

Name: _____

GCSE Maths 2022
Edexcel Higher Paper 3
Set A
Non-Calculator



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.

Answers

Guidance

1. Read each question carefully.
2. Check your answers seem right.
3. Always show your workings

Information

1. This paper has been created based on topics in the Advance Information.
2. Also see Corbettmaths for the checklist for the entire GCSE as these topics may still be useful for Paper 3
3. There is one question per topic - this paper is designed to give an opportunity to practice each topic rather than replicate the actual paper.
4. The marks for questions are shown in brackets

GCSE 2022 Resources



1. (a) $y^4 \times y^n = 1$

Work out the value of n

$$y^4 \times y^{-4} = y^0$$

$$y^0 = 1$$

$$\begin{array}{r} -4 \\ \hline \end{array}$$

(1)

(b) Simplify fully $\frac{a^8}{a^3 \times a^{-9}}$

$$\frac{a^8}{a^{-6}}$$

$$\begin{array}{r} 14 \\ a \\ \hline \end{array}$$

(2)

2. Harriet travelled from Bath to Cardiff.
Her average speed was 58 miles per hour.

There is traffic on the return journey.

Her average speed is reduced by 23%

$$\text{multiplier} = 0.77$$

Work out the average speed on the return journey.

$$58 \times 0.77$$

$$\begin{array}{r} 44.66 \\ \hline \end{array} \text{mph}$$

(3)

3. Susan buys an antique for £120 and sells it for £216.

Work out her percentage profit

$$\frac{96}{120} \times 100$$

.....80%
(3)

4. Natalie invests £600 for 5 years at 3% per year compound interest.
How much interest does she earn?

$$600 \times 1.03^5 = £695.56 \quad \text{or} \quad 695.57$$

$$695.56 - 600 = 95.56$$

£ 95.56 or 95.57
(2)

5. Lauren is given a 12% pay rise.
Her new salary is £24,080

What was Lauren's salary before the pay rise?

$$112\% \text{ of } y = 24080$$

$$1\% \text{ of } y = 215$$

$$100\% \text{ of } y = 21500$$

£ 21500
(3)

2.165

$$x = 2.1656565 \dots$$

$$10x = 21.6565 \dots$$

$$1000x = 2165.6565 \dots$$

$$9902 = 2144$$

$$x = \frac{2144}{990}$$

$$\begin{array}{r} 1072 \\ \hline 495 \end{array}$$

$$\begin{array}{r} 82 \\ 2 \overline{) 495} \end{array}$$

7. Jim is making green paint by mixing blue paint and yellow paint in the ratio 8:3

(a) Write the ratio of blue paint to yellow paint in the form 1:n

$$\div 8 \quad \begin{matrix} 8:3 \\ \downarrow \div 8 \end{matrix}$$

$$\frac{1}{3} = 0.375$$

Jim has 120 litres of blue paint and 31.5 litres of yellow paint.

(b) What is the maximum amount of green paint he can make?

$$120 \div 8 = 15$$

$15 \times 3 = 45$ yellow. (not enough)

$$31.5 \div 3 = 10.5$$

$$10.5 \times 8 = 84 \text{ blue } \checkmark$$

$$84 + 31.5$$

115.5 litres
(3)

8. The table shows a set of values for x and y .
 y is directly proportional to the square root of x .

| | | |
|-----|----|-----|
| x | 25 | 400 |
| y | 9 | 36 |

Complete the table

$$y \propto \sqrt{x}$$

$$y = k\sqrt{x}$$

$$9 = k \times \sqrt{25}$$

$$9 = k \times 5$$

$$k = 1.8$$

$$y = 1.8 \sqrt{x}$$

$$36 = 1.8 \sqrt{x}$$

$$20 = \sqrt{x}$$

$$x = 400$$

(3)

9. It takes 6 hours for 20 workers to seed 40 acres.

How long would it take 15 people to seed 25 acres?

120 hours for 1 worker to seed 40 acres
 3 hours for 1 worker to seed 1 acre
 75 hours for 1 worker to seed 25 acres
 5 hours for 15 workers to seed 25 acres

5 hours

(2)

10. Anthony measured the length and width of a rectangle. 37.5×38.5
 He measured the length to be 38cm correct to the nearest centimetre.
 He measured the width to be 30cm correct to the nearest 10 centimetres.

$$25\text{cm} \times 35\text{cm}$$

Calculate the lower bound for the area of this rectangle.

$$37.5 \times 25 = 937.5$$

$$\begin{array}{r} 937.5 \\ \hline \end{array} \text{cm}^2$$

(2)

11. Jim picks a five digit odd number.
 The second digit is less than 5.
 The fourth digit is a positive cube number
 The first digit is a prime number.

