THE BRITISH INTERNATIONAL SCHOOL ABU DHABI

A NORD ANGLIA EDUCATION SCHOOL

Year 8 Maths

Topic 13–14–15–16 Workbook

In the table below translate the key terms into your home language and write a short definition for each term [if needed visit www.mathsisfun.com/definitions/].

TOPIC 13 – APPLYING NUMBER		
Time		
Currency		
Conversion		
TOPIC 14 – TRANSFORMATIONS		
Translation		
Reflection		
Rotation		
Clockwise		
Column Vector		
TOPIC 15 – PROBABILITY		
Probability		
Chance		
Sample Space		
TOPIC 16 – 3D SHAPES AND VOLUME		
Cylinder		
Cuboid		
Prism		

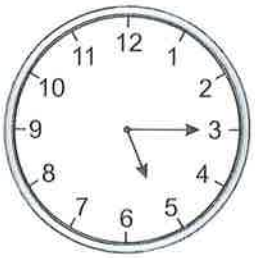
Time

1. Aleks goes to bed at 10:10 pm and Alexis goes to bed at 22:22.

Who goes to bed at the later time?

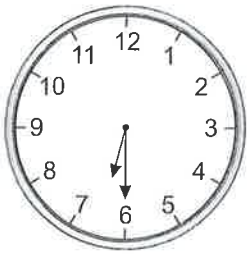
.....

2. The clocks below show times in the afternoon or evening. Write down the time on each one using the 12-hour clock and the 24-hour clock.



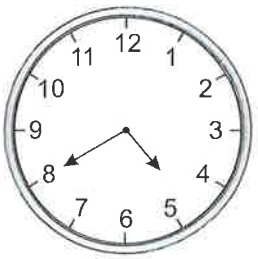
12-hour: .....

24-hour: .....



12-hour: .....

24-hour: .....



12-hour: .....

24-hour: .....

3. Zara can either walk or cycle between home and school.
The journey takes 48 minutes to walk or 22 minutes to cycle.

a) Zara leaves school at 15:49 and cycles home. What time will she arrive?
Give your answer in the 24-hour clock.

.....

b) What time would Zara need to leave home to walk to school and arrive at 08:30?
Give your answer in the 12-hour clock.

.....

4. Convert...

a) 180 minutes into hours,

..... hours

b) 2.5 hours into minutes,

..... minutes

c) $5\frac{1}{4}$ minutes into seconds.

..... seconds

Time

5. Below is part of a bus timetable.

Neptune Street	06:54	07:18	07:33	07:48
Drumlin Lane	07:08	07:32	07:47	08:02
Redmile Road	07:17	07:41	07:56	08:11
Mortimer Crescent	07:32	07:56	08:11	08:26

a) Janet needs to arrive at Redmile Road by 08:00. What is the latest time she can catch a bus from Neptune Street and arrive at Redmile Road without being late?

.....

b) How long does it take to get from Drumlin Lane to Mortimer Crescent?

..... minutes

c) Olga wants to catch the 07:56 bus from Mortimer Crescent, but it doesn't leave Redmile Road until 07:52. What time can she expect the bus to arrive?

.....

6. The schedule for a family fun day is shown on the right.

a) What time does Afternoon Tea start in the 12-hour clock?

.....

b) How many minutes later does Sandcastle Building start than Sock Puppet Shakespeare?

..... minutes

c) Sandcastle Building lasts for 85 minutes and the Medieval Costume Contest starts immediately after. Fill in the start time of the Medieval Costume Contest on the schedule, writing it in the 24-hour clock.

Time	Event
13:00	Harmonica Recital
14:10	Balloon Animal Workshop
15:25	Afternoon Tea
16:15	Sock Puppet Shakespeare
17:55	Sandcastle Building
.....	Medieval Costume Contest

How did you do?

Once you've got this stuff covered, you'll never miss the bus again. Time to make sure you can:

- ☐ **Convert between 12- and 24-hour clocks.**
- ☐ **Convert between different units of time (seconds, minutes and hours).**
- ☐ **Solve problems that involve time, e.g. interpreting and using timetables.**

Time and Timetables

It's about time you had a page like this... As long as you break time calculations down into simple stages this page shouldn't cause you any bother.

Q1 The times below are given using the 24 hour system.
Using am or pm, give the equivalent time for a 12 hour clock:

a) 1000 .....

b) 1201 .....

c) 0001 .....

d) 1430 .....

Q2 The times below are taken from a 12 hour clock. Give the equivalent 24 hour readings:

a) 10.30 pm .....

b) 11.22 am .....

c) 12.30 am .....

d) 12.30 pm .....

Q3 The train timetable shows what time trains leave Hykeham and arrive at Tadley.

TRAIN TIMETABLE: HYKEHAM TO TADLEY					
Depart Hykeham:	**0915**	**1134**	**1345**	**1536**	**1658**
Arrive Tadley:	**1023**	**1234**	**1456**	**1649**	**1803**

a) Jane catches the train at 0915.
What time does the train pull into Tadley station? .....

b) How long did the journey take? Give your answer in minutes. .....

c) Helena is also travelling to Tadley and she catches the train at 1.45 pm.
How many minutes does her journey take? .....

d) Kathy is supposed to be in Tadley by 5 pm. She wants to take the latest possible train from Hykeham. Which train should she take? .....

e) Kathy lives a 15 minute walk from the train station in Hykeham.
What is the latest time she could leave her house and still catch her train? .....

Real-Life Graphs

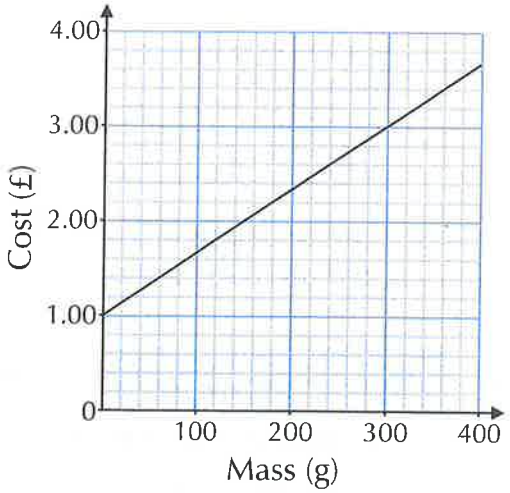
1. The graph below shows the cost of pick 'n' mix sweets from a shop.

a) Use the graph to work out the cost of a 180 g bag of pick 'n' mix.

