Education Quality and Accountability Office

EQAO

Assessment of Reading, Writing and Mathematics:
Junior Division

Released 2011 Assessment: Mathematics

Item-Specific Rubric and Sample Student Responses with Annotations

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Scoring Guide for Junior Mathematics Open-Response Question 7

Code	Descriptor
B	• Blank: nothing written or drawn in response to the question
I	• Illegible: cannot be read; completely crossed out/erased; not written in English • Irrelevant content: does not attempt assigned question (e.g., comment on the task, drawings, “?”, “!”, “I don’t know”) • Off topic: no relationship of written work to the question
10	Problem-solving process to determine the reasonableness of Ali and Nadia’s estimates shows limited effectiveness due to • minimal evidence of a solution process • limited identification of important elements of the problem • too much emphasis on unimportant elements of the problem • no conclusions presented • conclusion presented without supporting evidence
20	Problem-solving process to determine the reasonableness of Ali and Nadia’s estimates shows some effectiveness due to • an incomplete solution process • identification of some of the important elements of the problem • some understanding of the relationships between important elements of the problem • simple conclusions with little supporting evidence
30	Problem-solving process to determine the reasonableness of Ali and Nadia’s estimates shows considerable effectiveness due to • a solution process that is nearly complete • identification of most of the important elements of the problem • a considerable understanding of the relationships between important elements of the problem • appropriate conclusions with supporting evidence
40	Problem-solving process to determine the reasonableness of Ali and Nadia’s estimates shows a high degree of effectiveness due to • a complete solution process • identification of all important elements of the problem • a thorough understanding of the relationships between all of the important elements of the problem • appropriate conclusions with thorough and insightful supporting evidence

Code 10

The table below shows the changes in the amount of snow on the ground over 10 days.

Ali estimates that the total change is an increase of 30 cm.

Nadia estimates that the total change is an increase of 25 cm.

Day	Change
1	15 cm new snow
2	7.5 cm new snow
3	no change
4	4.5 cm melted
5	3.5 cm melted
6	4 cm melted
7	no change
8	12 cm new snow
9	2.5 cm new snow
10	8 cm new snow

Which student makes a more accurate estimate?

Circle one: (Ali) Nadia

Justify your answer.

I know Ali estimated more accurately because The total amount of new snow was 28 cm. Ali estimated 20 cm and Nadia estimated 25. 28 is closer to 30 so Ali was closer.

Annotation:
Student demonstrates minimal evidence of a solution process; states that the snow has not accumulated to a value greater than 30, but shows no evidence of adding or subtracting new and melted snow, selects Ali based on estimation.

Code 20

The table below shows the changes in the amount of snow on the ground over 10 days.

Ali estimates that the total change is an increase of 30 cm.

Nadia estimates that the total change is an increase of 25 cm.

Day	Change
1	15 cm new snow
2	7.5 cm new snow
3	no change
4	4.5 cm melted
5	3.5 cm melted
6	4 cm melted
7	no change
8	12 cm new snow
9	2.5 cm new snow
10	8 cm new snow

Which student makes a more accurate estimate?

Circle one: (Ali) Nadia

Justify your answer. Ali makes a more accurate answer. I know that because I added up all of the change and it equated 57cm. Since Ali guessed 30cm and Nadia 25cm Ali was more accurate.

Annotation:
Student demonstrates some understanding of the relationships between important elements of the problem; does not recognize that melted snow should be subtracted and adds all the data, but makes an accurate conclusion based on misconception.

Code 30

The table below shows the changes in the amount of snow on the ground over 10 days.

Ali estimates that the total change is an increase of 30 cm.

Nadia estimates that the total change is an increase of 25 cm.

Day	Change
1	15 cm new snow
2	7.5 cm new snow
3	no change
4	4.5 cm melted
5	3.5 cm melted
6	4 cm melted
7	no change
8	12 cm new snow
9	2.5 cm new snow
10	8 cm new snow

Which student makes a more accurate estimate?

Circle one: (Ali) Nadia

Justify your answer.

Ali because Day 1 Day 2 Day 3 Day 4 Day 5 Day 6 Day 7 Day 8 Day 9 Day 10
15 + 7.5 + 0 − 4.5 − 3.5 − 4 + 0 + 12 + 2.5 + 8 =

33.5 cm of Snow

And 33.5 is rounded to 30 and

Ali estimated

30 cm.

Annotation:
Student demonstrates a considerable understanding of the relationships between important elements of the problem; correctly adds new snow and subtracts melted snow, with a calculation error but makes a correct conclusion based on error.

Code 40

The table below shows the changes in the amount of snow on the ground over 10 days.

Ali estimates that the total change is an increase of 30 cm.

Nadia estimates that the total change is an increase of 25 cm.

Day	Change
1	15 cm new snow
2	7.5 cm new snow
3	no change
4	4.5 cm melted
5	3.5 cm melted
6	4 cm melted
7	no change
8	12 cm new snow
9	2.5 cm new snow
10	8 cm new snow

Which student makes a more accurate estimate?

Circle one: (Ali) Nadia

Justify your answer.

15 +7.5-4.5-3.5-4 +12+2.5 +8=33

33

Annotation :
Student demonstrates a thorough understanding of the relationships between all of the important elements of the problem; correctly adds new snow and subtracts melted snow and makes an accurate conclusion, by choosing Ali.

Scoring Guide for Junior Mathematics Open-Response Question 8

Code	Descriptor
B	• Blank: nothing written or drawn in response to the question
I	• Illegible: cannot be read; completely crossed out/erased; not written in English • Irrelevant content: does not attempt assigned question (e.g., comment on the task, drawings, “?”, “!”, “I don’t know”) • Off topic: no relationship of written work to the question
10	Application of knowledge and skills to determine the prime number factors of 168 shows limited effectiveness due to • misunderstanding of concepts • incorrect selection or misuse of procedures
20	Application of knowledge and skills to determine the prime number factors of 168 shows some effectiveness due to • partial understanding of the concepts • errors and/or omissions in the application of the procedures
30	Application of knowledge and skills to determine the prime number factors of 168 shows considerable effectiveness due to • an understanding of most of the concepts • minor errors and/or omissions in the application of the procedures
40	Application of knowledge and skills to determine the prime number factors of 168 shows a high degree of effectiveness due to • a thorough understanding of the concepts • an accurate application of the procedures (any minor errors and/or omissions do not detract from the demonstration of a thorough understanding)

