

# Mathematical part

**While working on the mathematical part, please take note of the following:**

- Figures accompanying some of the questions do not reflect the sizes and proportions specified. Therefore, do not base your conclusions concerning lengths of segments and other magnitudes on the actual sizes and proportions on a Figure. Concentrate instead on the information given in the question;
- If nothing is mentioned in the question concerning a segment depicted in a Figure, then it should be assumed that this segment is a straight line or part of a straight line;
- For representing numbers, only the decimal system is used throughout the test.

**Mathematical Notations and Formulae:**

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**1. 0** is neither positive nor negative; **1** is not a prime number.

**2. Percentage:**  $k\%$  of  $a$  is equal to  $a \cdot \frac{k}{100}$ .

**3. Powers:**  $a^n = a \cdot a \cdot a \cdot \dots \cdot a$  ( $n$ -times);

$$a^n \cdot a^m = a^{n+m} \quad a^n : a^m = a^{n-m} \quad (a^n)^m = a^{n \cdot m}.$$

**4. Proportion:** If  $\frac{a}{b} = \frac{c}{d}$ , then  $ad = bc$ .

**5. Velocity:**  $\text{velocity} = \frac{\text{distance}}{\text{time}}$ .

**6. Arithmetic mean:**

$$\text{Mean of data} = \frac{\text{sum of data}}{\text{number of data}}.$$

**7. Probability:** if probabilities of all elementary events are the same, then the **probability of a compound event** is equal to the number of all elementary events associated with this event divided by the total number of elementary events.

If nothing is stated to the contrary, it is always assumed that probabilities of all elementary events are the same.

**8. Contracted multiplication formulae:**

$$(a + b)^2 = a^2 + 2ab + b^2$$

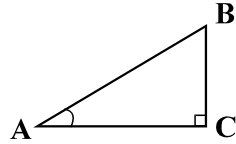
$$(a - b)^2 = a^2 - 2ab + b^2$$

$$(a + b)(a - b) = a^2 - b^2$$

[to the formulae](#)

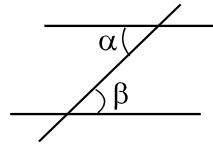
9. On a Figure, an angle can be marked with a small arc placed between the sides, a right angle - by a small square.

$\angle A$  stands for the measure of the angle A.



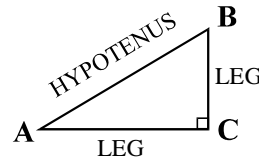
### 10. Parallel lines:

When two parallel lines are intersected by a third line, alternate angles are equal:  $\alpha = \beta$ .



### 11. Triangles:

- The sum of measures of all angles of a triangle is equal to  $180^\circ$ ;
- **Pythagorean Theorem:** In any right triangle the square of the hypotenuse is equal to the sum of the squares of the two legs:  $AB^2 = AC^2 + BC^2$
- The area of a triangle is equal to the half of the product of one of its sides and the height to this side:  $S = \frac{ah}{2}$ .

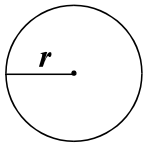


### 12. Quadrilaterals:

- The sum of measures of all angles of a quadrilateral is equal to  $360^\circ$ ;
- The area of a rectangle is equal to the product of its length and its width:  $S = ab$ ;
- The area of a parallelogram is equal to the product of its side and the height to this side:  $S = ah$ .

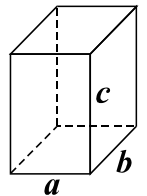
### 13. Circle, circumference:

- The circumference of a circle is calculated using its radius by the formula:  $L = 2\pi r$ ; The numerical value of  $\pi$ , with two decimal digit precision, is 3.14;
- The area of a circle with radius  $r$  is calculated by the formula:  $S = \pi r^2$ .



### 14. Box (rectangular prism):

- The volume of a box is equal to the product of its length, width and height:  $V = abc$ ;
- In the case of a cube:  $a = b = c$ .