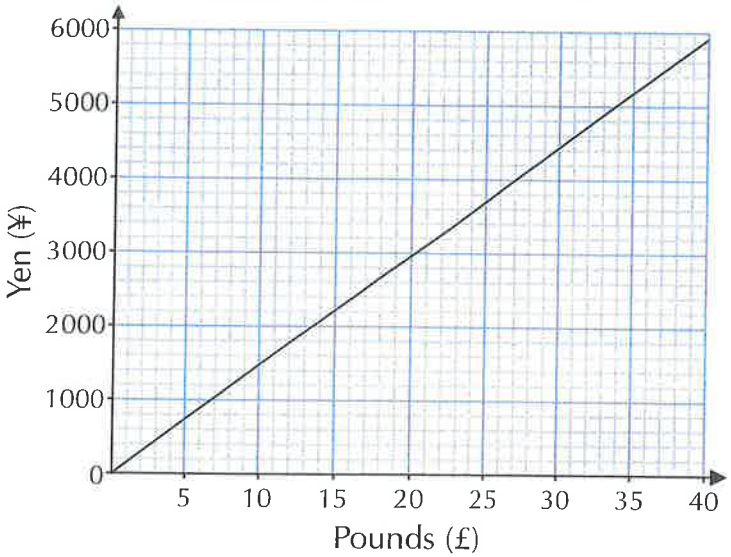
£.....

b) Eimear has £3.20 to spend on sweets. What is the heaviest mass of pick 'n' mix that she could buy?

..... g



2. The graph below shows the conversion of British pounds (£) to Japanese yen (¥).



Freddy buys a new camera from an online store that exports from Japan. All prices are given in yen.

a) Use to graph to convert ¥3500 to pounds.

£.....

b) The camera is priced at ¥35 000. What is the cost of the camera in pounds?

£.....

3. Chris and Jodie went go-kart racing on a 1.2 km track.

The graph on the right shows their first lap.

a) Who was leading the race at the following times?

(i) At 1 minute: .....

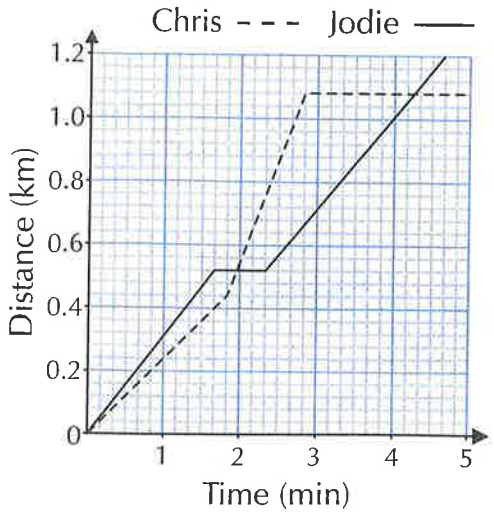
(ii) At the half-way point: .....

b) (i) Who failed to finish their lap?

.....

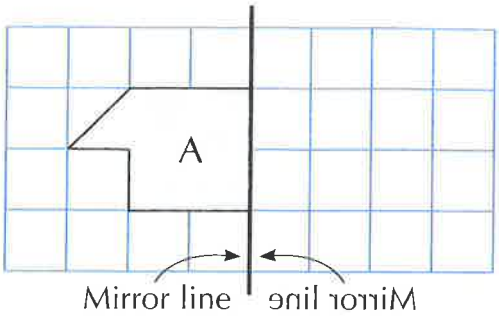
(ii) How far did this person travel before stopping?

..... km



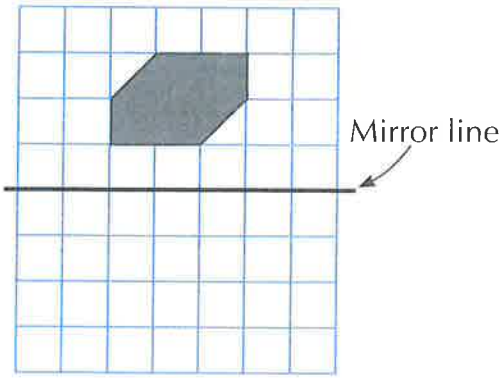
Reflection

1. Reflect shape A in the mirror line. Label the new shape B.

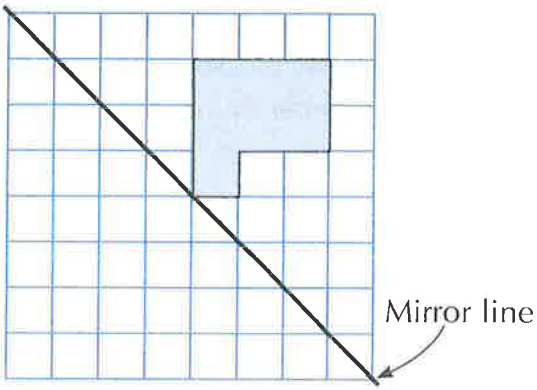


2. Reflect each of these shapes in the given mirror line.

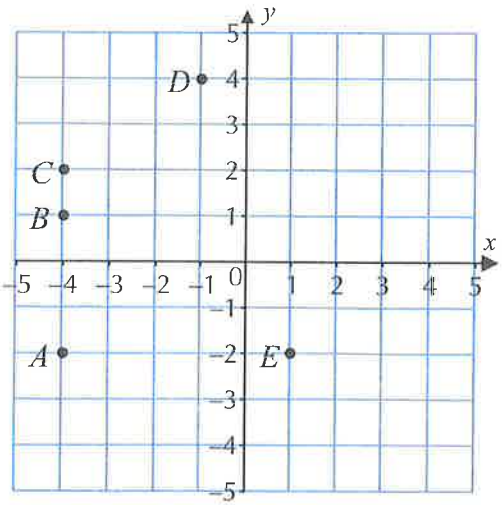
a)



b)



3. Five points have been plotted on the axes on the right.



a) What point is obtained by reflecting A in the x-axis?

