Student's Name: .....

Teacher's Initials: .....

Barker College

- BHC*
- AYG
- RAS
- VAB
- KJL
- PDJ
- JWH
- ARP
- JZT
- WMD
- DXC

Year 10

5.3 Mathematics

Assessment Task 1

THURSDAY 7th MARCH 2019

PERIODS 3AB, 5

TIME: 50 MINUTES

Surds and Indices
Interest and Depreciation

250 copies

INSTRUCTIONS TO STUDENTS:

* **Write ALL answers in the spaces provided.**
* **A formula sheet is provided on page 2 for use throughout the examination. Detach this sheet.**
* **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 TO SCALE**
* **Board-approved, non-programmable calculators may be used.**

TOTAL MARKS: 56

YEAR 10 – REFERENCE SHEET

Simple Interest

$I = Prn$

P is initial amount

r is interest rate per period, expressed as a decimal

n is number of periods

Compound Interest

$A = P(1 + r)^n$

A is final amount

P is initial amount

r is interest rate per period, expressed as a decimal

n is number of compounding periods

Depreciation

$A = P(1 - r)^n$

A is final value of asset after n periods

P is initial value of asset

r is interest rate per period, expressed as a decimal

Gradient-intercept form of a line

$y = mx + b$

m is gradient

b is y-intercept

Slope (gradient) of a line

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

Distance between two points

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

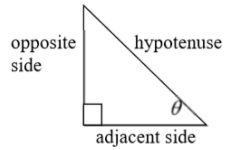
Point-gradient of the equation of a line

$y - y_1 = m(x - x_1)$

Solution of a quadratic equation

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Trigonometric Ratios



$$\sin\theta = \frac{\text{opposite side}}{\text{hypotenuse}}$$

$$\cos\theta = \frac{\text{adjacent side}}{\text{hypotenuse}}$$

$$\tan\theta = \frac{\text{opposite side}}{\text{adjacent side}}$$

Sine rule

In $\triangle ABC$,

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

Area of a triangle

In $\triangle ABC$,

$$A = \frac{1}{2}ab\sin C$$

Cosine Rule

In $\triangle ABC$,

$$c^2 = a^2 + b^2 - 2ab\cos C$$

or

$$\cos C = \frac{a^2 + b^2 - c^2}{2ab}$$

Circumference of a circle

$C = 2\pi r$ or $C = \pi D$

r is radius

D is diameter

Student's Name: .....

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Question 1 (12 marks)

Simplify fully:

(a) $2\sqrt{3} + \sqrt{9} - 5\sqrt{3}$ **2**

(b) $\sqrt{50}$ **1**

(c) $2\sqrt{3} \times \sqrt{9} \times \left(-5\sqrt{3}\right)$ **2**

(d) $\sqrt{20} + \sqrt{12} - \sqrt{45}$ **3**

(e) $\left(5\sqrt{6}\right)^2$ **2**

(f) $\left(2m^2n^3\right)^4$ **2**

Question 2 (5 marks)

Write in **simplest index form** with positive indices.

(a) $\dfrac{a^2b^{-1}}{b^{-2}}$ **1**

(b) $\left(\sqrt{5}\right)^6$ **1**

(c) $\left(5^3 \times 5^{-2} \times 5^o\right)^2$ **1**

(d) $\sqrt{m^3}$ **1**

(e) $\sqrt{\dfrac{a^4}{k}}$ **1**

Question 3 (2 marks)

Write with positive indices.

(a) $4m^{-2}$ **1**

(b) $\left(4m\right)^{-2}$ **1**

Question 4 (3 marks)

(i) Calculate the simple interest earned on a deposit of $2000 in an account earning 6% p.a. for 4 years. **1**

(ii) Will more interest be earned if interest is paid twice each year (namely, every 6 months)? Justify your answer. **2**

Question 5 (1 mark)

How much money will be in the bank after 6 years if $3000 is invested at 5% p.a. compounded annually? **1**

Question 6 (3 marks)

Find the interest earned on $100 000 if it is invested at 12% p.a. for 5 years and compounded quarterly. **3**

Question 7 (8 marks)

Fully simplify each expression and express with a rational denominator.

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

(b) $\frac{\sqrt{7}}{2\sqrt{7}+3}$ **2**

(c) $\frac{5}{\sqrt{3}}+\frac{3}{2\sqrt{5}}$ **2**

(d) $\frac{5}{\left(\sqrt{7}-1\right)^2}$ **3**

Question 8 (2 marks)

Find k if $\sqrt{80}-\sqrt{20}=\sqrt{k}$ **2**

Question 9 (6 marks)

Write in simplest index form. No brackets are allowed in your answer.

(a) $\sqrt[3]{10}$ **1**

(b) $\frac{g^2}{m^2}$ **1**

(c) $\sqrt[3]{5m^4}$ **2**

(d) $\sqrt{\left(3\times10^8\right)}$ **2**

Question 10 (2 marks)

Jess has an asset which has been depreciating by 15% p.a. for the last 3 years. If the asset is currently valued at $1000, what was the asset worth 3 years ago? **2**

Question 11 (5 marks)

Austin wants to buy a new car which costs $65 000. He pays a deposit of 20% and borrows the remainder of the amount owing from a bank which charges 10% simple interest p.a.. He agrees to repay the loan plus interest over 3 years.

