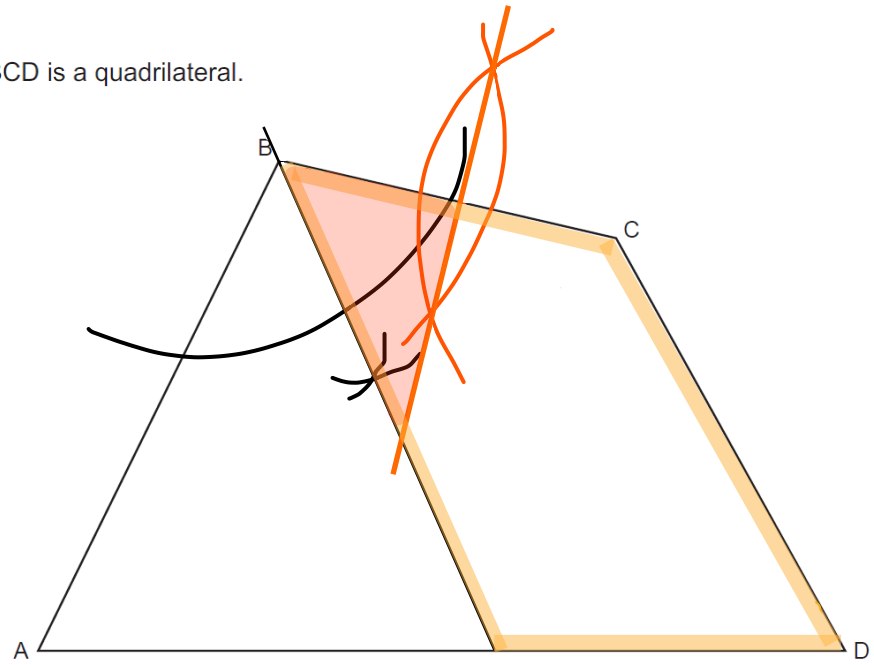
GCSE (9 – 1) Mathematics

J560/04 Paper 4 (Higher Tier)

Question Set 5

1. **(a)** ABCD is a quadrilateral.



Construct the bisector of angle ABC.
Show all your construction lines. **[2]**

(b) Construct the perpendicular bisector of BC.
Show all your construction lines. **[2]**

in orange

(c) Shade the region which is

- nearer to BC than to AB

and

- nearer to B than to C.

[1]

2 Lily buys and sells microwaves.

She buys each one for £32 and sells it for £60.
She also pays £7 for the delivery of each microwave she sells.

If she sells a microwave that is faulty then Lily must pay for its repair and redelivery.
This costs her another £25 for each faulty microwave.

Last month, 6 out of the 80 microwaves Lily sold were faulty.

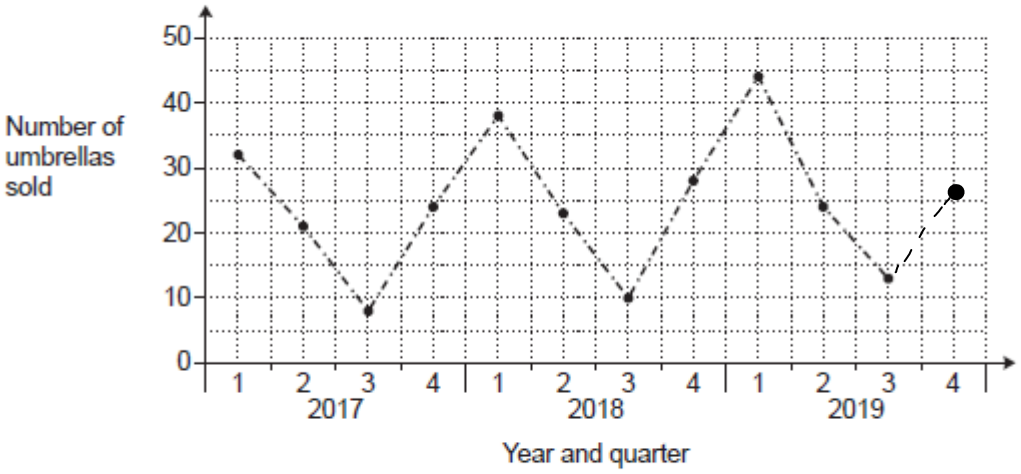
This month she has orders for 133 microwaves.

