EXAM PAPERS PRACTICE

Numbers & Accuracy

Model Answers

Question 1

Find the lowest common multiple (LCM) of 20 and 24. [2]

Multiples of 20

$$20, 40, 60, 80, 100, 120, 140, 160, 180, 200, 220, 240, \ldots$$

Multiples of 24

$$24, 48, 72, 96, 120, \ldots$$

We can see that the LCM is

$$= \mathbf{120}$$

Question 2

Without using your calculator and by rounding each number correct to 1 significant figure, estimate the value of

$$\frac{10.3 \times 19.5}{88.9 - 43.2}.$$

You must show all your working. [2]

To find an approximation, we can round all of these numbers to the nearest 10 (to 1 significant figure).

$$\frac{10.3 \times 19.5}{88.9 - 43.2}$$

$$\approx \frac{10 \times 20}{90 - 40}$$

$$\approx \frac{200}{50}$$

$$\approx \mathbf{4}$$

Question 3

Write these in order of size, smallest first.

0.6^3 $\quad$ 0.22 $\quad$ $\sqrt{0.09}$ $\quad$ 0.4^2 $\quad$ [2]

Work them out: $\quad$ 0.216 $\quad$ 0.22 $\quad$ 0.3 $\quad$ 0.16

In order: $\quad$ $\mathbf{0.4^2}$, $\mathbf{0.6^3}$, $\mathbf{0.22}$, $\mathbf{\sqrt{0.09}}$

Question 4

The probability that it will rain on any day is $\frac{1}{5}$.

Calculate an estimate of the number of days it will rain in a month with 30 days. [1]

To get the estimate, multiply the number of days in a month by the probability that is will rain on any given day.

$$30\ days \times \frac{1}{5}$$

$$= \mathbf{6\ days}$$

Question 5

A lake has an area of 63 800000 000 square metres.

Write this area in square kilometres, correct to 2 significant figures. [2]

In standard form

$$63\,800\,000\,000 = 6.38 \times 10^{10}$$

Convert to km

$$6.38 \times 10^{10} \div 1000^2$$

$$= 6.38 \times 10^8 \div 10^6$$

$$= \mathbf{6.4 \times 10^4}$$

Question 6

210 211 212 213 214 215 216

From the list of numbers, find

(a) a prime number, [1]

A prime number is a number which is only divisible by 1 or itself.

To work out a prime number, we first exclude all the even numbers from the list since they are divisible by 2.

The rest of the numbers are: 211, 213, 215

Our of these numbers, 215 is divisible by 5 and 213 is divisible by 3.

Therefore, the prime number is 211.

(b) a cube number. [1]

To work out if a number is a cube number, we can calculate its cube root and see If it is an integer.

$\sqrt[3]{210} = 5.94$

$\sqrt[3]{211} = 5.95$

$\sqrt[3]{212} = 6.96$

$\sqrt[3]{213} = 5.97$

$\sqrt[3]{214} = 5.98$

$\sqrt[3]{215} = 5.99$

$\sqrt[3]{216} = 6$

Therefore, the cube number is 216.

Question 7

Which of the following numbers are irrational?

$\frac{2}{3}$ $\sqrt{36}$ $\sqrt{3} + \sqrt{6}$ π 0.75 48% $8^{\frac{1}{3}}$ [2]

A rational number can be expressed as a fraction of two integers.

Numbers which are not rational are irrational.

Hence we can see that the following numbers are rational:

$$\frac{2}{3}$$

$$0.75 = \frac{3}{4}$$

$$48\% = 0.48 = \frac{48}{100} = \frac{12}{25}$$

If we take the roots of the next numbers, we can also see

that they are rational:

$$\sqrt{36} = 6 = \frac{6}{1}$$

$$8^{\frac{1}{3}} = 2 = \frac{2}{1}$$

However certain numbers cannot be expressed as a

fraction of two integers:

$$\pi = 3.14159\ldots$$

$$\sqrt{3} = 1.73205\ldots$$

Hence the irrational numbers:

$$\boldsymbol{\pi \quad and \quad \sqrt{3} + \sqrt{6}}$$

Question 8

Write 0.00658

(a) in standard form, [1]

6.58×10^{-3}

(b) correct to 2 significant figures. [1]

0.0066

Question 9

$$p = \frac{0.002751 \times 3400}{(9.8923 + 24.7777)^2}.$$

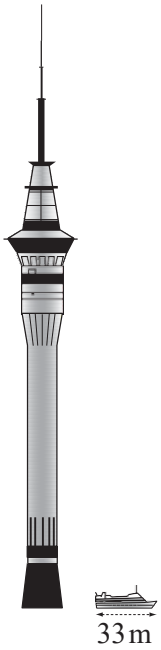
(a) In the spaces provided, write each number in this calculation correct to 1 significant figure. [1]

$$\frac{\mathbf{0.003 \times 3000}}{\mathbf{(10 + 20)^2}}$$

(b) Use your answer to **part (a)** to **estimate** the value of p. [1]

$$\boldsymbol{p \approx 0.01}$$

Question 10



The picture shows the Sky Tower in Auckland.
Alongside the tower is a boat. The boat is 33 metres long.
Use the length of the boat to estimate the height of the Sky Tower. [2]

Using a ruler, we can estimate the height of the tour as approximately

=**330 m.**

Question 11

The area of a small country is 78 133 square kilometres.

