EXAMINATIONS COUNCIL OF ZAMBIA

Joint Examination for the School Certificate
and General Certificate of Education Ordinary Level

MATHEMATICS (SYLLABUS D)   4024/1

PAPER 1

Monday   5 NOVEMBER 2012

Candidates answer on the question paper.
Additional materials:
Geometrical instruments

Time: 2 hours

INSTRUCTIONS TO CANDIDATES

Write your name, centre number and candidate number in the spaces provided at the top of this page.

There are **twenty-three** questions in this paper.

Answer **all** questions.

Write your answers in the spaces provided on the question paper.

If working is needed for any question, it must be shown in the space below that question.

No paper for rough work is to be provided.

Omission of essential working will result in loss of marks.

ELECTRONIC CALCULATORS AND MATHEMATICAL TABLES SHOULD NOT BE USED IN THIS PAPER.

CELL PHONES SHOULD NOT BE BROUGHT IN THE EXAMINATION ROOM.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets [ ] at the end of each question or part question.

The total number of marks for this paper is 80.

FOR EXAMINER'S USE

1   Find the exact value of

(a) $2\frac{1}{5} - \frac{3}{4}$,

(b) 1.892 + 452.

Answer: (a)... [1]

(b)... [1]

2   Simplify $3x - 7(2x - 5)$.

Answer: .... [2]

3   The population of an African country in 2010 was 13 046 508. Express this population in standard form, correct to 3 significant figures.

Answer: .... [2]

4 Given that $A = \begin{pmatrix} 1 & -3 \\ 4 & 5 \end{pmatrix}$ and $B = \begin{pmatrix} 9 & 3 \\ -12 & 6 \end{pmatrix}$, find $A - \frac{1}{3}B$.

Answer: .... [2]

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5 Factorise completely $4 - 16x^2$.

Answer: .... [2]

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6 Mr Hambwiimbwi planned to employ 20 men to build his house in 7 days. On the day work was to start, he decided to reduce the number of men so that work could now be completed in 28 days, working at the same rate.
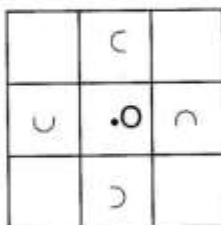
(a) How many men were needed for the work?

(b) Express the number of men that completed the work in 28 days to the number of men he planned to employ as a ratio in its simplest form.

Answer: **(a)**... [1]

(b)... [1]

7 (a) Find the gradient of a straight line with equation $4x + 2y = 9$.

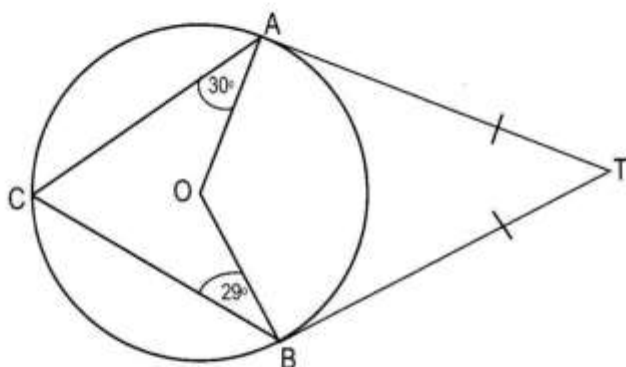(b) The diagram below shows a squared floor tile with centre O.

Describe fully the rotational symmetry, about O, of this floor tile.

Answer: (a) .... [1]

(b) ....

.... [2]

8 In the diagram below, A, B and C are points on the circumference of a circle with centre O. AT and TB are tangents to the circle, $C\hat{A}O = 30°$ and $C\hat{B}O = 29°$.

Calculate:

(a) $A\hat{C}B$,

(b) $A\hat{T}B$.

Answer: (a) $A\hat{C}B$ =................................. [1]

(b) $A\hat{T}B$ =................................. [2]

9   Solve the simultaneous equations

$2x + 5y = 16,$

$3x - 2y = 5.$

Answer: x = ...

              y = ... [3]

10 **(a)** Evaluate $7 + 21 \div 3 \times 7 - 7$.

