Name: SOLUTIONS

GCSE 9-1
Practice Paper
Set A
Paper 1 - Non Calculator

Corbettmaths

Question	Mark	Available
1		5
2		2
3		3
4		3
5		4
6		2
7		3
8		3
9		4
10		3
11		5
12		2
13		4
14		4
15		4
16		4
17		4
18		3
19		4
20		5
21		4
22		5
Total		80

Equipment

1. A black ink ball-point pen.
2. A pencil.
3. An eraser.
4. A ruler.
5. A pair of compasses.
6. A protractor.

Guidance

1. Read each question carefully.
2. Don't spend too long on one question.
3. Attempt every question.
4. Check your answers seem right.
5. Always show your workings

Information

1. Time: 1 hour 30 minutes
2. The maximum mark for this paper is 80.
3. The marks for questions are shown in brackets
4. You may use tracing paper.

1. A shop sells umbrellas.

The scatter graph shows information about the number of umbrellas sold each week and the rainfall that week, in millimetres.

Umbrellas sold (vertical axis)

Rainfall (millimetres) (horizontal axis)
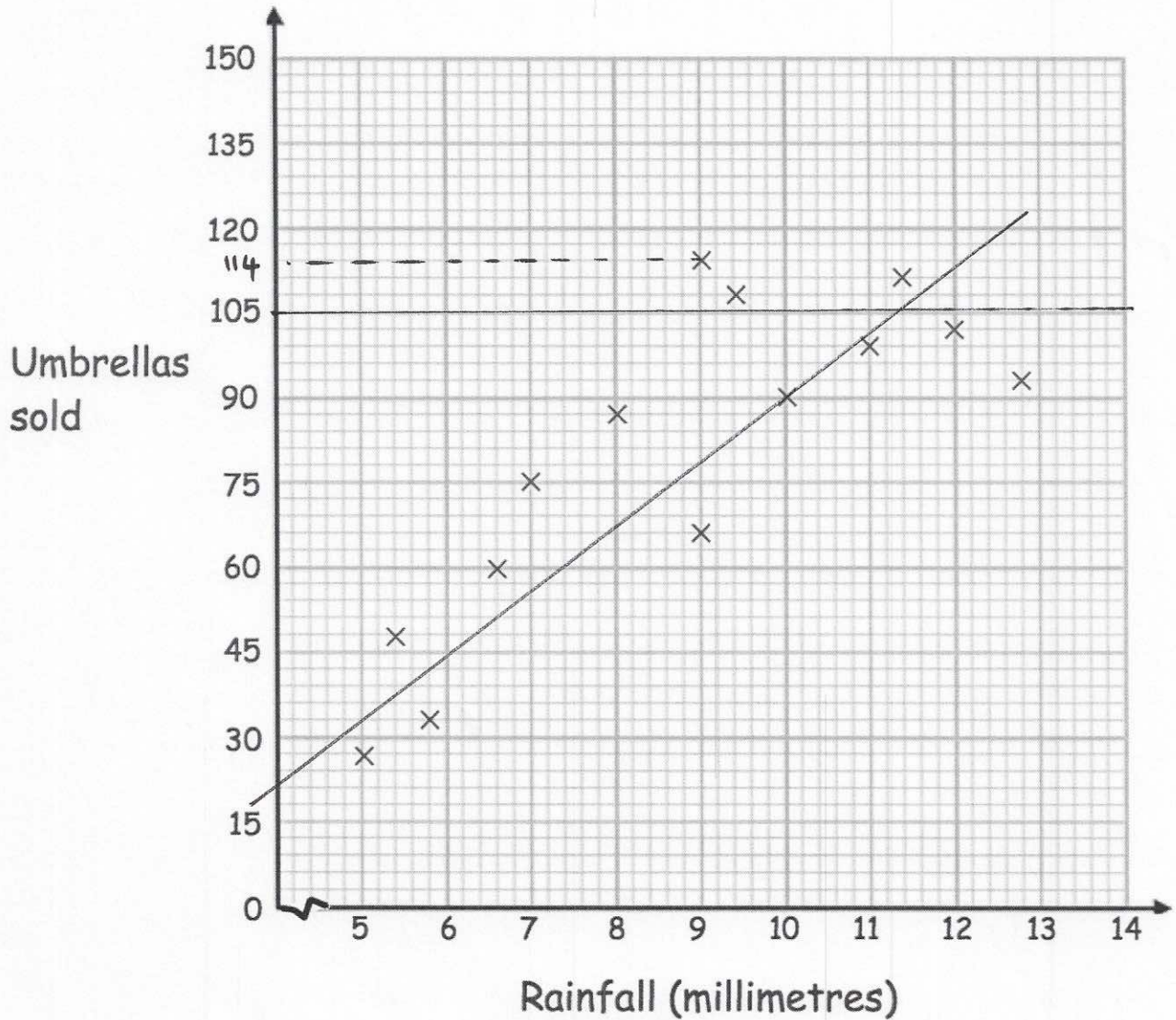
(a) Describe the relationship between the rainfall and umbrellas sold.