Tick your answer: ☐ B ☐ C ☐ D ☐ E

b) Draw the triangle ACD and then draw its reflection in the y-axis.

c) The point E is reflected in the x-axis and then in the y-axis. What are its new coordinates?

(....., ...)

How did you do?

Well done, you've completed the page on reflections! Look in a mirror and you'll see a champion!
What do you mean you'll need a mirror to read that? Check to see if you can now:

☐ Reflect shapes on grids and axes in horizontal, vertical and diagonal mirror lines.

Transformations

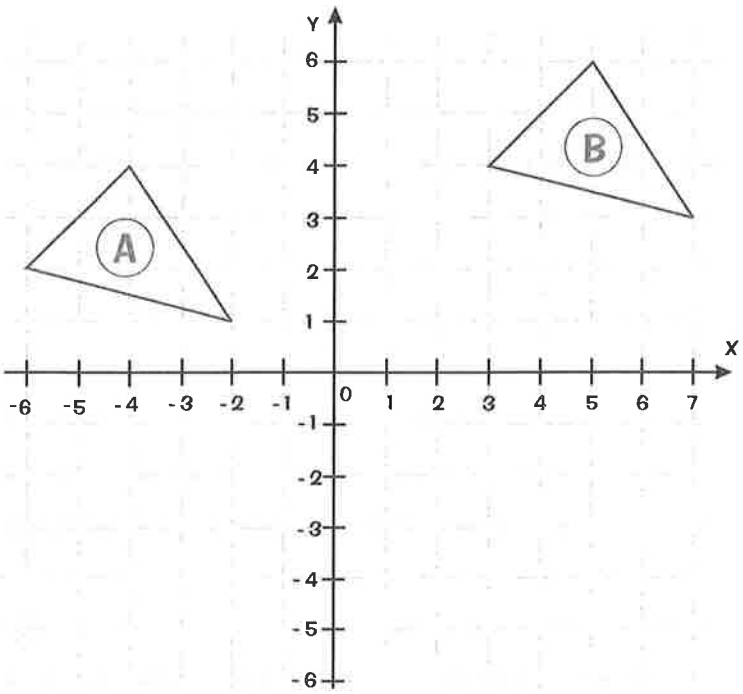
Transformations — the most fun you can have with a pencil and paper.
There are 4 different transformations — translation, reflection, rotation and enlargement.
You'll need to know them all, so practise, practise, practise...

Q1 Triangle B is the translation of triangle A by the vector $\begin{pmatrix} 9 \\ 2 \end{pmatrix}$
(9 units in the positive x-direction, 2 units in the positive y-direction).

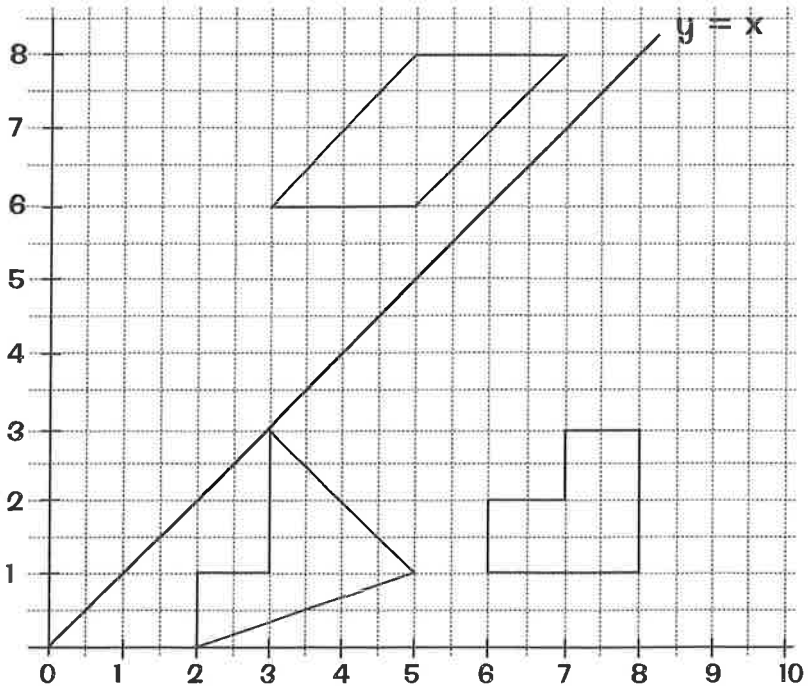
a) Translate A by the vector $\begin{pmatrix} 6 \\ -4 \end{pmatrix}$.
Label the result C.

b) Translate A now by the vector $\begin{pmatrix} 0 \\ -6 \end{pmatrix}$.
(This will be a movement parallel to the y-axis). Label the result D.

Make sure you get the vector numbers the right way round.



Q2 Reflect each shape in the line $y = x$.



Transformations

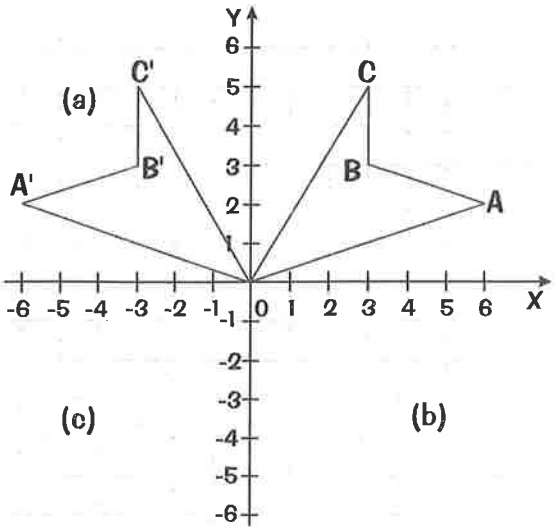
It's a good idea to learn the 4 different transformations before starting these pages — they are translation, reflection, rotation and enlargement.

Q1 On graph paper draw axes from -6 to +6 in each direction.

a) Copy the shape OABC and its reflection in the y-axis, OA'B'C'.

b) Draw the reflection of OABC in the x-axis and label it OA''B''C''.

c) Finally draw the reflection of OA'B'C' in the x-axis and label it OA'''B'''C'''.



d) Copy and complete the chart of coordinates:

Original	Reflection (a)	Reflection (b)	Reflection (c)
A (6, 2)	A' (-6, 2)	A'' (6, -2)	A''' (-6, -2)
B ( )	B' ( )	B'' ( )	B''' ( )
C ( )	C' ( )	C'' ( )	C''' ( )

e) Copy and complete these statements:

i) When reflecting in the x-axis, the sign of the y coordinate changes but .....

