

Surname	Centre Number	Candidate Number
First name(s)		0



**GCSE**

3300U30-1



**MONDAY, 13 NOVEMBER 2023 – MORNING**

**MATHEMATICS  
UNIT 1: NON-CALCULATOR  
INTERMEDIATE TIER**

1 hour 45 minutes

**ADDITIONAL MATERIALS**

The use of a calculator is not permitted in this examination.  
A ruler, a protractor and a pair of compasses may be required.

**INSTRUCTIONS TO CANDIDATES**

Use black ink or black ball-point pen. Do not use gel pen or correction fluid.

You may use a pencil for graphs and diagrams only.

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

Answer **all** questions.

Write your answers in the spaces provided in this booklet. If you run out of space, use the additional page(s) at the back of the booklet, taking care to number the question(s) correctly.

Take  $\pi$  as 3.14.

**INFORMATION FOR CANDIDATES**

You should give details of your method of solution when appropriate.

Unless stated, diagrams are not drawn to scale.

Scale drawing solutions will not be acceptable where you are asked to calculate.

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

In question 7, the assessment will take into account the quality of your linguistic and mathematical organisation, communication and accuracy in writing.

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1.	6	
2.	3	
3.	4	
4.	6	
5.	3	
6.	4	
7.	7	
8.	4	
9.	2	
10.	6	
11.	4	
12.	6	
13.	3	
14.	3	
15.	4	
16.	4	
17.	3	
18.	4	
19.	4	
<b>Total</b>	<b>80</b>	

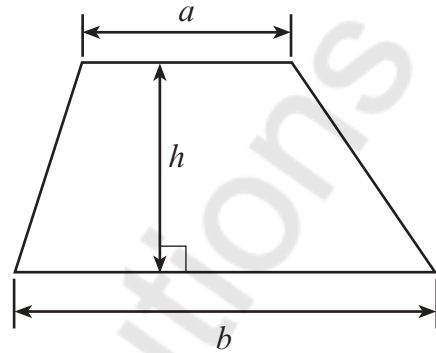
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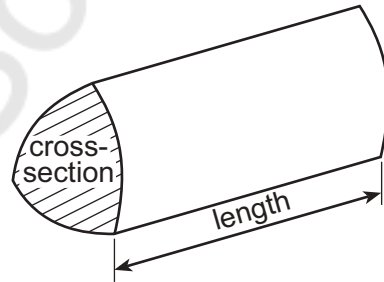
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## Formula List – Intermediate Tier

**Area of trapezium** =  $\frac{1}{2}(a + b)h$



**Volume of prism** = area of cross-section  $\times$  length



1. (a) Write down the next two numbers in the following sequence. [2]

26, <sup>2</sup> 24, <sup>4</sup> 20, <sup>6</sup> 14, <sup>8</sup> 6, <sup>10</sup> -4

$$14 - 8 = 6$$

$$6 - 10 = -4$$

The next 2 nos in the sequence are 6 & -4

- (b) Find the value of  $5x + 2y$  when  $x = -4$  and  $y = 9$ . [2]

$$5(-4) + 2(9)$$

$$= -20 + 18$$

$$= -2$$

- (c) Simplify the expression  $5y + 7m - 3y - 10m$ . [2]

$$5y + 7m - 3y - 10m$$

$$5y - 3y + 7m - 10m$$

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

2. Write  $0.41$ ,  $\frac{7}{20}$  and  $45\%$  in descending order. [3]

You must show all your working.