How many different numbers could he pick?

| | | | | |
|-----------------|-----------------|-----------------|-----------------|-----------------|
| 1 st | 2 nd | 3 rd | 4 th | 5 th |
| 2, 3, 5, 7 | 0, 1, 2, 3, 4 | | 1, 8 | 1, 3, 5, 7, 9 |

$$4 \times 5 \times 10 \times 2 \times 5$$

$$\begin{array}{r} 2000 \\ \hline \end{array}$$

(3)

12. Ballymena Rovers started a football season on -14 points

Each win is worth 5 points.

Each draw is worth 1 point

Each loss is worth -2 points.

Over the season, Ballymena Rovers won 15 matches, drew 3 matches & lost 7.

How many points did they finish with at the end of the season?

$$15 \times 5 = 75$$

$$3 \times 1 = 3$$

$$7 \times -2 = -14$$

$$-14 + 75 + 3 - 14$$

$$\begin{array}{r} 50 \\ \hline \end{array} \quad (2)$$

13. Expand and simplify $y(3y - 1) + (y + 4)(1 - y)$

$$3y^2 - y + (y - y^2 + 4 - 4y)$$

$$3y^2 - y + y - y^2 + 4 - 4y$$

$$2y^2 - 4y + 4$$

$$\begin{array}{r} \hline \end{array} \quad (2)$$

14. Expand and simplify $(x - 7)^2$

$$(x - 7)(x - 7)$$

$$x^2 - 14x + 49$$

$$\begin{array}{r} x^2 - 14x + 49 \\ \hline \end{array} \quad (2)$$

15. Factorise $81 - 4y^2$

$$(9 - 2y)(9 + 2y)$$

$$\frac{(9 - 2y)(9 + 2y)}{(2)}$$

16. Simplify fully

$$\frac{x^3 - x}{x + 2} \div \frac{x^2 - x}{x^2 - 5x - 14}$$

$$\frac{x^3 - x}{x + 2} \times \frac{x^2 - 5x - 14}{x^2 - x}$$

$$\frac{x(x^2 - 1)}{x + 2} \times \frac{(x - 7)(x + 2)}{x(x - 1)}$$

$$\frac{\cancel{x}(x - 1)(x + 1)(x - 7)(\cancel{x + 2})}{\cancel{x}(x - 1)(x + \cancel{2})}$$

$$\frac{(x + 1)(x - 7)}{(3)}$$

17. Given that $a = 4$, $b = 9$ and $c = -5$

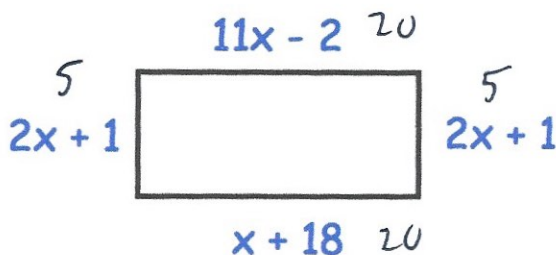
Work out the value of

$$\frac{ab + 24}{2c}$$

$$\frac{36 + 24}{-10} = \frac{60}{-10}$$

$$\frac{-6}{(3)}$$

18. Shown below is a rectangle.
The expressions for the lengths and widths are in centimetres.



Find the perimeter of the rectangle.

$$11x - 2 = x + 18$$

$$10x = 20$$

$$x = 2$$

$$20 + 5 + 20 + 5$$

$$50 \text{ cm}$$

(4)

