



# MATHEMATICS ENTRANCE EXAM

January 2021

Scholarship Students

Year 9 Entry

Time allowed: 60 minutes

## INSTRUCTIONS TO CANDIDATES

Attempt as many questions as you can, you may not have time to do all of them

Calculators are permitted

Always make your method clear and show your working

CANDIDATE NAME:

SCORE:

1. Without the use of a calculator work out  $4.89 \times 0.97$

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[3]

2. What is the remainder when 487 is divided by 17?

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[2]

3. Show that

(a)  $4\frac{2}{3} + 3\frac{4}{5} = 8\frac{7}{15}$

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[2]

(b)  $3\frac{3}{5} \div 2\frac{1}{7} = \frac{42}{25}$

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[2]

4. Use methods for adding and subtracting fractions to write the following as a single fraction simplifying your answer as much as possible.

(a)  $\frac{x}{4} + \frac{x}{6}$

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[3]

(b)  $\frac{4}{x-1} - \frac{3}{x+1}$

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[4]

5. Simplify

(a)  $6p^2 \div 9p^5$

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[2]

(b)  $\sqrt{(q)^4}$

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[1]

6. Remove the brackets and simplify:

(a)  $7(x+2) - 3(x-3)$

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[3]

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

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[3]

(c)  $(2x+7)^2$

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[2]

(d)  $(a+b)(a-b)$

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[2]

(e)  $3(x+1)(x-2)$

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[3]

7. Solve

(a)  $17 - 2(x - 3) = 7$

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[3]

(b)  $\frac{6x-1}{4} - \frac{5-2x}{2} = 1$

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[3]

8. (i) Solve the inequality

$$2(5-x) \leq 6$$

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[2]

Given that  $2(5-x) \leq 6$ ,  $x \leq 12$  and that  $x$  is a prime number

(ii) List all possible values of  $x$

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[2]

- 10.** As a result of Brexit it is thought that the cost of the large flag will increase by 13% to £762.75.  
What is the cost of the flag now.

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[3]

- 11.** Factorise  $x^2 - 3x - 18$

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[3]

12.

$$m = 3^4 \times 5^3$$

$$n = 3^3 \times 5^2 \times 11$$

(a) Find the lowest common multiple (LCM) of  $m$  and  $n$ .

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[4]

(b) Find the HCF (Highest Common Factor) of  $5m$  and  $3n$

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[5]

(c) Find the smallest number, which can be multiplied by  $3n$  to give a square number.

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[5]

**13. (a)** The equations of two lines are:

$$y = x - 1$$

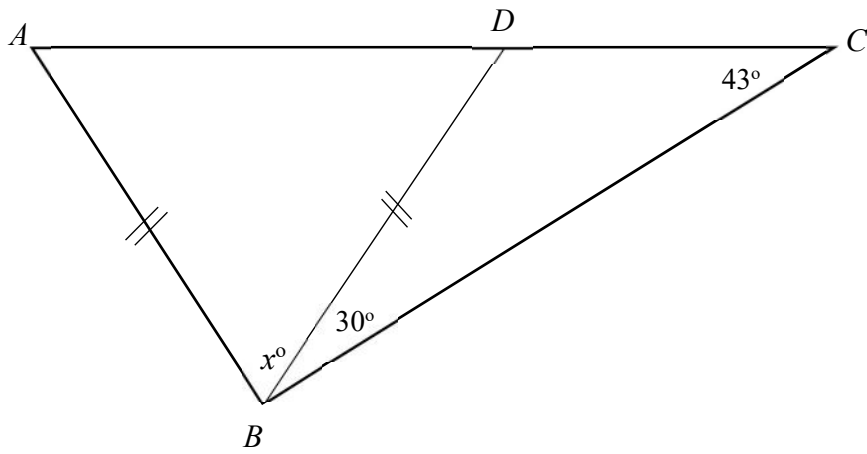
$$2x + 3y = 12$$

Find the co-ordinate of the point where the two lines meet.

(b) Find an equation of the line which is parallel to the line with equation  $2x + 3y = 12$  and passes through the point  $(0, 10)$



14. Find the value of  $x$  in isosceles triangle  $ABD$ .



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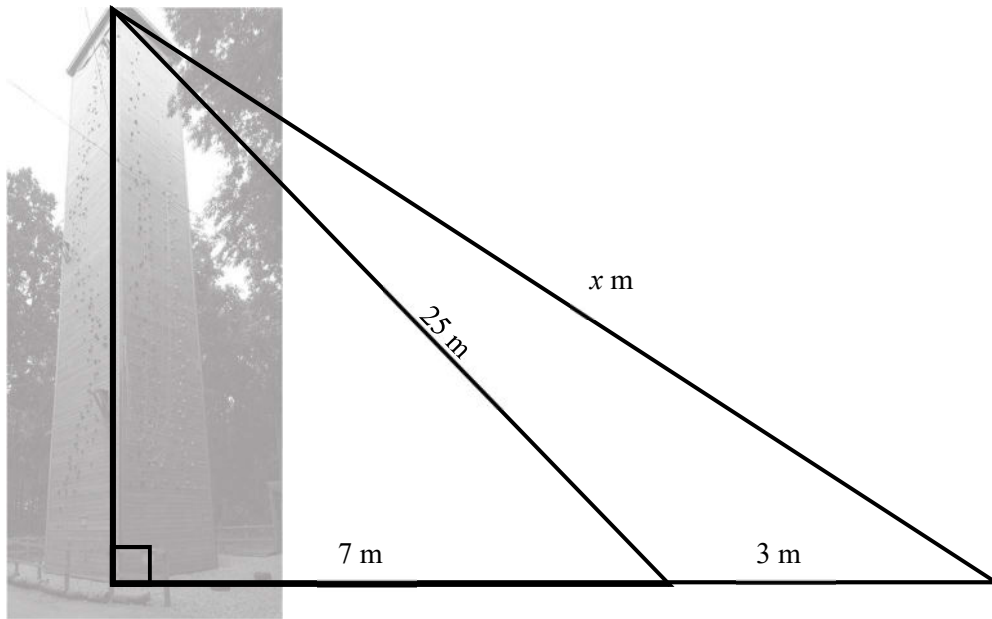
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[3]

15. The Bourdillon Tower in the woods at Gresham's has guy ropes to keep it steady. The length of one guy rope is 24m and is 7m from the base of the tower. Another guy rope is placed 3m



further away from the tower in the same plane as per the diagram.

