UNSW THE UNIVERSITY OF NEW SOUTH WALES SYDNEY • AUSTRALIA
EDUCATIONAL ASSESSMENT AUSTRALIA

PAPER F

ICAS

INTERNATIONAL COMPETITIONS AND ASSESSMENTS FOR SCHOOLS

MATHEMATICS

2008

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.

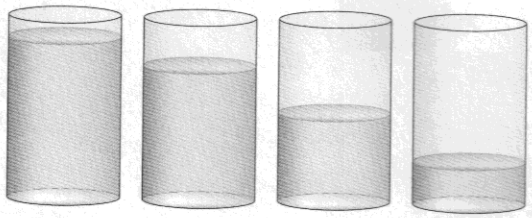
There are **35 MULTIPLE-CHOICE QUESTIONS** (1–35).
Use the information provided to choose the **BEST** answer from the four possible options.
On your **ANSWER SHEET** fill in the oval that matches your answer.

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

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

PLEASE SEE BACK COVER FOR A LIST OF THE YEAR LEVELS THAT SHOULD SIT THIS PAPER

1. Which cylinder is three-quarters full of liquid?



(A) (B) (C) (D)

2. The table shows which type of TV program some children watched one afternoon.

	cartoons	sport
boys	34	52
girls	45	19

What is the difference between the number of girls and the number of boys watching cartoons?

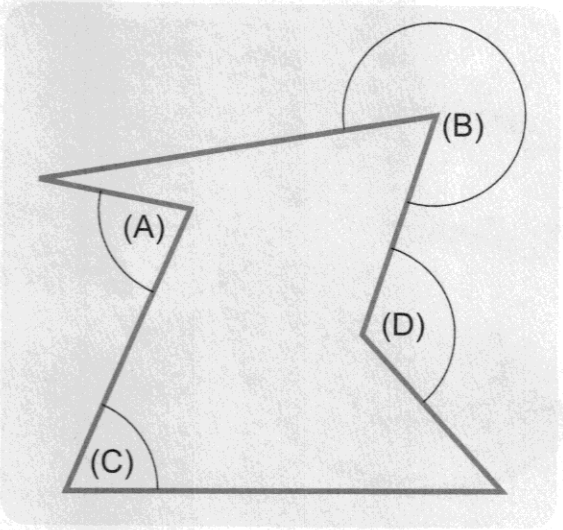
(A) 9
(B) 10
(C) 11
(D) 12

3. Which property do squares share with all other rectangles?

(A) all angles equal
(B) four lines of symmetry
(C) all sides of equal length
(D) perpendicular diagonals

4. An obtuse angle is greater than 90° but less than 180°.

Which of these angles is obtuse?

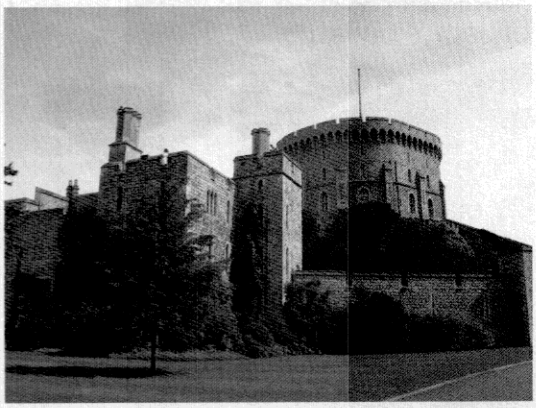


5. What is the next number in this pattern?

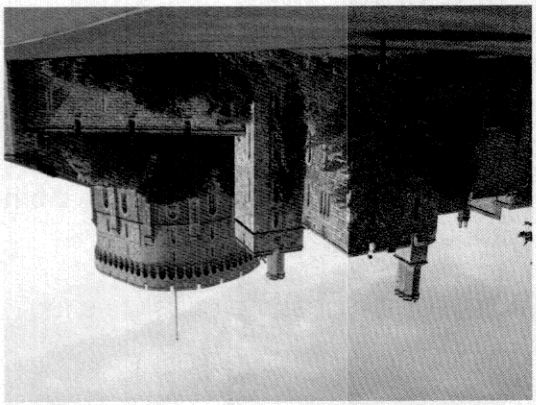
3, 6, 11, 18, 27, 38, 51, ?

