PISA MATH SAMPLE ITEMS

WALKING

The picture shows the footprints of a man walking. The pacelength P is the distance between the rear of two consecutive footprints.

For men, the formula, $\dfrac{n}{P} = 140$, gives an approximate relationship between n and P where,

   n = number of steps per minute, and

   P = pacelength in metres.

Question 1: WALKING

If the formula applies to Heiko's walking and Heiko takes 70 steps per minute, what is Heiko's pacelength?   Show your work.

WALKING SCORING 1

Full Credit

Code 2:   0.5 m or 50 cm, $\dfrac{1}{2}$ (unit not required).

- 70/ p = 140
  70 = 140 p
  p = 0.5.
- 70/140.

Partial Credit

Code 1:   Correct substitution of numbers in the formula, but incorrect answer, or no answer.

- $\dfrac{70}{p} = 140$ [substitute numbers in the formula only].

- $\dfrac{70}{p} = 140$
  70 = 140 p
  p = 2 [correct substitution, but working out is incorrect].

  OR

  Correctly manipulated the formula into $P=n/140$, but no further correct working.

2

No Credit

Code 0:   Other responses.
   • 70 cm.

Code 9:   Missing.

M124Q01 Student Response Distribution

Code	Hong Kong (%)
2	62.6
1	21.6
0	8.6
9	7.2

% Correct					
Hong Kong					**OECD**
F.4	**F.1-F.3**	**Girls**	**Boys**	**Overall**	
80.5	63.1	75.5	71.4	73.4	48.1

Question 2: WALKING

M124Q03- 00 11 21 22 23 24 31 99

Bernard knows his pacelength is 0.80 metres. The formula applies to Bernard's walking.

Calculate Bernard's walking speed in metres per minute and in kilometres per hour.
Show your working out.

WALKING SCORING 3

Full Credit

Code 31:   Correct answers (unit not required) for both metres/minute and km/hour:
   n = 140 x .80 = 112.
   Per minute he walks 112 x .80 metres = 89.6 metres.
   His speed is 89.6 metres per minute.
   So his speed is 5.38 or 5.4 km/hr.

   Code 31 as long as both correct answers are given (89.6 and 5.4), whether
   working out is shown or not.   Note that errors due to rounding are acceptable.
   For example, 90 metres per minute and 5.3 km/hr (89 X 60) are acceptable.
   • 89.6, 5.4.
   • 90, 5.376 km/h.
   • 89.8, 5376 m/hour [note that if the second answer is given without units, it should be
      coded as 22].

Partial Credit (2-point)

Code 21:   As for code 31 but fails to multiply by 0.80 to convert from steps per minute to
   metres per minute.   For example, his speed is 112 metres per minute and 6.72
   km/hr.
   • 112, 6.72 km/h.

Code 22:   The speed in metres per minute correct (89.6 metres per minute) but conversion
   to kilometres per hour incorrect or missing.
   • 89.6 metres/minute, 8960 km/hr.
   • 89.6, 5376.
   • 89.6, 53.76.

- 89.6, 0.087 km/h.
- 89.6, 1.49 km/h.

Code 23: Correct method (explicitly shown) with minor calculation error(s) not covered by Code 21 and Code 22.   No answers correct.
- n=140 x .8 = 1120;   1120 x 0.8 = 896.   He walks 896 m/min, 53.76km/h.
- n=140 x .8 = 116;   116 x 0.8 =92.8.   92.8 m/min -> 5.57km/h.

Code 24: Only 5.4 km/hr is given, but not 89.6 metres/minute (intermediate calculations not shown).
- 5.4.
- 5.376 km/h.
- 5376 m/h.

Partial Credit (1-point)

Code 11: n = 140 x .80 = 112. No further working out is shown or incorrect working out from this point.
- 112.
- n=112,   0.112 km/h.
- n=112, 1120 km/h.
- 112 m/min, 504 km/h.

No Credit

Code 00: Other responses.

Code 99: Missing.

M124Q03 Student Response Distribution

	Hong Kong (%)	
Code	**Breakdown**	**Overall**
31	19.1	19.1
21	21.9	29.9
22	2.6	
23	1.2	
24	4.2	
11	20.6	20.6
00	18.3	18.3
99	12.0	12.0

% Correct					
Hong Kong					OECD
F.4	**F.1-F.3**	**Girls**	**Boys**	**Overall**	
53.1	36.0	46.2	46.0	46.0	21.2

CUBES

Question 3: CUBES

In this photograph you see six dice, labelled (a) to (f).   For all dice there is a rule:

The total number of dots on two opposite faces of each die is always seven.
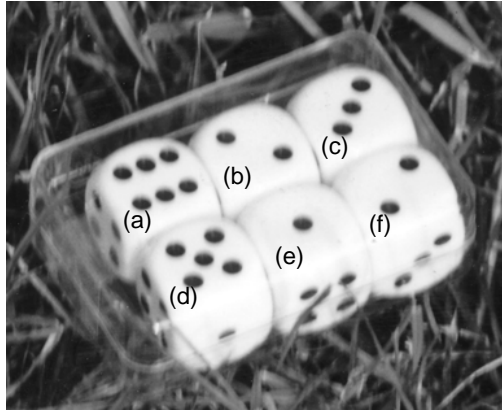
Write in each box the number of dots on the **bottom** face of the dice corresponding to the photograph.

```
(a)    (b)    (c)
+------+------+------+
|      |      |      |
+------+------+------+
|      |      |      |
+------+------+------+
(d)    (e)    (f)
```
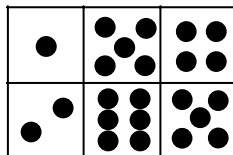
CUBES SCORING 1

Full Credit

Code 1:   Top row (1 5 4) Bottom Row (2 6 5).   Equivalent answer shown as dice faces is also acceptable.

1	5	4
2	6	5

No Credit

Code 0:   Other responses.

Code 9:   Missing.

M145Q01a Student Response Distribution

Code	Hong Kong (%)
1	86.3
0	10.6
9	3.1

M145Q01b Student Response Distribution

Code	Hong Kong (%)
1	79.7
0	16.9
9	3.4

M145Q01c Student Response Distribution

Code	Hong Kong (%)
1	80.0
0	16.5
9	3.5

M145Q01d Student Response Distribution

Code	Hong Kong (%)
1	80.3
0	16.4
9	3.3

M145Q01e Student Response Distribution

Code	Hong Kong (%)
1	83.9
0	12.5
9	3.6

M145Q01f Student Response Distribution

Code	Hong Kong (%)
1	78.8
0	17.5
9	3.7

% Correct					
Hong Kong					**OECD**
F.4	**F.1-F.3**	**Girls**	**Boys**	**Overall**	
78.5	69.7	76.3	73.3	74.7	67.9

GROWING UP

YOUTH GROWS TALLER

In 1998 the average height of both young males and young females in the Netherlands is represented in this graph.

