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

042 **ADDITIONAL MATHEMATICS**

Time: 2:30 Hours **SOLUTIONS** **Year: 2021**

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) You are given the following numbers; 14932, 438454, 1946, 23842, 11748, 254174, 746164, 1914. Determine which numbers are exactly divisible by 4.

From Divisibility rule,

14932 ÷ 4 = 3733 → divisible

438454 ÷ 4 = 109613.5 → not divisible

1946 ÷ 4 = 486.5 → not divisible

23842 ÷ 4 = 5960.5 → not divisible

11748 ÷ 4 = 2937 → divisible

254174 ÷ 4 = 63543.5 → not divisible

746164 ÷ 4 = 186541 → divisible

1914 ÷ 4 = 478.5 → not divisible

Answer: **14932, 11748, 746164 are exactly divisible by 4.**

(b) Find the next three numbers from the following given pattern 2, 9, 20, 35…

Differences: 9−2=7, 20−9=11, 35−20=15

Next differences: 19, 23, 27

Next numbers: 35+19=54, 54+23=77, 77+27=104

The next three numbers are 54, 77, 104

(c) You are given the formula nth = n(n+1)/2. Find the 14th term.

14th term = 14×15/2 = 105

the 14th term is 105

2. (a) Solve for x if $|(x-1)/(x+1)| = 3$

Case 1: $(x-1)/(x+1) = 3$

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

$x-1 = 3x + 3$

$-2x = 4$

$x = -2$

Case 2: $(x-1)/(x+1) = -3$

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

$x-1 = -3x - 3$

$4x = -2$

$x = -1/2$

Answer: $x = -2$ or $x = -1/2$

(b) Express h as a subject of the formula given that $s = (wd/h)(h+d)$

$s = wd(h+d)/h$

$sh = wd(h+d)$

$sh = wdh + wd^2$

$sh - wdh = wd^2$

$h(s-wd) = wd^2$

$h = wd^2 / (s-wd)$

$h = wd^2 / (s-wd)$

(c) Use graphical method to solve the system of simultaneous equations x−y = 3, y−2x+5 = 0

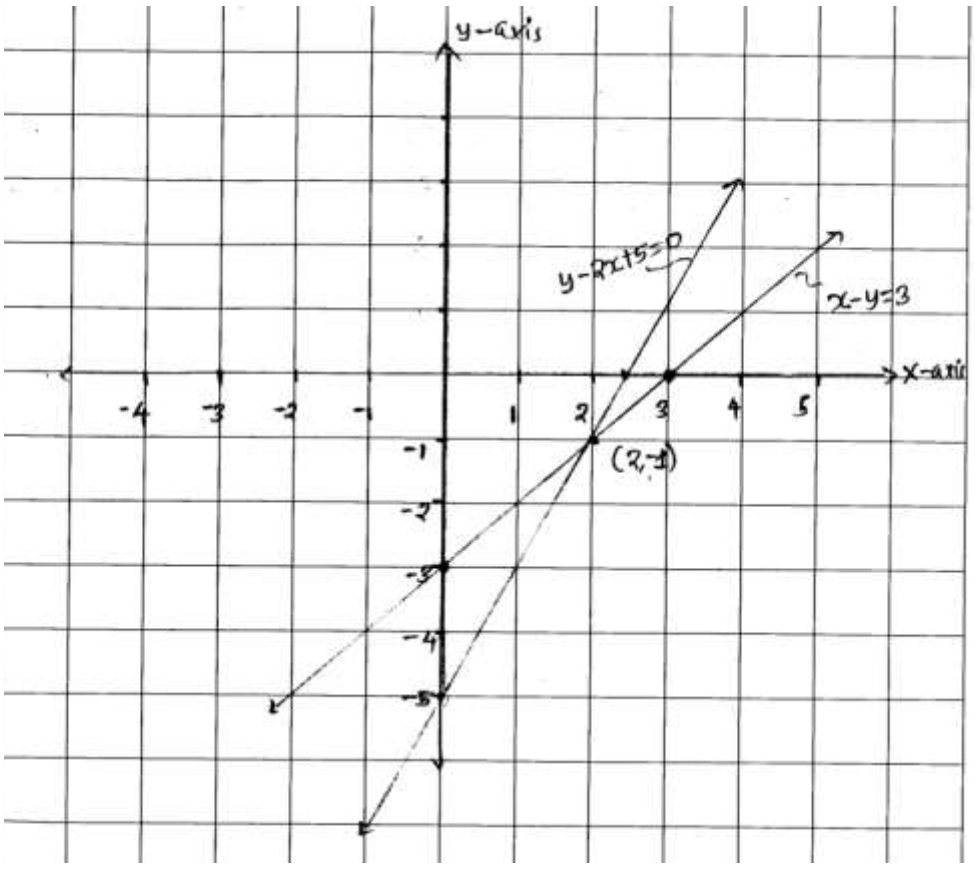
Table of value for x and y intercepts.