(A) 63
(B) 64
(C) 65
(D) 66

6. Jane had this image on her computer.



She changed it so that it looked like this.



How did she change the image?

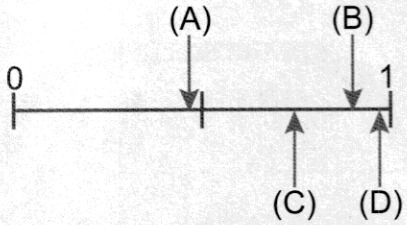
(A) a rotation
(B) a reflection
(C) a translation
(D) an enlargement

7. Darwin is approximately 3000 km north of Adelaide by rail.

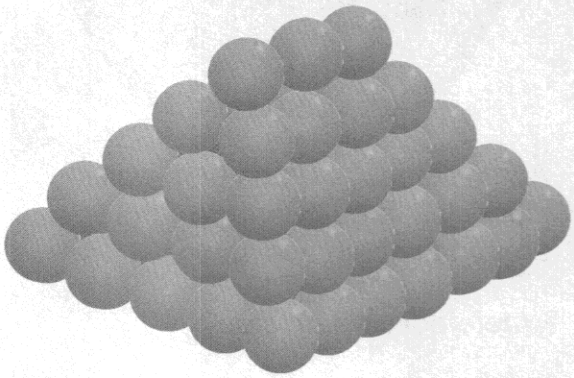
How fast does a train need to travel to complete this trip in 40 hours?

(A) 95 km/h
(B) 80 km/h
(C) 75 km/h
(D) 60 km/h

8. Which arrow is closest to 0.9 on this number line?



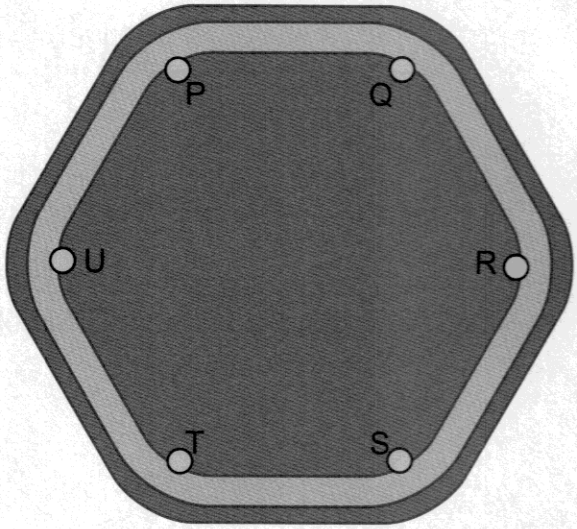
9. This stack of oranges has a rectangular base of 7 oranges by 5 oranges. The other layers are also rectangular.



How many oranges are in this stack?

(A) 35
(B) 55
(C) 85
(D) 140

10. A path in a park is in the shape of a regular hexagon with a lamp at each corner.



Adam stands at P and then walks clockwise three-quarters of the way around the path and stops.

Where does Adam stop?

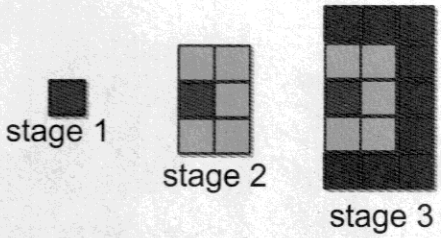
(A) between R and S
(B) between S and T
(C) between T and U
(D) between U and P

11. Which of these numbers is smallest?

(A) 0.1 (B) 0.09

(C) 0.109 (D) 0.0999

12. Jack is making a pattern with tiles. The pictures show the first three stages of Jack's pattern.

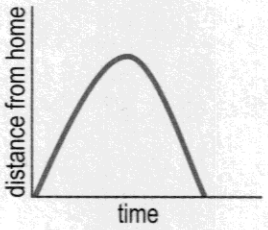


How many tiles will be in stage 5?

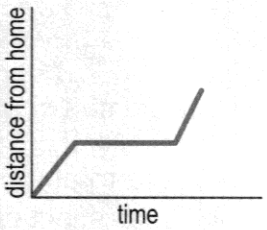
(A) 13
(B) 17
(C) 28
(D) 45

13. Jia jogs on a straight road to the park and then turns around and jogs back home without resting.

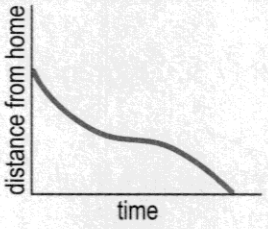
Which graph best matches Jia's jog?