Height

(cm)

190

180

170

160

150

140

130

Average height of young males 1998

Average height of young females 1998

10 11 12 13 14 15 16 17 18 19 20   Age

(Years)
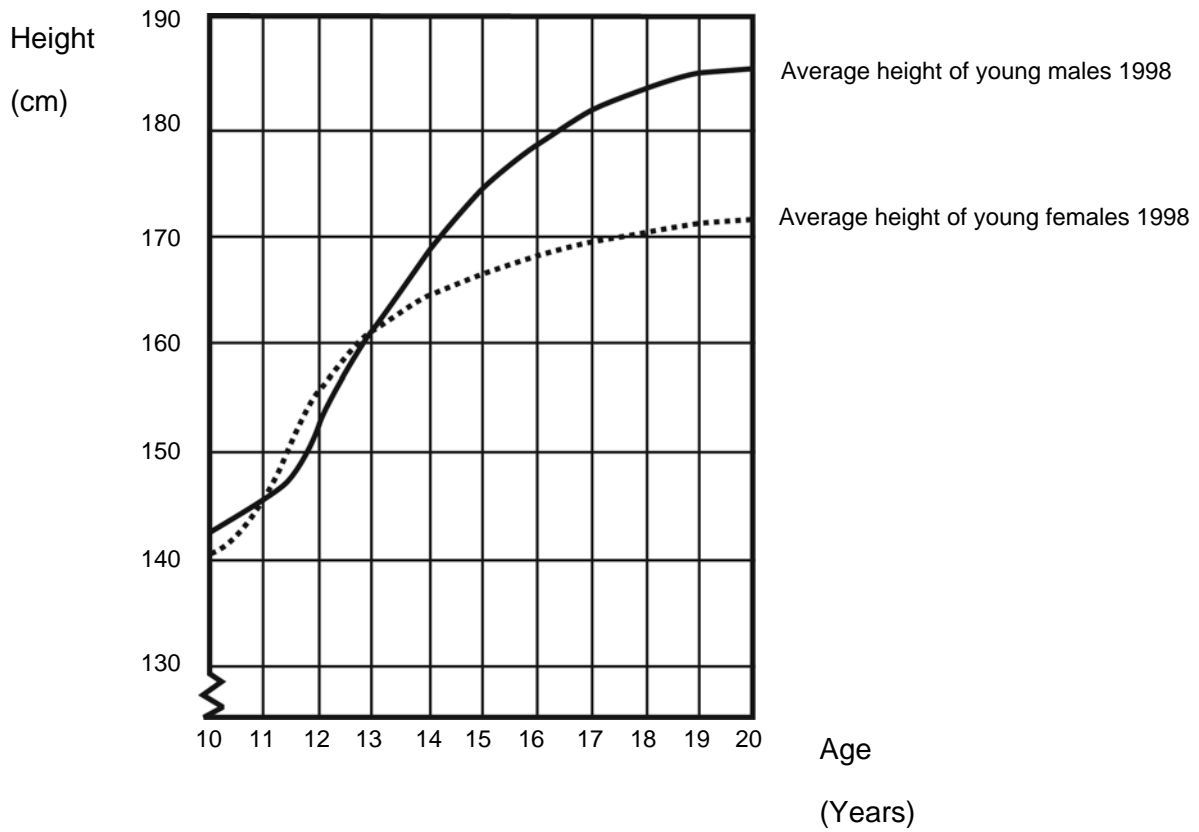
Question 4: GROWING UP

Since 1980 the average height of 20-year-old females has increased by 2.3 cm, to 170.6 cm.   What was the average height of a 20-year-old female in 1980?

Answer: .... cm

GROWING UP SCORING 1

Full Credit

Code 1:   168.3 cm (unit already given).

No Credit

Code 0:   Other responses.

Code 9:   Missing.

M150Q01 Student Response Distribution

Code	Hong Kong (%)	% Correct					
		Hong Kong					**OECD**
		F.4	**F.1-F.3**	**Girls**	**Boys**	**Overall**	
1	46.6	49.7	42.1	47.8	45.6	46.6	66.7
0	47.3						
9	6.1						

Question 5: GROWING UP

According to this graph, on average, during which period in their life are females taller than males of the same age?

....

....

GROWING UP SCORING 2

Full Credit

Code 21: Gives the correct interval, from 11-13 years.
- Between age 11 and 13.
- From 11 years old to 13 years old, girls are taller than boys on average.
- 11-13.

Code 22: States that girls are taller than boys when they are 11 and 12 years old. (This answer is correct in daily-life language, because it means the interval from 11 to 13).
- Girls are taller than boys when they are 11 and 12 years old.
- 11 and 12 years old.

Partial Credit

Code 11: Other subsets of (11, 12, 13), not included in the full credit section.
- 12 to 13.
- 12.
- 13.
- 11.
- 11.2 to 12 .8.

No Credit

Code 00: Other responses.
- 1998.
- Girls are taller than boys when they're older than 13 years.
- Girls are taller than boys from 10 to 11.

Code 99: Missing.

M150Q02 Student Response Distribution

Hong Kong (%)		
Code	Breakdown	Overall
21	54.4	55.2
22	0.8	
11	32.7	32.7
00	7.6	7.6
99	4.5	4.5

% Correct					
Hong Kong					OECD
F.4	F.1-F.3	Girls	Boys	Overall	
76.0	64.5	74.6	68.3	71.5	67.6

Question 6: GROWING UP

Explain how the graph shows that on average the growth rate for girls slows down after 12 years of age.

....

....

....

GROWING UP SCORING 3

Full Credit

The key here is that the response should refer to the "change" of the gradient of the graph for female.   This can be done explicitly or implicitly.   Code 11 and code 12 are for explicitly mentioning about the steepness of the curve of the graph, while code 13 is for implicit comparison using the actual amount of growth before 12 years and after 12 years of age.

Code 11: Refers to the reduced steepness of the curve from 12 years onwards, using daily-life language, not mathematical language.
- It does no longer go straight up, it straightens out.
- The curve levels off.
- It is more flat after 12.
- The line of the girls starts to even out and the boys line just gets bigger.
- It straightens out and the boys graph keeps rising.

Code 12: Refers to the reduced steepness of the curve from 12 years onwards, using mathematical language.
- You can see the gradient is less.
- The rate of change of the graph decreases from 12 years on.
- [*The student computed the angles of the curve with respect to the x-axis before and after 12 years.*]

   In general, if words like "gradient", "slope", or "rate of change" are used, regard it as using mathematical language.

Code 13: Comparing actual growth (comparison can be implicit).
- From 10 to 12 the growth is about 15 cm, but from 12 to 20 the growth is only about 17 cm.
- The average growth rate from 10 to 12 is about 7.5 cm per year, but about 2 cm per year from 12 to 20 years.

No Credit

Code 01: Student indicates that female height drops below male height, but does NOT mention the steepness of the female graph or a comparison of the female growth rate before and after 12 years.
- The female line drops below the male line.

   If the student mentions that the female graph becomes less steep, AS WELL AS the fact that the graph falls below the male graph, then full credit (Code 11, 12 or 13) should be given.   We are not looking for a comparison between male and

10

female graphs here, so ignore any reference on such a comparison, and make a judgement based on the rest of the response.

