Surname	Centre Number	Candidate Number
Other Names		0

GCSE LINKED PAIR PILOT

4362/02

S15-4362-02

APPLICATIONS OF MATHEMATICS

UNIT 2: Financial, Business and Other Applications

HIGHER TIER

P.M. THURSDAY, 11 June 2015

2 hours

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1.	6	
2.	6	
3.	6	
4.	8	
5.	9	
6.*(a)*	8	
6.*(b)*	3	
7.	6	
8.*(a)*	6	
8.*(b)*	7	
9.	12	
10.	6	
11.*(a)(b)*	13	
11.*(c)*	4	
Total	100	

4362
020001

ADDITIONAL MATERIALS

A calculator will be required for this paper.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

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.

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 that assessment will take into account the quality of written communication (including mathematical communication) used in your answer to question **3**.

Examiner only

1. Lois lives in Llandudno.
She is changing some pounds into other currencies before going on holiday in Europe.

The exchange rates are displayed below.

Exchange £1 for	
1.48 SF	Swiss francs
1.20 €	euros
5.04 Zl	Polish zloty

(a) Calculate how much Lois would receive in exchanging each of the following.

(i) £450 exchanged for Swiss francs. [2]

450 x 1.48

666 Swiss francs

(ii) £300 exchanged for Polish zloty. [2]

300 x 5.04

1512 Polish zloty

(b) How many pounds will Lois have to exchange to receive 363.60 euros? [2]