19. Make w the subject of the formula

$$g = \frac{w}{w - 5}$$

$$g(w - 5) = w$$

$$gw - 5g = w$$

$$gw - w = 5g$$

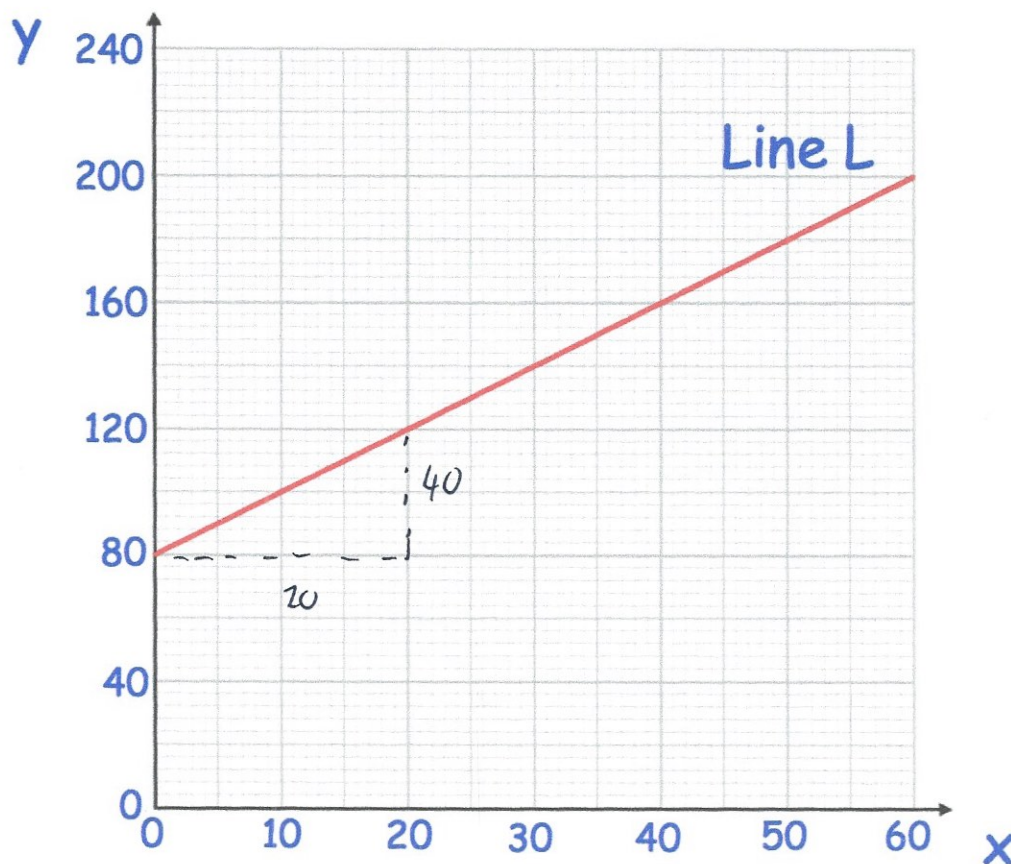
$$w(g - 1) = 5g$$

$$w = \frac{5g}{g - 1}$$

$$w = \frac{5g}{g - 1}$$

(3)

20.



(a) Work out the gradient of Line L.

$$\frac{40}{20} = 2$$

$$\frac{2}{(2)}$$

(b) Work out the equation of Line L.

$$y = 2x + 80$$

(2)

21. Solve the simultaneous equations

$$x^2 + y^2 = 25$$

$$x + y = 7$$

$$x = 7 - y$$

$$(7 - y)^2 + y^2 = 25$$

$$49 - 14y + y^2 + y^2 = 25$$

$$2y^2 - 14y + 24 = 0$$

$$y^2 - 7y + 12 = 0$$

$$(y - 3)(y - 4) = 0$$

$$y = 3 \quad \text{or} \quad y = 4$$

$$x = 4 \quad \quad \quad x = 3$$

22. (a) Show that the equation $20 - x^3 - 7x^2 = 0$ can be rearranged to give

$$x = \frac{20}{x^2} - 7$$

$$20 - x^3 - 7x^2 = 0$$

$$20 - 7x^2 = x^3$$

$$\frac{20}{x^2} - 7 = x$$

(2)

- (b) Using $x_{n+1} = \frac{20}{x_n^2} - 7$ with $x_0 = -9$

find the values of x_1 , x_2 and x_3

$$x_1 = -6.753086419$$

$$x_2 = -6.561443673$$

$$x_3 = -6.535451368$$

(3)