Code 02: Other incorrect responses.   For example, the response does not refer to the characteristics of the graph, as the question clearly asks about how the GRAPH shows …
- Girls mature early.
- Because females go through puberty before males do and they get their growth spurt earlier.
- Girls don't grow much after 12.   [*Gives a statement that girls' growth slows down after 12 years of age, and no reference to the graph is mentioned.*]

Code 99: Missing.

M150Q03 Student Response Distribution

	Hong Kong (%)	
Code	**Breakdown**	**Overall**
11	22.6	
12	11.9	42.1
13	7.5	
01	4.0	45.2
02	41.2	
99	12.7	12.7

		% Correct			
		Hong Kong			**OECD**
F.4	**F.1-F.3**	**Girls**	**Boys**	**Overall**	
52.9	24.9	45.5	38.4	42.1	43.8

ROBBERIES

Question 7: ROBBERIES

A TV reporter showed this graph and said:

"The graph shows that there is a huge increase in the number of robberies from 1998 to 1999."
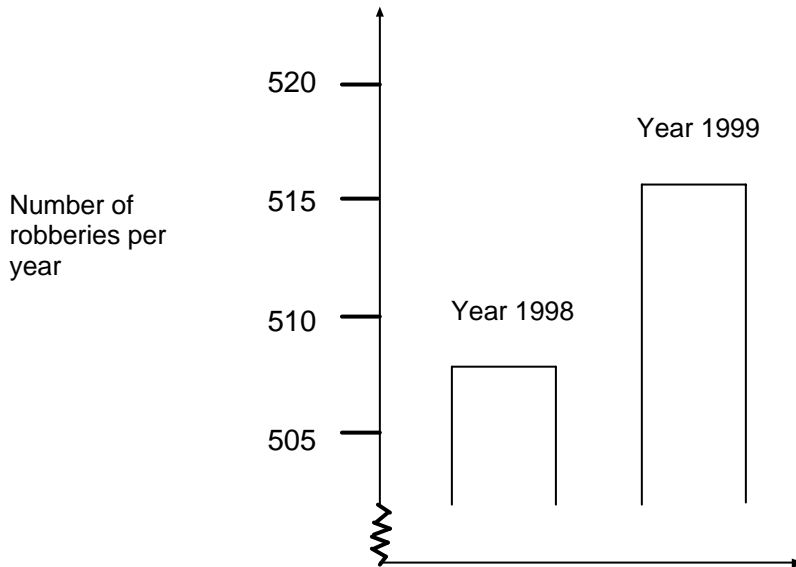
Do you consider the reporter's statement to be a reasonable interpretation of the graph? Give an explanation to support your answer.

ROBBERIES SCORING 1

[Note: The use of NO in these codes includes all statements indicating that the interpretation of the graph is NOT reasonable. YES includes all statements indicating that the interpretation is reasonable. Please assess whether the student's response indicates that the interpretation of the graph is reasonable or not reasonable, and do not simply take the words "YES" or "NO" as criteria for codes.]

Full Credit

Code 21: No, not reasonable. Focuses on the fact that only a **small part** of the graph is shown.
- Not reasonable. The entire graph should be displayed.
- I don't think it is a reasonable interpretation of the graph because if they were to show the whole graph you would see that there is only a slight increase in robberies.
- No, because he has used the top bit of the graph and if you looked at the whole graph from 0 – 520, it wouldn't have risen so much.
- No, because the graph makes it look like there's been a big increase but you look at the numbers and there's not much of an increase.

Code 22: No, not reasonable. Contains correct arguments in terms of ratio or percentage increase.
- No, not reasonable. 10 is not a huge increase compared to a total of 500.

12

- No, not reasonable. According to the percentage, the increase is only about 2%.
- No. 8 more robberies is 1.5% increase.   Not much in my opinion!
- No, only 8 or 9 more for this year.   Compared to 507, it is not a large number.

Code 23: Trend data is required before a judgement can be made.
- We can't tell whether the increase is huge or not.   If in 1997, the number of robberies is the same as in 1998, then we could say there is a huge increase in 1999.
- There is no way of knowing what "huge" is because you need at least two changes to think one huge and one small.

Partial Credit

Code 11: No, not reasonable, but explanation lacks detail. Focuses ONLY on an increase given by the exact number of robberies, but does not compare with the total.
- Not reasonable.   It increased by about 10 robberies.   The word "huge" does not explain the reality of the increased number of robberies.   The increase was only about 10 and I wouldn't call that "huge".
- From 508 to 515 is not a large increase.
- No, because 8 or 9 is not a large amount.
- Sort of.   From 507 to 515 is an increase, but not huge.

[Note that as the scale on the graph is not that clear, accept between 5 and 15 for the increase of the exact number of robberies.]

Code 12: No, not reasonable, with correct method but with minor computational errors.
- Correct method and conclusion but the percentage calculated is 0.03%.

No Credit

Code 01: No, with no, insufficient or incorrect explanation.
- No, I don't agree.
- The reporter should not have used the word "huge".
- No, it's not reasonable.   Reporters always like to exaggerate.

Code 02: Yes, focuses on the appearance of the graph and mentions that the number of robberies doubled.
- Yes, the graph doubles its height.
- Yes, the number of robberies has almost doubled.

Code 03: Yes, with no explanation, or explanations other than Code 02.

Code 04: Other responses.

Code 99: Missing.

M179Q01 Student Response Distribution

Hong Kong (%)

Code	Breakdown	Overall
21	12.9	
22	7.1	23.7
23	3.6	
11	32.5	33.1
12	0.7	
01	15.1	
02	0.8	33.5
03	14.9	
04	2.6	
99	9.8	9.8

% Correct					
Hong Kong					OECD
F.4	F.1-F.3	Girls	Boys	Overall	
44.5	33.8	36.3	44.2	40.2	29.2

14

CARPENTER

Question 8: CARPENTER

A carpenter has 32 metres of timber and wants to make a border around a garden bed. He is considering the following designs for the garden bed.
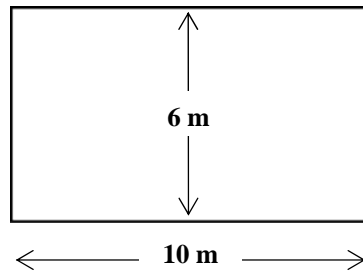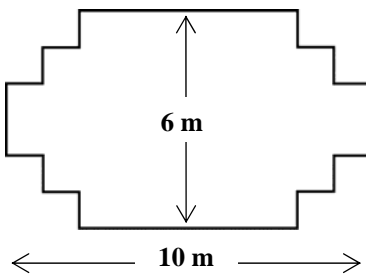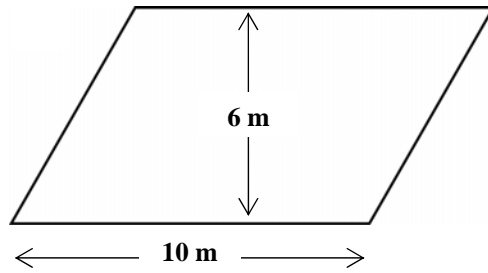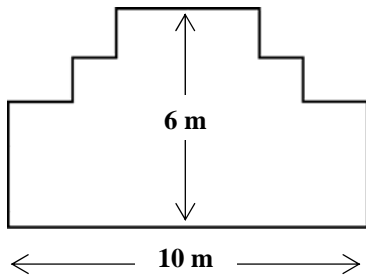
Circle either "Yes" or "No" for each design to indicate whether the garden bed can be made with 32 metres of timber.