$$\frac{7}{20} \times \frac{5}{5} = \frac{35}{100} = 0.35$$

$$45\% = \frac{45}{100} = 0.45$$

$$0.41$$

$$0.45 \left(45\%\right)$$

$$0.41$$

$$0.35 \left(\frac{7}{20}\right)$$

Greatest value

Smallest value



3. Here is a net of a cuboid.

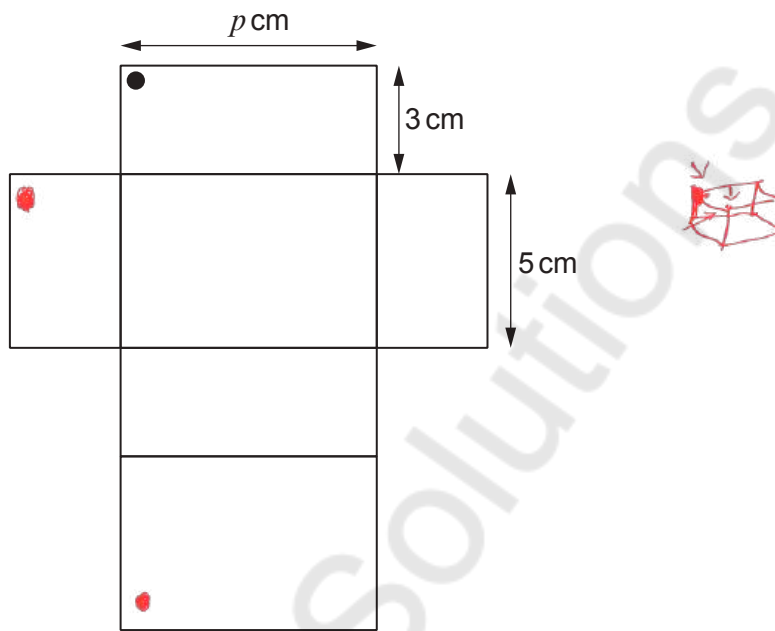


Diagram not drawn to scale

The net is folded to form a cuboid.

- (a) The corner marked with ● meets two other corners on the net.  
Mark these two other corners with ●.

[2]

- (b) The volume of the cuboid is  $90 \text{ cm}^3$ .  
What is the value of  $p$ ?

[2]

$$V = l \times w \times h$$

$$90 \text{ cm}^3 = p \times 3 \times 5$$

$$15p = 90 \text{ cm}^3$$

$$p = \frac{90}{15} = 6 \text{ cm}$$



4. (a) Find  $\frac{3}{7}$  of 9.17 km.

Give your answer in metres.

[3]

$$\begin{aligned}
 & 1000 \text{ m} = 1 \text{ km} \therefore 9.17 \text{ km} = 9.17 \times 1000 = 9170 \text{ m} \\
 & \frac{3}{7} \times 9170 = 3 \times 1310 \\
 & = 3930 \text{ metres}
 \end{aligned}$$

3930 metres

- (b) Express 25 minutes as a percentage of 2 hours 5 minutes.

[3]

$$\begin{aligned}
 & 60 \text{ mins} \times 1 \text{ hr} \\
 & \times 2 \text{ hrs} \\
 & x = 60 \times 2 = 120 \text{ mins} + 5 \text{ mins} \\
 & = 125 \text{ mins} \\
 & \frac{25}{125} \times 100 = \frac{100}{5} = 20\%
 \end{aligned}$$



5. (a) The mean of four numbers is 9.  
What is the total of the four numbers?

[1]

$$\text{Mean} = \frac{\text{Total no. of values}}{\text{no. of values}} \quad | \quad x = 9 \times 4$$

$$9 = \frac{x}{4} \quad | \quad = \underline{\underline{36}}$$

- (b) Find a set of four numbers such that:
- their mean is 9
  - their mode is 11.

Write your four numbers in the boxes below.

[2]

$$a + b + c + d = 36 \quad | \quad \text{Since } c + d = 14$$

$$11 + 11 + c + d = 36 \quad | \quad \text{Use the possible numbers}$$

$$36 - 22 = c + d \quad | \quad 6 + 8 = 14$$

$$14 = c + d$$

6

8

11

11



6. There are many socks in a drawer.  
The socks are red, green, blue or pink.

- (a) A sock is chosen at random from the drawer.  
Complete the table below.

[2]

Colour	Red	Green	Blue	Pink
Probability	0.3	0.1	0.35	0.25

$$0.3 + 0.1 + \text{blue} + 0.25 = 1$$

$$\text{blue} = 1 - 0.65$$

$$= \underline{\underline{0.35}}$$

- (b) In the drawer, there are 20 pink socks.  
How many red socks are there in the drawer?

