

* WORKED SOLUTIONS *

Surname	Centre Number	Candidate Number
First name(s)		0



GCSE

C300U20-1



THURSDAY, 5 NOVEMBER 2020 – MORNING

MATHEMATICS – Component 2

Calculator-Allowed Mathematics

FOUNDATION TIER

2 hours 15 minutes

ADDITIONAL MATERIALS

A calculator will be required for this examination.
A ruler, protractor and a pair of compasses may be required.

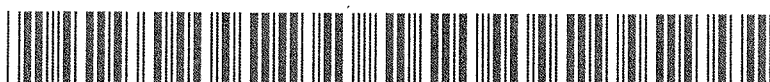
INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.
Do not use gel pen or correction fluid.
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 additional page at the back of the booklet, taking care to number the question(s) correctly.
Take π as 3.142 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.

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



NOV20C300U20101

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:

$$\text{Curved surface area of a cone} = \pi r l$$

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

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

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

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:

$$v = u + at$$

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

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



1.

18

29

94

108

162

343

From the numbers in the list above, write down:

(a) a multiple of 4

[1]

108 //

(b) a prime number

[1]

29 //

(c) the square root of 324

[1]

$\sqrt{324} = 18 //$

(d) a cube number.

[1]

$7^3 = 343 //$



2. (a) Use $A = \frac{6B}{8}$ to find the value of A when $B = 34$. [2]

$$A = \frac{6 \times 34}{8} = 25.5 //$$

- (b) The cost to hire a bike is given by the formula:

$$\text{Cost} = \text{£}14 + \text{£}5.75 \times \text{number of whole days hired}$$

Tom has £80 to spend.

He wants to hire a bike for as many days as possible.

For how many whole days can Tom afford to hire a bike? [3]

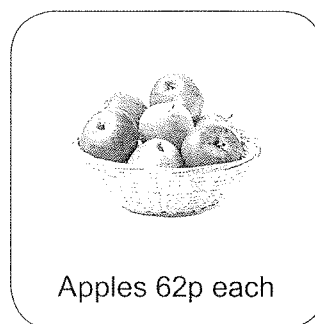
$$80 - 14 = 66$$

$$66 \div 5.75 = 11.478 \dots$$

\Rightarrow 11 whole days //



3.



- (a) (i) Ami buys a pack of sandwiches and an apple for herself and the same for each of her three children.

How much does this cost altogether? [3]

$$2.74 + 0.62 = £3.36$$

$$3.36 \times 4 = £13.44$$

- (ii) Ami pays with a £20 note.

How much change should she get? [1]

$$20.00 - 13.44 = £6.56$$



(b)

A 'Meal Deal' gives a pack of sandwiches, an apple and a drink for £3.79. Alex buys one 'Meal Deal'.

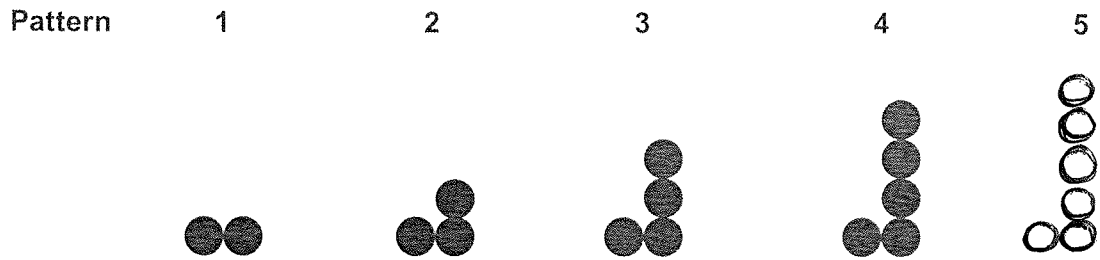
How much cheaper is this than buying the three items separately? [2]

$$2.74 + 0.62 + 1.15 = £4.51$$

$$4.51 - 3.79 = £0.72 \text{ or } 72p$$



4. (a) Here are the first four patterns in a sequence.



- (i) Draw pattern 5.

[1]

- (ii) How many circles will be in pattern 6?

[1]

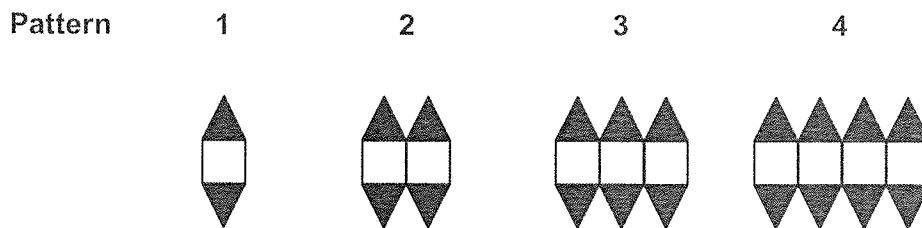
7 //

- (iii) Which pattern uses exactly 99 circles?

[1]

$$99 - 1 = 98 //$$

- (b) Here are the first four patterns in a different sequence.