- (b) Explain what the values of x_1 , x_2 and x_3 represent

Increasingly accurate approximations to a solution of
 $20 - x^3 - 7x^2 = 0$

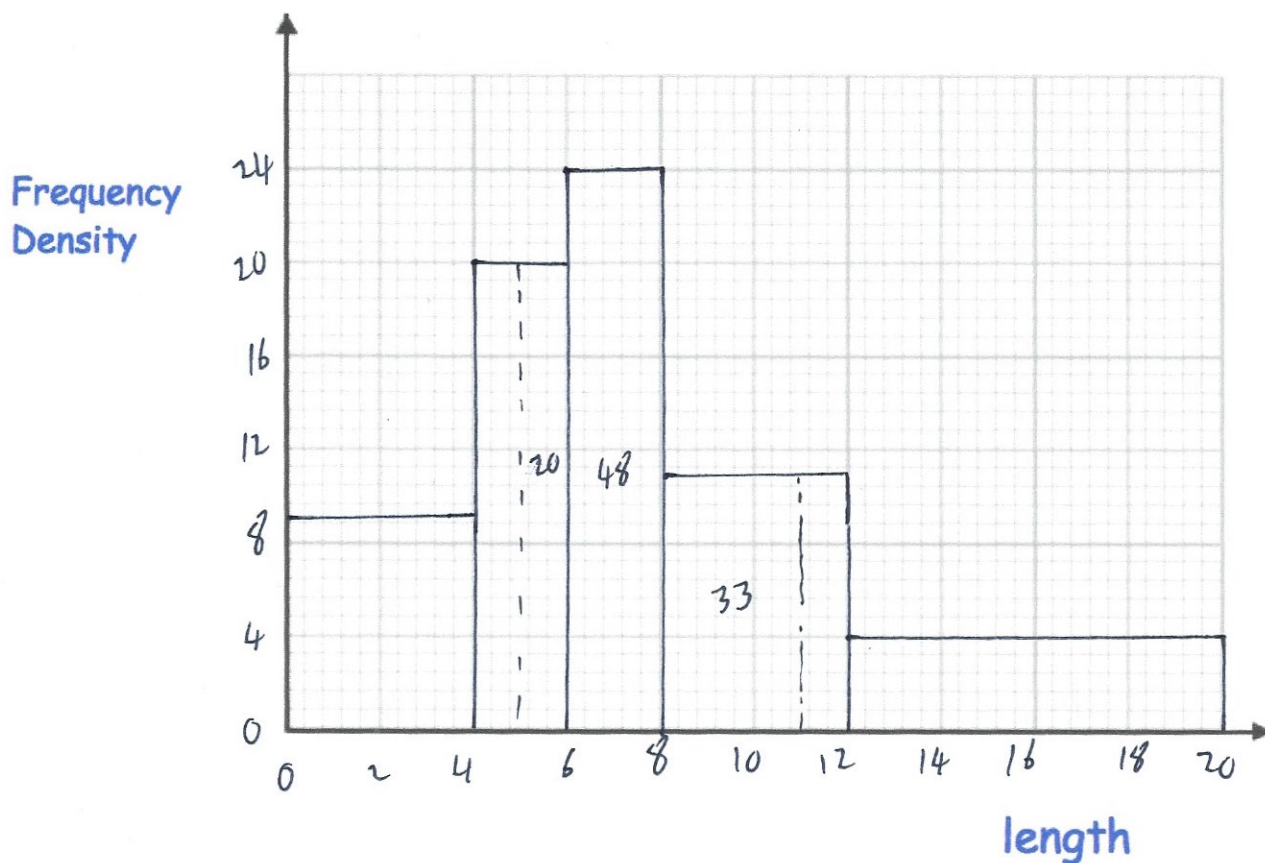
(2)

23. The lengths of 200 fish in a pond, l centimetres, are recorded below.

| Length, l | Frequency |
|------------------|-----------|
| $0 < l \leq 4$ | 36 |
| $4 < l \leq 6$ | 40 |
| $6 < l \leq 8$ | 48 |
| $8 < l \leq 12$ | 44 |
| $12 < l \leq 20$ | 32 |

$$\begin{aligned}
 f & l \\
 36 \div 4 & = 9 \\
 40 \div 2 & = 20 \\
 48 \div 2 & = 24 \\
 44 \div 4 & = 11 \\
 32 \div 8 & = 4
 \end{aligned}$$

- (a) Draw a histogram for this data.