[2]

$$\frac{20}{x} = 0.25 \quad ; \quad x = \frac{20}{0.25} = 20 \times \frac{4}{1} = \underline{\underline{80}}$$

$$\text{To find red} = \frac{\text{red}}{80} = 0.3$$

$$= 80 \times 0.3$$

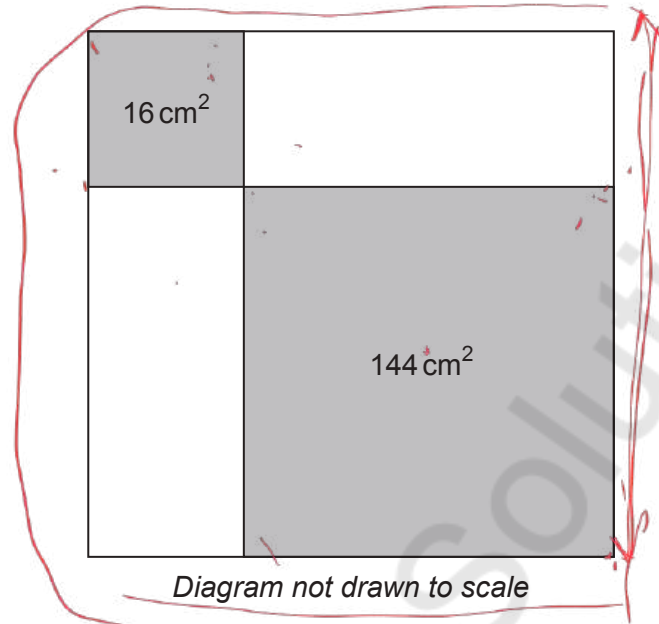
$$= \underline{\underline{24}}$$

There are 24 red socks in the drawer



7. In this question, you will be assessed on the quality of your organisation, communication and accuracy in writing.

The diagram below shows two shaded squares inside a larger square.



The diagram shows the area of each of the two shaded squares.

Calculate the **total** area of the two regions that have **not** been shaded.  
You must show all your working.

[5 + 2 OCW]

$$\text{Area} = l^2 = (\sqrt{144} * \sqrt{16})^2 = (12 * 4)^2 = 16^2 = 256 \text{ cm}^2$$

To calculate the area of the parts not shaded:

= Area of full box - Area of shaded parts

$$= 256 \text{ cm}^2 - 144 \text{ cm}^2 - 16 \text{ cm}^2$$

$$= 256 \text{ cm}^2 - 160 \text{ cm}^2$$

$$= 96 \text{ cm}^2$$



8. There are  $7y - 2$  counters in Bag A.  
There are  $4y + 1$  counters in Bag B.



9 counters are added to Bag B.  
There are now the same number of counters in each bag.

Form an equation in terms of  $y$ .  
Solve the equation to find the value of  $y$ .  
You must show all your working.

[4]

$$7y - 2 = 4y + 1 + 9$$

$$7y - 2 = 4y + 10$$

$$7y - 4y = 10 + 2$$

$$3y = 12$$

$$y = \frac{12}{3} = \underline{\underline{4}}$$

9. A cup contains some tea.

Elsie drinks  $\frac{5}{7}$  of the tea.

There are 44 ml of tea left in the cup.

How much tea was in the cup before Elsie drank any?

[2]

$$x - \frac{5}{7}x = 44 \text{ ml}$$

$$\frac{7-5}{7}x = 44 \text{ ml}$$

$$\frac{2}{7}x = 44 \text{ ml}$$

$$2x = 44 \times 7$$

$$x = \frac{44 \times 7}{2}$$

$$= 154 \text{ ml}$$



10. The Geometric Mean is a special type of average.

- (a) To find the Geometric Mean of two numbers, you must:
- multiply the two numbers together, and
  - then find the square root.

Find the Geometric Mean of 250 and 0.4.

[2]

$$= 250 \times 0.4 = 100$$

$$\text{Find the square root of } 100 = \sqrt{100}$$

$$= 10$$

- (b) To find the Geometric Mean of three numbers, you must:
- multiply the three numbers together, and
  - then find the cube root.

(i) Find the Geometric Mean of 100, 0.3 and 0.9.

[2]

$$100 \times 0.3 \times 0.9 = 27$$

$$\text{Find the cube root of } 27 = \sqrt[3]{27}$$

$$= 3$$

(ii) The Geometric Mean of three numbers is 10.  
Two of the numbers are 8 and 25.  
Find the third number.

[2]

$$10 = \sqrt[3]{8 \times 25 \times y}$$

$$10^3 = 8 \times 25 \times y$$

$$1000 = 8 \times 25 \times y$$

$$1000 = 8 \times 25 \times y$$

$$y = \frac{1000}{8 \times 25} = \frac{40}{8} = 5$$



11. (a) Write down an expression for the  $n$ th term of the following sequence. [2]

11, <sup>4</sup> 15, <sup>4</sup> 19, <sup>4</sup> 23, <sup>4</sup> 27, ...