x – y = 3

x	0	3
y = x-3	-3	0

y – 2x + 5 = 0

x	0	5/2
y = 2x - 5	-5	0



Answer: **x = 2, y = −1**

3. (a)(i) Define the term quadrilateral.

A quadrilateral is a polygon with 4 sides

(ii) Calculate the number of sides of the polygon given that each interior angle of the regular polygon is 150°

Sum of interior angles = $(n-2)\times180$

$150n = 180(n-2)$

$150n = 180n - 360$

$30n = 360$

$n = 12$

Number of sides of the polygon 12 sides

(b) You are given the interior angles of a hexagon as 100°, 110°, 120° and 128°. Find the size of the other two angles which are equal

Sum of interior angles of hexagon = $(6-2)\times180 = 720°$

Sum of given angles = $100 + 110 + 120 + 128 = 458$

Remaining = $720-458 = 262$

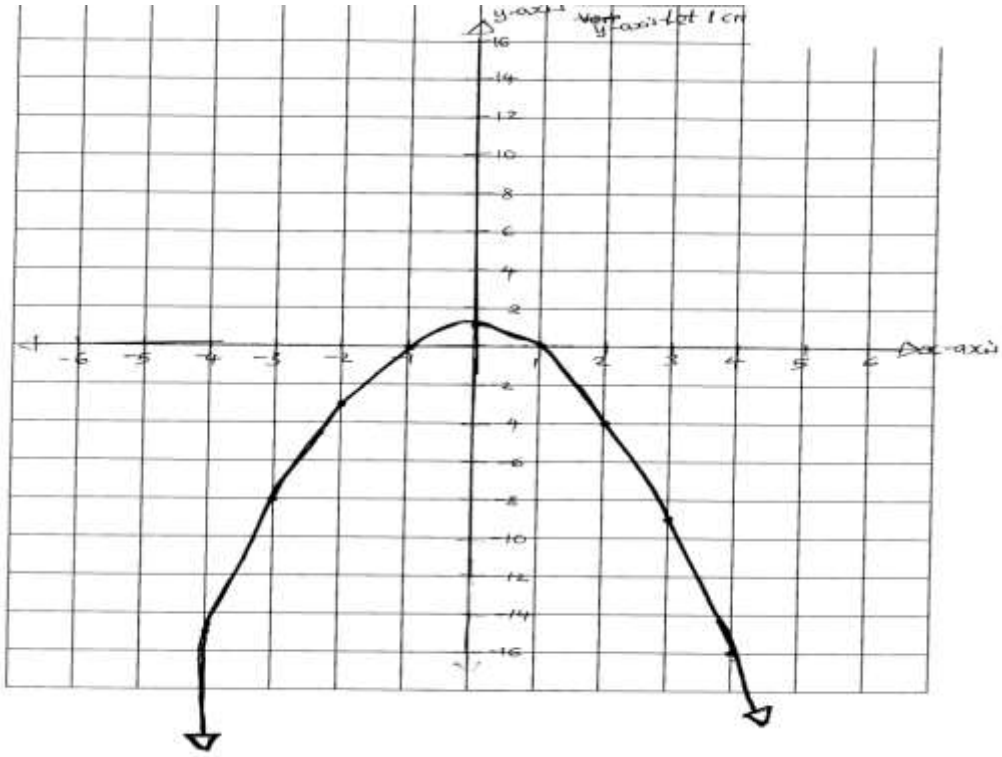
Each remaining angle = $262/2 = 131$

The size of the other two angles which are equal 131°, 131°

4. (a) Draw the locus of (x,y): $y = -x^2 + 1$, and state the value of y which makes the locus to be defined.