$\frac{363.6}{1.2}$

£ 303

4362 020003

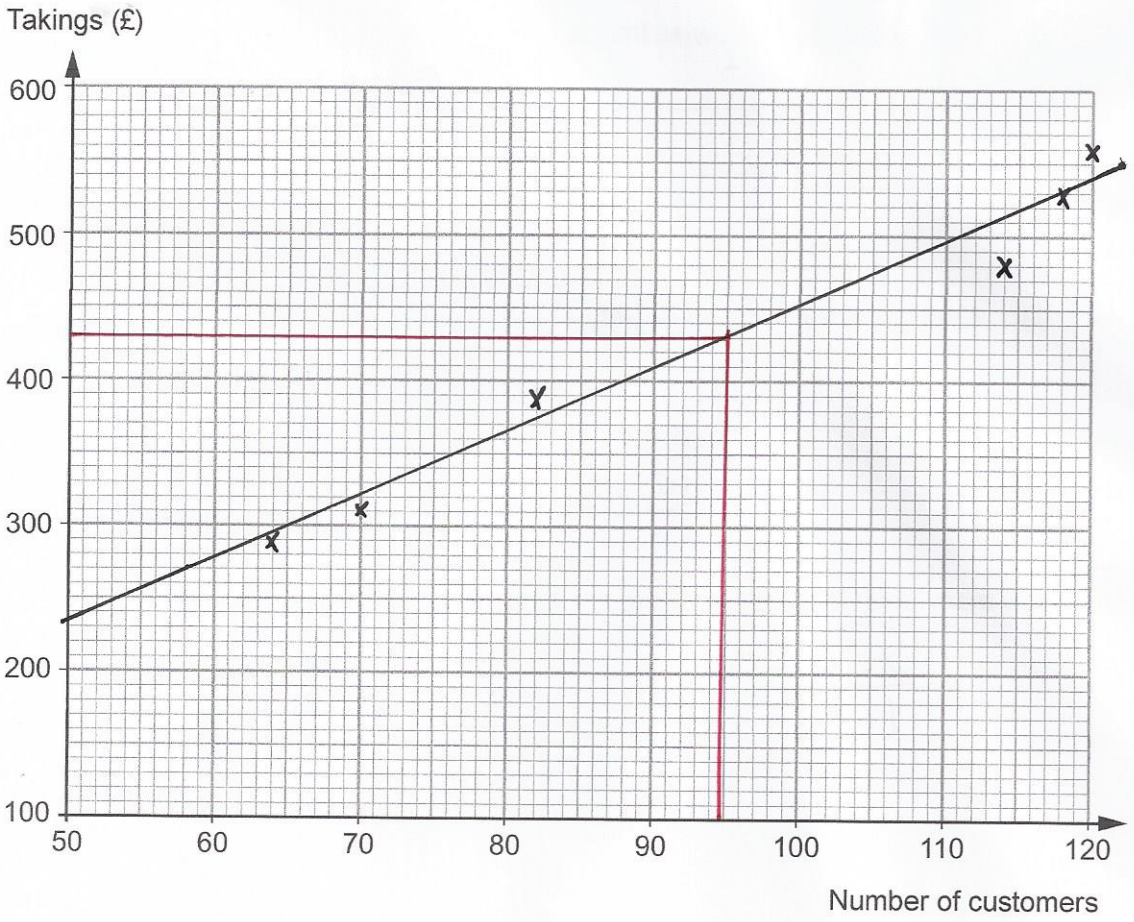
Examiner only

2. Every Monday for 6 weeks, the number of customers entering a juice bar and the takings of the juice bar were recorded.
The takings were recorded correct to the nearest £10.

The table below shows the results.

Number of customers	104	82	120	64	70	118
Takings (£)	480	390	560	290	310	530

(a) On the graph paper below, draw a scatter diagram of these results. [2]



Examiner only

(b) Draw, by eye, a line of best fit on your scatter diagram. [1]

(c) Estimate the takings for a Monday when there are 95 customers. [1]

£430

(d) Approximately how much does a customer spend, on average, in the juice bar on a Monday? [2]

$$\text{Average} = \frac{\text{Sum. Takings}}{\text{Sum. Customers}} = \frac{480+390+560+290+310+530}{104+82+120+64+70+118}$$

$$= £4.59$$

Examiner only

3. *You will be assessed on the quality of your written communication in this question.*

Jenna is saving for a summer holiday.
She has already saved £45.

Jenna earns £250 per week.
She plans to save 12% of the money she earns each week towards her holiday.

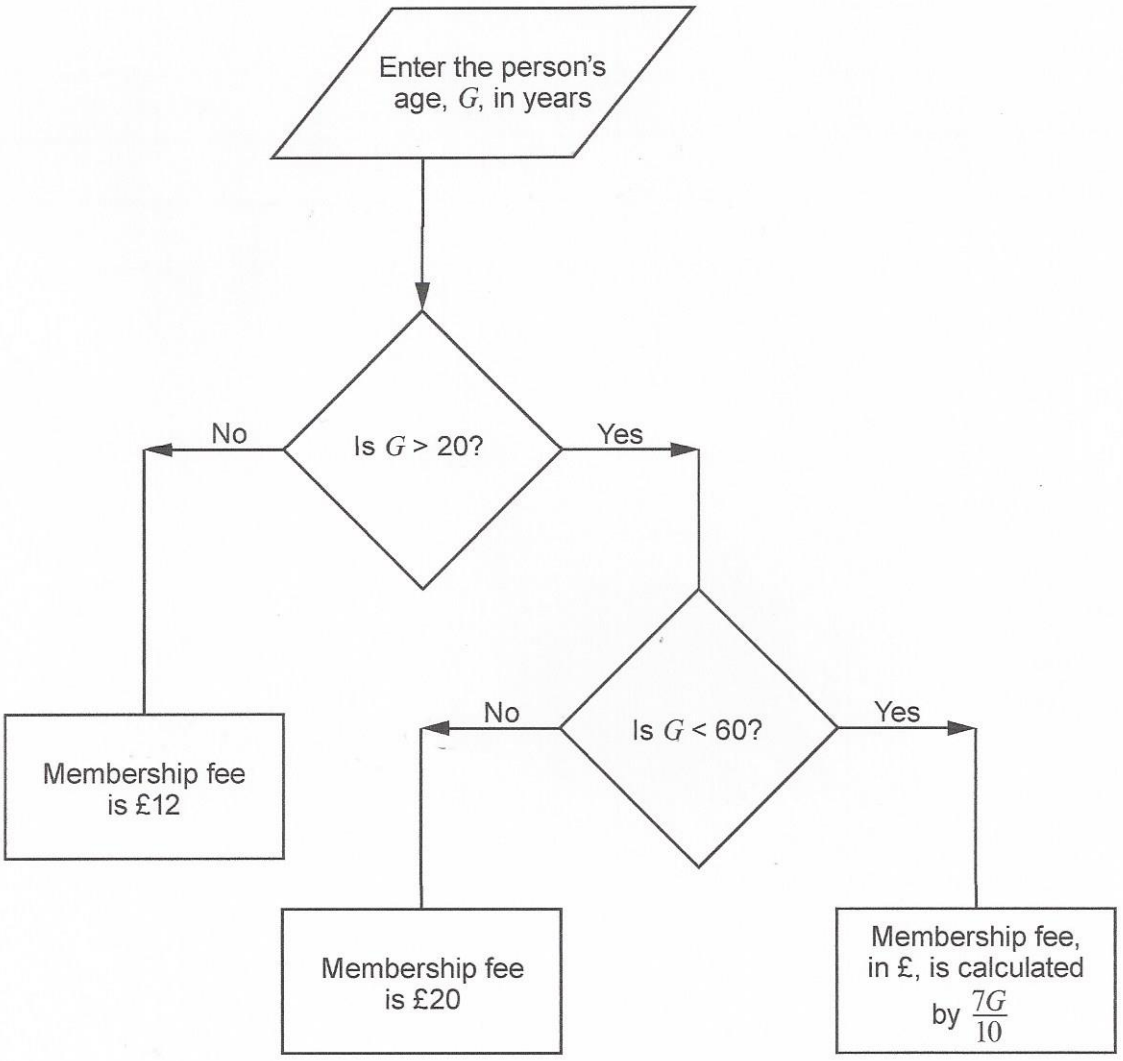
She has to pay a £100 deposit for the holiday in 2 weeks' time.
12 weeks after paying her deposit, Jenna has to make a final payment of £365.

