Barker College

Student's Name: ……..

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DXC LMD
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YEAR 10
5.3 MATHEMATICS
ASSESSMENT TASK 1

Tuesday 9th March 2021
Period 1 or Period 2

Total Time: 55 min

Surds, Indices & Algebra
Interest & Depreciation

250 copies

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: Surds	**/ 17**
Part B: Indices & Algebra	**/ 22**
Part C: Interest & Depreciation	**/ 13**
Part D: Working Mathematically	**/ 8**
TOTAL	**/ 60**

Part A: Surds (17 Marks)

Question 1
Circle the irrational numbers below. **1**

$\frac{\pi}{2}$, $\sqrt{11}$, $0.1\dot{2}$, $-2\sqrt{81}$, $2\frac{3}{4}$

Question 2
Simplify fully:

(a) $\sqrt{72}$ **1**

(b) $-3\sqrt{63}+2\sqrt{28}$ **2**

(c) $10\sqrt{45}\div\sqrt{60}$ **2**

Question 3
Solve for n

$\sqrt{n}=4\sqrt{5}-\sqrt{5}$ **2**

Question 4
Expand and simplify, where necessary

(a) $3\sqrt{5}(2\sqrt{3}-3\sqrt{2})$ **2**

(b) $(5\sqrt{3}-2\sqrt{2})(4\sqrt{3}-3\sqrt{2})$ **3**

Question 5

Rationalise the denominator and simplify.

(a) $\frac{5}{4\sqrt{3}}$ **1**

(b) $\frac{\sqrt{3}-\sqrt{7}}{3\sqrt{6}-\sqrt{7}}$ **3**

Part B: Indices & Algebra **(22 Marks)**

Question 6

Simplify fully:

(a) $\frac{5}{xy} \times \frac{y}{15}$ **2**

(b) $\frac{2}{x-1} - \frac{1}{x-2}$ **3**

Question 7

Expand and simplify

$2pq(3p^2 - 4pq^5) - (-4p^2q^6)$ **2**

Question 8

Fully factorise

$-4a^2bc^5 - 2ab^4c^7$ **2**

Question 9
Write in simplest index form, without negative indices

(a) $3x^{-3}$ **1**

(b) $\left(\frac{2x}{y}\right)^{-2}$ **2**

(c) $2x^{-3} \times -5x^{-3}y$ **2**

(d) $\frac{(5xy)^0 \times 4x^5y^{-2}}{12x^{11}y^{-2}}$ **3**

Question 10
Simplify fully.
Leave you answer in index form.

(a) $(p^2q^4)^{\frac{3}{2}}$ **2**

(b) $\sqrt[3]{(8p^6q^3)^2}$ **3**

Part C: Interest & Depreciation **(13 Marks)**

Question 11
Find the simple interest earned if \$10 700 is invested for 5 years at 4% p.a. **1**

Question 12
Shay opened a savings account and deposited \$7 650. The account earns 4% p.a. compound interest, compounded half yearly.

(i) What is the balance in the account after 10 years? **2**

(ii) Calculate the interest earned. **1**

Question 13
A car now worth \$15 600 has been depreciating at a rate of r% p.a. for the last 3 years. If the car was originally purchased for \$18 544, find the value of r to one decimal place. **3**

Question 14

Connor purchases a bathroom unit valued at $9 990. He pays a deposit of $999 and repays the balance in 24 monthly instalments. Interest on the balance is charged at a flat rate of 6% p.a.
Calculate:

(i) The balance owing **1**

(ii) The interest charged **2**

(iii) The total amount to repay **1**

(iv) The amount of each instalment **1**

(v) The total price paid for the bathroom unit **1**

Part D: Working Mathematically **(8 Marks)**

Question 15

Fully Simplify **3**

$$\frac{\sqrt{4x^7}-32\sqrt{x^3}}{\sqrt{x}}$$

Question 16

Evaluate **3**

$$\frac{1}{\sqrt{1}+\sqrt{2}}+\frac{1}{\sqrt{2}+\sqrt{3}}+\ldots.+\frac{1}{\sqrt{99}+\sqrt{100}}$$

Question 17 **2**

If $y = 2$ and

$$\sqrt{x + \sqrt{y + \sqrt{x + \sqrt{y + \ldots}}}} = 7$$

Solve for x.

