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DIRECTORATE OF  
INTELLIGENCE

# Intelligence Memorandum

*Free World Exports Supporting  
Communist China's Modern Weapons Program*



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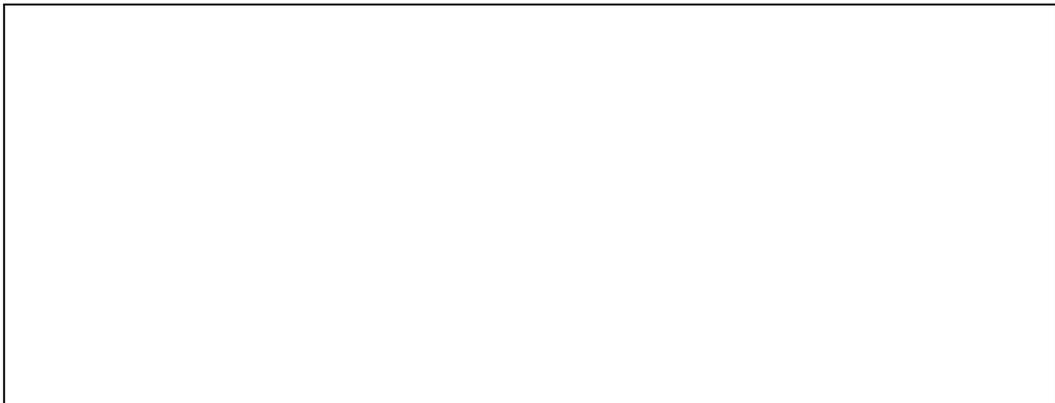
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CENTRAL INTELLIGENCE AGENCY  
Directorate of Intelligence  
December 1967

INTELLIGENCE MEMORANDUM

Free World Exports  
Supporting Communist China's  
Modern Weapons Program

Summary

Machinery, industrial materials, and technology imported from the Free World are playing a key role in Communist China's modern weapons program. Some of these imports directly support a particular weapons system; most of the remaining imports contribute to the development of China's general military-industrial base. A reduction of these imports, therefore, would reduce both the pace and the scope of China's modern weapons program.

In the past three years, 1965-67, imports of machinery, equipment, and scientific instruments from the Free World totaled more than \$500 million -- a sharp increase over preceding years (see Figure 1). Japan, West Germany, the United Kingdom, and France have been the chief suppliers. Four general categories of equipment stand out: machine building equipment, electronic equipment, metallurgical equipment, and chemical equipment.

Among China's imports from the Free World since 1964, some 250 major items of machinery and equipment, plus another 8,000 items of electronic equipment and precision instruments, have been identified as "strategic." These items include large quantities of theodolites (instruments useful in the deployment of guided missiles), a honeycomb milling machine

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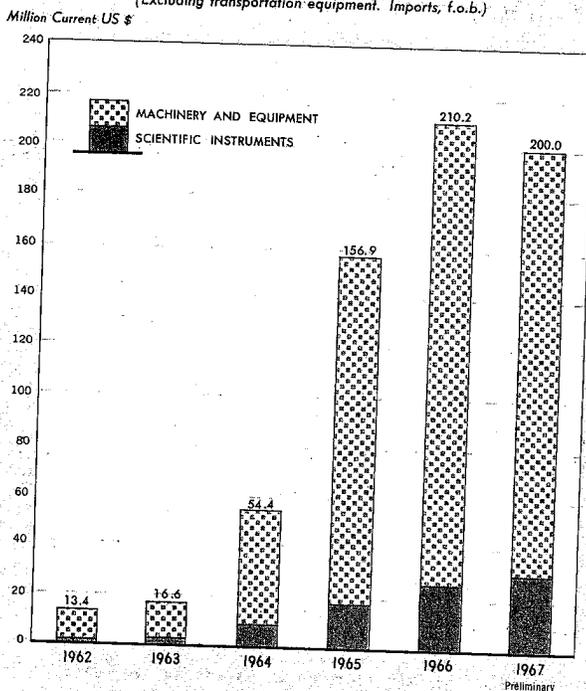
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Figure 1

**COMMUNIST CHINA: Value of Imports  
of Machinery, Equipment, and  
Scientific Instruments from the Free World, 1962-67**

(Excluding transportation equipment. Imports, f.o.b.)



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used in the production of wing and helicopter blades, whole plants for the production of military electronic equipment, equipment for refining such space-age metals as tantalum and beryllium oxide, and equipment to produce chemicals for solid propellants.

These "strategic" imports are not large -- their aggregate value probably does not exceed \$200 million over the past three years. Nevertheless, they are highly important to the Chinese advanced weapons program because of the relatively low technological level of Chinese industry.

Chinese imports of industrial materials from the Free World consist mainly of general-purpose materials that the small Chinese industrial base cannot provide in sufficient amounts, such as rolled steel products. A small proportion consists

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of specialized alloys and alloying materials of direct importance to the modern weapons program. Examples are stainless steel, chromium, nickel, and teflon.

The advanced machinery and materials furnished by the Free World make available technology that often is beyond present Chinese capabilities. The Chinese use the occasion of plant visits and trade negotiations to extract all possible technical information from potential suppliers in Japan and Western Europe. They also systematically procure scientific and technical literature in the Free World. This Free World technology is especially important to the modern weapons program because it permits China to concentrate its small supply of top-grade technical people on specific weapons projects.

Of the some 250 "strategic" items cited above, less than one-half are embargoed under COCOM\* controls; almost all of them, however, would have been embargoed under the CHINCOM list which was abandoned in 1957. In any event, most of the COCOM items were exported legally under COCOM administrative exception procedures whereby member governments are permitted to export certain items on the COCOM list. A significant number of items, however, moved to China illegally.

*\* COCOM is an informal, non-treaty agreement among the United States and a number of its allies intended to control the export to Communist countries of materials considered essential to military weapons and their development. The International Lists of COCOM defining the items embargoed are similar to the Mutual Defense Assistance Act (Battle Act) Control Lists put out by the United States to further restrict such exports to Communist countries. CHINCOM was the China Committee of these same nations set up during the Korean War to restrict trade with Communist China on an even broader scale than the COCOM controls. A consolidated China Special List -- the so-called China Differential List -- was developed but never agreed on officially. CHINCOM and its lists were abandoned in 1957.*

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China has tested seven nuclear devices since 1964 and is developing systems necessary to deliver such devices. This involves programs for production and deployment of MRBM's and ICBM's, a ballistic-missile submarine program, and an aircraft delivery system. China almost certainly will continue to push its independent military research and development efforts and will undertake series production and large-scale deployment of missiles and other modern weapons. Imports of machinery, materials, and technology from the Free World will become increasingly important to these programs.

In the long run a possible constraint on these imports might be China's supply of foreign exchange. Chinese earnings from exports to the West are likely to grow much more slowly than in the past few years even if the disruptions of the cultural revolution were to end abruptly. Nevertheless, China has some \$650 million in gold and hard currency reserves and has the option of reducing imports of grain and other less strategic goods. Accordingly, China should have adequate means to import the critical strategic items required in the foreseeable future. Finally, over the short term, China could supplement its foreign exchange by acquiring additional foreign credits if it so desired.

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## General Economic Background

1. The ultimate objective of the economic policy of Communist China is political and military power. The industrialization of China, therefore, has featured the expansion of heavy industry -- machine building, steel, coal, electric power, and petroleum -- and has greatly increased the capacity to produce weapons. Since coming to power in 1949, the regime has emphasized that industrialization would go forward along autarchic or "self-reliant" lines. Nevertheless, foreign support -- in the early years in the form of assistance from the Soviet Union and more recently in the form of trade with the Free World -- has played a crucial role in Chinese industrial and military development. China made substantial strides toward the goal of becoming a modern industrial nation in the first eight years of Communist rule. Since 1957, however, progress has been erratic

## Progress in Industrialization

2. In a series of agreements signed between 1950 and 1959, the USSR agreed to supply China with 300 modern industrial plants worth about \$3 billion. These plants included almost the entire range of modern industrial installations -- steel mills, electric power stations, machine building facilities, aircraft plants, chemical facilities, and the like. The Communist countries of Eastern Europe also agreed to contribute a substantial number of industrial projects to China's ambitious development program. China could have produced these facilities domestically only after much delay and at a tremendously high cost. China paid for this industrialization through exports of goods that it could produce efficiently at home -- textiles, ores, and specialty foodstuffs.

3. As a result of increases in domestic production and assistance from other Communist countries, Communist China greatly expanded its industrial base in the first five-year plan period (1953-57). Production of major items increased as follows:

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Item	Unit	Production	
		1952	1957
Crude steel	Million metric tons	1.35	5.35
Coal	Million metric tons	66.5	130.7
Petroleum	Million metric tons	0.44	1.46
Electric power	Billion kilowatt-hours	7.3	19.3
Cement	Million metric tons	2.9	6.9
Sulfuric acid	Thousand metric tons	190	632

#### The Disastrous Leap Forward

4. During the Great Leap Forward (1958-60), however, a disastrous change occurred in Chinese Communist economic policy. The tempo of production was accelerated to intolerable rates, and manpower and raw materials were wasted on primitive industrial schemes. In agriculture, the communes -- supercollectives averaging 25,000 people -- were established and private plots were banned. These improvident measures quickly led to disruptions in agricultural production and in the distribution of food. Adverse weather in 1959-61 also hurt agriculture.

5. The Soviet authorities took few pains to conceal their anxiety over the economic policies of the Leap Forward. Increasing political and ideological differences caused a rapid deterioration in Sino-Soviet relations. Finally, in mid-1960 the USSR peremptorily withdrew the 1,500 Soviet engineers and technicians then in China and brought to a halt practically all of its economic assistance. At this time, only about one-half of the scheduled 300 Soviet-aided plants had been completed. Aid from Eastern Europe, was reduced to a trickle. During the winter of 1960-61 the Chinese economy reached its lowest ebb. Industrial production was severely reduced, malnutrition was widespread, and discontent extended even to the army.

#### Slow But Steady Recovery

6. In spite of the collapse of the Leap Forward, Communist China retained the legacy of Soviet and Eastern European assistance -- the plant, the technology, and the trained workers.

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And it was not long before China began a slow but steady recovery. Industrial production recovered from the low point of 1962, mainly because capacity, idled by the Leap Forward, was put back into operation (see Figure 2). Since 1961, efforts to expand capacity have been limited to priority industrial sectors such as modern weapons, chemicals, electronics, special metallurgy, and petroleum refining. Excess capacity still exists in many industries, particularly light industries requiring agricultural raw materials. Capacity is insufficient in some industries that produce priority finished products, such as flat-rolled steel products.

7. Agricultural production also recovered from the low point of 1960-61, but, in comparison with 1957, population has increased more than grain production (see Figure 3). To help offset this decline in per capita production, China since 1961 has been forced to import 5 million or 6 million tons of grain per year from hard currency areas. These imports have used foreign exchange that could have bought modern industrial equipment from Japan and Western Europe.

8. During this period of recovery, China's trade with the other Communist countries fell sharply, whereas trade with the non-Communist world rose, not only because of large grain purchases but also because of growing imports of machinery and industrial materials from Japan and Western Europe. When China was industrializing under the tutelage of the USSR, more than two-thirds of Chinese trade was with the Communist countries. Since 1960 the situation has been reversed; now three-fourths of China's trade is with non-Communist countries (see Figure 4). China's total trade almost certainly declined in 1967, but the relative shares did not change appreciably.

#### Current Economic Problems and Prospects

9. By 1966 the economy had completed its comeback from the low point of 1960-61 and seemed to promise steady if slow development over the next few years. Mao's Cultural Revolution has

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interrupted this trend, however, and continues to cast a shadow on China's near-term prospects. The political turmoil has halted growth in industrial output and foreign trade. Industrial production for all of 1967 may have fallen below the level for 1966, and an appreciable decline in foreign trade took place during the last half of 1967. Other sectors of the economy have been adversely affected, particularly rail and river transport and the educational system.

10. In spite of the Cultural Revolution, agricultural production in 1967 rose in comparison with that of 1966. But the debilitated state of administrative control in the rural areas of China poses problems for the regime in procuring and distributing the harvest. The modern weapons programs have been least affected by the cultural revolution. Even these priority programs, however, have suffered from political attacks on managers and scientists and from disturbances in transportation and foreign trade.

11. The Cultural Revolution has fluctuated between periods of radical political action and periods of more moderate and practical policies. So long as Mao holds power, this erratic course will continue. Mao's revolution can only further complicate the solution of the fundamental economic problems of China, the most serious of which is the tendency of the population to outrun the food supply. But even if political stability is soon regained, this problem probably will not be solved for a long time.

12. The general characteristics of Chinese industry today stem from these economic policies and events. Chinese industry is fairly large in absolute amount but small on a per capita basis and for the most part quite backward in technology. National economic policy dictates austerity in living standards; hence there is no pressure to raise the level of technology in civilian industry. Furthermore, in both agriculture and civilian industry, the supply of labor is so vast that the substitution of machines for men would be a foolish use of scarce resources. The small quantity of top-grade manpower and machinery goes for the development and production of advanced weapons.

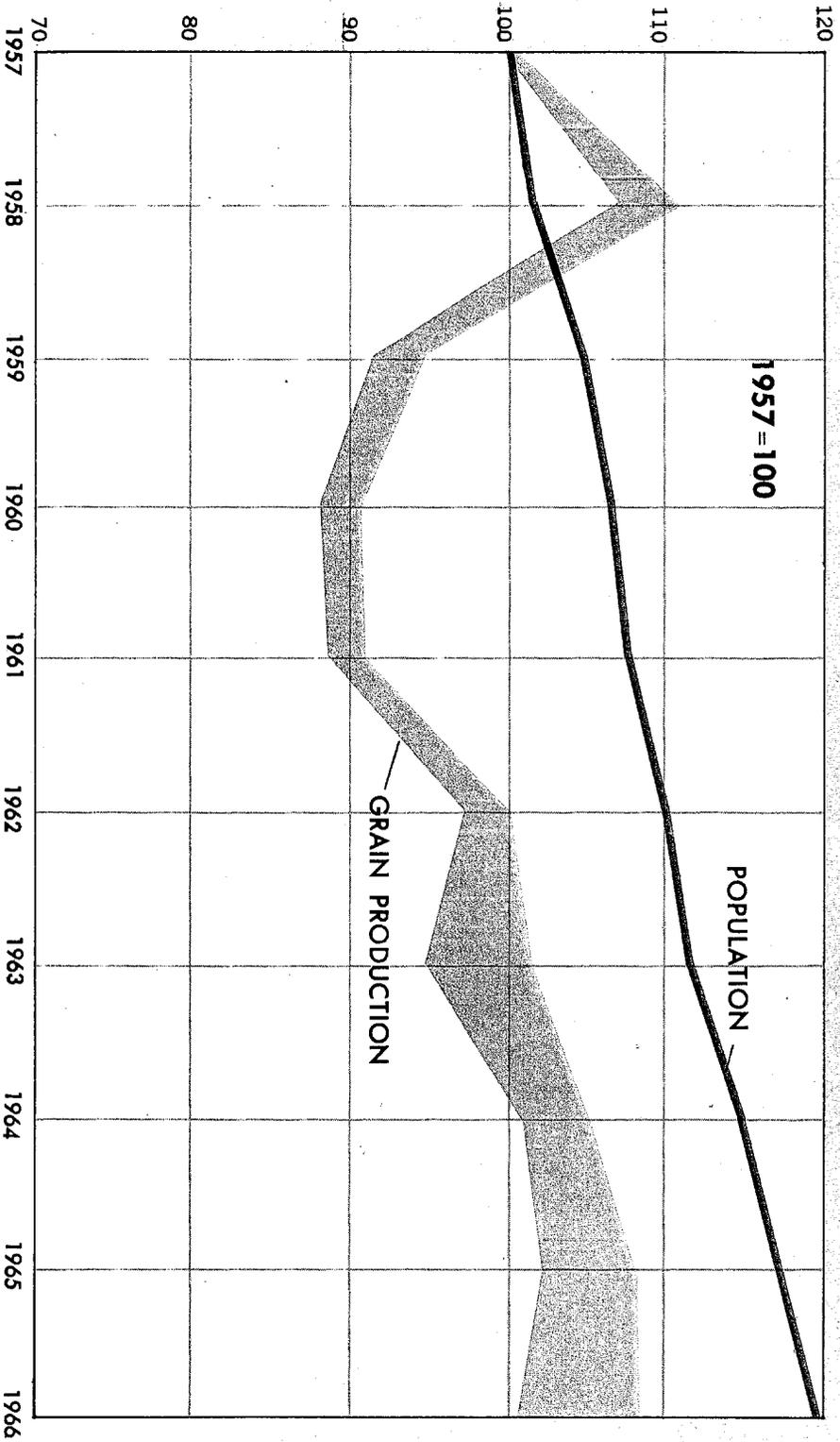
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Figure 2

### COMMUNIST CHINA: Index of Population and Grain Production, 1957-66



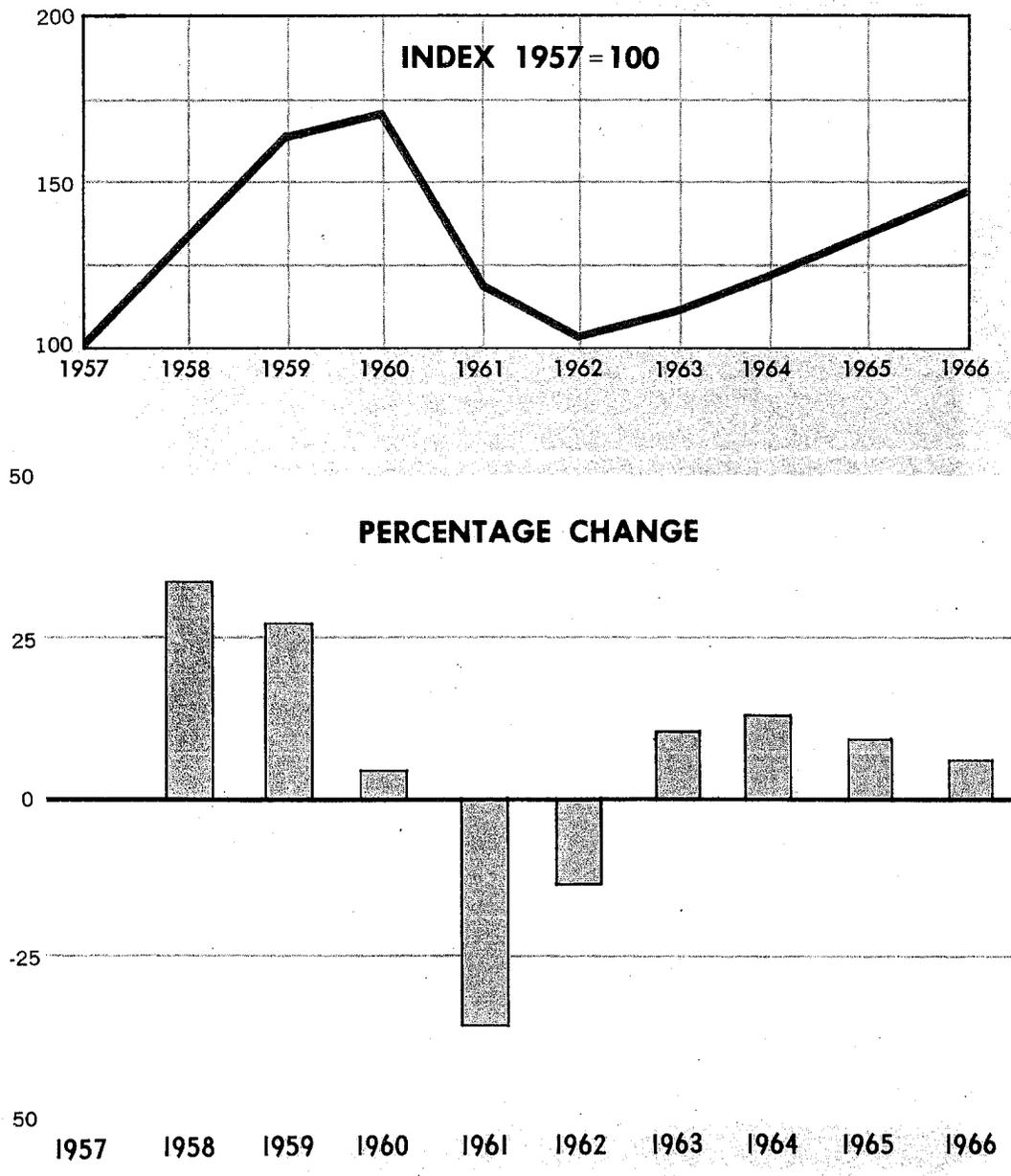
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Figure 3

# COMMUNIST CHINA: Growth of Industrial Production 1957-66

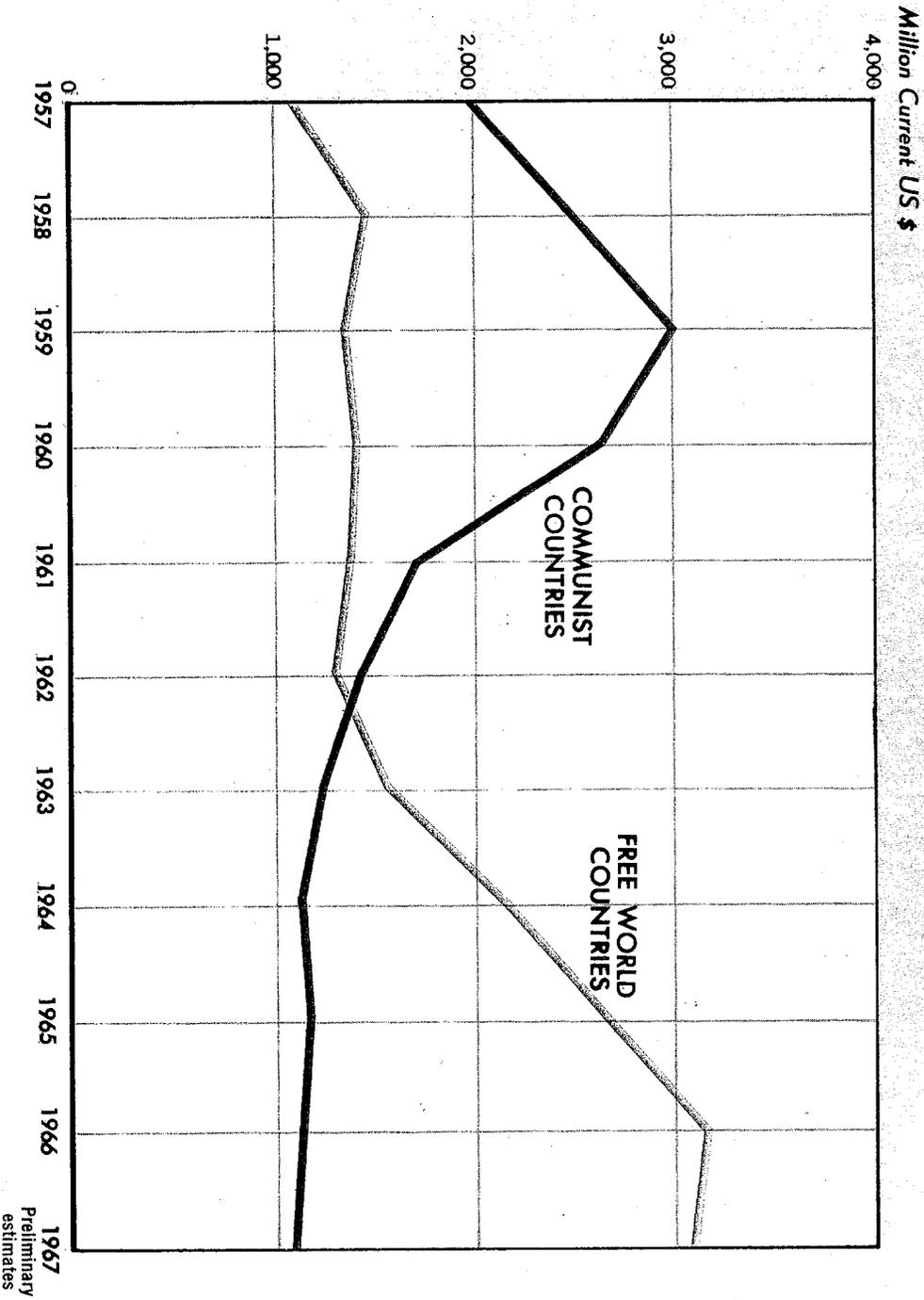


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# COMMUNIST CHINA: Comparison of Trade with Free World and Communist Countries, 1957-67

Figure 4



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## China's Modern Weapons Program

### General

13. In spite of the disruptions of the Leap Forward, the withdrawal of Soviet technical support, and the Cultural Revolution, Communist China has made rapid progress in weapons development. China has tested seven nuclear devices since October 1964, four of which have contained thermo-nuclear material. Furthermore, these tests have demonstrated China's ability to deliver nuclear devices by both medium bombers and missiles.

14. The Chinese nuclear weapons program was started in the mid-1950's with strong Soviet assistance. Chinese atomic scientists were trained in the Soviet Union, and the construction of the key installations in the present Chinese program -- a gaseous diffusion plant [redacted] for the production of U-235 and a nuclear test site [redacted] -- was begun while Soviet technicians were still in China.

15. In spite of the complete Soviet withdrawal of support, the Chinese still have managed to carry the programs forward with their own resources and the momentum supplied by the USSR. Nevertheless, substantial problems remain. For example, the supply of fissionable material is still small, and the regime is in a poor position to carry on a testing program and at the same time build a substantial stockpile of weapons. This constraint will not be relaxed until plutonium becomes available for the weapons program. China probably has now a few fission weapons in its stockpile which are deliverable by its 14 medium bombers (12 propeller-driven and two jet).

16. Communist China is developing three and possibly four systems for delivering nuclear weapons. The Chinese have test fired MRBM's from the missile test range at Shuang-ch'eng-tzu -- a facility in western Inner Mongolia constructed with Soviet assistance in the late 1950's. Soviet missiles were used in early tests, but recently Chinese-manufactured missiles probably similar to older Soviet designs have been fired. This MRBM program could be nearly ready for deployment.

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When deployed, these missiles will be able to reach:

- (a) all the capitals and industrial complexes of Japan, South Korea, Taiwan, the Philippines, South Vietnam, Thailand, and India;
- (b) targets in Soviet Central Asia and the Soviet Far East; and
- (c) all US bases in east and southeast Asia.

17. The Chinese reportedly are constructing a large new launch facility at Shuang-ch'eng-tzu. The size of the complex indicates that it is designed for an ICBM which could also be used as a space booster.

18. Communist China may also be working on a ballistic missile submarine program. At present the Chinese have one G-class conventionally powered ballistic-missile submarine. However, there appears to have been little recent progress either in constructing additional vessels or in developing the missiles required for these vessels.

19. China has only two jet medium bombers on hand. But the regime could begin to produce jet medium bombers -- probably similar to the Soviet TU-16 (Badger) -- in early 1968. Although obsolescent, such aircraft would be adequate for use around the periphery of China.

20. The Chinese Communist missile research and development effort appears to be centered in the Peking area. [REDACTED]

[REDACTED] engine test stands capable of testing MRBM and ICBM propulsion stages exist at the Chang-hsin-tien complex. The Nan-yuan airframe plant located near Peking has also been associated with the Chang-hsin-tien complex and may be a missile production facility. So far as is known, the Chinese are not now developing long-range heavy bombers or nuclear-powered submarines.

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The Burden of the Modern Weapons Program

21. The burden of the advanced weapons programs for the Chinese economy has been heavy and will become even heavier as these programs expand and become more complex. In large measure, the Chinese programs have been based on technology supplied by the USSR before 1960. The Chinese must now develop more up-to-date weapons using their own scientific and technological resources and must push beyond the technology provided by the Soviet Union. This may prove difficult because China continues to lag far behind the major industrial nations of the world in industrial production and technology (see Figure 5).

22. Communist China's military and military-related programs may take as much as 10 percent of China's GNP. This is a somewhat higher share of GNP -- and a much larger share of industrial production -- than in France and the United Kingdom. Of greater importance, China's weapons program uses manpower, equipment, and materials of the highest quality -- scarce resources that otherwise could be used to build up the civilian sector of the economy. [redacted]

[redacted] in 1964, Premier Chou En-lai acknowledged that China's pursuit of a nuclear capability had imposed an enormous burden on the economy.

23. The burden of China's modern weapons program is also indicated by a comparison of the economic strength of Communist China in 1966 with that of the USSR in 1956 when Soviet missile programs first got under way. For example, Soviet output of four basic industrial commodities -- crude steel, cement, electric power, and aluminum -- in 1956 was two to four times the 1966 level of Chinese production of the same commodities (see Figure 6). In more general terms, total industrial production in Communist China in 1966 was roughly one-third of that of the USSR in 1956 when the Soviets were starting their missile production programs. Moreover, many of China's weapons-associated industries, such as the machine building industry, compared even less favorably with Soviet capabilities 10 years earlier.

24. Other constraints on Chinese industrial capabilities relative to Soviet industry are the

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small number of highly trained engineers and technicians available to industry and the limited stock of experience embodied in the industrial work force. China does not have large numbers of experienced mechanics capable of making useful adjustments to machinery and equipment or experienced managers with proved talents for organizational innovation.

25. The experience of other countries indicates that military costs will become even greater in the years ahead, especially when Communist China attempts to move various weapons systems into production and deployment. Weapons systems now being developed are based on Soviet designs and hence have most of the basic research already proved. The Chinese would be able to lessen the rise in R&D costs if they were willing to settle only for the acquisition of proved Soviet systems and thus the technology of the 1950's. China, however, almost certainly is going ahead with its own independent R&D efforts, such as those needed for an ICBM program, and this means rapidly rising R&D costs.

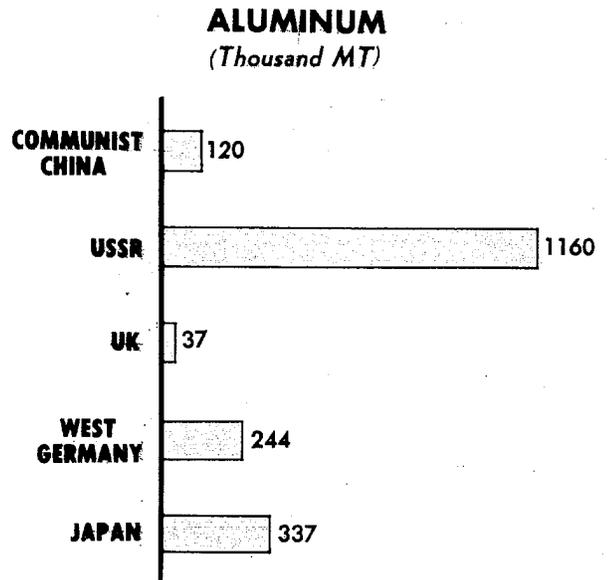
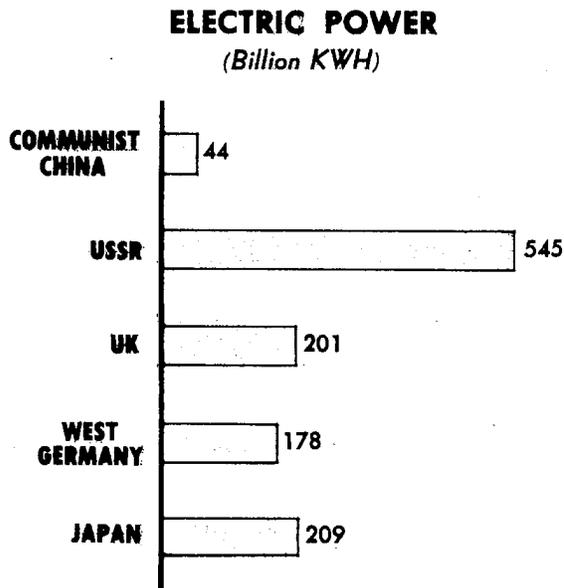
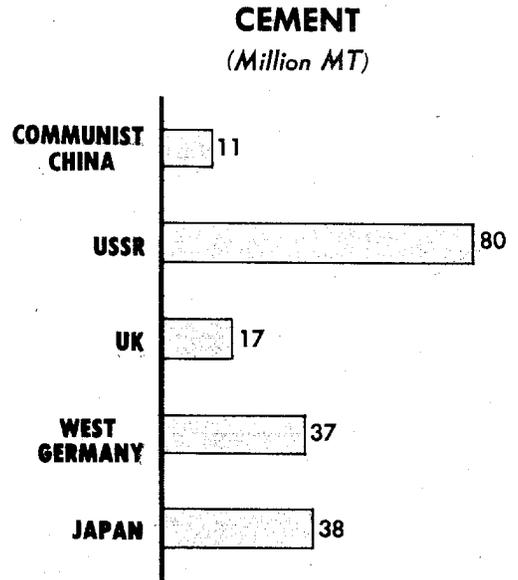
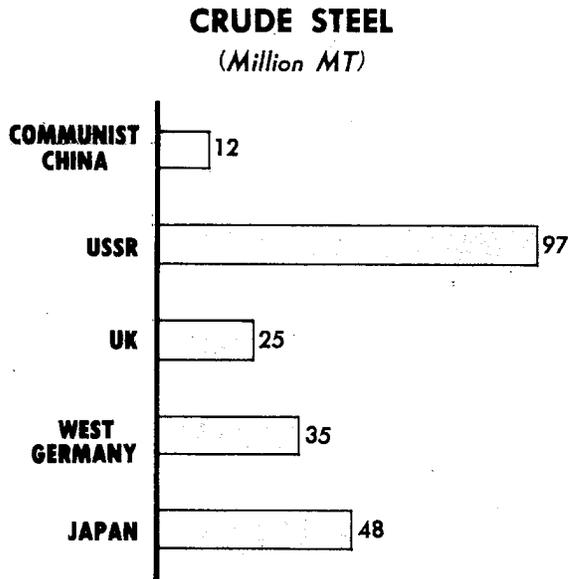
26. Total costs will also mount as China attempts to place various weapons systems in series production and to deploy them in the field. Even if in the next few years China produces only improved copies of Soviet systems, serious problems will be faced in mastering the production techniques and reproducing specialized parts of components. Production costs relative to R&D costs are likely to be higher for China than they were for the United States or France because those countries already had in existence the industrial machinery, processes, and skills needed to support their production programs. In addition, China will have to meet the heavy annual operating and maintenance expenses of the deployed units.

