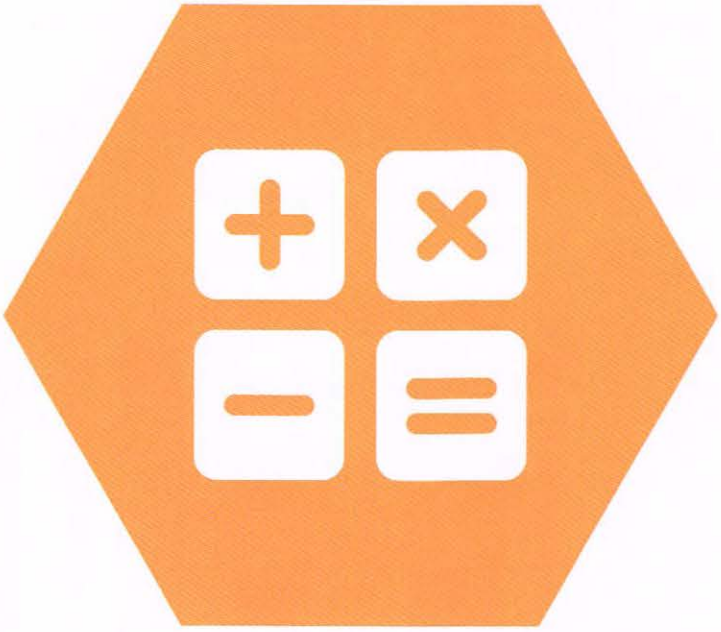
UNSW Global
AUSTRALIA

PAPER F



2016 ICAS

International Competitions and Assessments for Schools

MATHEMATICS

DO NOT OPEN THIS BOOKLET UNTIL INSTRUCTED.

40 QUESTIONS

TIME ALLOWED: 1 HOUR

STUDENT'S NAME:

Read the instructions on the **ANSWER SHEET** and fill in your **NAME, SCHOOL** and **OTHER INFORMATION**.
Use a 2B or B pencil.
Do **NOT** use a pen.
Rub out any mistakes completely.

You **MUST** record your answers on the **ANSWER SHEET**.

Mark only **ONE** answer for each question.
Your score will be the number of correct answers.
Marks are **NOT** deducted for incorrect answers.

There are **35 MULTIPLE-CHOICE QUESTIONS** (1–35).
Use the information provided to choose the **BEST** answer from the four possible options.
On your **ANSWER SHEET** fill in the oval that matches your answer.

There are **5 FREE-RESPONSE QUESTIONS** (36–40).
Write your answer in the boxes provided on the **ANSWER SHEET** and fill in the ovals that match your answer.

You may use a ruler and spare paper.
A **CALCULATOR** is required.

Educational Assessment Australia
eaa.unsw.edu.au

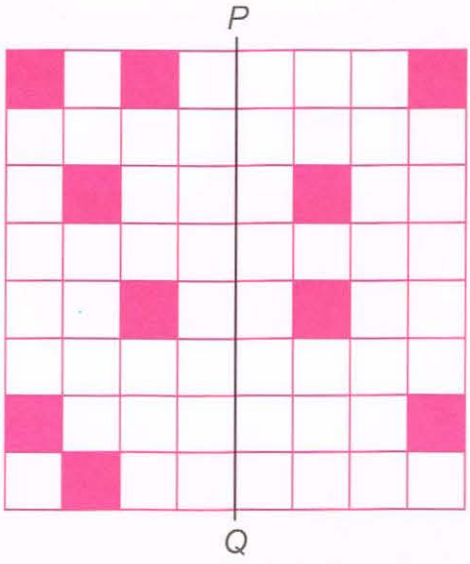
1. Jia's soccer game started at 10:00 am.

The game went for 90 minutes plus a 15-minute break at half time.

At what time did Jia's game finish?

(A) 11:05 am
(B) 11:15 am
(C) 11:30 am
(D) 11:45 am

2. Dani is making a design with PQ as the line of symmetry.



What is the minimum number of squares that Dani still needs to shade?