......positive correlation......

As the rainfall increases, the number of umbrellas sold increases

(1)

(b) What is the most number of umbrellas sold in one week?

......114......

(1)

(c) In how many weeks did the shop sell over 105 umbrellas?

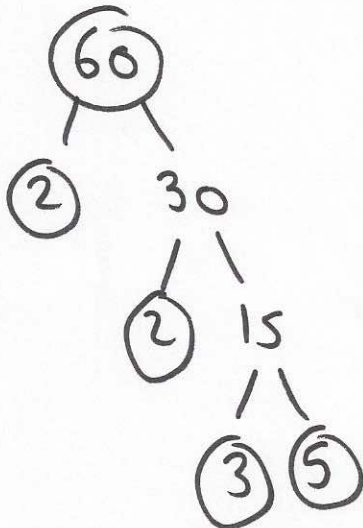...3...
(1)

In another week, there was 6mm of rain.

(d) Estimate the number of umbrellas sold.

~45
(1)

(e) Explain why it may **not** be appropriate to use your line of best fit to estimate the number of umbrellas sold in a week with 25mm of rainfall.

The graph doesn't show any data for more than 14mm of rainfall
(1)

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2. Write 60 as a product of its prime factors.

$$2 \times 2 \times 3 \times 5$$
$$= 2^2 \times 3 \times 5$$
(2)

3. Work out $412.8 \div 2.4$ $= 4128 \div 24$

$$24 \overline{)41^{17}2^{\cdot}8}^{172}$$

172

(3)

4. A rectangle is shown below.

x + 9

x - 1
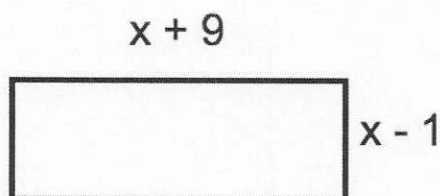
The length of the rectangle is x + 9 cm.
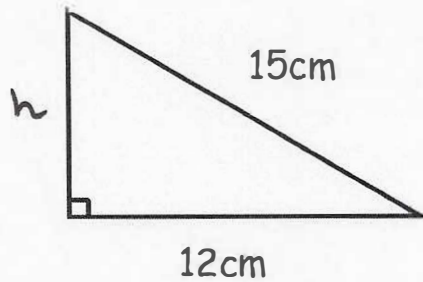The width of the rectangle is x - 1 cm.

Form an expression for the area of the rectangle.

$area = (x+9)(x-1) = x^2 - x + 9x - 9$

$= x^2 + 8x - 9$

(3)

5.

15cm

h

12cm

Shown is a right-angled triangle.
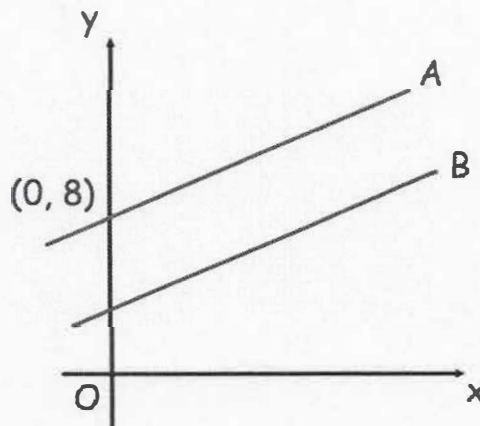
Work out the area of the triangle

$$h^2 = 15^2 - 12^2 = 225 - 144 = 81$$

$$h = \sqrt{81} = 9 \text{ cm}$$

$$\text{area} = {}^1/_2 \, (9 \times 12) = 54 \text{cm}^2$$

(4)

6.

