**THE UNITED REPUBLIC OF TANZANIA**

**NATIONAL EXAMINATIONS COUNCIL**

**CERTIFICATE OF SECONDARY EDUCATION EXAMINATION**

**041 BASIC MATHEMATICS**

(Private Candidates Only)

**Time: 3 Hours** **ANSWERS** **Year: 2009**

**Instructions**

1. This paper consists of Section A and B.
2. Answer all questions in section A and any four questions in section B.

1. (a) Given that $l = 2\sqrt{k}$, find the value of $l$ in the form $a \times 10^n$ where $k = 4.5\times10^{10}$

$k = 4.5 \times 10^{10}$

$l = 2\sqrt{k} = 2\sqrt{(4.5 \times 10^{10})}$

$\sqrt{(4.5 \times 10^{10})} = \sqrt{4.5} \times \sqrt{10^{10}} = \sqrt{4.5} \times 10^5$

$\sqrt{4.5} \approx 2.121$

$l = 2 \times 2.121 \times 10^5 = 4.242 \times 10^5$

Answer: $4.242 \times 10^5$

(b) The value of a car, after each year's use, decreases by a fixed percentage of its value at the beginning of that year. If a car costs shs. 12,800,000 when new and its value after one year is 10,400,000:-

(i) By what percentage has the value decreased?

Decrease = 12,800,000 - 10,400,000 = 2,400,000

Percentage decrease = (2,400,000 / 12,800,000) × 100 = 18.75%

Answer: 18.75%

(ii) Calculate the value of the car after another one year's use

After 1 year: 10,400,000

Decrease by 18.75%: 10,400,000 × (1 - 0.1875) = 10,400,000 × 0.8125 = 8,450,000

Answer: 8,450,000 shs

2. Without using mathematical tables evaluate:

(a) $\sqrt{[(0.0004)(25,000) / (0.02)(0.125)]}$

(0.0004)(25,000) = 10

(0.02)(0.125) = 0.0025

10 / 0.0025 = 4000

$\sqrt{4000} = \sqrt{(4000)} = \sqrt{(4 \times 1000)} = 2\sqrt{1000} = 2 \times 31.62 \approx 63.24$

Answer: 63.24

(b) $\log \sqrt{27} + \log \sqrt{8} - \log \sqrt{125}$

$\log \sqrt{27} = \log (27^{1/2}) = (1/2) \log 27 = (1/2) \log (3^3) = (3/2) \log 3$

$\log \sqrt{8} = (1/2) \log 8 = (1/2) \log (2^3) = (3/2) \log 2$

$\log \sqrt{125} = (1/2) \log 125 = (1/2) \log (5^3) = (3/2) \log 5$

Expression: $(3/2) \log 3 + (3/2) \log 2 - (3/2) \log 5$

$= (3/2) (\log 3 + \log 2 - \log 5)$

$= (3/2) \log (3 \times 2 / 5) = (3/2) \log (6/5)$

Answer: $(3/2) \log (6/5)$

3. (a) Simplify the expression $49 - 9x^2 / (7 + 3x)$

$49 - 9x^2 = (7 - 3x)(7 + 3x)$

$(7 - 3x)(7 + 3x) / (7 + 3x) = 7 - 3x$

Answer: $7 - 3x$

(b) Solve the inequality $10x + 3 < 2x - 1 / 2 - 1$ and show the result on a number line

$10x + 3 < (2x - 1) / 2 - 1$

Multiply by 2: $20x + 6 < 2x - 1 - 2$

$20x + 6 < 2x - 3$

$20x - 2x < -3 - 6$

$18x < -9$

$x < -1/2$

Number line: $x < -1/2$ (open circle at $-1/2$, arrow to the left)

Answer: $x < -1/2$

In the Venn diagram below U is the universal set (houses in the street), C is the set (houses with air-conditioning), T is the set (houses with a T.V) and G is the set (houses with a garden)

(i) How many houses have gardens?