Calculate her expected percentage profit on this month's order.
Showing your working in the boxes below may help you present your work.

Expected number of faulty microwaves:	Expected costs:
$\frac{6}{80} = 0.075$ $0.075 \times 133 = 9.975$	$133 \times 32 = 4256$ $25 \times 9.975 = 249.375$ $7 \times 133 = 931$ $4256 + 249.375 + 931$ $= 5436.375$
Income from sales: $60 \times 133 = 7980$	**Expected percentage profit:** $\frac{7980 - 5436.375}{7980} \times 100$ $= 0.31875 \times 100$ $= 31.88\%$

[6]

3 (a) The graph shows the number of umbrellas sold in Ling's shop for each quarter from quarter 1 of 2017 to quarter 3 of 2019.



(a) The shop sold 32 umbrellas in quarter 4 of 2019.

Complete the graph. **[1]**

(b) Make one comment about the **seasonal** variation shown in this graph.

The number of umbrellas sold is highest in the first quarter of each year, usually because this is the wettest time of the year **[1]**

(c) Make one comment about the **annual** variation shown in this graph.

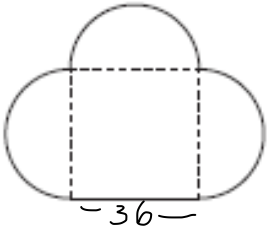
The number of umbrellas sold is increasing as each year passes. **[1]**

(d) Ling predicts that she will sell 50 umbrellas in quarter 1 of 2020.

What assumption has she made?

The number of umbrellas sold will continue to increase at a similar rate to previous years. **[1]**

4 The diagram shows Jane's lawn.
It is in the shape of a square of side 36 m and three semi-circles.



Not to scale

She is going to spread fertiliser on the lawn at a rate of 30 g per square metre.
The fertiliser is only sold in 10 kg bags costing £15.80 each.

Calculate the cost of buying the bags of fertiliser for her lawn.
You must show all your working.

$36 \times 36 = 1296$ → area of square

$\pi r^2 = \pi 18^2 = \left(\frac{324\pi}{2}\right) \times 3 = 486\pi$

36 ÷ 2

area of all 3 semi circles

1 kg = 1000 g

$1296 + 486\pi$

Total = $2822.81 \times 30 = 84684.42$ g

$\frac{84684.42}{1000} = 84.68$ kg

$84.68 \div 10 = 8.5$ bags

∴ 9 bags are needed for her lawn.

$9 \times 15.80 = 142.2$

£ 142.20 **[6]**

5 **(a)** The length, d, of Jamal's car is 4.72 m, correct to 2 decimal places.

Complete the error interval for the length, d.

4.725

4.715

(a) 4.715 $\leqslant d <$ 4.725 **[2]**

(b) Jamal travels 430 km, correct to the nearest 10 km. → 425 → 435

His average speed is 57.3 km/h, correct to 1 decimal place. → 57.25 → 57.35

Calculate the shortest possible time for Jamal's journey.
Give your answer correct to the nearest minute.

(to have the shortest time s ↓ & v ↑)

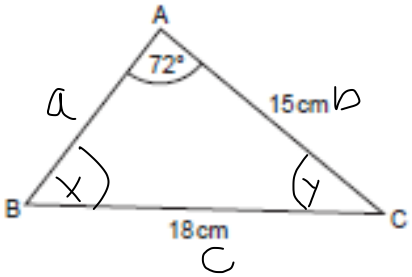
$v = \frac{s}{t}$ $t = \frac{s}{v} = \frac{425}{57.35} \approx 7.41\text{h}$

7h 0.41h = 60 × 0.41 ≈ 24.6

≈ 25 min

(b) 7 hours 25 minutes **[5]**

6 The diagram shows triangle ABC.



Not to scale

AC = 15cm, BC = 18cm and angle BAC = 72°.