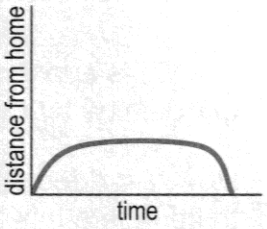
(A)



(B)

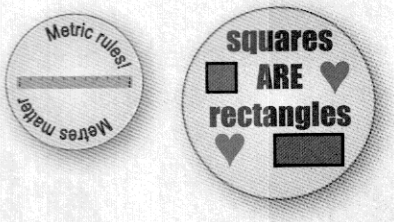


(C)



(D)

14. Ethan spent two hours making badges. A small badge took 5 minutes to make and a large badge took 10 minutes to make.



Ethan spent the same amount of time making both kinds of badge.

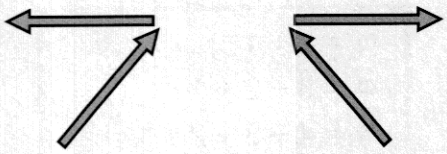
How many badges did Ethan make?

(A) 12 (B) 15

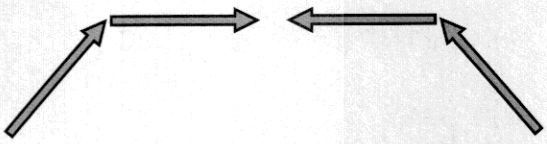
(C) 18 (D) 24

15. Lien walked northeast for one kilometre and then west for one kilometre.

Which of these diagrams shows the direction of Lien's walk?



(A) (B)



(C) (D)

16. Sarah and Ben travel from Central to Morrisdale by train.

CENTRAL TO WYNTON

	pm	pm	pm
Central	2:42	2:52	3:18
Willow Park	2:54	...	3:31
Morrisdale	2:58	...	3:36
Wynton	3:10	3:15	3:51

WYNTON TO CENTRAL

	pm	pm	pm
Wynton	3:10	3:17	3:22
Morrisdale	3:23	...	3:35
Willow Park	3:28	...	3:40
Central	3:42	3:40	3:55

Sarah catches the 3:18 pm train. Ben catches the 2:52 pm train. He changes trains at Wynton to get back to Morrisdale.

What is the difference between the times they arrive at Morrisdale?

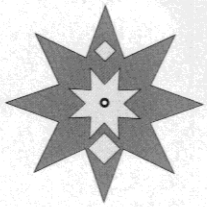
(A) 1 minute
(B) 4 minutes
(C) 26 minutes
(D) 36 minutes

17. Kate has m counters. John has n counters. John has p counters more than Kate.

Which equation shows this?

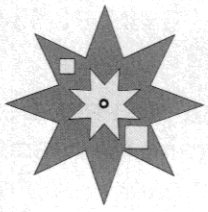
(A) $m = p - n$
(B) $n = p - m$
(C) $m = n + p$
(D) $n = m + p$

18. Anita made this design.

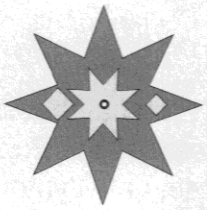


She rotated the design 45° anti-clockwise around its centre. She then rotated it 135° clockwise around its centre.

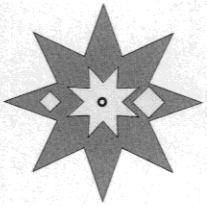
What did the design look like after the rotations?



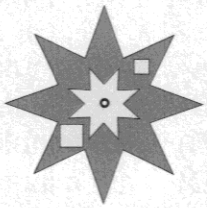
(A)



(B)



(C)



(D)

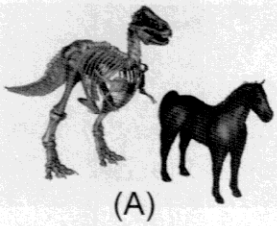
19. A father and son have the same birthday. In 2001 the father was 42 and the son was 11.

In what year will the father be exactly twice as old as his son?