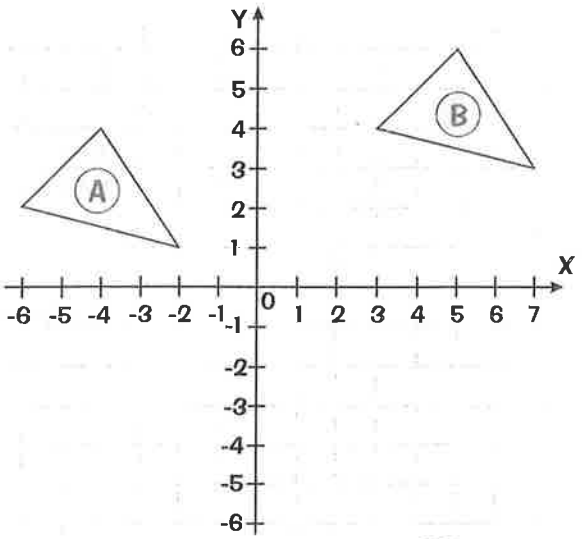
ii) When reflecting in the y-axis, ... but .....

Q2 B is the translation of the triangle A by the vector $\begin{pmatrix} 9 \\ 2 \end{pmatrix}$
(9 units in the positive x-direction, 2 units in the positive y-direction).

a) Copy the diagram onto graph paper.

b) Translate A by the vector $\begin{pmatrix} 6 \\ -4 \end{pmatrix}$. Label the result C.

c) Translate A now by the vector $\begin{pmatrix} 0 \\ -6 \end{pmatrix}$
(This will be a movement parallel to the y-axis).
Label the result D.



Make sure you get the vector numbers the right way round...

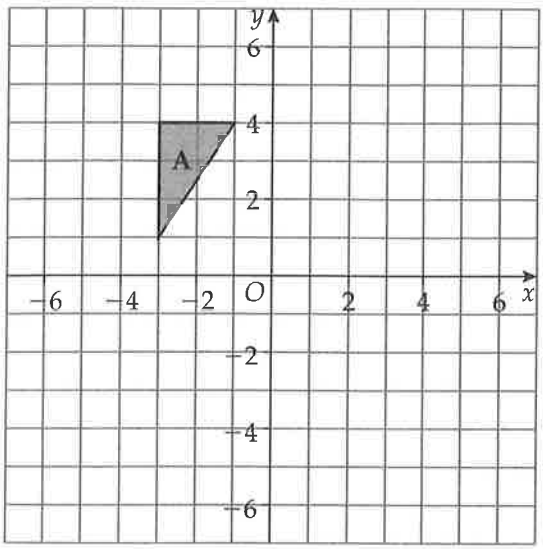
Yikes — vectors... well no-one likes these, but you're still gonna have to do them. They represent a certain distance in a certain direction, that's all.

Translations, reflections and rotations

C 1 (a) On the grid, translate triangle **A** by $\begin{pmatrix} 4 \\ -3 \end{pmatrix}$.
Label the new triangle **B**.

$\begin{pmatrix} 4 \\ -3 \end{pmatrix}$ means 4 units to the right and 3 units down.

(2 marks)



(b) On the grid, rotate triangle **A** 180° about (0, 0).
Label the new triangle **C**.

Use tracing paper to help with the rotation.

(2 marks)

C 2 (a) Describe fully the single transformation that will map triangle **A** onto triangle **B**.

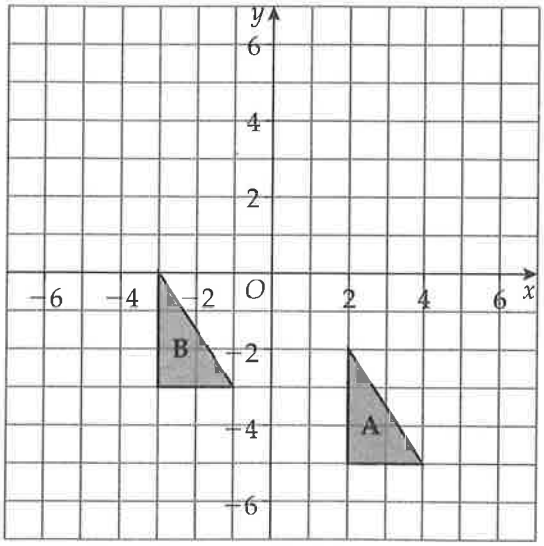
EXAM ALERT

Exam questions similar to this have proved especially tricky – be prepared! ResultsPlus

.....

.....

(2 marks)



(b) On the grid, rotate triangle **A** 180° about (1, 0).
Label the new triangle **C**.

(2 marks)

(c) On the grid, reflect triangle *A* in the line $y = 1$
Label the new triangle **D**.

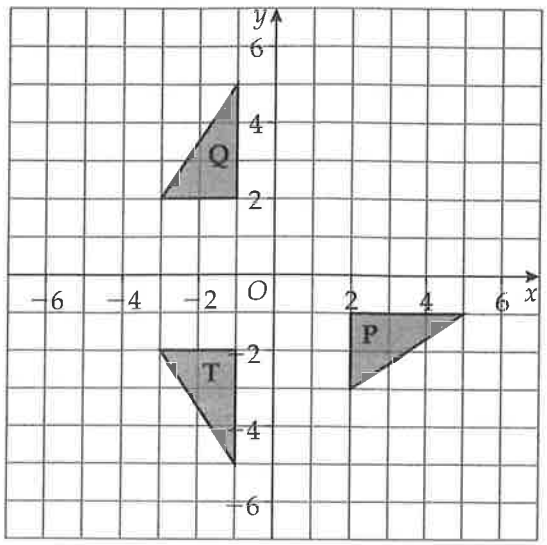
(2 marks)

C 3 (a) Describe fully the single transformation that will map triangle **P** onto triangle **Q**.

.....

.....

(2 marks)



(b) Describe fully the single transformation that will map triangle **P** onto triangle **T**.

.....

