NAME	MARK
Memo	
TEACHER	
CLASS	PERCENTAGE

HERZLIA MIDDLE SCHOOL

GRADE 9

MATHEMATICS EXAMINATION

Paper 1

16 November 2017

TIME: 90 Minutes

MARKS: 100

This paper consists of 14 pages

- All working details must be shown clearly.
- Marks will be deducted if work is set out incorrectly.
- Please note that diagrams are not necessarily drawn to scale.
- Calculators may be used.
- Unless convention or instructions dictate otherwise, round answers to two decimal places.
- It is in your own interest to write legibly and to present your work neatly.

Question 1

Circle the correct answer from each of the four possible answers:

1.1 If $x = 13$, then the value of $\sqrt{x-5}$ is (1)

A a rational number

(B) an irrational number

C undefined

D an integer

1.2 Which expression is equivalent to $(3x^2)^{-1}$ (1)

A $-\frac{1}{3x^2}$

B $-3x^2$

(C) $\frac{1}{3x^2}$

D $-9x^2$

1.3 The expression $8^{-4} \cdot 8^6$ is equivalent to (1)

A 8^{-24}

B 8^{-2}

(C) 8^2

D 8^{10}

1.4 Which expression is equivalent to 3^8? (1)

A $(3^4)^4$

B $(3^2 \times 3^2)^4$

C $3^2 \times 3^2 \times 3^2$

(D) $(3^2)^2 \times (3^2)^2$

1.5 Expresses 72 kilometers per hour as meters per hour in scientific notation. (1)

A $7{,}2 \times 10^{-2}$ m/h

B $7{,}2 \times 10^{2}$ m/h

C $7{,}2 \times 10^{-4}$ m/h

(D) $7{,}2 \times 10^{4}$ m/h

(5)

1.6 If n is a negative integer, then which statement is always true? (1)

A $6n^{-2} < 4n - 1$

B $\frac{n}{4} > -6n^{-1}$

(C) $6n^{-1} < 4n^{-1}$

D $4n^{-1} > (6n)^{-1}$

1.7 When solved for y, the equation $ay - b = c$ is equal to (1)

A $\frac{c - b}{a}$

B $\frac{c + a}{b}$

C $\frac{c + b}{y}$

(D) $\frac{c + b}{a}$

1.8 If 7 identical pipes fill 3 identical tanks in 45 minutes, 5 pipes fill one of these tanks in (1)

A 20 min

(B) 21 min

C 15 min

D 10 min

Question 2

Formulae for Question 2

$I = P \times r \times t$	$A = P(1 + in)$	$A = P(1 + i)^n$

2.1 The Grade Nines sold bracelets at R20 each to raise funds for their end of year gift to the school. R7,50 from each sale is profit. What percentage profit is made on the cost price of each bracelet? (3)

CP of bracelets = 20 − 7,50 ✓
= 12,50 ✓

% Profit = $\frac{7.50}{12.50}$ ✓
= 60% ✓

2.2 If a car costs R456 000 today, what will it cost in 3 years' time if the rate of inflation is 7% per annum? Give your answer correct to the nearest Rand. (2)

$A = 456000(1 + 0{,}07)^3$ ✓
≈ R558619,61 ✓
≈ R558620.00 ✓

2.3 Samantha bought a TV on Hire Purchase over 3 years. Altogether she paid a total of R12 000. The cash price would have been R8 500.
Calculate the interest rate that was used in this Hire Purchase agreement. Round to one decimal place. (3)

$12000 = 8500(1 + i.3)$ ✓
$12000 = 8500 + 25500i$ ✓
$i = 0{,}13725\ldots$ ✓

Rate ≈ 13,7% ✓

8

Question 3

3.1 Firm A calculates the cost of a job using the formula $K = 500 + 36t$ where K is the cost in Rands and t is the number of days needed to complete the job.