Show whether it is possible for Jenna to save enough to pay the deposit on time and make the final payment on time.
You must show all your working. [6]

12% of 250 ⇒ 0·12 × 250 = £30 ⇒ £5 left over
∴ £30 saved per week
Deposit: 45 + 30 + 30 = £105
⇒ Can pay deposit
12 weeks After ⇒ 12 × 30 = £360
∴ Total Earned = 360 + 5
= £365
⇒ Jenna can pay ~~deposit~~ for holiday

4.

The following section of a flowchart is used to find the membership fee for a snooker club.



Examiner only

(a) Use this section of the flowchart to find the membership fee for each of the following people.

Donald, aged 20 [1]

£12

Dawn, aged 16 [1]

£12

Shiona, aged 52 [2]

$7 \times \frac{52}{10} = £36.40$

(b) Shiona, aged 52, has a younger brother Marc, aged 42.
How much **less** does Marc have to pay to be a member of the snooker club than his sister Shiona? [2]

$36.40 - \left(\frac{7 \times 42}{10}\right) = £7$

∴ Marc pays £7 less

(c) At what age does the membership fee become more expensive than the membership fee for a 60 year-old?
You must show your working. [2]

~~$\frac{36 \times 100}{7} = 543$~~

Price

Use $\frac{7G}{10} > 20$

$\Rightarrow \frac{7G}{10} = 20 \Rightarrow G = \frac{20 \times 10}{7}$

round up for age

$G = 28.57$

∴ $G = 29$ years old

Examiner only

5. A retail index number is calculated by looking at increases or decreases in price over a period of time.
A loaf of bread that cost £1.60 on 1st January last year, costs £2.00 on 1st January this year.

The index number for this year's cost of a loaf of bread, based on last year's cost, is calculated as follows:

$$\text{Index number} = \frac{2.00}{1.60} \times 100$$

$$= 125$$

(a) The index number for this year's cost of bananas, based on last year's cost, is 140.

(i) Has the cost of bananas increased more or less steeply than the cost of a loaf of bread?
You must give a reason for your answer. [1]

More steeply, a 40%. increase is greater than a 25%. increase.

(ii) For this year's costs, are you able to tell from the information given whether 1 kg of bananas is cheaper or more expensive than a loaf of bread?
You must give a reason for your answer. [1]

Not able to tell price of bananas, therefore can't work out if more expensive

Examiner only

(b) Below is last year's cost of a basket of shopping.
The index number for calculating this year's cost, based on last year's cost, is also given.