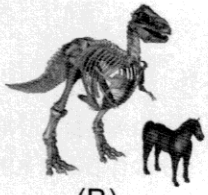
(A) 2008
(B) 2018
(C) 2021
(D) 2031

20. A museum has a skeleton of a dinosaur that is 3 metres high. The same museum has a model of a horse that is 2 metres high.

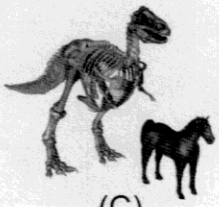
Which picture shows the dinosaur and the horse at the right scale?



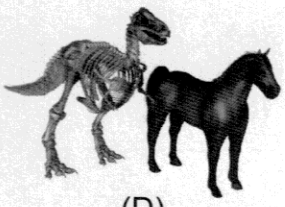
(A)



(B)



(C)



(D)

21. Here are examples of a short notation for writing the sum of counting numbers.

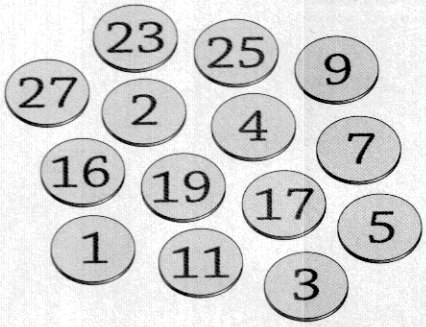
$\varpi_2 = 2 + 1$
$\varpi_3 = 3 + 2 + 1$
$\varpi_4 = 4 + 3 + 2 + 1$
$\varpi_5 = 5 + 4 + 3 + 2 + 1$

What is the value of $\varpi_8 - \varpi_2$?

(A) 21 (B) 33

(C) 34 (D) 35

22. Nina has these counters.

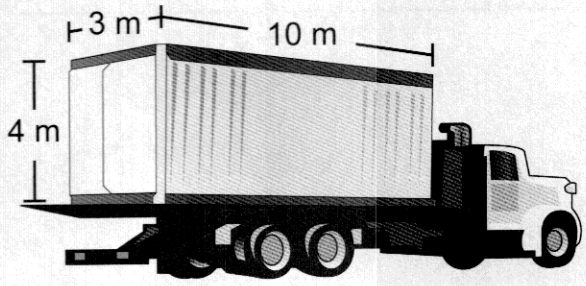


She turns over all of the counters with a square number on them. Then she turns over all of the counters with a prime number on them. There is one counter that Nina has **NOT** turned over.

Which of these is true of the number on that counter?

(A) It is between 1 and 4 inclusive.
(B) It is between 5 and 10 inclusive.
(C) It is between 11 and 20 inclusive.
(D) It is between 21 and 30 inclusive.

23. The container shown on the truck is stacked half full with bags of rice.



Which of these is closest to the volume, in m^3, of the bags of rice in the container?

(A) 30
(B) 60
(C) 120
(D) 240

24. In each of these equations k is an even number.

In which equation **must** n be an odd number?

(A) $n = k + 2$ (B) $n = \frac{k}{2} + 1$

(C) $n = 2(k+1)$ (D) $n = (k+1)^2$

25. Anne is a gardener. She has sticks of various lengths to support her plants.

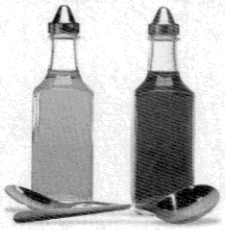
Length	Quantity
10 cm	4
15 cm	7
40 cm	8
100 cm	20

Anne arranged the sticks in a row from longest to shortest.

How long is the stick in the middle?

(A) 10 cm
(B) 15 cm
(C) 40 cm
(D) 100 cm

26. Kent has a recipe for salad dressing that uses 12 spoons of oil and 3 spoons of vinegar.



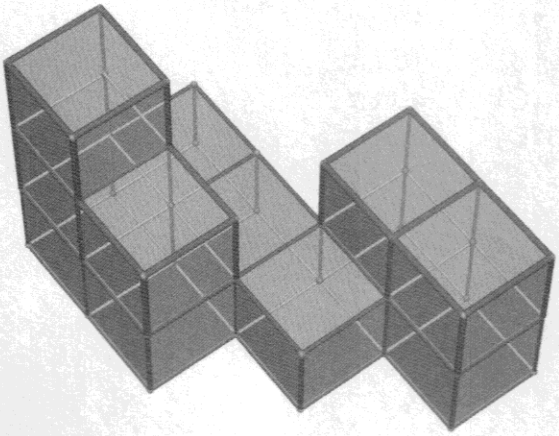
Kent decides to use $\frac{2}{3}$ of the amount of oil, but the same amount of vinegar.

