* WORKED SOLUTIONS *

Surname	Centre Number	Candidate Number
Other Names		0

wjec cbac

GCSE

C300U20-1

S18-C300U20-1

eduqas Part of WJEC

MATHEMATICS – Component 2

Calculator-Allowed Mathematics

FOUNDATION TIER

THURSDAY, 7 JUNE 2018

– MORNING

2 hours 15 minutes

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1.	4	
2.	3	
3.	4	
4.	4	
5.	4	
6.	4	
7.	3	
8.	7	
9.	9	
10.	6	
11.	5	
12.	8	
13.	4	
14.	4	
15.	7	
16.	2	
17.	3	
18.	4	
19.	5	
20.	5	
21.	3	
22.	5	
23.	6	
24.	4	
25.	6	
26.	1	
Total	120	

ADDITIONAL MATERIALS

A calculator will be required for this examination.

A ruler, protractor and a pair of compasses may be required.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

You may use a pencil for graphs and diagrams only.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** the questions in the spaces provided.

If you run out of space, use the continuation page at the back of the booklet, taking care to number the question(s) correctly.

Take π as 3·14 or use the π button on your calculator.

INFORMATION FOR CANDIDATES

You should give details of your method of solution when appropriate.

Unless stated, diagrams are not drawn to scale.

Scale drawing solutions will not be acceptable where you are asked to calculate.

The number of marks is given in brackets at the end of each question or part-question.

You are reminded of the need for good English and orderly, clear presentation in your answers.

Formula list

Area and volume formulae

Where r is the radius of the sphere or cone, l is the slant height of a cone and h is the perpendicular height of a cone:

Curved surface area of a cone = πrl

Surface area of a sphere = $4\pi r^2$

Volume of a sphere = $\frac{4}{3}\pi r^3$

Volume of a cone = $\frac{1}{3}\pi r^2 h$

Kinematics formulae

Where a is constant acceleration, u is initial velocity, v is final velocity, s is displacement from the position when $t = 0$ and t is time taken:

$$v = u + at$$

$$s = ut + \frac{1}{2}at^2$$

$$v^2 = u^2 + 2as$$

Examiner only

1. The table below is part of a form for ordering equipment.

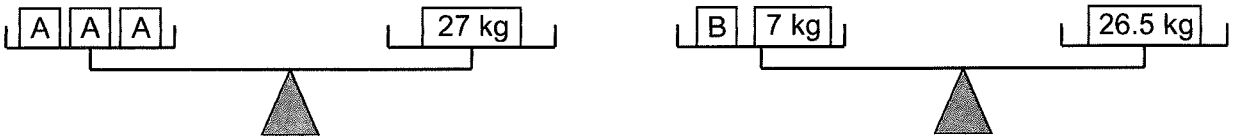
Fill in all the missing numbers. [4]

Item	Quantity	Cost per box	Total cost
Box of exercise books	8	£13.30	£106·40
Box of rulers	25	95 p	£23.75
Box of pens	7	£1·21	£8.47
	Total		£138·62

$8 \times 13{\cdot}30 = 106{\cdot}40$ $8{\cdot}47 \div 7 = 1{\cdot}21$

$23{\cdot}75 \div 0{\cdot}95 = 25$

2. Each diagram shows a balance with the total mass on each side being equal.



Use the information above to complete the balance below with the missing mass. [3]

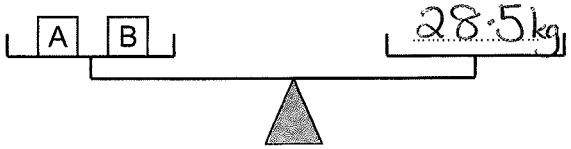
$\frac{3A}{3} = \frac{27}{3}$ $A = 9$

$B + 7 = 26{\cdot}5$

$-7 \quad -7$

$B = 19{\cdot}5$

$A + B = 9 + 19{\cdot}5 = 28{\cdot}5$



Examiner only

3. A rectangle has a perimeter of 18 cm.

The length and the width are both whole numbers.
The length is always greater than the width.

(a) Complete the table to show all the possible lengths and widths of the rectangle. [2]

Rectangle	Length (cm)	Width (cm)
A	8	1
B	7	2
C	6	3
D	5	4

(b) Which rectangle from your table has the greatest area?

