THE UNITED REPUBLIC OF TANZANIA
NATIONAL EXAMINATIONS COUNCIL OF TANZANIA
FORM TWO NATIONAL ASSESSMENT

042 **ADDITIONAL MATHEMATICS**

Time: 2:30 Hours **SOLUTIONS** **Year: 2020**

Instructions

1. This paper consists of two sections of **ten (10) Compulsory** questions.
2. Answer **all** questions.
3. All writing must be in **blue** or **black** ink **except** drawing which must be in pencil.
4. Cellular phones and any unauthorized materials are **not** allowed in the assessment room.
5. Write your **Assessment Number** at the top right hand corner of every page.

1. (a) Write down all factors of 30 which are greater than 2.

   The factors of 30 are 1, 2, 3, 5, 6, 10, 15 and 30.

   Those greater than 2 are 3, 5, 6, 10, 15 and 30.

   (b) Given the whole numbers 14472 and 91896 and required to identify the number which is divisible by both 8 and 9.

   Answer:

   For divisibility by 8, check the last three digits.

   14472 ends with 472.

   472 divided by 8 equals 59, so 14472 is divisible by 8.

   91896 ends with 896.

   896 divided by 8 equals 112, so 91896 is also divisible by 8.

   For divisibility by 9, sum digits.

   14472 gives 1+4+4+7+2 = 18.

   18 divided by 9 equals 2, so 14472 is divisible by 9.

   91896 gives 9+1+8+9+6 = 33.

   33 is not divisible by 9.

   Therefore 14472 is divisible by both 8 and 9.

2. (a) Simplify the expression 6(x + 1) + 2(x + 2y) minus 8x + 10y minus 2(3 + 4y).

   Answer:

   Expand

   6x + 6 + 2x + 4y minus 8x + 10y minus 6 minus 8y

   Combine like terms

   x terms: 6x + 2x minus 8x = 0

   y terms: 4y + 10y minus 8y = 6y

constants: 6 minus 6 = 0

Final answer is 6y.

(b) (i) Use elimination method to solve the simultaneous equations.

Here are the copied questions with clear answers.

2. (b) (i) Use elimination method to solve the simultaneous equations $6m = -2n + 14$ and $2m + 5n = 9$.

Answer:

First rewrite the first equation in standard form.

$6m = -2n + 14$

$6m + 2n = 14$

Now we have

$6m + 2n = 14$

$2m + 5n = 9$

Eliminate m.

Multiply the second equation by 3.

3 times $(2m + 5n = 9)$ gives $6m + 15n = 27$

Now subtract the first equation.

$(6m + 15n)$ minus $(6m + 2n)$ = 27 minus 14

$13n = 13$

$n = 1$

Substitute $n = 1$ into $2m + 5n = 9$

$2m + 5 = 9$

$2m = 4$

$m = 2$

So $m = 2$ and $n = 1$.

(ii) Solve the linear inequality 7 < 3y + 1 <= 13.

Answer:

Start with 7 < 3y + 1.

7 minus 1 < 3y

6 < 3y

Divide by 3

2 < y

Now solve 3y + 1 <= 13.

3y <= 12

y <= 4

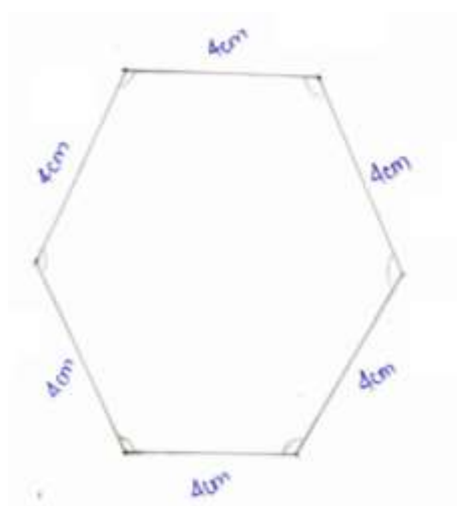
Combine the two results

2 < y <= 4

Final answer is y is greater than 2 and less than or equal to 4.

3. (a) Draw the line segment XY, then divide it into two equal parts.

(b) Construct the Hexagon with sides of length 4 cm each.



4. Find the locus of a point which is equidistant from points (0, 2) and (0, -3).

Find the locus of a point which is equidistant from points (0, 2) and (0, -3).

Answer:

Let the point be (x, y).

