

September 1, 2020 ☎: 301-251-7014 ☆ site: http://www.MathEnglish.com	By Dr. Li E-mail : programs@MathEnglish.com
Name: (First)(Last)	
School: Grade:	
SOLVING LINEAK EQUATION	2 1
GEOMETRY	9
MATH OLYMPIAD	
ASSESSMENT TEST	

Sc	olvina I inear Fa	Math Level 7 (Pre	Alg2) Sample 8. $7(t-5) = 5(t+3)$
1.	2x - 1 = -2 + 3x		
2.	-5 - 5x = 23 + 2x		9. $2(3t - 1) = 3(3t - 2)$
3.	12y + 13 = -15		10. $6 = 3(-1 + 3x)$
4.	-9x + 5 = -18		11. 5 + 0.1(x + 2) = 7
5.	-5(4x + 15) = 5		12. 8(<i>n</i> - 3) = 12
6.	-(2x + 5) = -7		13. $-16 = -4(t + 7)$
			14. $x + 1 = 13 + 7x$

7. 4(x - 1) + 5(x + 2) = 3(x - 8)

15. -18 = -3(2 - 4x)

16. 2x - 1 = -2 + 3x

17. -4 + 2x = -48 - 9x

18. x - 3 = -2 + 2x

19. -3(4 - 4x) = -72

20. -3x - 3 = 1 + x



Math Imagination

21. How many 4-digit numbers are there?

27. *P*(not an ace)

26. *P*(red card)

- 22. If a customer buys lunch at a restaurant that offers four kinds of soups, seven kinds of sandwiches and three kinds of pies, how many different soup-sandwichpie lunches can she choose?
- 28. The figure shows all roads between Rockville, Sandville, and Toadville. Martina is traveling from Rockville to Toadville. How many different ways could she make the trip without making loops?
- 23. In a sack there are exactly 48 marbles, each of which is either red, black, or yellow. The probability of randomly selecting a red marble from the sack is $\frac{5}{8}$, and the probability of randomly selecting a black marble from the sack is $\frac{1}{8}$. How many marbles in the sack are yellow?



<u>Question set</u> [24 - 27] Select a card from a deck.

24. *P*(a king or a heart)

25. Chance of drawing a red 7

Question set [29 - 31]

[Comparison of Ratios]

To compare ratios, write them as fractions. The ratios are equal if they are equal when written as fractions. Remember that order matters! A ratio of 1:7 is not the same as a ratio of 7:1.

29. 3 to 4 = (A) 6 to 9 (B) 9 to 15 (C) 15 to 21 (D) 21 to 28



30. 7:1 = (A) 71:11 (B) 70:11 (C) 700:100 (D) 7000:10001

31. 7:14 = (A) 36:70 (B) 21:40 (C) 27:56 (D) 35:70

[Proportion]

A proportion is an equation with a ratio on each side. It is a statement that two ratios are equal.

 $\frac{3}{4} = \frac{6}{8}$ is an example of a proportion.

When one of the four numbers in a proportion is unknown, <u>cross products</u> may be used to find the unknown number. This is called <u>solving the proportion</u>. Question marks or letters are frequently used in place of the unknown number.

- 32. The swimming records of Jenny and Hanna are listed below.
 - Jenny swims 15 lengths within $2\frac{1}{2}$ min.
 - Hanna swims 20 lengths within $3\frac{1}{3}$ min.

Who swims faster?

34. The graph shows numbers of magazine subscriptions sold during the annual fundraising drive of Old York High School.



What is the ratio of the number sold by students in grades 9-12 to the number sold by students in grades 7-8?

<u>Question set</u> [35 - 37]

[Compound Units Conversions] Example: Find the ratio for 1 yd² to 1 ft²

Sol: 1 yd² to 1 ft² = $(3 \text{ ft})^2 : 1 \text{ ft}^2$ = 9 : 1

Express the following ratios in lowest terms.

35. 1 in² to 1 ft^2

36. 1 m^2 to 1 cm^2

33. A type of steel used for bicycle frames contains 5 g of manganese in every 400 g of steel. How much manganese would a 2240 g bicycle frame contain?

