Sample Questions

Module 2 – Reasoning in the Sciences, Mathematics and Social Sciences (1 hour)
Module 3 – Written English (1 hour)
The rate at which freshwater animals absorb dissolved oxygen (O₂) from the surrounding water is affected by the water current.

Data on the effect of the speed of the current on the rate of oxygen absorption of some groups of freshwater animals at a temperature of 18 °C are shown in the figure. The data for individuals of each group of animals have been averaged and plotted in the figure as points which have been linked together. Different groups of the same species are numbered (e.g. Baetis 1, Baetis 2, and Baetis 3).
At a current speed of between 2 and 3 centimetres per second, the group of animals with the highest rate of oxygen consumption was

A  Hydropsyche.
B  Baetis 1.
C  Rhyacophila 1.
D  Rhithrogena.

Which of the following had a rate of oxygen consumption which was least affected by increasing the speed of the current?

A  Ephemerella 1
B  Hydropsyche
C  Anabolia 1
D  Anabolia 2

According to the figure, groups of animals of the same species showed differences in their rates of oxygen consumption with increasing current speed.

The differences were most marked in

A  Baetis.
B  Ephemerella.
C  Anabolia.
D  Hydropsyche.
UNIT 11

Questions 39 – 42

The Burger Index (BI) uses the cost of a burger in different countries as a way of determining whether official exchange rates are appropriate (with respect to the US$).

- $BI = \frac{\text{Cost of a burger in a particular country in the local currency}}{\text{Cost of a burger in the USA in US$}}$

Comparing actual exchange rates with the BI indicates whether a currency is undervalued or overvalued.

- $\% \text{ over/undervaluation against US$} = \frac{(BI - \text{Exchange Rate})}{\text{Exchange Rate}} \times 100$

For example, if a burger costs €2.50 (2.50 Euros) in Europe and $2.50 in the USA, then the BI is $\frac{2.50}{2.50}$, or 1.00.

The % the Euro is over/undervalued $= \frac{1.00 - 0.80}{0.80} \times 100 = 25\%$.

Thus, according to the BI, the Euro is overvalued against the US$ by 25%.

The table shows the typical cost of a standard burger in a number of countries in their local currencies and typical exchange rates of those countries against the US$ in a particular time period.

<table>
<thead>
<tr>
<th>Country</th>
<th>Cost of burger in local currency</th>
<th>Exchange rate 1 US$ =</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>US$2.50</td>
<td></td>
</tr>
<tr>
<td>Australia</td>
<td>A$3.00</td>
<td>A$1.30</td>
</tr>
<tr>
<td>UK</td>
<td>£2.00</td>
<td>£0.50</td>
</tr>
<tr>
<td>European Union</td>
<td>€2.50</td>
<td>€0.80</td>
</tr>
<tr>
<td>Mexico</td>
<td>20 Peso</td>
<td>10 Peso</td>
</tr>
<tr>
<td>New Zealand</td>
<td>NZ$4.00</td>
<td>NZ$1.40</td>
</tr>
<tr>
<td>Russia</td>
<td>40 Rouble</td>
<td>30 Rouble</td>
</tr>
<tr>
<td>South Korea</td>
<td>3000 Won</td>
<td>1000 Won</td>
</tr>
</tbody>
</table>

- Answer the questions for the typical costs and exchange rates given for the time period.
- Assume there is no charge in converting money from one currency to another.

39 How many Mexican Pesos would be required to buy a burger in South Korea?

A 3 Pesos  
B 30 Pesos  
C 3000 Pesos  
D 30 000 Pesos
40 According to the BI, a currency is generally correctly valued with respect to the US$ when the BI equals
A 0.
B 1.0.
C the Exchange Rate.
D \frac{1}{\text{Exchange Rate}}.

41 According to the BI, how does the UK£ compare to the US$?
A The £ is 60% overvalued.
B The £ is 60% undervalued.
C The £ is correctly valued.
D There is insufficient information to determine if the value is appropriate.

