GCSE Mathematics Practice Exam Paper
(For the 9 - 1 Syllabus and appropriate for all Exam Boards)

Non-Calculator

Time Allowed: 1 Hour 30 Minutes

Total Marks: 80

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March 2018

Instructions for candidates.

- Answer all questions in the space provided.

- If you need more space for a particular question, continue on the lined paper provided, making sure you number the question you are continuing.

- The number of marks for each question provides a rough guide of how much calculation you may need to show, but as a guide, SHOW ALL WORKING FULLY AND CLEARLY.

- For questions involving drawing graphs, do so on the axes on the provided.

1. (a) Solve the following equation.

$$3x + 7 = 13$$

[1 Mark]

(b) Mohammed thinks of a non-integer number. He multiplies it by 6 and then adds 9. The answer is 33.6.

What number was Mohammed thinking of?

How is this problem similar to part (a)?

[2 Marks]

2. Find the Highest Common Factor of 110 and 120.

[2 Marks]

3. Factorise the following fully:

(a) $6x + 9$

[1 Mark]

(b) $3xy + 15x^3y^7 - 27x^8yz$

[2 Marks]

(c) $a^2 - a - 90$

[2 Marks]

4. Expand and simplify:

   (a) $4(5x + 9)$

   (b) $(2x + 1)(x^2 + 3x - 5)$

   (c) $(a + b)^3$

5. On Monday March 6th, Gemma decides to begin saving for a holiday that will cost £950.

Her sole source of income is her job, which requires her to work 40 hours per week and pays £12.50 per hour.

Each week, she pays £200 rent and spends 70% of the remainder of her salary on further expenses such as bills and food.

Assuming that she saves the rest, after how many full weeks will she have saved up enough for the holiday?

[3 Marks]

6. In a linear sequence, the second term is 13 and the fifth term is 19. By finding a formula for the nth term or otherwise, work out what the value of the 17th term will be.

[3 Marks]

7. (a) Find a formula for the nth term of the following sequence.

$$7, 10, 15, 22, 31, 42, ...$$

[3 Marks]

(b) By formulating and solving a quadratic equation, decide whether 235 will be a term in the sequence given in part (a).

[2 Marks]

8. Convert $\frac{7}{13}$ into a recurring decimal.

[3 Marks]

9. Charisse and Hidaya together win a large cash prize in a raffle. Because Charisse contributed more of the money towards the ticket, she suggests that they split the prize such that the ratio of Hidaya's share to her share is 4 : 5.

They go ahead with this. As a result, Hidaya gets £30.50 less than Charisse. How much money does Hidaya get?

[2 Marks]

10. Find the value of x such that,

$$2 : 5 \quad = \quad 3x + 2 : 7x + 8$$

[3 Marks]

11. In a bag, there are 5 red counters, 7 blue counters and d green counters.

(a) A counter is taken from the bag at random. Complete the table below by stating the probability of it being blue and the probability of it being green.

Colour	Red	Blue	Green
Probability	$\dfrac{5}{12+d}$		

[2 Marks]

(b) A counter is taken from the bag at random. It is replaced. A second counter is then taken at random. Alice says "Without any further information, it is impossible to know the actual probability of both counters being red". Is Alice correct? Give a reason for your answer.

[1 Mark]

(c) A counter is taken from the bag at random. It is replaced. A second counter is then taken at random. Given that the probability that both counters were red is $\frac{25}{169}$, work out how many green counters were in the bag.
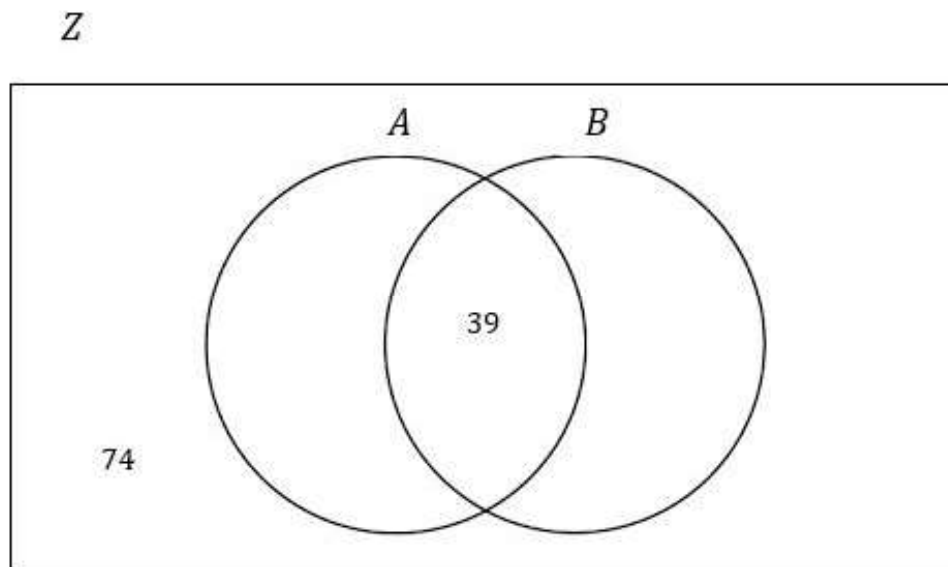
[4 Marks]

12. The Venn diagram below shows information about the pupils in Year 11.

$Z = $ Set of pupils in Year 11.

