2. (*a*) Two cog-wheels, containing 210 and 330 cogs respectively, are working together. After how many revolutions of the larger wheel will two cogs which once touched, touch again?

(*b*) Extract the square root of $11\frac{3}{4}\frac{7}{9}$.

(*a*) Find the least common multiple of 210 and 330 = 2310. Divide by the number of cogs in the larger wheel, $2310 \div 330 = 7$. *Ans.*

(*b*) $\sqrt{11\ \frac{3}{4}\frac{7}{9}} = \sqrt{\frac{5}{4}\frac{7}{9}\frac{6}{}} = \frac{2}{}\frac{4}{7}$. *Ans.*

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3. (*a*) Find the cost of $3768\frac{1}{2}$ articles at £1 7*s*. $4\frac{1}{2}$d.

(*b*) If 3 men can earn \$15 in 4 days, what sum will 18 men earn in 12 days?

(*a*) *Ans.* £5158 2*s*. $8\frac{1}{4}$d.

(*b*) *Ans.* \$270

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4. Make out an account of the following sales, supplying names and dates of your own selection: 6 pairs of blankets @ \$5.50; $12\frac{1}{2}$ yds. merino, @ 45 cts.; $15\frac{3}{4}$ yds. cloth, @ \$3.25;; $5\frac{1}{8}$ yds. of flannel, @ 30 cts.; 2 counterpanes, @ \$4.25 each; $25\frac{1}{4}$ yds. of calico, @ 15 cts.

Ans. \$103.70.

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5. (*a*) Find the interest on \$1,000 at 3 per cent. per annum from the 11th January, 1895, to the 9th July, 1897.

(*b*) At what rate per cent. will \$520 amount to \$800.80 in 6 years, simple interest?

(*a*) *Ans.* \$74.71, if leap year is not taken into account.

(*b*) \$800.80 − \$520 = \$280.80 interest for 6 years
\$46.80 interest for one year.
If \$520 gives \$46.80
\$100 will give \$9.

Drawing and Book-Keeping.

10.10 to 11.10 A. M., Friday, 9th July, 1897.

(Values need not be expected in this paper for answers in which the *Drawing* and *Writing* are not good, for this paper is designed to test the degree to which the hand has been trained to do beautiful and accurate work.)

1. The two sides of a triangle are 325 and 479, and the angle opposite the former side is 36°. Construct the triangle (on the scale of 100 to an inch if convenient, but any other scale will do as well), and find the other angles and side. If this problem has two solutions, find the other parts of each triangle.

Problems like this have two solutions when the side opposite the given angle is less than the other given side.

Ans. 1st solution: Third side about 225, angles 120° and 24°.
2nd solution: Third side 550, angles 60° and 84°.

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2. Draw (*a*) the front of a house, or (*b*) a vase or pitcher standing on a rectilineal surface.

3. Draw (*a*) any original design you choose, or (*b*) any object in connection with your "science" or "nature" studies.

4. Draw out a form of a Cash Book, and explain its use. What sums entered in the Cash Book for Single Entry are found in the Ledger? Describe the process of balancing the Cash Book.

5. Write out the form of a "Due Bill payable in goods," a "Receipt in full," and a "Joint Promissory Note." Explain Voucher, Discount, Draft, Invoice, Assets.

Algebra.

9.00 to 10.00 A. M., Wednesday, 7th July, 1897.

1. (*a*) If $a = 0$, $b = 1$, $c = -2$, $d = 3$, find the value of $(3\,a\,b\,c - 2\,b\,c\,d)\ \sqrt[3]{a^3\,b\,c - c^3\,b\,d + 3}$.

(*b*) Simplify $4\ \{a - \frac{3}{2}\,(b - \frac{}{3}\}\ \{\frac{1}{2}\,(2a - b) + 2\,(b - c)\}$.

(*a*) *Ans.* 36.

(*b*) *Ans.* $4\,a^2 - 9\,b^2 + 24\,b\,c - 16c^2$.

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2. (*a*) Write down five consecutive numbers, of which x is the middle one.

(*b*) Given the equation $\frac{x + .75}{.125} - \frac{x - .25}{.25} = 15$, find the value of x.

(*a*) *Ans.* $x - 2$, $x - 1$, x, $x + 1$, $x + 2$.

(*b*) *Ans.* 2.

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3. The width of a room is two-thirds of its length. If the width had been 3 feet more and the length 3 feet less, the room would have been square; find its dimensions.

3. Let x = length then $\frac{2}{3}\,x$ = breadth
$x - 3 = \frac{2}{3}x + 3$
$x = 18$. *Ans.*

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4. Given $\left.\begin{aligned} x - \frac{y}{5} &= 6 \\ y - \frac{z}{7} &= 8 \\ z - \frac{x}{2} &= 10 \end{aligned}\right\}$, find x, y and z.

$x = 8$, $y = 10$, $z = 14$.

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5. (*a*) Simplify $\sqrt[5]{(-32\,x^{10}\,y^{15})}$; and

(*b*) Extract the cube root of $108x + 90x^2 - 8\,x^6 + 48\,x^5 - 60\,x^4 - 80\,x^3 + 27$.

5. (*a*) $-2\,x^2\,y^3$

(*b*) $12x^4 - 24x^3 + 16x^2$
$12x^4 - 48x^3 + 48x^2$
$-18x^2 + 36x + 9$
$12x^4 - 48x^3 + 30x^2 + 36x + 9$
$-8x^6 + 48x^5 - 60x^4 - 80x^3 + 90x^2 + 108x + 27$
$-8x^6$ $(-2x^2 + 4x + 3$. *Ans.*
$48x^5 - 60x^4 - 80x^3$
$48x^5 - 96x^4 + 64x^3$
$36x^4 - 144x^3 + 90x^2 + 108x + 27$
$36x^4 - 144x^3 + 90x^2 + 108x + 27$