What would Firm A charge for a job that takes 10 days? (2)

$K = 500 + 36(10)$ ✓

$= R860$ ✓

3.2 Firm B calculates the cost of the same job using the formula $C = 260 + 48t$ where C is the cost in Rands and t is the number of days needed to complete the job.

How long would Firm B take to complete a job for which the charge is R596? (2)

$596 = 260 + 48t$ ✓

$t = 7$ days ✓

3.3 There is a specific job for which the charge by either firm would be the same. How many days are needed for this specific job? (2)

$500 + 36t = 260 + 48t$ ✓

$240 = 12t$

$20 = t$ ✓

20 days ✓

6

Question 4

Remove brackets where necessary and simplify. Leave answers with positive exponents.

4.1 $\dfrac{(4a-b)^0}{4a^0.b^{-1}}$ (2)

$= \dfrac{1.b}{4.}$ ✓ ✓

$= \dfrac{b}{4}$ ✓

4.2 $\sqrt{\dfrac{98x^5}{8xy^2}}$ (2)

$= \sqrt{\dfrac{49x^4}{4y^2}}$ ✓

$= \dfrac{7x^2}{2y}$ ✓ ✓

$(-\frac{1}{2})$ $3{,}5\,\dfrac{x^2}{y}$

4.3 $\dfrac{5a(2a^3)^2}{-25a^4+5a^4}$ (4)

$= \dfrac{5a(4a^6)}{-20a^4}$ ✓ ✓ ✓

$= \dfrac{20a^7}{-2a^4}$ ✓

$= -a^3$ ✓

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4.4 $(2x-1)^2-(1-2x)(1+3x)-2$ (4)

$= 4x^2 - 4x + 1 - (1 + x - 6x^2) - 2$

$= 4x^2 - 4x + 1 - 1 - x + 6x^2 - 2$

$= 10x^2 - 5x - 2$

4.5 $\frac{1}{2}(x-2)-\frac{1}{3}(x+3)+1\frac{3}{4}$ (5)

$= \frac{6(x-2)-4(x+3)+21}{12}$

$= \frac{6x-12-4x-12+21}{12}$

$= \frac{2x-3}{12}$

Question5

Simplify using factorisation:

5.1 $12xy^3 + 18xy^2 - 6xy$ (1)

$= 6xy(2y^2+3y-1)$

5.2 $m^2 - 5mn - 24n^2$ (1)

$= (m+3n)(m-8n)$

5.3 $32a^4 - 50$ (2)

$= 2(16a^4-25)$

$= 2(4a^2+5)(4a^2-5)$

5.4 $\dfrac{-2x^2+4x+6}{x^2-9} \times \dfrac{x^2+2x-3}{x^2+5x+4} \div \dfrac{-2x+2x^2}{x^3}$ (7)

$= \dfrac{-2(x^2-2x-3)}{(x+3)(x-3)} \times \dfrac{(x+3)(x-1)}{(x+4)(x+1)} \times \dfrac{x^3}{2x(x-1)}$

$= \dfrac{-2(x+1)(x-3)}{(x+3)(x-3)} \times \dfrac{(x+3)(x-1)}{(x+4)(x+1)} \times \dfrac{x^2}{2x(x-1)}$

$= \dfrac{-x^2}{x+4}$

Question 6

Solve for x:

6.1 $\frac{1}{2}(x-2)-\frac{1}{3}(x+3)=x-1$ (5)

$\dfrac{x-2}{2} - \dfrac{x+3}{3} = \dfrac{x-1}{1}$

(×6)

$\therefore 3(x-2)-2(x+3)=6(x-1)$

$\therefore 3x-6-2x-6=6x-6$

$\therefore x-12=6x-6$

$\therefore -6=5x$

$\therefore x=\dfrac{-6}{5}$

6.2 $x(x+3)=10$ (3)

