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# Numeracy Reasoning Practice Test 2 - Answers

## Mark Scheme (1 mark for every correct answer)

Question Number	Correct Answer
1	A
2	C
3	B
4	A
5	E
6	E
7	E
8	B
9	D
10	B
11	E
12	A
13	D
14	E
15	B
16	D
17	C
18	A
19	E
20	B
21	A
22	D
23	B
24	A

## Definitions and Formulae

### ***Average (Mean)***

To calculate the average of a set of data we must add up (sum) all of the data values and then divide the result by the number of values:

$$\text{average} = \text{sum of the data values} \div \text{number of values}$$

### ***(Compound) growth/decay***

To calculate the compound growth/decay the following formula is used:

$$N = N_0 \times (\text{multiplier})^n, \text{ where:}$$

$N$  is the amount after  $n$  days/hours/years

$N_0$  is the initial amount

multiplier is the percentage change multiplier. Multiplier is obtained by adding (or subtracting) the percentage change value when there is an increase (or decrease) to (from) 100% and then changed into a decimal number.

$n$  is the number of days/hours/years

### ***Expressing one quantity as a percentage of another***

To express one quantity (A) as a percentage of another (B), A should be divided by B and multiplied by 100, i.e.  $\frac{A}{B} \times 100$ .

### ***Percentage change (increase or decrease)***

To calculate a percentage change (increase or decrease) as a percentage, the following formula can be used:  $\frac{\text{new number} - \text{original number}}{\text{original number}} \times 100$ .

If the answer is negative then this is a percentage decrease, if positive then it is an increase.

### ***Ratio***

A ratio compares the amount of two items  $a$  and  $b$  and is written in the form  $a:b$ .

## Guidance for Answering the Questions

### Question 1

*If needed, please refer to the formula on how to calculate the average of numbers on page 2.*

Over 5 months there was  $£9,000 + £8,000 + £8,400 + £7,500 + £6,900 = £39,800$  turnover from hot drink.

The average monthly turnover from hot drink over the 5 month period is:  $\frac{£39,800}{5} = £7,960$ .

The answer is A (£7,960).

### Question 2

There are two types of drink at the Café: hot and cold.

The turnover from drink in January was  $£9,000 + £3,000 = £12,000$ .

The turnover from drink in February was  $£8,000 + £4,800 = £12,800$ .

The turnover from drink in March was  $£8,400 + £4,900 = £13,300$ .

The turnover from drink in April was  $£7,500 + £5,000 = £12,500$ .

The turnover from drink in May was  $£6,900 + £6,200 = £13,100$ .

The greatest turnover from drink of £13,300 was in March.

The answer is C (March).

### Question 3

*If needed, please refer to the definition and formula on how to calculate the percentage change on page 2.*

There are two types of food at the Café: hot and cold.

The turnover from food in March was  $£8,000 + £3,000 = £11,000$ .

The turnover from food in April was  $£7,500 + £3,200 = £10,700$ .

There is a  $\frac{£10,700 - £11,000}{£11,000} \times 100 = -2.73\%$  percentage change in turnover for food between March and April.

The answer is B (-2.73%).

### Question 4

*If needed, please refer to the definition of ratio on page 2.*

The turnover from hot drink for the period from January to March was  $£9,000 + £8,000 + £8,400 = £25,400$ .

The turnover from cold drink for the period from January to March was  $£3,000 + £4,800 + £4,900 = £12,700$ .

The ratio of the turnover between hot drink and cold drink for the period from January to March is 25,400: 12,700 which can be simplified to 2: 1 by dividing both numbers by 12,700.

The answer is A (2: 1).

### **Question 5**

This is a two stage question.

The first stage is to calculate the new turnover in February. This consists of new turnover for hot and cold food, and unchanged turnover for the remaining three categories.

*If needed, please refer to the formula on how to calculate the (compound) growth/decay on page 2 and make the following substitutions:*

$N$  is what needs to be found (new turnover in February for hot and cold food).

$N_0$  are £5,500 for hot food and £2,5000 for cold food.

