Dr Oliver Mathematics
AQA GCSE Mathematics
2020 June Paper 3: Calculator
1 hour 30 minutes

The total number of marks available is 80.
You must write down all the stages in your working.

1. What does (1)

$$A \cup B$$

represent in

$$\mathrm{P}(A \cup B)?$$

Circle your answer.

A or B or both A but not B not A and not B A and B

2. Circle the equation of the line that is parallel to (1)

$$y = \tfrac{1}{2}x + 3.$$

$y = -2x$ $y = 2x$ $y = \tfrac{1}{2}x$ $y = -\tfrac{1}{2}x$

3. Work out 320 as a percentage of 80. (1)
Circle your answer.

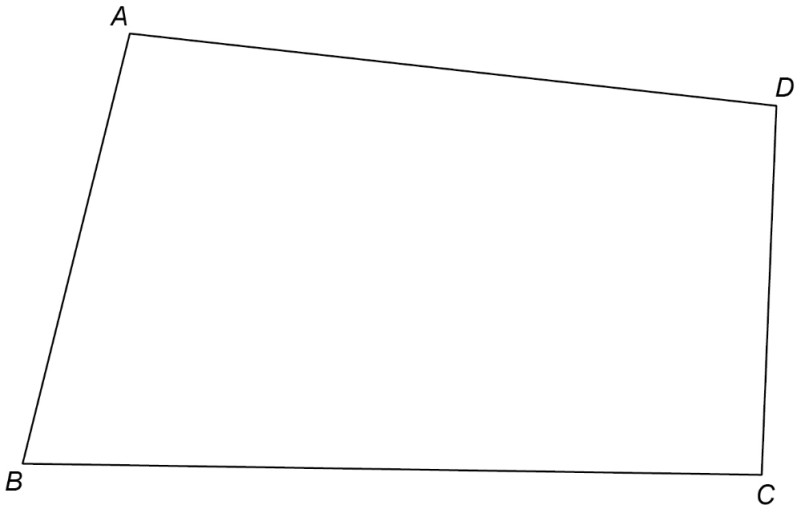
25% 75% 300% 400%

4. A fair coin is spun four times. (1)
Circle the probability of getting four Heads.

$\tfrac{1}{2}$ 2 $\tfrac{1}{8}$ $\tfrac{1}{16}$

5. To the nearest 1 000, there are 18 000 people at a festival.
   (a) Write down the minimum possible number of people at the festival. (1)
   (b) Write down the maximum possible number of people at the festival. (1)

6. $ABCD$ represents the plan of a field. (2)

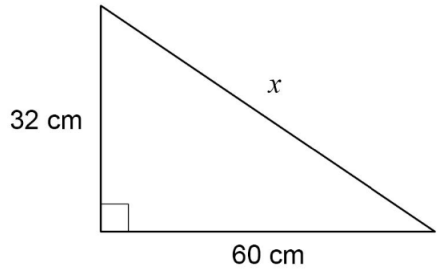


There is a path across the field that

- starts at B and
- is the same distance from BA and BC.

Using ruler and compasses, show the position of the path.

7. Use Pythagoras' theorem to work out the value of x. (3)



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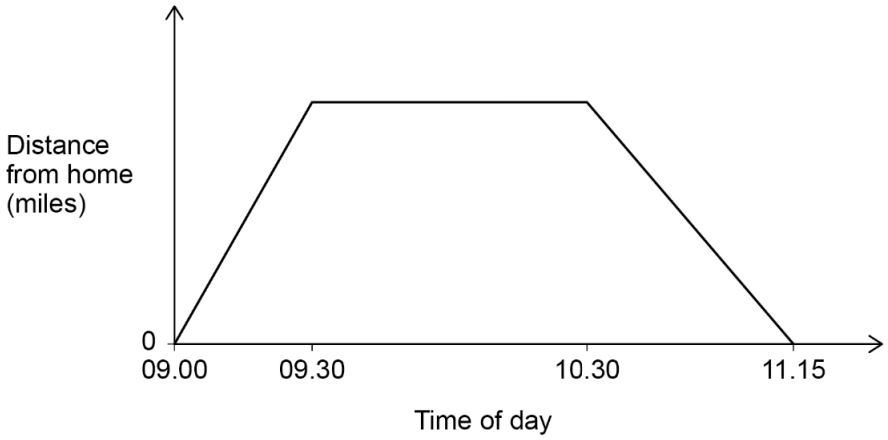
8. Chris visits a library. (3)

