# GCSE
# MATHEMATICS (8300)
# HIGHER

Number

Total number of marks: 33 per optional item

**Instructions:**

- This test was designed so that the first 5 questions are assessed without calculator.

**Q5**

Write 36 as a product of prime factors.

Give your answer in index form.

$2^2 \times 3^2$

36

18  ②

9  ②

③ ③

**(Total 3 marks)**

**Q7**

$\frac{3}{5}$ of a number is 162

Work out the number.

$\frac{3}{5}x = 162$

$x = 270$

**(Total 2 marks)**

**Q8**

Work out the value of $(3^{12} \div 3^5) \div (3^2 \times 3)$

$\frac{3^{12}}{3^5} = 3^7 \rightarrow 3^7 \div (3^2 \times 3)$

$\Rightarrow 3^7 \div (3^3)$

$\Rightarrow 3^{7-3} = 3^4 = 81$

**(Total 3 marks)**

**Q16**

Circle the number that is closest to the value of $29^3$

27 000        90        2700        9000

**(Total 1 mark)**

$30^3 = 30 \times 30 \times 30 = 27000$

**Q5**

Work out $8\dfrac{1}{2} \div 2\dfrac{2}{3}$

Give your answer as a mixed number.

$\dfrac{17}{2} \div \dfrac{8}{3} = \dfrac{17}{2} \times \dfrac{3}{8} = \dfrac{51}{16}$

$\Rightarrow 3\dfrac{3}{16}$

**(Total 4 marks)**

**Q6**

To the nearest pound, Jon has £9

To the nearest 50p, Ellie has £6.50

$9.49 + 6.74 = 16.23$

Work out the maximum possible total amount of money.

Answer £ 16.23

**(Total 3 marks)**

**Q22**

Show that $(5\sqrt{3} - \sqrt{12})^2$ simplifies to an integer.

**(Total 3 marks)**

$(5\sqrt{3} - \sqrt{12})(5\sqrt{3} - \sqrt{12})$

$75 - 5\sqrt{36} - 5\sqrt{36} + 12$

$\Rightarrow 87 - 10\sqrt{36}$

$\Rightarrow 87 - 10(6) = 87 - 60 = \underline{27}$

**Q15a**

| Meal Deal |
| :---: |
| Choose one sandwich, one drink and one snack |

There are

    7 different sandwiches

    5 different drinks

    and

    3 different snacks.

(a)   How many different Meal Deal combinations are there?

**(Total 2 marks)**

$7 \times 5 \times 3 = 105$ different meal deal combinations

**Q11**

Work out

    cube root of 512 : reciprocal of 0.4

Give your answer in the form   $n : 1$

$\sqrt[3]{512} = \dfrac{1}{0.4}$

$\dfrac{\frac{1}{4}}{10} = \dfrac{10}{4}$

$\Rightarrow \quad 8 = \dfrac{10}{4}$

$\Rightarrow 3.2 = 1$

Answer    __3.2__    :    __1__

**(Total 3 marks)**

**Q15**

When you earn money you pay income tax.

The amount you pay depends on how much you earn that year.

You pay

minimum tax for those in the 20%
bracket = 20% of 37500 = £7500

0% on the first £12 500 you earn

20% on the next £37 500 you earn — min. salary for those in the 40%
bracket = 40% of 112500 = £45000

40% on the next £112 500 you earn.

One year, Kim paid £9260 income tax.

∴ we know she falls under the 20%
bracket

Work out how much she earned that year.

**(Total 4 marks)**

$$20\% \times \text{Kim's salary} = 9260$$
$$\Rightarrow \quad \text{Kim's salary} = £46,300$$

**Q6**

Show that 268 can be written as the sum of a power of 3 and a square number.

**(Total 2 marks)**

$$268 = 3^5 (243) + 5^2 (25)$$
$$= \boxed{3^5 + 5^2}$$

**Q27**

Prove algebraically that $2.7\dot{5}$ converts to the fraction $\dfrac{124}{45}$

**(Total 3 marks)**

$x = 2.75555555$

$10x = 27.55555$

$100x = 275.5555$

$100x - 10x \Rightarrow 100x = 275.555$
$10x = 27.555$

$\Rightarrow 90x = 248$

$x = \dfrac{248}{90} \div 2$

$\therefore x = \dfrac{124}{45}$