Y

A

B

(0, 8)

O

x

The lines A and B are parallel.

The line A passes through the point (0, 8)
The line B has equation $y = 3x + 1$

Write down the equation of line A

gradient = 3
y - intercept = 8

$$y = 3x + 8$$

(2)

7. 10 girls and 15 boys sit a test.

The mean mark for the boys is 70.
The mean mark for the girls is 82.

Work out the mean mark for the whole class.

boys' total = 70×15 = 1050
girls' total = 82×10 = 820
_____
total = 1870

mean = $\dfrac{1870}{25}$ =

$$\begin{array}{r} 74.8 \\ 25\overline{)1870.^{12}0^{20}0} \end{array}$$

74.8
....
(3)

8. Jacob buys a watch costing £84
This cost includes VAT at a rate of 20%.

How much is the watch without VAT?

original $\dfrac{\times 1.2}{\longrightarrow}$ = 84

∴ original price = $84 \div 1.2$ = 70

£ 70
....
(3)

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9. (a) Express $\sqrt{75}$ in its simplest form

$$\sqrt{25} \times \sqrt{3}$$

.....$5\sqrt{3}$.....

(1)

(b) Arrange the following numbers in order, smallest to largest

$5\sqrt{3}$ $3\sqrt{10}$ $2\sqrt{22}$ $4\sqrt{5}$

$\sqrt{75}$ $\sqrt{90}$ $\sqrt{88}$ $\sqrt{80}$

.....$5\sqrt{3}$, $4\sqrt{5}$, $2\sqrt{22}$, $3\sqrt{10}$.....

(3)

10. Expand and simplify $(1 - 2x)(x + 3)(x - 1)$

$$(1-2x)(x+3) = x + 3 - 2x^2 - 6x$$
$$= 3 - 2x^2 - 5x$$

$$(3 - 2x^2 - 5x)(x - 1) = 3x - 3 - 2x^3 + 2x^2 - 5x^2 + 5x$$
$$= 8x - 3x^2 - 2x^3 - 3$$

or

$$-2x^3 - 3x^2 + 8x - 3$$

(3)

11.

(a) Find the value of $100^{\frac{1}{2}}$

$\sqrt{100}$

10

(1)

(b) Find the value of $4^{-\frac{5}{2}}$

$\dfrac{1}{\sqrt{4}}^5 = \dfrac{1}{2^5}$

$\dfrac{1}{32}$

(2)

(c) Simplify $(27x^6)^{\frac{2}{3}}$

$27^{2/3} = 3^2 = 9$

$(x^6)^{2/3} = x^{12/3} = x^4$

$9x^4$

(2)