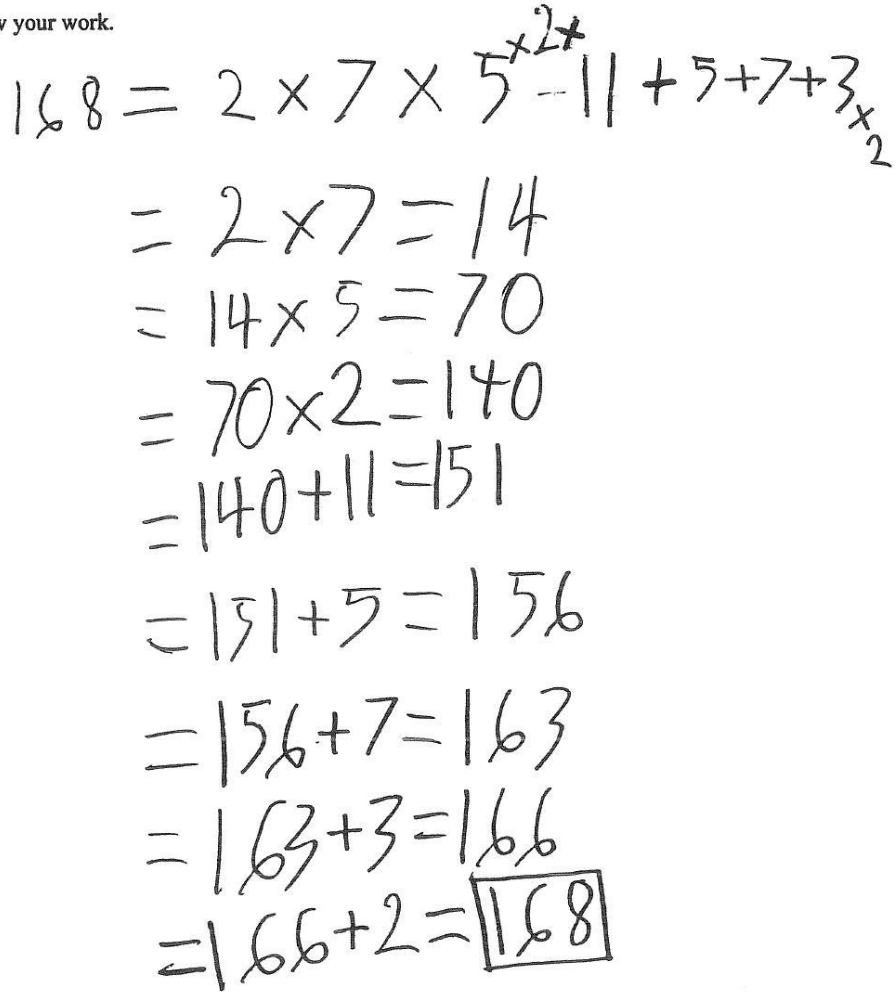
Code 10

Consider how 30 is written below as the product of prime numbers.

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

Write 168 as the product of prime numbers.

Show your work.



Annotation:
Student demonstrates an incorrect selection of procedures; combines addition and multiplication to reach 168.

Code 20

Consider how 30 is written below as the product of prime numbers.

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

Write 168 as the product of prime numbers.

Show your work.

Prime number means that it has two factors.

$168 = 7 \times 3 \times 8$

$$\begin{array}{r} 7 \\ \times\ 3 \\ \hline 21 \\ \times\quad 8 \\ \hline 168 \end{array}$$

$168 = 8 \times 3 \times 7$

35

Annotation:
Student demonstrates omissions in the application of the procedures; product includes 2 prime factors and the remaining composite factor (8) is the product of more than 2 prime numbers.

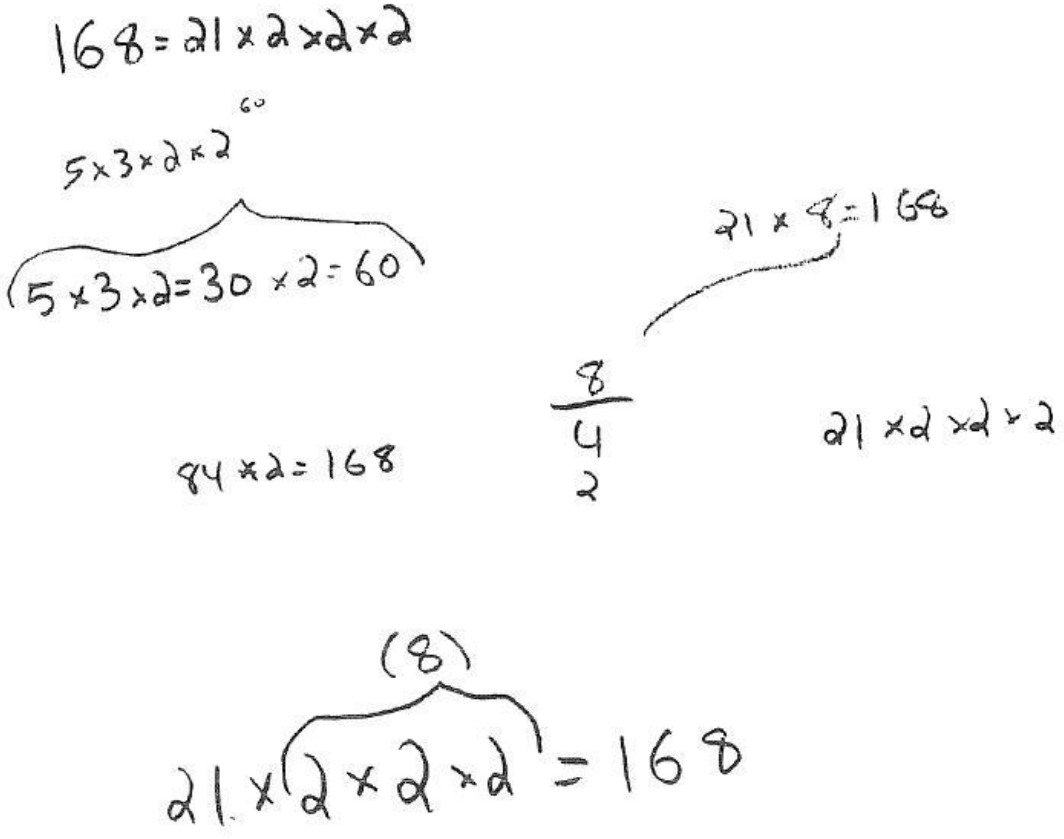
Code 30

Consider how 30 is written below as the product of prime numbers.

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

Write 168 as the product of prime numbers.

Show your work.



Annotation:
Student demonstrates a minor omission in the application of the procedures; finds most of the prime factors but product has one composite factor (21) which is the product of 2 primes.

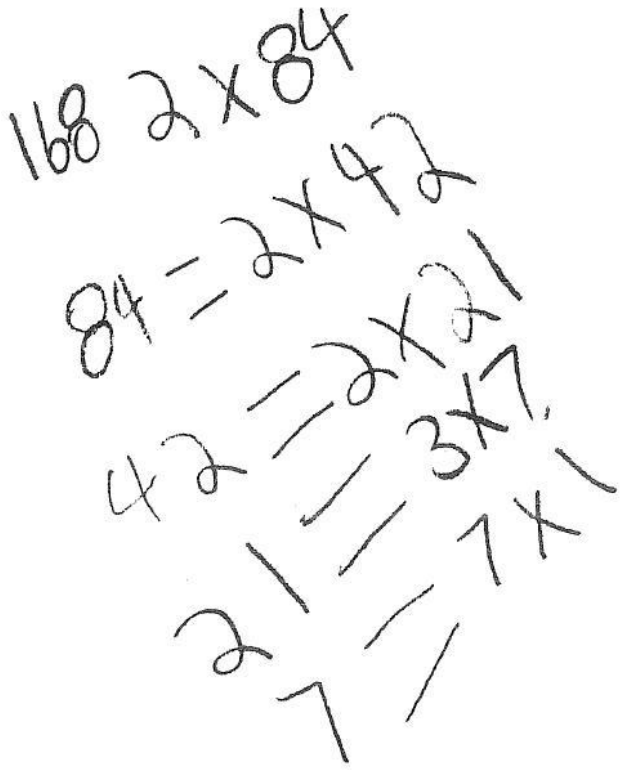
Code 40

Consider how 30 is written below as the product of prime numbers.

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

Write 168 as the product of prime numbers.

Show your work. $168 = 2 \times 2 \times 2 \times 3 \times 7$



Annotation:
Student demonstrates an accurate application of the procedures; all the prime factors of 168 are written as a product.