(a) Write this area correct to 1 significant figure. [1]

To round to 1 significant figure, look at the second (in this case 8) and round the 1st significant figure up if the 2nd is 5 or greater.

In this case we will need several "place-holder" zeroes to keep the number the right size (these zeroes are NOT significant).

So: 78133

$= \mathbf{80000}$ **square kilometres**

(b) Write your answer to **part (a)** in standard form. [1]

To write in Standard Form put a decimal point after the first non-zero number and multiply by 10^n where n is the number of times you have to move the decimal point. For small numbers (< 1) n is negative, for large numbers (> 1) n is positive.

In this case the first (and only) non-zero number is 8 and the decimal point is moved 4 places. The number is > 1 so we use $+4$ as the power of 10.

$$80000$$

$$= \mathbf{8 \times 10^4}$$

Question 12

The altitude of Death Valley is 086 metres.
The altitude of Mount Whitney is 4418 metres.
Calculate the difference between these two altitudes. [1]

The difference is:

4418 – (-86)

= **4504**

Question 13

$\mathcal{E} = \{-2\frac{1}{2},\ -1,\ \sqrt{2},\ 3.5,\ \sqrt{30},\ \sqrt{36}\}$

$X = \{\text{integers}\}$
$Y = \{\text{irrational numbers}\}$
List the members of

(a) X, [1]

X = {integers = -1, $\sqrt{36}$ = 6}

(b) Y. [1]

Y = {irrational numbers = $\sqrt{2}$, $\sqrt{30}$}

Question 14

Complete this table of squares and cubes.
The numbers are not in sequence. [3]

Number	Square	Cube
3	9	27
.....	121	.....
.....	.....	2744
.....	.....	0343

$\sqrt{121}$ = $\pm$**11**,

11^3 = $\pm$**1331**

$\sqrt[3]{2744}$ = **14**,

14^2 = **196**

$\sqrt[3]{(-343)}$ = **-7**,

$(-7)^2$ = **49**

Question 15

By writing each number correct to 1 significant figure, estimate the value of $\frac{\sqrt{3.9} \times 29.3}{8.9 - 2.7}$.

Show all your working. [2]

Write all numbers correct to one significant figure:

$$\frac{\sqrt{4} \times 30}{9 - 3}$$

Do the calculations.

$$\frac{2 \times 30}{6} = \frac{60}{6}$$

We get the final answer:

10

Question 16

Work out the highest common factor (HCF) of 36 and 90. [2]

Prime factorization of 36 and 90:

$$36 = 2 \times 2 \times 3 \times 3$$

$$90 = 2 \times 3 \times 3 \times 5$$

Both numbers contain numbers 2 least once and three at least twice.

The highest common factor is the product of these prime numbers

$$HCF = 2 \times 3 \times 3 = \mathbf{18}$$

Question 17

Write down the difference in temperature between 8°C and −9°C. [1]

Subtract the temperature readings to get the temperature difference:

$$difference = 9°C - (-8°C)$$

$$difference$$

$$= \mathbf{17°C}$$

Question 18

Write 168.9 correct to 2 significant figures. [1]

The third significant figure (8) is greater than 4, so we need to round up.

The number correct to 2 significant figures is

170.

Question 19

11 12 13 14 15 16

From the list of numbers, write down

(a) the factors of 60, [1]

There are two factors of 60.

$$\frac{60}{12} = 5 \quad and \quad \frac{60}{15} = 4$$

Therefore **12 and 15**.

(b) the prime numbers. [1]

There are two prime numbers

11 and 13.

Other number are not prime:

$$12 = 3 \times 4 \; ; \; 14 = 2 \times 7 \; ; \; 15 = 3 \times 5 \; ; \; 16 = 4 \times 4$$

Question 20

At noon the temperature was 4 °C.
At midnight the temperature was –5.5 °C.