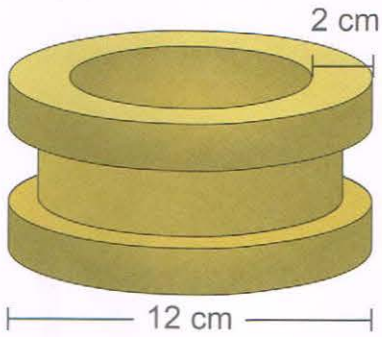
(A) 2
(B) 3
(C) 4
(D) 5

3. This number line has been divided into equal parts.

What value must ? be?

(A) 7 (B) 8
(C) 10 (D) 11

4. Pete wanted to buy a cylindrical candle to fit perfectly in this candle holder.

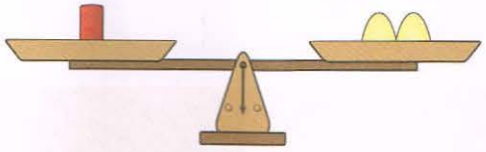


NOT TO SCALE

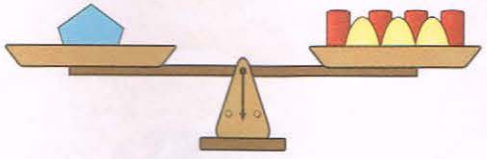
What is the radius of the candle Pete must buy?

(A) 4 cm
(B) 5 cm
(C) 6 cm
(D) 8 cm

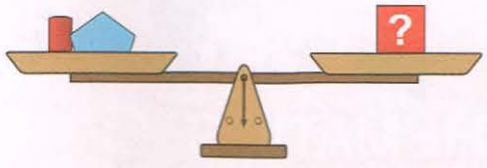
5. Priya used a set of scales to balance 2 eggs with a cylinder.



She combined some more of these solids to see what else would balance.



How many eggs does Priya need to balance these two solids?



(A) 9
(B) 11
(C) 13
(D) 15

6. It is now possible to make an artificial arm using a 3-D printer.

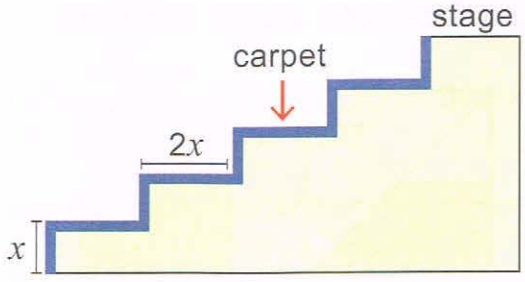
This has reduced the cost of an artificial arm from \$40 000 to just \$400.

What is the new cost as a percentage of the old cost?

(A) 0.01% (B) 0.1%
(C) 1% (D) 10%

7. There are 5 steps leading up to the stage in the school hall. Each step is twice as wide as it is high.

Mr Lo wants to buy a strip of carpet to cover the steps as shown.

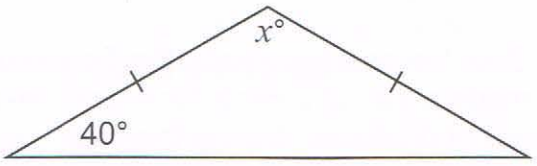


He measures the height of one step. He then calculates the length, l, of carpet required using a formula.

Which formula should Mr Lo use?

(A) $l = 15x$
(B) $l = 13x$
(C) $l = 12x$
(D) $l = 10x$

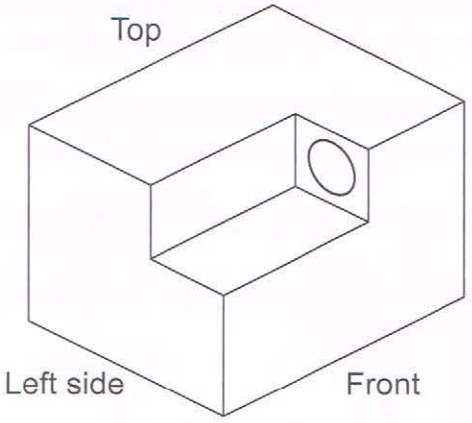
8. What is the value of x?