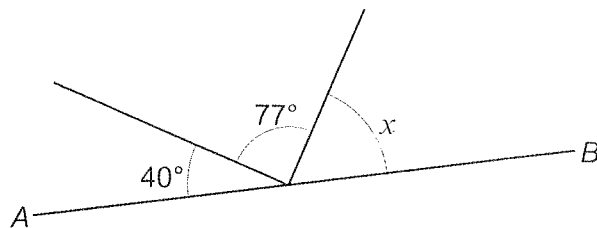
Write down the rule connecting the number of triangles with the number of squares in each pattern. [1]

□	1	2	3	4	↓ × 2
△	2	4	6	8	

Number of triangles = $2 \times \text{number of squares}$.



5. (a)

*Diagram not drawn to scale**AB is a straight line.*Calculate the size of angle x .

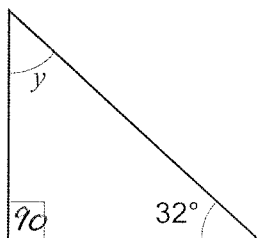
[2]

$$40 + 77 = 117$$

$$180 - 117 = 63^\circ$$

$$x = 63^\circ$$

(b)

*Diagram not drawn to scale*Calculate the size of angle y .

[2]

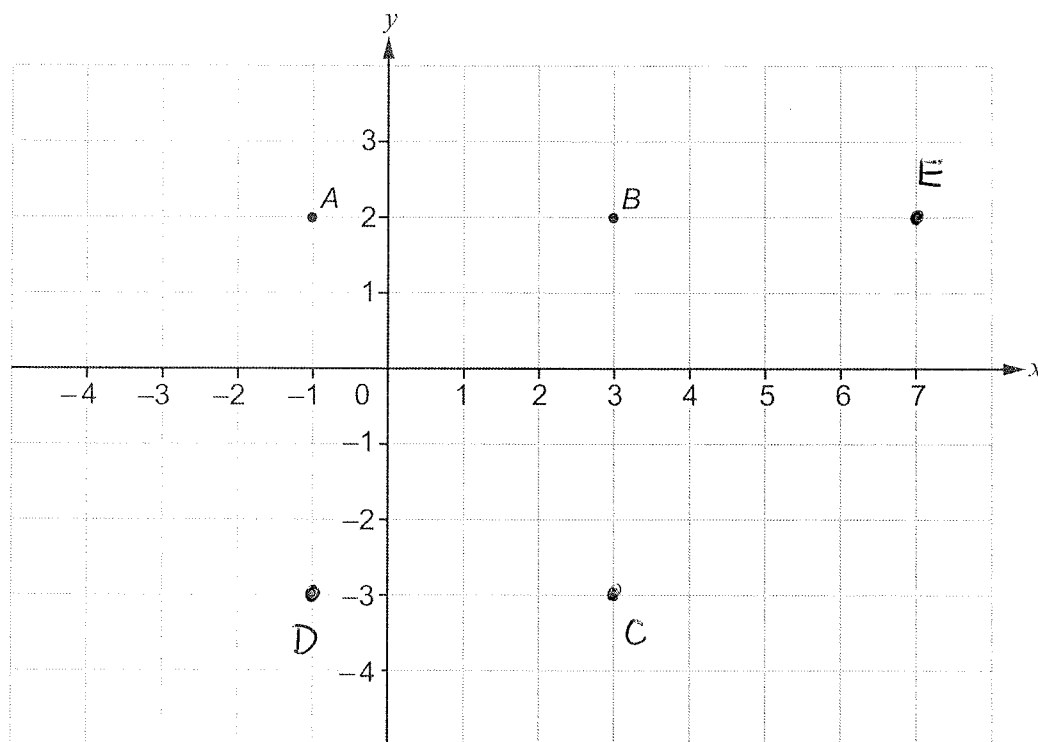
$$90 + 32 = 122$$

$$180 - 122 = 58^\circ$$

$$y = 58^\circ$$



6. Points A and B are shown on the 1 cm grid below.



(a) $ABCD$ is a rectangle with area 20 cm^2 .

Mark the points C and D on the grid.

[2]

$$AB = 4 \Rightarrow BC = 5$$

(b) (i) B is the midpoint of AE .

Mark the point E on the grid.

[1]

(ii) Write down the coordinates of the point E .

[1]

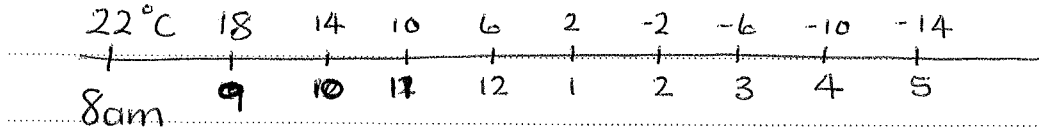
E is the point (7 , 2)



7. (a) At 8 a.m. the temperature in a new freezer is 22°C .
The temperature decreases at 4°C per hour.

