Mathematics

Paper 3 (Calculator)   Higher Tier

Time Allowed: 1 hour

You must have: Ruler graduated in centimetres and millimetres,

Protractor, pair of compasses, pen, HB pencil, eraser, calculator.

Tracing paper may be used.

Total Marks

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.*
- You must **show all your working.**
- Diagrams are **NOT** accurately drawn, unless otherwise indicated.
- **Calculators may be used.**
- If your calculator does not have a π button, take the value of π to be 3.142 unless the question instructs otherwise.

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.*

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.

1. (a) Write 160 as a product of prime factors.

(3)

(b) Hence, or otherwise, find the lowest common multiple of 160 and 280.

(2)

(5 marks)

2. If a = 4.1 x 10⁵, b = 2.9 x 10⁻² and c = 9.2 x 10³ find the value of $\frac{a}{bc}$ giving your answer in standard form correct to 2 significant figures.

(3 marks)

3. (a) Solve the inequality $7x - 4 < 10x + 5$

(2)

(b) Solve the inequality $-20 < 2x - 5 \leq 1$

(2)

(c) Which integer values satisfy **both** of these inequalities?

(2)

(6 marks)

Practice Paper 3 – Calculator Allowed   © mrchadburn

4. A nurse at a surgery measured the heights of 100 men.
   The measurements are recorded in the table.

Height, h (cm)	Cumulative Frequency
168 < h ≤ 170	4
168 < h ≤ 173	14
168< h ≤ 176	28
168 < h ≤ 179	54
168 < h ≤ 182	76
168 < h ≤ 185	90
168 < h ≤ 188	97
168 < h ≤ 191	100

(a) Draw a cumulative frequency diagram to illustrate this information.
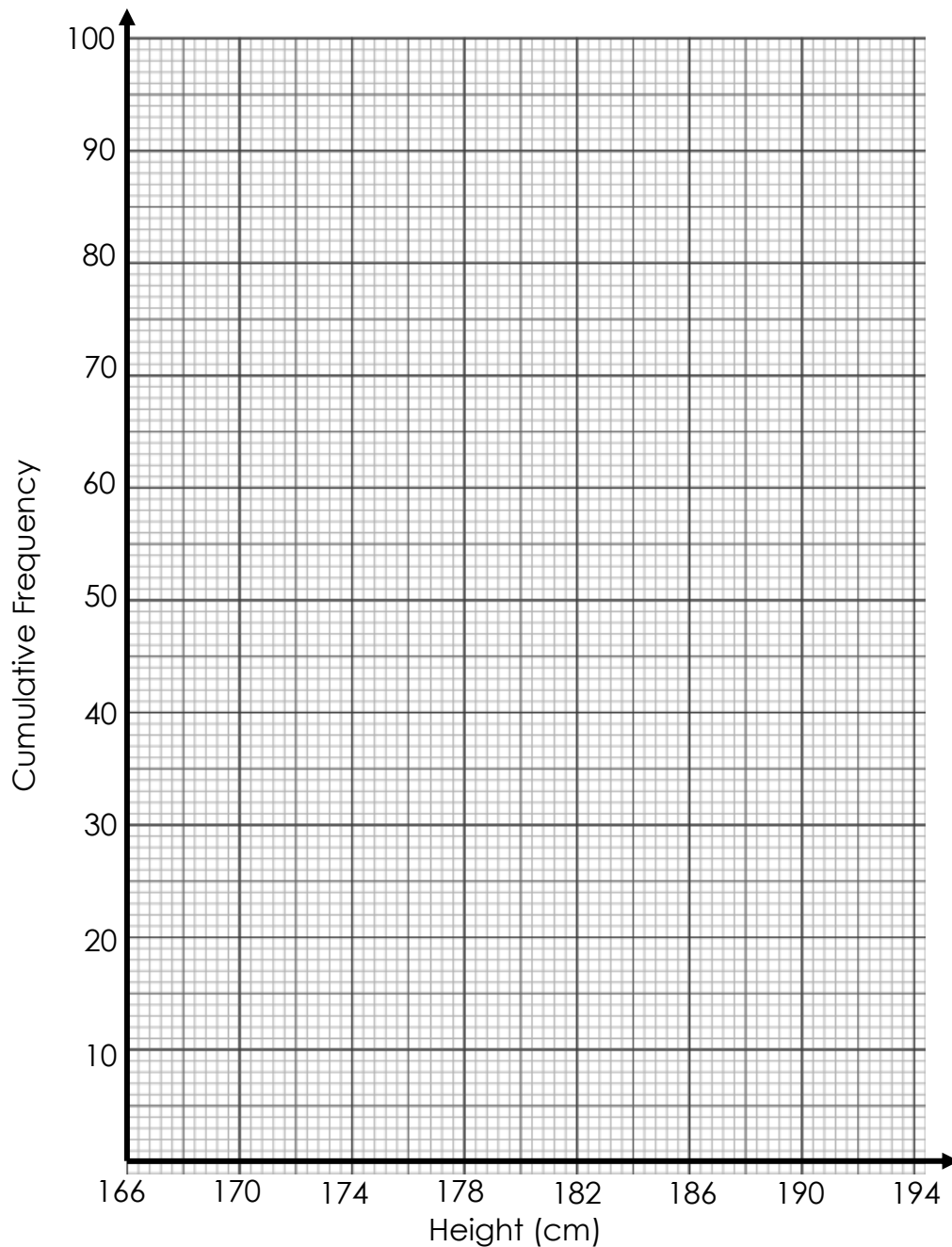
(2)

