Write your name here

Surname	Other names

Edexcel GCSE

Centre Number	Candidate Number

Mathematics B

Unit 2: Number, Algebra, Geometry 1 (Non-Calculator)

Higher Tier

Sample Assessment Material
Time: 1 hour 15 minutes

Paper Reference
5MB2/2H

You must have:
Ruler graduated in centimetres and millimetres, protractor, compasses, pen, HB pencil, eraser. Tracing paper may be used.

Total Marks

SOLUTIONS

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*
- **Calculators must not be used.**

Information

- The total mark for this paper is 60.
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*
- Questions labelled with an **asterisk** (*) are ones where the quality of your written communication will be assessed
  – *you should take particular care on these questions with your spelling, punctuation and grammar, as well as the clarity of expression.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

S37722A

©2010 Edexcel Limited.

2/3/3/2

S 3 7 7 2 2 A 0 1 1 3

Turn over

edexcel
advancing learning, changing lives

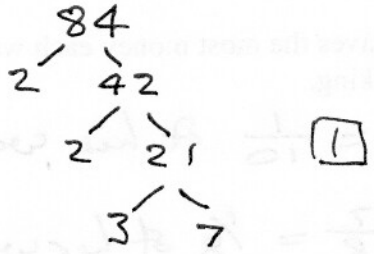
Answer ALL questions.

Write your answers in the spaces provided.

You must write down all stages in your working.

1 (a) Express 84 as a product of its prime factors.

(2)



[1]

[1]

$84 = 2^2 \times 3 \times 7$

Sally is a patient in a hospital.
She has to take a red pill every 4 hours, a blue pill every 6 hours and a white pill every 8 hours.
She takes a pill of each colour at midday.

(b) When will she next take a pill of each colour at the same time?

(2)

Red 4 8 12 16 20 24

Blue 6 12 18 24

White 8 16 24

[1]

[1]

She next takes one of each at midday tomorrow, 24 hours after the previous midday.

(Total for Question 1 = 4 marks)

2 Anwar, Bethany and Colin each earn the same weekly wage.

Each week, Anwar saves 12% of his wage and spends the rest.

Each week, Bethany spends $\frac{7}{8}$ of her wage and saves the rest.

The ratio of the money Colin saves each week to what he spends is 1 : 9

Which of Anwar, Bethany and Colin, saves the most money each week?
You must show each stage of your working.

Colin saves $\frac{1}{1+9} = \frac{1}{10}$ of his wage, 10% of it. [1]

Bethany saves $1 - \frac{7}{8} = \frac{1}{8}$ of her wage, 12½% of it. [1] [1]

Anwar saves 12%.

[1]

Bethany saves the most.

(Total for Question 2 = 4 marks)

3 Here are the first 5 terms of an arithmetic sequence.

5 8 11 14 17

+3 +3

(a) Write down an expression, in terms of n, for the nth term of this sequence.

[1] [1]

$3n + 2$

The expression $3n^2 + 2$ is the nth term of another sequence.

(b) Find the 4th term of this sequence.

$n = 4$ [1]

$3n^2 + 2 = 3 \times 16 + 2 = 48 + 2$

[1]

$= 50$

(Total for Question 3 = 4 marks)

4

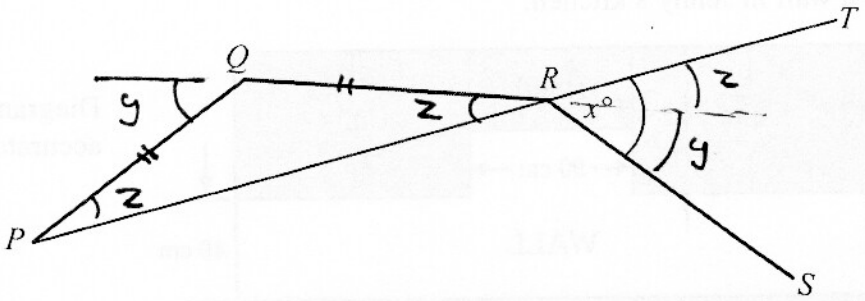


Diagram **NOT** accurately drawn

PQ, *QR* and *RS* are 3 sides of a regular decagon.
PRT is a straight line.
Angle *TRS* = *x*°

