

Student's Name:

Teacher's Initials:

YEAR 10

VAB*	ARP
BHC	JYR
LMD	RAS
WMD	JZT
JWH	RJW

5.3 MATHEMATICS ASSESSMENT TASK 1

260 copies

Surds and Indices,
Interest and
Depreciation

Thursday 8 March 2018

Period 4 or 6

Total Time: 50 min

INSTRUCTIONS TO STUDENTS:

- Write 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.
- REFERENCE SHEET: There is a reference sheet on the other side of this cover page.
You should detach this page for easy reference.

This assessment task consists of TWO Sections.

Section 1: NON-CALCULATOR (15 minutes)

- This section will be collected at the end of 15 minutes.

18 marks

Section 2: CALCULATOR (35 minutes)

- Board-approved non-programmable calculators may be used.

36 marks

Section 1: Non-calculator	/18
Section 2: Calculator	
Interest & Depreciation	/14
Surds & Indices	/22
TOTAL	/54

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

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

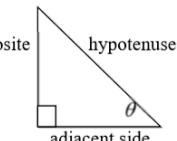
Point-gradient of the equation of a line

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

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

$$C = 2\pi r \text{ or } C = \pi D$$

r is radius

D is diameter

Section 1: NON-CALCULATOR (18 marks)

Student's Name:

- Calculators may NOT be used in this section. Teacher's Initials:
- This section will be collected after 15 minutes.

Questions 1-14 (1 mark each)**Questions 15, 16 (2 marks each)**

1. Write 0.75% as a decimal.

2. Circle the irrational numbers in this list:

0.1̇, $\sqrt{7}$, $3\sqrt{49}$, π , -13

3. Simplify $12\sqrt{5} - 4 - \sqrt{5} + 7$

4. Between which two consecutive integers (whole numbers) does $\sqrt{55}$ lie?5. Express $4\sqrt{5}$ as an entire surd, ie in the form \sqrt{x} Questions 6 and 7
Write in simplest form without using indices:

6. $5x^{-1}$

7. $(36x)^{\frac{1}{2}}$

Questions 8 to 10
Simplify, answering in simplest index form:

8. $8x^3 \div 2x$

9. $x^4 + x^4$

10. $3^5 \times 3^7$

11. John borrows some money for a whole number of months and is charged simple interest. Paul borrows twice the amount, for twice the number of months, at twice the simple interest rate.

How much more is Paul's interest compared to John's? Choose the correct answer.

- (A) Twice as much
 (B) Four times as much
 (C) Six times as much
 (D) Eight times as much

NON-CALCULATOR SECTION (continued)

Marks

Questions 12 to 14: Evaluate:

12. $5x^0 + 5$ 1

13. $\left(\frac{6}{5}\right)^{-1}$ 1

14. $(16)^{\frac{3}{2}}$ 1

15. Simplify fully 2

$$\frac{25m^2n^2}{12m^7} \times \frac{2}{5n}$$

16. Find a if $\sqrt{99} + \sqrt{44} = \sqrt{a}$

Marks
2

Section 2: CALCULATOR (36 marks)

Student's Name:

- Show all necessary working.

Teacher's Initials:

- This section will be collected after 35 minutes.

Interest & Depreciation, Questions 17 to 21 (14 marks)

Marks

Question 17

Term rates—Interest paid at maturity—Interest rates p.a.						
	3-<6 months	6-<8 months	8-<10 months	10-<12 months	12-<24 months	24 months
\$500-\$4999	4.10%	4.10%	4.15%	4.20%	4.25%	4.35%
\$5000-\$9999	4.60%	4.60%	4.65%	4.70%	4.75%	4.85%
\$10 000-\$19 999	4.60%	4.65%	4.70%	4.75%	4.85%	4.92%
\$20 000-\$49 999	4.65%	4.70%	4.75%	4.80%	4.87%	4.95%

The table shows a bank's interest rates for term deposits.

- (a) If Madi wants an interest rate of at least 4.75% p.a., what is the smallest number of months she must invest for?

1

- (b) If Oliver wants to earn 4.95% p.a. interest what is the smallest amount he must invest?

1

Question 18

- (i) Susan invested \$7320 at 2% p.a. interest, compounded annually.

Find the value of her investment after 5 years.

2

- (ii) How much interest did she earn?

1

Marks

Question 19

When Ian borrowed \$4800 at a 2.3% p.a. rate of simple interest he was charged \$102 interest.

Find how long he invested the money for, answering to the nearest month.

3

Marks

Question 21

Ewan's car cost \$29 400 when new, and it depreciated in value each year by 13%.

- (i) Find its value at the end of 4 years to the nearest dollar.

2

- (ii) By how much does its value drop during the 5th year?

(Answer to the nearest dollar.)

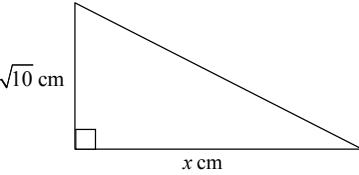
1

Question 20

Alex invested \$550 at 8% p.a. compound interest, with interest being compounded every half year. Calculate how much was in the account after

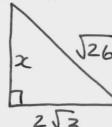
$3\frac{1}{2}$ years.