37.1 m^2 to 200 cm^2

- 38. "Three out of five customers compliment me on our Back-to-School decorations," Julius said. "So far this month, I have received 171 compliments." How many customers visited the store?
- 42. A 32-ounce bottle of alcohol cleaner costs \$6.40. It takes only a third as much concentrate as cleaner to do the same job and it was available as a 4-ounce bottle selles for \$2.50. Which is a better buy?

- 39. 72 children attended a trip to Six Flags. 40 of them were boys.
 - (a) Find the ratio of the number of boys to girls.
 - (b) What part (in fraction) of the group is boys?
- 43. A boat made a trip of 91 miles at a rate of 35 miles per hour. How long (hr/min) would it take?

44. A certain airplane climbs at a rate of 400 feet per second. At this rate, how many <u>seconds</u> will it take the plane to reach a cruising altitude of 32,000?

<u>Question set</u> [40 - 41]

75 cm³ of maple sap can be boiled down to make 2 oz of maple syrup.

40. How much maple syrup would 225 cm³ of sap make?

- 41. How much sap would be needed to make 8 oz of syrup?
- gas per hour while cruising. If a pilot has 28.5 gallons of gas, how many <u>hours and minutes</u> can he cruise?

45. A certain type of plane uses 6 gallons of

46. A gas pump can fill a tank of 15 gallons in 3 minutes. How many <u>minutes</u> it take to fill a tank of 24 gallons?



<u>Question set</u> [47 - 48]

A geologist found that silt was deposited on a riverbed at the rate of 4 cm every 170 years.

47. How many years would it take for 10 cm of silt to be deposited?

52. A car can travel 130 mi on 6.5 gal of gas. A van can travel 252 mi on 12 gal. Mpg, or miles per gallon, is used to measure the gas efficiency of a vehicle. What is the mpg ratio of both vehicles?

- 48. How much silt would be deposited in 255 years?
- 53. A rectangle measures 25 cm at its length and 15 cm at its width. Find the ratio of the width to the length to the perimeter of the rectangle in lowest form.

- 49. *A* is five times *B*. What is the ratio between *A* and *B*?
- 54. A rectangle measures 45 cm at its length and 30 cm at its width. Find the ratio of the length to the width in lowest form.

Question set [50 - 51]

A long-playing record revolves 100 times every 3 min.

- 50. How many revolutions does it make in 2.25 min?
- 51. How many minutes does it take for 275 revolutions?

55. A vehicle is moving at 40 miles per hour. How many minutes will it take to travel 18 miles?

56. A woman bought curtain material 25 yards long. Each curtain is made with $5\frac{1}{2}$ yards of the material. How many curtains can she make at most? How many <u>feet</u> is the material left?



- 57. Juan runs 4 km in 30 minutes.(a) How many hours will it take him to run 1 km?
 - (b) At the same rate, how far could he run in 45 minutes?

58. Anna, the owner of Fabulous Fashions, usually sends flyers to attract new customers. She must mail out 600 flyers to get 14 potential customers. How many flyers must she mail to get 35 customers?

59. At a milk processing plant 300 lb of farm milk are needed to make 3.75 lb of nonfat dry milk. To the nearest pound, how many pounds of farm milk are needed to produce 100 lb of nonfat dry milk?

60. Bill buys furniture valued at \$9,750. He makes a down payment of \$2,750 and agrees to pay the balance in installments* of \$500 each. How many installments will he need to pay?



^{*} A debt does not need to be cleared once. It can be divided into several times. A part of a sum of money to be paid each time is called <u>installment</u>.

Geometry

61. \triangle ABC is a right triangle. \angle A = 30°. BD bisects \angle B. Find the measures of \angle 1 in the figure.



64. \triangle ABC is an isosceles triangle with AB=AC. Find the value for *x* in the figure.



- 65. \triangle ABC is an isosceles triangle. Find the measure of a base angle.
- 62. ΔABC is an equilateral triangle. AD is the bisector of ∠BAC. Find the measures of angle ∠1.