$\therefore x^2+3x-10=0$

$\therefore (x+5)(x-2)=0$

$\therefore x=-5$ or $x=2$

6.3 $2^x.4^{x-1} = 8$ (4)

$2^x \cdot 2^{2x-2} = 2^3$ ✓ ✓ ✓

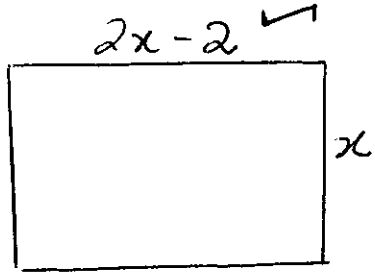
$2^{3x-2} = 2^3$ ✓

$3x - 2 = 3$ ✓

$x = \frac{5}{3}$ ✓

Question 7

7.1 Mr Jackson had a rectangular shaped garden where the length was 2 less than twice the width. If the area of the garden was 420 square meters, find the width of the garden. (5)



$x(2x-2) = 420$ ✓

$\therefore 2x^2 - 2x - 420 = 0$ ✓

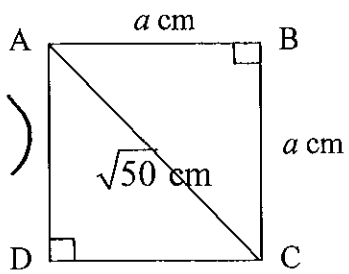
$\therefore x^2 - x - 210 = 0$ ✓

$\therefore (x - 15)(x+14) = 0$ ✓

$x = 15$ or -14 ✓

the width is 15 m ✓

8.2 Determine the length of AB. (3)



$a^2 + a^2 = (\sqrt{50})^2$ ✓ (pythag)