10 sides

Work out the value of *x*

External angle $y = \frac{360}{10} = 36°$

Triangle PQR is isosceles, $2z = y$,

$z = \frac{36}{2} = 18°$

$x = y + z$

$= 36 + 18$

$= 54°$

x = 54°

(Total for Question 4 = 5 marks)

5 The diagram shows a wall in Jenny's kitchen.

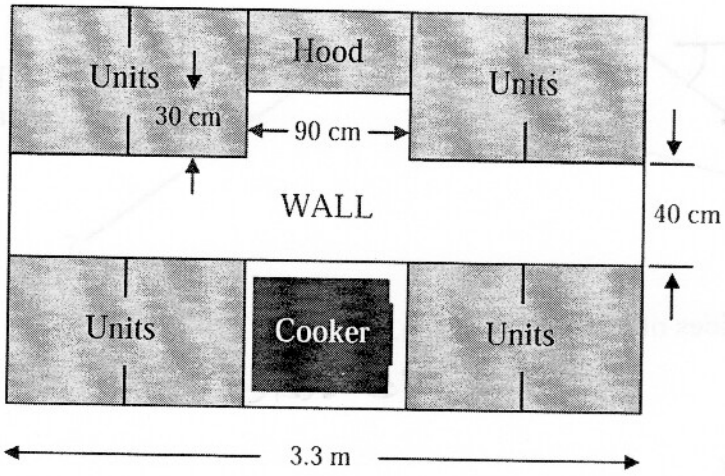
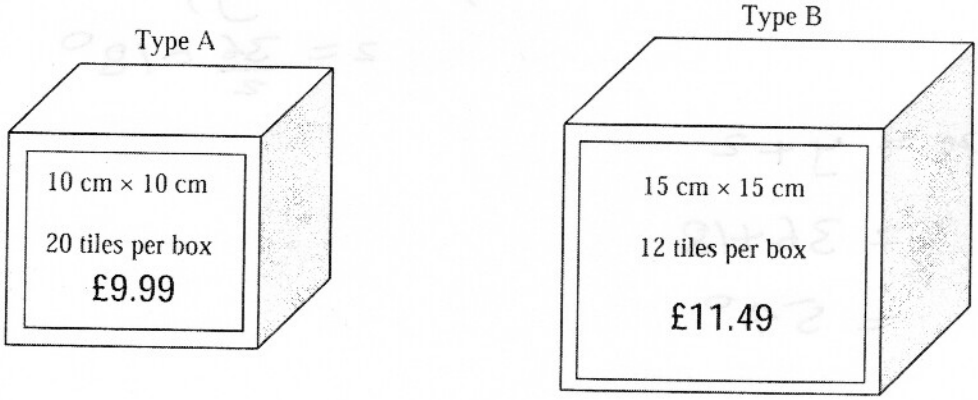


Diagram **NOT** accurately drawn

Jenny wishes to tile this wall in her kitchen.
She chooses between the two types of tile shown below.

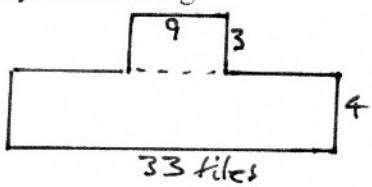


*(a) Which tiles should Jenny use to spend the least amount of money on tiling the wall?

You must show all of your working.

(6)

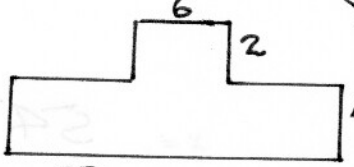
Type A



Would need
$33 \times 4 + 9 \times 3$
$= 132 + 27 = 159$ tiles [1]

$\frac{159}{20} = 7\frac{19}{20}$, must buy 8 boxes, cost $8 \times £9.99 = £79.92$ [1] [1]

Type B



$\frac{40}{15} = 2\frac{2}{3}$, need 3 rows.