Garden bed design	Using this design, can the garden bed be made with 32 metres of timber?
Design A	Yes / No
Design B	Yes / No
Design C	Yes / No
Design D	Yes / No

CARPENTER SCORING 1

Full Credit

Code 2: Exactly four correct

Design A Yes

Design B No

Design C Yes

Design D Yes

15

Partial Credit

Code 1:   Exactly three correct.

No Credit

Code 0:   Two or fewer correct.

Code 9:   Missing.

M266Q01a Student Response Distribution

Code	Hong Kong (%)
1	67.6
0	30.4
9	2.0

M266Q01b Student Response Distribution

Code	Hong Kong (%)
1	68.0
0	30.1
9	1.9

M266Q01c Student Response Distribution

Code	Hong Kong (%)
1	64.9
0	33.0
9	2.1

M266Q01d Student Response Distribution

Code	Hong Kong (%)
1	81.8
0	16.6
9	1.7

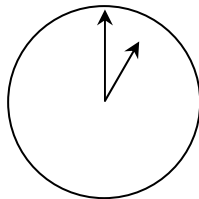| % Correct					
Hong Kong					OECD
F.4	F.1-F.3	Girls	Boys	Overall	
58.1	44.0	50.5	54.4	52.4	35.4

INTERNET RELAY CHAT

Mark (from Sydney, Australia) and Hans (from Berlin, Germany) often communicate with each other using "chat" on the Internet.   They have to log on to the Internet at the same time to be able to chat.
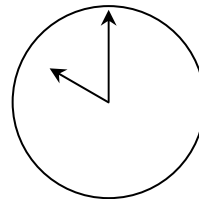
To find a suitable time to chat, Mark looked up a chart of world times and found the following:
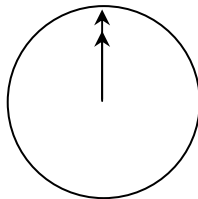
Greenwich 12 Midnight   Berlin 1:00 AM   Sydney 10:00 AM

Question 9: INTERNET RELAY CHAT

At 7:00 PM in Sydney, what time is it in Berlin?

Answer: ....

INTERNET RELAY CHAT SCORING 1

Full Credit

Code 1:   10 AM or 10:00.

No Credit

Code 0:   Other responses.

Code 9:   Missing.

M402Q01 Student Response Distribution

Code	Hong Kong (%)
1	48.0
0	50.1
9	1.9

% Correct					
Hong Kong					**OECD**
F.4	**F.1-F.3**	**Girls**	**Boys**	**Overall**	
53.3	39.8	43.9	52.0	48.0	53.5

Mark and Hans are not able to chat between 9:00 AM and 4:30 PM their local time, as they have to go to school. Also, from 11:00 PM till 7:00 AM their local time they won't be able to chat because they will be sleeping.

When would be a good time for Mark and Hans to chat?   Write the local times in the table.

Place	Time
Sydney	
Berlin	

INTERNET RELAY CHAT SCORING 2

Full Credit

Code 1:   Any time or interval of time satisfying the 9 hours time difference and taken from one of these intervals:

Sydney: 4:30 PM – 6:00 PM; Berlin: 7:30 AM – 9:00 AM

OR

Sydney: 7:00 AM – 8:00 AM; Berlin: 10:00 PM – 11:00 PM
• Sydney 17:00, Berlin 8:00.

NOTE: If an interval is given, the entire interval must satisfy the constraints. Also, if morning (AM) or evening (PM) is not specified, but the times could otherwise be regarded as correct, the response should be given the benefit of the doubt, and coded as correct.

No Credit

Code 0:   Other responses, including one time correct, but corresponding time incorrect.
• Sydney 8 am, Berlin 10 pm.

Code 9:   Missing.

M402Q02 Student Response Distribution

Code	Hong Kong (%)
1	28.0
0	61.9
9	10.1

% Correct					
Hong Kong					OECD
F.4	F.1-F.3	Girls	Boys	Overall	
33.7	19.8	26.2	30.0	28.0	28.7

18

EXCHANGE RATE

Mei-Ling from Singapore was preparing to go to South Africa for 3 months as an exchange student.   She needed to change some Singapore dollars (SGD) into South African rand (ZAR).

Question 11: EXCHANGE RATE

Mei-Ling found out that the exchange rate between Singapore dollars and South African rand was:

1 SGD = 4.2 ZAR

Mei-Ling changed 3000 Singapore dollars into South African rand at this exchange rate.

How much money in South African rand did Mei-Ling get?

Answer: ....

EXCHANGE RATE SCORING 1

Full Credit

Code 1:   12 600 ZAR (unit not required).

No Credit

Code 0:   Other responses.

Code 9:   Missing.

M413Q01 Student Response Distribution

Code	Hong Kong (%)	% Correct					
		Hong Kong					**OECD**
1	89.3	**F.4**	**F.1-F.3**	**Girls**	**Boys**	**Overall**	
0	8.2						
9	2.5	92.1	85.0	90.6	88.0	89.3	80.5

Question 12: EXCHANGE RATE

On returning to Singapore after 3 months, Mei-Ling had 3 900 ZAR left.   She changed this back to Singapore dollars, noting that the exchange rate had changed to:

1 SGD = 4.0 ZAR

How much money in Singapore dollars did Mei-Ling get?

Answer: ....

EXCHANGE RATE SCORING 2

Full Credit

Code 1:   975 SGD (unit not required).

No Credit

Code 0:   Other responses.

Code 9:   Missing.

M413Q02 Student Response Distribution

Code	Hong Kong (%)	% Correct					
		Hong Kong					**OECD**
		F.4	**F.1-F.3**	**Girls**	**Boys**	**Overall**	
1	88.4	91.9	82.9	89.2	87.6	88.4	74.5
0	8.5						
9	3.1						

Question 13: EXCHANGE RATE

During these 3 months the exchange rate had changed from 4.2 to 4.0 ZAR per SGD.

Was it in Mei-Ling's favour that the exchange rate now was 4.0 ZAR instead of 4.2 ZAR, when she changed her South African rand back to Singapore dollars? Give an explanation to support your answer.

EXCHANGE RATE SCORING 3

Full Credit

Code 11: 'Yes', with adequate explanation.
- Yes, by the lower exchange rate (for 1 SGD) Mei-Ling will get more Singapore dollars for her South African rand.
- Yes, 4.2 ZAR for one dollar would have resulted in 929 ZAR. *[Note: student wrote ZAR instead of SGD, but clearly the correct calculation and comparison have been carried out and this error can be ignored]*
- Yes, because she received 4.2 ZAR for 1 SGD, and now she has to pay only 4.0 ZAR to get 1 SGD.

