Index Number: ....

NATIONAL CERTIFICATE OF EDUCATION
March / April 2021

MATHEMATICS (N510)

TIME: 2 HOURS

Candidates answer on the Question Paper.
Additional Materials: Geometrical Instruments

READ THESE INSTRUCTIONS FIRST

1. Write your index number in the space provided above.

2. Write in dark blue or black ink.

3. You may use an HB pencil for any diagrams. Do not use staples, paper clips, glue or correction fluid.

4. Diagrams are not drawn to scale unless otherwise specified.

5. Answer **ALL** questions.

6. All necessary workings should be shown in the spaces provided.

7. This document consists of **28** questions printed on **22** pages.

8. ELECTRONIC CALCULATORS MUST **NOT** BE USED IN THIS PAPER.

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

10. The total number of marks for this paper is **100**.

For Examiners' use													
Page No.	3	5	7	9	11	13	15	17	19	21	23	Total	Signature
Marker													
Team Leader													
Quality Controller													
CE/ACE													

1. Work out

$$\begin{array}{r} 4\ 5\ 7 \\ +\ \ 2\ 6\ 1 \\ \hline \\ \hline \end{array}$$

Answer: ………………………………. **[1]**

2. Evaluate $\dfrac{7}{9} - \dfrac{5}{9}$

Answer: ………………………………. **[1]**

3. Simplify $\left(x^3\right)^4$

Answer: ………………………………. **[1]**

4. Calculate 1.04×2

Answer: ………………………………. **[1]**

5. Express $\dfrac{23}{100}$ as a decimal.

Answer: ……………………………….. **[1]**

6. Which of the following is an irrational number ?

$$5.08 \qquad \sqrt{5} \qquad 7\frac{2}{5} \qquad \sqrt{36}$$

Answer: ……………………………….. **[1]**

7(a) Simplify $5x^2 + 2x^2$

Answer: ……………………………….. **[1]**

(b) Evaluate $2 + 3 \times 5$

Answer: ……………………………….. **[1]**

8.   State the value of **x** shown on the number line below.
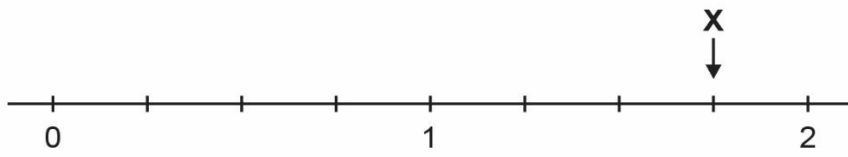
Answer: …………………………….. **[1]**

9.   Evaluate $(27)^{\frac{1}{3}}$

Answer: ……………………………. **[1]**

10.   Find the L.C.M. of the numbers 4, 6 and 9.

Answer: …………………………… **[1]**

11. **Circle the letter corresponding to the correct answer.**

Each item carries 1 mark.

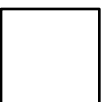(a) What special name is given to the quadrilateral shown below?
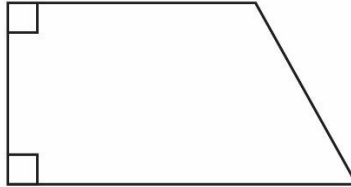
A   Kite

B   Parallelogram

C   Rhombus

D   Trapezium

[1]

(b) Rs 1550 is shared equally among 5 students.

How much money does each student get?

A   Rs 301

B   Rs 310

C   Rs 501

D   Rs 510

[1]

(c)   Find the value of x in the equation $x + 4 = 6$.

      A   -10

      B   -2

      C   2

      D   10

[1]

(d)   Express 20 cm as a percentage of 400 cm.

      A   5 %

      B   8 %

      C   50 %

      D   80 %   **[1]**

(e)   Reduce 16 : 48 to its simplest form.

      A   1 : 3

      B   1 : 4

      C   4 : 12

      D   8 : 24

[1]

(f)   Convert 35 tonnes(t) into kilograms(kg).

      A   3.5 kg

      B   350 kg

      C   3500 kg

      D   35 000 kg   **[1]**

(g) Simplify $4x^{-2}$

A $-\dfrac{x^2}{4}$

B $\dfrac{4}{x^2}$

C $-4x^2$

D $\dfrac{1}{4x^2}$

[1]

(h) The point where the lines $y = -1$ and $x = 3$ meet is ………..

