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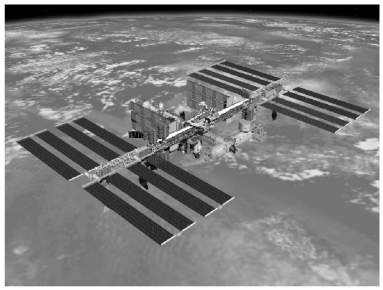
MathLinks 8 Option 2
Final Exam Multiple Choice and Numerical Response

Record your answers on the answer sheet provided.

Space and Technology

Humans continue to explore creative ways to travel in space. When a spacecraft is being designed, mathematics is needed to make precise calculations and predictions. Use your mathematical skills to solve problems related to space and technology.

Space Shuttle



International Space Station (ISS)

Orion

Use this information to answer #1–2.

Spacecraft require protection to keep from burning up when re-entering Earth's atmosphere. The space shuttle has approximately 24 000 heat protection tiles and the Orion has approximately 500 heat protection blocks.

1. If the space shuttle loses 50 tiles on re-entry, approximately how many blocks will Orion lose? Assume that the same proportion is lost.

A 1 **B** 2 **C** 10 **D** 11

2. Four blocks is what percent of the total number of Orion's heat protection blocks?

A 0.0008% **B** 0.008% **C** 0.08% **D** 0.80%

Use this information to answer #3.

The space shuttle begins its decent back to Earth at a rate of 50 km/s.

3. Which integer represents this rate in kilometres per minute?

A –50 **B** –100 **C** –2000 **D** –3000

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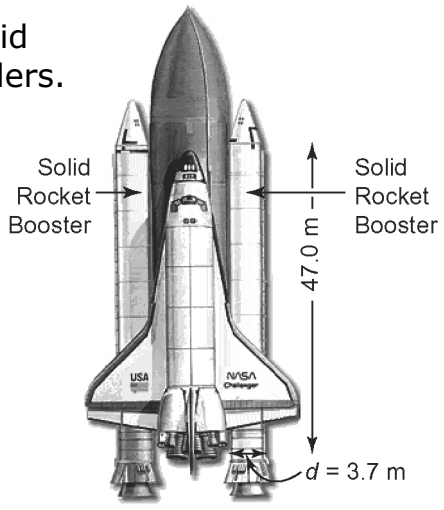
Use this information to answer #4.

The space shuttle has two external fuel tanks, or solid rocket boosters, in the shapes of right circular cylinders.

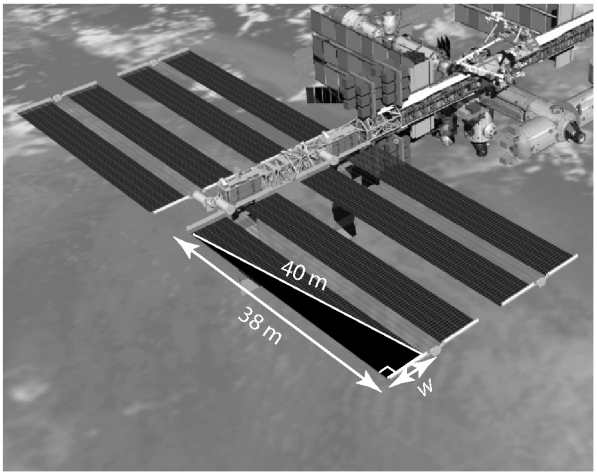


4. What is the total volume of the cylindrical parts of the two solid rocket boosters, to the nearest metre?

A 2184 m^2 **B** 2010 m^2 **C** 1092 m^2 **D** 1010 m^2

Use this information to answer #5.

The International Space Station (ISS) collects its energy from solar panels.



Numerical Response

5. If each solar panel is 38 m long with a 40 m diagonal, how wide is the panel, to the nearest tenth of a metre?

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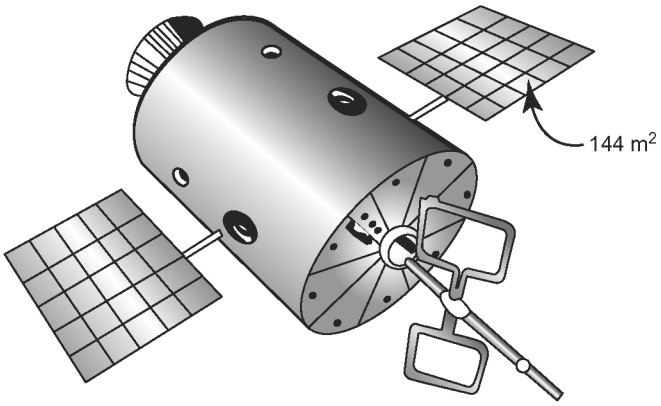
Use this information to answer #6.

Satellites that orbit Earth also have solar panels. The large panels are square with an area of 144 m^2. Each large square panel is made of several smaller squares.



Numerical Response

6. What is the length of a side of a large square panel?

Use this information to answer #7.

The average speed that a planet travels around the sun varies depending on how far it is from the sun.