Distance from (x, y) to (0, 2) is

$\text{sqrt}[(x - 0)^2 + (y - 2)^2]$

Distance from (x, y) to (0, -3) is

$\text{sqrt}[(x - 0)^2 + (y + 3)^2]$

Set the distances equal.

$\text{sqrt}[x^2 + (y - 2)^2] = \text{sqrt}[x^2 + (y + 3)^2]$

Square both sides.

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

Remove x^2 from both sides.

$(y - 2)^2 = (y + 3)^2$

Expand both sides.

Left: $y^2 - 4y + 4$

Right: $y^2 + 6y + 9$

Now equate.

$y^2 - 4y + 4 = y^2 + 6y + 9$

$-4y - 6y = 9 - 4$

$-10y = 5$

$y = -0.5$

This is a horizontal line.

Final locus: $y = -0.5$ OR $2y + 1 = 0$

5. Find the coordinates of the points of intersection of the graphs of $y = x^2 - x - 3$ and $y = x$.

Given $y = x^2 - x - 3$, and $y = x$

Set the two equations equal to each other.
$x = x^2 - x - 3$

Bring all terms to one side.
$0 = x^2 - x - 3 - x$
$0 = x^2 - 2x - 3$

Factor the quadratic.
$x^2 - 2x - 3 = 0$

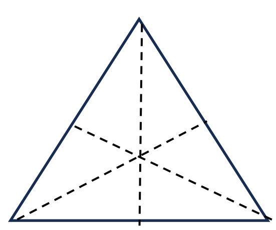
$(x - 3)(x + 1) = 0$

Solve for x.
$x - 3 = 0$ gives $x = 3$
$x + 1 = 0$ gives $x = -1$

Now find y by using $y = x$.
If $x = 3$, $y = 3$
If $x = -1$, $y = -1$

Final intersection points:
(3, 3) and (-1, -1)

6. (a) (i) Draw all lines of symmetry in an equilateral triangle.



(ii) Determine the number of lines of symmetry in an equilateral triangle.

Answer: **It has 3 lines of symmetry.**

(b) For each of the following figures, state whether they are symmetrical or not.

(i) a circle

Answer: A circle is symmetrical.

(ii) rhombus

Answer: **A rhombus is symmetrical. It has two lines of symmetry.**

7. (a) If P stands for Anna is the tallest girl in form two and Q stands for Anna is an intelligent girl in form two, write verbal statements for:

(i) not P and not Q

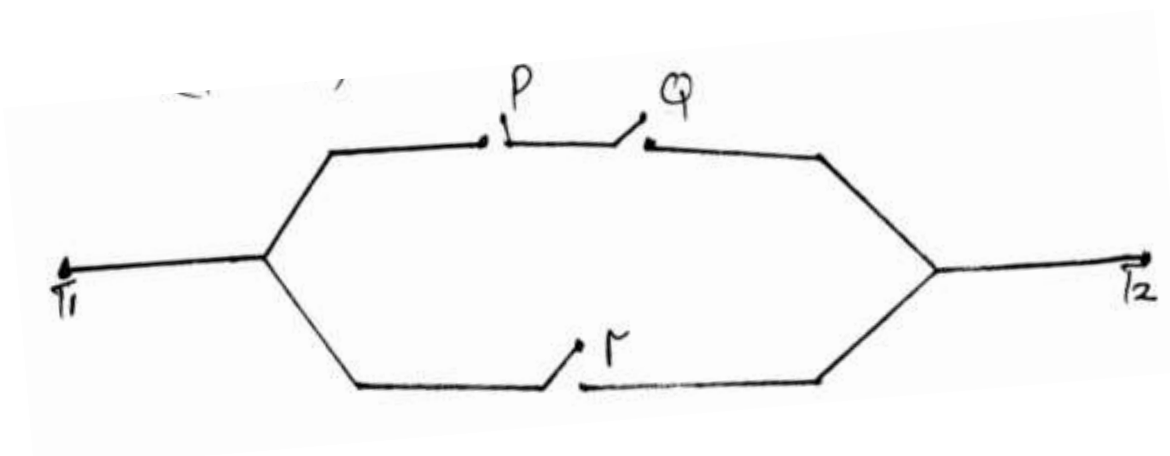
Answer: Anna is not the tallest girl in form two, and she is not an intelligent girl in form two.

(ii) P if and only if not Q

Answer: Anna is the tallest girl in form two if and only if she is not intelligent girl in form two.

(b) Draw an electrical circuit for the statement (P ^ q) v r.