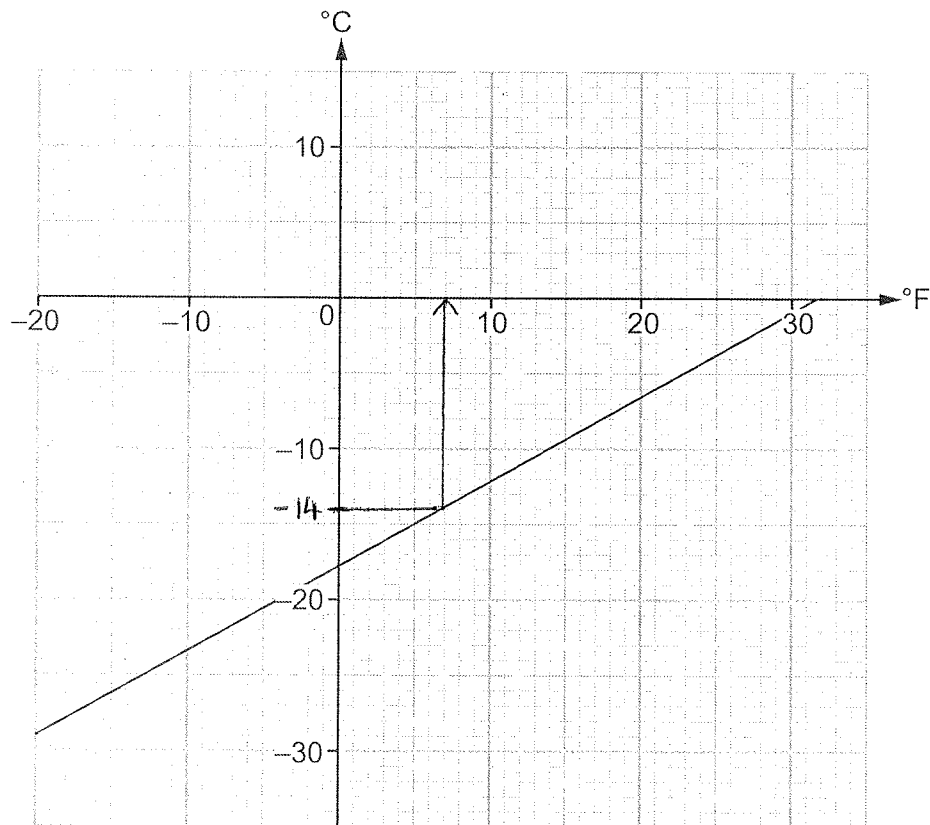
At what time will it reach -14°C ?

[2]



5pm //

- (b) The graph below can be used to convert between degrees Fahrenheit ($^{\circ}\text{F}$) and degrees Celsius ($^{\circ}\text{C}$).



Use the graph to convert the temperature -14°C to $^{\circ}\text{F}$.

[1]

7°F //



8. A set of raffle tickets numbered 1 to 500 are all sold at a charity event. A ticket, picked at random, wins the only prize.

(a) What is the probability that the number on the winning ticket is 20? [1]

$$\frac{1}{500}$$

(b) What is the probability that the number on the winning ticket is greater than 200? [1]

$$500 - 200 = 300$$

$$\frac{300}{500}$$

(c) Ben has bought 8 of the tickets.
He says,

"I have a 50% chance of winning because either I win or I don't win."

Is Ben correct?

Yes

☐

No

☒

Explain your answer. [1]

He only has 8 tickets, so the chance of winning is very small = $\frac{8}{500}$ which is less than 50%.

(d) The probability that Zac wins the prize is 0.01.

(i) What is the probability that Zac does **not** win the prize? [1]

$$1.0 - 0.01 = 0.99$$

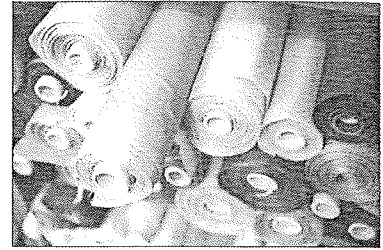
(ii) How many raffle tickets does Zac have? [2]

$$\frac{1}{100} = \frac{5}{500} \text{ He has 5 tickets.}$$

$$\text{OR } 0.01 \times 500 = 5$$



9. Fabric is sold from rolls.
All the rolls contain fabric of the same width.
Any length can be cut from a roll of fabric.



Tien buys:

- a 1.8 m length of flowered fabric,
- a 3.2 m length of plain fabric.

Flowered fabric costs £12.50 for one metre.
Tien spends £58.50 altogether.

Show that plain fabric costs £11.25 for one metre.

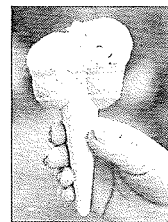
[3]

(F) $1.8 \times 12.50 = £22.50$

(P) $58.50 - 22.50 = £36$ cost of plain
 $36 \div 3.2 = £11.25$ / metre.



10. Jack sells ice-cream cones at a beach cafe.
Each ice-cream cone has **two** scoops of ice cream.



- (a) The scoops can be the same or different flavours.