Scoring Guide for Junior Mathematics Open-Response Question 9

Code	Descriptor
B	• Blank: nothing written or drawn in response to the question
I	• Illegible: cannot be read; completely crossed out/erased; not written in English • Irrelevant content: does not attempt assigned question (e.g., comment on the task, drawings, “?”, “!”, “I don’t know”) • Off topic: no relationship of written work to the question
10	Application of knowledge and skills to express the theoretical probability of Dakota choosing a red paper clip shows limited effectiveness due to • misunderstanding of concepts • incorrect selection or misuse of procedures
20	Application of knowledge and skills to express the theoretical probability of Dakota choosing a red paper clip shows some effectiveness due to • partial understanding of the concepts • errors and/or omissions in the application of the procedures
30	Application of knowledge and skills to express the theoretical probability of Dakota choosing a red paper clip shows considerable effectiveness due to • an understanding of most of the concepts • minor errors and/or omissions in the application of the procedures
40	Application of knowledge and skills to express the theoretical probability of Dakota choosing a red paper clip shows a high degree of effectiveness due to • a thorough understanding of the concepts • an accurate application of the procedures (any minor errors and/or omissions do not detract from the demonstration of a thorough understanding)

Code 10

9 Dakota and Bryan count their coloured paper clips and record the results in the table below.

Colour	Dakota	Bryan	
Red	14	18	32
Yellow	7	9	16
Blue	6	5	11
White	17	20	37

They put all of the paper clips in a box. Dakota chooses one paper clip from the box without looking.

Determine the probability that Dakota chooses a red paper clip.

Show your work.

For Dakota to pick a red paper clip would be likly but not mostlikly because white has more but not that much more. And for a fraction it would be $\frac{3}{4}$

Annotation:
Student demonstrates a misunderstanding of concepts; determines totals for each colour, and writes a fraction (3/4) with no explanation for the fraction relating to probability.

Code 20

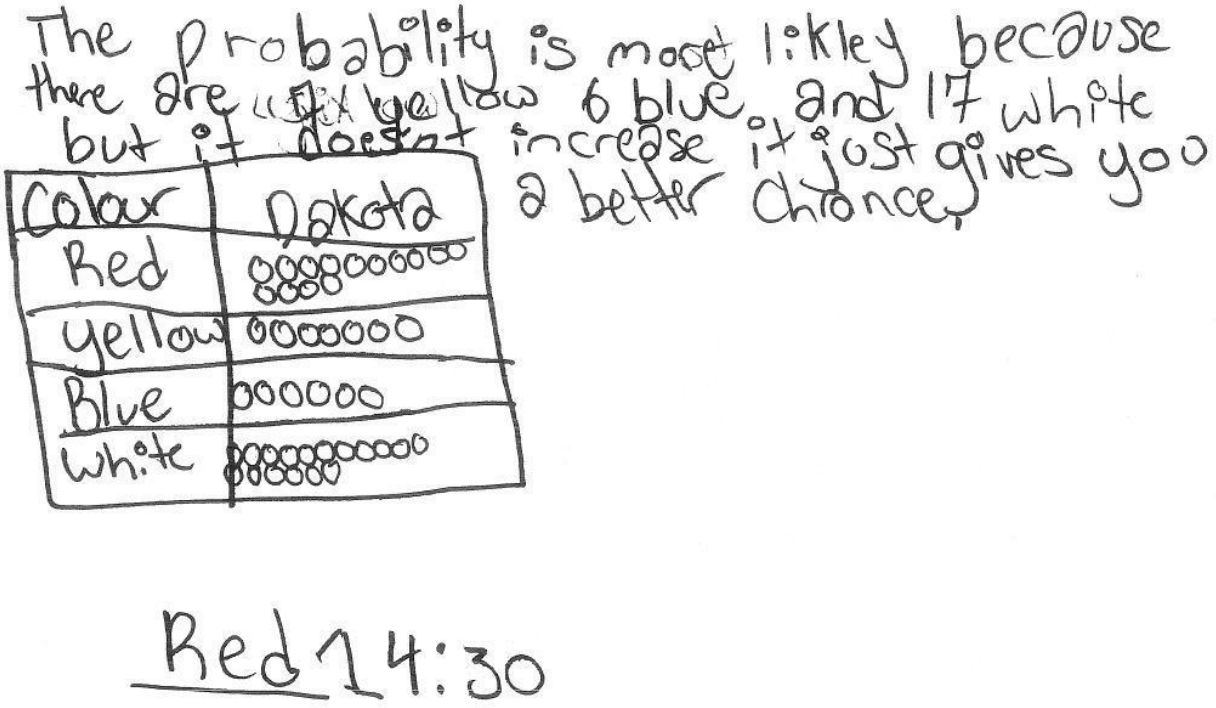
Dakota and Bryan count their coloured paper clips and record the results in the table below.

Colour	Dakota	Bryan
Red	14	18
Yellow	7	9
Blue	6	5
White	17	20

They put all of the paper clips in a box. Dakota chooses one paper clip from the box without looking.

Determine the probability that Dakota chooses a red paper clip.

Show your work.



Annotation:
Student demonstrates a partial understanding of the concepts; writes a ratio of the number of Dakota's red paper clips to the total of the rest of Dakota's paper clips (not including red) and ignores Bryan's paper clips.

Code 30

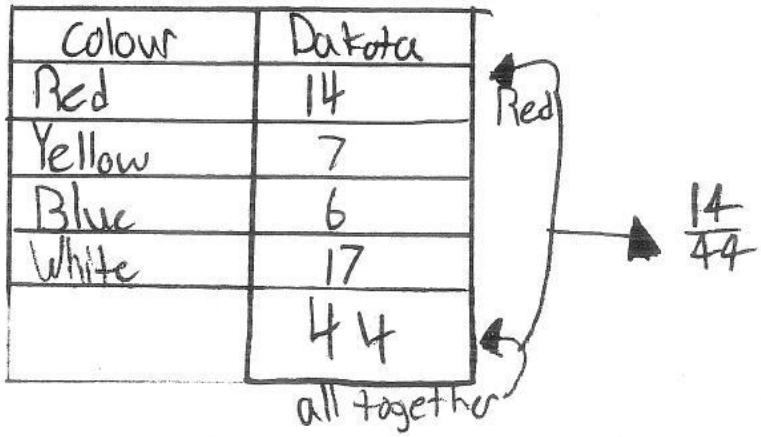
Dakota and Bryan count their coloured paper clips and record the results in the table below.

Colour	Dakota	Bryan
Red	14	18
Yellow	7	9
Blue	6	5
White	17	20

They put all of the paper clips in a box. Dakota chooses one paper clip from the box without looking.

Determine the probability that Dakota chooses a red paper clip.

Show your work.



Annotation:
Student demonstrates an understanding of most of the concepts; correctly determines the probability of choosing a red paper clip from Dakota's paper clips, but ignores Bryan's paper clips.

Code 40

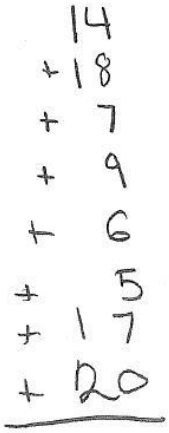
Dakota and Bryan count their coloured paper clips and record the results in the table below.

Colour	Dakota	Bryan
Red	14	18
Yellow	7	9
Blue	6	5
White	17	20

They put all of the paper clips in a box. Dakota chooses one paper clip from the box without looking.

Determine the probability that Dakota chooses a red paper clip.

Show your work.