    (b) The price of a shirt was K55 000 after an increase of 10%. What was the price of the shirt before the increment?

Answer: **(a)** ....[1]

              (b) .... [2]

11 (a) Given that $\underline{a} = \begin{pmatrix} -8 \\ 6 \end{pmatrix}$, Find $|\underline{a}|$.

(b) The diagram shows two circles with the same centre O. The radius of the smaller circle is 5cm and that of the larger is 15cm. Chord AB is 7cm and $A\hat{B}O = D\hat{C}O = 40°$. Calculate the length of the chord CD.
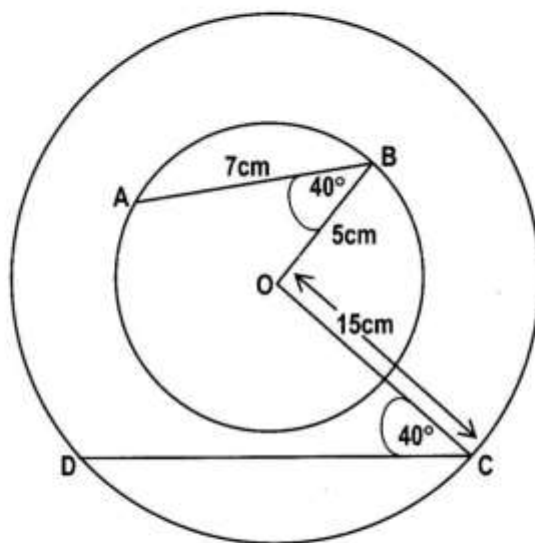
Answer: (a) .... [1]

(b) .... [2]

12 Given that E = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12}, list the following subsets of set E:

(a) A = {x: x is a factor of 55},

(b) B = { x: $\frac{1}{2}$x ≥ 5$\frac{1}{2}$}.

Answer: (a) .... [1]

(b) .... [2]

13 In the diagram below, BCD is a straight line, AB = 6cm, BD = 13cm, A$\hat{C}$D = 135°
and A$\hat{B}$C = 90°.
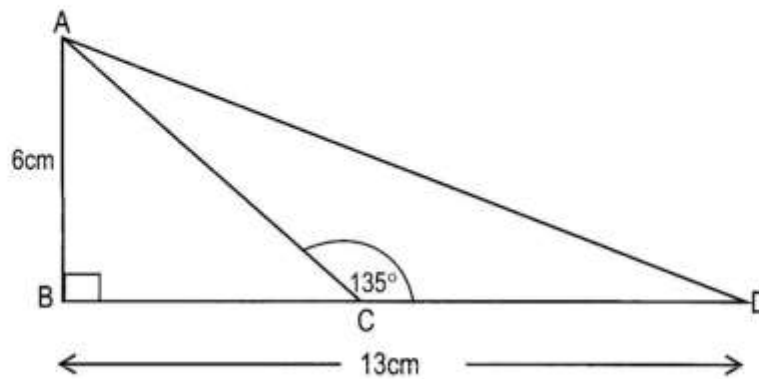
(a) Calculate the length of CD.

(b) Calculate the area of triangle ACD.

Answer: (a).. [1]

(b).. [2]

14 (a) Solve the inequality 2y − 1 < 5.

(b) The week Doreen went to South Africa, the exchange rate between the
Zambian Kwacha (K) and US Dollar ($) was K4 500 = $1. Given that she
changed K1 800 000 to US $, how many Dollars did she receive?

Answer: (a) .... [1]

(b) .... [2]

[Turn over

15 (a) A pack of eleven identical cards, are labelled 1 to 11. The cards are shuffled and placed upside down. If a card is picked at random from the pack, what is the probability that it is a prime numbered card?

(b) In the diagram below, AC = 10cm, BC = 5cm and $A\hat{C}B = 60°$.