$\frac{330\text{cm}}{15\text{cm}} = \frac{660}{30} = 22$ tiles [1]

$22 \times 3 + 6 \times 2 = 66 + 12 = 78$ tiles, $\frac{78}{12} = 6\frac{1}{2}$, need 7 boxes. [1]

$7 \times £11.49 = 77 + 3.5 - 0.07$
$= £80.43$.

Type A is cheaper, by £0.51.

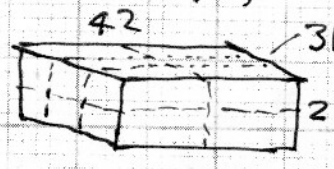
[1]

A Box of Type A tiles has dimensions 10.5 cm × 10.5 cm × 21 cm.
Readypac wants to produce cartons which hold 12 boxes of Type A tiles, when full.

(b) On the grid below, design a net of a carton that Readypac could use.

(3)

$12 = 3 \times 2 \times 2$, a carton $(3 \times 10.5\text{cm})$ wide by $(2 \times 10.5\text{cm})$ high $\times (2 \times 21\text{cm})$ long would be a convenient shape, $31.5\text{cm} \times 21\text{cm} \times 42\text{cm}$



[1] carton size

[1] choose cuboid

[1] any suitable net

END

21 cm

LID | SIDE | BASE | SIDE

42cm

31.5cm

21cm

END

21cm

31.5 cm

(Total for Question 5 = 9 marks)

6 (a) Factorise fully $8p^2q + 12p$

(2)

$= 4(2p^2q + 3p)$ — [1]

$= 4p(2pq + 3)$ — [1]

(b) Expand and simplify $5 - 2(m - 3)$

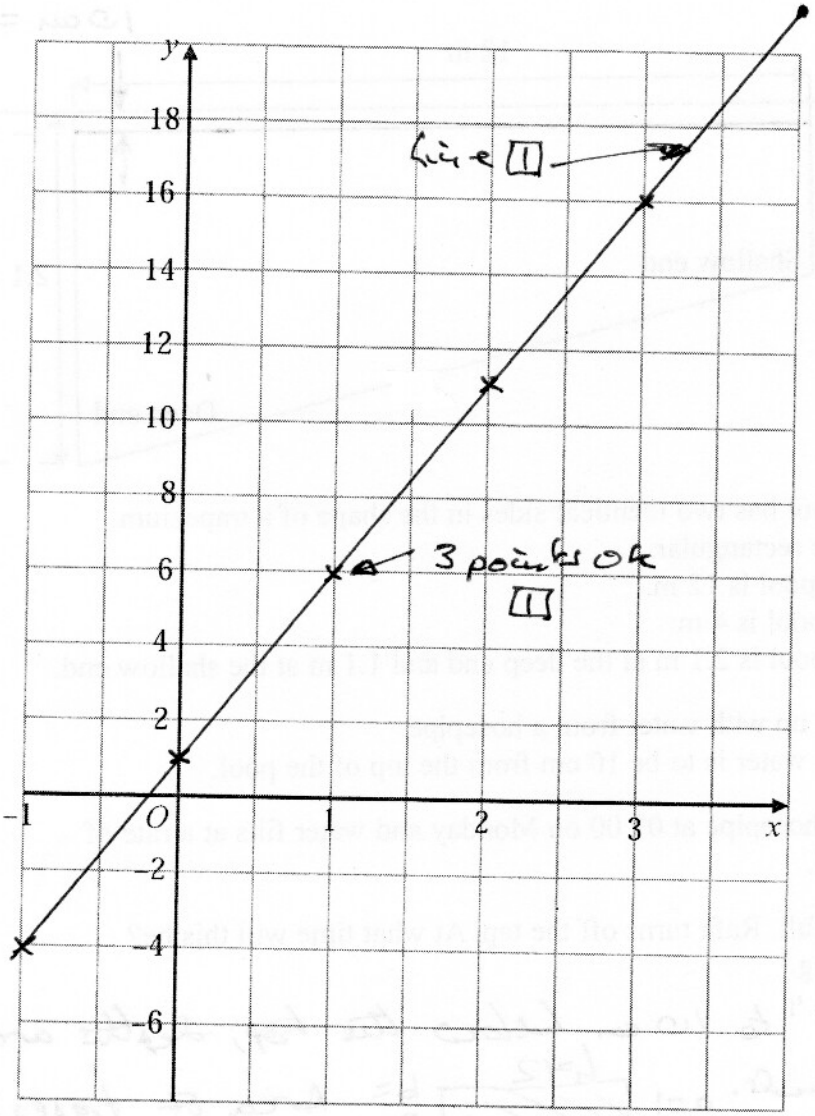
(2)