There are 96 paper clips altogether and there are only 32 red paper clips all together, so the probability of picking a red paper clip is $\frac{32}{96}$ or $\frac{1}{3}$. wich is about 33%.

Annotation:
Student demonstrates an accurate application of the procedures; correctly identifies the total number of red paper clips, adds all colours accurately and determines the correct probability for Dakota choosing a red paper clip.

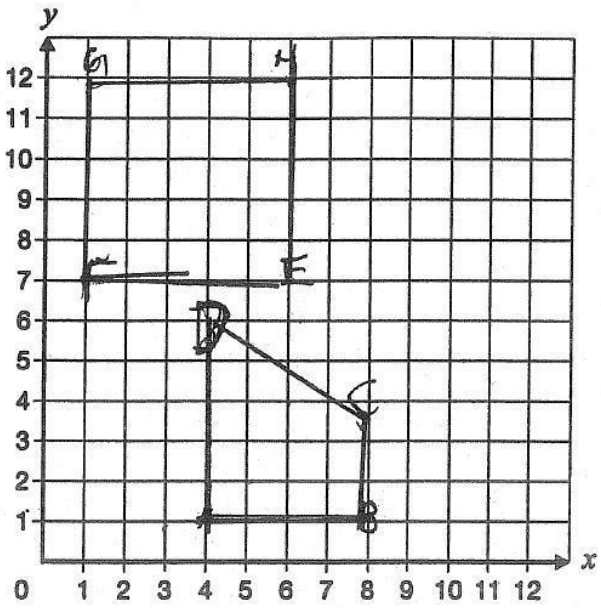
Scoring Guide for Junior Mathematics Open-Response Question 10

Code	Descriptor
B	• Blank: nothing written or drawn in response to the question
I	• Illegible: cannot be read; completely crossed out/erased; not written in English • Irrelevant content: does not attempt assigned question (e.g., comment on the task, drawings, “?”, “!”, “I don’t know”) • Off topic: no relationship of written work to the question
10	Problem-solving process to plot points in the first quadrant of a Cartesian coordinate plane shows limited effectiveness due to • minimal evidence of a solution process • limited identification of important elements of the problem • too much emphasis on unimportant elements of the problem • no conclusions presented • conclusion presented without supporting evidence
20	Problem-solving process to plot points in the first quadrant of a Cartesian coordinate plane shows some effectiveness due to • an incomplete solution process • identification of some of the important elements of the problem • some understanding of the relationships between important elements of the problem • simple conclusions with little supporting evidence
30	Problem-solving process to plot points in the first quadrant of a Cartesian coordinate plane shows considerable effectiveness due to • a solution process that is nearly complete • identification of most of the important elements of the problem • a considerable understanding of the relationships between important elements of the problem • appropriate conclusions with supporting evidence
40	Problem-solving process to plot points in the first quadrant of a Cartesian coordinate plane shows a high degree of effectiveness due to • a complete solution process • identification of all important elements of the problem • a thorough understanding of the relationships between all of the important elements of the problem • appropriate conclusions with thorough and insightful supporting evidence

Code 10

Liam creates a shape using the ordered pairs A(1, 4), B(1, 8), C(4, 8) and D(6, 4).

Draw Liam's shape on the grid below.



Draw a shape on the grid that is congruent to Liam's. Start with the ordered pairs E(7, 6) and F(7, 1).

Write the coordinates of your shape's other 2 vertices.

(12, 1) (12, 6)

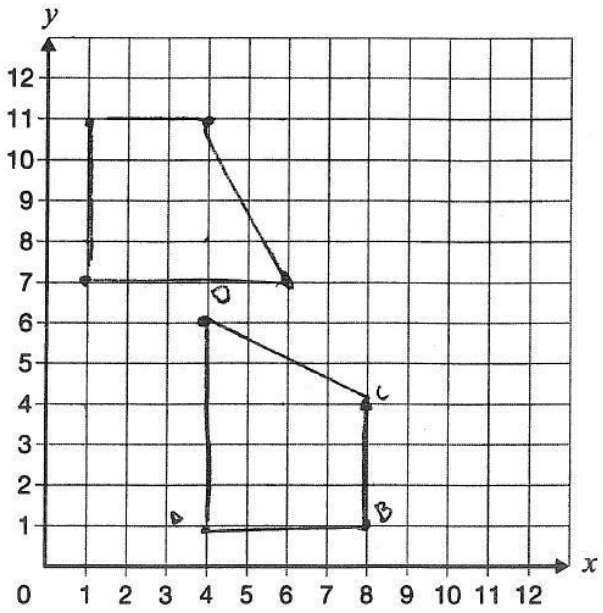
Annotation:
Student demonstrates limited identification of important elements of the problem; reverses coordinates (y, x) when plotting the points of the original shape, new shape is not congruent and follows through with misconception when writing required coordinates.

Scoring Guide for Junior Mathematics Open-Response Question 10

Code 20

Liam creates a shape using the ordered pairs A(1, 4), B(1, 8), C(4, 8) and D(6, 4).

Draw Liam's shape on the grid below.



Draw a shape on the grid that is congruent to Liam's. Start with the ordered pairs E(7, 6) and F(7, 1).

Write the coordinates of your shape's other 2 vertices.

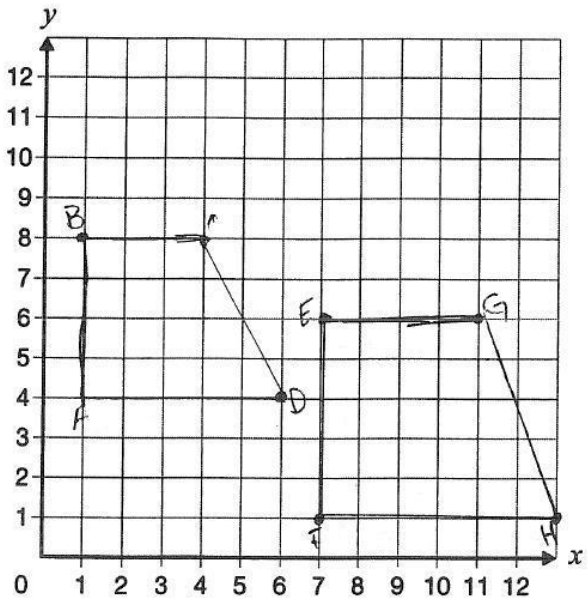
(١١ ,١) (١١ ,٤)

Annotation:
Student demonstrates some understanding of the relationships between important elements of the problem; plots points with all the coordinates reversed (y, x), creates a congruent shape, but follows through with misconception to write required coordinates.

Code 30

Liam creates a shape using the ordered pairs A(1, 4), B(1, 8), C(4, 8) and D(6, 4).

Draw Liam's shape on the grid below.



Draw a shape on the grid that is congruent to Liam's. Start with the ordered pairs E(7, 6) and F(7, 1).

Write the coordinates of your shape's other 2 vertices.