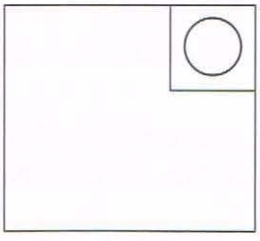
NOT TO SCALE

(A) 40
(B) 80
(C) 100
(D) 140

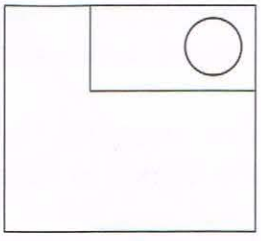
9. Elisa has this solid.



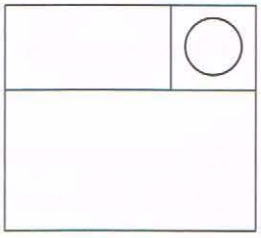
Which of these shows the left side view of her 3-D shape?



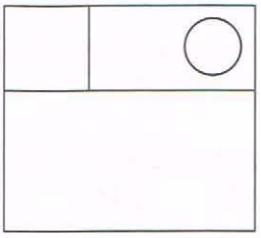
(A)



(B)



(C)



(D)

10. In Australian currency, \$1 equals 100 cents.

Over the past two years, the Government made a loss of 2 cents for every five-cent coin it produced. During this time, 64 million of these coins were made.

What was the total loss?

(A) \$128 000 000
(B) \$12 800 000
(C) \$1 280 000
(D) \$12 800

11. The manager of a sports centre surveyed 30 girls who played soccer, tennis or both.

She found that 5 played both soccer and tennis, and 18 played only tennis.

One of the 30 girls was chosen at random.

What is the probability that she played only soccer?

(A) $\frac{2}{5}$ (B) $\frac{1}{6}$

(C) $\frac{1}{15}$ (D) $\frac{7}{30}$

12. One weekend, Ravi played his guitar at the market to raise money for charity.

Ravi raised \$180 on Saturday. This was 75% of the total amount he raised.

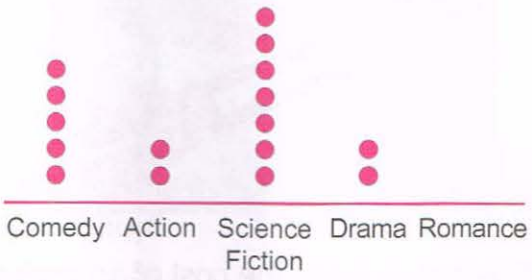
How much money did Ravi raise on Sunday?

(A) \$135 (B) \$60
(C) \$45 (D) \$36

13. The teacher asked all 30 students in Simon's class to name their favourite type of movie.

Simon is drawing a dot plot to show the results. Some dots for Drama and Romance still need to be added.

Favourite Type of Movie

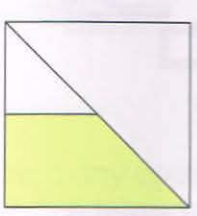


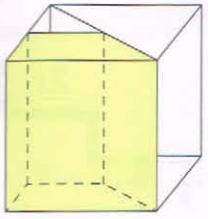
Four more students chose Romance than Comedy.

How many students chose Drama?

(A) 4
(B) 5
(C) 6
(D) 7

14. Jake had a hollow cube with sides of 20 cm. He inserted two vertical dividers. The smaller divider bisected the diagonal and one side of the cube. Jake filled the trapezoidal section with sand.

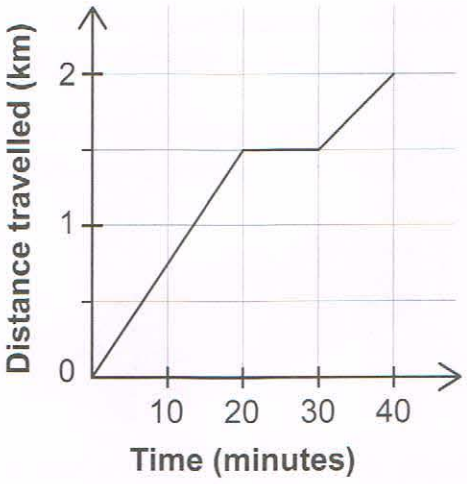

top view


3-D view

What was the volume of the sand?