Planet	Average Speed Around the Sun (km/s)
Mercury	48
Venus	35
Earth	30
Uranus	7

7. Which is the best choice of graph to display the above data?

A circle graph **B** line graph **C** pictograph **D** bar graph

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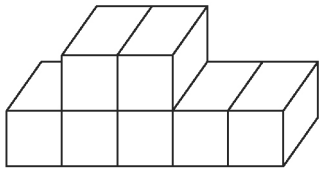
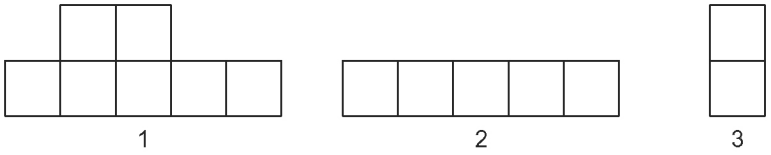
Use this information to answer #8.

Supplies for space missions are transported to the launch site in storage boxes. The boxes are stacked as shown.



Numerical Response

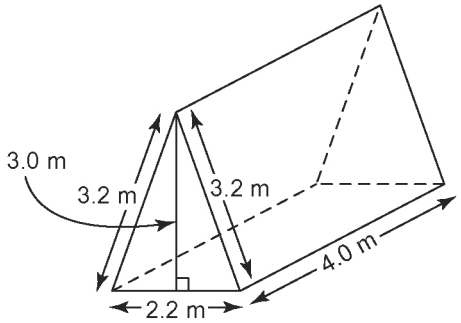
8. These numbered diagrams show three views of the stack of storage boxes.



What are the diagram numbers that show the top, side, and front view in this order?

Use this information to answer #9–10.

Another storage box is in the shape of a triangular prism with dimensions shown.

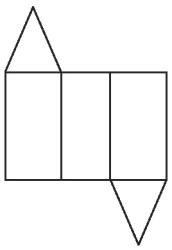


9. How many square metres of material were used to build the container, to the nearest tenth of a square metre?

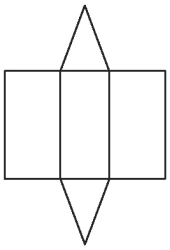
A 41.0 m^2 **B** 37.7 m^2 **C** 32.2 m^2 **D** 29.5 m^2

10. Which diagram could be the net for the right triangular prism storage box?

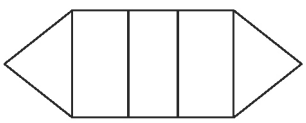
A



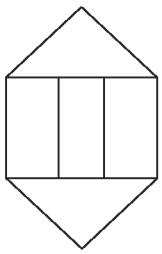
B



C



D



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Use this information to answer #11.

The ground crew used the equation, $y = \frac{x}{5} - 14$.

This is an incomplete table for values for the equation.

x	***y***
5	–13
15	–11
30	
	–5
50	
	–2

11. One missing value from the table is

A $x = 55$ **B** $x = 40$ **C** $y = -4$ **D** $y = -3$

12. One calculation used resulted in 3. Which expression was used?

A $2 + 3 \times (-8) \div (-6) - 3$ **B** $2 \times 3 + 8 \div (-6) - 3$
C $2 + 3 \times (-8) + (-6) \div (-3)$ **D** $2 \times 3 \times (-8) \div (-6) - 3$

13. Weight on Earth compared to on Mercury is in a ratio of 3:1. If an object weighs 60 on Earth, what would it weigh on Mercury?

A 20 **B** 30 **C** 120 **D** 180

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The Great Outdoors

The outdoors is home to many recreational activities as well as many jobs. Apply your understanding of mathematics to solve problems related to the outdoors.

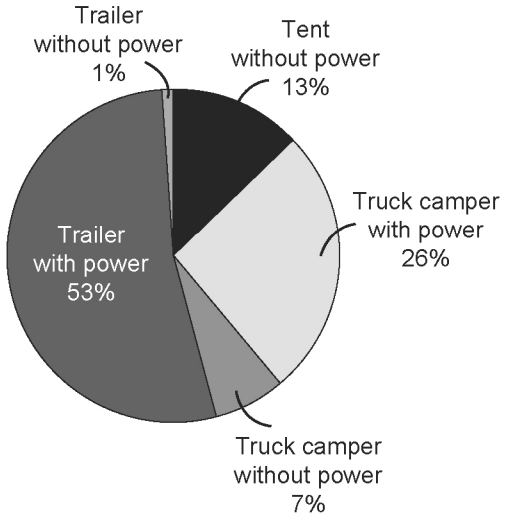
Use this information to answer #14.

A campground owner kept records of the first 144 000 requests for campsites by type that were received for each of two years.

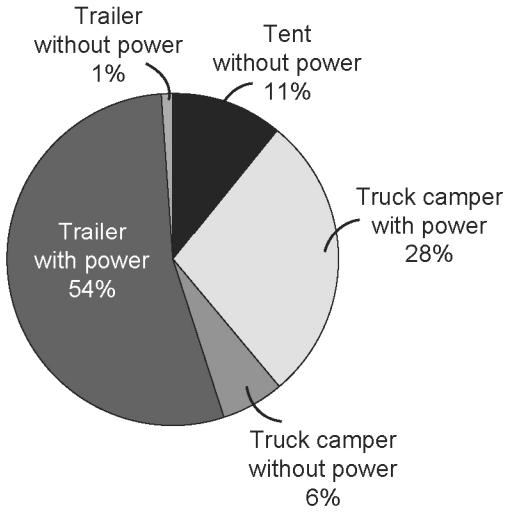
Type of Campsite Requested	Year 1	Year 2
Tent without power	18 800	16 296
Truck camper with power	37 800	40 100
Truck camper without power	9 600	8 735
Trailer with power	76 480	77 480
Trailer without power	1 320	1 389
Total	144 000	144 000

Then, the owner created two circle graphs to compare the data.

