Student's Name:_____

Teacher's Initials:_____

(DXC) Mr Chua*
(LMD) Mrs de Gorter
(PDJ) Ms Jouliany
(LZM) Mr Mildren
(DZP) Mr Peattie
(RJW) Mr Williams

YEAR 9

5.3 MATHEMATICS

MAJOR ASSESSMENT

TASK 2

THURSDAY 16th MAY 2019

PERIOD 3AB, 5

TIME: 50 MINUTES

165 copies

Indices
Trigonometry
Algebra
Products and Factors

INSTRUCTIONS TO STUDENTS:

* Write your name and teacher's initials in the spaces indicated.
* Write in blue or black pen
* Answer ALL questions in the spaces provided.
* Show ALL necessary working.
* Marks may not be awarded for careless or badly arranged work.
* Diagrams are NOT drawn to scale.
* Approved calculators may be used in the Calculator Section only.

This assessment consists of TWO sections.

SECTION 1 : NON-CALCULATOR (10 minutes)

SECTION 2 : CALCULATOR (40 minutes)

SECTION 1	**/ 15 marks**
SECTION 2	**/ 53 marks**
TOTAL	**/ 68 marks**

SECTION 1: NON-CALCULATOR (15 marks) 10 minutes

1. Fully simplify:

(a) $r^4 \times r^2 \div r^3$ **1** (b) $(3p^2q)^3$ **2**

2. Rewrite using negative indices or the simplest fractional index:

(a) $\sqrt[3]{w^4}$ **1** (b) $\frac{2}{x^2}$ **1**

3. Evaluate $3^0 + 3^2$ **2**

4. Fully simplify:

(a) $4s^{-2} \div 2t^2$ **2** (b) $(27)^{\frac{2}{3}}$ **2**

5. Write 23415000 in scientific notation, rounding your answer to 3 significant figures. **2**

6. The speed of light is approximately 3.0×10^8 metres per second. The distance from Earth to Venus is approximately 2.61×10^{11} metres.

How many seconds does it take to travel from Earth to Venus if travelling at the speed of light? Give your answer in scientific notation. (Note: Time = Distance ÷ Speed) **2**

End of Section 1: Non-Calculator

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Student's Name:_____

Teacher's Initials:_____

Barker College

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YEAR 9

THURSDAY 16th MAY 2019

PERIOD 3AB, 5

5.3 MATHEMATICS

SECTION 2: CALCULATOR
40 minutes

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SECTION 2: There are THREE parts in this section.

SECTION 2	
Part A Algebra, Products and Factors	**/ 19 marks**
Part B Indices	**/ 14 marks**
Part C Trigonometry	**/ 20 marks**

Part A: Algebra, Products and Factors (19 marks)

Question 7

Expand and simplify:

(a) $(x-3)(x+6)$ **2**

(b) $(2d-5)^2$ **2**

Question 8

Factorise fully:

(a) $x^2+7x-18$ **2**

(b) $6a^2+3ab+10a+5b$ **2**

(c) $9a^2-4b^2$ **2**

Question 9

Fully simplify:

(a) $\frac{z}{4} - \frac{z}{5}$ **2**

(b) $\frac{a+3}{a^2+4a+3} \div \frac{a-3}{a+1}$ **3**

(c) $\frac{1}{x^2-9x+20} + \frac{1}{x^2-11x+30}$ **4**

End of Part A

Part B: Indices (14 marks)

Question 10

Simplify fully:

(a) $6x^4y^3 \times 8x^2y$ **2**

(b) $\frac{54a^7b^2}{6a^4b^5}$ **2**

(c) $\left(\frac{9x}{5y}\right)^{-1}$ **2**

(d) $\left(\frac{28x^3}{15a^4} \times \frac{20a^6}{21x^7}\right)^{\frac{1}{2}}$ **3**

Question 11

Simplify fully: **2**

$$\frac{3^n}{3^n + 3^n}$$

Question 12

Solve for x: **3**

$$25^{3x} \times 64^x = 10^{90}$$

End of Part B

Part C: Trigonometry (20 marks)

Question 13

Evaluate the following, correct to 2 decimal places.