$A = $ Set of pupils in Year 11 who are a member of a sports club.

$B = $ Set of pupils in Year 11 who play a musical instrument.

Z

(a) Given that there are 207 pupils in Year 11 and that 113 of them are a member of a sports club, complete the Venn diagram.

[2 Marks]

(b) A pupil is picked at random.

- What is the probability that they play a musical instrument?

[1 Mark]

- What is the probability that they play a musical instrument but are not a member of a sports club?

[1 Mark]

- Given that they are a member of a sports club, what is the probability that they play a musical instrument?

[2 Marks]

13. Prove that the angle subtended at the centre of a circle is twice the angle at the circumference. You may use a diagram to help you.
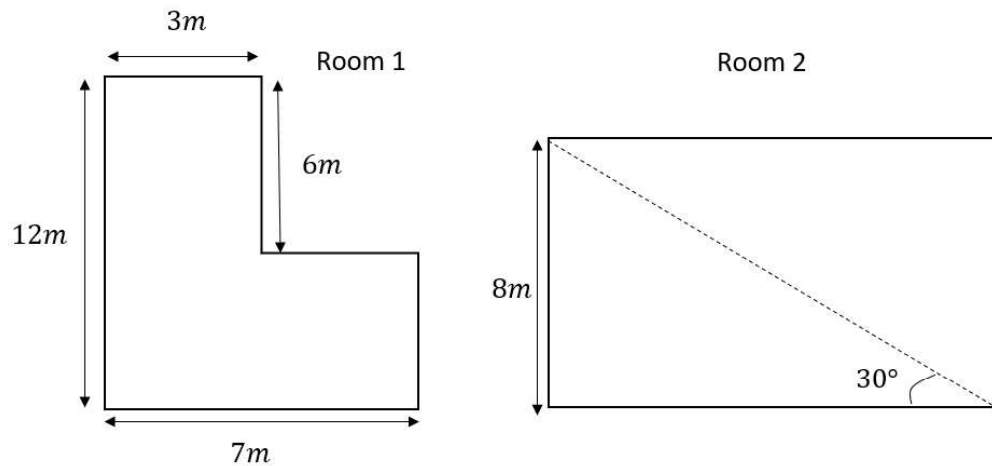
[4 Marks]

14. Anne is looking into renting a new office. She is choosing between two possible rooms in an office block. One is an L-Shape, the other rectangular, as shown below.

Given that the monthly rent per square metre is the same for each office, work out which would be cheaper to rent.

[5 Marks]

DIAGRAM NOT DRAWN TO SCALE

15. $ACDE$ as shown below is a rectangle.

$\angle BDE = \angle BED = x°$

Prove that triangle ABE is congruent to triangle BCD.
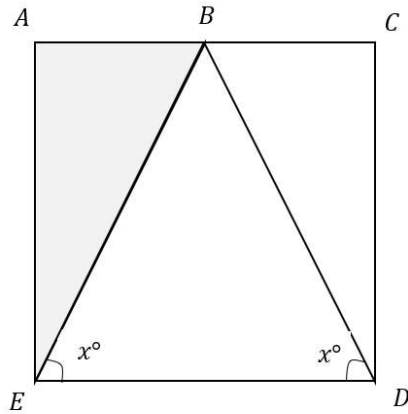
[4 Marks]

DIAGRAM NOT DRAWN TO SCALE

16. Line l_1 has equation $y = 2x + 3$.
    Line l_2 has equation $y = -\frac{1}{2}x + 7$.
    C is a circle, centre the origin, radius 5.

    (a) Are lines l_1 and l_2 parallel or perpendicular to each other? Give a reason for your answer.

    [1 Mark]

    (b) Write down the equation of C.