A   (-1, 3)

B   (3, -1)

C   (3, 1)

D   (1, 3)   **[1]**

(i) How many lines of symmetry does a **regular pentagon** have?

A   2

B   3

C   4

D   5

[1]

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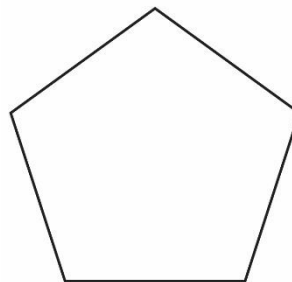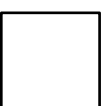
(j)   Which of the following represents vector $\overrightarrow{XY}$?
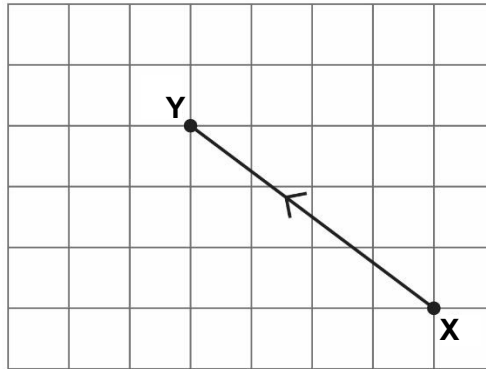
A $\begin{pmatrix} 4 \\ -3 \end{pmatrix}$

B $\begin{pmatrix} -4 \\ -3 \end{pmatrix}$

C $\begin{pmatrix} -4 \\ 3 \end{pmatrix}$
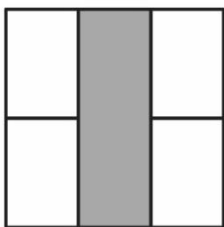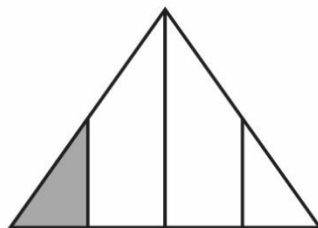
D $\begin{pmatrix} 3 \\ -4 \end{pmatrix}$ [1]
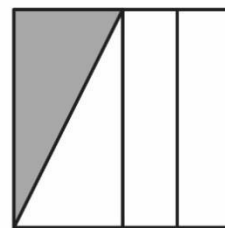
12.   (a) Complete the sequence below.

-1, 2, 5, 8, ―――   [1]

(b)   Tick ✓ the diagram where the shaded part represents $\frac{1}{4}$.

☐   ☐   ☐   ☐

[1]

13. Using the information given below, find $\sqrt{2000}$.
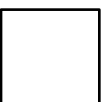
$(\sqrt{2} = 1.414 \qquad \sqrt{20} = 4.472)$

Answer: ……………………………….. **[2]**

14 (a) Solve $5x + 3 > 28$

Answer: ……………………………….. **[2]**

(b) Hence, find the smallest integer that satisfies the inequality

$5x + 3 > 28$

Answer: ……………………………….. **[1]**

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15. **PQR** is an isosceles triangle with **PQ** = **PR**. Line **L** is parallel to line **M.**
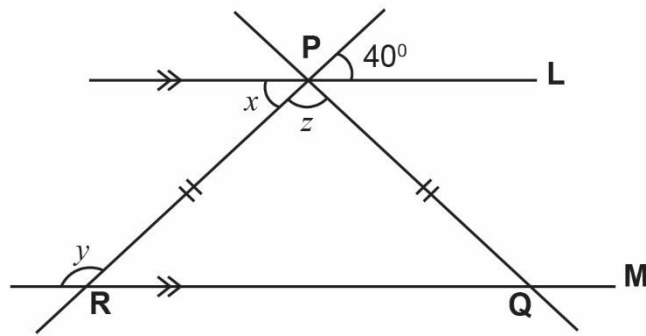
Find

(a) angle x

Answer: x = ……………………….… **[1]**

(b) angle y

Answer: y = …………………….…… **[2]**

(c) angle z

Answer: z = …………………….…… **[2]**

16. **(a)** Using the expansion $a^2 - b^2 = (a + b)(a - b)$, evaluate $22^2 - 18^2$.