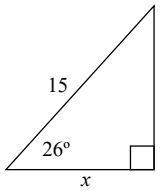
(a) $\sin 38°$ **1**

(b) $\tan 23° 47'$ **1**

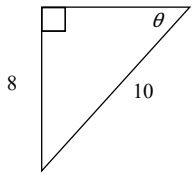
(c) θ if $\cos\theta = \frac{1}{2}$ **1**

Question 14

(a) Find the value of x, correct to 1 decimal place. **2**

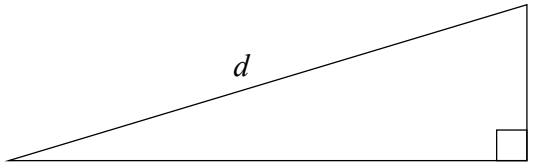


(b) Find θ correct to the nearest degree. **2**



Question 15

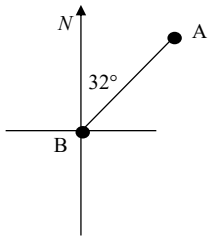
A house has a driveway ramp of length d that leads from the road to the house. The angle of elevation from the bottom of the driveway to the top of the driveway is 3°. If the driveway rises vertically by 1 metre over this distance, find the length d of the driveway (give your answer correct to 1 decimal place). **2**



Question 16

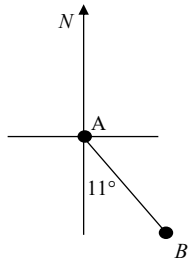
In each of the following diagrams, find the true bearing of A from B:

(a) **1**



NOT TO SCALE

(b) **1**



NOT TO SCALE

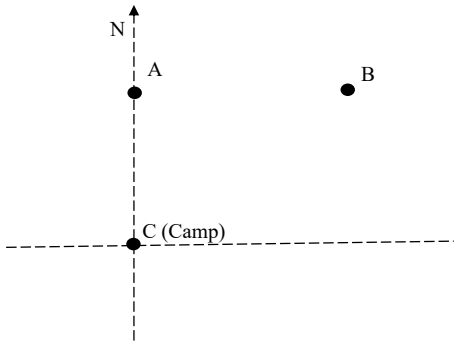
Question 17

A hiker leaves camp (C) and travels 4.6 km north to a scenic spot (A).

After taking in the sights, the hiker then turns and walks directly east to another scenic spot (B).

The hiker then returns to his original campsite on a bearing of 205°.

(i) Complete the sketch below, filling in the missing details of the hiker's journey. **1**



NOT TO SCALE

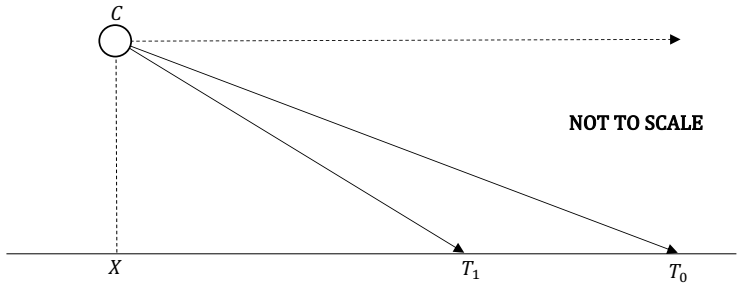
(ii) Find the size of $\angle ABC$ **1**

(iii) Hence, find the distance BC (correct to 1 decimal place). **2**

Question 18

A speed camera (C) is positioned 4.4m vertically above a motorway. The speed camera initially detects a car moving towards the camera at an angle of depression of 5° at point T_0. After 1 second, the speed camera detects the same car again, this time at an angle of depression of 17° at point T_1.

(i) Fill in the diagram with the information provided in this question. **1**



NOT TO SCALE

(ii) If the speed limit for this motorway was 110 km/hr, was the car breaking the speed limit? Justify your answer. **4**

End of Paper

Year 9 5.3 Assessment Task 2 Student Solutions

Non Calculator

1. a) r^3

   b) $3^3 p^6 q^3 = 27p^6q^3$

2. a) $w^{\frac{8}{3}}$

   b) $2x^{-2}$

3. $3^0 + 3^2 = 1 + 9$
   $= 10$

4. a) $\frac{4s^{-2}}{2t^2} = \frac{2}{s^2t^2}$ or $2s^{-2}t^{-2}$

   b) $(27)^{\frac{2}{3}} = (27^{\frac{1}{3}})^2$
   $= 3^2$
   $= 9$

5. $23\,415\,000 = 2.3415 \times 10^7$
   $\Rightarrow 2.34 \times 10^7$

6. Time $= \frac{2.61 \times 10^{11}}{3 \times 10^8}$ m/s
   $= \frac{2.61 \times 10^3}{3}$ s
   $= \frac{2610}{3}$ s $= 870$s
   $= 8.7 \times 10^2$s