Answer:



(c) Test the validity of not p implies not q by using a truth table.

Answer:

p q not p not q not p implies not q

T T F F T

T F F T T

F T T F F

F F T T T

It is not valid in all cases because one row is false.

8. (a) The variable x and y are directly proportional to each other. If x = 3 and y = 12, find the equation relating x and y.

Answer:

Since y = kx

12 = k times 3

k = 4

Equation is y = 4x.

(b) If r is directly proportional to t, and r is 6 when t is 18, and were required to find r when t is 24.

Answer:

r = kt

6 = k times 18

k = 6 divided by 18

k = 1 divided by 3

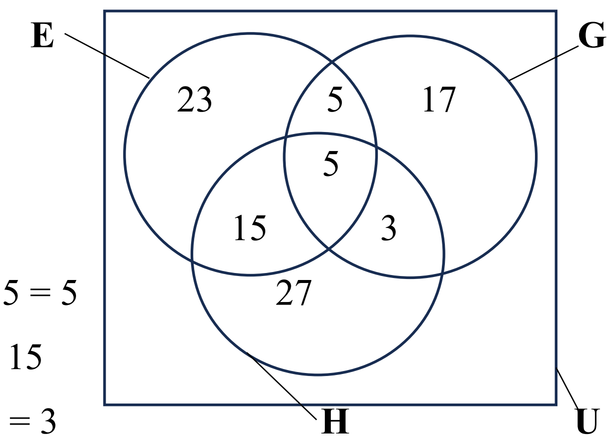
When t = 24

r = (1 divided by 3) times 24 = 8

Answer: r is 8.

9. In a class of 105 students, 10 study English and Geography, 8 study History and Geography, 20 study English and History and 5 study all the three subjects. If the number of students studying English only, Geography only and History only are 23, 17 and 27 respectively,

(a) Show this information on a Venn diagram.



The regions are

English only = 23

Geography only = 17

History only = 27

English and Geography only = 10 minus 5 = 5

English and History only = 20 minus 5 = 15

History and Geography only = 8 minus 5 = 3

All three = 5

(b) Determine the number of students who are taking neither of the three subjects.

Answer:

Sum of all inside Venn

23 + 17 + 27 + 5 + 15 + 3 + 5

90 + 5 = 95

Total students = 105

Neither = 105 minus 95 = 10

Therefore, 10 Students study Neither of the three subjects.

10.(a) Simplify the expression $(a + 1)/3 - (2a + 1)/4$.

Find the common denominator.

The common denominator of 3 and 4 is 12.

Convert each term.

$(a + 1)/3$ becomes $4(a + 1)/12$

$(2a + 1)/4$ becomes $3(2a + 1)/12$

Now subtract.

$4(a + 1)/12$ minus $3(2a + 1)/12$

Expand numerators.

$4a + 4$ minus $(6a + 3)$ all over 12

Now subtract the numerators.

$4a + 4$ minus $6a$ minus $3 = -2a + 1$

Final answer is $(-2a + 1)/12$.

(b) Solve $2/(c - 1) + 3/(c + 1) = 5/c$.

Multiply both sides by $c(c - 1)(c + 1)$.

Left side gives

$2c(c + 1) + 3c(c - 1)$

Right side gives

$5(c - 1)(c + 1)$

Expand left.

$2c(c + 1) = 2c^2 + 2c$

$3c(c - 1) = 3c^2 - 3c$

Left total: $2c^2 + 2c + 3c^2 - 3c = 5c^2 - c$

Expand right.

$(c - 1)(c + 1) = c^2 - 1$

$5(c^2 - 1) = 5c^2 - 5$

Now equate.

$5c^2 - c = 5c^2 - 5$

Subtract $5c^2$ from both sides.

$-c = -5$

$c = 5$

Final answer is c = 5.

(c) Solve the simultaneous equations $c^2 + d = 9$ and $d + 6 = 2c$.

From the second equation

$d = 2c - 6$

Substitute into the first equation.

$c^2 + (2c - 6) = 9$

$c^2 + 2c - 6 = 9$

$c^2 + 2c - 15 = 0$

$(c + 5)(c - 3) = 0$

So $c = -5$ or $c = 3$

Now find d.

Case 1. $c = 3$

$d = 2(3) - 6$

$d = 6 - 6 = 0$

Case 2. $c = -5$

$d = 2(-5) - 6$

$d = -10 - 6 = -16$

Final solutions:

(c, d) = (3, 0) and (c, d) = (-5, -16).