Answer: …………………………… **[2]**

(b) Given $a^2 + b^2 = 79$ and $ab = 24$, find $(a - b)^2$.

Answer: …………………………… **[2]**

17. Given that $\mathbf{P} = \begin{pmatrix} 1 & 4 \\ 0 & -2 \end{pmatrix}$ and $\mathbf{Q} = \begin{pmatrix} 6 & 3 \\ -1 & 7 \end{pmatrix}$
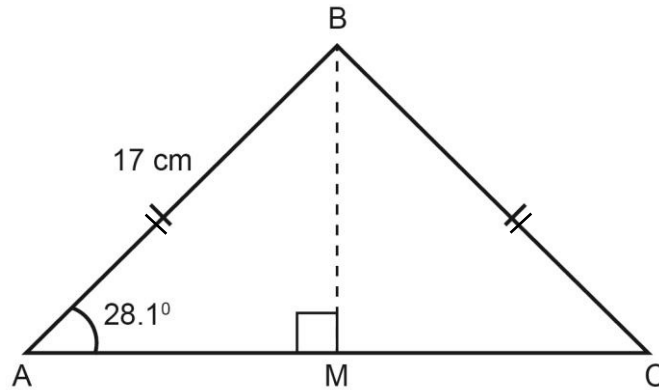
find

(a) $3\mathbf{P} + \mathbf{Q}$

Answer: ………………………………. [2]

(b) **PQ**

Answer: ………………………..…..… [3]

18. Triangle ABC is isosceles with AB = BC. Angle BAC = 28.1°, angle AMB = 90° and AB = 17 cm.

(a) Using the information given below, show that BM = 8 cm, correct to

the nearest whole number.

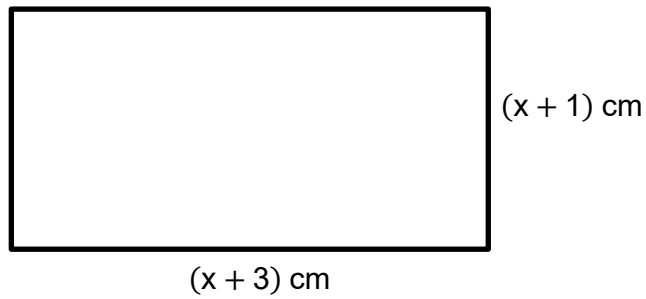[sin 28.1° = 0.471   cos 28.1° = 0.882   tan 28.1° = 0.534]

[3]

(b) Using BM = 8 cm and Pythagoras' theorem, find AC.