$= 5 - 2m + 6$ — [1]

$= 11 - 2m$ — [1]

(Total for Question 6 = 4 marks)

7 (a) On the grid, draw the graph of $y = 5x + 1$ from $x = -1$ to $x = 3$



x	y
-1	-4
0	1
1	6
2	11
3	16

[1]

(b) Which of the following is the equation of a line parallel to $y = 5x + 1$?

A	**B**	**C**	**D**	**E**
$y = x + 1$	$5y = x + 1$	$y + 5x = 3$	$y - 5x + 1 = 0$ $y = 5x - 1$	$y = -\frac{x}{5} + 1$

D [1]

(c) Find the equation of line which is perpendicular to $y = 5x + 1$ and passes through the point (0, 0).

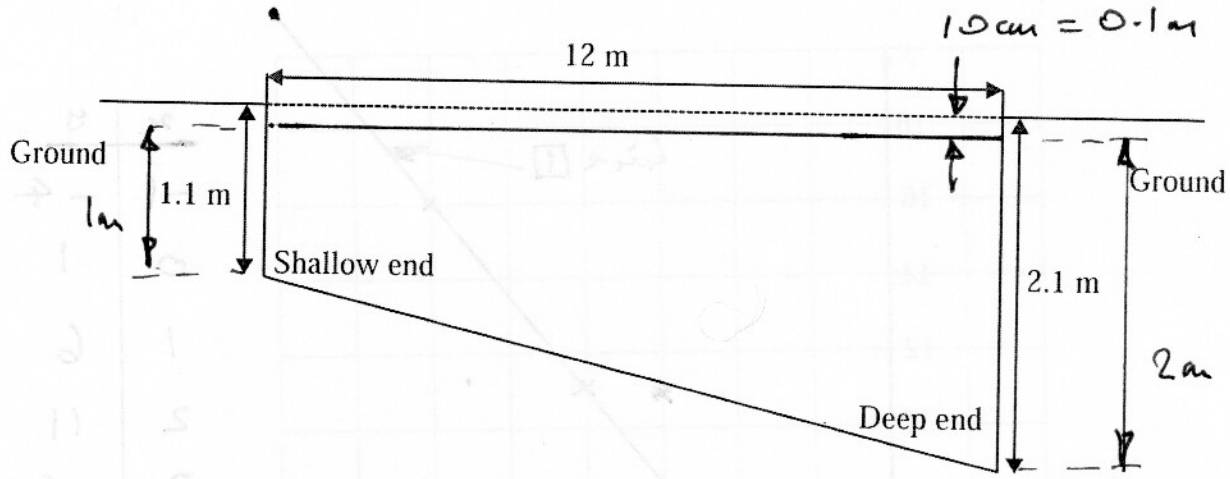
Gradient of $y = 5x + 1$, $m_1 = 5$

Need perpendicular gradient $m_2 = \frac{-1}{m_1} = -\frac{1}{5}$ [1]

$y = -\frac{1}{5}x$ [1]

(Total for Question 7 = 6 marks)

8 The diagram shows a cross-section of Rafa's new swimming pool.



The swimming pool has two identical sides in the shape of a trapezium.
All other sides are rectangular.
The length of the pool is 12 m.
The width of the pool is 4 m.
The depth of the pool is 2.1 m at the deep end and 1.1 m at the shallow end.