(i) Calculate the deposit Austin paid. **1**

(ii) Calculate the balance owing. **1**

(iii) Calculate the interest charged on the loan (the amount borrowed from the bank). **1**

(iv) If the loan plus interest is to be repaid in equal monthly repayments, what is the amount of each repayment? **2**

Question 12 (2 marks)

The two short sides of a right-angled triangle are $2\sqrt{3}$ and $3\sqrt{5}$ units long, respectively. What is the length of the hypotenuse, in surd form? **2**

Question 13 (3 marks)

If $12^8 \times 24^6 = 2^a \times 3^b$ what are the values of a and b? **3**

Question 14 (2 marks)

Solve for n:

$$\sqrt{10^{20}} + \sqrt{10^{18}} + \sqrt{10^{16}} + \ldots + \sqrt{10^2} = \left(\frac{1}{9}\right) \times 10^n - \frac{10}{9}$$ **2**

End of Paper

YEAR 10 5.3 MATHEMATICS
ASSESSMENT TASK 1

Question 1

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

(b) $\sqrt{25 \times 2} = 5\sqrt{2}$

(c) $2\sqrt{3} \times 3 \times (-5\sqrt{3}) =$
$6\sqrt{3} \times (-5\sqrt{3}) =$
$-30\sqrt{9} =$
-90

(d) $\sqrt{4 \times 5} + \sqrt{4 \times 3} - \sqrt{9 \times 5} =$
$2\sqrt{5} + 2\sqrt{3} - 3\sqrt{5} =$
$2\sqrt{3} - \sqrt{5}$

(e) $(5\sqrt{6})^2 = 25\sqrt{36}$
$= 25 \times 6$
$= 150$

(f) $2^4 m^8 n^{12} =$
$16 m^8 n^{12}$

Question 2

(a) $a^2 b^{(-1)-(-2)} = a^2 b$

(b) $(5^{\frac{1}{2}})^6 = 5^3$

(c) $5^6 \times 5^{-4} \times 5^0) = 5^2$

(d) $(m^3)^{\frac{1}{2}} = m^{\frac{3}{2}}$

(e) $\frac{\sqrt{a^4}}{\sqrt{k}} = \frac{a^2}{k^{\frac{1}{2}}}$

Question 3

(a) $4\left(\frac{1}{m^2}\right) = \frac{4}{m^2}$

(b) $\frac{1}{(4m)^2} = \frac{1}{16m^2}$

Question 4

(i) $I = \$2000 \times 0.06 \times 4$
$I = \$480$

(ii) $I = \$2000 \times 0.03 \times 8$
$I = \$480$

Interest earned remains the same

Question 5

$A = \$3000(1 + 0.05)^6$
$A = \$4020.29$

Question 6

$r = 12\%$ p.a
$= 3\%$ per quarter
$n = 5$ years
$= 5 \times 4$ quarters
$A = \$100000(1 + 0.03)^{20}$
$A = \$180611.12$
Interest earned = $\$180611.12$
$\$100000$
$\$80611.12$

Question 7

(a) $\frac{6}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} = \frac{6\sqrt{2}}{2} = 3\sqrt{2}$

(b) $\frac{\sqrt{7}}{2\sqrt{7}+3} \times \frac{2\sqrt{7}-3}{2\sqrt{7}-3} = \frac{14-3\sqrt{7}}{19}$

(c) $\frac{5}{\sqrt{3}} + \frac{3}{2\sqrt{5}} = \frac{5\sqrt{3}}{3} + \frac{3\sqrt{5}}{10}$

$= \frac{50\sqrt{3}}{30} + \frac{9\sqrt{5}}{30}$

$= \frac{50\sqrt{3}+9\sqrt{5}}{30}$

(d) $\frac{5}{(\sqrt{7}-1)^2} = \frac{5}{8-2\sqrt{7}} \times \frac{8+2\sqrt{7}}{8+2\sqrt{7}}$

$= \frac{40+10\sqrt{7}}{36}$

$= \frac{\cancel{2}(20+5\sqrt{7})}{\cancel{2}(18)}$

$= \frac{20+5\sqrt{7}}{18}$

Question 8

$\sqrt{80} - \sqrt{20} = \sqrt{K}$

$\sqrt{16\times5} - \sqrt{4\times5} = \sqrt{K}$

$4\sqrt{5} - 2\sqrt{5} = \sqrt{K}$

$2\sqrt{5} = \sqrt{K}$

$\sqrt{4\times5} = \sqrt{K}$

$\sqrt{20} = \sqrt{K}$

$K = 20$

Question 9

(a) $10^{\frac{1}{3}}$ (b) $9^2 m^{-2}$

(c) $5^{\frac{1}{2}} m^{\frac{4}{3}}$ (d) $\frac{\sqrt{3}\times10^4}{3^{\frac{1}{2}}\times10^4}$ or

Question 10

$\$1000 = P(1-0.15)^3$

$\frac{\$1000}{(1-0.15)^3} = P$

$\$1628.33 = P$

Asset was worth $1628.33

Question 11

(i) $\$65000 \times 0.2 = \$13000$

(ii) $\$65000 - \$13000 = \$52000$

(iii) $I = \$52000 \times 0.1 \times 3$

$I = \$15600$

(iv) Total to be repaid = $\$52000 + \$15600 = \$67600$

Each repayment = $\frac{\$67600}{36 \text{ months}} = \$1877.78$

Question 12

$c^2 = (2\sqrt{3})^2 + (3\sqrt{5})^2$

$c = \sqrt{57}$

Question 13

$(2^2\times3)^8 \times (2^3\times3)^6 = 2^a \times 3^b$

$2^{16}\times3^8 \times 2^{18}\times3^6 = 2^a\times3^b$

$2^{16}\times2^{18}\times3^8\times3^6 = 2^a\times3^b$

$2^{34}\times3^{14} = 2^a\times3^b$

so $a = 34$, $b = 14$

Question 14

$10^{10}+10^9+10^8+\cdots10^1 = \left(\frac{1}{9}\right)\times10^n - \frac{10}{9}$

$1111111110 = 0.\dot{1}\times10^n - 1.\dot{1}$

$n = 11$