 $(y^2)^6$ (1)

8.1.2 $\frac{2n^2(2n)^0}{2^2n}$ (2)

8.1.3 $\sqrt{64x^{64}}$ (2)

8.2 Simplify.

8.2.1 $\frac{(3xy^3)^2}{18x^2y^4}$ (3)

8.2.2 $\frac{4w^{-2}}{v} \times \frac{2v^{-3}}{6w}$ (3)

8.3 Write down the value of b if $3^{15} \times 3^b = 3^{30}$. (1)

8.4 If $x = -2$ and $y = -1$, determine the value of $\sqrt{y^2 - x^3}$. (3)

8.5 Write 0,0000046 in scientific notation. (1)

8.6 The speed of light is 3×10^8 metres per second. Determine how many kilometres light travels in one year. Leave your answer in scientific notation. (2)

[18]

Question 9

9.1 Solve for x.

9.1.1 $3x + 27 = 9x - 3$ (2)

9.1.2 $2^x = 64$ (1)

9.1.3 $\frac{x + 3}{2} - \frac{x - 6}{3} = x - 4$ (4)

9.1.4 $(x - a)(x - b) = 0$ (Hint: do not multiply out) (3)

9.2 John is five years older than Mary. In seven years' time Mary's age will be three-quarters of John's age. Write a linear equation and solve it to find Mary's current age. (3)

	Now	Future
Mary	x	$x + 7$
John		

[13]

Paper 2: Geometry and data handling

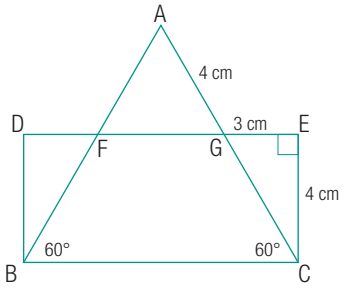
Marks: 135

Instructions

- Answer all the questions.
- Show all your workings.
- Work neatly and write legibly.
- Use $\pi = 3{,}14$ where appropriate.
- Round all answers to two decimal places.

Question 1

1.1 In the diagram alongside DECB is a rectangle. $\triangle ABC$ is an equilateral triangle. EC = 4 cm = AG and GE = 3 cm. Answer the following questions.



1.1.1 Write down, giving a reason, the size of $\hat{A}$. (2)

1.1.2 Use the Pythagoras Theorem to calculate the length of GC. (4)

1.1.3 Write down, giving a reason, the length of DB. (2)

1.1.4 Show that $\triangle ABC \,|||\, \triangle AFG$. (5)

1.1.5 Determine the length of FG. (4)

1.1.6 Determine the size of $G\hat{C}E$. (5)

1.1.7 Prove that $\triangle EGC \equiv \triangle DFB$. (5)

1.2 A decagon is a polygon made up of 10 straight lines.

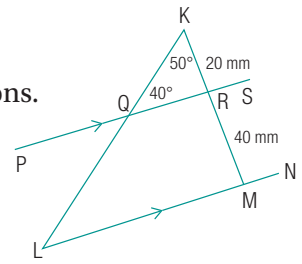
1.2.1 Write down a formula that may be used to calculate the sum of interior angles of a polygon with n sides. (2)

1.2.2 Calculate the sum of the interior angles of a decagon. (3)

[32]

Question 2

2.1 In the diagram alongside PS || LN, $K\hat{Q}R = 40°$ and $Q\hat{K}R = 50°$. KR = 20 mm, KL = 100 mm and RM = 40 mm. Answer the following questions.



2.1.1 Calculate, with reason(s), the size of KRS. (3)

2.1.2 Prove that △KLM ||| △KQR. (4)

2.1.3 Calculate the length of KM. (2)

2.1.4 Calculate the length of KQ. (4)

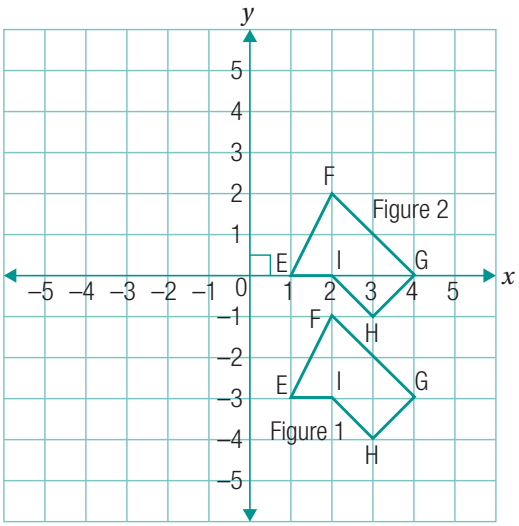
2.1.5 Prove that △KML is a right-angled triangle. (4)

2.1.6 Calculate the length of LM. (4)

2.1.7 Calculate the area of △KLM in cm². (4)

2.1.8 Show that: Area of trapezium QRML = area △KLM − area △KQR. (6)

2.2 The diagram below shows a geometric Figure 1.



2.2.1 Write down the coordinates of the vertices of Figure 1. (5)

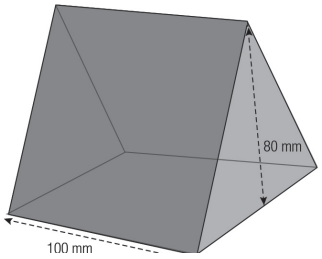
2.2.2 Name the transformation that will have Figure 2 as image. (2)