Given that sin 60° = 0.866, Cos 60° = 0.5 and tan 60° = 1.73, calculate the value of $(AB)^2$.
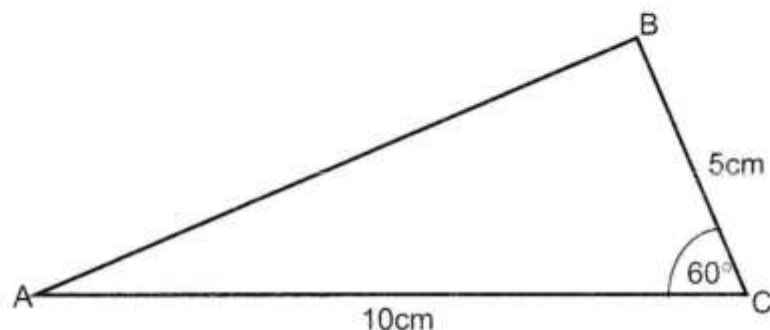
Answer: (a) .... [1]

(b) .... [2]

16 Given that $f(x) = \dfrac{3x - 5}{2}$ and $g(x) = \dfrac{x - 4}{6}$, find

(a) f(−9),

(b) $f^{-1}(x)$,

(c) the value of x for which f(x) = 3g(x).

Answer: (a) .... [1]

(b) .... [1]

(c) .... [2]

17 y varies directly as x and z. Given that y = 9 when x = 6 and z = $\frac{1}{2}$, find

    (a)   k (the constant of variation),

    (b)   the value of y when x = 4 and z = 3,

   **(c)**   the value of x when y = $4\frac{1}{2}$ and z = 5.

Answer: (a) .... [1]

        (b) .... [1]

        (c) .... [2]

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18 A map of a game park is drawn to a scale of 1 : 50 000.

    (a) Two game camps, Tagwidwa and Muoneni, are 7cm apart on the map. Find the actual distance between the two camps, in **kilometres.**

    (b) The actual area of the game park is 25 square kilometres. Calculate the area of the game park on the map, in **square centimetres.**
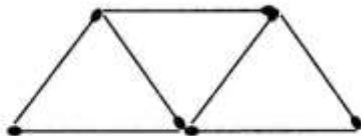
Answer: (a) .... Km [2]

        (b) ....cm^2 [2]

[Turn over

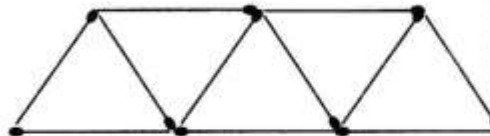**19 (a)** Match sticks were used to construct triangles as shown below.
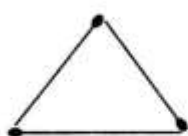
Pattern 1   Pattern 2   Pattern 3

    (i) Complete the table in the answer space.

    (ii) Write an expression, in terms of n, for the number of match sticks that would be required to form the nth pattern.
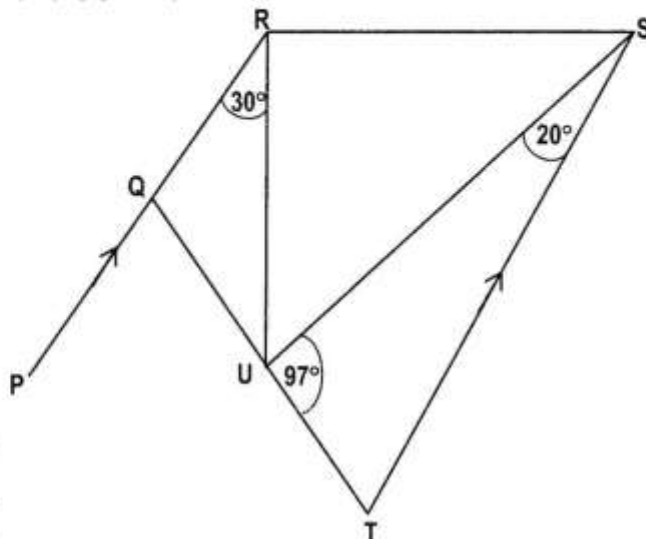
(b) Solve the equation $x^2 - 4x = 0$.