Show how you decide. [2]

Area = L x W

A = 8 x 1 = 8 cm²

B = 7 x 2 = 14 cm²

C = 6 x 3 = 18 cm²

D = 5 x 4 = 20 cm² D has the greatest area

Examiner only

4. Simon is ironing shirts.
It takes him 15 minutes to iron 2 shirts.

(a) How long would it take Simon to iron 26 shirts?
Give your answer in hours and minutes. [2]

15 mins → 2 shirts (×13)
195 mins → 26 shirts (×13)

3 × 60 = 180
15
195

3 hours 15 minutes

(b) What assumption have you made in answering part *(a)*? [1]

All shirts are same size - each one takes the same amount of time to iron.

(c) If this assumption were not correct, what effect would this have on your answer to part *(a)*? [1]

The time would change - could be longer or shorter depending on the difference.

5. Use the list of numbers below to complete the following statements.

75 50 13 25 17

(a) The prime numbers are 13 and 17

The sum of the prime numbers is 30 [2]

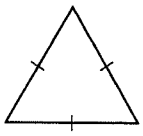
(b) The product of two numbers from the list is calculated.
This product is as large as possible and is **not** a multiple of 10.

The two numbers are 25 and 75

The product of these numbers is 1875 [2]

Examiner only

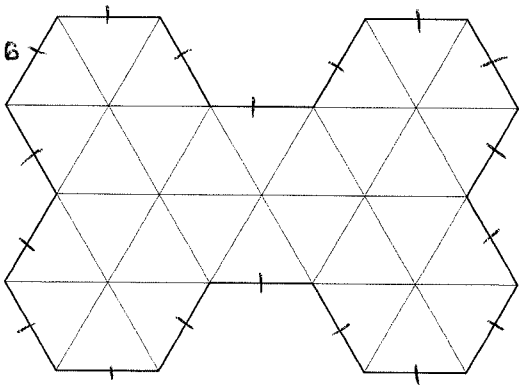
6. *(a)* The diagram below shows a triangular tile.



What is the mathematical name of the triangle used for the tile? [1]

Equilateral triangle.

(b) Some of these triangular tiles are arranged into a pattern.



Each triangle has sides of length 6 cm.
Calculate the perimeter of the pattern. [2]

18 × 6 = 108 cm //

(c) What fraction of the pattern is one triangular tile? [1]

5 × 6 = 30 triangles.

$\frac{1}{30}$ //

Examiner only

7. *(a)* Simplify $a + 14a + 8a$. [1]

23a

(b) Sadie has simplified the following expression.

$6a + 12b - 4a + 15b$.

Her answer is $2a - 3b$.

6a - 4a = 2a
12b + 15b = 27b

Is she correct?

Yes ☐ No ☑

You must show all your working. [2]

Answer should be 2a + 27b

Examiner only

8. Anne is using an old recipe to make Bolognese sauce.

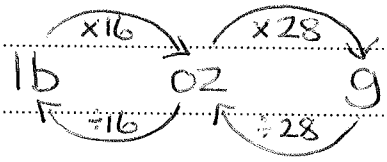
Bolognese *sauce* Serves 6	
$1\frac{1}{2}$ lb	beef
13 oz	tomatoes
2	onions
3	cloves of garlic

She knows that;

1 pound (lb) = 16 ounces (oz),
1 ounce (oz) is approximately equal to 28 grams (g).

(a) Show that the quantity of beef needed is 672 grams. [2]

Conversions.



1·5 x 16 = 24 oz
24 x 28 = 672 g

(b) How much beef is needed to make enough Bolognese sauce for 8 people? Give your answer in grams. [2]

672 g → 6 people
÷3 ↓ ↓ ÷3
224 g → 2 people
x4 ↓ ↓ x4
896 g → 8 people

896 g //

(c) If Anne uses 728g of tomatoes, how many servings is she making? [3]

13 oz x 28 = 364 g
364 g → 6 people
x2 ↓ ↓ x2
728 g → 12 people

12 servings

Examiner only

9. The table shows the prices of 1st class and 2nd class stamps for some years between 2006 and 2016.

Year	1st Class	2nd Class
2006	32p	23p
2010	41p	32p
2011	46p	36p
2012	60p	50p
2015	63p	54p
2016	64p	55p

(a) In which year was the price of a 1st class stamp double the price of a 1st class stamp in 2006? [1]

32 × 2 = 64p in 2016 //

(b) Write the ratio of the price of a 1st class stamp to the price of a 2nd class stamp in 2015. Simplify the ratio as far as possible. [2]

63 : 54
÷9 (7 : 6) ÷9

Ratio is 7 : 6

(c) In 2010, an accountant sent 2 500 letters using 1st class stamps.
In 2015, the accountant sent 2 150 letters using 2nd class stamps.