- Yes, because it is 0.2 ZAR cheaper for every SGD.
- Yes, because when you divide by 4.2 the outcome is smaller than when you divide by 4.
- Yes, it was in her favour because if it didn't go down she would have got about $50 less.

No Credit

Code 01: 'Yes', with no explanation or with inadequate explanation.
- Yes, a lower exchange rate is better.
- Yes it was in Mei-Ling's favour, because if the ZAR goes down, then she will have more money to exchange into SGD.
- Yes it was in Mei-Ling's favour.

Code 02: Other responses.

Code 99: Missing.

M413Q03 Student Response Distribution

	Hong Kong (%)	
Code	Breakdown	Overall
11	53.5	53.5
01	16.2	38.4
02	22.2	
99	8.1	8.1

% Correct					
Hong Kong					OECD
F.4	F.1-F.3	Girls	Boys	Overall	
60.3	42.9	56.5	50.5	53.5	40.6

EXPORTS

The graphics below show information about exports from Zedland, a country that uses zeds as its currency.

Total annual exports from Zedland in millions of zeds, 1996-2000
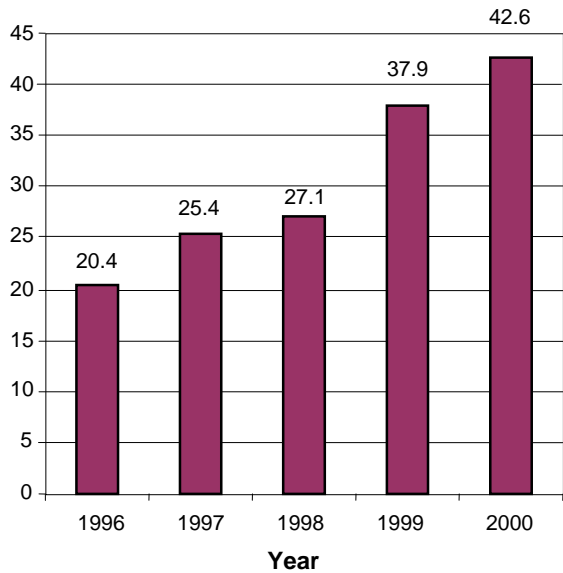
Distribution of exports from Zedland in 2000

Question 14: EXPORTS

What was the total value (in millions of zeds) of exports from Zedland in 1998?

Answer: ....

EXPORTS SCORING 1

Full Credit

Code 1:   27.1 million zeds or 27 100 000 zeds or 27.1 (unit not required). Accept also rounding to 27.

No Credit

Code 0:   Other responses.

Code 9:   Missing.

M438Q01 Student Response Distribution

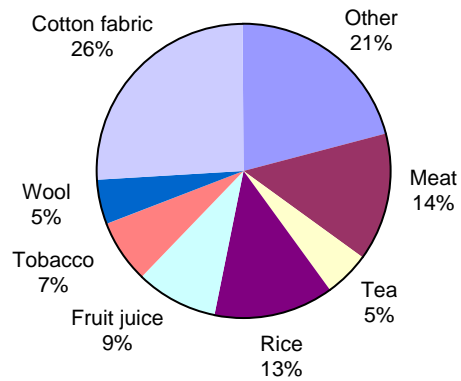| Code	Hong Kong (%)
1	77.7
0	17.1
9	5.2

% Correct					
	Hong Kong				OECD
F.4	F.1-F.3	Girls	Boys	Overall	
81.3	72.4	78.2	77.0	77.7	77.2

Question 15: EXPORTS

What was the value of fruit juice exported from Zedland in 2000?

A   1.8 million zeds.
B   2.3 million zeds.
C   2.4 million zeds.
D   3.4 million zeds.
E   3.8 million zeds.

EXPORTS SCORING 2

Full Credit

Code 1:   E.   3.8 million zeds.

No Credit

Code 0:   Other responses.

Code 9:   Missing.

M438Q02 Student Response Distribution

	Hong Kong (%)
A	5.8%
B	4.6%
C	11.3%
D	6.0%
E	**68.5%**

% Correct					
	Hong Kong				OECD
F.4	F.1-F.3	Girls	Boys	Overall	
75.1	59.4	68.0	69.3	68.5	47.8

COLOURED CANDIES

Question 16: COLOURED CANDIES

Robert's mother lets him pick one candy from a bag. He can't see the candies. The number of candies of each colour in the bag is shown in the following graph.
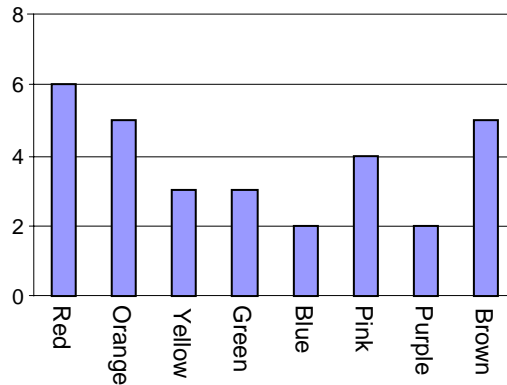
What is the probability that Robert will pick a red candy?

A   10%
B   20%
C   25%
D   50%

COLOURED CANDIES SCORING 1

Full Credit

Code 1:   B.   20%.

No Credit

Code 0:   Other responses.

Code 9:   Missing.

M467Q01 Student Response Distribution	
Hong Kong (%)	
A	4.4%
B	**72.5%**
C	13.8%
D	8.7%

% Correct					
Hong Kong					**OECD**
F.4	**F.1-F.3**	**Girls**	**Boys**	**Overall**	
76.5	66.9	69.6	75.6	72.5	50.4

SCIENCE TESTS

Question 17: SCIENCE TESTS

In Mei Lin's school, her science teacher gives tests that are marked out of 100.   Mei Lin has an average of 60 marks on her first four Science tests. On the fifth test she got 80 marks.

What is the average of Mei Lin's marks in Science after all five tests?

Average: ....

SCIENCE TESTS SCORING 1

Full Credit

Code 1:   64.

No Credit

Code 0:   Other responses.

Code 9:   Missing.

M468Q01 Student Response Distribution

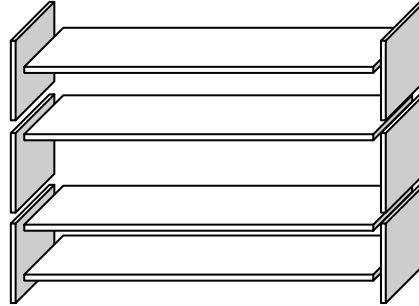| Code	Hong Kong (%)	% Correct					
		Hong Kong					**OECD**
		F.4	**F.1-F.3**	**Girls**	**Boys**	**Overall**	
1	74.9	79.2	68.5	73.7	76.3	74.9	46.1
0	19.2						
9	5.9						

BOOKSHELVES

Question 18: BOOKSHELVES

M484Q01

To complete one set of bookshelves a carpenter needs the following components:

> 4 long wooden panels,
>
> 6 short wooden panels,
>
> 12 small clips,
>
> 2 large clips and
>
> 14 screws.