There are three possible flavours to choose from:

- chocolate (C),
- vanilla (V),
- strawberry (S).

List all the possible flavour combinations for two scoops of ice cream.

[2]

CC VV SS
CV VS
CS

- (b) Two scoops of vanilla ice cream is the most popular.

Jack gets 125 single scoops of vanilla ice cream from one tub.

Each tub costs £43.50.

Jack needs to buy enough tubs to make 1300 of his two-scoop vanilla ice-cream cones.

What is the least amount Jack will need to pay?

[5]

1300 two-scoop ice-creams \Rightarrow 2600 scoops.
2600 \div 125 = 20.8 tubs
 \hookrightarrow needs to buy 21 tubs.

21 \times £43.50 = £913.50 //



11. (a) The original price of a car is £6500.
It is sold at a 12.5% discount.

Calculate the discounted price.

[3]

$$100 - 12.5 = 87.5 \% = 0.875$$

$$6500 \times 0.875 = £5687.50$$

Discounted price = £ 5687.50

- (b) Emma borrows £875 to pay for a new computer.
She pays simple interest on the loan at 6% per year for 3 years.

Calculate the total amount of interest Emma pays.

[2]

$$875 \times \frac{6}{100} = £52.50 / \text{yr.}$$

$$52.50 \times 3 = £157.50$$

Interest = £ 157.50

- (c) Asha buys a bike.
She sells it for three times what she paid for it.

What percentage profit has Asha made?

[1]

$$\frac{\text{Profit}}{\text{Orig}} \times 100 = \frac{3x - x}{x} \times 100 = \frac{2x}{x} \times 100 = 200\%$$

Percentage profit = 200 %



12. (a) Two taxi drivers record the number of miles they each drive on 12 days. The results are shown in the table below.

Miles driven											
Barry						Samira					
160	171	171	175			161	172	174	174		
177	182	188	189			180	181	185	186		
190	191	193	208			192	192	196	203		

- (i) Use the data to complete this table.

[2]

	Barry	Samira
Range	48	42
Median	185	183

$$\frac{182 + 188}{2} = 185$$

$$203 - 161 = 42$$

- (ii) Which taxi driver drove a more consistent number of miles each day?
Give a reason for your answer.

[1]

Samira - because the range is smaller.



- (b) Tanya is also a taxi driver.
Last month she drove 3405 miles.

She says,

"That means that I drive over 40000 miles in a year!"

- (i) Show how Tanya could be correct.

[2]

$$3405 \times 12 = 40\,860 > 40\,000$$

- (ii) State **one** assumption Tanya has made.
Explain how this has affected the answer.

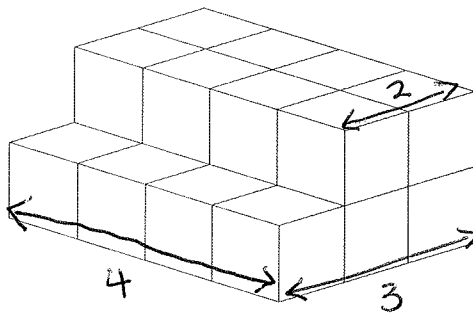
[2]

Assumption: She has assumed that she'll
drive the same amount each month.

Explanation: If other months are busier then
she will drive further.



13. (a) This solid prism is made from identical cubes. Each cube has sides of length 1 cm.



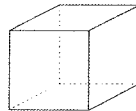
$$\begin{aligned}\text{Base} &= 4 \times 3 = 12 \\ \text{Top} &= 2 \times 4 = 8 \\ \text{Total} &= 20 \text{ cm}^3\end{aligned}$$

Give the dimensions of a cuboid that could be made with the same number of cubes. [1]

$$5 \times 2 \times 2$$

$$[\text{or } 1 \times 4 \times 5, 1 \times 2 \times 10, 1 \times 1 \times 20]$$

- (b) The total surface area of a different cube is 144 cm^2 .



6 faces.

To work out the side length of this cube, Mai does the following calculations:

$$\begin{aligned}\sqrt{144} &= 12 \\ 12 \div 6 &= 2\end{aligned}$$

$$\begin{aligned}\text{Correct method} \\ 144 \div 6 &= 24 \text{ cm}^2 \\ \text{Area each face} \\ \sqrt{24} &= 4.898 \dots \\ \text{Length one side}\end{aligned}$$

Mai's method is incorrect.

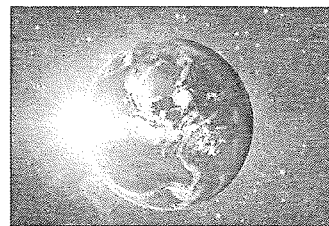
Explain the mistake that Mai has made. [1]

mai should have divided by 6 first
and then $\sqrt{\text{ANS}}$.



14.

Use: 1 mile = 1.6 km



- (a) The Earth travels around the Sun at 30 km per second.

Convert 30 km per second into miles per second.

