Student's Name:_____

Teacher's Initials:_____

ALY
ARM
BHC
HYB
JZT
LZM*

YEAR 9

5.3 MATHEMATICS

MAJOR ASSESSMENT

TASK 2

TUESDAY 4th MAY 2021

PERIOD 1, 2

TIME: 55 MINUTES

185 copies

Algebra, Products and Factors
Trigonometry
Indices

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.

Part A - Algebra, Products and Factors	/19 marks
Part B - Trigonometry	/18 marks
Part C - Indices	/21 marks
Part D – Mixed Questions	/10 marks
Total	**/68 marks**

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

Question 1

Expand and simplify:

(a) $3x(x+4)$ **1**

(b) $x(y-x)-2(x-xy)$ **2**

(c) $(4x-3)^2$ **2**

Question 2

Factorise fully:

(a) $x^2-14x+24$ **1**

(b) $2x^2-2x-40$ **2**

(c) $16a^2-9$ **1**

Question 3

Fully simplify:

(a) $\frac{3x+1}{2} - \frac{4x+1}{3}$ **3**

(b) $\frac{a-3}{2a+1} \div \frac{a+3}{2a^2+7a+3}$ **3**

(c) $\frac{4}{x^2+15x+44} - \frac{8}{x^2+8x-33}$ **4**

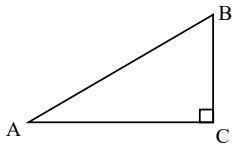
End of Part A

Part B: Trigonometry (18 marks)

Question 4

A right-angle triangle has a hypotenuse of 17cm and BC is 8cm.

(i) Show this information on the triangle ABC below. **1**

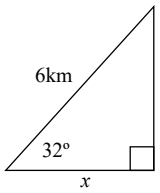


(ii) Find the length of the side AC. **1**

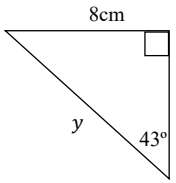
(iii) Find the size of $\angle ABC$ correct to the nearest minute. **2**

Question 5

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



(b) Find the value of y, correct to 1 decimal place. **2**



Question 6

A pigeon flies from point A on a bearing of 195° for 10km to arrive at Point B.

(i) Draw a diagram showing this information. **1**

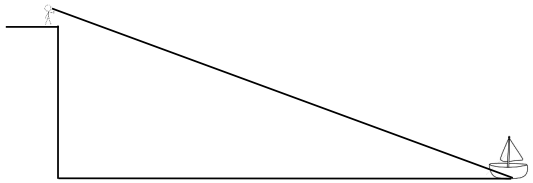
(ii) How far south is the pigeon from its starting point? Correct to 2 decimal places. **2**

(iii) What is the **true bearing** of A from B? **1**

Question 7

Will stands on top of a vertical cliff and his eyes are 35m above the ocean. He observes a boat at an angle of depression of 13°.

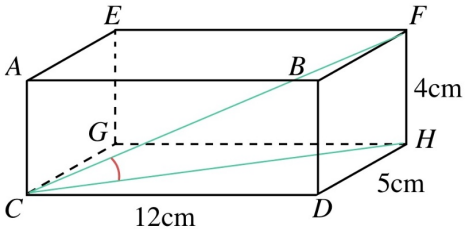
(i) Label the above information on the diagram below. **1**



(ii) How far is the boat from the cliff? Give your answer to the nearest metre. **2**

Question 8

In the rectangular prism below, two diagonals have been drawn: CH and CF.



(i) Find the length of CH. **1**

(ii) Find $\angle FCH$ correct to the nearest minute. **2**

End of Part B

Part C: Indices (21 marks)

Question 9

Express the following in simple index form.

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

(b) $\sqrt{16z^6}$ **2**

Question 10

Express the following in scientific notation.

(a) 160 000 000 **1**

(b) 0.000034568 **1**

Question 11

Express the following with positive indices.

(a) $7x^{-2}$ **1**

(b) $(8y^6)^{-\frac{1}{3}}$ **2**

Question 12

Simplify fully.