42 According to the BI, the currency of which of the following countries is most undervalued against the US$?
A South Korea
B Mexico
C Russia
D New Zealand
UNIT 12

Questions 43 – 47

In some areas of the world, marine birds such as kelp gulls feed on mussels which have been deposited on the beaches. To break open the shells, the birds carry the mussels to heights and drop them onto hard surfaces, such as rocks or wet beach sand.

Experimental evidence indicates that the minimum drop height required to fracture a mussel shell depends on its size, and also on the nature of the surface onto which it is dropped. Moreover, the speed on impact with the ground can be related to the mussel’s drop height and its shell length. The graphs in Figures 1 to 4 show the relationships between the size, impact speed, and drop height of mussels. The figures are based on the results of extensive mussel dropping experiments that attempted to simulate real conditions.

Assume that all mussels referred to in the following questions are described by these relationships.

![Figure 1](image1)

**Impact speed (metres per second)**

**Drop height (metres)**

120 millimetres
100 millimetres
80 millimetres
60 millimetres

![Figure 2](image2)

**Mussel mass (grams)**

![Figure 3](image3)

**Shell area (square centimetres)**

![Figure 4](image4)

**Shell length (millimetres)**
43 An 80 gram mussel has a shell area closest to

A  20 square centimetres.
B  24 square centimetres.
C  40 square centimetres.
D  45 square centimetres.

44 Which one of the following is the smallest drop height required to fracture three mussels with lengths 75 millimetres, 85 millimetres, and 100 millimetres, when all three are dropped onto wet beach sand?

A  1.90 metres
B  2.35 metres
C  2.67 metres
D  3.00 metres
For a group of mussels, all of which have a shell length of 80 millimetres, the difference between the drop heights required to fracture the mussels when they drop onto rock and wet beach sand is closest to

A. 0.6 metres.
B. 1.0 metres.
C. 1.9 metres.
D. 2.5 metres.

Which of the following is closest to the lowest impact speed required to fracture a 30 gram mussel by impact with wet beach sand?

A. 5.5 metres per second
B. 6.8 metres per second
C. 8.4 metres per second
D. 10 metres per second

Two mussels are dropped from a height of 2.5 metres onto wet beach sand. Mussel X has a mass of 30 grams and mussel Y has a mass of 60 grams.

According to the available evidence,
A. only mussel X will fracture.
B. only mussel Y will fracture.
C. both mussels will fracture.
D. neither mussel will fracture.
Questions 48 and 49
The figure shows the corn crop yields expected under different conditions of rainfall and temperature, compared to the standard yield (100%). The standard yield occurs for conditions corresponding to the 100 contour line. The [0, 0] point on the figure indicates normal temperature and rainfall conditions.

For example, the 40 contour line shows the combinations of temperature and rainfall under which yields are expected to be 40% of the standard yield. One set of conditions in which this could occur is when temperature is normal but rainfall drops to around 50% of normal.

- Answer all questions with regard only to the temperature and rainfall ranges shown.

48 Crop yields are reduced from the standard yield by almost any
    A increase in rainfall.
    B increase in temperature.
    C decrease in rainfall.
    D decrease in temperature.

49 What is the change in crop yield from the standard yield with a 20% increase in rainfall and a 5 °C increase in temperature?
    A 10% increase
    B 20% decrease
    C 80% decrease
    D no change
Questions 50 – 52

A pedometer is a device that records the number of steps a person takes. This information, together with the length of the person’s step, can be used to determine the distance they walk or run. Furthermore, it can give an estimate of the energy expenditure (in kilojoules, kJ) due to the activity.

A number of people took part in a competition in which they walked or ran for a number of days. The table gives information for six of the participants at the end of Day 2 of the competition.

Assume that:
• walking uses 15 kJ of energy per kilogram of body mass per hour; and
• running uses 30 kJ of energy per kilogram of body mass per hour.