Table of values of $y = -x^2 + 1$

x	-3	-2	-1	0	1	2	3
y	-8	-3	0	1	0	-3	-8



For the locus to be defined,

$y = -x^2 + 1 \rightarrow y \leq 1$

$y \leq 1$ make the locus to be defined.

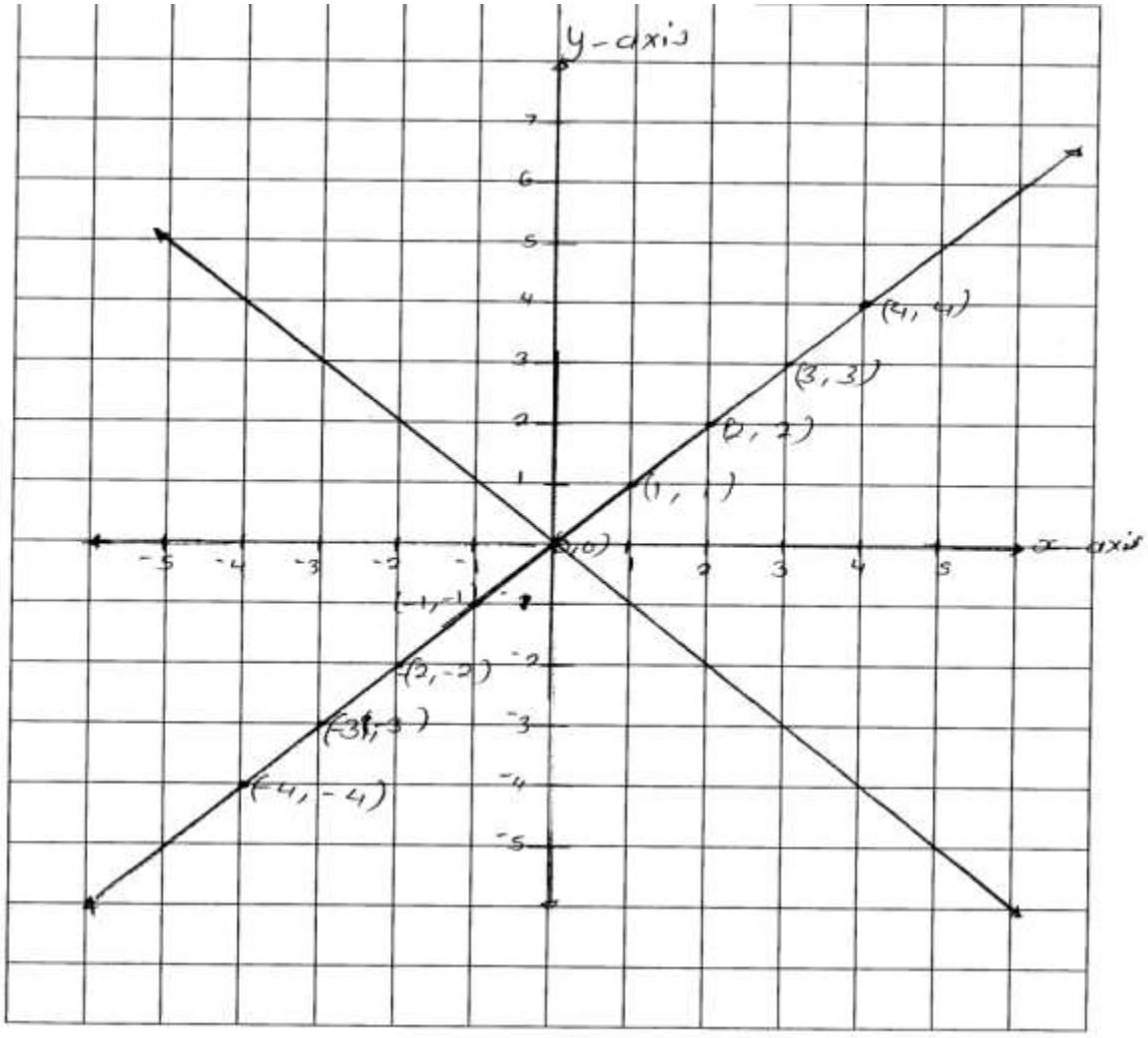
(b) Find and draw the loci of a moving point whose distance from y–axis is equal to its distance from the x–axis.

