City of London School

4th Form

Mathematics

Monday 1st June 2009

2pm - 4pm

Name: .....

Tutor Group: .....

- Circle your maths teacher's initials: DJC SSF ELM JCM CSS
- Time allowed : 2 hours
- **Calculators are required**.
- You will require a pencil and ruler.
- Write your answers in the spaces provided.
- Marks may be obtained for showing clear working.
- Total mark : 113

Mark	Percentage
/113	Grade

1. (a) (i) Use your calculator to find $\sqrt{28.9^2 - 9.24^2}$.
Give **all** the figures in your calculator display.

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.....

Answer .....

(1)

(ii) Write your answer to 3 significant figures.

Answer .....

(1)

(b) Find the value of $(3.18 \times 10^5) \times (4.25 \times 10^3)$.
Give your answer in standard form.

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Answer .....

(2)

(Total 4 marks)

2. (a) Expand and simplify $(x + y)(x - y)$

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Answer.....

(2)

(b) (i) Factorise $x^2 - 13x + 36$

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Answer.....

(2)

(ii) Hence, or otherwise, solve the equation $x^2 - 13x + 36 = 0$

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Answer.....

(1)

(Total 5 marks)

3. Sam sees this sign in a shop window.

How much was the phone before the price reduction?

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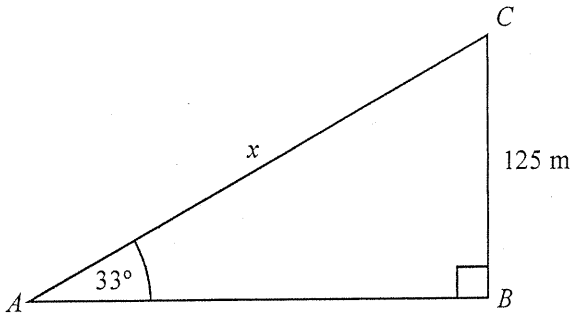
Answer £ .....

(Total 3 marks)

4. ABC is a right-angled triangle.
$BC = 125$ m.
Angle $CAB = 33°$.



Not drawn accurately

Find the length of AC (marked x in the diagram).
Give your answer to an appropriate degree of accuracy.

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Answer ..... m

(Total 4 marks)

5. (a) Solve the inequality $4x - 3 < 5$

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Answer.....

(2)

(b) Expand $4x(x^2 + 5)$

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Answer.....

(2)

(c) Simplify

(i) $d^3 \times d^2$

Answer.....

(1)

(ii) $\frac{e}{e^8}$

Answer.....

(1)

(iii) $(2g^2h^4) \times (3g^3h)$

.....

Answer.....

(2)

(Total 8 marks)

6. (a) Simplify $\dfrac{6(x+5)^2}{2(x+5)}$

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Answer .....

(Total 2 marks)

7. A builder has 7200 kg of sand.

(a) Write 7200 kg in grams.
Give your answer in standard form.

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Answer ..... g

(2)

(b) One grain of this sand weighs 0.0006 g.
Write the weight of one grain of sand in standard form.

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Answer ..... g

(1)

(c) How many grains of sand are there in 7200 kg of sand?
Give your answer in standard form.

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Answer .....

(2)

(Total 5 marks)

8. Make x the subject of the formula

$$w = x^2 + y$$

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Answer x = ...

(Total 2 marks)

9. In a school, there are 750 pupils in total in years 9, 10 and 11.
The numbers of pupils in years 9, 10 and 11 are in the ratio 12:7:6

How many pupils are there in each year?

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Answer Year 9 .....

Year 10 .....

Year 11 .....

(Total 3 marks)

10. (a) Clare bought a cello for £1300.
After one year its value increased by 4%.

Find the value of the cello after one year.

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Answer £ .....

(2)

(b) Ben bought a violin for £1700.
In each year the value of the violin increases by 12% of its value at the start of that year.

Calculate after how many complete years the value of the violin will be at least £2600.

You **must** show all your working.