Calculator

7. a) $x^2 + 6x - 3x - 18$
   $= x^2 + 3x - 18$

   b) $4d^2 - 10d - 10d + 25$
   $= 4d^2 - 20d + 25$

8. a) $(x+9)(x+2)$

   b) $3a(2a+b) + 5(2a+b)$
   $= (2a+b)(3a+5)$

   c) $(3a-2b)(3a+2b)$

9. a) $\frac{5z}{20} - \frac{4z}{20} = \frac{z}{20}$

9. b) $\frac{a+3}{(a+3)(a+1)} \times \frac{a+1}{a-3}$
   $= \frac{1}{a-3}$

   c) $\frac{1}{(x-4)(x-5)} + \frac{1}{(x-5)(x-6)}$
   $= \frac{x-6}{(x-4)(x-5)(x-6)} + \frac{x-4}{(x-4)(x-5)(x-6)}$
   $= \frac{2x-10}{(x-4)(x-5)(x-6)} = \frac{2(x-5)}{(x-4)(x-5)(x-6)}$
   $= \frac{2}{(x-4)(x-6)}$

10. a) $48x^6y^4$ b) $9a^3b^{-3}$ or $\frac{9a^3}{b^3}$

    c) $\frac{5y}{9x}$ d) $\left(\frac{16a^2}{9x^4}\right)^{\frac{1}{2}}$
    $= \frac{4a}{3x^2}$

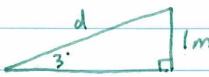
11. $\frac{3^n}{3^n(1+1)} = \frac{1}{2}$

12. $(5^2)^{3x} \times (2^6)^x = (5 \times 2)^{90}$
    $5^{6x} \times 2^{6x} = 5^{90} \times 2^{90}$
    $6x = 90 \quad \therefore x = 15$

13. a) 0.62 b) 0.44 c) 60°

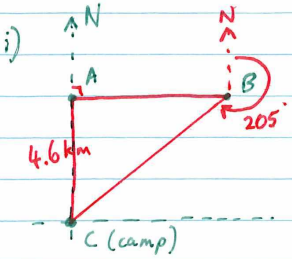
14. a) $\cos 26 = \frac{x}{15}$
    $x = 15 \times \cos 26$
    $= 13.4819...$
    $= 13.5$

    b) $\sin\theta = \frac{8}{10}$
    $\theta = \sin^{-1}\left(\frac{8}{10}\right)$
    $= 53.1301...°$
    $= 53°$

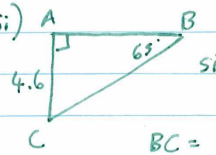
15. 

    $\sin 3° = \frac{1}{d}$
    $d = \frac{1}{\sin 3°}$
    $= 19.107322...$
    $= 19.1$m

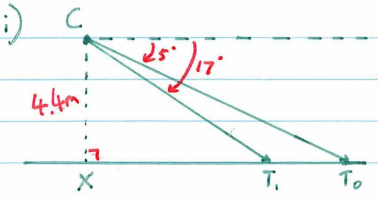
16. a) 032° b) 349°

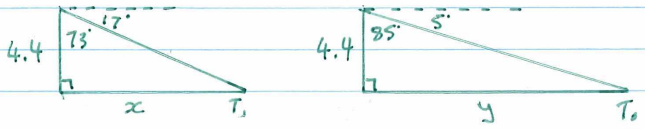
17. i) 

    ii) $\angle ABC = 360 - 90 - 205$
    $= 65°$

    iii) 

    $\sin 65 = \frac{4.6}{BC}$
    $BC = \frac{4.6}{\sin 65}$
    $= 5.0755...$
    $= 5.1$km

18. i) 

    ii) 

    $\tan 73° = \frac{x}{4.4}$
    $x = 4.4 \times \tan 73°$
    $= 14.39175$

    $\tan 85 = \frac{y}{4.4}$
    $y = 4.4 \times \tan 85°$
    $= 50.29223$

    distance travelled in 1 second $= 50.29223 - 14.39175$
    $= 35.9$ m $\quad \therefore$ speed $= 35.9$m/s

    speed limit $= 110$km/h
    110km/h $\div 3.6 = 30.\dot{5}$ m/s $\quad \therefore$ SPEEDING