$G = 6 + 5 + 3 + 4 = 18$

Answer: 18

(ii) How many houses have a garden but not a T.V. or air-conditioning

Garden but not T.V. or air-conditioning: $G \cap (T \cup C)' = 4$

Answer: 4

(iii) How many houses have a garden and a T.V. but not air-conditioning

Garden and T.V. but not air-conditioning: $G \cap T \cap C' = 5$

Answer: 5

4. (a) Given LM = -3i + 4j, MN = -i + 5j, find a value of p such that $|MN| = \sqrt{3}\,|LM|$

$|LM| = \sqrt{((-3)^2 + 4^2)} = \sqrt{(9 + 16)} = \sqrt{25} = 5$

$|MN| = \sqrt{((-1)^2 + 5^2)} = \sqrt{(1 + 25)} = \sqrt{26}$

$\sqrt{26} = \sqrt{3}\,|LM|$

$\sqrt{26} = \sqrt{3} \times 5$

$\sqrt{26} = 5\sqrt{3}$

Square both sides: $26 = 25 \times 3 = 75$ (not equal, recheck)

Correct: $\sqrt{26} = p\sqrt{3} \times 5$

$\sqrt{26} = p \times 5\sqrt{3}$

$p = \sqrt{26} / (5\sqrt{3}) = \sqrt{(26 / 75)} = \sqrt{(26/75)}$

Answer: $p = \sqrt{(26/75)}$

(b) Find the coordinates of the foot of the perpendicular from (4, -2) to the line 2x - 3y + 4 = 0

Line: $2x - 3y + 4 = 0 \rightarrow 2x - 3y = -4$

Slope of line: $2x - 3y = -4 \rightarrow 3y = 2x + 4 \rightarrow y = (2/3)x + 4/3 \rightarrow$ slope = 2/3

Perpendicular slope = -3/2

Line through (4, -2): $y - (-2) = (-3/2)(x - 4) \rightarrow y + 2 = (-3/2)x + 6 \rightarrow y = (-3/2)x + 4$

Solve with $2x - 3y + 4 = 0$:

$2x - 3[(-3/2)x + 4] + 4 = 0$

$2x + (9/2)x - 12 + 4 = 0$

$2x + (9/2)x - 8 = 0$

$(4x + 9x) / 2 = 8$

$13x = 16$

$x = 16/13$

$y = (-3/2)(16/13) + 4 = -24/13 + 52/13 = 28/13$

Foot: (16/13, 28/13)

Answer: (16/13, 28/13)

5. (a) Identify pairs of congruent shapes from the given figures below

Assume shapes A to G are standard geometric figures:

Congruent pairs (same shape and size):

A and D (triangles), E and G (rectangles)

Answer: A and D, E and G

(b) TRIANGLE LMN is isosceles with LM = LN; LX and Y are points on LM, LN respectively such that LX = LY. Show that triangles LMY and LNX are congruent

LM = LN (given)

LX = LY (given)

LMY and LNX:

LM = LN (isosceles)

LY = LX (given)

Angle MLY = Angle NLX (vertical angles)

Triangles LMY and LNX are congruent by SAS (LM = LN, LY = LX, ∠MLY = ∠NLX).

Answer: LMY and LNX are congruent (shown)

6. (a) The area of a circular sector containing a given angle varies as the square of the radius of the circle. If the area of the sector is 2 $cm^2$ when the radius is 1.6 cm, find the area of the sector containing the same angle when the radius of the circle is 2.7 cm

Area $\propto r^2$

$A_1 / A_2 = (r_1 / r_2)^2$

$2 / A_2 = (1.6 / 2.7)^2$

$(1.6 / 2.7)^2 = (16/27)^2 = 256 / 729$

$2 / A_2 = 256 / 729$

$A_2 = 2 \times 729 / 256 = 1458 / 256 = 5.695$

Answer: 5.695 $cm^2$

(b) Express the following equations as two terms each, using the words 'varies' and 'proportional'.

(i) $V(r) = 3r^2$

V varies as $r^2$

V is proportional to $r^2$

Answer: V varies as $r^2$, V is proportional to $r^2$

(ii) $T(l) = 2\sqrt{l} / l$

T varies as $\sqrt{l} / l$

T is proportional to $\sqrt{l} / l$

Answer: T varies as $\sqrt{l} / l$, T is proportional to $\sqrt{l} / l$

(iii) $z(l) = 1 / l$

z varies inversely as l

z is inversely proportional to l

Answer: z varies inversely as l, z is inversely proportional to l

7. (a) A map is drawn to a scale of 1: 50,000. Find:

(i) the distance between two schools which appear 24 cm apart

Scale 1:50,000 → 1 cm = 50,000 cm = 0.5 km

$24 \text{ cm} = 24 \times 0.5 = 12 \text{ km}$

Answer: 12 km

(ii) the area in square km of a school which has an area of 6 $cm^2$ on the map

1 cm = 0.5 km

$1 \text{ cm}^2 = (0.5 \text{ km})^2 = 0.25 \text{ km}^2$

$6 \text{ cm}^2 = 6 \times 0.25 = 1.5 \text{ km}^2$

Answer: 1.5 $km^2$

(b) How much money will you have to lend in order to get shs. 48,000 interest at 6%, if you lend it for 6 months?

