Student's Name: _____

Teacher's Initials: _____

Barker College YEAR 9

THURSDAY 17th MAY 2018

GPF AYG
TE RMH
DZP/RJW ARP*

5.3 MATHEMATICS

PERIOD 4, 6

MAJOR ASSESSMENT

TIME: 50 MINS

TASK 2

160 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 (20 minutes)

SECTION 2 : CALCULATOR (30 minutes)

Marks

SECTION 1 – NON CALCULATOR	**/ 36 marks**
SECTION 2 – CALCULATOR	**/ 34 marks**
TOTAL	**/ 70 marks**

SECTION 1: NON – CALCULATOR 36 marks

1. Round $32°49'$ to the nearest degree. **1**

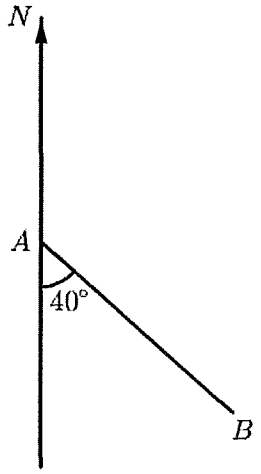
2. Write the following in metres (m) using scientific notation.

   (a) $0.012\ mm$ **2**

   (b) $3790\ km$ **2**

3. Round the number 4979 to two significant figures. **1**

4. In the diagram below what is the bearing of B from A? **1**



5. Calculate the expression below and express your answer in Scientific Notation. **2**

   $(2 \times 10^5) \times (6 \times 10^{-2})$

6. Simplify the following:

   (a) $10m - m$ **1**

   (b) $\frac{2x+6y}{2x}$ **1**

7. Fully simplify the following:

   (a) $\frac{4x}{5} - \frac{3x}{10}$ **2**

   (b) $\frac{3x}{5} \times \frac{2}{9x}$ **2**

8. Fully factorise the following:

(a) $5x^2 - 10xy$ **1**

(b) $4(y-1) + 3x(y-1)$ **1**

(c) $5m^2 - 20$ **2**

(d) $x^2 - 5x - 24$ **2**

9. Fully simplify the following:

(a) $21x^5 \div 7x^3$ **1**

(b) $3^4 \times 3^6$ (express answer in index form) **1**

(c) $(3m^3)^3$ **2**

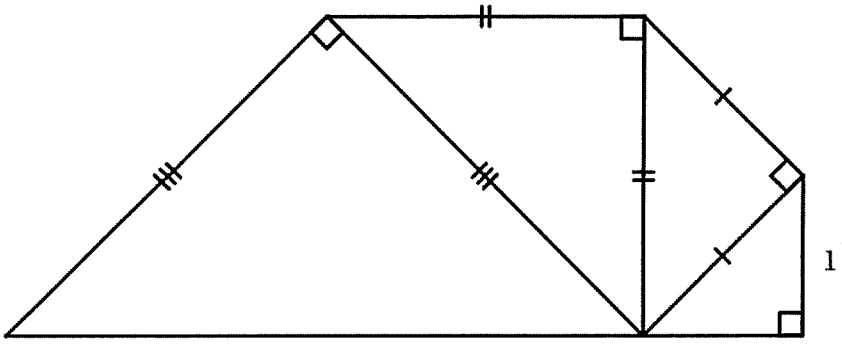
(d) $(8p)^0 - 8p^0$ **1**

(e) $16^{\frac{3}{2}}$ **2**

(f) $2^{n+2} \times 2^{2n} \div 2^{n-1}$ **2**

10. Which is larger 15^7 or 2^{28}? Justify with suitable calculations. **2**

11. Using the information in the diagram below find the exact value of x. **2**



Not to scale

12. Evaluate $1.\dot{2} - 0.\dot{7}$ expressing your answer in fraction form. **2**

(Hint: You may wish to express each recurring decimal in fraction form first)