[to the formulae](#)

## Quantitative comparison

41. Compare to each other quantities  $A$  and  $B$  given in the table below:

$A$	$B$
The sum of positive integer divisors of 20	The sum of positive integer divisors of 25

- (a) The quantity  $A$  is greater than the quantity  $B$ .
- (b) The quantity  $B$  is greater than the quantity  $A$ .
- (c) The quantities  $A$  and  $B$  are equal.
- (d) The given information is insufficient for determining which quantity is greater.

[to the formulae](#)

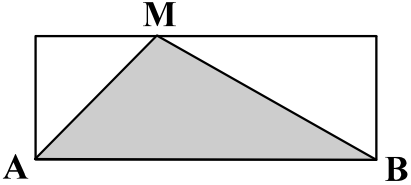
42. Compare to each other quantities  $A$  and  $B$  given in the table below:

$A$	$B$
$y > x$	$\frac{y + 1}{x - 1}$
	1

- (a) The quantity  $A$  is greater than the quantity  $B$ .
- (b) The quantity  $B$  is greater than the quantity  $A$ .
- (c) The quantities  $A$  and  $B$  are equal.
- (d) The given information is insufficient for determining which quantity is greater.

[to the formulae](#)

43. Compare to each other quantities  $A$  and  $B$  given in the table below:

$A$	$B$
<p>Point <math>M</math> on the longer side of a rectangle is connected with the endpoints <math>A</math> and <math>B</math> of the opposite side. The resulting triangle <math>AMB</math> is shaded.</p> <div data-bbox="267 625 973 718" style="border: 1px solid black; padding: 5px; margin: 10px auto; width: fit-content;">The area of the triangle <math>AMB</math></div>	<div data-bbox="1513 379 1921 562" style="text-align: center;"></div> <div data-bbox="1223 586 1949 736" style="border: 1px solid black; padding: 5px; margin: 10px auto; width: fit-content;">The area of the <b>unshaded</b> part of the rectangle</div>

- (a) The quantity  $A$  is greater than the quantity  $B$ .
- (b) The quantity  $B$  is greater than the quantity  $A$ .
- (c) The quantities  $A$  and  $B$  are equal.
- (d) The given information is insufficient for determining which quantity is greater.

[to the formulae](#)

44. Compare to each other quantities  $A$  and  $B$  given in the table below:

$A$	$B$		
<p>There are 6 identical balls in the box, numbered 1 to 6. One ball is drawn from the box at random.</p> <table border="1" data-bbox="198 519 1977 718"><tr><td data-bbox="198 519 998 718">The probability that the number of the drawn ball is greater than 4.</td><td data-bbox="1187 519 1977 718">The probability that the number of the drawn ball is less than 4.</td></tr></table>		The probability that the number of the drawn ball is greater than 4.	The probability that the number of the drawn ball is less than 4.
The probability that the number of the drawn ball is greater than 4.	The probability that the number of the drawn ball is less than 4.		

- (a) The quantity  $A$  is greater than the quantity  $B$ .
- (b) The quantity  $B$  is greater than the quantity  $A$ .
- (c) The quantities  $A$  and  $B$  are equal.
- (d) The given information is insufficient for determining which quantity is greater.

[to the formulae](#)

45. Compare to each other quantities  $A$  and  $B$  given in the table below:

$A$	$B$
$-\frac{7}{6}$	$-\frac{8}{7}$

- (a) The quantity  $A$  is greater than the quantity  $B$ .
- (b) The quantity  $B$  is greater than the quantity  $A$ .
- (c) The quantities  $A$  and  $B$  are equal.
- (d) The given information is insufficient for determining which quantity is greater.

[to the formulae](#)



46. Compare to each other quantities  $A$  and  $B$  given in the table below:

$A$	$B$
The product of <b>positive numbers</b> $a$ and $b$ is greater than either of them.	
The smallest of these two numbers	1

- (a) The quantity  $A$  is greater than the quantity  $B$ .
- (b) The quantity  $B$  is greater than the quantity  $A$ .
- (c) The quantities  $A$  and  $B$  are equal.
- (d) The given information is insufficient for determining which quantity is greater.