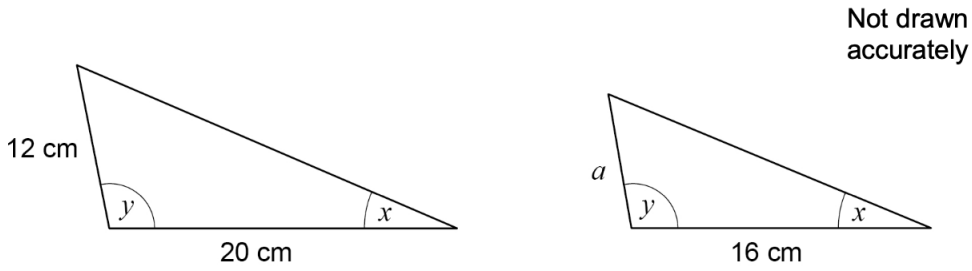
- He cycles to the library in half an hour at a speed of 12 miles per hour.
- He stays at the library for one hour.
- He then cycles home.

The sketch graph represents his visit.



Work out the speed, in miles per hour, at which Chris cycles home.

9. These two triangles are similar. (2)



Work out the value of a.

10. Expand and simplify fully (2)

$$4(2c + 3) - (5c - 1).$$

11. A spinner can land on red, blue, or green. (3)

After 350 spins,

- relative frequency of red = 0.18 and
- relative frequency of blue = 0.62.

Work out the number of times the spinner landed on green.

12. Here is some information about 26 houses. (3)
a, b, and c are all different numbers.

Number of bedrooms	Number of houses
1	7
2	a
3	b
4	c
5	8

The median number of bedrooms is 3.5.
Work out a possible set of values for a, b, and c.

13. (a) Simplify (2)

$$\frac{25a}{8} \times \frac{2a}{5}.$$

Give your answer as a single fraction in its simplest form.

(b) Sofia is trying to simplify (1)

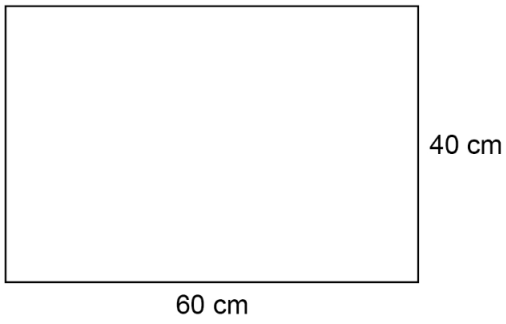
$$\frac{6c + 10}{2}.$$

Her method is

- divide $6c$ by 2 then
- then add 10.

Evaluate her method.

14. A rectangle has length 60 cm and width 40 cm. (4)



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- The length decreases by 15%.
- The width decreases by 10%.

Sue says, "The perimeter decreases by 25% because 15% + 10% is 25%."

Is she correct?
You **must** show calculations to support your answer.

15. Solve (2)

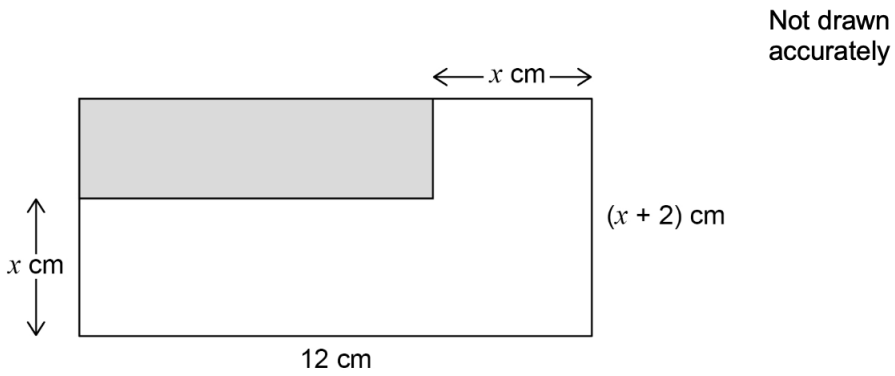
$$4 > 11 - \frac{x}{3}.$$

16. The number of goals scored by 20 players in a season is shown. (3)

Number of goals	Frequency	Midpoint
0 to 4	6	
5 to 9	11	
10 to 14	3	
	Total = 20	

Work out an estimate of the mean number of goals per player.
Give your answer as a decimal.