Type of Campsite Requested in Year 1



Type of Campsite Requested in Year 2



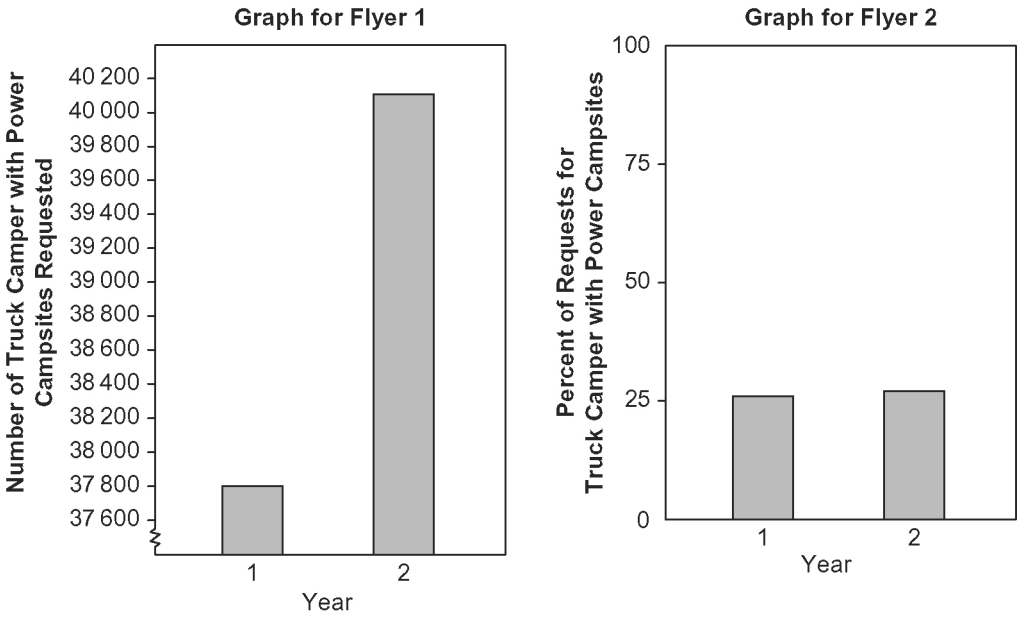
14. What is the number of requests for Truck camper with power campsites in Year 2 as a percent of the same request in Year 1, rounded to the nearest whole percent?

A 1060% **B** 106% **C** 10% **D** 1%

Name: _____ Date: _____

Use this information to answer #15.

The campground owner wants to expand the campground believing more campsites with power are needed. A neighbourhood group prefers no expansion. Both the owner and the neighbourhood group circulated flyers with a graph to area residents.



15. Which statement is most likely true?

A Flyer 2 is the neighbourhood group's and is not misleading.
B Flyer 2 is the neighbourhood group's and is misleading.
C Flyer 1 is the neighbourhood group's and is not misleading.
D Flyer 1 is the neighbourhood group's and is misleading.

16. A tree farmer has 180 willow, 270 pine, and 315 spruce trees. The number of pine to willow to spruce as a ratio is

A 54:63:36 **B** 12:21:18 **C** 6:4:7 **D** 6:7:4

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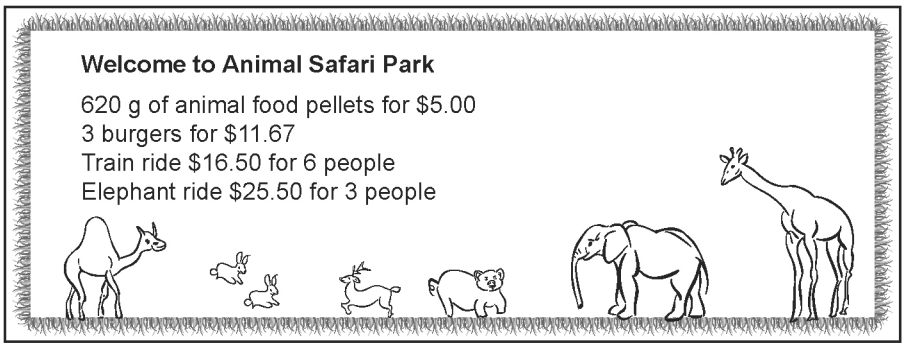
Use this information to answer #17.

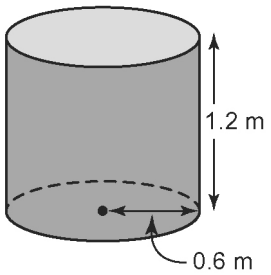


17. Which is a correct unit rate for an item listed in Welcome to Animal Safari Park?

A 248 g of animal food pellets for $3.00
B burgers for $5.83/person
C Train ride $8.25/3 people
D Elephant ride $8.25/person

Use this information to answer #18.

The park is having 14 extra metal garbage cans made. They will be in the shape of open right circular cylinders.



