

1 NUMBER – Further Maths

Section 1.1

Q1. Write this ratio in its simplest form $\sqrt{12} : \sqrt{48} : \sqrt{300}$ (3 marks)

Q2. The n th term of a sequence is $n^2 + 12n + 27$

By factorising, or otherwise, show that the 20th term can be written as the product of two prime numbers. (2 marks)

Q3. The value of x is 50% **more** than the value of t .
The value of y is 10% **less** than the value of w .

$x = y$ Work out $\frac{t}{w}$ Give your answer as a decimal. (4 marks)

Q4. You are given that $m : n = 2 : 5$

(a) Write m in terms of n . (1 mark)

(b) You are also given that $a : b = 10m : 3n$

Work out $a : b$ where a and b are integers. (2 marks)

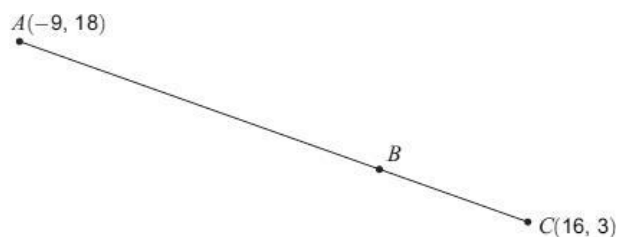
Q5. $(x + 1)$ is increased by 20% Its value is now the same as $(x + 6)$

Work out the value of x . (3 marks)

Q6. $a : b : c = 5 : 3 : 2$

Work out $4a - c : 3b$ Give your answer in its simplest form. (2 marks)

Q7. ABC is a straight line. BC is 20% of AC .



Work out the coordinates of B . (4 marks)

Q8. A bag contains $5x$ red balls and $2x$ blue balls.

The number of red balls is **decreased** by 20%

The number of blue balls is **increased** by 30%

There are now 35 **more** red balls than blue balls in the bag.

Work out the value of x .

(4 marks)

Q9. a , b and c are numbers such that

$$a < 0$$

$$b > 1$$

$$-1 < c < -1$$

Tick the correct box for each statement.

	Always true	Sometimes true	Never true
$a^3 < 0$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
$b < 10a^2$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
$ab > 0$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
$b - c > 1$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

(4 marks)

Q10. a and b are both **square** numbers greater than 1

$ab - 11b$ is also a **square** number.

By factorising $ab - 11b$, work out one possible pair of values for a and b .

You **must** show your working.

(2 marks)

Q11.

$$P = 4x \text{ and } Q = 7x$$

P **increases** by 25%

Q **decreases** by 40%

Now, P is 28 greater than Q .

Work out the value of x .

(4 marks)

- Q12.** p, q and r are all integers greater than 1
 $pqr = 1365$

Work out one possible set of values for p, q and r . (2 marks)

- Q13.** $5m$ is decreased by 40% The answer is $(m + 1)$

Work out the value of m . (2 marks)

- Q14.** A cone has $\text{volume} = \frac{320}{9} \pi \text{ cm}^3$

$$h : r = 5 : 3$$

$$\text{Volume of a cone} = \frac{1}{3} \pi r^2 h$$

where r is the radius of the base and h is the perpendicular height.

Work out the radius of the base. (3 marks)

- Q15.** Work out the value of $\sqrt{\frac{r-49}{r+39}}$ when $r = 1.3 \times 10^2$ (2 marks)

- Q16.** $\frac{1}{5}$ of $3a = 35\%$ of $(a + 6)$ Work out the value of a . (3 marks)

Section 1.2

- Q1.** How many integers between 200 000 and 400 000 can be formed using only the digits
1 2 3 5 8 9 with no repetition of any digit? (2 marks)

- Q2.** Miriam's date of birth is 14/09/2006

She makes a 4-digit number code using digits from her date of birth.

The 4-digit number she makes must
not start with 0
have all different digits.

How many codes can she make? (3 marks)

Q3. Integers are made using some or all of the digits 1, 2, 3, 4, 5 and 6

Each integer made

is greater than 50 000

has no digit repeated.

How many integers can be made?

(3 marks)

Q4. How many **odd** numbers greater than 30 000 can be formed from these digits

2 4 6 7 8

with no repetition of any digit?

(3 marks)

Section 1.3

Q1. Write this ratio in its simplest form $\sqrt{12} : \sqrt{48} : \sqrt{300}$ **(3 marks)**

Q2. Write $\frac{5\sqrt{2}}{3\sqrt{6}-7}$ in the form $\sqrt{w} + \sqrt{k}$ where w and k are integers. **(5 marks)**

Q3. Write $\sqrt{500} - 2\sqrt{45}$ in the form $a\sqrt{5}$ where a is an integer. **(2 marks)**

Q4. Solve $y(\sqrt{3} - 1) = 8$

Give your answer in the form $a + b\sqrt{3}$ where a and b are integers. **(4 marks)**

Q5. Solve $\sqrt{125} + \sqrt{20} = \sqrt{80} + \sqrt{x}$ **(3 marks)**

Q6. Simplify fully $\frac{24 - \sqrt{300}}{4\sqrt{3} - 5}$ Give your answer in the form $a\sqrt{b}$ where a and b are integers. **(5 marks)**

Q7. Solve $(3 - \sqrt{x})^{\frac{1}{3}} = -2$ **(3 marks)**

Q8. Write $(1 + 2\sqrt{5})(4 - \sqrt{5})$ in the form $a + b\sqrt{5}$ where a and b are integers. **(2 marks)**

Q9. A linear sequence has first term $7 + 12\sqrt{5}$

add $9 - 2\sqrt{5}$

The term-to-term rule is

One term of the sequence is an integer. Work out the value of this integer. **(2 marks)**

Q10. Rationalise the denominator and simplify fully $\frac{21 - 11\sqrt{5}}{3 - \sqrt{5}}$ **(4 marks)**

Q11. Rationalise and simplify fully $\frac{\sqrt{3}}{3 + \sqrt{3}}$ **(3 marks)**

Q12. Rationalise and simplify $\frac{\sqrt{3} - 7}{\sqrt{3} + 1}$

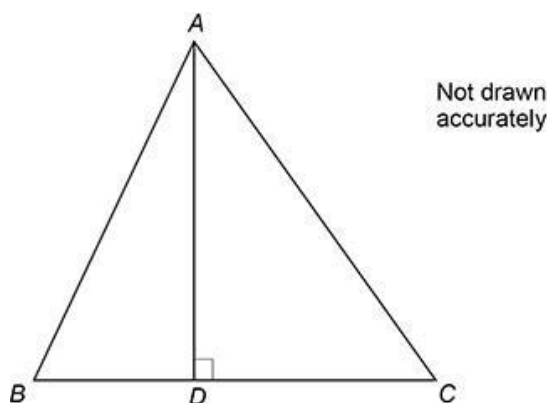
Give your answer in the form $a + b\sqrt{3}$ where a and b are integers. **(4 marks)**

Q13. Simplify $\sqrt{3}(\sqrt{75} + \sqrt{48})$ writing your answer as an integer. **(2 marks)**

Q14. Simplify fully $\frac{\sqrt{600} - \sqrt{54}}{\sqrt{24}}$ **(3 marks)**

Q15. ABC is a triangle. The perpendicular from A meets BC at D .

$$BC = (6 + 2\sqrt{7}) \text{ cm}$$



Area of triangle $ABC = (13 + 3\sqrt{7}) \text{ cm}^2$
Work out the length, in cm, of AD .

Give your answer in the form $a + b\sqrt{c}$ where a , b and c are integers. **(5 marks)**