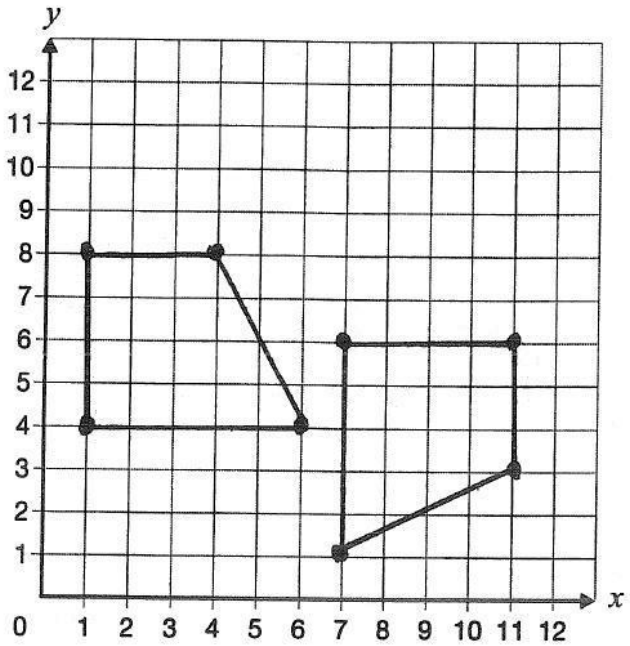
(11, 6) (13, 1)

Annotation:
Student demonstrates a considerable understanding of the relationships between important elements of the problem; correctly plots all given points, new shape is not congruent, but correctly writes required coordinates.

Code 40

Liam creates a shape using the ordered pairs A(1, 4), B(1, 8), C(4, 8) and D(6, 4).

Draw Liam's shape on the grid below.



Draw a shape on the grid that is congruent to Liam's. Start with the ordered pairs E(7, 6) and F(7, 1).

Write the coordinates of your shape's other 2 vertices.

(11, 6) (11, 3)

Annotation:
Student demonstrates a thorough understanding of the relationships between all of the important elements of the problem; accurately plots all given points, new shape is congruent, and correctly writes required coordinates.

Scoring Guide for Junior Mathematics Open-Response Question 26

Code	Descriptor
B	• Blank: nothing written or drawn in response to the question
I	• Illegible: cannot be read; completely crossed out/erased; not written in English • Irrelevant content: does not attempt assigned question (e.g., comment on the task, drawings, “?”, “!”, “I don’t know”) • Off topic: no relationship of written work to the question
10	Application of knowledge and skills to display data on a bar graph shows limited effectiveness due to • misunderstanding of concepts • incorrect selection or misuse of procedures
20	Application of knowledge and skills to display data on a bar graph shows some effectiveness due to • partial understanding of the concepts • errors and/or omissions in the application of the procedures
30	Application of knowledge and skills to display data on a bar graph shows considerable effectiveness due to • an understanding of most of the concepts • minor errors and/or omissions in the application of the procedures
40	Application of knowledge and skills to display data on a bar graph shows a high degree of effectiveness due to • a thorough understanding of the concepts • an accurate application of the procedures (any minor errors and/or omissions do not detract from the demonstration of a thorough understanding)

Code 10

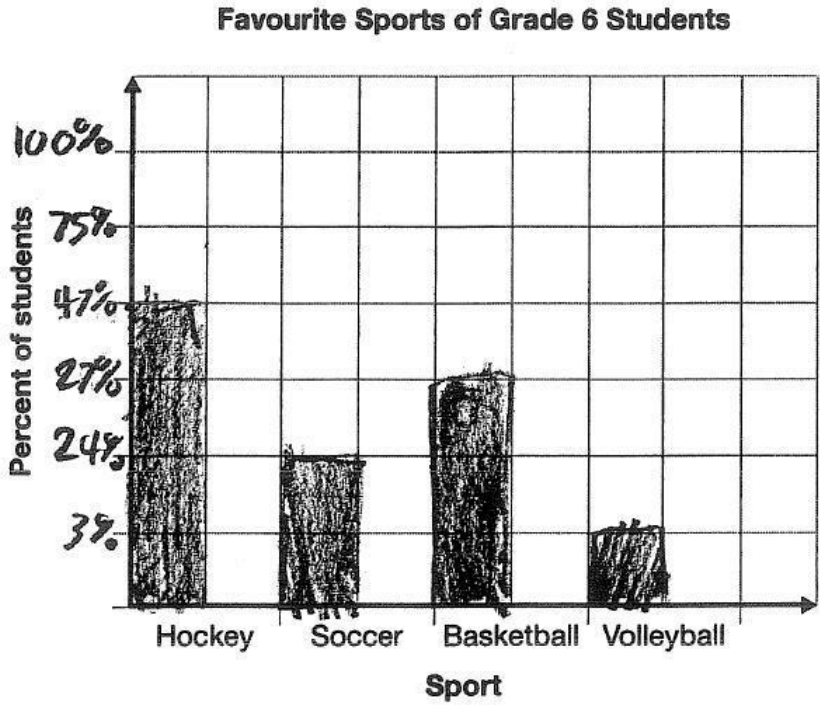
Some Grade 6 students participate in a survey about their favourite sports.

The results are shown in the table below.

Complete the table.

Sport	Number of students	Percent of students
Hockey	22	47%
Soccer	11	24%
Basketball	14	27%
Volleyball	3	3%

Complete the graph below using the percents.



Annotation:
Student demonstrates a misuse of procedures; attempts to convert to percent but does so inaccurately and provides an inaccurate scale (uses numbers from table) to complete the graph.

Code 20

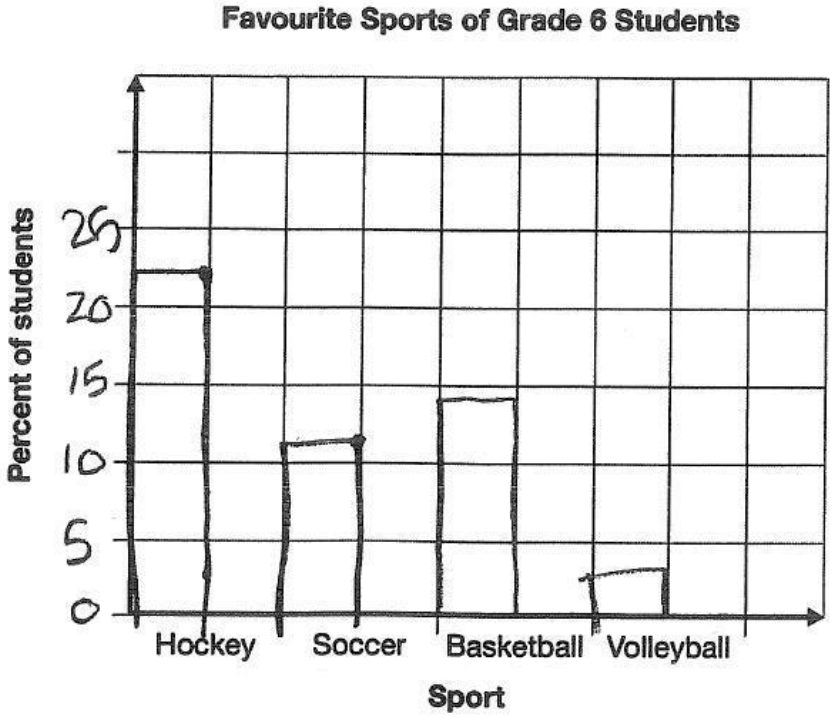
Some Grade 6 students participate in a survey about their favourite sports.

The results are shown in the table below.

Complete the table.

Sport	Number of students	Percent of students
Hockey	22	22 %
Soccer	11	11 %
Basketball	14	14 %
Volleyball	3	3 %

Complete the graph below using the percents.



Annotation:
Student demonstrates a partial understanding of the concepts; uses number of students as the percent of students, provides an accurate scale, selects appropriate type of graph and accurately graphs incorrect percents to create graph.

