

Honors Math 3
Linear Programming

1. A carpentry shop makes dinner tables and coffee tables. Each week the shop must complete at least 9 dinner tables and 13 coffee tables to be shipped to furniture stores. The shop can produce at most 30 dinner tables and coffee tables combined each week. If the shop sells dinner tables for \$120 and coffee tables for \$150, how many of each item should be produced for a maximum weekly income? What is the maximum weekly income?
2. Mrs. Smith grows peaches and apples. At least 500 peaches and 700 apples must be picked daily to meet minimum demands from the buyers. The workers can pick no more than 1200 apples and 1400 peaches daily. The combined number of peaches and apples that the packaging department can handle is 2300 per day. If Mrs. Smith sells her apples at 25¢ each and peaches at 20¢ each, how many of each should be picked daily for maximum income? What is her maximum income?
3. A machine can produce either nuts or bolts, but not both at the same time. The machine can be used at most 8 hours a day. Furthermore, at most 6 hours a day can be used for making nuts and at most 5 hours a day can be used for making bolts. There is a \$2 profit for each hour the machine makes nuts and a \$3 profit for each hour the machine makes bolts. How many hours per day should the machine make each item in order to maximize profit? What is the maximum profit?
4. Mr. Beauregard raises only pigs and goats, and this year he intends to raise 16 animals. There is plenty of room in the pigpen, but a lack of space limits the number of goats to 12. One other limitation is money: it costs \$5/day to raise a pig and \$2/day to raise a goat, and Mr. Beauregard can spend only \$50/day on the animals. If Mr. Beauregard can make a profit of \$17.50 per goat and \$14.00 per pig, how many of each should he raise to maximize his profit? What is his maximum profit?
5. Farmer Jones is going to plant a combination of corn and tomatoes on 20 acres of land. Corn seed costs \$255 per acre and tomato seed costs \$320 per acre. A local restriction limits corn production to 15 acres. Furthermore, corn requires 15 hours of labor per acre at \$6.20 per hour, while tomatoes will require 12 hours of labor per acre at \$7.00 per hour. If the expected income is \$725 per acre for corn and \$810 per acre for tomatoes, how should the 20 acres be planted to earn the maximum profit? What is the maximum profit?
6. A theater contains 500 seats. For an upcoming talent show, the theater manager plans to sell \$4 and \$5 tickets. He must sell at least 200 \$4 tickets and 100 \$5 tickets for the show to be produced, and he must bring in at least \$2000 to break even. How many tickets at each price should be sold to maximize income? What is the maximum income?
7. As office manager of her firm, Marcellyne has been directed to buy new filing cabinets. She knows that Cabinet A costs \$10, requires 6 square feet of floor space, and holds 9 cubic feet of files. Cabinet B costs \$20, requires 8 square feet of floor space, and holds 12.5 cubic feet of files. She can spend at most \$140 and her office has room for no more than 72 square feet of cabinets. Her goal is to maximize storage capacity within her money and space limitations. How many of each type of cabinet should she buy, and how many cubic feet of storage will she get?
8. Company ABC makes 2 models of door handles, plain and decorative, each of which must be assembled and packaged. The plain handles require 12 minutes to assemble and 2 minutes to package, while the decorative handles require 18 minutes to assemble but only one minute to package. Each week there are 240 available hours of assembly time and 20 available hours for packaging. If the plain handles sell for \$2.20 and the decorative handles sell for \$3.50, how many of each type should be made to obtain the maximum weekly income? What is the maximum weekly income?