- 66. \triangle ABC is an isosceles. AD \perp BC. Find the length of the altitude.
- 63. \triangle ABC is an isosceles triangle with AB = AC. Find the measure of \angle B.





Question set [67 - 69]



 Δ ABC is an isosceles. AD \perp BC. The height to the base is 5.



67. What is the length of the base BC?

71. \angle ABC is bisected by BD. If \angle ABD = 30°, find the value for *x*.



72. $\angle AOC$ is bisected by OB. Find the value for *x* in the figure.



- 68. What is the area of $\triangle ABC$?
- 69. What is the perimeter of $\triangle ABC$?

70. \angle ABC is bisected by BD in the figure. If \angle ABE = 100°, find the value for *x*.



73. \angle AOD is a straight angle (180°), OB and OC divide the entire angle into three congruent angles, what should be the value for *x*?



74. \angle CAB is right angle, bisected by AD. What should be the value for *x* and *y*?



78. What is the area of the outer garden?

79. What is the combined area of the two gardens?

- 75. A circle has a circumference of 1256 in. What is its area? (Use 3.14 for π .)
- 80. What is the area of the path?

- 76. A circle has an area of 1256 m². What is its circumference? (Use 3.14 for π .)
- 81. What is the total area of the two gardens and the path?

<u>Question set</u> [77 - 81]

A circular garden with radius 10 ft is divided into two parts by a 2-ft path. The radius of the inner garden is 3 ft. (Leave π in your answer.)



77. What is the area of the inner garden?



Math Olympiad

- 82. The sum of Tom's, Dick's, and Harry's ages is 31. Tom is twice as old as Dick, and Harry is 6 years older than Tom. How old is each? (Hint: Let Dick be *x* years old.)
- 86. In a stationery store, pencils have one price and pens have another price. Two pencils and three pens cost 78¢. But three pencils and two pens cost 72¢. How much does one pencil cost?

83. A round wheel with a radius of 15 cm rolls at a constant speed of 5 revolutions per second. How far (in meters) does the axle of the wheel move in 20 seconds?

<u>Question set</u> [**84 - 85**] Race problems.

84. Arlene runs 3 times as fast as Brenda. Candace runs 4 times as fast as Brenda. In a race 60 yards, when Candace crosses the finish line, how many yards will Brenda fall behind Arlene?

85. Alex, Ben and Carl run at constant rates. In a race of 1000 *m*, Alex finished 200 *m* ahead of Ben and 400 *m* ahead of Carl. When Ben finished, how far was he ahead of Carl? (in *m*)

Assessment Test

87. In the right triangle below, Side A is 6 centimeters long and Side B is 8 centimeters long. What is the length of Side C?



- (A) 10 centimeters
- (B) 14 centimeters
- (C) 48 centimeters
- (D) 100 centimeters
- 88. Identify the property represented by this equation.
 - 5 + 3 = 3 + 5
 - (A) associative
 - (B) commutative
 - (C) distributive
 - (D) identity
- 89. Look at the equation below. $(3 \times 5) + (3 \times -7) = 3(5 + -7)$ Which property is illustrated by the equation?
 - (A) associative property
 - (B) commutative property
 - (C) distributive property
 - (D) identity property

- 90. The population of Mexico City is about 12,490,000. Which of these numbers is the correct way to represent the population of Mexico City using scientific notation?
 (A) 1.249×10⁷
 (B) 12.49×10⁶
 (C) 124.9×10⁵
 - (D) 1249×10^4
- 91. Beth must buy an equal number of red marbles and green marbles. The red marbles are sold in bags of 12 and the green marbles are sold in bags of 9. What is the minimum number of each color marble she can buy?
 - (A) 21
 - (B) 36
 - (C) 72
 - (D) 108
- 92. Which of the following sets of numbers is in order from greatest to least?
 (A) -2, 2, -3, 3, -4, 4, -5, 5
 (B) -2, -3, -4, -5, 2, 3, 4, 5
 (C) 5, 4, 3, 2, -5, -4, -3, -2
 (D) 5, 4, 3, 2, -2, -3, -4, -5
- 93. The temperature was -12°C at 6 A.M. At 6 P.M. the temperature was 15°C. Which of these numbers shows the change in temperature from 6 A.M. to 6 P.M.?
 (A) +3°C
 (B) -3°C
 (C) +27°C
 - (C) $+27^{\circ}$ C (D) -27° C