17. Here are two rectangles. (4)



The area of the shaded rectangle is $\frac{1}{4}$ the area of the large rectangle.

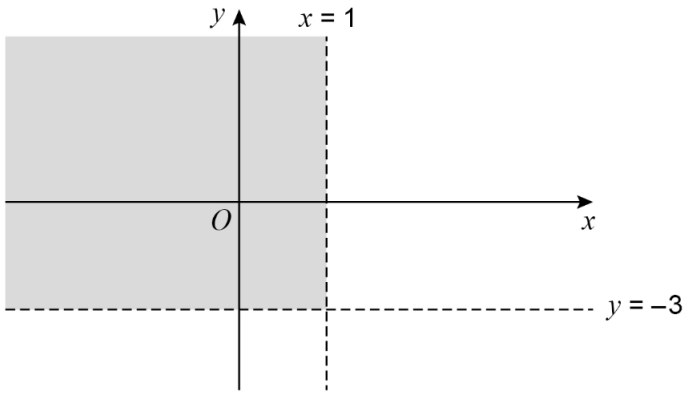
Work out the value of x.

18. The pressure in a tyre is 30 pounds per square inch. (3)

Use 1 pound = 0.45 kilograms and 1 inch = 2.54 centimetres

Convert the pressure into kilograms per square centimetre.

19. The sketch shows the lines $x = 1$ and $y = -3$. (1)



Which pair of inequalities describes the shaded region?
Tick **one** box.

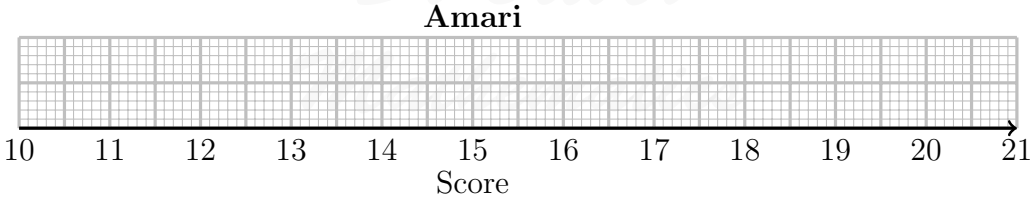
- ☐ $x < 1$ and $y < -3$
- ☐ $x < 1$ and $y > -3$
- ☐ $x > 1$ and $y > -3$
- ☐ $x > 1$ and $y < -3$

20. Amari and Ben each play a game.

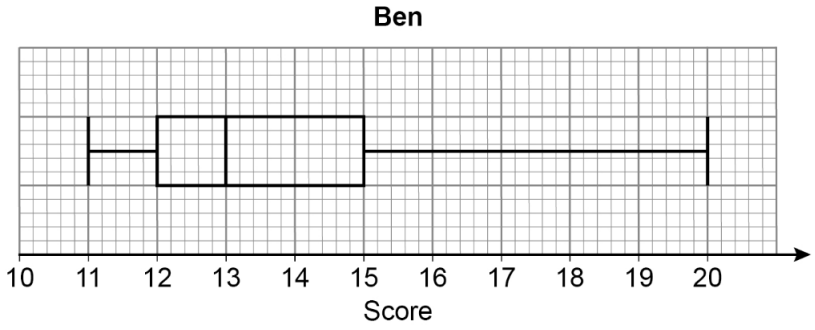
(a) Here is some information about Amari's scores. (2)

- Lowest: 12.
- Highest: 20.
- Lower quartile: 13.
- Upper quartile: 19
- Median: 17.

Draw a box plot to represent his scores.