(3)

- (b) Work out an estimate for the fraction of the fish that have a length between 5cm and 11cm.

$$20 + 48 + 33 = 101$$

$$\begin{array}{r}
 101 \\
 \hline
 200 \\
 \hline
 \end{array}$$

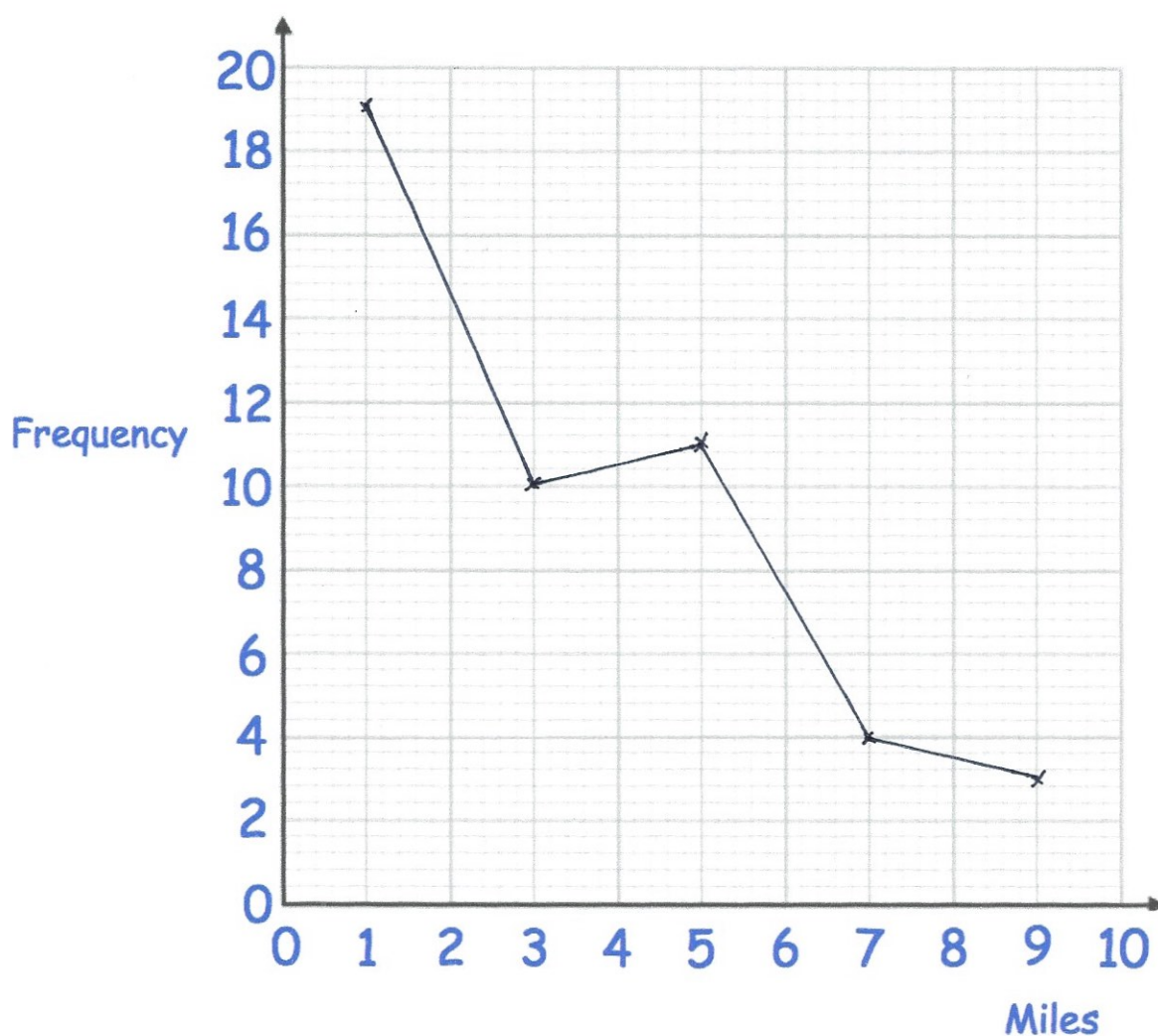
(2)

24. The table shows the distance travelled to school by 47 students.

| Distance (miles) | Frequency |
|------------------|-----------|
| $0 < d \leq 2$ | 19 |
| $2 < d \leq 4$ | 10 |
| $4 < d \leq 6$ | 11 |
| $6 < d \leq 8$ | 4 |
| $8 < d \leq 10$ | 3 |

- (a) Draw a frequency polygon to represent this data.

(2)



One student is chosen at random.

- (b) Work out the probability that this student travels more than 6 miles to school.