[to the formulae](#)

## Problems:

47. To paint  $8\text{m}^2$  area of the surface 1 can of paint is required. The 4 walls of a room have to be painted. Each of the walls has the area of  $22\text{ m}^2$ . How many cans of paint are required to paint the 4 walls?

- (a) 9
- (b) 10
- (c) 11
- (d) 12
- (e) 13

[to the formulae](#)

48. If  $2a + 7 = 3b$ , then  $6a - 9b =$

(a)  $-21$

(b)  $-14$

(c)  $-10$

(d)  $4$

(e)  $10$

[to the formulae](#)

49. There are only red and blue pencils on the table. Out of any three pencils taken from the table, at least one will necessarily be red. Which of the following is a possible number of blue pencils on the table?

(a) 6

(b) 5

(c) 4

(d) 3

(e) 2

[to the formulae](#)

50. The area of the first isosceles triangle is equal to  $a$ , while the area of the second isosceles triangle is equal to  $b$ . If the ratio of the lengths of the bases of the first and second triangles is  $1 : 3$ , while the ratio of the lengths of the altitudes dropped onto bases of the first and second triangles is  $15 : 5$ , then

(a)  $b = 6a$

(b)  $b = 3a$

(c)  $9a = b$

(d)  $2a = b$

(e)  $a = b$

[to the formulae](#)

**51.** Which of the following can possibly appear as a last digit of the product of two consecutive odd numbers?

- (a) 1 as well as 3
- (b) 3 as well as 5
- (c) 5 as well as 7
- (d) 7 as well as 9
- (e) 9 as well as 1

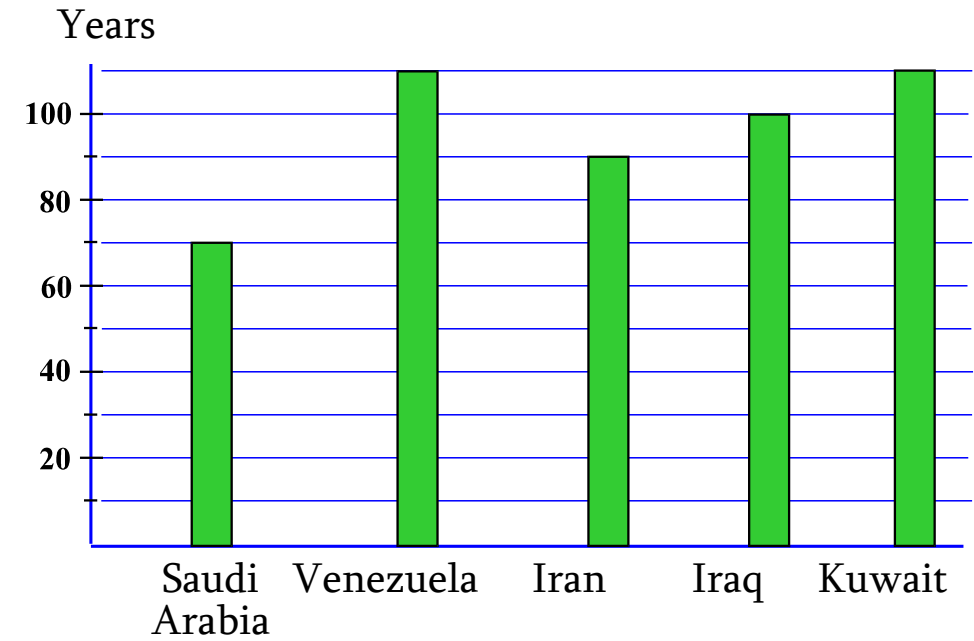
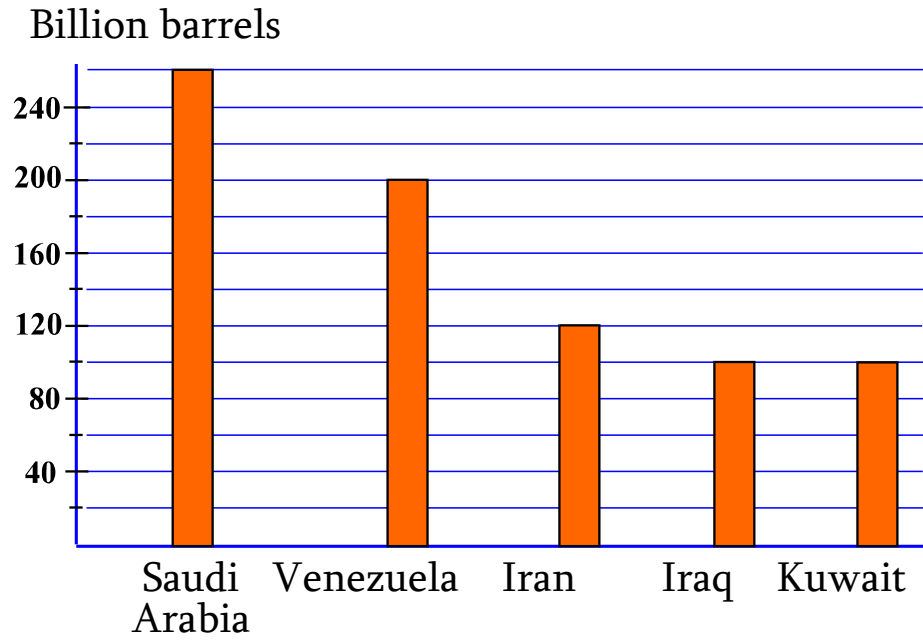
[to the formulae](#)