The carpenter has in stock 26 long wooden panels, 33 short wooden panels, 200 small clips, 20 large clips and 510 screws.

How many sets of bookshelves can the carpenter make?

Answer: ....

BOOKSHELVES SCORING 1

Full Credit

Code 1:   5.

No Credit

Code 0:   Other responses.

Code 9:   Missing.

M484Q01 Student Response Distribution

Code	Hong Kong (%)	% Correct					
		Hong Kong					**OECD**
1	74.8						
0	22.3	**F.4**	**F.1-F.3**	**Girls**	**Boys**	**Overall**	
9	2.9	80.8	65.8	72.6	77.2	74.8	61.1

LITTER

Question 19: LITTER

For a homework assignment on the environment, students collected information on the decomposition time of several types of litter that people throw away:

Type of Litter	Decomposition time
Banana peel	1–3 years
Orange peel	1–3 years
Cardboard boxes	0.5 year
Chewing gum	20–25 years
Newspapers	A few days
Polystyrene cups	Over 100 years

A student thinks of displaying the results in a bar graph.

Give **one** reason why a bar graph is unsuitable for displaying these data.

LITTER SCORING 1

Full Credit

Code 1:   Reason focuses on big variance in data.
- The difference in the lengths of the bars of the bar graph would be too big.
- If you make a bar with length 10 centimetres for polystyrene, the one for cardboard boxes would be 0.05 centimetres.

     OR

Reason focuses on the variability of the data for some categories.
- The length of the bar for "polystyrene cups" is undetermined.
- You cannot make one bar for 1–3 years or one bar for 20–25 years.

No Credit

Code 0:   Other responses.
- Because it will not work.
- A pictogram is better.
- You cannot verify the info.
- Because the numbers in the table are only approximations.

Code 9:   Missing.

M505Q01 Student Response Distribution

Code	Hong Kong (%)	% Correct					
		Hong Kong					**OECD**
1	68.0	**F.4**	**F.1-F.3**	**Girls**	**Boys**	**Overall**	
0	24.9						
9	7.1	72.9	61.2	70.1	66.0	68.0	51.3

EARTHQUAKE

Question 20: EARTHQUAKE

A documentary was broadcast about earthquakes and how often earthquakes occur. It included a discussion about the predictability of earthquakes.

A geologist stated: "In the next twenty years, the chance that an earthquake will occur in Zed City is two out of three".

Which of the following best reflects the meaning *of the geologist's statement*?

A $\frac{2}{3} \times 20 = 13.3$, so between 13 and 14 years from now there will be an earthquake in Zed City.

B $\frac{2}{3}$ is more than $\frac{1}{2}$, so you can be sure there will be an earthquake in Zed City at some time during the next 20 years.

C The likelihood that there will be an earthquake in Zed City at some time during the next 20 years is higher than the likelihood of no earthquake.

D You cannot tell what will happen, because nobody can be sure when an earthquake will occur.

EARTHQUAKE SCORING 1

Full Credit

Code 1: C. The likelihood that there will be an earthquake in Zed City at some time during the next 20 years is higher than the likelihood of no earthquake.

No Credit

Code 0: Other responses.

Code 9: Missing.

M509Q01 Student Response Distribution

	Hong Kong (%)
A	8.7%
B	9.6%
C	**56.0%**
D	17.8%

% Correct					
Hong Kong					OECD
F.4	F.1-F.3	Girls	Boys	Overall	
60.5	49.6	53.3	59.2	56.0	45.5

CHOICES

Question 21: CHOICES

In a pizza restaurant, you can get a basic pizza with two toppings: cheese and tomato. You can also make up your own pizza with **extra** toppings. You can choose from four different extra toppings: olives, ham, mushrooms and salami.

Ross wants to order a pizza with two different **extra** toppings.

How many different combinations can Ross choose from?

Answer: .... combinations.

CHOICES SCORING 1

Full Credit

Code 1:   6.

No Credit

Code 0:   Other responses.

Code 9:   Missing.

M510Q01 Student Response Distribution

Code	Hong Kong (%)
1	46.5
0	51.5
9	2.0

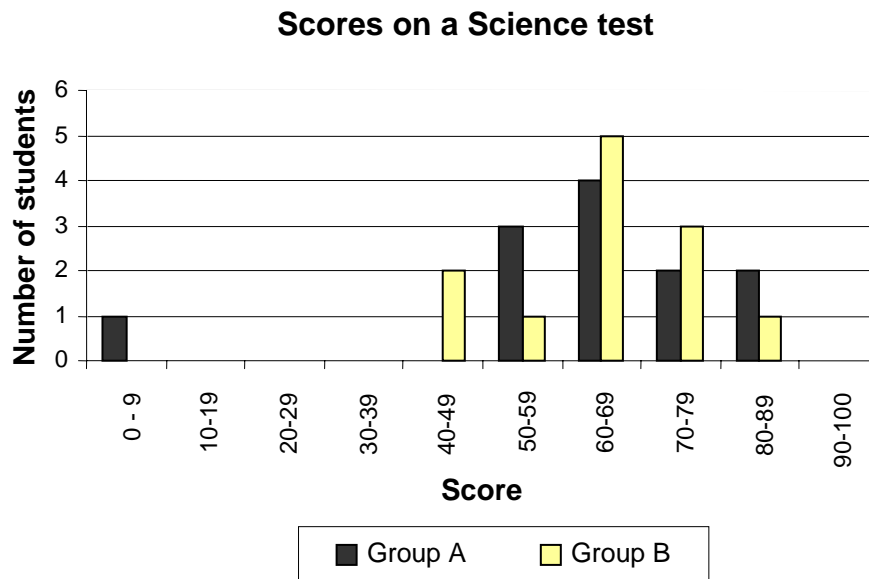| % Correct					
Hong Kong					**OECD**
F.4	**F.1-F.3**	**Girls**	**Boys**	**Overall**	
51.6	38.8	47.3	45.5	46.5	48.7

TEST SCORES

Question 22: TEST SCORES

The diagram below shows the results on a Science test for two groups, labelled as Group A and Group B.

The mean score for Group A is 62.0 and the mean for Group B is 64.5.   Students pass this test when their score is 50 or above.

Scores on a Science test

Looking at the diagram, the teacher claims that Group B did better than Group A in this test.

The students in Group A don't agree with their teacher. They try to convince the teacher that Group B may not necessarily have done better.

Give one mathematical argument, using the graph, that the students in Group A could use.

TEST SCORES SCORING 1

Full Credit

Code 1:   One valid argument is given. Valid arguments could relate to the number of students passing, the disproportionate influence of the outlier, or the number of students with scores in the highest level.
- More students in Group A than in Group B passed the test.
- If you ignore the weakest Group A student, the students in Group A do better than those in Group B.
- More Group A students than Group B students scored 80 or over.