27. In the absence of extensive foreign assistance, China's supply of skilled manpower almost certainly will prove to be insufficient to both pursue a high-priority modern weapons program and provide adequately for the development of the civilian economy. Over the next several years, China will continue to be faced with an acute shortage of scientific, managerial, and engineering

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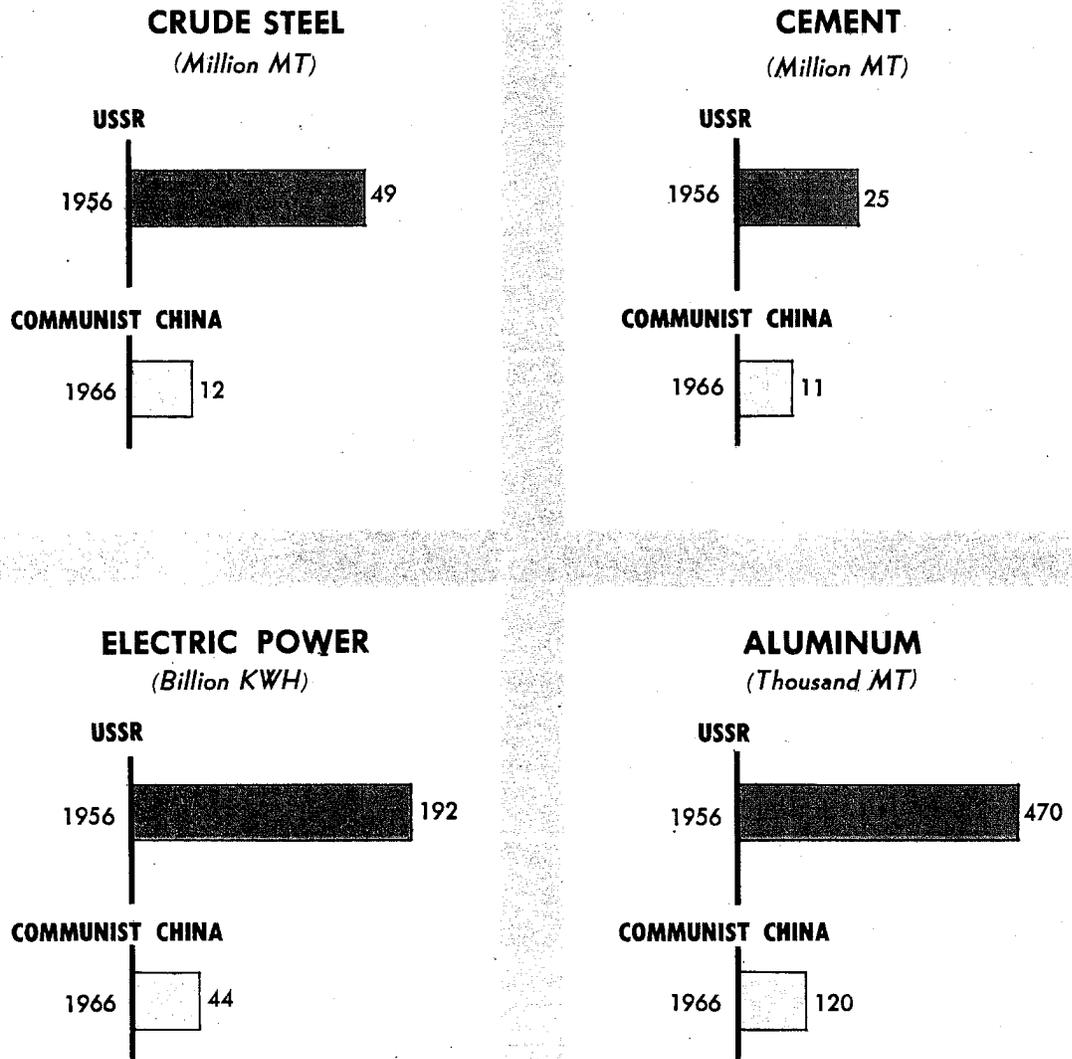
### SELECTED COUNTRIES: Comparative Output of Major Industrial Commodities, 1966



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Figure 6

# COMMUNIST CHINA AND THE USSR: Comparative Output of Major Industrial Commodities 1956 and 1966



personnel and will be forced to concentrate its efforts on a narrow range of high-priority industries. Most of China's best technical talent continues to be those Chinese who were educated abroad, both in the Free World and in the USSR. For top scientific and technical talent, China still relies heavily on those Chinese educated abroad, but significant numbers of China-trained researchers with 5 to 10 years experience are now reaching upper levels of competence. The closing of China's universities for the past 18 months because of the Cultural Revolution has certainly interrupted this program.

### China's Industrial Base

#### Chinese Industrial Capabilities and Limitations

28. The capabilities of the Chinese industrial base for supporting programs of modern weapons development are uneven. (The locations of China's main industrial centers are shown on the map, Figure 7.) While China produces most of the materials and basic types of machinery for its weapons program, it needs to import certain raw materials and specialized machinery and test equipment. The principal industrial deficiencies of importance to the weapons program fall into four categories: machine building equipment, electronic equipment and precision instruments, metallurgical equipment and special metals, and chemical equipment and certain key chemicals (see Figure 8).

#### Machine Building Equipment

29. The machine building industry carries the heaviest load in support of China's military programs. Since 1960, this sector of industry has been unable to support simultaneously the development of modern weapons systems and the requirements of broad economic development. Loss of Soviet aid has forced the machine building industry to develop greater self-sufficiency in the manufacture and design of new equipment. This industry has had to shift a larger share of its production to the manufacture of specialized equipment required in such facilities as aircraft plants, nuclear reactors, metallurgical plants, and oil refineries.

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30. Compounding the problem has been the need for China to obtain from domestic or Free World sources most of the instrumentation, controls, and other specialized components formerly obtained from the USSR. Even so, over the last two or three years, China has made progress by concentrating the industry's best manpower and equipment to meet these requirements. The Chinese have been able to supplement domestic output by purchases from the West of precision and specialized types of machine tools such as jig-borers, gear-making machines, and precision grinders. Chinese imports of machine tools such as these have risen steadily since 1963.

31. Imports of Free World equipment not only contribute to the filling of large gaps in Chinese capabilities but also provide the Chinese with prototypes for native designs. Imports such as whole machine building plants involve purchase of readymade technology and provide a training ground for Chinese technicians, especially in those instances where contracts include provisions for training by the supplier.

#### Electronic Equipment and Precision Instruments

32. The Chinese profited as much from Soviet assistance in building up a domestic electronics industry as in any other field of modern industry. After 1960, China met new military needs chiefly by producing its own versions of foreign-designed equipment. In addition, many varieties of Western electronics equipment can now be purchased by the Chinese, and considerable Chinese effort is devoted to adapting this equipment to meet specific military requirements.

33. As a result of (a) earlier Soviet assistance, (b) access to Western technology, and (c) its own capability to adapt and improve foreign designs, China is now capable of producing much of the control and instrumentation equipment -- including radars, computers, and gyroscopes -- needed for guidance and control of first-generation surface-to-surface missiles and short-range cruise missiles. China also produces enough communications equipment to meet most of the minimum requirements of its ground, naval, and air forces.

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Figure 8

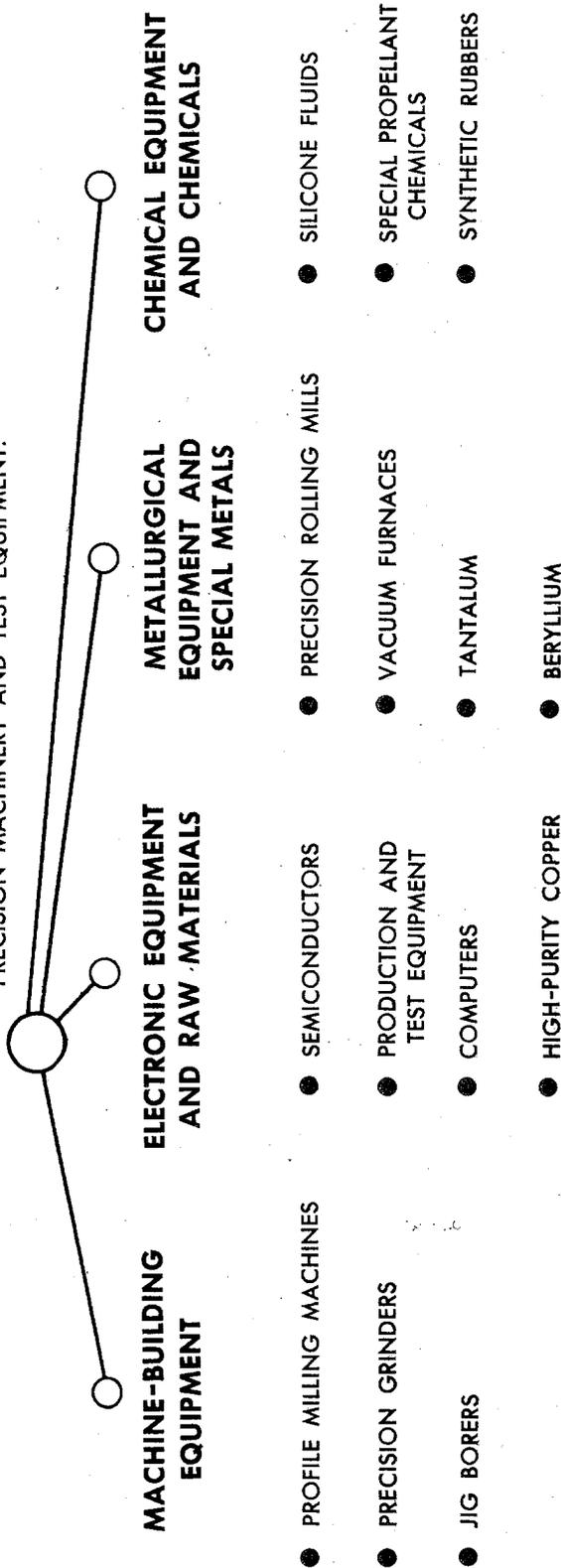
## COMMUNIST CHINA: Industrial Needs

### COMMUNIST CHINA PRODUCES:

MOST OF THE MATERIALS AND BASIC TYPES OF MACHINERY FOR ITS  
ADVANCED WEAPONS PROGRAMS.

### COMMUNIST CHINA NEEDS:

TO IMPORT CERTAIN CRITICAL RAW MATERIALS AND SPECIALIZED  
PRECISION MACHINERY AND TEST EQUIPMENT.



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Most of its deployed ground radar is of domestic manufacture.

34. As the need for more complex equipment develops, the Chinese are seeking larger imports of electronics and communications equipment (including prototypes) as well as technical data from Japan and Western Europe. In addition to imports of high-speed computers, quality production machinery, and test equipment, the electronics industry is dependent on imported raw and semi-finished materials including mica, quartz, and high-purity copper.

#### Metallurgical Equipment and Special Metals

35. China has inadequate domestic capacity to produce many alloy and special steels, certain nonferrous metals, and refractory metals used in the modern weapons program. At the same time, China probably has sufficient metallurgical competence and the necessary equipment, including vacuum melting equipment, to produce small quantities of superalloys, electrical steels, and stainless steels, including special types needed for research and development. Substantial increases in high-grade alloy steel production, however, will depend on an expansion of capacity. In recent years, the Chinese have intensified their efforts to develop the production of stainless steel to support the expansion of the chemical industry as well as to supply new military needs such as the construction of nuclear reactors.

36. China's metallurgical industry is able to depend on domestic resources for most of the raw materials used to produce basic metals and alloys. Among the exceptions are chrome, nickel, and cobalt. Imports of rolling mill equipment and complete plants will be required if China is to cover its own requirements for finished steel -- particularly sheet and strip. In the missile program, capacity to roll stainless steel will be especially important. Little is known of China's ability to produce and fabricate such metals as titanium, tungsten, tantalum, beryllium, columbium, and molybdenum. However, evidence exists of problems with steel processing and of efforts to import certain of these special metals and the equipment for their processing. This evidence

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suggests that China is having difficulty producing and fabricating these metals.

Chemical Equipment and Chemicals

37. The technological development of Communist China's chemical industry lagged behind that of other heavy industries up to 1960. Since then, considerable progress has been made in the production of basic chemicals, fertilizers, and plastics; and since 1965 the Chinese have placed a high priority on the development of petrochemicals. China's output of chemicals seems adequate to meet most of the present needs of its advanced weapons programs. [REDACTED] imports of weapons-related chemicals and equipment have been limited in type and quantity.

38. China is capable of producing a small number of solid and liquid propellants for missiles and rockets. In the case of solid propellants, the munitions complex at T'ai-yuan produces traditional types of double-base propellants in sufficient amounts for test and development purposes. Recent acquisition of Western technology for production of nitroglycerin will enhance capabilities for production of traditional solid propellants, but the more advanced (composite) types of solid propellants are not believed to be in production. Of the liquid propellants, China produces alcohol, kerosine, liquid oxygen, and concentrated nitric acid in quantity. China, however, probably produces only small amounts of high-strength liquid propellants such as liquid hydrogen, nitrogen tetroxide, hydrazine, and other amines.

39. The plastics industry of China is new and underdeveloped. Chinese chemists have succeeded in producing some of the more common types of polymers but cannot mass-produce the specialized types that are useful in military weapons. In 1965, China claimed to have mastered the production of teflon; output is small, however, and quality probably is below Western standards. Teflon has a number of strategic uses in the aircraft and electronics industries and is extremely important (because of its resistance to corrosion) as a gasket material in the gaseous diffusion process for the production of U-235.

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40. Specialized types of synthetic rubbers are needed for military programs, yet China produces very little rubber and relies on imports for almost all of its needs. China still lacks processes capable of mass-producing silicone rubbers, oil-resistant synthetic rubbers, and lightweight chemical resistant materials. In the 1950's a 50,000-ton synthetic rubber plant was built by the USSR at Lan-chou; production from this plant still remains far below capacity. Imported plant and technology would be required for expansion of China's synthetic rubber industry. A major reorientation would have to follow in rubber fabricating since present technology in fabricating is based on the use of natural rubber.

### Significance of Imports from Japan and Western Europe

#### General

41. Although China has scored some striking successes in meeting the industrial requirements of modern weapons, it is still unable to produce many of the needed items. Important requirements are and will continue to be met through imports, mainly from Japan and Western Europe. During the 1950's, China relied heavily on industrial assistance from the Soviet Union and Eastern Europe, and more than two-thirds of China's trade was with the Communist world (see Figure 4). After the breakdown in Sino-Soviet economic relations, Chinese trade plummeted and did not begin to recover until 1963. Total trade by now has returned to the pre-1960 level, but with a startling change in pattern -- today three-fourths of China's trade is with the Free World. Furthermore, whereas Communist support in the 1950's provided China with basic across-the-board industrial equipment and technology, current trade is providing China with plant and equipment that embody the latest technology available in the Free World.

42. Imports from the Free World of machinery and equipment and scientific instruments began to grow rapidly in 1963, and in the past three years such imports from Japan and Western Europe totaled more than one-half billion dollars -- up sharply from the first years of the decade (see Figure 1). In 1966, West Germany, Japan, and the United

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Kingdom were the chief suppliers of machinery and equipment and scientific instruments to China, with France providing a smaller but still important share, as follows:

	<u>Million US \$ (f.o.b.)</u>			
	<u>West Germany</u>	<u>Japan</u>	<u>United Kingdom</u>	<u>France</u>
Machinery and equipment <u>a/</u>	48.7	44.4	39.0	17.0
Of which:				
Metalworking machinery	10.5	6.1	3.3	2.9
Machinery for special industries	1.9	3.4	1.1	3.9
Non-electric machinery	18.8	15.9	18.5	2.4
Electric power machinery	0.3	0.8	0.7	0.4
Telecommunication apparatus	1.8	0.9	2.8	0.3
Other electrical machinery	2.2	9.3	6.4	1.8
Scientific instruments	4.2	6.8	8.1	0.7

*a. Excluding transport equipment.*

Although these goods are crucial to Communist China, the Chinese market accounts for only a small portion of exports by the four suppliers.

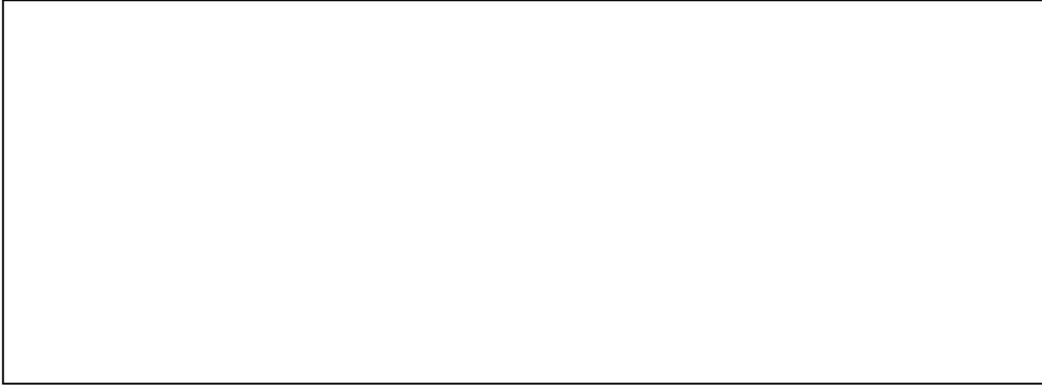
43. Imports of industrial materials from Japan and Western Europe have also risen sharply. In 1966, these imports -- excluding chemical fertilizer -- were about \$300 million compared with about \$50 million in 1962. In 1966, these imports included such items as stainless steel, chromium, nickel, and teflon.

44. Except for the United States and the Soviet Union, nations embarking on modern weapons programs must import certain advanced machinery and specialized materials. These imports often have non-military uses as well. In the case of China, however, it is highly probable that such imports are in fact used to produce modern weapons; in

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China, (a) civilian needs are kept simple; (b) available high-quality resources are scarce; and (c) the system of economic priorities favors weapons production. In a nation with a broader industrial base and higher living standards, the end use of these imports would be far harder to ascertain.



46. The value of the items which have been identified as delivered or contracted for totals \$120 million to \$160 million. Many of the items were procured by China outside normal trade channels at premium prices; thus, the cost to China for these imports probably was in the upper range of the above estimate. These estimates, it should be emphasized, are based only on the items which have been identified. The value of these commodities would be considerably larger if detailed information were available on all shipments of strategic items -- possibly up to \$200 million in the past three years. Metallurgical plant and equipment represent the largest value figure -- a minimum of \$75 million and possibly as much as \$100 million. Electronic equipment and precision instruments constitute the largest number of items, representing a minimum value figure of \$25 million. The 207 items delivered on the machine building list have a minimum value figure of \$15 million, and the 18 items delivered or under contract on the chemical list cost a minimum of \$3 million.

#### Machine Building Equipment

47. Imports of special purpose and precision machine tools from Japan and from three industrial nations in Europe (the Federal Republic of Germany, the United Kingdom, and France) increased sharply

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from about \$1 million in 1963 to more than \$25 million in 1966. Orders for future delivery almost certainly will continue to increase as weapons production grows in size and complexity. Recent Chinese purchases have included high-precision jig-borers, profile milling machines, copy milling machines, precision gear grinders, and numerically controlled machine tools.

48. A good example of a machine that almost certainly is destined for use in the Chinese weapons program is the honeycomb milling machine. This versatile machine shapes honeycomb cores of asymmetrical form for wing and helicopter rotor blades. In addition, China has imported equipment for production of hydraulic mechanisms useful in the aerospace industry and has contracted for equipment capable of the precision machining of large missile parts.

#### Electronic Equipment and Precision Instruments

49. An impressive list of electronic equipment and scientific instruments has moved from the Free World to China in recent years.

The contribution of these items to advanced weapons programs has been accelerating. A recent example is China's intensive buying of high-precision theodolites in the West during January-September 1967. Instruments of this type are needed in the deployment of surface-to-surface missiles. The Chinese have purchased or were negotiating for more than 400 theodolites to be delivered in 1967-68; they purchased only about 20 from the West in 1965-66. The number and quality of theodolites far exceeds Chinese needs for geodetic surveying or construction work. The list covers end products, components, and test equipment and includes vibration equipment, tracking radar, telemetering equipment, digital computers, special-purpose electron tubes such as magnetrons and klystrons, and equipment for acquiring missile flight data.

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50. Numerous items of production equipment are also moving, including complete plants. For example, the import of semiconductor production equipment from the Free World is mainly responsible for recent Chinese progress in establishing the production of transistorized military electronic equipment. Of some 30 known major semiconductor manufacturing facilities in Communist China, seven were originally equipped by the Soviet Union and in operation by mid-1960. The remaining facilities -- put into operation during the years 1962-65 -- were equipped with Free World production equipment or domestic equipment copied from Free World production equipment. [redacted] suggest that in at least two of the original Soviet-aid plants, Soviet equipment has been replaced with Free World equipment. In addition to electronic equipment, China continues to be dependent on imports of raw and semifinished materials, including quartz and high-purity copper.

Metallurgical Equipment and Materials

51. The development of new lines of military production calls for parallel advances in metals production and processing. China has been shopping for a broad range of production and processing equipment for space-age metals. China has sought particularly to buy special furnaces for the processing of refractory alloys and high-strength steel. Peking has scored some successes in these negotiations -- including the purchase of furnaces required for the production of very-high-temperature metals for rocket engines. [redacted]

52. China also has had some success in obtaining equipment for refining and fabricating such materials as tantalum and beryllium oxide. In addition, China has concluded a number of transactions for precision rolling and finishing mills, including mills capable of high-temperature rolling of such metals as tantalum, uranium, and zirconium. Finally, resource deficiencies in important alloying metals have been made up through imports. Some of these latter imports such as

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chrome, cobalt metal, and nickel have come from Free World countries.

#### Chemicals and Chemical Equipment

53. Over the past two and one-half years, a growing number of items of chemical equipment and special chemicals have moved from the Free World to China.

[REDACTED]  
[REDACTED] Included among the equipment and technology have been:

- a. equipment to produce chemicals for fuel binders for solid propellants,
- b. a plant to produce silicones that have important applications in electronics used in aircraft and missile production, and
- c. technology for the manufacture of nitroglycerin in forms suitable for production of solid propellants.

Among the chemical products that have been imported are: lubricants, fluids, and corrosion-resistant plastics which can tolerate extremely wide temperature ranges and certain amines and other chemicals useful in the production of missile fuels.

#### Acquisition of Technical Data

54. Communist China has long been engaged in an extensive program of acquiring and exploiting foreign scientific and technical literature. Most of this information is readily available in non-Communist countries from libraries, bookstores, universities, and scientific publishing houses. Furthermore, Chinese commercial and scientific delegations obtain as much technical and scientific literature as possible during their visits to industrial sites, commercial laboratories, scientific institutes, and scientific conferences. A

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given Chinese delegation may leave several hundred pounds of literature behind for their local embassy to ship to the Mainland.

55. Technical data and training are also acquired by Communist China as the result of advanced training provided by Free World countries to Chinese engineers and scientists. Perhaps the greatest source of technical literature, however, comes from China's commercial activities. The Chinese use every contract and every stage of commercial negotiation as vehicles for obtaining great quantities of information on technical processes. The Chinese may even request literature completely unrelated to the items under negotiation. Lastly, on some occasions, the Chinese have levied a specific requirement for specialized technical literature on agents and sympathizers in order to procure such information without demonstrating Chinese interest in the subject.

The Effect of Present Trade Controls

56. Considerably less than one-half of the items [redacted] are embargoed under the COCOM controls and nearly all of the items probably would have been embargoed under the defunct CHINCOM list. In the electronic and instrument category, close to one-half the items are COCOM controlled, and almost all would have been on the CHINCOM list. Only the metallurgical list shows a majority of items shipped or delivered as being embargoed, and many of these are subject to differing interpretations of the COCOM list.

57. Despite the presence of many of these items on the COCOM embargo list, a large number of strategic items have been or are being shipped to China from nations which generally support COCOM controls. The largest loophole is the administrative exception procedure, whereby a government unilaterally permits the export of an item in the list. The increased use of this mechanism is shown in the following tabulation of electronic equipment and scientific instruments exported under administrative exceptions from China's principal Free World industrial trading partners, 1963-66:

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	Thousand US \$			
	<u>1963</u>	<u>1964</u>	<u>1965 a/</u>	<u>1966 a/</u>
United Kingdom	721.6	1,033.7	2,921.3	4,753.1
France	N.A.	219.8	22.1	2,125.0
Japan	130.0	14.2	N.A.	640.9
West Germany	34.1	72.8	340.1	382.0
Minimum total	885.7	1,340.5	3,283.4	7,901.1

*a. Because of rounding, components do not add to the totals shown.*

58. Another loophole is the differing interpretations of the definitions of items on the COCOM lists. Examples of this are the continued shipment of production and processing equipment even though the end-product of such production or processing is itself embargoed. Furthermore, some of the most critical items exported, particularly items clearly falling under the COCOM embargo, are shipped illegally -- by diversion through a third country, by false documentation, or by outright smuggling -- usually as a result of lax administrative procedures in the responsible government ministry. All of these latter procedures have been used at one time or another for items on the appended lists.

#### Minor Position of Communist Trading Partners

59. Trade with the USSR and the Eastern European Communist countries now contributes little to China's weapons program, despite the fact that it consists primarily of machinery and equipment. Much of this trade is in transportation equipment, and most of the balance consists of simpler items than those obtained from the Free World. Even though China did obtain its first electron beam furnaces from East Germany, practically all advanced technology secured in recent years has come from the Free World. If China were cut off from Western materials and technology, the USSR and the Eastern European countries could supply many of the items China needs for its weapons program. However, they probably could not supply in quantities sufficient for all of China's needs and almost certainly could not meet the high technological levels embodied in present Chinese imports from the Free World.

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Because of the present political tension between China and other Communist states, these nations might not wish to help China in its weapons program.

#### Outlook

60. The need to expand imports of strategic goods from the West will grow as China continues to pursue more independent military R&D efforts and ambitious production-deployment programs. In the long run a possible constraint on the flow of these imports might be China's supply of foreign exchange. Chinese earnings of foreign exchange probably will grow only slowly in the next few years. Prospects for substantial increases in agriculture and industry -- which are necessary for the expansion of Chinese exports -- are poor. In addition, the expansion of exports to the Free World in the past few years has in part represented recovery of markets lost in 1960-62; thus, marketing problems will become much greater as Peking attempts to expand exports. Further shifts in exports from Communist to Free World markets are not likely to be large with trade with the USSR and Eastern Europe already at an extremely low level.

61. In the next few years, however, foreign exchange limitations on China's ability to import strategic goods will not be severe. China now has some \$650 million in gold and hard currency reserves and could obtain additional foreign exchange for purchase of strategic goods by curtailing imports of such non-strategic goods as, for example, grain or transportation equipment. There are current indications of cuts in imports of non-strategic machinery and equipment. The most recent statistics on trade with the principal suppliers of strategic materials show a drop in total imports of machinery and equipment from Japan, West Germany, France, and the United Kingdom. However, imports of the items most closely related to modern weapons continue their upward trend. Accordingly, China should have adequate means to import the critical strategic items required in the foreseeable future. Lastly, substantial credits from China's trading partners are likely to be available if China becomes faced with a tight foreign exchange situation.