18. What total amount of sheet metal, to the nearest square metre, is needed to make these garbage cans?

A 35 m^2 **B** 51 m^2 **C** 79 m^2 **D** 95 m^2

19. A clown walks around the park and hands out cards with skill-testing questions. Answering correctly wins you an ice cream treat. What is the answer to the following skill-testing question?

$10 - (13^2 - 9) \div 2 \times \frac{1}{4} \div \frac{5}{4} + 1$

A –15 **B** –5 **C** 5 **D** 15

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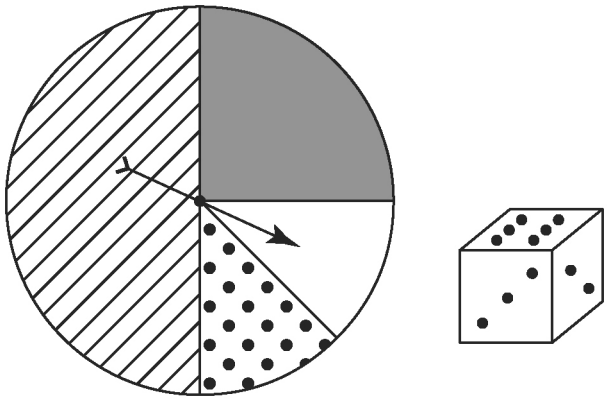
Use this information to answer #20.

A bird at the park uses its beak to push two buttons that spin the spinner and roll the die shown.

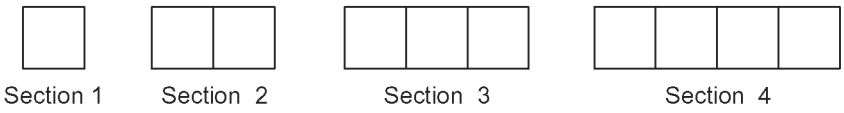


20. The probability of the bird spinning grey and rolling 5 can be calculated using

A $\frac{1}{5} \div \frac{1}{4}$ **B** $\frac{2}{8} \times \frac{1}{6}$ **C** $\frac{1}{4} \div \frac{1}{6}$ **D** $\frac{1}{5} \div \frac{2}{8}$

Use this information to answer #21.

A wooden fence has sections in a pattern with an increasing number of squares.



21. Which relation represents the number of pieces of wood, W, in a section based on the section number, s?

A $W = 2s + 2$ **B** $W = 3s + 1$ **C** $W = 4s - 1$ **D** $W = 5s - 1$

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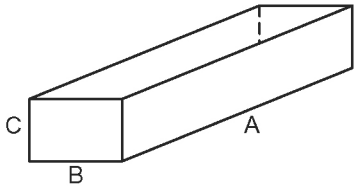
Use this information to answer #22.

A right rectangular prism-shaped feeding trough has edges A, B, and C.



Numerical Response

22. Edges A, B, and C are in a ratio of 10:5:3. What is the volume of the feeding trough if edge B is 10 dm?

23. A pair of in-line skates regularly rent for $8 a day. They are on special today for 30% off. GST is 5%. What is the cost of renting a pair today?

A $5.88 **B** $5.60 **C** $2.52 **D** $2.40

24. The rhinoceros watering pond is square with side length of $\sqrt{102}$ m. The length of each side is between

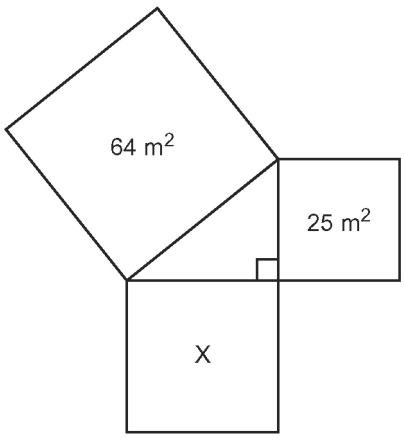
A 12 m and 11 m **B** 11 m and 10 m **C** 10 m and 9 m **D** 9 m and 8 m

25. An animal-viewing pad is square with an area of 40 m^2. Which is the best approximation of the dimensions?

A 4 m × 10 m **B** 8 m × 5 m
C 6.3 m × 6.3 m **D** 20.1 m × 20.1 m

Use this information to answer #26.

An animal-grazing pen is in the shape of a right triangle. On each side is a fenced square area.



26. What is the area of square X?

A 89 m^2 **B** 49 m^2 **C** 39 m^2 **D** 19 m^2

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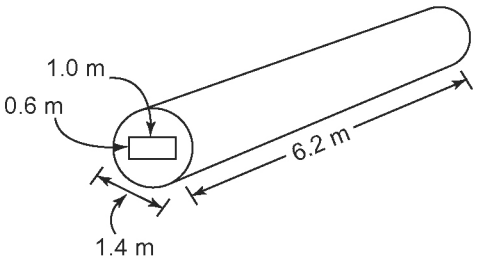
27. The cost to renovate the concession area at the park was 154% higher than expected. The expected cost was $675 000. Which is an expression to calculate the actual cost?

A 0.154 × 675 000 **B** 1.54 × 675 000
C 15.4 × 675 000 **D** 154 × 675 000

Use this information to answer #28–29.