What fraction of Kent's dressing will be vinegar?

(A) $\frac{3}{11}$ (B) $\frac{1}{3}$

(C) $\frac{3}{8}$ (D) $\frac{8}{11}$

27. Tony made the shape shown by gluing 12 cubes together.

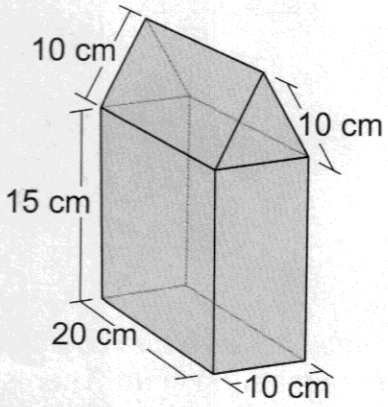


He then painted over the entire surface of the shape including the bottom.

How many of the cubes will have exactly four faces painted?

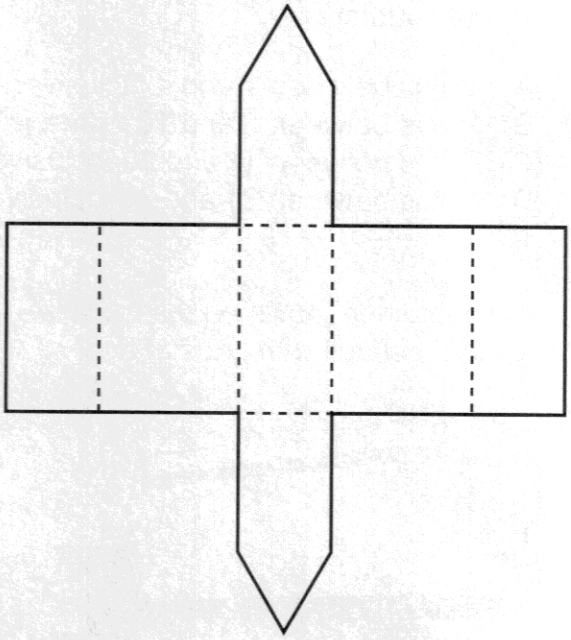
(A) 5
(B) 6
(C) 7
(D) 8

28. Mario is building a model shed as shown in the picture.



NOT TO SCALE

Mario draws this net of the model.



NOT TO SCALE

What is the perimeter, in cm, of Mario's net?

(A) 270
(B) 240
(C) 220
(D) 200

29. Mathland's population changes frequently. There is 1 birth every 2 minutes. There is 1 death every 4 minutes and 1 new migrant enters every 5 minutes.

What is the rate of increase of Mathland's population?

(A) 0.45 persons per minute
(B) 0.66 persons per minute
(C) 1 person per minute
(D) 3 persons per minute

30. Here is a student's attempt to solve an equation.

step 0: $11x - 7 = 5(5 - x)$
step 1: $11x - 7 = 25 - x$
step 2: $11x + x - 7 = 25$
step 3: $12x = 25 - 7$
step 4: $12x = 18$
step 5: $x = 18 \div 12$
step 6: $x = 1.5$

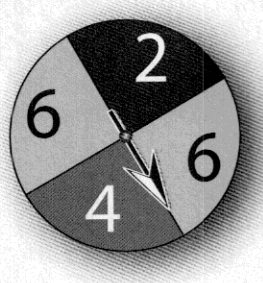
The student made two errors.

Where did the student make the errors?

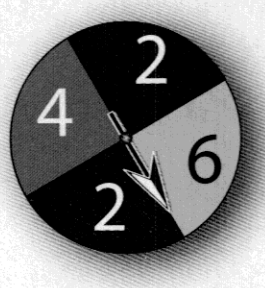
(A) step 1 and step 2
(B) step 1 and step 3
(C) step 2 and step 3
(D) step 2 and step 5

31. William has a spinner. He will spin it twice and add the two results to get a total.

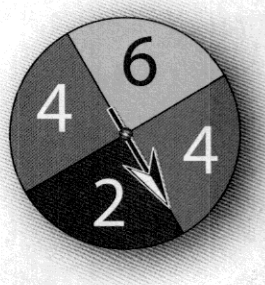
Which of these spinners is most likely to give a total of 8?