Item	Cost last year	Index number for calculating this year's cost based on last year's cost
Box of teabags	£2.36	110
Box of eggs	£2.40	105
Carton of milk	90p	120
Carton of orange juice	£1.10	90

Calculate the total cost of this basket of shopping for this year.
Give your final answer correct to the nearest 10 pence. [4]

Cost = (2·36×110)+(2·4×105)+(0·9×120)+(1·1×90)
= £7·20 (to nearest 10 pence)

(c) A litre tub of ice cream now costs £2.36.
The index number for the cost of a litre tub of ice cream based on last year's cost is 97.
What was the cost of a litre tub of ice cream last year? [3]

Read Previous page

$IN = \frac{\text{This Year}}{\text{Last Year}} \times 100$

$\Rightarrow 97 = \frac{2.36}{LY} \times 100$

$\Rightarrow LY = \frac{2.36 \times 100}{97} = £2.43$

Examiner only

6. Gareth spends some time looking at his outgoings and his savings.

(a) Gareth is trying to estimate the total cost of the electricity he uses over a 90-day period.

Last year he used 550 units of electricity during a 90-day period.
The cost of electricity was 16p per unit.
The standing charge was 30p per day.
VAT was charged at 5%.

For a similar 90-day period this year Gareth estimates that
- he will use the same quantity of electricity,
- the cost of electricity per unit will rise by 12%,
- the standing charge will rise by 8%,
- VAT will be charged at 5%.

His sister has said that this will mean a 9% rise in the total cost of his electricity.

By calculating the actual increase in the total cost that Gareth is estimating for this 90-day period, find out whether Gareth's sister has made a reasonable statement.
You must show all your working. [8]

Last Year = $(550 \times 0.16) + (90 \times 0.30)$
cost = £115

5% Vat = 115×1.05 (5%)
= £120.75

This Year = $(550 \times 0.16 \times 1.12) + (90 \times 0.30 \times 1.08)$ (12%, 8%)
Cost = £127.72

5% Vat = 127.72×1.05 (5%)
= £134.11

~~∴ % increase = $\frac{134.11 - 127.72}{134.11} \times 100$~~

If true then, $127.72 \times 1.09 = 134.11$
however $127.72 \times 1.09 = 139.2$
∴ Sister is wrong

Examiner only

8

(b) Gareth decides to invest £3000 in a savings bond offering a fixed rate of 1·25% per annum.
The investment company provides information stating how much the bond will be worth after 5, 15 and 25 years.
Gareth has lost the details so he decides to create his own table.

Complete Gareth's table below, giving your answers correct to the nearest penny. [3]

	After 5 years	After 15 years	After 25 years
£3000 bond is worth	£ 3192.25	£ 3614.49	£ 4092.58

$3000 \times (1.0125)^5 = £3192.25$ 5years

↑ 1.25%

$3000 \times (1.0125)^{15} = £3614.49$

$3000 \times (1.0125)^{25} = £4092.58$

3

Examiner only

7. *(a)* Ursula is designing data collection sheets.

She needs to decide on suitable groups for collecting her data.

The data she is collecting is as follows:

- European shoe sizes, with none smaller than 32 and none greater than 46.
- Lengths of shoe laces, with no measurement less than 30 cm and no measurement greater than 88 cm.

For each data collection sheet, Ursula has decided she must have **at least 5 groups all of equal width**.

The outlines of Ursula's data collection sheets are given below.
Complete the first columns of these data collection sheets to show suitable groups. [4]

$46 - 32 = 14$

$\frac{14}{7} = 2$ → Multiple of 7

∴ Group width 2

$88 - 30 = 58$

$\frac{58}{4} = 14.5$

∴ Group width 14.5

European shoe size	Tally	Frequency
32 34 36 38 40 42 43 46		

Length of shoe lace (cm)	Tally	Frequency
30 44.5 59 73.5 88		

Examiner only

(b) Luc has been recording 'hours of sunshine' each day.

The table below shows Luc's data collection so far.

Hours of sunshine		Frequency
None		
Less than an hour		
More than an hour	✓ ✓	
More than 2 hours	✓ ✓	
More than 3 hours	✓	

(i) Griff looks at Luc's table and says:

"Looks to me like Luc has been recording hours of sunshine for **five** days."

