Barker College

Student's Name: ……..

Teacher's Initials: ……

GPF	AXD
RJW	LZM
WMD	BHC
JAI	AYG
JWH	HYB*

YEAR 10
5.3 MATHEMATICS
ASSESSMENT TASK 1

Monday 2nd March 2020
Period 1 or Period 4

Total Time: 55 min

250 copies

Surds, Indices & Algebra
Financial Mathematics

INSTRUCTIONS TO STUDENTS:

- **Write ALL answers in the spaces provided.**
- **ALL NECESSARY working for each question must be shown to gain full marks.**
- **Marks may not be awarded for careless or badly arranged working.**
- **Diagrams are NOT NECESSARILY TO SCALE.**
- **Board-approved non-programmable calculators may be used.**

Part A: Financial Mathematics	**/ 12**
Part B: Surds	**/ 12**
Part C: Algebra	**/ 12**
Part D: Indices	**/ 12**
Part E: Working Mathematically	**/ 12**
TOTAL	**/ 60**

Part A: Financial Mathematics (12 Marks)

1. Luke earns a base salary of $1300 per month, plus 3.5% commission on all sales. If he sells $56 000 worth of items in March, what are his total earnings for the month? **2**

2. Darren's business earned him $97 000 last year. He had deductible expenses of $1200 for work equipment and $2300 for the maintenance of his work vehicle.

   i. Calculate Darren's taxable income for the year. **1**

   ii. Calculate the amount of tax Darren must pay, using the tax table provided. **2**

Taxable income	Tax on this income
0 – $18,200	Nil
$18,201 – $37,000	19c for each $1 over $18,200
$37,001 – $90,000	$3,572 plus 32.5c for each $1 over $37,000
$90,001 – $180,000	$20,797 plus 37c for each $1 over $90,000
$180,001 and over	$54,097 plus 45c for each $1 over $180,000

3. Find the simple interest earned on $4000 invested at 4.67% p.a. for 4 years. **1**

4. Boyd paid $600 in interest over 3 years, on a loan of $8500. What was the annual simple rate of interest for his loan, to 2 decimal places? Express your answer as a percentage. **3**

5. Calculate the compound interest earned on an investment of $31 500 over 4 years, at a rate of 6% p.a., compounded annually. **3**

Part B: Surds **(12 Marks)**

1. Simplify fully:

   a) $\sqrt{48}$ **1**

   b) $\sqrt{6} - 2\sqrt{24} + 3\sqrt{96}$ **3**

   c) $\frac{12\sqrt{70}}{18\sqrt{14}}$ **2**

2. Rationalise the denominator and simplify: **1**

   $\frac{10}{\sqrt{2}}$

3.

i. Expand and simplify: **3**

$$\left(5-3\sqrt{2}\right)\left(2\sqrt{10}+3\sqrt{5}\right)$$

ii. Hence, using Part (i) or otherwise, rationalise the denominator and simplify: **2**

$$\frac{2\sqrt{10}+3\sqrt{5}}{5+3\sqrt{2}}$$

Part C: Algebra **(12 Marks)**

1. Simplify fully:

a) $\frac{4}{p}\times\frac{t}{7}$ **1**

b) $\frac{3}{4}-\frac{a}{3}$ **2**

c) $\frac{x+4}{3}-\frac{x-3}{4}$ **2**

2. Expand and simplify:

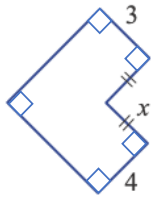
$$-3e(1-5e)-6e$$ **2**

3. Factorise:

a) $-6mn-18mn^2$ **2**

b) $3y(5y-4)-4(5y-4)$ **1**

4. Write an algebraic expression for the perimeter of this shape: **2**



Part D: Indices **(12 Marks)**

1. Write in simplest index form, with positive indices only:

a) $4m^6n^7 \times 3mn^2$ **2**

b) $\frac{3x^4y^2}{9x^0y}$ **2**

c) $(a^2)^{\frac{1}{6}}$ **1**

d) $\frac{r^{-3}s^{-4}}{r^3}$ **2**

e) $\sqrt[3]{125t^{12}}$ **2**

2. If $m = 2$, determine the value of: **3**

$$\frac{6a^{3m} \times 2b^{2m} \times (3ab)^{-m}}{(4b)^{m} \times (9a^{4m})^{\frac{1}{2}}}$$

Part E: Working Mathematically **(12 Marks)**

1. Find the length of the diagonal for a square with area $15cm^2$, leaving your answer in surd form. **3**

2. Harj's parents would like to set up a trust fund for him as a birthday gift. In 18 years' time, they would like him to have $250 000. If their chosen investment earns 5% p.a., compounded quarterly, how much do they need to invest now? **3**

3. The simplified version of: **3**

$$\left(1+\frac{\frac{1}{x}}{1+\frac{1}{x}}\right)\left(1+\frac{\frac{1}{x}}{1-\frac{1}{x}}\right) \quad \text{is} \quad \frac{x(x+\square)}{(x+1)(x-1)}$$

Find the number that goes into the box, showing all working.