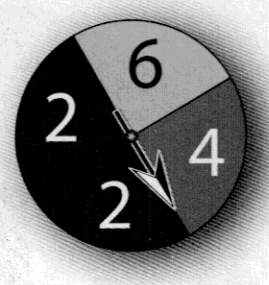
(A)



(B)



(C)



(D)

32. Carrie and Luke together drank $\frac{4}{5}$ of a bottle of juice. Carrie drank half as much as Luke.

What fraction of the juice did Carrie drink?

(A) $\frac{1}{3}$ (B) $\frac{2}{5}$

(C) $\frac{1}{6}$ (D) $\frac{4}{15}$

33. Polly wrote this number pattern.

0, 2, 5, 10, 17, 28, 41, ?

What is the missing number ? ?

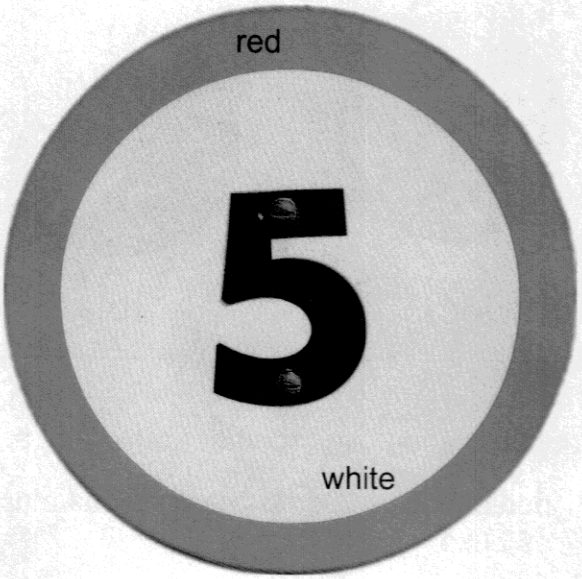
(A) 56
(B) 58
(C) 62
(D) 63

34. The angle between the hour and minute hands of a clock is measured every minute.

What is the smallest angle measured between 3:00 pm and 3:59 pm?

(A) 7.5°
(B) 3.5°
(C) 2.0°
(D) 1.5°

35. The diameter of this circular sign is 55 cm. The diameter of the white part is 44 cm.

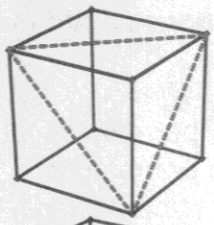


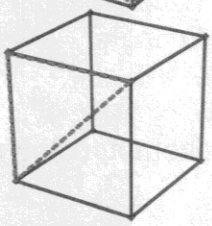
What is the area of the red part of the sign to the nearest cm^2?

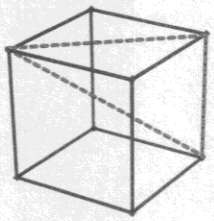
(A) 855
(B) 1521
(C) 2375
(D) 3421

QUESTIONS 36 TO 40 ARE FREE RESPONSE.

36. Three vertices of a cube can be joined to make a triangle. The diagram shows the types of ways this can be done.


3 face diagonals


2 edges
1 face diagonal


1 edge
1 face diagonal
1 cube diagonal

How many triangles can be made by joining three vertices of a cube?

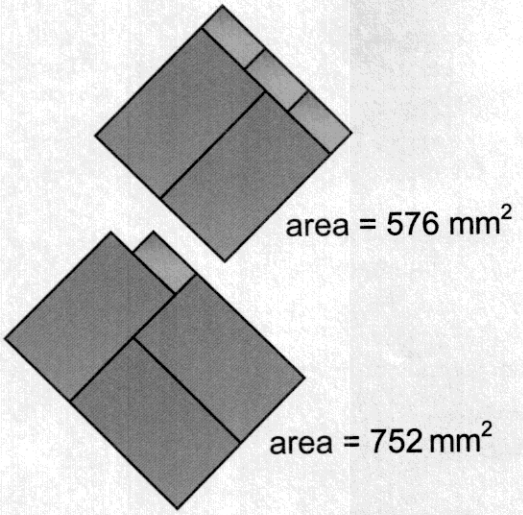
(Write only the number on your answer sheet.)