In which year did the accountant spend more money on stamps, and by how much? Give your answer in pounds (£). [4]

2010 2500 × 0·41 = £1025

2015 2150 × 0·54 = £1161 ← most money

1161 − 1025 = £136 more in 2015 //

(d) Jenny looked at the table of prices of stamps and said,

"In 2012, the price of a 1st class stamp is 20% more than the price of a 2nd class stamp".

Show that Jenny is correct. [2]

$\frac{60-50}{50} \times 100 = 20\%$

Examiner only

10. *(a)* Calculate 104% of 1240. [2]

$\frac{104}{100} \times 1240 = 1289.6$

(b) Write one of the symbols, <, > or = to make this statement true.

35% of 48 [=] 48% of 35

Show how you decide. [2]

$\frac{35}{100} \times 48 = 16.8$

$\frac{48}{100} \times 35 = 16.8$

} same

(c) Seren scored 19 out of 24 in her maths test.

David scored 75% in the same maths test.

Who scored a higher mark in this test?

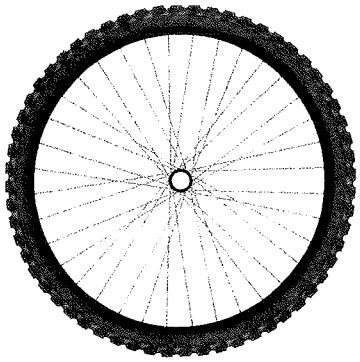
You must show all your working. [2]

(S) $\frac{19}{24} \times 100 = 79.16\% > 75\%$

Seren scored more than David

Examiner only

11. *(a)*



A bicycle wheel has a diameter of 700 mm.

Calculate the circumference of the wheel. [2]

$C = \pi d = \pi \times 700 = 2199.11\ldots$ mm

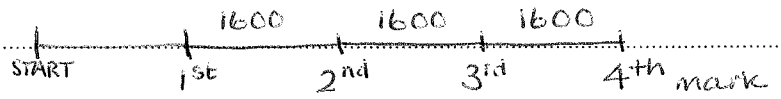
$= 2199$ mm.

(b) A different wheel has a circumference of 1600 mm.

This wheel is rolled along the ground to measure distance.

A mark is made on the ground as the wheel completes each turn.

How far apart are the first and fourth marks?
Give your answer in metres. [3]



$1600 \times 3 = 4800$ mm) ÷10

$= 480$ cm) ÷100

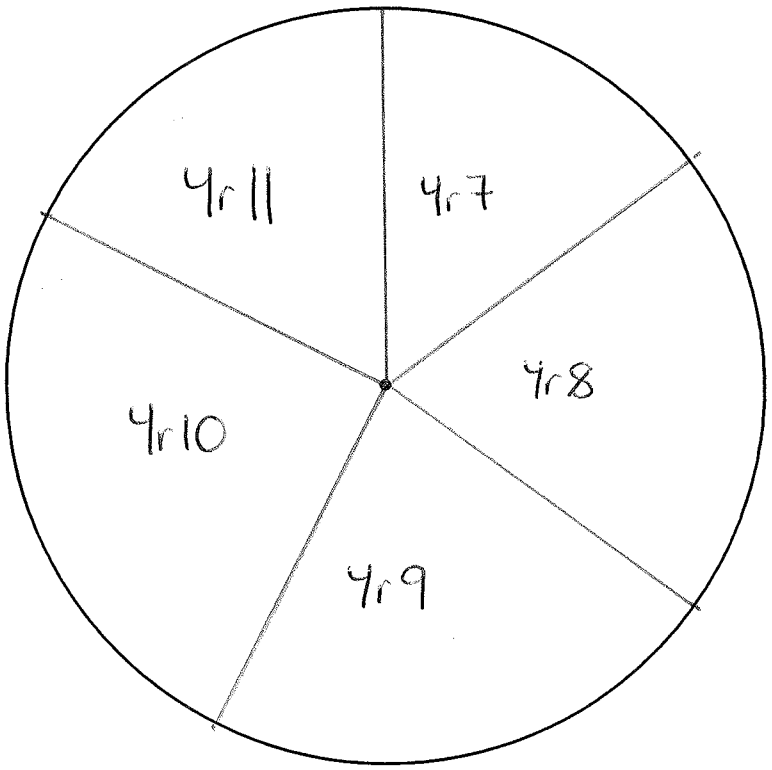
$= 4.8$ m

Examiner only

12. *(a)* The number of students in each year of a school is shown in the table below.