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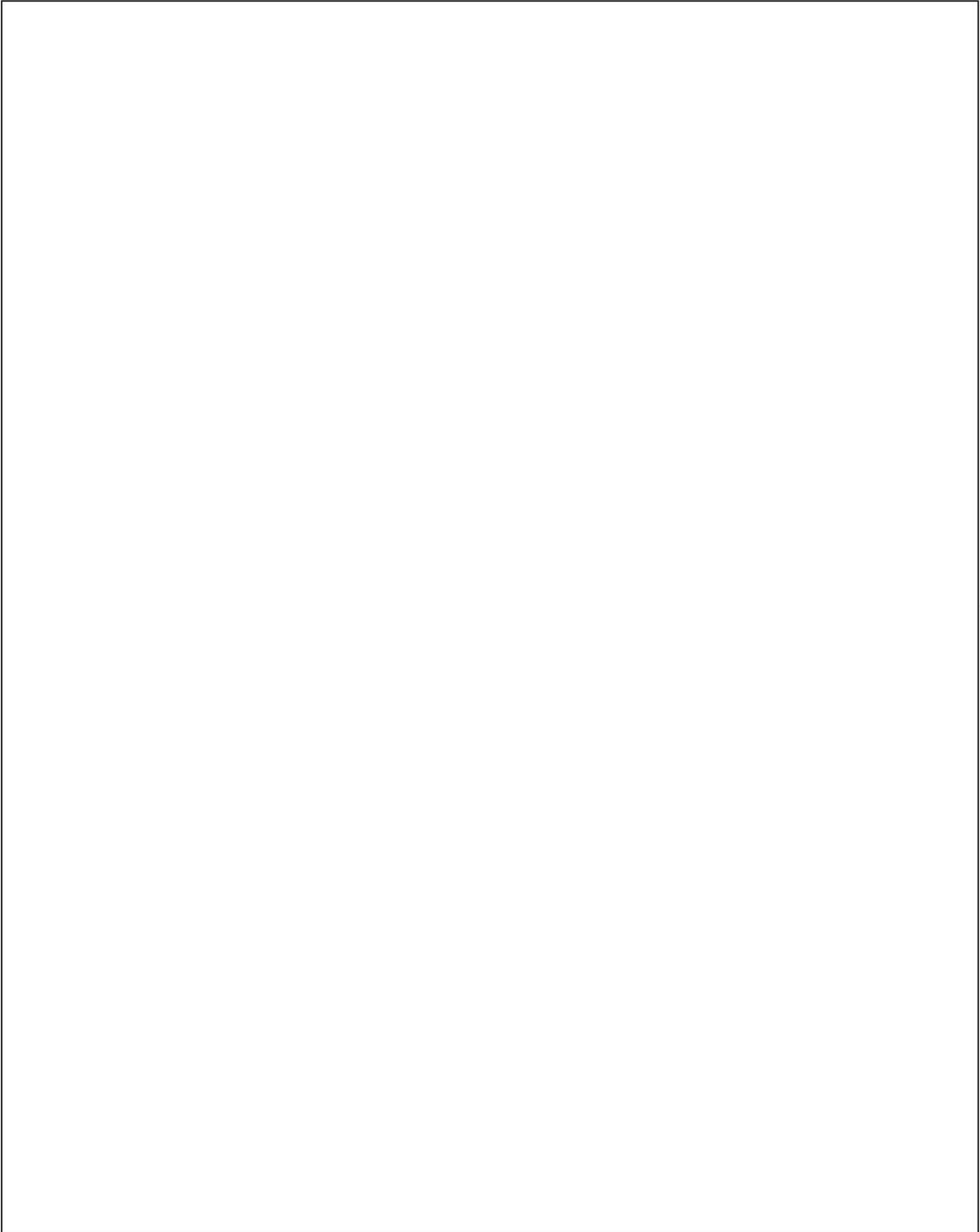
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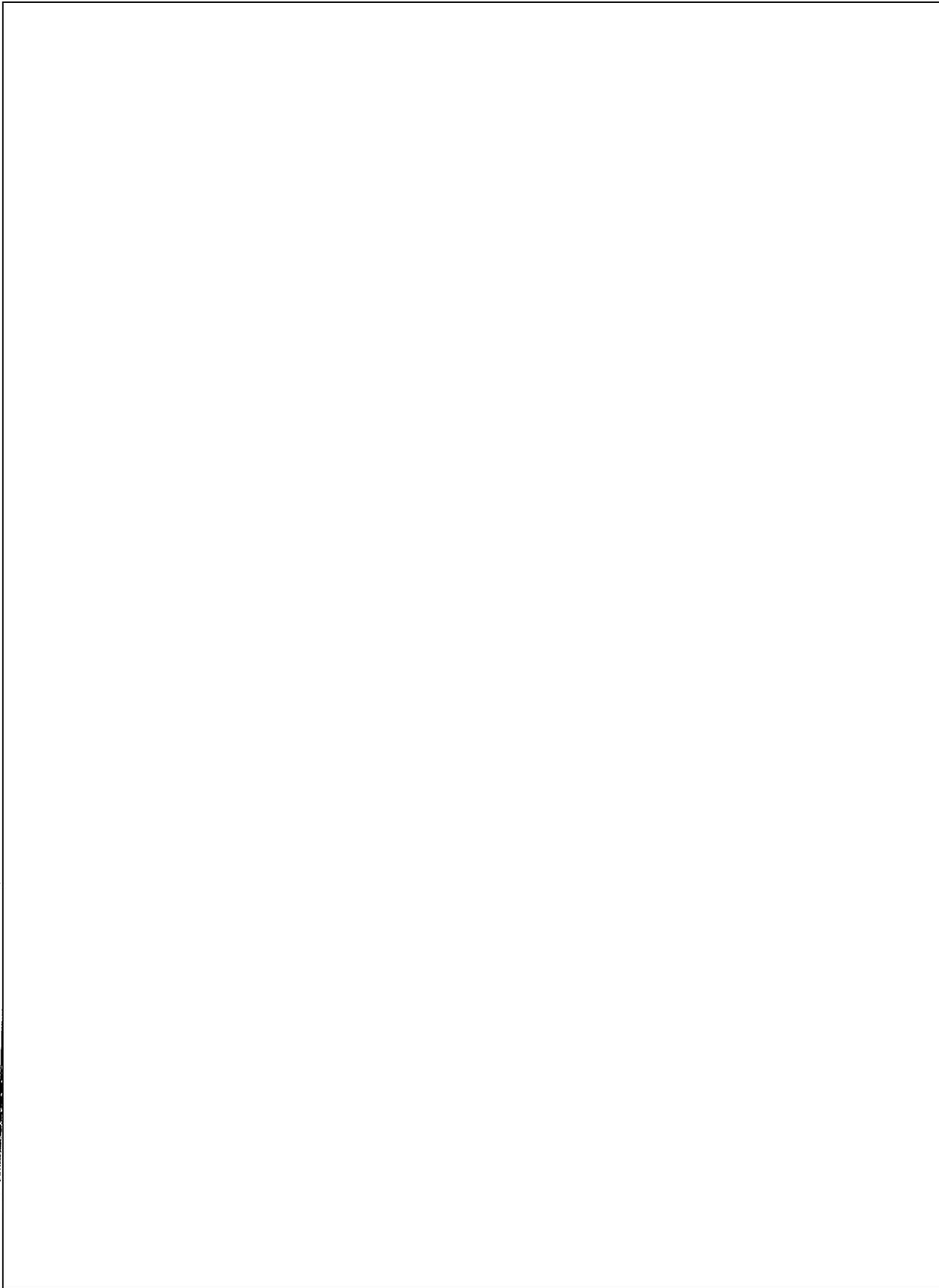
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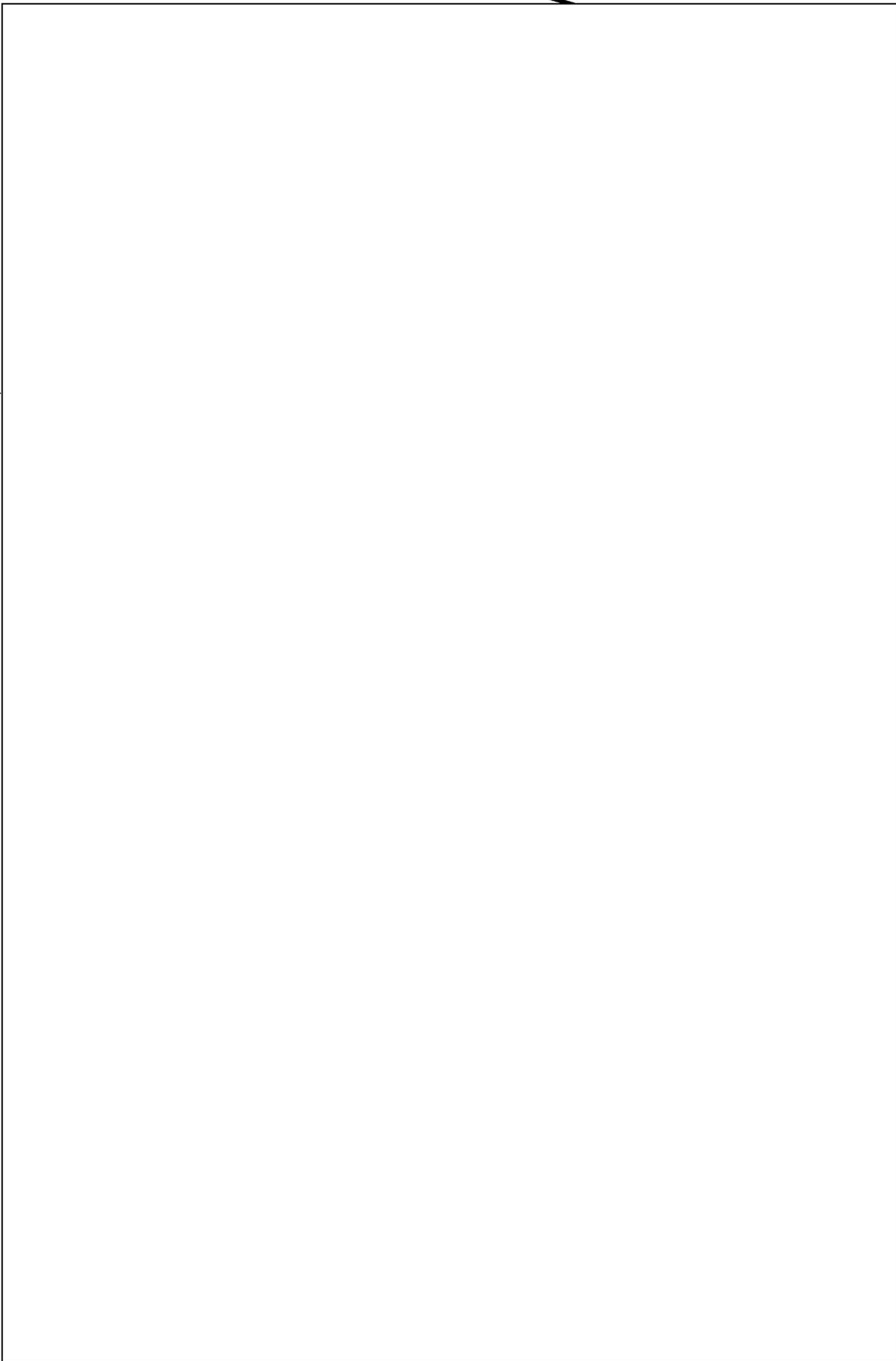
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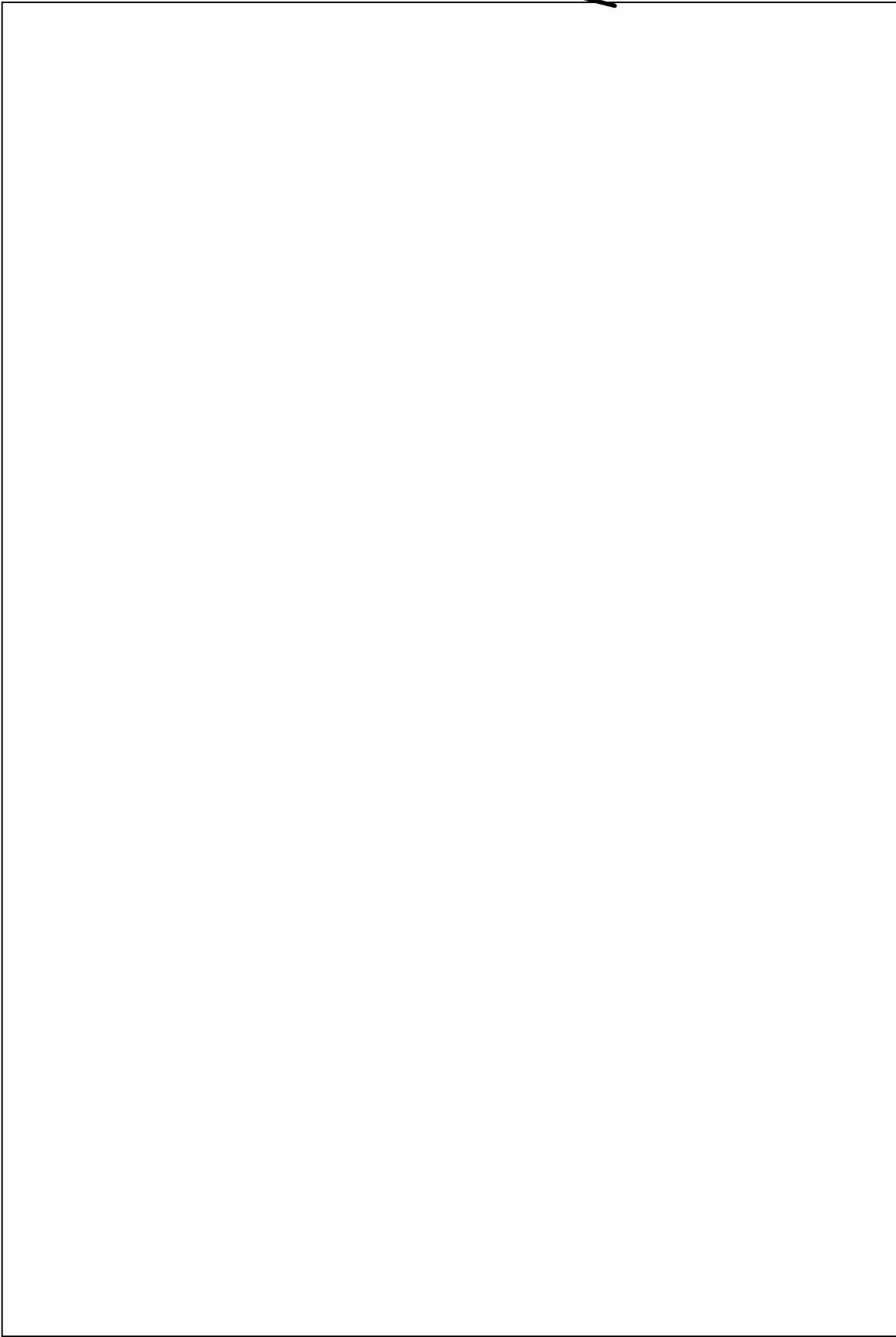
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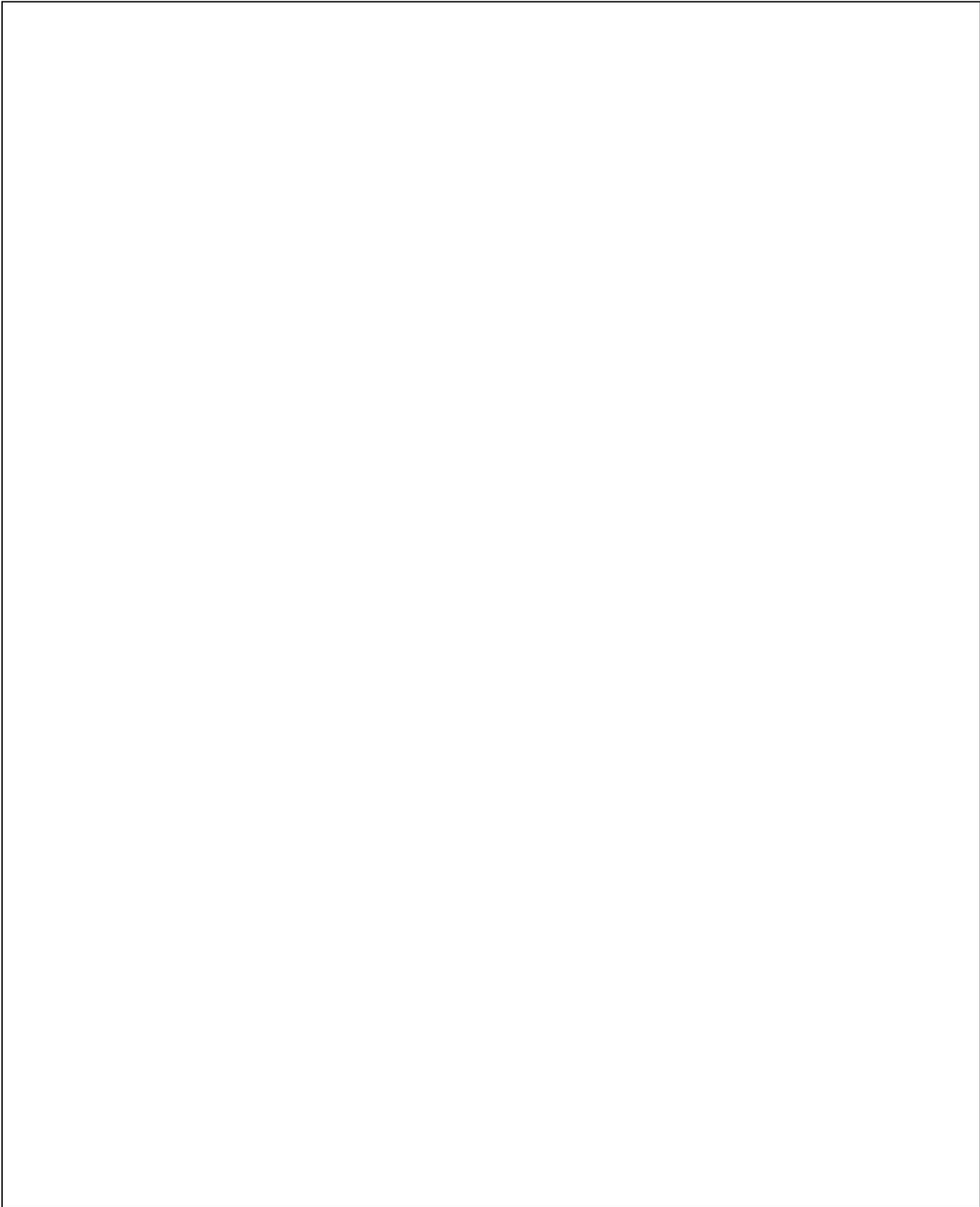
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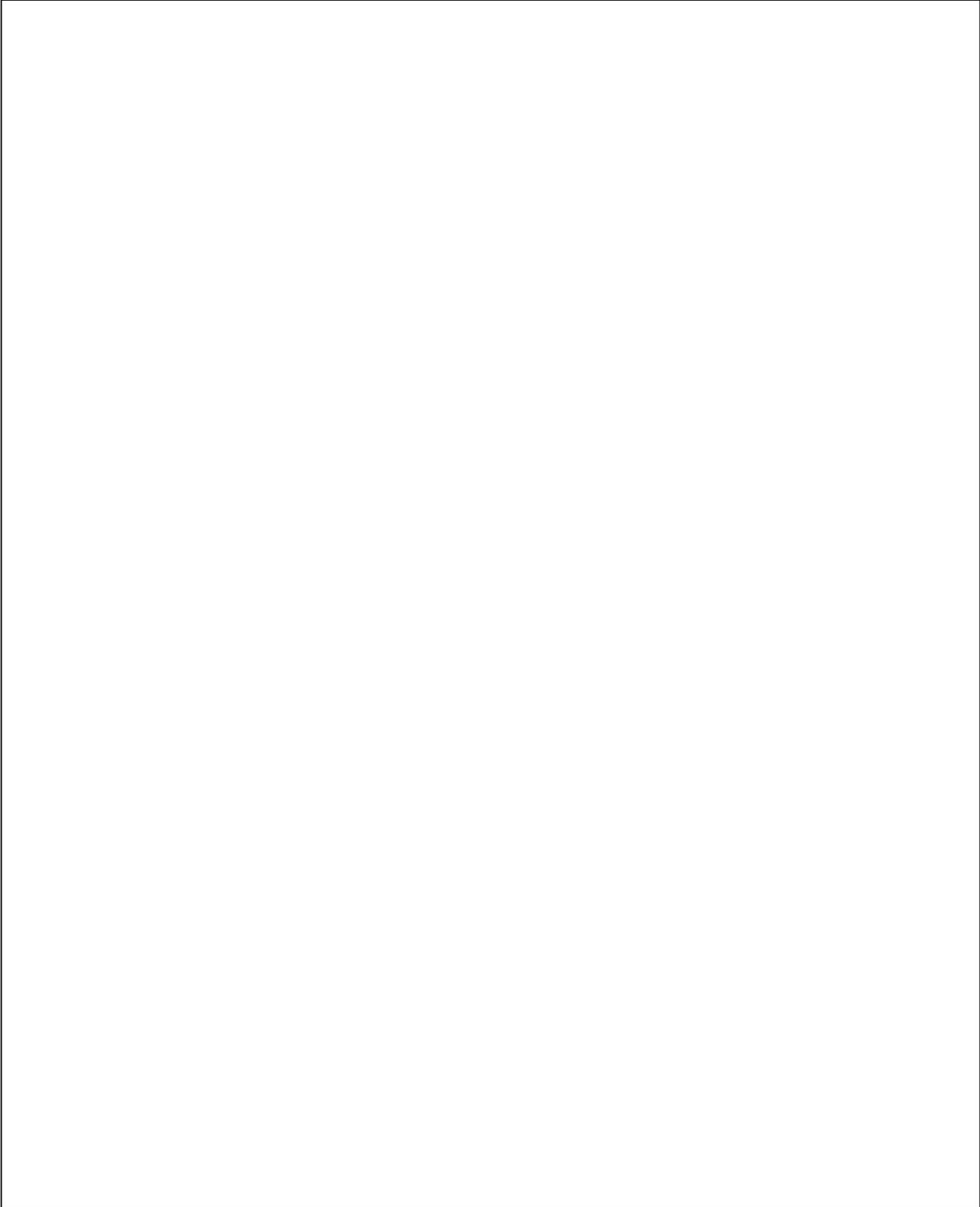
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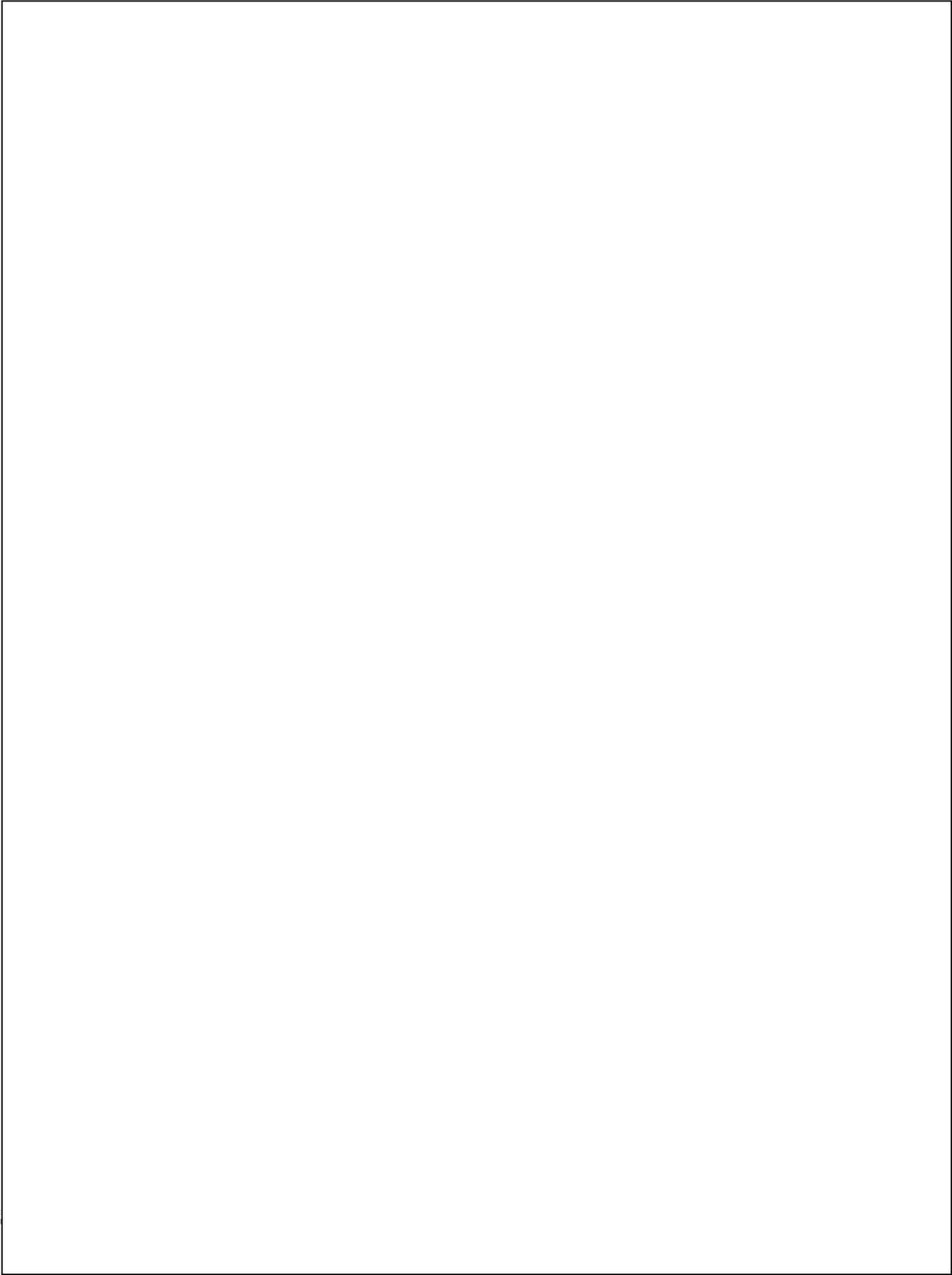
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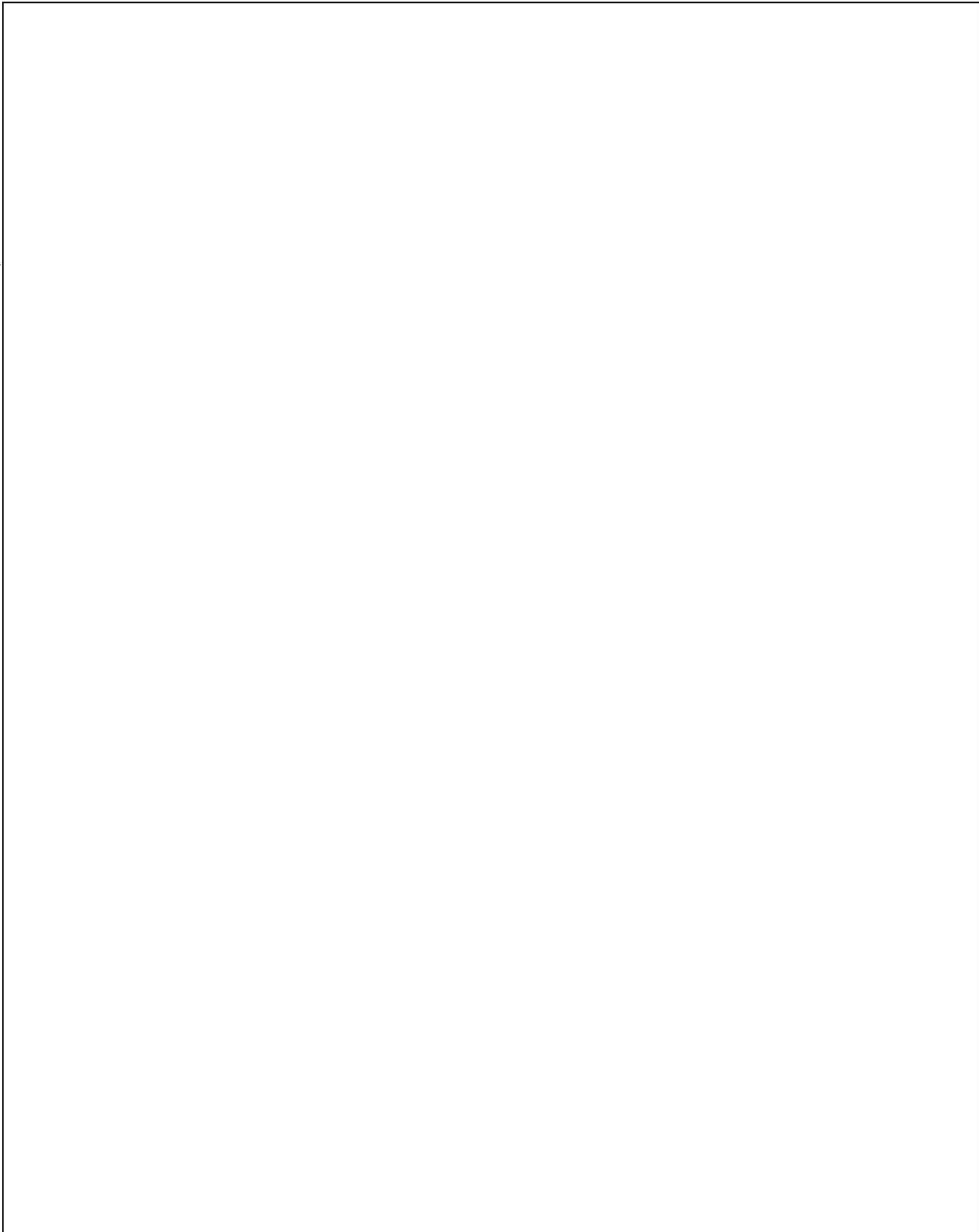
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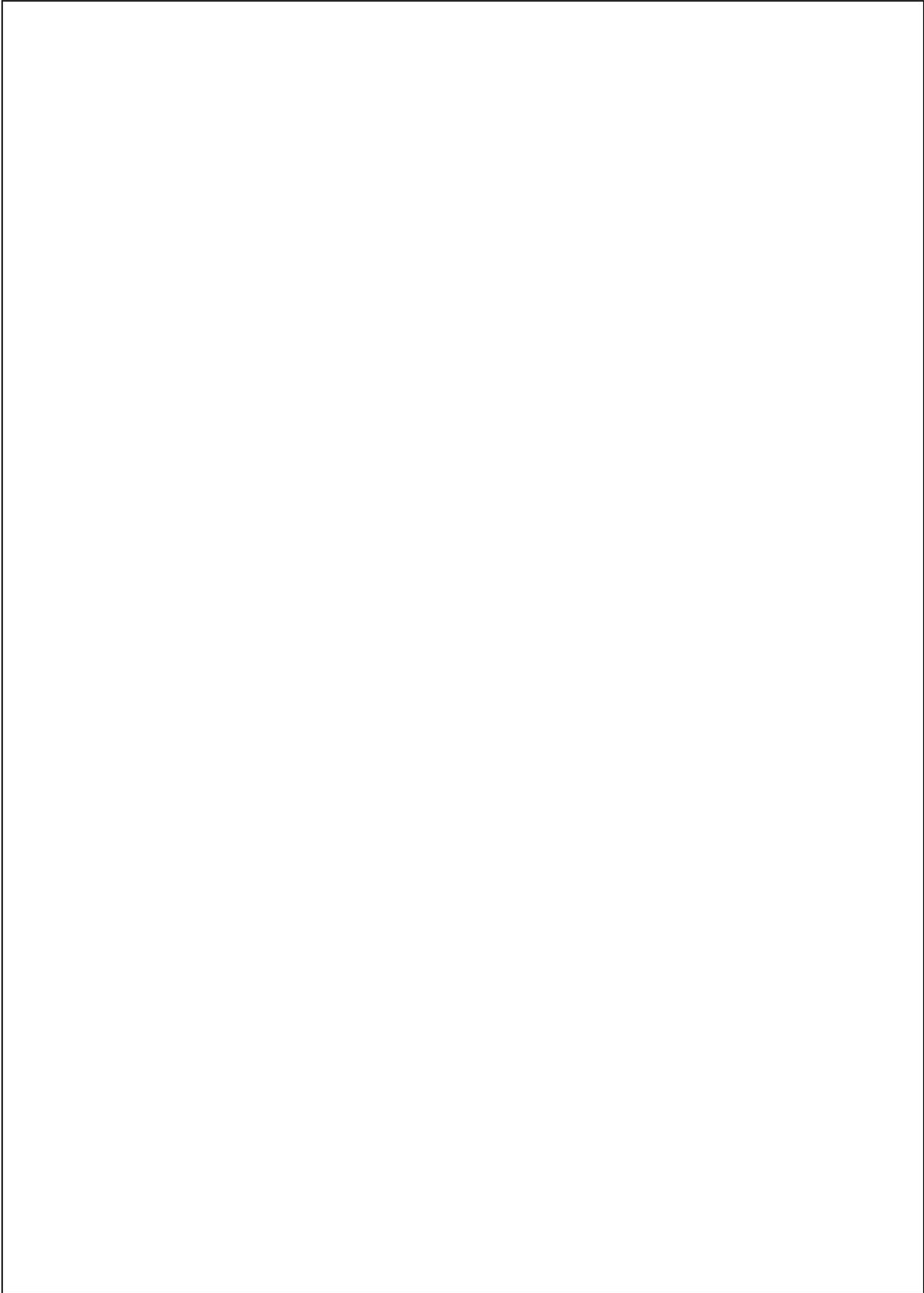
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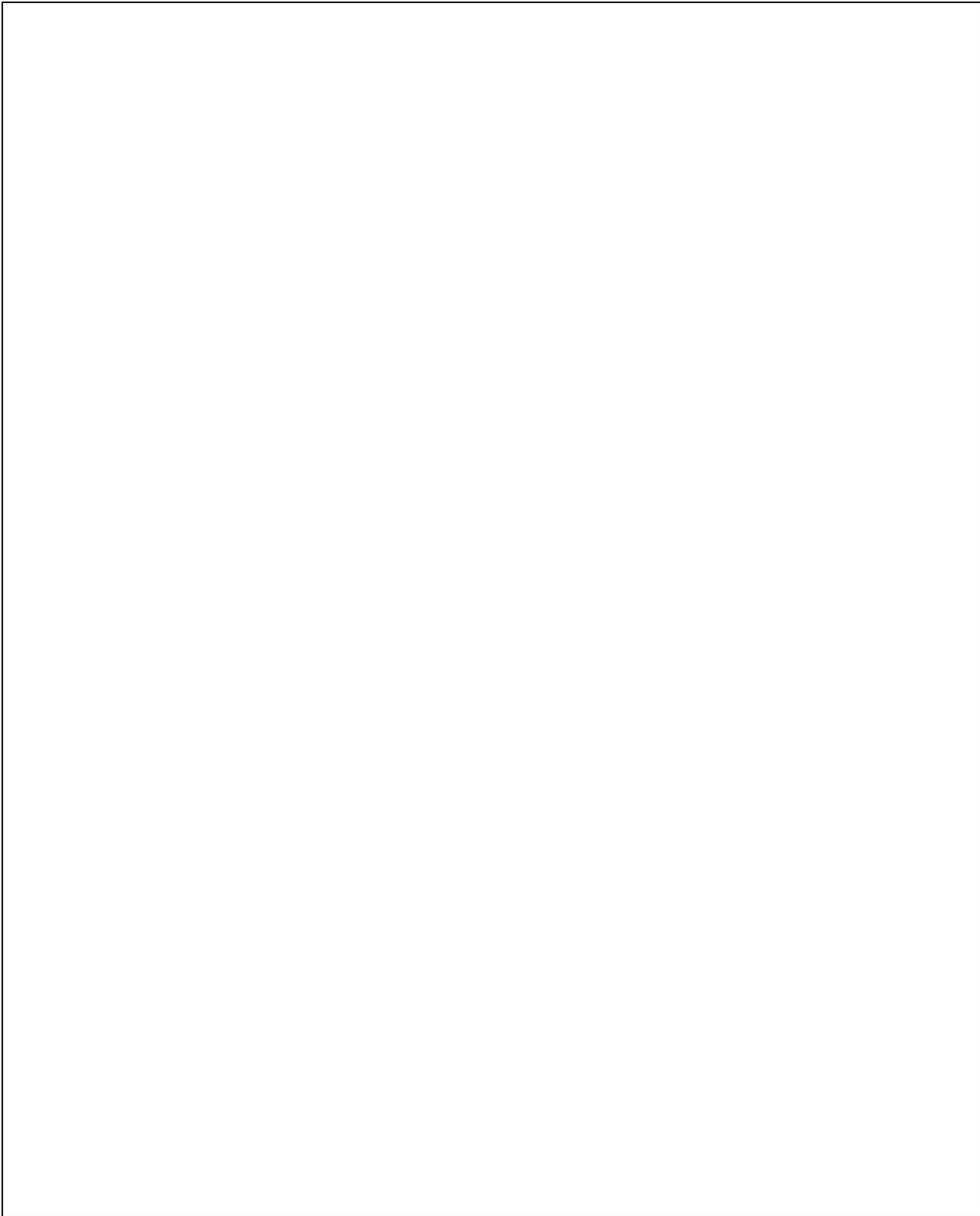