<table>
<thead>
<tr>
<th></th>
<th>Number of steps recorded by pedometer</th>
<th>Average step length (m)</th>
<th>Distance covered (km)</th>
<th>Body mass (kg)</th>
<th>Total energy used (kJ)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adele</td>
<td>5000</td>
<td>0.40</td>
<td></td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>Beau</td>
<td>3000</td>
<td>0.70</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Celine</td>
<td>0.60</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dale</td>
<td>0.75</td>
<td>4</td>
<td>60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ellen</td>
<td>0.40</td>
<td>4</td>
<td>70</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Greg</td>
<td>1.20</td>
<td>15</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

50  By the end of Day 2, compared to Adele, the distance that Beau walked was
   A  5% less.
   B  5% greater.
   C  10% less.
   D  10% greater.

51  For the first two days of the competition Greg ran at an average speed of 15 km/h.
    What further information (i.e. information not given in the table and not able to be calculated from the information provided) is needed to determine Greg’s energy expenditure due to running?
    A  his mass only
    B  his mass and the number of steps he took only
    C  his mass and the duration of his run each day only
    D  his mass, the number of steps he took and the duration of his run each day

52  Another participant, Fran, ran for one hour on Day 1. On Day 2, she walked the same distance. Her running speed was twice her walking speed and her mass did not change during this time.
    How did Fran’s energy expenditure on Day 1 compare to that on Day 2?
    A  It was higher on Day 1.
    B  It was higher on Day 2.
    C  It was the same on both days.
    D  There is insufficient information to determine this.
A triangular pile is a stack constructed from equal-sized balls. It has a triangular base (first layer) and a single ball in its top-most layer. The number of layers depends on the total number of balls used. For example, the triangular pile shown below has three horizontal layers with six balls in the first layer, three balls in the second layer and one ball in the third layer.

53 Which one of the following could be the number of balls in the base of a triangular pile?

A 16
B 28
C 44
D 52

54 The number of balls along a side of the base of a triangular pile with 36 balls in its first layer is

A 6
B 7
C 8
D 9

55 If the number of balls along a side of the base of a triangular pile is \( n \), then the number of layers in the pile is

A \( 2n - 3 \)
B \( 3(n - 2) \)
C \( n - 1 \)
D \( n \)
UNIT 16

Questions 56–58

When fighting forest fires, a major problem for firefighters is dealing with the heat. Heat enters, leaves or is produced in a firefighter’s body by the following processes:

I radiation — heat from the fire and the sun radiate to the firefighter’s body
II conduction/convection — body heat is carried away by the surrounding air
III metabolism — heat is produced in the firefighter’s body
IV evaporation of sweat — heat is removed from the firefighter’s body when sweat evaporates from skin and clothing

In a study of heat balance in firefighters, two groups of firefighters built a firebreak — a hard physical task. One group did so next to a fire. The other group did exactly the same work under the same conditions except that no fire was burning nearby. The table gives the average results for the firefighters in the two groups.

<table>
<thead>
<tr>
<th>Process</th>
<th>Amount of heat gained or lost per minute by the body</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>fire nearby</td>
</tr>
<tr>
<td>Radiation</td>
<td>gain of 260 joule</td>
</tr>
<tr>
<td>Conduction / convection</td>
<td>loss of 60 joule</td>
</tr>
<tr>
<td>Metabolism</td>
<td>gain of 488 joule</td>
</tr>
<tr>
<td>Evaporation of sweat</td>
<td>loss of 688 joule</td>
</tr>
</tbody>
</table>

- Assume that the figures given apply to any individual firefighter.
- Although some of the processes can transfer heat to or from a firefighter, this unit and the table refer to net gains or losses of heat by each process.
56  When building a firebreak, the body of a firefighter

A  loses heat by radiation and gains heat by conduction/convection.
B  loses heat by both radiation and by conduction/convection.
C  gains heat by radiation and loses heat by conduction/convection.
D  gains heat by both radiation and by conduction/convection.