Explain why Griff could be correct. [1]

If tick was entered at the end of the day and there is 5 ticks, we can say there has been 5 days recorded.

(ii) Sara looks at Luc's table and says:

"Looks to me like Luc has been recording hours of sunshine for just **two** days."

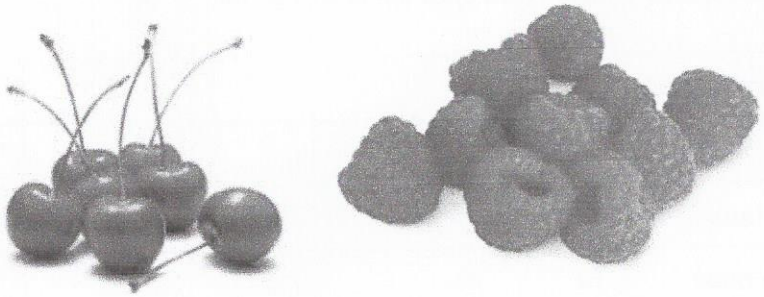
Explain why Sara could be correct. [1]

Increasing hours of sunshine each day could result in more than one ✓ per day (ticks added as days progress

6

Examiner only

8. *(a)* An organic fruit farm sells cherries and raspberries.



Poppy buys 3 kg of cherries and 5 kg of raspberries.
Harry buys 4 kg of cherries and 7 kg of raspberries.
Poppy spends £66.10 and Harry spends £91.

Simultaneous Eqn.

Use an algebraic method to calculate the **total cost** of 10 kg of cherries and 1 kg of raspberries.
You must show your working. [6]

$3C + 5r = 66.1$ ①
$4C + 7r = 91$ ②

① × 4 ⇒ $12C + 20r = 264.4$ ③
② × 3 ⇒ $12C + 21r = 273$ ④

④ − ③ $r = 8.6$

Sub $r = 8.6$ into ①

$3C + 5(8.6) = 66.1$
$3C + 43 = 66.1$
$C = \frac{66.1 - 43}{3} = 7.7$

∴ Cost of 10 kg cherrie + 1 kg of raspberrie $= (10 \times 7.7) + 8.6$
$= £85.60$

6

Examiner only

(b) The organic fruit farm also sells gooseberries and blackcurrants.
Gooseberries sell for £8.20 per kg.
Blackcurrants sell for £10.80 per kg.
An incomplete section of the spreadsheet used to enter sales of fruit is given below.

	A	B	C	D	E	F	G
1							
2	Prices	Cherries	.....				
3		Raspberries	.....				
4		Gooseberries	8.20				
5		Blackcurrants	10.80				
6							
7	Customer	Cherries	Raspberries	Gooseberries	Blackcurrants	Spend	Total
8	Poppy	3	5	0	0	66.10	66.10
9	Harry	4	7	0	0	91.00	157.10
10	Gemma	0	0	3	2	46.20	203.3
11	Nia	0	0	5	3	73.40	276.7
12	Haf	....	....	....	....	....	....

(3×8.2)+(2×10.8)

157.1 +

(i) What amounts should be entered in cells C2 and C3? raspberrie. [1]

Cost of cherries and ~~raspberrie~~

(ii) Why do you think the spreadsheet is designed so that amounts can be entered in cells C2, C3, C4 and C5? [1]

Prices can be changed

(iii) Complete the value of each entry for F10, G10, F11 and G11 in the spreadsheet above. [2]

(iv) Haf intends to buy some of all 4 types of fruit.
Write down the formulae that would be used to calculate the amounts for cells F12 and G12.

F12 [2]

F12=(B12×C2)+(C12×C3)+(D12×C4)
+(E12×C5)

G12 [1]

G12= F12 +G11

7

Examiner only

9. Ben and Catrin both buy new fleece jackets.

The label inside Ben's jacket says:

Astra Jacket
90% Polyester, 10% Elastane
Soft fleece fabric 180 g/m^2

The label inside Catrin's jacket says:

Snug Jacket
80% Polyester, 20% Elastane
Stretchy fleece fabric 140 g/m^2

Ben and Catrin know the following facts about their jackets.