[2]

$$\begin{array}{l}
 30 \text{ km} \longrightarrow 1 \text{ sec} \\
 \div 1.6 \left(\begin{array}{l} \longrightarrow 18.75 \text{ miles} \longrightarrow 1 \text{ sec} \end{array} \right. \\
 \hline
 18.75 \text{ miles/sec}
 \end{array}$$

- (b) (i) The diagram shows a field. It has an area of 1 square mile.

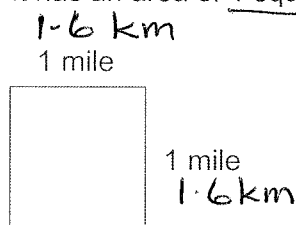


Diagram not drawn to scale

What is the area of the field in square kilometres?

[2]

$$\begin{array}{l}
 1 \text{ square mile} = 1.6 \times 1.6 \text{ square km} \\
 = 2.56 \text{ square km}
 \end{array}$$

- (ii) The surface area of the Earth is about two hundred million square miles.

Calculate the surface area of the Earth in square kilometres.

[2]

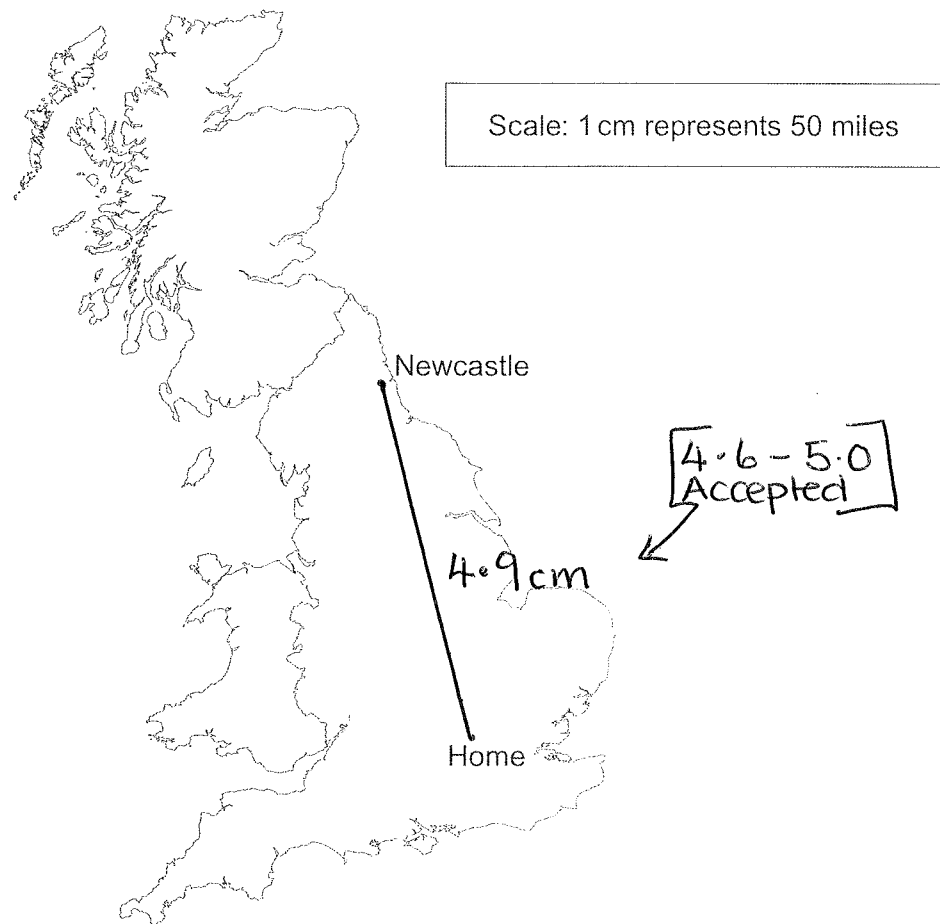
$$\begin{array}{l}
 200 \text{ } 000 \text{ } 000 \text{ square miles} \\
 \downarrow \times 2.56
 \end{array}$$

$$512 \text{ } 000 \text{ } 000 \text{ square kilometres}$$

$$[\text{or } 512 \text{ million square km}]$$



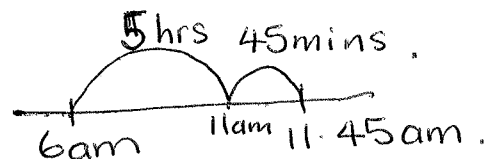
15. Nadia is going to drive from her home to a meeting in Newcastle.



Her route can be approximated using a straight line.

She plans to leave home at 6 a.m.

She wants to arrive in Newcastle at 11:45 a.m.



What must Nadia's average speed be for her to get to Newcastle on time?

Give your answer in miles per hour.

[5]

Time: 5hrs 45mins = 5.75 hrs

Distance: 4.9 cm = $4.9 \times 50 = 245$ miles

$$S = \frac{D}{T} = \frac{245}{5.75} = 42.6 \text{ mph}$$

[Ans in range 40 - 43.5 accepted.]



