UNIVERSITY WORK.

MATHEMATICS.

ARCHIBALD MACMURCHY, M.A., TORONTO, EDITOR.

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Junior Matriculation.

TRIGONOMETRY—HONORS.

Examiner—A. K. Blackadar, B.A.

1. Explain what is meant by the *Common* and the *Napierian* logarithm of any number.

Write down the characteristics of the common logarithm of 6, 5320, and .0042, and prove that your results are correct.

$$\left.\begin{array}{l}\text{If } y=e^{\frac{1}{1-\log_e x}}\\ \text{and } z=e^{\frac{1}{1-\log_e y}}\end{array}\right\}$$

prove that $x=e^{\frac{1}{1-\log_e z}}$.

2. Perform the following operations by means of logarithms:

(1) What per cent. of \$119,048 is \$300?

(2) $\cos A=\sin 148^\circ \tan 125^\circ$, find A.

(3) $\left.\begin{array}{l}2_x 3^y=252\\ 10^{y-x}=10000\end{array}\right\}$ find x and y.

3. Prove the formulæ:

(1) $\tan A+\cot A=\sec A \operatorname{cosec} A$.

(2) $\sin(A+B)=\sin A\cos B+\cos A\sin B$.

Show by a geometrical demonstration that $\sin(A+B)=\sin A+2\sin\frac{1}{2}B\cos(A+\frac{1}{2}B)$.

4. Find the value of sin 30° and cot 15°.

Find x from the equation

$$\tan x+\cot 2x=2.$$

5. In any triangle prove the formulæ:

(1) $\tan\frac{1}{2}A=\sqrt{\frac{(s-b)(s-c)}{s(s-a)}}$.

(2) $\frac{a\cos B+b\cos A}{a\sin B+b\sin A}=\frac{1}{2}(\cot B+\cot A)$.

6. In a right-angled triangle, having given the area $=246.458$, $A=39^\circ 9'$, find a, b, B.

7. Having given

$A=49^\circ 9' 50''$, $b=387.465$, $c=245.985$; find

(1) a, B, C.

(2) Area of the triangle.

(3) Radius of inscribed circle.

8. (*a*) If the sides of a triangle are in arithmetical progression, show that the radii of the escribed circles are in harmonical progression.

(*b*) In any triangle, if $c^2=a^2+ab$, show that $C=2A$.

NUMBER.	LOG.		LOG.
200000	301030	sin 32°	9.724210
300000	477121	tan 55°	10.154773
252000	401400	cos 40° 49′	9.878983
119048	075721	tan 39° 9′	9.910645
360552	556968	cot 24° 34′ 55″	10.339653
778151	891064	sin 49° 9′ 50″	9.878857
492916	692773	tan 26° 1′ 26″	9.688639
463345	665904	sin 39° 23′ 39″	9.802538
633450	801709	sin 88° 33′ 29″	9.999861
246458	391743		
387465	588232		
245985	390909		
141480	150695		
293240	467228		
170105	230717		

EUCLID—HONORS.

1. If a side of a triangle be produced, the exterior angle is equal to the two interior and opposite angles; and the three interior angles of every triangle are equal to two right angles.

In the sides AB, AC of the triangle ABC are taken points D and E at equal distances from A, and a straight line is drawn through D and E to meet BC produced in F. If angle ABC is one-third of angle ACB, then triangle DFB will be isosceles.

2. Divide a given straight line into two parts, so that the rectangle contained by the