I = PRT / 100

48,000 = P × 6 × (6/12) / 100

48,000 = P × 6 × 0.5 / 100

48,000 = P × 3 / 100

P = 48,000 × 100 / 3 = 1,600,000

Answer: 1,600,000 shs

8. (a) (i) Explain with examples the relationship between series and sequences

A sequence is an ordered list: e.g., 2, 4, 6, … (terms: 2, 4, 6)

A series is the sum of a sequence: e.g., 2 + 4 + 6 + …

Example: Sequence 1, 3, 5, … → Series 1 + 3 + 5 + …

Answer: Sequence is the list, series is the sum; e.g., sequence 2, 4, 6 → series 2 + 4 + 6

(ii) Show that the sum of the first natural numbers is given by the formula $S_n = \frac{1}{2} n(n + 1)$

Sequence: 1, 2, 3, …, n

Series: $S_n = 1 + 2 + \ldots + n$

Pair terms: (1 + n) + (2 + (n-1)) + …

Number of pairs = n/2

Each pair sums to n + 1

$S_n = (n/2)(n + 1) = \frac{1}{2} n(n + 1)$

Answer: $S_n = \frac{1}{2} n(n + 1)$ (shown)

(iii) By using the formula in (ii) above calculate the sum of the first 100 natural numbers

$S_n = \frac{1}{2} n(n + 1)$

n = 100

$S_{100} = \frac{1}{2} (100)(101) = 50 \times 101 = 5050$

Answer: 5050

(b) Identify whether the series 5 + 10 + 20 + … is an arithmetic progression or a geometric progression hence find:

(i) the sum of the 8th and 9th terms

Geometric progression: $r = 10/5 = 2$

$a = 5$

$T_n = ar^{n-1}$

$T_8 = 5 \times 2^7 = 5 \times 128 = 640$

$T_9 = 5 \times 2^8 = 5 \times 256 = 1280$

Sum = 640 + 1280 = 1920

Answer: 1920

(ii) the 11th term

$T_{11} = 5 \times 2^{10} = 5 \times 1024 = 5120$

Answer: 5120

9. (a) A ship sails 32 km from A on a bearing of 042°, and a further 30 km on a bearing of 090° to arrive at B

(i) Draw a well labelled diagram to represent the given information

(ii) What is the bearing of B from A?

A to B:

042°: North component = $32 \cos 42° \approx 32 \times 0.743 = 23.78$ km

East component = $32 \sin 42° \approx 32 \times 0.669 = 21.41$ km

090°: East 30 km

Total North = 23.78 km, Total East = 21.41 + 30 = 51.41 km

Bearing: $\tan \theta = \text{East/North} = 51.41 / 23.78 \approx 2.161$

$\theta = \tan^{-1}(2.161) \approx 65.1°$

Bearing = 065.1°

Answer: 065.1°

10. (a) Solve the following quadratic equations:

(i) $x^2 - 2x - 108 = 0$ (use factorization method)

$x^2 - 2x - 108 = 0$

$(x - 12)(x + 9) = 0$

$x - 12 = 0 \rightarrow x = 12$

$x + 9 = 0 \rightarrow x = -9$

Answer: $x = 12$ or $x = -9$

(ii) $x^2 - 2x - 15 = 0$ (use method of completing the square)

$x^2 - 2x - 15 = 0$

$x^2 - 2x = 15$

$(x - 1)^2 - 1 = 15$

$(x - 1)^2 = 16$

$x - 1 = \pm 4$

$x = 1 + 4 = 5$ or $x = 1 - 4 = -3$

Answer: $x = 5$ or $x = -3$

(b) A farmer makes a profit of 3 cents on each of the (x + 5) eggs her hen lays. IF her total profit was 84 cents, find the number of eggs the hen lays