Calculate the length of the Guy rope marked  $x$ .

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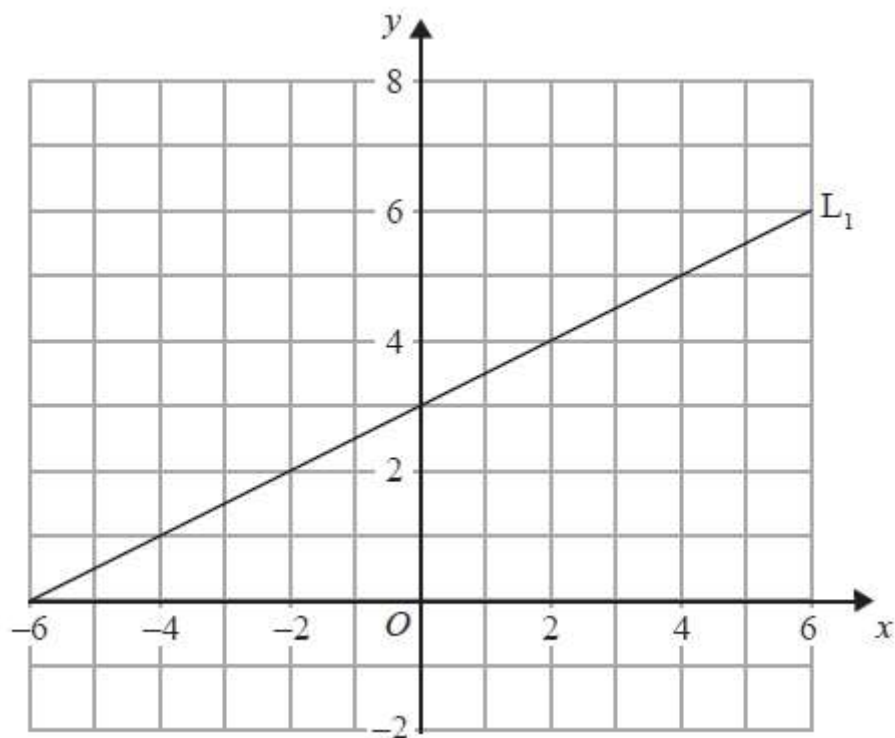
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[3]

16. The diagram shows a straight line,  $L_1$ , drawn on a grid.



A straight line,  $L_2$ , is parallel to the straight line  $L_1$  and passes through the point  $(0, -5)$ . Find an equation of the straight line  $L_2$ .

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17.

(a) A circle C has area  $2\pi \text{ cm}^2$ .

(i) Find the area of the circle correct to 5 significant figures.

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[3]

(ii) A square S has the same area as the circle C. Find the perimeter of the square.

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[3]

(b) A square T has a side length of 10cm, and a circle K has an area which is twice that of the square T. Find the circumference of the circle K.

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[3]

18.

$$\begin{array}{r} \text{T H I S} \\ + \quad \quad \text{I S} \\ \hline \text{H A R D} \end{array}$$

In the sum shown, different letters stand for different digits.

(a) Explain why the letter I must be at least equal to 5.

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[3]

(b) What must be the value of H.

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[3]

(c) What must be the value of T.

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[3]

**19.**

- (a) If the numbers 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14 are all multiplied together, how many zeros are at the end of the answer?

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[3]

- (b) How many zeros are at the end of the answer if all the numbers from 1 to 25 are multiplied together?

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[3]

**20.** The mean of three numbers  $x, y$  and  $z$  is  $x$ . What is the mean of  $y$  and  $z$ ?

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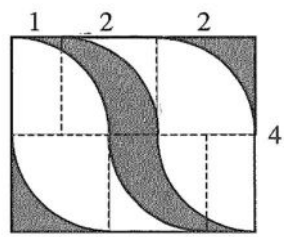
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[3]

21. The diagram shows a rectangle with sides of length 5 cm and 4 cm. All the arcs are quarter-circles of radius 2 cm. What is the total shaded area in  $\text{cm}^2$ ?



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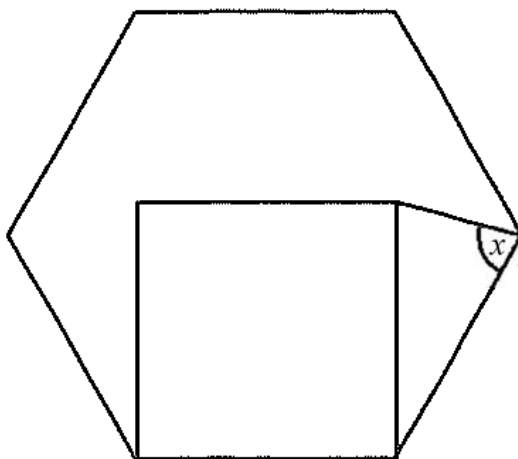
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[3]

22. The diagram shows a square inside a regular hexagon. What is the size of the angle marked



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