*multipliers* are 1.2 for hot food (because of the 20% increase) and 0.8 for cold food (because of the 20% decrease).

$n$  is 1 for both food.

The new turnover for hot and cold food in February is:  $N = £5,500 \times (1.2)^1 + £2,500 \times (0.8)^1 = £6,600 + £2,000 = £8,600$ .

The new turnover in February is:  $£8,600 + £8,000 + £4,800 + £3,000 = £24,400$ .

The second stage is to calculate the percentage change in turnover in February comparing original and new/changed turnover.

*If needed, please refer to the definition and formula on how to calculate the percentage change on page 2.*

The original turnover in February is  $£5,500 + £2,500 + £8,000 + £4,800 + £3,000 = £23,800$ .

The new/changed turnover in February is £24,400.

The percentage change in turnover between original and new/changed turnover is

$$\frac{£24,400 - £23,800}{£23,800} \times 100 = 2.52\% \text{ (rounded to 2 d.p.)}$$

The answer is E (2.52%).

### Question 6

The turnover from May from hot food and hot drink is:  $£6,300 + £9,900 = £13,200$ .

The turnover for June is based on the turnover for May in a way that:

- the turnover from hot food and hot drink falls by 30%,
- the turnover from Other remains unchanged,
- the total turnover equals the turnover for May,
- therefore, the turnover from cold food and cold drink must increase by the same amount that hot food and drink decreased.

The turnover for June from hot food and drink in comparison to the turnover for May decreased by 30%, i.e. 30% of  $£13,200 = 0.3 \times £13,200 = £3,960$ .

*If needed, please refer to the formula on expressing one quantity as a percentage of another on page 2.*

The turnover from May from cold food and cold drink is:  $£3,500 + £6,200 = £9,700$ .

In order for the total turnover for June to equal the May turnover, the turnover from cold food and drink must increase. We must calculate what percentage of  $£9,700$  (the turnover from May from cold food and cold drink) is  $£3,960$  (30% decrease of the turnover from hot food and hot drink in May):  $\frac{£3,960}{£9,700} \times 100 = 40.8\%$ .

The answer is D (40.8%).

### Question 7

*If needed, please refer to the definition and formula on how to calculate the percentage increase on page 2.*

To calculate the percentage change new and original numbers are needed, e.g. to calculate the percentage difference in turnover for March, the turnover for March and February (previous month) are needed. This can be calculated for all month but January as we do not have turnover figures for December.

Therefore, there is not enough information to answer this question.

The answer is E (Cannot tell).

### Question 8

A company's profits in 2015 are  $£200m$ .

A company's profits in 2017 are  $£195m$ .

*If needed, please refer to the definition and formula on how to calculate the percentage increase on page 2.*

The UK profits in 2015 are: 21% of  $£200m = 0.21 \times £200m = £42m$ .

The UK profits in 2017 are: 23% of  $£195m = 0.23 \times £195m = £44.85m$ .

Percentage increase in the UK profits between 2015 and 2017 is:  $\frac{£44.85m - £42m}{£42m} \times 100 = 6.8\%$ .

The answer is B (6.8%).

### Question 9

Australia is part (or possibly all) of Other. Hence, Australia's exact profit is unknown.

However, in each of the 3 years the profit from Europe (less UK) exceeds that of the Other total (percentages on the pie chart are higher for Europe (less UK)). Therefore, profit from Europe (less UK) must exceed profit from Australia.

The answer is D (3).

### Question 10

*If needed, please refer to the formula on expressing one quantity as a percentage of another on page 2.*

The UK profits in 2016 are: 22% of £209m =  $0.22 \times £209m = £45.98m$ .

The Europe (less UK) profits in 2016 are: 28% of £209m =  $0.28 \times £209m = £58.52m$ .

Therefore, the profits from Europe are:  $£45.98m + 58.52m = £104.5m$ .

The percentage of the profits from the whole of Europe that came from the UK is:

$$\frac{£45.98m}{£104.5m} \times 100 = 44.0\%$$

The answer is B (44.0%).

### Question 11

*If needed, please refer to the definition of ratio on page 2.*

The profits in the USA in 2016 are: 16% of £209m =  $0.16 \times £209m = £33.44m$ .