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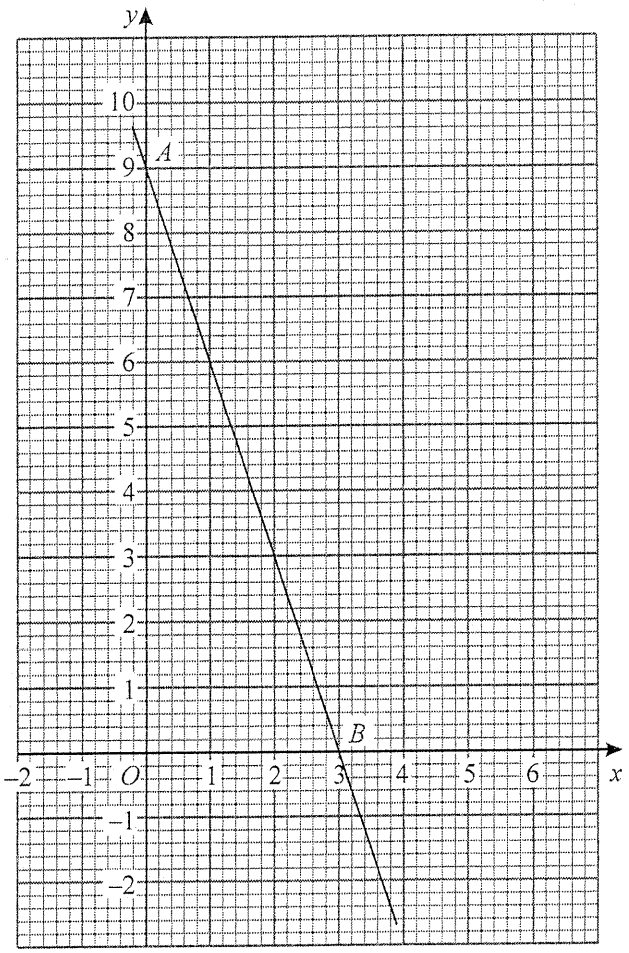
Answer ..... years

(4)

(Total 6 marks)

11. (a) Find the equation of the line AB.



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Answer .....

(3)

(b) Give the y-coordinate of the point on the line with an x-coordinate of 6.

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Answer .....

(2)

(c) Write down the gradient of a line perpendicular to AB.

Answer .....

(1)

(Total 6 marks)

12. (a) Write 28 as the product of its prime factors.

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Answer.....

(2)

(b) Find the lowest common multiple (LCM) of 28 and 42.

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Answer.....

(2)

(Total 4 marks)

13. Susan completes a journey in two stages.
In stage 1 of her journey, she drives at an average speed of 80 km/h and takes 1 hour 45 minutes.

(a) How far does Susan travel in stage 1 of her journey?

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Answer ..... km

(2)

(b) Altogether, Susan drives 190 km and takes a total time of 2 hours 15 minutes.
What is her average speed, in km/h, in **stage 2** of her journey?

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Answer ..... km/h

(2)

(Total 4 marks)

14. A can of drink weighs 342 g to the nearest gram.

(a) What are the lower and upper bounds of the weight of the can?

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Lower bound ..... g

Upper bound ..... g

(2)

(b) The cans are sold in packs of 12
What are the lower and upper bounds of the weight of a pack of cans?

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Lower bound ..... g

Upper bound ..... g

(2)

(Total 4 marks)

15. (a) Factorise $m^2 - 49$

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Answer .....

(1)

(b) Solve these simultaneous equations

$$5x + 3y = 6$$
$$3x - 7y = 19$$

You **must** show your working. Do **not** use trial and improvement.

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Answer x = ... , y = ...

(4)

(Total 5 marks)

16. The illumination, L, provided by a torch is inversely proportional to the square of the distance, d, from the torch.
When $L = 2$, $d = 10$.

(a) Find an equation expressing L in terms of d.

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Answer L = ...

(3)

(b) Find the value of L when $d = 2$.

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Answer .....

(1)

(c) Find the value of d when $L = 8$.

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Answer .....

(2)

(Total 6 marks)