Answer: ….………………….…..…… cm   **[3]**

19. A rectangle has length $(x + 3)$ cm and width $(x + 1)$ cm.

$(x + 1)$ cm

$(x + 3)$ cm

Given that the area of the rectangle is 24 cm^2,

(a) form an equation in terms of x and show that it simplifies
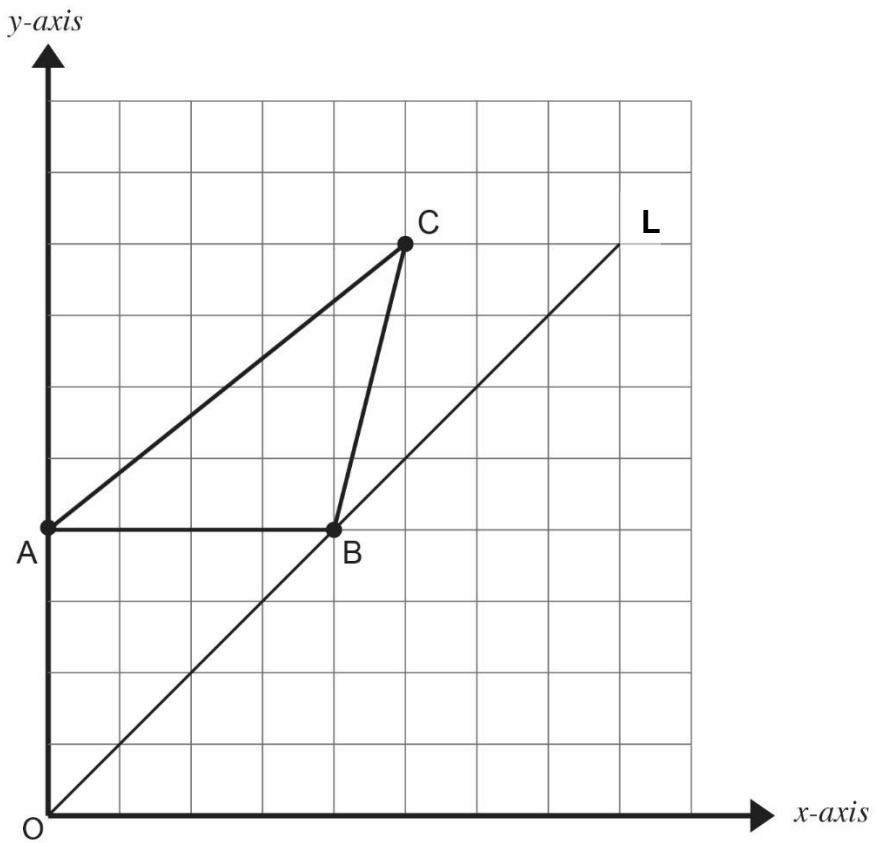
to $x^2 + 4x - 21 = 0$.

[3]

(b) Solve the equation $x^2 + 4x - 21 = 0$.

Answer: x = ……….…… or …….….…… **[3]**

14

(c)   Hence, find the perimeter of the rectangle.

Answer: ….………………………… **[4]**

20.   The graph below shows triangle ABC.

On the same graph, **draw** the image of triangle ABC under a reflection in the line **L**.

[3]
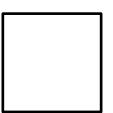
21. A bag contains 3 red balls, 4 green balls and 2 white balls.

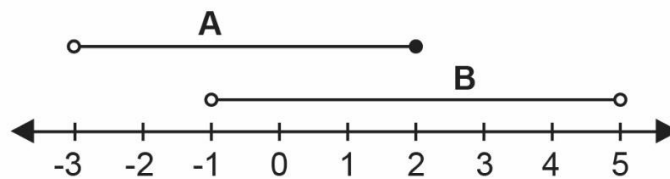One ball is chosen at random from the bag.

Find the probability that it is

(a) a green ball

Answer: .... **[1]**

(b) not a white ball

Answer: .... **[1]**

22. The number line below shows the values of sets A and B.

Write down the following in set-builder notation.

(a) **A**

Answer: .... **[2]**

(b) **A ∩ B**

Answer: .... **[1]**

23. If the vector $\overrightarrow{CD}$ is given by $\begin{pmatrix} 12 \\ -5 \end{pmatrix}$, find

(a) $\overrightarrow{DC}$

Answer: …………………………….. **[1]**

(b) $\left|\overrightarrow{CD}\right|$

Answer: …………………………….. **[2]**

24. The following set of values represents the number of marbles that 6 different children bring in a game.

<div align="center">

4   4   7   6   4   5

</div>

(a) Find the mean number of marbles.

Answer: …………………………….. **[2]**

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(b)   Alan joins the game later with x marbles. The mean number of marbles is now 6. Find the value of x.

Answer: x = …………………………… **[3]**

25. Solve the simultaneous equations.

$$2x + y = 5$$
$$3x + 2y = 7$$

Answer: x =………………… y =……………………… **[4]**

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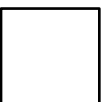
26.   (a)   Find the equation of the line passing through the point (0, 4) and parallel to

the line $2y = -6x$.