12. The graph of y = f(x) is shown on the grid
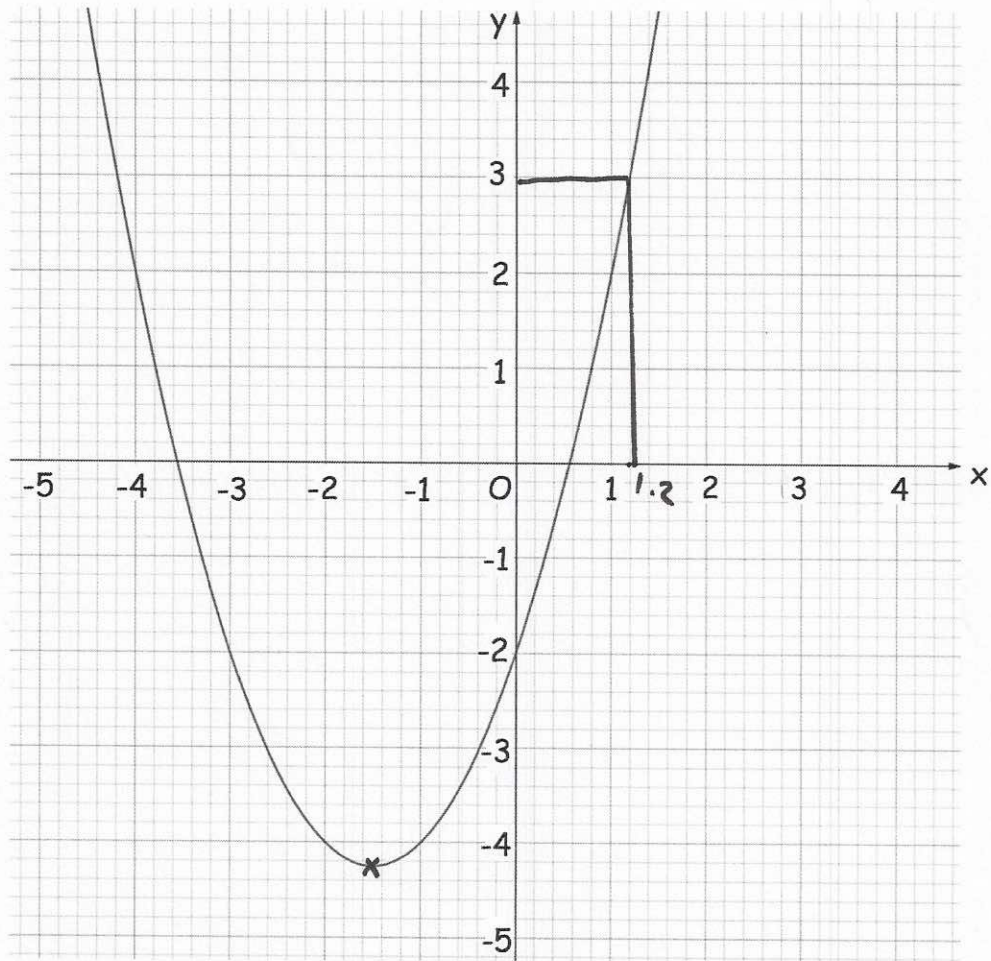
(a) Write down an estimate for the coordinates of the turning point of the graph

(-1.5, -4.2)
(1)

(b) Use your graph to find the value of f(1.2)

3
(1)

13. The force, F newtons, exerted by a magnet on a metal object is inversely proportional to the square of the distance d cm.

When d = 2 cm, F = 50 N.

(a) Express F in terms of d.

$$F \alpha \frac{1}{d^2} \Rightarrow F = \frac{k}{d^2} \quad 50 = \frac{k}{2^2} \Rightarrow k = 200$$

F = $\frac{200}{d^2}$

(3)

(b) Find the force when the distance between the magnet and metal object is 10cm

$$F = \frac{200}{10^2} = 2$$

F = 2 N

(1)

14. The cost of a mobile phone is x pounds
The cost of a television is y pounds

When both prices are increased by £40, the ratio for the cost of the mobile phone to the cost of the television is 15:22

When both prices are decreased by £100, the ratio for the cost of the mobile phone to the cost of the television is 8:15

Find the values of x and y

$$\frac{x+40}{y+40} = \frac{15}{22} \qquad \frac{x-100}{y-100} = \frac{8}{15}$$

$$22x + 880 = 15y + 600 \qquad 15x - 1500 = 8y - 800$$

$$22x - 15y = -280 \qquad 15x - 8y = 700$$

$$\times 8 \qquad\qquad \times 15$$

$$176x - 120y = -2240 \qquad 225x - 120y = 10500$$
$$\textcircled{1} \qquad\qquad\qquad \textcircled{2}$$

$\textcircled{2} - \textcircled{1}$ gives

$$49x = 12740$$
$$x = 260$$

hence

$$15 \times 260 - 8y = 700$$
$$8y = 3900 - 700$$
$$y = 400$$

x = £ 260
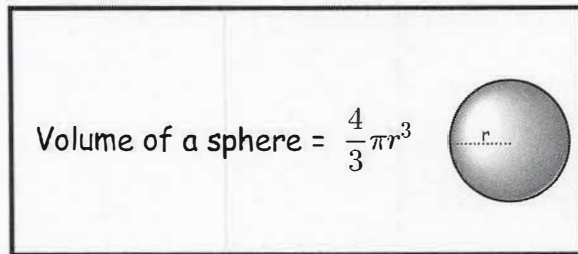
y = £ 400

(4)