Calculate length AB, giving your answer correct to 3 significant figures.
Show your working.

$$\frac{\sin 72}{18} = \frac{\sin(x)}{15}$$

$$\sin(x) = 0.79254$$

$$x = \sin^{-1}(0.79254)$$

$$x = 52.4$$

$$Y = 180 - 52.4 - 72 = 55.57^\circ$$

$$a^2 = b^2 + c^2 - 2bc\cos(A)$$

$$a^2 = 15^2 + 18^2 - 2 \times 15 \times 18 \cos(56)$$

$$a^2 = 247 \rightarrow a = 15.61$$

or

$$\frac{\sin 55.57}{a} = \frac{\sin 72}{18}$$

$$\frac{a}{0.824} = \frac{18}{\sin 72} \quad (\times 0.824)$$

$$a = 15.61$$

15.6 ..... cm [6]

7 y is inversely proportional to the square of x.
$y = 2$ when $x = 5$.

Find a formula linking x and y.

$$y = \frac{k}{x^2}$$

$$2 = \frac{k}{5^2}$$

$$k = 50$$

$$y = \frac{50}{x^2}$$

$y = \frac{50}{x^2}$ [3]

8 Expand and simplify.

$(x+1)(x-1)(x+2)$

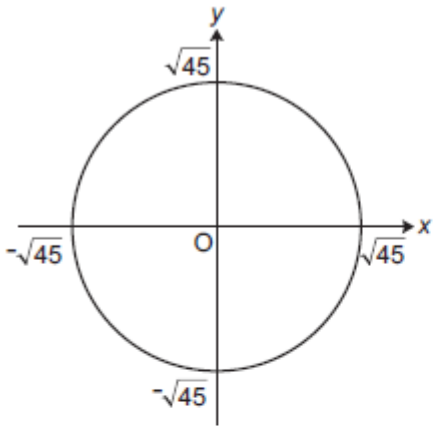
$$(x+1)(x-1)$$

$$= (x^2 - 1)(x+2)$$

$$= x^3 + 2x^2 - x - 2$$

$x^3 + 2x^2 - x - 2$ [3]

9 (a) Here is a sketch of the circle $x^2 + y^2 = 45$.



(a) Show that the tangent to this circle at the point (-3, 6) has a gradient of $\frac{1}{2}$. **[2]**

gradient of radius → $m = \left(\frac{0-6}{0-(-3)}\right) \therefore -2$

$m' = (-2)^{-1} \times -1 = \frac{1}{-2} \times -1 = \frac{1}{2}$

↑ gradient of tangent

(b) Find the equation of the tangent at the point (-3, 6).

$y = mx + C$

$m = 1/2$

$6 = (1/2 \times -3) + C$

$7.5 = C$

$y = 1/2\,x + 7.5$

(b) $y = \frac{1}{2}x + 7.5$ **[2]**

10 Solve.

$x^2 + y^2 = 34$
$y = x + 2$

Show your working.

$y^2 = (x+2)^2$

$y^2 = x^2 + 4x + 4$

Substitute

$x^2 + x^2 + 4x + 4 = 34$

$2x^2 + 4x - 30 = 0$

$\div 2$

$x^2 + 2x - 15 = 0$

$(x-3)(x+5) = 0$

$x = 3$ or $x = -5$

$y = x + 2$

$y = 5$ or $y = -3$

$x =$ 3 $y =$ 5

$x =$ -5 $y =$ -3 **[6]**

Total Marks for Question Set 5 : 50