17. (a) Complete the table of values for $y = 2x^2 - 4x - 1$

x	–2	–1	0	1	2	3
y	15		–1		–1	5

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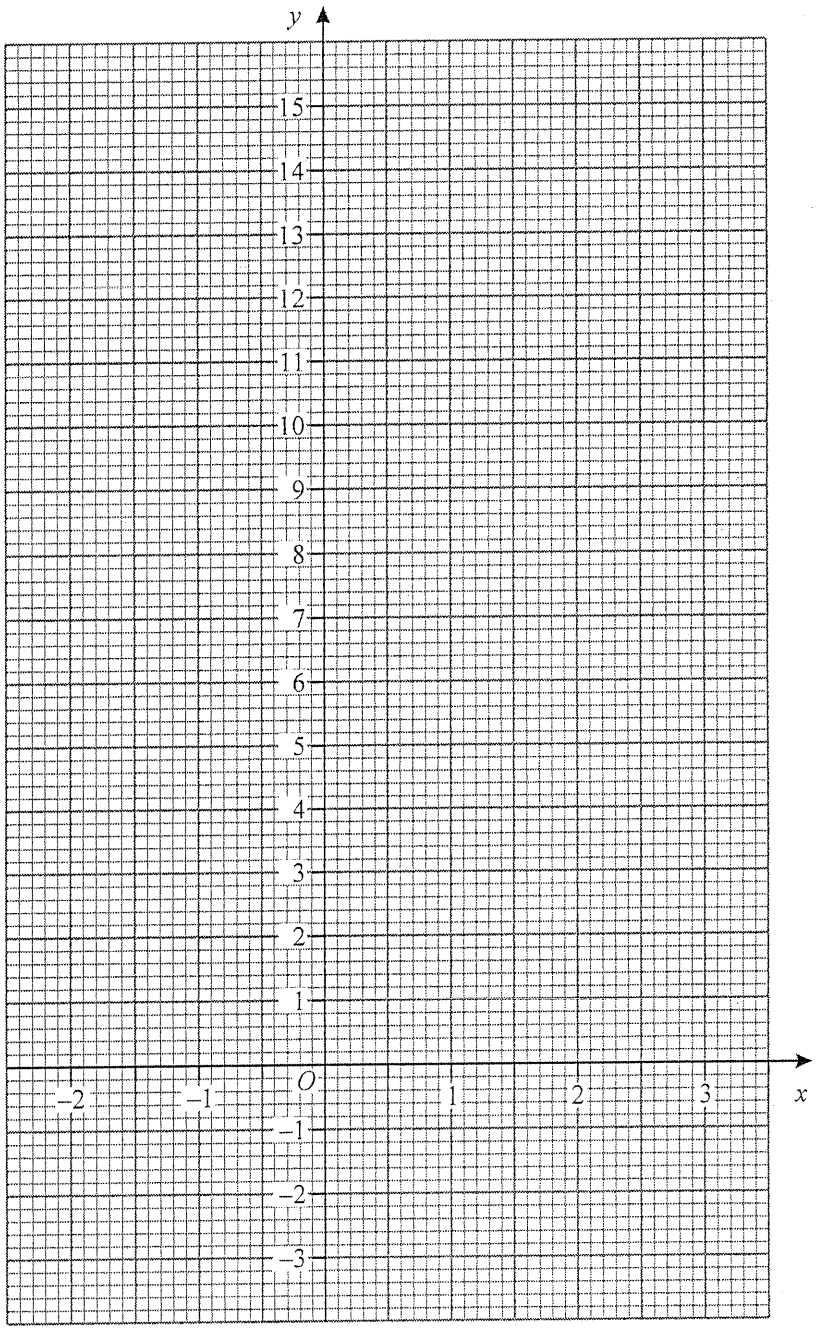
(2)

(b) On the grid, draw the graph of $y = 2x^2 - 4x - 1$ for values of x from – 2 to +3.



(2)

(c) An approximate solution of the equation $2x^2 - 4x - 1 = 0$ is $x = 2.2$

(i) Explain how you can find this from the graph.

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(1)

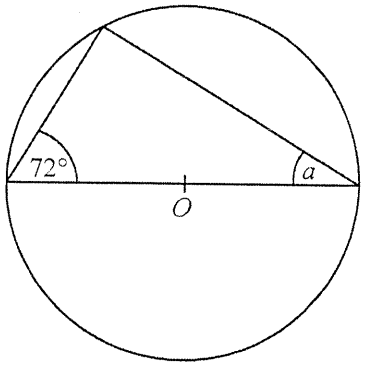
(ii) Use your graph to write down another solution of this equation.

Answer x = ...

(1)

(Total 6 marks)

18. (a) O is the centre of the circle.



Not drawn accurately

Calculate the value of a.

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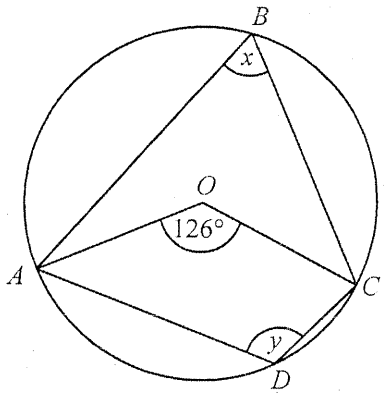
Answer ..... degrees

(2)

(b) O is the centre of the circle.
A, B, C and D are points on the circumference.
Angle $AOC = 126°$



Not drawn accurately

(i) Calculate the value of x.