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15. A solid wooden sphere has radius of 5.97cm

(a) Work out an estimate for the volume of the sphere
Give your answer in terms of π

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

$r \simeq 6cm$

$V = \frac{4}{3}\pi \times 6^3 = \frac{4 \times 216 \pi}{3}$

288π ....cm³

(2)

The sphere has a mass of 1002g

Richard wants to work out the density of the wood.
In his calculations, he uses a radius of 6cm and a mass of 1000g

(b) Is his answer an over-estimate or an under-estimate of the actual density?
Explain why

density = $\frac{Mass}{Volume}$

his approximation for mass is an underestimate
his approximation for volume is an overestimate

$\frac{underestimate}{overestimate}$ = underestimate

(2)

16. Prove algebraically that

$$(4n + 1)^2 - (2n - 1) \text{ is an even number}$$

for all positive integer values of n.

$$(4n+1)^2 - (2n-1)$$

$$= 16n^2 + 8n + 1 - 2n + 1$$

$$= 16n^2 + 6n + 2$$

$$= 2(8n^2 + 3n + 1) \text{ which is a multiple of 2}$$

$$\text{so clearly even}$$

(4)

17. Samantha has 10 black socks, 8 white socks and 2 blue socks.
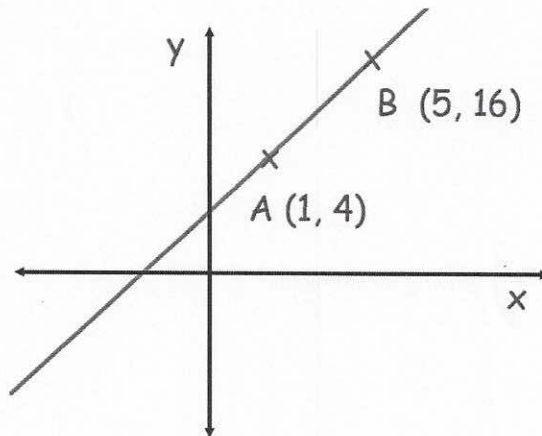She picks two socks at random, without replacement.

Calculate the probability she chooses two socks of the same colour.

$$P(\text{black, black}) = \frac{10}{20} \times \frac{9}{19} = \frac{90}{380}$$

$$P(\text{white, white}) = \frac{8}{20} \times \frac{7}{19} = \frac{56}{380}$$

$$P(\text{blue, blue}) = \frac{2}{20} \times \frac{1}{19} = \frac{2}{380}$$

$$= \frac{148}{380}$$

(4)

18. A straight line passes through the points A(1, 4) and B(5, 16).

Find the equation of the line perpendicular to AB that passes through the midpoint of AB.

gradient AB $= \dfrac{16-4}{5-1} = \dfrac{12}{4} = 3$

$\therefore$ perpendicular gradient $= \dfrac{-1}{3}$

midpoint of AB $= \left(\dfrac{5+1}{2}, \dfrac{16+4}{2} \right) = (3, 10)$
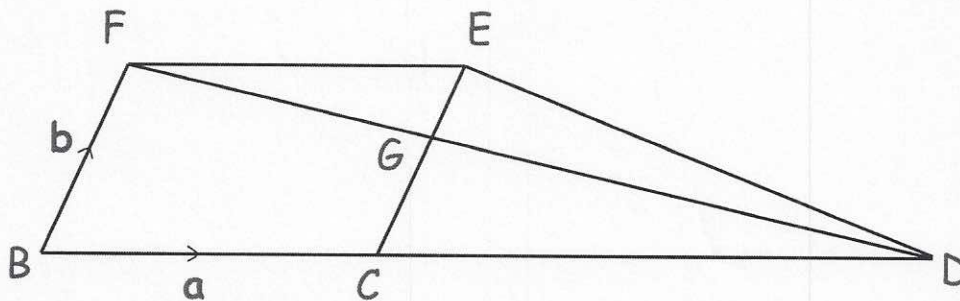
$y = -\dfrac{1}{3}x + c$

$10 = -\dfrac{1}{3} \times 3 + c$

$c = 11$

$y = -\dfrac{1}{3}x + 11$

(3)