37. The mean height of eleven football players is 187 cm. The mean height of the five shortest players is 183 cm. The mean height of the five tallest players is 191.4 cm.

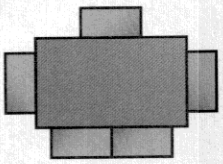
What is the median height of all of the players?

(Write only the number on your answer sheet.)

38. The shapes shown are made out of two different sizes of rectangles.

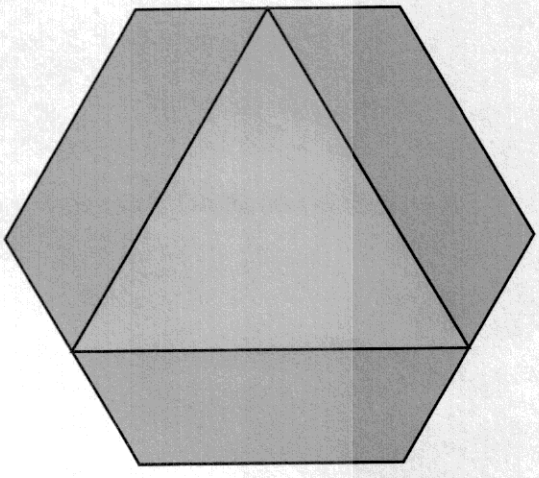


What is the area in mm^2 of this shape?



(Write only the number on your answer sheet.)

39. The diagram shows an equilateral triangle whose vertices touch the midpoints of three sides of a regular hexagon.

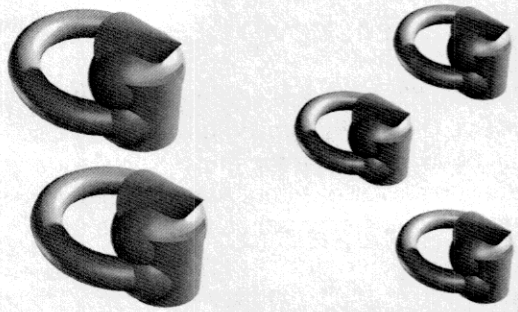


The area of the triangle is 12 cm^2.

What is the area of the hexagon in cm^2?

(Write only the number on your answer sheet.)

40. A machine makes big widgets. Another machine makes small widgets. Three small widgets have the same mass as two big widgets.



big widgets small widgets

It takes the same amount of time to make 3 big widgets as it does to make 5 small widgets.

The machines start at the same time and make widgets until the total mass of all of the widgets made is equal to the mass of 380 small widgets.

What is the total number of widgets made?

(Write only the number on your answer sheet.)

ACKNOWLEDGMENT

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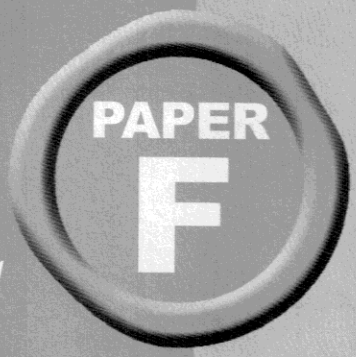
INDONESIA: Year 9
MALAYSIA: Form 2
NEW ZEALAND: Year 9
PACIFIC: Year 8
SINGAPORE: Secondary 1
SOUTH AFRICA: Grade 8



Quality System
Quality Endorsed Company

Worked Solutions for Paper F, 2008

1. Ans: (B)

2. Ans: (C)

$45 - 34 = 11$

3. Ans: (A)

4. Ans: (D)

5. Ans: (D)

$51 + 15 = 66$

6. Ans: (A)

7. Ans: (C)

$3000 \div 40 = 75$ km/h

8. Ans: (B)

9. Ans: (C)

$1\times3 + 2\times4 + 3\times5 + 4\times6 + 5\times7 = 85$

10. Ans: (C)

11. Ans: (B)

12. Ans: (D)

$5 \times 9 = 45$

13. Ans: (A)

14. Ans: (C)

$5x = 10y$

$5x + 10y = 120$

$y = 6, x = 12$

$\therefore 12 + 6 = 18$

15. Ans: (A)

16. Ans: (B)

$3.36 - 3.35 = 1$ min.