(A) 1500 cm^3
(B) 2500 cm^3
(C) 3000 cm^3
(D) 4000 cm^3

15. This graph represents Jane's walk to school.



Which table of values matches her graph?

(A)

Time	10	20	30	40
Distance	0.6	1.5	1.75	2

(B)

Time	10	20	30	40
Distance	0.75	1.5	1.75	2

(C)

Time	10	20	30	40
Distance	0.6	1.5	1.5	2

(D)

Time	10	20	30	40
Distance	0.75	1.5	1.5	2

16. Raj was born on 15 May 2003. Sue was born on 3 December 2002.

How many days older than Raj is Sue?

(A) 162
(B) 163
(C) 165
(D) 166

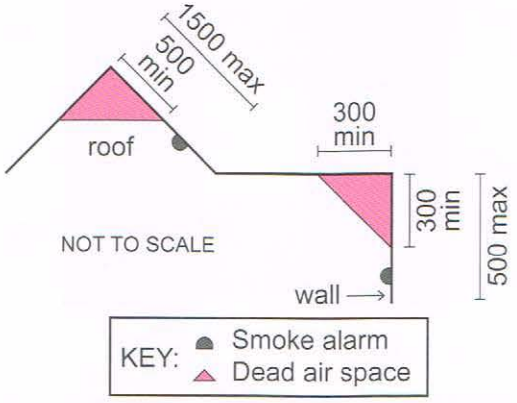
17. $4 - 2x < 3x + 19$

Which of the options is the lowest value of x to satisfy this inequality?

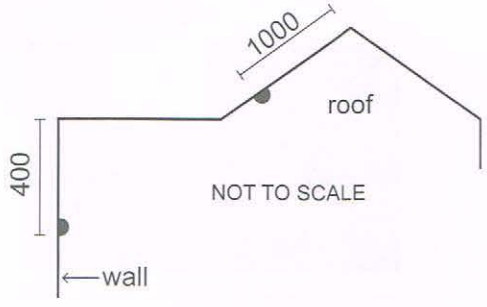
(A) -6
(B) -4
(C) -3
(D) -2

18. Smoke alarms in buildings should not be installed in a corner or 'dead air space'.

The diagram represents the zones within which smoke alarms should be installed. They should be installed between the maximum and minimum distances shown, in mm.



Pete installed two alarms of diameter 80 mm in the positions shown below.

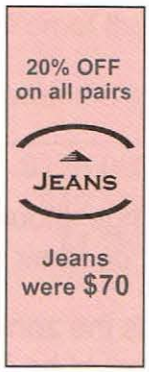


Which option is true for the position of these two alarms?

	Correct position			
Roof	✓	✓	×	×
Wall	✓	×	✓	×
	(A)	(B)	(C)	(D)

19. These posters are in four different shop windows.

Which shop is selling jeans for the lowest price?



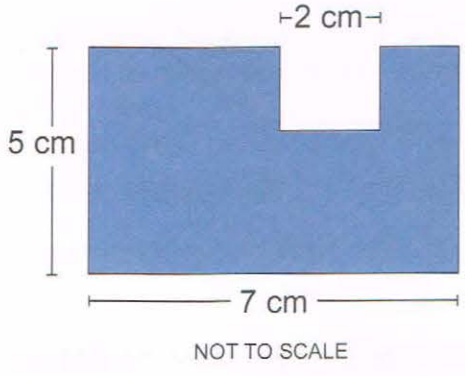
(A)

(B)

(C)

(D)