Code 30

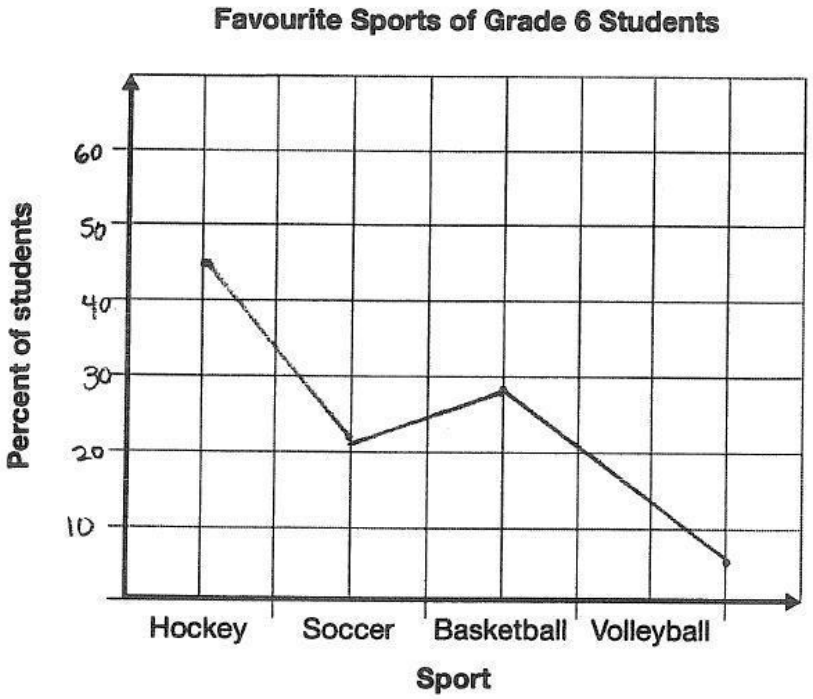
Some Grade 6 students participate in a survey about their favourite sports.

The results are shown in the table below.

Complete the table.

Sport	Number of students	Percent of students
Hockey	22	44%
Soccer	11	22%
Basketball	14	28%
Volleyball	3	6%

Complete the graph below using the percents.



Annotation:
Student demonstrates an understanding of most of the concepts; correctly converts to percents, provides an accurate scale (omits writing zero), graphs the percent data, but selects inappropriate type of graph.

Code 40

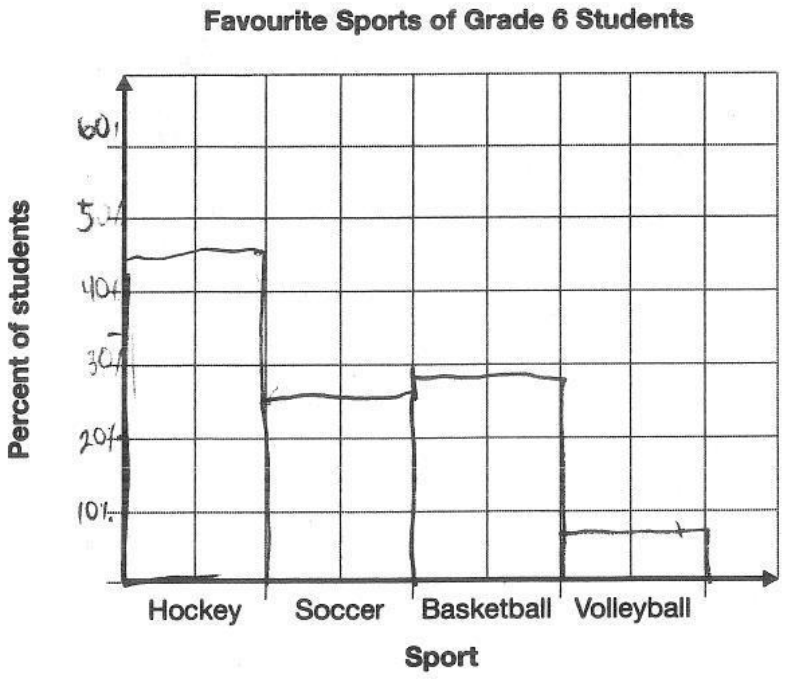
Some Grade 6 students participate in a survey about their favourite sports.

The results are shown in the table below.

Complete the table.

Sport	Number of students	Percent of students
Hockey	22	44%
Soccer	11	22%
Basketball	14	28%
Volleyball	3	6%

Complete the graph below using the percents.



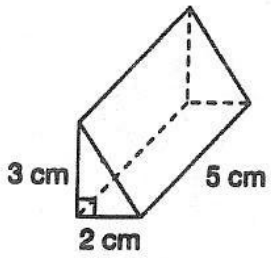
Annotation:
Student demonstrates a thorough understanding of the concepts; correctly converts to percents, provides an accurate scale (omits writing zero), selects appropriate type of graph and graphs the percent data to complete the graph.

Scoring Guide for Junior Mathematics Open-Response Question 27

Code	Descriptor
B	• Blank: nothing written or drawn in response to the question
I	• Illegible: cannot be read; completely crossed out/erased; not written in English • Irrelevant content: does not attempt assigned question (e.g., comment on the task, drawings, “?”, “!”, “I don’t know”) • Off topic: no relationship of written work to the question
10	Problem-solving process to determine the number of small triangular prisms needed to fill a larger rectangular prism shows limited effectiveness due to • minimal evidence of a solution process • limited identification of important elements of the problem • too much emphasis on unimportant elements of the problem • no conclusions presented • conclusion presented without supporting evidence
20	Problem-solving process to determine the number of small triangular prisms needed to fill a larger rectangular prism shows some effectiveness due to • an incomplete solution process • identification of some of the important elements of the problem • some understanding of the relationships between important elements of the problem • simple conclusions with little supporting evidence
30	Problem-solving process to determine the number of small triangular prisms needed to fill a larger rectangular prism shows considerable effectiveness due to • a solution process that is nearly complete • identification of most of the important elements of the problem • a considerable understanding of the relationships between important elements of the problem • appropriate conclusions with supporting evidence
40	Problem-solving process to determine the number of small triangular prisms needed to fill a larger rectangular prism shows a high degree of effectiveness due to • a complete solution process • identification of all important elements of the problem • a thorough understanding of the relationships between all of the important elements of the problem • appropriate conclusions with thorough and insightful supporting evidence

Code 10

Jackie fills the triangular prism pictured below with water. Then she empties the water into a rectangular prism.



Determine the number of times that Jackie must fill the triangular prism with water to fill a rectangular prism that is 10 cm long, 2 cm wide and 12 cm high.

Justify your answer.

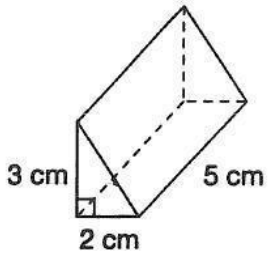
A	length	Width	Area
B	5	3	15
C	5	3	15
D	2	3	6
E	2	3	6
			42cm²

Jackie needs to fill 42cm² water in the rectangular prism.

Annotation:
Student demonstrates too much emphasis on unimportant elements of the problem; attempts to determine the surface area of the triangular prism (disregarding one face) using length and width.

Code 20

Jackie fills the triangular prism pictured below with water. Then she empties the water into a rectangular prism.



Determine the number of times that Jackie must fill the triangular prism with water to fill a rectangular prism that is 10 cm long, 2 cm wide and 12 cm high.

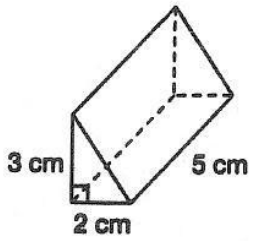
Justify your answer.

