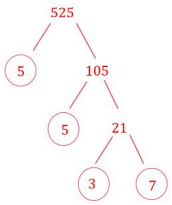
Q1

1

Either a factor tree or repeated division could be used here.

Start with the number 525 and choose any two numbers that multiply together to make 525.
Break it down into these two numbers and circle any prime numbers.

Repeat this with the next numbers until all of the values are prime numbers and cannot be broken down any further.



Correct method [1]
All factors c*orrect* [1]

The answer will be the same regardless of the factors chosen in the first step.

Write the prime numbers out as a product, any repeated prime numbers can be written as a power.

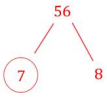
$3 \times 5^2 \times 7$ [1]

Q2

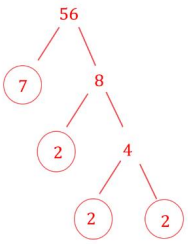
2

Either a factor tree or repeated division could be used here.

Start with the number 56 and choose any two numbers that multiply together to make 56.
Break it down into these two numbers and circle any prime numbers.



Repeat this with the next numbers until all of the values are prime numbers and cannot be broken down any further.



Correct method [1]

The answer will be the same regardless of the factors chosen in the first step.

Write the prime numbers out as a product, any repeated prime numbers can be written as a power.

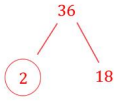
$2^3 \times 7$ [1]

Q3

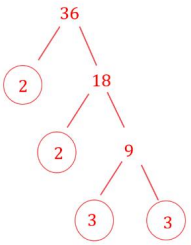
3

Either a factor tree or repeated division could be used here.

Start with the number 36 and choose any two numbers that multiply together to make 36.
Break it down into these two numbers and circle any prime numbers.



Repeat this with the next numbers until all of the values are prime numbers and cannot be broken down any further.



Correct method [1]

The answer will be the same regardless of the factors chosen in the first step.

Write the prime numbers out as a product, any repeated prime numbers can be written as a power.

$2^2 \times 3^2$ [1]

Q4

4

Find the lowest common multiple (LCM) of 9 and 12.
List the multiples of both numbers.

9 , 18, 27, 36, 45, 54, ...

12 , 24, 36, ...

1 mark for each correct list [2]

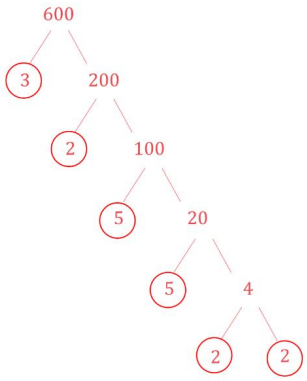
The smallest number that is in both lists is 36.
The next time will be after 36 minutes.

9.36 am [1]

Q5

5

Start by splitting 600 up as 3 times 200
Repeat this, splitting each number up using a prime factor



Correct method [1]
All factors correct [1]

$600 = 2^3 \times 3 \times 5^2$ [1]

Q6

6

8 as a product of primes is 2^3. So multiplying by 8 is the same as multiplying by 2^3.

$$8A = 8 \times 2^n \times 3 \times 5^m$$
$$= 2^3 \times 2^n \times 3 \times 5^m$$

[1]

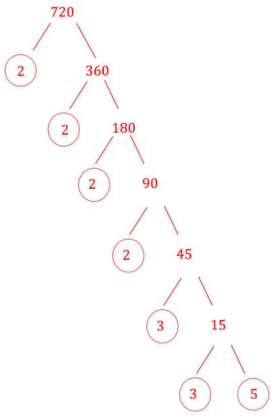
Use the laws of indices to write "$2^3 \times 2^n$" as one power (add the powers).

$8A = 2^{3+n} \times 3 \times 5^m$ [1]

Q7

7a

Use factor tree method or repeated division. E.g.



[1]

$720 = 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 5 = 2^4 \times 3^2 \times 5$ [1]
You can write the final answer in either of the above forms

7b

Method 1

If your answer to (a) is written in the form "2 × 2 × 2 × 2 × 3 × 3 × 5" then we can rearrange this to

$$[2 \times 2 \times 3] \times [2 \times 2 \times 3] \times 5$$

[2 × 2 × 3] × [2 × 2 × 3] is already square so to make the full number square we would need to multiply by another 5 so the number becomes

$$[2 \times 2 \times 3 \times 5] \times [2 \times 2 \times 3 \times 5]$$

Using your calculator to evaluate this number gives

3600 [1]

Method 2

If your answer to (a) is written in the form "$2^4 \times 3^2 \times 5$" then we can see that "$2^4 \times 3^{2}$" is already square (all even powers are square numbers, $2^4 \times 3^2 = [2^2 \times 3] \times [2^2 \times 3]$)

To make the full number square, we would need to multiply by another 5 so the number becomes

$$2^4 \times 3^2 \times 5^2$$

Using your calculator to evaluate this number gives

3600 [1]