57  The heat lost by evaporation of sweat from the body of a firefighter in one minute while building a
firebreak without a fire nearby is

A  532 joule.
B  590 joule.
C  612 joule.
D  688 joule.

58  Which one of the following increases when a firefighter moves from an area where there is no fire
nearby to an area where there is a fire nearby?

A  the amount of heat produced per minute by metabolism
B  the amount of heat lost per minute by conduction/convection
C  the amount of heat lost per minute by the evaporation of sweat
D  none of A or B or C
When designing work desks it is important to consider people’s standing height because it is related to their optimal (i.e. most suitable) seat height and desk height.

Figure 1 presents information about the optimal seat heights and desk heights for typical men and women of various standing heights. For a person of a given height, optimal seat and desk heights can be obtained by ruling a horizontal line across the figure from their standing height value. For example, a typical 1700 mm tall person has an optimal seat height of 430 mm and an optimal desk height of close to 705 mm.

The figure also gives percentile information for heights of typical men and women. For example, 95.0% of typical men have a standing height less than, or equal to, 1860 mm and an optimal seat height less than, or equal to, 470 mm. 50.0% of typical men have a standing height less than, or equal to, 1740 mm and an optimal seat height less than, or equal to, 440 mm.

- For the population represented in Figure 1, assume there are equal numbers of men and women.
59. What percentage of males have an optimal seat height between 470 mm and 440 mm?
   A. 2.5%  
   B. 5%  
   C. 25%  
   D. 45%

60. A company employs a new person who is 1660 mm tall.  
The person’s seat height should be adjusted to
   A. 420 mm irrespective of whether they are male or female.  
   B. 420 mm if they are male but less than this if they are female.  
   C. any height between 370 and 480 mm because people vary so much.  
   D. any height between 380 and 470 mm because this range covers most people.

61. Which one of the following seat height ranges would suit the greatest number of people?
   A. 440–480 mm  
   B. 430–450 mm  
   C. 405–440 mm  
   D. 370–410 mm

62. Which of the following best describes the relationship between change in standing height and change in optimal seat and desk heights?
   For each 100 mm increase in standing height,
   A. seat height increases by 30 mm and desk height increases by 25 mm.  
   B. seat height increases by 25 mm and desk height increases by 30 mm.  
   C. seat height increases by 25 mm and desk height increases by 25 mm.  
   D. seat height increases by 30 mm and desk height increases by 30 mm.
Questions 63 and 64

The figure below accompanied an article in a magazine explaining the pungent (hot, spicy) effect of Indian mustard powder on nose and palate.

- Enzymes referred to in the figure are substances which control chemical reactions in living things.

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**Why mustard tastes hot**

![Diagram of mustard seed chemistry]

Indian mustard seeds → crushing the seed releases the enzyme myrosinase → mustard meal or condiment

\[
\text{CH}_2\text{CH} - \text{CH}_2\text{CH}_2\text{N} - \text{O} - \text{SO}_3^- \quad \text{enzyme} \quad \text{water} \quad \text{CH}_2\text{CH} - \text{CH}_2\text{N} = \text{C} = \text{S} \quad \text{and glucose and sulfate}
\]

allyl glucosinolate (sinigrin) in seeds → allyl isothiocyanate in meal or mustard paste — volatile and pungent

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63 The figure above indicates that uncrushed Indian mustard seed

- A is pungent.
- B contains allyl isothiocyanate.
- C contains myrosinase and sinigrin.
- D contains no enzymes.

64 Of the following, the best explanation for the pungency of Indian mustard powder is that crushing the seed

- A breaks down allyl glucosinolate into mustard meal.
- B causes the enzyme myrosinase to turn into the pungent substance allyl isothiocyanate.
- C brings myrosinase and sinigrin together to produce the pungent substance allyl isothiocyanate when water is added.
- D causes the enzyme myrosinase to produce sinigrin, which then turns into the pungent substance allyl isothiocyanate.
UNIT 19

Questions 65 and 66

In the grid below, the letters represent different whole numbers of less than 20. The numbers to the right and below the grid are row and column totals.