She would have to fill it 240 time becaus if you do 10x2x12 it would equal 240

Annotation:
Student demonstrates an identification of some of the important elements of the problem; correctly calculates the volume of one of the prisms (rectangular prism).

Code 30

Jackie fills the triangular prism pictured below with water. Then she empties the water into a rectangular prism.



Determine the number of times that Jackie must fill the triangular prism with water to fill a rectangular prism that is 10 cm long, 2 cm wide and 12 cm high.

Justify your answer.

Rectangle - $10cm \times 2cm \times 12cm = 240cm^3$

Triangle - $3cm \times 2cm \times 5cm = 30cm^3$

$240cm^3 \div 30cm^3 = 8$

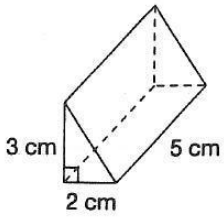
$30cm^3 \times 8 = 240.$

She needs to fill up the triangular prisim 8 times to fill up the rectangular prisim.

Annotation:
Student demonstrates a considerable understanding of the relationships between important elements of the problem; accurately determines the volume for the rectangular prism, makes an error when calculating the volume of the triangular prism (does not divide by 2), but accurately determines the number of times needed to fill the rectangular prism, based on volume error.

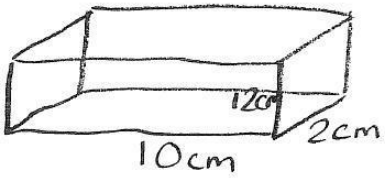
Code 40

Jackie fills the triangular prism pictured below with water. Then she empties the water into a rectangular prism.



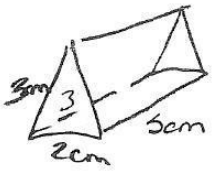
Determine the number of times that Jackie must fill the triangular prism with water to fill a rectangular prism that is 10 cm long, 2 cm wide and 12 cm high.

Justify your answer.



V = Length x Width x height

V = 10 x 2 x 12 = 240 cm^3



V = A of base x height

V = 3x2÷2 = 3 x 5 = 15 cm^3

240 ÷ 15 = 16

Jackie must fill the triangular prism 16 times to fill the rectangular prism.

Annotation:
Student demonstrates a thorough understanding of the relationships between all of the important elements of the problem; accurately calculates the volumes of both prisms and divides to determine the number of times it takes to fill the rectangular prism.

Scoring Guide for Junior Mathematics Open-Response Question 28

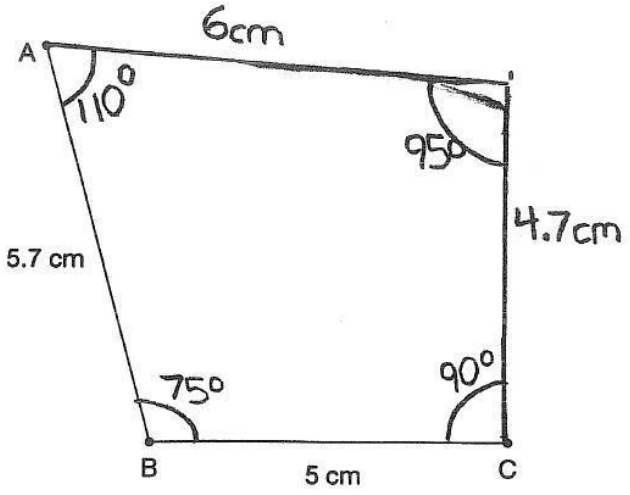
Code	Descriptor
B	• Blank: nothing written or drawn in response to the question
I	• Illegible: cannot be read; completely crossed out/erased; not written in English • Irrelevant content: does not attempt assigned question (e.g., comment on the task, drawings, “?”, “!”, “I don’t know”) • Off topic: no relationship of written work to the question
10	Application of knowledge and skills to measure and construct a right angle and a 110° angle shows limited effectiveness due to • misunderstanding of concepts • incorrect selection or misuse of procedures
20	Application of knowledge and skills to measure and construct a right angle and a 110° angle shows some effectiveness due to • partial understanding of the concepts • errors and/or omissions in the application of the procedures
30	Application of knowledge and skills to measure and construct a right angle and a 110° angle shows considerable effectiveness due to • an understanding of most of the concepts • minor errors and/or omissions in the application of the procedures
40	Application of knowledge and skills to measure and construct a right angle and a 110° angle shows a high degree of effectiveness due to • a thorough understanding of the concepts • an accurate application of the procedures (any minor errors and/or omissions do not detract from the demonstration of a thorough understanding)

Code 10

Use the line segments AB and BC below to construct pentagon ABCDE with the following properties:

- a right angle at point C
- an angle that measures 110° at point A
- a side of 4.7 cm

Label all angles and sides with their measures.



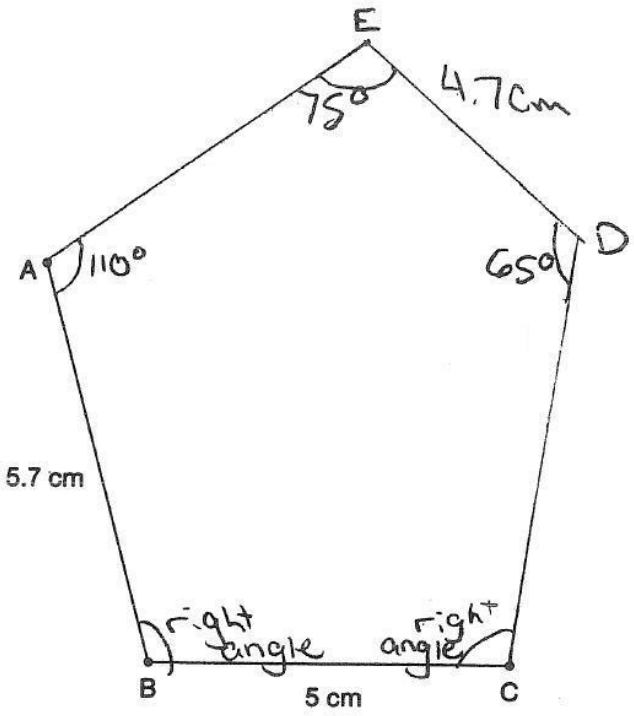
Annotation:
Student demonstrates a misunderstanding of concepts; creates a 90° angle at C, but does not construct a pentagon.

Code 20

Use the line segments AB and BC below to construct pentagon ABCDE with the following properties:

- a right angle at point C
- an angle that measures 110° at point A
- a side of 4.7 cm

Label all angles and sides with their measures.



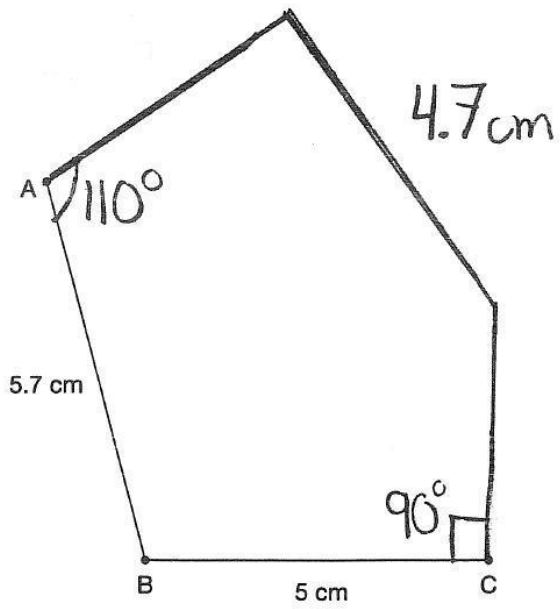
Annotation:
Student demonstrates a partial understanding of the concepts; constructs a pentagon with a 110° angle at A, but angle C is not within 2° of 90° (105°) and the required 4.7 cm is not between 4.5 cm and 5.0 cm (4.0 cm).