(a) $7x^2y \times 3x^4y^3$ **2**

(b) $32a^7b \div 4a^3b^3$ (note: your answer cannot have negative indices) **2**

(c) $(-3x)^2$ **2**

(d) $(8x^6)^{\frac{2}{3}}$ **2**

(e) $(3x^3)^2 + 3(x^3)^2 + 3(x^3)^0 + (3x^3)^0$ **2**

Question 13

Expand and Simplify:

$(3x^2 - y^{\frac{1}{2}})(2x^3 - 4xy^{\frac{1}{2}})$ **3**

End of Part C

Part D: Mixed Questions (10 Marks)

Question 14

Simplify fully: **4**

$$\left(\frac{56x^5y^5}{x^2y^8} \times \frac{(7x^3y^2)^2}{y}\right)^{\frac{1}{3}}$$

Question 15

Fully **Factorise**:

$128(x^2 - 4x + 4) - 50(x - 3)^2$ **3**

Question 16

On the first day of a 2 night camping trip Sam leaves the car park and hikes on a bearing 320° for 15km before setting up camp for the night. On the second day he hikes 4km South West and then 5km North West before setting up camp.

How far is he, in a straight line, from the car park? **3**

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Year 9 5.3 Assessment Task 2

PART A: Algebra, Products & factors

① a. $3x(x+4) = 3x^2 + 12x$

b. $x(y-x) - 2(x-xy)$

$= xy - x^2 - 2x + 2xy$

c. $(4x-3)^2 = (4x-3)(4x-3)$

$= 16x^2 - 24x + 9$

② a) $x^2 - 14x + 24 = (x-2)(x-12)$

b. $2x^2 - 2x - 40 = 2(x^2 - x - 20)$

$= 2(x+4)(x-5)$

c. $16a^2 - 9 = (4a-3)(4a+3)$

③ a. $\frac{3x+1}{2} - \frac{4x+1}{3}$

$= \frac{3(3x+1) - 2(4x+1)}{6}$

$= \frac{9x+3-8x-2}{6}$

$= \frac{x+1}{6}$

b. $\frac{a-3}{2a+1} \div \frac{a+3}{2a^2+7a+3}$

$= \frac{a-3}{2a+1} \times \frac{(2a+1)(a+3)}{a+3}$

$= a-3$

c. $\frac{4}{x^2+15x+44} - \frac{8}{x^2+8x-33}$

$= \frac{4}{(x+4)(x+11)} - \frac{8}{(x+11)(x-3)}$

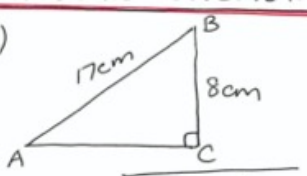
$= \frac{4(x-3) - 8(x+4)}{(x+4)(x+11)(x-3)}$

$= \frac{-4x-44}{(x+4)(x+11)(x-3)}$

$= \frac{-4(x+11)}{-(x+4)(x+11)(x-3)} = \frac{-4}{(x+4)(x-3)}$

PART B: TRIGONOMETRY

④ i)



ii. $AC = \sqrt{17^2 - 8^2}$

$= 15\text{ cm}$

iii. $\cos \angle ABC = \frac{8}{17}$

$\angle ABC = \cos^{-1}\frac{8}{17} =$

$= 61°56'$ (nearest minute)

⑤ a. $\cos 32° = \frac{x}{6}$

$x = 6\cos 32°$

$= 5.0882...$

$= 5.1\text{km}$ (1 dp)

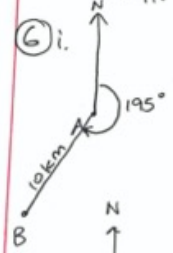
b. $\sin 43 = \frac{8}{y}$

$y = \frac{8}{\sin 43}$

$= 11.7302...$

$= 11.7\text{cm}$ (1dp)

⑥ i.



ii.