Table of value

x	-3	-2	-1	0	1	2	3
y = x	-3	-2	-1	0	1	2	3
y = -x	3	2	1	0	-1	-2	-3

$|x| = |y| \rightarrow y = x$ or $y = -x$

Answer: **y = x and y = −x**



5. (a) Find the system of simultaneous equations satisfying the given graph

Given: L1 points (-2,−4), (−1,−3), L2 points (2,3), (4,−1)

Slope L1: m1 = (−3−(−4))/(−1−(−2)) = 1/1 = 1

Equation L1: y − (−4) = 1(x−(−2))

y + 4 = x + 2

y = x − 2

Slope L2: m2 = (−1−3)/(4−2) = −4/2 = −2

Equation L2: y − 3 = −2(x−2)

y − 3 = −2x + 4

y = −2x + 7

Required simultaneous equations:

x − y = 2

2x + y = 7

(b) (i) Given: A(1, k+2), B(4, 3k), C(10, 6k)

Req: Find k

Slope AB: m1 = (3k − (k+2)) / (4−1)

m1 = (2k−2)/3

Slope BC: m2 = (6k−3k) / (10−4)

m2 = 3k/6 = k/2

Slope AC: m3 = (6k−(k+2)) / (10−1)

m3 = (5k−2)/9

Collinear → m1 = m2

(2k−2)/3 = k/2

2(2k−2) = 3k

4k−4 = 3k

k = 4

Check m1 = m3

(2k−2)/3 = (5k−2)/9

3(2k−2) = 5k−2

6k−6 = 5k−2

k = 4

Answer: k = 4

(ii) Given: L1 ky + 3x = 2, L2 y = ½x − 4

Req: Find k so that L1 ∥ L2

Rewrite L1: ky = 2−3x → y = (2/k) − (3x/k)

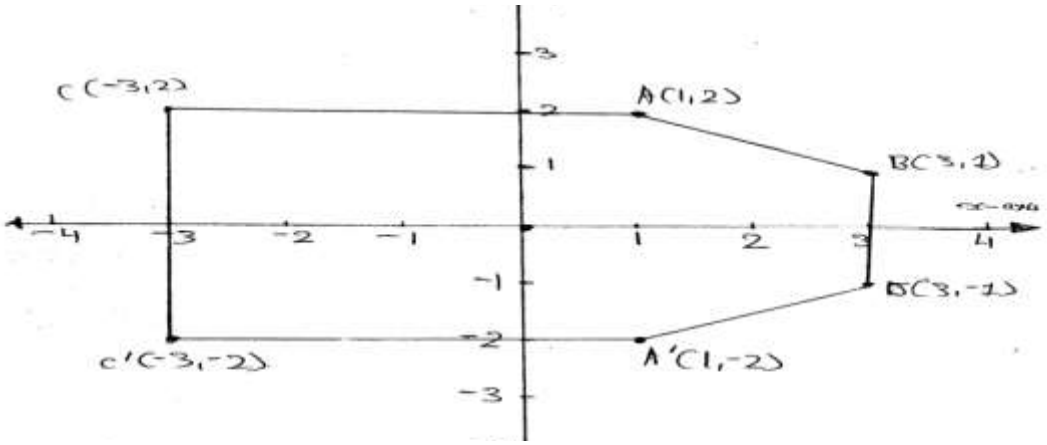
Slope L1: m1 = −3/k

Slope L2: m2 = ½

Parallel → m1 = m2 → −3/k = ½ → k = −6

Answer: k = −6

6. (a) Given that A(1,2), B(3,1), C(-3,2) and D(3,-1) are some of the vertices of a six-sided polygon. Draw the complete figure on x-y plane so that x-axis is the only line of symmetry



