

a fixed and perfectly rough sphere. The altitude and diameter of the base of the cylinder are each equal in length to a quadrant of a great circle of the sphere. Find the greatest angle through which the cylinder may rock without falling off.

27. Show that, if $2^n - 1$ be a prime, the sum of the divisors of the number $2^n - 1$ ($2^n - 1$) will be equal to twice the number.

28. Prove that the roots of the cubic equation $x^3 - 3ax^2 + 3bx - c = 0$ are $a + p + q$, $a + pw + qw^2$, $a + pw^2 + qw$ where w is an imaginary cube root of unity, and p and q are given by the equations :

$$pq = a^3 - b$$

$$p^3 + q^3 = 2a^3 - 3ab + c.$$

Prove that the roots may also be expressed in the form :

$$\frac{r-s}{p-q}, \frac{r-sw}{p-qw}, \frac{r-sw^2}{p-qw^2}$$

where $r = ap - q^3$, $s = aq - p^3$.

MODERN LANGUAGES.

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EXERCISES IN ENGLISH.

1. Give the grammatical value and relation of the infinitive phrases in the following.

- I am very sorry to hear such reports.
- She offered to show me the list.
- He waited to see the papers.
- I have no desire to hear the particulars.

- It is difficult to answer that question.
- To make sure, he counted them twice.

2. Contract the following sentences into simple ones.

- His face haunts me wherever I go.
- If he perseveres he will probably succeed.
- There was great danger that they might break forth into open rebellion.
- He feared that such a result might happen, and therefore had sent for assistance.
- It was not till the following day that he discovered that he had made the mistake.
- As they knew from the deserters how

weak the defenders were, they had no doubt that they should be able to capture the fort.

3. Break each of the following complex sentences into a series of simple ones.

(a) While Randolph was considering what to do, there came to him a gentleman, named Francis, who told him that at one time he had lived in the castle, of which his father had then been keeper.

(b) With this ship he succeeded in capturing a vessel in which were a number of rebels who had intended to make a descent on the island, and brought them prisoners into the very harbour which they had expected to enter as conquerors.

4. Divide the following sentences into clauses, supplying the necessary ellipsis, and tell the kind and relation of each clause.

(a) Regions Cæsar never knew.

Thy posterity shall sway.

Where his eagles never flew.

None invincible as they.

(b) Thrice is he armed that bath his quarrel just ;

And he but naked, though locked up in steel,
Whose conscience with injustice is corrupted.

5. Analyze, and parse underlined words.

(a) On the 19th of September, 1535, Cartier, leaving his two larger vessels well protected in the harbour of St. Croix, commenced his voyage up the river with his pinnace and two long boats, capable of holding thirty-five persons.

(b) In 1669 a company formed in London, under the direction of Prince Rupert, obtained a charter from Charles II., granting to them and their successors, the sole right of trading in all the country watered by the rivers flowing into Hudson Bay.

(c) Now fades the glimmering landscape on the sight,

And all the air a solemn stillness holds.

6. Change the voice of the finite verbs in the following.

(a) None of the speakers made any reference to it.

(b) You will probably be called on to address the meeting.

(c) The matter must be looked into without delay.