## Data analysis

*Data represented by the diagrams is given below. The next four questions refer to these diagrams.*

*After reading a question, you might need to return to the diagrams, look for the corresponding data and return to the question. This is made easy by the clicking on the respective links at the end of the diagrams and at the end of each question.*

The diagram on the left shows how much oil, in billions of barrels, is currently in the oil deposits of the major oil producing countries of the world (oil supplies). The diagram on the right indicates in how many years these oil supplies will be exhausted, if the oil extraction is continued at the current rate.



to the questions: [52](#) [53](#) [54](#) [55](#)

[to the formulae](#)



**52.** How many times more is the oil supply of Saudi Arabia at the present time compared to the oil supply of Kuwait?

- (a) 2.4 times
- (b) 2.6 times
- (c) 2.8 times
- (d) 3 times
- (e) 3.2 times

[back to the diagrams](#)

[to the formulae](#)

53. How does the oil supply of Iran compare to the sum of the oil supplies of Venezuela and Iraq?

- (a) Equals to half.
- (b) Is less than half by 20 billion barrels.
- (c) Is less than half by 30 billion barrels.
- (d) Is more than half by 20 billion barrels.
- (e) Is more than half by 30 billion barrels.

[back to the diagrams](#)

[to the formulae](#)

54. Which of the following countries produces 1 billion barrels of oil annually?

- (a) Saudi Arabia
- (b) Venezuela
- (c) Iran
- (d) Iraq
- (e) Kuwait

[back to the diagrams](#)

[to the formulae](#)

55. By what factor will Iran's oil supply be reduced in 30 years, if oil extraction in the country is kept at the current rate?

- (a) 1.5 times
- (b) 1.8 times
- (c) 2 times
- (d) 2.5 times
- (e) 2.8 times

[back to the diagrams](#)

[to the formulae](#)

## Problems

56. Sandro's salary is more than Vazha's salary by 10%, and 2 times less than Irakli's salary. By how many percent is Irakli's salary more than Vazha's salary?

- (a) By 20%
- (b) By 80%
- (c) By 90%
- (d) By 110%
- (e) By 120%

[to the formulae](#)

57. The square is partitioned into two rectangles. The first rectangle has the smaller side equal to 3 cm in length. By how many centimeters does the perimeter of the square exceed the perimeter of the second rectangle?