End of Paper

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① $\frac{\pi}{2}$, $\sqrt{11}$

② a) $\sqrt{72} = 6\sqrt{2}$

b) $-3\sqrt{63} + 2\sqrt{28} = -9\sqrt{7} + 4\sqrt{7} = -5\sqrt{7}$

c) $10\sqrt{45} \div \sqrt{60}$

$= \frac{10\sqrt{45}}{\sqrt{60}}$

$= \frac{10\sqrt{3}}{\sqrt{4}}$

$= 5\sqrt{3}$

③ $\sqrt{n} = 4\sqrt{5} - \sqrt{5}$

$\sqrt{n} = 3\sqrt{5}$

$n = 9 \times 5$

$n = 45$

④ a) $3\sqrt{5}(2\sqrt{3} - 3\sqrt{2})$

$= 6\sqrt{15} - 9\sqrt{10}$

b) $(5\sqrt{3} - 2\sqrt{2})(4\sqrt{3} - 3\sqrt{2})$

$= 20 \times 3 - 15\sqrt{6} - 8\sqrt{6} + 6 \times 2$

$= 72 - 23\sqrt{6}$

⑤ a) $\frac{5}{4\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$

$= \frac{5\sqrt{3}}{12}$

⑤ b) $\frac{(\sqrt{3} - \sqrt{7})}{(3\sqrt{6} - \sqrt{7})} \times \frac{(3\sqrt{6} + \sqrt{7})}{(3\sqrt{6} + \sqrt{7})}$

$= \frac{3\sqrt{81} + \sqrt{21} - 3\sqrt{42} - 7}{9 \times 6 - 7}$

$= \frac{9\sqrt{2} + \sqrt{21} - 3\sqrt{42} - 7}{47}$

⑥ a) $\frac{1}{3x}$

b) $\frac{2}{(x-1)(x-2)} \times (x-2) - \frac{1}{(x-2)(x-1)} \times (x-1)$

$= \frac{2(x-2)}{(x-1)(x-2)} - \frac{1(x-1)}{(x-1)(x-2)}$

$= \frac{2(x-2) - (x-1)}{(x-1)(x-2)}$

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

$= \frac{x - 3}{x^2 - 3x + 2}$

⑦ $2pq(3p^2 - 4pq^5) - (-4p^2q^6)$

$= 6p^3q - 8p^2q^6 + 4p^2q^6$

$= 6p^3q - 4p^2q^6$

⑧ $-4a^2bc^5 - 2ab^4c^7$

$= -2abc^5(2a + b^3c^2)$

⑨ a) $\frac{3}{x^3}$

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

$= \frac{y^2}{4x^2}$

⑨ c) $-10x^{-6}y$

$= \frac{-10y}{x^6}$

d) $\frac{(5xy)^0 \times 4x^5y^{-2}}{3^{12}x^{16}y^{-2}}$

$= \frac{1 \times 1}{3x^6}$

$= \frac{1}{3x^6}$

⑩ a) p^3q^6

b) $(8p^6q^3)^{\frac{2}{3}}$

$= 4p^4q^2$

⑪ $I = Prn$

$= 10700 \times 0.04 \times 5$

$= \$2140$

⑫ (i) $A = 7650\left(1 + \frac{0.04}{2}\right)^{10 \times 2}$

$= \$11367.50$

(ii) $11367.50 - 7650$

$= \$3717.50$

⑬ $15600 = 18544(1 - r)^3$

$\frac{15600}{18544} = (1 - r)^3$

$\sqrt[3]{\frac{15600}{18544}} = 1 - r$

$-0.0559 = -r$

$r = 5.6\%$

⑭ (i) $9990 - 999$

$= \$8991$

(ii) $I = 8991 \times 0.06 \times 2$

$= \$1078.92$

(iii) $8991 + 1078.92$

$= \$10069.92$

(iv) $10069.92 \div 24$

$= \$419.58$

(v) $10069.92 + 999$

$= \$11068.92$

⑮ $\frac{2x^{\frac{7}{2}} - 32x^{\frac{3}{2}}}{x^{\frac{1}{2}}}$

$= \frac{x^{\frac{1}{2}}(2x^3 - 32x)}{x^{\frac{1}{2}}}$

$= 2x^3 - 32x$

⑯ Rationalising each denominator

$= \frac{\sqrt{1} - \sqrt{2}}{-1} + \frac{\sqrt{2} - \sqrt{3}}{-1} + \ldots + \frac{\sqrt{99} - \sqrt{100}}{-1}$

$= -\sqrt{1} + \sqrt{2} - \sqrt{2} + \sqrt{3} - \ldots - \sqrt{99} + \sqrt{100}$

$= -\sqrt{1} + \sqrt{100}$

$= -1 + 10$

$= 9$

⑰ $\sqrt{x + \sqrt{2 + \sqrt{x + \sqrt{2 + \ldots}}}} = 7$

$x + \sqrt{2 + \sqrt{x + \sqrt{2 + \ldots}}} = 49$

$x + \sqrt{2 + 7} = 49$

$x + \sqrt{9} = 49$

$x = 46$