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Answer ..... degrees

(1)

(ii) Calculate the value of y.

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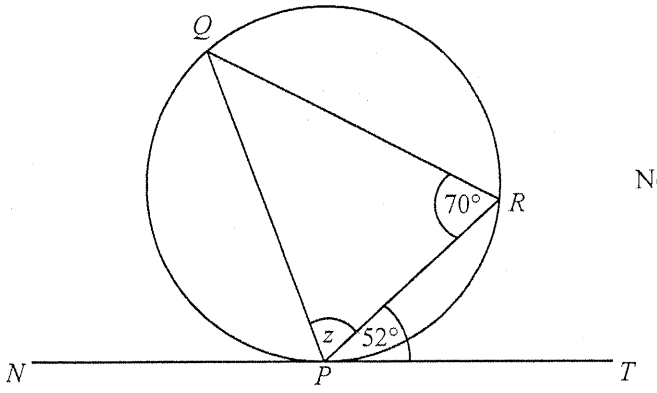
Answer ..... degrees

(1)

(c) P, Q, and R are points on the circumference of the circle.
NPT is the tangent to the circle at P.



Not drawn accurately

Calculate the value of z.
Give a reason for each step of your working.

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Answer ..... degrees

(3)

(Total 7 marks)

19. Solve the equations.

(a) $5y + 11 = 3(y + 7)$

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Answer y = ...

(3)

(b) $\frac{x+1}{3} + \frac{x+2}{5} = 1$

You **must** show your working.

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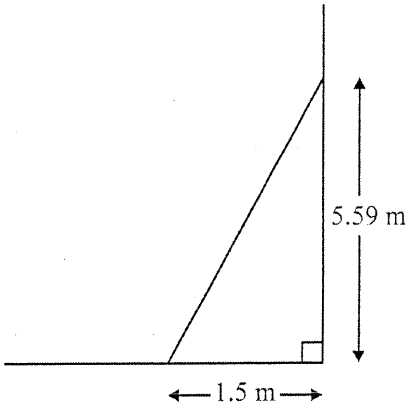
Answer x = ...

(4)

(Total 7 marks)

20. For a ladder to be safe it must be inclined at between 70° and 80° to the ground.
The diagram shows a ladder resting against a wall.



Not to scale

Is it safe?
You **must** show your working.

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(Total 3 marks)

21. On the grid below, indicate clearly the region defined by the three inequalities

$$y \leq 4$$
$$x \geq -3$$
$$y \geq x + 2$$

Mark the region with an *R*.