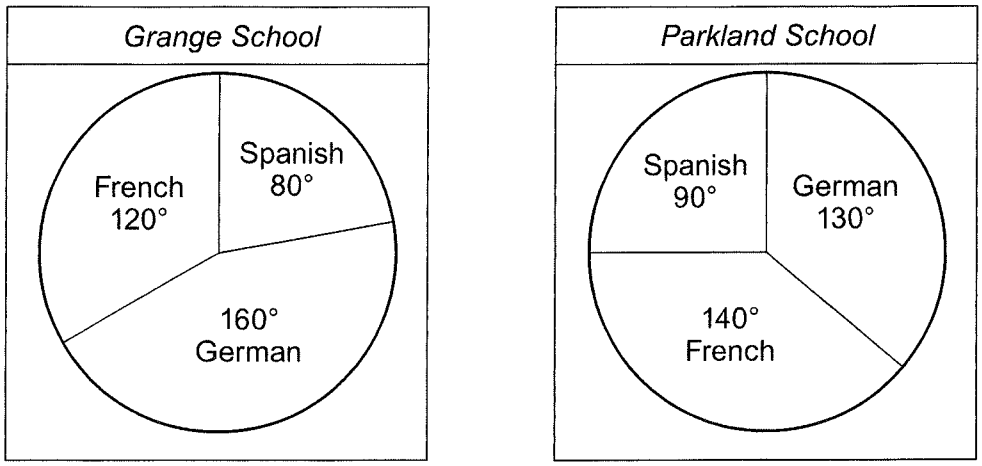
Year group	Number of students	Angle
Year 7	90	×0·6 = 54
Year 8	120	×0·6 = 72
Year 9	135	×0·6 = 81
Year 10	150	×0·6 = 90
Year 11	105	×0·6 = 63
TOTAL	600	×0·6 → 360

Complete the table and draw a pie chart to display this information. [4]



Examiner only

(b) Two schools, *Grange School* and *Parkland School* each produce information leaflets. The pie charts below are from the different information leaflets. They show the proportions of students who study French, German and Spanish at these schools.



(i) Is it true that twice as many students at *Grange School* study German than study Spanish?

Yes [✓] No [ ] Cannot tell [ ]

Give a reason for your answer. [1]

the angle is double $80° \times 2 = 160°$

(ii) Is it true that more students study French at *Parkland School* than at *Grange School*?

Yes [ ] No [ ] Cannot tell [✓]

Give a reason for your answer. [1]

We don't know how many students are at each school

(iii) At *Grange School*, 48 students study Spanish.
Calculate the number of students who study French at *Grange School*. [2]

$80° \longrightarrow 48$ students (÷8)
$10° \longrightarrow 6$ students (×12)
$120° \longrightarrow 72$ students

Examiner only

13. Eight friends go to a restaurant for a meal.
The bill comes to a total of £280.

The friends agree to

- add **at least** 12% to the bill to give a tip,
- share the bill equally,
- pay a whole number of pounds.

Gordon says that each of the friends must pay £39.
Decide whether Gordon is correct or incorrect.
You must show all your working and give a reason for your answer. [4]

39 × 8 = £312

Tip: $\frac{12}{100} \times 280 = £33.60$ at least

280 + 33.60 = £313.60

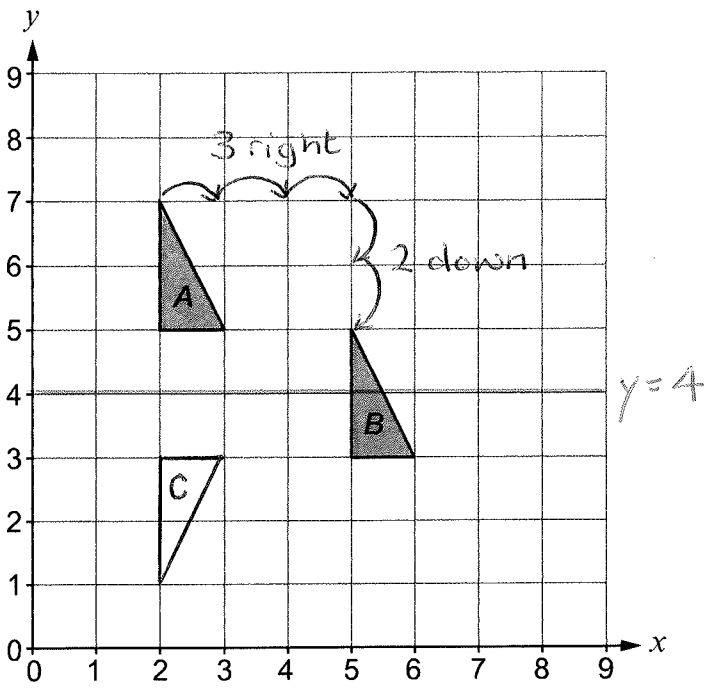
313.60 ÷ 8 = £39.20 ↑ needs to round up £40 each

Otherwise they'd be paying less than 12% tip.