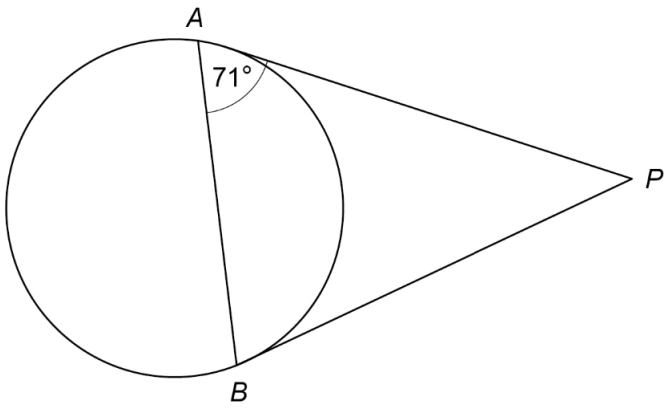


(b) This box plot represents Ben's scores. (2)



Who had more consistent scores, Amari or Ben?
Work out the interquartile ranges to support your answer.

21. (a) A and B are points on a circle. (2)
PA and PB are tangents.



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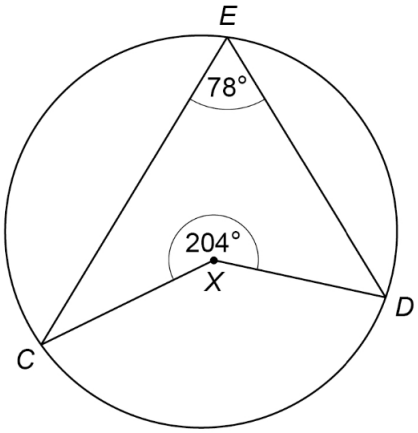
Work out the size of angle APB.

(b) C, D, and E are points on a different circle. (2)



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Is X the centre of the circle?
Tick a box.

☐ Yes ☐ No

Show working to support your answer.

22. Visitors to a museum buy a child ticket or an adult ticket. (4)
Here is some information about two groups of visitors.

Group X	250 visitors, including 120 children
Group Y	number of children : number of adults = 17 : 15

One visitor from each group is picked at random.

Is this statement correct?

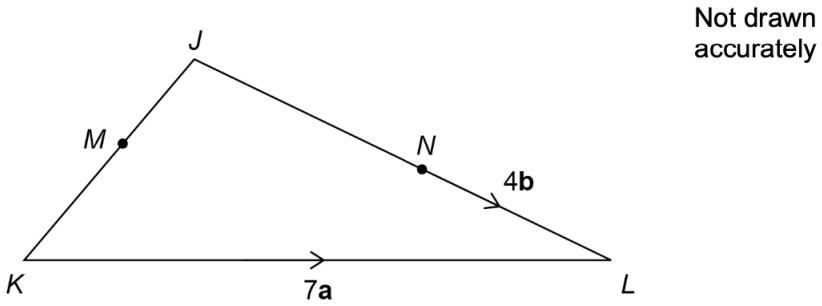
Probability of picking two children > probability of picking two adults.

You **must** show your working.

23. In triangle JKL, (3)

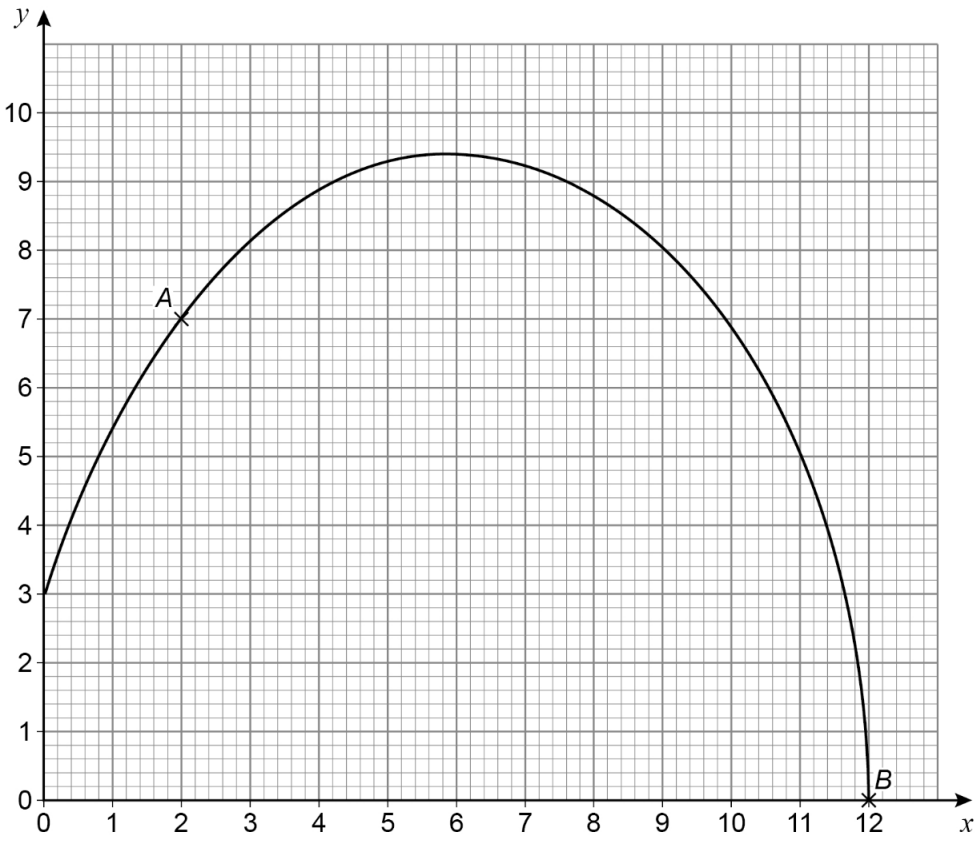
- M is the midpoint of JK,
- $JN : NL = 3 : 2$,
- $\overrightarrow{KL} = 7\mathbf{a}$, and