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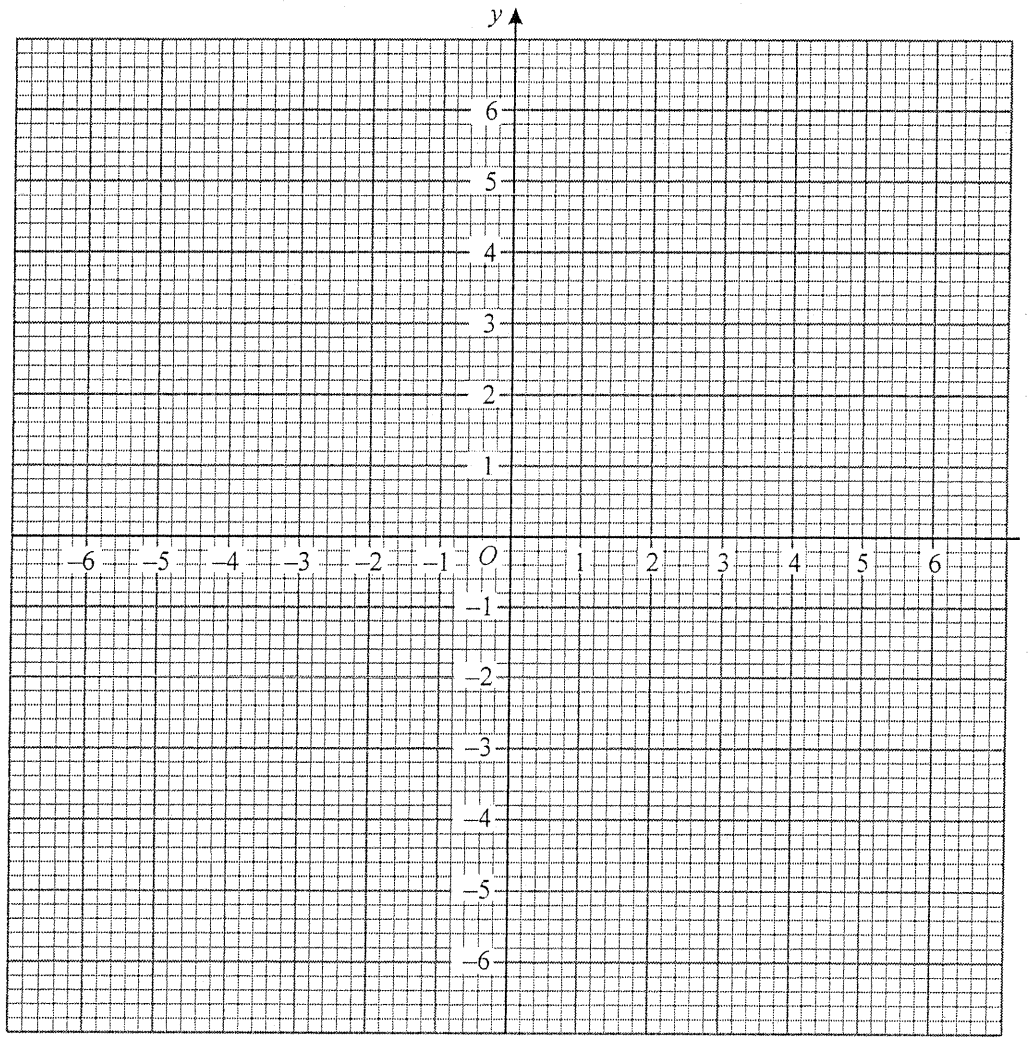
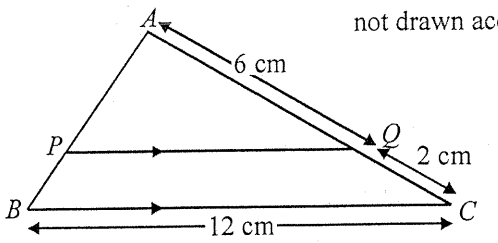


(Total 3 marks)

22. Triangles *ABC and APQ* are similar.
PQ is parallel to *BC*.

AQ = 6 cm, *QC* = 2 cm and *BC* = 12 cm



Calculate the length of *PQ*.

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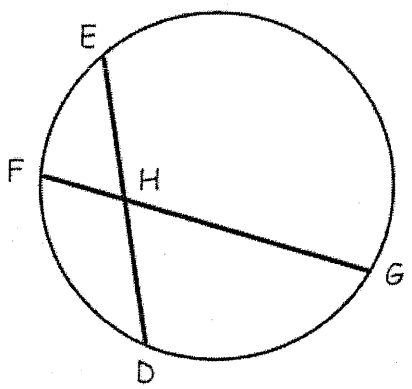
Answer.....cm

(Total 3 marks)

23. In the diagram below (which is NOT drawn to scale), DE = 28cm, DH = 16cm, FG = 38cm and HF = x cm.



(a) Write an expression for the length of HG.

Answer: .....cm

(1)

(b) Form and equation and solve it to find two possible values for x.

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Answer x = ...cm or x =.....cm

(5)

(Total 6 marks)

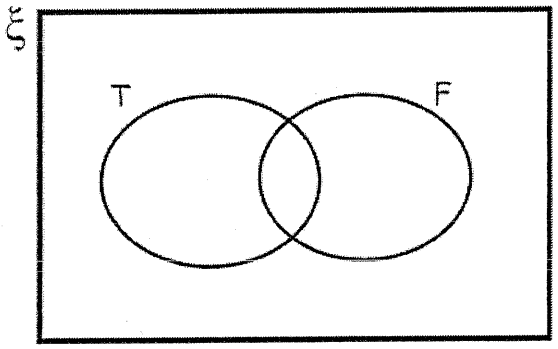
24. Of the 30 pupils in Miss Arthur's class, 17 play tennis, 12 play football and 4 play both.

(a) How many pupils play neither of these sports?

Answer: .....

(1)

(b) Display the information in the Venn Diagram below, where T represents the set of pupils who play tennis and F represents the set of pupils who play football. Each section should contain the relevant number of pupils.



(2)

(c) Write down the number of pupils in each of the following sets:

(i) $T \cup F$ Answer:..... **(1)**

(ii) T' Answer:..... **(1)**

(iii) $(T \cap F)'$ Answer:..... **(1)**

(iv) $T \cup F'$ Answer:..... **(1)**

(Total 7 marks)

END OF TEST

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