Answer: ……………………………. [2]

(b)   Study the graph below carefully.
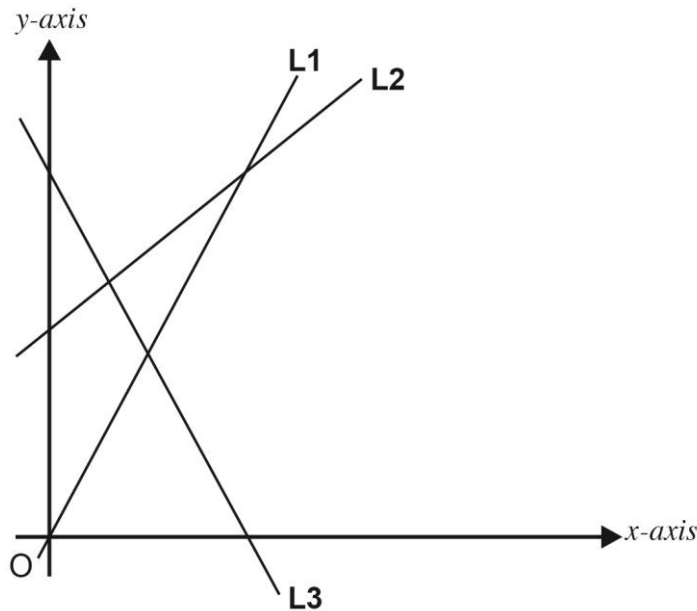
The equations of the lines **L1**, **L2**, and **L3** are given in the list below.

$y = -2$ $y = 2x$ $y = 3$ $y = 8 - 2x$ $y = x + 5$

From the list, write down the equations of lines **L1**, **L2** and **L3** in the spaces provided.

L1: ………………………………….

L2: ………………………………….

L3: ………………………………….

[3]

27. Dev decides to buy a TV set on hire purchase under the following conditions:

> **Cash price: Rs 18 000**
>
> **No deposit**
>
> **Time of repayment**: 3 years, payable in equal monthly instalments
>
> **Rate of interest**: 15 % per annum

Calculate

(a) the simple interest that Dev pays over the 3 years

Answer: Rs ………………….…… [2]

(b) the monthly instalment that Dev pays

Answer: Rs ………………….… [3]

28. **Diagram 1** shows an open rectangular tank with a base 20 cm by 15 cm and height 18 cm. This tank contains water to a height of 14 cm.

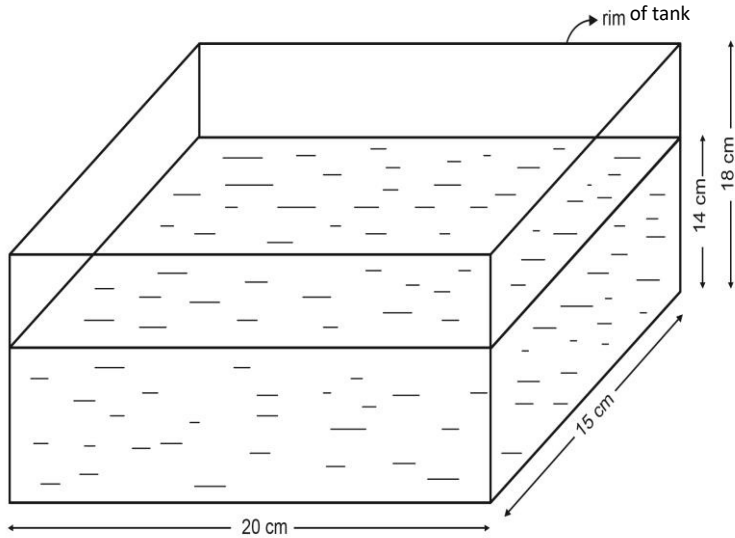**Diagram 2** shows a solid metal cylinder of diameter 10 cm and height 7 cm.
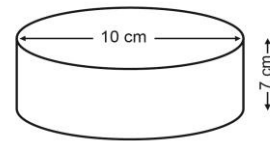

Diagram 1

Diagram 2

(a) Calculate

(i) the volume of water in the tank,

Answer: …………………………cm^3 [2]

(ii) the total surface area of the tank that is in contact with water.

Answer: …………………………cm^2 [4]

The solid metal cylinder, shown in **Diagram 2**, is completely immersed in the tank.

(b) Calculate the rise in the water level in the tank.

[Take $\pi = \dfrac{22}{7}$]

Answer: ……………………….. cm **[4]**

(c) A second **identical** cylinder is now completely immersed in the tank.

Find the distance between the new level of water and the rim of the tank.

Answer: …………………………. cm **[2]**

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