$2a^2 = 50$ ✓

$a^2 = 25$

$a = 5$ cm ✓

12

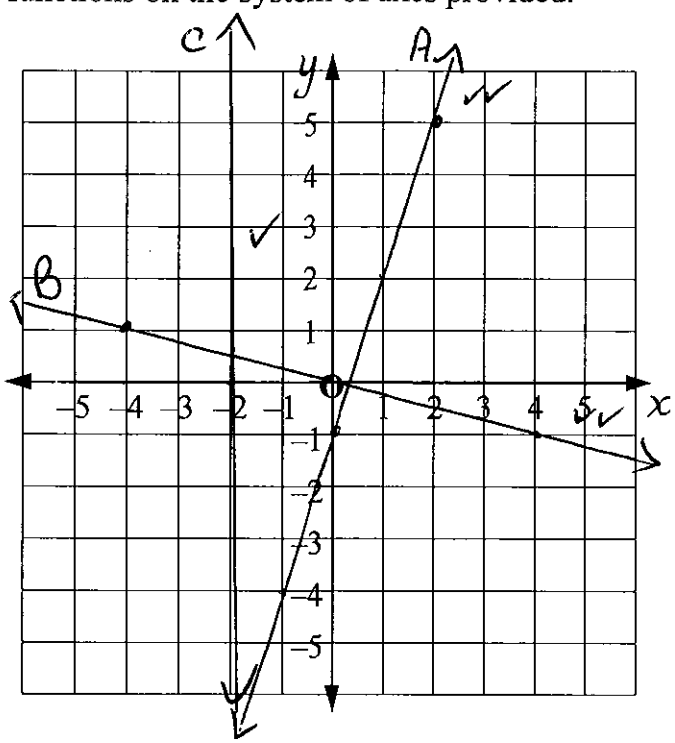
Question 8

8.1 Draw the graphs the following functions on the system of axes provided. (5)

A: $y = 3x - 1$

B: $y = -\frac{1}{4}x$

C: $x = -2$



8.2 Read off the intersection of B and C. (1)

$(-2; \frac{1}{2})$ ✓

8.3 What is the equation of the line parallel to A through the origin? (1)

$y = 3x$ ✓

7

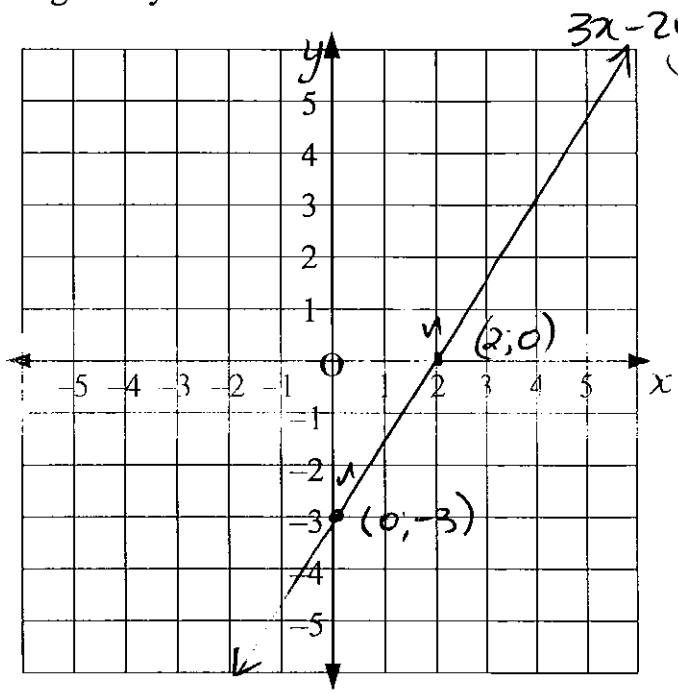
Question 9

9.1 Given: $3x - 2y = 6$. Calculate the y-intercept and the x-intercept of the graph of this equation. (4)

$x = 0$
$-2y = 6$ ✓
$y = -3$
$(0; -3)$ ✓

$y = 0$
$3x = 6$ ✓
$x = 2$
$(2; 0)$ ✓

9.2 Plot the graph on the given system of axes. (1)



9.3 What is the gradient of the graph? (1)

$m = \frac{3}{2}$ ✓

9.4 What is the equation of the graph which is perpendicular to $3x - 2y = 6$ and which cuts the y-axis at –2? (2)

$y = -\frac{2}{3}x - 2$ ✓ ✓

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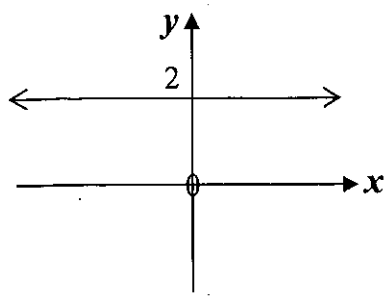
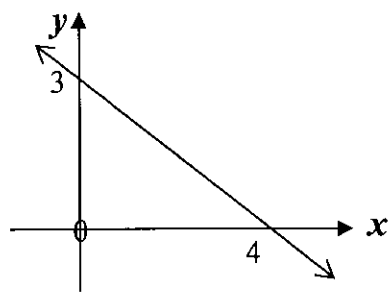
Question 10

Give the equations of each of the following graphs:

10.1 $y = 2$ (1)



10.2 $y = -\frac{3}{4}x + 3$ ✓ ✓ (2)



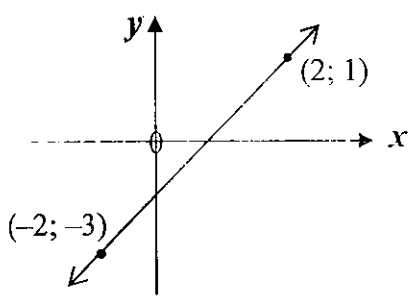
10.3 $y = \frac{4}{4}x + c$ ✓

Subst (2; 1) ✓

$1 = 2 + c$

$-1 = c$ ✓

$y = x - 1$ ✓ (3)