(b)(i) Letters O, N, T, V. Determine which has no axis of symmetry

O → infinite axes

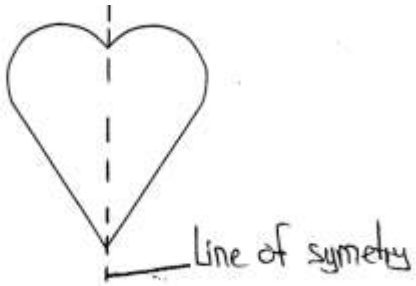
N → none

T → 1 vertical axis

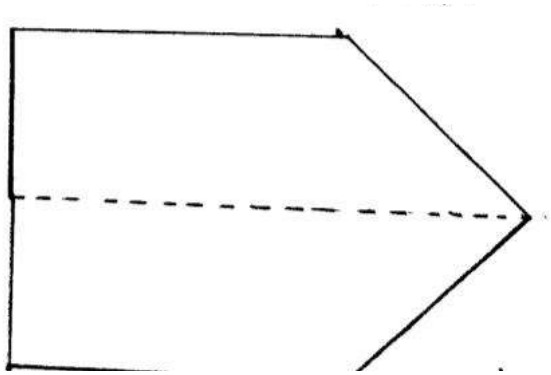
V → 1 vertical axis

Answer: **N has no axis of symmetry**

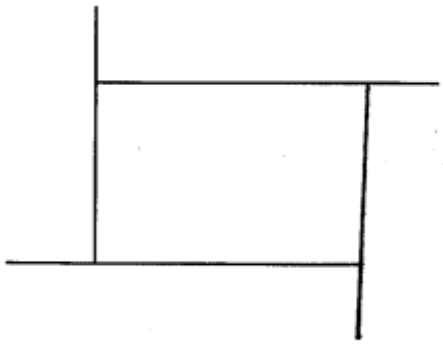
(ii) Draw line of symmetry on given figure



(c)(i) Copy given shape and complete it so dotted line becomes line of symmetry



(ii) Add one line to the given diagram so the resulting figure will have rotational symmetry but no line of symmetry



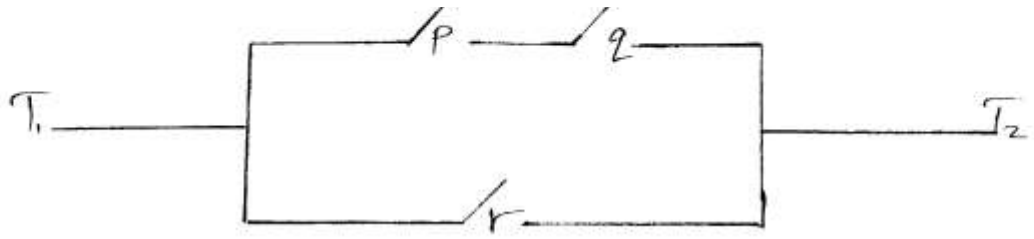
7. (a)(i) Let p be ‘He is happy’ and q be ‘He is rich’. Write the statement ‘He is rich but not happy’ in symbolic form and construct the corresponding truth table

Symbolic form: $q \wedge \neg p$

Truth table:

p	q	¬p	q∧¬p
T	T	F	F
T	F	F	F
F	T	T	T
F	F	T	F

(ii) Electrical network for $(p \wedge q) \vee r \rightarrow$ AND gate for $p \wedge q$, then OR with r



(b)(i) Use truth table to verify equivalence: $(p \rightarrow q) \wedge (q \rightarrow p) \equiv p \leftrightarrow q$

p	q	p→q	q→p	(p→q)∧(q→p)	p↔q
T	T	T	T	T	T
T	F	F	T	F	F
F	T	T	F	F	F
F	F	T	T	T	T

Hence it is equivalent.

(ii) Test validity:

"If I like Mathematics, then I will study. Either I study or I fail. Therefore, if I fail then I do not like Mathematics."

Let p = I like Mathematics, q = I study, r = I fail

Premises: $p \rightarrow q$, $q \vee r$

Conclusion: $r \rightarrow \neg p$

truth table

p	q	r	$\sim p$	$p \rightarrow q$	$q \vee r$	$5 \wedge 6$	$r \rightarrow \sim p$	$7 \rightarrow 8$
T	T	T	F	T	T	T	F	F
T	T	F	F	T	T	T	T	T
T	F	T	F	F	T	F	F	T
T	F	F	F	F	F	F	T	T
F	T	T	T	T	T	T	T	T
F	T	F	T	T	T	T	T	T
F	F	T	T	T	T	T	T	T
F	F	F	T	T	F	F	T	T

since the last column has F, then the statement is not tautology, therefore the argument is invalid.