17. Ans: (D)

18. Ans: (B)

19. Ans: (C)

$x - y = 31, x = 2y$

$\therefore x = 62, y = 31$

$62 - 42 = 20$

$\therefore 2001 + 20 = 2021$

20. Ans: (A)

21. Ans: (B)

$8 + 7 + 6 + 5 + 4 + 3 = 33$

22. Ans: (D)

square nos: 1, 4, 9, 16, 25

prime nos: 3, 5, 7, 11, 17, 19, 2, 23

(27) has not turned over.

23. Ans: (B)

$\frac{1}{2}(4 \times 3 \times 10) = 60$

24. Ans: (D)

Since k is even, $(k+1)$ is odd

and $(k+1)^2$ is odd.

25. Ans: (D)

$[(39+1) \div 2]^{th} = 20^{th}$

26. Ans: (D)

$\frac{2}{3}$ of 0:1 = 8 spoons.

$\therefore 8 : (8+3) = 8 : 11$

27. Ans: (B)

28. Ans: (B)

$[20 + (10+15)\times2 + (15+10)\times2] \times 2$

$= 240.$

29. Ans: (A)

$0.5 + 0.2 - 0.25 = 0.45$ persons/min.

30 Ans: (B)

31. Ans: (C)

P(get a total of 8) $= \frac{3}{16}$ for (A)

$= \frac{3}{16}$ for (B)

$= \frac{4}{16}$ for (C)

$= \frac{3}{16}$ for (D)

32. Ans: (D)

$x + y = \frac{4}{5}$ and $\frac{x}{y} = \frac{1}{2}$ (x for Annie, y for Luke)

$\therefore 2x = y$ and $3x = \frac{4}{5}$

$\therefore x = \frac{4}{15}$

33. Ans: (B)

0, 2, 5, 10, 17, 28, 41, (58)

difference: 2 3 5 7 11 13 17

34. Ans: (C)

Angle travelled by the min hand in 1 min. $= \frac{360^\circ}{60} = 6^\circ$.

Angle travelled by the hr hand in 1 hr $= 5 \times 6^\circ = 30^\circ$, travelled $\frac{30^\circ}{60} = 0.5^\circ$ in 1 min

Consider the min hand travelled x mins,

the angle beetween 3pm and 3:59pm $= 90^\circ + 0.5^\circ x - 6^\circ x = 90^\circ - 5.5^\circ x$

when $90^\circ - 5.5^\circ x = 0$, $x = 16.4$; when $x=16$, $90^\circ - 5.5^\circ x = 2^\circ$; when $x=17$, $90^\circ - 5.5^\circ x = -3$

35. Ans: (A)

$$\pi\left(\frac{55}{2}\right)^2 - \pi\left(\frac{44}{2}\right)^2 = 855.2 \approx 855\,cm^2$$

36. Ans: 56

$$8C_5 = \frac{8 \times 7 \times 6}{3 \times 2 \times 1}$$
$$= 56$$

37. Ans: 185cm

$$187 \times 11 - 191.4 \times 5 - 183 \times 5 = 185cm$$

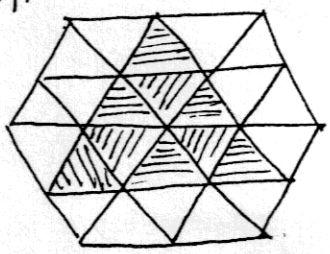
38. Ans: $400mm^2$

$$2x + 3y = 576,\ 3x + y = 752$$
$$\therefore x = 240 \text{ and } y = 32.$$

39. Ans: $32cm^2$

$$\frac{12}{9} \times 24 = 32cm^2$$

Q39.



40. Ans: 320.

For the same amount of time, $3b = 5s$

For the weight, $3s = 2b$

$$b = \frac{3}{2}s$$

For the same amount of time, the total weight is $3 \times \frac{3}{2}s + 5s = 9.5s$.

$380 \div 9.5 = 40$ units.

$\therefore$ Total no. of widgets made $= 40 \times 3 + 40 \times 5 = 320$.