END OF NON-CALCULATOR SECTION

Student's Name:_____

Teacher's Initials:_____

SECTION 2: CALCULATOR 34 Marks

Part A Algebra, Products, Factors and Indices 12 marks

1. Fully factorise the following:

(a) $pq + q^2 - p - q$ **2**

(b) $2x^2 + 15x - 8$ **2**

(c) $9a^2 - 25b^2$ **2**

2. Write the following without negative indices:

(a) $2m^{-5}$ **1**

(b) $\frac{1}{x^2y^{-5}}$ **1**

(c) $\left(\frac{2}{a}\right)^{-4}$ **1**

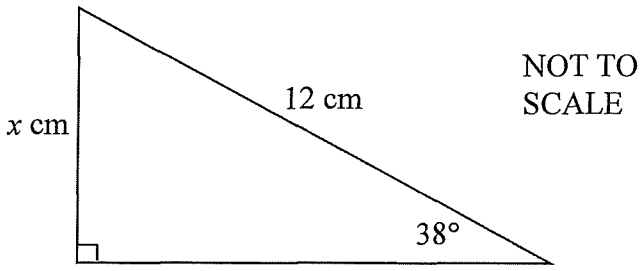
3. Simplify the following:

(a) $9x^{\frac{1}{2}} \times 6x^{\frac{1}{2}}$ **1**

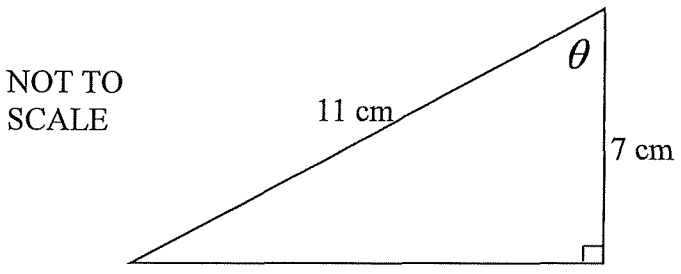
(b) $\sqrt[4]{16p^8q^{-4}}$ **2**

Part B Trigonometry — 11 Marks

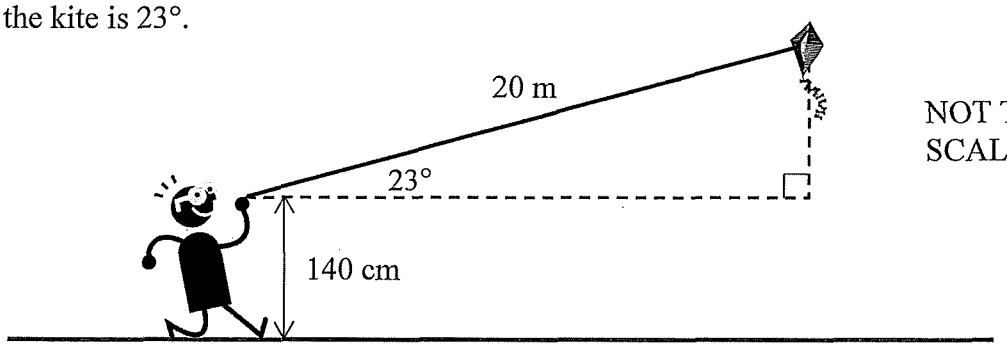
1. Find the value of x correct to 1 decimal place. **2**



2. Find the size of θ, correct to the nearest degree. **2**

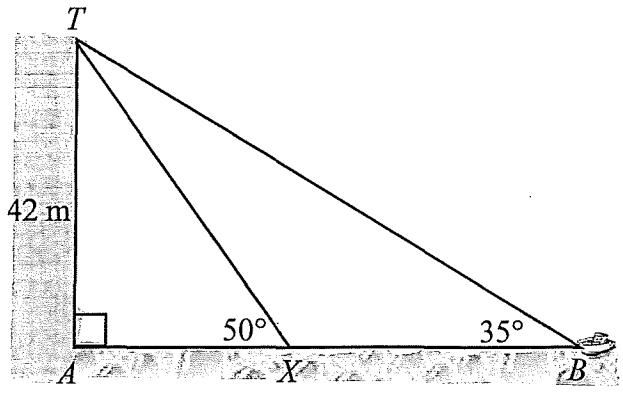


3. Connor is flying a kite in a strong wind. He has let out 20 metres of string and is holding the end of the kite string 140 centimetres above the ground. The angle of elevation from Connor's hand to the kite is 23°. **3**



How high above ground level is Connor's kite? Leave your answer correct to the nearest centimetre.

4. Following a 42 metre cliff jump, Jack had to swim out from the base of the cliff (A) to the pick-up boat (B). When he had made it part of the way (X) the angle of elevation back to the top of the cliff (T) was 50°. The angle of elevation from the pick-up boat to the cliff-top was 35°.