- Ben's jacket weighs 234 g.
- Catrin's jacket is made with 8% less fleece fabric than Ben's jacket.

(a) How much does Catrin's *Snug Jacket* weigh?
You must show your working. [4]

Fabric in Catrins Fleece (weight) = 0.92 × 234 =

Area of Bens

Bens Jacket = $\frac{234}{180}$ = 1.3 m^2

8% less Area

⇒ Catrin Jacket = 1.3 × 0.92
= 1.196 m^2

∴ Catrins Weight = 1.196 × 140
= 167.44 g

Examiner only

(b) The density of the fleece fabric in *Snug Jackets* is actually 140 g/m^2, correct to the nearest 2 g/m^2.
This fabric is sold to the makers of the jackets on cardboard rolls.
A cardboard roll with fleece fabric on it weighs 4·5 kg.
The empty cardboard roll weighs 360 g.

Complete the following sentence by inserting a correct value, accurate to 4 significant figures.

The roll contains **at least** ..... m^2 of *Snug Jacket* fleece fabric.

roll

You must show your working. [6]

Weight of fabric = 4500 - 360 = 4140g

Density => 139 g/m^2 or 140g/m^2 or 141g/m^2

=> Area = $\frac{4140}{141}$ = 29.36 m^2

if 139 g/m^2 gives maximum

Gives least amount of fabric

(c) A different roll contains 45 m^2 of fleece fabric.
This roll of fleece fabric has a label attached giving the area of fabric in cm^2, written in standard form.
Complete the label below.
You must show your working. [2]

45 m^2 => 450000 cm^2
=> 4.5×10^5 cm^2

45 m^2 is 4.5×10^5 cm^2, written in standard form

Examiner only

10. A garden centre sells plastic plant pots and saucers.

Plant pots cost £0.45 each. Saucers cost £0.20 each.

The garden centre manager says that last week
- the total number of plant pots and saucers sold was less than 3500 **and**
- more than £500 was taken from sales of plant pots and saucers.

Let P represent the number of plant pots sold.
Let S represent the number of saucers sold.

(a) Write down **two inequalities**, in terms of P and S, that satisfy the information given by the garden centre manager. [2]