The profits in the UK in 2017 are: 23% of £195m =  $0.23 \times £195m = £44.85m$ .

The ratio of profits in the USA in 2016 to profits in the UK in 2017 is approximately 3: 4 (as  $33.44 \div 44.85 = 0.7455 \dots \approx 0.75$  which is  $\frac{3}{4}$ ).

The answer is E (3: 4).

### Question 12

The UK profits in 2015 are: 21% of £200m =  $0.21 \times £200m = £42m$ .

The UK profits in 2016 are: 22% of £209m =  $0.22 \times £209m = £45.98m$ .

The UK profits in 2017 are: 23% of £195m =  $0.23 \times £195m = £44.85m$ .

Therefore, in the two previous years to 2017, only in 2015 the UK profits are lower.

The answer is A (2015).

**Question 13**

*If needed, please refer to the formula on how to calculate the average of numbers on page 2.*

The profits from Asia in 2016 are: 14% of £209m =  $0.14 \times £209m = £29.26m$ .

The profits from Asia in 2017 are: 18% of £195m =  $0.18 \times £195m = £35.1m$ .

Over 2 years there are  $£29.26m + £35.1m = £64.36m$  of profits in Asia.

The average profits from Asia over the last two years are:  $\frac{£64.36m}{2} = £32.18m$ .

The answer is D (£32.18m).

**Question 14**

*If needed, please refer to the formula on expressing one quantity as a percentage of another on page 2.*

The number of visitors in August who payed Junior fee is 900.

The total number of fee paying visitors (Total minus Free) in August is  $2,500 - 200 = 2,300$ .

The percentage of fee paying visitors that are Juniors is:  $\frac{900}{2,300} \times 100 = 39.1\%$ .

The answer is E (39.1%).

**Question 15**

*If needed, please refer to the formula on expressing one quantity as a percentage of another on page 2.*

The number of visitors in May who paid Concession fees is 200.

The total number of visitors in May is 1,300.

The percentage of Concessions recorded in May is:  $\frac{200}{1,300} \times 100 = 15.4\%$ .

The number of visitors in June who paid Concession fees is 300.

The total number of visitors in June is 1,350.

The percentage of Concessions recorded in June is:  $\frac{300}{1,350} \times 100 = 22.2\%$ .

The number of visitors in July who paid Concession fees is 350.

The total number of visitors in July is 2,200.

The percentage of Concessions recorded in July is:  $\frac{350}{2,200} \times 100 = 15.9\%$ .



The number of visitors in August who paid Concession fees is 450.

The total number of visitors in August is 2,500.

The percentage of Concessions recorded in August is:  $\frac{450}{2,500} \times 100 = 18.0\%$ .

The number of visitors in September who paid Concession fees is 250.

The total number of visitors in September is 1,250.

The percentage of Concessions recorded in September is:  $\frac{250}{1,250} \times 100 = 20.0\%$ .

The highest percentage of Concessions recorded is in June.

The answer is B (June).

### **Question 16**

*If needed, please refer to the definition and formula on how to calculate the percentage increase on page 2.*

The number of Juniors visiting in June is 250.

The number of Juniors visiting in July is 800.

There is a  $\frac{800-250}{250} \times 100 = 220\%$  percentage increase in Juniors visiting between June and July.

The answer is D (220%).

### **Question 17**

*If needed, please refer to the formula on how to calculate the average of numbers on page 2.*

In May, adult visitors paid  $600 \times £10 = £6,000$ .

In May, junior visitors paid  $400 \times £7 = £2,800$ .

In May, concession visitors paid  $200 \times £4 = £800$ .

The total fees paid in May are  $£6,000 + £2,800 + £800 = £9,600$ .

The total number of visitors in May is 1,300.

The average admission price paid in May is:  $\frac{£9,600}{1,300} = £7.38$ .

The answer is C (£7.38).

### **Question 18**

*If needed, please refer to the definition of ratio on page 2.*

The number of Adult visitors between July and September is  $900 + 950 + 600 = 2,450$ .