16. (a) 135 women and 150 men were asked to complete a survey.
44 of the women completed the survey.
32 % of the men completed the survey.

Which of the following statements is correct?
You must show all your working.

[3]

A greater proportion of men than women completed the survey.

☐

A greater proportion of women than men completed the survey.

☒

$$\text{Women : } \frac{44}{135} \times 100 = 32.592\%$$

$$\text{Men : } 32\%$$

$$[\text{OR } \frac{32}{100} \times 150 = 48 \text{ men} > 44]$$

- (b) 225 people took part in a different survey.
40 % were women.
20 % of the women were over 50 years of age.

How many women over 50 years of age took part in this survey?

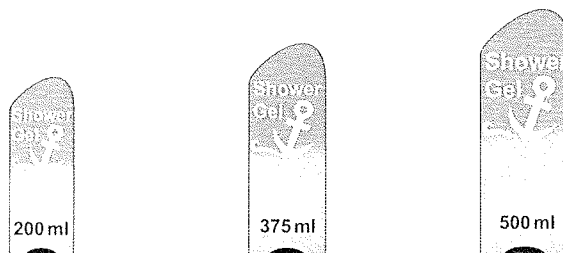
[3]

$$40\% \text{ of } 225 = \frac{40}{100} \times 225 = 90 \text{ women}$$

$$20\% \text{ of } 90 = \frac{20}{100} \times 90 = \underline{\underline{18 \text{ women} > 50 \text{ yrs}}}$$



17.



200ml	375ml	500ml
98p	£1.80	£2.30

Which size of bottle offers the best value for money?

200ml ☐375ml ☐500ml ☒

Show how you decide.

[3]

$$\begin{aligned} 200\text{ml} &\rightarrow 98\text{p} \\ \downarrow \div 200 \\ 1\text{ml} &\rightarrow 0.49\text{p} \end{aligned}$$

$$\begin{aligned} 500\text{ml} &\rightarrow 230\text{p} \\ \downarrow \div 500 \\ 1\text{ml} &\rightarrow 0.46\text{p} \end{aligned}$$

$$\begin{aligned} 375\text{ml} &\rightarrow 180\text{p} \\ \downarrow \div 375 \\ 1\text{ml} &\rightarrow 0.48\text{p} \end{aligned}$$

500ml is best
value

[Any other comparison of price for same quantity]



18. (a) Sam and Jody share £366 in the ratio 1 : 3.

How much money does Jody get?

[2]

S : J	Total	1 Part
1 : 3	4	$366 \div 4 = 91.5$
$\downarrow \times 91.5$	$\downarrow \times 91.5$	
£91.50	£274.50	366

Jody gets £ 274.50

- (b) Maria is 4 years old.

She is half Connor's age. \Rightarrow Connor is 8 years old

What will be the ratio of their ages in 2 years' time?

Give your answer in its simplest form.

[2]

M : C

6 : 10

3 : 5

Maria's age : Connor's age will be 3 : 5

19. (a) n is a whole number where $-4 \leq 2n < 6$.

Write down all the possible values of n .

[2]

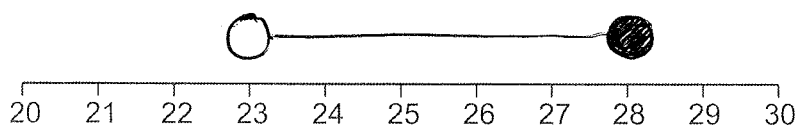
$$\frac{-4}{2} < \frac{2n}{2} < \frac{6}{2}$$

$$-2 \leq n < 3$$

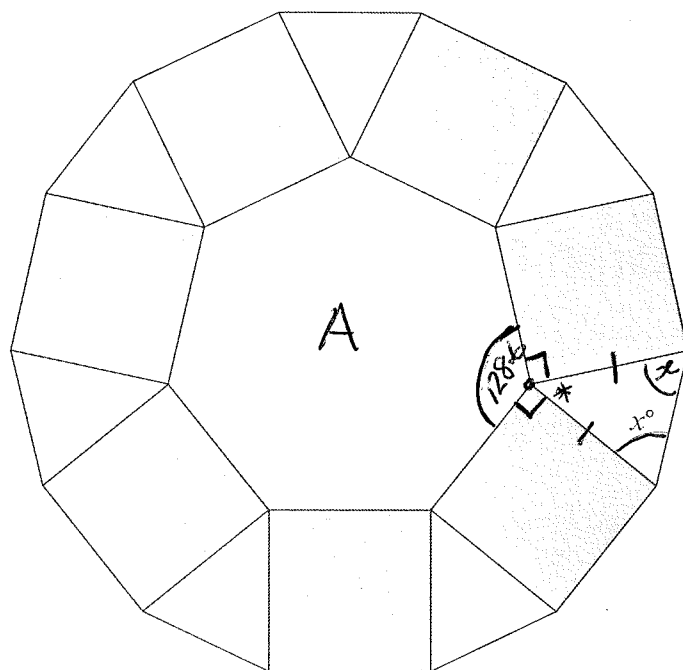
Possible values -2, -1, 0, 1, 2

- (b) Represent the inequality $23 < x \leq 28$ on this number line.