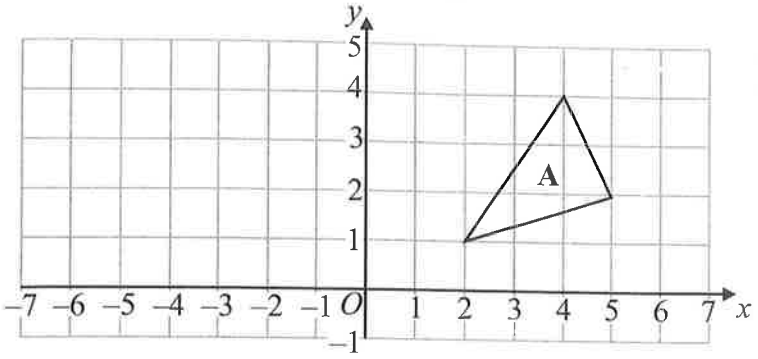
.....

(3 marks)

The Four Transformations

1 Triangle **A** has been drawn on the grid below. It has vertices at (2, 1), (5, 2) and (4, 4). (D)

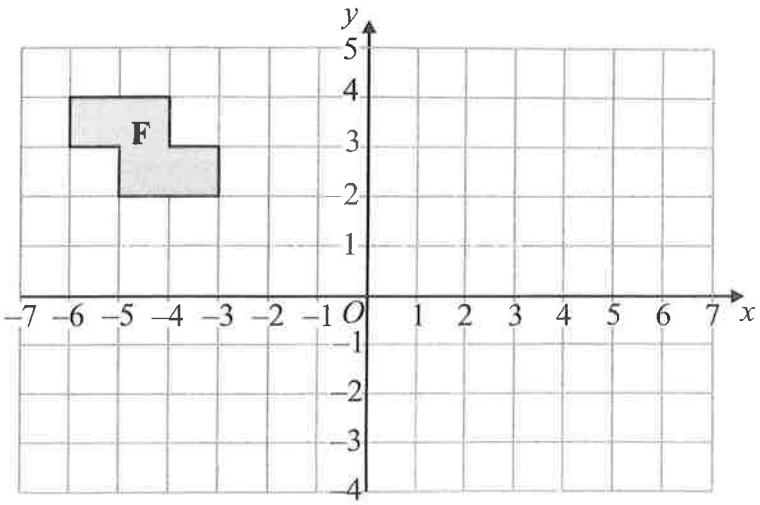
Reflect triangle **A** in the line $x = -1$. Label your image **B**.



Take each vertex of the triangle one-by-one, reflect them and then join them up.

[Total 2 marks]

2 Shape **F** has been drawn on the grid below. (D)



a) Translate shape **F** by the vector $\begin{pmatrix} 2 \\ -5 \end{pmatrix}$. Label your image **G**.

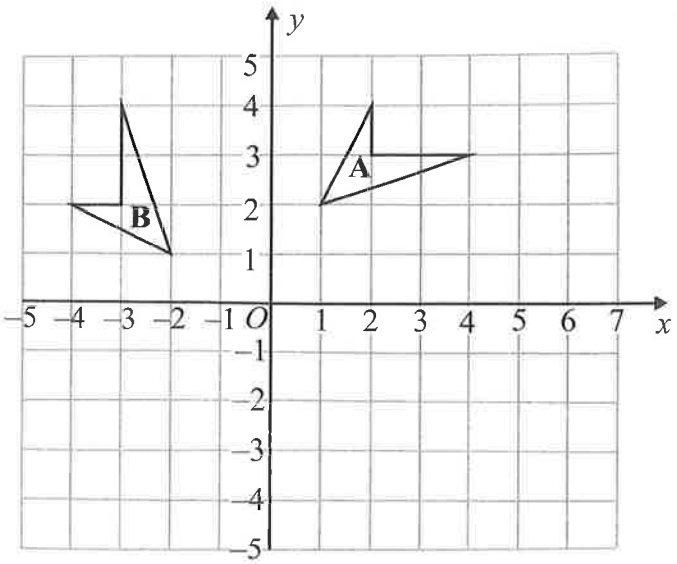
[1]

b) Rotate shape **F** by 90° clockwise around the point (0, –2). Label your image **H**.

[2]

[Total 3 marks]

3 In the diagram below, **B** is an image of **A**. (D)



a) Describe fully the single transformation that maps **A** onto **B**.

.....

.....

.....

[3]

b) Translate shape **B** by the vector $\begin{pmatrix} -1 \\ -4 \end{pmatrix}$. Label the image as **C**.

[1]

[Total 4 marks]

Probability

1. Five events are written below, along with five words that describe how likely things are to happen.

Match each event with its description by drawing straight lines between them.

There will be fewer than 30 days in February.	Certain
You will find a giraffe in your street tomorrow.	Likely
It will rain while you're outside at some point in the next year.	Evens
You will pick a red ball from a bag containing only 5 red and 5 blue balls.	Unlikely
You will develop X-ray vision by correctly answering this question.	Impossible

2. Kelly asks the five people in her office how they got to work. Four of them got a bus, but the bus was late for two of these people. All five of them managed to arrive at work on time.

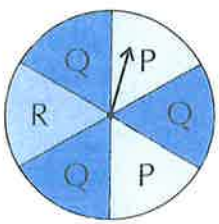
Kelly picks someone at random from the five people in her office.

a) Write A on the line above to show the probability that the person she picks got a bus.

b) Write B on the line above to show the probability that the person she picks got a bus that was late.

c) Write C on the line above to show the probability that the person she picks arrived on time.

3. Put these events in order of likelihood, starting with the least likely.



A — A fair coin landing on heads

B — The spinner on the right landing on R

C — A fair dice, labelled 1-6, landing on a 7

..... , ... , ...

Probability

4. There are 10 tickets, numbered 1-10, in a raffle. The winning ticket is drawn at random.

Find, as a fraction in its simplest form, the probability that:

a) the winning ticket is 6

.....

b) the winning ticket is even

.....

c) the winning ticket is odd and less than 5

.....

5. The probability that Nathan goes for a walk on Monday is 0.2.

a) What is the probability that Nathan doesn't go for a walk on Monday?