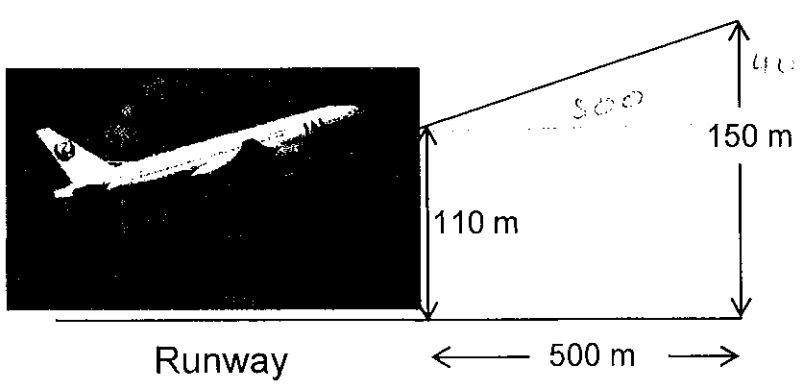


Question 11

11.1 A passenger jet takes off along the flight path shown below. What is the gradient of the path? (2)

$m = \frac{40}{500}$ ✓ ✓

$= \frac{2}{25}$ ✓



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11.2 Three equations are given. Two represent the same straight line and one represents a different line. Which equation is the odd one out? (3)

Equation 1: $4x + 2y = 4$

$2y = -4x + 4$

$y = -2x + 2$ ✓

Equation 2: $y - 2x + 2 = 0$

$y = 2x - 2$ ✓

Equation 3: $y = 2x - 2$

Equation 1 is the odd one out ✓

11.3 Algebraically determine the point of intersection of Equation 1 and Equation 3 in the above question. (4)

$-2x + 2 = 2x - 2$ ✓

$-4x = -4$

$x = 1$ ✓

Subst $x = 1$ into Eqn 3

$y = 2(1) - 2$ ✓

$= 2 - 2$ ✓

$= 0$

Pt of intersection $(1; 0)$ ✓

(7)

Bonus Questions

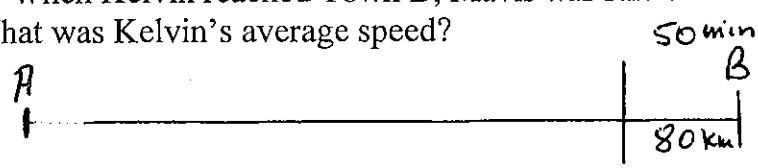
1. Look at the number patterns in the squares.
What does the question mark (?) represent? (1)

p	$2p$
$2t$	$4t$

$3a$	$12c$
$2a$	$8c$

5	? 42 ✓
$10p$	$8pz$

2. Mavis and Kelvin drove 848 km from Town A to Town B in separate cars at 08:00. Kelvin overtook Mavis on the way and arrived at Town B 50 min earlier than Mavis. When Kelvin reached Town B, Mavis was still 80 km away from Town B. What was Kelvin's average speed? (2)

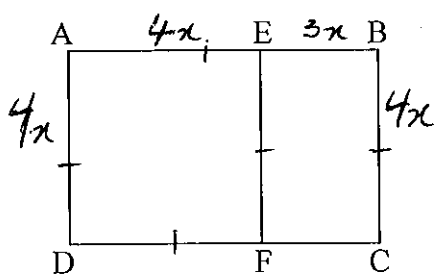


50 mins : 80 km
1 m : 1,6 km
60 m : 96 km

Mavis $\frac{848}{96} = 8\text{hr } 50\text{ min}$

Kevin $\frac{848}{8} = 106\text{ km/h}$ ✓✓

3. In the accompanying diagram, square ADFE is inscribed in rectangle ABCD.
EB : AB = 3 : 7, and the perimeter of ABCD is 132 cm.
Determine the length of AE (2)



$x = 132$

$x = 6$.

$AE = 24$ cm ✓

(5)