20. The area of this shape is 30 cm^2.

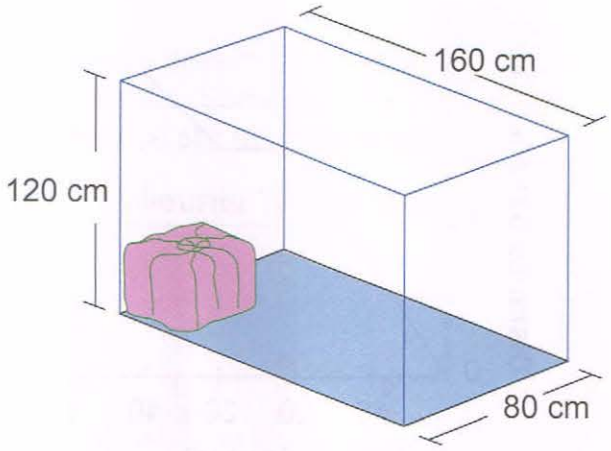


NOT TO SCALE

What is the perimeter of the shape?

(A) 22 cm
(B) 24 cm
(C) 28 cm
(D) 29 cm

21. A package is placed into a large storage box as shown.

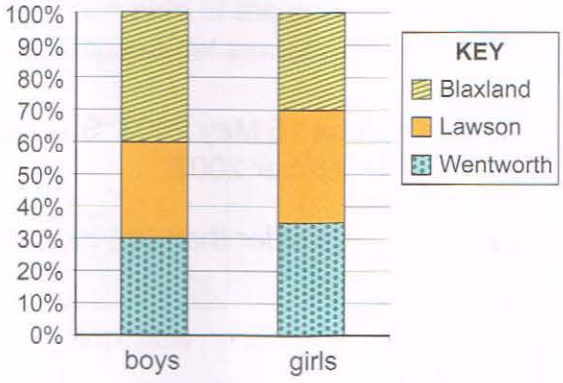


Which of the following is the best estimate of the volume of the package?

(A) 20 000 cm^3
(B) 60 000 cm^3
(C) 120 000 cm^3
(D) 190 000 cm^3

22. A school of 180 boys and 160 girls has 3 houses: Blaxland, Lawson and Wentworth.

This graph shows data about boys and girls in each house.



How many more boys than girls are there in Blaxland house?

(A) 10
(B) 18
(C) 24
(D) 34

23. Lin has a cube. On each side of the cube she writes a different positive number.

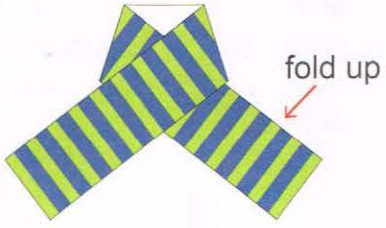
The numbers on opposite sides of Lin's cube are consecutive.

Which of the following is a possible sum of the six numbers on Lin's cube?

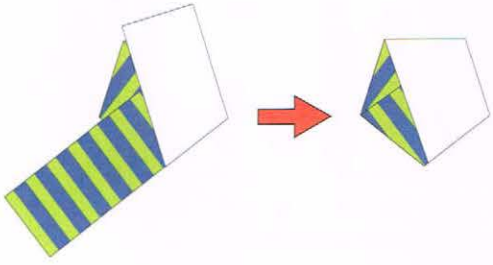
(A) 36
(B) 31
(C) 22
(D) 19

24. Cai had a rectangular strip of paper with stripes on one side.

He made two folds and formed this shape.



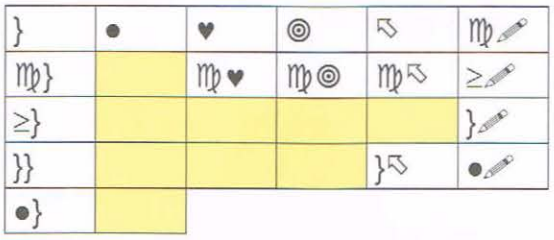
Cai made one more fold then cut off the ends of his strip to leave this folded regular pentagon.



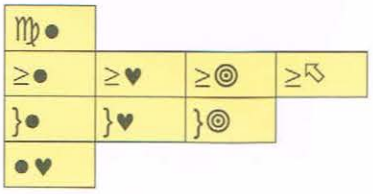
What shape did Cai have when he unfolded this pentagon?