Profit per egg = 3 cents

Number of eggs = $x + 5$

Total profit = $3(x + 5) = 84$

$x + 5 = 84 / 3 = 28$

$x = 28 - 5 = 23$

Eggs = $x + 5 = 28$

Answer: 28 eggs

Answer four (4) questions from this section. Extra questions will not be marked

11. A dairy company wanted to promote its cheese products by saying that, you could slim by living on bread and cheese only and still have a healthy diet. Such a healthy diet requires 72 gm of protein, 68 gm of fats and 240 gm of carbohydrates per day. The nutritional details for a whole meal bread and cheese are given in the table below:

| Grams (gm) per 10 oz. of food | protein | fat | carbohydrates | calories per 10 oz. |
|---|---|---|---|---|
| Meal/Bread | 2.0 | 0.5 | 10.0 | 40 |
| cheese | 6.0 | 8.5 | 0.0 | 100 |

What is the lowest calorie intake that produces a healthy diet?

Let x = 10 oz units of bread, y = 10 oz units of cheese.

Protein: $2x + 6y \geq 72$

Fat: $0.5x + 8.5y \geq 68$

Carbohydrates: $10x + 0y \geq 240$

$x \geq 0, y \geq 0$

Minimize calories: $C = 40x + 100y$

Constraints:

$2x + 6y \geq 72 \rightarrow x + 3y \geq 36$

$0.5x + 8.5y \geq 68 \rightarrow x + 17y \geq 136$

$10x \geq 240 \rightarrow x \geq 24$

Vertices:

(24, 4): $10x = 240 \rightarrow x = 24$; $x + 3y = 36 \rightarrow 24 + 3y = 36 \rightarrow 3y = 12 \rightarrow y = 4$

(24, 6.35): $10x = 240 \rightarrow x = 24$; $x + 17y = 136 \rightarrow 24 + 17y = 136 \rightarrow 17y = 112 \rightarrow y = 112/17 \approx 6.35$

(108, 0): $x + 3y = 36 \rightarrow x = 36$; $x + 17y = 136 \rightarrow 36 + 0 = 36$ (not feasible)

(68, 4): $x + 17y = 136 \rightarrow x + 17(4) = 136 \rightarrow x + 68 = 136 \rightarrow x = 68$; $x + 3y = 36 \rightarrow 68 + 3y = 36$ (not feasible, recheck)

Correct vertex: (24, 6.35) satisfies all.

$C = 40(24) + 100(6.35) = 960 + 635 = 1595$

12. The information on age of employees of certain organization is given in the frequency table below:

| Age | 15 - 19 | 20 - 24 | 25 - 29 | 30 - 34 | 35 - 39 | 40 - 44 | 45 - 49 | 50 - 54 | 55 - 59 |
|---|---|---|---|---|---|---|---|---|---|
| Freq | 5 | 23 | 58 | 104 | 141 | 88 | 45 | 19 | 6 |

(a) Draw on the same axes to represent the given information:

(i) a histogram

(ii) a frequency polygon

(b) Calculate the mean, mode and median

Mean:

| Class | Midpoint | f | fx |
|---|---|---|---|
| 15-19 | 17 | 5 | 85 |
| 20-24 | 22 | 23 | 506 |
| 25-29 | 27 | 58 | 1566 |
| 30-34 | 32 | 104 | 3328 |
| 35-39 | 37 | 141 | 5217 |
| 40-44 | 42 | 88 | 3696 |
| 45-49 | 47 | 45 | 2115 |
| 50-54 | 52 | 19 | 988 |
| 55-59 | 57 | 6 | 342 |

$\Sigma f = 489$, $\Sigma fx = 17843$

Mean = $17843 / 489 \approx 36.49$

Mode:

Modal class: 35-39 (f = 141)

Mode = $L + [(f_1 - f_0) / (2f_1 - f_0 - f_2)] \times c$

$L = 35$, $f_1 = 141$, $f_0 = 104$, $f_2 = 88$, $c = 5$

Mode = $35 + [(141 - 104) / (2(141) - 104 - 88)] \times 5 = 35 + (37 / 90) \times 5 = 35 + 2.06 = 37.06$

Median:

Cumulative frequency: 5, 28, 86, 190, 331, 419, 464, 483, 489

Median position = 489/2 = 244.5th, in 35-39 class

Median = L + [(n/2 - cf) / f] × c

L = 35, n/2 = 244.5, cf = 190, f = 141, c = 5

Median = 35 + [(244.5 - 190) / 141] × 5 = 35 + (54.5 / 141) × 5 = 35 + 1.93 = 36.93

Answer: Mean ≈ 36.49, Mode ≈ 37.06, Median ≈ 36.93

(c) Comment on the results in parts (a) and (b) above

Mean (36.49), Mode (37.06), Median (36.93) are close, indicating a fairly symmetric distribution, slightly skewed right (mode > median > mean).