Answer: **(a)** **(i)**

Pattern number	1	2	3	4	5	10
Number of triangles	1	3	5	7	9	
Number of match sticks	3	7	11	15	19	39

.[1]

    (ii) ....[2]

    (b) ....[2]

20 **(a)** In the diagram below, PQR is parallel to TS, QUT is a straight line, $Q\hat{R}U = 30°$,
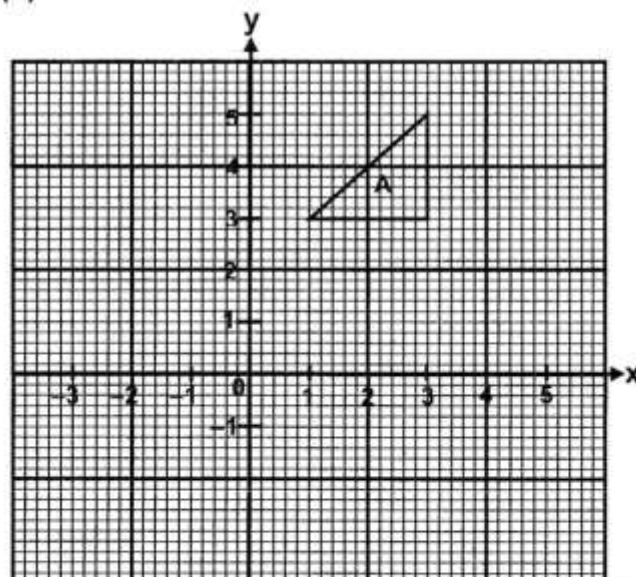$T\hat{S}U = 20°$ and $S\hat{U}T = 97°$.

Calculate

(i) $P\hat{Q}T$,

(ii) $R\hat{U}S$.

(b) The diagram in the answer space shows triangle A on a Cartesian plane.
Triangle A is transformed by a shear with invariant line y = 2 and shear factor
–2. Draw on the same diagram the image of triangle A under this
transformation and label it B.

Answer: **(a)** **(i)** $P\hat{Q}T$ .... [1]

(ii) $R\hat{U}S$ .... [2]

(b)

[2]

[Turn over

21 (a) The table below shows the distribution of children in 40 families.

| Number of children	1	2	3	4
Number of families	7	18	11	4

Calculate:

(i) the mode,

(ii) the median.

(b) A plane flew north from town A (28°S, 20°E) to town B (32°N, 20°E) in 9 hours. Find the speed of the plane in knots.

Answer **(a) (i)** .... [1]

(ii) .... [1]

(b) .... [3]

22 (a) Given that $y = \sqrt{x-9}$, express x in terms of y.

(b) A region R is defined by $y \le x$, $x + y \le 4$ and $y \ge 0$. Show this region R, by shading the unwanted regions, on the diagram in the answer space.

[5]