Since the sequence has a difference of 4

$$23 + 4 = n\text{th term}$$

$$= 27$$

- (b) The  $n$ th term of a different sequence is given by  $n^2 - 5$ .  
Write down the first three terms of this sequence. [2]

So will calculate for  $n=1$ ,  $n=2$ ,  $n=3$  using the equation

$$\text{For } n=1; = (1)^2 - 5 = 1 - 5 = -4$$

$$\text{For } n=2; = (2)^2 - 5 = 4 - 5 = -1$$

$$\text{For } n=3; = (3)^2 - 5 = 9 - 5 = 4$$

First three terms are  $-4$ ,  $-1$ ,  $4$



12. (a) Express 495 as a product of its prime factors in index form. [3]

Factorize the prime numbers of 495

$$495 \text{ can be divided by } 3 \text{ i.e. } \frac{495}{3} = 165$$

$$165 \text{ can still be divided by } 3 \text{ i.e. } \frac{165}{3} = 55$$

$$55 \text{ can be divided by } 5 = 11$$

11 itself is a prime number.

$$\text{So } \underline{3^2}, \underline{5}, \underline{11}$$

- (b) Explain how your answer to part (a) tells you that 495 is **not** a square number. [1]

A square no. is a no. that has all the prime factors raised to an even power

3 is raised to an even power i.e.  $3^2$  but  $5^1$  &  $11^1$  are not

So 495 is not a square no.

- (c) Find the Highest Common Factor (HCF) of 495 and 60. [2]

$$\begin{array}{r} 2 \mid 60 \\ 2 \mid 30 \\ 5 \mid 15 \\ 3 \mid 3 \end{array}$$

$$60 = 2, 2, \underline{3}, \underline{5}$$

$$\begin{array}{r} 3 \mid 495 \\ 3 \mid 165 \\ 5 \mid 55 \\ 11 \mid 11 \\ 1 \end{array}$$

$$495 = \underline{3}, \underline{3}, \underline{5}, 11$$

$$\text{HCF} = 3 \times 5 = \underline{\underline{15}}$$



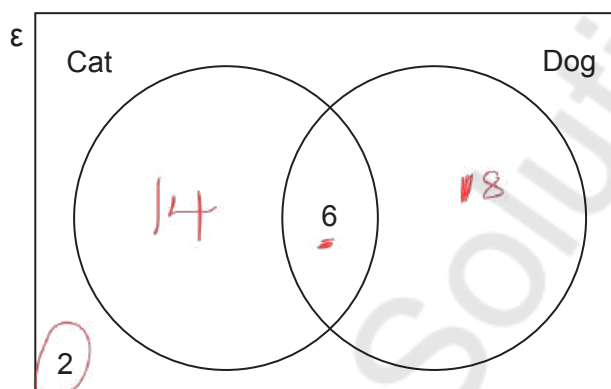
13. In a group of 40 people, some own a cat, some own a dog, and some own both a cat and a dog.  
2 people in the group do not own a cat or a dog.

A person is chosen at random from the group.

The probability that the person owns a dog is  $\frac{3}{5}$ .

Complete the Venn diagram.

[3]



No. of people is 40

People that own a dog =  $\frac{3}{5} \times 40 = 3 \times 8 = 24$  people

To get people that own only dog =  $24 - 6 = 18$  people

To get no. of people with cat =  $40 - 18 - 6$

$$= 40 - 24$$

$$= 14 \text{ people}$$



14. (a) £285 is decreased by 4%.  
This is done 3 times in total.  
Each time, the previous value is decreased by 4%.  
What calculation would you use to find the value after the 3 decreases?  
Circle your answer. [1]

$$£285 \times 1.04^3$$

$$£285 \times 0.04^3$$

$$£285 \times 0.96^3$$

$$£285 \times 0.6^3$$

$$£285 \times 0.96^2$$

*£285 decreased by 4% means multiply by 96% or 0.96*

*If we do it 3x = £285 × 0.96<sup>3</sup>*

- (b) A number has been decreased by 10% to give an answer of 34.2.  
What was the original number? [2]