Gordon is incorrect.

Examiner only

14. Two triangles, *A* and *B*, are shown on the grid below.



(a) Describe the single transformation that transforms triangle *A* onto triangle *B*. [2]

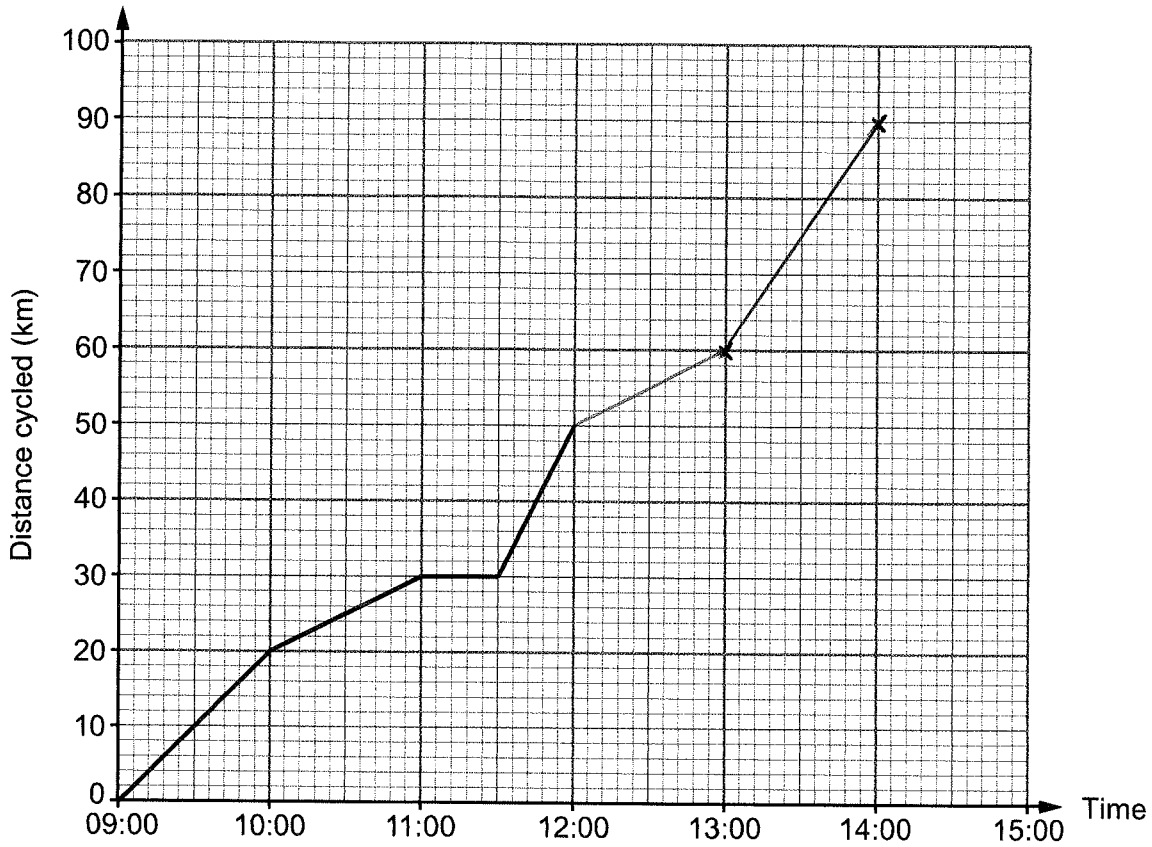
Translation by vector $\begin{pmatrix} 3 \\ -2 \end{pmatrix}$

(b) Reflect triangle *A* in the line $y = 4$ and label your answer *C*. [2]

Examiner only

15. Jimmy went for a bike ride.

His journey is represented on the distance time graph below.