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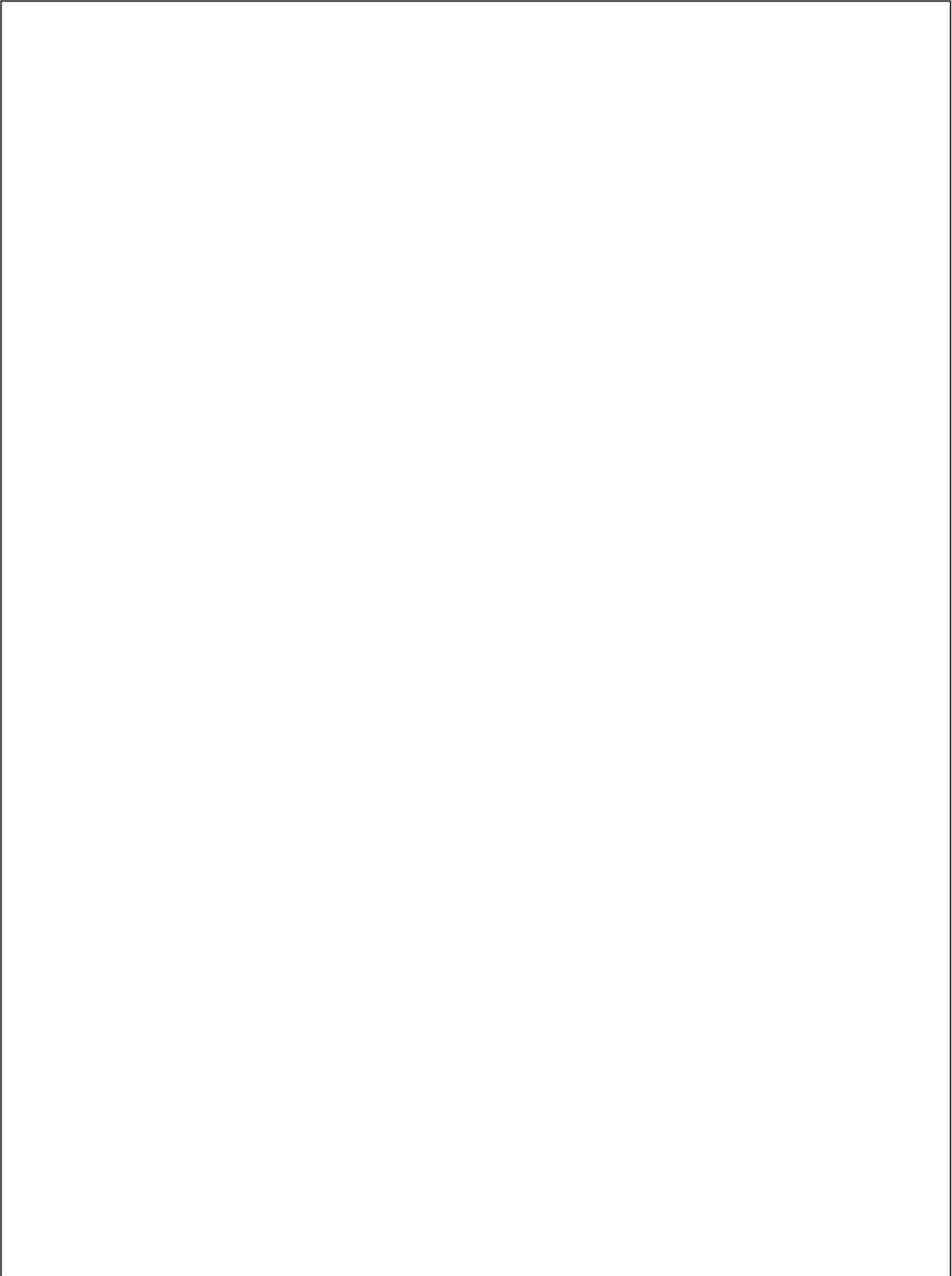
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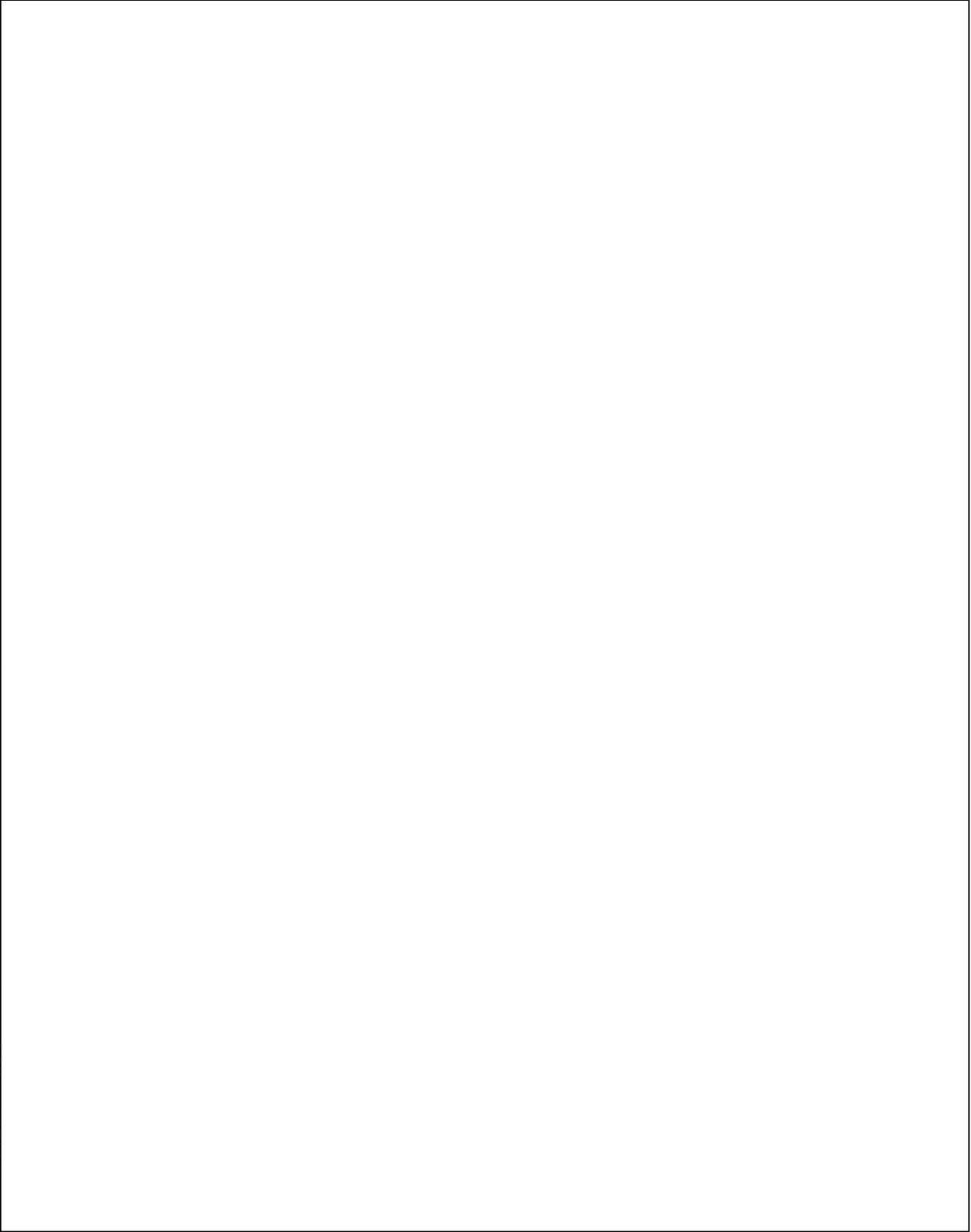
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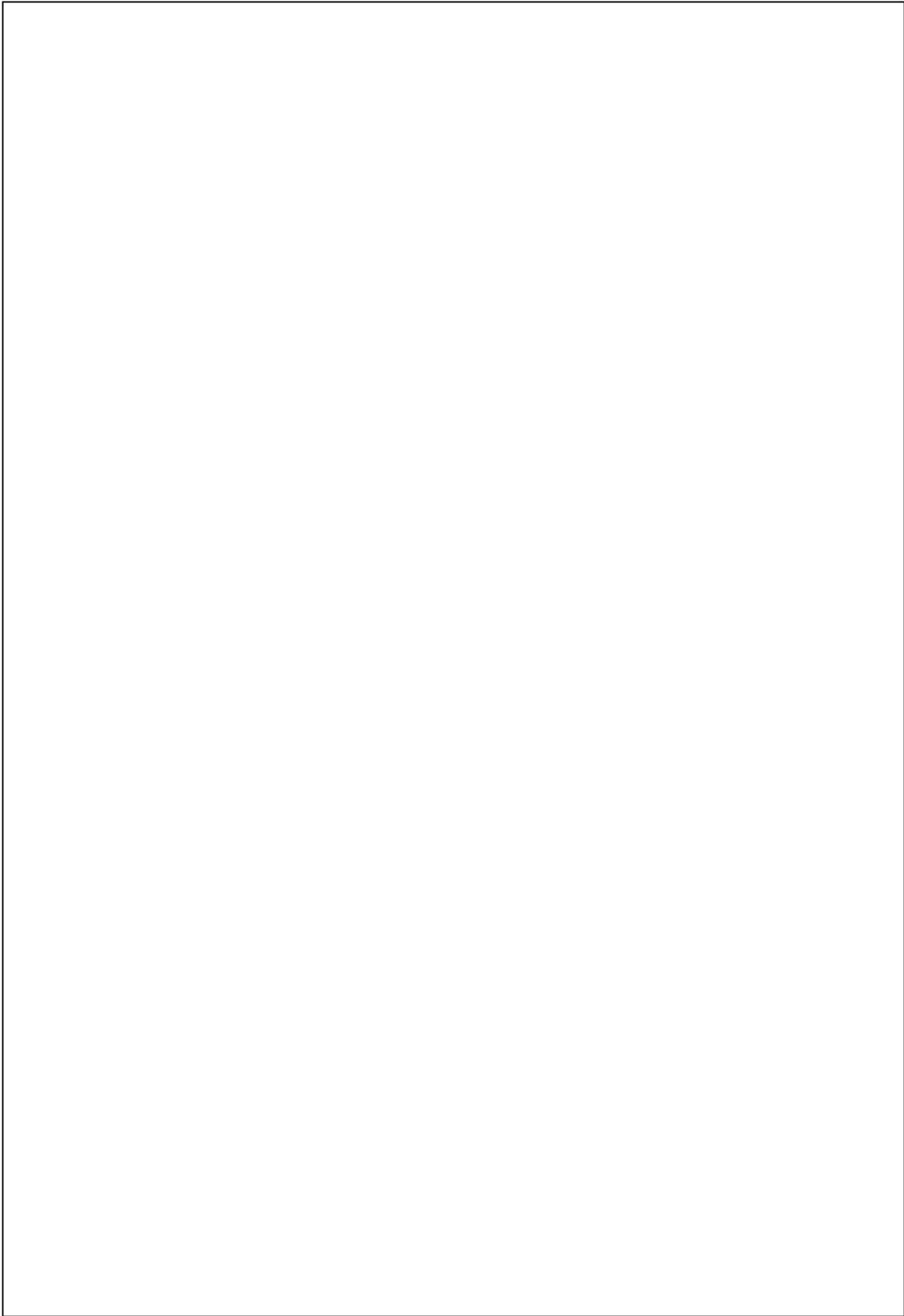
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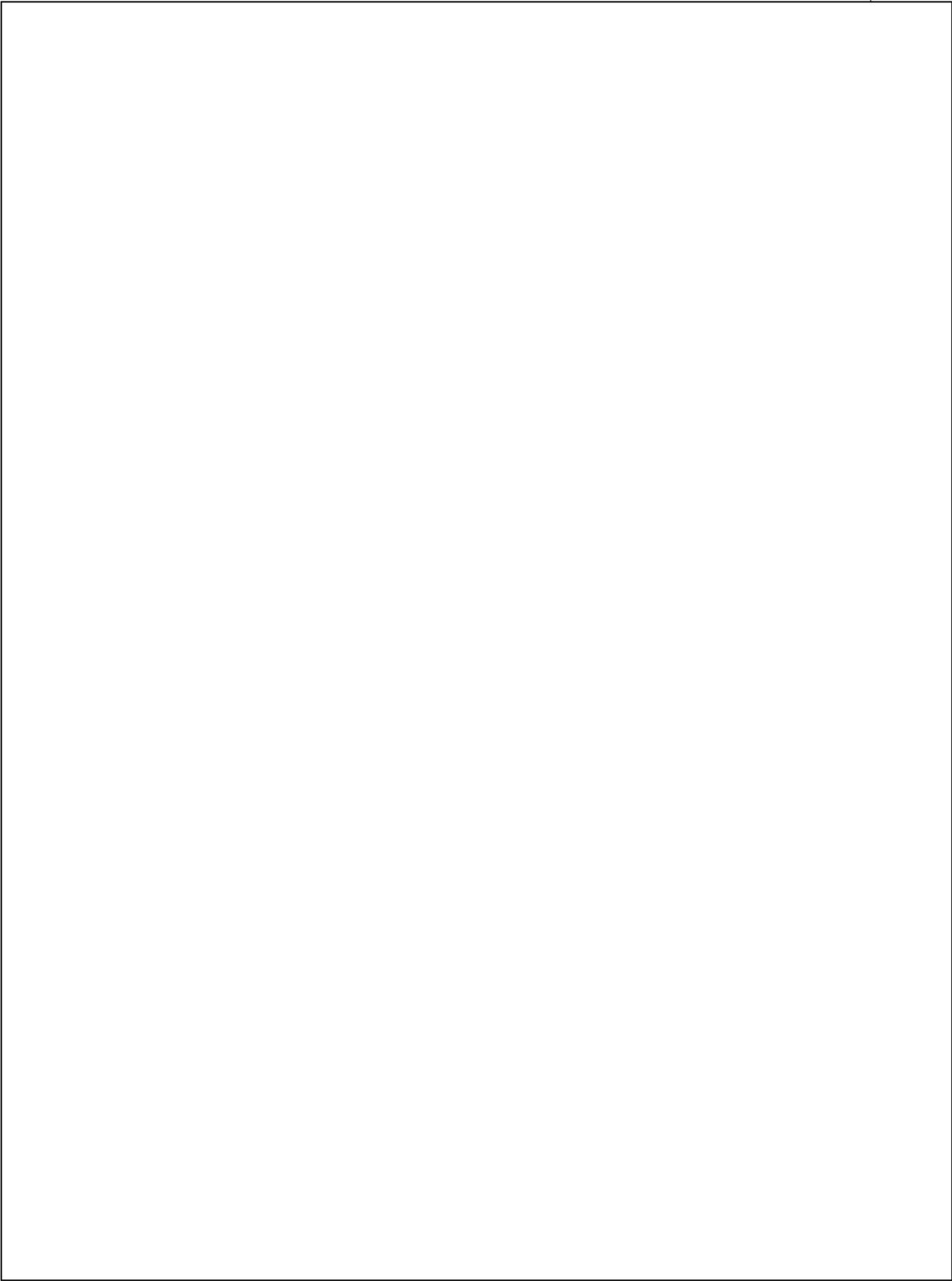
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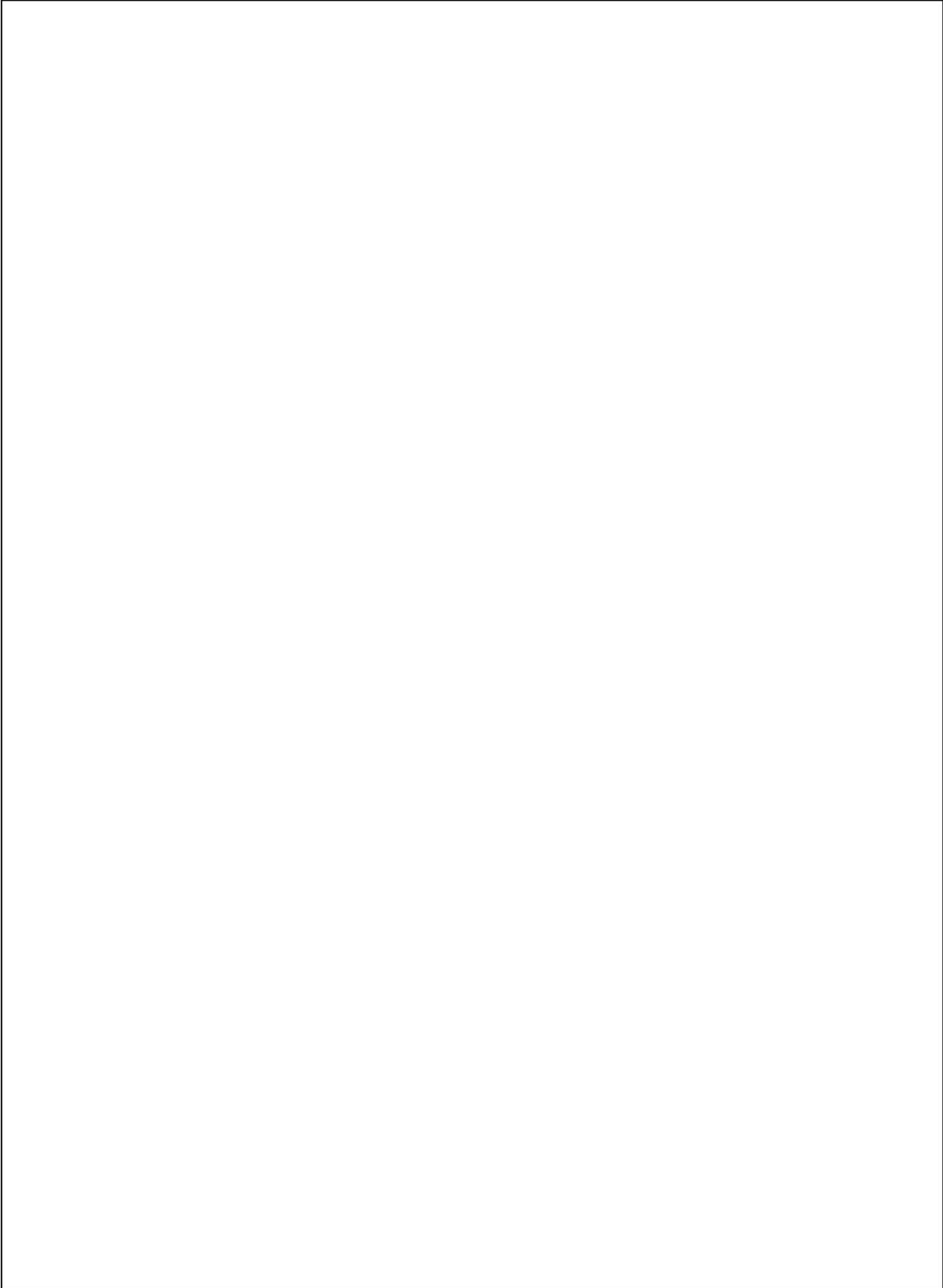
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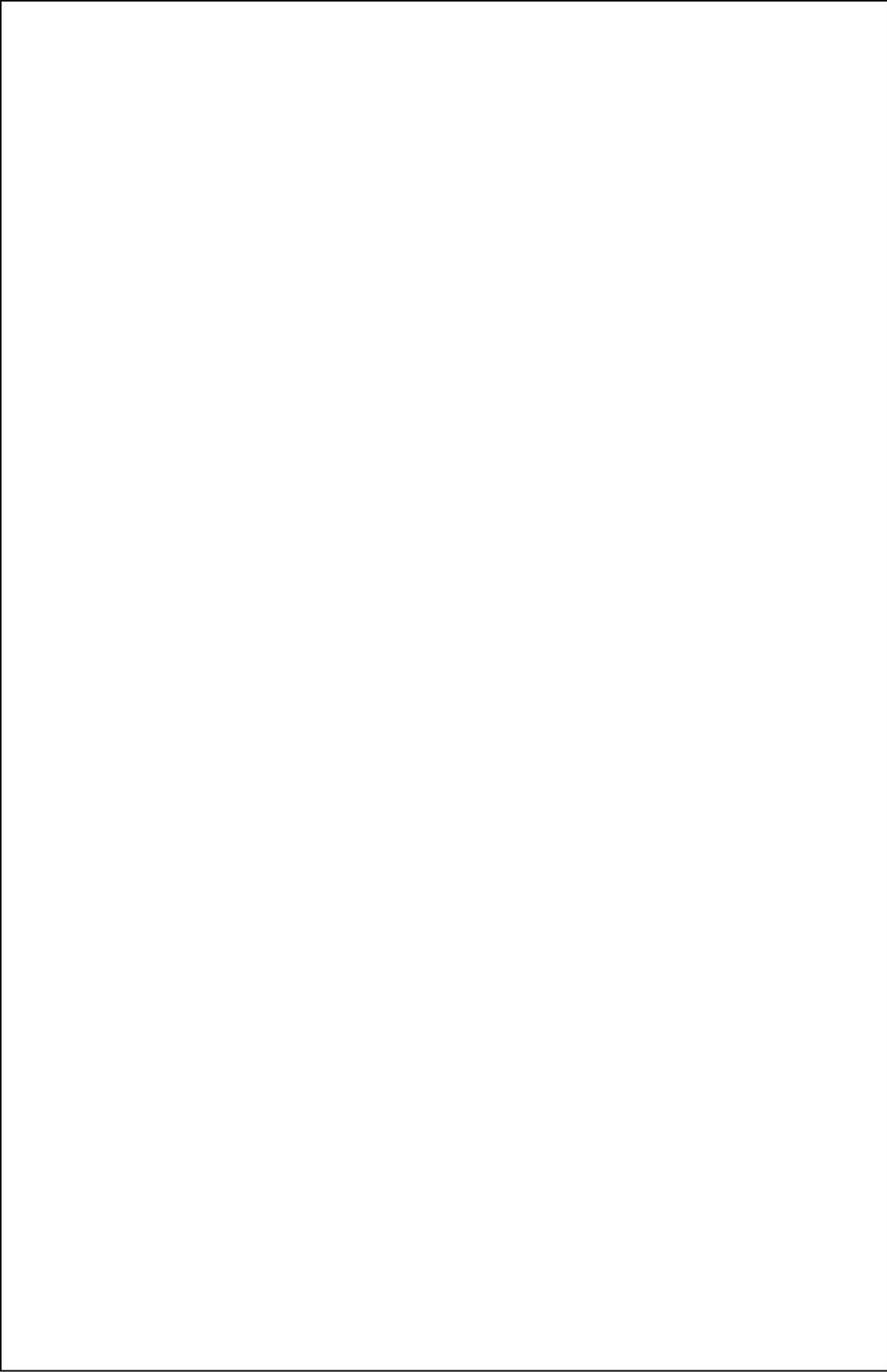
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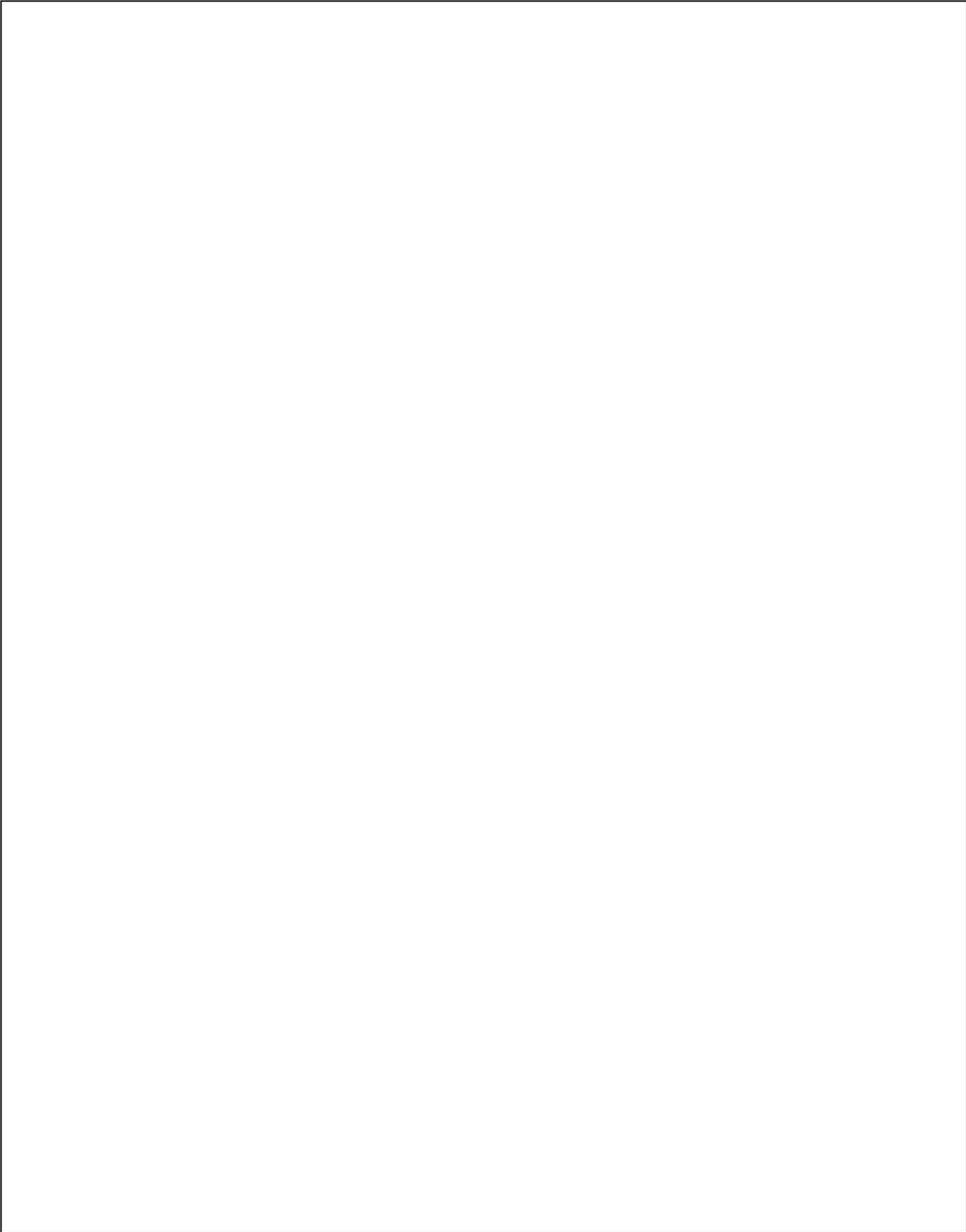
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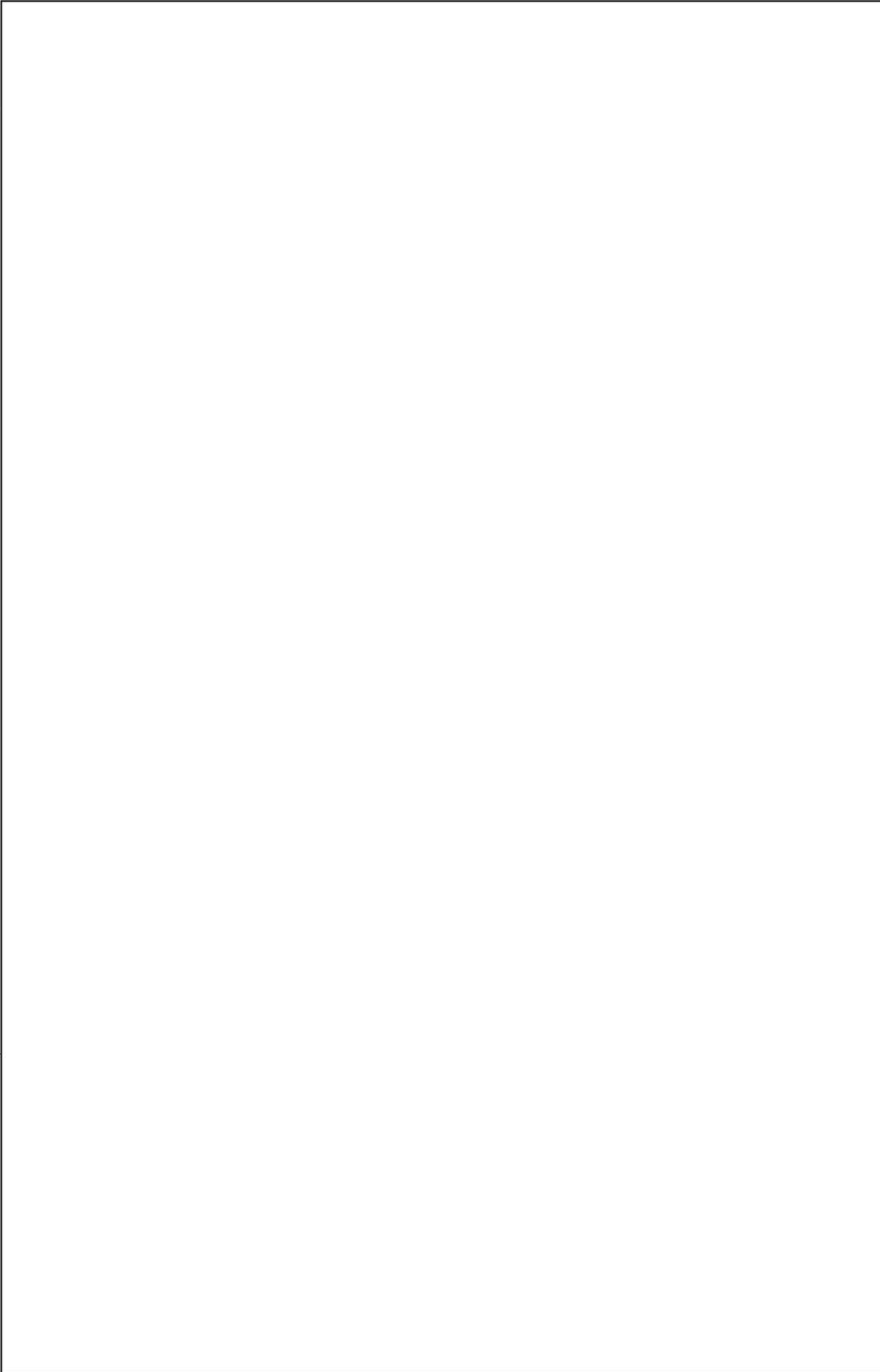
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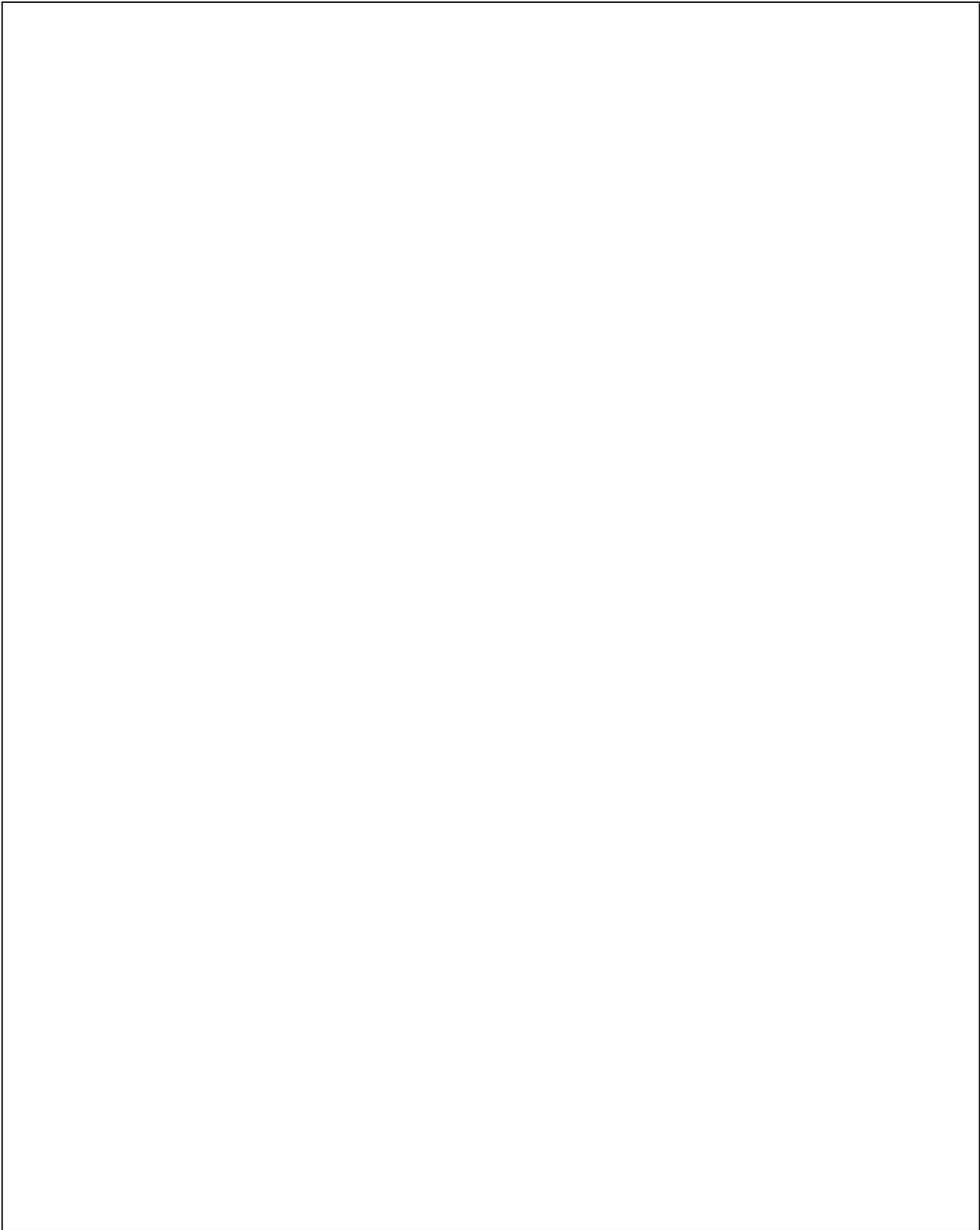
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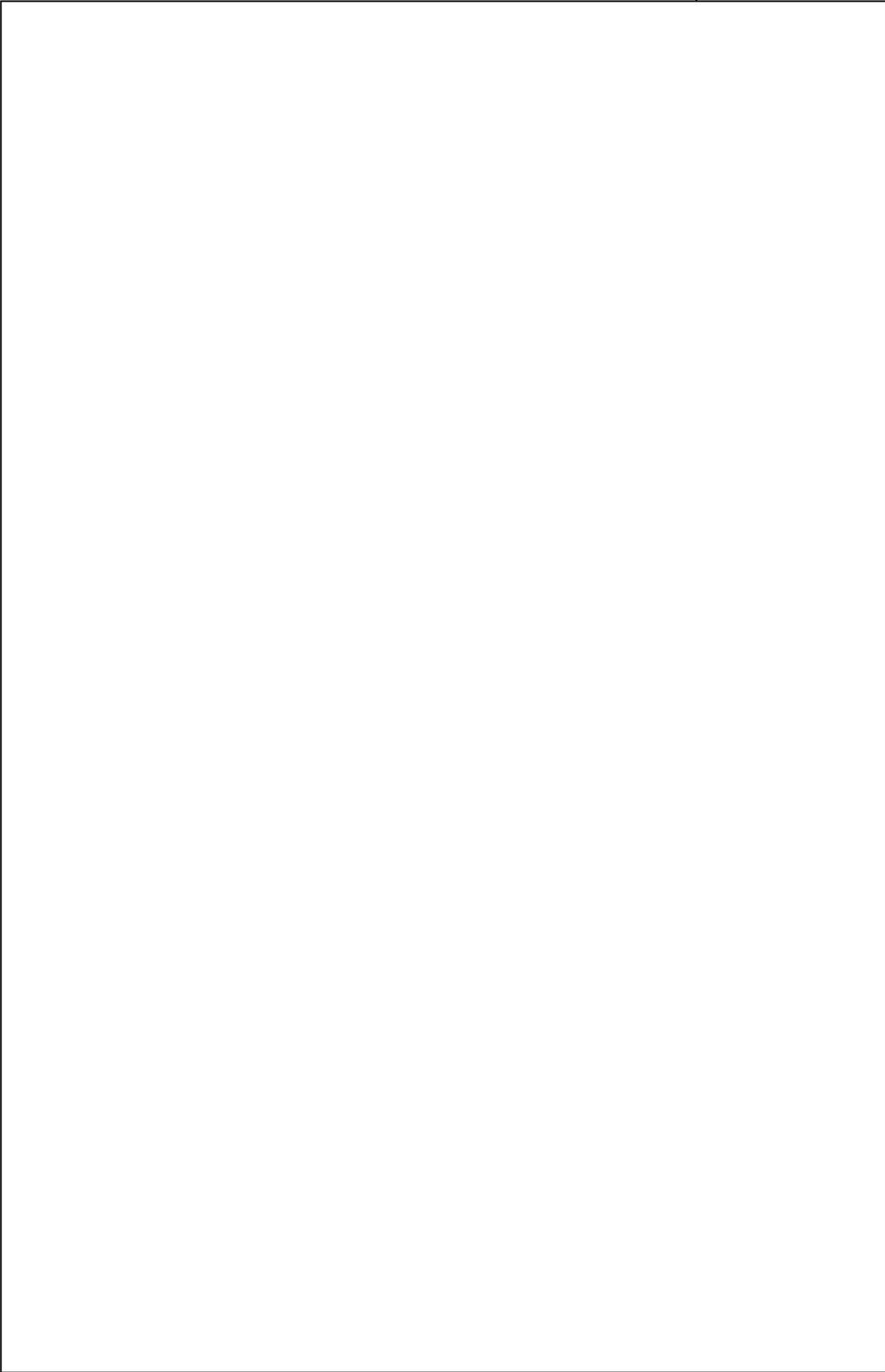
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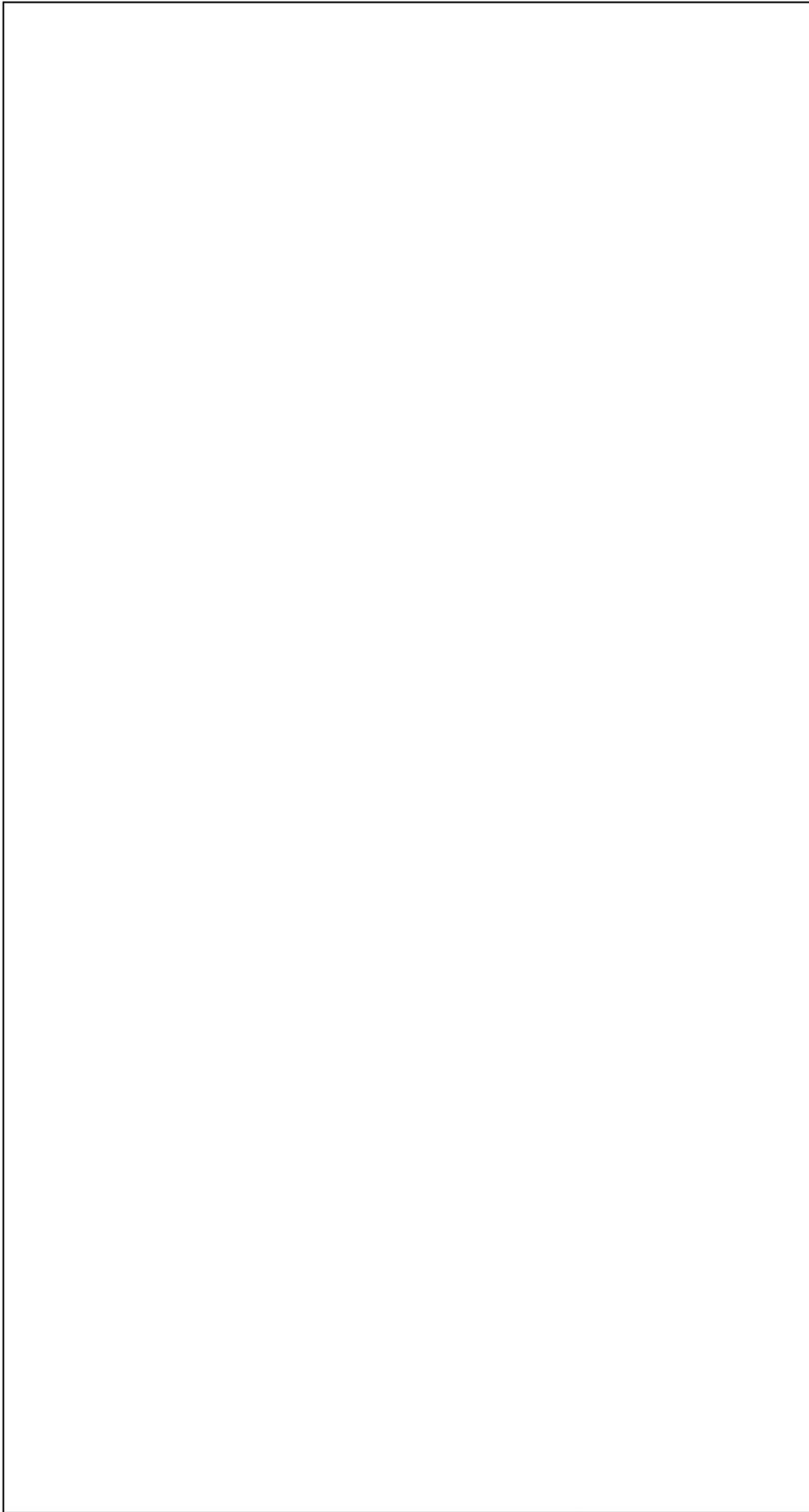
