



13 + Entrance Examination

Maths Level 3 Non-Calculator Paper 2

Calculators are **not** allowed.

Use scrap paper to do your working and write the final answer on the line at the end of each question.

There are 22 questions here but the exact format of 13+ papers varies from school to school. This paper is designed to give you an idea of the kind of questions that might appear in an 13+ paper.

There are a total of 110 marks. You may find some questions easier than others. The questions in Section B are designed to make you think more; they are not necessarily more difficult than those in Section A.

Full name

SECTION A

1. (a) **Work out**

$$\frac{\sqrt{121}}{2.13 - 1.03}$$

_____ (3 marks)

- (b) **Multiply out** $x\left(\frac{1}{x} + x\right)$ **and use your answer to work out** $\sqrt{5}\left(\frac{1}{\sqrt{5}} + \sqrt{5}\right)$

_____ (4 marks)

2. **Calculate exactly:**

$$19.2 \times 6.43$$

_____ (3 marks)

3. **Write 0.064 as a fraction in its lowest terms.**

_____ (3 marks)

4. If $f(x) = \frac{3x-4}{2}$, work out:

(a) $f(-2)$

_____ (3 marks)

(b) x if $f(x) = -2$

_____ (3 marks)

5. Taking $\pi = \frac{22}{7}$, work out:

(a) The area of a circle with radius 7cm.

_____ (3 marks)

(b) The radius of a circle with circumference 33cm.

_____ (3 marks)

6. Multiply out the brackets and simplify :

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

_____ (3 marks)

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

_____ (3 marks)

7. Work out the following, giving your answers in standard form:

(a)

$$\frac{2 \times 10^3 \times 9 \times 10^4}{6,000,000,000,000,000}$$

_____ (3 marks)

(b) $6 \times 10^{-5} - 4 \times 10^{-6}$

_____ (3 marks)

8. A man leaves £27,000 in his will to be shared between his three children in the ratio 7 : 3 : 8. How much does each child get?

_____ (3 marks)

9. (a) What is the y coordinate of any point on the x -axis?

_____ (3 marks)

- (b) What is x coordinate of the point on the y -axis and on the line $y = 2x + 1$?

_____ (3 marks)

10. How many square metres are there in one square kilometre?

_____ (3 marks)

11. Work out the following fractions :

(a) $6\frac{1}{8} \div 1\frac{1}{6}$

_____ (3 marks)

(b) $2\frac{1}{4} + \frac{3}{4} \times 2\frac{1}{3}$

_____ (3 marks)

12. Solve these equations :

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

_____ (3 marks)

(b) $\frac{x-2}{2x+3} = 0$

_____ (3 marks)

(c) $\frac{3}{5}(x-2) - (2x+3) = -21$

_____ (3 marks)

13. A woman buys a length of silk for £40 and sells it for £55. What percentage profit does she make?

_____ (3 marks)

14. A mobile phone costs £60 deposit, and then £25 per month for 12 months.

(a) What is the total amount paid for the phone?

_____ (3 marks)

(b) What is the total amount paid after n months.

_____ (3 marks)

15. Make s the subject of the formula:

$$v^2 = u^2 + 2as$$

_____ (3 marks)

16. (a) Calculate the area of a sector of 18° from a circle with radius 2 cm, leaving π in your answer.

_____ (3 marks)

(b) Now, using a suitable approximation for π , find the area to one significant figure.

_____ (3 marks)

17. Find the value of x if $3^{\frac{1}{2}} \times 3^x = \sqrt{3}$

_____ (3 marks)

SECTION B

18. If three circular metal discs of equal thickness whose radii are 5cm, 20cm and 40cm are melted down to form one circular disc of the same thickness, find its radius.

_____ (5 marks)

19. A ball is dropped from a height of h metres on to the floor. The time it takes to stop bouncing is t seconds, where :

$$t = \left(\frac{1+e}{1-e} \right) \sqrt{\frac{h}{5}}$$

e is a number which measures the bounciness of the ball.

When the ball is dropped from a height of 3.2 metres it bounces for 3.2 seconds. Find the value of e .

_____ (5 marks)

20. A shopkeeper set the selling price of a small table at 40% above what it cost him. Then, seeing that it didn't sell, he decided to reduce its price by 10%. The final price was £9.45. How much did the table originally cost him?

_____ (5 marks)

21. A formula for the area of a triangle $A = \sqrt{s(s-a)(s-b)(s-c)}$ is:

$s = \frac{1}{2}(a+b+c)$ where a , b and c are the lengths of the sides of the triangle.

Calculate the area of a triangle with sides of lengths 7cm, 15cm and 20cm.

_____ (5 marks)

22. The length of a rectangle is 5 cm more than its width. If each side is increased by 2 cm, the area is increased by 70 cm^2 . Find the length and width of the original rectangle.

_____ (5 marks)

SECTION A Answers

1 (a) 10
(b) 6

2 123.456

3 $\frac{8}{125}$

4 (a) -5
(b) 0

5 (a) 154 cm^2
(b) 5.25 cm

6 (a) $9x^2 - 4$
(b) $9x - 4$

7 (a) 3×10^{-8}
(b) 5.6×10^{-5}

8 £10500 £4500 £12000

9 (a) 0
(b) 0

10 1,000,000

11 (a) $5\frac{1}{4}$ (b) 4

12 (a) -5 (b) 2 (c) 12

13 37.5%

14 (a) £360 (b) $25n + 60$

15 $s = \frac{v^2 - u^2}{2a}$

16 $\frac{\pi}{5}$

17 -1

SECTION B Answers

18 $(5^2 + 20^2 + 40^2)\pi h = r^2\pi h \Rightarrow 1^2 + 4^2 + 8^2 = \frac{r^2}{5^2} \Rightarrow 81 \times 25 = r^2 \Rightarrow r = 9 \times 5 = 45\text{cm}$

19 $\frac{3}{5}$

20 £7.50

21 42 cm^2 using $s = 21$

22 $w(w + 5) + 70 = (w + 2)(w + 7)$ so $w = 14$

So the rectangle is 14 cm by 19 cm

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