$P + S < 3500$

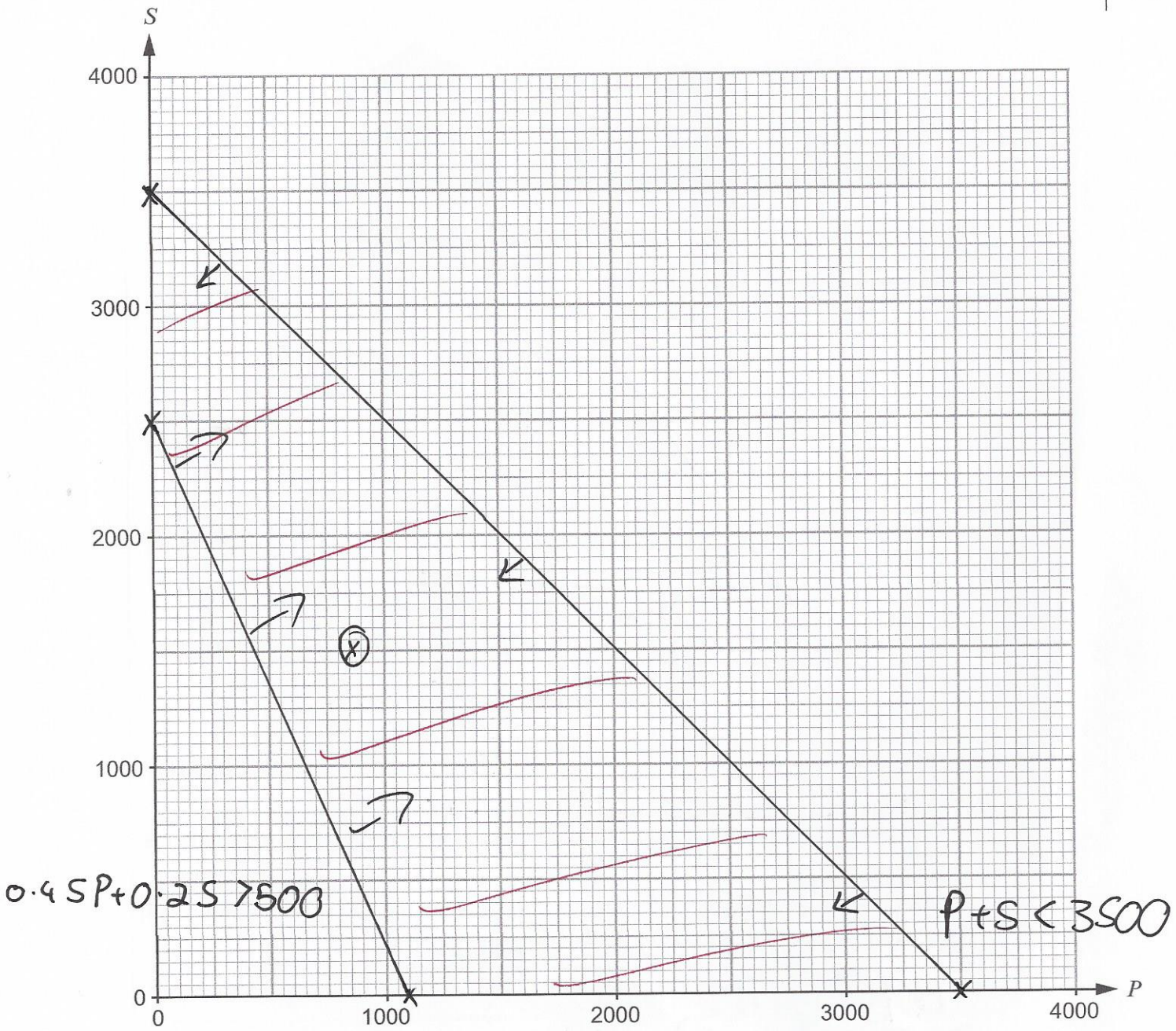
$0.45P + 0.2S > 500$

(b) Use the graph paper opposite to find a region that is satisfied by your inequalities. You must clearly indicate your region. [3]

$P + S = 3500$
when $P = 0$ $S = 3500$
$S = 0$ $P = 3500$

$0.45P + 0.2S > 500$ $\times 5$
$2.25P + S > 2500$
when $S = 0$ $P = \frac{2500}{2.25} = 1111$
$P = 0$ $S = 2500$

Examiner only



(c) The following statement was made by a sales assistant about the sales of plant pots and saucers last week.

"800 plant pots and 1500 saucers were sold."

Use your graph to complete the following table to indicate whether the statement could be true or not.
You **must show on your graph** how you justify your decision. [1]

Statement	Could be true? Yes or No
800 plant pots and 1500 saucers were sold	Yes

Examiner only

11. *BuildGen* makes roof turrets for apartment blocks.

(a) *BuildGen* is building a turret in the shape of a square-base pyramid.
The frame for the turret is made using metal rods.
An outline of the frame is shown below.

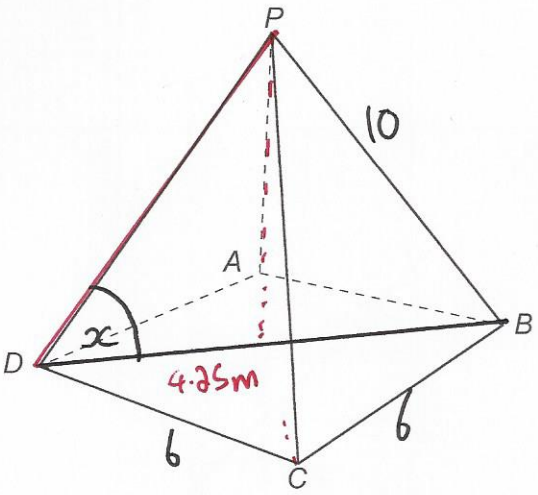


Diagram not drawn to scale

(i) *BuildGen* has ordered two packs of metal rods. Each pack contains 4 metal rods.
One pack contains rods of length 6 m and the other pack contains rods of length 10 m.
No rods are cut.
Calculate the angle between the diagonal *BD* and the rod *DP*. [6]