A concrete culvert is used to allow small animals to move from one fenced area to another. It is in the shape of a cylinder with a rectangular prism-shaped passage in the middle of it for the animals to walk through.



28. The outer surface area of the culvert, to the nearest tenth of a square metre, is

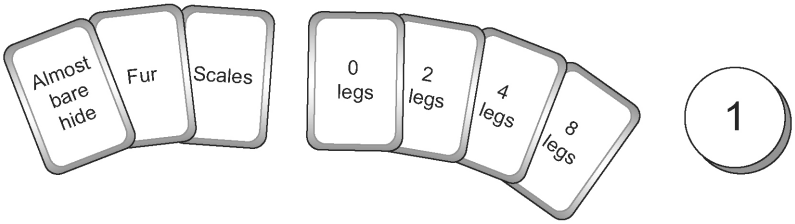
A 30.3 m^2 **B** 29.1 m^2 **C** 9.5 m^2 **D** 8.1 m^2

Numerical Response

29. What is the volume of concrete in the culvert, to the nearest tenth of a cubic metre?

Use this information to answer #30–35.

Students are playing a game of chance about animals. The game uses three Coat cards, four Legs cards, and a chip with 1 on one side and 2 on the other.



30. All possible outcomes when a card is drawn from the Coat pile of cards and then from the Legs pile are called

A a simulation **B** a favourable outcome
C a sample space **D** independent events

Name: _____ Date: _____

31. The result when a card is drawn from the Coat pile and the chip is tossed so that one does not affect the other is called

A a simulation **B** a favourable outcome
C a sample space **D** independent events

32. A card is drawn from each pile. What is the probability of getting Fur and 4?

A $\frac{7}{12}$ **B** $\frac{1}{12}$ **C** $\frac{1}{7}$ **D** $\frac{2}{7}$

33. A card is drawn from the Legs pile of cards and the chip is tossed. What is the probability of getting even numbers on both?

A 25% **B** 37.5% **C** 50% **D** 75%

34. The chip is tossed three times in a row. What is the probability of getting a 1 each time?

A 12.5% **B** 25% **C** 37.5% **D** 50%

Numerical Response

35. There are 11 boys and 12 girls ready to play this game of chance. If a team consists of one boy and one girl, how many different teams are possible?

Use this information to answer #36.

Thompson has put in 58 fence posts for a new running pen. His goal is to put in 76 before he leaves on holidays. He has 2 days left before his holidays.

36. Which equation can be used to find the average number of fence posts, p, that Thompson must put in each day before his holidays?

A $76 + 2p = 58$ **B** $58 + 2p = 76$ **C** $58 - 2p = 76$ **D** $52p + 2 = 76$

Use this information to answer #37.

For working the night shift and watching the animals, Moira gets paid using the formula $W = 15h + 12$ where W is the wage and h is hours worked.

37. Moira's wage was $589.50 for a week. How many hours were worked?

A 38.0 h **B** 38.5 h **C** 40.0 h **D** 40.5 h

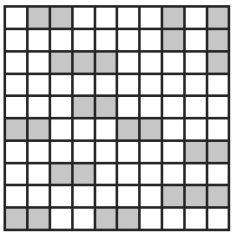
38. Several different polygons can be used to tile an outdoor eating area. To make sure the tiles tessellate, the interior angles were the vertices meet must add up to

A 90° **B** 180° **C** 270° **D** 360°

Name: _____ Date: _____

Use this information to answer #39.

A section of a square grid lights up at night when motion in the area it represents is detected. At 11:30 p.m., it looked like this.

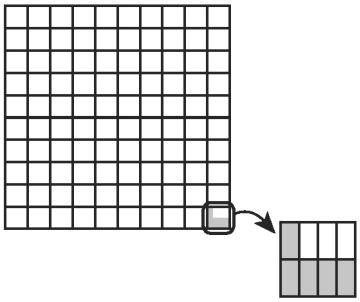


Numerical Response

39. What percent of this grid is lit up?

Use this information to answer #40.

At 2:15 a.m., the grid looked like this.



40. What percent of this grid is lit up?

A $\frac{5}{8}\%$ **B** $\frac{1}{160}\%$ **C** 6.25% **D** 62.5%

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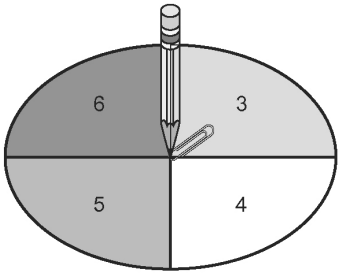
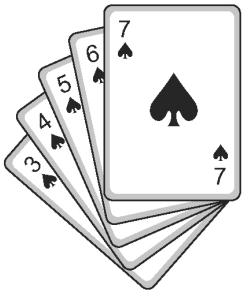
Connections

Many concepts learned in one chapter can help us solve problems in another. Use your mathematical understanding to solve the following problems.

Use this information to answer #41–43.

A trick is based on one spin of a spinner and one draw of a card.





A variation of the trick is based on the sum of the spin and the card drawn. The sum chart has been started.