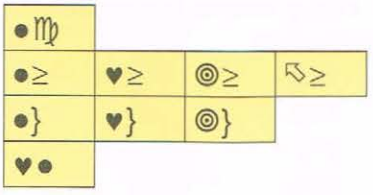
(A) parallelogram
(B) rectangle
(C) rhombus
(D) trapezium

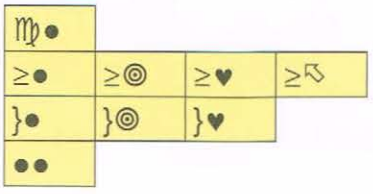
25. Kate is using a pattern of symbols to write a code. Some of the code is missing.

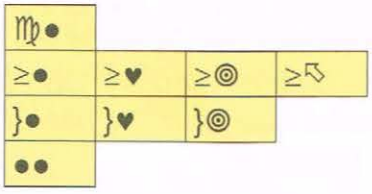


Which of these patterns completes the code?

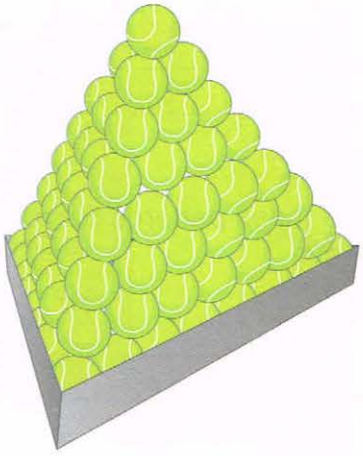
(A)


(B)


(C)


(D)


26. Min had a regular triangular frame that holds 36 tennis balls. He used more tennis balls to build a triangular pyramid which was 8 layers high.



How many tennis balls did Min use to build the pyramid?

(A) 108
(B) 112
(C) 120
(D) 144

27. Edward had a book to read.

On Monday he read half of the book. On Tuesday he read a third of the pages remaining from Monday. On Wednesday he read a quarter of the pages remaining from Tuesday.

What fraction of the book does Edward have left to read?

(A) $\frac{1}{24}$ (B) $\frac{1}{4}$

(C) $\frac{3}{9}$ (D) $\frac{3}{4}$

28. Sara performed two transformations on Figure A to produce Figure B.

Figure A

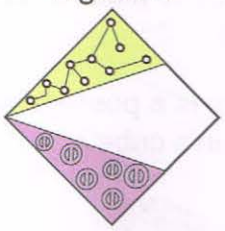
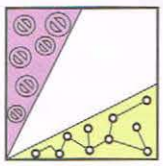


Figure B



Which two transformations did Sara perform on Figure A?

(A) reflected it in the dotted line and rotated it 135° clockwise about its centre
(B) rotated it 45° clockwise about its centre and reflected it in the dotted line
(C) rotated it 135° clockwise about its centre and reflected it in the dotted line
(D) reflected it in the dotted line and rotated it 45° clockwise about its centre

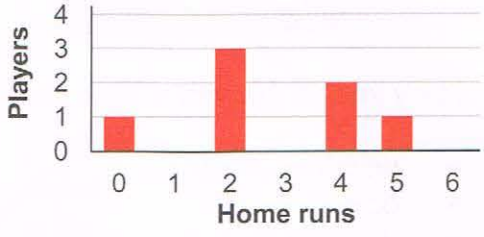
29. This table shows the number of home runs scored by some players in a softball team.

	Game					
Player	**1**	**2**	**3**	**4**	**5**	**Total**
Milly	0	1	0	0	1	**2**
Pam	1	0	0	2	1	**4**
Jane	1	1	2	0	0	**4**
Ruby	0	0	1	1	0	**2**
Alison	0	0	0	0	0	**0**
Jess	0	0	1	1	0	**2**
Liz	1	0	2	1	1	**5**
Total	**3**	**2**	**6**	**5**	**3**	**19**

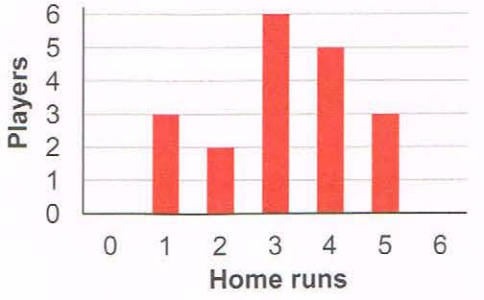
Which graph shows the number of players who scored a given number of home runs?