- (a) By 3 cm
- (b) By 6 cm
- (c) By 9 cm
- (d) By 12 cm
- (e) By 15 cm

[to the formulae](#)

**58.** The master makes as many items in 1 hour as his apprentice makes in 3 hours. The master has to make 30 items and the apprentice has to make 15 items. Who will finish their task faster and by what factor?

- (a) Apprentice, 1.5 times faster.
- (b) Apprentice, 2 times faster.
- (c) Master, 1.5 times faster.
- (d) Master, 2 times faster.
- (e) Both will need the same amount of time.

[to the formulae](#)

59. The pumpkin weighs  $\frac{1}{2}$  kg more than  $\frac{3}{4}$  part of the pumpkin. How many kilograms is the pumpkin?

(a) 1

(b) 2

(c) 3

(d) 4

(e) 5

[to the formulae](#)



60.  $a$  tons of flour were evenly distributed onto 6 trucks and sent to a region. Two trucks broke down on the way, so the flour carried by these two trucks was evenly redistributed onto the remaining four trucks. How many tons of flour were added to each of the four trucks?

(a)  $\frac{a}{2}$

(b)  $\frac{a}{8}$

(c)  $\frac{a}{10}$

(d)  $\frac{a}{12}$

(e)  $\frac{a}{18}$

[to the formulae](#)

## Quantitative comparison

61. Compare to each other quantities  $A$  and  $B$  given in the table below:

$A$	$B$
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For an arbitrary number  $x$ , the number obtained by subtracting from  $x$  the greatest integer which is not larger than  $x$  is denoted  $(x)^*$ .

$(1.4)^*$

$(21.4)^*$

- (a) The quantity  $A$  is greater than the quantity  $B$ .
- (b) The quantity  $B$  is greater than the quantity  $A$ .
- (c) The quantities  $A$  and  $B$  are equal.
- (d) The given information is insufficient for determining which quantity is greater.

[to the formulae](#)

62. Compare to each other quantities  $A$  and  $B$  given in the table below:

$A$	$B$		
<p>The length of the side of a square is equal to the diameter of a circle.</p> <table border="1" data-bbox="224 428 1967 514"><tr><td data-bbox="224 428 970 514">The perimeter of the square</td><td data-bbox="1202 428 1967 514">The circumference of the circle</td></tr></table>		The perimeter of the square	The circumference of the circle
The perimeter of the square	The circumference of the circle		

- (a) The quantity  $A$  is greater than the quantity  $B$ .
- (b) The quantity  $B$  is greater than the quantity  $A$ .
- (c) The quantities  $A$  and  $B$  are equal.
- (d) The given information is insufficient for determining which quantity is greater.

[to the formulae](#)

63. Compare to each other quantities  $A$  and  $B$  given in the table below:

$A$	$B$
-----	-----

There are jars of milk, sour cream and yoghurt on the counter. 1 jar of sour cream and 6 jars of yoghurt together weigh as much as 4 jars of sour cream and 9 jars of milk together.

The weight of 2 jars of yoghurt

The total weight of 3 jars of milk and  
1 jar of sour cream

- (a) The quantity  $A$  is greater than the quantity  $B$ .
- (b) The quantity  $B$  is greater than the quantity  $A$ .
- (c) The quantities  $A$  and  $B$  are equal.
- (d) The given information is insufficient for determining which quantity is greater.

[to the formulae](#)

64. Compare to each other quantities  $A$  and  $B$  given in the table below:

$A$	$B$
$ab < 0, ac > 0$	
$b \cdot (a + c)$	$0$

- (a) The quantity  $A$  is greater than the quantity  $B$ .
- (b) The quantity  $B$  is greater than the quantity  $A$ .
- (c) The quantities  $A$  and  $B$  are equal.
- (d) The given information is insufficient for determining which quantity is greater.