The Adult admission fee is £10.

The income from Junior between July and September is  $2,450 \times £10 = £24,500$ .

The number of Junior visitors between July and September is  $800 + 900 + 300 = 2,000$ .

The Junior admission fee is £7.

The income from Adults between July and September is  $2,000 \times £7 = £14,000$ .

The ratio of the income from Adults to the income from Juniors is 24,500: 14,000 which can be simplified to 7: 4 by dividing both numbers by 3,500.

The answer is A (7: 4).

### **Question 19**

There is no information about weekly totals.

The answer is E (Cannot tell).

### **Question 20**

*If needed, please refer to the formula on how to calculate the average of numbers on page 2.*

Over the 5 year period 2013-2017 there were  $15 + 20 + 15 + 20 + 15 = 85$  Junior members.

The average for Junior membership for the period 2013-2017 is:  $\frac{85}{5} = 17$ .

The answer is B (17).

### **Question 21**

*If needed, please refer to the formula on expressing one quantity as a percentage of another on page 2.*

The number of Adult Female members in 2013 is 20.

The total number of members in 2013 is 70.

The percentage of members in 2013 that are Adult Female is:  $\frac{20}{70} \times 100 = 28.6\%$ .

The answer is A (28.6%).

### **Question 22**

*If needed, please refer to the definition and formula on how to calculate the percentage increase on page 2.*

The number of members in 2015 is 65.

The number of members in 2016 is 80.

There is a  $\frac{80-65}{65} \times 100 = 23.08\%$  percentage increase in membership between 2015 and 2016.

The answer is D (23.08%).

### **Question 23**

The ratio of 6: 5: 4 suggest that the membership of Adult Male is the highest, followed by Adult Female and then Junior. This is the case in 2013, 2014 and 2017. Therefore, the ratio for only these three years can be calculated.

*If needed, please refer to the definition of ratio on page 2.*

The number of Adult Male members in 2013 is 35.

The number of Adult Female members in 2013 is 20.

The number of Junior members in 2013 is 15.

The ratio of Adult Male members to Adult Female members to Junior members in 2013 is 35:20:15 which can be simplified to 7: 4: 3 by dividing all three numbers by 5.

The number of Adult Male members in 2014 is 30.

The number of Adult Female members in 2014 is 25.

The number of Junior members in 2014 is 20.

The ratio of Adult Male members to Adult Female members to Junior members in 2014 is 30:25:20 which can be simplified to 6: 5: 4 by dividing all three numbers by 5.

The number of Adult Male members in 2017 is 35.

The number of Adult Female members in 2017 is 25.

The number of Junior members in 2017 is 15.

The ratio of Adult Male members to Adult Female members to Junior members in 2017 is 35:25:15 which can be simplified to 7: 5: 3 by dividing all three numbers by 5.

The answer is B (2014).

### **Question 24**

*If needed, please refer to the formula on expressing one quantity as a percentage of another on page 2.*

The number of Adult Male members in 2013 is 35.

The total number of members in 2013 is 70.

The percentage of members in 2013 that are Adult Male is:  $\frac{35}{70} \times 100 = 50\%$ .

The number of Adult Male members in 2014 is 30.

The total number of members in 2014 is 75.

The percentage of members in 2014 that are Adult Male is:  $\frac{30}{75} \times 100 = 40\%$ .

The number of Adult Male members in 2015 is 25.

The total number of members in 2015 is 65.

The percentage of members in 2015 that are Adult Male is:  $\frac{25}{65} \times 100 = 38.46\%$ .

The number of Adult Male members in 2016 is 30.

The total number of members in 2016 is 80.

The percentage of members in 2016 that are Adult Male is:  $\frac{30}{80} \times 100 = 37.5\%$ .

The number of Adult Male members in 2017 is 35.

The total number of members in 2017 is 75.

The percentage of members in 2017 that are Adult Male is:  $\frac{35}{75} \times 100 = 46.6\%$ .

In none of these years was Adult Male membership less than 35% of the total membership.

The answer is A (0).

This resource was produced by the **sigma** Network Employability Special Interest Group whose members are:

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