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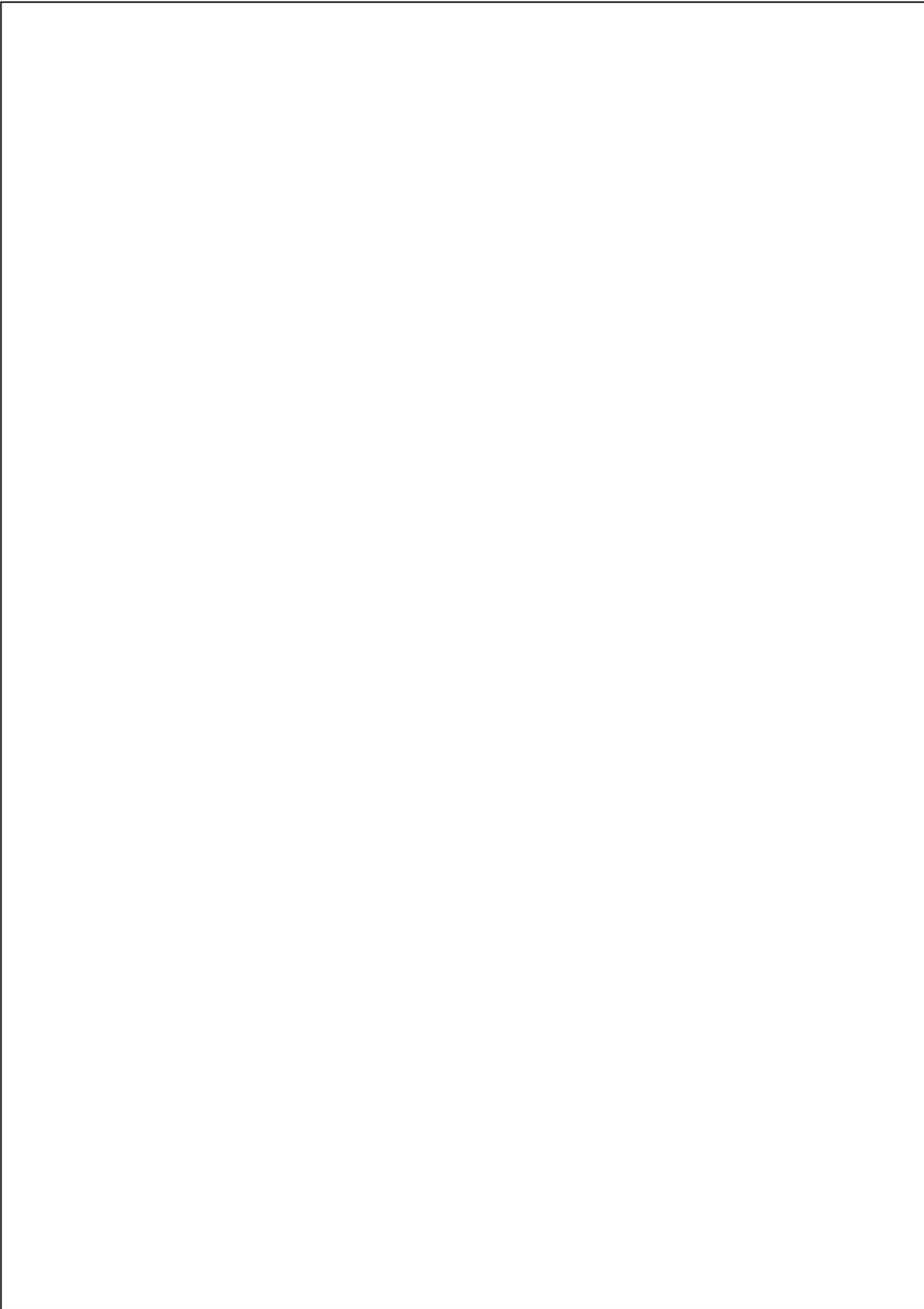
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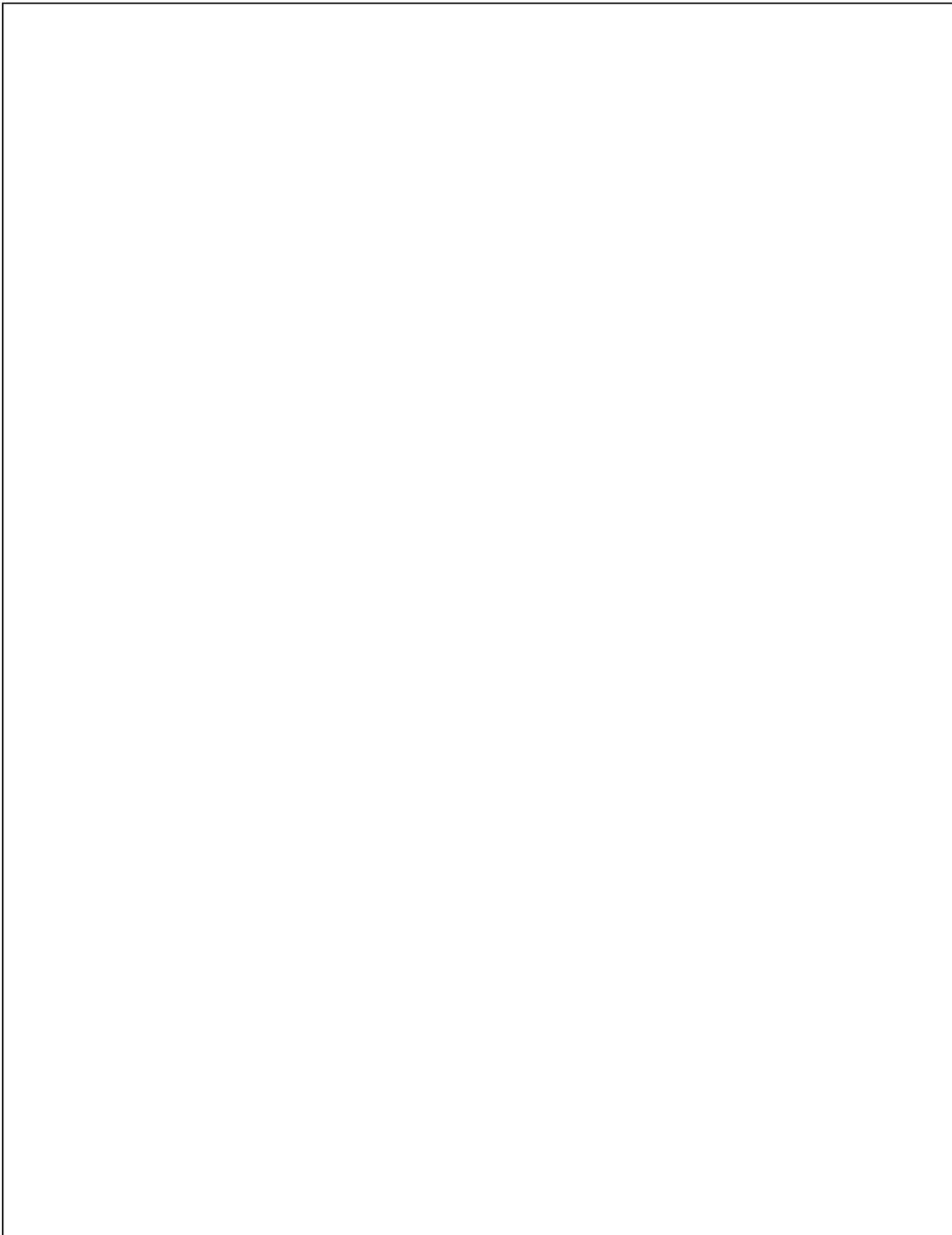
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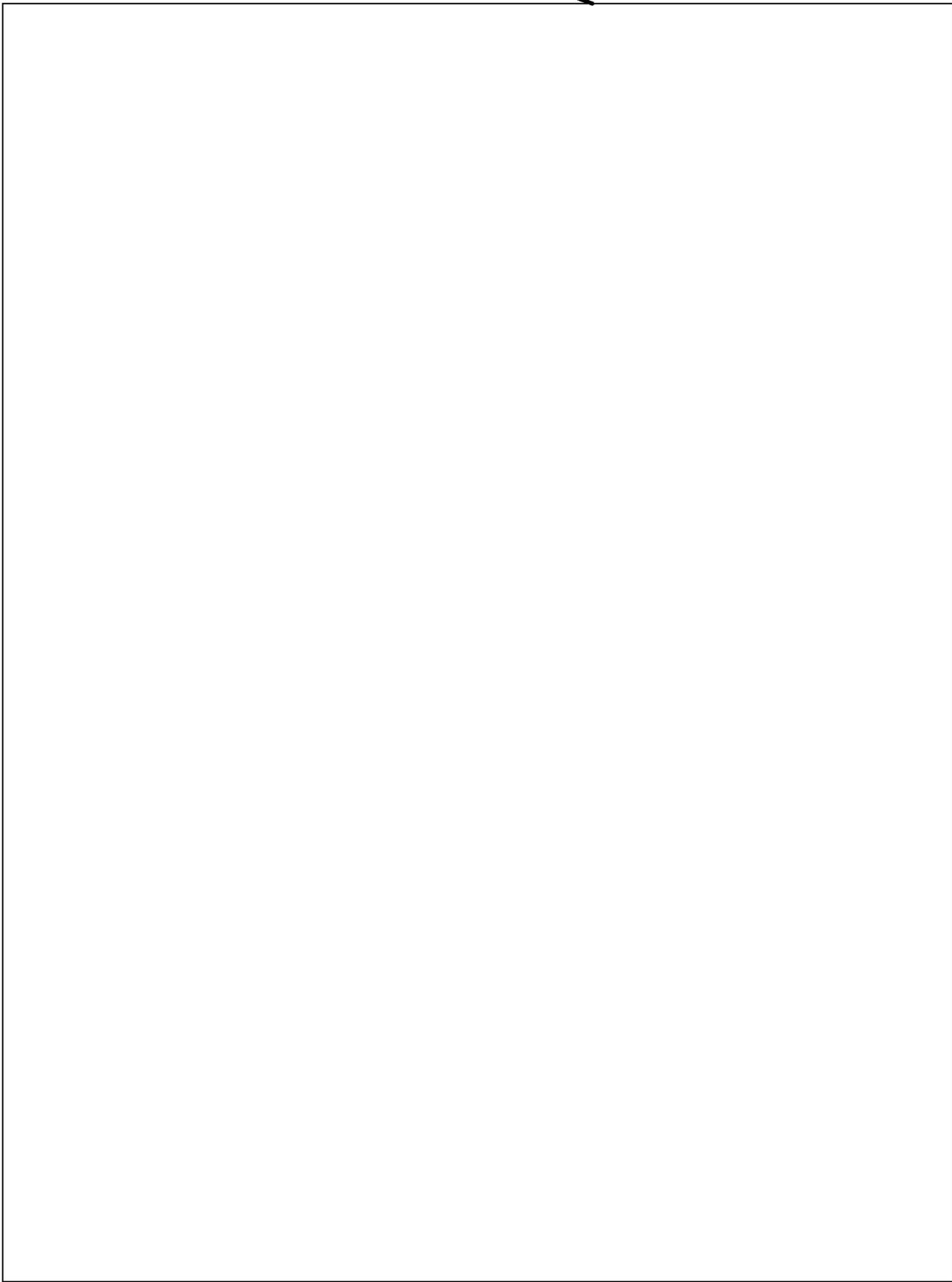
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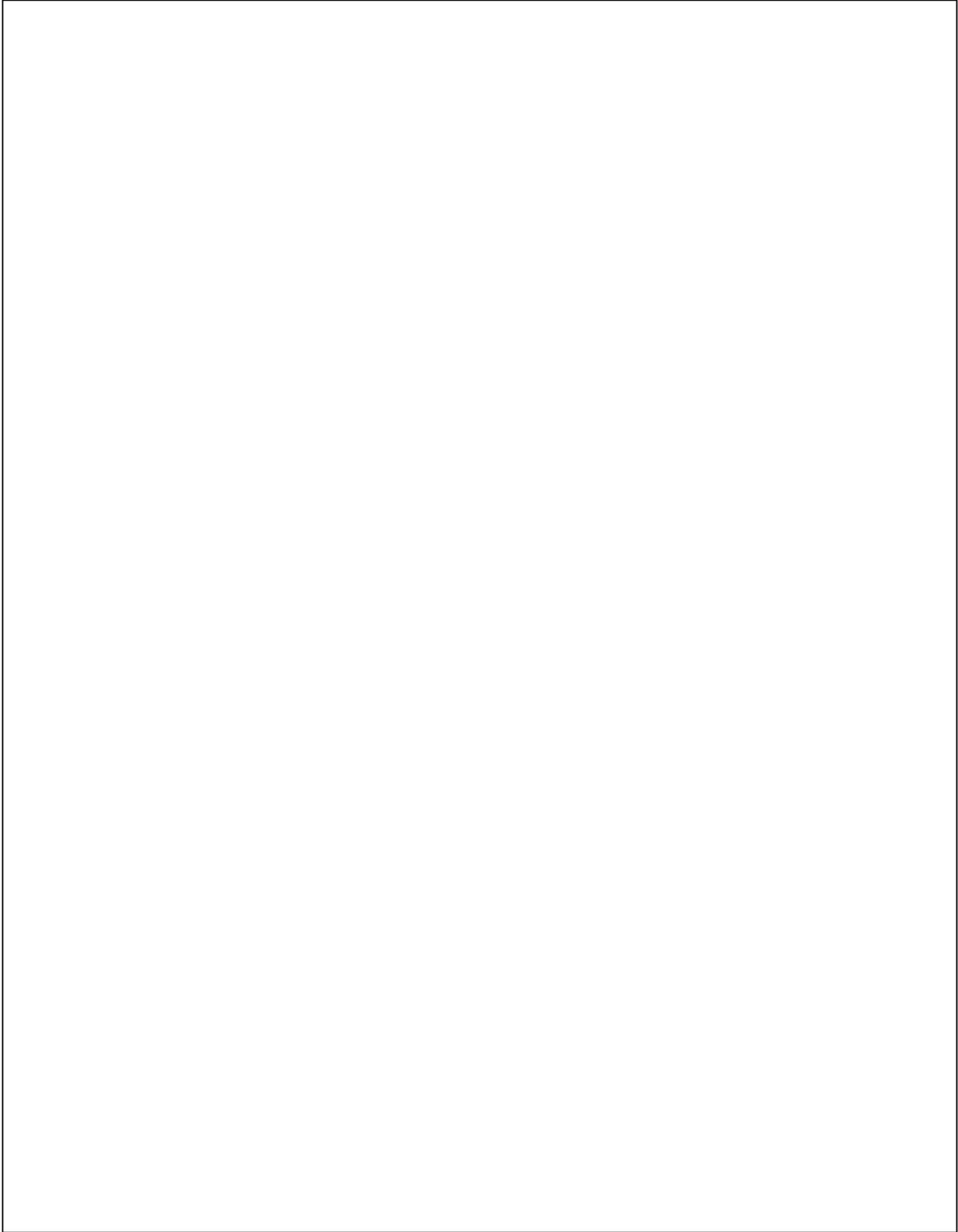
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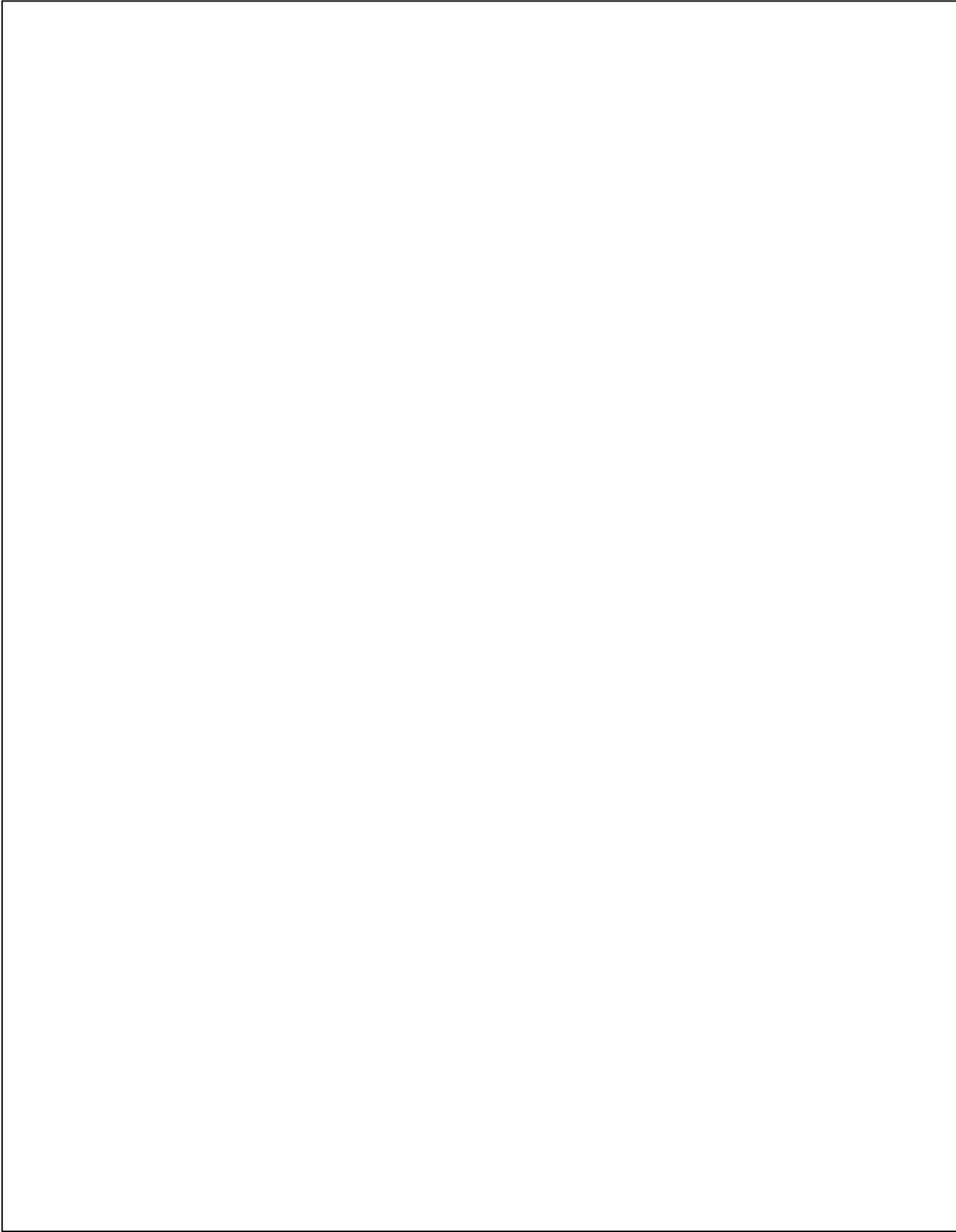
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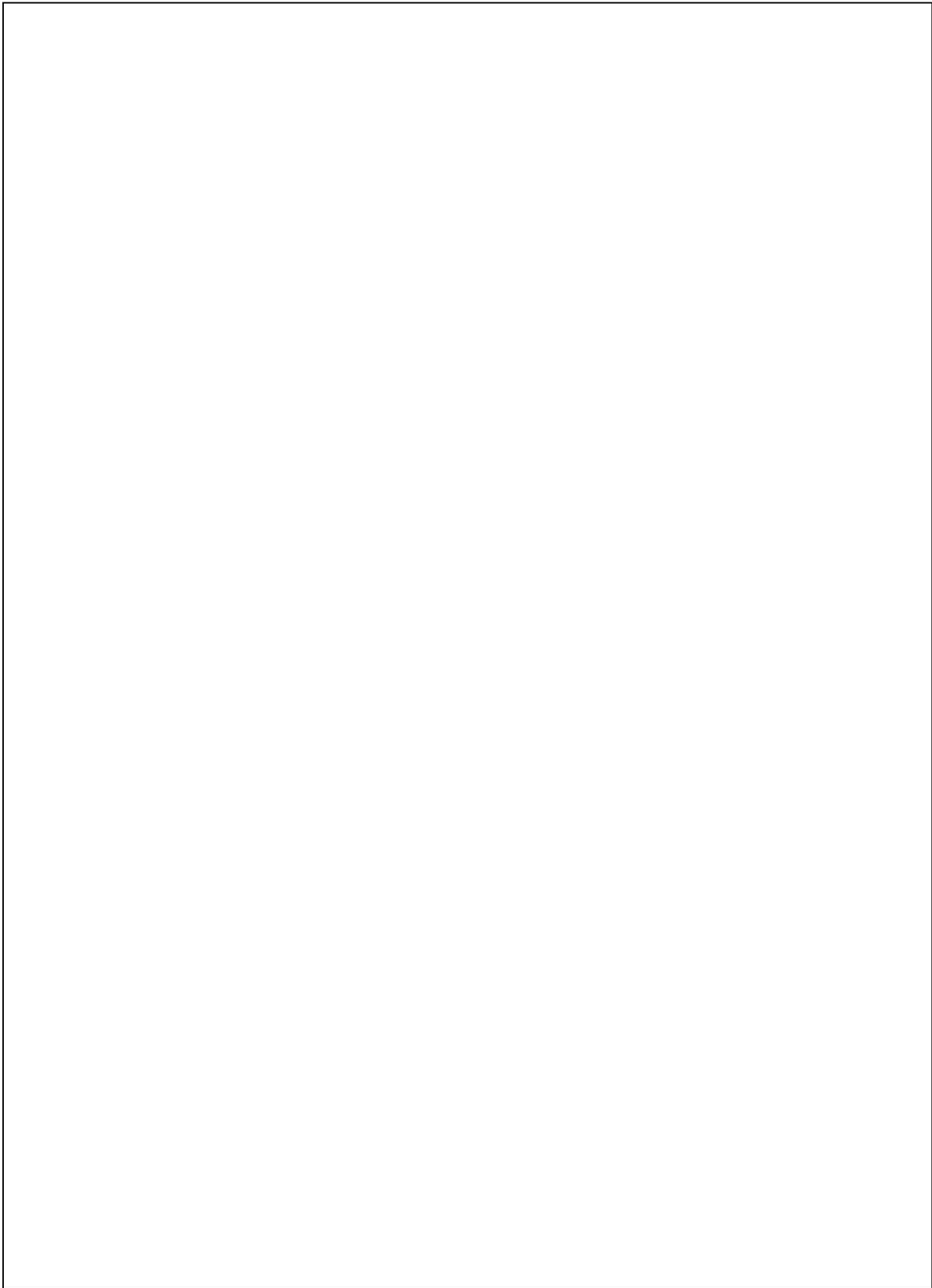
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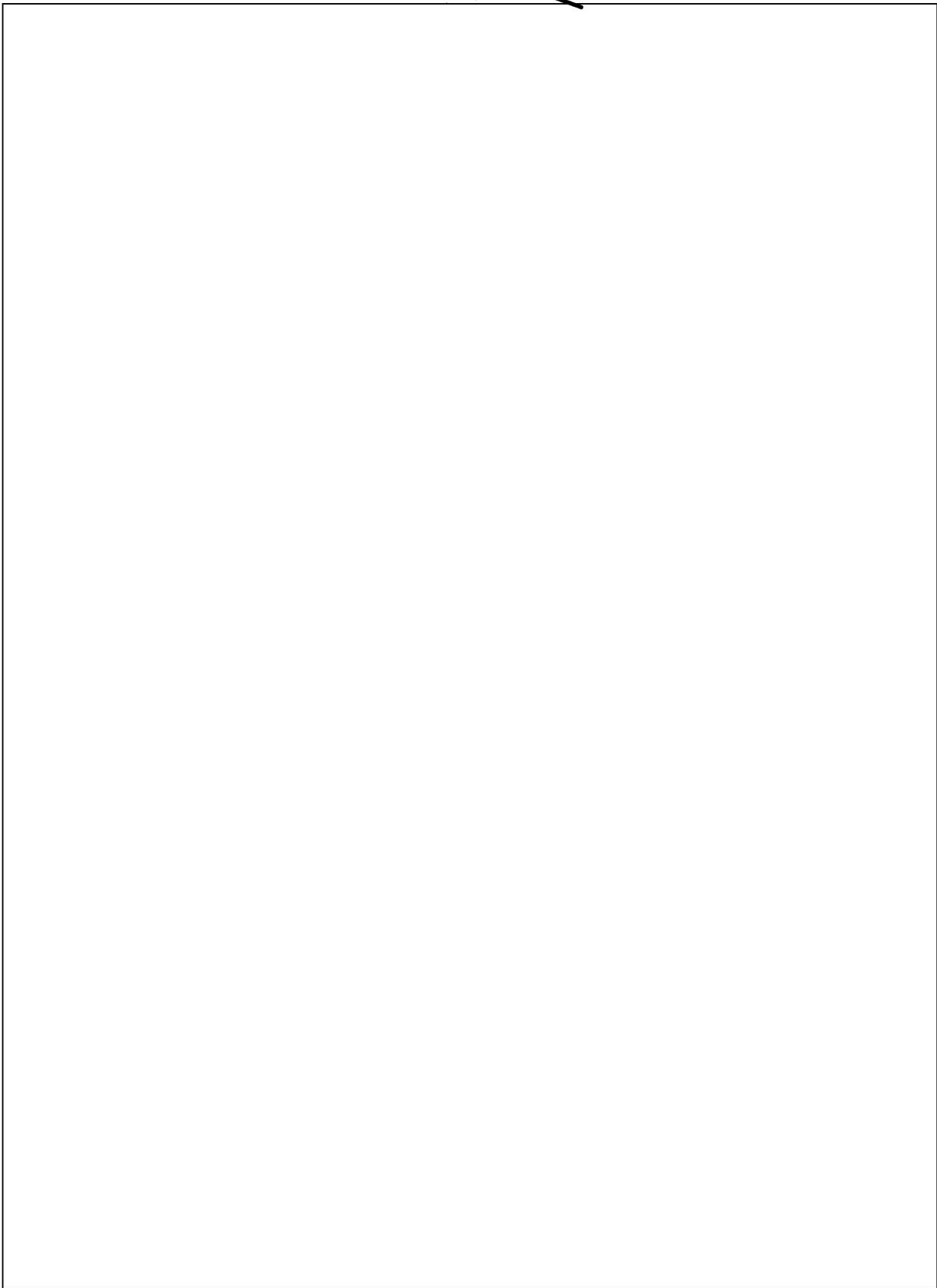
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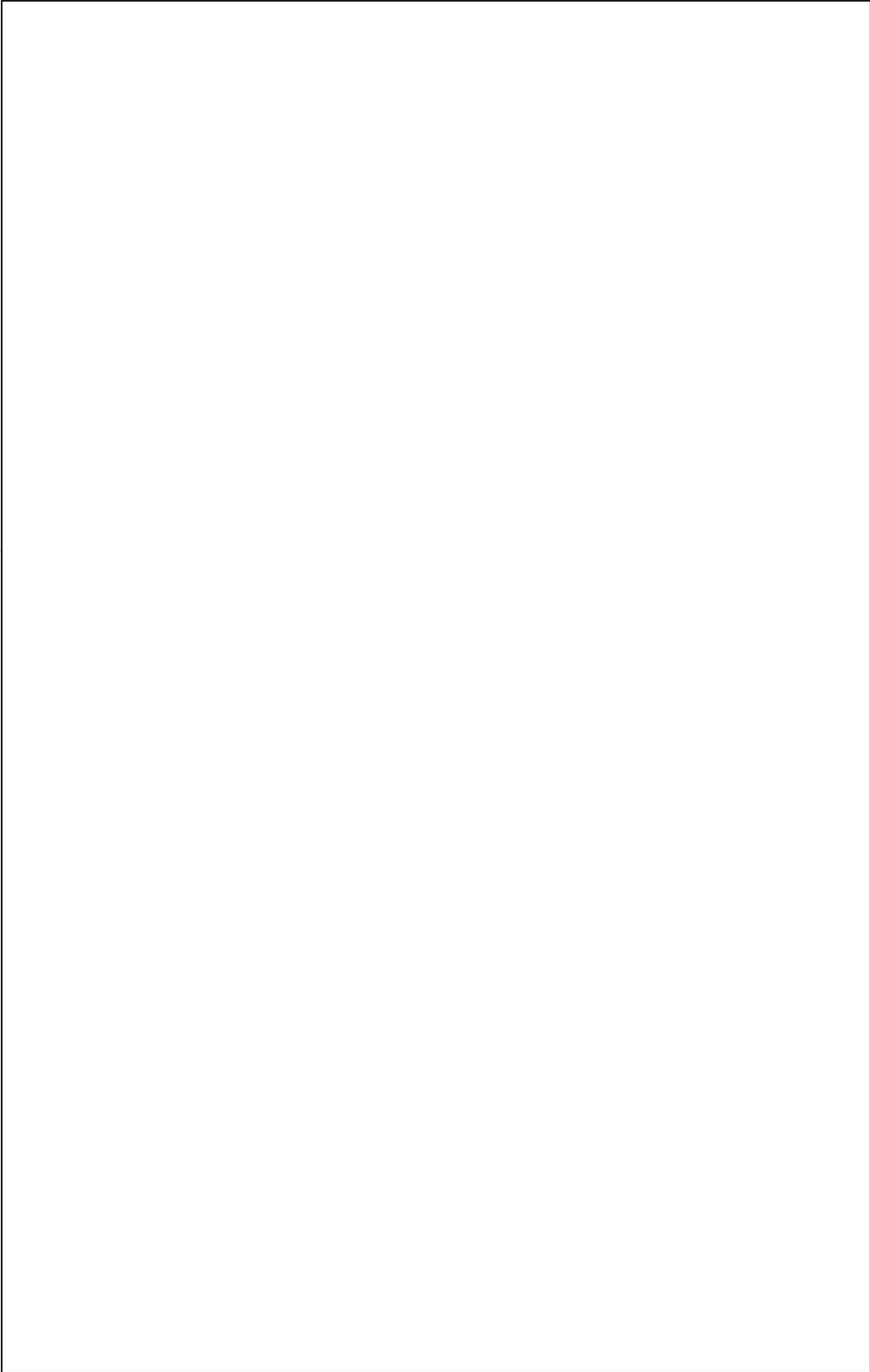
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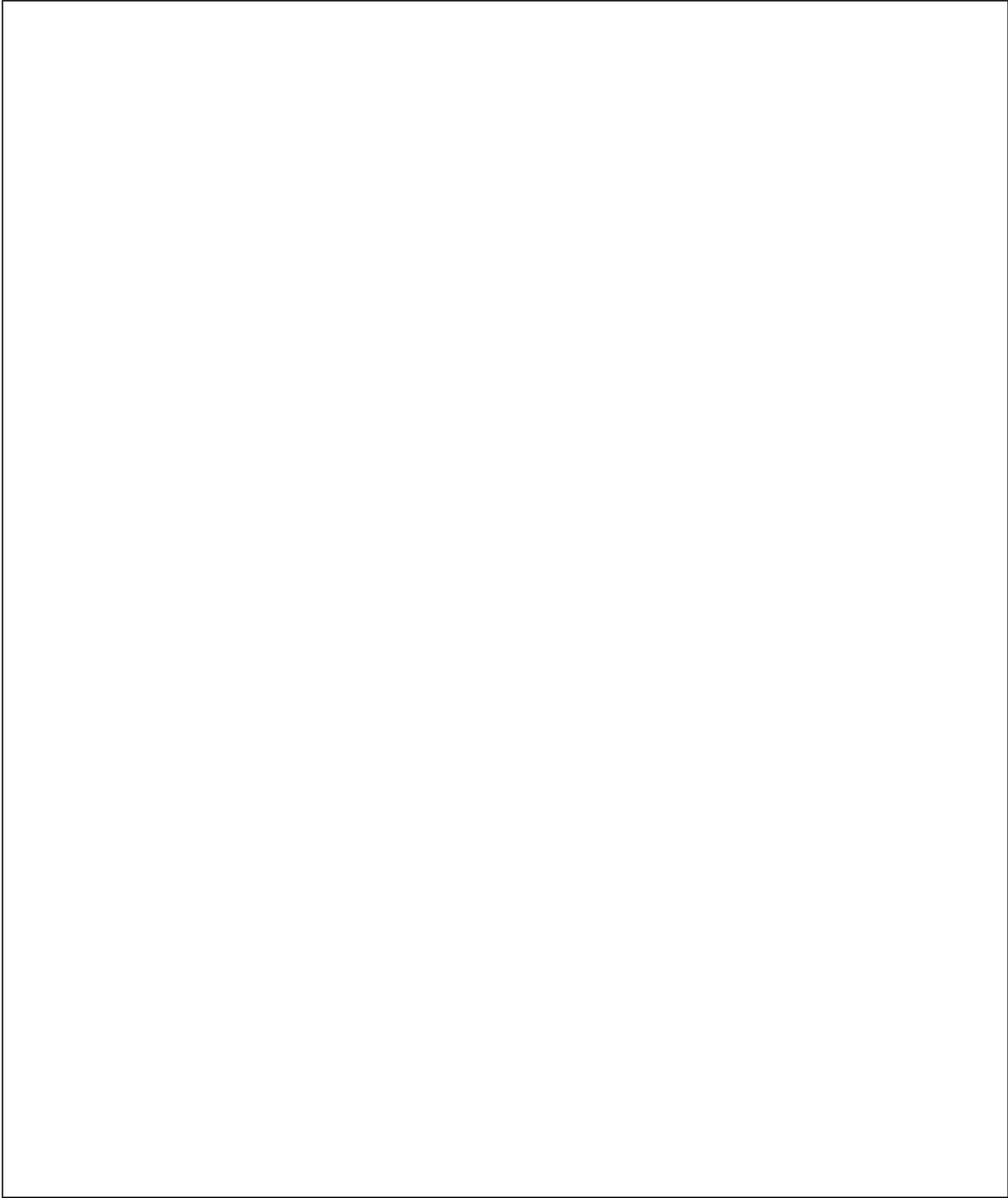
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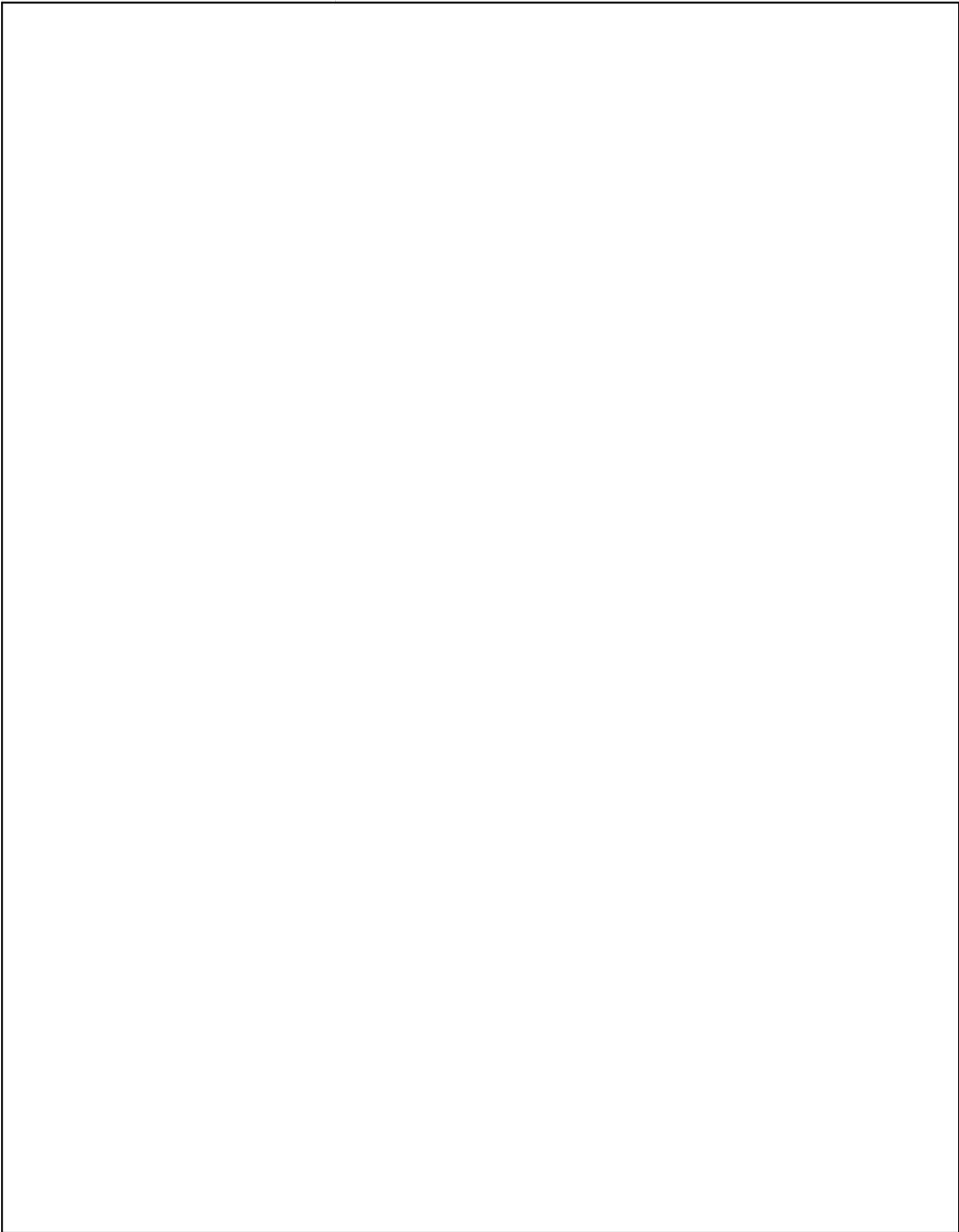