4. Determine the value of: **3**

$$\frac{7^{2x+1}-7^{2x-1}-48}{36\times 7^{2x}-252}$$

End of Paper

Year 10 5·3 Assessment 1 (2020)

Part A

1) $1300 + 0.035 \times 56000$
$= \$3260$

2) i) \$93 500

ii) $Tax = 20797 + 0.37(93500 - 90000)$
$= \$22092$

3) $I = 4000 \times 0.0467 \times 4$
$= \$747.20$

4) $600 = 8500 \times r \times 3$
$r = \frac{600}{8500 \times 3}$
$r = 0.0235\ldots$
$r = 2.35\%$

5) $A = 31500(1+0.06)^4$
$= 39768.02$
$I = \$8268.02$

Part B

1) a) $4\sqrt{3}$

b) $\sqrt{6} - 4\sqrt{6} + 12\sqrt{6}$
$= 9\sqrt{6}$

c) $\frac{2\sqrt{5}}{3}$

2) $\frac{10}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}}$
$= 5\sqrt{2}$

3) i) $10\sqrt{10} + 15\sqrt{5} - 6\sqrt{20} - 9\sqrt{10}$
$= \sqrt{10} + 3\sqrt{5}$

ii) $\frac{(2\sqrt{10} + 3\sqrt{5})}{(5+3\sqrt{2})} \times \frac{(5-3\sqrt{2})}{(5-3\sqrt{2})}$
$= \frac{\sqrt{10} + 3\sqrt{5}}{7}$

Part C

1a) $\frac{4t}{7p}$

b) $\frac{9-4a}{12}$

c) $\frac{4(x+4) - 3(x-3)}{12}$
$= \frac{x+25}{12}$

2) $-3e + 15e^2 - 6e$
$-9e + 15e^2$

3a) $-6mn(1+3n)$

b) $(5y-4)(3y-4)$

4) $P = 4x + 14$

Part D

1) a) $12m^7n^9$

b) $\frac{x^4y}{3}$

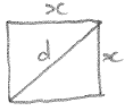
c) $a^{\frac{1}{3}}$

d) $\frac{1}{r^6 s^4}$

e) $5t^4$

2) $\frac{6a^6 2b^4 (3a6)^{-2}}{(4b)^2 (9a^8)^{\frac{1}{2}}}$
$= \frac{12a^6b^4}{432a^6b^4}$
$= \frac{12}{432}$
$= \frac{1}{36}$

Part E

1) 

$A = 15$
$\therefore x = \sqrt{15}$
$d^2 = (\sqrt{15})^2 + (\sqrt{15})^2$
$d = \sqrt{30}$

2) $250000 = x\left(1 + \frac{0.05}{4}\right)^{72}$
$x = \frac{250000}{\left(1 + \frac{0.05}{4}\right)^{72}}$
$x = \$102211.02$

3) $\left(1 + \frac{\frac{1}{x}}{1+\frac{1}{x}}\right)\left(1 + \frac{\frac{1}{x}}{1-\frac{1}{x}}\right)$
$\left(1 + \frac{1}{x} \times \frac{x}{x+1}\right)\left(1 + \frac{1}{x} \times \frac{x}{x-1}\right)$
$\left(\frac{x+1+1}{x+1}\right)\left(\frac{x-1+1}{x-1}\right)$
$\frac{x(x+2)}{(x+1)(x-1)}$
$\square = 2$ (as required)

4) $\frac{7^{2x+1} - 7^{2x-1} - 48}{36 \times 7^{2x} - 252}$
$= \frac{7^2 7^{2x-1} - 49 - 7^{2x-1} + 1}{36 \times 7 \times 7^{2x-1} - 36 \times 7}$
$= \frac{49(7^{2x-1} - 1) - 1(7^{2x-1} - 1)}{36 \times 7(7^{2x-1} - 1)}$
$= \frac{(49-1)(7^{2x-1} - 1)}{252(7^{2x-1} - 1)}$
$= \frac{48}{252}$
$= \frac{4}{21}$