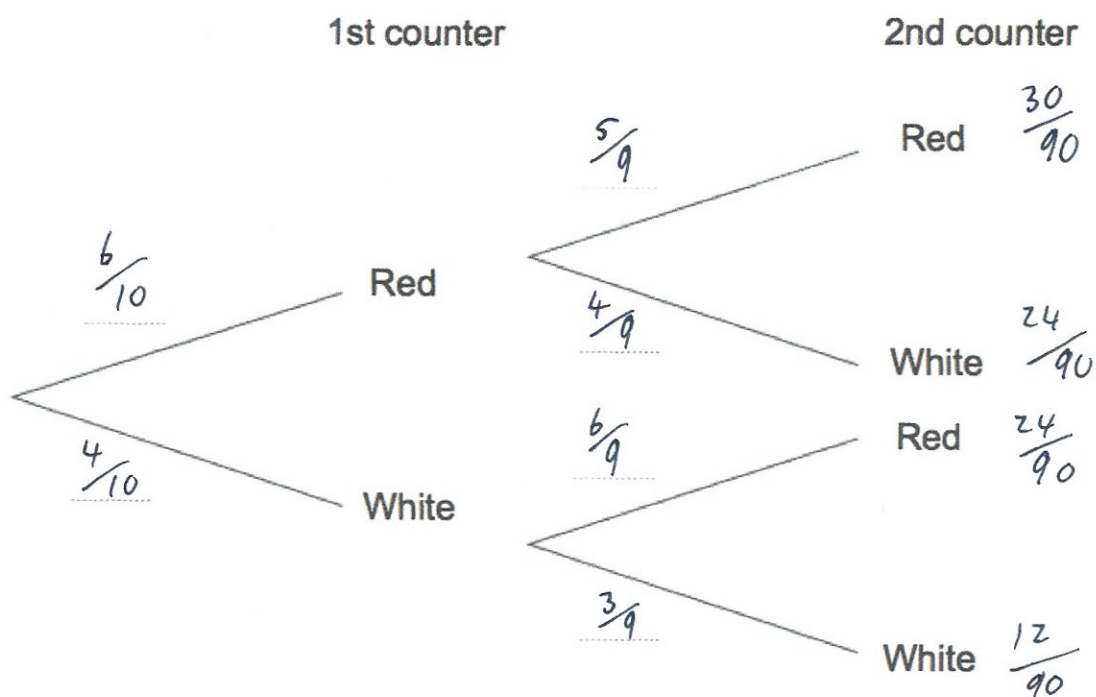
$$\frac{7}{47}$$

(1)

25. George has a bag of marbles.
There are 6 red and 4 white marbles.

George takes out a marble at random and records its colour.
Without replacement, George takes out another marble, at random.

- (a) Complete the probability tree diagram.



(2)

- (b) Find the probability that the two marbles are the same colour.

$$\left. \begin{aligned} P(WW) &= \frac{12}{90} \\ P(RR) &= \frac{30}{90} \end{aligned} \right\} \frac{42}{90}$$

$$\frac{7}{15}$$

(3)

26. A bag contains discs, each with a letter written on it.

M A T H E M A T I C S

One disc is taken at random from the bag.

The disc is not replaced.

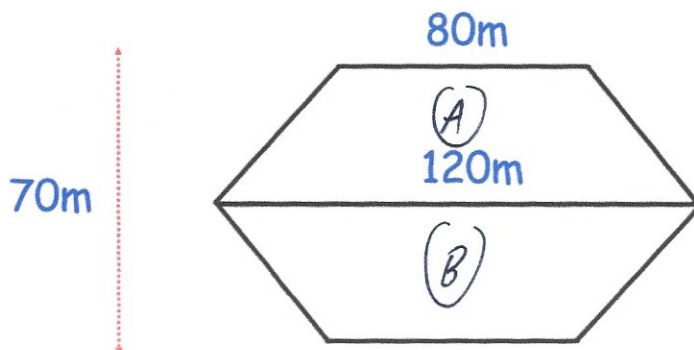
Another disc is taken at random from the bag.

Calculate the probability that exactly one M is taken from the bag.

$$\left. \begin{aligned} P(M, \text{Not } M) &= \frac{2}{11} \times \frac{9}{10} = \frac{18}{110} \\ P(\text{Not } M, M) &= \frac{9}{11} \times \frac{2}{10} = \frac{18}{110} \end{aligned} \right\} \frac{36}{110}$$

$$\begin{array}{r} 18 \\ \hline 55 \\ \hline \end{array} \quad \dots\dots\dots (5)$$

27. A farmer owns two identical fields.
Each field is a trapezium



The farmer is going to plant a crop.