Rafa fills the pool up with water from a hosepipe.
The surface of the water is to be 10 cm from the top of the pool.

Rafa turns on the hosepipe at 09 00 on Monday and water fills at a rate of 200 ml per second.

When the pool is full, Rafa turns off the tap. At what time will this be?
Show your working.

When "full" to 10 cm below the top, depths are 1m and 2m at the ends. a=1 h=12 b=2m.

Area of trapezium $= \frac{(a+b)}{2} h = \frac{(1+2)}{2} \times 12$

$= 3 \times 6 = 18 m^2$ — [1]

Volume of prism = (cross-section area) × 4m = $72 m^3$ — [1]

Flow rate 200ml/sec = 0.2 l/sec = 0.2×60 l/min
= 12 l/min.

Volume = (flow rate) × time,

time = $\frac{\text{volume}}{\text{flow rate}} = \frac{72000 \text{ litres}}{12 \text{ l/min}}$ [1] dividing

= 6000 minutes
= 100 hours [1]
= 4 days 4 hours.

4 days 4 hours on from Monday 9 am is Friday 13:00 [1]

(Total for Question 8 = 6 marks)

9 Find the value of

(i) 8^0 $8^0 = 1$ — [1]

(ii) $\left(\frac{1}{3}\right)^{-2} = \frac{1}{(1/3)^2} = \frac{1}{(1/9)} = 9$ — [1]

(iii) $\left(16^{-2}\right)^{-\frac{3}{4}}$ $(16^{-2})^{-3/4} = 16^{\frac{6}{4}} = 16^{3/2}$ (−2 × −3/4) — [1]

$= (16^{1/2})^3 = 4^3 = 64$ — [1]

(Total for Question 9 = 4 marks)

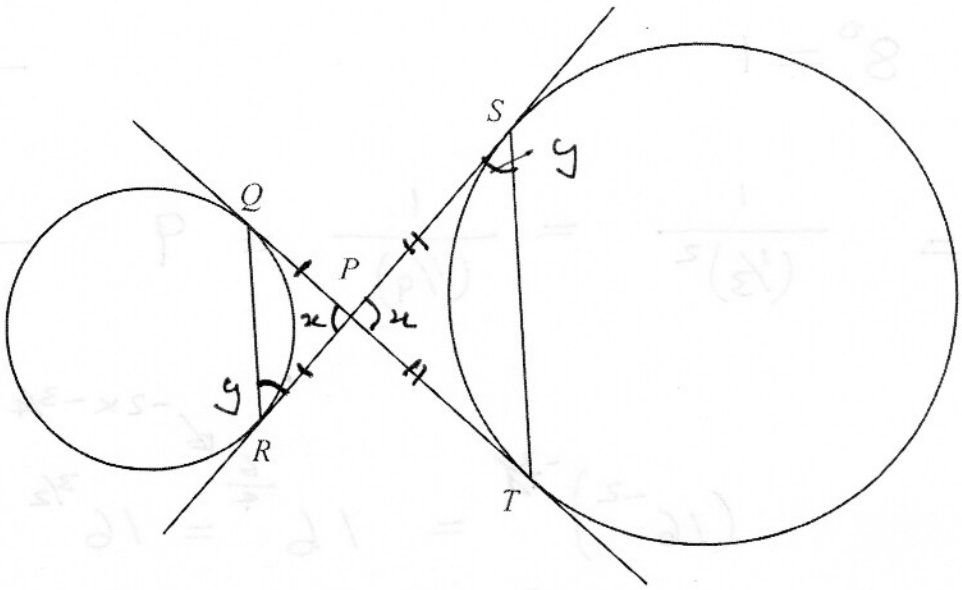
10 Simplify fully $\frac{x+3}{4} + \frac{x-5}{3}$ $= \frac{3(x+3) + 4(x-5)}{12}$ — [1]

$= \frac{3x + 9 + 4x - 20}{12}$ — [1]

$= \frac{7x - 11}{12}$ — [1]

(Total for Question 10 = 3 marks)

*11



Q and R are two points on the circumference of a circle.
S and T are two points on the circumference of another circle.