No Credit

Code 0:   Other responses, including responses with no mathematical reasons, or wrong mathematical reasons, or responses that simply describe differences but are not

valid arguments that Group B may not have done better.
- Group A students are normally better than Group B students in science. This test result is just a coincidence.
- Because the difference between the highest and lowest scores is smaller for Group B than for Group A.
- Group A has better score results in the 80-89 range and the 50-59 range.
- Group A has a larger inter-quartile range than Group B.

Code 9:   Missing.

M513Q01 Student Response Distribution
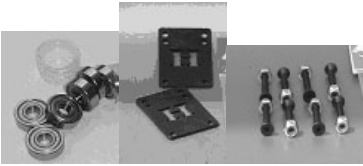
Code	Hong Kong (%)
1	64.8
0	17.7
9	17.4

% Correct					
Hong Kong					OECD
F.4	F.1-F.3	Girls	Boys	Overall	
71.0	56.0	64.4	65.4	64.8	32.0

SKATEBOARD

Eric is a great skateboard fan. He visits a shop named SKATERS to check some prices.

At this shop you can buy a complete board. Or you can buy a deck, a set of 4 wheels, a set of 2 trucks and a set of hardware, and assemble your own board.

The prices for the shop's products are:

Product	Price in zeds	
Complete skateboard	82 or 84	
Deck	40, 60 or 65	
One set of 4 Wheels	14 or 36	
One set of 2 Trucks	16	
One set of hardware (bearings, rubber pads, bolts and nuts)	10 or 20	

Question 23: SKATEBOARD

Eric wants to assemble his own skateboard. What is the minimum price and the maximum price in this shop for self-assembled skateboards?

(a) Minimum price: .... zeds.

(b) Maximum price: .... zeds.

SKATEBOARD SCORING 1

Full Credit

Code 21: Both the minimum (80) and the maximum (137) correct.

Partial Credit

Code 11: Only the minimum (80) correct.

Code 12: Only the maximum (137) correct.

No Credit

Code 00: Other responses.

Code 99: Missing.

M520Q01 Student Response Distribution

Code	Hong Kong (%) Breakdown	Overall
21	70.3	70.3
11	4.3	8.5
12	4.1	
00	18.3	18.3
99	2.9	2.9

% Correct					
Hong Kong					**OECD**
F.4	**F.1-F.3**	**Girls**	**Boys**	**Overall**	
79.6	67.3	74.8	74.3	74.6	72.1

The shop offers three different decks, two different sets of wheels and two different sets of hardware. There is only one choice for a set of trucks.

How many different skateboards can Eric construct?

A   6
B   8
C   10
D   12

SKATEBOARD SCORING 2

Full Credit

Code 1:   D.   12.

No Credit

Code 0:   Other responses.

Code 9:   Missing.

M520Q02 Student Response Distribution

	Hong Kong (%)
A	19.5%
B	11.0%
C	6.4%
D	**61.1%**

% Correct					
Hong Kong					OECD
F.4	F.1-F.3	Girls	Boys	Overall	
69.9	48.3	57.3	64.8	61.1	46.1

Question 25: SKATEBOARD

Eric has 120 zeds to spend and wants to buy the most expensive skateboard he can afford.

How much money can Eric afford to spend on each of the 4 parts?   Put your answer in the table below.

Part	Amount (zeds)
Deck	
Wheels	
Trucks	
Hardware	

SKATEBOARD SCORING 3

Full Credit

Code 1:   65 zeds on a deck, 14 on wheels, 16 on trucks and 20 on hardware.

No Credit

Code 0:   Other responses.

Code 9:   Missing.

M520Q03a Student Response Distribution

Code	Hong Kong (%)
1	69.7
0	26.4
9	3.9

M520Q03b Student Response Distribution

Code	Hong Kong (%)
1	75.9
0	20.2
9	3.9

M520Q03c Student Response Distribution

Code	Hong Kong (%)
1	92.3
0	3.8
9	3.9

M520Q03d Student Response Distribution

Code	Hong Kong (%)
1	85.0
0	11.1
9	3.9

% Correct					
Hong Kong					OECD
F.4	F.1-F.3	Girls	Boys	Overall	
68.5	53.4	62.7	62.0	62.4	49.9

STAIRCASE

Question 26: STAIRCASE

The diagram below illustrates a staircase with 14 steps and a total height of 252 cm:

Total height 252 cm

Total depth 400 cm
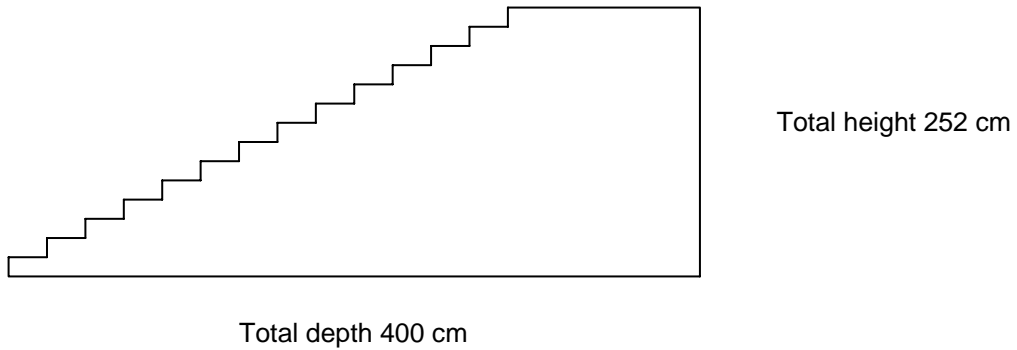
What is the height of each of the 14 steps?

Height: .... cm.

STAIRCASE SCORING 1

Full Credit

Code 1:   18.

No Credit

Code 0:   Other responses.

Code 9:   Missing.

M547Q01 Student Response Distribution

Code	Hong Kong (%)
1	85.5
0	10.2
9	4.2

% Correct					
Hong Kong					**OECD**
F.4	**F.1-F.3**	**Girls**	**Boys**	**Overall**	
88.2	81.7	86.1	84.8	85.5	76.4

NUMBER CUBES

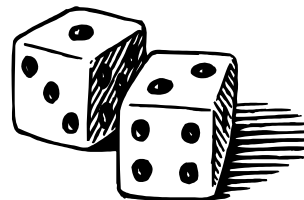## Question 27: NUMBER CUBES

On the right, there is a picture of two dice.

Dice are special number cubes for which the following rule applies:

> The total number of dots on two opposite faces is always seven.

You can make a simple number cube by cutting, folding and gluing cardboard.   This can be done in many ways.   In the figure below you can see four cuttings that can be used to make cubes, with dots on the sides.