Code 30

Use the line segments AB and BC below to construct pentagon ABCDE with the following properties:

- a right angle at point C
- an angle that measures 110° at point A
- a side of 4.7 cm

Label all angles and sides with their measures.



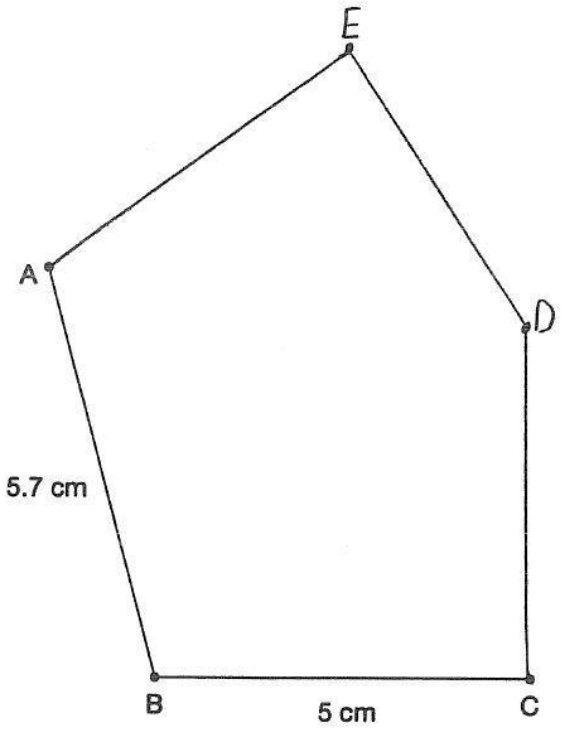
Annotation:
Student demonstrates a minor error in the application of the procedures; constructs a pentagon with a 90° angle at C, a 110° angle at A, but the required 4.7 cm side is not between 4.5 cm and 5.0 cm (5.2 cm).

Code 40

Use the line segments AB and BC below to construct pentagon ABCDE with the following properties:

- a right angle at point C
- an angle that measures 110° at point A
- a side of 4.7 cm

Label all angles and sides with their measures.



Annotation:
Student demonstrates a thorough understanding of the concepts; constructs a pentagon with a 90° angle at C, a 110° angle at A and a side length between 4.5 cm and 5.0 cm (4.8 cm).

Scoring Guide for Junior Mathematics Open-Response Question 29

Code	Descriptor
B	• Blank: nothing written or drawn in response to the question
I	• Illegible: cannot be read; completely crossed out/erased; not written in English • Irrelevant content: does not attempt assigned question (e.g., comment on the task, drawings, "?", "!", "I don't know") • Off topic: no relationship of written work to the question
10	Problem-solving process to describe and extend the patterns shows limited effectiveness due to • minimal evidence of a solution process • limited identification of important elements of the problem • too much emphasis on unimportant elements of the problem • no conclusions presented • conclusion presented without supporting evidence
20	Problem-solving process to describe and extend the patterns shows some effectiveness due to • an incomplete solution process • identification of some of the important elements of the problem • some understanding of the relationships between important elements of the problem • simple conclusions with little supporting evidence
30	Problem-solving process to describe and extend the patterns shows considerable effectiveness due to • a solution process that is nearly complete • identification of most of the important elements of the problem • a considerable understanding of the relationships between important elements of the problem • appropriate conclusions with supporting evidence
40	Problem-solving process to describe and extend the patterns shows a high degree of effectiveness due to • a complete solution process • identification of all important elements of the problem • a thorough understanding of the relationships between all of the important elements of the problem • appropriate conclusions with thorough and insightful supporting evidence

Code 10

Karen and Riley create the shrinking patterns shown below.

Karen's Pattern

Term number	Term
1	1024
2	512
3	256

Riley's Pattern

Term number	Term
1	111
2	99
3	87

What are their pattern rules?

Karen's rule:
Start at 1024, subtract the next number by the previous number.

Riley's rule:
Start at 111, subtract the next term by the previous term.

Which pattern will be the first to reach a term smaller than 10?

Justify your answer.

Karen's Pattern

$$\begin{array}{r} 1024 \\ -\ 512 \\ \hline 512 \\ -\ 256 \\ \hline 256 \end{array}$$

Riley's Pattern

$$\begin{array}{r} 111 \\ -\ 99 \\ \hline 12 \end{array} \qquad \begin{array}{r} 99 \\ -\ 87 \\ \hline 12 \end{array}$$

Riley's Pattern will be the first to reach a term smaller than 10.

Annotation:
Student demonstrates minimal evidence of a solution process; identifies incorrect pattern rules and does not extend either pattern and draws a conclusion but does not provide mathematical support.

Code 20

Karen and Riley create the shrinking patterns shown below.

Karen's Pattern

Term number	Term
1	1024
2	512
3	256

Riley's Pattern

Term number	Term
1	111
2	99
3	87

What are their pattern rules?

Karen's rule:

Start at 1024 and didvicded by 2 each time.

Riley's rule:

Start at 111 and subtract 12 each time.

Which pattern will be the first to reach a term smaller than 10?

Justify your answer.

Karen's Pattern will be the first to reach a term smaller than 10, because the numbers goes down alot faster than Riley's Pattern.

Annotation:
Student demonstrates an identification of some of the important elements of the problem; accurately identifies both pattern rules, but does not extend either pattern and draws a conclusion but does not provide mathematical support.

Code 30

Karen and Riley create the shrinking patterns shown below.

Karen's Pattern

Term number	Term
1	1024
2	512
3	256

Riley's Pattern

Term number	Term
1	111
2	99
3	87

What are their pattern rules?

Karen's rule:

Start at 1024. Then minus by the next number.

Riley's rule:

Start at 111. Then minus 12.

Which pattern will be the first to reach a term smaller than 10?

Justify your answer.

Karen
1) 1024
2) 512
3) 256
4) 64
5) 12.8
6) 2.1

Riley
1) 111
2) 99
3) 87
4) 75
5) 63
6) 51
7) 39
8) 27
9) 15
10) 3

Karen's pattern will be first because it takes the the term number to 6 not 10.

Annotation:
Student demonstrates a solution process that is nearly complete; identifies Riley's pattern rule and extends the pattern correctly to a term smaller than 10, attempts to extend Karen's pattern with errors and draws an appropriate conclusion based on errors.

Code 40

Karen and Riley create the shrinking patterns shown below.

Karen's Pattern

Term number	Term
1	1024
2	512
3	256

Riley's Pattern

Term number	Term
1	111
2	99
3	87

What are their pattern rules?

Karen's rule:
divide by 2 each time.

Riley's rule:
Subtract 12 each time.

Which pattern will be the first to reach a term smaller than 10?

Justify your answer.

Karens Pattern reaches a number smaller that 10 as you can see

term Number	Term	Term Number	Term
4	128	4	75
5	64	5	63
6	32	6	51
7	16	7	39
		8	27
		9	15
8	8	10	3

Annotation:
Student demonstrates an identification of all important elements of the problem; accurately identifies both pattern rules and extends the patterns to terms smaller than 10 and draws an appropriate conclusion.