(A)

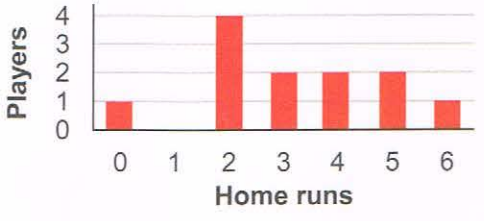
(B)



(C)



(D)



30. The number 86 is a happy number because the following two-line pattern ends with the number 1.

$8^2 + 6^2 = 64 + 36 = 100$

$1^2 + 0^2 + 0^2 = 1 + 0 + 0 = 1$

How many lines are in the pattern needed to show that 70 is a happy number?

(A) 3
(B) 4
(C) 5
(D) 6

31. Marnie found a magic carpet.

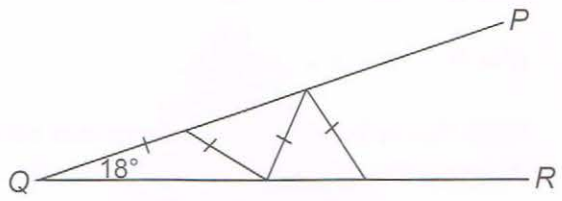
Each time Marnie used the carpet, it would shrink to one-half of its length and one-third of its width.

After three uses, the area of the carpet had shrunk to 250 cm^2.

What was the original area of the magic carpet?

(A) 5.4 m^2
(B) 1.2 m^2
(C) 0.45 m^2
(D) 0.14 m^2

32. In the figure below, $\angle PQR = 18°$.
Three adjacent isosceles triangles have been drawn by joining points on PQ to points on QR with lines of equal length.



NOT TO SCALE

What is the maximum number of isosceles triangles that can be drawn in this way?

(A) 6
(B) 5
(C) 4
(D) 3

33. Reservoirs A and B supply water to the City of Bigland.

The ratio of the capacity of Reservoir A to the capacity of Reservoir B is 3:1.

When Reservoir A is 40% full it holds 427 200 megalitres (ML) of water.

What is the capacity of Reservoir B?

(A) 170 880 ML
(B) 356 000 ML
(C) 1 068 000 ML
(D) 3 204 200 ML

34. Jake, Tim and Shadia are standing in a field. Each person is 6 metres away from anyone else.

Uma arrives and stands 6 metres away from both Shadia and Tim but at a greater distance from Jake.

Jake is facing Tim. Jake then turns to face Uma.

How many degrees did Jake turn?

(A) 15°
(B) 30°
(C) 60°
(D) 90°

35. Mary has a 4-digit code for her lock but she has forgotten two of the digits.

Mary knows that her 4-digit code is

- less than 4000
- odd
- divisible by 3
- made up of 4 different digits.

How many 4-digit codes are possible?

(A) 3 (B) 5
(C) 6 (D) 10

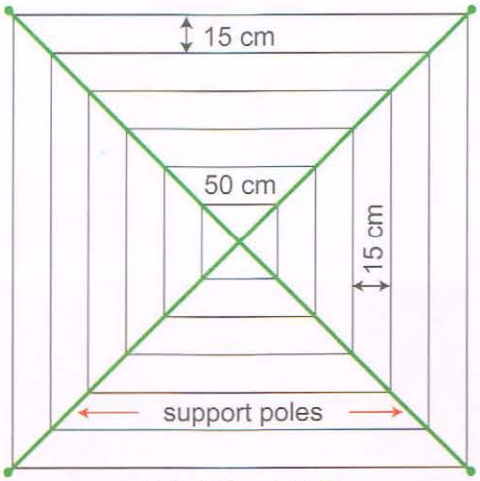
QUESTIONS 36 TO 40 ARE FREE RESPONSE.

Write your answer in the boxes provided on the ANSWER SHEET and fill in the ovals that match your answer.