(a) What was Jimmy's average speed between 09:00 and 11:00? [2]

$S = \frac{D}{T} = \frac{30}{2} = 15$ km/h

(b) Give an explanation for the shape of the graph between 11:00 and 11:30. [1]

The distance doesn't change so he must have stopped

(c) (i) Between which times was Jimmy cycling at the greatest speed? [1]

11·30 and 12·00

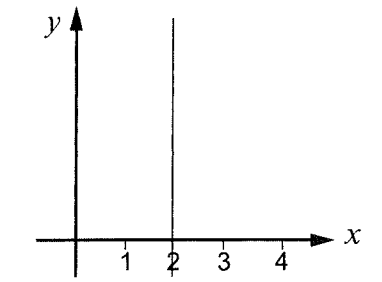
(ii) How can you tell this from the graph? [1]

it's the steepest line on the graph

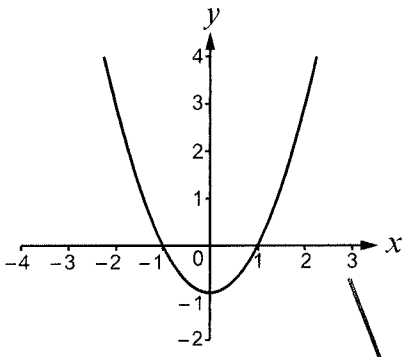
(d) Between 12:00 and 13:00, Jimmy cycled at a speed of 10 km/h. 10km in 1hr
At 13:00, he increased his speed so that he had cycled a total of 90 km between 09:00 and 14:00.
Show his journey from 12:00 to 14:00 on the graph. [2]

16. Match each graph to the correct equation. [2]

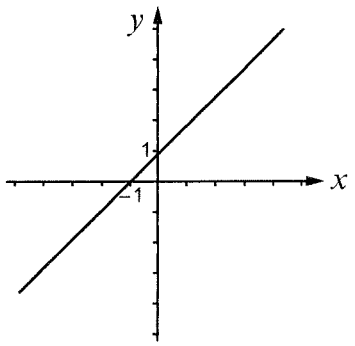
The first one has been completed for you.



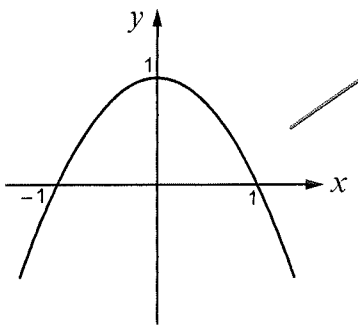
$x = 2$



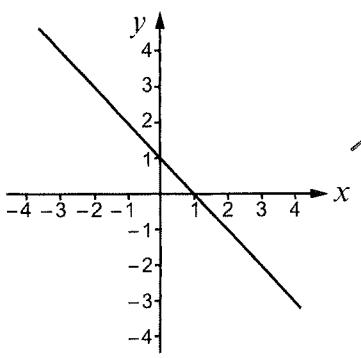
$y = x + 1$



$y = 1 - x^2$



$y = 1 - x$



$y = x^2 - 1$

Examiner only

Examiner only

17. *(a)* Which of the following are **not** written in standard form?

Circle your answers. [1]

$1{\cdot}2 \times 10^3$ $12{\cdot}5 \times 10^7$ 12000000 7 million $6{\cdot}087 \times 10^6$

(b) Calculate $5 \times (2{\cdot}6 \times 10^4)$, giving your answer in standard form. [2]

$= 130000$

$= 1{\cdot}3 \times 10^5$

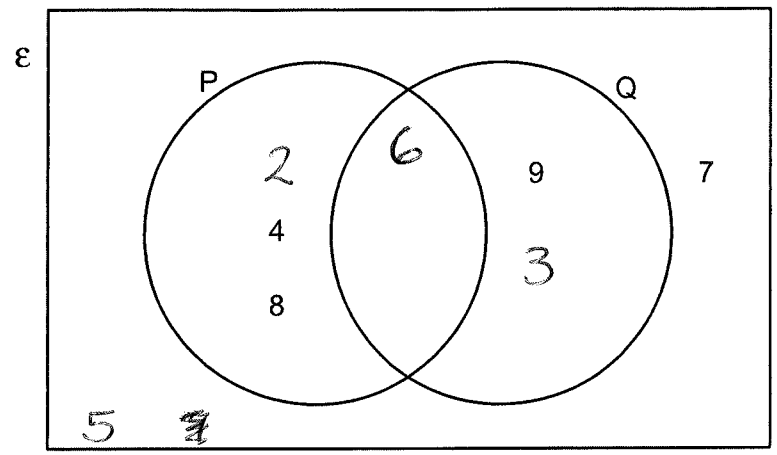
Examiner only

18. $\varepsilon = \{2,3,4,5,6,7,8,9\}$

P = {even numbers} = 2, 4, 6, 8

Q = {numbers divisible by 3} = 3, 6, 9

(a) Complete the Venn diagram below. [2]



(b) A number is chosen at random from the numbers 2 to 9.