Work out the difference in temperature between noon and midnight. [1]

Subtract the temperature readings to get the temperature difference:

$$difference = noon - midnight = 4 - (-5.5)$$

$$difference = \mathbf{9.5}$$

Question 21

(a) Write 30 as a product of its prime factors. [2]

Number 30 is divisible by 2 (2 is a prime number).

$$30/2 = 15$$

We are left with number 15. This number can be easily split into a product of two prime numbers.

$$15 = 3 \times 5$$

Therefore:

$$30 = \mathbf{2} \times \mathbf{3} \times \mathbf{5}$$

(b) Find the lowest common multiple (LCM) of 30 and 45. [2]

Prime factorization of 30 and 45:

$$30 = 2 \times 3 \times 5$$

$$45 = 3 \times 3 \times 5$$

Both numbers contain numbers 3 and 5 at least once (red).

The number 30 contains one extra number 2 (green) and the number 45 contains number 3 one more time (blue). The LCM is therefore

$$LCM = 3 \times 5 \times 2 \times 3$$

$$= \mathbf{90}$$

Question 22

Find the lowest common multiple (LCM) of 24 and 32. [2]

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Prime factorization of 24 and 32:

$$24 = 2 \times 2 \times 2 \times 3$$

$$32 = 2 \times 2 \times 2 \times 2 \times 2$$

Both numbers contain number 2 at least three times (red).

The number 24 contains one extra number 3 (green) and the number 32 contains number 2 two more times (blue). The LCM is therefore

$$LCM = 2 \times 2 \times 2 \times 3 \times 2 \times 2 = 96$$

$$\boldsymbol{LCM = 96}$$

Question 23

Write 15.0782 correct to

(a) one decimal place, [1]

We can round 15.0782 to 1 decimal place like this:

Looking at 15.0782 it's either going to round to 15.0 or 15.1 – the rule regarding this is that if the next digit is 5 or above, it'll round up (to 1), and if it's below 5 then it'll round down (to 0)

So the answer is 15.1.

(b) the nearest 10. [1]

We can round 15.0782 to the nearest 10 like this:

Any number above 15 will round to 20, and anything below 15 will round to 10

15.0782 > 15

so we round it to 20.

Question 24

Insert **one pair** of brackets only to make the following statement correct.

$$6 + 5 \times 10 - 8 = 16$$

[1]

$\mathbf{6 + 5 \times (10 - 8)}$

$\mathbf{= 16}$

Question 25

(a) Write 90 as a product of prime factors. [2]

$$90 = 2 \times 45$$

$$= 2 \times 3 \times 15$$

$$= \mathbf{2 \times 3 \times 3 \times 5}$$

(b) Find the lowest common multiple of 90 and 105. [2]

Multiples of 90 are:

$$90, 180, 270, 360, 450, 540, 630, 720, \ldots$$

Multiples of 105 are:

$$105, 210, 315, 420, 525, 630, \ldots$$

We can see that the LCM is:

$$\mathbf{630}$$

Question 26

$$p = \frac{4.8 \times 1.98276}{16.83}$$

(a) In the spaces provided, write each number in this calculation correct to 1 significant figure. [1]

$p = \frac{5 \times 2}{20}$

For 4.8, we look at its decimal place and see that it is greater than or equal to 5.

$(8 \geq 5)$

Therefore, we can approximate 4.8 to 5, the next digit after 4, to give 1 significant figure.

(b) Use your answer to **part (a)** to estimate the value of p. [1]

$p = \frac{10}{20}$

This fraction can be simplified to estimate:

$p = 0.5 = \frac{1}{2}$

Question 27

(a) Write 569000 correct to 2 significant figures. [1]

570 000

(b) Write 569 000 in standard form. [1]

5.69×10^5

Question HY

In March 2011, the average temperature in Kiev was 3°C.
In March 2012, the average temperature in Kiev was 19°C lower than in March 2011.

Write down the average temperature in Kiev in March 2012. [1]

$3 - 19$

$= -16$

Question 29

Calculate $\frac{5.27 - 0.93}{4.89 - 4.07}$.

Give your answer correct to 4 significant figures. [2]

Enter the calculation into a calculator:

$$\frac{5.27 - 0.93}{4.89 - 4.07}$$

$$= \frac{4.34}{0.82}$$

$$= \mathbf{5.293}$$

Question 30

One January day in Munich, the temperature at noon was 3°C.
At midnight the temperature was –8°C.

Write down the difference between these two temperatures. [1]

Here we need to find the difference between two numbers – to do this we just have to take one away from the other.

$$3 - (-8) = 3 + 8 = 11$$

OR

$$(-8) - 3 = -11$$

Hence the difference is ± 11.

Question 31

The sum of the prime numbers less than 8 is equal to 17.

(a) Find the sum of the prime numbers less than 21. [2]

The prime numbers between 8 and 21 are: 11, 13, 17, 19

The sum of those numbers $= 11 + 13 + 17 + 19 = 60$

Therefore, the sum of all prime numbers under 21

$$= \mathbf{17 + 60 = 77}$$

(b) The sum of the prime numbers less than x is 58.