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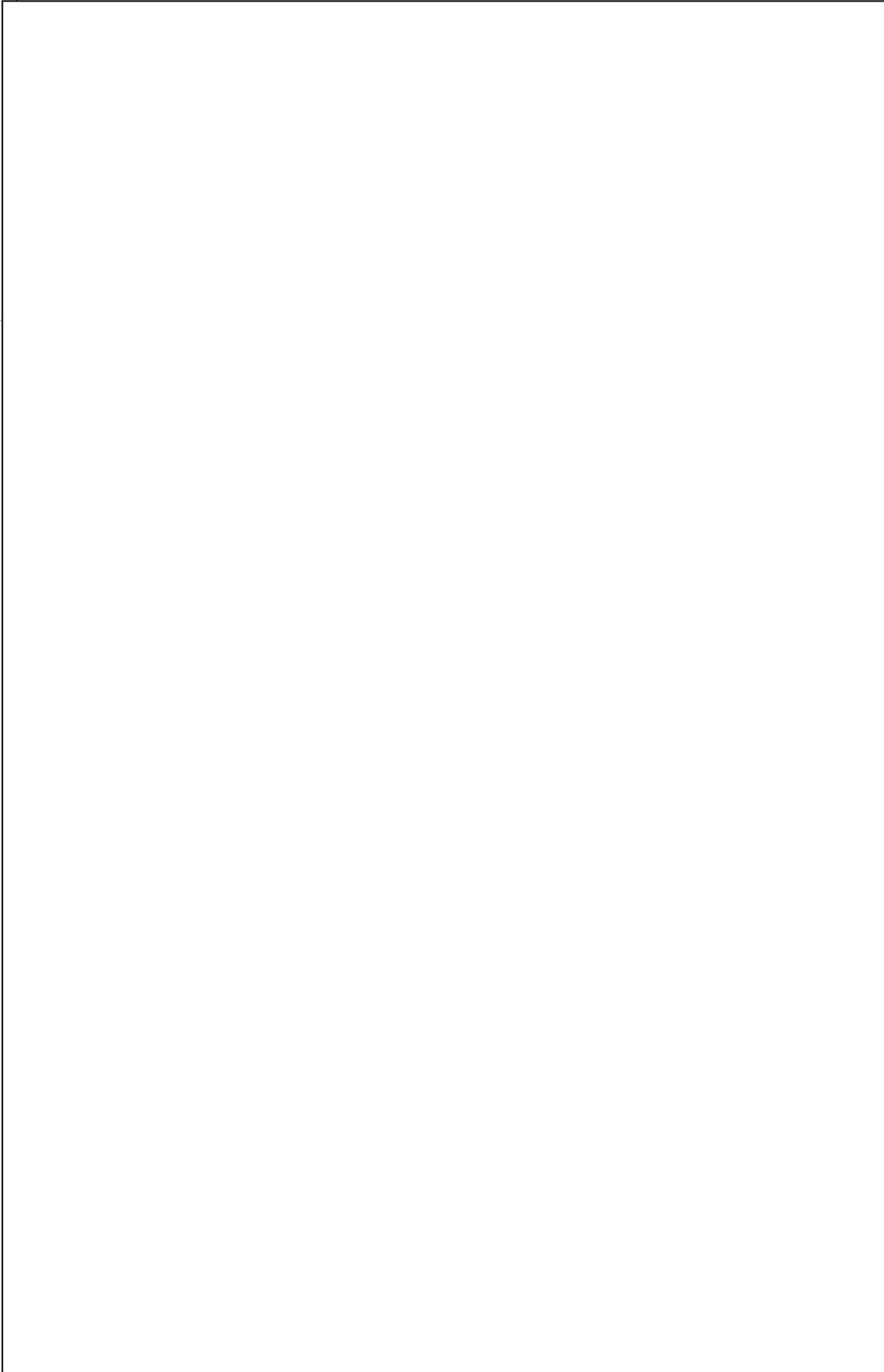
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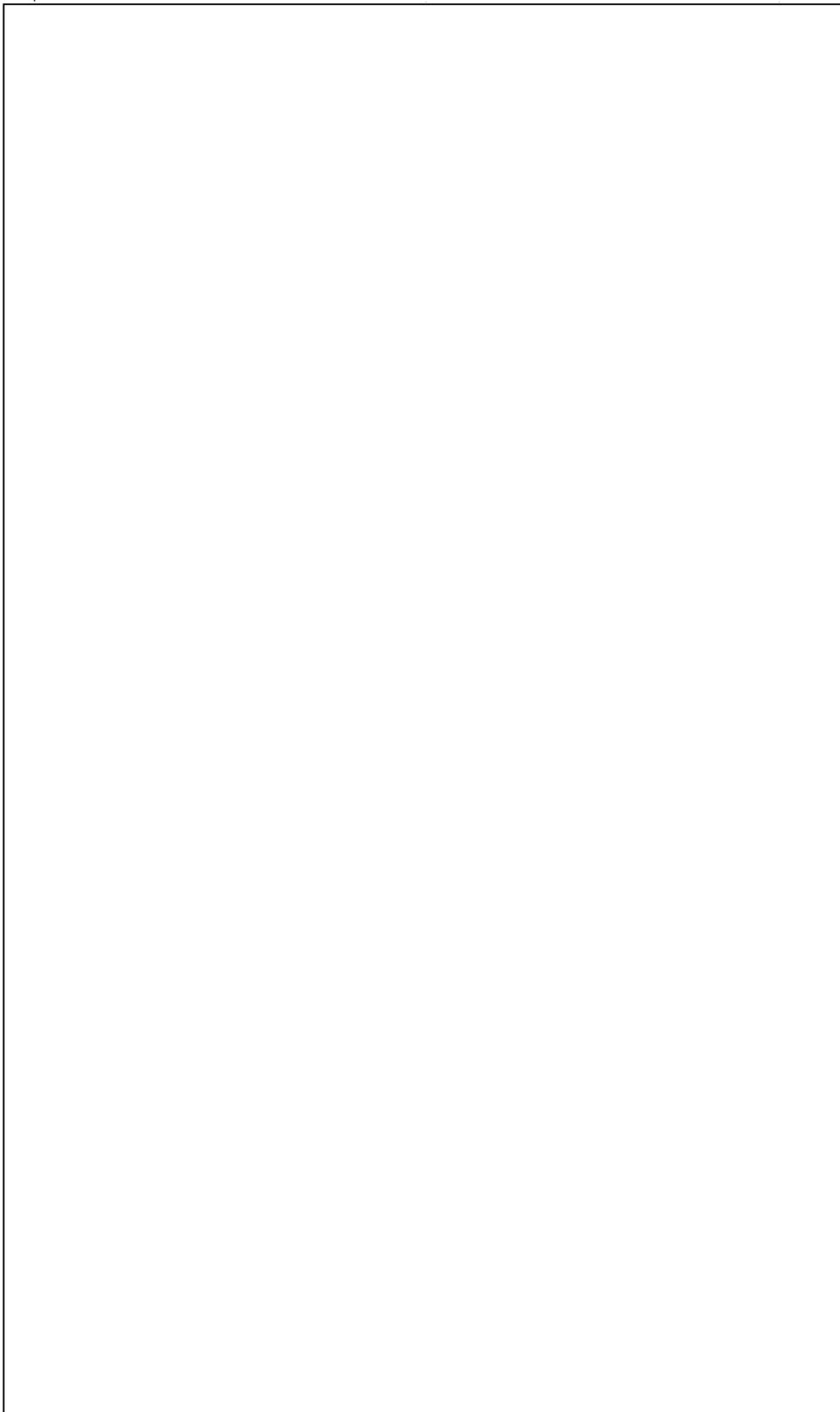
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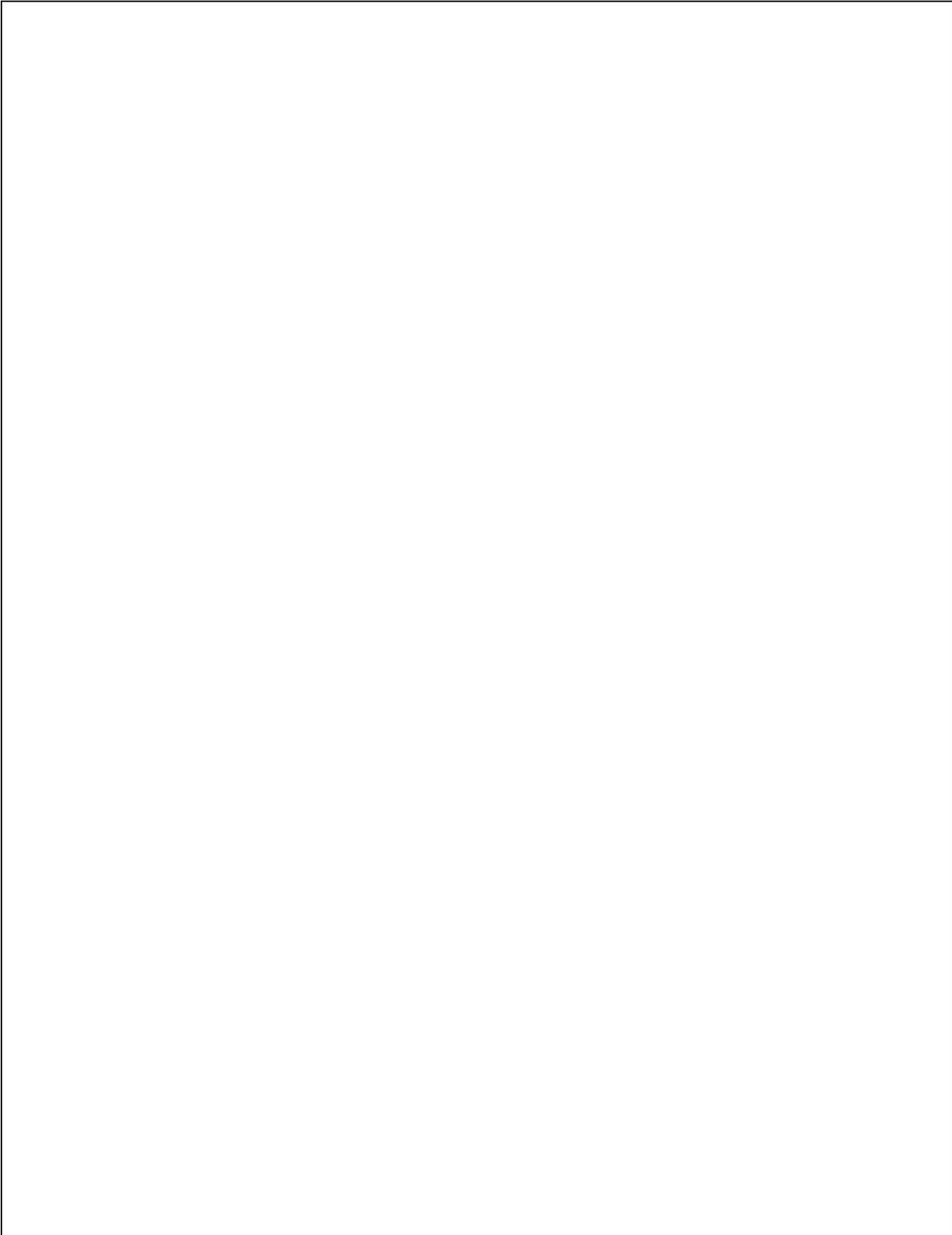
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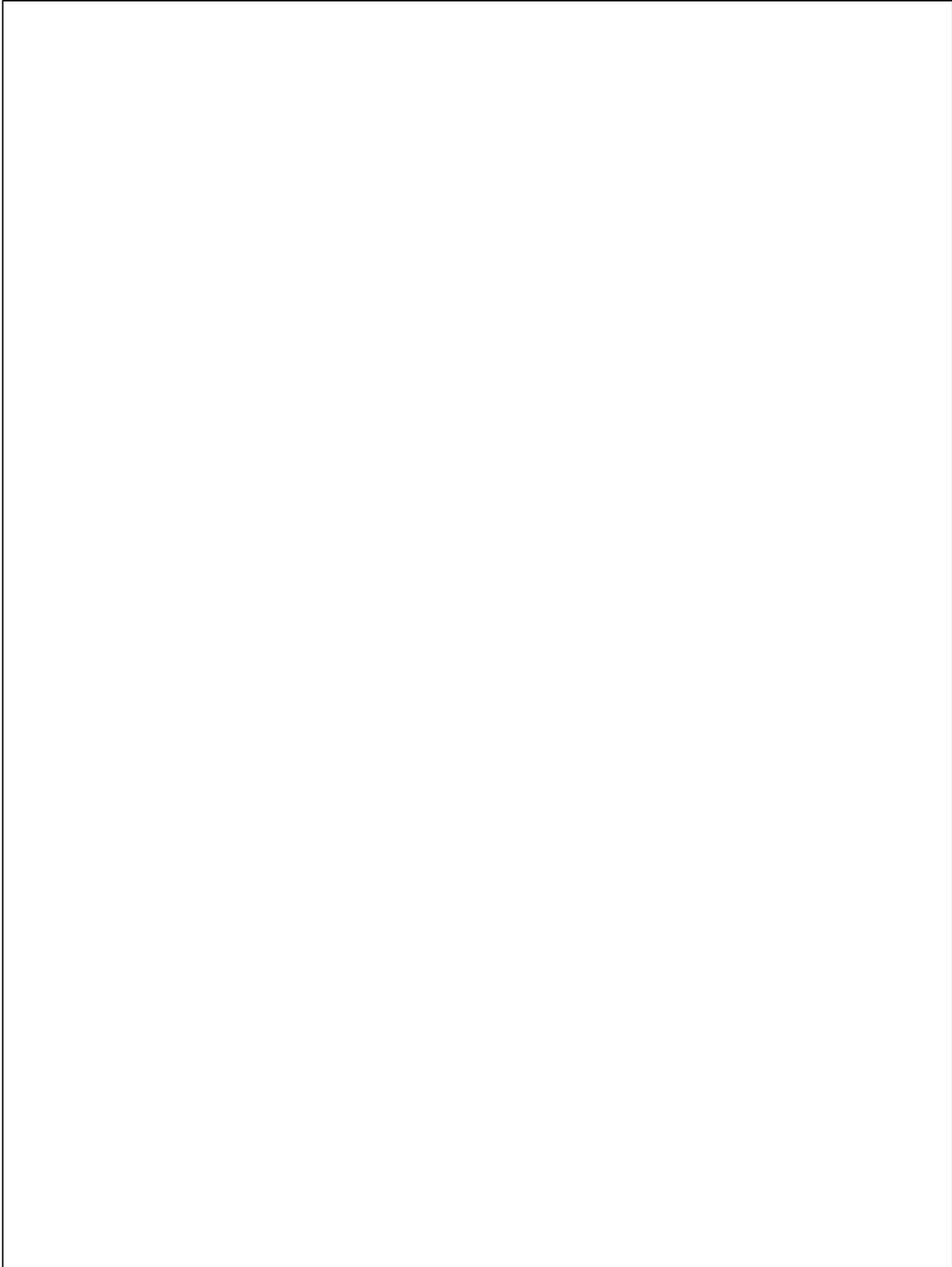
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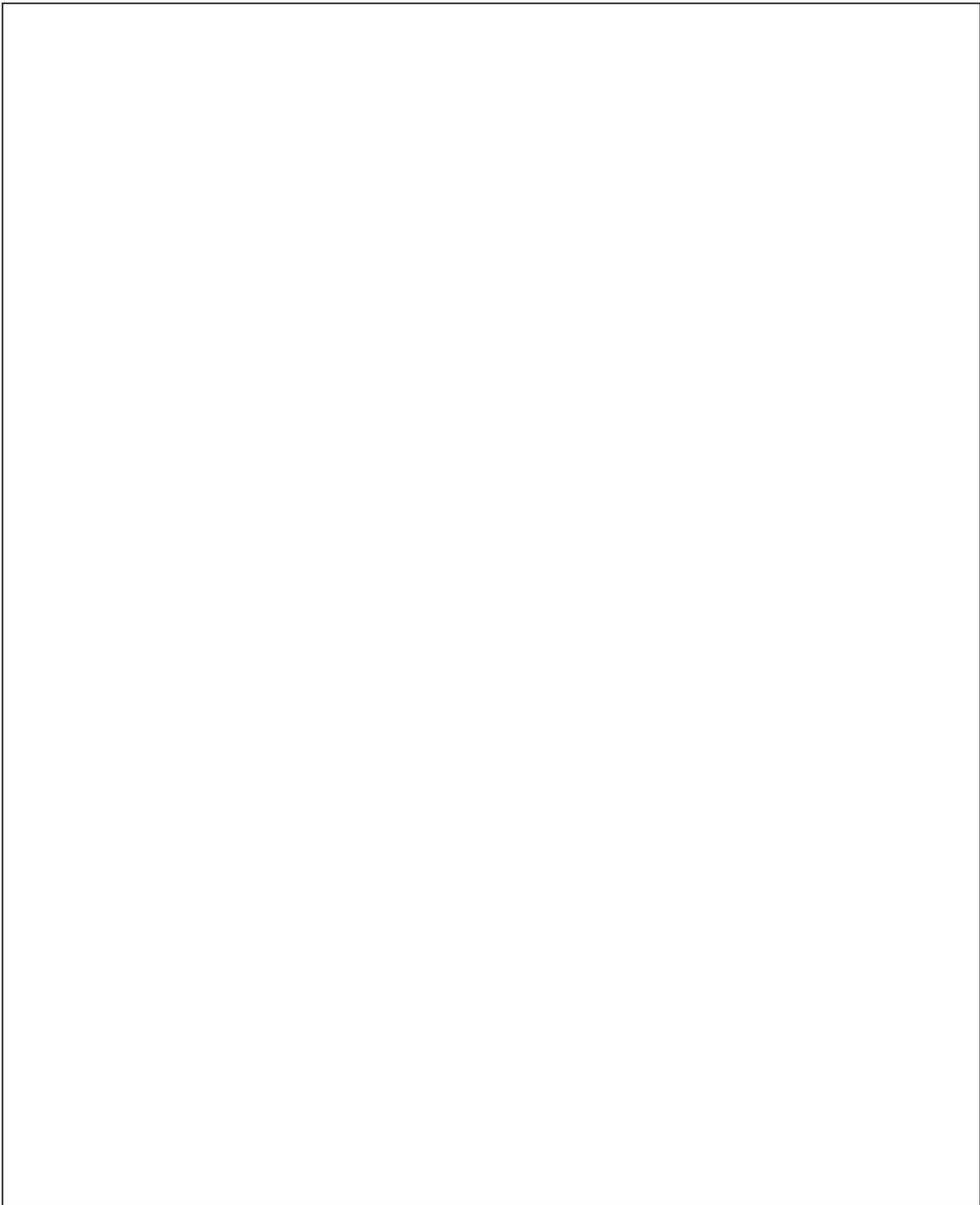
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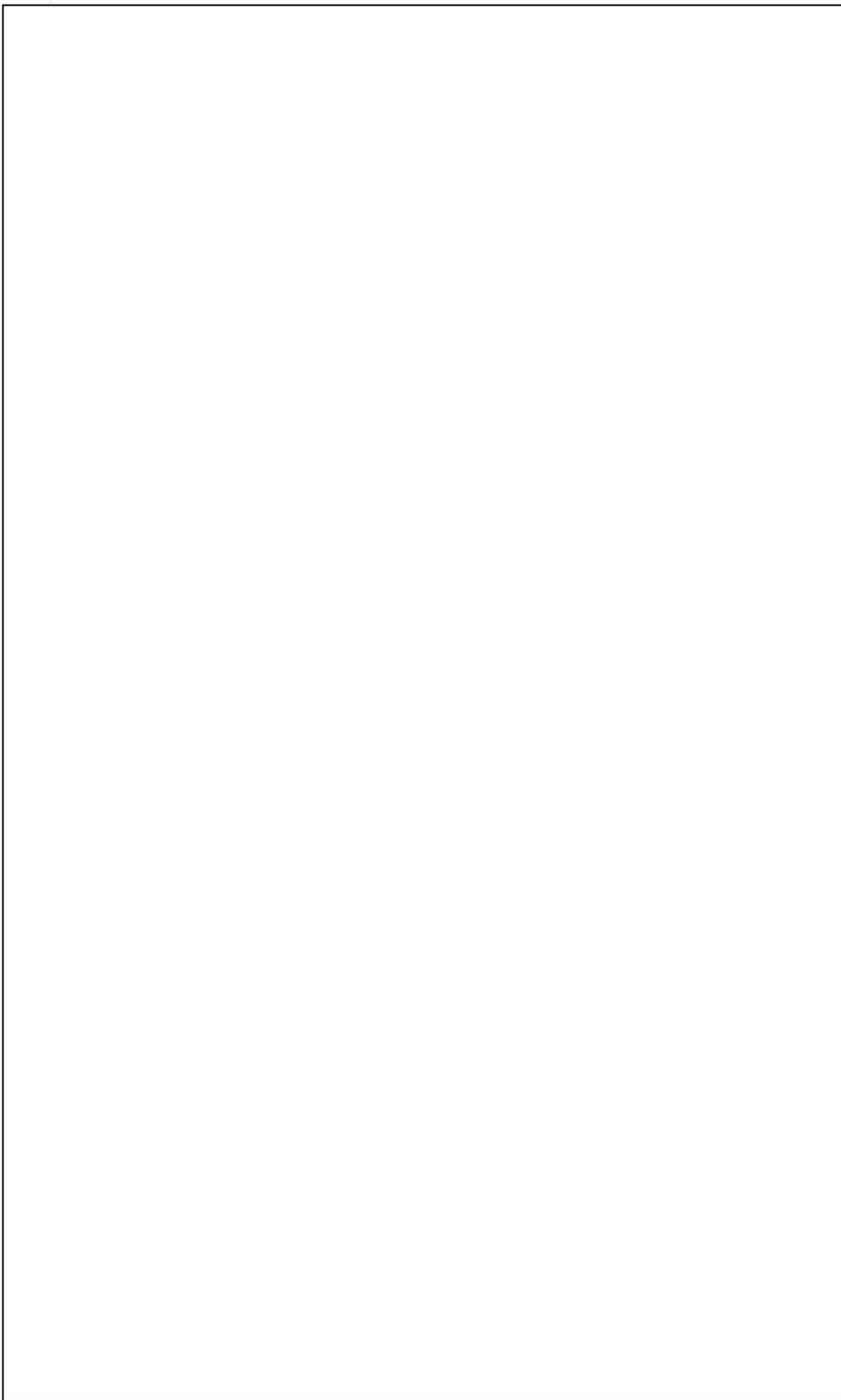
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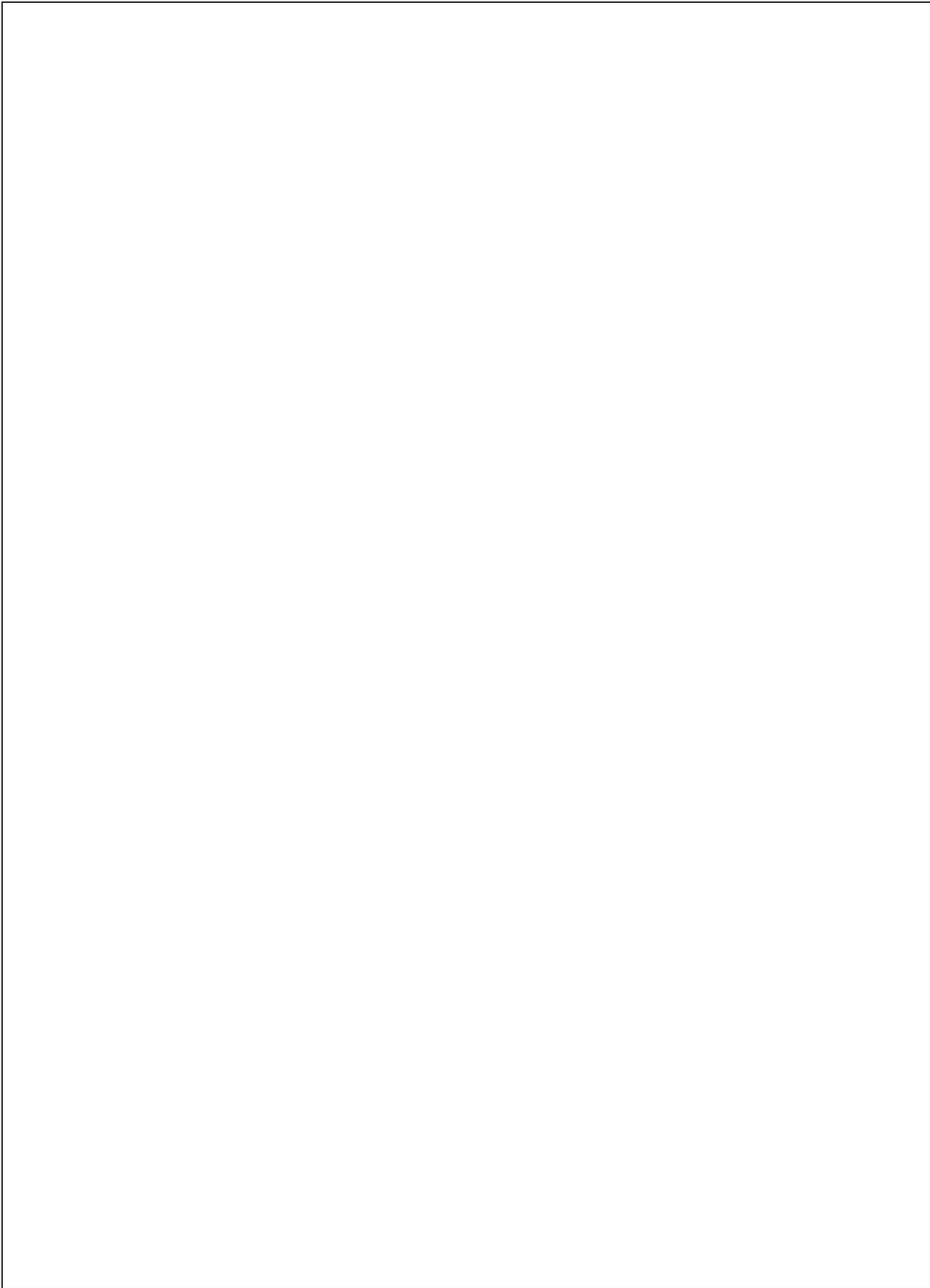
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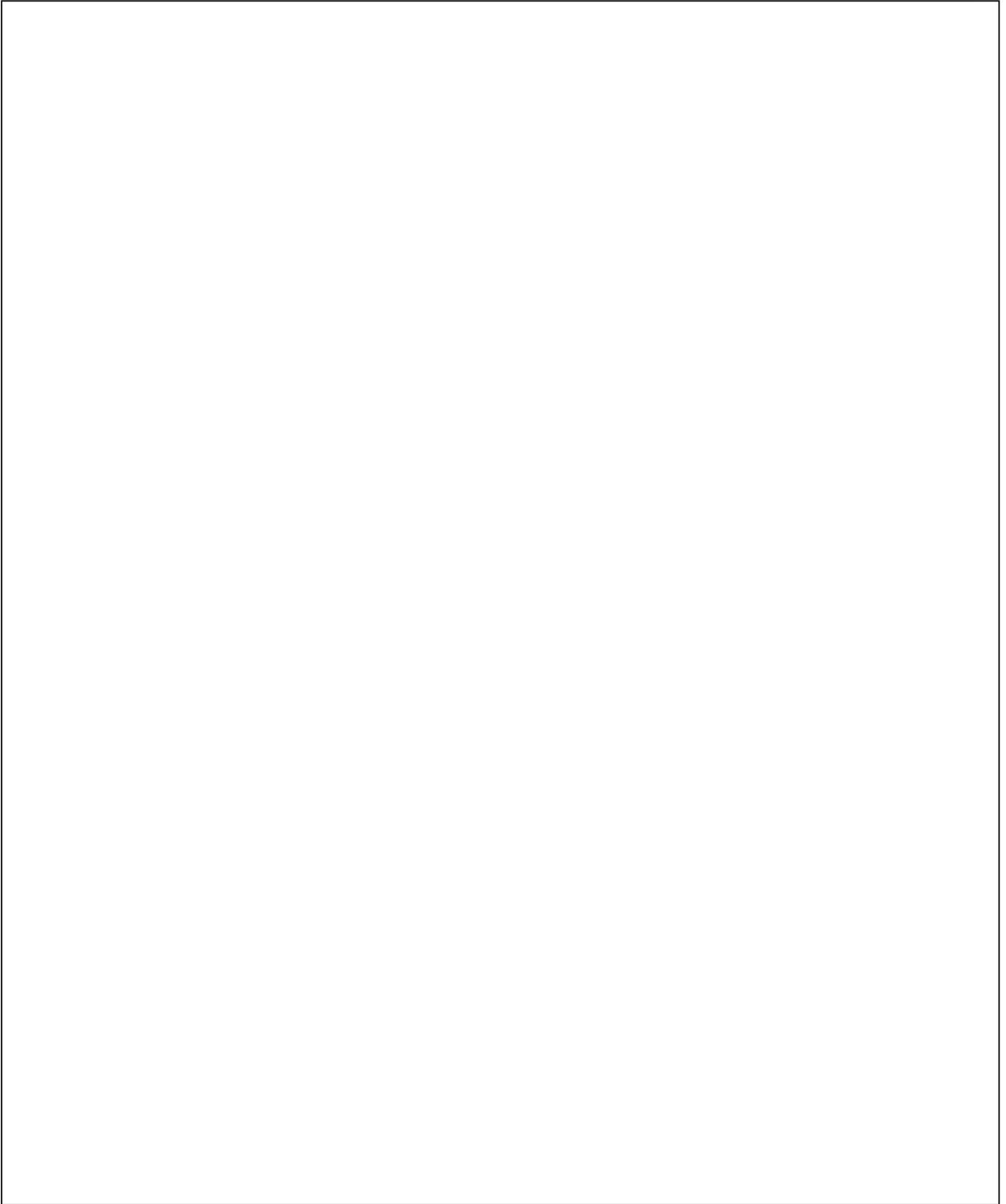
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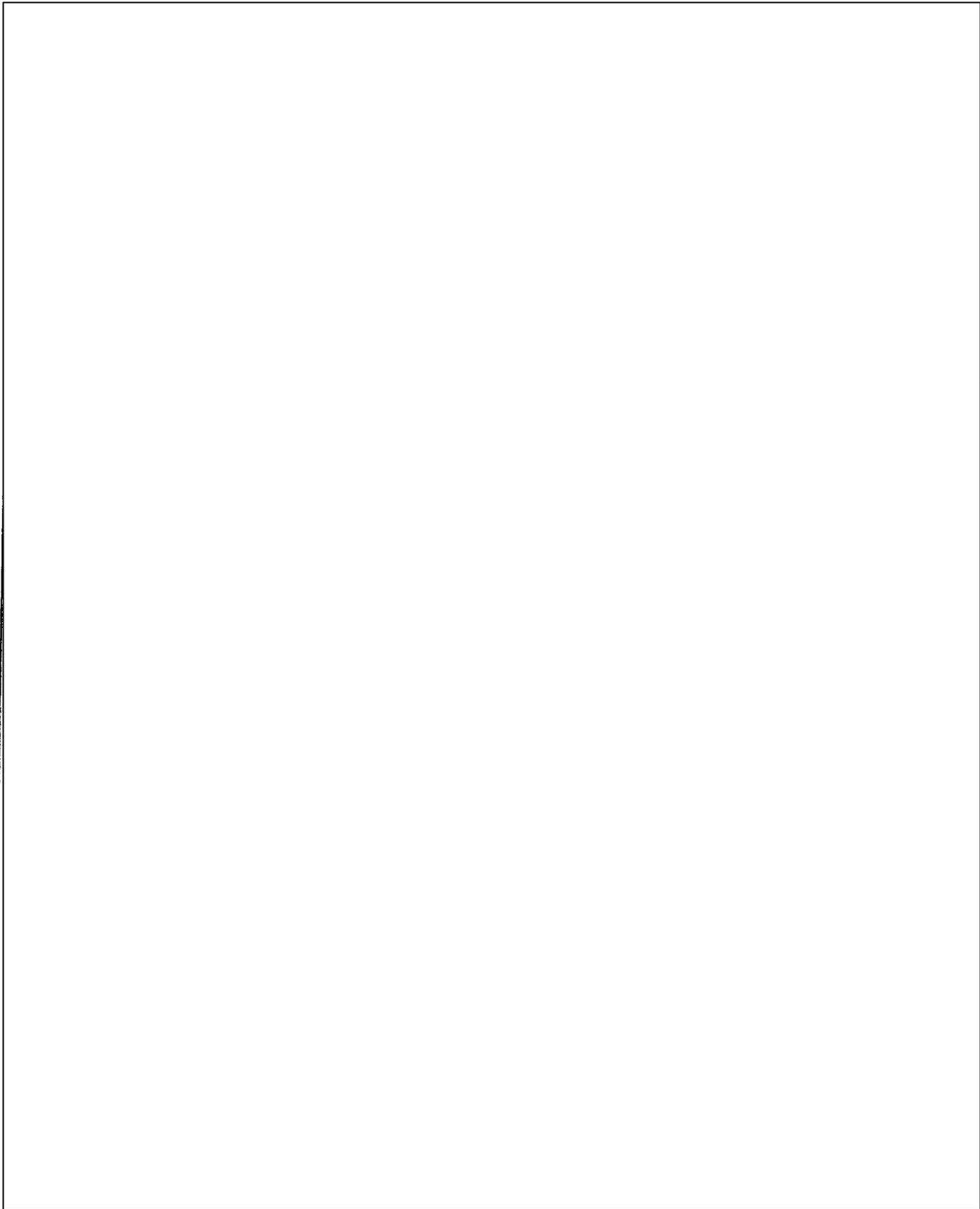
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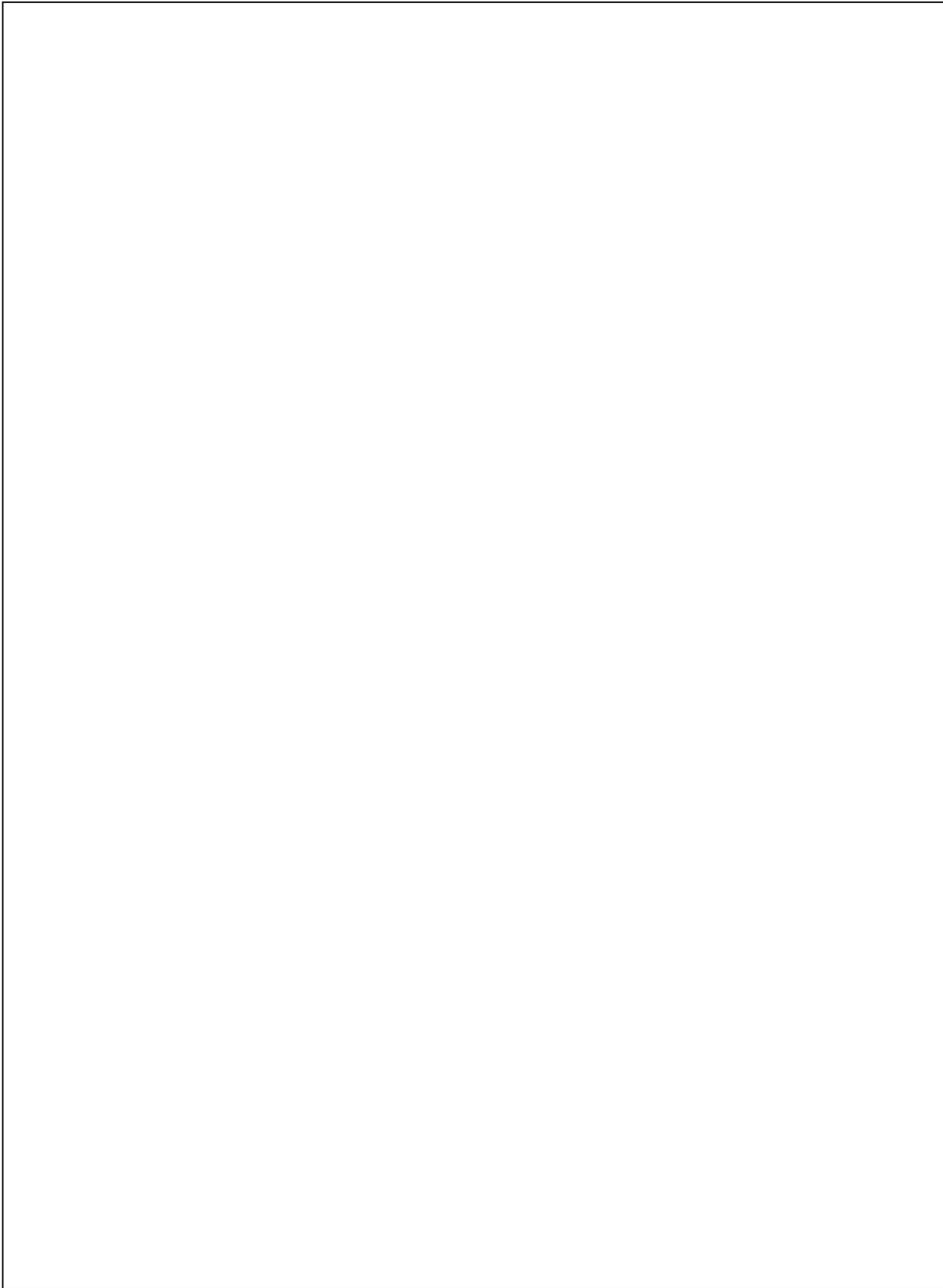