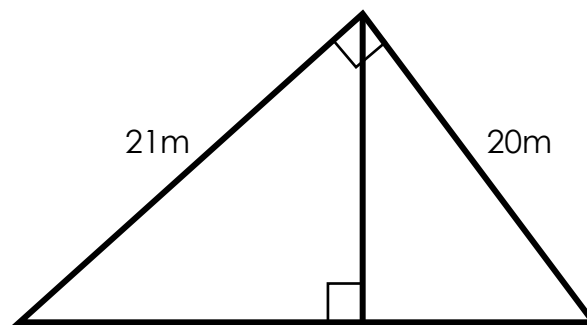(b)   Estimate the inter-quartile range for the heights of the men.

(2)

(c)   Estimate the number of men who were taller than 184cm.

(2)

(6 marks)

5.   A triangular frame is made of four pieces of metal welded together as shown in the diagram below.


The cost of the metal needed to construct the frame is £1.25 per metre. Work out the cost of constructing the frame.

(5 marks)

6. Esther invested £4000 in a bank account four years ago.
The account pays interest of x% compound at the end of each year.
She currently has £4590 in the account. She has not deposited any more
funds nor withdrawn any over the four year period.
What is the value of x to 1 decimal place?

(3 marks)

7. A box, in the shape of a cuboid, has dimensions
24cm by 16cm by 16cm.
Six spheres of radius 4cm are able to be packed into the
box.
Work out the proportion of the box that is not filled with
the spheres.

Volume of sphere $= \frac{4}{3}\pi r^3$
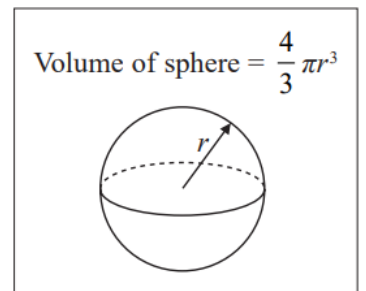
(4 marks)

8. $x = 1.1\dot{2}\dot{4}$

Using an algebraic method and showing your working clearly, show that x can be written as a fraction in its simplest form.

(3 marks)

9. M is indirectly proportional to the square root of P.
When M = 40, P = 36.
Find the value of P when M = 1200.

(3 marks)

10. $r = \dfrac{a^2}{b}$

a = 50 correct to 1 significant figure
b = 2.24 correct to 2 decimal places.
Find the largest possible value for r.

(3 marks)

11. Make m the subject of the formula $r = \frac{4m+3}{5-3m}$

(4 marks)

12. The function f is defined as $f(x) = \frac{2}{x+2} + \frac{3}{2x-1}$

(a) Find f(5) giving your answer as a fraction.

(2)

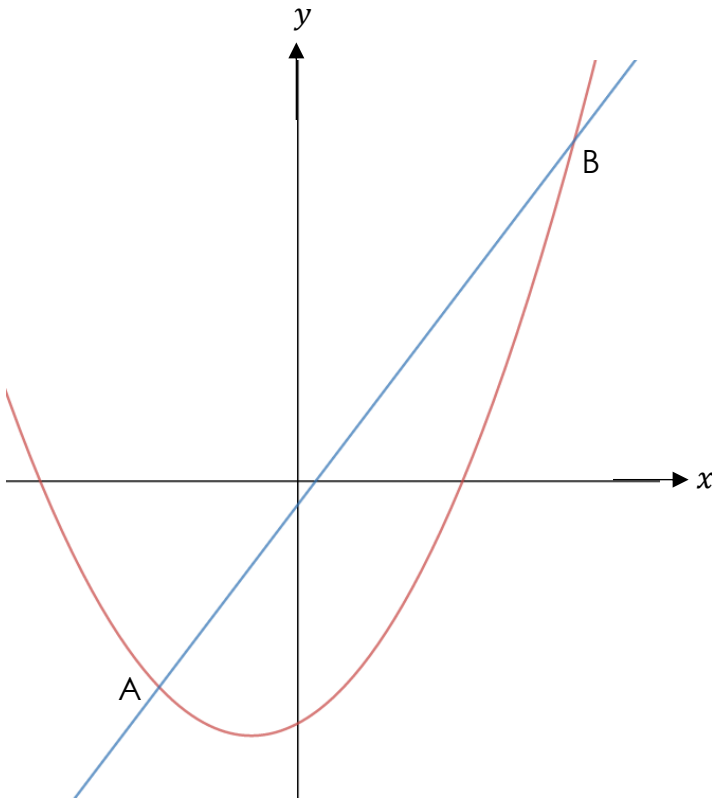(b) Write down the two values for x for which $f(x)$ is not defined.

(2)

(c) Given that $f(x) = 1$ find the values of x.

(4)

(8 marks)

13. The diagram shows the graphs of the functions
$y = x^2 + 2x - 20$ and $y + 2 = 5x$.
They intersect at points A and B.
Find the length of the line AB.

(7 marks)