Find an integer value for x. [2]

The prime numbers up to 17 add up to 58 . Therefore, x must be a number higher than 17 but lower than or equal to the next prime number, 19

$$\boldsymbol{x = 18 \; or \; 19 \; or \; both}$$

Question 32

On a mountain, the temperature decreases by 6.5 °C for every 1000 metres increase in height.
At 2000 metres the temperature is 10 °C.

Find the temperature at 6000 metres. [2]

The difference in height is 4000m.

We take away 6.5˚C for each 1000m.

$$10 - 4 \times 6.5$$

$$= \mathbf{-16^{\circ}C}$$

Question 33

Write the following numbers correct to one significant figure.

(a) 7682 [1]

8000

(b) 0.07682 [1]

0.08

Question 34

Write each number correct to 1 significant figure and estimate the value of the calculation.
You must show your working.

$2.65 \times 4.1758 + 7.917$ [2]

$. 2.65 \times 4.1758 + 7.917$

$= 3 \times 4 + 8$

$= \mathbf{20}$

Question 35

p is the largest prime number between 50 and 100.
q is the smallest prime number between 50 and 100.

Calculate the value of $p - q$. [2]

The prime number that is closest to 100 (and less than 100) is 97.

The prime number closest to 50 (and larger than 50) is 53.

$$p = 97$$

$$q = 53$$

$$\rightarrow p - q$$

$$= \mathbf{44}$$

Question 36

Write down the next two prime numbers after 43. [2]

By using the definition of prime numbers – “Prime numbers are numbers that have two and only two factors,” we can see that the next two prime numbers after 43 are:

47 and 53

Question 37

Write down the next two prime numbers after 47. [2]

53, 59

Question 38

Write the number 1045.2781 correct to

(a) 2 decimal places, [1]

1045.28

(b) 2 significant figures. [1]

1000

Question 39

Write down

(a) an irrational number, [1]

$\sqrt{2}$

(b) a prime number between 60 and 70. [1]

61

A prime number is a number which has exactly two factors.

Question 40

Write down the next prime number after 89. [1]

97.

A prime number is a number which has exactly two factors.

Question 41

The table gives the average surface temperature (°C) on the following planets.

Planet	Earth	Mercury	Neptune	Pluto	Saturn	Uranus
Average temperature	15	350	−220	−240	−180	−200

(a) Calculate the range of these temperatures. [1]

The range of temperatures is the difference between the highest one,

350C and the lowest one, -240C.

Range = 350C – (-240)C

Range = 590C

(b) Which planet has a temperature 20 °C lower than that of Uranus? [1]

Uranus temperature = -200C

-200C – 20C = -220C

The answer is:

Neptune

Question 42

Write the number 2381.597 correct to

(a) 3 significant figures, [1]

The number correct to 3 significant figures is: 2380.

To correct to 3 significant figures, we count 3 digits from left to right in the number 2381.597.

The 3 digits are: 2, 3 and 8. The following digits after 8 is 1, which is not equal to 5 or greater, therefore we keep the third digit as 8. We replace the following digits with 0.

(b) 2 decimal places, [1]

The number correct to 2 decimal places is: 2381.60

In the number 2381.597, the second decimal place is 9. This digit is greater than 5, so we increase the preceding decimal by 1 and replace the rest of the decimal places with 0.

(c) the nearest hundred. [1]

The number correct to the nearest hundred is: 2400

The digit in the hundredths place in the number 2381.597 is 8. This digit is greater than 5, so we increase the preceding digit by 1 and replace the rest of the digits with 0.

Question 43

From the list of numbers $\frac{22}{7}$, π, $\sqrt{14}$, $\sqrt{16}$, 27.4, $\frac{65}{13}$ write down

(a) one integer, [1]

From the list, $\sqrt{16}$ = 4, an integer.

Similarly, $\frac{65}{13}$ = 5, an integer.

(b) one irrational number. [1]

Rational numbers represent all the numbers which may be represented as fractions of two integers.

Irrational numbers represent all the real numbers which are not rational.

In our case, **an irrational number would be**

π or $\sqrt{14}$.

Question 44

The table shows the maximum daily temperatures during one week in Punta Arenas.

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
2°C	3°C	1°C	2.5°C	–1.5°C	1°C	2°C

(a) By how many degrees did the maximum temperature change between Thursday and Friday? [1]

Temperature difference = 2.5 – (-1.5)

= 4 degrees.

(b) What is the difference between the greatest and the least of these temperatures? [1]

Greatest temp = 3, lowest temp = -1.5

Temperature difference = 3 – (-1.5)

= 4.5 degrees