2.2.3 Write down the coordinates of the vertices of the image if Figure 1 is reflected in the line $y = x$. (5)

[43]

Question 3

3.1 The triangular prism alongside has a regular triangle as base and square lateral faces with sides 100 mm long.



3.1.1 Draw a net of the prism. (3)

3.1.2 Prove that the triangular base is 87 mm high (to the nearest mm). (3)

3.1.3 Calculate the surface area of the prism. (3)

3.1.4 Calculate the volume of the prism. (3)

3.2 A certain polyhedron is both a prism and a Platonic solid with 12 edges.

3.2.1 Write down the name of the polyhedron. (2)

3.2.2 How many faces does the polyhedron have? (2)

3.2.3 Use Euler's Formula to calculate the number of vertices of the polyhedron. (3)

[19]

Question 4

The Twenty 20 (T20) cricket game has grown at a very fast rate over the past six years. A T20 Cricket World Cup was held in Sri Lanka in September 2012.

4.1 A survey to determine the favourite team to win the World Cup was conducted among the top cricket playing countries before the competition began. The table below shows the results of the survey.

Who will win the 2012 T20 Cricket World Cup?									
South Africa	South Africa	En-gland	Wind-ies	Sri Lanka	India	Austra-lia	Kiwis	Austra-lia	South Africa
India	South Africa	En-gland	India	Wind-ies	Paki-stan	Sri Lanka	South Africa	Wind-ies	Kiwis
En-gland	Wind-ies	Paki-stan	Sri Lanka	India	South Africa	En-gland	Paki-stan	South Africa	En-gland
En-gland	Paki-stan	Sri Lanka	India	South Africa	En-gland	Austra-lia	South Africa	En-gland	Wind-ies
South Africa	South Africa	Paki-stan	India	Sri Lanka	India	En-gland	South Africa	En-gland	Austra-lia
Austra-lia	Paki-stan	Sri Lanka	South Africa	Paki-stan	India	En-gland	South Africa	South Africa	India

4.1.1 How many people took part in the survey? (2)

4.1.2 Suggest the most suitable way for organising this data to make it easy to interpret. (2)

4.1.3 Organise the data as suggested in question **4.1.2** above. (5)

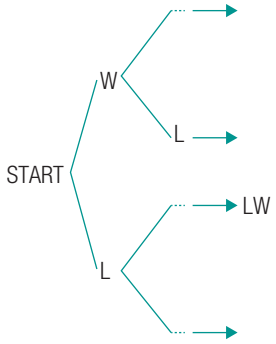
4.1.4 Use your organised data to answer the following questions:

4.1.4.1 Which country was the favourite to win the T20 Cricket World Cup? (1)

4.1.4.2 Which country was least favoured as winners of the event? (1)

4.2 At the start of the T20 World Cup, South Africa was put in Group C along with Sri Lanka and Zimbabwe.

A team had to win at least one of the two matches in a group to proceed to the next phase of the tournament. A draw (tie) is not allowed.
The incomplete tree diagram on the right shows possible outcomes for the first two South African matches.



4.2.1 Copy and complete the tree diagram in your exercise book. (6)

4.2.2 Calculate the probability that South Africa will proceed to phase 2 of the tournament. (4)

4.2.3 What is the probability that South Africa wins both games in the group C? (3)

4.3 The following are marks (as percentages) obtained by Izibele in all Mathematics tasks for 2012:

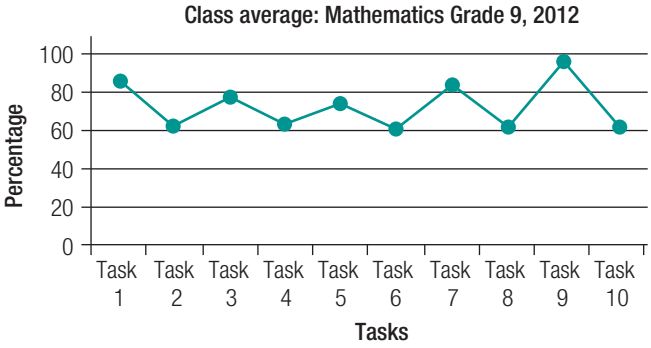
98 65 80 75 86 72 98 61 90 67

4.3.1 What is the range of Izibele's marks for Mathematics in 2012? (3)

4.3.2 Determine the median of her marks. (3)

4.3.3 Calculate the mean of her marks. (3)

4.4 The Mathematics teacher gave each Grade 9 learner a broken-line graph showing the class average score for each task. The graph is given below.



4.4.1 On the same set of axes draw a broken-line graph showing Izibele's Mathematics marks. (6)

4.4.2 Use the two graphs to comment on Izibele's performance in Mathematics in 2012. Write at least two comments based on the graphs. (2)

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