.....

b) Nathan decides to go for a walk on Tuesday. He either walks to the beach, the park or the river. The probability that he walks to the beach is 0.4 and the probability that he walks to the park is 0.1. What is the probability that he walks to the river?

.....

6. There are 80 jars of jam on a market stall. 10 of the jars contain apricot jam, 25 contain strawberry jam and the rest contain raspberry jam. The stall owner picks a jar at random.

a) What is the probability that the jar contains either apricot or strawberry jam?

.....

b) What is the probability that the jar doesn't contain apricot jam?

.....

c) What is the probability that the jar contains blackberry jam?

.....

How did you do?

So that's probability covered — what are the chances that you breezed through it? Before moving on, have a think about what you've just achieved. You should:

- ☐ **Be able to describe the likelihood of events.**
- ☐ **Understand the 0-1 probability scale.**
- ☐ **Know that the probabilities of all possible outcomes add up to 1.**
- ☐ **Be able to calculate the probability of events based on equally likely outcomes.**

Probability

1. 30 blue bottles and 50 grey bottles are put into a recycling box.
Two of the blue bottles and three of the grey bottles in the box are broken.

Give your answers to these questions as fractions in their simplest form.

a) What is the probability of randomly picking a blue bottle from the box?

.....

b) What is the probability of randomly picking a broken grey bottle from the box?

.....

c) What is the probability of randomly picking a bottle that is not broken from the box?

.....

2. A fair, six-sided dice (labelled 1-6) is rolled and a fair coin is tossed.

a) List all the possible outcomes of this experiment. The first two have been done for you.

1, Heads 1, Tails

b) What is the probability that the dice lands on 5 and the coin lands on tails?

.....

c) What is the probability that the coin lands on heads and the dice lands on a number less than 4?

.....

3. Amber writes the names of all of the members of her chess club in the appropriate place on this sorting diagram.

	Likes avocados	Doesn't like avocados
Likes olives	Ted Mackenzie	Virginia
Doesn't like olives	Katie Stanley Milly	Ekrem Katrina Leanne Olivia

a) Amber likes avocados but doesn't like olives.
Put her name in the correct part of the sorting diagram.

b) A member of the chess club is picked at random.

(i) What is the probability that Amber is picked?

.....

(ii) What is the probability that the person who is picked likes olives?

.....

Probability

4. A cinema is showing three comedy films, a horror film and two historical films. Claudia picks a film to watch at random.

a) What is the probability, as a decimal, that Claudia picks a comedy film?

.....

b) Whenever Claudia goes to the cinema, she either buys popcorn, a hot dog or neither — but never both. The probability that she will buy popcorn is 10% and the probability that she will buy neither is 50%.

What is the probability, as a percentage, that she will buy a hot dog?

..... %

5. Two fair spinners, numbered 1-4, are spun and the numbers that they land on are multiplied together.

×	1	2	3	4
1	.....	.....	.....	.....
2	2	.....	.....	.....
3	.....	.....	.....	12
4	.....	.....	.....	.....

a) Complete the sample space diagram on the right to show all the possible outcomes.

b) How many possible outcomes are there?

.....

c) Giving your answers as fractions in their simplest form, find the probability that the result is:

16 .....

a multiple of 3 .....

greater than 5 .....

How did you do?

My favourite sample space is that little counter in the supermarket where they give out the free cubes of cheese. But enough about me. Before you move on, you should:

- ☐ **Be able to calculate the probability of events based on equally likely outcomes.**
- ☐ **Know that the probabilities of all possible outcomes add up to 1.**
- ☐ **Be able to list possible outcomes of experiments, and display these in a sample space diagram.**
- ☐ **Be able to calculate the probability of events using a sample space diagram.**

Probability

A probability always has a value between 0 and 1 — if it's 0, the thing's DEFINITELY NOT going to happen... if it's 1, it DEFINITELY IS going to happen. For example, I'd say that the probability of disco-dancing rats falling from the sky is pretty close to 0...

Q1 For each of the following events, say whether you think they are certain, likely, even, unlikely or impossible:

a) Monday will follow Sunday,

.....

b) you will get a head when you toss an unbiased coin,

.....

c) if your head is cut off, it will grow back in less than a week.

.....

Q2 Write the letters a) - d) on the probability scale below for each of the following events. Explain your answers.

a) You will get wet if you jump into the sea.

Explanation: .....

b) You will throw a fair 6-sided dice and get a 6.

Explanation: .....

c) If I drop my toast it will land butter side down.

Explanation: .....

d) If I kiss a frog, it will turn into a handsome prince.

Explanation: .....

Probability

Q3 I have 6 football cards which I collected from boxes of teabags. I have 3 of Mooney, 2 of Donaldo and 1 of Peckham. My friend Gemma picks one at random.

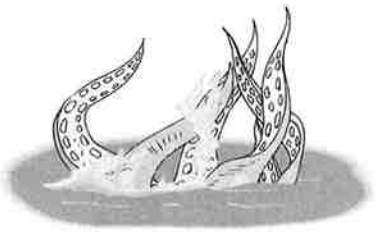
a) What is the probability of Gemma picking Mooney?

.....

b) What is the probability of her picking Peckham?

.....

Q4 The probability of the Windermere Monster existing is 0.1. What is the probability of it not existing?



.....

Q5 In my cupboard at home I have 8 identical bags. 1 contains CDs, 2 contain clothes and shoes, 4 contain books and 1 has got lots of money in it.

a) What is the probability of picking out the bag of money at random?

.....

b) What is the probability of picking a bag which doesn't have any money in it?

.....

Q6 List the 4 possible outcomes if I toss 2 coins together.

*

1st go ..... 2nd go .....

....

....

....

What is the probability that I will get just 1 head? .....

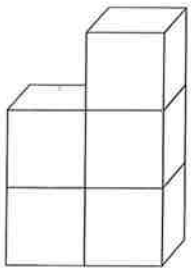
Two heads are better than one... finding the probability of "just one head" is a bit tricky — don't forget that there are 2 ways of getting "just one head".

*We would like to apologise for the poor quality of this graphic. The Quality Control Department is pleased to announce that the fool responsible has since been severely reprimanded. And given a wedgie.