Each 8 kilogram bag of seed costs £19.99

60g of seed covers an area of 1m^2

The farmer has ~~£1000~~¹⁰⁰⁰ to spend on seed.

Has the farmer got enough money to buy all the seed he needs to cover both fields?

$$\text{Area of A} : \frac{1}{2}(80 + 120) \times 35$$

$$= 3500\text{m}^2$$

$$\text{Area of A \& B} : 7000\text{m}^2$$

$$60\text{g} \times 7000 = 420000\text{g} \text{ of seed for both fields}$$

$$= 420\text{kg}$$

$$420 \div 8 = 52.5 \text{ bags}$$

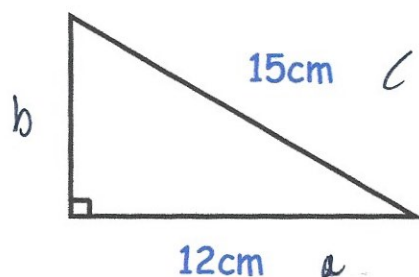
$$\underline{53 \text{ bags}}$$

$$53 \times £19.99 = £1059.47$$

(5)

No, he doesn't

28.



Shown is a right-angled triangle.

Work out the area of the triangle

$$a^2 + b^2 = c^2$$

$$12^2 + b^2 = 15^2$$

$$144 + b^2 = 225$$

$$b^2 = 81$$

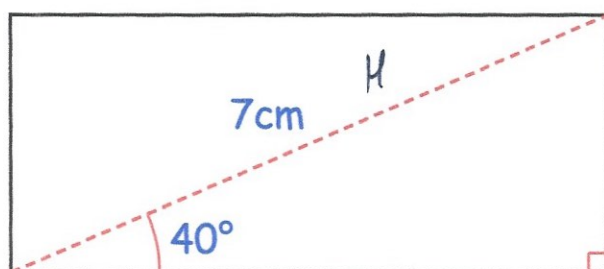
$$b = 9$$

$$\frac{1}{2} \times 9 \times 12 = 54 \text{ cm}^2$$

$$54 \text{ cm}^2$$

(4)

29.



$$4.499513268...$$

Work out the area of the rectangle

$$A \quad 5.362311102$$

$$\sin 40^\circ$$

$$\text{Opp} = \sin(40) \times 7$$

$$= 4.49951...$$

$$\cos 40^\circ$$

$$\text{Adj} = \cos(40) \times 7$$

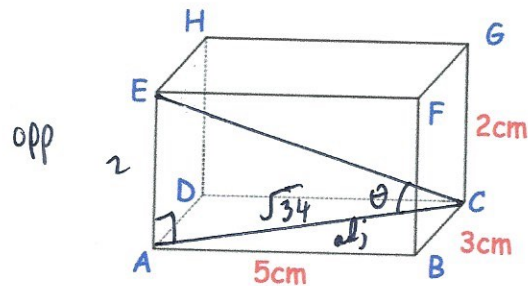
$$= 5.362311102$$

$$24.128 \text{ cm}^2$$

(4)

$$4.49951... \times 5.362311102$$

30. Shown below is a cuboid



Calculate the size of angle ACE.

$$\begin{aligned} AC^2 &= 5^2 + 3^2 \\ &= 25 + 9 \\ &= 34 \end{aligned}$$

$$AC = \sqrt{34}$$

$$\tan \theta = \frac{2}{\sqrt{34}}$$

$$\theta = 18.93$$

18.93

(4)

31. The flight from Perth to London is 16 hours and 35 minutes.
The time in Perth is 7 hours ahead of London.
A flight leaves Perth at 8am on Wednesday.
What is the time in London when the flight arrives?

flight departs at 1am London time (GMT)