NOT TO SCALE

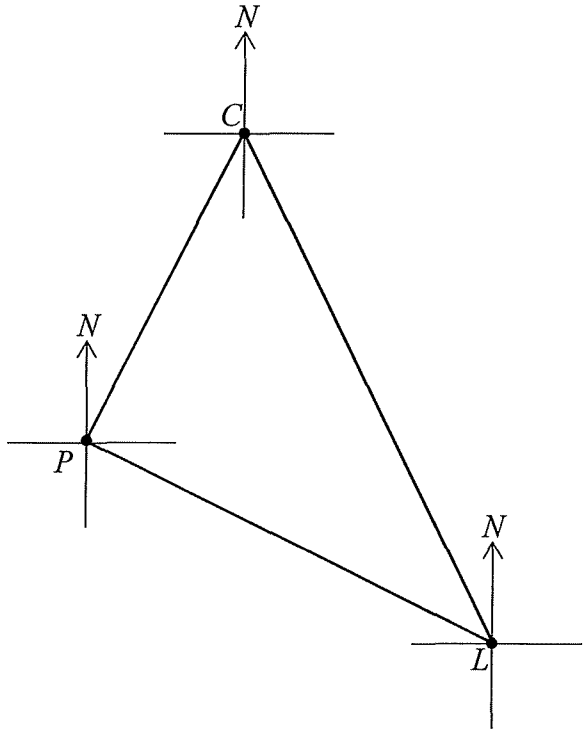
(i) Show that Jack swam approximately 35 metres from A to X. **1**

(ii) Hence find how much further Jack had to swim to get to the boat? **3**
Leave your answer correct to the nearest metre.

Part C Harder Problems — 11 Marks

1. Luke walked 12.5 kilometres on a bearing of 223° from his campsite (C) to a pond (P) to get water. He then changed direction and walked on a bearing of 133° until he got to a lookout (L). The bearing from the lookout back to his campsite was 343°.

   (i) Finish the diagram below by adding the given bearings and distance. **1**



NOT TO SCALE

   (ii) Show that $\angle CPL = 90°$. **1**

   (iii) What is the shortest distance from the lookout to his campsite? **3**

2. Fully simplify:

$$\frac{3}{x-1} - \frac{1}{5x+5} - \frac{4x+3}{x^2-1}$$

3

3. Fully factorise (note: factorise not expand):

3

$$x^4 - (x^2 - 4x + 4)$$

END OF PAPER

Year 9 5-3 Student Solutions.
17/05/18

Non Calculator Section

1) 33°

2) (a) $0.000012\text{m} = 1.2 \times 10^{-5}\text{m}$

(b) $3790000\text{m} = 3.79 \times 10^{6}\text{m}$

3) 5000

4) 140°

5) 12×10^3 | 200000×0.06
$= 1.2 \times 10^4$ OR | $= 12000$
| $= 1.2 \times 10^4$

6) (a) 9m

(b) $\frac{2(x+3y)}{2x} = \frac{x+3y}{x}$ or $\frac{1+3y}{x}$

7) (a) $\frac{8x-3x}{10} = \frac{5x}{10} = \frac{x}{2}$

(b) $\frac{3x}{5} \times \frac{2}{9x}$
$= \frac{6x}{45x} = \frac{2}{15}$

8) (a) $5x^2 - 10xy$
$= 5x(x-2y)$

(b) $4(y-1) + 3x(y-1)$
$(y-1)(4+3x)$

(c) $5m^2 - 20$
$5(m^2-4)$
$5(m-2)(m+2)$

(d) $x^2 - 5x - 24$
$(x-8)(x+3)$

9) (a) $\frac{21x^5}{7x^3} = 3x^2$

(b) 3^{10}

(c) $(3m^3)^3 = 27m^9$

(d) $(8p)^0 - 8p^0$
$1 - 8(1) = -7$

(e) $16^{3/2}$
$= (\sqrt{16})^3$
$= 4^3$
$= 64$

(f) $\frac{2^{n+2} \times 2^n \div 2^{n-1}}{2^{n-1}} = \frac{2^{n+2+n}}{2^{n-1}}$
$= 2^{3n+2-(n-1)}$
$= 2^{2n+3}$