SUM		**Spinner**			
		3	**4**	**5**	**6**
Cards	**3**	6	7	8	9
	4	7			
	5	8			
	6	9			
	7	10			

Numerical Response

41. What is the probability, as a decimal, of spinning an odd number and drawing an odd number?

42. Which of the following does **not** represent P(sum of 11 or 12)?

A $\frac{1}{5}$ **B** $\frac{1}{4}$ **C** 0.25 **D** 25%

43. Which is the same probability as P(sum of 8)?

A P(sum of 7) **B** P(sum of 9) **C** P(sum of 11) **D** P(sum of 13)

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Use this information to answer #44.

Tony solved the equation $-4(x - 3) = 5$.
His work was as follows:

$-4x - 12 = 5$	Step 1
$-4x - 12 + 12 = 5 + 12$	Step 2
$\frac{-4x}{-4} = \frac{17}{-4}$	Step 3
$x = -\frac{17}{4}$	Step 4

44. Tony's mistake was in

A Step 1 **B** Step 2 **C** Step 3 **D** Step 4

45. Which equation has the solution, $x = -7$?

A $3x = 21$ **B** $4x + 6 = -22$ **C** $\frac{x}{4} + 1 = 8$ **D** $4(x + 5) = 8$

46. Which equation represents the following statement?
Six more than five times a number is twenty.

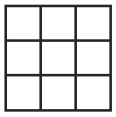
A $5(x + 1) = 20$ **B** $5(x + 6) = 20$ **C** $5x + 6 = 20$ **D** $5x + 6x = 20$

47. Which regular polygons can not be used to tile a plane?

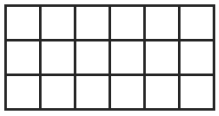
A triangle **B** square **C** hexagon **D** octagon

48. To represent $\frac{2}{3} \times \frac{2}{6}$, 4 squares would be shaded in which grid?

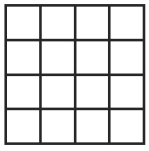
A



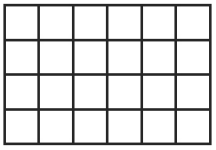
B



C



D



49. What does $4\frac{4}{5} \div 1\frac{4}{5}$ equal?

A $2\frac{2}{25}$ **B** $2\frac{2}{3}$ **C** 3 **D** 4

Name: _____ Date: _____

Numerical Response

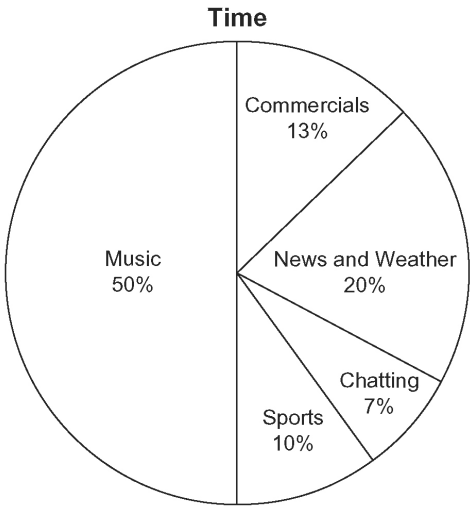
50. It was estimated that $\frac{9}{15}$ of 10 500 people attending a rally have an MP3 player. Based on the estimate, how many of those people have an MP3 player?

51. If each edge of a cube is doubled in length, how is the volume of the cube affected?

A The volume is 2 times the original volume.
B The volume is 4 times the original volume.
C The volume is 6 times the original volume.
D The volume is 8 times the original volume.

Use this information to answer #52.

How the time on a radio show is spent is shown in the circle graph.



52. How many minutes in an hour are spent on News and Weather and Sports?

A 30 min **B** 20 min **C** 18 min **D** 12 min

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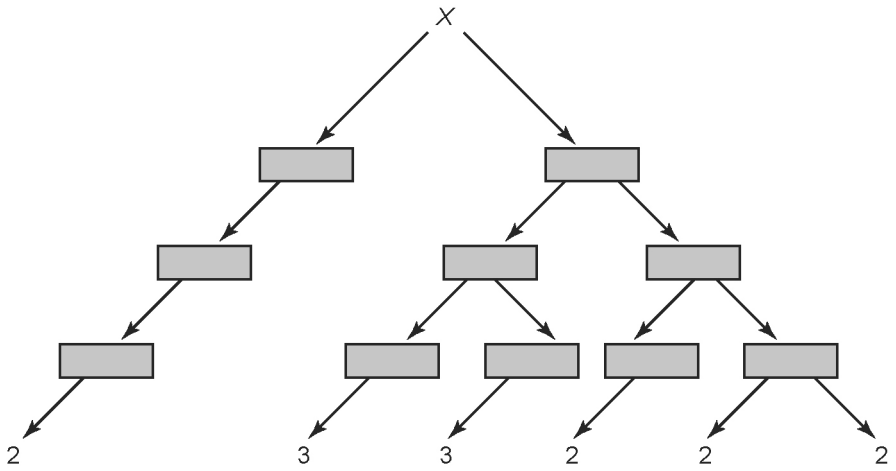
Use this information to answer #53–54.

A student drew the following factor tree for x. Some numbers are covered.



53. Use the bottom row to determine the square root of the start number, x.

A 14 **B** 12 **C** 6 **D** 5

Numerical Response

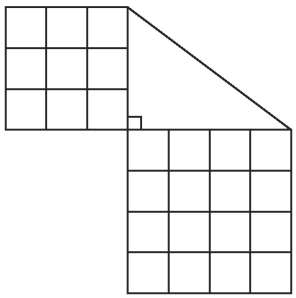
54. What is the start number, x?