- 94. Susan is paid \$6.25 per hour to baby-sit. Last week, she earned \$18.75. This week she baby-sat for 10 hours. What is the total amount of money she earned during these two weeks?
 - (A) \$18.75
 - (B) \$25.00
 - (C) \$62.50
 - (D) \$81.25
- 95. Which of these is the decimal equivalent
 - of $\frac{33}{50}$?
 - (A) 0.33
 - (B) 0.50
 - (C) 0.60
 - (D) 0.66
- 96. Solve the number sentence below:
 - $7\frac{1}{4} 5\frac{2}{3} =$ (A) $1\frac{5}{12}$ (B) $1\frac{7}{12}$
 - (C) $2\frac{5}{12}$
 - (D) $2\frac{7}{12}$
- 97. What is 40% of 35?
 - (A) 14
 - (B) 75
 - (C) 140
 - (D) 1400
- 98. Jackie threw a baseball at a target 5 times and hit the target 2 times. Which of the following is true?
 - (A) She hit the target 20% of the time.
 - (B) She hit the target 25% of the time.
 - (C) She hit the target 40% of the time.
 - (D) She hit the target 50% of the time.

- 99. Margo needs 15 ounces of green paint. To make green paint, she mixes 2 parts yellow paint and 3 parts blue paint. How many ounces of yellow paint does Margo need for her mix?(A) 2 ounces
 - (B) 6 ounces
 - (C) 9 ounces
 - (D) 10 ounces
- 100. A copy machine is able to copy 45 pages in 3 minutes. At this rate, how many pages can the machine copy in 1 hour?
 (A) 15 pages
 (B) 135 pages
 (C) 900 pages
 - (D) 2,700 pages
- 101. Ricky wants to buy a new pair of sneakers. The original price of the sneakers is \$72.00. The store is offering a 15% discount. What is the sale price of the sneakers?
 (A) \$10.80
 (B) \$61.20
 (C) \$62.80
 (D) \$82.80
- 102. Roberto wants to buy a pair of in-line skates that are on sale. The original price of \$195.00 has been discounted 30%. What is the sale price of the in-line skates? (A) \$30.00
 (B) \$58.80
 (C) \$136.50
 (D) \$165.00
- 103. Study the pattern below.

1,2, 4, 8, 16, 32, ____, ____ On the lines above, continue the pattern by writing the next two numbers.



104. The table shows the distance Pedro jogged each day last week.

Distance Jogged			
Day	Distance (miles)		
Monday	2.3		
Tuesday	1 3		
Wednesday	$2\frac{1}{2}$		
Thursday	2		
Friday 1.8			
Saturday	2.6		
Sunday	1 3		

What was the total distance Pedro jogged last week?

- (A) 8.7 mi
- (B) 11 mi
- (C) 14.7 mi
- (D) 16 mi
- 105. Which expression could be used to solve the problem below?

To cater a luncheon, a hotel charges \$50 per hour for use of a dining room plus \$24.50 per person. What is the total cost for a 2-hour luncheon for 45 people?

- (A) $2 \times 50 + 24.50 + 45$
- (B) $2 \times 50 + 24.50 \times 45$
- (C) $2 \times 24.50 + 50 \times 45$
- (D) 2×45 + 50×24.50
- 106. Conner's parents asked him to save $\frac{2}{5}$ of his allowance each week to help pay for summer camp. What percent of his allowance did Conner's parents ask him to save? (A) 25%
 - (B) 35%
 - (D) 5570
 - (C) 40% (D) 60%