What is the probability that the number chosen is odd and **not** divisible by 3? 5, 7 only [2]

2/8

Examiner only

19. Three friends, Jane, Caroline and Eddie, each throw the **same** dice 40 times. Their results are shown in the table below.

	Score on the dice					
	1	**2**	**3**	**4**	**5**	**6**
Jane	8	4	8	8	4	8
Caroline	8	5	7	7	5	8
Eddie	8	2	9	9	4	8
	24	11	24	24	13	24

(a) Do you think this dice is fair?
You must give a reason for your answer. [1]

Yes ☐ No ☑ Don't know ☐

Not all scores appear equally likely - there are less 2 and 5 thrown

(b) What is the best estimate of the probability of scoring a 2 on this dice? [2]

$\frac{11}{120}$

(c) Using Jane's, Caroline's and Eddie's results, how many times would you expect a score greater than 4 to occur in 480 throws of this dice? [2]

$\frac{13+24}{120} = \frac{37}{120} \xrightarrow{\times 4} \frac{148}{480}$

148 times

Examiner only

20. *(a)* Factorise $a^2 + 5a - 14$. [2]

$(a+7)(a-2)$

14
1×14
$2 \times 7 \rightarrow 7-2=5$
$7 \times -2 = -14$

(b) Factorise $b^2 - 25$. [1]

$(b+5)(b-5)$

(c) Solve $\frac{d}{5} + 2 = 12$. [2]

$-2 \quad -2$

$\frac{d}{5} = 10$

$\times 5 \quad \times 5$

$d = 50$

Examiner only

21. A statue in a museum is made from copper, tin and zinc in the ratio 65 : 14 : 9.

There are 27 kg of zinc in the statue.

The museum crane cannot lift more than $\frac{1}{4}$ tonne. $= \frac{1}{4} \times 1000 = 250\text{kg}$

Is it possible for this crane to lift this statue?

You must show all your working and give a reason for your answer. [3]

C : T : Z

65 : 14 : 9 ×3 (×3)

195kg : 42kg : 27kg

1 part

$\frac{27}{9} = 3\text{kg}$

Total = 195 + 42 + 27

= 264kg > 250kg

No, the crane cannot lift the statue

Reason:

Statue weighs 264kg which is 14kg more than the crane can lift.

Examiner only

22. The tourist office in Trofenberg displays the snowfall data each month in a table.

The table shows snowfall in Trofenberg for each day during January.

Snowfall, s (cm)	Midpoint		Number of days		
$0 \leqslant s < 20$	10	×	1	=	10
$20 \leqslant s < 40$	30	×	8	=	240
$40 \leqslant s < 60$	50	×	9	=	450
$60 \leqslant s < 80$	70	×	7	=	490
$80 \leqslant s < 100$	90	×	6	=	540
	TOTAL		31		1730

(a) Calculate an estimate for the mean daily snowfall in Trofenberg for January.
You must show all your working. [4]

Mean = $\frac{1730}{31}$ = 55.806... cm

= 55.8 cm (1dp)

(b) There were 9 days when the snowfall was between 40 cm and 60 cm.
On each of these days, the snowfall was actually between 57 cm and 59 cm.

Explain why the estimate for the mean daily snowfall in January may still be fairly accurate. [1]

Some of the other groups could have had snowfall below the midpoint of their group.

Examiner only

23.

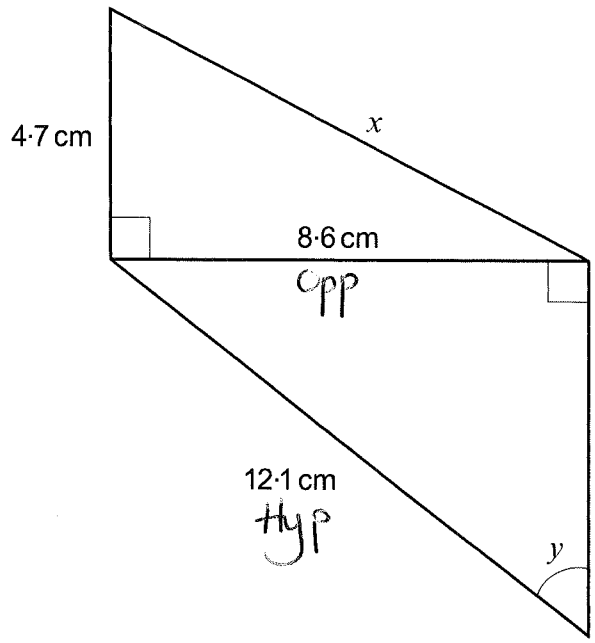


Diagram not drawn to scale

(a) Calculate the length x. [3]