55. The prime factorization of 60 is

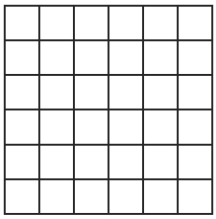
A 4×15 **B** 5×12 **C** $3 \times 4 \times 5$ **D** $2 \times 2 \times 3 \times 5$

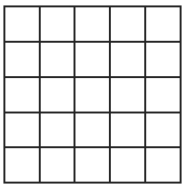
Use this information to answer #56.

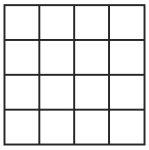
Two of the squares on the sides of this right triangle are shown.

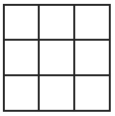


56. The square that completes the Pythagorean relationship shown is

A 

B 

C 

D 

Name: _____ Date: _____

Use this information to answer #57.

A whole number, x, lies somewhere between $\sqrt{48}$ and $\sqrt{55}$.

57. What is a possible whole number, *x*, between $\sqrt{48}$ and $\sqrt{55}$?

A 5 **B** 6 **C** 7 **D** 8

Use this information to answer #58.

The diagram shows a division being modelled using a number line.

58. Which division is being modelled using the number line?

A $4 \div 5$ **B** $\frac{4}{5} \div 5$ **C** $\frac{4}{5} \div 4$ **D** $5 \div 4$

Use this information to answer #59.

To convert a temperature in degrees Celsius (°C) to degrees Fahrenheit (°F), the formula $F = \frac{9}{5}C + 32$ is used.

Numerical Response

59. What is the equivalent temperature in degrees Fahrenheit for a temperature of 15°C?

60. Which shows three equivalent values?

A $\frac{11}{20}$, 0.44, 44% **B** $\frac{224}{100}$, 224.0, 224%

C $\frac{4}{25}$, 0.16, 16% **D** $\frac{5}{4}$, 0.125, 125%

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MathLinks 8 Option 2
Final Exam Written Response

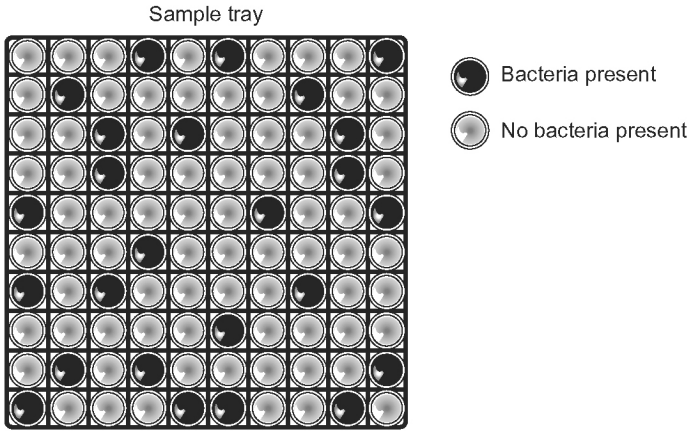
Write your response in the space provided. Present your response in a well-organized way using complete sentences and correct units.

Microbiology

Microbiology plays an important role in our daily lives. Scientists help monitor our environment and make sure that we stay healthy. Apply your understanding of mathematics to solve problems related to microbiology.

Use this information to answer #1a)–b).

A microbiologist took 100 samples of water from a river. She placed the samples on a sample tray. Then, she added a chemical that makes the water change colour if bacteria are present.



1. a) Of the 100 samples in the sample tray, the number of samples that have **no** bacteria present is _____?

b) Express the samples with bacteria present as a fraction, a decimal and a percent. Show your work.

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Use this information to answer #1c)–d).

For the water to be safe to use, bacteria can be present in at most 15% of the samples. When 842 samples were collected from various places on another river, bacteria were present in 130.

c) Is the water from this other river safe to use? Justify your answer mathematically.

d) What would you recommend regarding the water? Explain.

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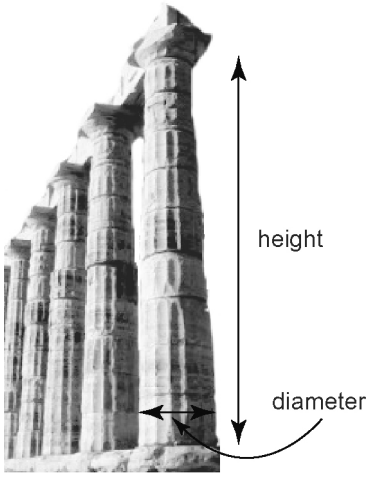
Historical Architecture

There are many examples of interesting architecture from different historical periods. The Greeks and Romans used stone to make buildings that have lasted 2500 years or more. Make connections with your understanding of mathematics to solve problems related to historical architecture.

Use this information to answer #2a)–b).

The Greeks used several different styles of columns in their buildings. Doric columns were shorter than other styles, but could hold more weight. The cylindrical part of Doric columns, shown here, has a height to width (diameter) ratio of 8:1.