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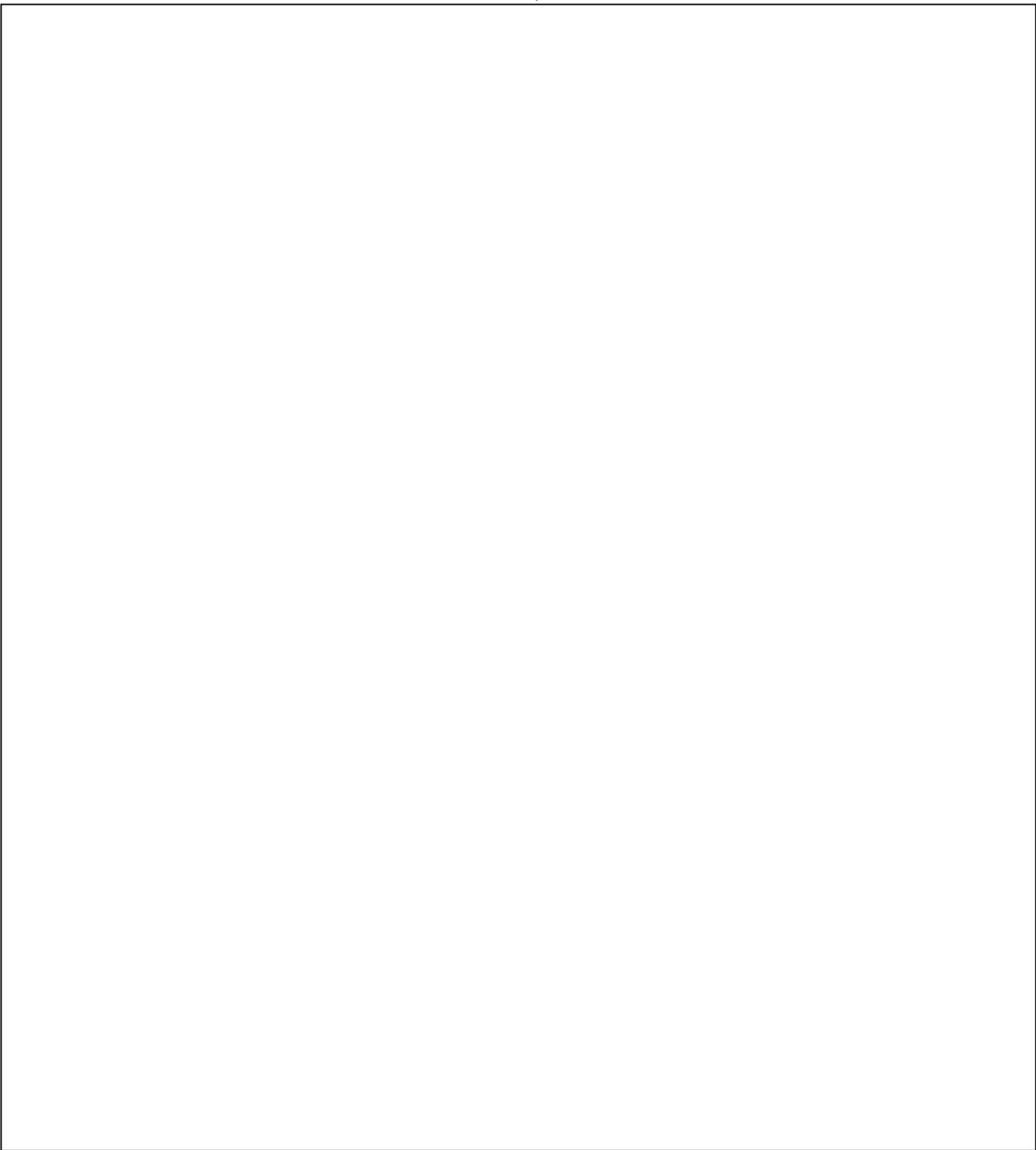
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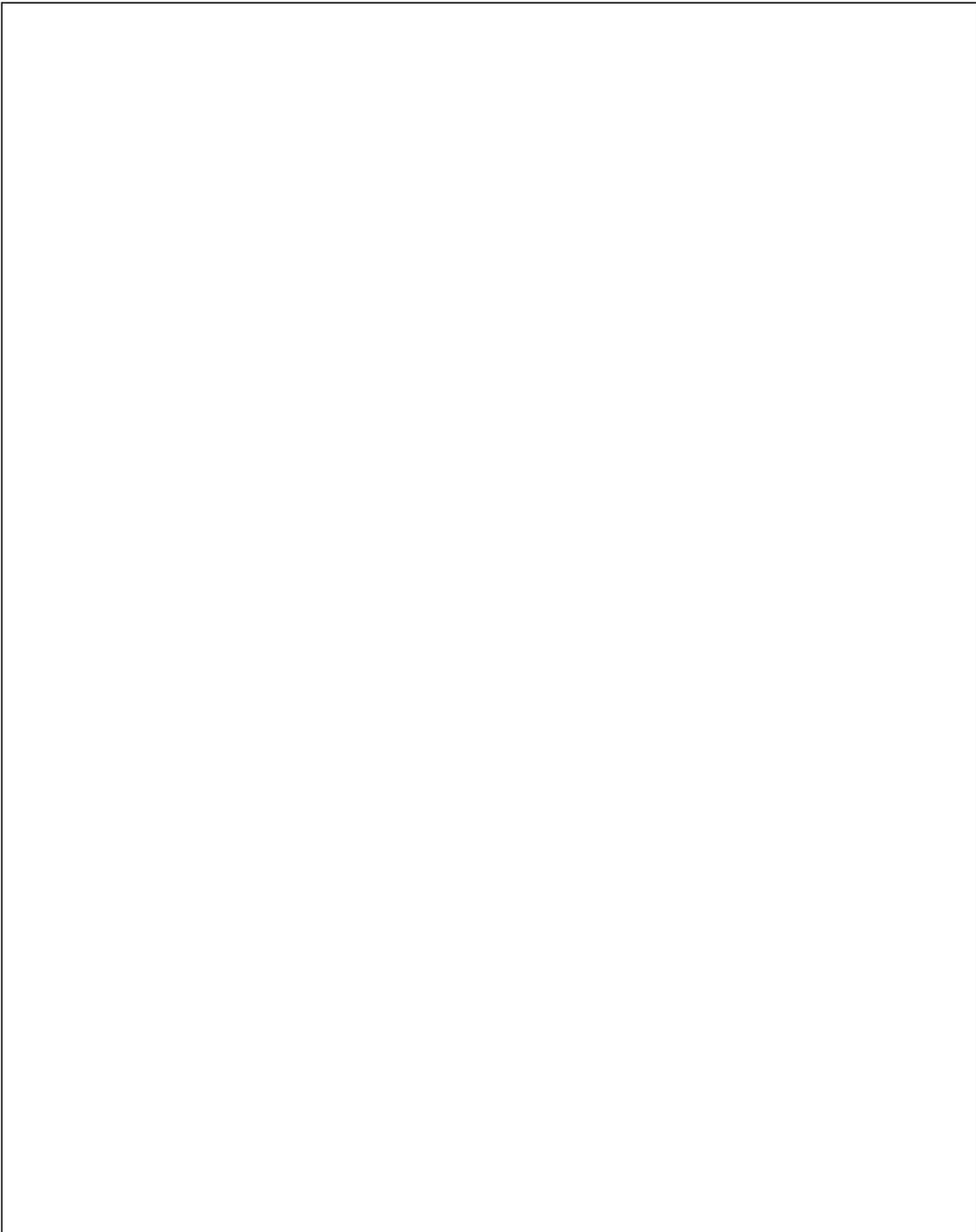
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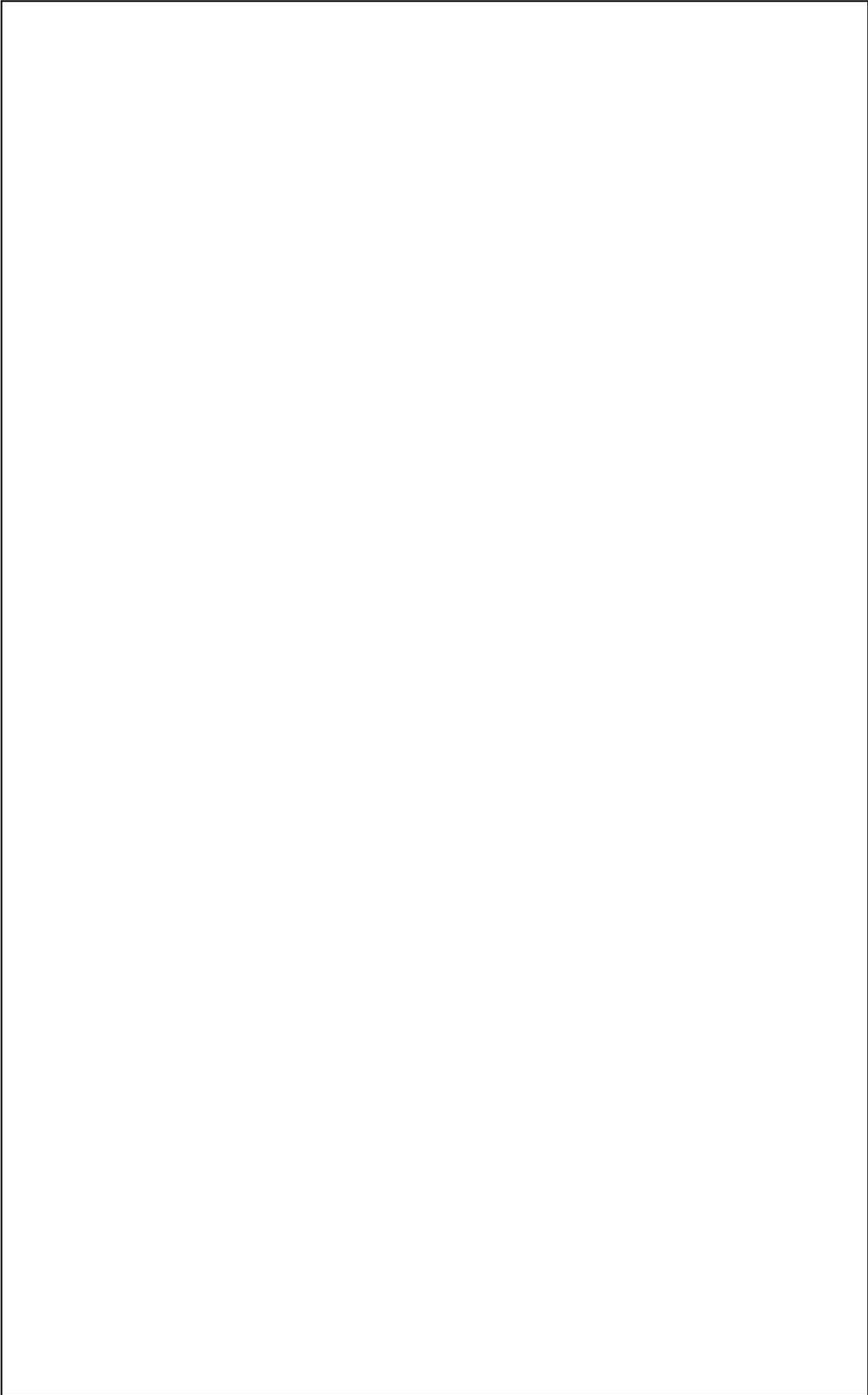
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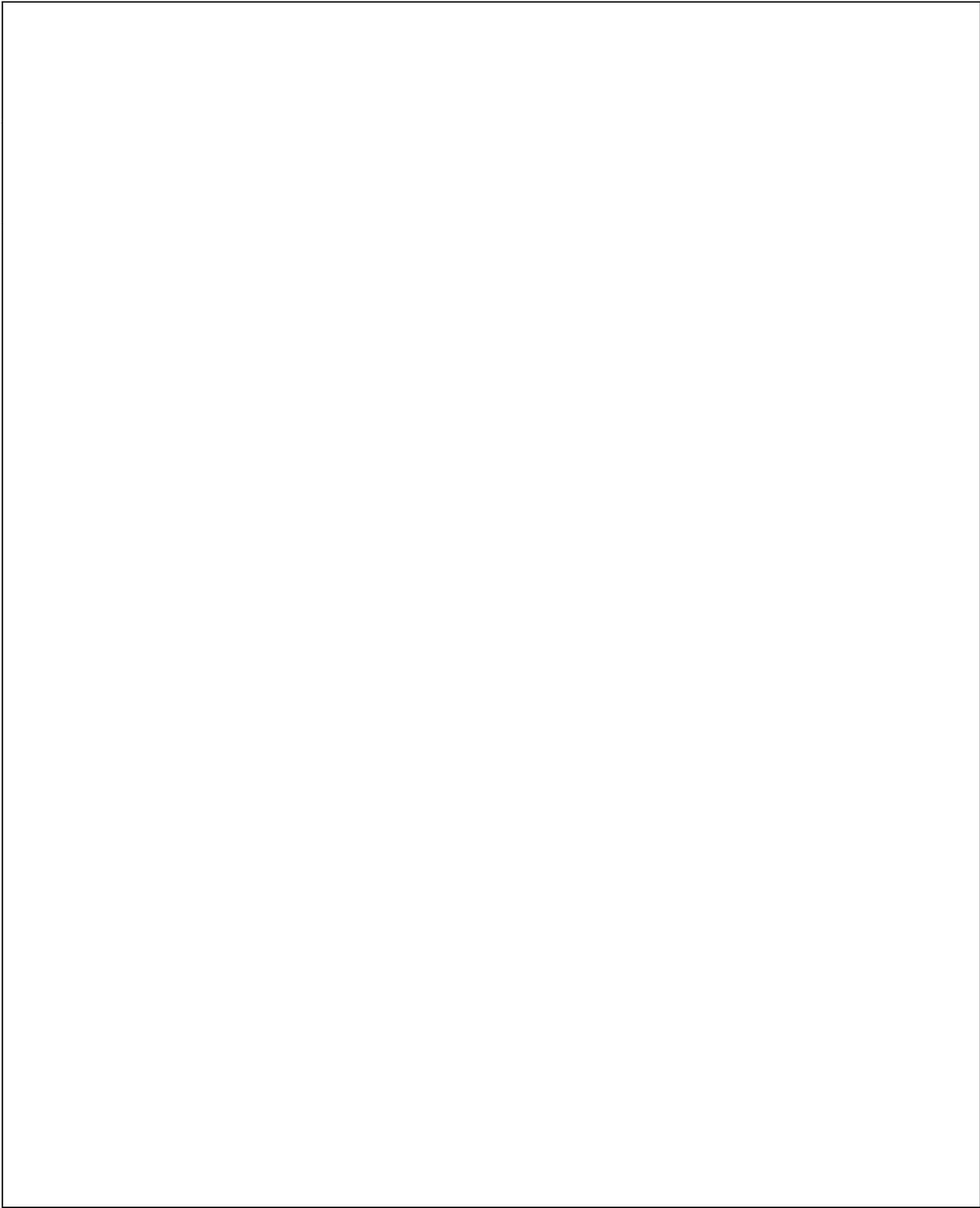
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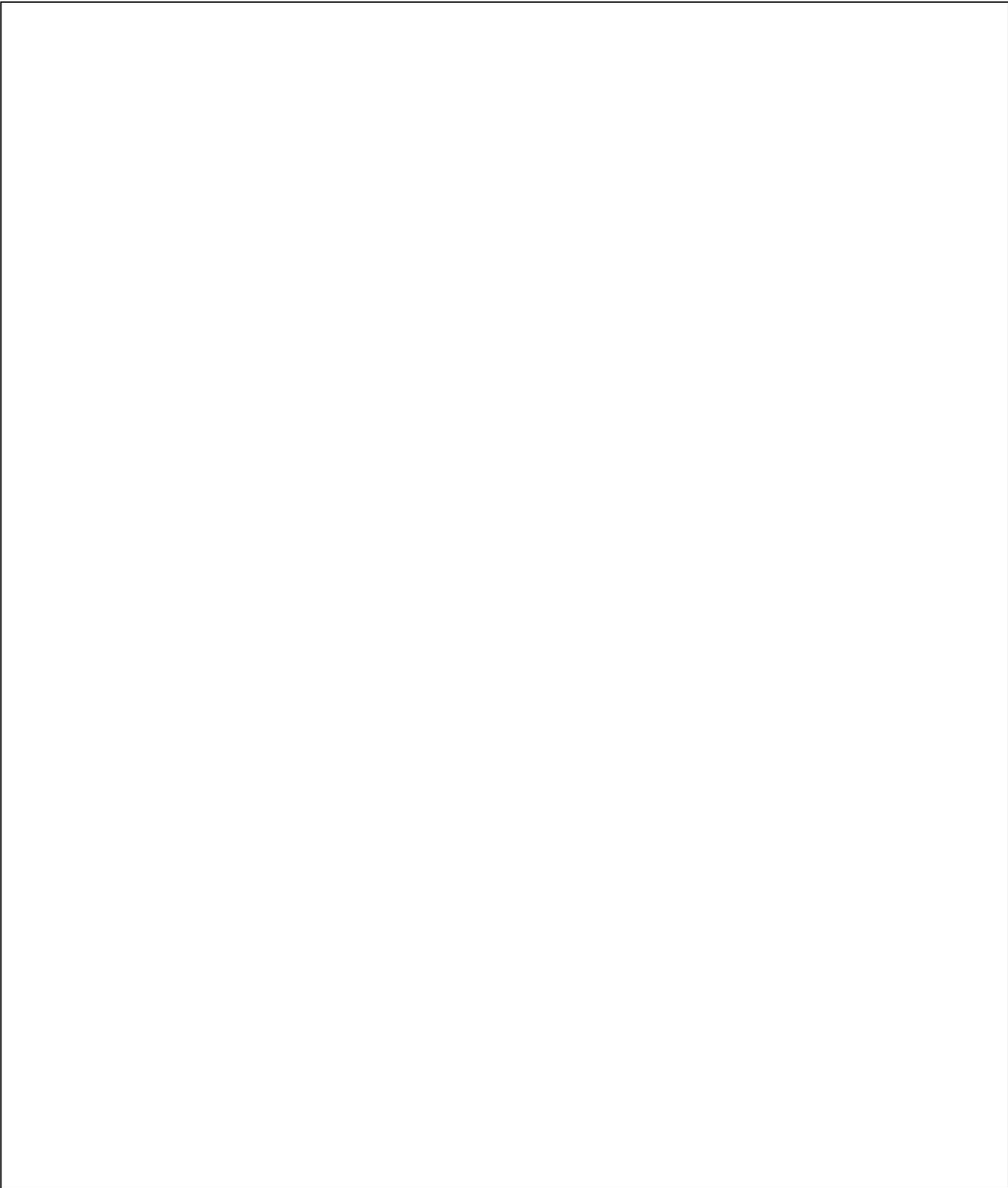
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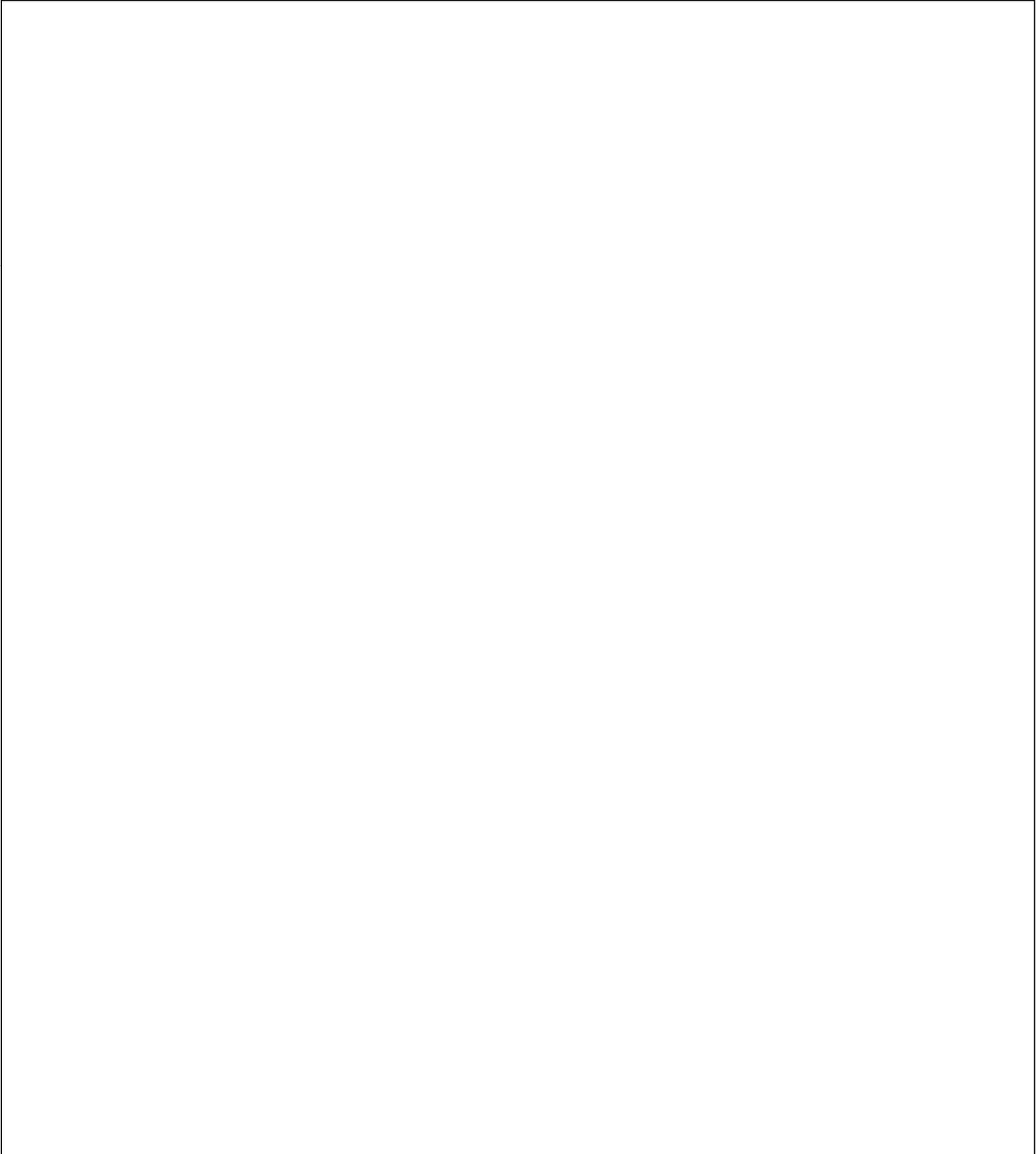
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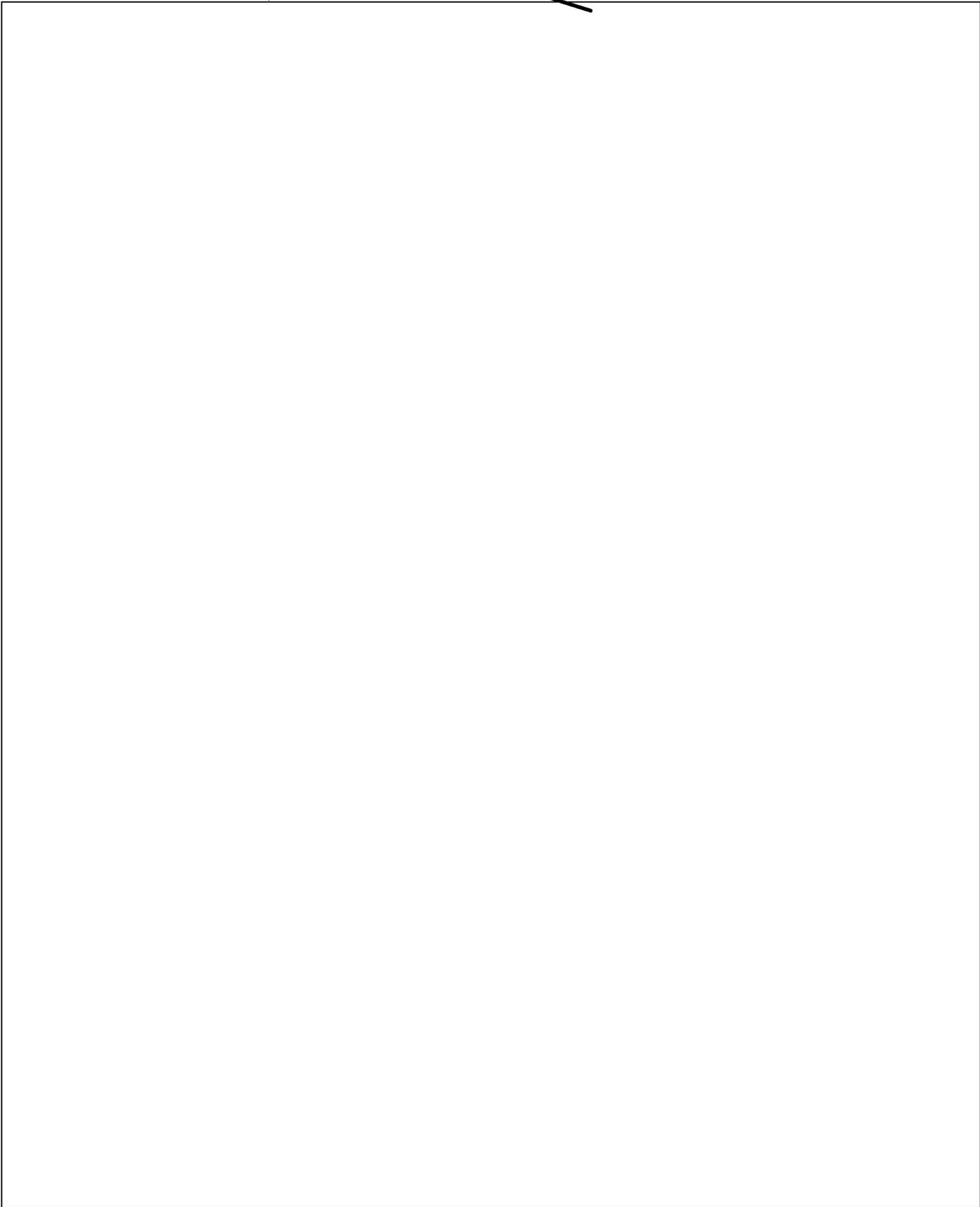
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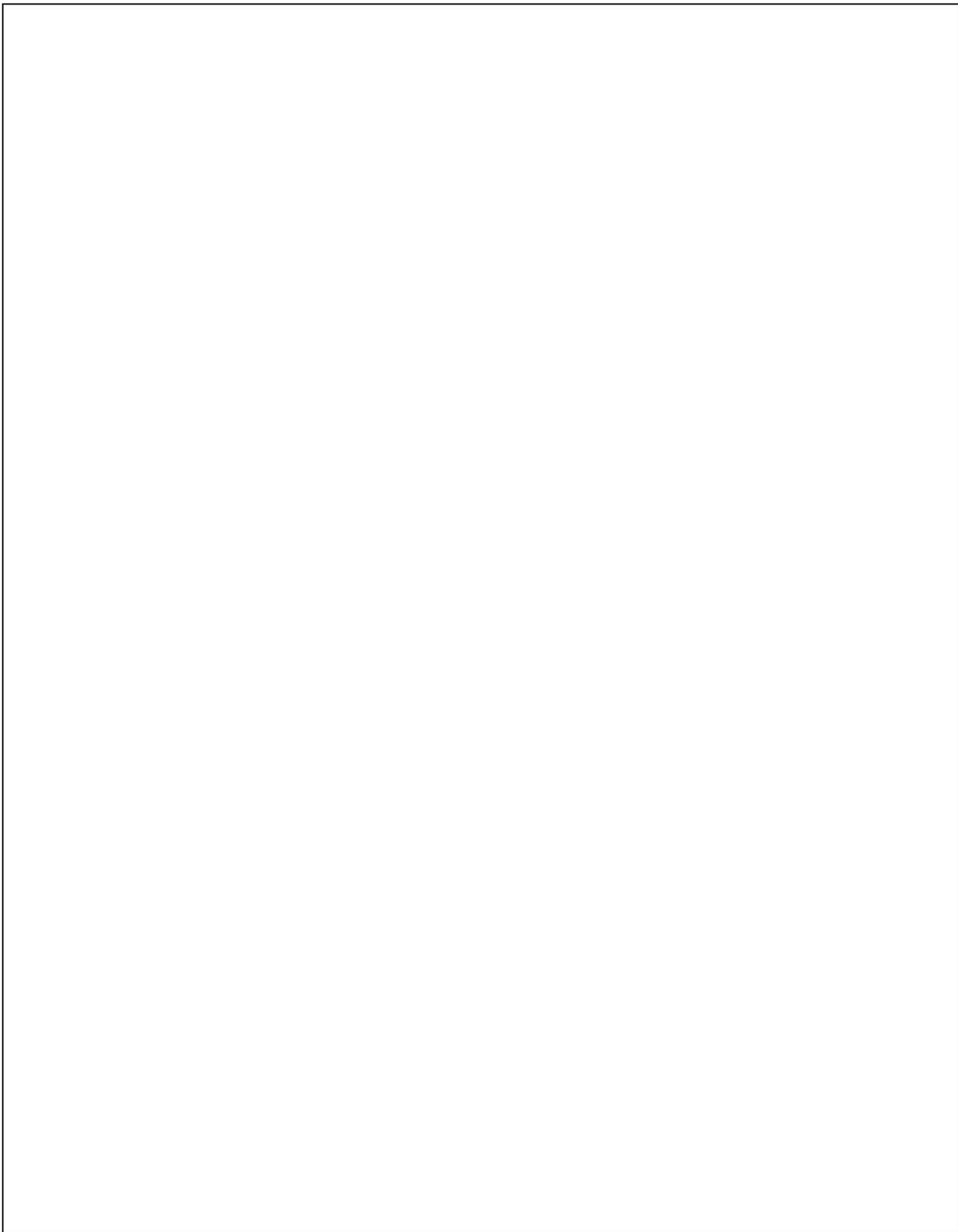
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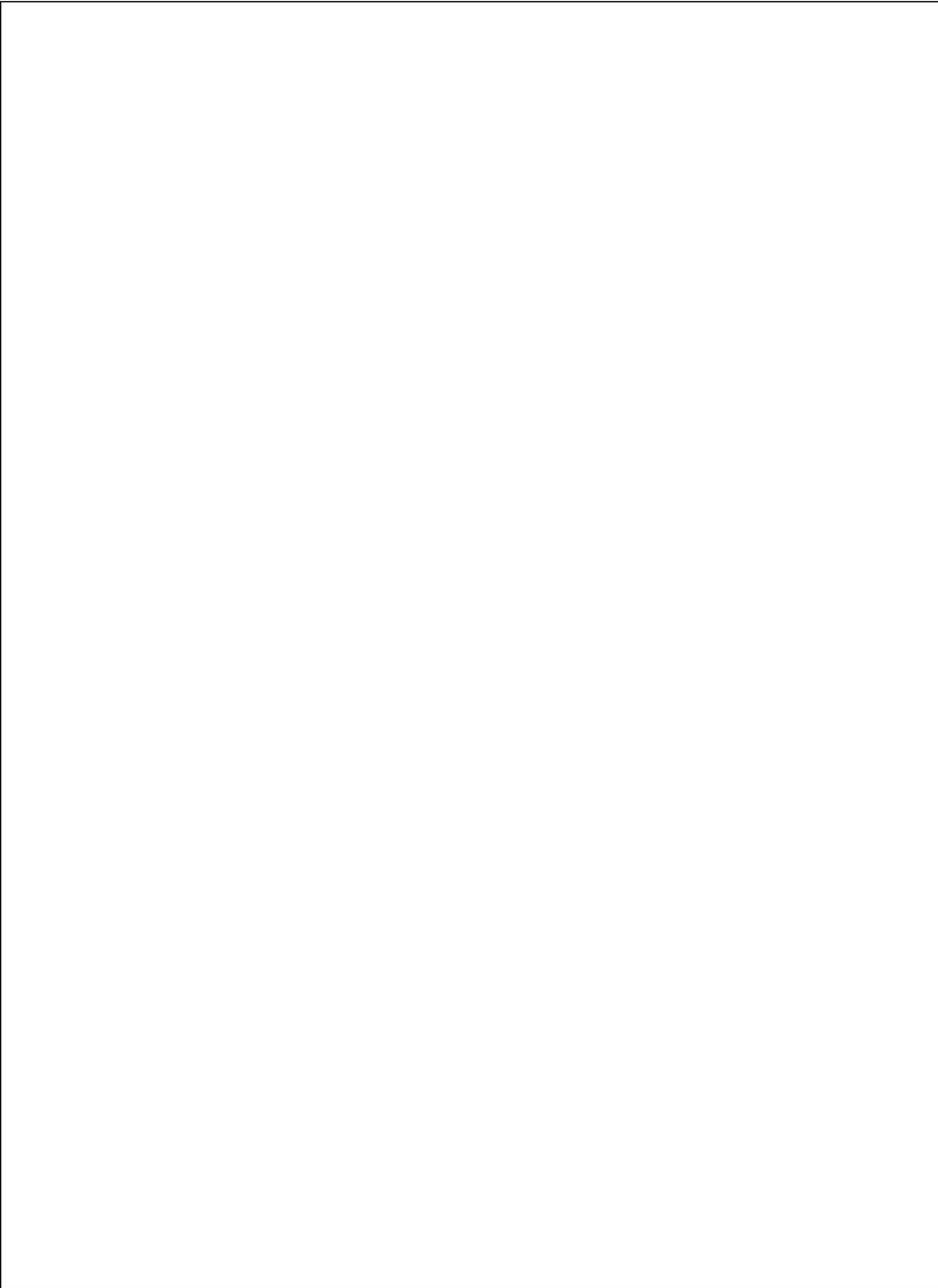
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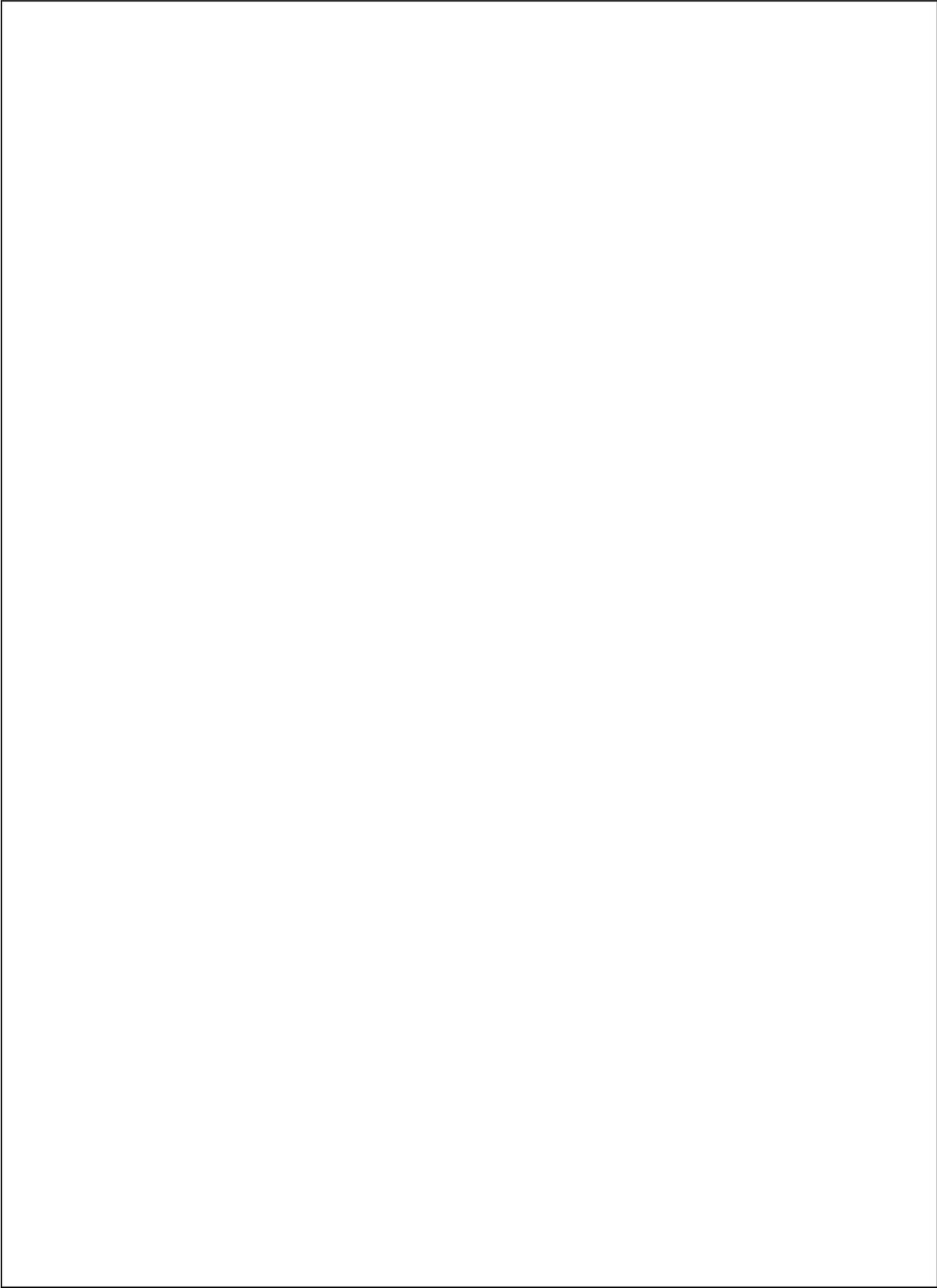