Shorter rods around Base

~~BD² = 6² + 6²~~

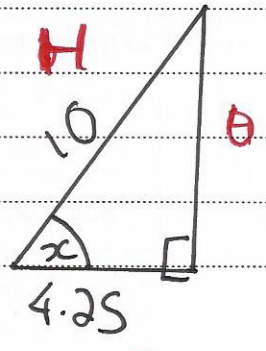
$\Rightarrow BD^2 = 6^2 + 6^2$

$\Rightarrow BD = \sqrt{6^2 + 6^2} = 8.49\,m$

$\Rightarrow$ half way $= \frac{8.49}{2} = 4.25\,m$

SOH CAH TOA

$\cos x = \frac{4.25}{10} \quad \therefore x = 64.8^\circ$



a

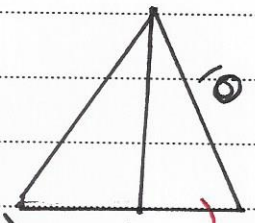
Examiner only

(ii) The four slanting faces of the turret are to be tiled.
Calculate the total area to be covered in tiles. [4]

Perp. height $\Rightarrow 10^2 = 3^2 + h^2$

$\Rightarrow h^2 = 91$

$\Rightarrow h = 9.54\,m$



$\Rightarrow$ Area of 1 face $= 2 \times (\frac{1}{2} b \times h)$

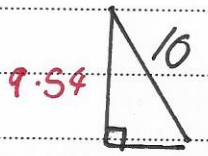
$= b \times h$

$\Rightarrow$ Area of 4 faces $= 4(b \times h)$

$= 4(3 \times 9.54)$

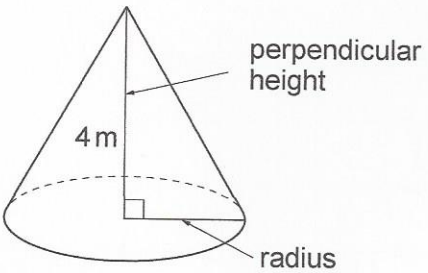
$= 114.5\,m^2$

↓ create this triangle



(b) *BuildGen* also builds turrets in the shape of a cone.

This turret has a perpendicular height of 4 m.



The volume of the turret is $122\,m^3$.
Calculate the radius of this turret. [3]

$Vol = \frac{1}{3}\pi r^2 h$

$\Rightarrow 122 = \frac{1}{3}\pi \times r^2 \times 4$

$\Rightarrow 122 = \frac{4}{3}\pi r^2$

$\Rightarrow r^2 = \frac{3 \times 122}{4\pi}$

$r = \sqrt{\frac{3 \times 122}{4\pi}}$

$\therefore r = 5.4\,m$

Examiner only

(c) *BuildGen* makes similar-shaped turrets, by enlarging the lengths of the rods in the frame by the same scale factor.

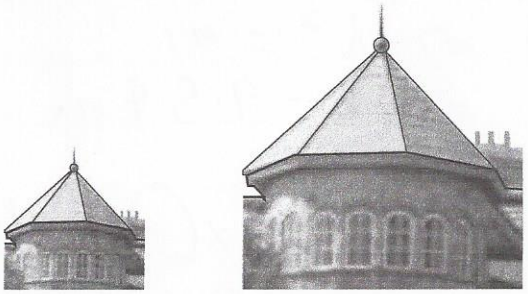


Diagram not drawn to scale

The diagram shows an example where *BuildGen* have enlarged all the lengths of the rods in the smaller frame by a scale factor of 1·6.
The area of each of the panels in the smaller frame is 4·6 m^2.
The internal volume of the larger frame is 76·2 m^3.

Area scale factor rule

Calculate

(i) the area of each of the panels in the larger frame, [2]

Area $= 4.6 \times (1.6)^2$
$= 11.8\ m^2$

(ii) the internal volume of the smaller frame. [2]

Volume $= \dfrac{76.2}{(1.6)^3} = 18.6\ m^3$

Volume Scale factor rule

END OF PAPER