19. BCEF is a parallelogram.
The point C is a point on the line BCD such that BC : CD = 4 : 7
FD and CE meet at the point G.

$$\overrightarrow{BC} = \mathbf{a} \qquad \overrightarrow{BF} = \mathbf{b}$$

Work out $\overrightarrow{GD}$ in terms of **a** and **b**
Give your answer in its simplest form.

$$\overrightarrow{CD} = \tfrac{7}{4}\,\underset{\sim}{a} \qquad \therefore \overrightarrow{BD} = \tfrac{11}{4}\,\underset{\sim}{a}$$

$$\therefore \overrightarrow{FD} = \overrightarrow{FB} + \overrightarrow{BD} = \tfrac{11}{4}\,\underset{\sim}{a} - \underset{\sim}{b}$$

$$\overrightarrow{GD} = \tfrac{7}{11}\overrightarrow{FD} = \tfrac{7}{11}\left(\tfrac{11}{4}\,\underset{\sim}{a} - \underset{\sim}{b}\right)$$

$$= \underline{\underline{\tfrac{7}{4}\,\underset{\sim}{a} - \tfrac{7}{11}\,\underset{\sim}{b}}}$$

(4)

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20. Solve the simultaneous equations

$$x^2 + y^2 = 1$$
$$x + 2y = 1$$

$$x = 1 - 2y$$

substituting gives

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

$$1 - 4y + 4y^2 + y^2 = 1$$

$$5y^2 - 4y = 0$$

$$y(5y - 4) = 0$$

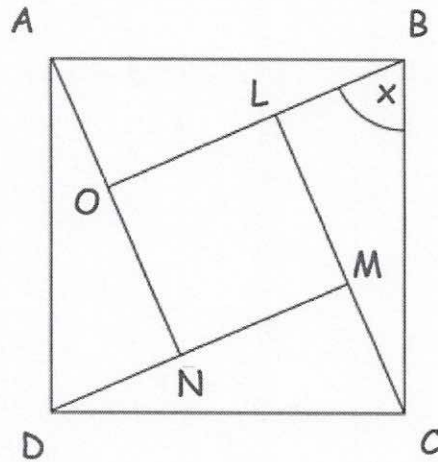$$y = 0 \text{ or } y = \frac{4}{5}$$

if $y = 0$ $x = 1$

if $y = \frac{4}{5}$ $x = 1 - 2 \times \frac{4}{5} = \frac{-3}{5}$

$$x = 1 \quad y = 0$$
$$x = -\frac{3}{5} \quad y = \frac{4}{5}$$

(5)

21. ABCD and LMNO are squares.
Angle CBL = x

Prove that triangles ABO and CBL are congruent.

angle $BCL = 90 - x$ (since BCD is a right angle)
also
angle $ABO = 90 - x$ (since ABC is a right angle)

So $B\hat{C}L = A\hat{B}O$ *

Also $B\hat{A}O = 130 - 90 - (90 - x) = x$

So $C\hat{B}L = B\hat{A}O$ $(= x)$ *

$BC = AB$ (since ABCD is a square)

(4)

∴ triangles ABO & CBL are congruent ASA.

22. The diagram shows a kite ABCD.
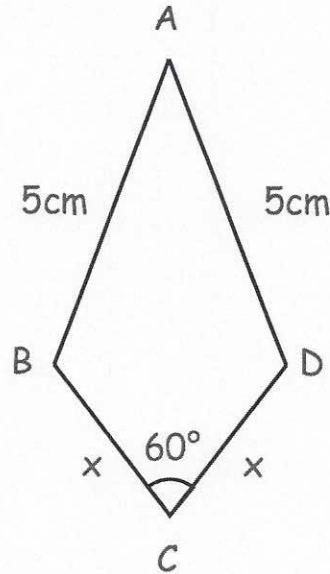
Given that BC = CD = x cm
AB = AD = 5cm
angle BCD = 60°

Prove $CosBAD = 1 - \dfrac{x^2}{50}$

$\triangle BCD$ is equilateral, so $BD = x$

using the cosine rule in triangle ABD:

$Cos\,BAD = \dfrac{5^2 + 5^2 - x^2}{2 \times 5 \times 5} = \dfrac{50 - x^2}{50}$

$= 1 - \dfrac{x^2}{50}$

(5)