$x^2 = 4{\cdot}7^2 + 8{\cdot}6^2$

$x^2 = 96{\cdot}05$

$x = \sqrt{96{\cdot}05} = 9{\cdot}8$ cm //

(b) Calculate the size of angle y. [3]

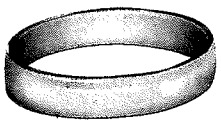
$\sin y = \frac{8{\cdot}6}{12{\cdot}1}$

$y = \sin^{-1}\left(\frac{8{\cdot}6}{12{\cdot}1}\right) = 45{\cdot}295\ldots^\circ$

$y = 45{\cdot}3^\circ$ (1dp)

Examiner only

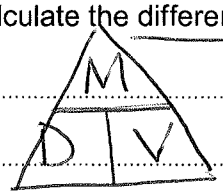
24. Adanna wants to buy a ring.



The ring she wants has a mass of 12 g when made from gold.
The density of the gold in the ring is 19·32 g/cm^3.

The same ring could also be made from silver.
The density of the silver in the ring would be 10·48 g/cm^3.

Calculate the difference in the masses of the two rings. [4]



Gold $V = \frac{M}{D} = \frac{12}{19.32} = 0.621118\ldots\ cm^3$

Silver $M = D \times V = 10.48 \times 0.621118\ldots$

$= 6.5093\ldots\ g$

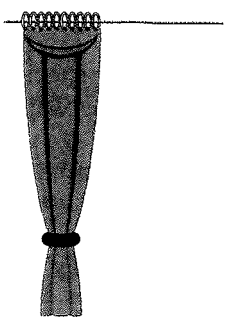
$12 - 6.5093 = 5.49068\ldots\ g$

$= 5.49$ (2dp)

Difference in mass is 5.49 g

Examiner only

25. *Alpha Bathrooms* sells only one size of shower curtain and one size of rail.



Sunita is buying shower curtains and rails for her guest house.
She needs more shower curtains than rails.

6 shower curtains and 3 rails would cost her £24.60.
5 shower curtains and 2 rails would cost her £18.60.

Calculate how much change Sunita would get from £40 when buying 7 shower curtains and 5 rails.
You must use an algebraic method. [6]

Let c = cost of a shower curtain

and r = cost of a rail.

$6c + 3r = 24{\cdot}60$ ①

$5c + 2r = 18{\cdot}60$ ②

① ×2 $12c + 6r = 49{\cdot}20$ ③

② ×3 $15c + 6r = 55{\cdot}80$ ④.

④ − ③ $\frac{3c}{3} = \frac{6{\cdot}60}{3}$

$c = £2{\cdot}20$

Substitute $c = 2{\cdot}20$ into ②

$5(2{\cdot}20) + 2r = 18{\cdot}60$

$11 + 2r = 18{\cdot}60$

$-11 \quad -11$

$\frac{2r}{2} = \frac{7{\cdot}60}{2}$

$r = £3{\cdot}80$

Examiner only

$7c + 5r = 7(2{\cdot}20) + 5(3{\cdot}80)$

$= 15{\cdot}40 + 19{\cdot}00$

$= £34{\cdot}40$

$40 - 34{\cdot}40 = £5{\cdot}60$

Sunita's change from £40 would be £5·60

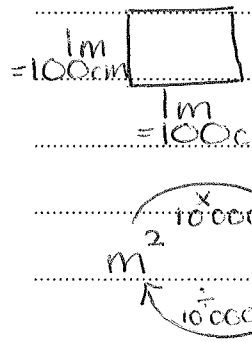
26. Wayne says,

'6·5 m^2 is the same as 650 cm^2, because there are 100 cm in 1 metre.'

Maria says,

'6·5 m^2 is the same as 65 000 cm^2.'

Explain why Maria is correct. [1]



$1m \times 1m = 1m^2$

$100cm \times 100cm = 10\,000\,cm^2$

Conversion is ×10 000 not ×100

$6{\cdot}5 \times 10\,000 = 65\,000\,cm^2$

END OF PAPER