Answer Key

Solving Linear Equation

1.	x = 1
2.	x = -4
3.	y = -7/3
4.	23/9
5.	x = -4
6.	x = 1
7.	x = -5
8.	<i>t</i> = 25
9.	$t = \frac{4}{3}$
10.	x = 1
11.	$5 + 0.1x + 0.2 = 7$ $\Rightarrow 0.1x + 5.2 = 7$ $\Rightarrow 0.1x = 1.8$ $\Rightarrow x = 18$
12.	9/2
13.	<i>t</i> = -3
13. 14.	t = -3 $x = -2$
 13. 14. 15. 	t = -3 $x = -2$ $x = -1$
 13. 14. 15. 16. 	t = -3 $x = -2$ $x = -1$ $x = 1$
 13. 14. 15. 16. 17. 	t = -3 x = -2 x = -1 x = 1 x = -4
 13. 14. 15. 16. 17. 18. 	t = -3 x = -2 x = -1 x = 1 x = -4 x = -1
 13. 14. 15. 16. 17. 18. 19. 	t = -3 x = -2 x = -1 x = 1 x = -4 x = -1 x = -5

Math Imagination

- 21. 9×10×10×10 = 9000 numbers Note: The first digit cannot be a 0, thus is has only 9 choices.
- 22. How many combinations does she have? Since she can any kind of soup, sandwich, and pie, she has 4(soup)×7(sandwiches)×3(pies)=84 (choices).
- 23. Prob(red) = $\frac{5}{8}$ Prob(blue) = $\frac{1}{8}$ Prob(yellow) = $2/8 = \frac{1}{4}$ $48 \times \frac{1}{4} = 12$ yellows
- 24. 4 + 13 1 = 16 (deducting 1 since there is a king of heart) 16/52 = 4/13
 25. 2/52 = 1/26
 26. 26/52 = 1/2
 27. 1 - 1/13 = 12/13
 28. 3 routes from R to S) 2 routes from S to T 3×2 = 6 ways
 29. D
- 30. C
- 31. D
- 32. Equally fast Jenny: $\frac{15}{2\frac{1}{2}} = 6$ lengths per min Hanna: $\frac{20}{3\frac{1}{3}} = \frac{20}{\frac{10}{3}} = 6$ lengths per min
- 33. $2240 \times \frac{5}{400} = 2240 \times \frac{1}{80} = 28 \text{ g}$



34.29 + 84 + 72 + 118 = 303 (total 9-12) 72+101 = 173 (total 7-8)ratio = 303:17335. 1:144 ft = 12 in $(ft)^2 = (12 in)^2 = 144 in^2$ 36.10000:1 m = 100 cm $m^2 = (100 \text{ cm})^2 = 10000 \text{ cm}^2$ 37.50:1 1 m^2 :200 cm² = (100 cm)² :200 cm² =10000:200 = 50:138. $\frac{3}{5} = \frac{171}{r}$ x = 28539. (a) 40:32 = 5:4(b) $\frac{40}{72} = \frac{5}{9}$ 40. 225 $\times \frac{2}{75} = 6$ oz 41. $8 \times \frac{75}{2} = 300 \text{ cm}^3$ 42. $6.4 \div 32 = 0.2$ (alcohol cleaner cheaper) $2.5 \div 4 \div 3 > 0.2$ 43. 91 \div 35 = 13 \div 5 = 2.6 hr = 2 hr 36 min 44. $32000 \div 400 = 32 \div 4 = 80$ sec 45. $28.5 \div 6 = 4.75$ hr = 4 hr 45 min 46. $15 \div 3 = 5$ $24 \div 5 = 4.8 \min$ 47. $10 \times \frac{170}{4} = 425$ years 48. $255 \times \frac{4}{170} = 6 \text{ cm}$ 49. A:B = 5:150. $2.25 \times \frac{100}{3} = 75$ rev. 51. $275 \times \frac{3}{100} = 8.25 \text{ min}$ 52. car:van = $\frac{130}{65}$: $\frac{252}{12}$ = 20:21

53. 15:25 = 3:52(3+5) = 16width : length : perimeter = 3:5:1654. 45: 30 = 3:255. time = $\frac{\text{distance}}{\text{speed}}$ = $\frac{18}{40}$ = 0.45 hour = $0.45 \times 60 \text{ min} = 27 \text{ min}$ 56. $4 \times 5\frac{1}{2} = 3$ yards = 9 ft 57. 30 min = $\frac{1}{2}$ hr (a) $\frac{1}{2} \div 4 = \frac{1}{8}$ hr (b) $45 \div 30 = 1.5$ $1.5 \times 4 = 6 \text{ km}$ 58. $\frac{600}{14} \times 35 = 1500$ 59. $100 \times \frac{300}{3.75} = 100 \times \frac{100}{1.25} = 8,000$ lb 60. $(9750 - 2750) \div 500 = 14$ installments