Which of the following shapes can be folded together to form a cube that obeys the rule that the sum of opposite faces is 7? For each shape, circle either "Yes" or "No" in the table below.
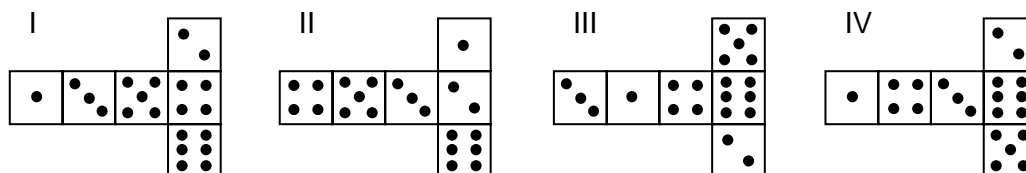
Shape	Obeys the rule that the sum of opposite faces is 7?
I	Yes / No
II	Yes / No
III	Yes / No
IV	Yes / No

NUMBER CUBES SCORING 2

Full Credit

Code 1:   No, Yes, Yes, No, in that order.

No Credit

Code 0:   Other responses.

Code 9:   Missing.

M555Q02a Student Response Distribution

Code	Hong Kong (%)
1	85.2
0	12.5
9	2.3

M555Q02b Student Response Distribution

Code	Hong Kong (%)
1	86.7
0	10.9
9	2.5

M555Q02c Student Response Distribution

Code	Hong Kong (%)
1	87.4
0	10.1
9	2.5

M555Q02d Student Response Distribution

Code	Hong Kong (%)
1	83.6
0	13.7
9	2.6

% Correct					
Hong Kong					**OECD**
F.4	**F.1-F.3**	**Girls**	**Boys**	**Overall**	
74.8	62.4	69.1	70.4	69.7	61.8

SUPPORT FOR THE PRESIDENT

Question 28: SUPPORT FOR THE PRESIDENT

In Zedland, opinion polls were conducted to find out the level of support for the President in the forthcoming election.   Four newspaper publishers did separate nationwide polls. The results for the four newspaper polls are shown below:

Newspaper 1: 36.5% (poll conducted on January 6, with a sample of 500 randomly selected citizens with voting rights)

Newspaper 2: 41.0% (poll conducted on January 20, with a sample of 500 randomly selected citizens with voting rights)

Newspaper 3: 39.0% (poll conducted on January 20, with a sample of 1000 randomly selected citizens with voting rights)

Newspaper 4: 44.5% (poll conducted on January 20, with 1000 readers phoning in to vote).

Which newspaper's result is likely to be the best for predicting the level of support for the President if the election is held on January 25?   Give two reasons to support your answer.

SUPPORT FOR THE PRESIDENT SCORING 1

Full Credit

Code 2:   Newspaper 3.   The poll is more recent, with larger sample size, a random selection of the sample, and only voters were asked.   (Give at least two reasons).   Additional information (including irrelevant or incorrect information) should be ignored.
- Newspaper 3, because they have selected more citizens randomly with voting rights.
- Newspaper 3 because it has asked 1000 people, randomly selected, and the date is closer to the election date so the voters have less time to change their mind.
- Newspaper 3 because they were randomly selected and they had voting rights.
- Newspaper 3 because it surveyed more people closer to the date.
- Newspaper 3 because the 1000 people were randomly selected.

Partial Credit

Code 1:   Newspaper 3, with only one reason, or without explanation.
- Newspaper 3, because the poll is closer to election date.
- Newspaper 3, because more people were surveyed than newspapers 1 and 2
- Newspaper 3

No Credit

Code 0:   Other responses.
- Newspaper 4.   More people means more accurate results, and people phoning in will have considered their vote better.

Code 9:   Missing.

M702Q01 Student Response Distribution

Code	Hong Kong (%)
2	49.4
1	3.8
0	32.6
9	14.2

% Correct					
Hong Kong					OECD
F.4	F.1-F.3	Girls	Boys	Overall	
59.4	40.3	51.1	52.1	51.3	38.8

THE BEST CAR

A car magazine uses a rating system to evaluate new cars, and gives the award of "The Car of the Year" to the car with the highest total score.   Five new cars are being evaluated, and their ratings are shown in the table.

Car	Safety Features (S)	Fuel Efficiency (F)	External Appearance (E)	Internal Fittings (T)
Ca	3	1	2	3
M2	2	2	2	2
Sp	3	1	3	2
N1	1	3	3	3
KK	3	2	3	2

The ratings are interpreted as follows:

   3 points = Excellent
   2 points = Good
   1 point = Fair

Question 29: THE BEST CAR

M704Q01

To calculate the total score for a car, the car magazine uses the following rule, which is a weighted sum of the individual score points:

Total Score = (3 x S) + F + E + T

Calculate the total score for Car "Ca".   Write your answer in the space below.

Total score for "Ca":   ....

THE BEST CAR SCORING 1

Full Credit

Code 1:   15 points.

No Credit

Code 0:   Other responses.

Code 9:   Missing.

M704Q01 Student Response Distribution

Code	Hong Kong (%)
1	87.3
0	9.7
9	3.0

% Correct					
Hong Kong					**OECD**
F.4	**F.1-F.3**	**Girls**	**Boys**	**Overall**	
92.2	79.8	88.0	86.6	87.3	72.4

Question 30: THE BEST CAR

The manufacturer of car "Ca" thought the rule for the total score was unfair.

Write down a rule for calculating the total score so that Car "Ca" will be the winner.

Your rule should include all four of the variables, and you should write down your rule by filling in positive numbers in the four spaces in the equation below.

Total score = ... $\times$ S + ... $\times$ F + ... $\times$ E + ... $\times$ T.

THE BEST CAR SCORING 2

Full Credit

Code 1: Correct rule that will make "Ca" the winner.

No Credit

Code 0: Other responses.

Code 9: Missing.

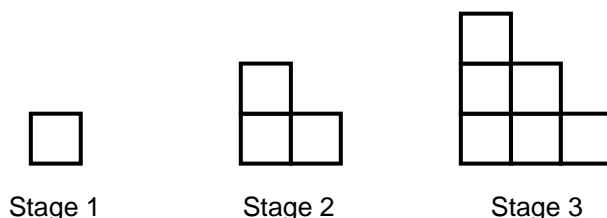**M704Q02 Student Response Distribution**

Code	Hong Kong (%)
1	38.3
0	54.1
9	7.6

% Correct					
Hong Kong					**OECD**
F.4	**F.1-F.3**	**Girls**	**Boys**	**Overall**	
47.1	25.3	34.7	42.5	38.3	25.9

STEP PATTERN

Question 31: STEP PATTERN

Robert builds a step pattern using squares. Here are the stages he follows.

Stage 1	Stage 2	Stage 3

As you can see, he uses one square for Stage 1, three squares for Stage 2 and six for Stage 3.

How many squares should he use for the fourth stage?

Answer: .... squares.

STEP PATTERN SCORING 1

Full Credit

Code 1:   10.

No Credit

Code 0:   Other responses.

Code 9:   Missing.

M806Q01 Student Response Distribution

Code	Hong Kong (%)
1	81.8
0	15.0
9	3.1

% Correct					
Hong Kong					**OECD**
F.4	**F.1-F.3**	**Girls**	**Boys**	**Overall**	
85.7	76.3	81.8	82.0	81.8	64.7