For example, \( Q + L + Z + Z = 46 \).

\[
\begin{array}{cccc}
Q & L & Z & Z \\
K & K & K & K \\
K & K & Q & Q \\
K & Z & L & Q \\
\end{array}
\]

30 38 X Y

65 The value of \( Q \) is

A 7.
B 9.
C 11.
D 13.

66 The value of \( X \) is

A 40.
B 42.
C 44.
D 46.
Questions 67 – 70

Attached to Runalong Fire Station there are seven firefighters (1, 2, 3, 4, 5, 6, 7). It is necessary to have three firefighters at the station each night in case of emergency, and the Firefighters’ Union requires that each firefighter works the same number of nights.

Schedules I–IV were prepared for consideration.

<table>
<thead>
<tr>
<th></th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sunday</td>
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<td>{1,2,4}</td>
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<td>{2,3,5}</td>
<td>{2,3,5}</td>
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<td>{3,4,6}</td>
<td>{3,4,6}</td>
<td>{3,4,6}</td>
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<td>{4,5,7}</td>
<td>{1,2,4}</td>
<td>{4,5,7}</td>
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<td>Thursday</td>
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<td>{5,6,1}</td>
<td>{5,6,1}</td>
<td>{5,6,1}</td>
</tr>
<tr>
<td>Friday</td>
<td>{2,3,5}</td>
<td>{6,7,2}</td>
<td>{6,7,2}</td>
<td>{7,1,2}</td>
</tr>
<tr>
<td>Saturday</td>
<td>{3,4,6}</td>
<td>{7,1,3}</td>
<td>{7,1,3}</td>
<td>{6,1,3}</td>
</tr>
</tbody>
</table>

67 Which one of the schedules meets the requirements of the Firefighters’ Union?
A I  C III
B II D IV

Questions 68 – 70 refer to the following additional information:

A schedule can be thought of as a set of \( v \) objects (in this case, firefighters) that have to be arranged into \( b \) sets (in this case, one set for each day of the week) all of size \( k \) and such that each object occurs the same number of times \( (r) \) in the schedule and only once in any set. For the firefighters’ schedules, \( v = 7, b = 7, k = 3, \) and \( r = 3. \)

68 If \( v = 3, b = 6, k = 1, r = 2, \) which one of the following completes the schedule \( \{1\}, \{2\}, \{3\}, \{1\}, \{2\}, \ldots? \)
A \( \{1\} \)  C \( \{3\} \)
B \( \{2\} \)  D neither \( \{1\}, \) nor \( \{2\} \) nor \( \{3\} \)

69 The schedule \( \{1,2\}, \{2,3\}, \{x,y\} \) is a schedule for which \( v = 3, b = 3, k = 2, r = 2, \) if
A \( x = 1, y = 2. \)  C \( x = 2, y = 2. \)
B \( x = 1, y = 3. \)  D \( x = 2, y = 3. \)

70 The schedule
\[
\begin{align*}
\{1,2,3\} & \quad \{4,5,6\} & \quad \{7,8,9\} & \quad \{1,4,7\} \\
\{2,5,8\} & \quad \{3,6,9\} & \quad \{1,5,9\} & \quad \{2,6,7\} \\
\{3,4,8\} & \quad \{1,6,8\} & \quad \{2,4,9\} & \quad \{x,y,z\}
\end{align*}
\]
is a schedule for which \( v = 9, b = 12, k = 3, r = 4, \) if
A \( x = 1, y = 2, z = 4. \)  C \( x = 2, y = 4, z = 6. \)
B \( x = 1, y = 3, z = 5. \)  D \( x = 3, y = 5, z = 7. \)

Answers are on page 20.
Sample Topics for MSAP Module 3 – Written English

Directions
You are required to produce two pieces of writing – one in response to a topic from Task A, and one in response to a topic from Task B.