$$x - \frac{10}{100}x = 34.2$$

$$x - 0.1x = 34.2$$

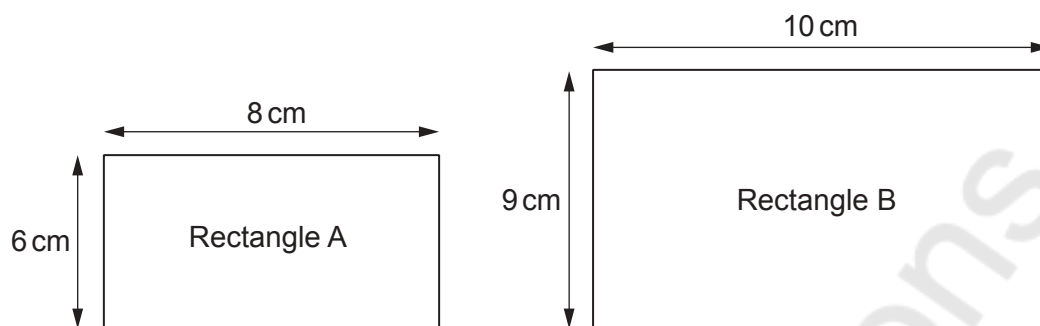
$$0.9x = 34.2$$

$$x = \frac{34.2}{0.9}$$

$$= 38$$



15.



Diagrams not drawn to scale

- (a) Explain why Rectangle A is **not** mathematically similar to Rectangle B. [2]

Rectangles are mathematically similar only if the ratios of the corresponding sides are equal

Rect. A = 8:6 4:3; Rect B = 10:9

10:9  $\neq$  4:3

The ratios are not equal so they are not mathematically similar.

- (b) Alun changes **only one** of the measurements of **Rectangle B** to make the two rectangles mathematically similar.

Write down a possible length and width of Alun's new rectangle.

You must show all your working.

[2]

Let's change the length

Rectangle B = Rectangle A

$$\frac{x}{9} = \frac{4}{3}$$

$$x = \frac{9 \times 4}{3} = \frac{36}{3} = \underline{\underline{12 \text{ cm}}}$$

Length = 12 cm cm

Width = 9 cm cm



16. Beti walks her dog to a local park and back home every day. She can either walk along a **footpath** or along a pavement at the side of a **road**.

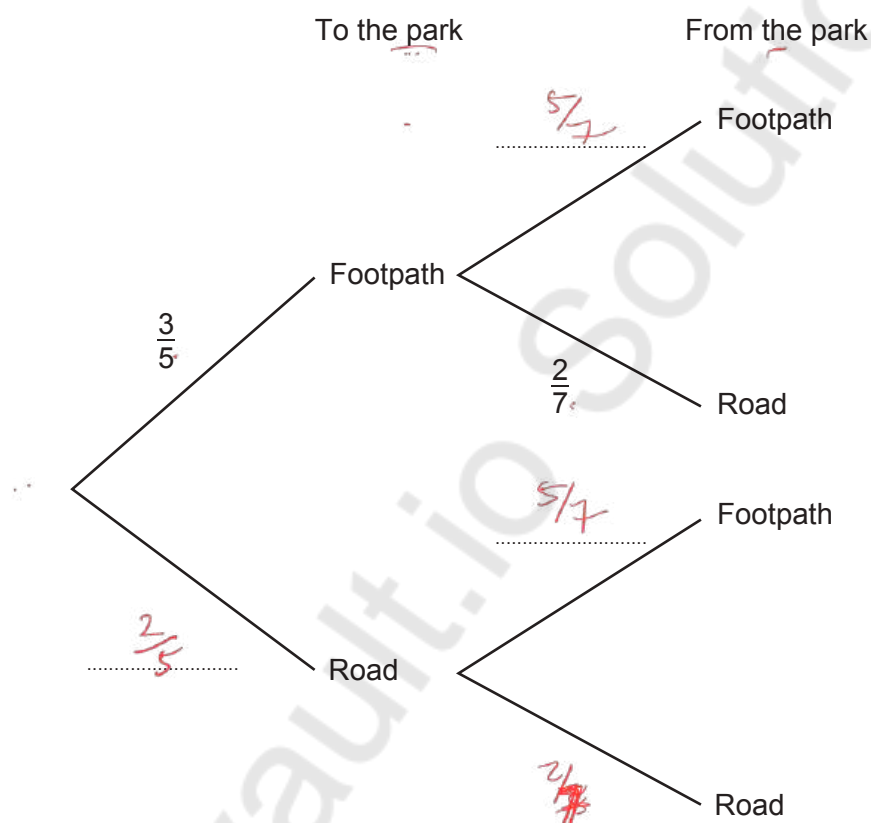
The probability that Beti walks to the park along the footpath is  $\frac{3}{5}$ .