2. a) If the height of the cylindrical part of a Doric column is 16 m, what is its width or diameter? Show your thinking.

b) What is the surface area of the curved face of the cylindrical part of one Doric column with the dimensions in part a)? Justify your answer mathematically. Round your answer to the nearest tenth of a square metre.

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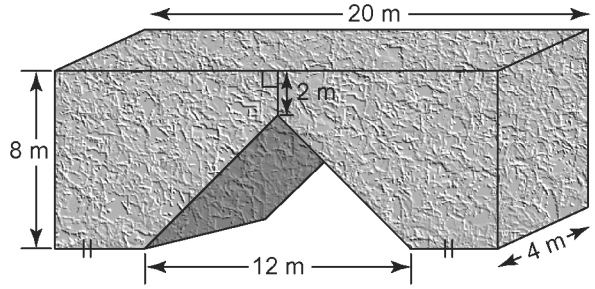
Use this information to answer #2c).

In addition to columns, the Romans also used block designs. The central block of an archway, shown here, is made of stone.



c) Find the volume of stone in the central block.

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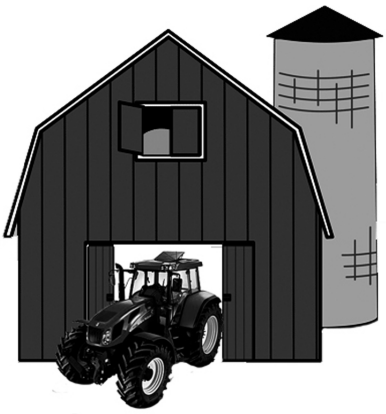
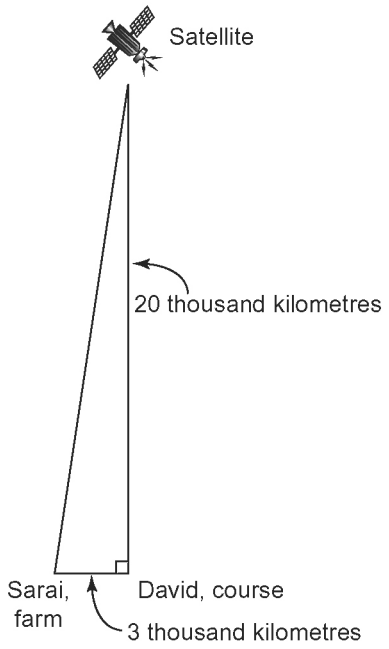
Farming
Farming makes use of mathematics daily. Apply your understanding of mathematics to solve problems related to farming.



Use this information to answer #3a).

David and Sarai are farmers. David is 3000 km or 3 thousand kilometres away at a course and need to keep in contact with Sarai on the farm. A satellite sends phone transmissions between David and Sarai.



3. a) Calculate the distance between the satellite and the farm, to the nearest tenth of a thousand kilometre. Show your work.

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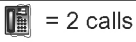
Use this information to answer #3b).

This pictograph shows the number of calls that David and Sarai made in one week.

David and Sarai's Phone Calls

Day	Number of Calls
Monday	
Tuesday	
Wednesday	
Thursday	
Friday	
Saturday	
Sunday	

 = 2 calls

b) Identify another type of graph to display the information that would make it easy to read. Explain why you selected that type. Give one advantage of that graph over the pictograph and one disadvantage.

Name: _____ Date: _____

Use this information to answer #3c).

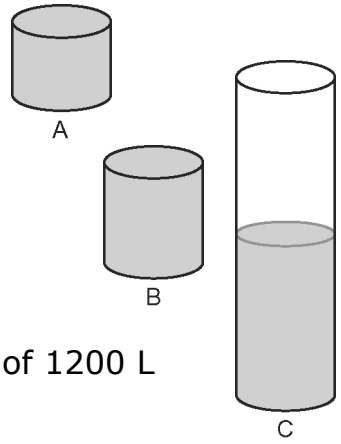
David and Sarai purchased a sprayer for use in their fields. The sprayer's tank holds 3600 L. This is the spray mixture they intend to use:

3000 L of water

$\frac{2}{3}$ of Barrel A with a capacity of 480 L

$\frac{1}{5}$ of Barrel B with a capacity of 620 L

$\frac{1}{4}$ of the $\frac{1}{2}$ full Barrel C with a capacity of 1200 L



c) Did they buy a sprayer with a large enough tank for this spray mixture? Explain.

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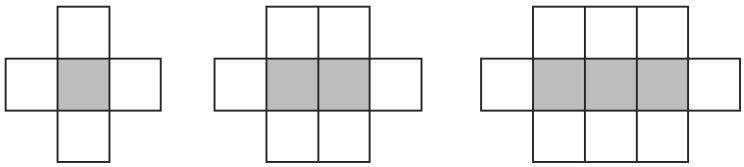
Use this information to answer #4a)–f).

A tile pattern has grey tiles with white tiles on each side.



4. a) Complete this table of values.

Grey	White
1	
2	
3	
4	

b) Draw a graph of the relation in the table.

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c) Would it be reasonable to include values on the graph between the points that correspond to the table of values? Explain.

d) Describe the pattern in words.

e) Write an equation that represents between the number of grey tiles, *g*, and the number of white tiles, *w*.

f) If there are 22 white tiles, how many grey tiles were used? Justify your answer mathematically.