

Name: _____

Marks: _____

Time: 75 minutes

Grade: _____

Instructions: Clearly show all your working for full marks.

Maximum Score: 71

Problem 1: Evaluate and simplify as much as possible.

a) $11 - [-29 - 3 \cdot (-9) - (-17)] =$ [1P]

b) $5 \cdot 3^0 - 3 \cdot 10^2 - (-5)^2 =$ [1P]

c) $3 \cdot 2^3 : 4 + 48 : (-6) + (-2)^3 =$ [1P]

d) $[-1 - (-2) - 5] : [(-2)^2 - 4 \cdot 2] - [-11 - (-2 - 5)] =$ [2P]

$$\text{e) } 18^{13} : (3^{10} \cdot 6^{12}) =$$

[2P]

$$\text{f) } \left(\frac{-6}{2}\right)^2 + \frac{4}{3} - \frac{5}{6} : \left(\frac{3}{6}\right)^0 - \left(\frac{6}{-3}\right)^2 =$$

[2P]

$$\text{g) } \left(\frac{2}{4}\right)^2 \cdot \frac{15}{6} : \left(\frac{9}{16} : \left(\frac{7}{20} + \frac{1}{4}\right)\right) =$$

[2P]

$$\text{h) } \frac{2 + \frac{1}{3}}{\frac{1}{5} - \frac{1}{3}} =$$

[2P]

Problem 2: Write without brackets and simplify the expression as much as possible.

a) $4x(3 - 2x) - 5(2x^2 - 3x) =$ [1P]

b) $s(t - 3s)(3s + t) + 3s(s^2 - t^2) =$ [2P]

c) $\frac{(2 + a)(4 - a) - 8}{4 - a^2} : \frac{a}{a - 2} =$ [3P]

Problem 3: Evaluate the expression for $a = 2$ and $b = -\frac{1}{2}$. Write the answer in fully simplified form.

a) $T(a, b) = (a - b^2)^2 + ab$ [2P]

b) $T(a, b) = \frac{(a - b)^2}{2b^2} - a^2b$ [2P]

Problem 4: Factorize as much as possible.

a) $25ax - 75a^2x^2y^3 =$ [1P]

b) $3xy - y + 9xp - 3p =$ [1P]

c) $3r^4 - 48 =$ [2P]

d) $2ay^4 - 4ay^2 + 2a =$ [2P]

e) $2s^2 + 9st - 5t^2 =$ [1P]

f) $7mn^2 - 7a^2m + 42am - 63m =$ [2P]

Problem 5: Calculate the **solution set** of each equation in the universal set $\mathbb{G} = \mathbb{Q}$:

a) $13 \cdot (9x - 2) - (-x + 3) \cdot 3 = 2x - 13 \cdot 2x - (x + 5)$ [2P]

b) $(x - 10)(2x - 6) = 3(x^2 - x) - x(x - 2)$ [2P]

c) $\frac{x - 3}{3} + 0.5x = \frac{1}{5} - \frac{3(1 - x)}{4}$ [2P]

d) $x^2 + 5x = 14$ [2P]

e) $2x^3 + 7x^2 - 15x = 0$ [3P]

Problem 6: Calculate the **solution set** of each inequality in the universal set \mathbb{Z} and write in enumerative (aufzählender) form.

a) $-2 \leq -3x + 2 < 11$

[2P]

b) $\frac{29x}{2} + \frac{19}{5} - 2x \leq 3 - \frac{7}{2}x - \frac{6}{5}$

[3P]

Problem 7: Prime factorisation:

a) The **greatest common divisor** of a and b is 6, the **least common multiple** of the two numbers is 462. The number b is 42. Determine the number a .

[2P]

b) Calculate the **greatest common divisor** of $(2a^2b^2 - 18b^2)$ and $(abc - 3bc)$.

[2P]

- c) Three metal rods are 520 cm, 416 cm, and 780 cm long. These rods are cut into equal length pieces so that these pieces are as large as possible and no scraps (Reste) are left over. How long should each piece be? [3P]

- d) Rectangular blocks ($15\text{cm} \times 12\text{cm} \times 8\text{cm}$) are to be put together to form a compact cube. How long is one edge of the smallest possible cube and how many blocks are needed to build this cube? [3P]

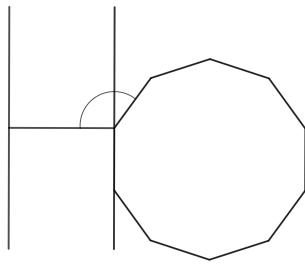
Problem 8: Solve the following word questions using an equation. Write an answer sentence.

- a) One side of a rectangle with perimeter 51 cm is 3 cm shorter than twice the other side. How long are the sides of the rectangle? [2P]

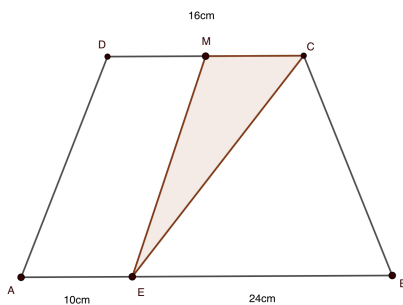
- b) A ride on the farris wheel at Bürkliplatz costs 5Fr. per child and 7Fr. per adult. On a particular day, 450 tickets were sold, generating 2610Fr. of revenue (Ertrag). How many children rode the farris wheel that day? [3P]

Problem 9:

- a) A company logo is designed by connecting a rectangular letter H to a regular decagon (10-sides). How large is the marked angle? [2P]



- b) Given trapezoid $ABCD$ where M is midpoint of CD , and E lies on AB . The following lengths are given: $\overline{AE} = 10$ cm, $\overline{EB} = 24$ cm, and $\overline{CD} = 16$ cm. What percentage of the trapezoid is shaded (i.e. the area of triangle ECM)? [3P]



Problem 10: Of the figure shown below (not drawn to scale) the following is known:
 O is center of the circle with diameter CD . Point B lies on the circle. Line AB is tangent to the circle and is therefore perpendicular to OB . The angle formed by line AB and segment BC is 58° .

- a) Determine angle $\angle BOC = x^\circ$ [1P]
b) Determine angle $\angle ADB = y^\circ$. [1P]
c) Determine angle $\angle BAD = z^\circ$. [1P]