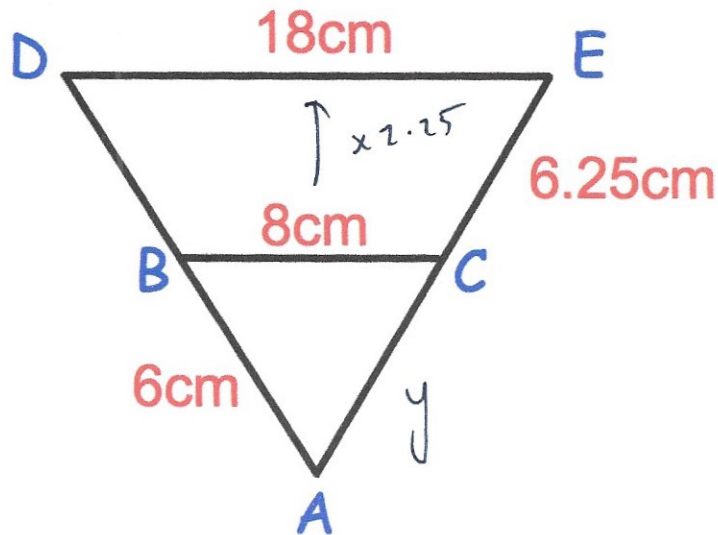
1am $\xrightarrow{16\text{hrs } 35\text{ mins}}$ 17:35

17:35 Wed.

(3)

32.

Not drawn accurately



Triangle ABC is similar to triangle ADE .

$$AB = 6\text{cm}$$

$$BC = 8\text{cm}$$

$$CE = 6.25\text{cm}$$

$$DE = 18\text{cm}$$

$$18 \div 8 = 2.25$$

(a) Work out the length of DB .

$$6 \times 2.25 = 13.5$$

$$13.5 - 6$$

$$\begin{array}{r} 7.5 \\ \hline \end{array} \text{cm} \quad (2)$$

(b) Work out the length of AC .

$$y \times 2.25 = y + 6.25$$

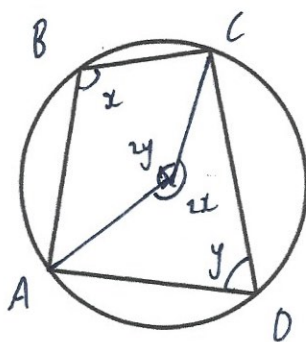
$$2.25y = y + 6.25$$

$$1.25y = 6.25$$

$$y = 5$$

$$\begin{array}{r} 5 \\ \hline \end{array} \text{cm} \quad (2)$$

33.



Prove the opposite angles in a cyclic quadrilateral add to 180°

$$\text{Let } \angle ABC = x \text{ and } \angle ADC = y$$

$$\left. \begin{array}{l} \text{reflex } \angle AOC = 2x \\ \text{and } \angle AOC = 2y \end{array} \right\} \begin{array}{l} \text{since the angle at the centre is} \\ \text{twice the angle at the circumference.} \end{array}$$

$$\therefore 2x + 2y = 360 \quad (\text{angles at a point})$$

$$x + y = 180$$

$$\therefore \angle ABC + \angle ADC = 180$$

(3)

$$34. \quad \mathbf{c} = \begin{pmatrix} -2 \\ q \end{pmatrix} \quad \mathbf{d} = \begin{pmatrix} p \\ 3 \end{pmatrix}$$

$$6p + 2 = 26$$

$$18 - q = 22$$

$$\text{Given } 6\mathbf{d} - \mathbf{c} = \begin{pmatrix} 26 \\ 22 \end{pmatrix}$$

Work out the values of p and q.

$$p = 4$$

$$q = -4$$

$$p = \underline{\quad 4 \quad} \quad q = \underline{\quad -4 \quad}$$

(2)

35. Miss Black completes a journey in 3 stages.
 In stage 1, she drives at a speed of 40km/h for 45 minutes.
 In stage 2, she drives at 60 km/h for 2 hours 9 minutes.
 Altogether, over the 3 stages, Miss Black drives 171.6km in 3 hours 15 minutes

What is her average speed, in km/h, in stage 3?

$$s = \frac{d}{t}$$

stage 1

$$d = s \times t$$

$$= 40 \times 0.75$$

$$= 30 \text{ km}$$

stage 2

$$d = s \times t$$

$$= 60 \times 2.15$$

$$= 129 \text{ km}$$

$$\frac{9}{60} = 0.15$$

$$171.6 - 30 - 129 = 12.6 \text{ km}$$

$$\frac{36}{\dots\dots\dots} \text{ km/h}$$

(4)

time 3 hr 15 min - 2 hr 54 min

$$= 21 \text{ min}$$

$$\frac{21}{60} = 0.35$$

$$s = \frac{d}{t}$$

$$s = \frac{12.6}{0.35}$$

$$= 36$$