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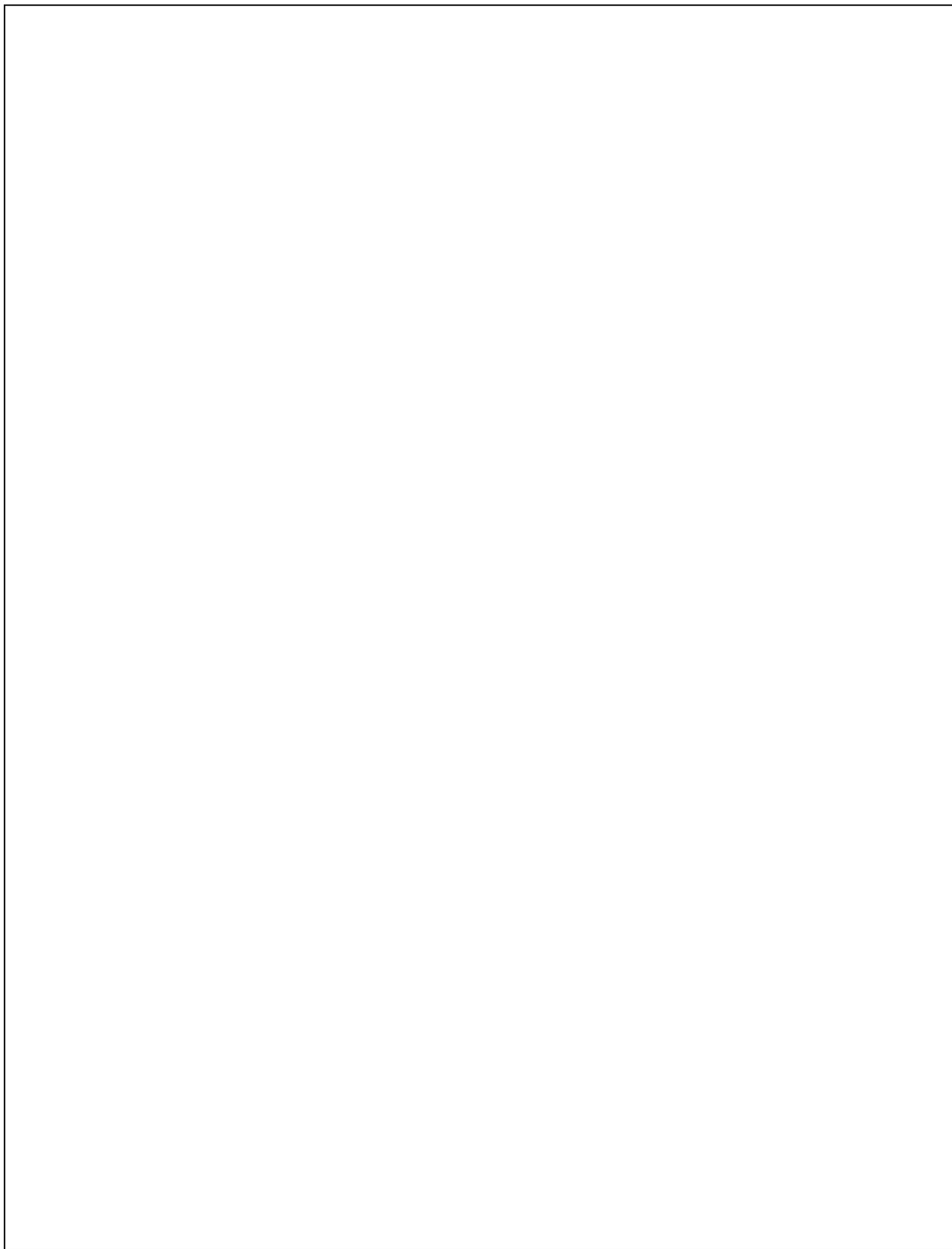
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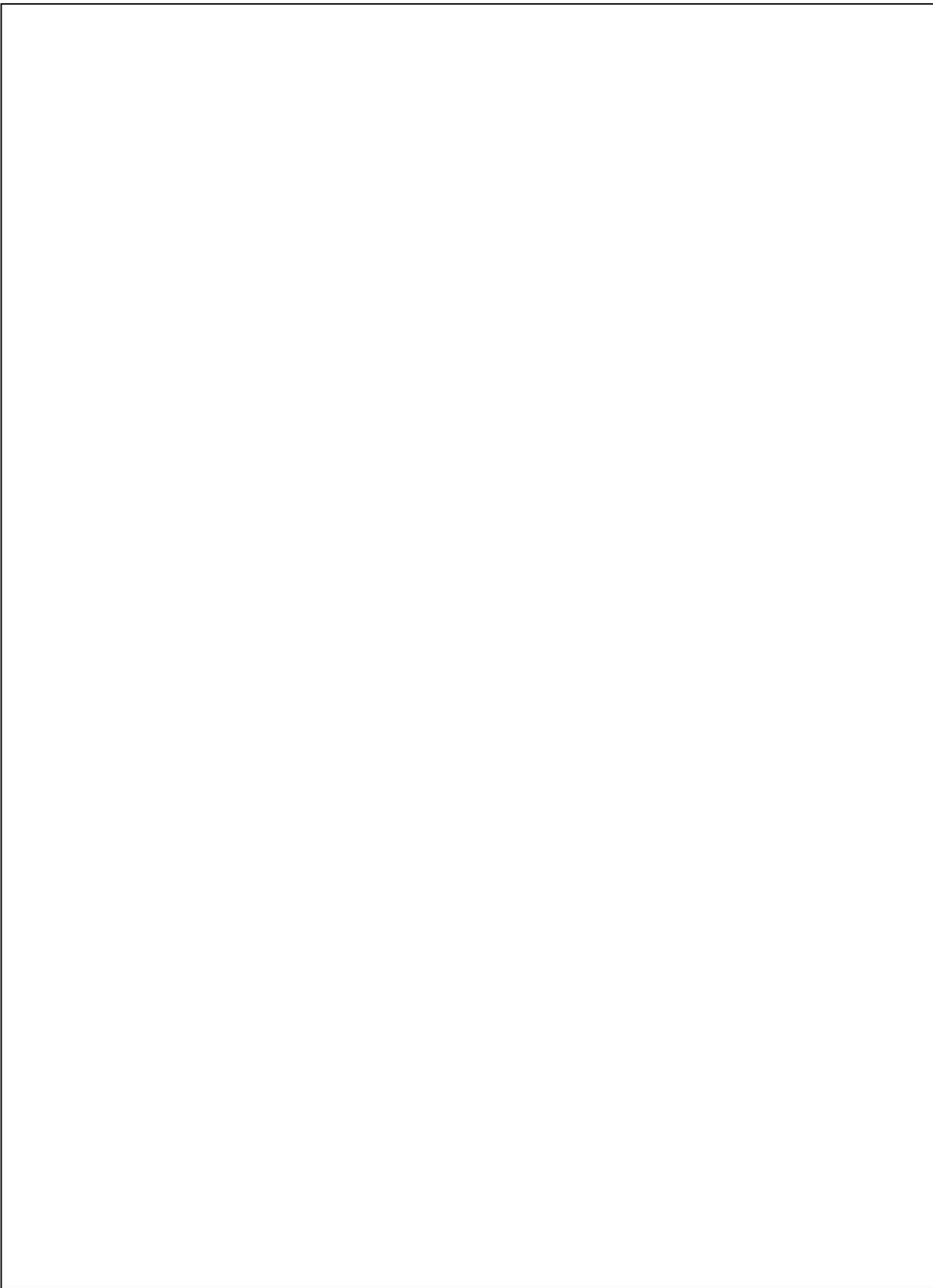
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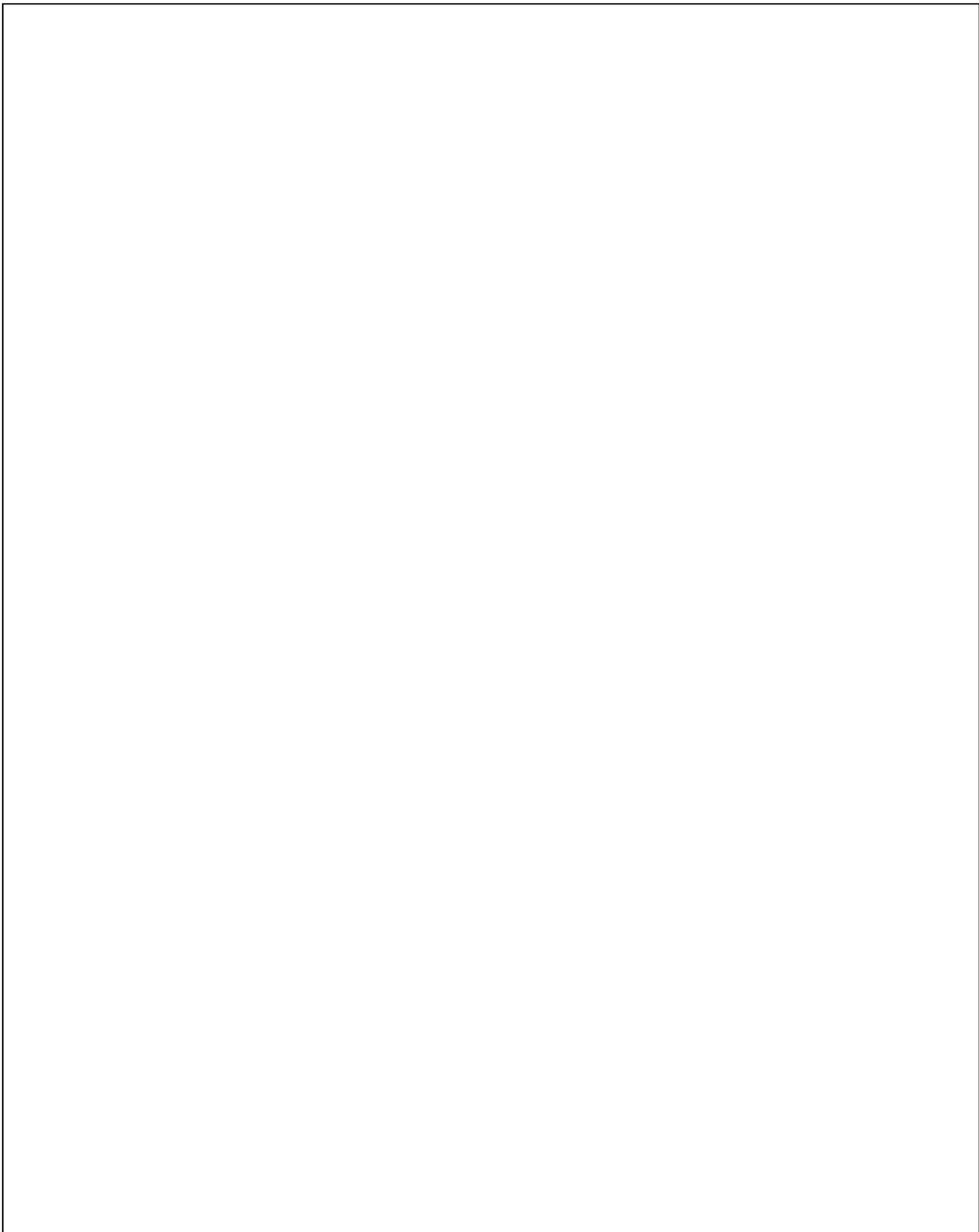
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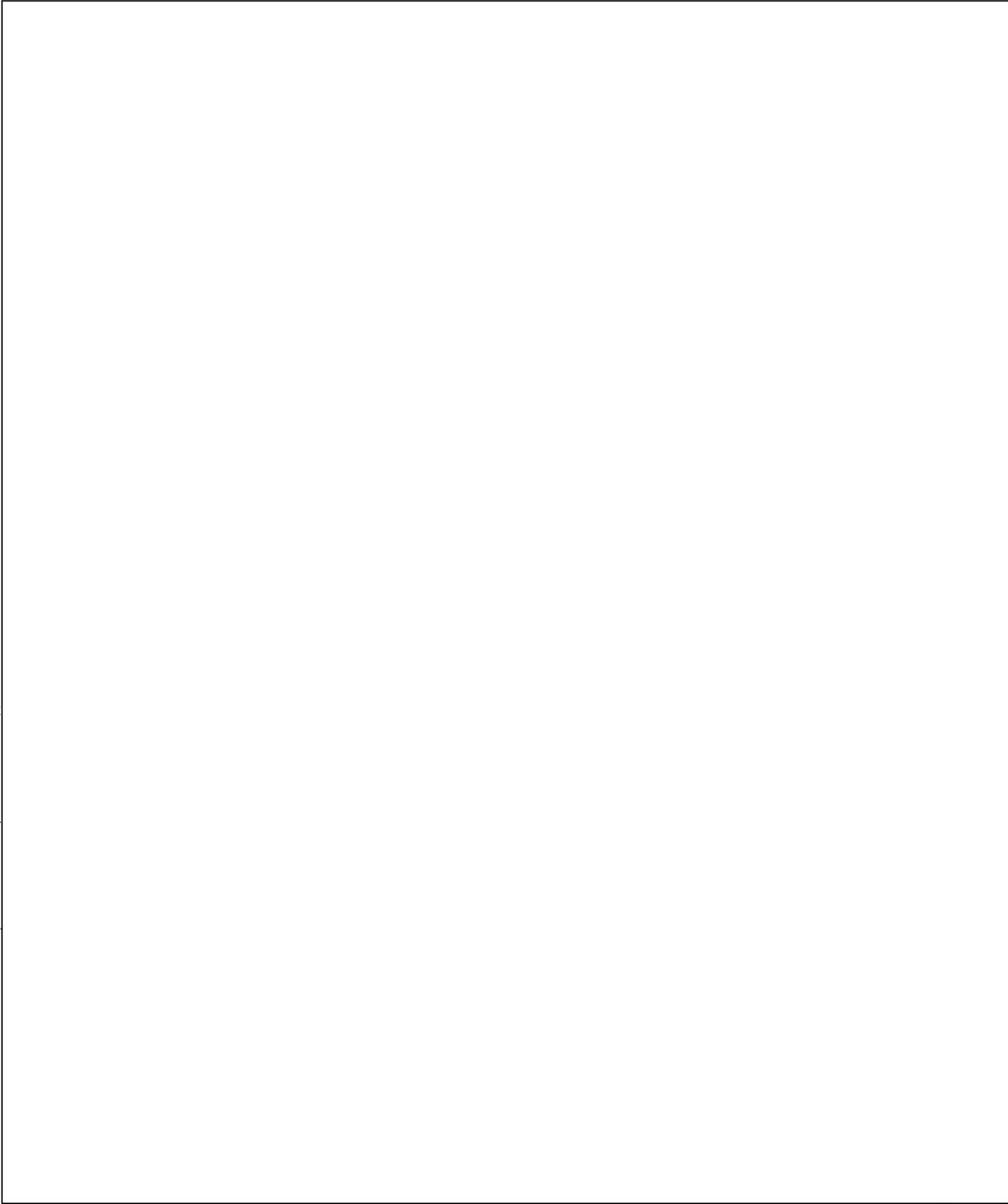
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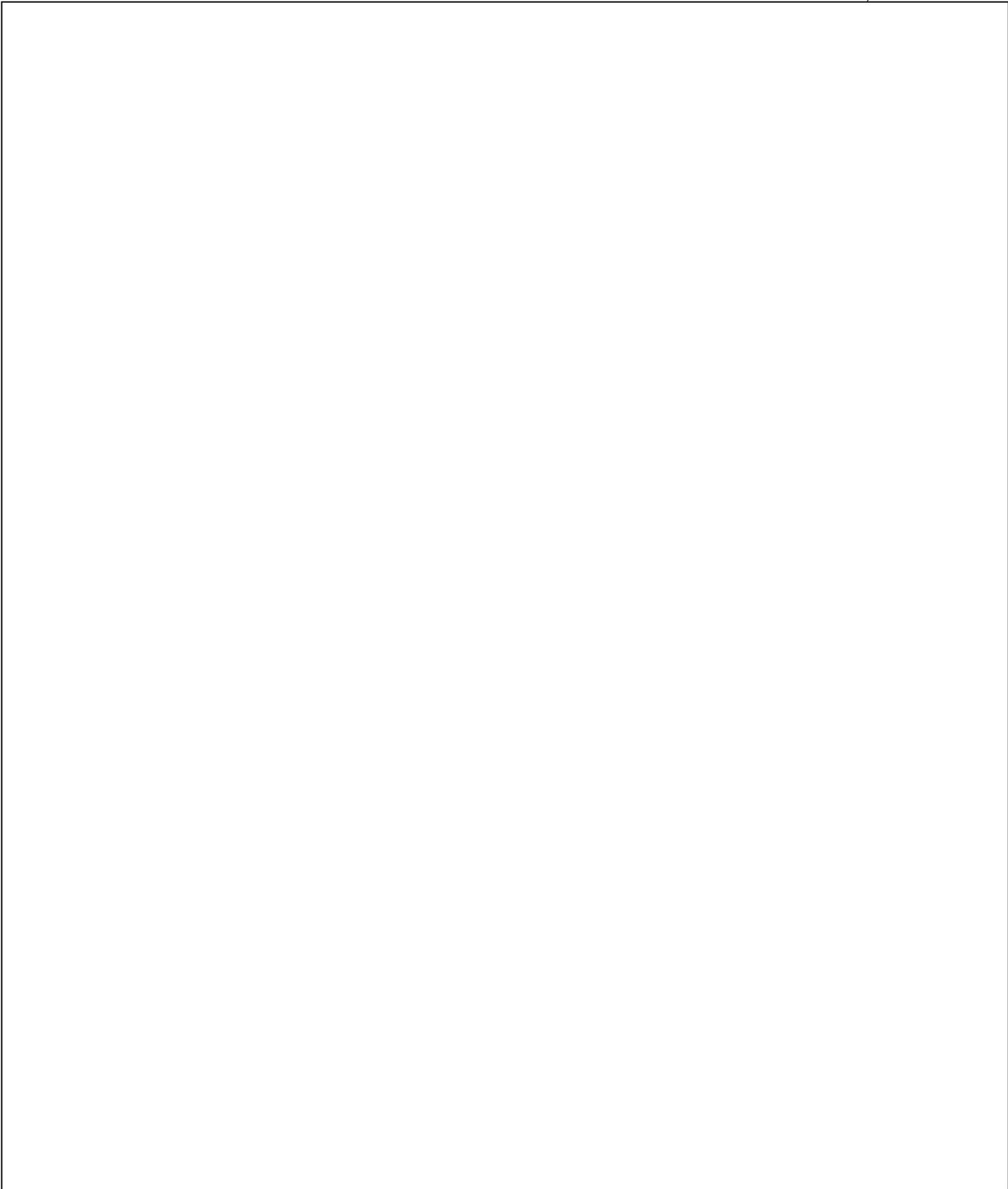
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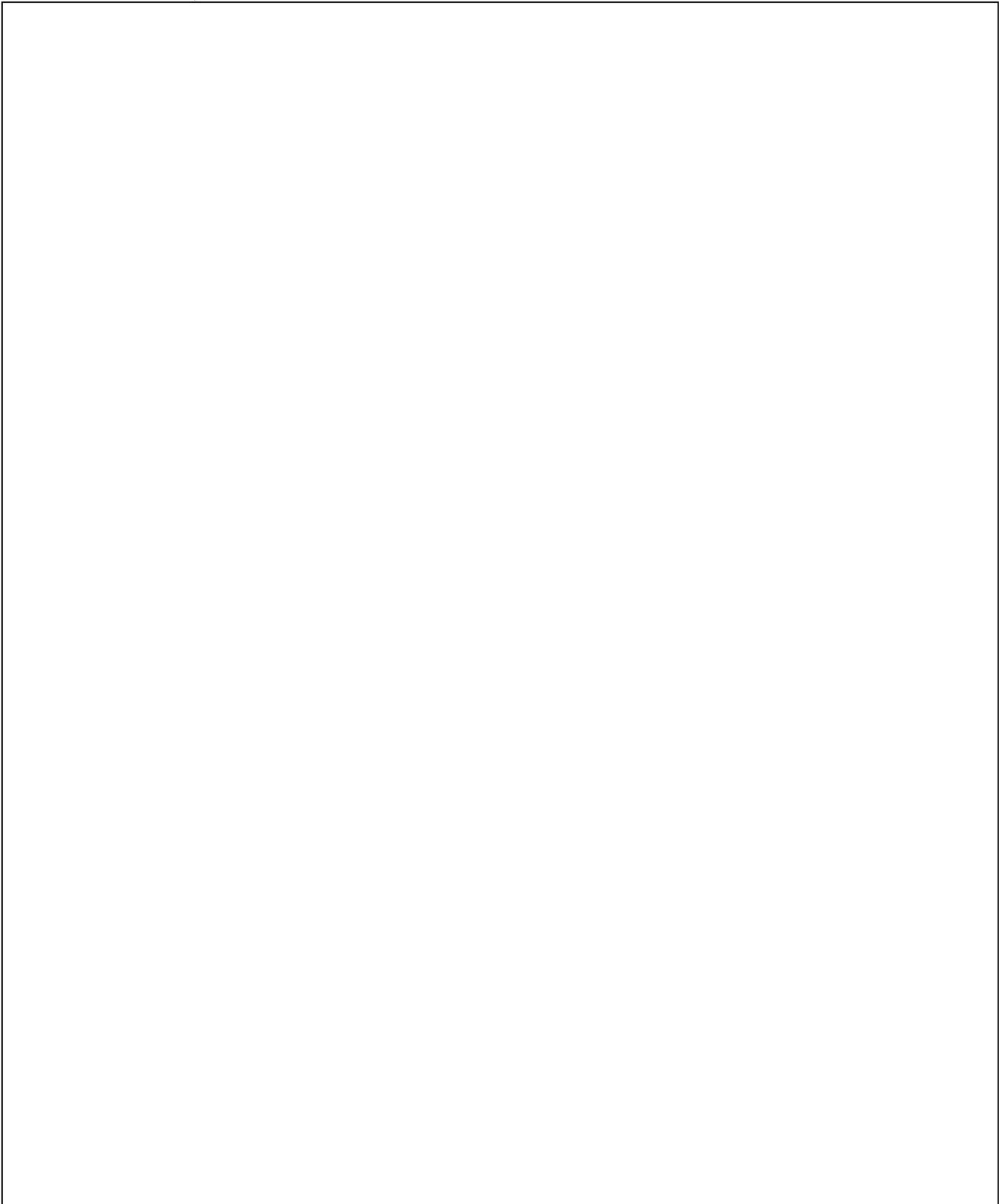
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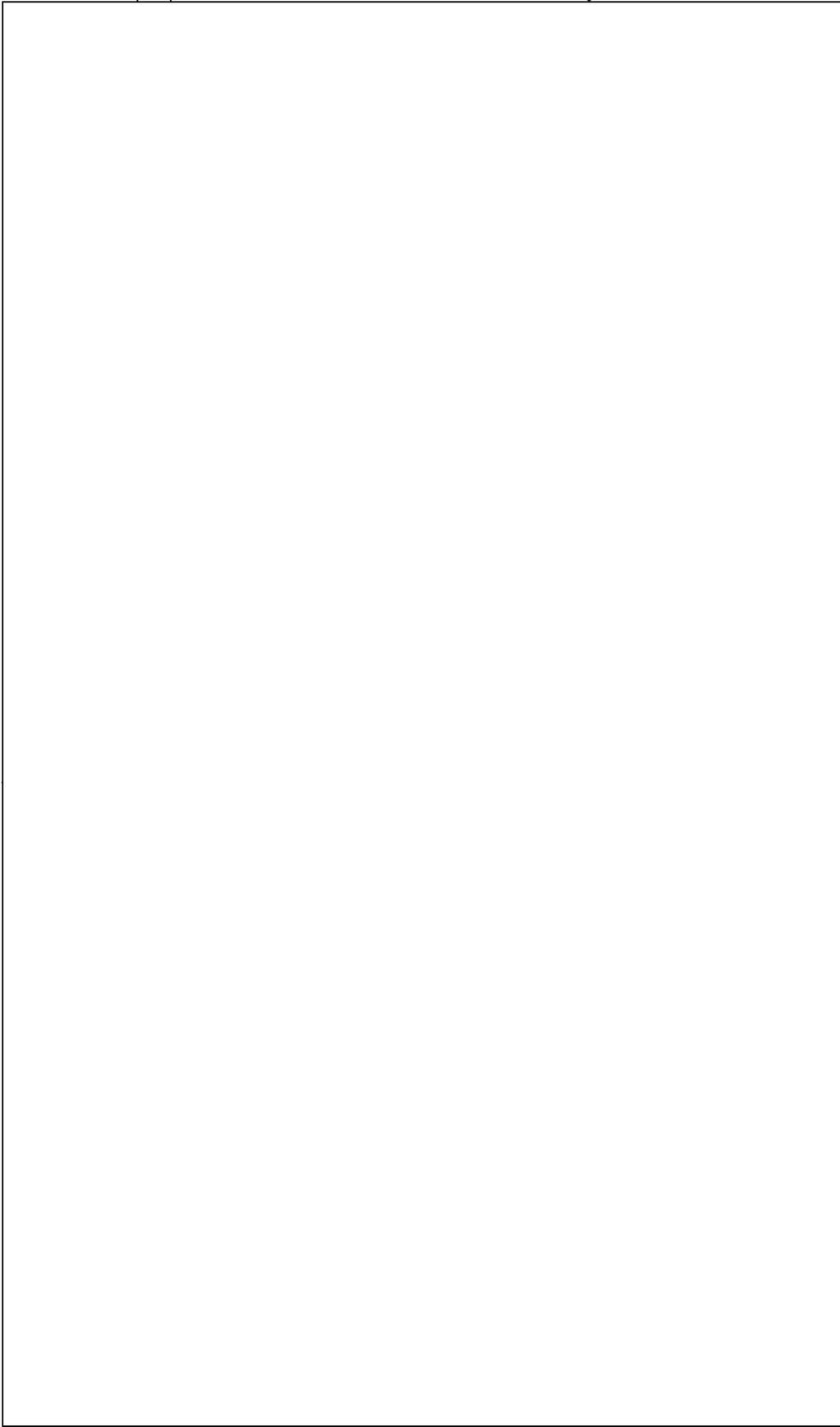
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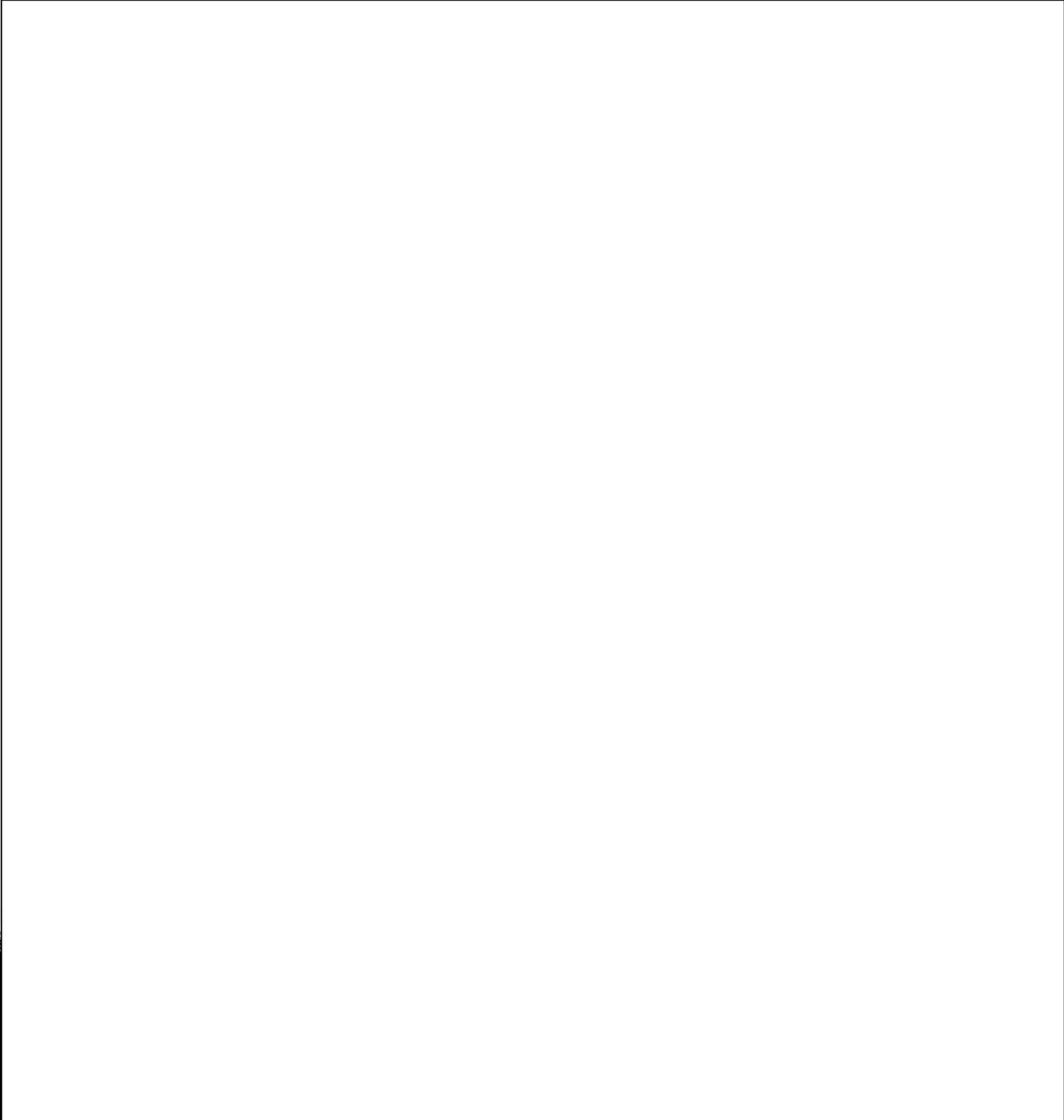
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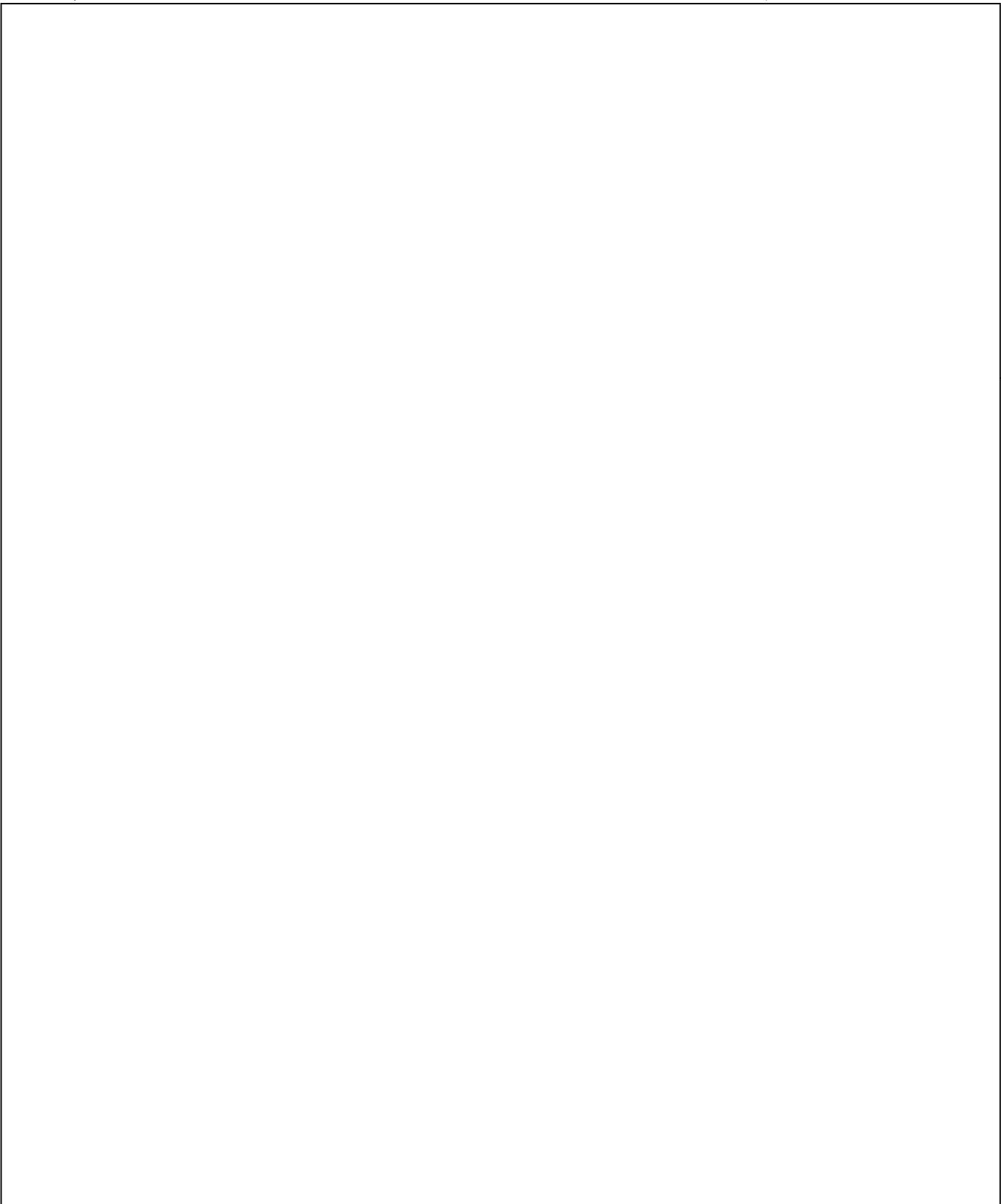
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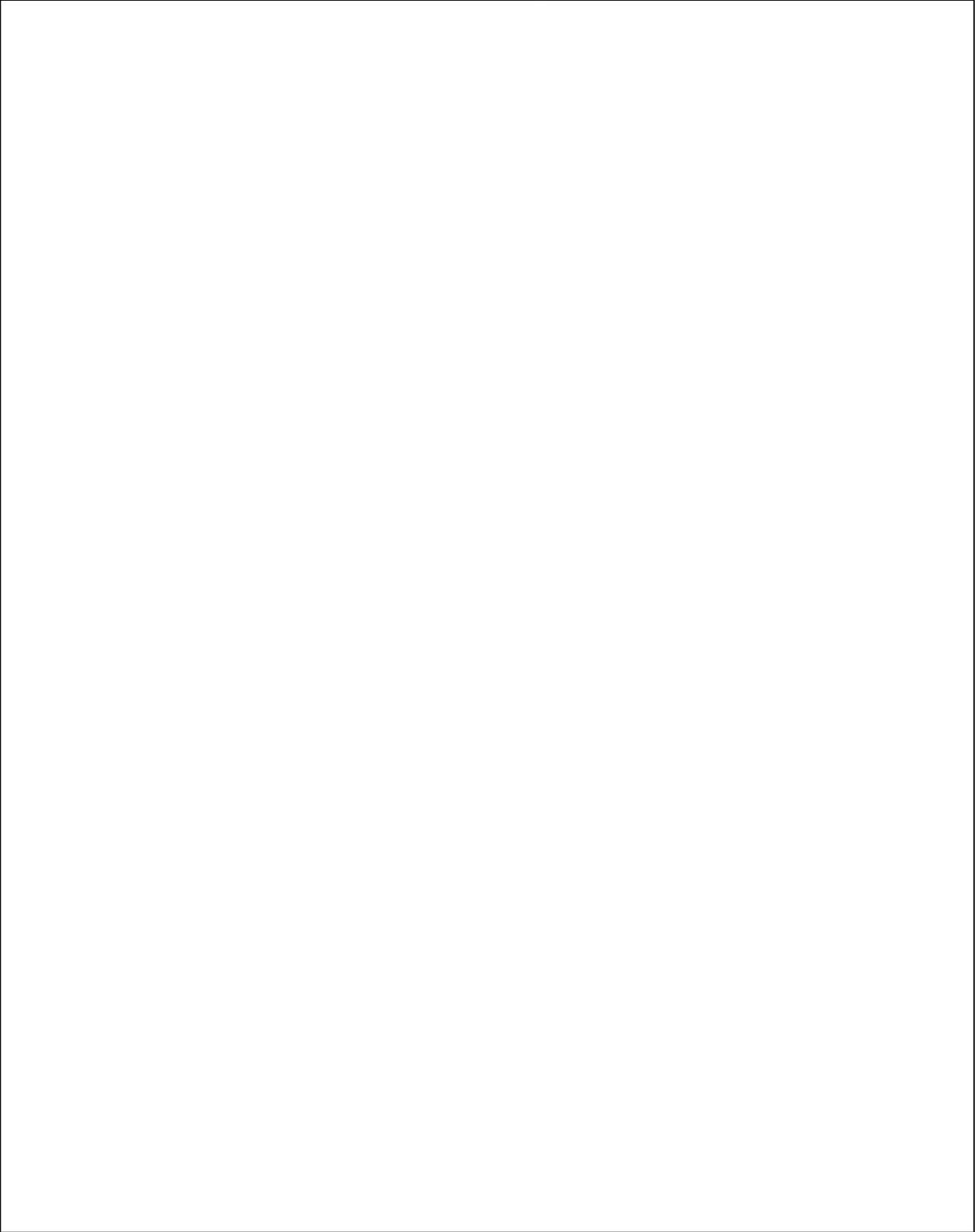
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