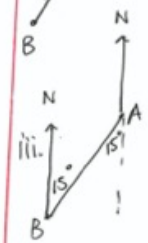
$\cos 15° = \frac{d}{10}$

$d = 10\cos 15°$

$= 9.659258...$

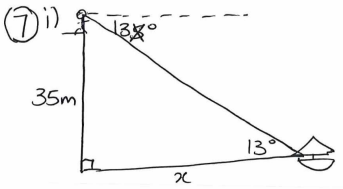
$= 9.66\text{ km}$ (2dp)

iii.



Bearing of A from B $= 015°$

⑦ i)



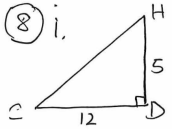
ii) $\tan 13 = \frac{35}{x}$

$x = \frac{35}{\tan 13}$

$= 151.601..$

$= 152\text{ m}$ (nearest metre)

⑧ i.



$CH = \sqrt{5^2 + 12^2}$

$= 13\text{ cm}$

ii. $\tan \angle FCH = \frac{4}{13}$

$\angle FCH = 17°6'9.82''$

$= 17°6'$ (nearest min)

PART C: INDICES

⑨ a. $\sqrt[3]{b^2} = b^{\frac{2}{3}}$

b. $\sqrt{16z^6} = 4z^3$

⑩ a. 1.6×10^8

b. 3.4568×10^{-5}

⑪ a. $\frac{7}{x^2}$

b. $\frac{1}{\sqrt[3]{8y^6}} = \frac{1}{2y^2}$

⑫ a. $21x^6y^4$

b. $8a^{7-3}b^{1-3} = 8a^4b^{-2}$

$= \frac{8a^4}{b^2}$

c. $(-3x)^2 = 9x^2$

d. $(8x^6)^{2/3} = \left(\sqrt[3]{8x^6}\right)^2 = (2x^2)^2 = 4x^4$

e. $(3x^3)^2 + 3(x^3)^2 + 3(x^3)^0 + (3x^3)^0$

$= 9x^6 + 3x^6 + 3 + 1 = 12x^6 + 4$

⑬ $(3x^2 - y^{\frac{1}{2}})(2x^3 - 4xy^{\frac{1}{2}})$

$= 6x^5 - 12x^3y^{\frac{1}{2}} - 2x^3y^{\frac{1}{2}} + 4xy$

$= 6x^5 - 14x^3y^{\frac{1}{2}} + 4xy$

PART D: MIXED QUESTIONS

⑭ $\left(\frac{56x^5y^5}{x^2y^8} \times \frac{(7x^3y^2)^2}{y}\right)^{\frac{1}{3}}$

$= \left(56 \times 7^2 \times x^{5+6-2} \times y^{5+4-8-1}\right)^{\frac{1}{3}}$

$= \left(8 \times 7^2 \times 7 \times x^9 \times y^0\right)^{\frac{1}{3}}$

$= \left(2^3 \times 7^3 \times x^9\right)^{\frac{1}{3}}$

$= 2 \times 7 \times x^3$

$= 14x^3$

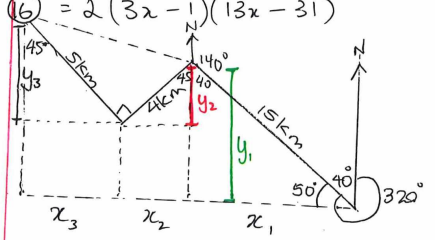
⑮ $128(x^2 - 4x + 4) - 50(x-3)^2$

$= 2\left[64(x-2)^2 - 25(x-3)^2\right]$

$= 2\left(8(x-2) - 5(x-3)\right)\left(8(x-2) + 5(x-3)\right)$

$= 2(3x-1)(13x-31)$

⑯



horiz dist $(x) = x_1 + x_2 + x_3$

$= 15\cos 50 + 4\sin 45 + 5\cos 4$

$= 16.005775...$

vert. dist $(y) = y_1 - y_2 + y_3$

$= 15\sin 50 - 4\cos 45 + 5\cos 4$

$= 12.19777...$

dist $= \sqrt{x^2 + y^2}$

$= 20.1238..$

$= 20\text{ km}$ (nearest km)