Volume

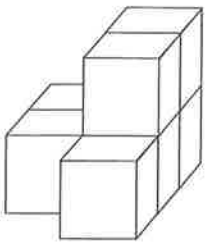
1. These shapes are made from blocks with a volume 1 cm^3. Find the volume of each shape.

a)



..... cm^3

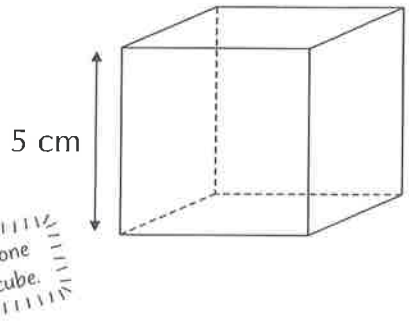
b)



..... cm^3

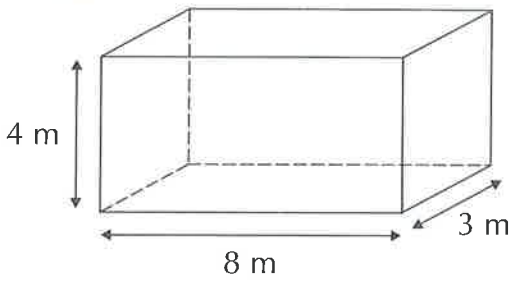
2. Work out the volume of the following cuboids.

a)



..... cm^3

b)



..... m^3

3. Colm has a collection of alphabet cubes. They each have the same volume.

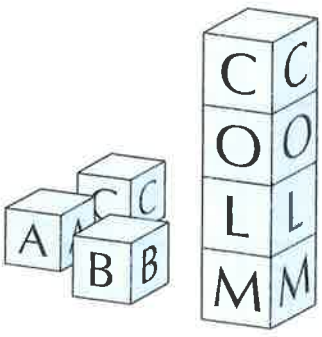
He stacks some cubes to spell out his name, making a tower that has a total volume of 108 cm^3.

a) What is the volume of each of the cubes?

..... cm^3

b) What is the height of the tower?

..... cm



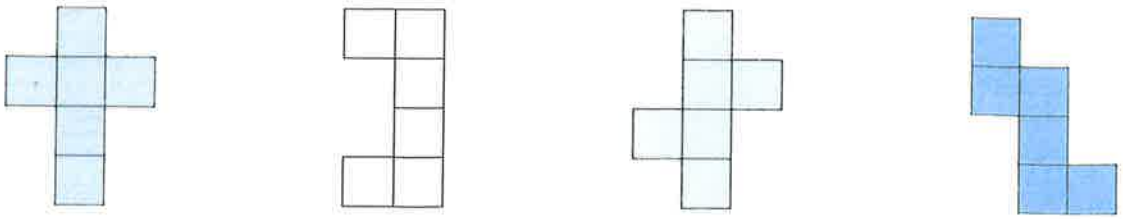
How did you do?

Last page, hurrah... but keep the volume down would you — I'm trying to sneak in a quick nap before the Review Exercise on the next page. One last time then, by now you should be able to:

- ☐ **Find the volume of shapes made from cubes.**
- ☐ **Calculate the volume of cubes and cuboids.**

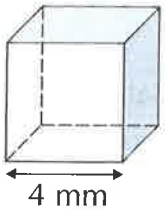
3D Shapes — Nets and Volume

1. Circle all the nets that would make a cube.



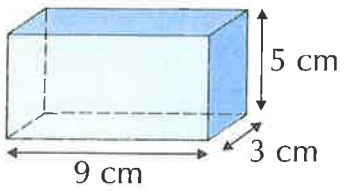
2. Find the volume of the 3D shapes below. Give the correct units with your answers.

a)



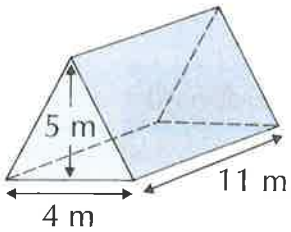
.....

b)



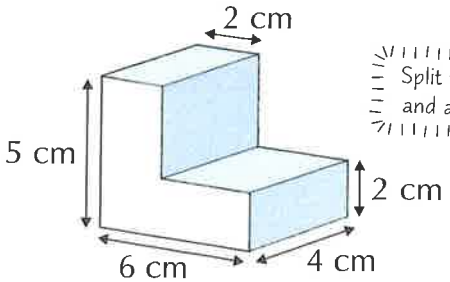
.....

c)



.....

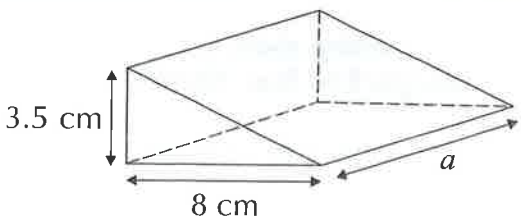
d)



Split the shape into two cuboids and add their volumes together.

.....

3. The volume of the triangular prism below is 126 cm^3. Find length a.

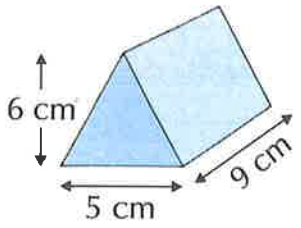


a = ... cm

3D Shapes

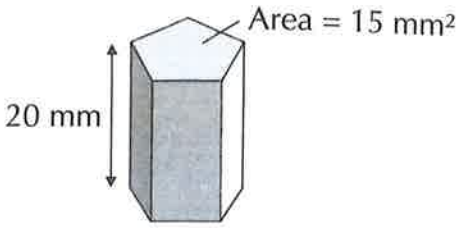
1. Find the volume of the following prisms and cylinders. Give the correct units.

a)



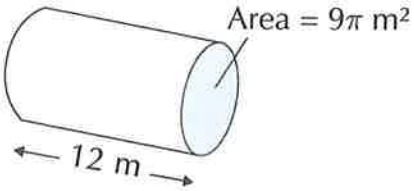
.....

b)



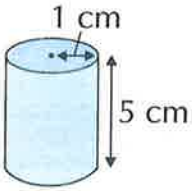
.....

c) Leave your answer in terms of π.



.....

d) Leave your answer in terms of π.



.....

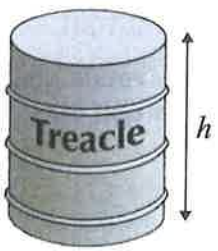
2. Monica bought a cylindrical tub of fish food. Work out the volume of the tub.