The probability that Beti walks home from the park along the road is  $\frac{2}{7}$ .

Her decisions on which routes to walk to and from the park are independent of each other.

- (a) Complete the tree diagram below.

[2]



- (b) Find the probability that Beti walks to and from the park along the footpath.

[2]

If the prob that Beti walks to the park along the footpath is  $\frac{3}{5}$   
 Then the prob that she walks to park on the road is  $1 - \frac{3}{5} = \frac{5-3}{5} = \frac{2}{5}$   
 The prob that walks from the park along the road =  $\frac{2}{7}$   
 The prob that walks " " " " " " footpath =  $1 - \frac{2}{7} = \frac{7-2}{7} = \frac{5}{7}$



17. Factorise  $x^2 - 8x - 20$ , and hence solve  $x^2 - 8x - 20 = 0$ .

[3]

$$ax^2 + bx + c = 0$$
$$x^2 - 8x - 20 = 0$$
$$(x - 10)(x + 2) = 0$$

$$x - 10 = 0$$

$$x = 10$$

$$x + 2 = 0$$

$$x = -2$$



18. The points  $B$ ,  $C$ ,  $D$  and  $E$  lie on the circumference of a circle, with centre  $O$ .  
 $AF$  is a tangent to the circle.  
 $AO$  is a straight line.

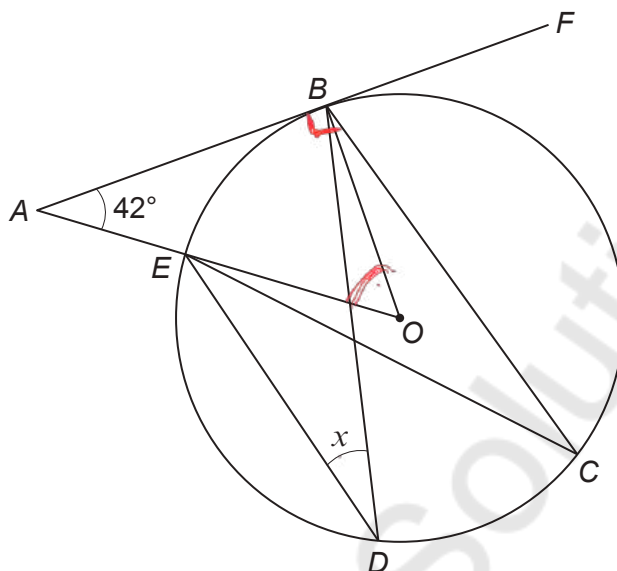


Diagram not drawn to scale

- (a) Explain how you know that  $AOB$  is a right-angled triangle. [1]

From the diagram,  $AF$  is a tangent to the circle &  $AO$  is a radius & a radius is perpendicular to a tangent. So the angle at  $AOB$  must be  $90^\circ$ . Thus  $AOB$  is a right-angled triangle.

- (b) Calculate the size of angle  $x$ .  
 You must show all your working. [3]

$$\text{So } \angle AOB = 180^\circ$$

$$180 - 90 - 42 = 180 - 132 = 48^\circ$$

$$x = \frac{48^\circ}{2}$$

$$= 24^\circ$$



19. Solve the equation  $\frac{10x+2}{3} - \frac{7x-3}{5} = 9$ . [4]

$$\frac{10x+2}{3} - \frac{7x-3}{5} = 9$$

$$= \frac{50x+10 - (7x-3)}{15} = 9$$

$$= \frac{50x+10 - 7x+3}{15} = 9$$

$$= \frac{50x - 7x + 10 + 3}{15} = 9$$

$$= \frac{29x + 13}{15} = 9$$

$$= 29x + 13 = 9 \times 15 = 135$$

$$= 29x = 135 - 13 = 122$$

$$x = \frac{122}{29}$$

$$x = 4.21$$

END OF PAPER