- $\overrightarrow{NL} = 4\mathbf{b}$.



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

24. A and B are points on a curve.
A is $(2, 7)$ and B is $(12, 0)$.



(a) Work out the instantaneous rate of change of y with respect to x at point A. (2)

(b) The average rate of change of y with respect to x between points A and B is worked out. (1)

Which statement is correct?
Tick **one** box.

- ☐ It is positive.
- ☐ It is zero.
- ☐ It is negative.
- ☐ You cannot tell if it is positive or negative.

25. The equation of a circle is (1)

$$x^2 + y^2 = 9.$$

Work out the length of the diameter.
Circle your answer.

3 6 9 18

26. Prove algebraically that (3)

$$3.4\dot{7} = \tfrac{313}{90}.$$

27. The equation of a curve is (1)

$$y = (x-1)^2 - 6.$$

Circle the coordinates of the turning point.

$(-1,-6)$ $(1,6)$ $(-1,6)$ $(1,-6)$

28. Line A has equation (4)

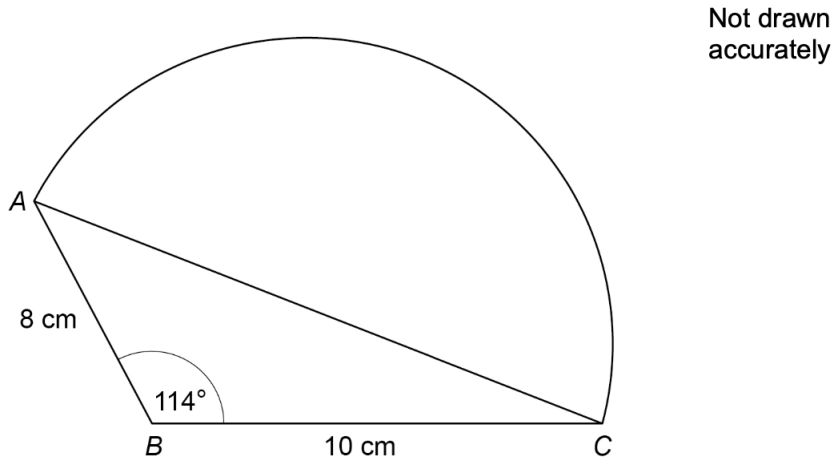
$$y = 4x - 1.$$

Line B is

- perpendicular to line A and
- passes through the point $(8,5)$.

Work out the coordinates of the point where line B intersects the x-axis.

29. A shape is made by joining triangle ABC to a semicircle with diameter AC. (5)



Work out the **total** area of the shape.

30. (4)

$$\mathrm{f}(x) = \tfrac{1}{2}x \text{ and } \mathrm{g}(x) = x - x^2.$$

Solve

$$\mathrm{f}^{-1}(x) = \mathrm{g}\,\mathrm{f}(x).$$