8. (a) y directly proportional to x^2, y = 98 when x = 7

   $k = y/x^2 = 98/49 = 2$

   $y = 2x^2$, x = 5

   $y = 2 \times 25 =$

   50

   (b) $y \propto x/z$, $x \propto 1/y^2$

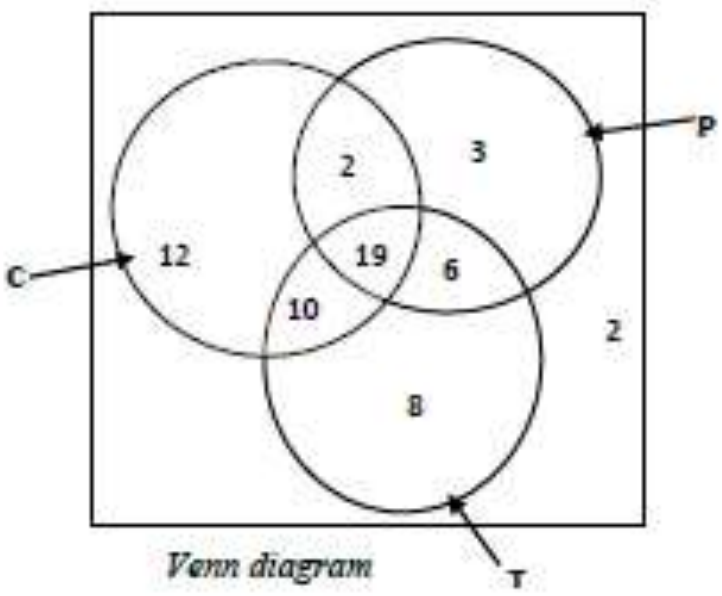
   $x = k_1/y^2$

   $y \propto x/z \rightarrow z^2 \propto x^3$

9. (a) 80 staff, carrots = 43, potatoes = 30, tomatoes = 43, carrots∩tomatoes=29, carrots∩potatoes=21, potatoes∩tomatoes=25, all three=19

Carrots only = 43−29−21+19 = 12

Tomatoes only = 43−29−25+19 = 8



Venn diagram

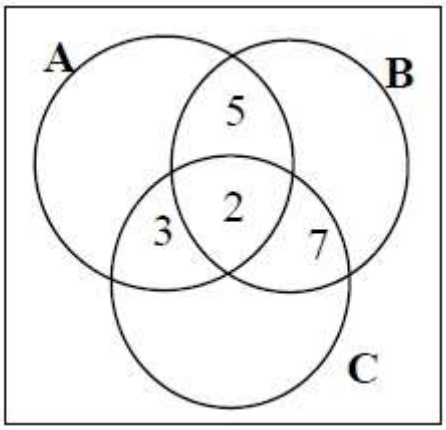
Answer: Carrots only = 12, Tomatoes only = 8

(b) n(A)=20, n(B)=24, n(C)=28, n(A∩B)=12, n(A∩C)=13, n(B∩C)= n(A∩B∩C)=10

n(A∪B∪C) = 20+24+28−12− n(B∩C) +10 = **57 - n(B∩C)**

(c) A = {2,3,5}, B = {2,5,7}, C = {2,3,7}

Venn diagram: intersection elements 2, 3, 5, 7 arranged in three sets



Members who selected carrot only or tomatoes only were 20

10.(a)(i) (i) R inversely proportional to T:

$R = k / T$

$4 = k / 8$

$k = 32$

Relationship: $R = 32 / T$

(ii) x directly proportional to y and inversely to $\sqrt{z}$:

$x = k\, y / \sqrt{z}$

$300 = k \times 65 / \sqrt{25}$

$300 = k \times 65 / 5$

$300 = k \times 13$

$k = 300 / 13$

Find x for y = 468, z = 144:

$x = 300 \times 468 / (13 \times \sqrt{144})$

x = 140400 / 156

x = 900

Answer: x = 900

(b)

Cost inversely proportional to distance covered:

Cost = k / distance

1000000 = k / 800

k = 1000000 × 800

k = 800000000

Cost for 1500 km:

Cost = 800000000 / 1500

Cost = 533333.33

Answer: 533,333/= approximately

(c)

Men digging trench (inverse proportion):

18 men, 4 days, 1 trench

x men, 9 days, 1 trench

18 × 4 = x × 9

x = 72 / 9

x = 8

Answer: 8 men will dig the trench in 9 days