[2]



20.



This pattern is made from a regular seven-sided polygon surrounded by squares and isosceles triangles.

Show that the value of x is 64.3 correct to 1 decimal place.

[4]

You must show all your working.

$$\text{Exterior angle of } A = \frac{360}{7} = \frac{360}{7} = 51.428571$$

$$\text{Interior angle of } A = 180 - 51.428... = 128.571428$$

$$360 - 128.57... - 90 - 90 = 51.428571 = *$$

$$\frac{180 - 51.4}{2} = x = 64.285714 = \underline{\underline{64.3^\circ}} \text{ (1dp)}$$



21. Rashid plays a game.
Each time he can score 1 point, 5 points or 10 points.
The table shows the probability of each outcome.

Points	Probability
1	0.80
5	0.15
10	0.05

Rashid plays the game 40 times.

How many times does he expect to score more than 1 point?

[3]

$$P(>1 \text{ pt}) = 0.15 + 0.05 = 0.2$$

$$40 \times 0.2 = 8 //$$

22. A cylindrical glass contains 500 cm^3 of water.
The glass has an internal radius of 3.5 cm .

Calculate the height of the water in the glass.

[3]



$$\text{Volume} = \pi r^2 \times h$$

$$\pi \times 3.5^2 \times h = 500$$

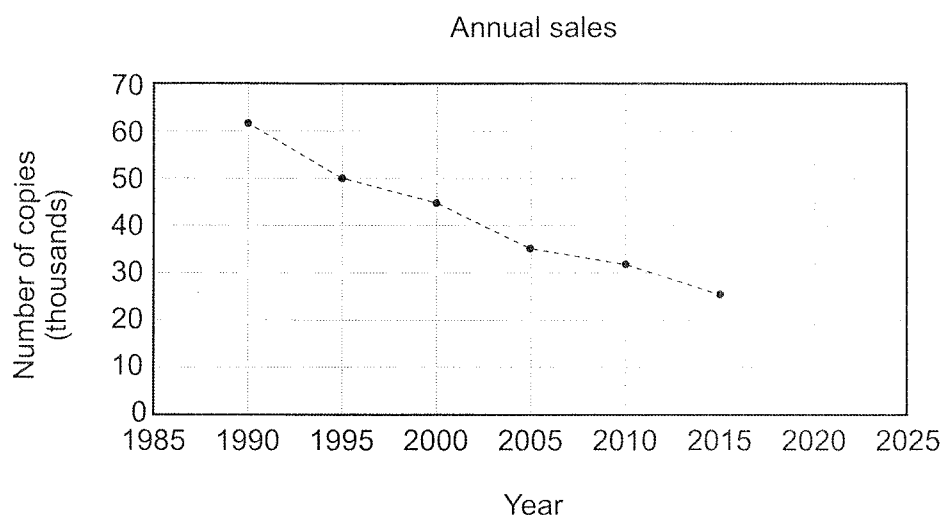
$$h = \frac{500}{\pi \times 3.5^2}$$

$$h = 12.9922 \dots \text{ cm}$$

$$h = 13 \text{ cm} //$$



23. The graph shows the number of copies of a local newspaper sold over a 25-year period.



- (a) (i) Eva uses the graph to predict that about 10 thousand newspapers will be sold in 2025.

Explain why her prediction may not be reliable.

[1]

10 years ahead is too far to predict

- (ii) Between 1990 and 2015, sales of the local newspaper fell from 62 000 to 26 000.

What was the percentage decrease in sales?

[2]

$$\frac{62000 - 26000}{62000} \times 100 = 58.1\% \text{ decrease}$$

- (b) The ratio of adults who read news online to those who do not is 16 : 9.
The adult population of the UK is about 52 000 000.

Calculate an estimate of the number of adults in the UK who read news online.

[2]

Online readers :	Not online	Total	
16	9	25	1 part
$\times 2.08 \text{ mill}$	\downarrow	52 000 000	$\frac{52 \text{ million}}{25} = 2.08 \text{ million}$
3 3280 000			



24. ABCD is a parallelogram. \Rightarrow opposite angles are the same.

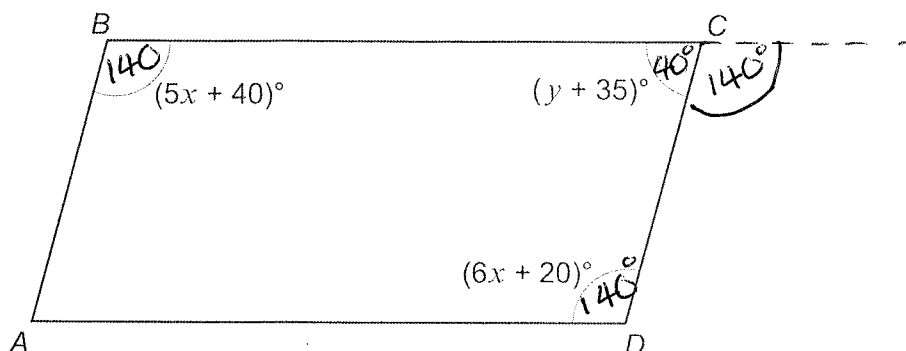


Diagram not drawn to scale

Work out the value of x and the value of y .
You must show all your working.