10) $2^{28} = (2^2)^{14} = 4^{14} = 16^7$
$\therefore 15^7 < 16^7$
$\Rightarrow 2^{28}$ is larger.
– OR –
Let $15 = 2^4$ as estimate
$(2^4)^7 = 2^{28}$
But $2^4 > 15$
$\Rightarrow 15^7 < 2^{28}$

11) $1^2 + 1^2 = a^2$
$\sqrt{2} = a$
$(\sqrt{2})^2 + (\sqrt{2})^2 = b^2$
$b = 2$
$2^2 + 2^2 = c^2$
$c = \sqrt{8}$
$(\sqrt{8})^2 + (\sqrt{8})^2 = x^2$
$x = 4$

12) $x = 1.222\ldots$
$10x = 12.222\ldots$
$x = 11/9$

$x = 0.777\ldots$
$10x = 7.777\ldots$
$x = 7/9$

$\therefore \frac{11}{9} - \frac{7}{9} = \frac{4}{9}$.

Calculator

Part A

1(a) $pq + q^2 - p - q$
$q(p+q) - 1(p+q)$
$(q-1)(p+q)$

(b) $2x^2 + 16x - x + 8$ $\quad -16 \wedge 16 \quad -1$

$2x(x+8) - 1(x+8)$

$(2x-1)(x+8)$

(c) $(3a)^2 - (5b)^2$

$(3a-5b)(3a+5b)$

2(a) $\frac{2}{m^5}$

(b) $\frac{y^5}{x^2}$

(c) $\left(\frac{a}{2}\right)^4 = \frac{a^4}{16}$

3(a) $54x$

(b) $(16p^8q^{-4})^{1/4}$

$= 2p^2q^{-1}$

$= \frac{2p^2}{q}$

Part B

1. $\sin 38 = \frac{x}{12}$

$x = 12 \times \sin 38$

$x = 7.4\text{cm}$

2. $\cos\theta = 7/11$

$\theta = \cos^{-1}(7/11)$

$\theta = 50°$

3. $\sin 23 = \frac{x}{20}$

$x = 20 \times \sin 23$

$x = 7.81$

$1.4 + 7.81 = 9.21\text{m}$

4. (i) $\tan 50 = \frac{42}{x}$

$x = \frac{42}{\tan 50}$

$x = 35.24\text{m}$

$x = 35\text{m}$

(ii) $\tan 35 = \frac{42}{y}$

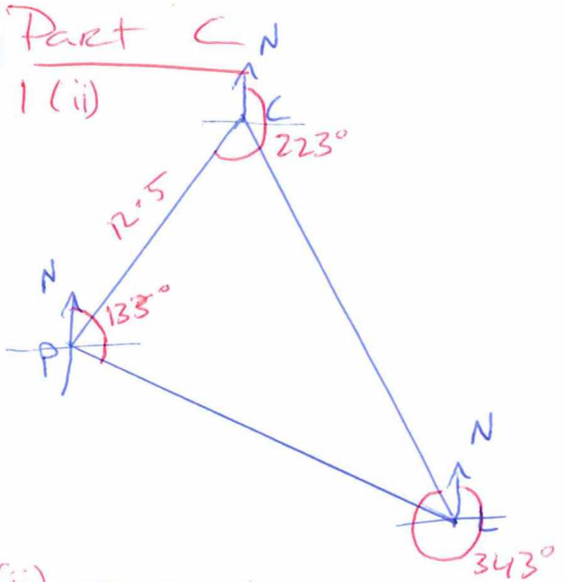
$y = \frac{42}{\tan 35}$

$y = 60\text{m}$

$\therefore 60 - 35 = 25\text{m}$

Part C

1 (ii)



(ii) $\angle PC\,South = 43°$

$\Rightarrow \angle NPC = 43°$ (alt. angles || lines)

$\angle CPL = 133° - 43° = 90°$

(iii) $\angle CL\,North = 17°\ (360° - 343°)$

$\Rightarrow \angle LC\,South = 17°$ (alt angles || lines)

$\therefore \angle PCL = 43° + 17° = 60°$

$\cos 60° = \frac{12.5}{x}$

$x = \frac{12.5}{\cos 60} = 25\text{km}.$

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

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

$= \frac{15x + 15 - x + 1 - 20x - 15}{5(x-1)(x+1)}$

$= \frac{-6x+1}{5(x-1)(x+1)}$

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

$= (x^2 - (x-2))(x^2 + (x-2))$

$= (x^2 - x + 2)(x^2 + x - 2)$

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