Geometry

61. $\angle B = 90^{\circ} - 30^{\circ} = 60^{\circ}$. $\angle 1 = 60^{\circ} \div 2 = 30^{\circ}$

- 62. Since $\angle A = 60^\circ$, $\angle 1 = 30^\circ$.
- 63. 180-80 = 100. 100÷2 = 50. ∠B = 50°. ∠C = 50°.
- 64. ∠ABC is twice 35°, so it is 70°. Since two base angles are congruent for an isosceles triangle, ∠ABC=∠BCA=70°. *x* =180-2(70)=40

65. 70° $\frac{1}{2}(180^{\circ}-40^{\circ})=70^{\circ}$



67. 24
CD =
$$\sqrt{13^2 - 5^2}$$
 = 12, BC = 2×CD = 24



68.60 $\frac{1}{2}$ (base)×(height) = $\frac{1}{2}$ (24)×(5) = 60 69.50 $13 \times 2 + 24 = 50$ 70. \angle CBA = 80°, therefore, $x = \frac{1}{2}(80) = 40$. 71. $x = 180^{\circ} - 2(30^{\circ}) = 120^{\circ}$ 72. 180-40 = 140 $x = \frac{1}{2}(140) = 70$ 73. $180 \div 3 = 60$ 74. $x = y = 45^{\circ}$ 75. $1256 \div 3.14 = 400$ in (diameter) $400 \div 2 = 200$ in (radius) $3.14 \times 200^2 = 125600 \text{ in}^2 \text{ (area)}$ 76. $1256 \div 3.14 = 400 = 20^2$ $2 \times 20 = 40$ m (diameter) $40 \times 3.14 = 125.6 \text{ m} \text{ (circumference)}$ 77.9 π 78. $(10^2 - 5^2)\pi = 75\pi$ 79. $9\pi + 75\pi = 84\pi$ 80. $(5^2 - 3^2)\pi = 16\pi$ 81. $84\pi + 16\pi = 100\pi$

Math Olympiad

82. 5 (D), 10 (T) and 16 (H)	
Let Dick be x years old, so Tom be $2x$	
years old, and Harry be $2x+6$. The sum of	
these ages	
= Dick + Tom + Harry	
= x + 2x + 2x + 6 = 31	
5x + 6 = 31	
x = 5 (Dick)	
So Tom = $2x = 10$ and Harry = $2x+6 =$	
16.	

83. 94.20 m diameter = $15 \times 2 = 30$ (cm) circumference = $30\pi = 94.2$ (cm) $5 \text{ rev} = 5 \times 94.2 = 471$ (cm) distance in 20 sec = 9420 (cm) = 94.20 m

84. 30 (yd) C: 60 B: 15 A: 45 45 - 15 = 30 (yd)

85.250 m

When Alex finished, Ben completed 1000 - 200 = 800 m, Carl completed 1000 - 400 = 600 m. The ratio of Ben's speed to Carl's is 8:6 = 4:3. When Ben finished, Carl completed $\frac{3}{4} \times 1000 = 750$, he still had 1000 - 750 = 250 m.

86. 12¢

How much does it cost for 5 pens and 5 pencils? It will cost $72\phi + 78\phi = 150$. Thus, a pen and a pencil cost 30ϕ . Therefore, it will cost 60ϕ for 2 pens and 2 pencils. Since the price of 3 pencils and 2 pens is 72ϕ , a pencil costs 12ϕ .

Assessment Test

87. A

- 88. B
- 89. C
- 90. A
- 91. B
- 92. D
- 93. C
- 94. D
- 95. D
- 96. B
- 97. A



98. C		103.	64 and 128
99. B		104.	С
100.	С	105.	В
101.	В	106.	С
102.	С		