QT and SR are tangents to both circles.
P is the point of intersection of the two tangents.

Prove that QR is parallel to ST.

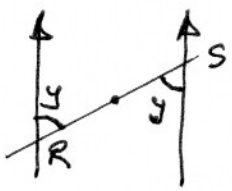
Triangle PQR is isosceles (tangents are same length PQ = PR to point of intersection). — [1]

Similarly, triangle PST is isosceles. — [1]

Both triangles have the same angle x at P (vertically opposite angles at a point). — [1]

In each triangle, $y + y + x = 180$, $2y = 180 - x$,

$y = \frac{180 - x}{2}$ so angles QRP and TSP are equal. — [1]



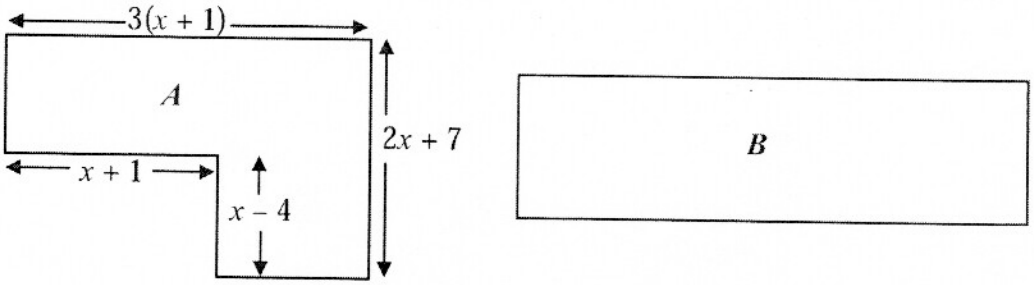
These are <u>alternate angles</u> so QR and ST are parallel. — [1]

<u>OR</u> Triangles PQR and PST are <u>similar</u>, PST is a copy of PQR that has <u>rotated by 180°</u>.

(Total for Question 11 = 5 marks)

12

Diagrams **NOT** accurately drawn

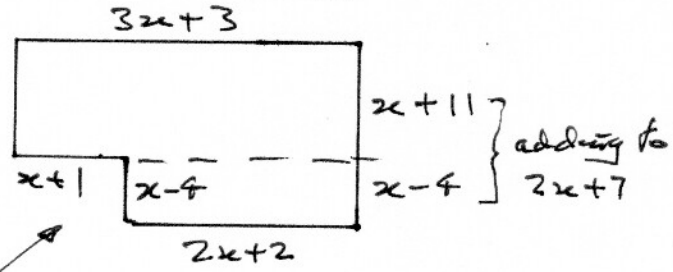


The diagram shows two shapes.
In shape A, all of the angles are right angles.
Shape B is a rectangle.
All the measurements are in centimetres.

The area of shape A is equal to the area of shape B.

Find an expression, in terms of x, for the length and an expression, in terms of x, for the width of shape B.

Find area of A



Split into rectangles — 1

Area = (x+11)(3x+3) + (x-4)(2x+2) — formula — 1

$= 3x^2 + 33x + 3x + 33 + 2x^2 - 8x + 2x - 8$ — expand — 1

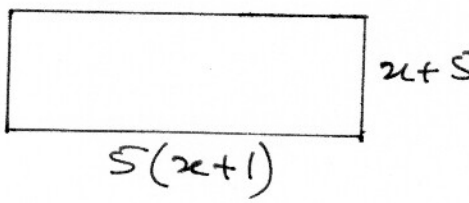
$= 5x^2 + 30x + 25$ — 1

$= 5(x^2 + 6x + 5)$

$= 5(x+1)(x+5)$. — 1

Any width and height such that $w \times h = 5(x+1)(x+5)$ will do,

e.g.



— 1

(Total for Question 12 = 6 marks)

TOTAL FOR PAPER = 60 MARKS