Grade 9 Mathematics Worksheet

Expressions and equations

Questions:

1. Learners were given the following question in a maths test:

   Simplify $\frac{(x+3)^2}{x}$.

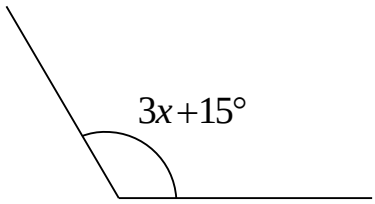
   One of your classmates wrote the following:

   $$\frac{(x+3)^2}{x}$$
   $$= \frac{x^2+9}{x}$$
   $$= x+9$$

   Explain fully what is wrong with this answer and show what would be the correct approach.

2. a) Find the three consecutive integers that add up to 117.

   b) If the sum of three consecutive even numbers is 78, what are the three numbers?

3. 

   For which values of *x* will the angle shown above be obtuse?

4. If $x \geq 0$ and $y < 0$, what can you say about the value of

   a) $\frac{(x-y)}{2y}$

   b) $\frac{-3x}{y^2}$

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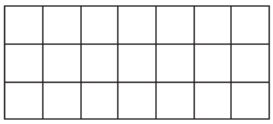
c) $\frac{y}{x}$

5. The sides of a triangle are given as: $4x$; $3x+2$; $5x-3$. If the perimeter of the triangle is 35 cm, what will be the length of the shortest side in this triangle?

6. a) If the perimeter of a rectangle is 32 cm, what will be the dimension of the rectangle with the largest area?

b) A rectangle is tiled with square tiles of x cm^2 area each. What will be the complete perimeter of the rectangle?



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Solution

1. The first mistake:

$$\frac{(x+3)^2}{x} \neq \frac{x^2+9}{x}$$

This is so because when we square a binomial, we get a trinomial and not another binomial.

So she said that:

$(x+3)^2 = x^2+3^2$

It should be $(x+3)^2 = x^2+6x+9$

Her second mistake happened when she simplified ignoring the term. She said that:

$\frac{x^2+9}{x} = x+9$ which shows that she simplified $\frac{x^2}{x} = x$. This type of expression cannot be simplified any further. The correct answer would have been: $\frac{(x+3)^2}{x} = \frac{x^2+6x+9}{x}$

2. a) $x-1+x+x+1=117$

$\therefore 3x=117$

$\therefore x=39$

So the numbers are 38, 39 and 40

Or

$x+x+1+x+2=117$

$\therefore 3x+3=117$

$\therefore 3x=114$

$\therefore x=38$

So the numbers are 38, 39 and 40

b) $x+x+2+x+4=78$

$\therefore 3x+6=78$

$\therefore 3x=72$

$\therefore x=24$

Thus the numbers are 24, 26 and 28

OR

$x-2+x+x+2=78$

$\therefore 3x=78$

$\therefore x=26$

Thus the numbers are 24, 26 and 28

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3. To be an obtuse angle, it must lie between 90 and 180 degrees.
So:

$$90° < 3x + 15° < 180°$$
$$\therefore 90° - 15° < 3x < 180° - 15°$$
$$\therefore 75° < 3x < 165°$$
$$\therefore 25° < x < 55°$$

So x must lie between 25 and 55 degrees.

4. a) $\frac{(x-y)}{2y}$:

If $x = 0$ *and* $y < 0$, *then* $\frac{(x-y)}{2y} = \frac{-y}{2y} = -\frac{1}{2}$

If $x > 0$ *and* $y < 0$, *then* $(x-y) > 0$

$$So: \frac{(x-y)}{2y} < 0$$

b) $\frac{-3x}{y^2}$:

If $x = 0$ *and* $y < 0$, *then* $\frac{-3x}{y^2} = 0.$

If $x > 0$ *and* $y < 0$, *then* $\frac{-3x}{y^2} < 0$

c) $\frac{y}{x}$:

If $x = 0$ *and* $y < 0$, *then* $\frac{y}{x}$ *is undefined*.

If $x > 0$ *and* $y < 0$, *then* $\frac{y}{x} < 0$

5. $4x + 3x + 2 + 5x - 3 = 35$
$\therefore 12x = 35 + 1$
$\therefore 12x = 36$
$\therefore x = 3$

The shortest side is: $3(3) + 2 = 11$

6. a) Let the length be x and the breadth be y:
Then $2(x+y) = 32 \rightarrow x + y = 16$ and the area will be $A = x(16 - x)$

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x	*Area*
0	0
1	15
2	28
3	39
4	48
5	55
6	60
7	63
8	64
9	63
10	60
11	55
12	48
13	39

The largest rectangle is formed when $x = 8$, that is when it is a square.

b) $2\times 3x+2\times 7x=20x$