3

Surds & Indices Questions 22 to 27 (22 marks)			Marks
Marks	Marks	Marks	Marks
Question 22 Simplify fully: (a) $6\sqrt{20} + \sqrt{45}$	3	Question 24 Rationalise the denominator of each fraction, and simplify fully: (a) $\frac{9}{4\sqrt{3}}$	2
(b) $\frac{6\sqrt{50}}{10\sqrt{5}}$	2	(b) $\frac{6}{5-\sqrt{3}}$	3
Question 23 Expand and simplify where possible: (a) $6\sqrt{3}(2+\sqrt{5})$	2	Question 25 Given $a = \sqrt{2}$, $b = 6$ and $c = 2\sqrt{2}$ evaluate \sqrt{abc} , answering in simplest surd form.	2
(b) $(2\sqrt{7}+5)(2\sqrt{7}-1)$	3	Question 26 A right-angled triangle has hypotenuse length $\sqrt{26}$ cm and one other side length $2\sqrt{3}$ cm. Find the length of the third side in surd form.	2
		Question 27 This right-angled triangle has area $(\sqrt{10} + 5)$ cm ² and one side has length $\sqrt{10}$ cm as shown. Find the length of the side labelled x cm in simplest surd form.	3
			

<u>NON-CALCULATOR</u>	
1. 0.0075	
2. $\sqrt{7}$, π	
3. $11\sqrt{5} + 3$	
4. $7^2 = 49$, $8^2 = 64$ $\therefore 7 \neq 8$	
5. $4\sqrt{5} = \sqrt{16} \times \sqrt{5} = \sqrt{80}$	
6. $\frac{5}{x}$	
7. $(36x)^{1/2} = \sqrt{36x} = 6\sqrt{x}$	
8. $4x^2$	
9. $2x^4$	
10. 3^{12}	
11. $I = Prn$ vs. $I = 2P \times 2r \times 2n$ $= 8Prn$ $\therefore 8 \text{ TIMES } \textcircled{D}$	
> IGNORE THIS SPACE <	
12. $5x^0 + 5 = 5 \times 1 + 5$ $= 10$	
13. $\left(\frac{6}{5}\right)^{-1} = \frac{1}{(6/5)} = \frac{5}{6}$	
14. $16^{3/2} = \sqrt{16^3}$ $= 4^3$ $= 64$	
15. $\frac{2m^2n^2}{12m^7} \times \frac{2}{5n} = \frac{50m^2n^2}{60m^7n}$ $= \frac{5n}{6m^5}$	

16.	$\sqrt{99} + \sqrt{44} = \sqrt{9}$ $= 3\sqrt{11} + 2\sqrt{11}$ $= 5\sqrt{11}$ $= \sqrt{25} \times \sqrt{11}$ $= \sqrt{275} \quad \therefore a = 275$
	<u>CALCULATOR</u>
17a.	8 MONTHS ... FROM TABLE
b.	\$20 000 ... " "
18i.	$A = \$7320 (1.02)^5$ $= \$8081.87$
ii.	$\$8081.87 - \7320 $= \$761.87$
19.	$I = Prn$ $102 = 4800 \times 0.023 \times n$ $n = \frac{102}{4800 \times 0.023}$ $= 0.923\dots$
	$0.923 \times 12 = 11 \text{ MONTHS}$
20.	$r = 8\% \text{ pa} \div 2 = 4\%$ $n = 3.5 \times 2 = 7$... CHANGE RATE & PERIOD $A = 550 (1.04)^7$ $= \$723.76$

21i.	$A = 29400 (0.87)^4$ $= \$16843 \text{ (TO NEAREST \$)}$
ii.	DROPS BY 13% EACH YR. $\therefore 0.13 \times \$16843$ $= \$2189.59$ $= \$2190$ (OR \$2189 IF ROUNDED)
22a.	$6\sqrt{20} + \sqrt{45}$ $= 6 \times 2\sqrt{5} + 3\sqrt{5}$ $= 12\sqrt{5} + 3\sqrt{5}$ $= 15\sqrt{5}$
b.	$\frac{6\sqrt{50}}{10\sqrt{5}} = \frac{3\sqrt{10}}{5} \text{ OR } \frac{3\sqrt{2}}{\sqrt{5}}$
23a.	$6\sqrt{3}(2 + \sqrt{5}) = 12\sqrt{3} + 6\sqrt{15}$
b.	$(2\sqrt{7} + 5)(2\sqrt{7} - 1)$ $= 4\sqrt{49} - 2\sqrt{7} + 10\sqrt{7} - 5$ $= 28 - 5 - 8\sqrt{7}$ $= 23 - 8\sqrt{7}$
24a.	$\frac{9}{4\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{9\sqrt{3}}{12} = \frac{3\sqrt{3}}{4}$
b.	$\frac{6}{5-\sqrt{3}} \times \frac{5+\sqrt{3}}{5+\sqrt{3}} = \frac{6(5+\sqrt{3})}{25-3}$ $= \frac{30+6\sqrt{3}}{22}$ $= \frac{15+3\sqrt{3}}{11}$
25.	$\sqrt{\sqrt{2} \times 6 \times 2\sqrt{2}} = \sqrt{24}$ $= 2\sqrt{6}$
26.	
	PYTHAG: $(\sqrt{26})^2 = x^2 + (2\sqrt{3})^2$ $26 = x^2 + 12$ $14 = x^2$ $\therefore x = \sqrt{14}$
27.	$A = \frac{1}{2} \times b \times h$ $\sqrt{10} + 5 = \frac{1}{2} \times x \times \sqrt{10}$ $\sqrt{10} + 5 = \frac{x\sqrt{10}}{2}$ $2\sqrt{10} + 10 = x\sqrt{10}$ $\frac{2\sqrt{10} + 10}{\sqrt{10}} = x$ $\frac{2\sqrt{10} + 10}{\sqrt{10}} \times \frac{\sqrt{10}}{\sqrt{10}} = x$ $\frac{20 + 10\sqrt{10}}{10} = x$ $2 + \sqrt{10} = x$