[to the formulae](#)

65. Compare to each other quantities  $A$  and  $B$  given in the table below:

$A$	$B$		
<p>Two circles are on the same plane, with one being inside the other. The radius of one circle is 3 cm, while the radius of the other circle is 10 cm.</p> <table border="1" data-bbox="216 504 1951 679"><tr><td data-bbox="216 504 988 679">The length of the line segment connecting the centers of the two circles</td><td data-bbox="1131 529 1951 629">5 cm</td></tr></table>		The length of the line segment connecting the centers of the two circles	5 cm
The length of the line segment connecting the centers of the two circles	5 cm		

- (a) The quantity  $A$  is greater than the quantity  $B$ .
- (b) The quantity  $B$  is greater than the quantity  $A$ .
- (c) The quantities  $A$  and  $B$  are equal.
- (d) The given information is insufficient for determining which quantity is greater.

[to the formulae](#)

# Problems

**66.** Half of one hundredth is:

(a) 0.002

(b) 0.005

(c) 0.5

(d) 0.02

(e) 0.05

[to the formulae](#)

67. The pool has a shape of a rectangular prism with a square base of area  $9 \text{ m}^2$ . The total area of the walls of the pool is equal to  $24 \text{ m}^2$ . How many cubic meters of water will fit into the pool?

- (a) 18
- (b) 27
- (c) 36
- (d) 45
- (e) 54

[to the formulae](#)



**68.** A tourist was biking along the seashore at a constant rate of 15 km/h. In 2 hours, she covered  $\frac{5}{6}$  of the way. She walked the rest of the way at a constant rate of 4 km/h. For how many hours did the tourist walk?

- (a) 3 hours
- (b) 2.5 hours
- (c) 2 hours
- (d) 1.5 hours
- (e) 1 hour

[to the formulae](#)

69. The acute angle between the minute hand and the hour hand of a clock is greater than  $60^\circ$ . Which of the following times could the clock possibly be showing?

I. 12:15

II. 11:45

III. 04:30

- (a) Only I
- (b) Only II
- (c) Only III
- (d) Only I and II
- (e) Only II and III

[to the formulae](#)

70. One hat costs 3 Laris more than 3 shirts, while 3 such hats cost 49 Laris more than 1 such shirt. By how many Laris more does 1 hat cost compared to 1 shirt?

- (a) 9
- (b) 11
- (c) 13
- (d) 15
- (e) 17

[to the formulae](#)

## Data sufficiency

71. Two conditions about a prism are given:

- I. The number of vertices of this prism is equal to 12.
- II. The number of edges of this prism is equal to 18.

For determining the number of faces of this prism:

- (a) Condition I is sufficient, Condition II – is not.
- (b) Condition II is sufficient, Condition I – is not.
- (c) Conditions I and II are sufficient jointly, while neither of them is sufficient independently.
- (d) Both conditions are sufficient independently.
- (e) These conditions are not sufficient even jointly.

[to the formulae](#)

72. A number of footballs and basketballs were purchased for a school totaling 24 balls altogether.

Two conditions are given:

I. The number of basketballs is equal to a third of the number of footballs.

II. The number of basketballs is 12 less than the number of footballs.

For determining how many of the purchased balls were footballs:

- (a) Condition I is sufficient, Condition II – is not.
- (b) Condition II is sufficient, Condition I – is not.
- (c) Conditions I and II are sufficient jointly, while neither of them is sufficient independently.
- (d) Both conditions are sufficient independently.
- (e) These conditions are not sufficient even jointly.

[to the formulae](#)

73.  $a$  and  $b$  are positive integers.

Two conditions are given:

I.  $ab$  is an odd number.

II.  $a + b$  is an even number.

To determine whether the number  $b$  is even or odd:

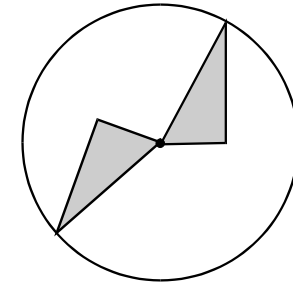
- (a) Condition I is sufficient, Condition II – is not.
- (b) Condition II is sufficient, Condition I – is not.
- (c) Conditions I and II are sufficient jointly, while neither of them is sufficient independently.
- (d) Both conditions are sufficient independently.
- (e) These conditions are not sufficient even jointly.