Give your answer to 1 d.p.

..... cm^3

3. A cylindrical tank of treacle has a volume of 72π m^3 and a cross-sectional area of 6π m^2.

What is the height, h, of the tank?



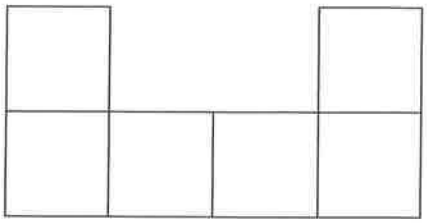
..... m

Nets and Surface Area

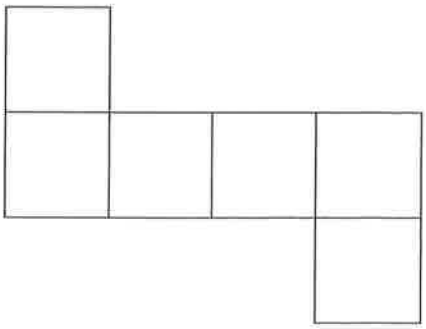
This page has some lovely questions about nets, just don't get them mixed up with the fishy kind... The sort of net we're talking about is just a hollow 3D shape that has been folded out flat.

Q1 Which of the two nets could be folded to form a cube?

A.

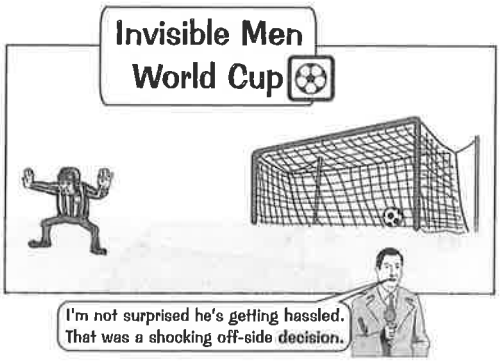


B.

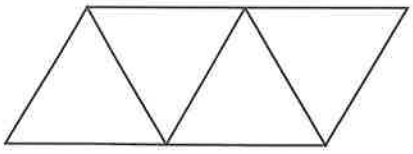


.....

Q2 Draw a net of a triangular prism.



Q3 Below is the net of a regular tetrahedron.



a) The area of each triangle is 1 cm^2.
What is the surface area of the tetrahedron that can be made from the net? ..... cm^2

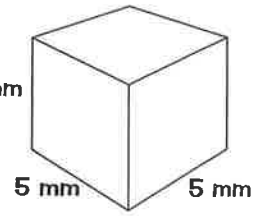
b) Draw a different net from the one above that would also fold to make a regular tetrahedron.

Nets and Surface Area

Surface area is the area of all the faces of a 3D shape added together. You might find it easier to work out if you draw out a net first, but I'll not force you into it — that would be mean.

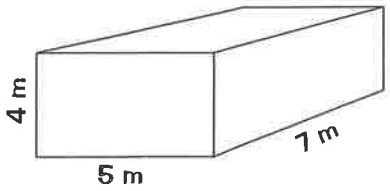
Q4 Work out the surface area of each of the shapes below:

a)



..... mm^2

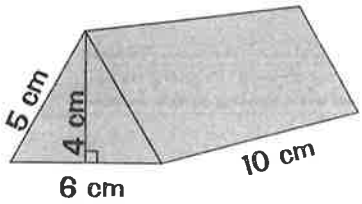
b)



..... m^2

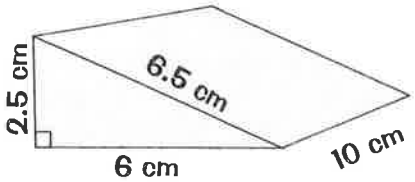
Q5 Calculate the surface area of each of these prisms.

a)



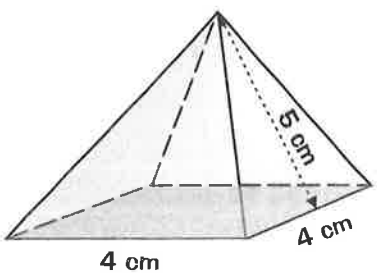
..... cm^2

b)

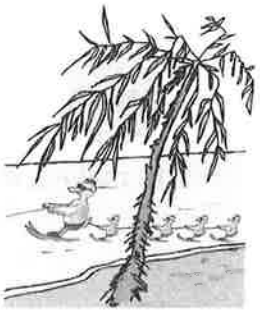


..... cm^2

Q6 Calculate the surface area of this square-based pyramid:



..... cm^2

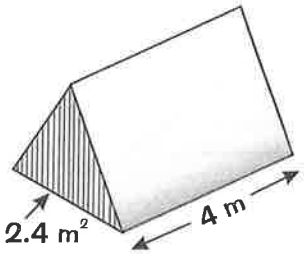


Volume

Remember, Volume of a prism = Cross-sectional area × Length.
There's no need for this section to make you cross though... just get that formula memorised and then all the questions work the same way.

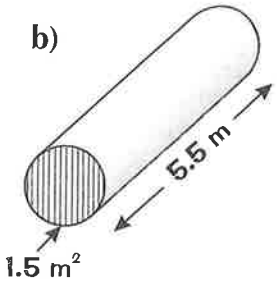
Q1 Calculate the volume of the following prisms:

a)



..... m^3

b)

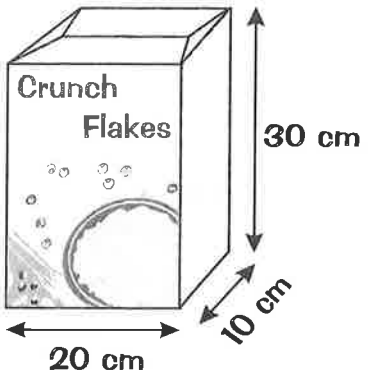


..... m^3

Q2 What is the volume of a cube with sides of 2 cm?

..... cm^3

Q3 Work out the volume of this box of Crunch Flakes.



..... cm^3

Q4 A small tent has a height of 2 m and a width of 2 m. It is 3 m long.

a) Calculate the area of the triangular cross-section in m^2.

..... m^2

b) Calculate the volume in m^3.

..... m^3