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9. A sewing company makes 2 styles of girls' dresses, jumpers and smocks. It takes 10 minutes of cutting time and 30 minutes of sewing time to make a jumper while 30 minutes of cutting time and 15 minutes of sewing time are required to make a smock. At most, 20 hours each day can be allotted to cutting, while at most 15 hours each day can be used for sewing. For each jumper there is a \$5 profit and for each smock there is a \$6.50 profit. If there is a demand for all dresses produced, how many of each type should be made to earn the highest daily profit? What is the highest daily profit?
10. In Santa Fe, an Indian Cultural Center makes woven blankets and shirts. Each blanket requires 24 hours for spinning the yarn, 4 hours for dyeing, and 15 hours for weaving. Shirts require 12 hours for spinning, 3 hours for dyeing, and 9 hours for weaving. There are 216, 44, and 147 hours available for spinning, dyeing, and weaving respectively. The cost to make each blanket is \$73 and its selling price is \$105. The cost to make each shirt is \$29 and its selling price is \$47. How many of each item should be made to maximize profit? What is the maximum profit?
11. The Balfour Tool Company uses 3 machines to manufacture 2 models of power drill, standard and super. The standard drill requires 1 hour on machine A, 2 hours on machine B, and 1.6 hours on machine C. The super drill requires 2 hours on machine A, 1 hour on machine B and 1.6 hours on machine C. Each machine can be used for at most 40 hours per week. If the profit on each standard drill is \$7.45 and the profit on each super drill is \$8.95, how many of each type should be made each week to maximize profit? What is the maximum profit?
12. The Fisher Motor Company makes two models of economy car, model A and model B, and makes a profit of \$700 for each model A sold and \$640 for each model B sold. The model A car requires 150 hours for assembly, 50 hours for painting, and 10 hours for testing. The model B car requires 60 hours for assembly, 40 hours for painting, and 20 hours for testing. During each production run, there are 30,000 hours available for assembly, 13,000 for painting, and 5000 for testing. How many cars of each type should Fisher Motor Company make in order to maximize the profit from a production run? What is the maximum profit?
13. Ernesto is about to take a history test consisting of matching questions worth 10 points each and essay questions worth 25 points each. He is required to do at least 3 matching questions, but time restricts doing more than 12. Similarly, he must do at least 4 essays, but time restricts doing more than 15. If Ernesto is required to answer a total of 20 questions, how many of each type should he answer to maximize his score? What is the maximum score?
14. A small clothing company makes two styles of women's bathing suits, bikini and one-piece. To make a bikini, 10 minutes of cutting time and 30 minutes of sewing time are required. To make a one-piece bathing suit, 30 minutes of cutting time and 15 minutes of sewing time are required. Currently, at most 20 hours a day are available for cutting and at most 15 hours a day are available for sewing. Suppose they earn \$13.50 profit for each bikini and \$9.95 profit for each one-piece suit they make. Assuming they can sell all the bathing suits they make, how many of each type should they produce in order to earn the most profit per day? What is the maximum daily profit?
15. The Southern Bagel Factory makes two types of bagels, plain and blueberry. The oven can cook up to 200 bagels per hour. Blueberry bagels each require 2 ounces of dry ingredients and plain bagels each require 1 ounce of dry ingredients. The staff can prepare at most 300 ounces of dry ingredients per hour of cooking time. If the profit on plain bagels is \$0.23 and the profit on blueberry bagels is \$0.31, how many of each type of bagel should be made per hour to maximize profit? What is the maximum hourly profit?
16. A brokerage firm offers 2 types of investments, producing income at the rates of 4% and 5%, respectively. A customer wants to invest at most \$100,000 and his total annual investment income must be at least \$4500. He has the additional stipulation that at least $\frac{3}{4}$ of the total be invested at 5%. The broker receives 1.5% of the income on the 5% investment and 2% of the income on the 4% investment. In order to maximize his fee, how much should the broker invest at each rate? What is his maximum fee?

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| <p>1.
Answer: 9 dinner tables, 21 coffee tables;
 \$4230
CodePath: EAS.TRI.F.F.3</p> <p>2.
Answer: 1200 apples, 1100 peaches; \$520
CodePath: EAS.TRI.F.F.4</p> <p>3.
Answer: 3 hours making nuts, 5 hours making
 bolts; \$21
CodePath: EAS.TRI.F.F.6</p> <p>4.
Answer: 4 pigs, 12 goats; \$266
CodePath: EAS.TRI.F.F.7</p> <p>5.
Answer: 20 acres of tomatoes; \$8120
CodePath: EAS.TRI.F.F.9</p> <p>6.
Answer: 200 tickets at \$4, 300 tickets at \$5;
 \$2300
CodePath: EAS.TRI.F.F.8</p> <p>7.
Answer: 8 of cabinet A, 3 of cabinet B;
 109.5 ft³
CodePath: EAS.TRI.F.F.10</p> <p>8.
Answer: 800 decorative handles; \$2800
CodePath: EAS.TRI.F.F.11</p> <p>9.
Answer: 12 jumpers, 36 smocks; \$294
CodePath: EAS.TRI.F.F.12</p> <p>10.
Answer: 5 blankets, 8 shirts; \$304
CodePath: EAS.TRI.F.F.13</p> <p>11.
Answer: 10 standard, 15 super; \$208.75
CodePath: EAS.TRI.F.F.15</p> <p>12.
Answer: 100 model A, 200 model B; \$198,000
CodePath: EAS.TRI.F.F.14</p> | <p>13.
Answer: 5 matching, 15 essays; 425 points
CodePath: EAS.TRI.F.F.17</p> <p>14.
Answer: 12 bikinis, 36 one-piece suits; \$520.20
CodePath: EAS.TRI.F.F.20</p> <p>15.
Answer: 100 plain, 100 blueberry; \$54
CodePath: EAS.TRI.F.F.22</p> <p>16.
Answer: 25,000 at 4%, 75,000 at 5%; \$76.25
CodePath: EAS.TRI.F.F.16</p> |
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