[5]

$$\begin{array}{r}
 6x + 20 = 5x + 40 \\
 -5x \quad -5x \\
 \hline
 x + 20 = 40 \\
 -20 \quad -20 \\
 \hline
 x = 20^\circ
 \end{array}$$

Sub $x = 20$ into ADC

$$6(20) + 20 = 140^\circ$$

$$180 - 140 = 40^\circ = \text{BCD}$$

$$\begin{array}{r}
 y + 35 = 40 \\
 -35 \quad -35 \\
 \hline
 y = 5^\circ
 \end{array}$$

$$x = 20 \quad y = 5$$



25. Cheng stands at O and rolls a ball along the horizontal ground.

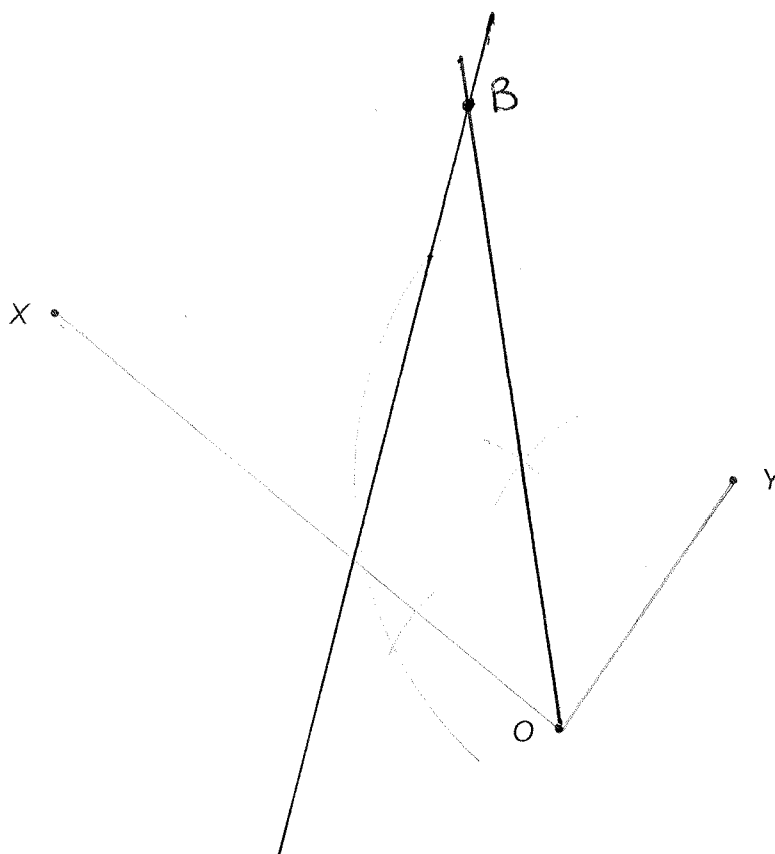
The ball stops at point B , which:

- is equidistant from X and Y ,
- lies on the bisector of angle XOY .

Use a ruler and a pair of compasses to **construct** suitable lines and arcs to show the position of point B .

Construction arcs must be clearly shown.

[5]



26. The diagram shows two right-angled triangles.

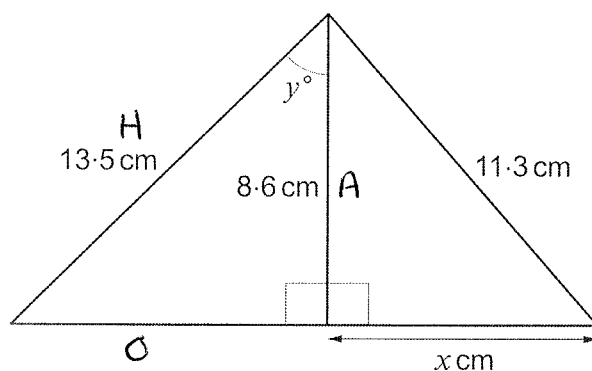


Diagram not drawn to scale

(a) Calculate the value of x .

[3]

$$x^2 = 11.3^2 - 8.6^2$$

$$x^2 = 53.73$$

$$x = \sqrt{53.73}$$

$$x = 7.33 \dots$$

$$x = 7.3 \text{ cm} \quad // \quad (1 \text{ dp})$$

(b) Calculate the value of y .

[3]

$$\cos y = \frac{8.6}{13.5}$$

$$y = \cos^{-1}\left(\frac{8.6}{13.5}\right)$$

$$y = 50.428 \dots$$

$$y = 50.4^\circ \quad // \quad (1 \text{ dp})$$



[illegible]