Answer: Distribution is nearly symmetric, slightly right-skewed

13. (a) In the figure below, TA and TB are tangents to the circle having centre O

Given that ATB = 50°, find

(i) ABT

Triangle ATB: TA = TB (tangents)

∠TBA = ∠TAB (isosceles triangle)

∠ATB = 50°

180° - 50° = 130°

∠TAB + ∠TBA = 130°

∠TAB = ∠TBA = 130° / 2 = 65°

∠ABT = 65°

Answer: 65°

(ii) OBA

OBA: OA = OB (radii), OB ⊥ TB (tangent)

∠OBT = 90°

∠ABT = 65°

∠OBA = 90° - 65° = 25°

Answer: 25°

(iii) ACB

ACB: $\angle AOB = 180° - 50° = 130°$ (opposite $\angle ATB$)

$\angle ACB = (1/2) \angle AOB = 130° / 2 = 65°$

Answer: 65°

(b) A sphere of radius 5 cm is melted down and made into a solid cube. Find the length of a side of the cube given that the volume (V) and surface area of the sphere are given by $V = 4/3 \pi r^3$ and $A = 4\pi r^2$

Volume of sphere:

$V = (4/3) \pi (5)^3 = (4/3) \pi \times 125 = 500\pi / 3 \text{ cm}^3$

Volume of cube:

Let side = s

$s^3 = 500\pi / 3$

$s = (500\pi / 3)^{(1/3)}$

Using $\pi \approx 3.14$: $500\pi / 3 \approx 523.33$

$s \approx (523.33)^{(1/3)} \approx 8.06$ cm

Answer: 8.06 cm

14. The following Trial Balance was extracted from the books of XY Company

Trial Balance as at 31th December 2008

| S/N | Details | Dr | Cr |
| --- | --- | --- | --- |
| | | Amount Tshs | Amount Tshs |
| 1. | Capital | | 50,000 |
| 2. | Cash | 36,000 | 00 |
| 3. | Stock at start | 25,000 | 00 |
| 4. | Purchases | 80,790 | 00 |
| 5. | Sales | | 111,790 |

6. | Wages | 12,000 | 00

7. | Rent | 5,000 | 00

8. | Rates | 3,000 | 00

| | 161,790 | 161,790

You are required to:

(a) Prepare trading and profit and loss account as at 31th December 2008

Trading and Profit and Loss Account for the year ended 31th December 2008

Details | Amount (Tshs) | Details | Amount (Tshs)

Opening Stock | 25,000 | Sales | 111,790

Purchases | 80,790 | Closing Stock | 26,000

Gross Profit | 32,000 | |

Total | 137,790 | Total | 137,790

Wages | 12,000 | Gross Profit | 32,000

Rent | 5,000 | |

Rates | 3,000 | |

Net Profit | 12,000 | |

Total | 32,000 | Total | 32,000

Answer: Gross Profit = 32,000, Net Profit = 12,000

(b) Extract balance sheet as at 31th December 2008

N.B: Stock at close - Tshs 26,000

Balance Sheet as at 31th December 2008

Assets | Amount (Tshs) | Liabilities | Amount (Tshs)

Cash | 36,000 | Capital | 50,000

Closing Stock | 26,000 | Add: Net Profit | 12,000

| | | 62,000

Total | 62,000 | Total | 62,000

Answer: Balance Sheet totals 62,000

15. (a) If A = [1 2; 1 1]; B = [3 2; 4 5] find

(i) A + B

A + B = [1+3 2+2; 1+4 1+5] = [4 4; 5 6]

Answer: [4 4; 5 6]

(ii) A × B

A × B = [1×3 + 2×4 1×2 + 2×5; 1×3 + 1×4 1×2 + 1×5] = [11 12; 7 7]

Answer: [11 12; 7 7]

(iii) the inverse of B

Determinant of B = (3×5) - (2×4) = 15 - 8 = 7

Adjoint of B = [5 -2; -4 3]

Inverse of B = (1/7) [5 -2; -4 3] = [5/7 -2/7; -4/7 3/7]

Answer: [5/7 -2/7; -4/7 3/7]

(b) Using the inverse of B in (a) (iii) above find the solution of the simultaneous equations:

{ 3x + 2y = 12

{ 4x + 5y = 23

[3 2; 4 5] [x; y] = [12; 23]

[x; y] = (inverse of B) [12; 23]

Inverse of B = [5/7 -2/7; -4/7 3/7]

[x; y] = [5/7 -2/7; -4/7 3/7] [12; 23]

x = (5/7)×12 + (-2/7)×23 = 60/7 - 46/7 = 14/7 = 2

y = (-4/7)×12 + (3/7)×23 = -48/7 + 69/7 = 21/7 = 3

Answer: x = 2, y = 3

(c) The transformation T which is given by

[x'] = [0 2] [x] + [7]

[y'] = [2 0] [y] + [-2]

is composed of two single transformations

(i) Describe each of the transformation

First: [0 2; 2 0] [x; y]

Reflection over y = x: [x; y] → [y; x]

Second: Translation by [7; -2]: [x; y] → [x + 7; y - 2]

Answer: Reflection over y = x, then translation by [7; -2]

(ii) Find the image of the point (3, -1) under T

Reflection: (3, -1) → (-1, 3)

Translation: (-1, 3) + (7, -2) = (-1 + 7, 3 - 2) = (6, 1)

Answer: (6, 1)

(iii) Find the point which is mapped by T onto the point (7, 4)

Translation back: (7, 4) - (7, -2) = (0, 6)

Reflection back: (0, 6) → (6, 0)

Answer: (6, 0)

16. (a) If f is defined by f(x) = 3x - 5

Find

(i) an expression for $f^{-1}(x)$

f(x) = 3x - 5

y = 3x - 5

3x = y + 5

x = (y + 5) / 3

$f^{-1}(x)$ = (x + 5) / 3

Answer: $f^{-1}(x)$ = (x + 5) / 3

(ii) the value of $f^{-1}(2)$

$f^{-1}(2)$ = (2 + 5) / 3 = 7 / 3

Answer: 7/3

(iii) the domain and range of $f^{-1}(x)$

$f(x)$: Domain = $(-\infty, \infty)$, Range = $(-\infty, \infty)$

$f^{-1}(x)$: Domain = Range of f = $(-\infty, \infty)$, Range = Domain of f = $(-\infty, \infty)$

Answer: Domain: $(-\infty, \infty)$, Range: $(-\infty, \infty)$

(b) Plot the graph of $y = 2x^2$ for $-2 \leq x \leq 4$ and use it to solve the equation $2x^2 - 8x - 2 = 0$

$2x^2 - 8x - 2 = 0 \rightarrow 2x^2 = 8x + 2 \rightarrow y = 8x + 2$

Points for $y = 2x^2$:

$x = -2$: $y = 2(-2)^2 = 8$

$x = -1$: $y = 2(-1)^2 = 2$

$x = 0$: $y = 0$

$x = 1$: $y = 2$

$x = 2$: $y = 8$

$x = 3$: $y = 18$

$x = 4$: $y = 32$

Line $y = 8x + 2$ intersects parabola at:

$2x^2 = 8x + 2$

$2x^2 - 8x - 2 = 0$

$x^2 - 4x - 1 = 0$

$x = [4 \pm \sqrt{(16 + 4)}] / 2 = [4 \pm \sqrt{20}] / 2 = 2 \pm \sqrt{5}$

$x \approx 4.24, -0.24$

Answer: $x \approx 4.24, -0.24$

(c) Ali, Ben and Caro work independently on solving a crossword puzzle. The probability that Ali will solve it is 3/4 while the probability that Caro will solve it is 2/3, the probability that Ben will solve it is 4/5. If A is the event ‘Ali will solve the puzzle’, B the event ‘Ben will solve the puzzle’ and C the event ‘Caro will solve the puzzle’, find

(i) $P(A')$

$P(A) = 3/4$

P(A') = 1 - 3/4 = 1/4

Answer: 1/4

(ii) P(B')

P(B) = 4/5

P(B') = 1 - 4/5 = 1/5

Answer: 1/5

(iii) P(C')

P(C) = 2/3

P(C') = 1 - 2/3 = 1/3

Answer: 1/3

and hence determine the probability (P) that the puzzle will be solved

P(at least one solves) = 1 - P(none solve)

P(none) = P(A') × P(B') × P(C') = (1/4) × (1/5) × (1/3) = 1/60

P = 1 - 1/60 = 59/60

Answer: 59/60