[to the formulae](#)

74. The hypotenuses of two right triangles sharing a vertex are radii of the same circle, as indicated on the figure

Two conditions are given:

- I. A leg of the first triangle is equal in length to a leg of the second triangle.
- II. The perimeter of the first triangle is equal to 24 cm.



For determining the perimeter of the second triangle:

- (a) Condition I is sufficient, Condition II – is not.
- (b) Condition II is sufficient, Condition I – is not.
- (c) Conditions I and II are sufficient jointly, while neither of them is sufficient independently.
- (d) Both conditions are sufficient independently.
- (e) These conditions are not sufficient even jointly.

[to the formulae](#)

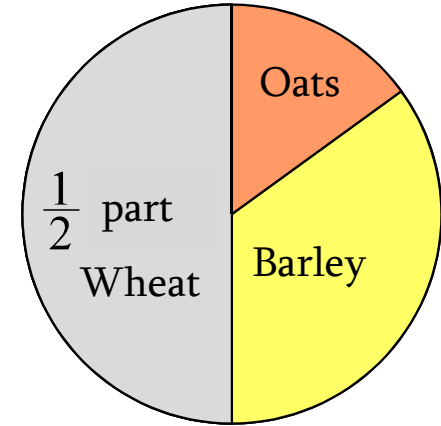
75. A farmer harvested wheat, oats and barley. Half of the total harvest was comprised of wheat (see the diagram).

Two conditions are given:

- I. Wheat harvest was 4 times more than the oats harvest.
- II. Barley harvest was 3 times more than the oats harvest.

To determine by how many tons the harvest of wheat was greater than the harvest of oats:

- (a) Condition I is sufficient, Condition II – is not.
- (b) Condition II is sufficient, Condition I – is not.
- (c) Conditions I and II are sufficient jointly, while neither of them is sufficient independently.
- (d) Both conditions are sufficient independently.
- (e) These conditions are not sufficient even jointly.



[to the formulae](#)



## Problems

76.  $\frac{3}{4}$  part of factory workers are female. Of the male workers,  $\frac{4}{7}$  are Georgian and 24 are foreigners. How many workers are there in the factory altogether?

- (a) 56
- (b) 112
- (c) 154
- (d) 180
- (e) 224

[to the formulae](#)

77. Sandro substituted letters with numbers in the expression  $\frac{5mn}{12abc}$  and calculated the result, which turned out to be equal to  $\frac{2}{9}$ .

Thea substituted each letter with a number that was 4 times greater than the corresponding number used by Sandro and calculated the result. What number would Thea get as a result?

(a)  $\frac{1}{18}$

(b)  $\frac{1}{9}$

(c)  $\frac{4}{27}$

(d)  $\frac{5}{6}$

(e)  $\frac{8}{9}$

[to the formulae](#)

**78.** The ratio between a side and the diagonal of a rectangle is equal to  $\frac{3}{5}$ . What part of the rectangle's greater side does its smaller side comprise?

(a)  $\frac{2}{5}$

(b)  $\frac{4}{9}$

(c)  $\frac{3}{4}$

(d)  $\frac{1}{3}$

(e)  $\frac{5}{8}$

[to the formulae](#)

79. The positive integer  $n$  is such that the least common multiple of 4, 6 and  $n$  is equal to 36. Each such number is evenly divisible by:

- (a) 6
- (b) 9
- (c) 15
- (d) 21
- (e) 28

[to the formulae](#)

80. The distance between the points on the number line corresponding to numbers  $a$  and  $b$  is equal to 4 units. Which of the following equalities is **cannot be true**?

(a)  $a + b = -2$

(b)  $a - b = 4$

(c)  $a + b = 0$

(d)  $a - b = -4$

(e)  $a - b = 2$

[to the formulae](#)