36. Jack rode his skateboard to his friend's house. He spent the first 20 minutes climbing a hill at an average speed of 12 km/h. The next 10 minutes he averaged 18 km/h on a downhill slope to his friend's house.

What was Jack's average speed for the trip, in km/h?

37. The top of Helen's clothesline has 6 wire squares passing through support poles. This is an aerial view of the clothesline.



NOT TO SCALE

The innermost wire square has side 50 cm. The squares are 15 cm apart.

What is the total length of the wire used in Helen's clothesline, in metres?

38. Jane uses arrows to help her solve problems.

Symbols	Jane's code	Example
$x \times y$	$x \rightarrow y$	$2 \rightarrow 3 = 6$
$x \div y$	$x \leftarrow y$	$6 \leftarrow 3 = 2$
x^y	$x \uparrow y$	$2 \uparrow 3 = 8$
$\sqrt[y]{x}$	$x \downarrow y$	$9 \downarrow 2 = 3$

Normal order of operations applies to Jane's code.

Jane changed a number sentence into her arrow code.

$$3 \uparrow 4 \rightarrow 2 \uparrow 5 \leftarrow (8 \downarrow 3) \uparrow 4$$

What was the correct answer?

39. There are 5 chairs in a row. Jane and Lin sit next to each other. Bill sits on one of the seats to the left of the two girls.

How many of these seating arrangements are possible?

40. Each letter represents a different non-zero digit.

$$A\overline{)BCC}\,\overline{4C}$$

What number is represented by BCC?

Acknowledgment

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Brunei	Form 2 & 3
Indonesia	Year 9
Malaysia	Form 2
New Zealand	Year 9
Pacific Region	Year 9
Singapore	Secondary 1
South Africa	Grade 8

PAPER F

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2016 MATHEMATICS ANSWER KEYS

QUESTION NUMBER	PAPER A	PAPER B	PAPER C	PAPER D	PAPER E	PAPER F	PAPERS G & H	PAPERS I & J
1	D	D	C	B	A	D	A	A
2	A	B	D	A	B	C	A	C
3	C	C	A	D	A	D	B	D
4	B	B	C	C	D	A	C	C
5	C	C	D	A	D	C	D	D
6	A	B	C	B	C	C	B	D
7	C	B	B	D	D	B	C	A
8	B	A	B	D	C	C	D	D
9	A	C	C	B	B	A	C	C
10	A	D	A	C	A	C	D	B
11	D	C	B	B	D	D	C	B
12	B	D	D	C	B	B	D	A
13	A	A	C	A	B	D	A	C
14	A	B	B	B	D	C	C	B
15	D	A	B	A	C	D	D	B
16	B	B	D	A	D	B	D	C
17	C	A	A	D	B	D	A	A
18	A	D	A	D	C	A	C	A
19	C	C	D	C	B	D	B	D
20	B	C	B	A	C	D	B	B
21	A	B	C	A	A	B	A	D
22	C	A	D	C	A	C	C	C
23	D	C	C	D	D	B	D	B
24	C	B	D	C	C	A	A	A
25	D	B	A	D	D	D	C	C
26	A	C	B	B	D	C	B	B
27	D	D	A	A	A	B	C	D
28	C	A	C	B	B	A	B	B
29	B	B	C	D	A	B	D	B
30	D	D	D	C	B	C	C	C

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M

2016 MATHEMATICS ANSWER KEYS

QUESTION NUMBER	PAPER A	PAPER B	PAPER C	PAPER D	PAPER E	PAPER F	PAPERS G & H	PAPERS I & J
31	B	D	B	B	C	A	B	D
32	A	B	B	C	A	C	A	D
33	C	A	A	A	B	B	B	A
34	D	C	C	C	C	B	A	A
35	C	C	D	B	A	A	B	C
36	A	D	A	58|058	35|035	14|014	204	204
37	C	A	C	126	67|067	30|030	20|020	750
38	B	D	B	65|065	963	162	216	15|015
39	D	C	D	98|098	14|014	12|012	184	27|027
40	A	D	B	300	288	288	89|089	765

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