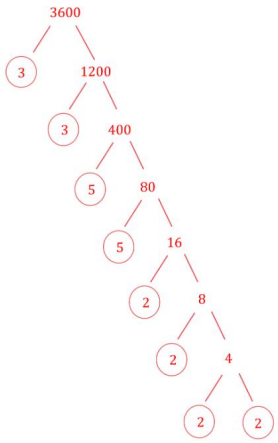
Q8

8

Rewrite without standard form

$$3.6 \times 10^3 = 3.6 \times 1000 = 3600$$

Use a factor tree to break down 3600 into its prime factors



At least 2 correct stages [1]

3600 = 2×2×2×2×3×3×5×5

At least 2 correct stages [1]

3600 = 2×2×2×2×3×3×5×5

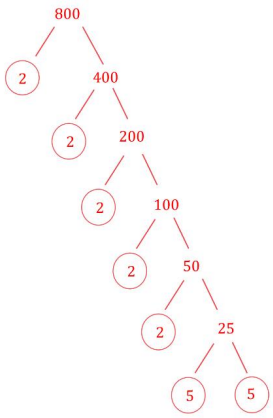
[1]

$3600 = 2^4 \times 3^2 \times 5^2$ [1]

Q9

9

Use factor tree method or repeated division. E.g.



[1]

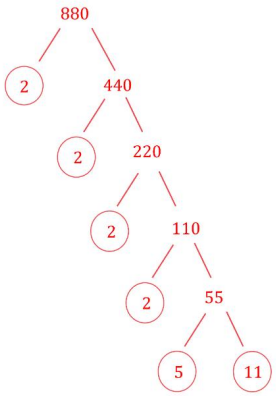
800 = 2 × 2 × 2 × 2 × 2 × 5 × 5

800 = $2^5 \times 5^2$ [1]

Q10

10

Use factor tree method or repeated division. E.g.



At least 2 stages correct [1]

880 = 2 × 2 × 2 × 2 × 5 × 11

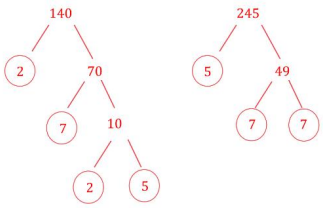
[1]

880 = $2^4 \times 5 \times 11$ [1]

Q11

11

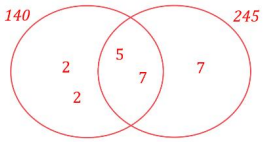
Find the prime factor decomposition of 140 and 245



$140 = 2 \times 2 \times 5 \times 7 = 2^2 \times 5 \times 7$
$245 = 5 \times 7 \times 7 = 5 \times 7^2$

[1]

We can show the prime factors in a Venn diagram



To find the highest common factor from the Venn diagram, multiply the numbers in the overlapping section in the middle

$5 \times 7 = 35$

HCF = 35 [1]

Alternatively, you could make a list of all the factors of both numbers, and compare the lists. However, it can be easy to miss a pair of factors like this.

Q12-13

12

The answer cannot be 5, as 5 is only a multiple of 5, and not 15 or 25 (although it is a factor of 15 and 25)

The answer cannot be 45 as 45 is not a multiple of 25

75 and 150 are both multiples of 5, 15, and 25, but 75 is the lowest

The answer is therefore 75 [1]

13

The answer cannot be 10, as 10 is a factor of 20, 30, 40, rather than a multiple

120, 240, and 24 000 are all multiples of 20, 30, and 40, but 120 is the lowest

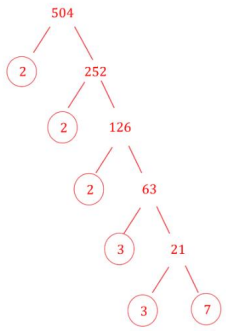
As this is a calculator question, you can divide 120 by 20, 30, and 40 to check

The answer is therefore 120 [1]

Q14

14

Start with the number 504 and choose any two numbers that multiply together to make 504.
Break it down into these two numbers and circle any prime numbers.



Correct factors [2]

Write the prime numbers out as a product, any repeated prime numbers can be written as a power.

$2^3 \times 3^2 \times 7$ [1]

Q15

15

The number we are given, 177 147 000 000, is 177 147 multiplied by 1 million (6 zeros)

1 million can be written as 10^6

As 177 147 = 3^{11}, we can write 177 147 000 000 as $3^{11} \times 10^6$

$$177\,147\,000\,000 = 3^{11} \times 10^6$$

[1]

We can then split 10 up into its prime factors

$$3^{11} \times 10^6 = 3^{11} \times (5 \times 2)^6$$

[1]

Expand this, remembering that the power will be applied to both terms in the bracket, as they are multiplied (this would not be true if it was $(5+2)^6$ however!)

$$3^{11} \times (5 \times 2)^6 = 3^{11} \times 5^6 \times 2^6$$

$3^{11} \times 5^6 \times 2^6$ [1]

Q16

16

Carla runs every 3 days, and swims every Thursday, which means that she swims every 7 days

So we need to find the lowest common multiple of 3 and 7

Write out several multiples of each

3, 6, 9, 12, 15, 18, **21**
7, 14, **21**

Listing multiples [1]

21 is the lowest common multiple of 3 and 7, so after 21 days, Carla will run and swim on the same day

Identifying 21 [1]

9th November + 21 days = 30th November

30th November [1]