[Turn over
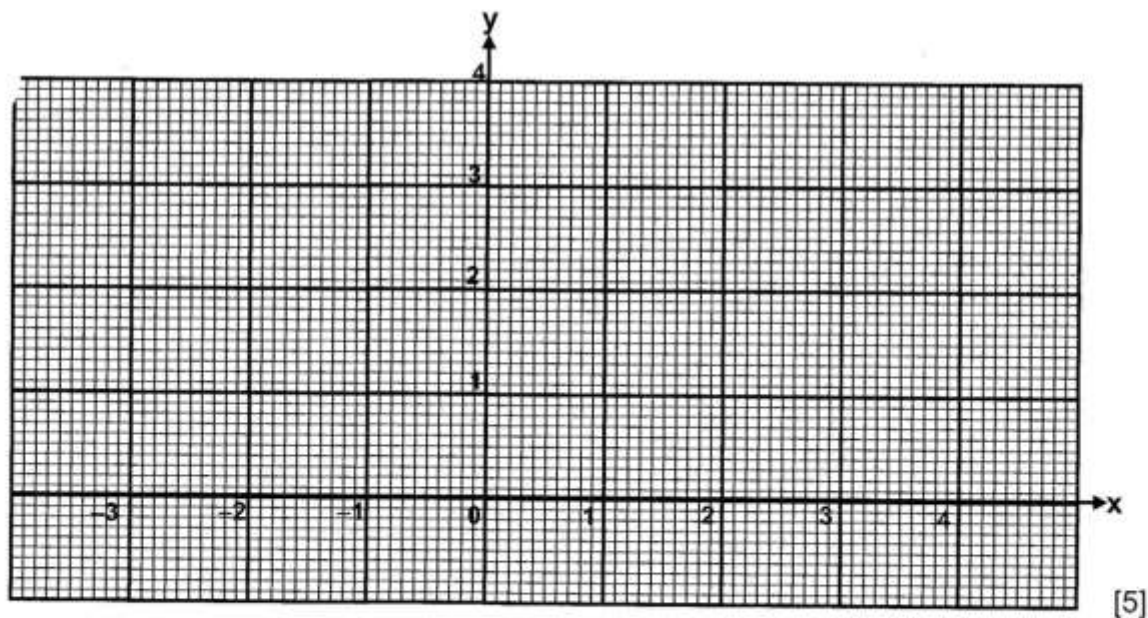
23 (a) Evaluate $216^{\frac{1}{3}}$.

(b) The diagram below shows the speed-time graphs of a van and a car. The van, starting from rest, accelerates uniformly for 8 seconds until it reaches a speed of 6m/s. It then continues to travel at this constant speed.
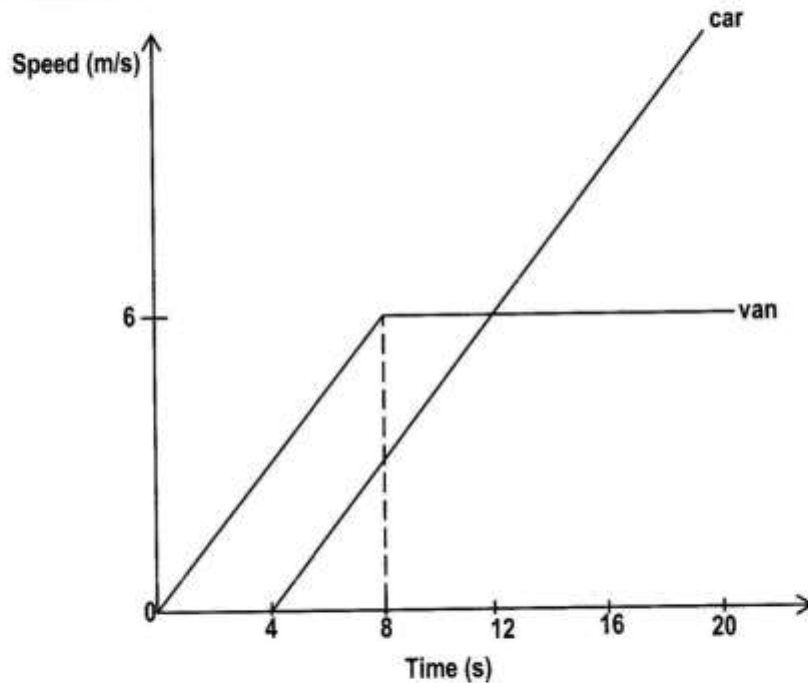
(i) Find the acceleration of the van during the first 8 seconds.

(ii) Find the distance travelled by the van in 20 seconds.

(iii) The car starts from the same place as the van, but 4 seconds later, and accelerates uniformly until it overtakes the van as shown on the diagram above. Given that overtaking occurs when the van has been travelling for 20 seconds, calculate the speed of the car at this instant.

Answer: (a) .... [1]

(b) (i) .... [1]

(ii) .... [2]

(iii) .... [3]