    [2 Marks]

(c) Solve algebraically, the following pair of simultaneous equations, leaving your answers as fractions in their simplest form.

$$y = 2x + 3$$
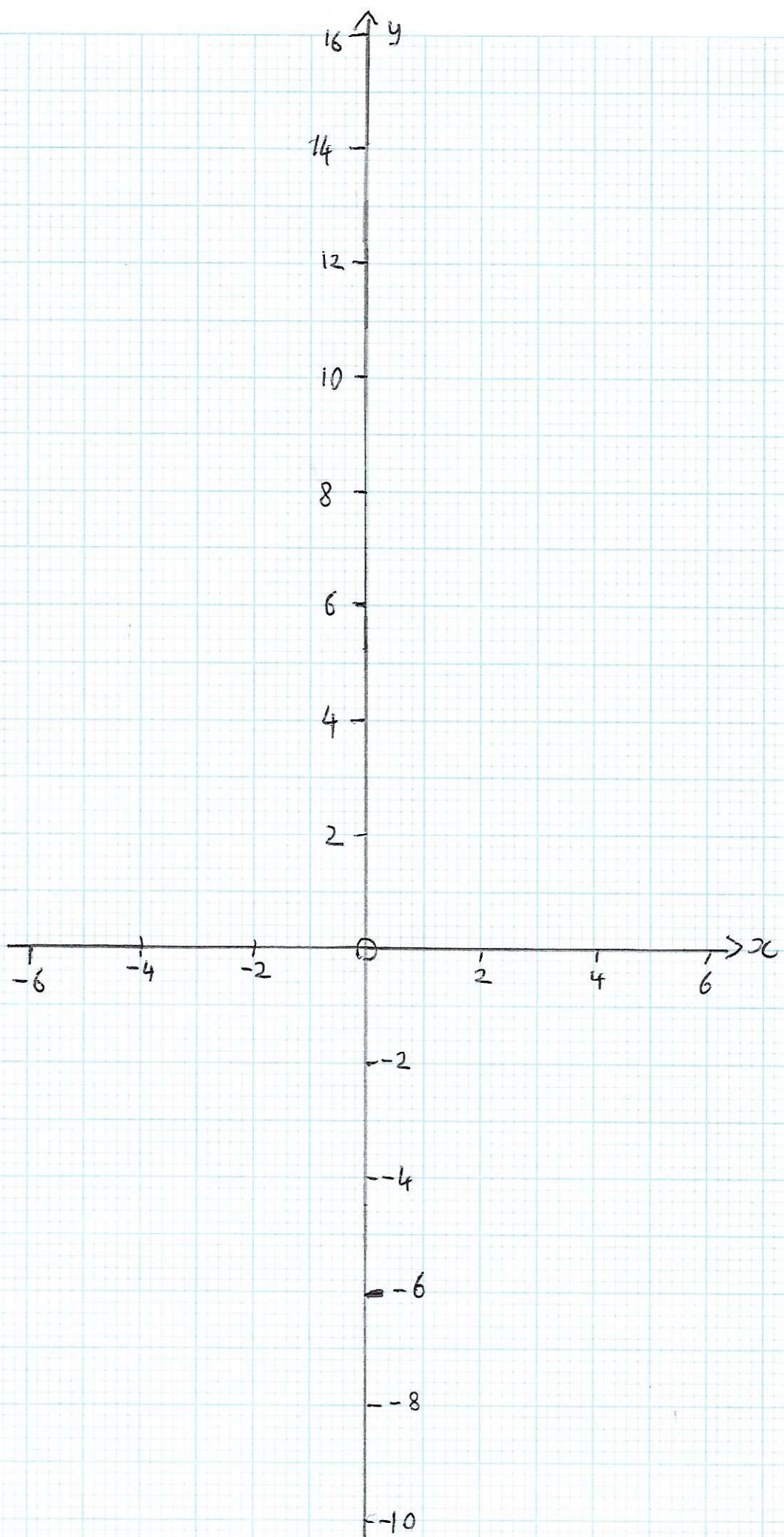$$y = -\tfrac{1}{2}x + 7$$

[3 Marks]

(d) Hence write down the coordinates of the point of intersection between l_1 and l_2.

[1 Mark]

(e) On the graph paper provided, accurately draw;
- Line l_1 for $-5 \leq x \leq 3$
- Line l_2 for $-4 \leq x \leq 6$
- Circle C

[3 Marks]

(f) Using your answer to part e) or otherwise, decide which of the following two equations has solutions and write down approximations of the solutions.

1) $25 - x^2 = (2x + 3)^2$

2) $25 - x^2 = (-\frac{1}{2}x + 7)^2$

[3 Marks]

17. The length of time, in minutes, it takes for a decorator to paint the walls inside a property can be seen as a function of the area of wall he needs to paint, x square metres. This function is such that the length of time is obtained by multiplying the area by 30 and then subtracting 5.

(a) Letting $f(x)$ denote the function, express $f(x)$ in terms of x.

[2 Marks]

(b) How long will it take for the decorator to carry out a job that requires $20m^2$ of wall to be painted?

[2 Marks]

(c) If the decorator works with a colleague, they are able to get twice as large an area of wall painted in any particular length of time. Letting $g(x)$ denote the length of time, in minutes, it takes the two of them working together to paint x square metres of wall, express $g(x)$ in terms of $f(x)$.

[1 Mark]

(d) The decorator and his colleague are working together on a job. They have $7m^2$ of wall left to paint with 2 hours left of the working day. Will they be able to finish today?

[3 Marks]