- Task A is a more formal public affairs issue that invites argument.
- Task B is a less formal topic that invites more personal reflection.
- One hour is allocated for this test, with an additional five minutes reading time.
- Your responses to the topics are written directly onto the test paper. You should write your essays neatly in pen.
- Use a planning page to organise your thoughts before you commence writing.
- Write the number of the topic you are responding to at the top of each response. NB: Do not try to address all of the other topics in your response.
- Give each piece of writing a title that will help orient the reader to the approach you are taking.
- No extra paper is to be used. Only one test booklet is permitted per candidate.

The following themes and topics indicate the kind of stimulus material that will be offered in the real test.

Topics

Task A: Discussion of a current affairs theme – Respond to one (1) topic from Task A.

1. Our society is changing a great deal, but change is not always progress, and there are some ways in which our society is changing for the worse.
2. There has never been a time in human history when so many people have been able to live a safe and secure life, and we have science and technology to thank for such benefits.
3. Science and technology have brought many benefits, but they have also brought problems that may eventually negate those benefits.
4. Science has made great progress in understanding the physical world, but science has not made much progress in understanding the human world.

Task B: Personal point of view – Respond to one (1) topic from Task B.

5. Friendship is something that most people see as very important, but most friendships turn out to be superficial and fragile.
6. Romances come and go, but it is friendship that remains.
7. It is important that we learn to be confident within ourselves rather than dependent on the good opinion of others.
8. You have to work at a friendship, because without tolerance and respect, even the best friendships soon disappear.
ANSWERS

<table>
<thead>
<tr>
<th>Unit 10: Freshwater animals</th>
<th>36 C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>37 A</td>
</tr>
<tr>
<td></td>
<td>38 A</td>
</tr>
<tr>
<td>Unit 11: Burger index</td>
<td>39 B</td>
</tr>
<tr>
<td></td>
<td>40 C</td>
</tr>
<tr>
<td></td>
<td>41 A</td>
</tr>
<tr>
<td></td>
<td>42 C</td>
</tr>
<tr>
<td>Unit 12: Mussels</td>
<td>43 C</td>
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<td></td>
<td>44 C</td>
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<td></td>
<td>46 A</td>
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<tr>
<td></td>
<td>47 B</td>
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<td>Unit 13: Corn crop yield</td>
<td>48 C</td>
</tr>
<tr>
<td></td>
<td>49 B</td>
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<tr>
<td>Unit 14: Pedometers</td>
<td>50 B</td>
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<td></td>
<td>51 A</td>
</tr>
<tr>
<td></td>
<td>52 C</td>
</tr>
<tr>
<td>Unit 15: Triangular Pile</td>
<td>53 B</td>
</tr>
<tr>
<td></td>
<td>54 C</td>
</tr>
<tr>
<td></td>
<td>55 D</td>
</tr>
<tr>
<td>Unit 16: Firefighters</td>
<td>56 C</td>
</tr>
<tr>
<td></td>
<td>57 A</td>
</tr>
<tr>
<td></td>
<td>58 C</td>
</tr>
<tr>
<td>Unit 17: Seat height</td>
<td>59 D</td>
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<td></td>
<td>60 A</td>
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<tr>
<td></td>
<td>61 C</td>
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<tr>
<td></td>
<td>62 B</td>
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<tr>
<td>Unit 18: Mustard</td>
<td>63 C</td>
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<tr>
<td></td>
<td>64 C</td>
</tr>
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<td>Unit 19: Grid</td>
<td>65 B</td>
</tr>
<tr>
<td></td>
<td>66 A</td>
</tr>
<tr>
<td>Unit 20: Runalong fire station</td>
<td>67 B</td>
</tr>
<tr>
<td></td>
<td>68 C</td>
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<td></td>
<td>69 B</td>
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<tr>
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<td>70 D</td>
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</tbody>
</table>

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