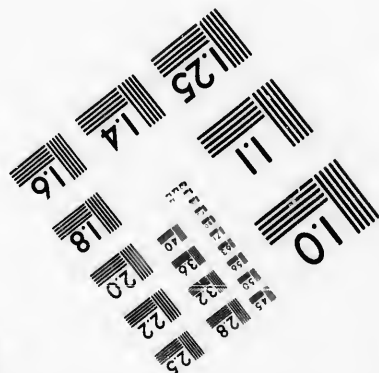
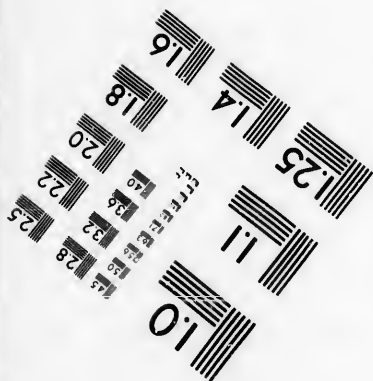
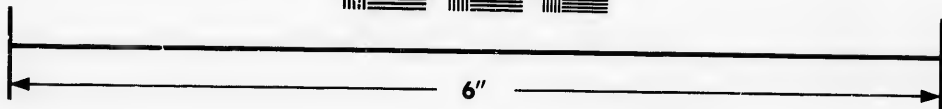
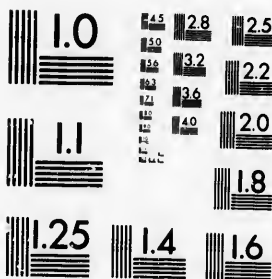


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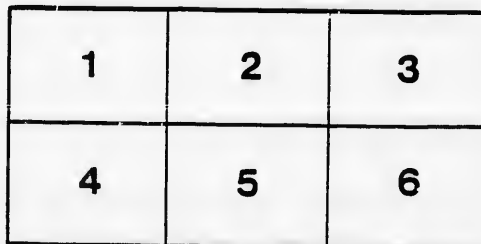
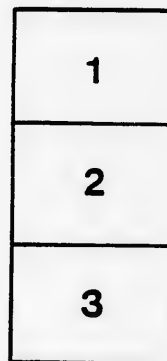
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SESSIONAL EXAMINATION, JUNE 24, 1851.

MORNING—MATHEMATICS & ARITHMETIC.

1. If the two sides of a right angled triangle are respectively 30 feet and 60 feet ; What is the length of the third side ?

2. If the radius of a circle be 60 feet, what are its circumference and area ; and show how you obtain the value of  $\pi=3.14159$  ?

3. What is remarkable about the regular hexagon inscribed in a circle ? And how has the sexagesimal division of the circle been obtained from this relation, also point out the advantages of the decimal division, and convert  $6^\circ$  ,,  $3'$  ,,  $3''$  into decimal seconds ?

4. What is the difference between  $\cdot 25$  and  $\frac{1}{3}$ , and express  $\cdot 111'$  as a vulgar fraction ?

5. Extract the square root of 9876 $\cdot$ 543 and the 7th root of the same by logarithms.

6. Given one side of a triangle = 60 feet and two angles respectively  $45^\circ$  and  $75^\circ$  to find the other sides and angles ? And also the area ?

7. If in a triangle two sides are given, 50 feet and 100 feet respectively and the included angle  $30^\circ$ , what is the 3rd side and the other angles ? And the area ?

8. The sides of a triangle are respectively 36, 48, and 60 feet, find the angles and area ?

9. Prove Ptolemy's theorem, and deduce from it the following relation, expressed in Trigonometrical language.

When  $\eta$  and  $\epsilon$  represent any two arcs, and  $r$  the radius

$$r \cdot \text{Sine} (\eta \pm \epsilon) = \text{Sine} \eta \cdot \text{Cos} \epsilon \pm \text{Cos} \eta \cdot \text{Sine} \epsilon$$

and from this prove that in trigonometrical language

$$r \text{Sine} \eta = 2 \text{Sine} \frac{1}{2} \eta \cdot \text{Cos} \frac{1}{2} \eta ;$$

show also how this is used in finding *the rule* or formula for the area of a triangle in terms of the sides.

10. Solve the equation  $2x + \frac{1}{2}x + 3 - 5x = 1 - 2x$ .

*J. G. B. Marshall*

EVENING.—SURVEYING & ENGINEERING.

1. Point out the optical and mathematical principles and the mechanical contrivances by which the Sextant is suited to measure angles; and prove that it can indicate correctly the magnitude of any angle less than  $120^\circ$ .

2. What is the height of a tower, the angle of whose elevation is  $45^\circ$  at a distance of 1.3 chains?

3. How many square miles are in the area of a triangular Estate, whose sides are 30 miles, 60 miles, and 36 miles respectively.

4. How does the water act in Irrigation, and state the principles & rules for irrigation, as well as the most suitable soils for water meadows?

5. Write down detailed instructions for Draining a 50 acre Field, including size of main drain, &c., the fall of which may be made 8 feet in a mile.

6. What difference would you be called on to make in order to secure the same results, if the fall was only 4 feet per mile?

7. How much cutting would you require in order to remove a hill 1 mile long on an ordinary road, whose slope in either direction you find 400 feet in a mile, so as to leave it 1 in 20.

8. Describe all the instruments employed and the processes gone through in the collection of the following notes; reduce them and plot the section by writing figures for height and distances, (or to a scale of 3 chains to an inch horizontal and 20 feet to an inch vertical;) also, write down the elevation of one end of the section above the other;

Back Staff. feet.	Fore Staff. feet.	Distance in links.	
3.56	2.25	0	On B. M.
		300	R.A.C.
4.26	5.38	500	Avenue gate-post.
6.83	5.32	700	
3.66	17.44	1000	Farm Buildings

*J. G. B. Marshall*

